



INVITATION TO BID

ITB25-056

WELL REHABILITATION AND MAINTENANCE

Bid Opening: ~~November 19, 2025, 2:00:00 P.M.~~
December 3, 2025, 2:00 PM

Prebidders Conference: October 21, 2025, 10:00 A.M.

Virtual Zoom Meetings

For access, go to:

<https://pompanobeachfl.gov/pages/meetings>

SCHEDULE OF EVENTS

ITB documents and Addenda(s) are available and can be downloaded for free from the eBid System as a PDF at: <https://pompanobeachfl.ionwave.net>

ITB NUMBER:	ITB25-0567
ITB TITLE:	Well Rehabilitation and Maintenance
RELEASE DATES/TIME:	October 9, 2025, by 8:30 PM
NON-MANDATORY PRE-BID CONFERENCE (VIRTUAL)	October 21, 2025, by 10:00 AM
WRITTEN QUESTIONS AND INQUIRIES ARE DUE ON OR BEFORE:	November 7, 2025, at 12:00 PM
ITB RESPONSE DUE DATE/TIME:	~~November 19, 2025, at 2:00:00 PM~~ December 3, 2025, at 2:00 PM
RECOMMENDATION FOR AWARD:	TBD
DIRECT ALL INQUIRIES TO:	https://pompanobeachfl.ionwave.net
E-PROPOSAL SUBMITTALS ONLY:	https://pompanobeachfl.ionwave.net
PROPOSAL VIRTUAL OPENING:	https://pompanobeachfl.gov/pages/meetings

***The City may amend dates in this schedule in its sole discretion, and no rights shall accrue to any Proposer due to such amendment. Proposers may not rely on dates after the Due Date and Time until confirmed by the City. All times listed are Eastern Standard Time (EST)**



PROCUREMENT AND CONTRACTS DEPARTMENT
1010 NE 3RD AVE, POMPANO BEACH, FLORIDA 33060
Mary Rivero, Director

October 9, 2025

Dear Prospective Bidders,

SUBJECT: INVITATION TO BID (ITB) ITB25-056 Well Rehabilitation and Maintenance

The City of Pompano Beach (the "City") is interested in receiving bids in response to this Invitation to Bid (ITB) for Well Rehabilitation and Maintenance. The sole purpose and intent of this ITB is to secure firm, fixed pricing and establish a term contract for well maintenance for Water Utilities for the City of Pompano Beach.

Proposers must be registered on the City's eBid System to view the solicitation documents and respond to this solicitation. The complete solicitation document can be downloaded for free from the eBid System at <https://pompanobeachfl.ionwave.net/>. The CITY will consider the submittal of a bid as constituting an offer by the Bidder to perform the required services at the prices stated herein. The City is not responsible for the accuracy or completeness of any documentation the Bidder receives from any source other than the eBid System. The Bidder is solely responsible for downloading all required documents. Responses will be electronically unsealed in a public forum and read aloud.

Bids must be submitted electronically at <https://pompanobeachfl.ionwave.net/>, referred to hereinafter as the eBid System, on or before the date and time stated in **Section 2 —Schedule of Events. Proposals received after 2:00:00 P.M. ET on the due date will not be considered, and late bids will not be accepted.**

The Cone of Silence shall take effect once this solicitation is released to the General Public. Respondents to this solicitation or persons acting on their behalf may not contact, between the release of the solicitation and the end of the 72 hours following the agency posting the notice of intended award, excluding Saturdays, Sundays, and state holidays, any employee or officer of the executive or legislative branch concerning any aspect of this solicitation, except in writing to the procurement officer or as provided in the solicitation documents. Violation of this provision may be grounds for rejecting a response." [F.S. 287.057 (25)].

Any bidder or lobbyist for a bidder is prohibited from having any communications concerning any solicitation for a competitive procurement with any member of the City Commission, City Clerk, City Manager's Office, any Evaluation Committee Member, or any other City of Pompano Beach employee after Procurement and Contracts releases a solicitation to the General Public. All communications must go through the eBid System or through the Purchasing Agent assigned to this solicitation in the Procurement and Contracts Department. No other member of the City Commission, City Clerk, City Manager's Office, any Evaluation Committee Member, or any other City of Pompano Beach employee should be contacted concerning this ITB. Any information that amends any portion of this ITB received by any method other than an Addendum issued to the ITB is not binding on the City of Pompano Beach.

Carefully read all portions of the ITB document to ensure the Bidder's bid fully complies with all requirements.

~~Jeffrey English, Purchasing Agent~~ **Eric Seifer**

Procurement and Contracts Department
City of Pompano Beach, Florida

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SECTION 1 – Introduction and General Information

- December 3, 2025, at 2:00 PM** 1.1 **Introduction:** The City of Pompano Beach (the “City”) will receive sealed bids for Invitation to Bid (ITB) **ITB25-056 Well Rehabilitation and Maintenance**, until 2:00:00 p.m. (local) ~~November 19, 2025~~. Bids must be submitted electronically through the eBid System on or before the due date and time specified herein. Any bid received after the due date and time specified will not be considered. Any uncertainty regarding the time a bid is received will be resolved against the Bidder.

The City will select up to three (3) firms to perform Well Rehabilitation and Maintenance for the City of Pompano Beach Water Utilities. The Scope of Services, Bid Specifications, and Instructions to Bidders in **Attachment A1, A2, and B1**.

The bidder must be registered on the City’s eBid System in order to view the solicitation documents and respond to this ITB. The solicitation documents can be downloaded for free from the eBid System as a PDF at: <https://pompanobeachfl.ionwave.net>. The City is not responsible for the accuracy or completeness of any documentation the Bidder receives from any source other than the eBid System. The bidder is solely responsible for downloading all required documents. A list of Bidders will be read aloud in a public forum. To attend the virtual public meeting, go to <https://pompanobeachfl.gov/pages/meetings> to find the Zoom link.

- 1.2 **Cone of Silence Notice:** Bidders are notified that this Solicitation is subject to a “Cone of Silence”. A Cone of Silence means a prohibition on any communication regarding any particular competitive solicitation between:
- Any person who seeks an award therefrom, including a potential vendor or vendor's representative, and
 - Any member of the City Commission, all other city employees, and any non-employee appointed to evaluate or recommend selection in such procurement process. For purposes of this section, Vendor’s Representative means an employee, partner, officer, or director of a potential vendor, consultant, lobbyist, or actual or potential subcontractor or sub-consultant of a vendor.

The “cone of silence” shall terminate when the City awards or approves a contract, votes to reject all Proposals or responses, or otherwise takes action that ends the solicitation or other procurement process. If the City Commission refers the item back to the City Manager and staff for further review, the cone of silence shall remain in effect until an award is made, a contract is approved, or the City Commission takes any other action that ends the solicitation or other procurement process. Suppose a Cone of Silence is imposed for a competitive solicitation but the solicitation is not issued. In that case, the Cone of Silence shall terminate upon a final determination by the Procurement and Contracts Department that the solicitation will not be issued. When a Cone of Silence is terminated, public notice of the termination shall be posted.

- 1.3 **Line Items:** All bid figures **must** be entered into the City’s eBid System Line Items tab. **REVIEW CAREFULLY ALL INSTRUCTIONS INCLUDED IN ATTACHMENT A1.**
- 1.4 **Non-Mandatory Pre-Bidders Conference:** A non-mandatory pre-bid conference will be held on **October 21, 2025, at 10:00 AM** through Zoom meetings and in person at the Procurement and Contracts Department, 1010 NE 3 Avenue, Pompano Beach, FL 33060. Attendance is encouraged for all bidders wishing to submit a bid for this Project. The conference will provide an opportunity to discuss the bid preparation process and address any questions. None of the answers provided

during the Pre-Bidders conference reflects the City's official response and cannot bind the City. Only responses and clarification released through an Addendum in the eBid System are official.

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SECTION 2 - BIDDER'S RESPONSIVENESS AND RESPONSIBILITY

The award of the ITB shall be to the lowest responsive and responsible Bidder. In determining the lowest responsive and responsible Bidder and that the purchase or contract will best serve the interests of the City, the Commission, the City Manager, or the Procurement and Contracts Director, where applicable, shall consider various factors. These factors include, but are not limited to, price and the following:

- 2.1 **Responsiveness:** Each bid shall be reviewed in accordance with the conditions provided herein. If a Bidder fails to satisfy these conditions, the city may deem the bid non-responsive and not consider it for further review.
- a. Each Bid must be submitted prior to the deadline provided in the eBid System. Submission will not be accepted outside the eBid System, including but not limited to faxed, emailed, or hand-delivered submissions to the City's Procurement and Contracts Department. Any uncertainty regarding the time a bid is received will be resolved against the Bidder. Bidders shall contact the Purchasing Agent representative at 954-786-4098 in such a case for special permission.
 - b. Qualification of Bidders form must be completed and uploaded to the Response Attachments tab of the City's eBid System.
- 2.2 **Responsibility Documentation:** To demonstrate the Bidder's responsibility, the Bidder must submit the information provided herein to the City. Submittals requested pursuant to this paragraph are in addition to those required elsewhere. Missing any of the documents or information required, it is cause to declare the bidders non-responsive:

- a. **Bid Security Bond:** Each bid requires a cashier's check or Bid Bond executed on the prescribed form, payable to the City of Pompano Beach, P.O. Box 1300, Pompano Beach, Florida 33061, in an amount not less than five percent (5%) of the bid amount. Bidder shall upload a copy of its Bid Bond or a copy of the cashier's check to the Response Attachments tab in the eBid System. The Awarded Bidder will be required to submit the original executed Bid Bond or cashier's check prior to the execution of the contract and before the commencement of any work (**see Attachment J**).

The bid bond of the Awarded Bidder will be retained until such Bidder has executed the Contract and furnished (if required) contract security (if provided as a cashier's check or certified check), whereupon the bid security will be returned. Suppose the Awarded Bidder fails to execute and deliver the Contract and furnish the required contract security within ten (10) days after the Notice of Award. In that case, the City may annul the Notice of Award, and the bid bond of that Bidder will be forfeited. The City may retain the bid security bond of other Bidders whom the City believes to have a reasonable chance of receiving the award until a completed contract has been executed, whereupon bid security furnished by such Bidders will be returned.

If provided, the executed Bid Bond shall be issued by an entity with a registered agent in the State of Florida. If the bid is accepted, the city shall retain this check or bond as liquidated damages should the Bidder refuse or fail to enter into a contract with the City to execute the work embraced in the bid.

b. Prior Project Experience and References: Bidder must provide the following verifiable information with the bid at the time it is submitted (**see attachment E – References**):

- i. Evidence that Bidder was the Prime Contractor on three (3) municipal public supply well rehabilitation or construction projects completed (final completion) within the last five (5) years. Each project submitted as qualifying experience must be located within the continental United States, have a contract value equal to or greater than the amount specified in this Invitation to Bid (ITB), and must be of similar complexity and scope to the project described in this ITB.

Bidder must describe the following: 1) the project and the work completed by Bidder, 2) how the referenced project relates to the ITB, and 3) the amount paid to Bidder for the work completed.

- ii. At least one verifiable municipal contact (client) reference for each project described previously. The bidder must provide the client's name, phone number, and e-mail address for each project. If the Bidder has done work for the City, the City may, at its discretion, rely on the City's past performance records or may contact references. The City will only attempt to contact each reference three times.
 - iii. If the Bidder fails to provide the previously described items, or the City cannot reach a reference after three (3) attempts, the City may deem the Bidder non-responsible.
 - iv. The City reserves the right, at its sole discretion, to deem a Bidder's response non-responsible and reject it if the references submitted do not conform to the above or are deemed unsatisfactory to the City.
- c. License Requirements - Be able to provide proof of required licensure. (Such licensure must have been obtained prior to the date of Bid Submission.) The Bidder must be a Water Well Contractor licensed in the State of Florida by a Water Management District (e.g., SFWMD) and a Licensed Florida State General Contractor.
 - d. Corporations and Partnerships - The City will review the Bidder's business to confirm that it is in good standing with the Florida Department of State, Division of Corporations, based on the information provided in the Qualification of Bidders Form.
 - e. Have a satisfactory past and/or current performance record, based on the information gathered by the City regarding Bidder's performance on past or current contracts. The City shall rely on the contractor's periodic performance evaluations and any other reasonable and reliable sources within the City's organization and control from past and present City projects, where applicable.
 - f. Be financially solvent and have sufficient financial resources to perform the resulting Contract, and shall provide proof thereof of its financial solvency. At its sole discretion, the City may ask for additional proof of financial solvency, including additional documents post-bid unsealing and prior to award that demonstrate the Bidder's ability to perform the resulting contract and provide the required materials and/or services.

- g. Have the necessary production capacity, construction, and technical equipment and facilities, or the ability to obtain them.
- h. Provide satisfactory evidence that such elements as production control procedures, property control systems, quality assurance procedures, and safety programs applicable to work to be produced or services to be performed by the Bidder, Suppliers, and Subcontractors are present.
- i. Have the necessary management organization, experience, technical skills, accounting and operational controls, plan, manpower, and financial resources, and be otherwise qualified and eligible to perform the work under applicable laws and regulations.
- j. Environmental Regulations and OSHA Violations: The bidder shall submit a complete history of all citations, violations, notices, and dispositions within the Bid (see Response Attachments TAB). The City reserves the right to declare the bidder not responsible if the history of violations warrants such determination in the opinion of the City
- k. Understanding of the Project: Written understanding of the project needs and how the bidder's team intends to apply this information to benefit the City and the community.
- l. Statement of Skills and Experience of Project Team: Provide resumes for key project team members and their experience on similar projects within the last 5 years. Brief corporate background and explanation of qualifications for this particular type of project as related to key team members. Include the experience of the prime consultants as well as other members of the project team, i.e., additional personnel, sub-consultants, branch office, team members, and other resources anticipated to be utilized for this project. Name specific projects (successfully completed within the past 2 years) where the team members have performed projects with similar characteristics. Subcontractors must be preapproved by the City before initiating work on a task order.

Bidder's submission must include all required documents, certificates, and information as specified in the ITB. Failure to submit all the necessary documentation or to provide the requested information may result in the bid being deemed non-responsive and, consequently, disqualified from further consideration.

The City does not consider social, political, or ideological interest in determining the Contractor's responsibility in compliance with Florida Statute 287.05701.

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SECTION 3 - AWARD OF SOLICITATION AND RESULTING CONTRACT

- 3.1 The City reserves the right to reject any bids, to waive any informalities not involving price, time, and changes in the work, and to negotiate contract terms with the Awarded Bidder, and the right to disregard all nonconforming, nonresponsive, unbalanced, or conditional bids. Also, the City reserves the right to reject the bid of any Bidder if the City 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 responsible, or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or by the City criteria. Therefore, discrepancies between the indicated sum of any column of figures and the correctly tabulated sum of any column will be resolved in favor of the correctly tabulated sum of any column.

The City requires that all bidders submit cost estimates consistent with fair market pricing. All bids will be reviewed to ensure that proposed costs align with current industry standards for similar projects. Suppose any submitted bid is substantially higher or lower than what is deemed reasonable by prevailing market conditions. In that case, the City reserves the right to reject the bid. Such determinations will consider the overall project cost and individual line items within the bid. The City may rely on independent evaluations, cost databases, or comparative analyses to establish fair market ranges.

In submitting a bid, each bidder acknowledges and agrees that:

1. Submitted proposed costs reflect competitive pricing within the industry.
 2. Bidder understands and accepts that bids with significantly inflated or deflated costs, relative to fair market standards, may be excluded from consideration without further recourse.
- 3.2 In evaluating bids, the City will consider the bidders' qualifications, whether or not the bids comply with the prescribed requirements, and such alternates, unit prices, and other data as may be requested in the ITB or before the Notice of Award.
- 3.3 The City 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 as provided in the Supplementary Conditions. The City 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 must be submitted before the Notice of Award.
- 3.4 The City, through the Procurement and Contracts Department, may conduct such investigations as the City 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 resulting from the ITB to the City's satisfaction within the prescribed time.
- 3.5 The City reserves the right to award contracts to up to three (3) lowest responsive and responsible bidders due to this Invitation to Bid. The City may award contracts to up to three (3) bidders based on the evaluation criteria outlined in this ITB. Each awarded vendor will be responsible for its own contractual obligations and delivery of goods/services as specified.

- 3.6 The Awarded Bidder(s) will receive an automatically generated notice of award from the eBid System or an email notification from the City's Procurement and Contracts Department.
- 3.7 **City reserves the right to postpone the award of the Contract for a period which shall not exceed one hundred twenty (120) days from the Bid unsealing date.** City may, at its sole discretion, release any bid and return the Bid Security before that date. City also reserves the right to ask for additional postponement time, for which the Bidder may provide a written binding acceptance. An email to the purchasing agent from an authorized agent of the Bidder shall be considered a written, binding acceptance of the postponement time.
- 3.8 **Insurance Requirements.**
The Exhibit C includes the Insurance Requirements to be complied with by the Awarded Bidder(s), who will be required to furnish the necessary additional bond(s) for the faithful performance of the Contract Documents. All Bid Bonds, Contract Bonds, Insurance Contracts, and Certificates of Insurance shall be either executed by or countersigned by a licensed resident agent of the surety or insurance company having its place of business in the State of Florida and in all ways complying with the insurance laws of the State of Florida. Further, the said surety or insurance company shall be duly licensed and qualified to do business in the State of Florida.

Bid Bonds are required for all Bids; Performance and Payment Bonds are required for projects over two hundred thousand dollars (\$200,00.00). Performance and Payment Bonds must be recorded with Broward County. Insurance is required for all bids.

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SECTION 4 - INSTRUCTIONS TO BIDDERS AND SPECIFIC CONDITIONS

- 4.1 **Defined Terms:** Terms used in these Instructions to Bidders have the meanings assigned to them in the General Conditions. The term “Bidder” means one who submits a bid directly to the City, as distinct from a sub-bidder, who submits a bid to a Bidder. The term “Awarded Bidder” means the lowest, qualified, responsible, and responsive Bidder to whom the City (based on the City’s evaluation as hereinafter provided) makes an award. The term “ITB Documents” includes the ITB, attachments, and all addenda issued prior to receipt of bids. The term “Project” means the performance and completion of the Scope of Work included in this solicitation.
- 4.2 **Copies of ITB Documents:**
- a. Complete sets of the ITB Documents may be obtained from the City’s website at no charge.
 - b. Complete sets of ITB Documents must be used in preparing bids; the City assumes no responsibility for errors or misinterpretations resulting from incomplete sets of ITB Documents.
 - c. City, in making copies of ITB Documents available on the above terms, does so only to obtain bids on the work and does not confer a license or grant for any other use.
- 4.3 **Public Entity Crimes:** In accordance with Section 287.133 (2)(a), Florida Statutes: A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a Contractor, Supplier, Subcontractor or consultant under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided Section 287.017, Florida Statutes for CATEGORY TWO for a period of thirty-six (36) months from the date of being placed on the convicted vendor list.
- 4.4 **Drug-Free Workplace:** In accordance with Section 287.087, State of Florida Statutes, preference shall be given to businesses with Drug-Free Workplace Programs.
- 4.5 **Anti-Kickback Act:** The Awarded Bidder must comply with the Copeland “Anti-Kickback Act” (19 U.S.C. Section 874), as supplemented in the United States Department of Labor Regulations DOL 29 CFR, Part 3 (<https://www.ecfr.gov/current/title-29/subtitle-A/part-3>).
- 4.6 **Examination of ITB Documents and Sites:**
- 4.6.1 It is the responsibility of each Bidder before submitting a bid to:
- a. Examine the ITB Documents thoroughly,
 - b. Visit the site to become familiar with local conditions that may affect costs, progress, performance, or furnishing of the work,
 - c. Consider Federal, State, and Local Laws and Regulations that may affect the cost, progress, performance, or furnishing of the work,
 - d. Study and carefully correlate Bidder’s observations with the ITB Documents, and,
 - e. Notify the City Procurement and Contracts Department of all conflicts, errors, or discrepancies in the ITB Documents.

- 4.6.2 Information and data reflected in the ITB Documents concerning or contiguous to the site are based upon information and data furnished to the City by owners of such facilities or others, and the City does not assume responsibility for accuracy or completeness unless it is expressly provided otherwise.
- 4.6.3 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, underground facilities, and other physical conditions, and possible changes in the ITB Documents due to differing conditions appearing in the General Conditions section of the ITB.
- 4.6.4 Before submitting a bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any further information and data that pertain to the physical conditions (surface, subsurface, and underground facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the work and which Bidder deems necessary to determine its bid for performing and furnishing the work in accordance with the time, price and other terms and conditions of the ITB Documents.
- 4.6.5 On request in advance, the City will provide each Bidder with access to the site to conduct explorations and tests as each Bidder deems necessary for submitting a bid. Upon completion of such explorations, the bidder shall fill all holes, clean up, and restore the site to its former condition or better.
- 4.6.6 The lands upon which the work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by the Contractor in performing the work are identified in the ITB Documents. The Contractor will provide all additional lands and access required for temporary construction facilities or storage of materials and equipment. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the City unless otherwise provided in the Contract resulting from the ITB.
- 4.6.7 The electronic submission of a bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of the ITB Documents, that without exception, the bid is premised upon performing and furnishing the work required by the ITB Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the ITB Documents, and that the ITB Documents are sufficient in scope and detail to demonstrate and convey understanding of all terms and conditions for performance and furnishing of the work.

4.7 Interpretations and Addenda

- a. All questions must be submitted using the Questions feature in the eBid System. All questions must be submitted by 12:00 P.M. at least twelve (12) calendar days before the scheduled initial bid unsealing. No further questions will be accepted after this date. Oral and other interpretations or clarifications will be without legal effect.
- b. If any addendum is issued to the ITB, it will be issued via the eBid System. It shall be the responsibility of each Bidder, prior to submitting its bid, to contact the Purchasing

Agent assigned to this solicitation, Jeffrey English, at (954) 786-4098, or Jeffrey.english@copbfl.com, to determine if any addendum was issued and to make such addendum a part of its bid. The addendum will be posted in the eBid System.

- c. An addendum may also be issued to modify the ITB as deemed advisable by the City.

4.8 Contract Time:

The initial term of this contract shall commence on the date the Commission approves the contract and shall continue in effect for three (3) years, unless terminated earlier in accordance with the terms of this Agreement. Upon the expiration of the initial term, the Contract may be renewed for up to two (2) additional one (1) year periods ("Renewal Terms"), provided that the Contractor provides written notice of its intent to renew at least 90 days before the expiration of the then-current term.

The Contractor must be able to coordinate and complete the projects within the scheduled time. The Contractor shall perform all services, deliverables, and work required under this Contract on an "on-call" basis, as requested by the City. The City shall issue task orders or work directives specifying each assignment's scope, schedule, and specific deliverables.

The Contractor shall respond to each task order or work directive within the time frame requested by the City or based on a schedule and shall complete the work within the timeframe specified in each task order or schedule.

4.9 Liquidated Damages: Provisions for liquidated damages, if any, are outlined in Exhibit B - Contract General Conditions.

4.10 Indemnification: All Bidders must enter in the "Line Items" tab of the City's eBid System the amount of consideration required by the Bidder in return for the Bidder's promise of indemnity contained in the General Conditions section of the ITB.

4.11 Substitute or "Or-Equal" Items: The Contract, if awarded, shall 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 the Awarded Bidder/Contractor if acceptable to the City, application for such acceptance will not be considered by the City until after the effective date of the Contract.

4.12 Subcontractors, Suppliers, and Others.

- a. Each bid must identify the names and addresses of Subcontractors, Suppliers, and other persons and organizations, including those to furnish the principal items of material and equipment listed in the "Line Items" tab of the City's eBid System. If requested, the apparent lowest Bidder, and any other Bidder so requested, shall, within seven (7) days after the ITB opening, submit to the City 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 a list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each Subcontractor, Supplier, other persons, or organization, if requested by the City. Suppose the City has a reasonable objection to any proposed Subcontractor, Supplier, other person,

or organization. In that case, it may, before the Notice of Award is given, request the apparent lowest Bidder to submit an acceptable substitute without an increase in Bid Price. If the evident lowest Bidder declines to make any such substitution, the City 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, other person, or organization listed and to whom the City does not make a written objection prior to the giving of the Notice of Award will be deemed acceptable to the City, subject to revocation of each acceptance after the Effective Date of Contract.

- b. In contracts where the Contract Price is based on the cost of the work plus a fee, the apparent lowest Bidder, prior to the Notice of Award, shall identify in writing to the City 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 the City's written consent.
- c. No Contractor shall be required to employ any Subcontractor, Supplier, other person, or organization against whom the Contractor has a reasonable objection.

4.13 Bidder Acknowledgment (See SECTION 6)

- a. The Bidder Acknowledgement is included with the ITB.
- b. All requested information on the Bidder Acknowledgement will be provided electronically using the City's eBid System.
- c. In case of a discrepancy between unit prices and totals, unit prices will prevail.

4.14 Submission of Bids

- a. Bids shall be submitted electronically using the City's eBid System on or before the due date and time specified herein.
- b. More than one bid received for the same work from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. Reasonable grounds for believing that any Bidder is interested in more than one bid for the same work will cause the rejection of all such bids in which the Bidder is interested. If there are reasonable grounds for believing that collusion exists among the Bidders, the bids of participants in such collusion will not be considered.
- c. Bid tabulations will be posted in the City's eBid System. Bid results **will not** be read to you over the phone.

4.15 Modification and Withdrawal of Bids

- a. Bids may be modified or withdrawn at any time prior to the due date and time of the opening of bids by using the "Retract" feature of the City's eBid System.

- b. After bids are opened, and the Awarded Bidder defaults on a City Contract, the Awarded Bidder may be banned from doing business with the City for thirty-six (36) months from the default date.

4.16 Unsealing of Bids: A list of Bidders will be read aloud in a public forum. Bidder pricing will be made public only when the tabulation is posted. An abstract of the amounts of the base bids and major alternates (if any) will not be made available to Bidders until the tabulation is posted.

4.17 Bids To Remain Subject To Acceptance

- a. All bids will remain subject to acceptance for one hundred and twenty (120) days after the day of the bid deadline, but the City may, in its sole discretion, release any bid and return the Bid Security prior to that date.
- b. Extensions of time when bids shall remain open beyond the one hundred and twenty (120) day period may be made only by mutual agreement between the City, the apparent lowest responsive and lowest responsible bidder, and the surety, if any, for the Awarded Bidder.

4.18 Contract Security: For projects over two hundred thousand dollars (\$200,000), when the Awarded Bidder delivers the executed Contract to the City, it must be accompanied by the required Performance and Payment Bonds. Performance and Payment bonds must be recorded with Broward County.

4.19 Execution of Contract: When the City recommends awarding a vendor a contract to the lowest responsible and responsive bidder, the signed Contract by the vendor will be presented to the commission for approval. Within ten (10) days thereafter, the Contractor shall provide all required documents to the City with the required Bonds. Within fifteen (15) days thereafter, the City shall deliver one fully signed counterpart to the Contractor.

4.20 Employment Eligibility: By entering into a resulting contract with the City, the Contractor must comply with the provisions of Section 448.095, Fla. Stat., "Employment Eligibility." This includes but is not limited to the utilization of the E-Verify System to verify the work authorization status of all newly hired employees and requiring all subcontractors to provide an affidavit attesting that the subcontractor does not employ, contract with, or subcontract with an unauthorized alien. Failure to comply will lead to termination of the Contract, or if a subcontractor knowingly violates the statute, the subcontract must be terminated immediately. Any challenge to termination under this provision must be filed in the Circuit or County Court no later than 20 calendar days after the termination date. If this awarded contract is terminated for a violation of the statute by the Contractor, the Contractor may not be awarded a public contract for 1 year after the termination date.

4.21 Taxes: The Contractor shall pay all applicable sales, consumer, use, and other similar taxes required by law. The Contractor is responsible for reviewing the pertinent state statutes involving the sales tax and complying with all requirements.

4.22 Notice To Contractor: Pursuant to Chapter 8 CFR 274a.2” (see link) <https://www.govinfo.gov/content/pkg/CFR-2017-title8-vol1/pdf/CFR-2017-title8-vol1-sec274a-2.pdf>, the employment of unauthorized aliens by any Contractor is considered a violation of the

Immigration and Nationality Act. If the Contractor knowingly employs unauthorized aliens, such a violation shall cause unilateral cancellation of the Contract.

4.23 Non-Discrimination: There shall be no discrimination as to race, color, sex, religion, national origin, disability, age, marital status, political affiliation, sexual orientation, pregnancy, or gender identity and expression in the operations conducted under the Contract.

4.24 Occupational Health and Safety: In compliance with Section 442, Florida Statutes, any items included in the latest edition of "Florida Substance List", which are delivered from a Contract resulting from the ITB, must be accompanied by a Safety Data Sheet (SDS). The SDS must be maintained by the City and must include the following information:

- a. The chemical name and the common name of the toxic substance.
- b. The hazards or other risks in the use of toxic substances, including:
 - i. The potential for fire, explosion, corrosiveness, and reactivity.
 - ii. The known acute and chronic health effects of risks from exposure, including the medical conditions that are generally recognized as being aggravated by exposure to the toxic substance; and
 - iii. The primary routes of entry and symptoms of overexposure.
- c. The proper precautions, handling practices, necessary personal protective equipment, and other safety precautions in the use of or exposure to toxic substances, including appropriate emergency treatment in case of overexposure.
- d. The emergency procedure for spills, fire disposal, and first aid.
- e. A description in lay terms of the known specific potential health risks posed by the toxic substance, intended to alert any person reading this information.
- f. The year and month, if available, the information was compiled, and the name, address, and emergency telephone number of the manufacturer responsible for preparing the information.

Any questions regarding Section 442, Florida Statutes, should be directed to:

Department of Labor and Employment Security, Division of Safety, 2002 Old St. Augustine Road, Tallahassee, Florida, 32399; telephone: 1-800-367-4378.

ALL TOXIC SUBSTANCES MUST BE LABELED FOR IDENTIFICATION, IN ACCORDANCE WITH OSHA. STANDARDS.

Notice: For the City to process payment, your invoice must reference the federal ID number. Please note the ID number on the Bid Response page.

4.25 Waste Removal Services: The City has contracted with Coastal Waste & Recycling, Inc., for residential and commercial solid waste collection and disposal services. The City has granted to Coastal Waste & Recycling, Inc., the sole and exclusive right, franchise, license, and privilege to provide non-hazardous solid waste collection, removal, and disposal services within the corporate limits of the City, including collection and removal of certain Construction and Demolition Debris.

The Awarded Bidder/Contractor shall coordinate with Coastal Waste & Recycling, Inc., the level and type of service to be provided, and the manner of collection charges. Any Contractor or Subcontractor performing construction work within the City of Pompano Beach must use the City's franchised hauler for garbage removal services, including removal of Construction and Demolition Debris generated over ten (10) cubic yards, with the exception of Source Separated Recovered Materials as defined in Section 403.703(24), Florida Statutes and Chapter 96 of the City Ordinance. The City's current franchised hauler is Coastal Waste & Recycling, Inc., which may be contacted directly for dumpsters and/or roll-offs at:

Coastal Waste & Recycling, Inc.
1840 NW 33rd Street
Pompano Beach, FL 33064
(954) 947-4000

- 4.26. Conflict of Interest:** Section 112.313 (3) and (7), Florida Statutes, sets forth restrictions on the ability of City employees acting in a private capacity to rent, lease, or sell any realty, goods, or services to the City. It also places restrictions on the City employees concerning outside employment or contractual relationships with any business entity that is doing business with the City. If any employee is identified by the Proposer when completing the Attribute, they should obtain legal advice as to their obligations and restrictions under Section 112.313 (3) and (7), Florida Statutes.
- 4.27. Protesting of Bid Conditions/Specifications:** Any person desiring to protest the conditions/specifications in this ITB, or any Addenda subsequently released thereto, shall file a notice of intent to protest, in writing, within 72 hours after the electronic release of the competitive solicitation or Addendum and shall file a formal written protest within ten (10) calendar days after the date the notice of protest was filed. Fridays, Saturdays, Sundays, state holidays, or days during which the City administration is closed shall be excluded from the computation of the 72 hours. Suppose the tenth calendar day falls on a Friday, Saturday, Sunday, state holiday, or day during which the City administration is closed. In that case, the formal written protest must be received on or before 5:00 p.m. ET of the following calendar day that is not a Friday, Saturday, Sunday, state holiday, or day during which the City administration is closed. Section 120.57(3)(b), Florida Statutes, as currently enacted or as amended from time to time, states that "The formal written protest shall state with particularity the facts and law upon which the protest is based." Failure to file a notice of protest or to file a formal written protest within the time prescribed by Section 120.57(3), Florida Statutes, shall constitute a waiver of proceedings. Notices of protest, formal written protests, and the bonds required by the General Services Procedures Manual shall be filed at the office of the Director, Procurement and Contracts, 1010 NE 3 Avenue, Pompano Beach, FL 33060.
- 4.28. Posting of Bid Recommendations / Tabulations:** ITB Recommendations and Tabulations will be posted on <http://www.pompanobeachfl.ionwave.net> and will remain posted for 72 hours. Any change to the date and time established herein for the posting of ITB Recommendations/Tabulations shall be posted in Procurement and Contracts and/or at <http://www.pompanobeachfl.ionwave.net>. If the date and time of the posting of ITB Recommendations/Tabulations are changed, each Bidder is responsible for ascertaining the revised date of the posting of ITB Recommendations/Tabulations. Any person desiring to protest the Recommendation/Tabulations shall file a notice of intent to protest, in writing, within 72 hours after the posting of the ITB Recommendation/Tabulation and shall file a formal written protest within ten (10) calendar days after the date the notice of intent to protest was filed. Fridays, Saturdays, Sundays, state holidays, and days during which the City

administration is closed shall be excluded from the computation of the 72 hours. Suppose the tenth calendar day falls on a Friday, Saturday, Sunday, state holiday, or day during which the City administration is closed. In that case, the formal written protest must be received on or before 5:00 p.m. ET of the following calendar day that is not a Friday, Saturday, or Sunday, state holiday, or days during which the City administration is closed. No submissions made after the Bid opening, amending, or supplementing the Bid shall be considered. Section 120.57(3)(b), Florida Statutes, as currently enacted or as amended from time to time, states that “The formal written protest shall state with particularity the facts and law upon which the protest is based”. Any person who files an action protesting an intended decision shall physically deliver and post with the City, at the time of filing the formal written protest, an original bid protest bond, payable to the City, in an amount equal to one percent (1%) of the City’s estimate of the total volume of the contract. The City shall provide the estimated contract amount to the Proposer within 72 hours, excluding Fridays, Saturdays, Sundays, and other days during which the City administration is closed, of receipt of notice of intent to protest. The estimated contract amount is not subject to protest pursuant to Section 120.57(3), Florida Statutes. The bid protest bond shall be conditioned upon the payment of all costs which may be adjudged against the protester in an Administrative Hearing in which the action is brought and in any subsequent appellate court proceeding. In lieu of a bid protest bond, the City may accept a cashier's check, official bank check, or money order in the amount of the bond. If, after completion of the Administrative Hearing process and any appellate court proceedings, the City prevails, the City shall recover all costs and charges, which shall be included in the Final Order or judgment, including charges made by the Division of Administrative Hearings, but excluding attorney's fees. The bid protest bond shall be returned upon payment of such costs and charges by the protestant. If the protester prevails, then the protester shall recover from the City all expenses and charges incurred by the City. Payment options can be made by electronic check (e-check), Visa, MasterCard, or by using an established escrow account code.

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SECTION 5 - LOCAL BUSINESS PROGRAM

On March 13, 2018, the City Commission approved Ordinance 2018-46, establishing a Local Business Program, a policy to increase the participation of City businesses in the City's procurement process.

For purposes of this solicitation, “Local” will be defined as follows:

1. **TIER 1 LOCAL VENDOR. POMPANO BEACH BUSINESS EMPLOYING POMPANO BEACH RESIDENTS.** A business entity that has maintained a permanent place of business within the city limits and maintains a staffing level, within this local office, of at least ten percent (10%) who are residents of the City of Pompano Beach or includes subcontracting commitments to Local Vendor Subcontractors for at least ten percent of the contract value. The permanent place of business may not be a post office box. The business must be located in a non-residential zone and must actually distribute goods or services from that location. The business must be staffed with full-time employees within the limits of the City. In addition, the business must have a current business tax receipt from the City for a minimum of one year prior to the date of issuance of the current solicitation.
2. **TIER 2 LOCAL VENDOR. BROWARD COUNTY BUSINESS EMPLOYING POMPANO BEACH RESIDENTS OR UTILIZING LOCAL VENDOR SUBCONTRACTORS.** A business entity, which has maintained a permanent place of business within Broward County and maintains a staffing level, within this local office, of at least fifteen percent (15%) who are residents of the City of Pompano Beach or includes subcontracting commitments to Local Vendor Subcontractors for at least twenty percent (20%) of the contract value. The permanent place of business may not be a post office box. The business must be located in a non-residential zone and must actually distribute goods or services from that location. The business must be staffed with full-time employees within the limits of the city. In addition, the business must have a current business tax receipt from the respective Broward County municipality for a minimum of one year prior to the date of issuance of a solicitation.
3. **LOCAL VENDOR SUBCONTRACTOR. POMPANO BEACH BUSINESS.** A business entity, which has maintained a permanent place of business within the city limits of the City of Pompano Beach. The permanent place of business may not be a post office box. The business must be located in a non-residential zone and must actually distribute goods or services from that location. The business must be staffed with full-time employees within the limits of the city. In addition, the business must have a current business tax receipt from the City of Pompano Beach for a minimum of one year prior to the date of issuance of a solicitation.

You can view the list of City businesses that have a current Business Tax Receipt on the City’s website and locate local firms that are available to perform the work required by the ITB specifications. The business information, sorted by business use classification, is posted on the webpage for the Business Tax Receipt Division: www.pompanobeachfl.gov by selecting the Pompano Beach Business Directory in the section “Shop Pompano!”.

The City of Pompano Beach is strongly committed to ensuring the participation of City Businesses as Contractors and Subcontractors for the procurement of goods and services, including labor,

materials, and equipment. Bidders are required to participate in the City of Pompano Beach's Local Business Program by including, as part of their package, the Local Business Participation Form (Exhibit A) listing the local businesses that will be used on the Contract and the Letter of Intent Form (Exhibit B) from each local business that will participate in the Contract.

For the list of certified minority businesses in the State of Florida, please see the following link: https://www.dms.myflorida.com/business_operations/state_purchasing/office_of_supplier_development_osd/certified_vendor_reports

Suppose a Prime Contractor/Vendor cannot achieve the goal attainment of the Contract. In that case, the Prime Contractor/Vendor will be requested to demonstrate and document that good faith efforts were made to achieve the goal by providing the Local Business Unavailability Form (Attachment C), listing firms that were contacted but not available, and the Good Faith Effort Report (Attachment D), describing the efforts made to include local business participation in the Contract. This documentation shall be provided to the City Commission for acceptance.

The Awarded Bidder/Contractor will be required to submit "Local Business Subcontractor Utilization Reports" during projects and after projects have been completed. The reports will be submitted to the assigned City project manager of the project. The Local Business Subcontractor Utilization Report template and instructions have been included in the ITB document.

Failure to meet Local Vendor Goal commitments will result in an "unsatisfactory" compliance rating. Unsatisfactory ratings may impact the award of future projects if a sanction is imposed by the City Commission.

The City shall award a Local Vendor preference based upon vendors, Contractors, or Subcontractors who are local with a preference as follows:

1. For bid evaluation purposes, Tier 1 businesses, as defined by this subsection, shall be granted a preference in the amount of five percent (5%) of any bid. If the Tier 1 business submits a second bid that is at least one percent (1%) lower than that lowest responsive bid, then the award will go to the Tier 1 business. If not, the award will be made to the business that submits the lowest responsive bid. If the lowest responsive and responsible Bidder is also a Tier 1 business, the award will be made to that business, and no other Bidders will be given an opportunity to submit additional bids as described herein.
2. For bid evaluation purposes, Tier 2 businesses, as defined by this subsection, shall be granted a preference in the amount of two and one-half percent (2-1/2 %) of any bid or any proposal score. If the Tier 2 business submits a second bid, which is at least one percent lower than that lowest responsive bid, then the award will go to the Tier 2 business. If not, the award will be made to the business that submits the lowest responsive bid. If the lowest responsive and responsible Bidder is also a Tier 1 business, the award will be made to that business and no other Bidders will be given an opportunity to submit additional bids as described herein.
3. If there is a Tier 1 business and/or Tier 2 business participating in the same ITB and all businesses qualify to submit a second bid as previously detailed, the Tier 1 business will be given the first option, and the Tier 2 business will be given the second option. If the Tier 1 business is not the lowest bid received by at least one percent (1%), then an opportunity will be given to the Tier 2 business. If the Tier 2 business is not the lowest bid by at least one percent

(1%), then the bid will be awarded to the lowest Bidder regardless of the geographic location of the business.

4. The awarded Bidder/Contractor is responsible for complying with all Tier 1 & 2 guidelines and ensuring that all requirements are met before executing a Contract.

The required goal for this ITB is ten percent (10%) for Local Vendor participation.

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SECTION 6 - BIDDER ACKNOWLEDGEMENT

- 6.1 The Bidder submits and agrees, if its bid is accepted, to enter into a Contract with the City in the form included in the ITB to perform and furnish all work as specified or indicated in the Sample Contract Documents for the Contract Price and within the Contract Time indicated in this bid and in accordance with the other terms and conditions of the Sample Contract resulting from the ITB.
- 6.2 Bidder accepts all of the terms and conditions of the ITB Documents, including, without limitation, those dealing with the disposition of Bid Security and the Sample Contract. The bid will remain subject to acceptance for one hundred twenty (120) days after the Bid unsealing. Bidder will sign and submit the Contract with the bonds and other documents required by Bidding Requirements within ten (10) days after the City's Notice of Award date.
- 6.3 In submitting its bid, Bidder represents, as more fully set forth in the Contract, that:
- a. Bidder has examined copies of all the ITB documents and the addendum/addenda.
 - b. Bidder has familiarized itself with the nature and extent of the ITB Documents, work, site, locality, and all local conditions, laws, and regulations that may affect the cost, progress, performance, or furnishing of the work in any manner.
 - c. Bidder has studied carefully all reports and drawings of physical conditions that are identified in the ITB.
 - d. Bidder has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, and studies [in addition to or to supplement those referred to in (c) above], which pertain to the subsurface or physical conditions at the site or otherwise may affect the cost, progress, performance or furnishing of the work as Bidder considers necessary for the performance or furnishing of the work at the Contract Price within the Contract Time and in accordance with the other terms and conditions of the ITB Documents, and no additional examinations, investigations, explorations, tests, reports or similar information or data are or will be required by Bidder for such purposes.
 - e. Bidder has reviewed and checked all information and data shown or indicated on the ITB Documents with respect to existing site conditions and assumes responsibility for such. No additional examinations, investigations, explorations, tests, reports, or similar information or data in respect of said site area will be required by Bidder in order to perform and furnish the work at the Contract Price, within the Contract Time and in accordance with other terms and conditions of the ITB Documents.
 - f. Bidder has correlated the results of all such observations, examinations, investigations, explorations, tests, reports, and studies with the terms and conditions of the ITB Documents.
 - g. Bidder has given the City written notice of all conflicts, errors, or discrepancies that it has discovered in the ITB Documents, and the City's written resolution of these is acceptable to Bidder.
 - h. This bid is genuine and not made in the interest or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, or

corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham bid; Bidder has not solicited or induced any person, firm or corporation to refrain from Bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over the City.

- 6.4. Bidder agrees that all Federal, State, and Local sales and use taxes are included in the stated Bid Prices for the work.
- 6.5. Bidder further proposes to accept as full payment for the work proposed herein the amounts computed under the provisions of the Contract Documents and based on the unit prices herein (if applicable) represent a true measure of the labor, materials, equipment and any other incidentals required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in these Contract Documents.

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SECTION 7 – ITB ATTRIBUTES (this is a TAB in the eBid system IonWave). PROVIDE THIS INFORMATION ELECTRONICALLY.

This TAB includes the following Attributes:

1. Drug-Free Workplace
2. Conflict of Interest
3. Vendor Certification Regarding Scrutinized Companies Lists (Any Dollar Amount)
4. Terms & Conditions
5. Acknowledgement of Addenda
6. Local Business Participation Percentage
7. Extension of prices, terms, and conditions to other governmental entities

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SECTION 8 – ATTACHMENTS (attachment in the eBid system IonWave)

1. Attachment A1 General Information
2. Attachment A2 Technical Specifications
3. Attachment B1 Maps and Well Database
4. Attachment E - References
5. Attachment H - W9
6. Attachment I - Construction Agreement (DRAFT)
7. Exhibit B - General Conditions
8. Exhibit C – Insurance Requirements
9. Attachment J - Bid Bond Form
10. Local Business Program Forms (forms A, B, C, and D)

END OF THE INVITATION TO BID

ATTACHMENT A

SCOPE OF SERVICES, SPECIFICATIONS, AND BID INSTRUCTIONS

PURPOSE AND INTENT

The sole purpose and intent of this Invitation to Bid (ITB) is to secure firm, fixed pricing and establish a term contract for well maintenance for Water Utilities for the City of Pompano Beach.

GENERAL

- A. The work covered by these specifications generally comprises furnishing all labor, materials, equipment, supplies, tools, and manufactured articles of every kind required to conduct the work as described in the contract documents.
- B. The work described in these Specifications is for the maintenance of Production Wells as identified City of Pompano Beach wellfields. Appendix A provides maps illustrating the locations of the wellfields and production wells. Appendix B provides information on the wells from the production well database. The project scope of work shall include but is not limited to work performing treatment and biological testing, rehabilitation, step drawdown testing, pump and motor assessment/replacement, column pipe replacement, stilling well pipe replacement, repair and replacement of associated appurtenances and other well maintenance service work as necessary as identified on the selected production and monitoring wells.

MEASUREMENT AND PAYMENT

SUMMARY: Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Form, and all costs therefore shall be included in the prices named in the Bid Form for the various appurtenant items of work. Payment for Work will only be for bid items identified by the OWNER and completed by the CONTRACTOR.

- A. The omission of reference to any item in this description shall not alter the intent of the Bid Form or relieve the CONTRACTOR of the necessity of furnishing such as a part of the Contract.
- B. The unit prices as provided in the detailed Schedule of Values are used for periodic partial payments for Work performed, for determining the value of additions and/or deletions associated with approved Change Orders to the Contract, and wherever else reasonable.

MEASUREMENTS - GENERAL

- C. Units of measure shown on the Bid Summary Sheet shall be as follows unless otherwise specified in the Contract Documents.

UNIT	MEASUREMENT
CF	Cubic Feet – Field measure by ENGINEER within the limits specified or shown
CY	Cubic Yards – Field measure by ENGINEER within the limits specified or shown
EA	Each – Field Count
HR	Hours – Number of hours of work performed as documented by the ENGINEER
LF	Linear Feet – Field Measure by ENGINEER
LS	Lump Sum – Unit is one. No measurement will be made.
SF	Square Feet – Field measure by ENGINEER within the limits specified or shown
SY	Square Yards – Field measure by ENGINEER within the limits specified or shown
DY	Day – Day Count
Gal	Gallons – Field Measure by ENGINEER
AL	Allowance – To be authorized by OWNER

1.00 **BASIS FOR PAYMENTS:** The descriptions provided in this Section generally outline the Scope of Work required for those elements of the WORK to be paid for under each item listed in the Bid Form and provided in the Schedule of Values.

A. The CONTRACTOR shall submit the initial Schedule of Values in an electronic spreadsheet (Microsoft Excel) format prior to commencing work. The Schedule of Values activities shall match the Bid Form. Each activity in the Schedule of Values shall also indicate the material quantity, unit price and total price. Schedules not containing the required format shall be rejected.

1.01 **BID ITEMS**

The CONTRACTOR shall include costs to complete all work described in the Specifications and scope of work as part of their Bid package.

A. Bid Items I – General

Item No. I-1: Maintenance of Traffic Control. All costs associated with traffic Control as required for a well site. Payment will be made the amount of time in Days as stated in the CONTRACTOR's bid Payment will be in accordance with the cost breakdown as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. I-2: Mobilization/Demobilization. Mobilization and Demobilization associated with

all rehabilitation activities associated with the Work. The CONTRACTOR will be responsible for mobilizing and demobilizing all equipment, excess materials, and debris from site. The amount bid shall include site prep, cleanup, the removal of all trash and debris, load, transport, and discard in a lawful manner, including all tipping fees; the CONTRACTOR shall also restore the site to original or better including restoring any disturbed sodding, sidewalks, paving, and landscaping.

Mobilization/Demobilization will be paid as a lump sum amount as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

This item should include the costs of bonds, required insurance, and other preconstruction expenses, but will exclude the actual cost of permits, which are paid under a separate dedicated allowance, and will exclude the costs of materials which are paid under other bid items.

- a. No actual construction or physical preparatory work may be performed at the site until the WORK of this item has been successfully achieved unless specific written approval by the OWNER is granted for said WORK. Such permission by the OWNER will only be granted if all bond and insurance is in place and a complete Schedule of Values and Baseline Construction Schedule has been supplied by the CONTRACTOR and approved by the OWNER.
- b. The mobilization item will be paid for in the first four payments, each equal to twenty-five percent of the amount bid for this item, which will be made conditioned upon progress satisfactory to the OWNER being made pursuant to the accepted Project schedule.
- c. The total amount of the payment may not exceed five percent (5%) of the original Subtotal. Retainage, as specified in the General Terms and Conditions and any Special Provisions will apply to these payments.
- d. Since this item is bid as a lump sum, payment will be in accordance with the cost breakdown as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. I-3: Drill Rig and Crew (service truck included). Payment will be in accordance with the unit price bid per hour for drill rig and crew as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. I-4: Crane Truck with Crew (service truck included). Payment will be in accordance with the unit price per hour for crane truck with crew as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. I-5: Site Restoration Allowance: Payment will be for site restoration as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. I-6: Individual Production Well Report Preparation Documenting Work Performed

and Data. Preparation Documenting Work Performed and Data. Payment will be for each report as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

B. Bid Items II – Wellfield Maintenance: Monitoring Wells

Item No. II-1: Water Discharge and Disposal Setup and Removal. This item will be paid per well site at the unit price bid for each occurrence as stated in the CONTRACTOR's bid as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. II-2: Combined Static and Dynamic Down-hole View & Side View Color 360 Degree Video Survey Logging of Monitoring Well (with bidder's Pump: Pre-Rehabilitation video and Post- Rehabilitation video). Payment will be for each combined static and dynamic down-hole view & side view color video survey logging of the monitoring well in accordance with the unit price as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. II-3: Clear Debris/Obstruction from Monitoring Well. Payment will be per hour to clear debris/obstructions from the monitoring well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No II-4: Clean Monitoring Well Casing and Screen with Casing by Scraper, Swabbing & Brushing, cut and remove roots. Payment will be for each occurrence to clean the monitoring well casing and screen with casing scraper swabbing & brushing as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. II-5: Monitoring Well Plugging and Abandonment (cement grout not included). Payment will be for each monitoring well abandoned as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER. The CONTRACTOR shall use cement ASTM C-150 Type II Portland neat cement above the fine sand layer when abandoning the well.

Item No. II-6: Neat Cement Grout for Well Plugging Abandonment. Payment will be cubic feet of cement used as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No II-7: Monitoring Well Replacement, 4-inch Diameter Sch 40 PVC Installation – Shallow (complete). Payment will be for each monitoring well as stated in the CONTRACTOR's bid and as approved by the OWNER and measure as required by and satisfactory to the OWNER.

Item No II-8: Monitoring Well Replacement, 4-inch Diameter Sch 40 PVC Installation – Deep (complete). Payment will be for each monitoring well as stated in the CONTRACTOR's bid and as approved by the OWNER and measure as required by and satisfactory to the OWNER.

C. Bid Items III – Wellfield Maintenance: Production Wells

Item No. III-1: Water Discharge and Disposal Setup and Removal for Production Well. This item will be paid per well site at the unit price bid for each occurrence as stated in the CONTRACTOR's bid as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-2: Pump Curve Testing and Wire-to-Water Testing for Production Well. This item will be paid per test at the unit price bid for each occurrence as stated in the CONTRACTOR's bid as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-3: Removal of Production Wellhead, Column Pipe, Pump & Motor, and Appurtenances. Payment will be for the removal of production wellhead, piping, pump & motor, and appurtenances for each production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-4: Pre-Rehabilitation Specific Capacity Test and Post-Rehabilitation Specific Capacity Test of Production Well. Payment will be paid for each set of pre-rehabilitation and post-rehabilitation specific capacity tests for the Production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-5: Combined Static and Dynamic Down-hole View & Side View Color Video Survey Logging of Production Well (with Bidder's Pump: Pre-Rehabilitation Video and Post-Rehabilitation Video). Payment will be for each combined static and dynamic down-hole view & side view color video survey logging of production well in accordance with the unit price as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-6: Geophysical Logging: Includes the Cost for Each Individual Log to be Performed as Needed. Individual Logs are as follows: XY Caliper and Gamma Ray (XYC) and Gamma Ray (GR). Payment will be for each individual geophysical log (XYC and GR) as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-7: Clear Debris/Obstruction from Production Well. Payment will be per hour to clear debris/obstructions from the production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-8: Well Acidization Mobilization for Production Well. Payment will be for each mobilization as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-9: Well Acidization Treatment with 32% HCL for Production Well. Payment will

be for each well acidization with 32% HCL as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-10: Clean Production Well Casing and Screen using Casing Scraper, Brushing and Swabbing methods for Well Production Well. Payment will be per hour to clean the Production Well Casing and Screen for the production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-11: Jetting and Redevelop Production Well. Payment will be per hour of jetting and redevelopment of the production well as stated in the CONTRACTOR's bid and approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-12: Furnish and Install Additional Gravel into Production Well Screen Gravel Pack. Payment will be per cubic feet for the furnishing and installing additional gravel into production well screen gravel pack as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-13: Well Plugging and Abandonment for Production Well (cost of cement grout not included). Payment will be for each well plugged and abandoned as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-14: Neat Cement Grout for Production Well Plugging Abandonment. Payment will be cubic feet of cement used as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER. The CONTRACTOR shall use cement ASTM C-150 Type II Portland neat cement above the fine sand layer when abandoning the well.

Item No. III-15: Backplugging of Production Well. Payment will be cubic feet of cement used as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-16: Well Development and Redevelopment by Airlift with 600 to 1,000 SCFM Air Compressor for Production Well. Payment will be in accordance with the hours required to complete well development and redevelopment using the airlift method using 600 to 1,000 SCFM air compressor as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-17: Well Development Bidder's Pump and Flow Meter (capable of pumping at 2 times the design rate in gallons per minute (gpm) of Production Well. Payment will be in accordance with the hours required to complete well development using the BIDDERS's pump and flow meter (capable of pumping at 2 times the design rate in gpm) as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-18: Disposal of Development Solids Requiring Containerization and Proper Disposal by Bidder for Production Well. Payment will be for each event associated with the disposal of solids related to development activities as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-19: Disposal of Development Water to Approved Location for Production Well. Payment will be for each well site for hauling discharge water and disposal as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-20: Sand Content Testing for Production Well (by Rossum Sand Tester): Payment will be for each Sand Content Test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-21: Silt Density Index (SDI) Testing for Production Well (passing only, $SDI < 3$). Payment will for each Silt Density Index Test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-22: Step Drawdown Testing for Production Well. Payment will be for each Step Drawdown Test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-23: Disinfect Well/Chlorinate Well, and Pump and Pump Assembly per AWWA Standards for Production Well. Payment will be for each chemical treatment with chlorine solution and wastewater chlorine neutralization for each site as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-24: Biological Activity Reaction Tests (BART™ Iron Related Bacteria, Slime Forming Bacteria, Sulfate Reducing Bacteria) for Production Well. Payment will be for each test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-25: Reinstall Production Wellhead, Column Pipe, Pump & Motor, and Appurtenances. Payment will be for the reinstallation of wellhead, piping, pump & motor, and appurtenances for each well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. III-26: Water Sample Collection and Laboratory Bacteriological Analysis for Production Well. Payment will be for each sample collected as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

D. Bid Items III – Wellfield Maintenance: Additional As-Needed Work

Item No IV-1: Furnish and Install Production Well Replacement Column Pipe. Payment will be in accordance with the cost as stated in the CONTRACTOR's bid and as approved by the OWNER and measure as required by and satisfactory to the OWNER.

Item No IV-2: Furnish and Install Production Well Stilling Well. Payment will be in accordance with the cost as stated in the CONTRACTOR's bid and as approved by the OWNER and measure as required by and satisfactory to the OWNER.

Item No. IV-3: Furnish and Install Production Well New Pump, Motor, and SS Safety cables and Accessories. Payment will be in accordance with the cost as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. IV-4: Disassembly, Inspection and Reassembly of Production Well Pump in Shop. Payment will be for each pump as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. IV-5: Production Well Pump and Motor Maintenance in Shop Production Well. Payment will be in accordance with the hours required to complete each pump and motor maintenance in the shop as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

Item No. IV-6: Additional Well-Related Work not included above. Payment will be in accordance with the each additional well-related work activity not included above as requested and as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

SPECIFICATIONS

The project work scopes authorized for the selected wells shall be based on a combination of the individual items identified in the Bid Form and summarized as follows:

As the needs arise, the OWNER will develop written Work Assignments detailing a site location, wells to be rehabilitated and a detailed statement of work required. There are several tasks that may need to be conducted at various OWNER sites. Rehabilitation and repair activities may be performed on existing monitoring wells and Production Wells of various diameters and depths. The work is grouped into four main categories:

1. Scope A: General Requirements
2. Scope B: Monitoring Well Rehabilitative and Replacement Services

3. Scope C: Surficial Well Rehabilitative Services

1. General Requirements: Furnish all labor, equipment, and materials necessary to perform services that include, but may not be limited to, well rehabilitation, well development, acidization, repair, performance testing, geophysical logging and video surveys, removing wellheads and pumps, inspecting pumps, chlorination, backplugging of boreholes/wells, plugging and abandonment of supply wells with various diameters, and site restoration. Appropriate safety precautions shall be implemented. This may include safety procedures relating to confined space entry. CONTRACTOR shall perform work in accordance with all regulatory requirements. Specific work tasks under the General Requirements include, but are not limited to, the tasks noted below.
 - 1.1. Maintenance of Traffic: CONTRACTOR shall be responsible for providing any and all Maintenance of Traffic (MOT) or public safety elements, including but not limited to, signage, barricades, pedestrian, bicycle, and vehicle traffic control, etc. The CONTRACTOR will need to obtain any necessary MOT permits from agencies having jurisdiction.
 - 1.2. Mobilization and Demobilization: CONTRACTOR shall provide all labor, equipment and material associated with mobilization and demobilization to complete the tasks noted below. Mobilization/demobilization activities include performance of pre-mobilization condition documentation, coordination of subcontractor services, monitoring and removal of temporary environmental controls, establishment, and release of traffic control. These activities also include the following: setup and teardown of maintenance equipment, temporary containment, drilling pads, settling tanks, pumping equipment, filtering equipment, and piping. Establishment and restoration of existing facility protection measures, development and administration of health and safety activities, and preparation of hurricane preparedness programs.
 - 1.3. Drill Rig with Crew (service truck included): CONTRACTOR may be required to mobilize a drilling rig, crew, and equipment to perform extra work not contained within this scope of services. In such an event, the CONTRACTOR will notify the OWNER in writing of the work to be performed. No extra work will be conducted without prior written authorization by the OWNER

At times, an emergency situation may exist to restore water supply capacity at a particular wellfield. CONTRACTOR may be required to attend an onsite emergency evaluation meeting to develop a plan to restore pumping capacity from one or more production wells. CONTRACTOR shall provide an analysis of identified emergency situation(s) and provide recommendations to address the issue. Photographic documentation shall be provided to the OWNER as necessary.
 - 1.4. Crane Truck with Crew (service truck included): If notified by the OWNER, the CONTRACTOR shall mobilize and operate a crane truck with crew. The crane truck may be owned by the CONTRACTOR or may be a rented crane truck. CONTRACTOR shall provide an experienced operator that is qualified to operate the crane truck.
 - 1.5. Site Restoration Allowance: Upon completion of work, the CONTRACTOR shall restore the site to pre-work or better conditions. Where pavement, trees, shrubbery, fences, concrete walls or other property or surface structures not designated as pay items, have

been damaged, removed or disturbed by the CONTRACTOR, shall be replaced or repaired at the expense of the CONTRACTOR to a condition equal to that before Work began within a time frame approved by the OWNER. Whether this damage is deliberate or through failure to carry out the requirements of the Contract Documents, or the

specific direction of the OWNER, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be repaired at the expense of the CONTRACTOR. CONTRACTOR also shall perform site grading, sod replacement, and installation of additional fill material as required by the OWNER.

- 1.6. Individual Production Well Report Preparation Documenting Work Performed and Data: The CONTRACTOR will prepare a report outlining the rehabilitation activities and the results from all field-testing including inspections, pumping tests, wire-to-water tests, and water quality testing. Photographs also shall be included in the report documenting issues identified on the wellhead, pad, pump, piping, or any other issues identified by the CONTRACTOR. The report will be provided as DRAFT to the OWNER for review and the CONTRACTOR shall respond to comments and submit a final report.
2. Monitoring Well Rehabilitative Services: Furnish all labor, equipment, and materials necessary to perform services that include, but may not be limited to, well rehabilitation, well development, repair, performance testing, geophysical logging, video surveys, backplugging of boreholes and wells, plugging and abandonment of monitoring wells with various diameters, and site restoration. Specific work tasks under Scope B Services include, but are not limited to, the tasks noted below.
 - 2.1. Water Discharge and Disposal Setup and Removal: The CONTRACTOR shall coordinate with the OWNER to identify an onsite location for discharging development and test water. At some wellfields, discharge to the site may not be an option and the discharge water may need to be hauled to an off-site location. In this case, the CONTRACTOR shall identify a disposal location and provide the information to the OWNER.
 - 2.2. Combined Static and Dynamic Down Hole View & Side View Color 360 Degree Video Survey with Triplicate USB's (with Bidder's Pump: Pre-Rehabilitation Video and Post-Rehabilitation Video): As part of the assessment of the well, the CONTRACTOR may be required to run a video survey. This survey is to assess the condition of the casing and well screen, determine how much material has accumulated in the screen or open borehole, and to identify any holes or damage in the casing or screen. When completed, the CONTRACTOR shall provide three copies of the video survey and an interpretation of the results to the OWNER prior to leaving site.
 - 2.3. Clear Debris/Obstructions: The CONTRACTOR shall remove any debris or obstructions from the well observed during the video survey. This activity will be conducted with approval from the OWNER. If necessary, a follow up video survey shall be conducted to determine if all the debris or the obstruction has been removed and if the removal process damaged the well screen, casing or open borehole.
 - 2.4. Clean Monitoring Well Casing and Screen via Casing Scraper, Brushing and Swabbing; Cut and Remove Roots: The OWNER may request that the monitoring well casing and screen be cleaned. A recommendation shall be prepared by the CONTRACTOR and provided to the OWNER outlining what activities will be performed to clean the monitoring

well. Once the OWNER approves the cleaning activities, the CONTRACTOR will perform the work to clean the well.

- 2.5. Well Plugging and Abandonment (cost of cement grout not included): The CONTRACTOR shall provide all labor, equipment and materials required to plug and abandon a well. CONTRACTOR will be responsible for securing all permits required to complete the plugging and abandonment activities. CONTRACTOR shall submit copies of the permits to the OWNER prior to commencing abandonment activities. Plugging and abandonment activities shall be in accordance with Rule 40E-3, Florida Administrative Code and Form LEG-R.041.01, and in accordance with all local, state, and federal regulations. The CONTRACTOR shall use cement ASTM C-150 Type II Portland neat cement above the fine sand layer when abandoning the well.

The CONTRACTOR shall submit a written plan of action and schedule for well demolition and abandonment to OWNER prior to commencing well abandonment activities. The CONTRACTOR shall be responsible for the demolition and disposal of all existing equipment and structures including, but not limited to, any existing pumps, pump assemblies, pedestals, slabs, piping, valving, and instrumentation. The CONTRACTOR shall be responsible for the retrieval of any and all equipment or materials (such as the pump and/or pump assembly) from the well that may be lost in the well during demolition. The CONTRACTOR shall suitably dispose of all demolished items at an approved off-site location. The OWNER reserves the right to retain certain items. Items so designated shall be removed undamaged and delivered on-site to a location designated by the OWNER. Upon completion of the demolition work, all materials, equipment, waste and debris of every sort shall be removed and the premises shall be left clean, neat, and orderly. The CONTRACTOR shall provide the OWNER with an abandonment report outlining the activities associated with the abandonment of the well.

- 2.6. Neat Cement Grout for Well Plugging Abandonment: The CONTRACTOR shall use cement ASTM C-150 Type II Portland neat cement above the fine sand layer when abandoning the well.
- 2.7. Monitoring Well Replacement: 4-inch Diameter Sch 40 PVC Installation (minimum 100-foot depth and maximum 200-foot depth with screen linear footage ranging from 10 to 20-feet in length) with 10-slot screen and 20/30 sand pack) with 3 ft x 3 ft x 6 in pad, or as determined by the OWNER. The CONTRACTOR will install a new monitoring well at the request of the OWNER. The CONTRACTOR will provide a replacement plan to the OWNER for approval prior to the start of monitoring well construction. Two screened intervals will be constructed in one well. The CONTRACTOR shall use a combination of sand, bentonite, and gravel to construct the two screen intervals, as directed by the ENGINEER and OWNER. The amount and type of sand, bentonite, and gravel will be provided as needed for each monitoring well replacement, as directed by the ENGINEER and OWNER. The CONTRACTOR must refer to the gravel installation and cementing procedures in this specification for installation of the casing and screen.

3. SCOPE C and D Surficial Well Rehabilitative Services: Furnish all labor, equipment, and materials necessary to perform services that include, but may not be limited to, well rehabilitation, well development, acidization, repair, performance testing, geophysical logging

and video surveys, backplugging of boreholes and wells, plugging and abandonment of wells with various diameters, and site restoration. Specific work tasks under Scope C and D Services include, but are not limited to, the tasks noted below. Please note the measurement and payment section is outlined by item number. Detailed specifications are outlined by task description.

- 3.1. Water Discharge and Disposal Setup and Removal: The CONTRACTOR shall coordinate with the OWNER to identify an onsite location for discharging and disposal of development and test water. At some wellfields, discharge to the site may not be an option and the discharge water may need to be hauled to an off-site location. In this case, the CONTRACTOR shall identify a disposal location and provide the information to the OWNER for approval.
- 3.2. Pump Curve Testing and Wire to Water Testing: Pump performance will be evaluated during the well maintenance activities. The total dynamic head (TDH) of the pump will be determined and compared to the original pump curves and the original pumping conditions. This information will be used to determine if changes in well performance are related to excessive drawdown, poor pump performance, or a combination of the two. The CONTRACTOR will document the amperage draw to the pump motors during the testing for comparison to designed horsepower, pump efficiency, and flow rate. The CONTRACTOR will provide a table of wire-to-water efficiencies once the testing is complete. A calibrated test pressure gauge will be installed at the wellhead during performance testing to document system pressure. The CONTRACTOR will collect the required amperage information from the control panel.
- 3.3. Remove Wellhead, Column Pipe, Pump, and Motor and Accessories: The CONTRACTOR shall carefully disassemble the wellhead and remove/disassemble the column pipe as necessary. Each disassembled section of column pipe, including the wiring and pump, shall be carefully laid out on elevated plastic sheeting immediately adjacent to the well. The plastic sheeting must have a suitable thickness (minimum of 6 mils) and be large enough so that it can be folded over to cover all column pipe sections. The plastic sheeting must be secured in a manner to prevent direct exposure of the column pipe. If there is no room for laying down the column pipe intact, the CONTRACTOR shall be required to disassemble the column pipe as necessary and store the pump, wiring and column pipe in a similar manner as approved by the OWNER.

During disassembly of the wellhead, the CONTRACTOR shall conduct a thorough inspection of the wellhead, including bolts, flanges, appropriate connections and/or other minor hardware that may need to be repaired or replaced during reassembly of the wellhead. The CONTRACTOR shall inspect the column pipe, pump wiring and pump assembly for visible signs of wear or damage and document/communicate their findings with the OWNER.

The CONTRACTOR shall immediately coordinate with the OWNER if replacement of hardware or repairs to the wellhead pump or wiring is deemed to be necessary based on the visual inspection. The CONTRACTOR will coordinate with the OWNER to determine the level of repair and the availability of the hardware.

Once the pump and motor assembly are removed from the well, the CONTRACTOR shall

sound the well to determine the total depth prior to the start of rehabilitation activities. Once rehabilitation activities are completed and before the pump and motor assembly are re-installed, the CONTRACTOR shall once again sound the well to determine total depth. Both the depth sounds shall be reported to the OWNER.

- 3.4. Pre-Rehabilitation Specific Capacity Test and Post-Rehabilitation Specific Capacity Test: The CONTRACTOR shall perform a pre-rehabilitation specific capacity test for two (2) hours, or as determined by the OWNER, utilizing the OWNER'S existing pump. The pumps must be turned off for at least one (1) hour, or as determined by the OWNER, prior to testing to obtain a non- pumping, static water level in each well. The CONTRACTOR will assist the OWNER with measuring the static and dynamic water levels in each well before, during and after the specific

capacity test. If needed, the CONTRACTOR shall adjust the flow rate of the as determined by the OWNER. The OWNER will operate the pumps during all testing periods and coordinate the operation of the pumps with the CONTRACTOR and the on-site OWNER REPRESENTATIVE. If needed, the CONTRACTOR shall provide the appropriate equipment and fittings needed to measure and record water quality and well performance data.

- 3.5. Combined Static and Dynamic Down Hole View & Side View Color 360 Degree Video Survey

with triplicate USB's (with Bidder's Pump: Pre-Rehabilitation video and Post Rehabilitation video): As part of the assessment of the well, the CONTRACTOR may be required to run a video survey. This survey is to assess the condition of the casing, well screen, and open borehole and determine how much material has accumulated in the screen, the open borehole, and to identify any holes or damage in the casing or screen. The CONTRACTOR shall identify any foreign objects in the screen, open borehole, or casing. When completed, the CONTRACTOR shall provide three copies of the video survey and an interpretation of the results to the OWNER.

- 3.6. Clear Debris/Obstructions: CONTRACTOR shall provide all labor, equipment, and materials required to remove foreign objects from the well. This may include, but not be limited to, pump components, small diameter piping, tools, instrumentation, etc. CONTRACTOR shall perform this work in a manner not to cause damage to the well screen or casing.

- 3.7. Well Acidization Mobilization: The CONTRACTOR shall provide all labor, equipment, and materials required to perform well acidization. The CONTRACTOR is responsible for all potential receptors that may be impacted by the acid treatment activity and shall use best management practices in keeping all receptors free from harm. Prior to acidization, the CONTRACTOR shall provide a plan for acidization, temporary acid storage, site layout drawing, containment, and safety plan for approval by the OWNER. The CONTRACTOR shall ensure proper design and containment of acid pumps, hoses, fittings, and storage tanks to prevent spillage.

The setup for performing acid treatment shall include removal of the wellhead and associated appurtenances, installation of acid tubing to the desired acidization depth (as determined by the OWNER), installation of the acid to the acid depth, acid rated flowmeter and water flowmeters, installation of water frac tanks as determined by the

OWNER, check valves as necessary, monitoring of acidization pressures, discharge set up of spent acid, purging of spent acid in accordance with the specifications, removal of tremie, and re-installation of wellhead and appurtenances. The type and amount of acid to be used shall be approved by the OWNER. Prior to acidization activities the CONTRACTOR shall provide the following:

- Plan to ensure health and safety measures are met to the satisfaction of the OWNER (CONTRACTOR shall anticipate that the plan shall incorporate requirements concerning COVID-19).
- Proposed setting depths for all pump and hose intakes.
- Confirm the acid tubing setting depth with the OWNER.
- Work sequence and schedule.
- Measures to ensure proper acid dilutions are achieved. This may include pH strips for acid dilutions.
- Plan to properly contain and remove suspended solids discharged from the well during acidization activities.

3.8. Well Acidization Treatment with 32% HCL: The CONTRACTOR shall provide all labor, equipment, and materials required to perform acidization. The CONTRACTOR is responsible for all potential receptors that may be impacted by the acid treatment activity and shall use best management practices in keeping all receptors free from harm. Prior to acidization, the CONTRACTOR shall provide a plan for acidization, temporary acid storage, temporary water storage, containment, and safety plan for approval by the OWNER. The CONTRACTOR shall ensure proper design and containment of acid pumps, hoses, fittings, and storage tanks to prevent spillage. The setup for performing acid treatment shall include removal of the wellhead and associated appurtenances, installation of acid tubing to the desired acidization depth (as determined by the OWNER), installation of the acid to the acid depth, acid rated flowmeter, flowmeter for water source(s), monitoring of acidization pressures, discharge set up of spent acid, purging of spent acid in accordance with the specifications, removal of tremie, and re-installation of wellhead and appurtenances. The type and amount of acid to be used shall be approved by the OWNER.

3.8.1. CONTRACTOR shall set up an acidization wellhead, pack-off device, or other approved device at the well designated by the OWNER in accordance with the Specifications. The CONTRACTOR shall provide a drawing of the approved acidization wellhead set-up. The acidization wellhead shall incorporate a dedicated acid injection line and dedicated potable water injection line. These lines and wellhead shall be constructed of materials capable of withstanding anticipated acid concentrations and capable of withstanding pressures generated during the acidization process. Acidization lines shall be installed such that no leaks occur.

3.8.2. Test all equipment hoses, piping, and fittings for leaks. Inspect the acid header for water tightness with well fully alive. Perform a pre-test at maximum acid injection rates using water and record pressures and all necessary background information as deemed by the OWNER. Verify all flow measurement devices are operating and calibrated. Verify all isolation valves are operating and watertight when closed. Verify equipment and personnel are 100 percent ready for acid

treatment and notify OWNER or OWNER REPRESENTATIVE of final acid delivery schedule.

- 3.8.3. Discharge of water and spent acid from the well following acidization shall be to a suitable container at the site supplied by the CONTRACTOR. The CONTRACTOR will neutralize the discharge water with a suitable buffer until it is demonstrated that the pH of the water is 6.0 Standard Units (SU) and in accordance with all permits and regulations. Neutralized water will then be discharged to a suitable conveyance as approved by the OWNER. Discharge piping shall be the responsibility of the CONTRACTOR. The disposal location shall be approved by the OWNER prior to disposal of water and spent acid. CONTRACTOR shall coordinate all discharge activities, including maximum allowable flow rates and pH stabilization, if required, with the required regulatory agencies.
- 3.8.4. Verify all acid tankers are equipped with appropriate and functioning valves and other all other safety equipment. Verify that all acid haulers responsible for discharging acid from the tankers are 100 percent ready for acid treatment. All acid tankers must be onsite prior to acidizing.
- 3.8.5. The CONTRACTOR shall establish a flow of potable water down the well at a rate determined by the OWNER for a minimum of 15 minutes, or as determined by the OWNER, before and continuing into acid injection to demonstrate the ability of the formation to receive injected fluid. The potable water flush shall continue during acid injection and for a minimum of 30 minutes, or as determined by the OWNER, thereafter or until wellhead pressures are 0 pounds per square inch (psi) and/or a stable pressure as needed for performing acidization on wells.
- 3.8.6. The CONTRACTOR shall be responsible for maintaining the wellhead pressure at zero psi and/or a stable pressure as needed for performing acidization on wells until the acid is completely spent in the formation. The CONTRACTOR shall provide all piping, and fittings necessary to allow pumping of water down the well. Water pumped down the well shall be potable and supplied by the CONTRACTOR. Contractor shall be capable of accepting water (backside water) near the top of the well casing and independent of the acid tubing and gas blowoff ports. The water injection location within the well shall be always submerged prior to, during and after acid treatment. CONTRACTOR shall install a 2-inch diameter acid injection pipe to the depth selected by the owner and install 3-inch diameter water injection pipe. These pipes shall be approved by the owner. All fittings, ports and components shall provide a tight seal up to 200 psi. All access ports shall be fitted with isolation valves.
- 3.8.7. Provide and install a pressure gage on the wellhead to monitor pressure at the wellhead capable of reading pressures up to 200 psi or as approved by the OWNER. The pressure gauge range shall be appropriate for the expected pressures for the well during acidization. The CONTRACTOR shall place the pressure gauge port at a higher elevation than the backside water port on the temporary wellhead.

- 3.8.8. CONTRACTOR shall inject acid continuously through the acid line while maintaining water injection as described above. The rate of acid injection shall be determined by the CONTRACTOR and approved by the OWNER in the field. The type of acid used on a well will depend on the proximity of residential buildings and pedestrian traffic to the well and approved by the OWNER. The acid provided shall be approved for use in potable water wells, unless otherwise approved by the OWNER. Up to three times the open-hole volume of acid and a maximum pH of three (3) SU shall be required in the well at the end of acidization. The mix strength shall be approved by the OWNER prior to acidization. Actual quantities used in the field shall be pre-approved by the OWNER.
- 3.8.9. CONTRACTOR shall facilitate the release of gas during excessive pressure buildup inside the well (gas blowoff). The gas blowoff port shall be located above the backside water injection port. The gas blowoff pipe shall be extended a minimum of 50 feet away from the work area, downwind from any potential immediate receptor and downwind of the designated safety zone.
- 3.8.10. After pumping of the acid is complete, CONTRACTOR shall continue water injection in both tubing's (acid and water) for one hour, or as determined by the OWNER. After water injection is complete, close all valves and shut-in well for a minimum of 12 hours. At no time shall pressure in the well be allowed to exceed 50 psi. The pressure relief valve should activate at the specified maximum psi. A containment vessel shall be used to contain undesired acid discharge from the well during the entire acidization procedure. The containment vessel shall be approved by the OWNER.
- 3.8.11. Casing pressures shall be monitored continuously by the CONTRACTOR for at least 12 hours following acid treatment or until pressures stabilize in the well, whichever is greater. If wellhead pressure increases during the monitoring period, the CONTRACTOR shall pump additional chase water into the well at his own discretion or as determined by the OWNER. Excess gas pressure shall be bled off only if water injection does not dissipate pressure. A gas relief pipe shall be extended a minimum of 50 feet away from the work area, downwind from any potential immediate receptor.
- 3.8.12. If a second acid pump is to be performed, the CONTRACTOR shall purge the spent acid from the well between acid pumps until pH of the purged water is no less than 6.0 SU, or as directed by the OWNER.
- 3.8.13. After the 12-hour waiting period or as determined by the OWNER, the CONTRACTOR shall purge the well into the containment vessel and determine the pH of the water from the well. The CONTRACTOR shall provide a pump to discharge spent acid, water, or other fluids from the acid line into the temporary containment vessel supplied by the CONTRACTOR, as necessary. The containment vessel shall be approved by the OWNER. If the well water pH has reached 6.0 SU or higher and there is no pressure at the wellhead, the CONTRACTOR shall remove the piping and wellhead to prepare for well development. In the event the pH is not 6.0 SU or higher, the CONTRACTOR

The spent acid shall be neutralized, and the well shall be shut in for an additional two hours. After that, the CONTRACTOR will purge the well and determine its pH. The CONTRACTOR shall repeat the process until a pH of 6.0 SU or higher is achieved, or as determined by the OWNER.

- 3.8.14. Discharge piping shall be the responsibility of the CONTRACTOR. The OWNER shall approve the disposal location before disposing of water and spent acid. The CONTRACTOR shall coordinate all discharge activities, including maximum allowable flow rates and pH stabilization, if required, with the required regulatory agencies. The CONTRACTOR shall obtain approval from the OWNER or the OWNER'S REPRESENTATIVE before disposing of suppression fluids.

- 3.9. Clean Production Well Casing and Screen via Casing Scraper, Brushing, and Swabbing: The casing brush, scraper, and or swab will be run up and down the entire length of the casing a minimum of three times, or as determined by the OWNER.

- 3.10. Jetting to Redevelop and Develop Well: The CONTRACTOR shall commence development of the well using a combination of air development, pump development, and jet development using OWNER-approved equipment, equipment set-up, and use of development equipment. The CONTRACTOR shall use a test pump for well development; the OWNER shall approve the test pump.

The CONTRACTOR shall recommend and provide a jetting tool capable of creating a minimum water velocity of 25 feet per second (ft/sec) horizontal flow within the open-hole interval. The jetting tool shall have a minimum of four horizontal jets, equally spaced at 90 degrees apart. The total flow rate delivered to the jetting tool shall not be less than 500 gpm. The CONTRACTOR shall provide the OWNER with daily Imhoff Cone sand content readings and shall continue jetting activities until the OWNER determines jetting has been completed to an acceptable level.

The CONTRACTOR shall rotate, raise, and lower the jetting tool throughout the open-hole interval or screen interval or as directed by the OWNER. The CONTRACTOR shall make as many passes as required to ensure complete development. To preserve the well seal's integrity, jetting development will not be performed within 10 feet of the bottom of the casing.

Water for jetting will be recycled using the settling tanks. Prior to reintroduction into the borehole, jetting water will be chlorinated to obtain a 50 parts per million (ppm) residual. Water will be clear and free of sand and suspended solids prior to reintroduction into the well. The CONTRACTOR shall use all means necessary to settle, clean, and chlorinate water prior to reintroduction into the well, including but not limited to the use of settling tanks and baffle boards.

The CONTRACTOR shall install an airlift pipe at the base of the borehole to clear material from the base of the borehole. The water shall be directed into on-site settling tanks and dechlorinated before discharge or hauled from the site in a tanker. The location of water discharge shall be coordinated with the OWNER. Best practices shall be used to minimize turbidity and erosion from the discharge. The CONTRACTOR shall be responsible with meeting all regulatory requirements for disposing of discharged

groundwater from the well safely and appropriately using best management practices.

- 3.11. Furnish and Install Additional Gravel into Well Screen Gravel Pack: Prior to commencing rehabilitation activities in a screen and gravel-pack well, the CONTRACTOR shall measure the depth to the top of the gravel pack. If enough access is available, the CONTRACTOR shall hard tag the top of the gravel pack. The CONTRACTOR shall report the depth to the OWNER. If directed by the OWNER, the CONTRACTOR shall furnish and install an additional gravel pack in the annulus using the tremie method. The gravel pack shall be 95% silica, sorted and graded. The OWNER shall approve the gravel pack size and sieve analyses. A certified laboratory shall perform sieve analyses. If the OWNER does not provide a specific size, the CONTRACTOR shall provide gravel of the size and grade used for original well construction. Other gravel specifications will be provided for each project/site. Gravel pack depths shall be checked a minimum of twice daily during rehabilitation activities. If the gravel pack depths are within 10 feet of the top of the screen, the tremie method will install a minimum of 5 linear feet of gravel pack. Additional gravel may be required during development or other well construction procedures after gravel placement. Additional gravel shall be placed as outlined above, with no further measurable settlement of the gravel pack or as determined by the OWNER. Gravel pack shall be installed in a water slurry by the tremie method. The base of the tremie pipe shall be placed at the gravel placement depth and moved upward to be consistent with the gravel fill depth. The gravel pack shall be carefully installed to ensure complete filling of the annular space from the bottom of the hole to a minimum of 20 feet above the base of the outer casing or as specified by the OWNER. During gravel placement, the free-fall distance between the gravel in place and the lower end of the construction tremie shall not exceed 20 feet.
- 3.12. Well Plugging and Abandonment: The CONTRACTOR shall provide all labor, equipment, and materials required to plug and abandon a well. CONTRACTOR will be responsible for securing all permits required to complete the plugging and abandonment activities. CONTRACTOR shall submit copies of the permits to the OWNER prior to commencing abandonment activities. Plugging and abandonment activities shall be in accordance with Rule 40E-3, Florida Administrative Code, and Form LEG-R.041.01 referenced in said Rule.

The CONTRACTOR shall submit a written plan of action and schedule for well demolition and abandonment to the OWNER prior to commencing well abandonment activities. The CONTRACTOR shall be responsible for demolishing and disposing of all existing equipment and structures, including, but not limited to, existing pumps, pump assemblies, pedestals, slabs, piping, valving, and instrumentation. The CONTRACTOR shall be responsible for the retrieval of any and all equipment or materials (such as the pump and/or pump assembly) from the well that may be lost in the well during demolition. The CONTRACTOR shall suitably dispose of all demolished items at an acceptable off-site location. The OWNER reserves the right to retain certain items. Items so designated shall be removed undamaged and delivered on-site to a location designated by the OWNER. Upon completion of the demolition work, all materials, equipment, waste, and debris shall be removed, and the premises shall be left clean, neat, and orderly. The CONTRACTOR shall provide the OWNER with an abandonment report outlining the activities associated with the abandonment of the well.

- 3.13. Neat Cement Grout for Well Plugging Abandonment: The CONTRACTOR shall use ASTM C-150 Type II Portland neat cement for well abandonment.
- 3.14. Backplugging for Production Well: The CONTRACTOR shall provide all labor, equipment, and materials required to backplug an existing borehole or well. The CONTRACTOR shall tally/measure cement tubing and install the tubing to the bottom of the borehole/well. The CONTRACTOR shall provide the total depth measured to the OWNER. The CONTRACTOR shall provide API class B Portland cement grout that meets ASTM C150, Type II standards. During cementing, CONTRACTOR shall provide cement slurry weight data for each grouting stage, and the CONTRACTOR shall provide a calibrated densometer to measure the volume of cement pumped. Samples of the cement slurry shall be collected, weighed, and recorded. The correct mix ratios shall be maintained. If performed in batches, provide the slurry weight and collect a sample for each batch mixed. If performed in continuous mixing, provide slurry weights and collect samples at each grouting stage's beginning, middle, and end of pumping. The base of the cement tubing shall be submerged throughout the cementing process. The tubing may be lifted incrementally, while maintaining submergence, based on the calculated volume and vertical cement lift.
- 3.15. Well Development and Redevelopment by Airlift with 600 to 1,000 SCFM Air Compressor: The CONTRACTOR shall provide all labor, equipment, and materials required to perform airlift well development. Provide all air compressors, filter socks, settling basins, containment basins, and other ancillary equipment needed to develop the well to the extent that, as practically possible, suspended solids are removed from the well. Provide all pipe, fittings, and valves required to transmit discharge water from the pump to the settling tanks.

The development equipment must be able to divert the flow of water in a controlled manner to minimize flooding and erosion. Discharge water shall be clear and free of suspended solids. The discharge water then shall be conveyed via temporary piping to the discharge point as directed by the OWNER. Filter socks, turbidity booms, tanks required for settling of solids, and additional pumps and temporary piping needed to transmit water to the discharge point shall be included in the unit cost for development. Management and removal of development solids shall be included in the unit cost for development.

Throughout development and at the completion of development, as directed by and in the OWNER's presence, the CONTRACTOR shall measure the total depth of the well and the sand content using an Imhoff cone and report to the OWNER. If significant infilling has occurred, as determined by the OWNER, the CONTRACTOR shall proceed to clean out the borehole to the original total depth.

- 3.16. Well Development using Bidder's Pump and Flow Meter (capable of pumping a minimum of 2 times the design rate in gpm): The CONTRACTOR shall provide all labor, equipment and materials required to perform well development. Provide all pumps and motors, air compressors, filter socks, settling basins, containment basins and other ancillary equipment needed to develop the well to the extent that, as practical, suspended solids are removed from the well. Provide all pipe, fittings, and valves required to transmit discharge water from the pump to the settling tanks, as required.

The development equipment must be able to divert the flow of water in a controlled manner to minimize flooding and erosion. Discharge water shall be clear and free of suspended solids. The discharge water then shall be pumped via temporary piping to the discharge point as directed by the OWNER. Filter socks and tanks required for settling of solids and additional pumps and temporary piping needed to transmit water to the discharge point shall be included in the unit cost for development. Management and removal of development solids shall be included in the unit cost for development.

Throughout development and at the completion of development, as directed by and in the presence of the OWNER, the CONTRACTOR shall measure the total depth of the well. If significant in-filling has occurred, as determined by the OWNER, the CONTRACTOR shall proceed to clean out the borehole to the original total depth.

High-rate pumping (overpumping): The CONTRACTOR shall furnish the necessary instruments and pumping equipment capable of pumping at a steady rate ranging over rates to be determined by the OWNER with a throttling device and gate valve so that the flow rate can be adjusted as directed by the OWNER. Provide a calibrated flow meter with direct measurement and a totalizer to measure flow. Anticipated metered flows and or pump rates shall be capable of pumping a minimum of two times the design rate for the well in gpm. Certification shall be no older than 60 days prior to notice to proceed and attest to an accuracy of 95 percent or greater for the range of the meter.

The CONTRACTOR shall pump surge the well until, to the satisfaction of the OWNER, the pump discharge water is free of suspended material. The test pump shall be capable of maintaining a steady pumping rate determined by the OWNER and on/off surging. Throughout pump development, at intervals specified by the OWNER, the CONTRACTOR shall conduct sand testing. Sand testing shall be conducted using a Rossum Sand Tester provided by the CONTRACTOR and shall be performed as directed by the OWNER. The CONTRACTOR shall install the Rossum Sand Tester according to the manufacturer or as determined by the OWNER. The CONTRACTOR shall complete daily development summary forms provided by the OWNER, including daily static water level measurements, specific capacity measurements, and sand (Rossum) tests.

- 3.17. Disposal of Development Solids that Need to be Containerized and Properly Disposed by Contractor: The Contractor shall dispose of solids at an approved location.
- 3.18. Disposal of Development Water to Approved Location: The CONTRACTOR shall dispose of water produced by development at an OWNER approved location. If disposing of water into a surface water body, the CONTRACTOR is responsible for obtaining all discharge permits, installing turbidity booms, and collecting any water quality samples required by the permit.
- 3.19. Sand Content Testing (by Rossum Sand Tester): If required by OWNER, CONTRACTOR shall perform daily sand testing using a centrifugal sand tester (Rossum Sand Tester manufactured by Roscoe Moss) during pump development activities. Development will be deemed to be complete when the sand content is less than one (1)

ppm.

- 3.20. Silt Density Index Testing (passing only, SDI <3): CONTRACTOR shall also perform silt density index (SDI) testing on a daily basis. CONTRACTOR shall report sand content and SDI values to the OWNER on a daily basis. CONTRACTOR shall assume that pump development activities will continue until an SDI value of less than three (3) is achieved.
- 3.21. Step Drawdown Testing: The length of the step drawdown testing shall be determined by the OWNER. Prior to the start of the step drawdown test, the CONTRACTOR shall operate the test pump at the maximum pumping rate of the test to assure that the pumping and monitoring equipment are operating correctly, and shall pre-set the valve, VFD, and pump settings for the desired pumping rates for each step the day before or as specified by the OWNER. The estimated length of the step drawdown tests is 10-hours (a total of five, 2-hour long steps), or as determined by the OWNER. In addition, prior to testing, there shall be a minimum 12-hour non- pumping background water level monitoring period, or as determined by the OWNER. After completion of the 10-hour step drawdown test, a recovery phase of at least 12 hours will be completed or until water levels recover to 95 percent of pre-pumping conditions. The OWNER shall determine the actual length of each test and may increase or decrease the test duration as necessary to successfully complete each test.

The CONTRACTOR shall furnish and install an in-line flowmeter with a flow rate indicator and totalizer that has been calibrated within the last 60 days (with a written copy of calibration report submitted to OWNER) and capable of measuring discharge rates to be determined by the OWNER. The flowmeter and other meters for use in the pumping test shall have a totalizer and major gradations of 100 gpm and minor gradations of 10 gpm, or as determined by the OWNER. Accuracy shall be $\frac{1}{4}$ of one percent of full scale.

The CONTRACTOR will be responsible for supplying transducers (Insitu® Level Troll or equivalent as approved by OWNER) and data loggers capable of measuring and recording water levels on a logarithmic time scale. The pressure transducers/data loggers shall be able to record data in logarithmic mode or at a minimum of 1-second intervals during drawdown and recovery stages. The equipment shall have an appropriate range and accuracy for the well as approved by the OWNER prior to testing. Each well shall have at least two (2) transducers or as determined by the OWNER. In addition, two (2) barometric trolls shall be installed at the site. Prior to the start of the step drawdown test, the CONTRACTOR shall download the transducer data and provide data to the OWNER on the memory device.

The pressure transducers shall be re-programmed for each aspect of the test including pre-test monitoring, test monitoring, and post-test recovery. Sample frequency for the pre-test monitoring shall be determined by the OWNER. Sample frequency during the pumping test shall be logarithmic scale with 10-minute intervals once the test has matured. The post-test monitoring frequency shall be at a logarithmic scale with 10-minute intervals once the test has matured.

tests shall be free of rust, scale, and other foreign material that could be dislodged and interfere with a test or test performance.

The CONTRACTOR shall be responsible for providing on-site back-up equipment for all items necessary to perform successful pumping tests. In case of pump failure, pipe blockage, transducer failure, and/or unsatisfactory performance of the CONTRACTOR'S equipment, the pumping test shall be rerun at no additional cost to the OWNER.

The CONTRACTOR shall provide the following submittals:

- Calibration report for in-line flowmeters, calibrated within the last 60 days.
- Calibration records for all measuring instruments used in the wells shall be submitted to the OWNER for review prior to the installation or use of the instruments. Calibration of instruments shall have been performed within 60 days prior to use in testing. All calibration records shall be submitted to the OWNER prior to use.
- Pump size, make, and model with the associated pump curve.
- Temporary Wellhead Drawing, Set-up, and Testing Plan including, but not limited to the following: a sampling port for water quality data, a water level port for static and dynamic water levels, a Rossum Sand Tester, and a SDI Press and booster pump to achieve 30 psi on the wellhead, if necessary, for SDI's.
- A complete list of all proposed SUBCONTRACTORS to be used in the WORK.
- A pumping test plan for each pumping test.

At the OWNER'S discretion, a period of time (up to 24 hours) is required for pump shut down and water level recovery between the individual pump tests. There will be no additional payment for rig time or standby time during these periods of well background data collection or recovery data collection.

3.22. Disinfect Well/Chlorinate Well (and pump and pump assembly) per AWWA Standards:

The CONTRACTOR shall provide all labor, equipment, and materials required to perform disinfection. The CONTRACTOR shall provide sodium hypochlorite (example: Sterilene) or calcium hypochlorite as determined by the OWNER. The solutions shall be premixed prior to placement in the well. The concentration of the solution will be determined by the OWNER with concentrations typically ranging between 50 ppm and 250 ppm of free available chlorine. Project specific concentrations will be provided by the OWNER in a work plan.

Prior to placement into the well, the CONTRACTOR shall confirm the concentration of the solution using chlorine test strips (Hach AquaChek or equivalent as approved by OWNER). CONTRACTOR also shall check pH concentration of the solution prior to placement. The solution shall have a pH between 6.5 and 8.0. If the pH is above a pH of 8.0, the CONTRACTOR shall add small amounts of 32% hydrochloric acid until the solution is within the proper pH range.

Disinfection procedures shall ensure that the disinfecting agent is uniformly applied throughout the entire water depth of the well, without relying on subsequent mechanical or surging action for dispersing the disinfectant. The disinfecting agent shall be left in

the well for a period of at least 24 hours. After a 24 hour or longer contact period, the well is to be pumped to clear it of the disinfecting agent or as directed by the OWNER. The disposal point for the purged water shall be selected so as to minimize potential damage to aquatic life or vegetation. The CONTRACTOR is responsible for all hoses, piping, connections, tanks, and fittings required to transmit the purged water from the wellhead to the disposal point. All water used for treatment shall be potable. CONTRACTOR shall coordinate with the OWNER to gain access of potable water supply.

- 3.23. Biological Activity Reaction Tests (BART™ Iron Related Bacteria, Slime Forming Bacteria, Sulfate Reducing Bacteria) all 3 tests for each item unit: The CONTRACTOR shall provide the testing kits and collect bacteriological samples using Sulfate-Reducing Bacteria (SRB), Iron- Related Bacteria (IRB), and SLYM-BART™ testers similar to the BART testing kits manufactured by HACH. The results of the test shall be provided to the OWNER. Depending on the results, the CONTRACTOR shall provide recommendations to control bacterial formation in the well.
- 3.24. Reinstall Wellhead, Column Pipe, Pump and Motor, and Appurtenances: Once the well rehabilitation activities are complete, the CONTRACTOR shall reinstall the column pipe, pump/motor, wellhead, and appurtenances. New gadgets and bolts shall be used as part of the installation process.
- 3.25. Furnish and Install Replacement Column Pipe: If required, the CONTRACTOR shall furnish and install replacement column pipe. The OWNER shall be informed that the column pipe needs replaced and provide a submittal to the OWNER for approval. The replacement column pipe will be of similar diameter, depth, and material as the original pipe.
- 3.26. Furnish and Install New Stilling Well: If required, the CONTRACTOR shall furnish and install replacement stilling well. The OWNER shall be informed that the stilling well needs replaced and provide a submittal to the OWNER for approval. The replacement stilling well shall be of similar diameter, depth, and material as the original stilling well.
- 3.27. Furnish & Install New Pump, Motor, and SS Safety Cables & Accessories: If required, the CONTRACTOR shall furnish and install a new pump, motor, safety cables and accessories. The OWNER shall be informed that pump, motor, safety cables and accessories needs replaced and provide a submittal to the OWNER for approval. The replacement pump and motor will be the same horsepower and have a similar pump cure as the original pump and motor.
- 3.28. Bacteriological Sampling and Clearance for Health Department: The CONTRACTOR shall sanitize the well, pump and column pipe using proper disinfection techniques in accordance with Sections 1 - 4 and Section 5.2 of American Water Works Association (AWWA) Standard C654 as incorporated into Rule 62-555.330, Florida Administrative Code (F.A.C.). Proper sanitization of the well includes a chlorine concentration of at least 50 ppm of for a minimum of eight (8) hours in the well.

The CONTRACTOR shall utilize either sodium hypochlorite or calcium hypochlorite that meets NSF/ANSI 60 standard for chemicals used in drinking water systems for

sanitization. After a minimum of eight (8) hours contact time, the CONTRACTOR shall flush the well and piping to remove all chlorinated water (i.e. zero chlorine residual). All water pumped from the well must be properly collected in a tank and dechlorinated using sodium bisulfite before disposal to a pre- approved discharge area. Field testing to ensure a chlorine residual of zero prior to disposal is required.

The CONTRACTOR shall be required to contract a NELAC-certified lab to collect two (2) bacteria samples (Total Coliform) taken on separate days with at least six (6) hours between samples. The well must be purged for at least 15 minutes with zero chlorine residual prior to sampling. Detection of residual chlorine will negate the bacteria results. The well can only be put back into service once the results of both consecutive bacteria samples are deemed negative and the results have been received from the lab. If either of the samples are positive for Total Coliform, the well must be re-sampled until two consecutive samples show the absence of coliform. The CONTRACTOR shall be responsible for clearance of the well to be placed back online including any additional bacteria samples required and/or re-disinfection of the well if deemed necessary. The CONTRACTOR shall work with the on-site OWNER REPRESENTATIVE and OWNER staff to discuss purging techniques for bacteria sampling prior to scheduling.

ATTACHMENT C



CITY OF POMPANO BEACH TECHNICAL SPECIFICATIONS

FOR

Well REHABILITATION AND MAINTENANCE

POMPANO BEACH, FLORIDA

FINAL SET

FEBRUARY 2025

PREPARED BY:



Stantec Consulting Services, Inc.
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Deerfield Beach, FL 33441

BIDDING REQUIREMENTS, CONTRACT FORMS, AND CONDITIONS OF THE CONTRACT

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PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The WORK to be performed under this Contract shall consist of furnishing plant, tools, equipment, materials, supplies, and manufactured articles, and furnishing all labor, transportation, and services, including fuel, power, water, and essential communications, and performing all work or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The WORK shall be complete, and all work, materials, and services not expressly indicated or called for in the Contract Documents which may be necessary for the complete and proper construction of the WORK in good faith shall be provided by the CONTRACTOR as though originally so indicated, at no increase in cost to Broward County Water Utilities Department (OWNER). Pertinent information associated with the Work is provided in Appendix A and B.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The WORK of this Contract comprises the replacement and rehabilitation of water supply wells and monitoring wells for the City of Pompano Beach. The WORK includes demolition, rehabilitation, construction, development, testing and disinfection, and associated electrical supply to the wells and piping and installation of submersible pumps and wellhead equipment in accordance with contract documents.

1.3 CONTRACT METHOD

- A. The WORK hereunder will be constructed under a single unit-price contract.

1.4 WORK BY OTHERS

- A. Where two or more contracts are being performed at one time on the same Site or adjacent land in such manner that work under one contract may interfere with work under another, the OWNER will determine the sequence and order of the Work in either or both contracts. When the Site of one contract is the necessary or convenient means of access for performance of work under another, the OWNER may grant privilege of access or other reasonable privilege to the contractor so desiring, to the extent, amount, and in manner and at time that the OWNER may determine. No OWNER determination of method or time or sequence or order of the work or access privilege shall be the basis for a claim for delay or damage except under provisions of the General Conditions for temporary suspensions of the work. The CONTRACTOR shall conduct its operations so as to cause a minimum of interference with the work of such other contractors and shall cooperate fully with such contractors to allow continued safe access to their respective portions of the Site, as required to perform work under their respective contracts.
- B. **Interference With Work on Utilities:** The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.5 CONTRACTOR USE OF SITE

- A. The CONTRACTOR's use of the Site shall be limited to its construction operations, including on-Site storage of materials, on-Site fabrication facilities, and field offices.
- B. The CONTRACTOR shall not use the private property of the surrounding parcels unless written permission is obtained from the property owner of any of its construction operations.

1.6 OWNER USE OF THE SITE

- A. The OWNER may utilize all or part of the existing Site during the entire period of construction. The CONTRACTOR shall cooperate and coordinate with the OWNER to facilitate the OWNER's operations and to minimize interference with the CONTRACTOR's operations at the same time. In any event, the OWNER shall be allowed access to the Site during the period of construction.

1.7 PROJECT MEETINGS

A. Preconstruction Conference

- 1. Prior to the commencement of WORK at the Site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by the CONTRACTOR'S Project Manager, its superintendent, and its subcontractors as the CONTRACTOR deems appropriate. Other attendees will be:
 - a. ENGINEER and the Resident Project Representative.
 - b. Representatives of OWNER.
 - c. Governmental representatives as appropriate.
 - d. Others as requested by CONTRACTOR, OWNER, or ENGINEER.
- 2. The CONTRACTOR shall bring the preconstruction conference submittals in accordance with Section 01300 - Contractor Submittals.
- 3. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished to the CONTRACTOR prior to the meeting date. However, the CONTRACTOR should be prepared to discuss all of the items listed below.
 - a. Status of CONTRACTOR's insurance and bonds.
 - b. CONTRACTOR's tentative schedules.
 - c. Transmittal, review, and distribution of CONTRACTOR's submittals.
 - d. Processing applications for payment.
 - e. Maintaining record documents.
 - f. Critical work sequencing.

- g. Field decisions and Change Orders.
 - h. Use of Site, office and storage areas, security, housekeeping, and OWNER's needs.
 - i. Major equipment deliveries and priorities.
 - j. CONTRACTOR's assignments for safety and first aid.
 - k. Daily Report Form which the ENGINEER will furnish.
 - l. Submittal Transmittal Form which the ENGINEER will furnish.
- 4. The ENGINEER will preside at the preconstruction conference and will arrange for keeping and distributing the minutes to all persons in attendance.
 - 5. The CONTRACTOR and its subcontractors should plan on the conference taking no less than two hours.

B. Progress Meetings

- 1. The ENGINEER will schedule and hold regular on-Site progress meetings as requested by ENGINEER or as required by progress of the WORK. The CONTRACTOR, ENGINEER, and all subcontractors active on the Site shall attend each meeting. CONTRACTOR may at its discretion request attendance by representatives of its suppliers, manufacturers, and other subcontractors.
- 2. The ENGINEER will preside at the progress meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings is to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the CONTRACTOR shall present any issues that may impact its progress with a view to resolve these issues expeditiously.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

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SECTION 01025 - MEASUREMENT AND PAYMENT

PART 1 -- GENERAL

1.01 SUMMARY

- A. Payment for the various items of the Bid Schedule, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles, and for all labor, operations, and incidentals appurtenant to the items of work being described, as necessary to complete the various items of the WORK all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of permits and cost of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration of the U.S. Department of Labor (OSHA). No separate payment will be made for any item that is not specifically set forth in the Bid Schedule, and all costs therefor shall be included in the prices named in the Bid Schedule for the various appurtenant items of work.
- B. The omission of reference to any item in this description shall not alter the intent of the Bid Form or relieve the CONTRACTOR of the necessity of furnishing such as a part of the Contract.
- C. The unit quantities if any, set forth in the Bid Schedule are approximate and are given to establish a uniform basis for the comparison of Bids. The OWNER reserves the right to increase or decrease the quantity of any class or portion of the WORK during the progress of construction in accordance with these Specifications.
- D. The unit prices as provided in the detailed Schedule of Values are used for periodic partial payments for Work performed, for determining the value of additions and/or deletions associated with approved Change Orders to the Contract, and wherever else reasonable.
- E. For bidding purposes, the ENGINEER has estimated quantities of material; the CONTRACTOR shall be paid for only the actual amounts of materials required and services rendered under this Contract. There is no minimum amount of work guaranteed. The OWNER reserves the right to cancel the Contract without any further restitution other than payment for services rendered and material installed up to that time.

1.02 MEASUREMENTS AND PAYMENT- GENERAL

- A. Units of measure shown on the Bid Summary Sheet shall be as follows unless otherwise specified in the Contract Documents.

UNIT	MEASUREMENT
AL	Allowance – Unit is one. No measurement will be made.
CF	Cubic Feet – Field measure by ENGINEER within the limits specified or shown
Cost Proposal	Payment to be determined by CONTRACTOR's proposal and as approved by the OWNER
DY	Day – Unit is one. No measurement will be made.
EA	Each – Field measure by ENGINEER within the limits specified or shown
HR	Hours – Number of hours of work performed as documented by the ENGINEER
LS	Lump Sum – Unit is one. No measurement will be made.

1.03 BASIS FOR PAYMENTS

- A. The descriptions provided in this Section generally outline the Scope of Work required for those elements of the WORK to be paid for under each item listed in the Bid Form and provided in the Schedule of Values.
- B. The CONTRACTOR shall submit the initial Schedule of Values in electronic spreadsheet (Microsoft Excel) format prior to commencing work. The Schedule of Values activities shall match the Bid Form. Each activity in the Schedule of Values shall also indicate the material quantity, unit price and total price. Schedules not containing the required format shall be rejected.

1.04 BID ITEMS:

The CONTRACTOR shall include costs to compete all work described in the Specifications and scope of work as part of their Bid package.

A. Bid Items I – General

- Item No. I-1 – Maintenance of Traffic Control (including permitting): All costs associated with traffic Control as required for a well site. Payment will be made the amount of time in Days as stated in the CONTRACTOR's bid Payment will be in accordance with the cost breakdown as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. I-2 – Mobilization and Demobilization: Mobilization and Demobilization associated with all rehabilitation activities associated with the Work. The CONTRACTOR will be responsible for mobilizing and demobilizing all equipment, excess materials, and debris from site. The amount bid shall include site prep, cleanup, the removal of all trash and debris, load, transport, and discard in a lawful manner, including all tipping fees; the CONTRACTOR shall also restore the site to original or better including restoring any disturbed sodding, sidewalks, paving, and landscaping. Mobilization/Demobilization will be paid as a lump sum amount as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

This item should include the costs of bonds, required insurance, and other preconstruction expenses, but will exclude the actual cost of permits, which are paid under a separate dedicated allowance, and will exclude the costs of materials which are paid under other bid items.

- A. No actual construction or physical preparatory work may be performed at the site until the WORK of this item has been successfully achieved unless specific written approval by the OWNER is granted for said WORK. Such permission by the OWNER will only be granted if all bond and insurance is in place and a complete Schedule of Values and Baseline Construction Schedule has been supplied by the CONTRACTOR and approved by the OWNER.
- B. The mobilization item will be paid for in the first four payments, each equal to twenty-five percent of the amount bid for this item, which will be made conditioned

upon progress satisfactory to the OWNER being made pursuant to the accepted Project schedule.

- C. The total amount of the payment may not exceed five percent (5%) of the original Subtotal. Retainage, as specified in the General Terms and Conditions and any Special Provisions will apply to these payments.
- D. Since this item is bid as a lump sum, payment will be in accordance with the cost breakdown as approved by the OWNER and measured as required by and satisfactory to the OWNER.
 - Item No. I-3: Drill Rig with Crew (service truck and all equipment included). Payment will be in accordance with the unit price bid per hour for drill rig and crew as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
 - Item No. I-4: Crane Truck with Crew (service truck and all equipment included). Payment will be in accordance with the unit price per hour for crane truck with crew as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
 - Item No. I-5: Site Restoration Allowance: Payment will be for site restoration as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
 - Item No. I-6: Individual Production Well Report Preparation Documenting Work Performed and Data. Preparation Documenting Work Performed and Data. Payment will be for each report as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

B. Bid Items II – Wellfield Maintenance: Monitoring Wells

- Item No. II-1: Water Discharge and Disposal Setup and Removal. This item will be paid per well site at the unit price bid for each occurrence as stated in the CONTRACTOR's bid as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. II-2: Combined Static and Dynamic Down-hole View & Side View Color 360 Degree Video Survey Logging of Monitoring Well with Triplicate USB's (with Bidder's Pump: Pre-Rehabilitation Video and Post-Rehabilitation Video). Payment will be for each combined static and dynamic down-hole view & side view color video survey logging of the monitoring well in accordance with the unit price as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. II-3: Clear Debris/Obstruction from Monitoring Well. Payment will be per hour to clear debris/obstructions from the monitoring well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

- Item No II-4: Clean Monitoring Well Casing and Screen with Casing Scraper, Brushing and Swabbing; Cut and Remove Roots. Payment will be for each occurrence to clean the monitoring well casing and screen with casing scraper swabbing & brushing as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. II-5: Monitoring Well Plugging and Abandonment (cost of cement grout not included). Payment will be for each monitoring well abandoned as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER. The CONTRACTOR shall use cement ASTM C-150 Type II Portland neat cement above the fine sand layer when abandoning the well.
- Item No. II-6: Neat Cement Grout for Well Plugging Abandonment. Payment will be cubic feet of cement used as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No II-7: Monitoring Well Replacement, 4-inch Diameter Sch 40 PVC Screen and Casing Installation – Shallow (complete). Payment will be for each monitoring well as stated in the CONTRACTOR's bid and as approved by the OWNER and measure as required by and satisfactory to the OWNER.
- Item No II-8: Monitoring Well Replacement, 4-inch Diameter Sch 40 PVC Screen and Casing Installation – Deep (complete). Payment will be for each monitoring well as stated in the CONTRACTOR's bid and as approved by the OWNER and measure as required by and satisfactory to the OWNER.

C. Bid Items III – Wellfield Maintenance: Production Wells

- Item No. III-1: Water Discharge and Disposal Setup and Removal for Production Well. This item will be paid per well site at the unit price bid for each occurrence as stated in the CONTRACTOR's bid as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-2: Pump Curve Testing and Wire-to-Water Testing for Production Well. This item will be paid per test at the unit price bid for each occurrence as stated in the CONTRACTOR's bid as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-3: Removal of Production Wellhead, Column Pipe, Pump & Motor, and Appurtenances. Payment will be for the removal of production wellhead, piping, pump & motor, and appurtenances for each production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-4: Pre-Rehabilitation Specific Capacity Test and Post-Rehabilitation Specific Capacity Testing of Production Well. Payment will be paid for each set of pre-rehabilitation and post-rehabilitation specific capacity tests for the production well as stated in the CONTRACTOR's bid

and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

- Item No. III-5: Combined Static and Dynamic Down-hole View & Side View Color 360 Degree Video Survey Logging of Production Well with Triplicate USB's (with Bidder's Pump: Pre-Rehabilitation Video and Post-Rehabilitation Video). Payment will be for each combined static and dynamic down-hole view & side view color video survey logging of production well in accordance with the unit price as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-6: Geophysical Logging: Includes the Cost for Each Individual Log to be Performed as Needed. Individual Logs are as follows: XY Caliper (XYC) and Gamma Ray (GR). Payment will be for each individual geophysical log (XYC and GR) as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-7: Clear Debris/Obstruction from Production Well. Payment will be per hour to clear debris/obstructions from the production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-8: Well Acidization Mobilization for Production Well. Payment will be for each mobilization as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-9: Well Acidization Treatment with 32% HCL for Production Well. Payment will be for each well acidization with 32% HCL as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-10: Clean Production Well Casing and Screen using Casing Scraper, Brushing and Swabbing for Production Well. Payment will be per hour to clean the Production Well Casing and Screen for the production well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-11: Jetting and Redevelop Production Well. Payment will be per hour of jetting and redevelopment of the production well as stated in the CONTRACTOR's bid and approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-12: Furnish and Install Additional Gravel into Production Well Screen Gravel Pack. Payment will be per cubic feet for the furnishing and installing additional gravel into production well screen gravel pack as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-13: Production Well Plugging and Abandonment (cost of cement grout not included). Payment will be cubic feet as stated in the

CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

- Item No. III-14: Neat Cement Grout for Production Well Plugging Abandonment. Payment will be cubic feet of cement used as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER. The CONTRACTOR shall use cement ASTM C-150 Type II Portland neat cement above the fine sand layer when abandoning the well.
- Item No. III-15: Backplugging of Production Well. Payment will be cubic feet of cement used as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-16: Well Development and Redevelopment by Airlift with 600 to 1,000 CFM Air Compressor for Production Well. Payment will be in accordance with the hours required to complete well development and redevelopment using the airlift method using 600 to 1,000 CFM air compressor as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-17: Well Development Using Bidder's Pump and Flow Meter (capable of pumping a minimum of 2 times the design rate in gallons per minute (gpm) of Production Well). Payment will be in accordance with the hours required to complete well development using the BIDDERS's pump and flow meter (capable of pumping at 2 times the design rate in gpm) as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-18: Disposal of Development Solids Requiring Containerization and Proper Disposal by Bidder for Production Well. Payment will be for each event associated with the disposal of solids related to development activities as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-19: Disposal of Development Water to Approved Location for Production Well. Payment will be for each well site for hauling discharge water and disposal as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-20: Sand Content Testing for Production Well (by Rossum Sand Tester): Payment will be for each Sand Content Test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-21: Silt Density Index (SDI) Testing for Production Well (passing only, SDI <3). Payment will be for each Silt Density Index Test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-22: Step Drawdown Testing for Production Well. Payment will be for each Step Drawdown Test as stated in the CONTRACTOR's bid

and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

- Item No. III-23: Disinfect Well/Chlorinate Well, and Pump and Pump Assembly per AWWA Standards for Production Well. Payment will be for each chemical treatment with chlorine solution and wastewater chlorine neutralization for each site as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-24: Biological Activity Reaction Tests (BART™ Iron Related Bacteria, Slime Forming Bacteria, Sulfate Reducing Bacteria) All 3 Tests for Each Item Unit for Production Well. Payment will be for each test as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-25: Reinstall Production Wellhead, Column Pipe, Pump and Motor, and Appurtenances. Payment will be for the reinstallation of wellhead, piping, pump & motor, and appurtenances for each well as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No III-26: Furnish and Install Production Well Replacement Column Pipe. Payment will be in accordance with the cost as stated in the CONTRACTOR's proposal and as approved by the OWNER.
- Item No III-27: Furnish and Install Production Well Stilling Well. Payment will be in accordance with the cost as stated in the CONTRACTOR's proposal and as approved by the OWNER.
- Item No. III-28: Furnish and Install Production Well New Pump, Motor, and SS Safety Cables and Accessories. Payment will be in accordance with the cost as stated in the CONTRACTOR's proposal and as approved by the OWNER.
- Item No. III-29: Disassembly, Inspection, and Reassembly of Production Well Pump in Shop. Payment will be for each pump as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-30: Production Well Pump and Motor Maintenance in Shop. Payment will be in accordance with the hours required to complete each pump and motor maintenance in the shop as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.
- Item No. III-31: Water Sample Collection and Laboratory Bacteriological Analysis for Production Well. Payment will be for each sample collected as stated in the CONTRACTOR's bid and as approved by the OWNER and measured as required by and satisfactory to the OWNER.

2 PRODUCTS (NOT USED)

3 EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01041 – PROJECT COORDINATION

PART 1 -- GENERAL

1.1 REQUIREMENTS INCLUDED

- A. The Contractor shall:
 - 1. Coordinate the Work of its employees and all of its subcontractors.
 - 2. Expedite its Work to assure compliance with approved construction schedules.
 - 3. Coordinate its Work with the work of other Prime Contractors and work by the Owner.
 - 4. Comply with the orders and instructions of the Engineer and/or the Owner.

1.2 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work.
- B. Section 01025: Measurement and Payment.
- C. Section 01510: Temporary Utilities.
- D. Section 01700: Project Closeout.

1.3 CONSTRUCTION ORGANIZATION AND START-UP

- A. The Owner shall establish on-site lines of authority and communications:
 - 1. Schedule and conduct pre-construction conference and progress meetings as outlined in the Specifications.
 - 2. Establish procedures for intra-project communications:
 - a. Submittals.
 - b. Reports and records.
 - c. Recommendations.
Coordination of drawings.
Schedules.
Resolution of conflicts.
Interpret Contract Documents:
 - d. Transmit written interpretations to the Contractor and to other concerned parties.
- 4. Control the use of the Site:
 - a. Allocate space for the Contractor's use for field offices, storage trailers, storage areas and the work.
- 5. Inspection and Testing:
 - a. Inspect Work to assure performance in accordance with requirements of the Contract Documents.
 - b. Administer special testing and inspections of suspect work.
 - c. Reject Work not in compliance with the requirements of the Contract Documents.
 - d. Coordinate testing laboratory services:
 - 1) Verify that required laboratory personnel are present.

- 2) Verify that tests are made in accordance with specified standards.
- 3) Review test reports for compliance with specified criteria.
- 4) Recommend and administer any required re-testing.

1.4 CONTRACTOR'S DUTIES

A. Construction Schedules:

1. Prepare a detailed schedule of basic operations.
2. Monitor schedules as Work progresses:
 - a. Identify potential variances between scheduled and probable completion dates for each phase.
 - b. Recommend to the Owner adjustments in the schedule to meet required completion dates.
 - c. Document changes in schedule and submit to the Owner, the Engineer and to involved subcontractors.
3. Observe work of each subcontractor to monitor compliance with the schedule.
 - a. Verify that labor and equipment are adequate for the Work and the schedule.
 - b. Verify that product and equipment procurement schedules are adequate, including Owner furnished materials.
 - c. Verify that product and equipment deliveries are adequate to maintain the schedule, including Owner furnished materials
 - d. Report non-compliance to the Owner, with recommendations for changes.

B. Furnish and Erect an Informational Project Sign:

1. Project sign to meet minimum criteria:
 - a. The sign dimensions shall be 4' x 6' x $\frac{3}{4}$ " plywood securely supported with 2 posts so that the bottom of the sign is 2' from grade.
 - b. Sign layout to meet template provided at the end of this specification.
 - c. Placement location to be determined by Engineer.
 - d. Sign to be maintained in good conditions until project completion when sign shall then become the property of Owner.

C. Process Shop Drawings, Product Data and Samples:

1. Prior to submittal to the Owner, review for compliance with the Contract Documents:
 - a. Field dimensions and clearance dimensions.
 - b. Relation to available space.
 - c. Effect of any changes on the work of any subcontractor.

D. Review drawings prepared by subcontractors:

1. Prior to submittal to the Owner, review for compliance with the Contract Documents.

E. Prepare coordination drawings as required to resolve conflicts and to assure coordination of the Work of all trades or subcontractors or by special equipment requirements.

1. Submit to the Owner and the Engineer.
2. Reproduce and distribute copies to concerned parties after review by the Owner and the Engineer.

F. Maintain reports and records at the job site:

1. Daily log of the progress of Work.

2. Records:
 - a. Contracts.
 - b. Purchase Orders.
 - c. Materials and Equipment Records, including delivery tickets and invoices for Owner furnished materials.
 - d. Approved Field Orders and Change Orders.
 - e. Applicable handbooks, codes and standards.
3. Maintain a file of record documents.

1.5 CONTRACTOR'S CLOSE-OUT DUTIES

- A. Cleaning and testing of piping systems:
 1. Coordinate flushing/cleaning of piping systems to remove all construction deposits and debris.
 2. Supply Record Drawings for approval prior to pressure testing or equipment testing.
 3. Organize hydrostatic pressure testing.
 4. Record dates on which specific sections were tested.
 5. Submit to the Owner written notice of beginning of warranty and guarantee periods for equipment installed.
- B. Testing of wells:
 1. Coordinate flushing/cleaning of wells to remove all rehabilitation fluids and debris.
 2. Chlorinate well and flush residual chlorine.
 4. Supply Record Drawings for approval.
 5. Bacteriological testing.
 4. Submit to the Owner written notice of beginning of warranty and guarantee periods for equipment installed.
- C. Substantial Completion:
 1. Conduct an inspection with the Engineer and the Owner to develop a list of Work to be completed or corrected.
 2. Assist the Owner and the Engineer in conducting the inspection.
 3. Supervise correction and completion of work of subcontractors.
 4. Return all unused piping materials desired to be retained by the Owner to the Owner's storage yard.
- D. At completion of the Work, conduct an inspection to assure that:
 1. Specified cleaning and restoration has been accomplished to the satisfaction of the Owner or other governmental agencies.
 2. Temporary facilities have been removed from the site.

1.6 ENGINEER'S CLOSE-OUT DUTIES

- A. Final Completion:
 1. When the Contractor determines that the Work is finally complete, conduct an inspection with the Engineer and the Owner to verify final completion of the Work.
- B. Administration of Contract Close-Out:
 1. Receive and review Contractor's final submittals.
 2. Transmit to the Owner with recommendations for action.

PART 2 -- PART 2 – PRODUCTS (NOT USED)

PART 3 -- PART 3 – EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

PART 1 -- GENERAL

1.1 GENERAL

- A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of the Specifications, the following acronyms or abbreviations which may appear shall have the meanings indicated herein.

1.2 ABBREVIATIONS

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABMA	American Bearing Manufacturer's Association – ABMA
ACGIH	American Conference of Governmental Industrial Hygienists
ACI	American Concrete Institute
AF&PA	American Forest and Paper Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AI	The Asphalt Institute
AIA	American Institute of Architects
AIHA	American Industrial Hygiene Association
AIIM	Association for Information and Image Management
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMA	Acoustical Material Association
AMCA	Air Movement and Control Association International, Inc
ANS	American Nuclear Society
ANSI	American National Standards Institute, Inc.
APA	The Engineered Wood Association
API	American Petroleum Institute
APWA	American Public Works Association
ARI	Air-Conditioning and Refrigeration Institute
ASA	Acoustical Society of America
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASNT	American Society of Nondestructive Testing
ASQ	American Society for Quality
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWCI	American Wire Cloth Institute
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute

AWS	American Welding Society
AWWA	American Water Works Association
BBC	Basic Building Code, Building Officials and Code Administrators International
BHMA	Builders Hardware Manufacturer's Association
CABO	Council of American Building Officials
CDA	Copper Development Association
CEMA	Conveyors Equipment Manufacturer's Association
CGA	Compressed Gas Association
CLFMI	Chain Link Fence Manufacturer's Institute
CLPCA	California Lathing and Plastering Contractors Association
CMAA	A division/section of the Material Handling Industry of America
CRSI	Concrete Reinforcing Steel Institute
DCDMA	Diamond Core Drilling Manufacturer's Association
DHI	Door and Hardware Institute
DIPRA	Ductile Iron Pipe Research Association
DVS	German Welding Society
EI	Energy Institute
EIA	Electronic Industries Alliance
EPA	Environmental Protection Agency
ETL	Electrical Test Laboratories
FCC	Federal Communications Commission
FCI	Fluid Controls Institute
FEMA	Federal Emergency Management Association
FHWA	Federal Highway Administration
FM	Factory Mutual System
FPL	Forest Products Laboratory
HI	Hydronics Institute, Hydraulic Institute
HSWA	Federal Hazardous and Solid Waste Amendments
IAPMO	International Association of Plumbing and Mechanical Officials
ICBO	International Conference of Building Officials
IBC	International Building Code
ICC	International Code Council
ICEA	Insulated Cable Engineers Association
ICCEC	Electrical Code
ICC-ES	International Code Council Evaluation Service
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFC	International Fire Code
IFGC	International Fuel Gas Code
IMC	International Mechanical Code
IME	Institute of Makers of Explosives
IPC	International Plumbing Code, Association Connecting Electronic Industries
IRC	International Residential Code
ISA	Instrument Society of America
ISDI	Insulated Steel Door Institute
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
ITU-T	Telecommunications Standardization Sector of the International Telecommunications Union
LPI	Lightning Protection Institute
LRQA	Lloyd's Register Quality Assurance
MBMA	Metal Building Manufacturer's Association

MIL	Military Standards (DoD)
MPTA	Mechanical Power Transmission Association
MSS	Manufacturers Standardization Society
NAAMMM	National Association of Architectural Metal Manufacturer's
NACE	National Association of Corrosion Engineers
DASMA	Door and Access Systems Manufacturers Association International
NAPF	National Association of Pipe Fabricators
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NCCLS	National Committee for Clinical Laboratory Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NETA	International Electrical Testing Association
NFPA	National Fire Protection Association or National Fluid Power Association
NISO	National Information Standards Organization
NIST	National Institute of Standards and Technology
NLGI	National Lubricating Grease Institute
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PPI	Plastic Pipe Institute
RCRA	Resource Conservation and Recovery Act
RIS	Redwood Inspection Service, a division of the California Redwood Association, CRA
RMA	Rubber Manufacturers Association
RVIA	Recreational Vehicle Industry Association
RWMA	Resistance Welder Manufacturer's Association
SAE	Society of Automotive Engineers
SDI	Steel Door Institute, Steel Deck Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPFA	Steel Plate Fabricator's Association
SPIB	Southern Pine Inspection Bureau
SSBC	Southern Standard Building Code, Southern Building Code Congress
SSPC	Society for Protective Coating
SSPWC	Standard Specifications for Public Works Construction
STLE	Society of Tribologists and Lubricating Engineers
TAPPI	Technical Association of the Worldwide Pulp, Paper, and Converting Industry
TFI	The Fertilizer Institute
TIA	Telecommunications Industries Association
TPI	Truss Plate Institute
UBC	Uniform Building Code
UL	Underwriters Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WDMA	National Window and Door Manufacturers Association
WEF	Water Environment Federation
WI	Woodwork Institute
WRI	Wire Reinforcement Institute, Inc.
WWPA	Western Wood Products Association

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01090 - REFERENCE STANDARDS

PART 1 -- GENERAL

1.1 GENERAL

- A. **Titles of Sections and Paragraphs:** Titles and subtitles accompanying specification sections and paragraphs are for convenience and reference only and do not form a part of the Specifications.
- B. **Applicable Publications:** Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is indicated, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Contract is advertised for Bids shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth in the Specifications will be waived because of any provision of or omission from said standards or requirements.
- C. **Specialists, Assignments:** In certain instances, specification text requires (or implies) that specific WORK is to be assigned to specialists or expert entities who must be engaged to perform that WORK. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of WORK is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. The CONTRACTOR shall construct the WORK in accordance with the Contract Documents and the referenced portions of those referenced codes, standards, and specifications.
- B. References to "Building Code" or "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Association of Plumbing and Mechanical Officials (IAPMO) as amended by the local jurisdiction. "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for Bids shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.
- C. In case of conflict between codes, reference standards, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and direction prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

- D. References to "OSHA Regulations for Construction" shall mean **Title 29, Part 1926, Construction Safety and Health Regulations**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- E. References to "OSHA Standards" shall mean **Title 29, Part 1910, Occupational Safety and Health Standards**, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
- F. **Applicable Standard Specifications:** References in the Contract Documents to "Standard Specifications" or SSPWC shall mean the Standard Specifications for Public Works Construction.

1.3 REGULATIONS RELATED TO HAZARDOUS MATERIALS

- A. The CONTRACTOR shall be responsible that all WORK included in the Contract Documents, regardless if indicated or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other federal, state, and local regulations governing the storage and conveyance of hazardous materials, including petroleum products.
- B. Where no specific regulations exist and the OWNER has not waived the requirement in writing, chemical, hazardous, and petroleum product piping and storage in underground locations shall be double containment piping and tanks or be installed in separate concrete trenches and vaults with an approved lining that cannot be penetrated by the chemicals.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01300 -- CONTRACTOR SUBMITTALS

PART 1 -- GENERAL

1.1 GENERAL

- A. Wherever submittals are required by the Contract Documents, unless otherwise specified the CONTRACTOR shall submit five (5) copies and one reproducible copy to the ENGINEER.
- B. Within 7 Days after the date of commencement as stated in the Notice to Proceed, submit the following items for review:
 - 1. Submittal Schedule
 - a. Submit a preliminary schedule of Shop Drawings, Samples, and proposed Substitutes ("or equal") submittals listed in the Bid.
 - b. Base the schedule of submittals on CONTRACTOR's priority, planned construction sequence and schedule, long-lead items, and size of submittal package.
 - c. Allow time for resubmittals.
 - 2. Submit a list of permits and licenses the CONTRACTOR shall obtain, indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.
 - 3. A project overview bar chart schedule.
 - 4. A mobilization plan including site layout plan with a clearly delineated construction area, proposed access routes, and areas identified as access only (no construction related activities shall be conducted).

1.2 PRECONSTRUCTION CONFERENCE SUBMITTALS

- A. At the preconstruction conference of Section 01010 – Summary of Work, submit the following items to the ENGINEER for review:
 - 1. A revised schedule of Shop Drawings, Samples, and proposed Substitution ("or-equal") submittals listed in the Bid;
 - 2. A list of permits and licenses the CONTRACTOR shall obtain, indicating the agency required to grant the permit, the expected date of submittal for the permit, and required date for receipt of the permit;
 - 3. A preliminary schedule of values in accordance with Section 01301 – Schedule of Values;
 - 4. a 60-Day plan of operation in accordance with Section 01311 – CPM Construction Schedule;

1.3 SHOP DRAWINGS

- A. Shop Drawings may include detail design calculations, shop-prepared drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.
- B. Whenever the CONTRACTOR is required to submit design calculations as part of a submittal, such calculations shall bear the signature and seal of an engineer registered in the appropriate branch and in the state wherein the Project is located, unless otherwise indicated.
- C. Transmittal Form
 - 1. Shop Drawing submittals shall be accompanied by the ENGINEER's standard submittal transmittal form, a reproducible copy of which is available from the ENGINEER.
 - 2. A submittal without the form, or where applicable items on the form have not been completed, will be returned for resubmittal.
- D. Organization
 - 1. Use a single submittal transmittal form for each technical specification Section or item or class of material or equipment for which a submittal is required.
 - 2. A single submittal covering multiple Sections will not be accepted, unless the primary specification references other Sections for components: For example, if a pump Section references other Sections for the motor, shop-applied protective coating, anchor bolts, local control panel, and variable frequency drive, a single submittal would be accepted, whereas a single submittal covering vertical turbine pumps and horizontal split-case pumps would not be accepted.
 - 3. On the transmittal form, index the components of the submittal and insert tabs in the submittal to match the components.
 - 4. Relate the submittal components to specification paragraph and subparagraph, Drawing number, detail number, schedule title, room number, or building name, as applicable.
 - 5. Unless otherwise indicated, match terminology and equipment names and numbers used in the submittals with those used in the Contract Documents.
- E. Format
 - 1. Minimum sheet size shall be 8-1/2 inches by 11 inches, and maximum sheet size shall be 24 inches by 36 inches.
 - 2. Number every page in a submittal in sequence.
 - 3. Collate and staple or bind, as appropriate, each copy of a submittal; the ENGINEER will not collate sheets or copies.

4. Where product data from a manufacturer is submitted, clearly mark which model is proposed, with complete pertinent data capacities, dimensions, clearances, diagrams, controls, connections, anchorage, and supports.
 5. Present a sufficient level of detail for assessment of compliance with the Contract Documents.
 6. Numbering
 - a. Assign to each submittal a unique number.
 - b. Number the submittals sequentially, with the submittal numbers clearly noted on the transmittal.
 - c. Each submittal shall be assigned a unique number. Submittals shall be numbered sequentially. The submittal numbers shall be clearly noted on the transmittal. Assign original submittals a numeric submittal number followed by a letter of the alphabet in order to distinguish between the original submittal and each resubmittal: For example, if submittal "25-A" requires a resubmittal, the first resubmittal will bear the designation "25-B" and the second resubmittal will bear the designation "25-C," and so on.
- F. Disorganized submittals that do not meet the requirements of the Contract Documents will be returned without review.
- G. ENGINEER's Review
1. Except as otherwise indicated, the ENGINEER will return prints of each submittal to the CONTRACTOR with comments noted thereon, within 30 Days following receipt by the ENGINEER.
 2. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the first resubmittal on an item.
 3. The OWNER reserves the right to withhold monies due to the CONTRACTOR to cover additional costs of the ENGINEER's review beyond the first resubmittal.
 4. The ENGINEER'S maximum review period for each submittal or resubmittal will be 30 Days; thus, for a submittal that requires 2 resubmittals before it is complete, the maximum review period could be 90 Days.
- H. If a submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN," formal revision and resubmission will not be required.
- I. If a submittal is returned marked "MAKE CORRECTIONS NOTED," the CONTRACTOR shall make the corrections on the submittal, but formal revision and resubmission will not be required.
- J. Resubmittals

1. If a submittal is returned marked "AMEND-RESUBMIT," the CONTRACTOR shall revise the submittal and resubmit the required number of copies.
2. Resubmittal of portions of multi-page or multi-drawing submittals will not be accepted: For example, if a Shop Drawing submittal consisting of 10 drawings contains one drawing noted as "AMEND-RESUBMIT," the submittal as a whole is deemed "AMEND-RESUBMIT," and 10 drawings are required to be resubmitted.
3. Every change from a submittal to a resubmittal or from a resubmittal to a subsequent resubmittal shall be identified and flagged on the resubmittal.

K. Rejected Submittals

1. If a submittal is returned marked "REJECTED-RESUBMIT," the CONTRACTOR shall prepare a new submittal and shall submit the required number of copies to the ENGINEER for review.

L. The fabrication of an item may commence only after the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED."

M. Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as changes to the contract requirements.

N. Review by CONTRACTOR

1. Submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR prior to submission to the ENGINEER.
2. Each submittal shall be dated and signed by the CONTRACTOR as being correct and in strict conformance with the Contract Documents.
3. In the case of Shop Drawings, each sheet shall be so dated and signed.
4. Any deviations from the Contract Documents shall be noted on the transmittal sheet.
5. The ENGINEER will only review submittals that have been so verified by the CONTRACTOR.
6. Non-verified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.

O. Conformance

1. Corrections or comments made on the CONTRACTOR's Shop Drawings during review shall not relieve the CONTRACTOR from compliance with Contract Drawings and Specifications.

2. Review is for conformance to the design concept and general compliance with the Contract Documents only.
3. The CONTRACTOR shall be responsible for confirming and correlating quantities and dimensions, fabrication processes and techniques, coordinating WORK with the trades, and satisfactory and safe performance of the WORK.

1.4 SAMPLES

A. Quantity

1. The CONTRACTOR shall submit the number of samples indicated by the Specifications.
2. If the number is not indicated, submit not less than 3 samples.
3. Where the quantity of each sample is not indicated, submit such quantity as necessary for proper examination and testing by the methods indicated.
4. Unless otherwise indicated, samples shall be submitted a minimum of 24 days prior to ordering such material.
5. Samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and Manufacturer's name. Upon receiving acceptance of the ENGINEER, one set of the samples will be retained by the ENGINEER, and one set of samples shall remain at the Site until completion of the

B. Identification and Distribution

1. Individually and indelibly label or tag each sample, indicating the salient physical characteristics and the manufacturer's name.
2. Upon acceptance by the ENGINEER, one set of the samples will be stamped and dated by the ENGINEER and returned to the CONTRACTOR, one set of samples will be retained by the ENGINEER, and one set shall remain at the Site in the ENGINEER's field office until completion of the WORK.

C. Selection

1. Unless otherwise indicated, the ENGINEER will select colors and textures from the manufacturer's standard colors and standard materials, products, or equipment lines.
2. If certain samples represent non-standard colors, materials, products, or equipment lines that will require an increase in Contract Times or Price, the CONTRACTOR shall clearly state so on the transmittal page of the submittal.

D. The CONTRACTOR shall schedule sample submittals such that:

1. Sample submittals for color and texture selection are complete so the ENGINEER has 45 Days to assemble color panels and select color- and texture-dependent products and materials without delay to the construction schedule; and,

2. After the ENGINEER selects colors and textures, the CONTRACTOR has sufficient time to provide the products or materials without delay to the construction schedule.
3. The Contract Times will not be extended for the CONTRACTOR's failure to allow enough review and approval or selection time, failure to submit complete samples requiring color or texture selection, or failure to submit complete or approvable samples.

1.5 TECHNICAL MANUAL

- A. The CONTRACTOR shall submit technical operation and maintenance information for each item of mechanical, electrical, and instrumentation equipment in an organized manner in the Technical Manual.
- B. The manual shall be written such that it can be used and understood by the OWNER's operation and maintenance staff.
- C. Categories
 1. The Technical Manual shall be subdivided first by Specification Section number; second, by equipment item; and last, by "Category." The following "Categories" shall be addressed (as applicable):
 - a. Category 1 - Equipment Summary
 - 1) Summary: A table shall indicate the equipment name, equipment number, and process area in which the equipment is installed.
 - 2) Form: The ENGINEER will supply an Equipment Summary Form for each item of mechanical, electrical, and instrumentation equipment in the WORK. The CONTRACTOR shall fill in the relevant information on the form and include it in Part 1.
 - b. Category 2 - Operational Procedures
 - 1) Procedures: Manufacturer-recommended procedures on the following shall be included in Part 2:
 - Installation
 - Adjustment
 - Startup
 - Location of controls, special tools, equipment required, or related instrumentation needed for operation
 - Operation procedures
 - Load changes
 - Calibration
 - Shutdown
 - Troubleshooting
 - Disassembly
 - Reassembly
 - Realignment

Testing to determine performance efficiency
Tabulation of proper settings for pressure relief valves, low and high
pressure switches, and other protection devices
List of all electrical relay settings including alarm and contact settings

c. Category 3 - Preventive Maintenance Procedures

- 1) Procedures: Preventive maintenance procedures shall include manufacturer-recommended procedures to be performed on a periodic basis, both by removing and replacing the equipment or component, and by maintaining the equipment in place.
- 2) Schedules: Recommended frequency of preventive maintenance procedures shall be included. Lubrication schedules, including lubricant SAE grade, type, and temperature ranges, shall be covered.

d. Category 4 - Parts List

- 1) Parts List: A complete parts list shall be furnished, including a generic description and manufacturer's identification number for each part. Addresses and telephone numbers of the nearest supplier and parts warehouse shall be included.
- 2) Drawings: Cross-sectional or exploded view drawings shall accompany the parts list. Part numbers shall appear on the drawings with arrows to the corresponding part.

e. Category 5 - Wiring Diagrams

- 1) Diagrams: Category 5 shall include complete internal and connection wiring diagrams for electrical equipment items.

f. Category 6 - Shop Drawings

- 1) Drawings: This category includes approved shop or fabrication drawings with ENGINEER comments and corrections incorporated, complete with dimensions.

g. Category 7 - Safety

- 1) Procedures: This category describes the safety precautions to be taken when operating and maintaining the equipment or working near it.

h. Category 8 - Documentation:

- 1) Equipment warranties, affidavits, certifications, calibrations, laboratory test results, etc. required by the Technical Specifications shall be placed in this category.

D. Format

1. Bind each Technical Manual in standard size 3-ring hardcover binders, labeled on the spine and cover with Project name, OWNER's project number, Specification Section number, equipment name, and equipment identification number
2. Each Binder shall contain its own detailed table of contents at the front, plus a summary level table of contents information for the other binders in a multi-binder set.
3. Documents in binders shall be 3-hole punched, with no text punched out, and pages larger than 8-1/2 by 11 shall be folded to 8-1/2 by 11 size.
4. Provide a CD with electronic files with each final set of Technical Manuals, as follows:
 - a. Project-specific files created in Microsoft Office 2007;
 - b. AutoCad, version 2012;
 - c. Adobe Acrobat portable document format (PDF) or other software required by the Specifications; and,
 - d. Manufacturer literature in Adobe Acrobat portable document format (PDF).

E. Review Process

1. Furnish 3 draft Technical Manuals for each Specification Section that requires a manual.
2. The ENGINEER will retain one copy, will forward one copy to the OWNER, and will return onecopy to the CONTRACTOR with review comments.
3. Incorporate comments into the draft and submit 5 identical copies of the final manual for acceptance.

F. Submittal and Corrections

1. Except as otherwise indicated, submit the manuals in final form to the ENGINEER not later than the 75 percent of construction completion Time.
2. Discrepancies found by the ENGINEER shall be corrected within 30 Days from the Date of written notification by the ENGINEER.

- G. Manuals that are incomplete or unacceptable at the schedule criterion above will constitute sufficient justification for the OWNER to retain the amount in Paragraph "Technical Manual Submittals" of Section 01700 – Project Closeout, from any monies due the CONTRACTOR.

1.6 SPARE PARTS LIST

A. General

1. Furnish to the ENGINEER 5 identical sets of spare parts information for mechanical, electrical, and instrumentation equipment.
2. The spare parts list shall include those spare parts that each manufacturer recommends to be maintained by the OWNER in inventory.

B. Sources and Pricing

1. The spare parts list shall include a current list price of each spare part.
2. Each manufacturer or supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts, to assist the OWNER in ordering.

C. Format

1. Cross-reference the spare parts lists to the equipment numbers designated in the Contract Documents.
2. The spare parts lists shall be bound in standard-size, 3-ring, loose-leaf, vinyl plastic, hard-cover binders suitable for bookshelf storage.
3. The binder ring size shall not exceed 2-1/2 inches.
4. Each copy of the spare parts lists shall be accompanied by a CD containing the lists in electronic format, in files created under Microsoft Office 2007.

1.7 AS-BUILT DRAWINGS

A. On-Site Drawings Set

1. Maintain one set of Drawings at the Site for the preparation of as-built drawings.
2. On this set, mark every project condition, location, configuration, and any other change or deviation which may differ from the Contract Drawings at the time of award, including buried or concealed construction and utility features that are revealed during the course of construction.
3. Give special attention to recording the horizontal and vertical location of buried utilities that differ from the locations indicated, or that were not indicated on the Contract Drawings.
4. Supplement the as-built drawings by any detailed sketches as necessary or as directed, in order to fully indicate the WORK as actually constructed.
5. The as-built drawings are the CONTRACTOR's representation of as-built conditions, shall include revisions made by addenda and change orders, and shall be maintained up-to-date during the progress of the WORK.
6. Use red ink for alterations and notes.
7. Notes shall identify relevant Change Orders by number and date.

B. Submittal

1. Submit paper copies of the as-built drawings on the 20th Day of every third month after the month in which the Notice to Proceed is given, as well as at completion of the WORK.
2. Failure to submit complete as-built drawings on or before the 20th Day will enact the liquidated damages clause for interim record drawing submittals described in Article 3 of the Agreement.

C. In the case of those drawings that depict the detail requirement for equipment to be assembled and wired in the factory, such as motor control centers and the like, update the as-built drawings by indicating those portions which are superseded by Change Order drawings or final Shop Drawings, and by including appropriate reference information describing the Change Orders by number and the Shop Drawings by manufacturer, drawing, and revision numbers.

D. Unacceptable Drawings

1. Disorganized or incomplete as-built drawings will not be accepted.
2. The CONTRACTOR shall revise them and resubmit within 10 Days.

E. As-built drawings shall be accessible to the ENGINEER during the construction period.

F. Final Payment

1. Final payment will not be acted upon until the as-built drawings have been completed and delivered to the ENGINEER.
2. Up-to-date as-built drawings shall be in the form of a set of prints with carefully plotted information overlaid and an electronic form under Microsoft Office 2007, AutoCad 2012, Adobe (PDF), or other software required by the Specifications.

G. Information submitted by the CONTRACTOR will be assumed to be correct, and the CONTRACTOR shall be responsible for the accuracy of such information

1.8 QUALITY CONTROL (QC) SUBMITTALS

A. Quality control submittals are defined as those required by the Specifications to present documentary evidence to the ENGINEER that the CONTRACTOR has satisfied certain requirements of the Contract Documents.

B. Unless otherwise indicated, QC submittals shall be submitted:

1. Before delivery and unloading, for the following types of submittals:
 - a. Manufacturers' installation instructions
 - b. Manufacturers' and Installers' experience qualifications
 - c. Ready mix concrete delivery tickets

- d. Design calculations
 - e. Affidavits and manufacturers' certification of compliance with indicated product requirements
 - f. Laboratory analysis results
 - g. Factory test reports
2. Within 30 Days of the event documented for the following types of submittals:
- a. Manufacturers' field representative certification of proper installation
 - b. Field measurement
 - c. Field test reports
 - d. Receipt of permit
 - e. Receipt of regulatory approval
- C. The ENGINEER will record the date that a QC submittal was received and review it for compliance with submittal requirements, but the review procedures above for Shop Drawings and samples will not apply.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

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SECTION 01400 - QUALITY CONTROL

PART 1 -- GENERAL

1.1 DEFINITION

- A. Specific quality control requirements for the WORK are indicated throughout the Contract Documents. The requirements of this Section are primarily related to performance of the WORK beyond furnishing of manufactured products. The term "Quality Control" includes inspection, sampling and testing, and associated requirements.

1.2 INSPECTION AT PLACE OF MANUFACTURE

- A. Unless otherwise indicated, all products, materials, and equipment shall be subject to inspection by the ENGINEER at the place of manufacture.
- B. The presence of the ENGINEER at the place of manufacturer, however, shall not relieve the CONTRACTOR of the responsibility for providing products, materials, and equipment which comply with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR, and said duty shall not be avoided by any act or omission on the part of the ENGINEER.

1.3 SAMPLING AND TESTING

- A. Unless otherwise indicated, all sampling and testing will be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the ENGINEER will assure the OWNER that the quality of the workmanship is in full accord with the Contract Documents.
- B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the testing or other quality assurance requirements originally indicated, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial WORK, shall not be construed as a waiver of any requirements of the Contract Documents.
- C. Notwithstanding the existence of such waiver, the ENGINEER reserves the right to make independent investigations and tests, and failure of any portion of the WORK to meet any of the requirements of the Contract Documents, shall be reasonable cause for the ENGINEER to require the removal or correction and reconstruction of any such WORK in accordance with the General Conditions.

1.4 INSPECTION AND TESTING SERVICE

- A. Inspection and testing laboratory service shall comply with the following:
 - 1. Unless indicated otherwise by the Technical Specifications, the OWNER will appoint, employ, and pay for services of an independent firm to perform inspection and testing or will perform inspection and testing itself.

2. The OWNER or independent firm will perform inspections, testings, and other services as required by the ENGINEER under Paragraph 1.3C above.
3. Reports of testing, regardless of whether the testing was the OWNER'S or the CONTRACTOR'S responsibility, will be submitted to the ENGINEER in duplicate], indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
4. The CONTRACTOR shall cooperate with the OWNER or independent firm and furnish samples of materials, design mix, equipment, tools, storage, and assistance as requested.
5. The CONTRACTOR shall notify ENGINEER 24 hours prior to the expected time for operations requiring inspection and laboratory testing services.
6. Retesting required because of non-conformance to requirements shall be performed by the same independent firm on instructions by the ENGINEER. The CONTRACTOR shall bear all costs from such retesting.
7. For samples and tests required for CONTRACTOR'S use, the CONTRACTOR shall make arrangements with an independent firm for payment and scheduling of testing. The cost of sampling and testing for the CONTRACTOR'S use shall be the CONTRACTOR'S responsibility.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. **Inspection:** The CONTRACTOR shall inspect materials or equipment upon the arrival on the job site and immediately prior to installation, and reject damaged and defective items.
- B. **Measurements:** The CONTRACTOR shall verify measurements and dimensions of the WORK, as an integral step of starting each installation.
- C. **Manufacturer's Instructions:** Where installations include manufactured products, the CONTRACTOR shall comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in Contract Documents.

- END OF SECTION -

SECTION 01505 - MOBILIZATION

PART 1 -- GENERAL

1.1 GENERAL

- A. CONTRACTOR shall mobilize as required for the proper performance and completion of the WORK and in accordance with the Contract Documents.
- B. Mobilization shall include at least the following items:
 - 1. Moving onto the Site of CONTRACTOR's plant and equipment necessary for the first month of operations.
 - 2. Installing temporary construction power, wiring, and lighting facilities.
 - 3. Establishing fire protection system.
 - 4. Developing construction water supply.
 - 5. Providing on-site communication facilities, including telephones, and radio pagers.
 - 6. Providing on-site sanitary facilities and potable water facilities.
 - 7. Arranging for and erection of CONTRACTOR's WORK and storage yards.
 - 8. Constructing and implementing security features and requirements complying with Government Security Regulations.
 - 9. Obtaining required permits.
 - 10. Having OSHA required notices and establishing safety programs.
 - 11. Having the CONTRACTOR's superintendent at the Site full time.
 - 12. Submitting initial submittals.

1.2 PAYMENT FOR MOBILIZATION

- A. The payment for mobilization will be as stated in Section 01025 – Measurement and Payment.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

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SECTION 01510 – TEMPORARY UTILITIES

PART 1 -- GENERAL

1.1 GENERAL

- A. The types of utility services required for general temporary use at the Site include the following:
 - 1. Water service (potable for certain uses)
 - 2. Sanitary facilities
 - 3. Electric power service

1.2 JOB CONDITIONS

- A. **Scheduled Uses:** The CONTRACTOR, in conjunction with establishing the progress schedule, shall establish a schedule for implementation and termination of service for each temporary utility at the earliest feasible time, and when acceptable to OWNER, change over from temporary utility service to permanent service.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. The CONTRACTOR shall provide either new or used materials and equipment, that are in substantially undamaged condition and without significant deterioration and which are recognized in the construction industry by compliance with appropriate standards, as being suitable for intended use in each case. Where a portion of temporary utility is provided by utility company, the CONTRACTOR shall provide the remaining portion with matching and compatible materials and equipment and shall comply with recommendations of the utility company.

PART 3 -- EXECUTION

3.1 ELECTRICAL

- A. **General:** The Contractor shall provide temporary power panels and wirings when directed by the OWNER. Temporary power panels shall be rigidly supported and furnished with breakers sized to match existing. No exposed temporary wiring is allowed. All exposed temporary wiring shall be in Rigid Conduits and routed to avoid damage during construction.
- B. **Separation of Circuits:** Circuits used for power purposes shall be separate from lighting circuits.
- C. **Construction Wiring:** Wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. Electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

3.2 WATER SUPPLY

- A. **General:** The CONTRACTOR shall obtain the water supply necessary for construction of the facilities. The CONTRACTOR shall provide facilities necessary to convey the water from the source to the points of use in accordance with the requirements of the Contract Documents. The CONTRACTOR shall be responsible for all costs and charges associated with the construction of the water supply.
- B. **Water Connections:** The CONTRACTOR shall not make connection to or draw water from any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency. The CONTRACTOR shall pay permit and water charges.

3.3 INSTALLATION OF SANITARY FACILITIES

- A. **Toilet Facilities:** Fixed or portable chemical toilets shall be provided wherever needed for the use of CONTRACTOR's employees. Toilets at construction sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction. Provide separate field office facilities in conformance with Section 01590.
- B. **Sanitary and Other Organic Wastes:** The CONTRACTOR shall establish a regular daily collection of sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the Site in accordance with laws and regulations pertaining thereto.

3.4 INSTALLATION OF FIRE PROTECTION

- A. **Fire Protection:** The construction plant and the WORK shall be connected with the CONTRACTOR's temporary water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction.

3.5 OPERATIONS AND TERMINATIONS

- A. **Inspections:** Prior to placing temporary utility services into use, the CONTRACTOR shall inspect and test each service and arrange for governing authorities' required inspection and tests, and obtain required certifications and permits for use thereof.
- B. **Protection:** The CONTRACTOR shall maintain distinct markers for underground lines, and protect from damage during excavating operations.
- C. **Termination and Removal:** When need for a temporary utility service or a substantial portion thereof has ended, or when its service has been replaced by use of permanent services, or not later than time of substantial completion, the CONTRACTOR shall promptly remove installation unless requested by ENGINEER to retain it for a longer period. The CONTRACTOR shall complete and restore WORK which may have been

delayed or affected by installation and use of temporary utility, including repairs to construction and grades and restoration and cleaning of exposed surfaces.

- D. **Removal of Water Connections:** Before final acceptance of the WORK on the project, temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and affected improvements shall be restored to original condition or better, to the satisfaction of the ENGINEER and to the agency owning the affected utility.

- END OF SECTION -

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SECTION 01530 - PROTECTION OF EXISTING FACILITIES

PART 1 -- GENERAL

1.1 GENERAL

- A. The CONTRACTOR is responsible to protect the site and any access that is granted to the site.
- B. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than prior to such damage or temporary relocation, all in accordance with the Contract Documents.

1.2 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any WORK that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified that the OWNER has secured authority therefor from the proper party.
- B. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support, or otherwise protect such pipeline, transmission line, ditch, fence, or structure, or replace the same.

1.3 PROTECTION OF STREET OR ROADWAY MARKERS

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. Survey markers or points disturbed by the CONTRACTOR shall be accurately restored after street or roadway resurfacing has been completed.
- B. The CONTRACTOR shall Video tape roadways used by construction vehicles within "The Classic" and sweep debris from roadways during construction. Following construction activities, the CONTRACTOR shall restore roadways to original condition.

1.4 PROTECTION OF STRUCTURES

- A. The CONTRACTOR shall protect all existing structures from damage from vibration activities. Where required to protect the contractor, the contractor shall hire a professional experienced with vibration measurement to monitor the areas around construction during vibration activities completed.

1.5 RESTORATION OF PAVEMENT

- A. **General:** All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. The pavement restoration requirement to match existing sections shall apply to all components of existing sections, including sub-base, base, and

pavement. Temporary and permanent pavement shall conform to the requirements of the affected pavement owner. Pavements which are subject to partial removal shall be neatly saw cut in straight lines.

- B. **Temporary Resurfacing:** Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.
- C. **Permanent Resurfacing:** In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.
- D. **Restoration of Sidewalks or Private Driveways:** Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions. If no such period of time is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or roadways until the final restoration thereof has been made.

1.6 EXISTING UTILITIES AND IMPROVEMENTS

- A. **General:** The CONTRACTOR shall protect underground Utilities and other improvements which may be impaired during construction operations. The CONTRACTOR shall take all possible precautions for the protection of unforeseen Utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
- B. Except where the OWNER indicate Utilities have been field located during design or certain Utility locations shall be exposed as part of the WORK, the CONTRACTOR shall be responsible for exploratory excavations as it deems necessary to determine the exact locations and depths of Utilities which may interfere with its work. All such exploratory excavations shall be performed as soon as practicable after Notice to Proceed and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's progress. When such exploratory excavations show the Utility location to be in error, the CONTRACTOR shall so notify the ENGINEER.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the Utility.
- D. **Utilities to be Moved:** In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
- E. **Utilities to be Removed:** Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing Utility or other improvement which is indicated, the CONTRACTOR shall remove and, without

unnecessary delay, temporarily replace or relocate such Utility or improvement in a manner satisfactory to the ENGINEER and the owner of the facility. In all cases of such temporary removal or relocation, restoration to the former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the Utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

- F. **OWNER's Right of Access:** The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.
- G. **Underground Utilities Indicated:** Existing Utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all Utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR, unless otherwise repaired by the owner of the damaged Utility. If the owner of the damaged facility performs its own repairs, the CONTRACTOR shall reimburse said owner for the costs of repair. The CONTRACTOR shall be responsible for hiring an independent utility location service as part of the contract.
- H. **Underground Utilities Not Indicated:** In the event that the CONTRACTOR damages existing Utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a verbal report of such damage shall be made immediately to the ENGINEER and a written report thereof shall be made promptly thereafter. The ENGINEER will immediately notify the owner of the damaged Utility. If the ENGINEER is not immediately available, the CONTRACTOR shall notify the Utility owner of the damage. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in contained in relevant county documents.
- I. Costs of locating and repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such Utility facilities not indicated in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the WORK which was interrupted or idled by removal or relocation of such Utility facilities, and which was necessarily idled during such work will be paid for as extra work.
- J. **Approval of Repairs:** All repairs to a damaged Utility or improvement are subject to inspection and approval by an authorized representative of the Utility or improvement owner before being concealed by backfill or other work.
- K. **Maintaining in Service:** Unless indicated otherwise, oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

1.7 TREES OR SHRUBS WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. **General:** Except where trees or shrubs are indicated to be removed, the CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. Existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
- B. **Trimming:** Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. Cuts over 1-1/2 inches in diameter shall be coated with a tree paint product that is waterproof, adhesive, and elastic, and free from kerosenes, coal tar, creosote, or other material injurious to the life of the tree.
- C. **Replacement:** The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree or shrub is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree or shrub at its own expense. The tree or shrub shall be of a like size and variety as the one damaged, or, if of a smaller size, the CONTRACTOR shall pay to the owner of said tree a compensatory payment acceptable to the tree or shrub owner, subject to the approval of the jurisdictional agency or OWNER. The size of the tree or shrub shall be not less than 1-inch diameter nor less than 6 feet in height. Planting of replacement trees and shrubs shall be in accordance with [Section 02900 - Landscaping.] [the recommendations of the nursery furnishing the plants.] Unless otherwise indicated, the CONTRACTOR shall water and maintain the replacement trees and shrubs for [6 months] after planting.

1.8 LAWN AREAS

- A. Lawn or landscaped areas damaged during construction shall be repaired to match the pre-construction condition to the satisfaction of the land owner and the OWNER.

1.9 NOTIFICATION BY THE CONTRACTOR

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way, the CONTRACTOR shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said owners or agencies can be present during such work if they so desire.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01550 - SITE ACCESS AND STORAGE

PART 1 -- GENERAL

1.1 HIGHWAY LIMITATIONS

- A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.2 TEMPORARY CROSSINGS

- A. **General:** Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300-feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.
- B. **Temporary Bridges:** Wherever necessary, to maintain vehicular crossings, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the responsible individuals or authorities to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. Such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.
- C. **Street Use:** Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall conduct its operations to not interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of gutters, storm drain inlets, and other drainage facilities.
- D. **Traffic Control:** For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and

Highway Construction and Maintenance Operations," published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1).

1. The CONTRACTOR shall take necessary precautions for the protection of the WORK and the safety of the public. Barricades and obstructions shall be illuminated at night, and lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. Signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.
2. The CONTRACTOR shall submit 3 copies of a traffic control plan to the City Engineer for approval a minimum of 2 weeks prior to construction. The City Engineer shall be allowed access to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes required by the City Engineer shall supersede these plans and be done solely at the CONTRACTOR's expense.
3. The CONTRACTOR shall remove traffic control devices when no longer needed, repair damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.

E. **Temporary Street Closure:** If closure of any street is required during construction, the CONTRACTOR shall apply in writing to the City Engineer and any other jurisdictional agency at least 30 Days in advance of the required closure. A Detour and Traffic Control Plan shall accompany the application.

F. **Temporary Driveway Closure:** The CONTRACTOR shall notify the owner or occupant (if not owner-occupied) of the closure of the driveways to be closed more than one 8 hour work day at least 3 working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the closure will take and when closure will start.

1.3 CONTRACTOR'S WORK AND STORAGE AREA

- A. The CONTRACTOR shall make its own arrangements for any necessary off-Site storage or shop areas necessary for the proper execution of the WORK.
- B. Lands to be furnished by the OWNER for camp sites, construction operations, concrete aggregate pits, roads, and other purposes are indicated. Should the CONTRACTOR find it necessary to use any additional land for its camp or for other purposes during the construction of the WORK, it shall arrange for the use of such lands at its own expense.
- C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.
 1. For the purpose of this paragraph, hazardous materials to be stored in the separate area are products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, Flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, 2 part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

2. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.
3. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.
4. The CONTRACTOR shall obtain and submit to the ENGINEER a single EPA number for wastes generated at the Site.
5. The separate storage area shall meet the requirements of authorities having jurisdiction over the storage of hazardous materials.
6. The separate storage area shall be inspected by the City of Pompano Beach Water Utility Department prior to construction of the area, upon completion of construction of the area, and upon cleanup and removal of the area.
7. Hazardous materials that are delivered in containers shall be stored in the original containers until use. Hazardous materials delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

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SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 -- GENERAL

1.1 DUST ABATEMENT

- A. The CONTRACTOR shall prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity of the Site. The CONTRACTOR shall be responsible for any damage resulting from dust originating from its operations. Dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the ENGINEER.
- B. **Storage Piles:** Enclose, cover, water (as needed), or apply non-toxic soil binders according to manufacturer's specifications on material piles (i.e. gravel, sand, dirt) with a silt content of 5 percent or greater.
- C. **Active Areas of Site:** Water active construction areas and unpaved roads as needed and as requested by ENGINEER.
- D. **Inactive Areas of Site:** Apply non-toxic soil stabilizers according to manufacturer's specifications to inactive construction areas, or water as needed to maintain adequate dust control.
- E. **Vehicle Loads:** Cover or maintain at least 2-feet of freeboard vertical distance between the top of the load and the top of the trailer sides on trucks hauling dirt, sand, soil, or other loose materials off of the Site.
- F. **Roads:** When there is visible track-out onto a paved public road, install wheel washers where the vehicles exit and enter onto the paved roads and wash the undercarriage of trucks and any equipment leaving the Site on each trip. Sweep the paved street at the end of each shift with a **Mobil Athey** or similar water spray pick-up broom-type street sweeper as necessary or as directed.
- G. **Vehicle Speeds:** If watering of unpaved roads is not sufficient to control dust, reduce vehicle speeds to 15 mph or less on such roads.

1.2 SEDIMENTATION ABATEMENT

- A. The CONTRACTOR shall be responsible for collecting, storing, hauling, and disposing of spoil, silt, and waste materials in compliance with applicable federal, state, and local rules and regulations and the Contract Documents.
- B. Install and maintain erosion and sediment control measures, such as swales, grade stabilization structures, berms, dikes, waterways, filter fabric fences, and sediment basins.
- C. Filter fabric barrier systems, if used, shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- D. Remove and dispose of sediment deposits at the designated spoil area. If a spoil area is not indicated, dispose of sediment off-Site at a location not in or adjacent to a stream or floodplain. Sediment to be placed at the spoil area should be spread evenly,

compacted, and stabilized. Sediment shall not be allowed to flush into a stream or drainage way.

- E. Maintain erosion and sediment control measures until final acceptance or until requested by the ENGINEER to remove it.

1.3 RUBBISH CONTROL

- A. During the progress of the WORK, the CONTRACTOR shall keep the Site and other areas for which it is responsible in a neat and clean condition and free from any accumulation of rubbish. The CONTRACTOR shall dispose of rubbish and waste materials of any nature and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of rubbish and surplus materials shall be off the Site in accordance with local codes and ordinances governing locations and methods of disposal and in conformance with applicable safety laws and the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

1.4 SANITATION

- A. **Toilet Facilities:** Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.
- B. **Sanitary and Other Organic Wastes:** The CONTRACTOR shall establish a regular daily collection of sanitary and organic wastes. Wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the Site in a manner satisfactory to the ENGINEER and in accordance with Laws and Regulations pertaining thereto.

1.5 CHEMICALS

- A. Chemicals used on the WORK or furnished for facility operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. Use of such chemicals and disposal of residues shall be in strict accordance with the printed instructions of the manufacturer. In addition, see the requirements set forth in paragraph 6.11 of the General Conditions.

1.6 CULTURAL RESOURCES

- A. The CONTRACTOR's attention is directed to the National Historic Preservation Act of 1966 (16 U.S.C. 470) and 36 CFR 800 which provides for the preservation of potential historical architectural, archaeological, or cultural resources (hereinafter called "cultural resources").
- B. In the event potential cultural resources are discovered during subsurface excavations at the Site, the following procedures shall be instituted:
 - 1. The OWNER will issue a temporary Notice to Suspend Work directing the CONTRACTOR to cease construction operations at the location of such potential cultural resources find.

2. The suspension Notice will contain the following:
 - a. A clear description of the WORK to be suspended
 - b. Instructions regarding issuance of further orders by the CONTRACTOR for material services
 - c. Guidance as to the action to be taken on subcontracts
 - d. Suggestions to the CONTRACTOR to minimize incurred costs
 - e. Estimated duration of the temporary suspension.
 3. Such suspension shall be effective until such time as a qualified archeologist can assess the value of the potential cultural resources and make recommendations to the authority having jurisdiction.
 4. The OWNER will implement appropriate actions as directed by the authority having jurisdiction. The CONTRACTOR shall cease WORK in the area of a discovery until appropriate actions have been determined in accordance with this paragraph.
 5. If human remains are discovered, WORK in the immediate vicinity of the find shall stop. The County Coroner shall be notified.
- C. If the archeologist determines that the potential find is a bonafide cultural resource, at the direction of the authority having jurisdiction, the OWNER will extend the duration of the suspension.
- D. Changes to the Contract Price and Contract Times for suspension due to discovery of a potential cultural resource will be made in the following manner:
1. Contract Times
 - a. If the WORK temporarily suspended is on the "critical path", the total number of Days for which the suspension is in effect will be added to the Contract Times.
 - b. If a portion of WORK at the time of such suspension is not on the "critical path", but subsequently becomes WORK on the critical path, the Contract Times will be computed from the date such WORK is classified as on the critical path.
 2. Contract Price
 - a. If, as a result of a cultural resources suspension, the CONTRACTOR sustains a loss that could not have been avoided by judicious handling of forces and equipment or redirection of forces or equipment to perform other WORK on the contract, there will be paid an amount based on time and materials for the loss in accordance with the following:
 - 1) Idle Time of Equipment: Compensation for equipment idle time will be determined in accordance with the General Conditions for equipment time and equipment rental time.
 - 2) Idle Time of Labor: Compensation for idle time of workers will be determined in accordance with the General Conditions for labor.

- b. Costs of labor will be compensated only to the extent such cost was in fact caused by the suspension.
- c. Compensation for loss due to idle time of either equipment or labor will not include markup for profit.
- d. The hours for which compensation will be paid will be the actual normal working time during which such suspension lasts, but will in no case exceed eight hours in any single Day.
- e. The days for which compensation will be paid exclude Saturdays, Sundays, and legal holidays during the suspension.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01600 - PRODUCTS, MATERIALS, EQUIPMENT AND SUBSTITUTIONS

PART 1 -- GENERAL

1.1 DEFINITIONS

- A. The word "Products," as used in the Contract Documents, is defined to include purchased items for incorporation into the WORK, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form WORK. The word "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, and other like items). Definitions in this paragraph are not intended to negate the meaning of other terms used in the Contract Documents, including "specialties," "systems," "structure," "finishes," "accessories," "furnishings," special construction," and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- B. Neither "Products" nor "Materials" nor "Equipment" includes machinery and equipment used for preparation, fabrication, conveying, and erection of the WORK.

1.2 QUALITY ASSURANCE

- A. **Source Limitations:** To the greatest extent possible for each unit of WORK, the CONTRACTOR shall provide products, materials, and equipment of a singular generic kind from a single source.
- B. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products, materials, or equipment. Compatibility is a basic general requirement of product, material and equipment selections.

1.3 PRODUCT DELIVERY AND STORAGE

- A. The CONTRACTOR shall deliver and store the WORK in accordance with manufacturer's written recommendations and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at the Site and overcrowding of construction spaces. In particular, the CONTRACTOR shall ensure coordination to ensure minimum holding or storage times for flammable, hazardous, easily damaged, or sensitive materials to deterioration, theft, and other sources of loss.

1.4 TRANSPORTATION AND HANDLING

- A. Products shall be transported by methods to avoid damage and shall be delivered in undamaged condition in manufacturer's unopened containers and packaging.
- B. The CONTRACTOR shall provide equipment and personnel to handle products, materials, and equipment [including those furnished by OWNER,] by methods to prevent soiling and damage.

- C. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.5 STORAGE AND PROTECTION

- A. Products shall be stored in accordance with manufacturer's written instructions and with seals and labels intact and legible. Sensitive products shall be stored in weather-tight climate controlled enclosures and temperature and humidity ranges shall be maintained within tolerances required by manufacturer's recommendations.
- B. For exterior storage of fabricated products, products shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering and ventilation shall be provided to avoid condensation.
- C. Loose granular materials shall be stored on solid flat surfaces in a well-drained area and shall be prevented from mixing with foreign matter.
- D. Storage shall be arranged to provide access for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions.
- E. Storage shall be arranged in a manner to provide access for maintenance of stored items and for inspection.

1.6 MAINTENANCE OF PRODUCTS IN STORAGE

- A. Stored products shall be periodically inspected on a scheduled basis. The CONTRACTOR shall maintain a log of inspections and shall make the log available on request.
- B. The CONTRACTOR shall comply with manufacturer's product storage requirements and recommendations.
- C. The CONTRACTOR shall maintain manufacturer-required environmental conditions continuously.
- D. The CONTRACTOR shall ensure that surfaces of products exposed to the elements are not adversely affected and that weathering of finishes does not occur.
- E. For mechanical and electrical equipment, the CONTRACTOR shall provide a copy of the manufacturer's service instructions with each item and the exterior of the package shall contain notice that instructions are included.
- F. Products shall be serviced on a regularly scheduled basis, and a log of services shall be maintained and submitted as a record document prior to final acceptance by the OWNER in accordance with the Contract Documents.

1.7 PROPOSED SUBSTITUTIONS OR "OR-EQUAL" ITEM

- A. Whenever materials or equipment are indicated in the Contract Documents by using the name of a proprietary item or the name of a particular manufacturer, the naming of the item is intended to establish the type, function, and quality required. If the name is followed by the words "or equal" indicating that a substitution is permitted, materials or equipment of other manufacturers may be accepted if sufficient information is submitted

by the CONTRACTOR to allow the ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named, subject to the following requirements:

1. The burden of proof as to the type, function, and quality of any such substitution product, material or equipment shall be upon the CONTRACTOR.
2. The ENGINEER will be the sole judge as to the type, function, and quality of any such substitution and the ENGINEER's decision shall be final.
3. The ENGINEER may require the CONTRACTOR to furnish additional data about the proposed substitution.
4. The OWNER may require the CONTRACTOR to furnish a special performance guarantee or other surety with respect to any substitution.
5. Acceptance by the ENGINEER of a substitution item proposed by the CONTRACTOR shall not relieve the CONTRACTOR of the responsibility for full compliance with the Contract Documents and for adequacy of the substitution.
6. The CONTRACTOR shall pay all costs of implementing accepted substitutions, including redesign and changes to WORK necessary to accommodate the substitution.

B. The procedure for review by the ENGINEER will include the following:

1. If the CONTRACTOR wishes to provide a substitution item, the CONTRACTOR shall make written application to the ENGINEER on the "Substitution Request Form."
2. Unless otherwise provided by law or authorized in writing by the ENGINEER, the "Substitution Request Form(s)" shall be submitted within the 35-day period after award of the Contract.
3. Wherever a proposed substitution item has not been submitted within said 35-day period, or wherever the submission of a proposed substitution material or equipment has been judged to be unacceptable by the ENGINEER, the CONTRACTOR shall provide the material or equipment indicated in the Contract Documents.
4. The CONTRACTOR shall certify by signing the form that the list of paragraphs on the form are correct for the proposed substitution.
5. The ENGINEER will evaluate each proposed substitution within a reasonable period of time.
6. As applicable, no shop drawing submittals shall be made for a substitution item nor shall any substitution item be ordered, installed, or utilized without the ENGINEER'S prior written acceptance of the CONTRACTOR'S "Substitution Request Form."
7. The ENGINEER will record the time required by the ENGINEER in evaluating substitutions proposed by the CONTRACTOR and in making changes by the CONTRACTOR in the Contract Documents occasioned thereby.

- C. The CONTRACTOR's application shall address the following factors which will be considered by the ENGINEER in evaluating the proposed substitution:
1. Whether the evaluation and acceptance of the proposed substitution will prejudice the CONTRACTOR's achievement of Substantial Completion on time.
 2. Whether acceptance of the substitution for use in the WORK will require a change in any of the Contract Documents to adapt the design to the proposed substitution.
 3. Whether incorporation or use of the substitution in connection with the WORK is subject to payment of any license fee or royalty.
 4. Whether all variations of the proposed substitution from the items originally specified are identified.
 5. Whether available maintenance, repair, and replacement service are indicated. The manufacturer shall have a local service agency (within 50 miles of the site) which maintains properly trained personnel and adequate spare parts and is able to respond and complete repairs within 24 hours.
 6. Whether an itemized estimate is included of all costs that will result directly or indirectly from acceptance of such substitution, including cost of redesign and claims of other contractors affected by the resulting change.
 7. Whether the proposed substitute item meets or exceeds the experience and/or equivalency requirements listed in the appropriate technical specifications.
- D. Without any increase in cost to the OWNER, the CONTRACTOR shall be responsible for and pay all costs in connection with proposed substitutions and of inspections and testing of equipment or materials submitted for review prior to the CONTRACTOR's purchase thereof for incorporation in the WORK, whether or not the ENGINEER accepts the proposed substitution or proposed equipment or material. The CONTRACTOR shall reimburse the OWNER for the charges of the ENGINEER for evaluating each proposed substitution.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

SECTION 01656 - PRESSURE PIPE TESTING AND DISINFECTION

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall test and disinfect potable water pipelines and appurtenant piping, in accordance with the Contract Documents.
- B. The CONTRACTOR shall be responsible for obtaining permits for discharging excess testing and disinfection water and dechlorination of such water if required to satisfy permit limits.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 – Contractor Submittals.
- B. Furnish:
 - 1. A testing plan and schedule, including method for water conveyance, control, disposal, and disinfection shall be submitted in writing for approval.
 - 2. Name of certified bacteriological testing laboratory.
 - 3. Resume of experienced technician, if liquid chlorine is proposed.

PART 2 -- PRODUCTS

2.1 MATERIAL REQUIREMENTS

- A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, and other water control equipment, and choice of disinfectant shall be as determined by the CONTRACTOR. No materials shall be used which would be injurious to the WORK.
- B. Chlorine for disinfection may be in the form of liquid chlorine, sodium hypochlorite solution, or calcium hypochlorite granules or tablets.
 - 1. Liquid chlorine shall be in accordance with the requirements of ANSI/AWWA B301 - Liquid Chlorine, and shall be used only when each of the following conditions are satisfied:
 - a. An experienced technician directly supervises.
 - b. Appropriate safety practices are observed.
 - 2. Sodium and calcium hypochlorite shall be in accordance with ANSI/AWWA B300 - Hypochlorites.
- C. Dechlorination agents may be sodium bisulfate, sodium sulfite, or sodium thiosulfate.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Water for testing and disinfecting water pipelines will be furnished by the OWNER; however, the CONTRACTOR shall convey the water from the OWNER-designated source to the points of use.
- B. All pressure pipelines shall be tested; those for potable water shall be disinfected. All chlorinating and testing operations shall be performed in the presence of the ENGINEER.
- C. Disposal of flushing water and water containing chlorine shall be by methods acceptable to the ENGINEER.
- D. Disinfection operations shall be scheduled as late as possible during the Contract Time to maximize the degree of sterility of the facilities at the time the WORK is accepted by the OWNER. Bacteriological testing shall be performed by a certified testing laboratory accepted by the OWNER. Results of the bacteriological testing shall be satisfactory with the State Department of Health or other appropriate regulatory agency.

3.2 PIGGING

- A. The CONTRACTOR shall clean the system thoroughly by pigging to remove sand, grit, gravel, stones, fluids, construction waste, and all material which would not be found in a properly cleaned pipeline. Pigging shall obtain a smooth interior pipe surface free from any material or fluid not used in cleaning.
- B. Pigging shall be defined as passage of a sufficient number of pigs through the pipeline to achieve the clean conditions required. Flushing will not be acceptable as a substitute for pigging.
- C. Provision for pig access and egress points and disposal of water and materials shall be the CONTRACTOR's responsibility.
- D. Pigs shall be individually marked and their location shall be controlled and monitored so that no pigs remain in the system after cleaning.
- E. Pigging may be done in conjunction with initial filling for the hydrostatic test.

3.3 HYDROSTATIC TESTING OF PIPELINES

- A. Pipeline 30-inches diameter and larger shall be visually inspected that all debris has been removed prior to flushing.
- B. Prior to hydrostatic testing, pipelines shall be flushed or blown out as appropriate. The CONTRACTOR shall test pipelines in sections. Sections to be tested shall be defined by isolation valves in the pipeline. Where such valves are not present, the CONTRACTOR shall install temporary bulkheads or plugs for the purpose of testing. Sections that do not have isolation valves shall be tested in approximate one-mile segments. Sections that have a zero leakage allowance may be tested as a unit. No section of the pipeline shall be tested until field-placed concrete or mortar has attained an age of 14 Days. The test shall be made by closing valves when available or by placing bulkheads and filling the line slowly with water. The CONTRACTOR shall be

responsible for ascertaining that test bulkheads are suitably restrained to resist the thrust of the test pressure without damage to or movement of the adjacent pipe. Unharnessed sleeve-type couplings, expansion joints, or other sliding joints shall be restrained or suitably anchored prior to the test to avoid movement and damage to piping and equipment. Remove or protect any pipeline-mounted devices that may be damaged by the test pressure. The CONTRACTOR shall provide sufficient temporary tappings in the pipelines to allow for trapped air to exit. After completion of the tests, such taps shall be permanently plugged. Care shall be taken that air relief valves are open during filling.

- C. The pipeline shall be filled at a rate which will not cause any surges or exceed the rate at which the air can be released through the release valves at a reasonable velocity. The air within the pipeline shall be allowed to escape completely. The differential pressure across the orifices in the air release valves shall not be allowed to exceed 5 psi at any time during filling. After the pipeline or section thereof has been filled, it shall be allowed to stand under a slight pressure for at least 24 hours to allow the concrete or mortar lining, as applicable, to absorb water and to allow the escape of air from air pockets. During this period, bulkheads, valves, and connections shall be examined for leaks. If leaks are found, corrective measures satisfactory to the ENGINEER shall be taken.
- D. The hydrostatic test shall consist of holding the indicated test pressure on the pipeline segment for a period of 4 hours. The test pressure for yard piping shall be as indicated on the Piping Schedule measured at the lowest point of the pipeline section being tested. No pressure test will be required for a reservoir overflow line. Visible leaks that appear during testing shall be repaired in a manner acceptable to the ENGINEER. Add water to restore the test pressure if the pressure decreases 5 psi below test pressure during the test period.
- E. The maximum quantity of water (gallons per hour) that may be supplied to maintain pressure within 5 psi of the specified test pressure shall be in accordance with the test pressure schedule. The maximum leakage for yard piping shall be as indicated on the Piping Schedule. Pipe with welded joints shall have no leakage. Exposed piping shall show no visible leaks and no pressure loss during the test. In the case of pipelines that fail to pass the leakage test, the CONTRACTOR shall determine the cause of the leakage, shall take corrective measures necessary to repair the leaks, and shall again test the pipeline, repeating as necessary until the pipeline passes.

3.4 DISINFECTING PIPELINES

- A. **General:** Potable water pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with the requirements of ANSI/AWWA C651 - Disinfecting Water Mains, using the Continuous-Feed Method as modified herein.
- B. **Chlorination:** A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. The chlorine solution shall be introduced at one end of the pipeline through a tap in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be approximately 50 mg/L. Care shall be taken to prevent the strong chlorine solution in the line being disinfected from flowing back into the line supplying the water.
- C. **Retention Period:** Chlorinated water shall be retained in the pipeline for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the pipeline extremities and at other representative points shall be at least 25 mg/L. If testing does not demonstrate a residual of 25 mg/L or greater, the disinfection procedure above shall be repeated.

- D. **Chlorinating Valves:** During the process of chlorinating the pipelines, valves and other appurtenances shall be operated from closed to full open to closed while the pipeline is filled with the heavily-chlorinated water.
- E. **Sampling Ports:** The CONTRACTOR shall provide sampling ports along the pipeline as defined on AWWA C651. Taps may be made at manways and air valves to help facilitate the spacing requirement.
- F. **Final Flushing:** After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show that the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for domestic use. Any release of chlorinated water shall comply with federal, state, and local regulation and the permits for the project. Chlorine in excessive amounts shall be treated before discharge.
- G. **Bacteriological Testing:** After final flushing and before the pipeline is placed in service, a sample, or samples shall be collected from the end of the line, and shall be tested for bacteriological quality in accordance with the requirements of the State Department of Health or other appropriate regulatory agency. For this purpose the pipe shall be re-filled with fresh potable water and left for a period of 24 hours before any sample is collected. If testing does not demonstrate a free chlorine residual after the 24-hour period, the disinfection procedure above shall be repeated. If the initial disinfection treatment fails to produce satisfactory bacteriological test results, the disinfection procedure shall be repeated until acceptable results are obtained.

3.5 CONNECTIONS TO EXISTING SYSTEM

- A. Where connections are to be made to an existing potable water system, the interior surfaces of all pipe and fittings used in making the connections shall be swabbed or sprayed with a one percent hypochlorite solution before installation. Thorough flushing shall be started as soon as the connection is completed and shall be continued until discolored water is eliminated.

- END OF SECTION -

SECTION 01700 - PROJECT CLOSEOUT

PART 1 -- GENERAL

1.1 FINAL CLEANUP

- A. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, concrete forms, construction equipment, and temporary structures and facilities used during construction. Final acceptance of the WORK by the OWNER will be withheld until the CONTRACTOR has satisfactorily performed the final cleanup of the Site.

1.2 CLOSEOUT TIMETABLE

- A. The CONTRACTOR shall establish dates for equipment testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER, the ENGINEER, and their authorized representatives sufficient time to schedule attendance at such activities.

1.3 TECHNICAL MANUAL SUBMITTAL

- A. The CONTRACTOR's attention is directed to the condition that one percent of the Contract Price will be retained from any monies due the CONTRACTOR as progress payments, if at the 75 percent construction completion point, the approved Technical Manual complying with Section 01300 has not been submitted. The aforementioned amount will be retained by the OWNER as the agreed, estimated value of the approved Technical Manual. Any such retention of money for failure to submit the approved Technical Manual on or before the 75 percent construction completion point shall be in addition to the retention of any payments due to the CONTRACTOR under Article 14 of the General Conditions.

1.4 FINAL SUBMITTALS

- A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:
 - 1. Written guarantees, where required.
 - 2. Technical Manuals and instructions.
 - 3. New permanent cylinders and key blanks for all locks.
 - 4. Maintenance stock items; spare parts; special tools.
 - 5. Completed record drawings.
 - 6. Bonds for roofing, maintenance, etc., as required.
 - 7. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
 - 8. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.5 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with the maintenance and guarantee requirements contained in Article 13 of the General Conditions.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private owner or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.
- C. The CONTRACTOR shall make all repairs and replacements promptly upon receipt of written order from the OWNER. If the CONTRACTOR fails to make such repairs or replacements promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and its surety shall be liable to the OWNER for the cost thereof.

1.6 BOND

- A. The CONTRACTOR shall provide a bond to guarantee performance of the provisions contained in Paragraph "Maintenance and Guarantee" above, and Article 13 of the General Conditions.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION (NOT USED)

- END OF SECTION -

SECTION 02100 – SITE PREPARATION

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The WORK of this Section includes measures required during the CONTRACTOR's initial move onto the Site to protect existing fences, houses and associated improvements, streets, and utilities downslope of construction areas from damage due to boulders, trees, or other objects dislodged during the construction process and clear, grub, strip; and regrade certain areas, in accordance with the Contract Documents.

1.2 SITE INSPECTION

- A. Prior to moving onto the Site, the CONTRACTOR shall inspect the Site conditions and review maps of the Site and off-Site pipeline routes and facilities delineating the OWNER's property and right-of-way lines.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 PRIMARY PLANT SITE ACCESS

- A. The CONTRACTOR shall develop any necessary access to the Site, including access barriers to prohibit entry of unauthorized persons.
- B. **Utility Interference:** Where existing utilities interfere with the WORK, notify the utility owner and the ENGINEER before proceeding in accordance with the General Conditions.

3.2 CLEARING, GRUBBING, AND STRIPPING

- A. Construction areas shall be cleared of grass and weeds to at least a depth of 6-inches and cleared of structures, pavement, sidewalks, concrete or masonry debris, trees, logs, upturned stumps, loose boulders, and any other objectionable material of any kind which would interfere with the performance or completion of the WORK, create a hazard to safety, or impair the subsequent usefulness of the WORK, or obstruct its operation. Loose boulders within 10-feet of the top of cut lines shall be incorporated in landscaping or removed from the Site. Trees and other natural vegetation outside the actual lines of construction shall be protected from damage during construction.
- B. Within the limits of clearing, the areas below the natural ground surface shall be grubbed to a depth necessary to remove stumps, roots, buried logs, and other objectionable material. Septic tanks, drain fields, and connection lines and any other underground structures, debris or waste shall be removed if found on the Site. Objectionable material from the clearing and grubbing process shall be removed from the Site and wasted in approved safe locations.

- C. The entire area to be affected by construction shall be stripped to a depth of 2.5-feet below the existing ground contours. The stripped materials shall be stockpiled and incorporated into landscaped areas or other non-structural embankments.
- D. Unless otherwise indicated, native trees larger than 3-inches in diameter at the base shall not be removed without the ENGINEER's approval. The removal of any trees, shrubs, fences, or other improvements outside of rights-of-way, if necessary for the CONTRACTOR's choice of means and methods, shall be arranged with the owner of the property, and shall be removed and replaced, as part of the WORK.

- END OF SECTION -

SECTION 02268 - EROSION CONTROL BARRIER

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide erosion control barriers, complete and in place, in accordance with the Contract Documents

1.2 CONTRACTOR SUBMITTALS

- A. Submittals shall be in accordance with Section 01300 - Contractor Submittals.
- B. **Product Data:** Manufacturer's catalog sheets on geotextile fabrics.

PART 2 -- PRODUCTS

2.1 FABRIC

- A. Fabric may be woven or non-woven, made from polypropylene, polyethylene, or polyamid, and shall contain sufficient UV inhibitors so that it will last for 2 years in outdoor exposure.
- B. Fabric shall have the following properties:

Parameter	Standard Method	Value
Grab tensile strength	ASTM D 4632	100 lb
Burst strength	ASTM D 3786	200 psi
Apparent opening size	ASTM D 4751	Between 200 and 70 sieve size

- C. Fabric Manufacturer, or equal

1. **Mirafi**

2.2 POSTS

- A. Posts shall be wood, at least 2 inches by 2 inches, at least 6 feet long.

2.3 FENCING

- A. Woven wire fabric fencing shall be galvanized, mesh spacing of 6 inches, maximum 14-gauge, at least 30 inches tall.

2.4 FASTENERS

- A. Fasteners to wood posts shall be steel, at least 1 1/2 inches long.

PART 3 -- EXECUTION

3.1 PREPARATION

- A. Provide erosion control barriers at the indicated locations and as required to prevent erosion and silt loss from the Site.
- B. CONTRACTOR shall not commence clearing, grubbing, earthwork, or other activities which may cause erosion until barriers are in place.

3.2 INSTALLATION

- A. Barrier systems shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
- B. Attach the woven wire fencing to the posts that are spaced a maximum of 6 feet apart and embedded a minimum of 12 inches. Install posts at a slight angle toward the source of the anticipated runoff.
- C. Trench in the toe of the filter fabric barrier with a spade or mechanical trencher so that the downward face of the trench is flat and perpendicular to the direction of flow. Lay fabric along the edges of the trench. Backfill and compact.
- D. Securely fasten the fabric materials to the woven wire fencing with tie wires.
- E. Reinforced fabric barrier shall have a height of 18 inches.
- F. Provide the filter fabric in continuous rolls and cut to the length of the fence to minimize the use of joints. When joints are necessary, splice the fabric together only at a support post with a minimum 6-inch overlap and seal securely.

3.3 MAINTENANCE

- A. Regularly inspect and repair or replace damaged components of the barrier. Unless otherwise directed, maintain the erosion control system until final acceptance; then remove erosion and sediment control systems promptly.
- B. Remove sediment deposits when silt reaches a depth of 6 inches or 1/2 the height of the barrier, whichever is less. Dispose of sediments on the Site, if approved by the OWNER, or at a site arranged by the CONTRACTOR which is not in or adjacent to a stream or floodplain.

- END OF SECTION -

SECTION 02831 – CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall furnish and install vinyl coated chain link fencing and gates as shown and specified including all appurtenant work, complete, all in accordance with the requirements of the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

- A. Shop drawings of gates and typical fence and fence corner post construction shall be submitted prior to fabrication according to the provisions of Section 01300 - Contractor Submittals.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Fencing shall be eight feet (8') high unless directed by the OWNER. All fencing materials, including gates, shall be black vinyl-coated after fabrication with PVT slats. All materials and components shall be new, first quality items specifically manufactured for the intended application.

2.2 MATERIAL

- A. Fence fabric shall be No. 9 gage black vinyl coated steel wire, 2-inch mesh. The fabric shall have a twisted finish on the top edge and a twisted and barbed finish on the bottom edge. Galvanized wire shall be black vinyl coated unless specified otherwise.
- B. Fabric ties shall be No. 9 black vinyl coated steel wire, spaced 14 inches apart on posts and 24 inches apart on rails. Aluminum ties will not be permitted. A continuous No. 7 gage galvanized steel wire shall be interlaced with the fabric or attached to the fabric with clips along the extreme bottom of the fence.
- C. All posts shall be one-piece without circumferential welds, and shall be as follows:
 - 1. Line posts shall be 2-1/2-inch Schedule 40 pipe, 3.65 lb/ft.
 - 2. End and corner posts shall be 3-inch Schedule 40 pipe, 9.1 lb/ft.
 - 3. Gate posts shall be 3-inch Schedule 40 pipe, 9.1 lb/ft.
- D. Top rail and braces shall be 1-5/8-inch Schedule 40 pipe, 2.27 lb/ft.
- E. Stretcher bars shall be 1/4-inch by 3/4-inch steel bars and steel bands for fastening stretcher bars to the posts shall be 1/8-inch by 3/4-inch.
- F. Nuts, bolts and screws shall be of steel, hot-dipped galvanized after fabrication, minimum size 3/8-inch diameter.

- G. Truss Rod: Truss Rod shall be 3/8-inch diameter black vinyl coated steel rod and equipped with adjustable turnbuckles. Attach to posts with clamps and brackets designed for this purpose.
- H. Caps: Malleable iron, black vinyl coated; sized to post diameter, stainless steel set screw retainer.
- I. Swing gate frames shall be constructed of 2-inch Schedule 40 pipe and shall be fabricated by welding with all welds ground smooth prior to hot-dip galvanizing and black vinyl coating. Each gate leaf shall be provided with at least one diagonal brace. Frames shall be galvanized after fabrication. Galvanized malleable iron fittings for latching the gate shall be provided. Swing gates shall be hung by at least two steel or malleable iron hinges not less than 3 inches in width. Fabric shall match the fabric used in the fence. Each pair of gates shall be provided with a heavy drop rod latch assembly with a locking device for a padlock.
- J. Slats: Plastic Vertical Tubing (PVT) sized to fit the 2-inch mesh fabric, with locking notches and uniform lengths to assure a straight edge finish product. Slats shall be applied in both fencing and gates.
- K. Concrete shall have a minimum compressive strength of 2,000 psi at 28 days.

2.3 VINYL-COATED FENCE

- A. Vinyl fabric, posts, and accessories shall meet Federal Specification RR-F-191/GEN.
- B. Vinyl coated posts, rails, and gates shall be Schedule 40 or SS40 construction.
- C. Fence fabric, posts, and accessories shall be polyvinylchloride (PVC) coated over 2.9 zinc coated steel or polyvinylchloride (PVC) coated over aluminum high tensile steel wire.
- D. Fabric: Mesh shall be 2-inch gauge specified.
- E. PVC coated wire shall be uniform color and capable of being woven into fabric without the PVC coating cracking, crazing or peeling.
- F. PVC coating shall not shrink more than 1/16-inch per foot of length, demonstrate a significant visual change in color or gloss, or exhibit breaks, cracks, crazing, crumbling, or other visual forms of failure.

2.4 VINYL FENCE FABRIC

- A. All vinyl fence fabric shall be applied in a manner that results in a fused and bonded adherence.
- B. Fabric, posts, rails, and accessories shall be black in color.

C. Vinyl fence fabric shall meet the following specifications:

	Core Inches 0.005 -----	Finish Wire Gauge -----	Minimum PVC Thickness (in.) -----	Minimum Breaking Strength (lb.) -----
Zinc coated steel	0.148	9	0.006	1,290
Aluminum coated Steel	0.130	9	0.006	1,290

D. Accessories and hardware are to include latches, hinges, stops, and keepers and shall be vinyl coated over zinc-coated steel or aluminum-coated steel in conformance with the materials being used to accomplish the installation.

E. Gates shall include all applicable accessories to provide a fully functional installation.

F. Gate frames shall be constructed from applicable materials Schedule 40 or SS40.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All earth, brush, or other obstructions which interfere with the proper alignment of construction of fences shall be removed and disposed of at the expense of the CONTRACTOR.
- B. Line posts shall be spaced at not more than 8-foot intervals, measured from center to center of the posts and generally parallel to the ground slope. Posts shall be set plumb and shall be centered in 12-inch diameter concrete encasement extending 36 inches into the ground.
- C. Gate post shall be provided with concrete foundation. Posts shall be centered in 15-inch concrete encasement extending a minimum of 40-inches into the ground.
- D. Changes in the fence lines, where the horizontal angle is 15 degrees or more, shall be considered as corners and corner posts shall be installed.
 1. Bracing shall be provided at all end, gate, and corner posts, the latter in both directions. Horizontal brace rails shall be set midway between top rail and ground running from the corner, end, or gate post to first line post. Diagonal tension members shall connect tautly between posts below horizontal braces.
 2. Corner posts shall be installed in lieu of line posts at intervals not exceeding 500 feet and shall be braced horizontally in both directions.
 3. The chain-link fabric shall be fastened on the side of the posts as shown or as designated by the ENGINEER. The fabric shall be stretched and securely fastened to the posts, and, between the posts, the top and bottom edges of the fabric shall be fastened to the top rail and bottom rail, respectively. The bottom rail shall be installed on a straight grade between posts.
 4. The fabric shall be fastened to the end, corner, and gate posts with stretcher bars and stretcher bar bands spaced at approximately 14 inches on line posts and at approximately 18 inches on tension wires.

5. Encasement concrete for footings shall be placed immediately after mixing in a manner such that there will be no concentration of the large aggregates. The concrete shall be consolidated by tamping or vibrating in an approved manner. Concrete for footings may be placed without forms, providing the ground is firm enough to permit excavation to neat line dimensions. Prior to placing the concrete, the earth around the hole shall be thoroughly moistened. The concrete shall completely fill the hole and top surfaces of the concrete encasement shall be sloped outward to shed water and shall have a neat appearance. Not less than 7 days shall elapse after placing the concrete footings before the fence fabric is fastened to the posts.
 6. Any galvanized coating damaged during construction of the fencing shall be repaired by application of molten **Galvo-Weld; Galvinox; or equal.**
- E. Any black vinyl coating damaged during construction of the fencing shall be repaired to a condition acceptable to the OWNER.
- F. Electrical Grounds
1. A ground must be installed for all fences. The ground rod is to consist of an aluminum or galvanized rod, with connection of similar metal if required, or of other appropriate material, eight feet in length and at least 5/8 inch in diameter. Drive the rod vertically until the tip of the rod is approximately six inches below the ground surface. Use a No. 6 conductor to connect the rod and all fence elements. Connect the conductor to each fence element and the ground rod by means of electrical type clamps, which will prevent corrosion.

-END OF SECTION-

SECTION 03310 – CAST-IN-PLACE CONCRETE

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide cast-in-place concrete, joints in concrete, reinforcement steel and appurtenant work, formwork, bracing, shoring, supports, and shall design and construct falsework, complete and in place, in accordance with the Contract Documents.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.
- B. Shop Drawings
 - 1. Detailed drawings of the falsework proposed to be used. Such drawings shall be in sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the falsework, and typical soil conditions.
 - 2. Shop bending diagrams, placing lists, and drawings of reinforcing steel prior to fabrication.
 - 3. Details of the concrete reinforcing steel and concrete inserts shall be submitted at the earliest possible date after receipt by the CONTRACTOR of the Notice to Proceed. Details of reinforcing steel for fabrication and erection shall conform to ACI 315V and the requirements herein. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch measured to the intersection of the extensions (tangents for bars of circular cross section) of the outside surface. Include bar placement diagrams which clearly indicate the dimensions of each bar splice.
 - 4. Where mechanical couplers are required or permitted to be used to splice reinforcing steel, submit manufacturer's literature which contains instructions and recommendations for installation for each type of coupler used; certified test reports which verify the load capacity of each type and size of coupler used; and Shop Drawings that show the location of each coupler with details of how they are to be installed in the formwork.
 - 5. If reinforcement steel is spliced by welding at any location, submit mill test reports that contain the information necessary for the determination of the carbon equivalent per AWS D1.4 Structural Welding Code – Reinforcing Steel. The CONTRACTOR shall submit a written welding procedure for each type of weld for each size of bar which is to be spliced by welding; merely a statement that AWS procedures will be followed is not acceptable. The CONTRACTOR shall submit certifications of procedure qualifications for each welding procedure used and welder qualifications, for each welding procedure, and for each welder performing the WORK. Such qualifications shall be as specified in AWS D1.4.
 - 6. Manufacturer's information demonstrating compliance with requirements of the following:
 - a. Bearing pads

- b. Neoprene sponge
- c. Preformed joint filler
- d. Backing rod
- e. Bond breaker
- f. Slip dowels
- g. PVC tubing
- h. Form ties and related accessories
- i. Form gaskets
- j. Form release agent
- k. List of form materials and locations of use
- l. Mill tests for cement
- m. Admixture certification. Chloride ion content shall be included.
- n. Aggregate gradation test results and certification
- o. Materials and methods for curing

7. Placement drawings showing the location and type of joints for each structure.

- C. **Mix Designs:** Prior to beginning the WORK, submit preliminary concrete mix designs which shall show the proportions and gradations of materials proposed for each class and type of concrete. The mix designs shall be checked by an independent testing laboratory acceptable to the ENGINEER. Costs related to such checking shall be the CONTRACTOR's responsibility. When a water reducing admixture is to be used, the CONTRACTOR shall furnish mix designs for concrete both with and without the admixture.
- D. **Delivery Tickets:** Where ready-mix concrete is used, the CONTRACTOR shall furnish certified delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring, and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, the amounts of water in the aggregate, added at the batching plant, and the amount allowed to be added at the Site for the specific design mix. In addition, each certificate shall state the mix number, total yield in cubic yards, and the time of day to the nearest minute, corresponding to the time when the batch was dispatched, when it left the plant, when it arrived at the Site, when unloading began, and when unloading was finished.

1.3 QUALITY ASSURANCE

A. Testing of Reinforcing Steel

- 1. If requested by the ENGINEER, the CONTRACTOR shall furnish samples from each heat of reinforcing steel in a quantity adequate for testing. Costs of initial tests will be paid by the OWNER. Costs of additional tests, if material fails initial tests, shall be the CONTRACTOR's responsibility.

2. If requested by the ENGINEER, the CONTRACTOR shall furnish samples of each type of welded splice used in the WORK in a quantity and of dimensions adequate for testing. At the discretion of the ENGINEER, radiographic testing of direct butt welded splices will be performed. The CONTRACTOR shall provide assistance necessary to facilitate testing. The CONTRACTOR shall repair any weld that fails to meet the requirements of AWS D1.4. The costs of testing will be paid by the OWNER; but the costs of tests that fail to meet requirements shall be the CONTRACTOR's responsibility.

B. Testing of Materials

1. Tests on component materials and for compressive strength of concrete will be performed as indicated herein. Tests for determining slump will be in accordance with the requirements of ASTM C 143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
2. Testing for aggregate shall include sand equivalence, reactivity, organic impurities, abrasion resistance, and soundness in accordance with ASTM C 33 - Concrete Aggregates.
3. The cost of laboratory tests on cement, aggregates, and concrete, will be paid by the OWNER. However, the CONTRACTOR shall pay the cost of any additional tests and investigations on WORK that does not meet the Specifications. The laboratory will meet or exceed the requirements of ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
4. Concrete for testing shall be furnished by the CONTRACTOR at no cost to the OWNER, and the CONTRACTOR shall assist the ENGINEER in obtaining samples and disposal and cleanup of excess material.

C. Inspections: Continuous inspection by a special inspector approved by the local building department having jurisdiction and by the ENGINEER will be required where necessary to conform with code requirements. Costs of the special inspector shall be paid for by the CONTRACTOR. Inspection reports shall be submitted to the ENGINEER. The special inspector shall observe the following WORK for conformance with the Specifications:

1. During the preparation and taking of required test specimens.
2. Placing of concrete except sitework concrete fully supported on earth.

D. Field Compression Tests

1. Compression test specimens shall be taken during construction from the first placement of each class of concrete herein and at intervals thereafter as selected by the ENGINEER to insure continued compliance with these Specifications. Each set of test specimens will be a minimum of 4 cylinders.
2. Compression test specimens for concrete will be made in accordance with Section 9.2 of ASTM C 31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field. Specimens will be 6-inches diameter by 12-inches high cylinders.

3. Compression tests will be performed in accordance with ASTM C 39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens. One test cylinder will be tested at 7 Days and 2 at 28 Days. The remaining cylinder will be held to verify test results, if needed.

E. Evaluation and Acceptance of Concrete

1. Evaluation and acceptance of the compressive strength of concrete will be according to the requirements of ACI 318 - Building Code Requirements for Reinforced Concrete, Chapter 5 "Concrete Quality", and as indicated herein.
2. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for subsequent batches of the type of concrete affected.
3. Concrete that fails to meet the ACI requirements and these Specifications is subject to removal and replacement as part of the WORK.

F. **Construction Tolerances:** The CONTRACTOR shall set and maintain concrete forms and perform finishing operations so that the concrete is within the tolerances herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance is the permissible variation from lines, grades, or dimensions indicated. Where tolerances are not indicated, permissible deviations will be in accordance with ACI 117 - Standard Tolerance for Concrete Construction and Materials.

1. The variation from required lines or grades shall not exceed 1/4-inch in 10-feet and there shall be no offsets or visible waviness in the finished surface.

PART 2 -- PRODUCTS

2.1 FORM AND FALSEWORK MATERIALS

- A. Except as otherwise expressly accepted by the ENGINEER, lumber for use as forms, shoring, or bracing shall be new material.
- B. Materials for concrete forms, formwork, and falsework shall conform to the following requirements:
 1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20 - American Softwood Lumber Standard.
 2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Yellow Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 - Construction and Industrial Plywood for Concrete Forms, Class I, and shall be edge sealed.
 3. Form materials shall be metal, wood, plywood, or other material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade required. Metal forms shall be an approved type that will accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.

- C. Unless otherwise indicated, exterior corners in concrete members shall be provided with 3/4-inch chamfers or be tooled to a 1/2-inch radius. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.
- D. Forms and falsework to support the roof and floor slabs shall be designed for the total dead load, plus a live load of 50 psf (minimum). The minimum design load for combined dead and live loads shall be 100 psf.

2.2 FORM TIES

- A. Form ties shall be provided with a plastic cone or other suitable means for forming a conical hole to insure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties or other removable form-tie fasteners having a circular cross-section shall not exceed 1-1/2 inches; and such fasteners shall be such as to leave holes of regular shape for reaming. Form ties shall be **Wrench Head Snap Ties** by **MeadowBurke**, **Snap Ties** by **Dayton/Richmond**, or equal.
- B. Removable taper ties may be used when approved by the ENGINEER. Taper ties shall be **Taper Ties** by **MeadowBurke**, **Taper Ties** by **Dayton/Richmond**, or equal.

2.3 REINFORCEMENT STEEL

- A. **General:** Reinforcement steel for cast-in-place reinforced concrete construction shall conform to the following requirements:
 - 1. Bar reinforcement shall conform to the requirements of ASTM A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, for Grade 60 Billet Steel Reinforcement, unless otherwise indicated.
 - 2. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement, and the details indicated. Welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10-inches. Welded wire fabric with longitudinal wires larger than W4 size shall be furnished in flat sheets only.
 - 3. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82 - Steel Wire, Plain, for Concrete Reinforcement.
- B. Accessories
 - 1. Accessories shall include necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. Bar supports shall meet the requirements of the CRSI Manual of Standard Practice including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a 1/8-inch minimum thickness of plastic coating which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.
 - 2. Concrete blocks (dobies) used to support and position reinforcement steel shall have the same or higher compressive strength than required for the concrete in which they are located. Where concrete blocks are used on concrete surfaces exposed to view, the color and texture of the concrete blocks shall match that required for the finished surface. Wire ties shall be embedded in concrete block bar supports.

- C. Epoxy coating for reinforcing and accessories, where indicated, shall conform to ASTM A 775 - Epoxy Coated Reinforcing Steel Bars.

2.4 MECHANICAL COUPLERS

- A. Mechanical couplers shall be provided where indicated and where approved by the ENGINEER. Couplers shall develop a tensile strength that exceeds 125 percent of the yield strength of the reinforcing bars being spliced at each splice.

2.5 WELDED SPLICES

- A. Welded splices shall be provided where indicated and where approved by the ENGINEER. Welded splices of reinforcement steel shall develop a tensile strength exceeding 125 percent of the yield strength of the reinforcing bars that are connected.
- B. Materials required to perform the welded splices to the requirements of AWS D1.4 shall be provided.

2.6 CONCRETE MATERIALS

- A. Materials shall be delivered, stored, and handled so as to prevent damage by water or breakage. Only one brand of cement shall be used. Cement reclaimed from cleaning bags or leaking containers shall not be used. Cement shall be used in the sequence of receipt of shipments.
- B. Materials for the WORK shall comply with the requirements of Sections 201, 203, and 204 of ACI 301- Structural Concrete for Buildings, as applicable.
- C. Storage of materials shall conform to the requirements of Section 205 of ACI 301.
- D. Materials for concrete shall conform to the following requirements:
 - 1. Cement shall be standard brand portland cement conforming to ASTM C 150 - Portland Cement for Type II or Type V.
 - 2. Water shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts, and other impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids (over 1000 mg/l TDS) shall not be used.
 - 3. Aggregates shall be obtained from pits acceptable to the ENGINEER, shall be non-reactive, and shall conform to ASTM C 33. Maximum size of coarse aggregate shall be as indicated. Lightweight sand for fine aggregate will not be permitted.
 - 4. Ready-mix concrete shall conform to the requirements of ASTM C 94 - Ready-Mixed Concrete.
 - 5. Air-entraining agent meeting the requirements of ASTM C 260 – Air Entraining Admixtures for Concrete shall be used. Concrete floors to receive a dry-shake floor hardener shall have an air content not to exceed 3 percent. The OWNER reserves the right, at any time, to sample and test the air-entraining agent. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be batched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement. Air entraining agent shall be

Micro-Air by Master Builders, Daravair by W.R. Grace, Sika AEA-15 by Sika Corporation, or equal.

6. Admixtures: Admixtures may be added at the CONTRACTOR's option to control the set, affect water reduction, and increase workability. In either case, the addition of an admixture shall be at the CONTRACTOR's expense. The use of an admixture shall be subject to acceptance by the ENGINEER. Concrete containing an admixture shall be first placed at a location determined by the ENGINEER. If the use of an admixture is producing an inferior end result, the CONTRACTOR shall discontinue use of the admixture. Admixtures shall conform to the requirements of ASTM C 494 - Chemical Admixtures for Concrete. The required quantity of cement shall be used in the mix regardless of whether or not an admixture is used. Admixtures shall contain no free chloride ions, shall be non-toxic after 30 Days, and shall be compatible with and made by the same manufacturer as the air entraining admixture.
 - a. Concrete shall not contain more than one water-reducing admixture. Concrete containing an admixture shall be first placed at a location determined by the ENGINEER.
 - b. Set controlling admixture may be either with or without water-reducing properties. Where the air temperature at the time of placement is expected to be consistently over 80 degrees F, a set retarding admixture such as **Sika Corporation Plastocrete 161 MR, Master Builder Pozzolith 300R Dartard by Grace Construction Products**, or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees, a set accelerating admixture such as **Sika Corporation Plastocrete 161FL, Master Builder Pozzutec 20, Polarset by Grace Construction Products**, or equal shall be used.
 - c. Normal range water reducer shall conform to ASTM C 494, Type A. It shall be **WRDA 79 by Grace Construction Products, Pozzolith 322-N by Master Builders, Plastocrete 161 by Sika Corporation**, or equal. The quantity of admixture used and the method of mixing shall be in accordance with the manufacturer's instructions and recommendations.
7. Calcium Chloride: Calcium chloride will not be permitted in concrete.

2.7 CURING MATERIALS

- A. Materials for curing concrete shall conform to the following requirements and ASTM C 309 - Liquid Membrane-Forming Compounds for Curing Concrete:
 1. Curing compounds shall be white-pigmented and resin-based. Sodium silicate compounds shall not be allowed. Concrete curing compound shall be **Kurez VOX White Pigmented by Euclid Chemical Company, Cure R-2 by L&M Construction Chemicals, 1200-White by W.R. Meadows**, or equal. When curing compound must be removed for finishes or grouting, curing compounds shall be **Kurez DR VOX by Euclid Chemical Company, , L&M Cure R by L&M Construction Chemicals, 1100-Clear by WR Meadows**, or equal. Curing compounds shall meet local VOC requirements.
 2. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a nominal thickness of 6-mils. The loss of moisture when determined in accordance with the requirements of ASTM C 156 - Standard Test Method for Water Retention

by Concrete Curing Materials, shall not exceed 0.055 grams per square centimeter of surface.

3. Evaporation retardant shall be a material such as **Eucobar** by **Euclid Chemical Company**, **E-CON** by **L&M Construction Chemicals, Inc.**, or equal.

2.8 JOINT MATERIALS

- A. Materials for joints in concrete shall conform to the following requirements:

1. Joint filler material shall be of the preformed non-extruding type joint filler constructed of cellular neoprene sponge rubber or polyurethane of firm texture. Bituminous fiber type will not be permitted. Non-extruding and resilient-type preformed expansion joint fillers shall conform to the requirements and tests set forth in ASTM D 1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction; for Type I, except as otherwise indicated.
2. Elastomeric joint sealer shall conform to the requirements of Section 07920 - Sealants and Caulking.
3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth hereinafter, if testing is required by the ENGINEER.

2.9 MISCELLANEOUS MATERIALS

- A. Dampproofing agent shall be an asphalt emulsion such as **Emulsified Asphalt** by **Euclid Chemical Company**, **Sealmastic** by **W. R. Meadows Inc.**, or equal.
- B. Epoxy adhesives shall be the following products:
 1. For bonding freshly-mixed, plastic concrete to hardened concrete, **Sikadur 32 Hi-Mod Epoxy Adhesive** by **Sika Corporation**, **BurkEpoxy MV** by **Burke** by **Edoco**, or equal.
 2. For bonding hardened concrete or masonry to steel, **Sikadur 31 Hi-Mod Gel** by **Sika Corporation**, **BurkEpoxy NS** by **Burke** by **Edoco**; or equal.
- C. Epoxy grout for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled. Epoxy grout shall meet the requirements in Section 03315 - Grout.

2.10 CONCRETE DESIGN REQUIREMENTS

- A. General

1. Concrete shall be composed of cement, admixtures, aggregates, and water of the qualities indicated. In general, the mix shall be designed to produce a concrete

capable of being deposited so as to obtain maximum density and minimum shrinkage, and where deposited in forms, to have good consolidation properties and maximum smoothness of surface. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the OWNER. Mix changes shall be subject to review by the ENGINEER.

2. The CONTRACTOR is cautioned that the limiting parameters below are **NOT** a mix design. Admixtures may be required to achieve workability required by the CONTRACTOR's construction methods and aggregates. The CONTRACTOR is responsible for providing concrete with the required workability.

- B. **Water-Cement Ratio and Compressive Strength:** The minimum compressive strength and cement content of concrete shall be not less than the following tabulation.

Type of Work	Class of Concrete Min 28-Day Compressive Strength, psi	Max Size Aggregate in	Cement Content Per cu yd, lbs	Max W/C Ratio (by weight)
All concrete	4,000	1	564 to 600	0.45

2.11 CONSISTENCY

- A. Consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (in
All concrete unless indicated otherwise	3-inches plus or minus 1-inch
Ductbank and pipe encasement	5-inches plus or minus 1-inch
Mortar or grout for construction joints	8 inches plus or minus 1-1/2 inch

2.12 MEASUREMENT OF CEMENT AND AGGREGATE

- A. The amount of cement and of each separate size of aggregate entering into each batch of concrete shall be determined by direct weighing equipment furnished by the CONTRACTOR and acceptable to the ENGINEER; provided that, where batches are so proportioned as to contain an integral number of conventional sacks of cement and the cement is delivered at the mixer in the original unbroken sacks, the weight of the cement contained in each sack may be taken without weighing as 94 pounds.

2.13 MEASUREMENT OF WATER

- A. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the ENGINEER and capable of measuring the water in variable amounts within a tolerance of one percent.

2.14 READY-MIXED CONCRETE

- A. At the CONTRACTOR'S option, ready-mixed concrete may be used if it meets the requirements as to materials, batching, mixing, transporting, placing, the supplementary requirements as required herein, and is in accordance with ASTM C 94.
- B. Ready-mixed concrete shall be delivered to the WORK, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever comes first. In hot weather, under conditions contributing to quick stiffening of the concrete, or when the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes.
- C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counter shall be actuated at the time of starting the mixer at mixing speed.
- D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. Materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolutions of mixing.
- E. Each batch of ready-mixed concrete delivered to the WORK shall be accompanied by a delivery ticket furnished to the ENGINEER in accordance with the requirements above.
- F. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials used in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the ENGINEER.

PART 3 -- EXECUTION

3.1 GENERAL FORMWORK REQUIREMENTS

- A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of forms, and any forms that are unsafe or inadequate in any respect shall promptly be removed from the WORK and replaced. A sufficient number of forms of each kind shall be available to permit the required rate of progress to be maintained. The design and inspection of concrete forms, falsework, and shoring shall comply with applicable local, state and federal regulations. Design, construction, maintenance, preparation, and removal of forms shall be in accordance with ACI 347 - Guide to Formwork for Concrete and the requirements herein.
- B. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete.

3.2 CONSTRUCTION

- A. **Vertical Surfaces:** Vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground is indicated. Not less than 1-inch of concrete shall be added to the indicated thickness of a concrete member where concrete is permitted to be placed against trimmed ground in lieu of forms. Permission to do this on other concrete members will be granted only for members of comparatively limited height and where the character of the ground is such that it can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.
- B. **Construction Joints:** Concrete construction joints will not be permitted at locations other than those indicated, except as may be acceptable to the ENGINEER. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.
- C. **Form Ties**
 - 1. **Embedded Ties:** Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form in order to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1-inch back from the formed face or faces of the concrete.
 - 2. **Removable Ties:** Where taper ties are approved for use, after the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be completely filled with non-shrink or regular cement grout. Exposed faces of walls shall have at least the outer 2-inches of the exposed face filled with a cement grout which shall match the color and texture of the surrounding wall surface.

3.3 REUSE OF FORMS

- A. Forms may be reused only if in good condition and only if acceptable to the ENGINEER. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view.

3.4 REMOVAL OF FORMS

- A. Careful procedures for the removal of forms shall be strictly followed, and this WORK shall be done with care so as to avoid injury to the concrete. No heavy loading on green concrete will be permitted. Members which must support their own weight shall not have their forms removed until they have attained at least 75 percent of the 28-Day strength of the concrete. Forms for vertical walls and columns shall remain in place at least 48 hours after the concrete has been placed. Forms for parts of the WORK not specifically mentioned herein shall remain in place for periods of time as recommended in ACI 347.

3.5 GENERAL REINFORCEMENT REQUIREMENTS

- A. Reinforcement steel, welded wire fabric, couplers, and other appurtenances shall be fabricated, and placed in accordance with the requirements of the Building Code and the supplementary requirements indicated herein.

3.6 FABRICATION

A. General

1. Reinforcement steel shall be accurately formed to the dimensions and shapes indicated, and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318.
2. The CONTRACTOR shall fabricate reinforcement bars for structures in accordance with bending diagrams, placing lists, and placing drawings. Said drawings, diagrams, and lists shall be prepared by the CONTRACTOR.
3. Unless otherwise indicated, dowels shall match the size and spacing of the spliced bar.

- B. **Bending or Straightening:** Reinforcement shall not be straightened or rebent in a manner that will injure the material. Bars shall be bent or straight as indicated. Do not use bends different from the bends indicated. Bars shall be bent cold unless otherwise permitted by the ENGINEER. No bars partially embedded in concrete shall be field-bent except as indicated or specifically permitted by the ENGINEER.

3.7 PLACING

- A. Reinforcement steel shall be accurately positioned as indicated and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. Reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers that are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. Concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the CONTRACTOR shall provide concrete, metal, plastic, or other acceptable bar chairs and spacers.
- B. The portions of accessories in contact with the formwork shall be made of concrete, plastic, or steel coated with a 1/8-inch minimum thickness of plastic which extends at least 1/2-inch from the concrete surface. Plastic shall be gray in color.
- C. Tie wires shall be bent away from the forms in order to provide the required concrete coverage.
- D. Bars additional to those indicated which may be found necessary or desirable by the CONTRACTOR for the purpose of securing reinforcement in position shall be provided by the CONTRACTOR as part of the WORK.
- E. Unless otherwise indicated, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the Building Code.

- F. The minimum spacing requirements of ACI 318 shall be followed for reinforcing steel.
- G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters having gray, plastic-coated standard type legs. Slab bolsters shall be spaced not more than 30-inches on centers, shall extend continuously across the entire width of the reinforcing mat, and shall support the reinforcing mat in the plane indicated.
- H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dobies) spaced not more than 3-feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

3.8 SPLICING

- A. **General:** Reinforcement bar splices shall only be used at locations indicated. When it is necessary to splice reinforcement at points other than where indicated, the character of the splice shall be reviewed and accepted by the ENGINEER.
- B. Splices of Reinforcement
 - 1. The length of lap for reinforcement bars, unless otherwise indicated, shall be in accordance with ACI 318, Section 12.15.1 for a Class B splice.
 - 2. Welded splices shall be performed in accordance with AWS D1.4.
 - 3. Laps of welded wire fabric shall be in accordance with the ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

3.9 CLEANING AND PROTECTION

- A. Reinforcement steel shall always be protected from conditions conducive to corrosion until concrete is placed around it.
- B. The surfaces of reinforcement steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcing shall be reinspected and, if necessary recleaned.

3.10 PROPORTIONING AND MIXING

- A. **Proportioning:** Proportioning of the concrete mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301.
- B. **Mixing:** Mixing of concrete shall conform to the requirements of Chapter 7 ACI 301.
- C. **Slump:** Slumps shall be as indicated herein.
- D. **Retempering:** Retempering of concrete or mortar which has partially hardened shall not be permitted.

3.11 PREPARATION OF SURFACES FOR CONCRETING

- A. **General:** Earth surfaces shall be thoroughly wetted by sprinkling prior to the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the

time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

- B. **Joints in Concrete:** Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the ENGINEER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bonding. Except where the Drawings call for joint surfaces to be coated, the joint surfaces shall be cleaned of laitance, loose or defective concrete, and foreign material, and be roughened to a minimum 1/4-inch amplitude. Such cleaning and roughening shall be accomplished by hydroblasting. Pools of water shall be removed from the surface of construction joints before the new concrete is placed.
- C. **Placing Interruptions:** When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape by the use of forms or other means, that will secure proper union with subsequent WORK; provided that construction joints shall be made only where acceptable to the ENGINEER.
- D. **Embedded Items**
1. No concrete shall be placed until formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the ENGINEER at least 4 hours before placement of concrete. Surfaces of forms and embedded items that have become encrusted with dried grout from previous usage shall be cleaned before the surrounding or adjacent concrete is placed.
 2. Reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms at locations indicated and shall be acceptable to the ENGINEER before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.
- E. **Casting New Concrete Against Old:** Where concrete is to be cast against old concrete (defined as any concrete which is greater than 60 Days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydroblasting (exposing aggregate) prior to the application of an epoxy bonding agent. Application shall be according to the bonding agent manufacturer's instructions and recommendations.
- F. No concrete shall be placed in any structure until water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the WORK. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, shall be subject to the review of the ENGINEER.
- G. **Corrosion Protection:** Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported prior to placement of concrete that there will be a minimum of 2-inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

- H. Openings for pipes, inserts for pipe hangers and brackets, and anchors shall, where practicable, be provided for during the placing of concrete.
- I. Anchor bolts shall be accurately set and shall be maintained in position by templates while being embedded in concrete.

3.12 HANDLING, TRANSPORTING, AND PLACING

- A. **General:** Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.
- B. **Non-Conforming WORK or Materials:** Concrete which during or before placing is found not to conform to the requirements indicated herein shall be rejected and immediately removed from the WORK. Concrete which is not placed in accordance with these Specifications or which is of inferior quality shall be removed and replaced.
- C. **Unauthorized Placement:** No concrete shall be placed except in the presence of a duly authorized representative of the ENGINEER. The CONTRACTOR shall notify the ENGINEER in writing at least 24 hours in advance of placement of any concrete.
- D. **Placement in Wall and Column Forms**
 - 1. Concrete shall not be dropped through reinforcement steel or into any deep form nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4-feet in walls and 8-feet in columns below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6-feet in horizontal direction. Concrete in wall forms shall be deposited in uniform horizontal layers not deeper than 2-feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in wall forms shall not exceed 5-feet of vertical rise per hour. Sufficient illumination shall be provided in the interior of forms so that the concrete at the places of deposit is visible from the deck or runway.
 - 2. The surface of the concrete shall be level whenever a run of concrete is stopped. To insure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-inch thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2-inch above the underside of the strip. About one hour after the concrete is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel, and laitance shall be removed.
- E. **Conveyor Belts and Chutes:** Ends of chutes, hopper gates, and other points of concrete discharge throughout the CONTRACTOR'S conveying, hoisting, and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle immediately receives it. Conveyor belts, if used, shall be of a type acceptable to the ENGINEER. Chutes longer than 50-feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the required consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will

be wasted. All conveyor belts and chutes shall be covered. Sufficient illumination shall be provided in the interior of forms so that the concrete at the places of deposit is visible from the deck or runway.

- F. **Temperature of Concrete:** The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 40 degrees F in moderate weather, and not less than 50 degrees F in weather during which the mean daily temperature drops below 40 degrees F. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the required minimum temperature. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water, using ice, or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements.

G. Cold Weather Placement

1. Placement of concrete shall conform to ACI - 306.1 - Cold Weather Concreting, and the following.
2. Earth foundations shall be free from frost or ice when concrete is placed upon or against them.
3. Maintain the concrete temperature above 50 degrees F for at least 72-hours after placement.

3.13 PUMPING OF CONCRETE

- A. **General:** If the pumped concrete does not produce satisfactory end results, the CONTRACTOR shall discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment

1. The pumping equipment shall have 2 cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the Site during pumping.
2. The minimum diameter of the hose conduits shall be in accordance with ACI 304.2R - Placing Concrete by Pumping Methods.
3. Pumping equipment and hose conduits that are not functioning properly, shall be replaced.
4. Aluminum conduits for conveying the concrete shall not be permitted.

C. Proportioning

1. Minimum compressive strength, cement content and maximum size of aggregates shall be as required in this Section.
2. Gradation of coarse aggregates shall conform to ASTM C 33 and shall be as close to the middle range as possible.

3. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.

3.14 TAMPING AND VIBRATING

- A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete. Vibrators shall be high speed power vibrators (8000 to 12,000 rpm) of an immersion type in sufficient number and with at least one standby unit as required.
- B. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the required results within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall not contact the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.15 FINISHING CONCRETE SURFACES

- A. **General:** Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions indicated are defined as tolerances and are indicated above. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.
- B. **Formed Surfaces:** No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects.
- C. **Unformed Surfaces:** After proper and adequate vibration and tamping, unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Whenever the air temperature exceeds 85 degrees F or the wind speed exceeds 25 mph at the time of placement, the concrete shall be treated as follows. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each WORK operation as necessary to prevent drying shrinkage cracks. The classes of finish for unformed concrete surfaces are designated and defined as follows:
 1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8-inch. No further special finish is required.
 2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted. Floating shall be the minimum necessary to produce a surface that is

free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where indicated or as determined by the ENGINEER.

3. Finish U3 - After the Finish U2 surface has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of irregularities.
4. Finish U4 - Trowel the Finish U3 surface to remove local depressions or high points. In addition, the surface shall be given a light broom finish with brooming perpendicular to drainage unless otherwise indicated. The resulting surface shall be rough enough to provide a nonskid finish.

D. Unformed surfaces shall be finished according to the following schedule:

UNFORMED SURFACE FINISH SCHEDULE	
Area	Finish
Grade slabs and foundations to be covered with concrete or fill material	U1
Floors to be covered with grouted tile or topping grout	U2
Slabs to be covered with built-up roofing	U2
Interior slabs and floors to receive architectural finish	U3
Slabs	U4

3.16 CURING AND DAMPPROOFING

- A. **General:** Concrete shall be cured for not less than 7 Days after placing, in accordance with the methods indicated below for the different parts of the WORK.

Surface to be Cured or Dampproofed	Method
Unstripped forms	1
Construction joints between footings and walls, and between floor slab and columns	2
Encasement and ductbank concrete and thrust blocks	3
All concrete surfaces not specifically provided for elsewhere in this Paragraph	4
Buried slabs and backfilled walls	5

- B. **Method 1:** Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removal. If steel forms are used, the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 7 Days of placing the concrete, curing shall be continued in accordance with Method 4 below.
- C. **Method 2:** The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.
- D. **Method 3:** The surface shall be covered with moist earth not less than 4 hours nor more than 24 hours after the concrete is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 Days after placement of concrete.
- E. **Method 4:** The surface shall be sprayed with a liquid curing compound.
1. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film that will seal thoroughly.
 2. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the 7 Day curing period. If the seal is damaged or broken before the expiration of the curing period, the break shall be repaired immediately by the application of additional curing compound over the damaged portion.
 3. Wherever curing compound has been applied by mistake to surfaces against which concrete subsequently is to be placed and to which it is to adhere, compound shall be entirely removed by wet sandblasting just prior to the placing of new concrete.
 4. Curing compound shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces, and within 2 hours after removal of forms. Repairs required to be made to formed surfaces shall be made within the said 2 hour period; provided, however, that any such repairs which cannot be made within the said 2 hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area involved shall first be wet-sandblasted to remove the curing compound.
 5. During the curing period, no traffic of any nature and no depositing of any materials, temporary or otherwise, shall be permitted on surfaces coated with curing compound. Foot traffic and the depositing of materials may be allowed after 3 Days if the surface is covered with 5/8-inch plywood placed over polyethylene sheets.
- F. **Method 5:** This method applies to both buried slabs and walls to be backfilled.
1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 7 Days beginning immediately after the concrete has reached final set or forms have been removed.
 2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water through nozzles that atomize the flow so that the surface is not marred or washed.
 3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held

substantially in contact with the concrete surface to prevent being dislodged by wind or any other causes. Edges shall be continuously held in place.

4. The curing blankets and concrete shall be kept continuously wet by the use of sprinklers or other means both during and after normal working hours.
5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted, and curing compound shall be immediately applied in accordance with Method 4 above.
6. The CONTRACTOR shall dispose of excess water from the curing operation to avoid damage to the WORK.
7. Dampproofing: The exterior surfaces of buried roof slabs and backfilled walls shall be dampproofed as follows.
 - a. Immediately after completion of curing, the surface shall be sprayed with a dampproofing agent consisting of an asphalt emulsion. Application shall be in 2 coats. The first coat shall be diluted to one-half strength by the addition of water and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an application of the undiluted material, and shall be sprayed on so as to provide a maximum coverage rate of 100 square feet per gallon. Dampproofing material shall be as indicated above.
 - b. As soon as the material has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used if it produces a uniformly coated white surface and remains until placing of the backfill. If the whitewash fails to remain on the surface until the backfill is placed, the CONTRACTOR shall apply additional whitewash
- G. The CONTRACTOR may submit alternate methods of curing which maintain the concrete in a continuously wet condition for acceptance by the ENGINEER.

3.17 PROTECTION

- A. The CONTRACTOR shall protect concrete against injury until final acceptance.
- B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. The CONTRACTOR shall provide such protection while the concrete is still plastic and whenever precipitation is imminent or occurring.

3.18 CURING IN COLD WEATHER

- A. Water curing of concrete may be reduced to 6 Days during periods when the mean daily temperature in the vicinity of the Site is less than 40 degrees F; provided that, during the prescribed period of water curing, when temperatures are such that concrete surfaces may freeze, water curing shall be temporarily discontinued.
- B. Concrete cured by an application of curing compound will require no additional protection from freezing if the protection at 50 degrees F for 72 hours is obtained by means of approved insulation in contact with the forms or concrete surfaces; otherwise, the concrete shall be protected against freezing temperatures for 72 hours immediately following 72 hours protection at 50 degrees F. Concrete cured by water shall be protected against freezing temperatures for 72 hours immediately following the 72 hours of protection at 50 degrees F.

- C. Discontinuance of protection against freezing temperatures shall be such that the drop in temperature of any portion of the concrete will be gradual and will not exceed 40 degrees F in 24 hours. In the spring, when the mean daily temperature rises above 40 degrees F for more than 3 Days, 72 hour protection at a temperature not lower than 50 degrees F may be discontinued for as long as the mean daily temperature remains above 40 degrees F; provided, that the concrete shall be protected against freezing temperatures for not less than 48 hours after placement.
- D. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. Use of unvented heaters will be permitted only when unformed surfaces of concrete adjacent to the heaters are protected for the first 24 hours from an excessive carbon dioxide atmosphere by application of curing compound; provided, that the use of curing compound for such surfaces is otherwise permitted by these Specifications.

3.19 TREATMENT OF SURFACE DEFECTS

- A. As soon as forms are removed, exposed concrete surfaces shall be carefully examined and any irregularities shall be immediately rubbed or ground in a satisfactory manner in order to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the ENGINEER. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall be repaired as indicated below. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. Repairs and replacements shall be performed promptly.
- B. Defective surfaces to be repaired shall be cut back from trueline a minimum depth of 1/2-inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required in order to deepen the area properly, the surface shall be prepared for bonding by the removal of laitance or soft material, plus not less than 1/32-inch depth of the surface film from hard portions by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces underneath will remain moist but not so wet as to overcome the suction upon which a good bond depends. The material used for repair shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white portland cement as is required to make the color of the patch match the color of the surrounding concrete.
- C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers so as to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.
- D. Repairs shall be built up and shaped in such a manner that the completed WORK will conform to the requirements of this Section as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

3.20 CARE AND REPAIR OF CONCRETE

- A. The CONTRACTOR shall protect concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance. Particular care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, which becomes defective at any time prior to the final acceptance of the completed WORK, which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the Contract Documents, shall be satisfactorily repaired or removed and replaced with acceptable concrete.

- END OF SECTION -

SECTION 03315 – GROUT

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide grout, complete and in place, in accordance with the Contract Documents
- B. The following types of grout are covered in this Section:
 - 1. Cement Grout
 - 2. Non-Shrink Grout - Class I (cement-based)
 - 3. Non-Shrink Grout - Class II (cement-based)
 - 4. Non-Shrink Epoxy Grout
 - 5. Topping Grout and Concrete/Grout Fill

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.
 - 1. Certified testing lab reports for tests indicated herein.
 - 2. Test results and service report from the field tests and the demonstration and training session verifying the requirements indicated herein.
 - 3. Certifications that grouts used on the project contain no chlorides or other chemicals that cause corrosion.
 - 4. Manufacturer's literature containing instructions and recommendations on the mixing, handling, placement, curing, and appropriate uses for each type of grout used in the WORK, and location of use. The current ICC/ES report shall be submitted for all epoxy anchor grouts for adhesive anchors.
 - 5. Manufacturer's certification that its non-shrink grout does not contain aluminum, zinc, or magnesium powders as a method of expansion.
 - 6. Submit manufacturer's written warranty as indicated herein.
 - 7. Name and telephone number of grout manufacturer's representative who will give on-Site service. The representative shall have at least one year of experience with the indicated grouts.
- B. Provide manufacturer's independent certification of ASTM C 1107 – Packaged Dry, Hydraulic-Cement Grout (Nonshrink), compliance without modification of the standard methods certifying that the Class B or C grout post hardening non-shrink properties are non based on gas expansion, grouts have strengths of 3500 psi at day 1, 6500 psi at 3 days and 7500 psi at 28 days when cured at 72 degrees F as well as meeting the 3, 7,

and 28 day strengths when tested and cured at 45 degree and 95 degree limits and all other requirements of ASTM C 1107.

- C. The CONTRACTOR shall engage an independent testing laboratory to run a 24 hour grout evaluation in accordance with ASTM C 1107 of each grout submitted for approval showing compliance to all aspects of the evaluation and submit results to the ENGINEER for review.

1.3 QUALITY ASSURANCE

A. Field Tests

1. Compression test specimens will be taken from the first placement of each type of grout, and at intervals thereafter selected by the ENGINEER. The specimens will be made by the ENGINEER or its representative.
2. Compression tests and fabrication of specimens for cement grout and cement based non-shrink grout will be performed in accordance with ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink), at intervals during construction selected by the ENGINEER. A set of 3 specimens will be made for testing at 7 Days, 28 Days, and each additional time period as appropriate.
3. Compression tests and fabrication of specimens for epoxy grouts will be performed in accordance with ASTM C 579 – Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes, Method B, at intervals during construction selected by the ENGINEER. A set of 3 specimens will be made for testing at 7 Days and each earlier time period as appropriate.
4. The cost of laboratory tests on grout will be paid by the OWNER except where test results show the grout to be defective. In such case, the CONTRACTOR shall pay for the tests, removal and replacement of Defective Work, and re-testing, all as part of the WORK.
5. The CONTRACTOR shall assist the ENGINEER in obtaining specimens for testing and shall furnish materials necessary for fabricating the test specimens.

- B. **Construction Tolerances:** Construction tolerances shall be as indicated in Section 03310 unless indicated otherwise.

C. Pre-Installation Demonstration and Training

1. Cement and Epoxy-Based Non-Shrink Grouts
 - a. The grout manufacturer shall give a demonstration and training session for the cement based non-shrink and epoxy grouts to be used on the project, before any installation of grout is allowed.
 - b. Training session shall use a minimum of 5 bags of cement-based non-shrink class I grout mixed to fluid consistency. Tests shall be conducted for flow cone and bleed tests. Six cubes for testing at 1, 3, and 28 Days shall be made. The

remaining grout shall be placed, and curing may be initiated on actual project placements such as baseplates and tie holes to provide on-the-job training for the CONTRACTOR and ENGINEER. The CONTRACTOR employees who will be doing the grouting shall participate in this training and demonstration session. The training session shall include methods for curing the grout.

- c. The manufacturer shall mix enough cement-based non-shrink class II grout for a minimum of 15 tie holes and shall train the CONTRACTOR'S employees in how to perform the WORK and cure the grout. The CONTRACTOR shall have the employees assisting in the mixing and sealing of the tie holes.
- d. If the project includes patching, throughbolt holes, epoxy anchors, and/or blockouts, the manufacturer shall also train the CONTRACTOR'S employees in the mixing and curing of the epoxy grouts for each of these applications.
- e. The CONTRACTOR shall transport the test cubes to an independent test laboratory, obtain the test reports, and report these demonstration and training test cube strengths to the ENGINEER.

2. Epoxy Anchor Grout for Adhesive Anchors

- a. Before installing adhesive anchors in the WORK, adhesive anchor installers shall be trained and qualified at the Site by the manufacturer's representative. Training and qualification for each installer shall include at least:
 - 1) Hole drilling procedure, hole preparation and cleaning techniques, adhesive injection technique and dispenser training/maintenance, rebar dowel preparation and installation, and proof loading/torquing.
 - 2) Anchors installed in both the vertical and horizontal positions in a mock-up concrete panel of adequate size and thickness. Anchors shall be tested in tension and shear loading. A minimum of 3 anchors shall be tested for each installation position.
 - 3) Anchors shall be tested at 2 times the published allowable tension load or 1-1/4 times the maximum design strength of the anchors in tension as indicated in the ICC/ES report. The test load need not exceed 80 percent of the nominal yield strength of the anchor, based on steel strength, as determined by ACI 318 Appendix D.
 - 4) If any of the 3 test bolts in any installation position fail to reach the test loads, the installer shall be re-tested with the same procedure. Re-testing is required only for the failed installation position.
 - 5) An installer who has 3 consecutive successful bolt tests in the first or second trial is considered qualified for adhesive anchor installation for this project. The manufacturer's representative shall issue a certificate to the qualified installer, and a copy of the certificate shall be filed with the CONTRACTOR and be submitted to the ENGINEER.
 - 6) The test anchor size shall be the largest size adhesive anchor used on the project. The anchor embedment length and edge distances shall be adequate to resist the test loads listed above.

- 7) Each installer shall be re-qualified every 6 months for the duration of the project by the same qualifying procedure.
- 8) The certification of each qualified installer shall be available for verification at the Special Inspector's request.
- 9) Defective anchors noted by the Special Inspector shall be replaced and re-installed by the CONTRACTOR without any additional compensation.

1.4 SPECIAL CORRECTION OF DEFECTS PROVISIONS

A. Manufacturer's Warranty

1. Furnish one year warranty for WORK provided under this section.
2. Manufacturer's warranty shall not contain a disclaimer limiting responsibility to the purchase price of products or materials.

PART 2 -- PRODUCTS

2.1 APPLICATION

- A. Unless indicated otherwise, grouts shall be provided as listed below:

Application	Type of Grout
Anchor bolts and reinforcing steel required to be set in grout in which the average working or operating temperature will be over 100 degrees F or in high fire risk areas.	Non-Shrink - Class I
Anchor bolts and reinforcing steel required to be set in grout that is not in high temperature or high fire risk areas.	Epoxy Anchor Grout
Beam and column (1 or 2 story) base plates less than 16-inches in the least dimension.	Non-Shrink - Class I
Column base plates (greater than 2 story or larger than 16-inches in the least dimension)	Non-Shrink - Class II
Storage tanks and other non-motorized equipment and machinery under 30 horsepower	Non-Shrink - Class I
Pumps over 1000 horsepower, unless indicated otherwise	Non-Shrink Epoxy
Filling blockout spaces for embedded items such as railing posts, gate guide frames, etc.	Non-Shrink - Class I (Class II where placement time exceeds 20 min.)
Under precast concrete elements	Non-Shrink - Class II

Toppings and concrete/grout fill less than 3-inches thick	Topping Grout
Toppings and concrete/grout fill greater than 3-inches thick	Sitework Concrete03310
Surface repairs	Cement Grout
Repair of holes and defects in concrete members which are not water bearing and not in contact with soil or other fill material	Non-Shrink - Class I
Repair of holes and defects in concrete members which are water bearing or in contact with soil or other fill materials	Non-Shrink - Class II
Any application not listed above, where grout is indicated	Non-Shrink Class I, unless specifically indicated otherwise

2.2 CEMENT GROUT

- A. Cement grout shall be composed of one part cement, 3 parts sand, and the minimum amount of water necessary to obtain the desired consistency. Where needed to match the color of adjacent concrete, white portland cement shall be blended with regular cement as needed. The minimum compressive strength at 28 Days shall be 4000 psi.
- B. Cement grout materials shall be as indicated in Section 03310, except that no cement from kilns burning metal-rich hazardous waste fuel shall be used.

2.3 NON-SHRINK GROUTS (cement-based)

- A. General
 1. Cement-based non-shrink grout shall be a prepackaged, inorganic, fluid, non-gas liberating, non-metallic, cement type grout requiring only the addition of water. Cement from kilns burning metal-rich hazardous waste fuel shall not be used.
 2. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of non-shrink grout shall be as recommended by the manufacturer for the particular application.
 3. Grout shall not contain chlorides or additives that may contribute to corrosion.
 4. Grout shall be formulated to be used at any consistency from fluid to plastic.
 5. Cement-based non-shrink grout shall have the following minimum properties when tested at a fluid consistency, at 28 Days:
 - a. Minimum tensile splitting strength of 500 psi per ASTM C 496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.

- b. Minimum flexural strength of 1000 psi per ASTM C 580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes.
- c. Minimum bond strength (concrete to grout) of 1900 psi per modified ASTM C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

B. Class I Non-Shrink Grout

- 1. Class I non-shrink grout shall have a minimum 28 Day compressive strength of 5000 psi when mixed at a fluid consistency.
- 2. Class I non-shrink grout shall meet the requirements of ASTM C 1107, Grade B or C, when mixed to fluid, flowable, and plastic consistencies.
- 3. Grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827 – Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures. The grout when tested shall not bleed or segregate at maximum allowed water.
- 4. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090 – Standard Test Method for Measuring Changes in Height of Cylindrical Specimens from Hydraulic-Cement Grout.
- 5. Furnish certification that the non-shrink property of grout is not based on gas production or gypsum expansion.
- 6. Class I Non-Shrink Grout shall be **Masterflow 713 Plus** by **BASF**, **Five Star Grout** by **Five Star Products**, **Sikagrout 212** by **Sika Corporation**, **Duragrout** by **L&M Construction Chemicals**; **High-Flow Grout** by **Euclid Chemical Company**, **CG 200 PC** by **Hilti**, or equal.

C. Class II Non-Shrink Grout

- 1. Class II non-shrink grout shall be a high precision, fluid, extended working time, grout. The minimum 28-Day compressive strength shall be 7500 psi, when mixed at a fluid consistency.
- 2. Grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827.
- 3. Grout shall have no shrinkage (0.0 percent) and a maximum of 0.3 percent expansion in the hardened state when tested in accordance with ASTM C 1090.
- 4. Class II non-shrink grout shall have an extended working time of 30 minutes minimum when mixed to a fluid consistency as defined in ASTM C 827 at temperature extremes of 45 to 90 degrees F in accordance with ASTM C 1107.

5. Class II non-shrink grout shall meet the requirements of ASTM C 1107, Grade B or C when tested using the amount of water needed to achieve fluid consistency per ASTM C 939.
6. The grout when tested shall not bleed or segregate at maximum allowed water content.
7. Provide certification that its non-shrink property is not based on gas production or gypsum expansion.
8. Class II non-shrink grout shall be **Masterflow 928** by **BASF**, **Five Star Fluid Grout 100** by **Five Star Products**, **Crystex** by **L&M Construction Chemicals**, or equal.

2.4 NON-SHRINK EPOXY GROUT

- A. Non-shrink epoxy grout shall be a flowable, non-shrink, 100 percent solids system. The epoxy grout system shall have 3 components: resin, hardener, and specially blended aggregate, each premeasured and prepackaged. The resin component shall not contain any non-reactive diluents. Resins containing butyl glycidyl ether (BGE) or other highly volatile and hazardous reactive diluents are not acceptable. Variation of component ratios is not permitted unless specifically recommended by the manufacturer. Manufacturer's instructions shall be printed on each container in which the materials are packaged.
- B. Epoxy grout shall have a maximum early age height change of 4.0 percent expansion, and shall have no shrinkage (0.0 percent) in accordance with ASTM C 827, (modified for epoxy grouts by using an indicator ball with a specific gravity between 0.9 and 1.1).
- C. Epoxy grout shall have a negligible (less than 0.0006 in/in) length change after hardening, and a coefficient of thermal expansion less than 0.00003 in/in F when tested according to ASTM C 531 – Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- D. The epoxy grout shall develop a minimum compressive strength of 9000 psi in 24 hours and 13,000 psi in seven days when tested in accordance with ASTM C 579, method B.
- E. The mixed epoxy grout shall have a minimum working life of 90 to 120 minutes at 70 degrees F.
- F. The effective bearing area shall be a minimum of 95 percent EBA in accordance with ASTM C 1339 – Standard Test Method for Flowability and Bearing Area of Chemical-Resistant Polymer Machinery Grouts, for bearing area and flow.
- G. The chemical formulation of the epoxy grout shall be that recommended by the manufacturer for the particular application. Do not reduce aggregate loading or add solvents to increase flowability.
- H. Non-shrink epoxy grout shall have the following minimum properties when tested at 7 Days:
 1. Minimum bond strength to concrete of 3000 psi per ASTM C 882 modified.
 2. Minimum bond strength to steel of 1700 psi per ASTM C 882 modified.

3. Minimum flexural strength of 2500 psi per ASTM C 580.
4. Minimum tensile strength of 2000 psi per ASTM C 307 -- Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing.
- I. Non-shrink epoxy grout shall be **Five Star DP Epoxy Grout** by **Five Star Products, Inc.**, **Masterflow 648 CP Plus** by **BASF**, **Sikadur 42 Grout-Pak** by **Sika Corporation**, or equal.

2.5 EPOXY ANCHOR GROUT

- A. Epoxy anchor grout for use in concrete shall be certified for use in resisting seismic loads in cracked concrete applications in accordance with ICC-ES AC 308.
- B. Epoxy anchor grout shall conform to ASTM C 881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete, Type IV, Class B & C, Grade 3 with the exception of gel time.
- C. Heat deflection temperature per ASTM D 648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position shall be a minimum 120 degrees F.
- D. Manufacturer shall certify that the epoxy anchor grout will maintain 90 percent of its strength up to a temperature of 125 degrees F.
- E. Grout shall come in a 2 chambered cartridge with a metering system that provides the proper ratio of hardener and resin. The grout shall also come with a static mixer nozzle to thoroughly mix the hardener and resin together.
- F. Epoxy anchor grout shall be capable of being used in submersed applications once cured.
- G. Compressive strength per ASTM D 695 – Standard Test Method for Compressive Properties of Rigid Plastics shall be 10,000 psi minimum.
- H. Whenever possible, overhead anchors subject to vibration, anchors in fire-resistive construction or high fire risk areas, and anchors subject to working or operating temperatures above 100 degrees F shall be cast-in-place anchors. Whenever cast-in-place anchors cannot be used in these applications, use cement based non-shrink grout and oversized holes.
- I. Embedment of adhesive anchors/rebar shall be deep enough to develop the anchor/rebar. Embedment shall not exceed 67 percent of the member depth.
- J. Epoxy anchor grout shall be **PE1000+** by **Powers Fasteners**; **HIT-RE 500-SD** by **Hilti**, **SET-XP** by **Simpson Strong-Tie**, or equal.

2.6 TOPPING GROUT AND CONCRETE/GROUT FILL

- A. Where fill is thicker than 3-inches, sitework concrete, as indicated in Section 03310 - Cast-in-Place Concrete, may be used when accepted by the ENGINEER. Omit the coarse aggregate in topping grout used in clarifiers.

- B. Grout for topping of slabs and concrete/grout fill for built-up surfaces of tank, channel, and basin bottoms shall be composed of cement, fine aggregate, coarse aggregate, water, and admixtures proportioned and be mixed as indicated. Materials and procedures indicated for normal concrete in Section 03310 - Cast-in-Place Concrete, shall apply unless indicated otherwise.
- C. Topping grout and concrete/grout fill shall contain a minimum of 564 pounds of cement per cubic yard with a maximum water cement ratio of 0.45. Topping grout in clarifiers shall contain between 750 and 800 pounds of cement per cubic yard with a maximum water cement ratio of 0.42.
- D. Coarse aggregate shall be graded as follows:

U.S. Standard Sieve Size	Percent By Weight Passing
1/2 in	100
3/8 in	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 30	0

- E. Final mix design shall be as determined by trial mix design as indicated in Section 03310, except that drying shrinkage tests are not required.
- F. Topping grout and concrete grout/fill shall contain air-entraining agent per Section 03310.
- G. **Strength:** Minimum compressive strength of topping grout and concrete/grout fill at 28 Days shall be 4000 psi.
- H. Topping grout used in clarifiers shall contain fiber reinforcing. Fiber shall be 100 percent virgin polypropylene fibrillated fibers specifically manufactured in a blended gradation for use as concrete secondary reinforcement. Fibers shall be added at a rate of 1.5 pounds per cubic yard of concrete. Fibers shall conform to ASTM C 1116 – Standard Specification for Fiber-Reinforced Concrete, Type III.

2.7 CURING MATERIALS

- A. Curing materials shall be in accordance with Section 03310 and as recommended by the manufacturer of prepackaged grouts.

2.8 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is defined such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the

Contract Documents, it shall mean a grout of that consistency; the type of grout to be used shall be as indicated herein for the particular application.

- B. The slump for topping grout and concrete/grout fill shall be adjusted to match placement and finishing conditions but shall not exceed 4-inches.

2.9 MEASUREMENT OF INGREDIENTS

- A. Measurements for cement grout shall be made accurately by volume using containers. Shovel measurements shall not be allowed.
- B. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

PART 3 -- EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Grout shall be stored in accordance with manufacturer's recommendations.

3.2 GENERAL

- A. CONTRACTOR shall arrange for the manufacturer of prepackaged grouts to provide on-Site technical assistance within 72 hours of request, as part of the WORK.
- B. Grout shall not be placed until base concrete or masonry has attained its design strength, unless authorized otherwise by the ENGINEER.
- C. When cementitious grouts are used on concrete surfaces, the concrete surface shall be saturated with water for 24 hours prior to placement. Upon completion of the saturation period, excess water shall be removed with clean, oil free compressed air prior to grouting. Concrete substrate shall not be wet prior to placement of epoxy grouts.
- D. Surface preparation, curing, and protection of cement grout shall be in accordance with Section 03310. The finish of the grout surface shall match that of the adjacent concrete unless otherwise indicated.
- E. Surfaces that will be in contact with grout shall be free of dirt, loose rust, oil, wax, grease, curing compounds, laitance, loose concrete, and other deleterious materials.
- F. Shade the WORK from sunlight for at least 24 hours before and 48 hours after grouting.
- G. Contact the grout manufacturer's representative for assistance on hot and cold weather grouting techniques and precautions if applicable.

3.3 GROUTING PROCEDURES

- A. **General:** Mixing, surface preparation, handling, placing, consolidation, curing, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.
- B. Structural, equipment, tank, and piping support bases shall be grouted, unless indicated otherwise.

1. The original concrete shall be blocked out or finished off a sufficient distance below the plate to provide for a minimum one-inch thickness of grout or other thickness if indicated.
2. After the base plate has been set in position at the proper elevation by steel wedges or double nuts on the anchor bolts, the space between the bottom of the plate and the original pour of concrete shall be filled with non-shrink-type grout through a headbox of appropriate size. The mixture shall be of a fluid consistency and poured continuously into the space between the plate and the base concrete. Forms for grout shall be tight against retaining surfaces, and joints shall be sealed as recommended by the grout manufacturer to be liquid-tight. Forms shall be coated as recommended by the grout manufacturer for easy form release. Where this method of placement is not practical or where required by the ENGINEER, alternate grouting methods shall be submitted by the CONTRACTOR for acceptance by the ENGINEER.
3. Concrete equipment pads for equipment bases that will be epoxy-grouted shall be sized so that, when the equipment base is fully grouted, the epoxy grout is stopped not less than 4-inches from the edge of the pad.

C. Drilled anchors and Reinforcing Bars

1. General

- a. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions and applicable ICC/ES report requirements. Holes shall be roughened with a brush on a power drill, and cleaned. Drilled anchors shall not be installed until the concrete has reached the required 28 Day compressive strength. Anchors shall not be loaded until the grout has reached its indicated strength in accordance with the manufacturer's instructions.
- b. The CONTRACTOR shall identify the position of reinforcing steel and other embedded items prior to drilling holes. Care shall be exercised in coring and drilling to avoid damaging existing reinforcing or embedded items. Notify the ENGINEER if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and communications conduit, and piping.

2. Epoxy Adhesive Anchors

- a. Grout shall be proportioned and mixed with automatic equipment approved by the product manufacturer.
- b. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICC/ES report, but shall not be less than 8 diameters for threaded rod or 12 diameters for reinforcing or smooth bars.
- c. Holes shall be dry.

3. Cement Based Non-Shrink Grout

- a. In places of high temperature or fire hazard, anchor bolts shall be grouted in using cement based non-shrink grout, Class I.
- b. Unless otherwise indicated, embedment shall be sufficient to develop the ultimate tensile strength of the anchor or reinforcing bar per the manufacturer's ICC/ES report, but shall not be less than 16 diameters for threaded rod or 24 diameters for reinforcing or smooth bars.
- c. When the bolt diameter is one-inch or less, the hole diameter shall be a minimum of 2-inches. When the bolt diameter is greater than one-inch, the hole diameter shall be at least twice the bolt diameter.
- d. Drilled holes shall be saturated with water for not less than 24 hours before installation of anchor/rod/rebar.
- e. The non-shrink grout shall be placed in the holes in a non-sag (trowelable) consistency. The grout shall be placed in the holes before the anchor and then the anchor inserted and vibrated to ensure proper coverage.

D. Topping Grout and Concrete/Grout Fill

1. Mechanical, electrical, and finish WORK shall be completed prior to placement of topping or concrete/grout fill. To ensure bonding to the base slab, the base slab shall be given an exposed aggregate finish. Alternatively where accepted by the ENGINEER, the base slab shall be given a roughened textured surface by a close-spaced rake while the surface is green. After curing, high pressure washing shall expose the aggregates and produce not less than a 3/16-inch amplitude roughness. Jackhammers or chipping hammers shall not be used.
2. The minimum thickness of grout topping and concrete/grout fill shall be one-inch. Where the finished surface of concrete/grout fill is to form an intersecting angle of less than 45 degrees with the concrete surface it is to be placed against, a key shall be formed in the concrete surface at the intersection point. The key shall be a minimum of 3-1/2 inches wide by 1-1/2 inches deep.
3. The base slab shall be thoroughly cleaned and wetted to saturated surface dry (SSD) condition per the International Concrete Repair Institute (ICRI) -- Technical Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays, prior to placing topping and fill. No topping concrete shall be placed until the slab is completely free from standing pools or ponds of water. A thin coat of neat cement grout shall be broomed into the surface of the slab just before topping or fill placement. The neat cement grout shall not be allowed to dry before topping placement. If it does dry, it must be immediately removed using wet stiff brooms and reapplied. The topping and fill shall be compacted by rolling or thorough tamping, brought to established grade, and floated. Grouted fill for tank and basin bottoms where scraping mechanisms are to be installed shall be screeded by blades attached to the revolving mechanism of the equipment in accordance with the procedures outlined by the equipment manufacturer after the grout is brought to the established grade. Coat surface with evaporation retardant as needed to prevent plastic shrinkage cracks.
4. Topping grout placed on sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement.

5. The surface shall be tested with a straight edge to detect high and low spots which shall be immediately eliminated. When the topping or fill has hardened sufficiently, it shall be steel troweled to a smooth surface free from pinholes and other imperfections. An approved type of mechanical trowel may be used as an assist in this operation, but the last pass over the surface shall be by hand-troweling. During finishing, no water, dry cement, or mixture of dry cement and sand shall be applied to the surface.
6. As soon as topping or fill finishing is completed, coat surface with curing compound. After the topping is set and sufficiently hard in clarifiers and where required by the ENGINEER, the tank shall be filled with sufficient water to cover the entire floor for 14 days.

3.4 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, to assure that the space to be grouted is completely filled.

3.5 CURING

- A. Cement based grouts shall be cured per 03310 and per the manufacturer's recommendations.

- END OF SECTION -

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SECTION 05500 – MISCELLANEOUS METALWORK

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Provide miscellaneous metalwork and appurtenances, complete and in place, as indicated in accordance with the Contract Documents.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Federal Specifications

MIL-G-18015 A (3) (Ships) Aluminum Planks. (6063-T6)

MIL-PRF-907F Antiseize Thread Compound, High Temperature

- B. Codes

OSHA 1927.10 Fixed Ladders

- C. Commercial Standards

AA-M32C22A41 Aluminum Assn.

AISC Manual of Steel Construction

AISI Design of Light Gauge, Cold-Formed Steel Structural Members

ASTM A 36 Carbon Structural Steel

ASTM A 48 Gray Iron Castings

ASTM A 53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A 153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 193 Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service

ASTM A 194 Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service

ASTM A 307 Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

ASTM A 325 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength

ASTM A 500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

ASTM A 992	Steel for Structural Shapes for Use in Building Framing
ANSI/AWS D1.1	Structural Welding Code - Steel
ANSI/AWS D1.2	Structural Welding Code - Aluminum
ANSI/AWS QC1	Qualification and Certification of Welding Inspectors

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with the requirements of Section 01300 – Contractor Submittals.
- B. Shop Drawings
 - 1. Shop Drawings shall conform to AISC recommendations and specifications, and shall show holes, and the like, as may be required for other parts of the WORK.
 - 2. Shop Drawings shall include complete details of members and connections, anchor bolt layouts, schedules for fabrication procedures, and diagrams for the sequence of erection.
 - 3. Anchors
 - a. Submit an ICBO report listing the ultimate load capacity in tension and shear for each size and type of concrete anchor.
 - b. Submit manufacturer's recommended installation instructions and procedures for adhesive anchors.
 - c. Upon review by the ENGINEER, these instructions shall be followed specifically.
 - d. No substitution for the indicated adhesive anchors will be considered unless accompanied with ICBO report verifying strength and material equivalency, including temperature at which load capacity is reduced to 90 percent of that determined at 75 degrees F.

1.4 QUALITY ASSURANCE

- A. Weld procedures and welder qualifications shall be available in the CONTRACTOR's field office for review. Welding shall be inspected by a CONTRACTOR-furnished inspector qualified in accordance with AWS requirements and approved by the ENGINEER.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Steel

Wide Flange Shapes	ASTM A 992

Shapes, Plates, Bars	ASTM A 36
Pipe, Pipe Columns, Bollards	ASTM A 53, Type E or S, Grade B standard weight unless indicated otherwise
HSS	ASTM A 500 Grade B

B. Corrosion Protection

1. Unless otherwise indicated, fabricated steel metalwork which will be used in a corrosive environment and/or will be submerged in water or wastewater shall be coated in accordance with the requirements of Section 09800 – Protective Coating, and shall not be galvanized prior to coating.
2. Other miscellaneous steel metalwork shall be hot-dip galvanized after fabrication.

C. Stainless Steel

1. Unless otherwise indicated, stainless steel metalwork and bolts shall be fabricated from Type 316 stainless steel.

D. Aluminum

1. Unless otherwise indicated, aluminum metalwork shall be fabricated from Alloy 6061-T6.
2. Aluminum in contact with concrete, masonry, wood, porous materials, or dissimilar metals shall have contact surfaces coated in accordance with the requirements of Section 09800 – Protective Coating.

E. Cast Iron

1. Unless otherwise indicated, iron castings shall conform to the requirements of ASTM A 48, Class 50B, or better.

2.2 BOLTS AND ANCHORS

A. Standard Service (Non-Corrosive Application)

1. Unless otherwise indicated, bolts, anchor bolts, washers, and nuts shall be fabricated from steel as indicated.
2. Threads on galvanized bolts and nuts shall be formed with suitable taps and dies such that they retain their normal clearance after hot-dip galvanizing.
3. Except as otherwise indicated, steel for bolt material, anchor bolts, and cap screws shall be in accordance with the following requirements:
 - a. Structural Connections: ASTM A 307, Grade A or B, hot-dip galvanized
 - b. Anchor Bolts: Type 316 stainless steel
 - c. High-Strength Bolts, where indicated: ASTM A 325

d. Pipe and Equipment Flange Bolts: ASTM A 193, Grade B-7

B. Corrosive Service

1. Bolts, nuts, and washers in the locations listed below shall be fabricated from stainless steel as indicated.
 - a. buried locations
 - b. submerged locations
 - c. locations subject to seasonal or occasional flooding
 - d. inside hydraulic structures below the top of the structure
 - e. inside buried vaults, manholes, and structures that do not drain through a gravity sewer or to a sump with a pump
 - f. inside trenches, containment walls, and curbed areas
 - g. locations indicated or designated by the ENGINEER to be provided with stainless steel bolts

C. Unless otherwise indicated, stainless steel bolts, anchor bolts, nuts, and washers shall be fabricated from Type 316 stainless steel, Class 2, conforming to ASTM A 193 for bolts and to ASTM A 194 for nuts.

D. Buried pipe flange bolts and nuts on pipe of Class 275 and greater shall be in accordance with ASTM A193/A194, Grade B7.

E. Coating

1. Threads on stainless steel bolts shall be protected with an antiseize lubricant suitable for submerged stainless steel bolts, meeting government specification MIL-A-907E.
2. Buried bolts in poorly drained soil shall be coated the same as the buried pipe.
3. Antiseize lubricant shall be classified as acceptable for potable water use by the NSF.
4. Antiseize lubricant shall be "PURE WHITE" by **Anti-Seize Technology**, Franklin Park, IL, 60131, **AS-470** by **Dixon Ticonderoga Company**, Lakehurst, NJ, 08733, or equal.

F. Bolt Requirements

1. The bolt and nut material shall be free-cutting steel.
2. The nuts shall be capable of developing the full strength of the bolts.
3. Threads shall be Coarse Thread Series conforming to the requirements of the American Standard for Screw Threads.

4. Bolts and cap screws shall have hexagon heads and nuts shall be Heavy Hexagon Series.
5. Bolts and nuts shall be installed with washers fabricated from material matching the base material of bolts, except that hardened washers for high-strength bolts shall conform to the requirements of the AISC Specification.
6. Lock washers fabricated from material matching the bolts shall be installed where indicated.
7. The length of each bolt shall be such that the bolt extends at least 1/8 inch beyond the outside face of the nut before tightening, except for anchor bolts which shall be flush with the face of the nut before tightening.

G. Adhesive Anchors

1. General

- a. Unless otherwise indicated, drilled concrete or masonry anchors shall be adhesive anchors.
- b. No substitutions will be considered unless accompanied with an ICBO report verifying strength and material equivalency.

2. Epoxy Anchors

- a. Epoxy adhesive anchors are required for drilled anchors for outdoor installations, in submerged, wet, splash, overhead, and corrosive conditions, and for anchoring handrails and reinforcing bars.
 - b. Epoxy shall be in accordance with the requirements of Section 03315 – Grout.
 - c. Threaded rod shall be galvanized for general purpose applications and fabricated from Type 316 stainless steel for use in corrosive applications.
 - d. Epoxy anchors shall not be permitted in areas where the concrete temperature is in excess of 100 degrees F or higher than the limiting temperature recommended by the manufacturer, whichever is lower.
 - e. Epoxy anchors shall not be used where anchors are subject to vibration or fire.
 - f. Embedment depth shall be as the manufacturer recommends for the load to be supported.
3. Unless otherwise indicated, glass capsule, polyester resin adhesive anchors will be permitted in locations not included above, and shall be **Hilti HVA, Cobra Anchors**, or equal.
 4. Threaded rod shall be fabricated from galvanized steel.

H. Expanding-Type Anchors

1. Expanding-type anchors, if indicated or permitted, shall be fabricated from galvanized steel, shall be of the expansion type, and shall be **ITW Ramset/Redhead Trubolt** anchors, **Hilti Kwik-Bolt TZ**, or equal.

2. Lead caulking anchors will not be permitted.
3. Size shall be as indicated.
4. Embedment depth shall be as the manufacturer recommends for the load to be supported.
5. Expansion-type anchors that are to be embedded in grout may be fabricated from steel.
6. Non-embedded buried or submerged anchors shall be fabricated from stainless steel.

I. Non-Shrink Grouted Anchors

1. Anchors, if indicated or permitted, shall be grouted with a non-shrink cementitious grout in accordance with the manufacturer's recommendations.
2. Embedment depth shall be as the manufacturer recommends for the load to be supported.
3. Non-shrink grout material shall be Class B or C in accordance with Section 03315 – Grout.

PART 3 -- EXECUTION

3.1 FABRICATION AND INSTALLATION REQUIREMENTS

A. Fabrication and Erection

1. Except as otherwise indicated, the fabrication and erection of structural steel shall conform to the requirements of the American Institute of Steel Construction "Manual of Steel Construction."

3.2 WELDING

A. Method

1. Welding shall be performed by the metal-arc method or gas-shielded arc method as described in the American Welding Society "Welding Handbook" as supplemented by other pertinent standards of the AWS.
2. The qualification of the welders shall be in accordance with the AWS Standards.

B. Quality

1. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained in order to minimize distortion and for control of dimensions.
2. Weld reinforcement shall be as indicated by the AWS Code.
3. Upon completion of welding, remove weld splatter, flux, slag, and burrs left by attachments.

4. Welds shall be repaired in order to produce a workmanlike appearance, with uniform weld contours and dimensions.
5. Sharp corners of material that is to be painted or coated shall be ground to a minimum of 1/32 inch on the flat.

3.3 GALVANIZING

- A. Structural steel plates shapes, bars, and fabricated assemblies required to be galvanized shall, after the steel has been thoroughly cleaned of rust and scale, be galvanized in accordance with the requirements of ASTM A 123.
- B. Any galvanized part that becomes warped during the galvanizing operation shall be straightened.
- C. Bolts, anchor bolts, nuts, and similar threaded fasteners, after being properly cleaned, shall be galvanized in accordance with the requirements of ASTM A 153.
- D. Field Repairs
 1. Field repairs to damaged galvanizing shall be performed by preparing the surface and applying a coating.
 2. Surface preparation shall consist of removing oil, grease, soil, and soluble material by cleaning with water and detergent (SSPC SP1) followed by brush-off blast cleaning (SSPC SP7) over an area extending at least 4 inches into the undamaged area.
 3. The coating shall be applied to at least 3 mils dry film thickness, and shall be **Zinc-Clad XI** by **Sherwin-Williams**, **Galvax** by **Alvin Products**, **Galvite** by **ZRC Worldwide**, or equal.

3.4 DRILLED ANCHORS

- A. Drilled anchors and reinforcing bars shall be installed in strict accordance with the manufacturer's instructions.
- B. Holes shall be roughened with a brush on a power drill, and then cleaned and dried.
- C. Drilled anchors shall not be installed until the concrete has reached the required 28-day compressive strength.
- D. Adhesive anchors shall not be loaded until the adhesive has reached its indicated strength in accordance with the manufacturer's instructions.

- END OF SECTION -

SECTION 07920 – SEALANTS AND CAULKING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide caulking, sealing, and appurtenant work, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCE STANDARDS

- A. **General:** Portions of the following standards are incorporated into this Section by references below. The standards are listed here for convenience.

- B. Federal Specifications

TT-S-001543A	Sealing Compound, Silicone Rubber Base, (For Caulking, Sealing and Glazing in Buildings and Other Structures)
SS-S-200D	Sealants, Joint, Two Compound, Jet Blast Resistant, Cold Applied for Portland Cement Concrete Pavement.
TT-S-00227E	Sealing Compound, Elastomeric Type, Multi-Component, (For Caulking, Sealing and Glazing in Buildings and Other Structures)
TT-S-00230C	Sealing Compound, Elastomeric Type, Single Component, (For Caulking, Sealing, and Glazing in Buildings and Other Structures)

- C. Commercial Standards

ASTM C 557	Adhesives for Fastening Gypsum Wallboard to Wood Framing
ASTM C 834	Latex Sealants
ASTM C 919	Standard Practice for Use of Sealants in Acoustical Applications
ASTM C 920	Elastomeric Joint Sealants
ASTM D 1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM E 84	Standard Test Methods for Surface Burning Characteristics of Building Materials
ASTM E 814	Standard Test Methods for Fire Tests of Through Penetrations: Firestops
UL 1479	Underwriter's Laboratory Standard for Safety Fire Tests of Through Penetration Firestops.

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.

- B. **Technical Data:** The CONTRACTOR shall submit a complete materials list along with the manufacturer's technical data and literature, specifications, joint width and depth tables, and installation instructions.
- C. **Samples:** The CONTRACTOR shall submit to the ENGINEER for review, samples (including color samples) of all the caulking and sealant materials and other materials proposed for use on the WORK. The samples shall be clearly marked with the manufacturer's name and product identification.
- D. **Certificates:** The CONTRACTOR shall provide (if requested by the ENGINEER) certificates from an independent testing laboratory approved by the ENGINEER, certifying that the submitted materials meet all the requirements of the ASTM and Federal Specifications cited.
- E. **Warranty:** The CONTRACTOR shall furnish a copy of the manufacturer's warranty covering all sealants, caulking materials, and other materials against defects in materials.

PART 2 -- PRODUCTS

2.1 SEALANTS AND CAULKING MATERIALS

A. General

- 1. **Manufacturer's Standards:** In addition to the standards listed below, the sealants and caulking products and application shall be in accordance with the manufacturer's published recommendations and specifications.
- 2. Wherever manufacturer's names and products are listed in this Section, "or equal" products will be considered in accordance with Section 01300 - Contractor Submittals.

B. Materials shall conform to the following requirements:

- 1. **Significant Movement Sealants (plus or minus 25 percent movement capability)**
 - a. For expansion wall joints; masonry and metal curtainwall joints; precast concrete joints and concrete panels; perimeter sealing (windows, doors, and panels); control joints; interior and non-traffic horizontal joints.
 - 1) Two component, non-sag, polyurethane or polysulfide sealant conforming to Federal Specification TT-S-227E, Class A, Type II, and ASTM C 920, Type M, Class 25, Grade NS.
Products Research & Chemical Corp. "RC-2"
Progress Unlimited "Iso-Flex 2000"
 - 2) One component, non-sag, low modulus, polyurethane or polysulfide sealant conforming to Federal Specification TT-S230C, Class A, Type II, and ASTM C 920, Type S, Class 25, Grade NS.
Products Research & Chemical Corp. "RC-1"
Tremco "Dymonic"

- 3) One component, non-sag, medium modulus, neutral cure, silicone sealant conforming to Federal Specification TT-S-1543A, Class A, and ASTM C 920, Type S, Class 25, Grade NS.

Products Research & Chemical Corp. "PRC-4000"
Dow Corning "795"

- b. For horizontal joints not exposed to fuel spillage.

- 1) Two component, self-leveling, polyurethane or polysulfide sealant conforming to Federal Specification TT-S-227E, Class A, Type I, and ASTM C 920, Type M, Class 25, Grade P.

Products Research & Chemical Corp. "RC-2SL"
Bostic "Chem-Calk 550"

- 2) One component, self-leveling, polyurethane or polysulfide sealant conforming to Federal Specification TT-S-230C, Class A, Type I, and ASTM C 920, Type S, Class 25, Grade P.

Products Research & Chemical Corp. "6006"
Mameco "Vulkem 45"

2. Preformed Sealants: Preformed sealant shall be polybutylene or isoprene-butylene based pressure sensitive weather resistant tape or bead sealant capable of sealing out moisture, air, and dust when installed as recommended by the manufacturer. At temperatures from minus 30 to plus 160 degrees F, the sealant shall be non-bleeding and shall have no loss of adhesion.
3. Tape Sealant: Dimensions shall be as required for application conditions. Tape sealants shall be type recommended by tape manufacturer for connecting and bonding to surfaces.
4. Joint backing (backer rod) material shall be resilient, closed-cell polyethylene foam conforming to ASTM D 1752, Type II or III, and/or bond breakers of proper size for joint widths. Joint backing shall be compatible with sealant manufacturer's product and shall not stain the sealant nor the materials to which applied.
5. Primer: Primers shall be as recommended in the manufacturer's printed instructions for caulking and sealants, and shall not stain the sealant nor the materials to which applied. Manufacturer shall be consulted for all surfaces not specifically covered in submittal application instructions. Primer shall be used in accordance with manufacturer's instructions with all primers being applied prior to the installation of any backer rod or bond breaker tape.
6. Cleaning and cleanup solvents, agents, and accessory materials shall be as recommended in the manufacturer's printed instructions for cleaning up.

2.2 COLOR OF SEALANTS

- A. Color of sealants that are visible after installation shall match adjacent building finish. If in doubt of color match, obtain color approval from ENGINEER.

PART 3 -- EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. **Delivery of Materials:** Manufactured materials shall be delivered in original, unbroken packages or containers bearing the manufacturer's label. Packages or containers shall be delivered to the Site with seals unbroken.
- B. **Shelf Life:** Materials whose shelf life dates have expired shall not be used in the WORK. Such materials shall be promptly removed from the Site.
- C. **Storage:** All materials shall be carefully stored in accordance with the manufacturer's instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the product. Materials shall be stored at temperatures between 40 and 90 degrees unless otherwise specified by the manufacturer.

3.2 INSTALLATION

- A. **Manufacturer's Recommendations:** All work under this Section and all testing, where applicable, shall be performed in accordance with manufacturer's printed recommendations, specifications, and installation instructions except where more stringent requirements are indicated herein; and, except where project conditions require extra precautions or provisions to assure performance of the waterproofing system.
- B. **Authorized Installers:** Caulking and sealants shall be complete systems and be installed only by installers authorized and approved by the respective manufacturers.
- C. **Surface Preparation**
 - 1. **General:** The surfaces of joints to be sealed shall be dry. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale, and other foreign substances shall be removed from surfaces of joints which will be in contact with the sealant. Ferrous metal surfaces shall be cleaned of all rust, mill scale, and other coatings by wire brush, grinding, or sandblasting. Oil and grease shall be removed by cleaning in accordance with sealant manufacturer's printed recommendations. Protective coatings shall be removed from all aluminum surfaces against which caulking or sealing compound is to be placed. Bituminous or resinous materials shall be removed from surfaces to receive caulking or sealants.
 - 2. **Concrete and Masonry Surfaces:** Where surfaces have been treated with curing compounds, oil, or other such materials, the materials shall be removed by sandblasting or wire brushing. Laitance, efflorescence, and loose mortar shall be removed from the joint cavity.
 - 3. **Steel Surfaces:** Steel surfaces to be in contact with sealant shall be sandblasted or, if sandblasting would not be practical or would damage adjacent finish WORK, the metal shall be scraped and wire brushed to remove loose mill scale. Protective coatings on steel surfaces shall be removed by sandblasting or by a solvent that leaves no residue.
 - 4. **Aluminum Surfaces:** Aluminum surfaces to be in contact with sealants shall be cleaned of temporary protective coatings. When masking tape is used for a protective cover, the tape and any residual adhesive shall be removed just prior to applying the sealant. Solvents used to remove protective coating shall be as recommended by the manufacturer of the aluminum work and shall be non-staining.

5. **Wood Surfaces:** Wood surfaces to be in contact with sealants shall be free of splinters and sawdust or other loose particles.

- D. **Joint Types and Sizes:** Joint shapes and sizes shall be as indicated or as necessary for job conditions where not indicated. Joints to be caulked or sealed include through-bolt holes, door frames, louver and ventilator frames, joints between openings where items pass through exterior walls, concrete masonry, or combination of these surfaces, and as otherwise indicated or required for watertightness, weatherproofing, or airtightness. Use sealing compound at both exterior and interior surfaces of exterior wall penetrations.

3.3 SEALANT FILLED JOINTS

- A. **Manufacturer's Representative:** If requested by the ENGINEER, the CONTRACTOR shall furnish the on-site services of the sealant manufacturer's representative prior to sealant work for inspection of the joints to be sealed and for instructing the installer in the proper use of the materials.
- B. **Sealant:** Sealant shall be used before expiration of shelf life. Multi-component sealants shall be mixed according to manufacturer's printed instructions. Sealant in guns shall be applied with a nozzle of proper size to fit the width of joint. Sealant shall be installed to the required depth without displacing the backing. Unless otherwise indicated or recommended by the manufacturer, the installed sealant shall be tooled so that the surface is uniformly smooth and free of wrinkles and to assure full adhesion to the sides of the joint. Sealants shall be installed free of air pockets, foreign embedded matter, ridges, and sags. Sealer shall be applied over the sealant if recommended by the sealant manufacturer.
- C. **Sealant Depth:** Sealant depth in joints shall be 1/2 the width of joint, but not less than 1/8-inch deep and 1/4-inch wide nor more than 1/2-inch deep and 1-inch wide. All joints shall have a rigid filler material installed to proper depth prior to application of sealant.
- D. **Masking Tape:** Masking tape shall be placed on the finish surface on one or both sides of a joint cavity to protect adjacent finish surfaces from primer or sealant smears. Masking tape shall be removed within 10 minutes after joint has been filled and tooled.
- E. **Backing:** Backing shall be installed to provide the indicated sealant depth. The installation tool shall be shaped to avoid puncturing the backing.
- F. **Bond-Breaker:** Bond-breaker shall be applied to fully cover the bottom of the joint without contaminating the sides where sealant adhesion is required.
- G. **Primer:** Primer shall be used on concrete masonry units, wood, or other porous surfaces in accordance with instructions furnished with the sealant. Primer shall be applied to the joint surfaces to be sealed. Surfaces adjacent to joints shall not be primed.
- H. **Applications:** A full bead of sealant shall be applied into the joint under sufficient pressure, with the nozzle drawn across sealant, to completely fill the void space and to ensure complete wetting of contact area to obtain uniform adhesion. During application, the tip of the nozzle shall be kept at the bottom of the joint thereby forcing the sealant to fill from the bottom to the top. Sealants shall be tooled immediately after exposure with a caulking tool or soft bristled brush moistened with solvent. The finished sealant-filled joint shall be slightly concave unless otherwise indicated.

3.4 CLEANING

- A. After application of sealant and caulking materials, adjacent materials which have been soiled shall be cleaned and left in a neat, clean, undamaged, or unstained condition. On porous surfaces, excess sealant shall be removed per sealant or caulking manufacturer's printed instructions.

- END OF SECTION -

SECTION 09800 – PROTECTIVE COATING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide protective coatings, complete and in place, in accordance with the Contract Documents.
- B. Definitions
 - 1. The term "paint," "coatings," or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, and other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat.
 - 2. The term "DFT" means minimum dry film thickness, without any negative tolerance.
- C. The following surfaces shall not be coated:
 - 1. Concrete, unless required by items on the concrete coating schedule below.
 - 2. Stainless steel
 - 3. Electrical conduit
 - 4. Machined surfaces
 - 5. Grease fittings
 - 6. Glass
 - 7. Equipment nameplates
 - 8. Platform gratings, stair treads, door thresholds, and other walk surfaces, unless specifically indicated to be coated.
- D. The coating system schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied.
- E. Where protective coatings are to be performed by a Subcontractor, the Subcontractor shall possess a valid state license as required for performance of the painting and coating WORK called for in this specification and shall provide 5 references which show that the Subcontractor has previous successful experience with the indicated or comparable coating systems. Include the name, address, and the telephone number for the owner of each installation for which the Subcontractor provided the protective coating.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.
- B. Submittals shall include the following information and be submitted at least 30 Days prior to commencing protective coating WORK:
 - 1. Materials List: Eight copies of a coating materials list showing the manufacturer and the product number, keyed to the coating systems herein. The list shall be submitted prior to or at the time of submitting samples.
 - 2. Manufacturer's Information: For each coating system to be used, the following data:
 - a. Manufacturer's data sheet for each product proposed, including statements on the suitability of the material for the intended use.
 - b. Technical and performance information that demonstrates compliance with the system performance and material requirements.
 - c. Paint manufacturer's instructions and recommendations on surface preparation and application.
 - d. Colors available for each product (where applicable).
 - e. Compatibility of shop and field applied coatings (where applicable).
 - f. Material Safety Data Sheet for each product proposed.
- C. Samples
 - 1. Samples of paint, finishes, and other coating materials shall be submitted on 8-1/2 inch by 11-inch sheet metal. Each sheet shall be completely coated over its entire surface with one protective coating material, type, and color.
 - 2. Two sets of color samples to match each color selected by the ENGINEER from the manufacturer's standard color sheets. If custom mixed colors are indicated, the color samples shall be made using color formulations prepared to match the color samples furnished by the ENGINEER. The color formula shall be shown on the back of each color sample.
 - 3. One 5 pound sample of each abrasive proposed to be used for surface preparation for submerged and severe service coating systems.

1.3 SPECIAL CORRECTION OF DEFECTS REQUIREMENTS

- A. **Inspection:** An inspection may be conducted during the eleventh month following completion of coating WORK. The CONTRACTOR and a representative of the coating material manufacturer shall attend this inspection. Defective WORK shall be repaired in accordance with these specifications and to the satisfaction of the OWNER. The OWNER may, by written notice to the CONTRACTOR, reschedule the inspection to another date within the one year correction period or may cancel the inspection altogether. The CONTRACTOR is not relieved of its responsibilities to correct defects, whether or not the inspection is conducted.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. **Suitability:** The CONTRACTOR shall use suitable coating materials as recommended by the manufacturer. Materials shall comply with Volatile Organic Compound (VOC) limits applicable at the Site.
- B. **Material Sources:** Where manufacturers and product numbers are listed, it is to show the type and quality of coatings that are required. If a named product does not comply with VOC limits in effect at the time of Bid opening, that product will not be accepted, and the CONTRACTOR shall propose a substitution product of equal quality that does comply. Proposed substitute materials will be considered as indicated below. Coating materials shall be materials that have a record of satisfactory performance in industrial plants, manufacturing facilities, and water and wastewater treatment plants.
- C. **Compatibility:** In any coating system only compatible materials from a single manufacturer shall be used in the WORK. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.
- D. **Containers:** Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, and name of manufacturer, all of which shall be plainly legible at the time of use.
- E. **Colors:** Colors and shades of colors of coatings shall be as indicated or selected by the ENGINEER. Each coat shall be of a slightly different shade to facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the ENGINEER.
- F. Substitute or "Or-Equal" Products
 - 1. To establish equality under Section 01600 - Products, Materials, Equipment and Substitutions, the CONTRACTOR shall furnish satisfactory documentation from the manufacturer of the proposed substitute or "or-equal" product that the material meets the indicated requirements and is equivalent or better in the following properties:
 - a. Quality
 - b. Durability
 - c. Resistance to abrasion and physical damage
 - d. Life expectancy
 - e. Ability to recoat in future
 - f. Solids content by volume
 - g. Dry film thickness per coat
 - h. Compatibility with other coatings

- i. Suitability for the intended service
 - j. Resistance to chemical attack
 - k. Temperature limitations during application and in service
 - l. Type and quality of recommended undercoats and topcoats
 - m. Ease of application
 - n. Ease of repairing damaged areas
 - o. Stability of colors
2. Protective coating materials shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. When requested, the CONTRACTOR shall provide the ENGINEER with the names of not less than 10 successful applications of the proposed manufacturer's products that comply with these requirements.
 3. If a proposed substitution requires changes in the WORK, the CONTRACTOR shall bear such costs involved as part of the WORK.

2.2 INDUSTRIAL COATING SYSTEMS

A. System 1 - Alkyd Enamel

1. Materials

Primer	manufacturer's recommendation
Finish Coat	
Type	high quality alkyd, medium long enamel
Demonstrated suitable for	ferrous, galvanized, and nonferrous surfaces in industrial exposure, producing high gloss surface that is resistant to mild corrosion and chemical fumes, has good color and gloss retention, good weathering, and sunlight resistance
VOC Content, max	428 grams per liter

2. Application and manufacturers

Surface Preparation	Prime Coat (DFT = 2 to 4 mils)	Finish Coat (DFT = 2 to 4 mils)	Total System DFT
SSPC SP-6	Ameron Amercoat 5105	Ameron Amercoat 5450	

	Tnemec Series N69	Tnemec Series 2H	4 to 8 mils
	Devoe Devguard 4120	Devoe Devguard 4308	

B. System 2 - Not Used

C. System 3 – Not Used

D. System 4 - Epoxy/Polyurethane

1. Materials

Primer type	rust-inhibitive, 2 component epoxy
VOC Content, max	285 g/L
Finish type	2 component aliphatic polyurethane
VOC Content, max	300 g/L
Demonstrated suitable for	ferrous surfaces, superior color and gloss retention, exceptional resistance to weathering, chemical fumes, and splash

2. Application and manufacturers

Surface Preparation	Prime Coat (DFT = 3 - 5 mils)	Finish Coat (DFT = 3 - 4 mils)	Total System DFT
SSPC SP6	Ameron Amerlock 400/2	Ameron Amershield	6 - 9 mils
	Carboline Carboguard 893	Carboline Carbothane 134 HG (2 coats)	
	Tnemec Hi-Build Epoxoline II Series N69	Tnemec Endura- Shield Series 1075	

E. System 5 - Inorganic Zinc/Epoxy/Polyurethane

1. Material

Prime Coat	inorganic zinc silicate, water or solvent based, 2 component
zinc content in dry film	83 percent, minimum
VOC Content, max	325 grams per liter
Demonstrated suitable for	ferrous metal, providing superior corrosion, chemical, and abrasion resistance, recommended for use as primer under epoxy
Intermediate Coat	2 component epoxy, high build, recommended by manufacturer for application over inorganic zinc primer
VOC Content, max	276 grams per liter
Demonstrated suitable for	outstanding chemical, corrosion, and abrasion resistance
Finish Coat	2 component aliphatic or acrylic polyurethane
VOC Content, max	315 grams per liter
Demonstrated suitable for	superior color and gloss retention, resistance to chemical fumes and severe weathering, abrasion resistance

2. Application and manufacturers

Surface preparation for primer	SSPC SP 6
Anchor profile for primer	per manufacturer

Prime Coat (DFT = 2 - 4 mils)	Intermediate Coat (DFT = 3 - 5 mils)	Finish Coat (DFT = 2 - 4 mils)	Total System DFT
Ameron Dimetcote 9HS or Dimetcote 21-5	Amercoat 385	Amercoat 450H	7 - 13 mils
Carboline Carbozinc 11HS or 11WB	Carboguard 890	Carbothane 134HG	
Devco Cathacote 302H	Devran 224HS	Devthane 379UVA	

Prime Coat (DFT = 3 - 4 mils)	Intermediate Coat (DFT = 4 - 6 mils)	Finish Coat (DFT = 3 - 4 mils)	Total System DFT
Ameron Dimetecote 21-5	Amerlock 400/2	Amershield VOC	10 - 14 mils
Carboline Carbozinc 11WB	Carboguard 893	Carbothane 134VOC	

F. System 7 - Acrylic Latex

1. Material

Primer	Product, surface preparation, and DFT as recommended by manufacturer for the surface
Finish Type	Single component, water based acrylic latex, with fungicide
VOC Content, max	180 grams per gallon
Demonstrated suitable for	PVC piping, weather and mild chemical resistance, excellent color and gloss retention

2. Application and manufacturers

Surface Preparation	Finish (at least 2 coats required)	Total System DFT
SSPC SP1, min	Ameron Amercoat 220	primer plus 6 mils
	Carboline Carbocrylic 3359	
	Tnemec Tneme-Cryl 6	

G. System 8 - Epoxy, Equipment

1. Materials

Primer Type	2 component epoxy, recoatable up to one year
Demonstrated suitable for	rust inhibitive, outstanding chemical, abrasion, and weathering resistance, resistance to splash, washdown, and condensation. Immersion

	capability is not required
VOC content, max	330
Finish Type	2 component epoxy, available in many colors
Demonstrated suitable for	outstanding chemical, abrasion, and weathering resistance, resistance to splash, washdown, and condensation. Immersion capability is not required
VOC content, max	330

2. Application and manufacturers

Surface Preparation	Prime Coat (DFT = 4 to 6 mils)	Finish Coat (DFT = 3 to 4 mils)	Total System DFT
SSPC SP6	Ameron 400	Ameron 400	7 to 10 mils
	Tnemec N69	Tnemec N69	
	Devroe Devran 224HS	Devran 224HS	
	Carboline Carboguard 888	Carboguard 888	

H. System 10 - Acrylic, Concrete

1. Materials

Filler-Sealer Type	epoxy masonry sealer, for concrete and CMU, for wet and dry conditions
Primer	as recommended by manufacturer
VOC Content, g/L, max	75
Finish Type	single component waterborne acrylic, industrial grade, high molecular weight
VOC Content, g/L, max	180
Demonstrated suitable for	concrete under mild to moderate exposure conditions, splash but not immersion

2. Application and manufacturers

Surface Preparation	Prime Coat (Filler-Sealer)	Finish Coat (DFT = 5 - 7 mils)	Total System DFT

		(2 or more coats)	
SSPC SP13 (28 days old, protrusions removed, surface contamination removed)	Tnemec EnviroFill 130	Tnemec Tneme-Cryl Series 6	5 - 7 mils plus primer
	Ameron Amerlock 400BF and Nu-Klad 114A	Ameron Amercoat 220	
	Carboline Sanitile 600	Carboline Carbocrylic 3359DTM	

PART 3 -- EXECUTION

3.1 MANUFACTURER'S SERVICES

- A. The CONTRACTOR shall require the protective coating manufacturer to furnish a qualified technical representative to visit the Site for technical support as may be necessary to resolve field problems.

3.2 WORKMANSHIP

- A. Skilled craftsmen
- B. and experienced supervision shall be used on coating WORK.
- C. Coating shall be done in a workmanlike manner so as to produce an even film of uniform thickness. Edges, corners, crevices, and joints shall receive special attention to insure thorough surface preparation. The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so complete that the addition of another coat would not increase the hiding. Special attention shall be given so that edges, corners, crevices, welds, and similar areas receive a film thickness equivalent to adjacent areas, and installations shall be protected by the use of drop cloths or other precautionary measures.
- D. Damage to other surfaces resulting from the WORK shall be cleaned, repaired, and refinished to original condition.

3.3 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. **Manufacturer's Recommendations:** Unless otherwise indicated, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for other procedures relative to coating shall be strictly observed.
- B. Coating materials shall be used within the manufacturer's recommended shelf life.
- C. **Storage and Mixing:** Coating materials shall be stored under the conditions recommended by the Product Data Sheets, and shall be thoroughly stirred, strained, and

kept at a uniform consistency during application. Coatings from different manufacturers shall not be mixed together.

3.4 PREPARATION FOR COATING

- A. **General:** Surfaces to receive protective coatings shall be prepared as indicated prior to application of coatings. The CONTRACTOR shall examine surfaces to be coated and shall correct surface defects before application of any coating material. Marred or abraded spots on shop-primed and on factory-finished surfaces shall receive touch-up restoration prior to any field coating application. Surfaces to be coated shall be dry and free of visible dust.
- B. **Protection of Surfaces Not to be Coated:** Surfaces that are not to receive protective coatings shall be protected during surface preparation, cleaning, and coating operations.
- C. Hardware, lighting fixtures, switchplates, machined surfaces, couplings, shafts, bearings, nameplates on machinery, and other surfaces not to be painted shall be removed, masked, or otherwise protected. Drop cloths shall be provided to prevent coating materials from falling on or marring adjacent surfaces. The working parts of mechanical and electrical equipment shall be protected from damage during surface preparation and coating operations. Openings in motors shall be masked to prevent entry of coating or other materials.
- D. Care shall be exercised not to damage adjacent WORK during blasting operations. Spraying shall be conducted under carefully controlled conditions. The CONTRACTOR shall be fully responsible for and shall promptly repair any and all damage to adjacent WORK or adjoining property occurring from blasting or coating operations.
- E. **Protection of Painted Surfaces:** Cleaning and coating shall be coordinated so that dust and other contaminants from the preparation process will not fall on wet, newly-coated surfaces.

3.5 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification:
 - 1. Solvent Cleaning (SSPC SP1): Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
 - 2. Hand Tool Cleaning (SSPC SP2): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.
 - 3. Power Tool Cleaning (SSPC SP3): Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
 - 4. White Metal Blast Cleaning (SSPC SP5): Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products and foreign matter by blast cleaning.
 - 5. Commercial Blast Cleaning (SSPC SP6): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter,

except that staining shall be limited to no more than 33 percent of each square inch of surface area.

6. Brush-Off Blast Cleaning (SSPC SP7): Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.
7. Near-White Blast Cleaning (SSPC SP10): Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.
8. Surface Preparation of Concrete (SSPC-SP13): Removal of protrusions, laitance and efflorescence, existing coatings, form-release agents, and surface contamination by detergent or steam cleaning, abrasive blasting, water jetting, or impact or power tool methods as appropriate for the condition of the surface and the requirements of the coating system.

3.6 FERROUS METAL SURFACE PREPARATION (UNGALVANIZED)

- A. Surface salts shall be removed by washing with potable water and **Chlor*Rid**, followed by rinsing with potable water. Repeat the wash/rinse cycle until surface chloride salts are reduced to less than 7 micrograms per square centimeter.
- B. The minimum abrasive blasting surface preparation shall be as indicated in the coating system schedules included at the end of this Section. Where there is a conflict between these requirements and the coating manufacturer's printed recommendations for the intended service, the higher degree of cleaning shall apply.
- C. Workmanship for metal surface preparation shall be in conformance with the current SSPC Standards and this Section. Blast-cleaned surfaces shall match the standard samples available from the National Association of Corrosion Engineers, NACE Standard TM-01-70 - Visual Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive and TM-01-75 - Visual Standard for Surfaces of New Steel Centrifugally Blast Cleaned with Steel Grit.
- D. Oil, grease, welding fluxes, and other surface contaminants shall be removed by solvent cleaning per SSPC SP1 - Solvent Cleaning prior to blast cleaning.
- E. Sharp edges shall be rounded or chamfered, and burrs and surface defects and weld splatter shall be ground smooth prior to blast cleaning.
- F. The type and size of abrasive shall be selected to produce a surface profile that meets the coating manufacturer's recommendation for the particular product and service conditions. Abrasives for submerged and severe service coating systems shall be clean, hard, sharp cutting crushed slag. Automated blasting systems shall not be used for surfaces that will be in submerged service. Metal shot or grit shall not be used for surfaces that will be in submerged service, even if subsequent abrasive blasting will use hard, sharp cutting crushed slag.
- G. Abrasive shall not be reused unless an automated blasting system is used for surfaces that will be in non-submerged service. For automated blasting systems, clean oil-free abrasives shall be maintained. The abrasive mix shall include at least 50 percent grit.

- H. The CONTRACTOR shall comply with the applicable federal, state, and local air pollution control regulations for blast cleaning.
- I. Compressed air for air blast cleaning shall be supplied at adequate pressure from well-maintained compressors equipped with oil and moisture separators that remove at least 95 percent of the contaminants.
- J. Surfaces shall be cleaned of dust and residual particles of the cleaning operation by dry air blast cleaning, vacuuming, or another approved method prior to painting.
- K. Enclosed areas and other areas where dust settling is a problem shall be vacuum-cleaned and wiped with a tack cloth.
- L. Damaged or defective coating shall be removed by the blast cleaning to meet the clean surface requirements before recoating.
- M. If the required abrasive blast cleaning will damage adjacent WORK, the area to be cleaned is less than 100 square feet, and the coated surface will not be submerged in service, then SSPC SP2 or SSPC SP3 may be used.
- N. Shop-applied coatings of unknown composition shall be completely removed before the indicated coatings are applied. Valves, castings, ductile or cast iron pipe, and fabricated pipe or equipment shall be examined for the presence of shop-applied temporary coatings. Temporary coatings shall be completely removed by solvent cleaning per SSPC SP1 before the abrasive blast cleaning has been started.
- O. Shop primed equipment shall be solvent-cleaned in the field before finish coats are applied.

3.7 FERROUS METAL SURFACE PREPARATION (GALVANIZED)

- A. Galvanized ferrous metal shall be alkaline cleaned per SSPC SP1 to remove oil, grease, and other contaminants detrimental to adhesion of the protective coating system, followed by brush off blast cleaning per SSPC SP7.
- B. Pretreatment coatings of surfaces shall be in accordance with the printed recommendations of the coating manufacturer.

3.8 SURFACE PREPARATION OF FERROUS SURFACES WITH EXISTING COATINGS, EXCLUDING STEEL RESERVOIR INTERIORS

- A. **General:** Grease, oil, heavy chalk, dirt, or other contaminants shall be removed by solvent or detergent cleaning prior to abrasive blast cleaning. The generic type of the existing coatings shall be determined by laboratory testing.
- B. **Abrasive Blast Cleaning:** The CONTRACTOR shall provide the degree of cleaning indicated in the coating system schedule for the entire surface to be coated. If the degree of cleaning is not indicated in the schedule, deteriorated coatings shall be removed by abrasive blast cleaning to SSPC SP6. Areas of tightly adhering coatings shall be cleaned to SSPC SP7, with the remaining thickness of existing coating not to exceed 3-mils.
- C. **Incompatible Coatings:** If coatings to be applied are not compatible with existing coatings the CONTRACTOR shall apply intermediate coatings per the manufacturer's

recommendation for the indicated coating system or shall completely remove the existing coating prior to abrasive blast cleaning. A small trial application shall be conducted for compatibility prior to painting large areas.

- D. **Unknown Coatings:** Coatings of unknown composition shall be completely removed prior to application of new coatings.
- E. **Water Abrasive or Wet Abrasive Blast Cleaning:** Where indicated or where Site conditions do not permit dry abrasive blasting for industrial coating systems due to dust or air pollution considerations, water abrasive blasting or wet abrasive blasting may be used. In both methods, paint-compatible corrosion inhibitors shall be used, and coating application shall begin as soon as the surfaces are dry. Water abrasive blasting shall be done using high pressure water with sand injection. In both methods, the equipment used shall be commercially produced equipment with a successful service record. Wet blasting methods shall not be used for submerged or severe service coating systems unless indicated.

3.9 CONCRETE AND CONCRETE BLOCK MASONRY SURFACE PREPARATION

- A. Surface preparation shall not begin until at least 30 Days after the concrete or masonry has been placed.
- B. Oil, grease, and form release and curing compounds shall be removed by detergent cleaning per SSPC SP1 before abrasive blast cleaning.
- C. Concrete, concrete block masonry surfaces, and deteriorated concrete surfaces to be coated shall be abrasive blast cleaned to remove existing coatings, laitance, deteriorated concrete, and to roughen the surface equivalent to the surface of the No. 80 grit flint sandpaper.
- D. If acid etching is required by the coating application instructions, the treatment shall be made after abrasive blasting. After etching, rinse surfaces with water and test the pH. The pH shall be between neutral and 8.
- E. Surfaces shall be clean and as recommended by the coating manufacturer before coating is started.
- F. Unless required for proper adhesion, surfaces shall be dry prior to coating. The presence of moisture shall be determined with a moisture detection device such as **Delmhorst Model DB**, or equal.

3.10 CONCRETE SURFACE PREPARATION FOR WATERPROOFING

- A. Concrete deck shall be dry, clean, and free of contaminants that may interfere with proper adhesion or curing. The concrete shall be water cured for a minimum of 28 Days, or be at 80 percent of design strength.
- A. Verify that the concrete deck is finished by a power or hand steel trowel followed by a soft hair broom, or equivalent.
- B. Before starting application, conduct a Mat Test as follows: place a 2-foot by 2-foot non-breathing rubber mat onto the concrete deck not in sunlight; tape the edges of the mat to the concrete. If no condensation is seen under the mat at 16 hours, the concrete is dry enough that application may begin.

- C. Visible hairline cracks and cold joints in the concrete shall be treated with a liquid flashing a minimum of 2-inches on each side of the crack or joint. Liquid flashing shall have a minimum dry thickness of 30-mils.

3.11 PLASTIC, FIBER GLASS AND NONFERROUS METALS SURFACE PREPARATION

- A. Plastic and fiber glass surfaces shall be sanded or brush off blast cleaned prior to solvent cleaning with a chemical compatible with the coating system primer.
- B. Non-ferrous metal surfaces shall be solvent-cleaned SSPC SP1 followed by sanding or brush-off blast cleaning SSPC SP7.
- C. Surfaces shall be clean and dry prior to coating application.

3.12 ARCHITECTURAL CONCRETE BLOCK MASONRY SURFACE PREPARATION

- A. The mortar surfaces shall be cured at least 14 Days before surface preparation WORK is started.
- B. Dust, dirt, grease, and other foreign matter shall be removed prior to abrasive blasting.
- C. The masonry surfaces shall be prepared in accordance with the material manufacturer's printed instructions.

3.13 SHOP COATING REQUIREMENTS

- A. Unless otherwise indicated, items of equipment or parts of equipment which are not submerged in service shall be shop-primed and then finish-coated in the field after installation with the indicated or selected color. The methods, materials, application equipment, and other details of shop painting shall comply with this Section. If the shop primer requires topcoating within a specific period of time, the equipment shall be finish-coated in the shop and then be touched up after installation.
- B. Items of equipment or parts and surfaces of equipment which are submerged or inside an enclosed hydraulic structure when in service, with the exception of pumps and valves, shall have surface preparation and coating performed in the field.
- C. The interior surfaces of steel water reservoirs, except for Part A surfaces, shall have surface preparation and coating WORK performed in the field.
- D. For certain pieces of equipment it may be undesirable or impractical to apply finish coatings in the field. Such equipment may include engine generator sets, equipment such as electrical control panels, switchgear or main control boards, submerged parts of pumps, ferrous metal passages in valves, or other items where it is not possible to obtain the indicated quality in the field. Such equipment shall be primed and finish-coated in the shop and touched up in the field with the identical material after installation. The CONTRACTOR shall require the manufacturer of each such piece of equipment to certify as part of its Shop Drawings that the surface preparation is in accordance with these specifications. The coating material data sheet shall be submitted with the Shop Drawings for the equipment.
- E. For certain small pieces of equipment the manufacturer may have a standard coating system that is suitable for the intended service conditions. In such cases, the final determination of suitability will be made during review of the Shop Drawing submittals.

Equipment of this type generally includes only indoor equipment such as instruments, small compressors, and chemical metering pumps.

- F. Shop-painted surfaces shall be protected during shipment and handling by suitable provisions including padding, blocking, and the use of canvas or nylon slings. Primed surfaces shall not be exposed to the weather for more than 2 months before being topcoated, or less time if recommended by the coating manufacturer.
- G. Damage to shop-applied coatings shall be repaired in accordance with this Section and the coating manufacturer's printed instructions.
- H. The CONTRACTOR shall make certain that the shop primers and field topcoats are compatible and meet the requirements of this Section. Copies of applicable coating manufacturer's data sheets shall be submitted with equipment Shop Drawings.

3.14 APPLICATION OF COATINGS

- A. The application of protective coatings to steel substrates shall be in accordance with SSPC PA1 - Paint Application Specification No. 1.
- B. Cleaned surfaces and each coat shall be inspected prior to applying each succeeding coat. The CONTRACTOR shall schedule such inspection with the ENGINEER in advance.
- C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same day.
- D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations and this Section, whichever has the most stringent requirements.
- E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to occur. Use stripe painting with a brush in these areas.
- F. Special attention shall be given to materials that will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.
- G. Finish coats, including touch-up and damage repair coats shall be applied in a manner that will present a uniform texture and color matched appearance.
- H. Coatings shall not be applied under the following conditions:
 - 1. Temperatures exceeding the manufacturer's recommended maximum and minimum allowable.
 - 2. Concrete surfaces will be in direct sunlight during application or within 3 hours after application.
 - 3. Dust or smoke laden atmosphere.
 - 4. Damp or humid weather.

5. Substrate or air temperature is less than 5 degrees F above the dewpoint.
6. Air temperature is expected to drop below 40 degrees F or less than 5 degrees F above the dewpoint within 8 hours after application of coating.
7. Wind conditions are not calm.
- I. Dewpoint shall be determined by use of a sling psychrometer in conjunction with U.S. Dept. of Commerce, Weather Bureau psychrometric tables.
- J. Unburied steel piping shall be abrasive blast cleaned and primed before installation.
- K. Finish coats shall be applied after concrete, masonry, and equipment installation is complete, and the working areas are clean and dust free.

3.15 CURING OF COATINGS

- A. The CONTRACTOR shall maintain curing conditions in accordance with the conditions recommended by the coating material manufacturer or by this Section, whichever is the most stringent, prior to placing the completed coating system into service.
- B. In the case of enclosed areas, forced air ventilation, using heated air if necessary, may be required until the coatings have fully cured.

3.16 SHOP AND FIELD INSPECTION AND TESTING

- A. **General:** The CONTRACTOR shall give the ENGINEER a minimum of 3 Days advance notice of the start of any field surface preparation or coating application, and a minimum of 7 Days advance notice of the start of any surface preparation activity in the shop.
- B. Such WORK shall be performed only in the presence of the ENGINEER, unless the ENGINEER has granted prior approval to perform such WORK in its absence.
- C. Inspection by the ENGINEER, or the waiver of inspection of any particular portion of the WORK, shall not relieve the CONTRACTOR of its responsibility to perform the WORK in accordance with these Specifications.
- D. Scaffolding shall be erected and moved to locations where requested by the ENGINEER to facilitate inspection. Additional illumination shall be furnished on areas to be inspected.
- E. **Inspection Devices:** The CONTRACTOR shall furnish inspection devices in good working condition for the detection of holidays and measurement of dry film thicknesses of coatings. Dry-film thickness gauges shall be made available for the ENGINEER's use while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall furnish the services of a trained operator of the holiday detection devices until the final acceptance of such coatings. Holiday detection devices shall be operated only in the presence of the ENGINEER.
- F. **Holiday Testing:** The CONTRACTOR shall test for continuity all coated ferrous surfaces inside a steel reservoir, other surfaces that will be submerged in water or other liquids, surfaces that are enclosed in a vapor space in such structures, and surfaces coated with any of the submerged and severe service coating systems. Areas that

contain discontinuities shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then be retested.

1. Coatings with thickness exceeding 20-mils total DFT: Pulse-type holiday detector such as **Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20**, or equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the required coating thickness.
 2. Coatings with thickness of 20-mils or less total DFT: **Tinker & Rasor Model M1** non-destructive type holiday detector, **K-D Bird Dog**, or equal shall be used. The unit shall operate at less than 75 volts. For thicknesses between 10- and 20-mils, a non-sudsing type wetting agent, such as **Kodak Photo-Flo** or equal, shall be added to the water prior to wetting the detector sponge.
- G. **Film Thickness Testing:** On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC Paint Application Specification No. 2 using a magnetic type dry film thickness gauge such as **Mikrotest Model FM, Elcometer Model 111/1EZ**, or equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using a wet film gauge.
- H. **Surface Preparation:** Evaluation of blast cleaned surface preparation will be based upon comparison of the blasted surfaces with the standard samples available from NACE, using NACE standards TM-01-70 and TM-01-75.

3.17 COATING SYSTEM SCHEDULE, FERROUS METAL - NOT GALVANIZED

	Item	Surface Prep.	System No.
FM-1	All surfaces indoors and outdoors, exposed or covered, except those included below.	Commercial blast cleaning SSPC SP6	(1) alkyd enamel
FM-2	Surfaces in chlorination room, chlorine storage room.	Commercial blast cleaning SSPC SP6	(100) amine cure epoxy
FM-3	Surfaces of equipment and ferrous surfaces submerged or intermittently submerged in potable water, utility water, and wastewater including all surfaces lower than 2 feet above high water level in hydraulic structures, and all surfaces inside enclosed hydraulic structures and vents (excluding shop-coated valves, couplings, pumps).	White metal blast cleaning SSPC SP5	(100) amine cure epoxy
FM-4	Surfaces exposed to high temperature (between 150 and 600 degrees F).	Near white metal blast cleaning SSPC SP10	(6) inorganic zinc, water-based
FM-5	Surfaces exposed to high temperature (between 600 and 1000 degrees F).	Near white metal blast cleaning SSPC SP10	(3) aluminum silicone
FM-6	Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FM-7	Where indicated, ferrous surfaces in water passages of all valves 2-inch size and larger, exterior surfaces of submerged valves.	White metal blast cleaning SSPC SP5	(102) polyamide epoxy
FM-8	Where indicated, ferrous surfaces in water passages and submerged surfaces of all pumps which have discharge size of 4 inches or larger.	White metal blast cleaning SSPC SP5	(100) amine cure epoxy
FM-9	Ferrous surfaces of sleeve couplings.	Solvent cleaning SSPC SP1, followed by white metal blast cleaning SSPC-SP10	(106) fusion bond epoxy
FM-10	All ferrous surfaces of sluice gates, flap gates, and	White metal blast cleaning	(102) polyamide epoxy

	shear gates, including wall thimbles.	SSPC SP5	
FM-11	Buried surfaces that are not indicated to be coated elsewhere.	Near white metal blast cleaning SSPC SP10	(100) amine cure epoxy
FM-18	Buried pipe couplings, valves, fittings, and flanged joints (where piping is plastic).	Removal of dirt, grease, oil	(201) rich portland cement mortar
FM-19	Buried pipe couplings, valves, and flanged joints (where piping is ductile or cast iron, not tape-coated), including factory-coated surfaces.	As specified by reference specification	(205) polyethylene encasement
FM-20	Buried pipe couplings, valves, and flanged joints (where piping is mortar-coated steel or reinforced concrete), including factory-coated surfaces.	Removal of dirt, grease, oil	(206) cement mortar coating

3.18 COATING SYSTEM SCHEDULE, FERROUS METAL - GALVANIZED

- A. Pretreatment coatings, barrier coatings, or washes shall be applied as recommended by the coating manufacturer. All galvanized surfaces shall be coated

	Item	Surface Prep.	System No.
FMG-1	All exposed surfaces indoors and outdoors, except those included below.	Solvent cleaning SSPC SP1	(1) alkyd enamel
FMG-2	Surfaces in chlorinator room, chlorine storage room.	Solvent cleaning SSPC SP1	(100) amine cure epoxy
FMG-3	Buried small steel pipe.	Removal of dirt, grease, oil	(200) PVC tape
FMG-4	Surfaces buried or submerged in water or wastewater, including all surfaces lower than two feet above high water level and all surfaces inside enclosed hydraulic structures and vents.	Solvent cleaning SSPC SP1 followed by brush-off grade blast cleaning SSPC SP7	(100) amine cure epoxy

- END OF SECTION -

SECTION 11000 – EQUIPMENT GENERAL PROVISIONS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide equipment and appurtenant WORK, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to equipment throughout the Contract except where otherwise indicated.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Equipment shall be in accordance with the following standards, as applicable and as indicated in each equipment specification:
 - 1. American Society for Testing and Materials (ASTM).
 - 2. American National Standards Institute (ANSI).
 - 3. American Society of Mechanical Engineers (ASME).
 - 4. American Water Works Association (AWWA).
 - 5. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
 - 6. American Welding Society (AWS).
 - 7. National Fire Protection Association (NFPA).
 - 8. Federal Specifications (FS).
 - 9. National Electrical Manufacturers Association (NEMA).
 - 10. Manufacturer's published recommendations and specifications.
 - 11. General Industry Safety Orders (OSHA).
- B. The following standards are referenced in this Section:
 - ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
 - ASME B16.5 Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy and other Special Alloys
 - ASME B46.1 Surface Texture
 - ANSI S12.6 Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors
 - ASME B1.20.1 General Purpose Pipe Threads (Inch)

ASME B31.1	Power Piping
AWWA C206	Field Welding of Steel Water Pipe
AWWA C207	Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm through 3,600 mm)
AWWA D100	Welded Steel Tanks for Water Storage
ASTM A 48	Gray Iron Castings
ASTM A 108	Steel Bars, Carbon, Cold-Finished, Standard Quality

1.3 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 - Contractor Submittals.
- B. **Shop Drawings:** Furnish complete drawings and technical information for equipment, piping, valves, and controls. Where indicated or required by the ENGINEER, Shop Drawings shall include clear, concise calculations showing equipment anchorage forces and the capacities of the anchorage elements proposed by the CONTRACTOR.
- C. **Spare Parts List:** The CONTRACTOR shall obtain from the manufacturer and submit at the same time as Shop Drawings a list of suggested spare parts for each piece of equipment. CONTRACTOR shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment.
- D. Torsion and Vibration Analyses
 - 1. The CONTRACTOR shall arrange for and submit torsional and lateral vibration analyses for the following equipment types:
 - a. Engine driven equipment except engine generators.
 - b. Vertical pumps with universal joints and extended shafts.
 - c. Other equipment as indicated.
 - 2. The torsional natural frequency of the drive train must be avoided by plus and minus 25 percent by any exciting frequency of the equipment, throughout the entire operating range.
 - 3. The CONTRACTOR shall arrange for at least two Site visits by the abovementioned specialist during construction and testing of the equipment, to analyze and measure the amount of equipment vibration and prepare written recommendations for keeping the vibration within acceptance limits.
- E. Certifications that equipment and equipment supports comply with seismic and wind design criteria from Code.

1.4 QUALITY ASSURANCE

- A. **Costs:** Responsibility shall be the CONTRACTOR'S for performing and paying the costs of inspection, startup, testing, adjustment, and instruction services performed by

factory representatives. The OWNER will pay for costs of power and water. If available, the OWNER'S operating personnel will provide assistance in the field testing.

- B. **Inspection:** The CONTRACTOR shall inform the local authorities, such as building and plumbing inspectors, fire marshal, OSHA inspectors, and others, to witness required tests for piping, plumbing, fire protection systems, pressure vessels, safety systems, and related items to obtain required permits and certificates, and shall pay inspection fees.
- C. **Quality and Tolerances:** Tolerances and clearances shall be as shown on the Shop Drawings and shall be closely adhered to.
1. Machine WORK shall be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts. Members without milled ends and which are to be framed to other steel parts of the structure may have a variation in the detailed length of not greater than 1/16-inch for members 30-feet or less in length, and not greater than 1/8-inch for members over 30-feet in length.
 2. Castings shall be homogeneous and free from non-metallic inclusions and defects. Surfaces of castings which are not machined shall be cleaned to remove foundry irregularities. Casting defects not exceeding 12.5 percent of the total thickness and where defects will not affect the strength and serviceability of the casting may be repaired by approved welding procedures. The ENGINEER shall be notified of larger defects. No repair welding of such defects shall be carried out without the ENGINEER'S written approval. If the removal of metal for repair reduces the stress resisting cross-section of the casting by more than 25 percent or to such an extent that the computed stress in the remaining metal exceeds the allowable stress by more than 25 percent, then the casting may be rejected. Costs of casting new material shall be the CONTRACTOR'S responsibility as part of the WORK.
 3. Materials shall meet the physical and mechanical properties in accordance with the reference standards.
- D. **Machine Finish:** The type of finish shall be the most suitable for the application and shall be shown in micro-inches in accordance with ANSI B46.1. The following finishes shall be used:
1. Surface roughness not greater than 63 micro-inches shall be required for surfaces in sliding contact.
 2. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.
 3. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.
 4. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.
- E. **Manufacturer's Experience:** Equipment manufacturer shall have a record of at least 5 years of successful, troublefree operation in similar applications and size equal or larger than the equipment in this Contract.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. **Noise Level:** When in operation, no single piece of equipment shall exceed the OSHA noise level requirement of 105 dBA for one hour exposure per day.
- B. **High Noise Level Location:** The CONTRACTOR shall provide one personal hearing protection station at each high noise level location. Locations are defined as follows:
 - 1. **Outdoor Location:** Any single equipment item or any group of equipment items that produce noise exceeding OSHA noise level requirements for a 2 hour exposure. Where such equipment is separated by a distance of more than 20-feet, measured between edges of footings, each group of equipment shall be provided with a separate hearing protection station.
- C. **Personal Hearing Protection:** The CONTRACTOR shall furnish 3 pairs of high attenuation hearing protectors in the original unopened packaging. The ear protectors shall be capable of meeting the requirements of ANSI S12.6 and shall produce a noise level reduction of 25 dBA at a frequency of 500 Hz. The hearing protectors shall have fluid filled ear cushions and an adjustable, padded headband. The protectors shall be stored in a weatherproof, labeled, steel cabinet, provided at an approved location near the noise producing equipment.
- D. **Welding:** Unless otherwise indicated, welding shall conform to the following:
 - 1. Latest revision of AWWA D100.
 - 2. Latest revision of AWWA C206.
 - 3. Composite fabricated steel assemblies that are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds to prevent entrance of air or moisture.
 - 4. Welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards.
 - 5. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS code. Upon completion of welding, weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. Sharp corners of material that are to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.
- E. **Protective Coating:** Equipment shall be painted or coated in accordance with the drawings, unless otherwise indicated. Non-ferrous metal and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.

- F. **Potable water contact:** Materials immersed in or exposed to potable water shall be listed as compliant with NSF Standard 61.
- G. **Protection of Equipment:** Equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. Equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry. Pumps, motors, drives, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight storage facilities prior to installation. For extended storage periods, plastic equipment wrappers should be avoided to prevent accumulation of condensate in gears and bearings. In addition, motor space heaters shall be energized and shafts shall be rotated. Equipment delivered to the Site with rust or corroded parts shall be rejected. The CONTRACTOR, through the equipment manufacturer, shall disassemble, clean, and recoat the equipment to restore it to original condition.
- H. **Identification of Equipment Items:**
1. At the time of shipping, each item of equipment shall have a legible identifying mark corresponding to the equipment number in the Contract Documents for the particular item.
- I. **Shop Fabrication:** Shop fabrication shall be performed in accordance with the Contract Documents and the Shop Drawings.
- J. **Controls:** Equipment and system controls shall be in accordance with –the drawings and Sections of the contract documents.

2.2 EQUIPMENT SUPPORTS AND FOUNDATIONS

- A. **Equipment Supports:** Unless otherwise indicated, equipment supports, anchors, and restrainers shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be the greater of: that noted in the general structural notes or as required by the governing building code, or 10 percent of gravity. Submitted design calculations for equipment supports shall bear the signature and seal of an engineer registered in the State wherein the project is to be built, unless otherwise indicated. Calculations shall account for forces and distribution of forces on supporting structures resulting from normal operation, normal operation plus seismic loadings, and normal operation plus wind loadings.
1. Wind requirements: Exterior freestanding equipment shall be anchored in place by methods that satisfy the building code. Calculations shall be performed and signed and stamped, analyzing lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. Calculations shall include the distribution of forces imposed on the supporting structure and anchors, verifying that each anchor can develop the required resistance forces.
- B. **Equipment Foundations:** Mechanical equipment, tanks, control cabinets, enclosures, and related equipment shall be mounted on minimum 3.5-inch high concrete bases, unless otherwise indicated. Equipment foundations are indicated on Drawings. The CONTRACTOR through the equipment manufacturer shall verify the size and weight of equipment foundation to insure compatibility with equipment.

2.3 PIPING CONNECTIONS

- A. **Pipe Hangers, Supports, and Guides:** Pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment. Supports and hangers shall be in accordance with Section 15006 - Pipe Supports.
- B. **Flanges and Pipe Threads:** Flanges on equipment and appurtenances shall conform to ASME B16.1, Class 125, or B16.5, Class 150, unless otherwise indicated. Pipe threads shall be in accordance with ASME B1.20.1 and Section 15000 - Piping, General.
- C. **Insulating Connections:** Insulating bushings, unions, couplings, or flanges, as appropriate, shall be used in accordance with the requirements of the Section 15000.

2.4 GASKETS AND PACKINGS

- A. Gaskets shall be in accordance with Section 15000.
- B. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be **Garlock No. 432, John Crane Everseal**, or equal.
- C. Packing around rotating shafts (other than valve stems) shall be "O" rings, stuffing boxes, or mechanical seals, as recommended by the manufacturer and approved by the ENGINEER, in accordance with Section 11100 - Pumps, General.

2.5 NAMEPLATES

- A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.6 TOOLS AND SPARE PARTS

- A. **Tools:** The CONTRACTOR shall furnish one complete set of special wrenches and other special tools necessary for the assembly, adjustment, and dismantling of the equipment. Tools shall be of best quality hardened steel forgings with bright finish. Wrench heads shall have work faces dressed to fit nuts. Tools shall be suitable for professional work and manufactured by **Snap On, Crescent, Stanley**, or equal. The set of tools shall be neatly mounted in a labeled toolbox of suitable design provided with a hinged cover.
- B. Spare parts shall be furnished as indicated in the individual equipment sections. Spare parts shall be suitably packaged in a metal box and labeled with equipment numbers by means of stainless steel or solid plastic nametags attached to the box.

2.7 EQUIPMENT LUBRICANTS

- A. The CONTRACTOR shall provide lubricants for equipment during shipping, storage, and prior to testing, in accordance with the manufacturer's recommendations. Lubricants that could come in contact with potable water shall be food grade lubricants. After successful initial testing, final testing, and satisfactory completion startup testing, the CONTRACTOR shall conduct one complete lubricant change on all equipment. In

addition, the CONTRACTOR shall be responsible for the proper disposal of used lubricants. The OWNER will then be responsible for subsequent lubricant changes

PART 3 -- EXECUTION

3.1 SERVICES OF MANUFACTURER

- A. **Inspection, Startup, and Field Adjustment:** Where required by individual sections, an authorized, experienced, and competent service representative of the manufacturer shall visit the Site for the number of Days indicated in those sections to witness or perform the following and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation.
1. Installation of equipment
 2. Inspection, checking, and adjusting the equipment and approving its installation
 3. Startup and field testing for proper operation, efficiency, and capacity
 4. Performing field adjustments during the test period to ensure that the equipment installation and operation comply with requirements
- B. Instruction of the OWNER'S Personnel
1. Where required by the individual equipment sections, an authorized training representative of the manufacturer shall visit the Site for the number of Days indicated in those sections to instruct the OWNER'S personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment. Instruction shall be specific to the models of equipment provided.
 2. The representative shall have at least 2 years experience in training. A resume of the representative shall be submitted.
 3. Training shall be scheduled 3 weeks in advance of the scheduled session.
 4. Proposed training material and a detailed outline of each lesson shall be submitted for review. Review comments from the ENGINEER shall be incorporated into the material.
 5. The training materials shall remain with the trainees after the session.
 6. The OWNER may videotape the training for later use by the OWNER'S personnel.
- C. **Vibration Monitoring:** For the equipment types listed in paragraph 1.3D, the CONTRACTOR shall arrange for at least 2 Site visits by the manufacturer's specialist during testing of the equipment covered by torsional and vibration analysis submittals to measure the amount of vibration and prepare written recommendations for keeping the vibration within acceptance limits. If vibration readings exceed the specified or the applicable referenced standard vibration limits for the type of equipment, the CONTRACTOR shall make necessary corrections for the equipment to meet the acceptance criteria.

3.2 INSTALLATION

- A. **General:** Equipment shall be installed in accordance with the manufacturer's written recommendations.
- B. **Alignment:** Equipment shall be field tested to verify proper alignment.

3.3 PACKAGED EQUIPMENT

- A. When any system is furnished as pre-packaged equipment, the CONTRACTOR shall coordinate space and structural requirements, clearances, utility connections, signals, and outputs with Subcontractors to avoid later change orders.
- B. If the packaged system has any additional features (as safety interlocks, etc.) other than required by the Contract Documents, the CONTRACTOR shall coordinate such features with the ENGINEER and provide material and labor necessary for a complete installation as required by the manufacturer.

3.4 FIELD ASSEMBLY

- A. Studs, cap screws, bolt and nuts used in field assembly shall be coated with **Never Seize** compound or equal.

3.5 WELDING

- A. Welds shall be cleaned of weld-slag, splatter, etc. to provide a smooth surface.

3.6 FIELD TESTS

- A. Where indicated by the individual equipment sections, equipment shall be field tested after installation to demonstrate satisfactory operation without excessive noise, vibration, or overheating of bearings or motor.
- B. The following field testing shall be conducted:
 - 1. Start equipment, check, and operate the equipment over its entire operating range. Vibration level shall be within the amplitude limits as indicated or as recommended by the reference applicable standards.
 - 2. Obtain concurrent readings of motor voltage, amperage, capacity, vibration, and bearing temperatures.
- C. The ENGINEER shall witness field-testing. The CONTRACTOR shall notify the ENGINEER of the test schedule 3 Days in advance.
- D. In the event that any equipment fails to meet the test requirements, the equipment shall be modified and retested until it satisfies the requirement.

- END OF SECTION -

SECTION 11100 – PUMPS, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Provide pumps and pumping appurtenances, complete and operable, as indicated in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to pumps and pumping equipment throughout the Contract Documents, except where otherwise indicated.
- C. The requirements of Section 11000 – Equipment General Provisions, apply to this Section.
- D. **Unit Responsibility**
 - 1. The pump manufacturer shall be made responsible for furnishing the WORK and for the coordination of design, assembly, testing, and installation of the WORK of each specific pump Section.
 - 2. The CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each specific pump Section.
- E. **Single Manufacturer**
 - 1. Where 2 or more pump systems of the same type or size are required, provide pumps produced by the same manufacturer.

1.2 CONTRACTOR SUBMITTALS

- A. **General:** Furnish submittals in accordance with the requirements of Section 01300 – Contractor Submittals.
- B. **Shop Drawings:**
 - 1. Submit pump name, identification number, and specification Section number.
 - 2. Performance Information
 - a. Submit performance data curves showing head, capacity, horsepower demand, NPSH required, and pump efficiency over the entire operating range of the pump.
 - b. Require the equipment manufacturer to indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the design flow conditions and the maximum and minimum flow conditions.
 - c. Submit performance curves at intervals of 100 RPM from minimum speed to maximum speed for each centrifugal pump equipped with a variable speed drive.
 - 3. Operating Range

- a. Require the manufacturer to indicate the limits on the performance curves recommended for stable operation without surge, cavitation, or excessive vibration.
 - b. Provide a stable operating range as wide as possible, based on actual hydraulic and mechanical tests.
4. Submit assembly and installation drawings. including shaft size, seal, coupling, bearings, anchor bolt plan, part nomenclature, material list, outline dimensions, and shipping weights.
 5. Submit data, in accordance with the requirements by the OWNER, for the electric motor proposed for each pump.
 6. Submit an elevation of the proposed local control panel, showing panel-mounted devices, details of enclosure type, a single-line diagram of power distribution, current draw of the panel, and a list of all terminals required to receive inputs or to transmit outputs from the local control panel.
 7. Submit a wiring diagram of field connections, with identification of terminations between local control panels, junction terminal boxes, and equipment items.
 8. Submit a complete electrical schematic diagram.

C. Technical Manual:

1. Submit a Technical Manual containing the required information indicated in Section 01300 – Contractor Submittals and each specific pump Section.

D. Spare Parts List:

1. Submit a spare parts list containing the required information indicated in Section 01300 – Contractor Submittals and each specific pump Section.

E. Factory Test Data:

1. Submit signed, dated, and certified factory test data for each pump system which requires factory testing.
2. Submit these data before shipment of equipment.

F. Certifications:

1. Submit the manufacturer's certification of proper installation.
2. Submit the CONTRACTOR's certification of satisfactory field testing.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Compliance with the requirements of the specific pump Sections may necessitate modifications to the manufacturer's standard equipment.

B. Performance Curves:

1. Provide centrifugal pumps with a continuously rising curve or with the system operating range not crossing the pump curve at 2 different capacities or "dip region."
2. Unless otherwise indicated, the required shaft horsepower for the entire pump assembly at any point on the performance curve shall not exceed the rated horsepower of the motor or engine or encroach on the service factor.

C. Compatibility:

1. Provide entirely compatible components of each pump system provided under the specific pump Section.
2. In each unit of pumping equipment, incorporate basic mechanisms, couplings, electric motors or engine drives, variable speed controls, necessary mountings, and appurtenances.

2.2 MATERIALS

- A. Provide materials suitable for the intended application.
- B. For materials not indicated, provide high-grade, standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended, and conforming to the following requirements:
1. Provide cast iron pump casings and bowls constructed of close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or equal.
 2. Provide bronze pump impellers conforming to ASTM B 62 - Composition Bronze or Ounce Metal Castings, or B 584 - Copper Alloy Sand Castings for General Applications, where dezincification does not occur.
 3. Provide pump shafts constructed of Type 416 or 316 stainless steel.
 4. Miscellaneous stainless steel parts shall be of Type 316.
 5. Provide anchor bolts, washers, and nuts in standard service (non-corrosive application) of galvanized steel in accordance with the requirements of the Specifications and as approved by the OWNER.
 6. Provide anchor bolts, washers, and nuts in corrosive service as defined in Section 05500 – Miscellaneous Metalwork, of stainless steel in accordance with Section 05500 – Miscellaneous Metalwork.
- C. Materials in contact with potable water shall be listed as compliant with NSF Standard 61.

2.3 PUMP COMPONENTS - GENERAL

- A. **Flanges and Bolts:** Provide suction and discharge flanges conforming to ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800 or ASME

B16.5 - Pipe Flanges and Flanged Fittings dimensions. Bolts will be in accordance with industry standards.

B. Lubrication:

1. Vertical pump shafts of clean water pumps shall be product water-lubricated, unless otherwise indicated.
2. Provide deep-well pumps and pumps with dry barrels with water- or oil-lubricated bearings and seals, and enclosed line shafts.
3. Pumps for sewage, sludge, and other process fluids shall be lubricated as indicated.

C. Hand holes:

1. Provide hand holes on pump casings shaped to follow the contours of the casing in order to avoid any obstructions in the water passage.

D. Drains:

1. Pipe gland seals, air valves, cooling water drains, and drains from variable speed drive equipment to the nearest floor sink or drain, using galvanized steel pipe or copper tube that is properly supported with brackets.

E. Grease Lubrication:

1. For vertical propeller, mixed-flow, and turbine pumps, other than deep well pumps, of bowl sizes 10-inch and larger, provide a stainless steel tube attached to the column for grease lubrication of the bottom bearing.

F. Stuffing Boxes:

1. Where stuffing boxes are indicated for the pump seal, provide stuffing boxes of the best quality, using the manufacturer's suggested materials best suited for the specific application.
2. For sewage, sludge, drainage, and liquids containing sediments, provide fresh-water-flushed seals, using lantern rings.
3. If fresh water is not available, the seal shall be flushed with product water cleaned by a solids separator as manufactured by **John Crane Co., Lakos (Claude Laval Corp.)**, or equal.
4. Conventional Packing Gland Type Seal
 - a. Unless otherwise indicated, provide packing material of Teflon braiding, containing 50 percent ultrafine graphite impregnation in order to satisfy the requirements listed in the table below.
 - b. Acceptable ring materials are asbestos-free die-molded packing rings of braided graphite material free of PTFE, **Chesterton 1400R** or equal, for non-potable water service, and braided PTFE material, **Chesterton 1725** or equal, that is listed under NSF Standard 61 for potable water service.

c. Seal Requirements

Shaft speeds	up to 2500 fpm
Temperature	up to 500 deg F
pH range	0 - 14

5. Mechanical Seals

- a. Provide mechanical seals as recommended by the pump manufacturer.

2.4 PUMP APPURTENANCES

A. **Nameplates:**

1. Equip each pump with a stainless steel nameplate indicating serial number(s), rated head and flow, impeller size, pump speed, and manufacturer's name and model number.

B. **Gauges:**

1. Provide gauges as indicated.
2. Located gauges in a representative location, where not subject to shock or vibrations, in order to achieve true and accurate readings.
3. Where subject to shock or vibrations, wall-mount the gauges or attach the gauges to galvanized channel floor stands and connect by means of flexible connectors.

2.5 FACTORY TESTING

- A. Conduct the following tests on each indicated pump system:

1. **Motors:**

- a. Test electric motors in accordance with the requirements of Section 16150 – Electric Motors.
- b. Furnish test results to the pump manufacturer prior to the pump test.

2. **Factory Non-witnessed Test:**

- a. For pumps with motors smaller than 100 hp, the manufacturer's certified test motor will be accepted.
- b. Testing of prototype models will not be accepted.
- c. Conduct the following minimum tests and submit the test results:
- 1) hydrostatic test;
- 2) Performance Test:

- a) Conduct performance testing at maximum speed, obtain a minimum of 5 hydraulic test readings between shutoff head and 25 percent beyond the maximum indicated capacity, and record on data sheets as defined by the Hydraulic Institute standards;
 - b) For variable speed driven pumps, test each pump between maximum and minimum speed at 100-RPM increments;
 - c) Submit pump curves showing head, flow, bhp, and efficiency results;
- 3) mechanical test;
- 4) NPSH
 - a) Perform a net positive suction head required test (NPSHr3), if required by the specific pump Section.
 - b) If not required by the specific pump Section, submit the published manufacturer-calculated NPSHr3 curve.
- d. Submit certification signed by a senior official of the pump manufacturer that the pump shaft horsepower demand did not exceed the rated motor horsepower of 1.0 service rating at any point on the curve.
- e. Submit test results to the ENGINEER for review prior to delivery to the Site.

3. Acceptance:

- a. In the event of failure of any pump to meet any of the requirements, make necessary modifications, repairs, or replacements in order to conform to the requirements of the Contract Documents, and re-test the pump until found satisfactory.

PART 3 -- EXECUTION

3.1 MANUFACTURER'S SERVICES

A. Inspection, Startup, and Field Adjustment

- 1. Where required by the specific pump Section, furnish an authorized service representative of the manufacturer at the Site continuously to supervise the following items and to certify in writing that the equipment and controls have been properly installed, aligned, lubricated, adjusted, and readied for operation:
 - a. installation of the equipment;
 - b. inspection, checking, and adjusting the equipment;
 - c. startup and field testing for proper operation; and
 - d. performance of field adjustments to ensure that the equipment installation and operation comply with the indicated requirements.

B. Instruction of OWNER's Personnel

1. Where required by the individual pump Section, furnish an authorized training representative of the manufacturer at the Site for the number of Days indicated in the specific pump Section, to instruct the OWNER's personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment.
2. Furnish instruction specific to the model of equipment provided.
3. Qualifications
 - a. Furnish a representative with at least 2 years experience in training.
 - b. Submit a resume for the representative.
4. Schedule the training a minimum of 3 weeks in advance of the first session.
5. Lesson Plan Review
 - a. Submit the proposed training material and a detailed outline of each lesson for review.
 - b. Incorporate review comments into the material.
6. The trainees will keep the training materials.
7. The OWNER may videotape the training for later use with the OWNER's personnel.

3.2 INSTALLATION

A. General

1. Install pumping equipment in accordance with the manufacturer's written recommendations.

B. Alignment

1. Field-test the equipment in order to verify proper alignment and freedom from binding, scraping, shaft runout, or other defects.
2. Measure the pump drive shafts just prior to assembly in order to ensure correct alignment without forcing.
3. Ensure that the equipment is secure in position and neat in appearance.

C. Lubricants

1. Provide the necessary oil and grease for initial operation.

3.3 PROTECTIVE COATING

- A. Coat materials and equipment in accordance with the requirements of Section 09800 – Protective Coating.

3.4 FIELD TESTS

A. Field-test each pump system after installation in order to demonstrate:

1. satisfactory operation without excessive noise and vibration;
2. no material loss caused by cavitation;
3. no overheating of bearings; and,
4. indicated head, flow, and efficiency at the design point.

B. Conduct the following field testing:

1. Startup, check, and operate the pump system over its entire speed range.
2. If the pump is driven by a variable speed drive, test the pump and motor at 100-RPM increments.
3. If the pump is driven at constant speed, test the pump and motor at the maximum RPM.
4. Unless otherwise indicated, vibration shall be within the amplitude limits recommended by the Hydraulic Institute standards at a minimum of 4 pumping conditions defined by the ENGINEER.
5. Obtain concurrent readings of motor voltage, amperage, pump suction head, and pump discharge head for at least 4 pumping conditions at each pump rotational speed, at 100-RPM increments if equipped with a variable speed drive or at maximum RPM if equipped with a constant speed drive.
6. Check each power lead to the motor for proper current balance.
7. Bearing Temperatures
 - a. Determine bearing temperatures by a contact-type thermometer.
 - b. Precede this test with a run time sufficient to stabilize bearing temperatures, unless an insufficient liquid volume is available to furnish such a run time.
8. Ensure that electrical and instrumentation tests conform to the requirements of the Section under which that equipment is specified.

C. Witnessing

1. Field testing will be witnessed by the ENGINEER.
2. Furnish 3 Days advance notice of field testing.

D. If the pumping system fails to meet the indicated requirements, modify or replace the pump and re-test as indicated above until it satisfies the indicated requirements.

E. Certification

1. After each pumping system has satisfied the requirements, certify in writing that it has been satisfactorily tested and that final adjustments have been performed.
 2. Certification shall include the date of the field tests, a listing of persons present during the tests, and the test data.
- F. The CONTRACTOR shall be responsible for costs of field tests, including related services of the manufacturer's representative, except for power and water, which the OWNER will bear.
- G. If available, the OWNER'S operating personnel will provide assistance in field testing.

- END OF SECTION -

SECTION 11102 – SUBMERSIBLE DEEP WELL PUMPS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide a submersible well pump, electric motor, and appurtenant, completed and operable, in accordance with the Contract Document deep.
- B. The requirements of Section 11100 – Equipment General Provisions and Section 11102 – Submersible Deep Well Pumps, General, apply to the WORK of this Section.
- C. The Supplier shall examine the site condition, intended application, and operation of the pump system and recommend the pump that will satisfy the indicated requirements.

PART 2 -- PRODUCTS

2.1 SUBMERSIBLE WELL PUMP

- A. Pumps shall be submersible type of cast 316 stainless steel construction. Pumps shall have a stainless-steel adapter to 8" Certa-Lok pump column, or appropriate size designated by the OWNER. CONTRACTOR shall provide serial number of pump to OWNER.
- B. Pump safety cable shall be type 316 stainless aircraft cable at least ¼-inch diameter with a minimum breaking strength of 3,500 lbs. Safety cable will be attached using stainless steel clamps and hardware. CONTRACTOR shall coordinate with OWNER for safety cable inspection prior to installation in well.
- C. Pump motor shall be as specified the Specifications or as directed by the OWNER. CONTRACTOR shall provide serial number of pump motor to OWNER.
- D. Pump cable shall be a flat #4, 3-conductor with insulated ground, milprene rubber insulated and jacked. Cable shall be continuous without splices. Cable must be Centerline Water well cable, Hilo, 4/3 jacketed with motor.
- E. Pump column shall be 8" Certa-Lok of length, or as designated and approved by the OWNER, as indicated in the specifications.

2.2 PUMP REQUIREMENTS

- A. **Pump Design:** Pump shall include an integral Type 316 Stainless steel check valve designed for the discharge of the pump. Pump shall include integral carbon graphite bearing to handle momentary up thrust loads. An upthrust bumper bolt in the discharge of the pump will not be acceptable. Pump downthrust shall be absorbed by the motor thrust bearing. Each impeller shall be fitted with a seal ring around its eye or skirt to prevent hydraulic loss. A filter screen shall be included as part of the suction inlet assembly. All metallic components of the pump shall be 316 Stainless steel and included as part of the suction inlet assembly. All elastomeric components shall be Nitrile Rubber.
- B. **Motor Design:** The motor shall be designed for continuous underwater operation in conformance with NEMA standards.
- C. **Electrical Cable:** The electrical cable shall be strapped to the discharge column with stainless steel bands or plastic pull ties.

- D. **Discharge Head:** A fabricated steel discharge head shall be provided. Discharge head shall be constructed to support 150% of the weight of all items in the well. Tapping for electrical wire, instrumentation, sounder tube and venting shall be provided. A screened vent cap shall be included. The discharge head shall have lifting eyes. The discharge head shall rest on a sole plate welded to the casing. A 25-inch neoprene gasket and cadmium plated bolts with nuts shall seal the discharge head to the sole plate. If the well casing below the discharge head is to be encased in concrete the sole plate shall have tapped bolt holes.

2.3 MANUFACTURERS

- A. Goulds Pump Model No. 9TNLC, or approved equal.
- B. Goulds Pump Model No. 9TNHC, or approved equal.

PART 3 -- EXECUTION

3.1 INSTALLATION

- A. The installation shall be in accordance with manufacturers written recommendations and supervised by a representative of the pump manufacturer.
- B. Prior to OWNER acceptance and formal pump start-up, equipment shall be inspected for proper alignment, correct pump rotation, quiet operation, proper connection, and satisfactory performance by means of a trial operation and field performance function test. A start-up report showing function testing, motor voltages, running amperages and well water levels shall be providing to the ENGINEER after pump start-up. Function testing should include hydraulic performance verification testing by operating the pump and recording flow, pressure, well water levels, motor voltage and running amperage. The discharge valve shall be throttled so that the pump operates at the following points on the pump curve:
 - 1. Shutoff head
 - 2. One point between shutoff head do best efficiency point
 - 3. Best efficiency point
 - 4. Maximum flow point
- C. The well shall be operated continuously 24 hours per day for seven days. This test shall demonstrate constant operation of the point system without failure.
- D. After successful continuous operational test, the CONTRACTOR shall submit to the OWNER a certificate of the successful installation and operation.

- END OF SECTION -

SECTION 13210 - WELL REHABILITATION

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. **General:** The CONTRACTOR shall rehabilitate, test, and disinfect existing production and monitoring wells and perform all appurtenant work, complete and operable, all in accordance with the requirements of the Contract Documents.
- B. **Qualifications:** The CONTRACTOR shall have at least 5 years of experience in the construction and rehabilitation of production wells and shall have rehabilitated, acidized, chlorinated, cleaned, and performed a cement squeeze operation in not less than 10 wells of equivalent type and capacity. If the CONTRACTOR cannot demonstrate sufficient experience in each one of these operations, the WORK shall be subcontracted to a qualified well rehabilitation subcontractor acceptable to the ENGINEER for that operation.
- C. **References:** The CONTRACTOR shall furnish at least 5 references demonstrating experience in projects of similar size, skill, and complexity. For each project cited, furnish a list of references including name and address of the organization for which the project was performed, the casing diameter(s) and depths, the well capacity, the location, and the rehabilitation operations performed on each well.
- D. **Licensing Requirements:** The Work of this section shall be performed by a water well contractor licensed in the State of Florida. The CONTRACTOR's State license number shall be affixed to all correspondence and reports. All key employees (drillers in responsible charge of machinery) shall be registered by the South Florida Water Management District (SFWMD).
- E. **Equipment Requirements:** The work shall be performed by a competent crew with equipment that is adequate to complete all phases of well rehabilitation and construction. If the CONTRACTOR's equipment or crew is not capable of satisfactorily performing the work provided for in these specifications, as determined by the ENGINEER, the CONTRACTOR shall furnish acceptable equipment and/or crew at his own expense.
- F. **Permits:** The CONTRACTOR shall obtain all necessary federal, state, and local permits for the required rehabilitation work. All work shall comply with and be completed in full conformance with SFWMD Water Use Management Rules Chapter 40E-3 F.A.C. for water wells, other applicable requirements and these specifications, whichever is more stringent.
- G. **Noise Requirements:** The CONTRACTOR shall install soundproofing barriers, provide mufflers on equipment, and take whatever other steps are necessary during operations to ensure that noise levels conform to the local noise ordinance as required by the ENGINEER. Working hours for construction, demolition, drilling, rehabilitation, site work, and development will be determined by the ENGINEER for each well site.
- H. **Well Integrity:** The CONTRACTOR shall be responsible for the working condition of each well that is taken off-line and released for service. The CONTRACTOR shall be required to return each well to the OWNER in proper operating condition. Under no

conditions, shall the CONTRACTOR provide the OWNER with a well that has been compromised with respect to physical orientation, surface contamination, water quality, production capability, or any other factor that has been degraded as compared to the pre-rehabilitation performance and condition of the well. In the event the well is compromised by the CONTRACTOR's WORK activities, the CONTRACTOR shall be responsible to provide the OWNER with a well equivalent to the pre-rehabilitation condition via repair or abandonment/replacement of the well at no additional cost to the OWNER.

- I. **Compliance With Applicable Regulations:** All work shall comply with and be completed in full conformance with all federal, state, and local regulations including but not limited to the Broward County Health Department (BCHD) regulations, South Florida Water Management District (SFWMD), and Florida Department of Environmental Protection (FDEP) rules and regulations for water wells, or this specification, whichever is more restrictive.
- J. **Safety:** The CONTRACTOR will take necessary measures to limit access to drilling sites to minimize public hazard. The CONTRACTOR shall also implement safety measures at the treatment plant sites to minimize hazards to the OWNER's staff and minimize impact on daily routine plant operations.

1.2 WORK DESCRIPTION

- A. **General:** Existing production wells shall be rehabilitated via different methods including: well screen replacement, well pump replacement, liner or casing replacement, well head mechanical, electrical, and instrumentation modifications, and video logging. A summary of the work associated with each of these tasks follows.
- B. **Well Video Logging/Assessment:** A color video log/survey shall be performed on all wells scheduled for well screen replacement. The results of the color video logs shall be used to determine the appropriate rehabilitation process to be implemented at each individual well. The CONTRACTOR's bid shall be based upon performing video surveys at each site. The individual wells shall be verified by the ENGINEER before mobilization by the CONTRACTOR. Refer to Paragraph 1.2.G. of this section for a general sequence of work for this task.
 - 1. Within 2 days after the initial video survey, the ENGINEER shall select which of the repair and rehabilitation operations indicated below are to be performed in the well.
 - 2. The CONTRACTOR shall submit a plan to perform the specified repair and/or rehabilitation procedure within 5 days after receiving from the ENGINEER the list of selected techniques.
 - 3. The ENGINEER and CONTRACTOR shall discuss and reach consensus on the plan within 2 days after ENGINEER receipt of the plan.
 - 4. Any additional repair and/or rehabilitation procedure shall be implemented in a phased approach. This approach shall be determined by the ENGINEER, based on results from initial, and any subsequent, repair and rehabilitation procedures.

5. The ENGINEER may alter the sequence of testing and rehabilitation operations indicated below.
- C. **Screen and Gravel Pack Replacement:** The CONTRACTOR's bid shall include the cost of removing the existing screen and gravel pack and installing new screen and gravel pack as directed by the OWNER. All work associated with this procedure shall conform to these Specifications.
- D. **Pump Replacement:** The CONTRACTOR's bid shall include replacement of existing submersible pumps, motors, and appurtenances. In addition to pump replacement, the CONTRACTOR shall complete mechanical, electrical, and instrumentation modifications at these wells as detailed in the Specifications. Refer to Paragraph 1.2.G. of this section for a general sequence of work for this task.
- E. **Wellhead and Surface Modifications:** The CONTRACTOR's bid shall include modifications at a total of 4 wellheads. The individual wells to be modified shall be verified by the ENGINEER prior to mobilization. Refer to the Specifications for information regarding wellhead modifications.
- F. **General Work Sequence:** The following list of WORK activities is representative of general WORK that will be executed at each existing well requiring rehabilitation. The CONTRACTOR shall note that no more than two wells may be taken out of service from a given wellfield by the CONTRACTOR at one time. The CONTRACTOR shall coordinate his activities at each existing well with the OWNER to minimize impact to daily plant operations. At no time during the duration of the rehabilitation WORK may the OWNER's water treatment plants be taken off-line. Plant shutdowns of any nature shall not be permitted.
- G. **Well Rehabilitation/Pump Replacement:** The following list of WORK is representative of the general WORK that will be executed at each well. The number of wells that may be taken out of service by the CONTRACTOR at one time must be submitted to the OWNER and ENGINEER for review and approval.
1. Provide access to the well by removing fencing on one or more sides, as needed for entry of CONTRACTOR's and subcontractors' equipment. Install noise barriers, as necessary. The CONTRACTOR shall coordinate work with Plant Superintendent prior to mobilization. The CONTRACTOR shall be responsible for maintaining security for the well in the event the existing fence is removed. If possible, the CONTRACTOR shall replace the fence before leaving the construction site each day. The CONTRACTOR is responsible for properly securing the area such that adjacent residents are not impacted from the use of their property, driveway, street, etc. The CONTRACTOR shall be solely responsible for implementing theft prevention measures. The OWNER shall bear no responsibility for materials stolen or acts of vandalism.
 2. Remove wellhead, column pipe, production pump, and pump motor from well. Remove raw water connections as needed to provide access to the well. Store the pump and column on blocks to avoid contact with the earth and waste fluids. The CONTRACTOR shall be responsible for proper storage of the OWNER's existing equipment. In the event the existing well pump, motor, or other equipment is

damaged, the CONTRACTOR shall be required to provide the OWNER with replacement in-kind equipment.

3. Remove inner casing, screen, gravel fill tube(s), casing guides, etc. from within the outer casing. CONTRACTOR shall take care not to damage existing well screens. Well screens will be delivered to the CONTRACTOR's staging area for the OWNERS inspection and potential future use.
4. Clean well casing using wire brush. Circulate casing scale, rust, gravel, and other solids from the well to the casing depth and dispose of according to applicable regulations. The CONTRACTOR shall be required to submit a waste disposal plan to the ENGINEER for approval. Wastes shall not be disposed in a manner that impacts space outside the limits of the wellsite easement or adjacent residences.
5. Install CONTRACTOR's pump, video camera, and discharge piping for dynamic video.
6. Pump at least 3 well volumes of potable water into the well and continue pumping until clear static video image can be obtained. The OWNER shall provide to CONTRACTOR with the necessary amount of potable water for proper completion of the WORK. The CONTRACTOR shall be responsible for transporting the water from the OWNER's treatment plant to the well site. All transportation costs shall be included in the CONTRACTOR's bid.
7. Perform downhole video survey.
8. Drill out old gravel pack using the reverse-air or mud rotary drilling method to total depth
9. Backfill open hole to within 2 feet of the base of the outer casing with clean pea gravel.
10. Perform rehabilitation or repair operations with liner installation or outer casing replacement as directed by the ENGINEER.
11. Remove cement from the base of the liner or outer casing and remove gravel from below the casing to the base of the well.
12. Install replacement screen, inner casing, and gravel fill tube(s).
13. Install new gravel pack.
14. Re-Develop the well with the CONTRACTOR's test pump and compressor.
15. Conduct a 10-hour step drawdown test.
16. Conduct a 10-hour constant rate test.
17. Disinfect and install new production pump, wellhead and appurtenances, as directed by the ENGINEER, and restore fencing.
18. Disinfect the well.

19. Install new surface equipment.
20. Obtain regulatory clearance of the well.
21. Remove temporary piping and reconnect to raw water main.
22. Re-sod, replace fence, and restore site to its original or better condition and appearance.

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. **Codes:** All codes, as referenced herein, are as specified in Section 01090, "Reference Standards." Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the requirements of the applicable requirements of the referenced portion of the following documents to the extent that requirements therein are not in conflict with the provisions of this Section; provided, that where such documents have been adopted as a code or ordinance by the public agency having jurisdiction, such code or ordinance shall take precedence.
- B. **State Standards:** South Florida Water Management District (SFWMD) and Florida Department of Environmental Protection (FDEP) rules and regulations contained in the Florida Administrative Code (FAC).
- C. **Commercial Standards:**

ANSI/AWWA C654	Disinfection of Wells.
ASTM A 139	Specification for Electric-Fusion (Arc) Welded Steel Pipe (sizes 4 inches and over).
ASTM C 150	Specification for Portland Cement.
AWWA A 100	Standard for Water Wells.
AWWA C206	Field Welding of Steel Water Pipe.

1.4 CONTRACTOR SUBMITTALS

- A. **General:** All CONTRACTOR submittals shall conform to, the applicable requirements of Section 01300, "Contractor Submittals," and the supplementary requirements specified herein. All measurements for depths shall be referenced to existing well pads.
- B. **Equipment List:** The CONTRACTOR shall submit a list of the equipment it proposes to utilize on the project, which shall include manufacturer's load capacities, horsepower, and year of manufacture and year of purchase by the present ENGINEER.
- C. **Disposal Plan:** Prior to commencement of WORK, the CONTRACTOR shall submit a plan for disposal of rehabilitation waste products, including neutralization of acidization

wastes, and disposal of wastes from acidization, chlorination, casing cleaning, well screen removal, drilling, and development.

- D. **Geological Samples:** Should new borehole be installed as part of the WORK, the CONTRACTOR shall collect, label and store, in sturdy containers acceptable to the ENGINEER, at a well protected place near the drilling site, 2 sets of samples of all geological formations encountered during rehabilitation operations. Each sample shall be clearly labeled to indicate well number, date, time, and the exact depths from which the sample was taken.
- E. **Drilling Log:** Should new borehole be drilled as part of the WORK, a daily log of any formations drilled from surface to total depth indicating any change in formation shall be prepared by the CONTRACTOR. The drilling log shall be available for inspection at the site at all times and 2 copies of the drilling log shall be provided to the ENGINEER at the completion of each rehabilitation effort.
- F. **Sand Sieve Analysis:** Should new borehole be drilled as part of the WORK, the CONTRACTOR shall have sieve analyses performed on representative samples obtained from the potential screened interval as directed by the ENGINEER. The CONTRACTOR shall provide the ENGINEER with 2 copies of the sieve analysis report for each well. The CONTRACTOR shall submit sieve analyses results to the ENGINEER for review and acceptance at least 7 days prior to anticipated placement of the screen in the well.
- G. **Well Screen:** Should well screens be required as part of the WORK, the CONTRACTOR shall submit 4 copies of the proposed well screen shop drawings including gravel pack design, slot size and length, and related data for approval.
- H. **Well Screen/Riser Pipe Connection:** Four copies (4) of the manufacturer's recommended method of connecting Schedule 40 PVC riser pipe to the stainless steel well screen shall be provided by the CONTRACTOR to the ENGINEER for approval at least 7 days prior to installation.
- I. **Final Description:** Should new casing or screen be installed as part of the WORK, the CONTRACTOR shall prepare a final well description that indicates the following: diameter, wall thickness, depths, and lengths of casings and screens; type, aperture size, and pattern of screen perforations; borehole diameters; gradation of gravel envelope; quantity of gravel initially installed and quantity of gravel added during development operations; quantity of material removed during development operations; and all other pertinent details. The CONTRACTOR shall provide the ENGINEER with 2 copies of the final well description.
- J. **Completion Report Required:** A Water Well Completion Report (Form 0123) must be filed with the SFWMD within 30 days of completion of work. A grouting card (Form 0196) shall be furnished to the SFWMD prior to installation. Two copies of each form shall be provided to the ENGINEER.
- K. **Development and Test Records:** Development and test records shall be maintained on an hourly basis, showing production rates, static water level, pumping level, drawdown, production of sand, and all other pertinent information concerning the method of development. Pumping test records shall show drawdown versus production at 5-

minute intervals, for the step drawdown and constant rate tests. Also included with this submittal shall be records of all volumes and amounts of materials used in rehabilitation operations, such as chlorine, acid and potable water. Two copies of the development and test records shall be provided to the ENGINEER upon completion of each well.

- L. **Video Surveys:** The CONTRACTOR shall submit one copy of the downhole video survey to the ENGINEER at the completion of the survey and 2 copies of the video for each well within 2 weeks after the completion of the survey.
- M. **Rehabilitation Procedure Plan:** Two copies of the CONTRACTOR's recommendations for rehabilitation procedure shall be submitted to the ENGINEER to include rehabilitation operations as listed above.
- N. **Instrument Calibrations:** The CONTRACTOR shall submit to the ENGINEER at least 48 hours before testing begins. Calibration data sheets shall be within the last 60 days for each measuring instrument to be used in testing. The calibration records shall contain the following information:
 - 1. **Flow Meter Calibration Sheet:** Serial Number, Model Number, Gears, Test Apparatus Size, Meter Reading, and Flow Rate for at Least Three Steps, Percent Error for Each Step, Tester's Name and Title.
 - 2. **Pressure Gauge Calibration Sheet:** Serial Number, Scale Range, Meter Reading and Inches of Mercury for at Least Three Steps Covering the Entire Range of the Gauge, Percent Error for Each Step, Tester's Name and Title.
- O. **Daily Log:** A daily log of all site activities shall be maintained by the CONTRACTOR on an on-going basis. The daily log shall be kept updated and be available for inspection at the site at all times. The CONTRACTOR shall provide the ENGINEER with 2 copies of the daily log of activities at the end of each workweek.
- P. **Records Required by Law:** The CONTRACTOR shall maintain all records required by governmental agencies having jurisdiction, and shall submit such records to them as may be required. Two copies of all such material shall be furnished to the ENGINEER.
- Q. **Geophysical Logs:** The CONTRACTOR shall provide the ENGINEER with one electronic copy and 2 hard copies of each geophysical log at the time of logging and 15 copies and one reproducible within two weeks of completion of the logging.
- R. **Alignment Tests:** Four (4) copies of each alignment test results shall be provided to the ENGINEER within 72 hours of test completion.
- S. **Cement Squeeze Plan:** Two copies of the grouting techniques proposed by the CONTRACTOR for use during the WORK shall be submitted to the ENGINEER for approval at least 72 hours prior to grouting.

1.5 QUALITY ASSURANCE

- A. **Sand Production:** Sand production concentration during development is to be less than one ppm at the post-rehabilitation design rate, shall be measured using an Imhoff

cone and a centrifugal sand-separating device, as described in the Journal of the American Water Works Association, Vol. 46, No. 2, February 1954.

- B. **Silt Production:** Silt content shall be measured by the CONTRACTOR following the procedures outlined in ASTM D4189-95 Standard Test Method for Silt Density Index (SDI) of Water. The CONTRACTOR shall provide all materials, equipment, and power necessary to perform the tests. The SDI shall be less than 3 at the post-rehabilitation design rate.
- C. **Geophysical Logs:** The CONTRACTOR shall log any existing or newly drilled borehole from the borehole total depth to the cased depth of the well by a qualified service company acceptable to the ENGINEER and experienced in water well logging and the performance of such logs. The operator shall be knowledgeable in the interpretation of logs, to the degree that he can make decisions regarding the accuracy and validity of the logs and the sensitivity of the instruments, while using a geophysical logging system capable of producing logs in digital format. The resolution and precision of each instrument will be adequate for the interpretation of the formation properties being studied, calibration standards independent of the logging equipment will be used, and calibration and quality control information shall be presented on the logs. Each log shall be recorded using a depth measurement that is accurate to within 0.1 feet using a resolution of approximately 1/50th of the greatest deviation of the quantity measured over the entire log. Each log shall include a repeat section at a depth determined by the ENGINEER. Each logging tool shall be calibrated in the presence of the ENGINEER.
- D. **Pressure Gauge:** A well head pressure gauge shall be used for measuring discharge head. The gauge shall measure 0 to 150 psi with maximum 0.5 psi increments, and shall be accurate to within 1/4 of 1% of full-scale deflection.
- E. **Cement Grout:** Cement grout shall be used in sealing the annular space between the existing casing and formation, and shall be installed under pressure by a qualified cementing company, approved by the ENGINEER.
- F. **Alignment Tests:** Tests to determine the alignment of the inner casing (riser pipe) shall be made by the CONTRACTOR after the well has been completed and before its acceptance.

1.6 MATERIALS DELIVERY, STORAGE, AND PROTECTION OF MATERIALS

- A. All materials shall be delivered in an undamaged condition and stored to provide protection against damage. All defective or damaged materials shall be replaced with new materials at the CONTRACTOR's expense.

1.7 CONTRACTOR'S EQUIPMENT

- A. **General:** The CONTRACTOR'S equipment shall be clean, well maintained, and in good operating condition when delivered to the site and during the entire operation.
 - 1. **Requirements:** The equipment shall be of adequate size, strength, horsepower, and capacity for the project and shall be of the type successfully utilized for the construction and rehabilitation of similar or larger wells within the last 2 years.

2. **Safety:** All equipment shall be provided with safety devices as required by governmental authorities having jurisdiction.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 GENERAL

- A. **Equipment:** The testing and rehabilitation of the wells requires a variety of procedures, each using different materials and equipment. The CONTRACTOR shall submit a list of all necessary materials and equipment to the ENGINEER one day before starting each procedure and shall have all necessary materials and equipment on-site before starting each procedure.
- B. **Due Care and Attention:** Appropriate care should be taken by the CONTRACTOR when executing all down-hole operations.
- C. **Repeat Work:** All work required to be repeated, resulting from the CONTRACTOR's lack of performance in accordance with the specifications, including all additional materials, labor and equipment required, shall be furnished at the expense of the CONTRACTOR and no claim for additional compensation or time shall be made or be allowed therefore, except as specifically provided herein.
- D. **Testing:** The CONTRACTOR shall be responsible for providing all emergency power generation equipment required as for proper completion of the WORK. The CONTRACTOR shall not be allowed to use existing electric facilities and service from the existing wells to perform testing.

3.2 ENGINEER INSTRUCTIONS TO PROCEED

- A. **General:** If information indicates that the completion of rehabilitation operations at the production well site is not warranted, the ENGINEER reserves the right to terminate all further work at the site. In such an event, the CONTRACTOR will not be entitled to any additional compensation.

3.3 PRE-REHABILITATION PROCEDURES

- A. **General:** The WORK at each well shall consist of the following listed procedures, as determined by the ENGINEER.
- B. **Casing Cleaning:** Well casing interiors shall be cleaned to remove encrustation. The cleaning shall utilize a casing brush, or alternative method approved by the ENGINEER. The casing brush shall be constructed so that casing cleaning and circulation of the scale and rust from the well can take place simultaneously and the brush can be rotated to ensure effective cleaning of all parts of the casing. It is the CONTRACTOR's responsibility to pump the well during the brushing at a rate sufficient to lift the solids produced by the brushing operation out of the well. The brush shall be of sufficient diameter that it contacts and effectively cleans all sides of the casing simultaneously.

- C. **Fill Removal:** Accumulated fill in the well casing or open hole interval shall be removed using the reverse rotary process, reverse air process, bailing or airlift development.
- D. **Video Surveys:** Video tape the entire depth of each well using a downhole video system, which shall include a rotating color camera with side-view and radial-view lenses, remote focus adjustment, and onscreen automatic depth indicator. Each survey shall consist of one pass recorded from the top of well casing to the total depth of the well. The pass shall be made with the well under static conditions, in which potable water shall be pumped into the well during the survey to maintain clarity within the well casing and open hole interval or under dynamic pumping conditions. At the direction of the ENGINEER, the CONTRACTOR may be requested to pause, repeat, or revisit areas of interest within the well.

3.4 REHABILITATION PROCEDURES

- A. **General:** The following explicit operations may potentially be recommended by the ENGINEER during the course of WORK.
- B. **Chlorination:** When directed by the ENGINEER, the CONTRACTOR shall mobilize equipment for chlorination of the well.
 - 1. Pump 800 gallons of 2,000 mg/L sodium hypochlorite solution into the well through a tremie pipe, the exact amount shall be submitted to the ENGINEER for review and approval.
 - 2. Agitate the well to assure thorough mixing of the chlorine solution in the well.
 - 3. Sample the fluid in the well and demonstrate to the ENGINEER that the chlorine residual exceeds 500 mg/L. Add more sodium hypochlorite solution, if necessary, to assure a sufficient concentration of chlorine residual. Agitate the well and sample again.
 - 4. Agitate the well periodically while displacing one casing volume of chlorine solution with potable water to force the chlorine solution into the productive interval of the well.
 - 5. Allow 18 hours of contact time, including time spent agitating the well.
 - 6. Pump the chlorine solution from the well until the chlorine residual concentration in the discharge water is below 5 ppm. Contain the discharge and dispose of according to applicable regulations.
 - 7. **Wire-Wound Screen and Riser Installation:** Based on the results of the preliminary video survey and subsequent information collected during testing and following approval by the ENGINEER, the CONTRACTOR shall remove the existing screen and gravel pack and install a new screen and gravel pack. The screen and riser pipe shall conform to the description above or the Specifications whichever is more stringent, as approved by the ENGINEER.
- C. **Geophysical Logging:** The ENGINEER shall be given 48 hours' notice of the time when the survey will be run in order to witness the performance of the survey.

Geophysical logging shall include the following testing per each well selected by the ENGINEER:

1. **Final Caliper Log:** A caliper log shall be completed on the reamed borehole following drilling of the open hole to the total depth of the well.
- D. **Cementing Options:** The CONTRACTOR shall prepare a plan for approval by the ENGINEER as indicated above to ensure the integrity of the casing/liner during each grouting operation and to protect the productive formation underlying the casing/liner base. Cement grout shall be used in sealing the annular space between the existing casing and formation and shall be installed under pressure. Some of the following operations may be requested of the CONTRACTOR for the cementing operation:
1. Preliminary one-hour pressure test on the existing casing (utilizing an inflatable packer set near the base of the casing).
 2. Fill open borehole section with silica sand using the tremie method.
 3. Install grout seal at the base of the casing.
 4. For the liner installation, cement the annular space by the tremie method, by attaching cementing baskets on the exterior of the liner.
 5. Plug-back the base of the open borehole with grout, using the tremie method.

3.5 POST-REHABILITATION PROCEDURES

- A. **Well Development:** Development shall be performed in accordance with Section 13216 – Water Quality and Well Development.
- B. **Well Production Testing:** Pump Testing shall be performed in accordance with Section 13217 – Pumping Tests.
- a. **Sediment Removal:** After the test pump has been removed, the CONTRACTOR shall remove any accumulated sediment from the well.
- C. **Disinfection:** The CONTRACTOR shall provide for disinfection of the well immediately after test pumping of the well has been completed. The CONTRACTOR shall carry out adequate cleaning procedures immediately preceding disinfection where evidence indicates that normal well construction and development work have not adequately cleaned the well. All oil, soil, and other materials, which could harbor and protect bacteria from disinfectants, shall be removed from the well.
1. **Method:** Disinfection of the well shall be performed in accordance with the requirements of ANSI/AWWA C654, except as modified herein. Chlorine or other compounds approved by the State or local regulatory agencies shall be used as disinfectants. The method of chlorination to be used shall consist of (1) treating the water in the well casing to provide a chlorine residual of approximately 50 mg/L; (2) circulating the chlorinated water within the well casing and pump column; and (3) pumping the well to waste to remove chlorinated water. The quantity of chlorine compounds required to produce a chlorine residual of 50 mg/L may be calculated by

multiplying the appropriate quantity shown in ANSI/AWWA C654, Appendix A, Table A.1 by the appropriate factor. A reducing agent such as sodium bisulfite shall be applied to the chlorinated discharge water to thoroughly neutralize the chlorine residual remaining in the water, prior to disposal. The CONTRACTOR shall make provisions for disposal of chlorinated water in accordance with applicable environmental regulations.

2. **Bacteriological Clearance:** The CONTRACTOR shall be required to perform all post-disinfection sampling and analyses necessary to obtain a release for each well from the BCHD. The CONTRACTOR shall be responsible for compliance with all applicable regulatory requirements including 20 consecutive days of bacteriological testing. In the event a well does not satisfy the conditions for the bacteriological testing, the CONTRACTOR shall be required to repeat the 20-day test until the well is released for service from the BCHD. All labor, sampling, testing, and re-testing services shall be the CONTRACTOR's responsibility without additional cost to the OWNER.

-END OF SECTION-

SECTION 13211 – WELL DRILLING

PART 1 – GENERAL

1.1 WORK INCLUDED:

- A. This section covers the work, material, and equipment necessary for drilling the well bores, complete.
- B. The CONTRACTOR shall perform a due diligence investigation to determine anticipated subsurface conditions and consider this information in regard to onsite drilling and testing operations and construction activities. This information shall also be factored into the submitted unit costs, as necessary. Submitted unit costs shall be balanced and reflect all costs incurred plus profit to provide the specific service(s) and/or material. Claims for unit cost increase and/or damages related to differing subsurface conditions will not be considered.
- C. Information regarding subsurface conditions is intended to assist the CONTRACTOR in establishing a price for the Work. The OWNER does not guarantee its accuracy or that it is necessarily indicative of conditions to be encountered in drilling the well. The CONTRACTOR shall satisfy himself regarding all local conditions affecting his work by personal investigation and neither the information on local geology, nor that derived from maps or plans nor from the OWNER or his agents or employees shall act to relieve the CONTRACTOR of any responsibility hereunder or from fulfilling any and all of the terms and requirements of the Contract Documents.
- D. The CONTRACTOR shall furnish sound proofing barriers, provide mufflers on equipment, and take whatever other steps necessary during drilling, pumping, testing, and all other work incidental thereto to ensure that noise levels conform to any applicable noise ordinances.
- E. The CONTRACTOR shall take necessary measures to limit access to drilling sites to minimize hazards to the public.

1.2 WORK SEQUENCE

- A. The production and monitoring wells shall be constructed in accordance with the Specifications and as follows:
 - 1. Mobilization shall provide for the assembling of all materials and equipment to the job sites.
 - 2. Remove existing 2-inch diameter PVC shallow monitoring well casing and screen. Remove existing 16-inch diameter, or less than 16-inch diameter, PVC surface or final casing as applicable. The well design will vary on a site-by-site basis, the OWNER has a combination of 16-inch diameter Biscayne aquifer production wells and 2-inch diameter shallow monitoring wells. As requested by the OWNER and ENGINEER, the contractor shall remove the said casing and plug and abandon the monitoring well in accordance with this section and these Specifications.
 - 3. Furnish and install surface casing to a depth determined by the CONTRACTOR.
 - 4. Ream the borehole from the depth of the surface casing to the final casing depth specified by the ENGINEER and OWNER.

5. Perform XY caliper and gamma ray log on reamed hole in accordance with Section 13214 – Geophysical Logging.
6. Furnish, install, and cement outer casing to the depth specified by the ENGINEER and OWNER and grout into place in accordance with Sections 13212 – Well Casing and 13213 –Well Cementing.
7. Ream the pilot borehole from the bottom of the outer casing to the depth specified in the Specifications using the reverse air drilling method unless otherwise approved by the ENGINEER and OWNER.
8. Perform XY caliper log upon completion of reaming the open hole in accordance with Section 13214 – Geophysical Logging.
9. Furnish the ENGINEER and OWNER with grain-size analysis of gravel pack materials.
10. Install stainless steel screen with sump and PVC riser pipe (inner casing) and gravel fill tube assembly and fill the annular space up from the base of the well with gravel pack to a minimum of 20 feet above the base of the outer casing in accordance with Section 13212 – Well Casing.
11. Perform an alignment test on the riser pipe (inner casing) in accordance with Section 13212 – Well Casing.
12. Develop the well by jetting and/or airlift pumping at rates up to 2,000 gpm, or as specified by the ENGINEER and OWNER. It is anticipated a minimum of 200 hours will be required to jet and/or airlift develop the well in accordance with Section 13216 – Water Quality and Well Development.
13. Install a test pump assembly, including settling tank(s), pump and prime mover, discharge line, orifice manometer and totalizing flowmeter, PVC access pipe, and check valve in the pump column in accordance with Section 13216 – Water Quality and Well Development.
14. Develop the well by pump surging at rates up to 4,800 gpm, or as determined by the ENGINEER. It is anticipated a minimum of 200 hours will be required to pump develop the well in accordance with Section 13216 – Water Quality and Well Development. The number of hours shall be approved by the ENGINEER and OWNER prior to commencement, or continuation, of pump development
15. Perform a 10-hour step-rate pumping test at rates varying between 500 and 4,800 gpm, as determined by the ENGINEER and OWNER in accordance with Section 13217 – Pumping Tests.
16. Conduct a constant-rate pumping test on each well at a duration and discharge rate determined by the ENGINEER and OWNER within the range specified above in accordance with Section 13217 – Pumping Tests. Collect and analyze a water sample prior to the end of the test.
17. Complete the well in accordance with the Specifications.
18. Disinfect the well and wellhead and perform bacteriological clearance.

1.3 REMEDIAL WORK

- A. If remedial work proves to be necessary to make a well acceptable and come within the governing regulations and/or Contract Documents because of accident, loss of tools, defective material or for any other cause, the CONTRACTOR shall propose a method of correcting the problem, in writing. Suggested methods shall be reviewed and accepted by the ENGINEER and OWNER before work proceeds. Such work shall be performed at no additional cost to the OWNER, and it shall not extend the length of the Contract. The CONTRACTOR is notified that all requirements of the Contract Documents shall be met, including hole straightness and setting of casings to the points designated by the ENGINEER.

1.4 GUARANTEE

- A. The CONTRACTOR guarantees that the work and service to be performed under the Contract and all workmanship, materials, and equipment performed, furnished, used, or installed in the work shall be free from defects and flaws, and shall be performed and furnished in strict accordance with the Contract Documents; that the strength of all parts of all manufactured equipment shall be adequate and as specified; and that performance test requirements of the Contract Documents shall be fulfilled. The CONTRACTOR shall repair, correct, or replace all damage to the work resulting from failures covered by the guarantee. The guarantee shall remain in effect for one year from the date of final acceptance by the OWNER.

1.5 CALIBRATION DATA

- A. Calibration Data: Calibration records for each measuring instrument used in the construction of the well shall be submitted to the ENGINEER and OWNER for review prior to the installation or use of the instruments. Calibration of instruments shall have been performed within 60 days prior to use in testing. All calibration records shall be submitted to the ENGINEER and OWNER prior to use. The calibration records shall contain the following information:
 - 1. Inclination Tools: Each downhole instrument used in testing the well during construction shall demonstrate calibration acceptable to the ENGINEER and OWNER before use. Where possible, this calibration record shall be included on the output of the test or on the log.

PART 2 – PRODUCTS (NOT USED)

PART 3- EXECUTION

3.1 EQUIPMENT

- A. Provide standard, commercially available rotary type drilling rig with required hook-load capacity and equipment capable of performing mud and reverse-air drilling operations in accordance with API Bulletin D-10.
- B. All equipment shall be in good working condition before drilling operations commence. Operate and maintain all equipment in conformance with manufacturer's specification. The CONTRACTOR shall submit information regarding the equipment and materials planned for use in this project before mobilization.

- C. The CONTRACTOR shall certify that the present hook load/weight capacity of the derrick and draw works meets the original manufacture's specifications or at a minimum 1.5 times the heaviest load anticipated to complete the work.

3.2 ROTARY MUD METHOD DRILLING FLUIDS

- A. The CONTRACTOR shall provide high-yield, fine-grained sodium bentonite (manufactured by Baroid Industrial Drilling Products or equivalent) during mud rotary drilling operations meeting API Spec 13A. The CONTRACTOR shall provide all drilling fluid additives and lost circulation material, as required. Review drilling fluids and potential additives, itemize all products, and include the appropriate material safety data sheet (MSDS) to be used during the course of drilling operations. The CONTRACTOR shall submit these items to the ENGINEER before drilling operations commence.
- B. The CONTRACTOR shall maintain complete control over drilling fluid characteristics during the entire operation of well construction. If proper control of the drilling fluid is not maintained, the CONTRACTOR may be required, at the CONTRACTOR's expense, to retain or employ an experienced, qualified mud engineer on the job during all operations to supervise and maintain drilling fluid characteristics.
- C. Provide an adequate and safe water supply for mixing operations in accordance with State and Local regulations. Supply to the ENGINEER and OWNER in writing documentation identifying the proposed source of water prior to the start of construction, which shall conform to local Department of Health requirements.
- D. All additives shall be approved prior to use by the ENGINEER and OWNER.
- E. The CONTRACTOR shall provide holding tanks for handling the drilling fluid. The CONTRACTOR shall provide adequate protection for the public at all times. Upon completion of the drilling, drilling mud and cuttings from the well shall be removed from the site and disposed of by the CONTRACTOR. The ground surface shall be restored to its original condition.
- F. The use of salt or brine as a method of increasing the mud weight during drilling will not be permitted under any circumstances during the construction of the well. Any materials proposed for drilling must be reviewed and approved by the ENGINEER and OWNER, prior to use.

3.3 REVERSE AIR METHOD DRILLING FLUIDS

- A. Drilling fluid for well construction by the reverse circulation method shall be water. The CONTRACTOR shall ensure that any discharge of turbid water does not occur. At no time will the direct discharge of unsettled water to the surface drainage system or water outfall be allowed.

3.4 TESTING EQUIPMENT AND SAMPLING CONTAINERS

- A. The CONTRACTOR shall provide equipment to manually measure drilling fluid properties including a Marsh Funnel and a fluid density balance.
- B. The CONTRACTOR shall provide 3x5-inch cloth sample bags as manufactured by Forester Supplies or equivalent.
- C. The CONTRACTOR shall provide water sampling containers as acceptable to the ENGINEER and OWNER.

3.5 GENERAL:

- A. The CONTRACTOR selected shall furnish the materials, equipment, and labor to drill the production wells using both mud rotary and reverse-air drilling methods.
- B. Specific tasks not completely described in this Section that are necessary or normally required as part of the work described, or that are necessary or required to make the installation satisfactorily or legally operable, shall be performed by the CONTRACTOR as incidental work without extra cost. The expense of such work shall be included in the applicable unit or lump sum prices for the work described.
- C. The CONTRACTOR shall be required to provide direct and reliable telephone service with the onsite drilling superintendent at all times during drilling, construction, and testing operations. Daily progress reports shall be communicated from the drilling superintendent to the ENGINEER and OWNER. Cellular phone communication is the required method. The CONTRACTOR shall also provide a telephone list of individuals directly involved in the daily progression of work.

3.6 DRILLING

- A. The ENGINEER shall be given at least 72-hour notice with a schedule of activities prior to mobilization. All drilling activities shall be performed during normal working hours as approved by the ENGINEER and OWNER. CONTRACTOR working hours will be site specific, as approved by the OWNER. Conditions may arise when work must continue on a 24-hour basis. This work shall be coordinated with the ENGINEER 48-hours before initiation of the work. No additional compensation shall be afforded the CONTRACTOR for work performed outside normal working hours. The CONTRACTOR shall provide adequate lighting 24-hours before the start of nighttime work activities. Lighting levels shall comply with applicable federal and state regulations.
- B. The selected respondent must be a Water Well Contractor licensed in the State of Florida by a Water Management District (e.g., SFWMD). The CONTRACTOR, in addition to furnishing the services of a skilled and experienced drilling superintendent, shall also furnish a minimum of two competent driller's assistants. The drilling superintendent shall maintain clear and concise reports of all drilling, well construction, and testing operations, as instructed by the ENGINEER and OWNER.
- C. The CONTRACTOR shall drill the boreholes straight and plumb, of the dimensions through each interval and at the approximate location as determined by the ENGINEER and OWNER.
- D. During all pilot-hole drilling employing the mud-rotary method, laminar flow properties around the drill pipe and drill collars are required to minimize erosion resulting in borehole enlargement.
- E. The CONTRACTOR shall take all measures necessary to protect the top portions of the test hole from caving or raveling.
- F. An ENGINEER drilling mud-management program is essential to the proposed drilling program. Mechanical removal of solids from the drilling mud is necessary to reduce the build-up of a thick mud (over-balanced) and formation damage due to high mud invasion. As part of the solids control program, a mud cleaner (e.g., "shale shaker"), and de-silting/de-sanding cones shall be employed. Selection of appropriate screen cloth for the shale shaker shall be in accordance with API RP 13E.

- G. Mud weights (lbs/gal) shall be maintained during mud rotary drilling with mud viscosity determined using a Marsh funnel. Field testing of water-based drilling fluids shall conform to API RP 13B-1. Mud weight and viscosity shall be determined manually a minimum of 3 times daily and shall be recorded as part of the driller's daily log.
 - H. The CONTRACTOR shall prepare the well bore for geophysical logging as outlined in Section 13214 – Geophysical Logging. Borehole preparation shall include but not be limited to:
 - 1. Maintain continuous fluid circulation from the base of the borehole until all drill cuttings are removed.
 - 2. Run drill bit to the bottom of the drilled section, circulate drilling mud in the borehole until uniform, and continue this process until the drill pipe is completely removed from the borehole.
 - 3. The borehole shall be circulated over its entire length a minimum of 2 hours before conducting geophysical logging operations.
 - 4. The drill bit assembly shall be run-in and tripped-out of the borehole in a manner as to reduce swab and surge effects.
 - I. Reaming of the pilot hole shall be done using a stepped-bit reamer with lead bit the same diameter as the pilot-hole and progressively larger diameter bits up to the size required. A full nominal gauge near-bit stabilizer shall be used during reaming operations.
 - J. The CONTRACTOR shall use only drilling fluids and additives specifically recommended by the manufacturer for use in water well drilling operations. The use of cement having thixotropic properties may only be used after being reviewed and approved by the ENGINEER.
 - K. When pilot hole drilling is initiated within a casing or borehole of a larger diameter than the pilot hole drilling bit, the bit shall be centered in the casing or borehole using the reamed hole bottom hole assembly. The bottom hole assembly outer diameter shall be approximately equal to the existing casing or borehole. The centered lead hole shall have a minimum length of 5 feet.
 - L. During drilling, reaming, or other downhole operations within the final casings, the CONTRACTOR shall use rubber protective bumpers or other means to ensure no damage to the final casings occurs.
- 3.7 ALIGNMENT REQUIREMENTS – PLUMBNESS AND ALINGMENT TESTING
- A. Alignment of the well shall be tested by lowering a 40-foot-long section of pipe or a dummy to a depth of 200 feet below the ground surface, or as specified by the ENGINEER. The outside diameter of the pipe or dummy shall be 0.5 inches less than the inside diameter of the casing being tested. If a dummy is used it shall consist of a rigid spindle with a minimum of three cylindrical rings. The rings shall be located one at each end and one in the center of the dummy. The pipe or dummy shall move freely throughout the tested length of casing.
- 3.8 COMPLIANCE WITH GOVERNMENTAL REGULATIONS

- A. The CONTRACTOR shall fully inform themselves of all local ordinances, state and federal laws and regulations, and interpretations of these laws, ordinances and regulations by a governmental body or agency, including but not limited to, the Florida Department of Environmental Protection (FDEP), the Technical Advisory Committee of FDEP, the U.S Environmental Protection Agency (USEPA), the SFWMD, the Broward County Health Department, the Broward County Department of Environmental Resource Management, and applicable County regulations, which in any manner affect the work specified herein.
- B. The CONTRACTOR shall at all times comply with said ordinances, laws and regulations, and protect and indemnify the ENGINEER and their officers and agents against any claim or liability arising from or based on the violation of such laws, ordinances, or regulations. All permits, licenses, and inspection fees necessary for protection and completion of the work shall be secured and paid for by the CONTRACTOR unless otherwise specified.
- C. The CONTRACTOR shall acquire all FDEP or SFWMD, National Pollutant Discharge Elimination System (NPDES), generic surface water discharge permits, and permissions necessary to enter onto the site and perform the work. The CONTRACTOR shall obtain any other local, state, or federal drilling permits or occupational licenses and provide notifications to local municipalities prior to the start of well construction activities.
- D. The CONTRACTOR shall also conform to any local or county ordinances pertaining to noise levels and working hours, etc. to avoid any unnecessary delays. It is not anticipated, but should a delay in the project occur due to permit acquisition, the CONTRACTOR will not receive additional compensation.

3.9 FORMATION SAMPLES AND TESTING

- A. At 10-foot intervals during pilot hole drilling and at changes of formations, the CONTRACTOR shall collect representative cuttings samples in order to provide an indication and classification of geological formations penetrated. The CONTRACTOR shall take two large representative samples of the cuttings from the interval or new formation and shall label and preserve each sample in a sturdy container. All sample containers shall be labeled to indicate well number, date, time, and the exact depth from which the sample was taken. Samples shall be stored in a manner to prevent damage or loss. Two (2) sets of geologic samples should be collected by the CONTRACTOR and stored in cloth sample bags as directed by the ENGINEER.
 - 1. The CONTRACTOR will be responsible for sending, at the direction of the ENGINEER, one complete labeled set of geologic cuttings to:
City of Pompano Water Utilities Department
 - 2. The second complete set of geologic cuttings will be for the ENGINEER and OWNER.
- B. Drill cuttings and drilling fluid shall be removed from the drilling site by the CONTRACTOR by hauling to a FDEP-approved disposal site. The fluid displaced from the borehole during cementing operations shall be considered excess drilling fluid and shall be disposed of in the accepted manner. It shall be the CONTRACTOR's responsibility to obtain FDEP approval for the proposed disposal site, and to submit to the ENGINEER notice of FDEP approval prior to commencing work.

- C. The CONTRACTOR shall provide the ENGINEER and OWNER safe and unobstructed access to collect the formation samples. If the reverse-air circulation drilling method is used, the ENGINEER and OWNER shall collect water quality samples every 30 feet (average length of drill rod). A reasonable amount of time (approximately 5 to 10 minutes) shall be given to the ENGINEER to measure certain water quality parameters from the reverse-air samples. The CONTRACTOR shall accommodate the ENGINEER and OWNER in retrieving representative samples, including but not limited to, moderating drill rates and circulation times as necessary.
- D. The ENGINEER representative reserves the right to evaluate the safety of the sample collection site and shall have the authority to stop drilling operations until the safety concerns are addressed and met.

3.10 DRILLING AND WELL LOGS

- A. The CONTRACTOR shall maintain a detailed daily log of his operations during the construction of the production wells. The log shall be on IADC (International Association of Drilling Contractors) Forms or equal as approved by the ENGINEER and OWNER, and shall provide a brief and accurate description of the following: geologic materials and depths encountered, depths of lost circulation zone(s) and methods of regaining circulation, drilling rate, time, depth, description of any unusual occurrences or problems during drilling, diameters and lengths of casing installed, complete record of drilling fluids added, mud weights and viscosities, cementing operations, geophysical logs runs, repair time and any other work performed at the site. The CONTRACTOR shall keep the log up to date with the progress of drilling. Failure to keep this record up to date (maximum 48 hours from occurrence) shall be grounds for the ENGINEER and OWNER to stop drilling operations.
- B. Prepare a final well log that includes borehole diameters, depth of the borehole and casing seats, casing diameter and wall thickness, cemented zones and cement pumping summary, amount of sand removed during development and any/all information pertinent to well construction and testing activities.
- C. The CONTRACTOR must submit copies of daily logs to the ENGINEER and OWNER on a weekly basis. Additional copies of the daily logs shall be submitted with each request for partial payment as a condition of payment.

3.11 DRILLING FLUID AND WATER DISPOSAL

- A. The drilling will be accomplished using circulation systems designed and constructed so that under no conditions shall there be an overflow. The CONTRACTOR is required to take all necessary steps to prevent accidental spillages from occurring. Above ground, leak proof, steel, or fiberglass drilling fluid storage tanks shall be used during closed circulation mud rotary drilling operations. Tanks for the circulation system shall be constructed of steel or fiberglass and be leak-proof. Before mobilization, the CONTRACTOR shall submit design Specifications of the mud circulation system. The circulation system shall be capable of storing no less than 3,500 cubic feet (~25,000 gallons) of fluid and cuttings.
- B. During closed circulation mud rotary drilling, no discharge of drilling fluid shall be allowed at the drill site. Spent drilling fluids used during mud rotary drilling operations shall be disposed of by hauling the solid and liquid phases to a predetermined FDEP- approved disposal site provided by the CONTRACTOR.

- C. During reverse air closed circulation drilling, the drilling fluid shall be compressed air and water. Bentonite or other materials shall not be utilized without approval by the ENGINEER. If utilization of these materials is necessary due to lost circulation or other drilling problems that may arise, the CONTRACTOR shall submit the procedure to the ENGINEER and OWNER for review. Adequate fluid tanks shall be employed by the CONTRACTOR to settle out drill cuttings and to ensure that a minimum of silt and clay is returned to the drill hole.

3.12 WELL DISINFECTION

- A. The CONTRACTOR shall provide for disinfection of the well immediately after test pumping of the well has been completed and following installation of the final production pump and wellhead. The CONTRACTOR shall carry out adequate cleaning procedures immediately preceding disinfection where evidence indicates that normal well construction and development work have not adequately cleaned the well. All oil, soil, and other materials, which could harbor and protect bacteria from disinfectants, shall be removed from the well. All labor, sampling, testing, and re-testing services shall be the CONTRACTOR's responsibility without additional cost to the ENGINEER and OWNER.
- B. Disinfection of the well shall be performed in accordance with the requirements of ANSI/AWWA C654, except as modified herein. Chlorine or other compounds approved by the State or local regulatory agencies shall be used as disinfectants. The method of chlorination to be used shall consist of (1) treating the water in the well casing to provide a chlorine residual of approximately 50 mg/L or as directed by the ENGINEER and OWNER; (2) circulating the chlorinated water within the well casing and pump column; and (3) pumping the well to waste to remove chlorinated water. The quantity of chlorine compounds required to produce a chlorine residual of 50 mg/L may be calculated by multiplying the appropriate quantity shown in ANSI/AWWA C654, Appendix A, Table A.1 by the appropriate factor. A reducing agent such as sodium bisulfite shall be applied to the chlorinated discharge water to thoroughly neutralize the chlorine residual remaining in the water, prior to disposal. The CONTRACTOR shall make provisions for disposal of chlorinated water in accordance with applicable environmental regulations. All labor, sampling, testing, and re-testing services shall be the CONTRACTOR's responsibility without additional cost to the ENGINEER and OWNER.
- C. **Bacteriological Clearance:** The CONTRACTOR shall be required to perform all post-disinfection sampling and analyses necessary to obtain a release for each well from the Broward County Health Department. The CONTRACTOR shall be responsible for compliance with all applicable regulatory requirements including 20 consecutive days of bacteriological testing. In the event a well does not satisfy the conditions for the bacteriological testing, the CONTRACTOR shall be required to repeat the 20-day test until the well is released for service from the Broward County Health Department. All labor, sampling, testing, and re-testing services shall be the CONTRACTOR's responsibility without additional cost to the ENGINEER and OWNER.

3.13 Monitoring Well Abandonment

The monitoring well abandonment work shall be performed by a licensed Florida water well contractor with equipment that is adequate to complete all phases of well abandonment. All well abandonment activities shall be performed in accordance with FDEP, Broward County Health Department, and SFWMD regulations and requirements and AWWA procedures. The Contractor shall obtain an abandonment permit from the Broward County Health Department prior to performing the abandonment and submit a well completion report following the abandonment.

Sealing Material: The sealing material, commonly referred to as grout, shall be neat cement with 5 percent bentonite powder (by weight of cement). The neat cement grout shall be composed of one sack of Type II Portland cement (94 pounds) conforming to ASTM C-150 and SFWMD Rules Chapter 40E-3 F.A.C., 4.7 pounds of bentonite and 5 to 9 gallons of potable water to produce the slurry mixture capable of effectively sealing the wells. Grout shall be placed in the production well above the sand seal.

Grouting Method: Tremie pipe shall be used to positively displace cement in the test well. The tremie pipe used for the monitoring well abandonment shall be a minimum 1.5-inch Schedule 40 threaded and coupled or flush threaded steel pipe. The CONTRACTOR shall furnish a grout mixer capable of mixing the volume of grout required to assure continuous grouting operations. The grout mixer shall have sufficient agitation by means of paddles or jetting of fluid to create a homogeneous mix of the cement, bentonite, and clear water. The CONTRACTOR shall furnish a grout pump capable of providing sufficient pressure to overcome tremie pipe friction losses, fill the well intervals with grout, and displace any fluids in the well.

Water Source: The CONTRACTOR shall make all necessary provisions for conveying potable water to the wellsite for use during the abandonment operation. The OWNER shall provide the CONTRACTOR with the necessary amount of potable water for completion of the WORK. The CONTRACTOR shall be responsible for transporting the water from the OWNER's treatment plant to the well site. All transportation costs shall be included in the CONTRACTOR's bid.

A minimum 1.5-inch steel tremie pipe shall be placed in the well to within two feet of the top of the sand pack, or as approved by the ENGINEER and OWNER. The cement grout shall be pumped through the tremie pipe filling the well to the top and displacing any fluids within the well. The grouting operation shall be conducted at the pressure required to overcome friction losses in the tremie pipe and well casing string and raise the grout level to the surface. The tremie pipe shall be raised as the continuous grouting operation proceeds and grout appears at the surface. The CONTRACTOR shall verify that the well is properly filled by pumping the full well casing volume, minus gravel and sand packed volumes, with grout. Additional grout mix shall be prepared and available if needed. The cement grout shall be allowed to set for minimum of 12 hours prior to the continuation of abandonment activities.

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SECTION 13212 – WELL CASING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Commercial Standards: All work specified herein shall conform to or exceed the requirements of the applicable codes and standards relating to the referenced portions of the following documents only to the extent that the requirements therein are not in conflict with the provisions of this section. Where such documents have been adopted as a code or ordinance by the public agency having jurisdiction, such a code or ordinance shall take precedence.
- B. State Standards: SFWMD and FDEP Rules and Regulations for Water Wells in the Florida Administrative Code (FAC).
- C. Commercial Standards:
 - ANSI/ASTM A139 Specification for Electric-Fusion (Arc)-Welded Steel Pipe (sizes 4-inch diameter and over).
 - ANSI/AWS D1.1 Structural Welding Code – Steel.
 - ASTM A 53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - API 5L Specification for Line Pipe.
 - ASTMD1784 Specification for Rigid PVC Compounds and Chlorinated PVC Compounds.
 - ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
 - ASTM D2996 Standard Specification for Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
 - ASTM F480 Specification for Thermoplastic Well Casing Pipe and Couplings Made in Standard Dimension Ratios (SDR), SCH 40, and SCH 80.
 - AWWA A100 Standard for Water Wells.
 - AWWA C206 Field Welding of Steel Water Pipe.
 - API Spec. 10D Specification for Bow-Spring Casing Centralizers.

1.2 CONTRACTOR SUBMITTALS

- A. General: All CONTRACTOR submittals shall conform to the applicable requirements of Section 01300 - Contractor Submittals, and the supplementary requirements specified. Each item listed below shall be submitted to the ENGINEER and OWNER with a clear explanation or depiction of why or how the requirements, as listed, will be fulfilled by the products or services provided by the CONTRACTOR. This list is not considered all-inclusive and may be extended by the OWNER, ENGINEER, or CONTRACTOR.
- B. Subcontractor's List: The CONTRACTOR shall submit a complete list of all proposed subcontractors to be used in the work. The CONTRACTOR may be required to submit additional information or a resume of qualifications for any of the subcontractors proposed.

1. Welders: Prior to the start of work, the CONTRACTOR shall submit a list of the welders it proposes to use during well construction and the type of welding for which each has been qualified, along with current certification documents for each welder listed.
 - a. All welders and welding operators shall be qualified at the CONTRACTOR's sole expense by a qualified testing laboratory before performing any welding under this section. Qualification tests shall be in accordance with Section IX, Article III of the ASME Boiler and Pressure Vessel Code. Welders and operators shall be qualified for making groove welds in carbon steel pipe in position 6G for each welding process to be used.
 - b. Qualification tests may be waived if evidence of prior qualification is approved by the ENGINEER and OWNER. CONTRACTOR shall retest any welders at any time ENGINEER considers the quality of the welder's work substandard. When the ENGINEER requests the retest of a previously qualified welder, the labor costs for the retest will be at the OWNER's expense if the welder successfully passes the test. If the welder fails the retest, all costs shall be at the CONTRACTOR's expense.
- C. Mill Certificates: Casing mill certificates shall be submitted to the ENGINEER and OWNER for all casings at least one week prior to the installation of the casing. Heat numbers on casing joints shall be readily visible and legible or the casing will not be accepted by the ENGINEER and OWNER.
- D. Provide manufacturer's specifications and technical data on all screens and gravel to be provided for well construction.
- E. Provide grain size distribution data on gravel pack and a 16-ounce sample prior to use.
- F. Provide shop drawings showing screen/PVC casing transition coupling.
- G. Fittings: Provide all fittings; drive shoe and centering guides as specified or as necessary to complete the well.
- H. Operations: The CONTRACTOR shall submit for the ENGINEER's approval plans for cementing operation and casing installation at least 72 hours prior to commencing work on those operations. These plans shall include the following information:
 1. Casing Installation: Tabulation of casing on site and the length of each section, weight of each joint, cumulative string weight, order of installation of casing sections, and locations of centralizers and casing tabs.

PART 2 -- PRODUCTS

2.1 CASING:

- A. Surface (Pit) Casing: The CONTRACTOR shall furnish pit casing at the well site to isolate surficial deposits from the borehole and to prevent collapse of the drilled hole. Pit casing setting depth is to be selected by the CONTRACTOR but shall not be less than 30 feet in depth. The final depth and diameter of the pit casing is at the discretion of the CONTRACTOR. The casing shall be factory assembled in not less than 20-foot lengths. The ends of each joint shall be machine beveled perpendicular to the casing axis to ensure

straightness of each assembled section. Casing joints shall be welded in accordance with ANSI/AWS D1.1. All casing material shall be new. No used or rusted casing will be accepted.

- B. Steel Casing: Steel casing shall meet the requirements of ASTM A53 Grade B or ASTM A139. Steel casing shall be factory assembled in not less than 20-foot lengths. Wall thickness shall be a minimum of 0.375-inches. The ends of each joint shall be machine beveled to ensure straightness of each assembled section. Casing joints shall be welded in accordance with ANSI/AWS D1.1. All casing material shall be new. No used or rusted casing will be accepted.
- C. Outer Casing: The outer casing shall be SCH 40 PVC or SDR 17 pipe manufactured from a Type I, Grade I Polyvinyl Chloride compound having a minimum cell classification of 12454 per ASTM D1784. All casings shall be clearly marked with type, grade, and manufacturer. The casing shall be factory assembled in not less than 20-foot lengths. A solvent, approved by the NSF for use in water wells, shall be used to connect casing joints. Each casing joint shall be reinforced with eight stainless steel screws penetrating both parts of the coupling without protruding into the interior of the pipe. The casing must be shown to have sufficient joint and tensile strength, internal pressure rating, resistance to collapse, and ability to withstand all stresses of construction. All casing material shall be new and unused and approved the ENGINEER and OWNER prior to ordering and executing the installation.
- D. 316 Stainless Steel Slot Screen: Continuous wire-wound slot well screen shall be all-welded construction, as manufactured by Johnson Screens, or equal. Triangularly shaped wire shall be helically wound around an array of equally spaced longitudinal rods and welded at each point of intersection. The inlet slot openings between adjacent turns of the outer wire shall widen inwardly so as to be non-clogging. Screen end fittings shall be made of the same material as the screen body and shall be securely welded to each screen section. The well screen and its fittings shall be fabricated from Type 316 stainless steel and shall meet the requirements of ASTM A312. The bottom-most screen shall be manufactured with up to a 5-foot stainless steel tight-wound, zero slot screen or blank casing and a welded bottom plate. The manufacturer's recommended method for connecting the PVC inner casing pipe to stainless steel well screen shall be provided by the CONTRACTOR to the ENGINEER for approval prior to installation. The ENGINEER will provide a recommended screen slot size based upon the results of prior drilling activities, testing, and laboratory results.

- E. Riser pipe (inner casing): The riser pipe shall be SCH 40 PVC or SDR 17 PVC pipe by CertainTeed Corporation or equivalent, manufactured from a Type I, Grade I Polyvinyl Chloride compound having a minimum cell classification of 12454 per ASTM D1784 and shall meet the requirements of ASTM F480. The casing shall be factory assembled in not less than 20-foot lengths. The riser casing will be securely connected to the stainless-steel screen by a method approved by the screen manufacturer and the ENGINEER and OWNER. The CONTRACTOR is responsible for the intact placement of the screen and riser pipe to the depth specified by the ENGINEER and OWNER.
- F. Butt Welded PVC: Butt Welding the inner casing may be required if a well is being rehabilitated, as approved by the ENGINEER. This process will vary from each site, as approved by the ENGINEER. The heating element planned to be used shall be submitted to the ENGINEER for approval. The temperature shall be controlled and meet all manufacturer requirements. The CONTRACTOR shall provide the necessary calculations, based on casing thickness, to use for durations when applying heat, amount of time required when welding, and pressure to connect casing joints. The CONTRACTOR shall submit an installation plan for approval by the ENGINEER prior to installing the casing.
- G. Centralizers: Casing centralizers shall be fitted on all casing using Halliburton Company, Kwik-ZIP, or equal centralizers with straps at 0, 90, 180, and 270 degrees around the casing at each position or as approved by the ENGINEER and OWNER

2.2 GRAVEL PACK:

- A. Gravel for the stabilizing pack shall be hard, well rounded, water-worn gravels washed clean of silt, dirt and foreign matter; crushed rock will not be accepted. A sample and sieve analysis of gravel packing materials to be delivered to the Site must be submitted to the ENGINEER for review and acceptance at least 7 Days prior to anticipated placement of the material in the well annulus. A Certified Testing Laboratory shall submit a sieve analysis to verify conformance with the approved sample. Failure to meet gradation of approved sample shall be grounds for rejection of the material. The gravel, if stockpiled at the well, shall be kept free of foreign matter. The gravel size specification will be specified by the ENGINEER for each site.

PART 3 -- EXECUTION

3.1 GENERAL

- A. The work shall be performed by a competent crew with equipment that is adequate to complete all phases of well construction.
- B. The depths and lengths for casings shall be as indicated unless otherwise determined by the ENGINEER. Payment will be based on actual quantities furnished, installed, or constructed, in accordance with the schedule of values.
- C. All work required to be repeated, resulting from the CONTRACTOR's performance, or lack thereof, including all additional materials, labor and equipment required, shall be furnished at the expense of the CONTRACTOR and no claim for additional compensation shall be made or be allowed therefore, except as specifically provided herein.

3.2 CASING

- A. Equipment Use: Reaming and setting of casing shall be done with the same equipment and no resetting of equipment will be allowed after the hole is reamed.
- B. Casing Installation: When the reaming operation has been completed, casing will be installed. The lengths and intervals of each casing type, except for the pit casing, will be determined by the ENGINEER. The casing installation method will be consistent with the manufacturer's specifications and approved by the ENGINEER and OWNER.
- C. Tension: The casing shall be suspended in tension from the surface. The bottom of the casing shall be at a sufficient distance above the bottom of the reamed hole as to ensure that none of the casing will be supported from the bottom of the hole. The casings shall be lowered into the borehole open-ended, and the weight of the casing shall be supported by the drilling rig. The hook load of the drilling rig must exceed the maximum casing weight to be encountered during the construction of the well.
- D. Butt Welded PVC: The heating element used shall be kept very clean and shall be PTFE-coated stainless steel to prevent sticking of the PVC to the element. The temperature shall be controlled and meet all the manufacturer requirements. The edges of the casing to be welded should be as square as possible so that they will contact the heating element evenly. Solvents should not be used to clean the surfaces to be welded. The CONTRACTOR shall provide the necessary calculations, based on casing thickness, to use for durations when applying heat, time, and pressure to connect casing joints. The CONTRACTOR shall submit an installation plan for approval by the ENGINEER and OWNER prior to installing the casing.
- E. Failure to Complete: If the casing cannot be landed in the correct position or at a depth acceptable to the ENGINEER and OWNER, the CONTRACTOR shall construct another well immediately adjacent to the original location and complete this well in accordance with the Contract Documents at no additional cost to the OWNER. The abandoned hole shall be sealed in accordance with all State of Florida regulations.
- F. Collapsed Casing: If the casing or screen should collapse for any reason prior to well completion, it shall be withdrawn and replaced at the CONTRACTOR's expense.
- G. Casing Connections: Shall meet manufacturer specifications for water tightness. Connections shall have equal strength as the casing itself.

- H. Centralizers: Centralizers shall be attached to steel casing with steel straps made of the same material as the casing. Centralizers shall be attached to PVC using Kwik-ZIP Centralizers, or equal as approved by the ENGINEER. Casing centralizers shall meet the requirements of API Specification 10D. Centralizer material shall be non-ferrous and will not be attached by drilled into the casing. No ferrous materials will be used for attachment. All centralizer groups shall be vertically aligned one above the other in order to permit the passage of tremie pipes alongside the casing to the bottom of the borehole.
1. Centralizers: Centralizer groups will be placed as follows:
 - a. One group at the bottom end of the casing – placed 5 feet above the bottom of the screen.
 - b. One group across the first welded joint.
 - c. One group within 30 feet of the surface.
 - d. One group every 30 feet.
- I. Plumbness and Alignment: If the ENGINEER and OWNER has reason to believe that the casing installation is suspect, the CONTRACTOR shall perform plumbness and alignment tests prior to acceptance of the well. The testing shall be performed in accordance with AWWA A100.
1. The CONTRACTOR shall test plumbness of the casing by centering a plummet in the top of the casing and lowering the plummet into the casing. The length of the plummet shall be 1.25 times the inside diameter of the final casing and have a minimum outside diameter 0.5 inches smaller than the inside diameter of the casing. The plummet shall be lowered in 10-foot increments and the direction and amount of movement of the cable shall be measured at each stage using a template resting on top of the casing. The maximum allowable deviation from vertical shall be not more than 0.5 of 1 degree within the casing at any depth.
 2. Alignment of the well shall be tested by lowering a 40-foot-long section of pipe or a dummy to a depth of 100 feet below the ground surface. The outside diameter of the pipe or dummy shall be 0.5 inches less than the inside diameter of the casing being tested. If a dummy is used it shall consist of a rigid spindle with a minimum of three cylindrical rings, each ring shall be a minimum of 0.5 inches less than the casing inside diameter. The rings shall be located one at each end and one in the center of the dummy. The pipe or dummy shall move freely throughout the tested length of casing.

3.3 WELDING

- A. General: The standards of the American Welding Society, Structural Welding Code (AWS D1.1) shall apply for all welded joint casing and accessories. All welds shall conform to the latest revision of ANSI B31.1.
- B. Certification: All welded casing joints shall be made by welders certified in the State of Florida. The certified welder shall perform and be responsible for the integrity of all steel casing welds. The CONTRACTOR must provide the ENGINEER and OWNER proof of welders' certifications 72 hours before any welding is performed
- C. Surface Preparation: Any surface defects that shall affect the weld shall be chipped or ground out. A power-driven wire brush shall be used to thoroughly clean each layer of weld prior to each additional weld metal, including the final pass.
- D. Passes: There shall be a minimum of three (3) weld passes on pipe sizes 6-inches and greater.

- E. Cooling Time: Welded joints shall be allowed to cool for not less than 30 minutes before the weld is placed in contact with water or until the welded joint reaches a temperature equal to or less than 400 degrees Fahrenheit.
- F. Weld Reinforcement: Weld reinforcement shall be as specified by the AWS code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions.
- G. Field Joints: All field joints shall be welded during installation by qualified welders in accordance with the requirements of AWWA C206.

3.4 PREPARATION OF CASING

- A. The CONTRACTOR shall transport, store and handle all well casing in accordance with API Recommended Practice RP 5C1.
- B. The CONTRACTOR shall physically measure and label each section of casing to ensure proper depth control. The CONTRACTOR shall measure both ends of each section of casing to ensure the casing is not out-of-round. At least two measurements, 90 degrees to each other across the ends of each section of casing will be used to verify casing roundness. Casing with deviations greater than 0.25 inches will be deemed defective. All pipe measurement will be considered part of the driller's daily logs that must be submitted for partial payment related to footage of casing installed.
- C. Pipe ends shall be prepared preferably by machine shaping. Beveled ends for butt welding shall conform to ANSI B16.25.
- D. The pipe shall be clean and free of paint, oil, rust, scale, slag, or other material detrimental to welds and cement bonds. Casing that will not yield an acceptable cement bond as determined by the ENGINEER and OWNER representative shall be sandblasted at the CONTRACTOR'S expense.
- E. All casing shall be inspected for damage, if damaged the section of pipe will be disallowed for use. Thread compound, thread tape, and/or splines supplied by the manufacturer or equal is required when joining individual sections of PVC.

3.5 ALIGNMENT AND SPACING

- A. The CONTRACTOR shall align pipe ends to be joined within commercial tolerance limits on diameters, wall thickness, and out-of-roundness.
- B. The CONTRACTOR shall demonstrate that the installed casing is free hanging and can be easily rotated and reciprocated prior to grouting operations.
- C. Centralizers shall be secured to the casing in manner to prevent vertical or rotational movement on the pipe during grouting.

3.6 GRAVEL PACK INSTALLATION

- A. Prior to commencing rehabilitation activities in a screen and gravel-pack well, the CONTRACTOR shall measure the depth to the top of the gravel pack. If enough

access is available, the CONTRACTOR shall hard tag the top of gravel pack. The CONTRACTOR shall report the depth to the OWNER.

- B. If directed by the OWNER, the CONTRACTOR shall furnish and install additional gravel pack in the annulus by the tremie method. The type of gravel pack shall be determined by the ENGINEER and OWNER, and the supplier location of the gravel will be available within the State of Florida. Gravel pack material shall be a minimum of 95% silica, or as approved by the ENGINEER, sorted and graded so that there is 90% retention on the well screens installed.
- C. The gravel pack size and sieve analyses shall be approved by the ENGINEER and OWNER. Sieve analyses shall be performed by a certified laboratory. If a specific size is not provided by the OWNER, the CONTRACTOR shall provide gravel of size and grade used for original well construction. Other gravel specifications will be provided for each project/site.
- D. Gravel pack depths shall be checked a minimum of twice daily during rehabilitation activities. If gravel pack depths are within 10 feet of the top of the screen, a minimum of 5 linear feet of gravel pack shall be installed by the tremie method. After gravel placement, additional gravel may be required during development or other well construction procedures. Placement of additional gravel shall be performed as outlined above with no further measurable settlement of the gravel pack or as determined by the OWNER.
- E. Gravel, as specified, shall be installed in the annular space between the outer casing and riser pipe through a construction tremie pipe. The use of a gravel pump will not be required. Filter pack gravel shall be carefully installed to ensure complete filling of the annular space from the bottom of the hole to a minimum of 20 feet above the base of the outer casing or as specified by the ENGINEER. During gravel placement, the free fall distance between the gravel in place and the lower end of the construction tremie shall not exceed 20 feet.
- F. During the entire gravel packing operation, clean water shall be circulated through the screen and up the annular space outside of the casing. After the gravel has been placed, a swab shall be carefully worked opposite the entire screened interval while circulating with clean water. As the gravel settles, more shall be added. This operation shall be continued until there is no further measurable settlement of the gravel, and the gravel has been washed clean. Payment for consolidating the gravel pack by swabbing shall be included in the Bid Schedule unit price for gravel pack installation.
- G. Upon completion of this operation, and after removal of the swab, all rock, sand and foreign materials shall be removed from the casing, and the annulus shall be refilled with gravel up to a minimum of 20 feet above the base of the outer casing or as specified by the ENGINEER and OWNER.
- H. The volume of gravel used should be not less than the calculated volume of the annular space between the casing and the wall of the borehole as determined by the ENGINEER. The CONTRACTOR shall supply the devices required for measuring the gravel.

- END OF SECTION -

SECTION 13213 – WELL CEMENTING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Commercial Standards: All work specified herein shall conform to or exceed the requirements of the applicable codes and standards relating to the referenced portions of the following documents only to the extent that the requirements therein are not in conflict with the provisions of this section. Where such documents have been adopted as a code or ordinance by the public agency having jurisdiction, such a code or ordinance shall take precedence.
- B. State Standards: SFWMD and FDEP Rules and Regulations for Water Wells in the Florida Administrative Code (FAC).
- C. Commercial Standards:
 - ASTM C150 Specification for Portland Cement.
 - AWWA A100 Standard for Water Wells.
- D. The cost of cement, bentonite, and pumping equipment shall be paid at the unit price per cubic foot as stated in the bid schedule forms. This unit price shall include all necessary equipment, materials, and subcontracted services required to properly cement the casing as specified in this section.

1.2 CONTRACTOR SUBMITTALS

- A. General: All CONTRACTOR submittals shall conform to the applicable requirements of Section 01300 - Contractor Submittals, and the supplementary requirements specified. Each item listed in Section 01300 - Contractor Submittals shall be submitted to the ENGINEER with a clear explanation or depiction of why or how the requirements, as listed, will be fulfilled by the products or services provided by the CONTRACTOR. This list is not considered all-inclusive and may be extended by the OWNER, ENGINEER, or CONTRACTOR.
- B. Subcontractor's List: The CONTRACTOR shall submit a complete list of all proposed subcontractors to be used in the work. The CONTRACTOR may be required to submit additional information or a resume of qualifications for any of the subcontractors proposed.
 - 1. Specialty Cementing Contractor: In all cementing operations, the CONTRACTOR shall be assisted by a specialty subcontractor familiar with cementing the type of formations typically utilized for the work as specified in these Contract Documents and Technical Specifications. The CONTRACTOR will utilize the services of a company such as Halliburton Services, or equivalent, unless he can demonstrate previous experience and expertise in performing such operations on at least three equal or larger casing cementing projects in the past 5 years.
- C. Cement: Samples of cement shall be collected during the cementation of all casings, with the CONTRACTOR collecting dry and mixed samples of the cement being used. Mixed cement samples shall include at least three (3) 2-inch square cubes suitable for tests of compressive strength.

1. Grout samples shall be collected a minimum of three (3) times during each cement stage: Prior to pumping, at the middle, and at the end of the stage. The specified slurry density shall match the specified slurry density indicated on the delivery certificate.
 2. Only 2-inch square cubes, suitable for tests of compressive strength, will be acceptable as representative cement samples.
 3. Bentonite and other additives may be mixed with the sealing material to speed setting time or to expand the material as approved by the ENGINEER.
- D. Operations: The CONTRACTOR shall submit for the ENGINEER's approval plans for cementing operation and casing installation at least 72 hours prior to commencing work on those operations. These plans shall include the following information: top and bottom of each interval to be cemented, pre-flush and spacer, composition of cement to be used in each interval and volume to be pumped, method of emplacement of cement, expected fill-up, expected pressures, and any additives to be used.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. The CONTRACTOR shall provide all materials and equipment necessary for placing cement grout in the well annulus.
- B. The CONTRACTOR, or his Subcontractor, shall be responsible for calculating cement volumes prior to and following grouting operations. The ENGINEER shall review methods and volumes prior to commencement of pumping cement grout.

2.2 PORTLAND CEMENT

- A. Material used for sealing the casing shall consist of a neat cement grout using Type II Portland cement conforming to ASTM C 150. Neat cement grout shall contain not more than 5.2 gallons of water per 94 pound sack of cement.

2.3 BENTONITE AND OTHER ADDITIVES

- A. Additives may be mixed with the sealing material to speed setting time or to expand the material as approved by the ENGINEER. They shall not exceed the following:
 1. Not more than 2 percent, by weight, calcium chloride.
 2. Not more than 6 percent, by weight, bentonite.
 3. Other additives as approved by the ENGINEER.

- B. Provide all high-yield, fine-grained sodium bentonite (manufactured by Baroid Industrial Drilling Products or equivalent) as required for cementing in the proportions specified and directed by the ENGINEER. The cement grout shall not exceed 6 percent, by weight, bentonite and should be considered as part of the cement unit cost.
- C. Provide other cementing additives specifically formulated for use in water well cementing as required by the ENGINEER. Material Data Safety Sheet shall be provided to the ENGINEER for any proposed cement additives before the start of construction. Cement additives should be considered as part of the cement unit cost.

2.4 MIXING WATER

- A. Provide an adequate and safe water supply for cementing operations in accordance with State regulations. Supply the ENGINEER in writing identifying the proposed source of water prior to the start of construction.

2.5 THIXOTROPIC CEMENT

- A. Thixotropic cement may be required by the ENGINEER to bridge lost circulation horizons as a result of secondary permeability and porosity development, as required. This potential cost shall be considered part of unit cost for ASTM Type II cement.
- B. Thixotropic cement formulations (e.g., Material Data Safety Sheet) shall be provided to the ENGINEER for approval and shall have a minimum yield of 2.59 cubic feet per sack.

2.6 SAND – LIMESTONE GRAVEL

- A. Provide and install silica sand in the borehole using the tremie method. The size, amount and placement of sand shall be determined by the ENGINEER. Material shall be 6/20 silica sand, be well graded, and free of deleterious material.
- B. Provide and install limestone gravel in the borehole using the tremie method. The amount and placement of the limestone gravel shall be determined by the ENGINEER. Material shall be 1/4 to 3/8-inch in diameter, well sorted, and free of deleterious material.

2.7 MONITORING EQUIPMENT

- A. Provide a pressurized mud scale for manual measurements.

PART 3 -- EXECUTION

3.1 GENERAL

- A. The work shall be performed by a competent crew with equipment that is adequate to complete all phases of well construction.
- B. The depths and lengths for casings shall be as shown in the drawings unless otherwise determined by the ENGINEER. Payment will be based on actual quantities furnished, installed, or constructed, in accordance with the schedule of values.

- C. All work required to be repeated, resulting from the CONTRACTOR's performance, or lack thereof, including all additional materials, labor, and equipment required, shall be furnished at the expense of the CONTRACTOR and no claim for additional compensation shall be made or be allowed therefore, except as specifically provided herein.

3.2 CEMENTING OF CASING

- A. It is the CONTRACTOR's responsibility to conduct the cementing operations in such a manner that the burst or collapse strengths of the casing (with safety factor of 1.5) are not exceeded, and the casing is not caused to fail. Cement will be pumped or placed so that the pressure of the slurry and the pressure applied inside the casing pipe do not affect the bond.
- B. Cement grouting operations shall be done in the presence of the ENGINEER. Full access to all cementing equipment and gauges shall be provided to the ENGINEER representative by the CONTRACTOR before, during, and after pumping operations.
- C. Pressure grouting is the required initial method for each casing, followed by tremie grouting in stages, if the initial cement stage does not cause cement returns at land surface.
- D. A pressure-tight bulkhead is to be maintained on the casing being cemented during pressure cementing. The CONTRACTOR will be responsible for adding or releasing water from the casing to maintain required pressure. Minimum setting time between stages is 8 hours, if more than one stage is required. The well shall remain undisturbed for at least 24-hours after cementing on casing is complete.
- E. Grout slurry placed by the tremie method shall use collarless, minimum 1.25-inch diameter steel hydril tubing having an inside diameter of 1.0 inch or greater. Grout pipe shall be withdrawn as the annulus is filled, and before the cement begins to set. Grout pipes shall be set not more than 5 feet above the top of the previous cement stage. Other methods and materials may be used; however, a plan must be submitted with final approval by the ENGINEER.
- F. The first stage, and/or a minimum of 100 feet of annular fill, of cement pumped into the annulus around the base of the well casing shall consist of neat cement slurry.
- G. During the pumping of each cement stage, the CONTRACTOR shall be responsible for determining the density of a minimum of three grout samples. Grout samples shall be taken before pumping, at the midpoint, and near the end of each stage. The ENGINEER reserves the right to disallow any cement grout not meeting these minimum specifications.
- H. During the pumping of each cement stage, the CONTRACTOR shall utilize the monitoring equipment required in 2.7(A) of this section. Measurements of cement weight shall be provided to the ENGINEER at frequent intervals prior to and during cementing operations using either a densometer or mud scale.

- I. During the pumping of each cement stage, the CONTRACTOR shall supply a secondary means of measuring/infering cement volumes installed. This may include one or more of the following:
 - 1. Functional and accurate (calibrated) barrel counter readings with onsite verification,
 - 2. Before and after physical weight measurements of the bulk cement hopper at a certified weight station or copy of shipping manifest,
 - 3. Accurate volume measurement of displaced fluids from the annulus.
- J. It shall be solely the CONTRACTOR'S responsibility to protect against casing collapse during grouting. Any collapsed casing shall be removed and replaced at the CONTRACTOR'S own expense. Cement shall be pumped or placed so that excessive pressures and heat build-ups shall not result. Should the CONTRACTOR fail to correct any defects, the ENGINEER may refuse to accept the well.
- K. The CONTRACTOR shall exercise extreme caution to prevent the collapse of casing during cementing operations. During and 8 hours following the placement of cement, a pressure of 100 psi shall be maintained in the casing. The heating and cooling of the cement may require water to be added or released from the casing to maintain the required internal casing pressure.
- L. Either the cement pumping summary sheets or a complete written summary of the information pertaining to the cementing operation must be submitted to the ENGINEER by the cementing specialty contractor immediately following cement pumping. If cement pumping sheets are not submitted before the cement contractor leaves the site, the CONTRACTOR shall not be paid for the individual cementing job.
- M. If the ENGINEER has reason to believe that the casing cementing is suspect, a cement bond log may be required to identify if good bonding between the casing, cement, and formation is obtained. If the bond is unacceptable, remedial work shall be performed to the satisfaction of the ENGINEER. In addition, the ENGINEER may request additional temperature, gamma, or cement bond logs to evaluate the effectiveness of any remedial grout work performed. These operations shall be conducted at the CONTRACTOR's own expense.
- N. Grout shall be placed into the annular space using the pressure grouting technique. The grout shall be pumped under pressure from the bottom of the casing. In the event the borehole collapses prior to placement of the grout seal, the CONTRACTOR shall take whatever steps are necessary to re-open the hole and place the seal as specified.
- O. During all stages of cementing, the CONTRACTOR shall use a pre-flush or spacer. The CONTRACTOR shall submit the technical specifications of the pre-flush to the ENGINEER as part of the cementing plan submittal.

3.3 SETTING TIME

- A. A minimum of eight hours-setting time shall be required between successive cement lifts or as directed by the ENGINEER. All cement lifts shall be physically tagged by a collarless tremie pipe. After cement grouting is complete to land surface, the casing shall remain undisturbed for a minimum of 24 hours.
- B. The CONTRACTOR shall include waiting on grout time for each grout stage in the unit price of grout pumped in the Schedule of Values.

3.4 BOREHOLE (PILOT OR REAMED) BACKPLUGGING

- A. If field conditions warrant, the CONTRACTOR shall be responsible to backplug the borehole to a depth specified by ENGINEER.
- B. Back-plugging material shall consist of gravel, sand, and/or cement slurry or any combination of the three as determined by ENGINEER. If sand or gravel is used, a 20-foot cap of neat cement shall be placed on top of sand or gravel. Back-plugging material may also consist entirely of Type II neat cement. Each stage shall be tagged.
- C. Material and placement methods shall be reviewed and approved by ENGINEER before ordering the necessary materials.

3.5 REMEDIAL WORK

- A. The CONTRACTOR shall be responsible for all remedial work and related expenses in order to meet regulatory requirements and the Technical Specifications at no additional cost to the ENGINEER. This shall include defective materials, accident, loss of equipment or equipment malfunction, or for any other cause directly attributable to the CONTRACTOR. The ENGINEER shall be notified immediately in the event of a problem, and the following shall apply:
 - 1. The CONTRACTOR shall propose a method of correcting the problem, in writing to the ENGINEER. The ENGINEER shall review the method of corrective action, and accept the plan in writing before work proceeds.
 - 2. All remedial work shall be conducted in accordance with all applicable local, state, and federal regulations.
 - 3. Corrective work shall be done at no additional cost to the ENGINEER and shall not extend the length of the Contract.

3.6 WELL ABANDONMENT

- A. If, the CONTRACTOR voluntarily stops work, and/or fails to complete the well or borehole in accordance with governing regulations or the Contract Documents, the hole will be considered abandoned. The CONTRACTOR shall not be paid for all or part of a hole declared as abandoned by the ENGINEER.
- B. The CONTRACTOR shall propose their method of abandonment of the well or hole in writing to the ENGINEER. The ENGINEER shall review the method of abandonment and accept the plan in writing before work can proceed. At all times all work on the well must be in accordance with all applicable local, state, and federal regulations.

- C. The cost of properly plugging and sealing the well or borehole, in accordance with applicable local, state, or federal regulations, shall be at the CONTRACTOR's own expense. In addition, if a well or part thereof, does not have mechanical integrity as defined by the appropriate regulatory authorities, it must be rectified before abandonment.
- D. The cost of post-abandonment monitoring, if required, shall be at the CONTRACTOR's own expense.

- END OF SECTION -

SECTION 13214 – GEOPHYSICAL LOGGING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. This section covers the work, material, and equipment necessary to conduct geophysical logging of the well during construction and testing.
- B. The cost of each individual geophysical log shall be paid at the unit price per each log as stated in the bid schedule forms. This unit price shall include all necessary equipment, materials, and subcontracted services required to properly cement the casing as specified in this section.

1.2 CONTRACTOR SUBMITTALS

- A. General: All CONTRACTOR submittals shall conform to the applicable requirements of Section 01300 - Contractor Submittals, and the supplementary requirements specified. Each item listed below shall be submitted to the ENGINEER with a clear explanation or depiction of why or how the requirements, as listed, will be fulfilled by the products or services provided by the CONTRACTOR. This list is not considered all-inclusive and may be extended by the OWNER, ENGINEER, or CONTRACTOR.
- B. Geophysical Logging Firm: All geophysical logs shall be performed by a company experienced in the performance of such logs. The geophysical logging firm must be pre-approved by the ENGINEER.
- C. Geophysical Logging: The CONTRACTOR shall submit all geophysical logs in Log ASCII Standard (LAS) format immediately subsequent to logging. The CONTRACTOR also shall submit 5 field copies of all geophysical logs to the ENGINEER immediately following logging activities. Electronic copies of all geophysical logging data in LAS and Portable Document File (*.pdf) format shall be submitted to the ENGINEER immediately after the completion of each logging activity. Final logs shall also be provided in Portable Document File (*.pdf) format on a USB Drive within 24 hours of completion of logging. For each geophysical logging suite performed, the ENGINEER may request the CONTRACTOR to obtain a brief descriptive report from the service company interpreting the results of the log or logs. These completed reports must be submitted to the ENGINEER within 72 hours of completion of logging. The CONTRACTOR must have logging firm provide additional hard copies of logs to the ENGINEER if requested.
- D. When static and dynamic (pumping) logs are to be conducted, all static logging shall be completed prior to performing the dynamic logging.
- E. The CONTRACTOR shall provide continuous recording geophysical logging equipment capable of acquiring accurate data from the following log types:
 - **XY Caliper Survey (CAL):** A four-arm (XY) caliper tool shall be used for logging. Response shall be recorded in inches in diameter and the caliper log report shall indicate total borehole volume and annular borehole volume in barrels or other units as specified by the ENGINEER. Caliper logs shall be run under static conditions. Caliper log report must indicate borehole volume and/or data must be provided in an ASCII file. Caliper logs shall be run under static conditions.

- **Natural Gamma Ray (GR):** Response recorded in American Petroleum Institute (API) units. Gamma logs shall be run under static conditions.
 - **Color Video Survey with Side-Looking Rotating Camera:** The video shall be run under static and dynamic conditions to ensure video clarity, or as determined by the ENGINEER.
 - **Other logs as needed.**
- F. MANUFACTURER'S documentation of each tool's Specifications, calibration certificates within the last year and recommended operating procedures shall be submitted by the CONTRACTOR before any logging can be conducted at the site.
- G. The geophysical logs required for each site will vary depending on the conditions of the well. The ENGINEER will determine which geophysical logs are needed.
- H. No standby or additional rig time shall be paid to the CONTRACTOR during geophysical logging operations.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. The CONTRACTOR shall provide a sheave and appurtenances from which Geophysical Logging Firm may hang logging equipment that will be lowered into the borehole or well; the equipment shall be designed for use in wireline logging and shall have a capacity to support the weight and loads resulting from the operation.
- B. The CONTRACTOR shall furnish and install temporary pumping equipment and discharge valves and piping for all dynamic (pumping) geophysical logging operations. The CONTRACTOR shall provide calibrated flowmeter when performing dynamic geophysical logs as directed by the ENGINEER.
- C. The CONTRACTOR shall furnish and install a temporary stilling well fabricated from pipe or tubing to provide not less than a 1-inch inside diameter to allow for installation of a water level measuring device or other equipment by the ENGINEER. The stilling well shall be open to water in the well or borehole to permit measurement of water fluctuations over time. The stilling well shall be installed in a manner with appropriately sized valves.

2.2 GEOPHYSICAL LOGGING TOOLS

- A. The CONTRACTOR will provide continuous digital geophysical logging equipment capable of performing and recording digital data from the standard geophysical logs.

PART 3 -- EXECUTION

3.1 GEOPHYSICAL LOGGING

- A. General: Each log shall be recorded using a depth measurement that is accurate to within 0.1 feet using a resolution of approximately 1/50th of the greatest deviation of the quantity measured over the entire log.
- B. The ENGINEER shall be given 48 hours' notice of the time when the survey will be run to witness the performance of the survey. Geophysical logging shall be performed

following drilling and borehole preparation. The logging intervals shall be the total length of the borehole unless otherwise directed by ENGINEER. Each log must be run in a continuous fashion to be acceptable.

- C. The CONTRACTOR is responsible for conditioning the borehole prior to logging to remove any drill cuttings, formation fill, and/or to prevent formation collapse. The CONTRACTOR shall, at his own expense, clean the hole and rerun logs if they fail to survey within 5 feet of the bottom of the hole.
- D. Each logging tool shall be calibrated in the presence of the ENGINEER.
- E. To be acceptable to the ENGINEER, each geophysical log must be run in a continuous manner between the top and bottom of the depth interval specified or selected by the ENGINEER.
- F. Pump Testing and/or specific capacity testing of the well may be conducted concurrent with geophysical logging events. It shall be the CONTRACTOR'S responsibility to assist the ENGINEER as directed during logging events. The CONTRACTOR shall provide adequate access for geophysical logging during specific capacity or aquifer performance tests. Coordinate with SECTION 13216 – Water Quality and Well Development and SECTION 13217 – Pumping Tests. If necessary, the pump shall be removed and re-installed to facilitate logging operations at the CONTRACTOR'S own expense.
- G. All geophysical logging activities shall be performed during normal working hours as approved by the OWNER and ENGINEER.
- H. Each log shall include a repeat section of no less than half the total depth of the casing and screen/open borehole interval, or as specified by the ENGINEER.
 - 1. Each log will be submitted to the ENGINEER with a scale of:
 - 1-inch = 100 feet
 - 2 inches = 100 feet
 - 5 inches = 100 feet
- I. Geophysical Log Schedules are to be determined if needed by the OWNER and/or the ENGINEER.
- J. **Geophysical Logs of Drilled Boreholes** (for surface and final casing): Geophysical logging, consisting of a caliper and gamma ray log, shall be completed on the reamed borehole after the hole has been reamed to the casing setting depth. If a caliper survey shows the hole to be less than the specified diameter at any point, the hole shall be re-reamed and re-surveyed. If corrective measures are required, the CONTRACTOR shall provide and pay for all corrective measures and additional surveys. After the caliper/gamma ray survey has been made and accepted by the ENGINEER, installation of the well casing shall commence if applicable.
- K. If the open borehole collapses prior to or during geophysical logging or is obstructed in any manner, the CONTRACTOR shall be responsible for adequately clearing out the borehole for successful logging operations to the total depth of the drilled interval. All specified geophysical logging tools must reach within 5 feet of the total depth of the interval, as measured by the length of drill pipe, logged in a continuous manner, record the appropriate data, and be successfully retrieved. If these conditions are not met, the CONTRACTOR shall re-run the logs at their own expense. Any down time related to geophysical logging (e.g., stuck probe down-hole, tool problems or bridging) shall be the CONTRACTOR'S responsibility and shall not be reimbursed by the ENGINEER.

- L. The CONTRACTOR shall be responsible for all costs associated with retrieval “fishing” operations due to stuck or lost geophysical probe(s) down hole and will not be compensated for extra work or standby time during this period. The CONTRACTOR shall be responsible for partial and/or full replacement costs of any geophysical logging equipment that is damaged or lost downhole during logging operations.
- M. The ENGINEER representative shall have the authority to specify up/down hole logging speeds of the individual surveys, but logging speed shall not exceed 30 feet per minute.
- N. A color video record of the entire completed well shall be made from land surface to the total depth of the well in the downhole and up-hole directions. Each weld or casing connection shall be inspected using a sideward-looking camera with full 360-degree rotation capability. The quality of the picture must be acceptable to the ENGINEER for the entire depth. The survey shall be logged at slow play (SP) on USB Drive. The CONTRACTOR shall furnish the ENGINEER with the original video log plus 4 replicates on a USB Drive.
- O. When requested to perform a color video survey with the OWNER’s pump, the CONTRACTOR must obtain approval and guidance from the OWNER. The OWNER’s pump and appurtenances shall be returned to its original condition or better condition than found. The OWNER and ENGINEER will perform an inspection once the pump and appurtenances have been re-assembled, and the CONTRACTOR shall perform any requests to return the OWNER’s pump back to original conditions.

- END OF SECTION -

SECTION 13215 – ACIDIZATION

PART 1 -- GENERAL

1.1 SCOPE

- A. Summary of WORK: This SECTION covers the WORK necessary to acidize the Wells, complete, if directed by ENGINEER.
- B. Related WORK Specified Elsewhere:
 - 1. SECTION 01010 – Summary of Work
 - 2. SECTION 01300 – Contractor Submittals
 - 3. SECTION 13211 – Well Drilling
 - 4. SECTION 13216 – Water Quality and Well Development

1.2 CONTRACTOR SUBMITTALS

- A. General: All CONTRACTOR submittals shall conform to the applicable requirements of Section 01300 - Contractor Submittals, and the supplementary requirements specified. Each item listed in Section 01300 - Contractor Submittals shall be submitted to the ENGINEER with a clear explanation or depiction of why or how the requirements, as listed, will be fulfilled by the products or services provided by the CONTRACTOR. This list is not considered all-inclusive and may be extended by the OWNER, ENGINEER, or CONTRACTOR.
- B. Subcontractor's List: The CONTRACTOR shall submit a complete list of all proposed subcontractors to be used in the work. The CONTRACTOR may be required to submit additional information or a resume of qualifications for any of the subcontractors proposed.
- C. Acidization header drawing including location of acid line, water injection line, gas bleed line, associated pressure gauges, site layout drawing, and other access ports as needed to complete the scope of work.
- D. Provide a plan for acidization, temporary acid storage, temporary water storage, containment pads, and a safety plan to the OWNER and ENGINEER for review and approval.
- E. The CONTRACTOR shall provide containment of acid pumps, hoses, fittings, and storage tanks to prevent spillage. The setup for performing acid treatment shall include removal of the wellhead and associated appurtenances, and installation of acid tubing to the desired acidization depth (as determined by the OWNER and ENGINEER). Additional equipment and monitoring devices include an acid rated flowmeter, flowmeter for water source(s), gauges for monitoring of acidization pressures. Upon completion of acidization, provide a discharge set up of spent acid, and purging equipment of spent acid in accordance with the specifications and regulatory agencies. Also, remove tremie, and re-installation of wellhead and appurtenances. The amount of acid to be used shall be three times the open or screened interval and shall be approved by the OWNER and ENGINEER.
- F. Provide all chemical manufacturer information and the Safety Data Sheets (SDS).

- G. Provide acid transportation manifests and load weight tickets.

PART 2 -- PRODUCTS

2.1 MATERIAL AND EQUIPMENT

- A. Provide all materials and equipment required to accomplish the WORK as specified. The CONTRACTOR shall prepare a well acidization plan that includes the information contained in this Specification. The CONTRACTOR shall be responsible for maintaining water levels below land surface and be capable of closing in the well at all times during activities conducted under this WORK. No flow or spillage will be allowed from the well or well acidization equipment at any time. The volume of acid pumped will be up to three times the open borehole volume or screened interval volume of the well. At no time will the acid be transferred to a secondary container, unless otherwise approved by ENGINEER. Acid shall be added to the well directly from the tanker truck. All trucks must be onsite prior to pumping acid.
- B. The CONTRACTOR shall be responsible for removing the wellhead and setting up for acidization in accordance with the appropriate SECTIONS of these documents.
- C. Acid shall be 22 Baume strength 32 percent inhibited hydrochloric acid from a source and carrier approved by the ENGINEER. The hydrochloric acid provided shall be approved for use in potable water wells, unless otherwise approved by ENGINEER. The type of acid used on a well will depend on the proximity of residential buildings and pedestrian traffic to the well.
- D. The volume of 22 Baume strength 32 percent inhibited hydrochloric acid pumped will be up to three times the open borehole volume or screened interval volume of the well, or as determined by the ENGINEER. The actual quantity used shall be determined by the CONTRACTOR and approved by the ENGINEER. Certification and SDS from the acid supplier shall be required to verify materials and acid quantities at least three working days prior to acid delivery to site.
- E. CONTRACTOR shall provide all acid tanker manifest truck tickets (for each tanker) that include the acid quantities (load weight tickets), SDS, Certificates of Analysis (COA) as soon as tankers arrive onsite or as requested by the ENGINEER.
- F. CONTRACTOR shall supply up to four 20,000 gallon settling tanks, adequate water supply, and water pumps cable of pumping against 200 psi or greater. The CONTRACTOR shall provide a calibrated fluid filled 3-inch diameter pressure gauge and calibrated strap-on ultrasonic flowmeter, or acid-resistant flowmeter, to measure acid pumping rates. The CONTRACTOR also shall provide a calibrated strap-on ultrasonic flowmeter to measure water pumping rates. The strap-on ultrasonic flowmeters shall be provided with a Bluetooth tablet that displays the acid and water pump rate, as well as totalizers. Pressure gauges and flowmeters must be calibrated within 60 days and approved by the ENGINEER.

- G. The CONTRACTOR shall provide backside water pumps and centrifugal acid pumps (one for backup). Water pumps shall be capable of pumping against high pressure (up to 200 psi) at a minimum rate of 300 gallons per minute (gpm). Acid pumps shall be capable of pumping rates ranging from 10 to 80 gpm.
- H. The CONTRACTOR shall provide and install pressure monitoring equipment, including a surface mounted transducer, Insitu® LevelTroll 700, or equal, Bluetooth communication devices, Insitu® Vu-Link Telemetry communication devices for real time data and web access and data downloading, and computers for ENGINEER field staff as requested by the OWNER or ENGINEER.
- I. Furnish sufficient sodium bicarbonate to manually distribute around the wellhead, acid hoses, acid rated valves, and tanker trucks to neutralize any acid in the event of a spill.
- J. Acidization activities, if performed, may be requested at any time during the rehabilitation and/or drilling activities at the desired intervals within the well. Acidization of the well(s) may also be conducted following the completion of the rehabilitation and/or open borehole drilling at the discretion of the ENGINEER.

PART 3 -- EXECUTION

3.1 WORKMANSHIP

- A. The ENGINEER will notify the CONTRACTOR if the acid plan is approved by the Florida Department of Environmental Protection (FDEP), if required by State Law.
- B. Conduct required safety meeting reviewing safety rules and precautions with all onsite personnel (Must be OSHA Certified) the day prior to pumping acid as well as the day of the acid pump.
- C. Conduct a pre-test the day prior to pumping acid to ensure all equipment is functioning properly and no leaks occur. The pre-test must be approved by the ENGINEER. Volumetrically test all flowmeters, or as directed by the ENGINEER.
- D. Conduct a pre- and post-acid specific capacity test prior and post pumping acid, as directed by the ENGINEER.
- E. Have a safety station that will include an open water tank, eye wash, wind flag and escape route. Verify all personnel are wearing PPE and that all those working directly with the acid are wearing Tyvek suits with rubber or neoprene gloves.
- F. Conduct jetting with simultaneous airlift development of the entire borehole before and after to acidization activities in accordance with SECTION 13216 – Water Quality and Well Development.
- G. CONTRACTOR shall install a 2-inch diameter acid injection pipe to the depth selected by the ENGINEER and install three 3-inch diameter water injection pipes/ports, or as directed by the ENGINEER. These pipes/ports shall be approved by the ENGINEER. All fittings,

ports and components shall provide a tight seal up to 200 psi. All access ports shall be fitted with isolation valves and shall be acid rated.

- H. Install check valves on the acid port as well as the water and blowoff ports, or as directed by the ENGINEER.
- I. CONTRACTOR shall set up an acidization wellhead, pack-off device, or other approved device at the well designated by the ENGINEER in accordance with these Specifications. The acidization wellhead shall incorporate a dedicated acid injection line and multiple dedicated potable water injection lines. The acid lines and wellhead materials shall be constructed of acid-resistant materials and capable of withstanding pressures generated during the acidization process, acidization lines shall be installed such that no leaks occur.
- J. Test all equipment hoses, piping, and fittings for leaks. Inspect the acid header for water tightness. Perform a test pump at maximum acid injection rates (200 gpm) using water and record pressures before, during, and after. Verify all flow measurement devices are operating and calibrated. Verify all isolation valves are operating and watertight when closed. Verify equipment and personnel are 100 percent ready for acid treatment and notify the ENGINEER of final acid delivery schedule. The ENGINEER shall approve the delivery schedule.
- K. Verify all acid tankers are equipped with appropriate and functioning valves and other all other safety equipment. Verify that all acid haulers responsible for discharging acid from the tankers are 100 percent ready for acid treatment.
- L. The CONTRACTOR shall establish a flow of potable water down the well at the rate of approximately 200 gpm starting a minimum of 15 minutes before and continuing into acid injection to demonstrate the ability of the formation to receive injected fluid. The potable water flush shall continue during acid injection and for a minimum of 30 minutes thereafter or until wellhead pressures are 0 psi, back to background, and/or stable, or as directed by the ENGINEER. The CONTRACTOR shall be responsible for maintaining wellhead pressure at background or 0 psi and stable until the acid is completely spent in the formation. The CONTRACTOR shall provide all piping, and fittings necessary to allow pumping of water down the well. Water pumped down the well shall be potable and supplied by the CONTRACTOR. Shall be capable of accepting water (backside water) near the top of the well casing and independent of the acid tubing and gas blowoff ports. The water injection location within the well shall be always submerged prior to, during and after acid treatment. The gas blowoff line shall be located above the pressure gauge and pressure transducer, as well as above the water injection line, or at the highest point on the wellhead.
- M. Provide and install a pressure gage and Insitu® LevelTroll pressure transducer, or equal, on the wellhead to monitor pressure at the wellhead. The CONTRACTOR shall place the pressure gauge port and Insitu® LevelTroll pressure transducer at a higher elevation than the backside water port on the temporary wellhead.
- N. Provide a safety working area for the ENGINEER, with appropriate PPE and heat safety equipment for all personnel.
- O. CONTRACTOR shall inject acid continuously through the acid line while maintaining water injection as described above. The rate of acid injection shall be determined by the

CONTRACTOR and approved by the ENGINEER in the field. The acid provided shall be approved for use in potable water wells, unless otherwise approved by the ENGINEER. Up to three times the open borehole volume of acid and a maximum pH of three standard units (SU) shall be required in the well at the end of acidization. The mix strength shall be approved by the ENGINEER prior to acidization. Actual quantities used in the field shall be pre-approved by the ENGINEER.

- P. The CONTRACTOR shall facilitate the release of gas during excessive pressure build up inside the well (gas blowoff). The gas blowoff port shall be located above the backside water injection port. The gas blowoff pipe shall be extended a minimum of 50 feet away from the work area, downwind from any potential immediate receptor and downwind of the designated safety zone. In the event the gas blowoff port is used, a frac tank of approximately 20,000 gallons shall be utilized (or up to three times the amount of acid being used), and the water level shall be halfway full in the frac tank.
- Q. The CONTRACTOR shall facilitate pressure monitoring at all times. Pressures shall be measured at or immediately below the gas blowoff port location. CONTRACTOR shall furnish and install appropriate instrumentation and material to monitor pressures within the designated acid treatment safety zone.
- R. After pumping of the acid is complete, CONTRACTOR shall continue water injection in both casing and acid tubing for a minimum of 30 minutes, or as directed by the ENGINEER. After water injection is complete, close all valves and shut-in the well for a minimum of 12 hours. At no time shall pressure in the well be allowed to exceed 50 psi. The pressure relief valve should activate at the specified maximum psi. A containment vessel shall be used to contain undesired acid discharge from the well during the entire acidization procedure. The containment vessel shall be approved by the ENGINEER.
- S. Casing pressures shall be monitored continuously by the CONTRACTOR for at least 12 hours following acid treatment or until pressures stabilize in the well, whichever is greater. If wellhead pressure increases during the monitoring period, the CONTRACTOR shall pump additional chase water into the well using the same method as described above. Excess gas pressure shall be bled off only if water injection does not dissipate pressure.
- T. After the 12-hour shut-in period, the CONTRACTOR shall purge the well into the containment vessel supplied by the CONTRACTOR and determine the pH of the water from the well. The CONTRACTOR shall air develop and provide a pump to discharge spent acid, water, or other fluids from the acid line into the containment vessel, as necessary. The containment vessel shall be approved by the ENGINEER. If the well water pH has reached 6.0 SU or higher and there is no pressure at the wellhead, the CONTRACTOR shall remove the piping and wellhead to prepare for well development and removal of the spent acid. In the event the pH is not 6.0 SU or higher, the well shall be shut in for an additional waiting period of two hours, after which the CONTRACTOR will purge the well and determine the pH. If the pH is less than 6.0 S.U., the pH shall be treated with sodium bicarbonate, or another approved buffer, prior to being discharged. Repeat the process until a pH of 6.0 SU or higher is achieved. The removal of the spent acid shall proceed until specific conductance values are within 10 percent of background levels. The CONTRACTOR shall re-develop after acidization as described in SECTION 13216 – Water Quality and Well Development. All the activities in this paragraph shall be reported to the ENGINEER as requested.

- U. Discharge of water and spent acid from the well following acidization shall be to a suitable container at the site supplied by the CONTRACTOR. The CONTRACTOR will neutralize the discharge water with a suitable buffer until it is demonstrated that the pH of the water is 6.0 SU. Neutralized water will then be discharged to a suitable conveyance as approved by the ENGINEER. Discharge piping shall be the responsibility of the CONTRACTOR. The disposal location shall be approved by the ENGINEER prior to disposal of water and spent acid. CONTRACTOR shall coordinate all discharge activities, including maximum allowable flow rates, pH stabilization, turbidity measurements, and specific conductance measurements, if required, with the required regulatory agencies or requested by the ENGINEER.
- V. Once background water quality conditions have been achieved the CONTRACTOR shall perform a post-acid specific capacity test using a test pump capable of pumping up to 1,500 gpm, or as directed by the ENGINEER. The CONTRACTOR must supply adequate access ports for the ENGINEER to be able to measure static and dynamic water levels, sample ports for the ENGINEER to collect water quality samples, and a flowmeter (with a calibration certificate dated within the last 60 days) to provide accurate and precise pumping rates. The CONTRACTOR also shall measure sand production using a Rossum sand collector and monitor silt density index (SDI) during the specific capacity test.
- W. If a second acid pump is to be performed, the CONTRACTOR shall purge the spent acid from the well between acid pumps until pH of the purged water is no less than 6.0 and the specific conductance is within 10 percent of background, or as directed by the ENGINEER. The CONTRACTOR shall purge the well until the water quality has returned to background conditions, perform a specific capacity test as determined by the ENGINEER, and proceed as directed by the ENGINEER.

- END OF SECTION -

SECTION 13216 – WATER QUALITY AND WELL DEVELOPMENT

PART 1 -- GENERAL

1.1 GENERAL REQUIREMENT

- A. After the well has been completely constructed in accordance with the requirements of the Contract Documents, the CONTRACTOR shall notify the ENGINEER and OWNER and shall make the necessary arrangements for conducting well development.
- B. Commercial Standards: All work specified herein shall conform to or exceed the requirements of the applicable codes and standards relating to the referenced portions of the following documents only to the extent that the requirements therein are not in conflict with the provisions of this section. Where such documents have been adopted as a code or ordinance by the public agency having jurisdiction, such a code or ordinance shall take precedence.
- C. State Standards: SFWMD and FDEP Rules and Regulations for Water Wells in the Florida Administrative Code (FAC).
- D. Commercial Standards:
 - AWWA A100 Standard for Water Wells.

1.2 CONTRACTOR SUBMITTALS

- A. General: All CONTRACTOR submittals shall conform to the applicable requirements of Section 01300 - Contractor Submittals, and the supplementary requirements specified. Each item listed below shall be submitted to the ENGINEER and OWNER with a clear explanation or depiction of why or how the requirements, as listed, will be fulfilled by the products or services provided by the CONTRACTOR. This list is not considered all-inclusive and may be extended by the OWNER, ENGINEER, or CONTRACTOR.
- B. Development and Test Records: Development and test records shall be maintained by the CONTRACTOR on an hourly basis, showing production rates, static water level, pumping level, drawdown, production of sand, silt, and all other information. All development summary logs must be completed daily by the CONTRACTOR and submitted to the ENGINEER and OWNER as requested. Completed daily development logs shall be submitted weekly to the ENGINEER and OWNER.
- C. Calibration report for in-line flowmeters, calibrated within the last 60 days. Calibration records for all measuring instruments used in the wells shall be submitted to the OWNER for review prior to the installation or use of the instruments. Calibration of instruments shall have been performed within 60 days prior to use in testing. All calibration records shall be submitted to the OWNER and approved by the ENGINEER prior to use.
- D. The CONTRACTOR will furnish the ENGINEER and OWNER with manufacturer specifications for all chemical additives proposed for development.
- E. The CONTRACTOR will submit to the ENGINEER and OWNER, prior to installation of the development pump, a manufacturer pump curve for development and testing pump(s), pump size, make, and model with the associated motor size, make, and model. The CONTRACTOR shall submit a manufacturer's pump column pipe prior to installation.

- F. The CONTRACTOR will furnish the ENGINEER and OWNER with manufacturer specifications for generators, pumps, and corresponding silencers.
- G. The CONTRACTOR will submit to the ENGINEER and OWNER a shop drawing depicting schematic plan and equipment and piping for formation water disposal.
- H. Temporary Wellhead Drawing, site layout plan, and testing plan including, but not limited to the following: a sampling port for water quality data, a water level port for static and dynamic water levels, a Rossum Sand Tester, and a Silt Density Index (SDI) Press and associated booster pump, if necessary, to produce 35 psi on the produced discharge water to meet the pressure requirement to perform SDI's.
- I. A pumping test plan for each phase of development and pumping test.
- J. Water Quality Analyses Reports: The CONTRACTOR shall submit two (2) copies of the laboratory report for the analyses of the water quality samples within 30 days of receipt of samples by the laboratory.
 - 1. All water quality analyses will be performed by a laboratory certified by the State of Florida for analysis of drinking water with current methods and reporting format approved by FDEP.

PART 2 -- PRODUCTS

2.1 EQUIPMENT

- A. The CONTRACTOR shall furnish all equipment, compressors, piping, motors, pumps, and appurtenances to develop the well by reverse-air circulation, straight air, direct air, jetting, simultaneous air and jetting, and overjumping. The CONTRACTOR shall provide all labor, materials, and equipment needed to develop the well to the extent, as practical, suspended solids are removed from the borehole. All temporary development site layout plans, equipment to be used, and methodology to be used shall be approved by the ENGINEER and OWNER prior to commencement of the activity.
 - 1. Development Pump: The test pump used for well development and the rate pumping tests on the final completed well shall be capable of stressing the well, as approved by the ENGINEER, it is anticipated a minimum of 200 hours will be used for pump development. The CONTRACTOR shall include a gate valve and variable frequency drive (VFD) to regulate the flow rate during the tests. The pump shall be set to a depth that will allow for the test to be run at ENGINEER and OWNER approved rates without causing cavitation. The CONTRACTOR shall also provide and install two 1-inch minimum diameter access ports to allow passage of a pressure transducer and a water level probe furnished by the CONTRACTOR.
- B. The CONTRACTOR shall provide all necessary electrical pump wiring and control box, gas-powered, noise suppressed electrical generator, and an onsite qualified operator for the pump and generator for the duration of pump development.
- C. The CONTRACTOR shall configure the pumping system so pumping rates may be adjusted as directed by the ENGINEER and OWNER.
- D. The CONTRACTOR shall furnish and install an inline flowmeter with a flow rate indicator and totalizer calibrated within the last 60 days and capable of measuring accurate and precise discharge rates ranging from 200 gpm up to 4,800 gallons per minute (gpm). The placement of the flow meter shall be in accordance with manufacturer recommendations for flow meter placement. The CONTRACTOR shall also consult the ENGINEER and OWNER for optimal flow meter placement. Air release valves shall be provided and installed by the

CONTRACTOR at as many locations as required. Air release valves shall consist of tapping the discharge pipe and providing and installing a 2-inch diameter riser and gate valve. The CONTRACTOR will supply an orifice weir to verify pumping rates, if requested by the ENGINEER or OWNER.

- E. Furnish and install a valve on the discharge side of the pump, downstream of the flowmeter to obtain the optimal discharge rate, shut off flow, and stop gravity drainage.
- F. The development equipment must be able to divert flow of water in a controlled manner to minimize flooding and erosion. Discharge water shall be clear and free of suspended solids. Discharge water shall be retained temporarily using a settling tank for settlement of solids and pumped via temporary piping to the discharge point as directed by the ENGINEER and OWNER. Tanks required for settling of solids and additional pumps and temporary piping needed to transmit water to the discharge point shall be included in the unit cost for development. Management and removal of development solids shall be included in the unit cost for development.

PART 3 -- EXECUTION

3.1 WELL DEVELOPMENT: The CONTRACTOR shall commence development of the well using a combination of air development, jet development, and pump development using OWNER and ENGINEER approved equipment, equipment set-up, and use of development equipment. The CONTRACTOR shall use a test pump for well development, the test pump shall be approved by the OWNER and ENGINEER. At any time during any type of development, the OWNER and ENGINEER may request a specific capacity test to be performed at a pumping rate approved by the OWNER.

A. Development by Jetting:

1. The CONTRACTOR shall recommend and provide a jetting tool capable of maintaining a minimum water velocity of 50 feet per second (ft/sec) horizontal flow within the or open-hole interval or screen interval. The high velocity jetting tool shall have a minimum of four horizontal jet nozzles, equally spaced at 90 degrees apart. The total flow rate delivered to the jetting tool shall not be less than 500 gpm. Alternate nozzle sizes and flow rates may be proposed. The CONTRACTOR shall provide the OWNER and ENGINEER with daily Imhoff Cone sand content readings and shall continue jetting activities until the OWNER and ENGINEER determines jetting has been completed to an acceptable level.
2. The CONTRACTOR shall rotate, raise, and lower the jetting tool throughout the open-hole interval or screen interval, or as directed by the OWNER and ENGINEER. The CONTRACTOR shall make as many passes as required to ensure complete development. Jetting development will not be performed within 10 feet of the bottom of casing to preserve the integrity of the well seal.
3. Water for jetting will be recycled using the settling tanks. Prior to reintroduction into the borehole, jetting water will be chlorinated to obtain 50 parts per million (ppm) residual. Water will be clear and free of sand and suspended solids prior to reintroduction into the well. The CONTRACTOR shall use all means necessary to settle, clean, and chlorinate water prior to reintroduction into the well, including but not limited to the use of settling tanks and baffle boards. The initial phase of jetting shall be done using a solution of BMR and chlorinated water having a minimum chlorine concentration of 50 ppm. The initial jetting phase shall not be less than 8 hours. Thereafter, fresh water may be used for jetting development as directed by the ENGINEER and OWNER.

4. At the direction of the ENGINEER, the CONTRACTOR shall install an airlift pipe at the base of the borehole or screen to clear accumulated material. After thoroughly jetting and surging the well with the jetting tool, well development shall be completed using air lift at the base of the screen or directed by the ENGINEER. The water shall be directed into on-site settling tanks and dechlorinated prior to discharge or shall be hauled from the site in a tanker. The location of water discharge shall be coordinated with the OWNER and ENGINEER. Best practices shall be used to minimize turbidity and erosion from the discharge. The CONTRACTOR shall be responsible with meeting all regulatory requirements for disposing of discharged groundwater from the well safely and properly using best management practices.
- B. Development by Direct-Air Method (Airlifting): After receiving the ENGINEER and OWNERs authorization to proceed, the CONTRACTOR shall commence to develop the well by pumping with direct-air and shall continue until sand production is negligible in a 1,000 mL Imhoff cone, or as approved by the ENGINEER and OWNER.
1. The CONTRACTOR shall provide all labor, equipment and materials required to perform airlift well development. Provide all air compressors, filter socks, settling basins, containment basins and other ancillary equipment needed to develop the well to the extent that, as practical, suspended solids are removed from the well. Provide all pipe, fittings, and valves required to transmit discharge water from the pump to the settling tanks, as required.
 2. The CONTRACTOR shall furnish, install, operate and remove a pump of sufficient size and horsepower to continuously pump stored discharge water as required from the tanks to the discharge point. The CONTRACTOR shall furnish and install discharge piping of sufficient size and length. The CONTRACTOR shall install the discharge pipe to the point of discharge directed by the OWNER and ENGINEER. CONTRACTOR supplied temporary discharge piping is required from each well to the discharge point.
 3. Development water, as with all water produced from aquifers, must be allowed to settle out turbidity prior to discharge to meet the conditions of the General Discharge Permit for the project. The development equipment must be able to divert the flow of water in a controlled manner to minimize flooding and erosion. Discharge water shall be clear and free of suspended solids. The discharge water then shall be conveyed via temporary piping to the discharge point as directed by the OWNER and ENGINEER. Filter socks, turbidity booms, and tanks required for settling of solids and additional pumps and temporary piping needed to transmit water to the discharge point shall be included in the unit cost for development. Management and removal of development solids shall be included in the unit cost for development.
 4. Throughout development and at the completion of development, as directed by and in the presence of the OWNER and/or ENGINEER, the CONTRACTOR shall measure the total depth of the well and the sand content using an Imhoff cone and report to the OWNER and ENGINEER. If significant in-filling has occurred, as determined by the OWNER and ENGINEER, the CONTRACTOR shall proceed to clean out the borehole to the original total depth.
 5. Any necessary crossings over the discharge piping shall be constructed and maintained by the CONTRACTOR.
- C. Development by Pumping: After completion of airlifting development and jetting development, the CONTRACTOR shall commence well development by surging using the test pump. Pump development shall proceed as directed below:
1. The CONTRACTOR shall provide all labor, equipment and materials required to perform well development. Provide all pumps and motors, air compressors, filter

socks, settling basins, containment basins and other ancillary equipment needed to develop the well to the extent that, as practical, suspended solids are removed from the well. Provide all pipe, fittings, and valves required to transmit discharge water from the pump to the settling tanks, as required.

2. The development equipment must be able to divert the flow of water in a controlled manner to minimize flooding and erosion. Discharge water shall be clear and free of suspended solids. The discharge water then shall be pumped via temporary piping to the discharge point as directed by the OWNER and ENGINEER. Filter socks and tanks required for settling of solids and additional pumps and temporary piping needed to transmit water to the discharge point shall be included in the unit cost for development. Management and removal of development solids shall be included in the unit cost for development.
3. Throughout development and at the completion of development, as directed by and in the presence of the OWNER and ENGINEER, the CONTRACTOR shall measure the total depth of the well. If significant in-filling has occurred, as determined by the OWNER, the CONTRACTOR shall proceed to clean out the borehole to the original total depth.
4. High-rate pumping (overjumping): The CONTRACTOR shall furnish the necessary instruments and pumping equipment capable of pumping at a steady rate ranging over rates to be determined by the OWNER and ENGINEER with a throttling device and gate valve so that the flow rate can be adjusted as directed by the OWNER and ENGINEER.
5. Provide a calibrated flow meter with direct measurement and a totalizer to measure flow. Anticipated metered flows and or pump rates shall be capable of pumping a minimum of two times the design rate for the well in gpm. Certification shall be no older than 60 days prior to notice to proceed and attest to an accuracy of 95 percent or greater for the range of the meter.
6. The CONTRACTOR shall pump surge the well until, to the satisfaction of the OWNER, the pump discharge water is free of suspended material. The test pump shall be capable of maintaining a steady pumping rate determined by the OWNER and on/off surging.
7. The initial pumping rate shall be restricted and gradually increased until the maximum rate is reached as directed by the ENGINEER. The maximum rate will be determined by the ENGINEER after consideration of the well's drawdown and discharge characteristics. At frequent intervals, the pump shall be stopped and the water in the pump column shall be allowed to surge back through the pump bowls.
8. The test pump used for well development on the final completed well shall be capable of stressing the well, as approved by the ENGINEER, for up to 10 hours and shall also include a valve to regulate the flow rate during the tests. The pump shall be set to a depth that will allow for the test to be run at ENGINEER approved rates without causing cavitation.
9. The CONTRACTOR shall provide and install a 1-inch minimum diameter access port to allow passage of a pressure transducer and a water level probe furnished by the CONTRACTOR.
10. The CONTRACTOR will be responsible for supplying transducers (Insitu® Level Troll or equivalent as approved by OWNER and ENGINEER) and data loggers capable of measuring and recording water levels on a logarithmic time scale. The pressure transducers/data loggers shall be able to record data in logarithmic mode or at a minimum of 1-second intervals during drawdown and recovery stages. The

equipment shall have an appropriate range and accuracy for the well as approved by the OWNER and ENGINEER prior to testing. Each well shall have at least two (2) transducers or as determined by the OWNER and ENGINEER. In addition, two (2) barometric trols shall be installed at the site. Prior to the start of the step drawdown test, the CONTRACTOR shall download the transducer data and provide data to the OWNER and ENGINEER on the memory device.

a. The pressure transducers shall be re-programmed for each aspect of the test including pre-test monitoring, test monitoring, and post-test recovery. Sample frequency for the pre-test monitoring shall be determined by the OWNER and ENGINEER. Sample frequency during the pumping test shall be logarithmic scale with 10-minute intervals once the test has matured. The post-test monitoring frequency shall be at a logarithmic scale with 10-minute intervals once the test has matured.

11. Throughout pump development, at intervals specified by the OWNER and ENGINEER, the CONTRACTOR shall conduct sand testing. Sand testing shall be conducted using a Rossum Sand Tester provided by the CONTRACTOR and shall be performed as directed by the OWNER and ENGINEER. The CONTRACTOR shall install the Rossum Sand Tester according to the manufacturer or as determined by the OWNER. The CONTRACTOR shall complete daily development summary forms provided by the OWNER and ENGINEER, including daily static water level measurements, specific capacity measurements, sand (Rossum) tests, and SDI tests. Development will be deemed to be complete when the sand content is less than one (1) ppm and SDI values are less than three (3).

12. The CONTRACTOR shall perform SDI testing daily. CONTRACTOR shall report sand content and SDI values to the ENGINEER and OWNER daily. CONTRACTOR shall assume that pump development activities will continue until an SDI value of less than three (3) is achieved. The CONTRACTOR shall provide a booster pump capable of producing discharge sample water up to 35 psi, to meet the pressure requirement to perform SDI's.

a. The CONTRACTOR shall assist the ENGINEER and OWNER with any connections required to connect the ENGINEER'S temporary provided SDI testing equipment to the pump discharge. The CONTRACTOR shall provide, operate and maintain a clean auxiliary pump capable of maintaining 35 psi for SDI testing. The auxiliary pump shall be plumbed to the well discharge for sampling and testing. The CONTRACTOR shall provide fittings and fabricate connections as needed to enable the ENGINEER to perform the SDI tests, when requested, to confirm the CONTRACTORS SDI testing.

13. The CONTRACTOR shall be responsible for providing on-site back-up equipment for all items necessary to perform successful pumping tests. In case of pump failure, pipe blockage, transducer failure, and/or unsatisfactory performance of the CONTRACTOR'S equipment, the pumping test shall be rerun at no additional cost to the OWNER.

3.2 WATER QUALITY SAMPLING

A. General: The CONTRACTOR will be required to subcontract a State of Florida certified laboratory analyze water samples collected during well construction. The CONTRACTOR will be required to subcontract a State of Florida certified laboratory to COLLECT primary and secondary drinking water samples for analysis taken at the end of final pump testing.

- B. **General Discharge Permit Water Quality Samples:** The CONTRACTOR shall collect and analyze samples as required to meet the CONTRACTOR's General Discharge Permit or Federal, State, and Local requirements.
- C. **Final Well Water Quality Analyses:** The final wells will be properly purged and sampled by the CONTRACTOR's approved subcontracted laboratory and the water samples will be analyzed for List A parameters by an approved laboratory. The List A parameters include primary and secondary drinking water standards (P&S DWS) **excluding asbestos, dioxin, acrylamide and epichlorohydrin**. The CONTRACTOR's approved subcontracted laboratory shall collect one (1) final water sample at the end of the pump development after removal of a minimum of 3 well volumes from the well, after water quality has stabilized according to FDEP standard operating procedure. All samples shall be properly collected, preserved, and analyzed within the required holding time limits. All costs for water sample collection and analyses shall be paid by the CONTRACTOR. Any water samples taken during the course of this project shall follow the latest version of the DEP-SOP procedures (FS 2200 Groundwater Sampling). The laboratory shall be certified as meeting FDEP requirements to conduct these analyses.
- D. **Sample Bottles:** Samples for which laboratory analyses are required shall be collected in specially designated and approved sample containers provided CONTRACTOR by a State of Florida certified laboratory approved by the ENGINEER for the specific parameters required by these specification documents.
- E. **Labeling:** The sample containers shall be clearly labeled with the well identification, the depth interval below land surface from which the sample was collected, and the time and date of sample collection.
- F. **Delivery:** Samples shall be collected and stored in the appropriate manner as instructed by the laboratory and delivered to the laboratory in accordance with the laboratory's instructions.
- G. **Chain of Custody:** Chain of Custody forms shall be completed for all water samples. Copies of the Chain of Custody forms shall be submitted to the ENGINEER within five days of final delivery of the samples to the laboratory. All persons handling the samples shall be required to sign the Chain of Custody form.
- H. **Holding Times:** The CONTRACTOR shall be aware of applicable water sampling holding times for the samples for which he is responsible and ensure that the samples are transmitted to the laboratory within these time periods. For samples collected by the laboratory, the CONTRACTOR shall be responsible for the performance of the subcontractor's service analyzing the samples within established holding times.

3.3 STANDARD WATER QUALITY SAMPLING PARAMETERS

- A. The CONTRACTOR shall collect water samples during the rehabilitation and construction of the well and have them analyzed by a certified laboratory for the following parameters:

General Discharge Permit Parameter List

Total Organic Carbon (TOC)
 pH, standard units
 Total Recoverable Mercury
 Total Recoverable Cadmium
 Total Recoverable Copper
 Total Recoverable Lead
 Total Recoverable Zinc
 Total Recoverable Chromium (Hex.)
 Benzene

Naphthalene

List A (Final Water Quality Analysis)

State Primary and Secondary Drinking Water Standards excluding asbestos, dioxin, acrylamide and epichlorohydrin

Copper pipe corrosion parameters: alkalinity, dissolved iron, dissolved oxygen, pH, total sulfide, and turbidity in a minimum of one sample of raw water from the new or altered well

- END OF SECTION -

SECTION 13217 – PUMPING TESTS

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall be responsible for providing all necessary pumps, prime movers, pipelines, meters, data loggers and water level transducers, and gauges necessary for testing, and shall provide access for manual water-level measurements using an M-scope tape or electronic probe. The CONTRACTOR shall furnish an electrical depth gauge, capable of indicating depths to water to the nearest one-hundredth foot, with a sounding tube placed to the maximum depth to water anticipated.
- B. The total estimated length of the interval tests (step-pumping tests) is 10 hours. However, the ENGINEER shall determine the actual length of each test and may increase or decrease the test duration as necessary to successfully complete each test.
- C. The CONTRACTOR shall be responsible for providing on site back-up equipment for all items necessary to perform a successful pumping test. In case of pump failure, pipe blockage, and/or unsatisfactory performance of the CONTRACTOR'S equipment, the pumping test shall be rerun at no additional cost to the ENGINEER.

1.2 CONTRACTOR SUBMITTALS

- A. Calibration Data: Calibration records for each measuring instrument used in the construction of the well shall be submitted to the ENGINEER for review prior to the installation or use of the instruments. Calibration of instruments shall have been performed within 60 days prior to use in testing. All calibration records shall be submitted to the ENGINEER prior to use. The calibration records shall contain the following information:
 - 1. **Meters:** The CONTRACTOR shall supply flowmeters and other meters for use in testing the well. The flowmeter for use in the pumping test shall have a totalizer and major gradations of 100 gpm and minor gradations of 10 gpm. Accuracy shall be $\frac{1}{4}$ of 1 percent of full scale.
 - a. Serial number, model number, gears, test apparatus size, meter reading, and flow rate for at least three (3) steps, percent error for each step, and tester's name and title must be included in the submittal.
 - 2. **Electrical Depth Gauge:** The CONTRACTOR shall furnish an electrical depth gauge capable of indicating depths to water to the nearest one-hundredth foot, with sounding tube placed to the maximum depth to water anticipated.
 - 3. **Pressure Transducers:** The pressure transducers shall be calibrated in the well on the day that it is installed for monitoring the tests. The transducer pressure measurement shall be plotted against depth and a correction formula determined, if deemed necessary by the ENGINEER.
 - 4. **Pump size, make, and model with the associated pump curve.**
 - 5. **Rossum Sand Tester and SDI Filter Press and Booster Pump.**
 - 6. **Temporary Wellhead Drawing, Set-up, and Testing Plan including, but not limited to the following:** a sampling port for water quality data, a water level port for static and dynamic water levels, a Rossum Sand Tester, and a SDI Press and booster pump to achieve 30 psi on the wellhead, if necessary, for SDI's.

7. Pumping Test plan for each test.

PART 2 -- PRODUCTS (NOT USED)

PART 3 -- EXECUTION

3.1 GENERAL

- A. Test Failure: Should a test fail because of the presence of any rust or scale, or other foreign material in the tools or pipe, the CONTRACTOR will not be reimbursed for the test and he will be required to re-run the test successfully as part of the Contract requirements at his own cost.
- B. Supervision by the CONTRACTOR of pumping tests shall be maintained on a constant basis by qualified personnel
- C. Prior to pump testing, background water levels shall be recorded for a period determined by the ENGINEER, a minimum of 12 hours is anticipated.
- D. The test durations and pumping rates will be determined by the ENGINEER. During the tests, the CONTRACTOR shall manually record the time, pumping level, and discharge at 5-minute intervals. When the test is completed, the pump shall be stopped and the water level in the well allowed to recover for a period of at least 12 hours or a time determined by the ENGINEER.
- E. In addition to these measurements, the ENGINEER may require the CONTRACTOR to periodically take and record field measurements (i.e. conductivity, temperature, pH) on the discharge water and/or collect water samples.
- F. If the test is aborted or interrupted for any reason, the test shall be stopped, the water level allowed to recover, and the test restarted. No payment will be made to the CONTRACTOR for interrupted pumping tests.
- G. The CONTRACTOR shall furnish 2 copies of each test's records and results.

3.2 PUMPS

- A. The CONTRACTOR shall furnish and install a submersible or turbine pump capable of continuously pumping from 500 to 4,800 gallons per minute against a total head of 200 feet with the pumping bowl set at a minimum of 60 feet below land surface, or as determined by the ENGINEER.
- B. The CONTRACTOR shall provide all necessary electrical pump wiring and control box, gas-powered, noise suppressed electrical generator, and an onsite qualified operator for the pump and generator for the duration of each pumping test.
- C. The CONTRACTOR shall configure the pumping system so pumping rates may be adjusted as directed by the ENGINEER.
- D. Furnish and install a variable frequency drive (VFD) and a gate valve on the discharge side of the pump, downstream of the flowmeter to obtain the optimal discharge rate, shut off flow, and stop gravity drainage.

3.3 DISCHARGE PIPING

- A. Furnish and install all piping and hardware necessary to provide a leak-proof seal at the wellhead and along the discharge line to the point of discharge (POD).
- B. Furnish and install piping and appurtenances to convey the produced formation waters to a specified point of discharge as specified in Section 13218 - Formation Water Control and Discharge System.

3.4 FLOW MEASURING DEVICES

- A. During pump testing, an in-line propeller-type flow meter capable of recording total flow and discharge will be used to measure the flow from the tested zone.

3.5 WATER LEVEL MEASURING DEVICES

- A. The CONTRACTOR will be responsible for supplying two pressure transducer/data loggers (Insitu® mini-troll, Insitu® Level Troll or equivalent) capable of measuring and recording water levels on a logarithmic time scale. This pressure transducer/data logger shall be able to record data in logarithmic mode or at a minimum 1-second linear interval during drawdown and recovery stages. The equipment shall have an appropriate range and accuracy for the well as approved by the ENGINEER prior to testing. In addition, two barometric trolls shall be installed at the site. Prior to the start of the step drawdown test, the CONTRACTOR shall download the transducer data and provide data to the OWNER on the memory device.
 - a. The pressure transducers shall be re-programmed for each aspect of the test including pre-test monitoring, test monitoring, and post-test recovery. Sample frequency for the pre-test monitoring shall be determined by the OWNER. Sample frequency during the pumping test shall be logarithmic scale with 10-minute intervals once the test has matured. The post-test monitoring frequency shall be at a logarithmic scale with 10-minute intervals once the test has matured.
- B. The CONTRACTOR will be responsible for providing access for water-level measurements using an M-scope tape or electronic probe. The CONTRACTOR shall furnish an electrical depth gauge, capable of indicating depths to water to the nearest one-hundredth foot, with a sounding tube placed to the maximum depth to water anticipated. The CONTRACTOR shall provide a clear, flexible plastic manometer tube capable of measuring all anticipated water levels above land surface and the sealed wellhead.
- C. At the ENGINEER'S discretion, a period of time (up to 12 hours) is required for pump shut down and water level recovery between the well development and the pump tests and between the individual pump tests. There will be no additional payment for rig time or standby time during these periods of well recovery.

3.6 PUMPING TESTS

- A. **Step-Drawdown Test:** The CONTRACTOR shall perform a variable rate step-drawdown pumping test as follows:
 - 1. Following the completion of well development the water level in the well shall be allowed to recover for a period of at least 12 hours or until the water levels have recovered to the approval of the ENGINEER. Following this recovery period, step-

rate pump testing shall begin. The test shall be an estimated 10-hour long step-drawdown test, consisting of 5 steps of 2-hour duration. The pump shall be operated to maintain the same rate during each interval. The maximum flow rate is anticipated to be 4,800 gpm.

- B. **Constant Rate Discharge Test:** With the pump bowls set at an appropriate depth, as approved by the ENGINEER, the CONTRACTOR shall perform a 10-hour constant rate test as follows:

1. Following the completion of all wells and proper well development is completed, the water level in the wells shall be allowed to recover for a period of at least 12 hours or until the water levels have stabilized to the approval of the ENGINEER. Following this recovery/background period, the constant rate testing shall begin. The pump shall be operated to maintain a consistent flow rate during the entire test. The anticipated flow rate is expected to be 4,800 gpm for this constant rate test, or as determined by the ENGINEER. All available monitoring wells will be monitored by pressure transducer during this test. Following pumping, the well will be monitored for recovery for a minimum of 12 hours or until fully recovered to background conditions.

3.7 WATER DISPOSAL

- A. The CONTRACTOR shall dispose the water generated at the site in accordance with Section 13218 – Formation Water Control and Discharge System.

- END OF SECTION -

SECTION 13218 – FORMATION WATER CONTROL AND DISCHARGE CONTROL

PART 1 -- GENERAL

1.1 GENERAL

- A. This section covers the work, material, equipment, and temporary facilities necessary to meet the FDEP-issued National Pollutant Discharge Elimination System (NPDES) or Generic Surface Discharge permit criteria regulating produced formation water discharges to surface water, or other locally regulated discharge requirements.
- B. This section covers formation water discharged to surface water produced during drilling and testing operations in accordance with Section 13211 – Well Drilling; Section 13214 – Geophysical Logging; Section 13216 – Water Quality and Well Development; and Section 13217 – Pumping Tests.
- C. The CONTRACTOR shall provide all piping and valves to convey discharge water to and from the onsite storage tank(s) and from the storage tank(s) to the discharge point as directed by the ENGINEER.
- D. Points of Discharge:
 - 1. The point of discharge for the production wells and monitoring wells for each site will be proposed by the CONTRACTOR and approved by the ENGINEER.
 - 2. CONTRACTOR shall route discharge pipe as needed. CONTRACTOR shall take care to avoid damage to existing structures and properties and restore properties to pre-construction condition.
- E. The CONTRACTOR shall control flow rates so as not to surcharge the capacity of the temporary containment pad equipment.
- F. The CONTRACTOR will provide a vacuum truck or any other required equipment and dispose of all drilling and well testing fluids in accordance with local, state, and federal regulations.

1.2 THE REQUIREMENT

- A. The CONTRACTOR shall submit to the ENGINEER and OWNER a plan for drilling, development and testing formation water disposal that will meet the criteria to obtain a generic discharge permit through FDEP and/or other regulatory agencies. The plan shall consist of pipe lengths, diameters, and materials, meter installation locations and type of tanks to store the formation water.
- B. The CONTRACTOR will be responsible of disposing all formation cuttings and turbid water produced at a location approved by FDEP and the ENGINEER and OWNER.

PART 2 -- PRODUCTS

2.1 GENERAL

- A. Provide all labor, materials, equipment, and temporary facilities to comply with FDEP-issued NPDES, or Generic Surface Discharge permit regulating produced formation water discharges to surface water.

2.2 EQUIPMENT

- A. The CONTRACTOR shall provide, maintain, and operate an adequate volume of internal baffled steel or fiberglass settling tanks for settling of solids from the formation water drilling and testing operations as specified. The multiple tanks shall be connected in series using the uppermost discharge port(s) to provide sufficient retention time for solid separation. The CONTRACTOR may propose an alternate settling and retention system by submitting to the ENGINEER the applicable design drawings and material specifications. The proposed system shall conform to all local, state, and federal regulations and must be approved by the ENGINEER.
- B. The CONTRACTOR shall provide all necessary transmission piping, couplings, pumps, and other items needed to assemble, operate, and maintain the formation-water filtration-retention system.
- C. The CONTRACTOR shall provide, maintain, and operate de-silting/de-sanding cyclone-type separators in conjunction with other devices (e.g., mechanical filtration) in combination with the retention system to reduce formation water turbidity to acceptable levels prior to discharge.
- D. Furnish and install the length of temporary piping and appurtenances to convey the produced formation waters to a point of discharge as approved by the ENGINEER.
- E. The CONTRACTOR shall furnish and install an in-line flowmeter with a flow rate indicator and totalizer that has been calibrated within the last 60 days and capable of measuring discharge rates of 100 to 4,000 gallons per minute.

PART 3 -- EXECUTION

3.1 GENERAL

- A. Configure and construct the temporary control and discharge system as appropriate to meet local, state and federal regulations and requirements. Bidders are advised to carefully inspect the proposed sites before preparing their bid submittal. The removal and replacement of minor above-ground obstructions such as grating shall be anticipated and accomplished.
- B. Inspect and maintain filtration-retention-discharge system for leaks and make repairs as necessary or as directed by the ENGINEER. The Biscayne aquifer groundwater water quality at the site shall not be impacted by construction activities.
- C. Clean settling tanks and sludge tanks of solids and turbid waters using a vacuum truck and dispose of in accordance with local, state, and federal regulations. Accomplishing this task shall be considered incidental to the Work and will not result in additional compensation to the CONTRACTOR.
- D. The CONTRACTOR shall coordinate formation water discharge activities with the ENGINEER. Operate the system in conformance with FDEP-issued NPDES, or generic discharge permit using water quality readings obtained from the onsite-monitoring program. If monitoring data indicates non-compliance, discharges shall be discontinued until parameter levels are below permitted limits. This time shall be considered incidental to the Work and will not result in additional compensation to the CONTRACTOR.

- E. The CONTRACTOR shall monitor and maintain the in-line flowmeter installed on the discharge pipe during testing. Flowmeter readings shall be obtained before the start of discharge activities and at the end of each workday. The drilling superintendent shall report these readings on the daily activity sheets. The CONTRACTOR shall ensure that the discharge line is full for accurate flowmeter readings by employing an appropriate back-pressure device such as orifice weir.
- F. The control and discharge system may require modifications based on site activity and associated quality and quantity of produced formation water (e.g., reverse-air drilling and pump tests). The CONTRACTOR will not be compensated for these modifications and these costs should be considered as part of the lump sum associated with mobilization, demobilization, and site restoration.

- END OF SECTION -

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SECTION 13219 – WELL FACILITY DISINFECTION AND FINAL WATER QUALITY SAMPLING

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Provide labor, equipment and materials to disinfect the Production Wells pursuant to the requirements of AWWA C654-13; including pump facilities, wellhead, and piping according to the requirements of AWWA C-601.
- B. Provide labor, equipment and materials to perform analytical tests on the well. The CONTRACTOR shall subcontract an analytical laboratory to perform sampling and analytical services. The laboratory shall be certified to perform the scope of work by the Florida Department of Environmental Protection and local health department regulations.
- C. Provide labor, equipment and materials to perform analytical tests including (1 complete set) Chapter 62-550 Florida Administrative Code (FAC) drinking water analysis on each production well (including asbestos). The CONTRACTOR will subcontract an analytical laboratory to perform the scope of work by the Florida Department of Environmental Protection and Broward County Health Department.

1.2 CONTRACTOR SUBMITTALS

- A. State and County certifications for proposed laboratory.
- B. Provide sampling reports, disinfection forms, completed chain of custody forms and analytical results for all consecutive sampling events. Laboratory reports shall be submitted within 30 days of receipt of samples by the laboratory.
- C. MSDS for all products to be used for disinfection a minimum of 15-days prior to commencement of disinfection.

PART 2 -- PRODUCTS

2.1 MATERIALS

- A. Free chlorine liquid or gas.
- B. Sodium Hypochlorite.
- C. Steriline.

PART 3 -- EXECUTION

3.1 WELL FACILITY DISINFECTION

- A. Provide notice to ENGINEER 48 hours in advance of treatment. Provide injection and measurement methods for approval.
- B. Post warning notices and secure the well facility from unauthorized access or use. Secure the area.
- C. The CONTRACTOR shall disinfect the wells as soon as construction of the wells and cleaning procedures have been completed. The CONTRACTOR shall carry out adequate cleaning procedures immediately preceding disinfection where evidence indicates that normal well construction and development work have not adequately cleaned the wells. All oil, grease, soil, and other materials, which could protect bacteria from disinfectants shall not be allowed in the hole. If evidence indicates that this material has entered the hole, it shall be thoroughly removed. The cleaning operation is to be carried out by pumping and swabbing only. Where test pumping equipment is to be used, such equipment shall be thoroughly scrubbed, or otherwise cleaned of foreign material.
- D. Mix a sufficient concentration of chlorinated water solution to maintain 200 parts per million (ppm) chlorine residual throughout the wells, pump and added piping facilities. The pump and motor shall not be exposed to chlorinated water solutions with concentrations above 500 ppm. The recommended pH of chlorine solutions is between 5.5 and 6.8. Any well components sensitive to free chlorine or disinfecting agents will be disinfected and installed separately to prevent damage.
- E. Disinfection procedures shall ensure that the disinfecting agent is uniformly applied throughout the entire water depth of the wells, without relying on subsequent mechanical or surging action for dispersing the disinfectant. For this purpose, the disinfecting agent shall be furnished or prepared in liquid form and placed in the well through a hose or tremie of sufficient length to extend to the bottom of the wells. The disinfecting agent shall be applied through the hose, which is to be raised and lowered, to achieve uniform distribution of the solution throughout the wells.
- F. All portions of the wells above the water shall be maintained in a damp condition with water containing the required concentration of disinfecting agent for a period of not less than 20 minutes. The disinfecting agent shall be left in the wells for a period of at least 24 hours.
- G. After a 24 hour or longer contact period, the wells are to be pumped to clear it of the disinfecting agent. The disposal point for the purged water shall be selected so as to minimize potential damage to aquatic life or vegetation.
- H. All water used for treatment shall be potable and from an ENGINEER approved source.
- I. The complete disinfection program and methods followed, especially if materially different from those specified, shall be in accordance with directives of the Florida Department of Environmental Protection (FDEP), Division of Health and all methods employed shall have their approval. Final approval of the bacterial samples shall be

received from the FDEP and Broward County Health Department prior to the time that the system is placed into operation.

- J. Prepare and submit '*Disinfection Reporting Form*' for each well, form to be provided by the OWNER and/or ENGINEER.

3.2 BACTERIOLOGICAL ANALYSIS

- A. Purge detectable chlorine solution from the well facility.
- B. Collect ten (10) consecutive water samples at an approved location starting 48 hours after disinfection procedure. Not less than 8 hours will elapse between sample collection events. No more than two (2) samples shall be collected per day. Sample collection and handling procedures shall be in accordance with a State approved laboratory quality assurance plan by an experienced sampling technician.
- C. Samples shall be analyzed by an approved independent certified laboratory in accordance with State and local regulations, and in accordance with the methods published by AWWA.
- D. The CONTRACTOR shall continue to treat and conduct sample collection and analysis until an acceptable result is obtained. Any system disinfection (or any component thereof), sample collection, or analysis required after an unsuccessful first attempt, shall be conducted at the CONTRACTOR'S expense.

3.3 WATER QUALITY ANALYSIS

- A. Purge a minimum of five (5) well volumes of formation water from each well. The CONTRACTOR shall coordinate with the ENGINEER and OWNER for water quality analysis.
- B. Collect one set of water samples from each well for drinking water analysis. Sample analysis shall include all drinking water parameters required in FDEP, Chapter 62-550 FAC, and Article 14, Section B of the Broward County Unified Land Development Code, latest revision. Sample collection and handling procedures shall be in accordance with a State approved laboratory quality assurance plan by an approved sampling technician.
- C. Water samples shall be analyzed by an approved independent certified laboratory in accordance with state and local regulations.

- END OF SECTION -

SECTION 13220 – WELL PLUGGING AND ABANDONMENT

PART I -- GENERAL

1.1 SCOPE OF WORK

- A. This section covers the labor, equipment and materials required to furnish and install the cement grout to abandon existing wells as specified in the project documents. All work performed shall conform to State of Florida well drilling practices and to AWWA standards for wells (AWWA; A100-06).
- B. Obtain all required permits for abandonment of existing well(s).
- C. The reported well completion details for existing wells to be abandoned will be reported to the CONTRACTOR on a site-by-site basis, and depths will be approximately up to 200 feet below land surface.

1.2 SUBMITTALS

- A. Well abandonment permit.
- B. Provide data on all proposed cement supplier, additives and manufacturer's specifications.
- C. Provide bulk cement units weight tickets for verification of cement quantities pumped.
- D. During cementing, provide cement slurry weight data for each grouting stage. A fixed, safe, accessible location to collect samples must be provided to the satisfaction of the ENGINEER and OWNER. Samples of the cement slurry shall be collected, weighed and recorded. The correct mix ratios shall be maintained. If performed in batches, provide slurry weight and collect sample for each batch mixed. If performed in continuous mixing, provide slurry weights and collect samples at the beginning, middle, and end of pumping for each grouting stage.

PART II -- PRODUCTS

2.1 GENERAL REQUIREMENTS

The Contractor shall furnish and install all grout and additives as specified, and as approved by the ENGINEER and OWNER.

2.2 PORTLAND CEMENT

Cement grout shall be API class B Portland cement and conform to ASTM C150, Type II standards.

PART III -- EXECUTION

3.1 WELL ABANDONMENT

- A. Obtain permit for abandonment and any special instructions required by permit.
- B. The CONTRACTOR is solely responsible for the successful execution of grouting. Well abandonment shall be in conformance with all applicable State regulations. The CONTRACTOR shall provide adequate notice prior to cementing to enable the ENGINEER and OWNER to observe all cementing operations. The CONTRACTOR will remove riser casing and screen from the well as required by AWWA, A100-06 to ensure an effective seal.
- C. Prior to pumping grout, the total well depth will be measured by the CONTRACTOR and reported to the ENGINEER and OWNER.
- D. Abandonment shall be performed by pumping the cement slurry to the bottom of the well using a tremie pipe. Only neat cement will be used for the abandonment. The base of the tremie pipe will be placed within 3-feet of the total well depth. Cement will be pumped continuously from this depth, filling the well from bottom to top, until cement is visible at the top of the well. After the cement has hardened in the well, the depth of the hardened grout from the previous grouting stage will be measured in the presence of the ENGINEER and OWNER.
- E. As was performed for the prior grouting stage, cement will be pumped from the bottom to the top, filling the remaining cased interval, until grout is visible at the top of the well to within three feet below land surface.
- F. Cut surface casing to three (3) feet below land surface and backfill to grade with clean fill, or as directed by the ENGINEER and OWNER.
- G. Remove all existing above ground components within the fenced area, including fence, and transport all ENGINEER/OWNER considered reusable components to the OWNER'S water treatment plant, or to an OWNER approved alternative location. Properly dispose or recycle all un-usable components.

- END OF SECTION -

SECTION 13221 – SHALLOW MONITORING WELL REPLACEMENT

PART 1 -- GENERAL

1.1 RELATED WORK

- A. Section 13216 – Water Quality and Well Development.**

1.2 THE REQUIREMENT

- B.** These Specifications cover the work necessary for replacement and construction of the shallow monitoring wells.
- C.** The CONTRACTOR shall furnish all labor, materials, tools, and equipment necessary to drill and complete the wells, including drilling, casing, sealing, filter pack, and completion of well head, and all other work required to complete the Work as specified herein as directed by the OWNER.
- D.** The CONTRACTOR shall rehabilitate or replace existing 2-inch diameter PVC shallow monitoring wells with 4-inch diameter PVC shallow monitoring wells, or as directed by the OWNER.
- E.** The CONTRACTOR is responsible for SFWMD and Department of Health (DOH) permits to install and abandon the shallow monitoring wells.

PART 2 -- PRODUCTS

2.1 CASING, SCREENS, AND APPURTENANCES

- A.** Shallow Monitoring Well Casing: Each well casing shall be 4-inch nominal diameter Schedule 40 PVC pipe with ASTM threads according to ASTM F 480. The blank PVC shall be factory-assembled in 10 to 20-foot lengths, or as determined by the OWNER. Smaller lengths of 5 to 10-feet shall also be furnished to accommodate the final well design or as determined by the ENGINEER and OWNER. The blank PVC casing surface shall be free of solvents, oils, grease, paint, and dirt and shall be certified clean from factory. Sections of casing shall be received from the supplier wrapped in polyethylene protective wrappers with sealed ends to limit exposure to potential contaminants. Casing shall not be removed from the wrapping until immediately before placing it in the borehole.
- B.** Casing Joints: Casing joints shall be ASTM thread and shall be attached in accordance with the requirements of ASTM F 480. The CONTRACTOR shall not utilize glued joints.
- C.** Well Screen
 - 1.** Design: The well design, screen slot size, screen size, and other details may need to be changed in the field, as approved by the ENGINEER and OWNER, based on the lithology collected from each borehole.

2. Each well screen assembly shall be 4-inch nominal diameter, 0.010 or 0.020-inches, slotted Schedule 40 PVC. The screen shall be supplied in 20-foot lengths, or as specified by the ENGINEER and OWNER. Screen openings shall widen inward so as to be non-clogging. Final screen length and positioning will be approved by the OWNER and is subject to change based on observed field conditions. The well screen shall be sufficient size and design to hold back and support the filter pack and in-situ soils surrounding the screen. Field-constructed screen is not acceptable and will be rejected. The well screen surface shall be free of solvents, oils, grease, paint, and dirt and shall be certified clean from the factory. The well screen shall have smooth, sharp-edged openings free of burrs, chipped edges, or broken pieces on the interior and exterior surface of the pipe. Sections of screen shall be received from the supplier wrapped in polyethylene protective wrappers with sealed ends for limiting exposure to potential contaminants. Wrapping shall not be removed until screen is to be used.
- D. Above-Ground Completion/Well Heads: Wellheads shall be constructed as directed by the OWNER.
1. At a minimum, the wells will be completed as a stick-up well, with casing at least two feet above land surface, or if located in a traffic area, the well head must be protected by either a traffic rated cover, or an aluminum cover surrounded by a concrete pad and bollards. The covers for each well must be lockable and identified with the specific well name and the designation "Shallow Monitoring Well". The final wellheads and well name shall be approved by the OWNER prior to installation.

2.2 SEALING MATERIAL

- E. Cement: Material used in sealing of the surface casing and borehole annular space shall consist of neat cement grout using Type II Portland cement conforming to ASTM C 150, or as approved by the ENGINEER and OWNER.
1. Additives: No additives will be mixed with the sealing material to speed setting time or to expand the material.

2.3 FILTER PACK MATERIAL

- F. Primary Filter Pack material: The filter pack shall be #20/30 filter pack material, or as approved by the ENGINEER and OWNER. The CONTRACTOR shall furnish distribution curves of proposed filter pack material prior to mobilization. The filter pack material shall be a product of commercial sand and gravel manufacturer and shall be composed of hard, well rounded, water worn, 90 percent or greater siliceous sand, free of flat or elongated pieces, organic matter, and other foreign matter.
- G. Filter pack material shall be protected from contaminants prior to placement by either sorting it in plastic-lined paper bags or in a location protected from the weather and contamination on plastic sheeting. Filter pack materials shall

be transported to the well in a manner preventing contamination by other soils, oils and grease, and other chemicals.

- H. Bentonite Seal: One foot of bentonite pellets, or as approved by the ENGINEER and OWNER, shall be placed above the filter pack to protect the filter pack during grouting.

PART 3 EXECUTION

3.1 WELL CONSTRUCTION

- A. General: The CONTRACTOR shall install wells in the drilled boreholes at locations indicated.
- B. Well Design/Well Screen Placement: Install 20-feet of screen and necessary casing to reach the desired total depth of the well, or as directed by the OWNER. The casing/screen assembly shall be installed as follows:
 - 1. The well casing, including the sump and two screened sections, shall be lowered into the center of the borehole and suspended at the desired depth.
 - 2. The well casing/screen shall be plumb, true, and centered in the borehole
 - 3. The top of the well casing shall be set at the depth indicated.
- C. Filter Pack Installation: After the well casing and two screened sections have been positioned to the design depth inside the borehole, the filter pack shall be placed. The CONTRACTOR shall install a uniform and continuous filter pack in the full length of the well screen intervals.
 - 1. The filter pack material shall be placed with tremie pipe to the bottom of the annulus between the well casing and the borehole. The level of filter pack material in the annulus will be verified periodically at the direction of the ENGINEER by tag-line measurement during emplacement. The volume of filter pack material versus annular volume will be compared to verify proper placement of the filter pack.
 - 2. Following placement of the filter pack emplace 1-foot of bentonite pellets on top of the filter pack using a tremie pipe. At no time shall the filter pack material be allowed to free fall from the bottom of the tremie pipe more than 2-feet during placement. Allow sand and bentonite pellets to settle for a minimum of 20 minutes then tag the depth.
- D. Failure to Complete: If the casing cannot be landed in the correct position or at a depth approved by the ENGINEER and OWNER, the CONTRACTOR shall construct another well immediately adjacent to the original location and complete it in accordance with the Contract Documents as part of the Work. The abandoned borehole shall be sealed in accordance with SFWMD and FDEP regulations.

3.2 WELL DEVELOPMENT

- A. Develop and sample the shallow monitoring wells in accordance with **Section 13216 – Water Quality and Well Development**.
- B. At a minimum, the wells will be completed as a stick-up well, with casing at least two feet above land surface, or if located in a traffic area, the well head must be protected by either a traffic rated cover, or an aluminum cover surrounded by a concrete pad and bollards. The covers for each well must be lockable and identified with the specific well name and the designation “Shallow Monitoring Well”.
- C. The shallow monitoring wells shall be sampled and analyzed in accordance with **Section 13216 – Water Quality and Well Development**. In addition, depth to water measurements will be conducted at the time of sampling. All monitoring wells will be surveyed to NAVD 88 elevations to correct water levels to mean sea level.

3.3 WELL ABANDONMENT

- A. After substantial completion of the Project is attained by the CONTRACTOR, and with the direction of the ENGINEER and OWNER, the CONTRACTOR shall inform the OWNER, SFWMD, and FDEP of the intent of plugging and abandoning the shallow monitoring wells. The CONTRACTOR shall continue testing the water quality of the monitoring wells by the direction of the SFWMD and FDEP until SFWMD and FDEP approves their plugging and abandonment. No monitoring wells shall be plugged and abandoned without the written approval by SFWMD and FDEP, and other applicable regulatory agencies.
- B. The price of plugging and abandonment of the monitoring wells, and all prices associated with the Work and materials necessary to successfully plug and abandon the monitoring wells, shall be included in the CONTRACTORS Bid Form.

- END OF SECTION -

SECTION 15000 - PIPING, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. The CONTRACTOR shall provide the piping systems indicated, complete and operable, in accordance with the Contract Documents.
- B. The provisions of this Section shall apply to piping sections in Divisions 2 and 15.
- C. Where pipe supports are not indicated in the Specifications, it is the CONTRACTOR'S responsibility to develop the details necessary to design and construct mechanical piping systems to accommodate the specific equipment provided, and to provide spacers, adapters and connectors for a complete and functional system.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with Section 01300 – Contractor Submittals.
- B. Shop Drawings: Shop Drawings shall contain the following information:
 - 1. Drawings: Layout drawings including necessary dimensions, details, pipe joints, fittings, specials, bolts and nuts, gaskets, valves, appurtenances, anchors, guides, and material lists. Fabrication drawings shall indicate spacers, adapters, connectors, fittings, and pipe supports to accommodate the equipment and valves in a complete and functional system.
 - 2. Thermoplastic Pipe Joints: Submit solvent cement manufacturer's catalog indicating that the recommended product is suitable for each fluid service application.
 - 3. Gasket Material: Submit gasket manufacturer's catalog indicating that the recommended product is suitable for each fluid service application.
 - 4. Modular Seals for Pipe: Manufacturer's catalog sheet showing materials and installation procedures.
- C. Samples
 - 1. Performing and paying for sampling and testing as necessary for certifications are the CONTRACTOR'S responsibility.
- D. Certifications
 - 1. All Necessary certificates, test reports, and affidavits of compliance shall be obtained by the CONTRACTOR.
 - 2. A certification from the pipe fabricator that each pipe will be manufactured subject to the fabricator's or a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the manufacture of any pipe.

1.3 MATERIAL DELIVERY, STORAGE, AND PROTECTION

- A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact.
- B. Defective or damaged materials shall be replaced with new materials.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Extent of Work

- 1. Pipes, fittings, and appurtenances shall be provided in accordance with the requirements of the applicable Sections of Divisions 2 and 15 and as indicated.
- 2. Materials in contact with potable water shall be listed as compliant with NSF Standard 61.

B. Pressure Rating

- 1. Piping systems shall be designed for the maximum expected pressure as defined in section 02643-Water Pipeline Testing and Disinfection.

C. Inspection

- 1. Pipe shall be subject to inspection at the place of manufacture.
- 2. During the manufacture, the ENGINEER shall be given access to areas where manufacturing is in progress and shall be permitted to make inspections necessary to confirm compliance with requirements.

D. Tests

- 1. Except where otherwise indicated, materials used in the manufacture of the pipe shall be tested in accordance with the applicable specifications and standards.
- 2. Welds shall be tested as indicated.
- 3. The CONTRACTOR shall be responsible for performing material tests.

E. Welding Requirements

- 1. Qualification of welding procedures used to fabricate pipe shall be in accordance with the provisions of AWS D1.1 - Structural Welding Code or the ASME Boiler and Pressure Vessel Code, Section 9, whichever is applicable.
- 2. Welding procedures shall be submitted for the ENGINEER's review.

2.2 PIPE FLANGES

A. General

- B. Flanges shall be provided with flat faces and shall be attached with bolt holes straddling the vertical axis of the pipe unless otherwise indicated.
- C. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207.
- D. Flange faces shall be perpendicular to the axis of the adjoining pipe.
- E. Flanges for miscellaneous small diameter pipes shall be in accordance with the standards indicated for these pipes.
- F. Pressure Ratings
 - 1. 150 psig or less: Flanges shall conform to either AWWA C207 - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In., Class D, or ASME B16.5 - Pipe Flanges and Flanged Fittings, 150 lb class.
 - 2. 150 psig to 275 psig: Flanges shall conform to either AWWA C207 Class E or Class F, or ASME B16.5 150 lb class.
 - 3. 275 psig to 700 psig: Flanges shall conform to ASME B16.5, 300 lb class.
 - 4. Selection Based on Test Pressure
 - a. Do not expose AWWA flanges to test pressures greater than 100 percent of rated capacity.
 - b. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected.
- G. Blind Flanges
 - 1. Provide blind flanges in accordance with AWWA C207, or as indicated for miscellaneous small pipes.
 - 2. Blind flanges for pipe sizes 12-inches and greater shall be provided with lifting eyes in the form of welded or screwed eye bolts.
- H. Flange Coating
 - 1. Machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.
- I. Flange Bolts
 - 1. Bolts and nuts shall conform to the requirements of Section 05500 – Miscellaneous Metalwork.
 - 2. Use all-thread studs on valve flange connections where space restrictions preclude the use of regular bolts.
- J. Insulating Flanges

1. Insulated flanges shall be provided with bolt holes 1/4-inch diameter greater than the bolt diameter.

K. Insulating Flange Sets

1. Insulating flange sets shall be furnished on all piping connections where two dissimilar metals are to be connected in order to prevent corrosion. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers, and a steel washer.
2. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2 inch or smaller and shall be made of acetal resin.
3. For bolt diameters larger than 1-1/2 inches, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic material.
4. Steel washers shall be in conformance with ASTM A 325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
5. Insulating gaskets shall be full-face.

L. Insulating Flange Manufacturer, or Equal

1. **JM Red Devil, Type E**
2. **Maloney Pipeline Products Co.**
3. **GPT Industries (formerly PSI Products, Inc.)**

M. Flange Gaskets

1. Gaskets for flanged joints used in general water service shall be full-faced type, with material and thickness in accordance with AWWA C207, suitable for temperatures to 700 degrees F, a pH of one to 11, and pressures to 1000 psig.
2. Blind flanges shall be provided with gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange.
3. Ring gaskets will not be accepted unless otherwise indicated.
4. Flange gaskets shall be: **Toruseal or Flange-Tyte.**
5. Gaskets for flanged joints used in water with chloramines shall be: **Gylon, Style 3500** as manufactured by **Garlock**; by **Crane**; or equal.

2.3 THREADED INSULATING CONNECTIONS

A. General

1. Threaded insulating bushings, unions, or couplings, as appropriate, shall be furnished for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. Materials

1. Threaded insulating connections shall be constructed of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.4 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. General

1. Provide cast mechanical-type couplings where indicated, conforming to the requirements of AWWA C606 - Grooved and Shouldered Joints.
2. Bolts and nuts shall conform to the requirements of Section 05500 – Miscellaneous Metalwork.
3. Gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations.
4. The wall thickness of grooved piping shall conform to the coupling manufacturer's recommendations to suit the highest expected pressure.
5. In order to avoid excessive load on equipment caused by pipe movement due to steady state or transient pressure conditions, equipment connections with mechanical-type couplings shall be provided with rigid grooved couplings or flexible type coupling with harness in sizes where rigid type couplings are not available, unless thrust restraint is provided by other means.
6. Mechanical type couplings shall be bonded.
7. The CONTRACTOR shall have the coupling manufacturer's service representative verify the correct choice and application of couplings and gaskets, and the workmanship, to assure a correct installation.
8. Grooving tools shall be from the same manufacturer as the grooved components.

2.5 SLEEVE-TYPE COUPLINGS

A. General

1. Provide sleeve-type couplings where indicated.
2. The CONTRACTOR will not be allowed to substitute a sleeve-split coupling, or any other type in lieu of sleeve coupling unless approved by the ENGINEER.

B. Construction

1. Sleeve couplings shall be in accordance with AWWA C219 - Standard for Bolted Sleeve-Type Couplings for Plain-End Pipe.
2. Couplings shall be constructed of steel with steel bolts, without pipe stop.
3. Couplings shall be of sizes to fit the indicated pipe and fittings.
4. The middle ring shall be not less than 1/4-inch thick or at least the same wall thickness as the pipe to which the coupling is connected.
5. If the strength of the middle ring material is less than the strength of the pipe material, the thickness of the middle ring shall be increased to have the same strength as the pipe.
6. The coupling shall be either 5 or 7 inches long for sizes up to and including 30-inch and 10 inches long for sizes greater than 30-inch, for standard steel couplings, and 16 inches long for long-sleeve couplings.
7. The followers shall be single-piece contoured mill sections welded and cold-expanded as required for the middle rings, and of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling.
8. The shape of the follower shall be of such design as to provide positive confinement of the gasket.
9. Bolts and nuts shall be in accordance with the requirements of Section 05500 – Miscellaneous Metalwork.
10. Buried sleeve-type couplings shall be fusion epoxy-coated at the factory as indicated.

C. Pipe Preparation

1. Where indicated, prepare the ends of the pipe for flexible steel couplings.
2. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with an outside diameter not more than 1/64 inch smaller than the nominal outside diameter of the pipe.
3. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, in order to proof-test the weld to the strength of the parent metal.
4. The weld of the middle ring shall be subjected to air test for porosity.

D. Gaskets

1. Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions.
2. Gaskets for wastewater and sewerage applications shall be composed of Buna N, Grade 60, or equivalent suitable elastomer.
3. The rubber in the gasket shall meet the following specifications:

- a. Color: jet black
 - b. Surface: non-blooming
 - c. Durometer Hardness: 74, plus and minus 5
 - d. Tensile Strength: 1000 psi minimum
 - e. Elongation: 175 percent minimum
4. The gaskets shall be immune to attack by impurities normally found in water or wastewater.
 5. Gaskets shall meet the requirements of ASTM D 2000 - Classification System for Rubber Products in Automotive Applications, AA709Z, meeting Suffix B13 Grade 3, except as indicated above.

E. Piping Connection to Equipment

1. Where piping connects to mechanical equipment such as pumps, compressors, and blowers, bring the piping to the equipment connection aligned and perpendicular to the axis of the flange or fitting for which the piping is to be connected.
2. The piping shall not impose excessive stress to the equipment connection to cause misalignment of the equipment.
3. The CONTRACTOR shall assign the responsibility to the equipment manufacturer to review the piping connection to the equipment and submit any modifications to the ENGINEER for review.

F. Insulating Sleeve Couplings

1. Where insulating couplings are required, both ends of the coupling shall be provided with a wedge-shaped gasket which assembles over a sleeve of an insulating compound material compatible with the fluid service in order to obtain insulation of coupling metal parts from the pipe.

G. Restrained Joints

1. Sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means.
2. Harnesses shall be designed by the pipe manufacturer in accordance with AWWA Manual M11, or as indicated.
3. Harness sets shall be designed for the maximum test pressure of the pipe in which they are installed.

H. Sleeve-Type Couplings Manufacturer, or Equal

1. **Dresser, Style 38**
2. **Ford Meter Box Co., Inc., Style FC1 or FC3**
3. **Smith-Blair, Style 411**

PART 3 -- EXECUTION

3.1 MATERIAL, DELIVERY, STORAGE AND PROTECTION

- A. Piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground for protection against oxidation caused by ground contact. Defective or damaged material shall be replaced with new materials.

3.2 GENERAL

- A. Install piping, fittings, and appurtenances in accordance with the requirements of applicable Sections of Division 2 and Division 15.

- B. Lined Piping Systems

- 1. The lining manufacturer shall take full responsibility for the complete, final product and its application.
 - 2. Pipe ends and joints of lined pipes at screwed flanges shall be epoxy-coated in order to assure continuous protection.

- C. Core Drilling

- 1. Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction in order to avoid damage to embedded raceways and reinforcing bars.

- D. Cleanup

- 1. After completion of the WORK, cuttings, joining and wrapping materials, and other scattered debris shall be removed from the Site.
 - 2. The entire piping system shall be handed over in a clean and functional condition.

- END OF SECTION -

SECTION 15200 - VALVES, GENERAL

PART 1 -- GENERAL

1.1 THE REQUIREMENT

- A. Provide valves, actuators, and appurtenances, complete and operable, as indicated in accordance with the Contract Documents.
- B. The requirements of Section 11000 – Equipment General Provisions, apply to the WORK of this Section.
- C. Apply the provisions of this Section to all valves and valve actuators except where otherwise indicated.
- D. Valves and actuators in particular locations may require a combination of units, sensors, limit switches, and controls, as indicated.
- E. Support
 - 1. Where a valve is to be supported by means other than the piping to which it is attached, obtain from the valve manufacturer a design for its support and foundation that satisfies the criteria in Section 11000 – Equipment General Provisions.
 - 2. Submit the support design, including drawings and calculations sealed by an engineer, with the Shop Drawings.
 - 3. Provide the support after the design has been approved.
- F. Unit Responsibility
 - 1. Make a single manufacturer responsible for the coordination of design, assembly, testing, and furnishing of each valve; however, the CONTRACTOR shall be responsible to the OWNER for compliance with the requirements of each valve Section.
 - 2. Unless indicated otherwise, the responsible manufacturer shall be the manufacturer of the valve.
- G. Single Manufacturer
 - 1. Where 2 or more valves of the same type and size are required, the valves shall be furnished by the same manufacturer.

1.2 CONTRACTOR SUBMITTALS

- A. Furnish submittals in accordance with the requirements of Section 01300 – Contractor Submittals.
- B. Furnish the following information on Shop Drawings:
 - 1. valve name, size, Cv factor, pressure rating, identification number (if any), and specification section number;

2. complete information on the valve actuator, including size, manufacturer, model number, limit switches, and mounting;
 3. cavitation limits for control valves;
 4. assembly drawings showing part nomenclature, materials, dimensions, weights, and relationships of valve handles, hand wheels, position indicators, limit switches, integral control systems, needle valves, and control systems;
 5. complete wiring diagrams and control system schematics; and,
 6. a valve-labeling schedule, listing the valves to be furnished with stainless steel tags, indicating in each case the valve location and the proposed wording for the label.
- C. Furnish a technical manual containing the required information for each valve, as indicated.
- D. Furnish a spare parts list, containing the required information for each valve assembly, as indicated.
- E. Factory Test Data
1. Where indicated, submit signed, dated, and certified factory test data for each valve requiring certification, before shipping the valve.
 2. Furnish a certification of quality and test results for factory-applied coatings.

PART 2 -- PRODUCTS

2.1 PRODUCTS

A. General

1. Provide valves and gates of new and current manufacture.
2. Provide shut-off valves 6-inch and larger with actuators with position indicators.
3. Provide gate valves 18-inch and larger, or where chain wheel is required, with spur gear and hand wheel.
4. Provide buried valves with valve boxes and covers containing position indicators and valve extensions.
5. Provide manual shut-off valves mounted higher than 7 feet above the working level with chain actuators.

B. Valve Actuators

1. Unless otherwise indicated, provide valve actuators in accordance with Section 15201 – Valve and Gate Actuators.

C. Protective Coating

1. Coat the exterior surfaces of valves and the wet interior surfaces of ferrous valves of sizes 4-inch and larger in accordance with the requirements of Section 09800 – Protective Coating.
2. The valve manufacturer shall certify in writing that the required coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with the indicated requirements.
3. Do not epoxy-coat the flange faces of valves.

D. Valve Labeling

1. Valve boxes set in sodded areas shall be provided with a concrete collar. A 2" diameter brass identification tag shall be provided on the concrete collar.

E. Valve Testing

1. As a minimum, unless otherwise indicated or recommended by the reference standards, test valves 3 inches in diameter and smaller in accordance with the manufacturer's standard procedure.
2. Factory-test valves 4 inches in diameter and larger as follows:
 - a. Hydrostatic Testing
 - 1) Subject valve bodies to an internal hydrostatic pressure equivalent to twice the water-rated pressure of the valve.
 - 2) Metallic valves rating pressures shall be at 100 degrees F.
 - 3) Plastic valves rating pressures shall be at 73 degrees F, or at a higher temperature according to material type.
 - 4) During the hydrostatic test, there shall be no leakage through the valve body, end joints, or shaft seals, nor shall parts of the valve be permanently deformed.
 - 5) Allow a test duration of at least 10 minutes, in order to allow visual examination for leakage.
 - b. Seat Testing
 - 1) Test the valves for leaks in the closed position, with the pressure differential across the seat equal to the water rated pressure of the valve.
 - 2) Provide a test duration of at least 10 minutes, in order to allow visual examination for leakage.
 - 3) The leakage rate shall be the more stringent of the following:
 - a) as recommended by the reference standard for that type of valve; or,
 - b) leakage past the closed valve not to exceed one fluid ounce per hour per inch diameter for metal seated valves, and drop-tight for resilient seated valves.

c. Performance Testing

- 1) Shop-operate the valves from the fully-closed to the fully-open position, and reverse under no-flow conditions in order to demonstrate that the valve assembly operates properly.

F. Certification

1. Prior to shipment of valves over 12-inches in size, submit certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, or ASTM.

G. Valve Markings

1. Permanently mark valve bodies in accordance with MSS SP25 - Standard Marking Systems for Valves, Fittings, Flanges, and Unions.

2.2 MATERIALS

A. General

1. Provide materials suitable for the intended application.
2. Provide materials in contact with potable water listed as compliant with NSF Standard 61.
3. Ensure that materials not indicated are of high-grade standard commercial quality, free from defects and imperfections that might affect the serviceability of the product for the purpose for which it is intended.
4. Unless otherwise indicated, provide valve and actuator bodies conforming to the following requirements:
 - a. Cast Iron: Close-grained gray cast iron, conforming to ASTM A 48 - Gray Iron Castings, Class 30, or to ASTM A 126 - Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - b. Bronze: ASTM B 62 - Composition Bronze or Ounce Metal Castings, and valve stems not subject to dezincification shall conform to ASTM B 584 - Copper Alloy Sand Castings for General Applications
 - c. NSF Standard 14: Materials shall be listed for use in contact with potable water.

2.3 VALVE CONSTRUCTION

A. Bodies

1. Provide valve bodies that are cast, molded (in the case of plastic valves), forged, or welded, of the materials indicated, and with smooth interior passages.
2. Provide wall thicknesses uniform and in agreement with the applicable standards for each type of valve, without casting defects, pinholes, and other defects that could weaken the body.
3. Perform welds on welded bodies by certified welders and ground welds smooth.

4. Provide valve ends as indicated, and rated for the maximum temperature and pressure to which the valve will be subjected.

B. Valve End Connections

1. Unless otherwise indicated, valves 2-1/2 inches in diameter and smaller may be provided with threaded end connections.
2. Provide valves 3 inches in diameter and larger with flanged end connections.

C. Bonnets

1. Connect valve bonnets to the body by clamping, screwing, or flanging.
2. Provide bonnets of the same material, temperature, and pressure rating as the body.
3. Make provisions for the stem seal with the necessary glands, packing nuts, and yokes.

D. Stems

1. Provide valve stems of the materials indicated, or, if not indicated, of the best commercial material for the specific service, with adjustable stem packing, O-rings, chevron V-type packing, or other suitable seal.

E. Internal Parts

1. Provide internal parts and valve trim as indicated for each individual valve.
2. Where not indicated, construct valve trim from Type 316 stainless steel or other best-suited material.

F. Nuts and Bolts

1. Provide nuts and bolts on valve flanges and supports in accordance with the requirements of Section 05500 – Miscellaneous Metalwork.

2.4 VALVE ACCESSORIES

- A. Provide valves complete with the accessories required to provide a functional system.

2.5 SPARE PARTS

- A. Furnish the required spare parts, suitably packaged and labeled with the valve name, location, and identification number.
- B. Furnish the name, address, and telephone number of the nearest distributor for the spare parts of each valve.
- C. Spare parts are intended for use by the OWNER, after expiration of the correction of defects period.

2.6 MANUFACTURERS

- A. Valve manufacturers shall have a successful record of not less than 5 years in the manufacture of the indicated valves.

PART 3 -- EXECUTION

3.1 VALVE INSTALLATION

A. General

1. Install valves, actuating units, stem extensions, valve boxes, and accessories in accordance with the manufacturer's written instructions and as indicated.
2. Adequately brace gates in order to prevent warpage and bending under the intended use.
3. Firmly support valves in order to avoid undue stresses on the pipe.

B. Access

1. Install valves in a manner to provide easy access for actuation, removal, and maintenance, and to avoid interference between valve actuators and structural members, handrails, and other equipment.

C. Valve Accessories

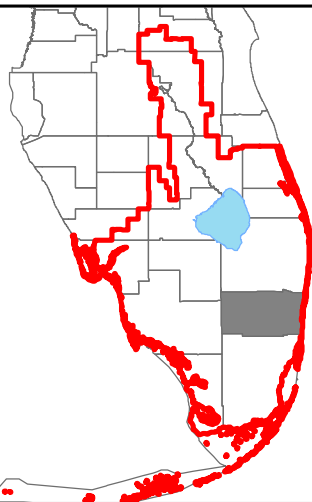
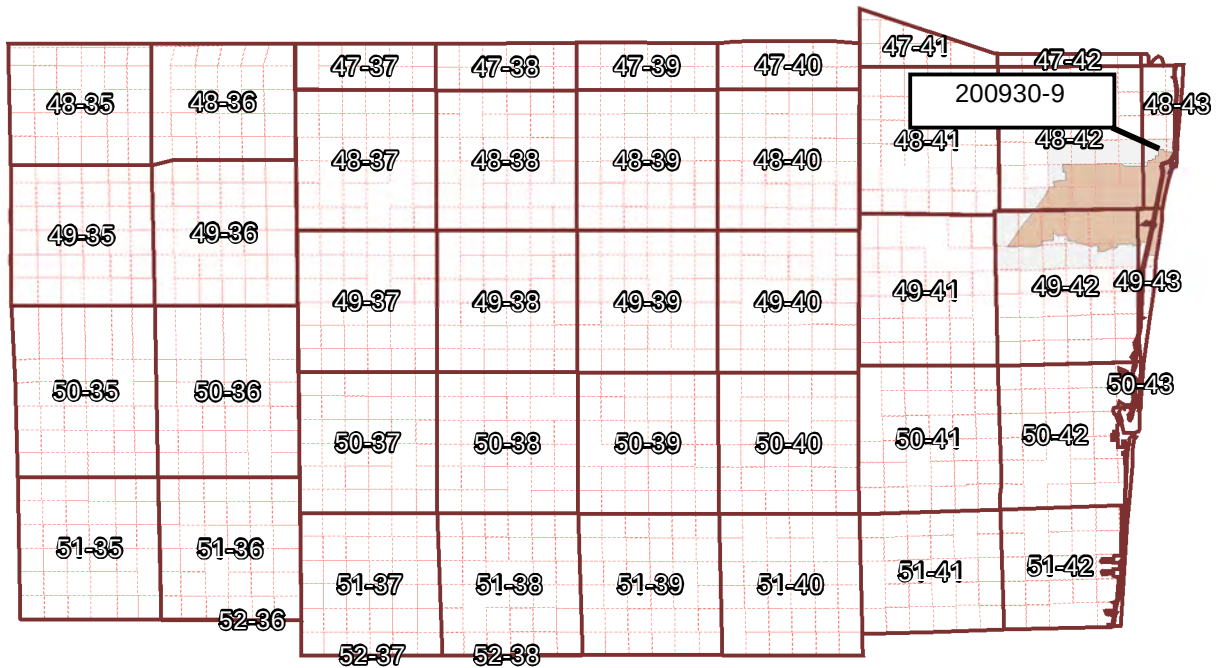
1. Where combinations of valves, sensors, switches, and controls are indicated, properly assemble and install such items such that systems are compatible and operating properly.
2. Clearly note the relationship between interrelated items on Shop Drawing submittals.

- END OF SECTION -

City of Pompano Beach

Well Rehabilitation and Maintenance

Maps



BROWARD COUNTY, FLORIDA

Application No: 200930-9

Permit No: 06-00070-W

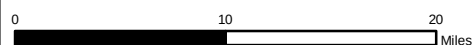
Sec 25-28,32-36 / Twp 48 / Rge 42

Sec 1-12 / Twp 49 / Rge 42

Sec 19,20,29-32 / Twp 48 / Rge 43

Sec 5-7 / Twp 49 / Rge 43

Project Name: CITY OF POMPANO BEACH

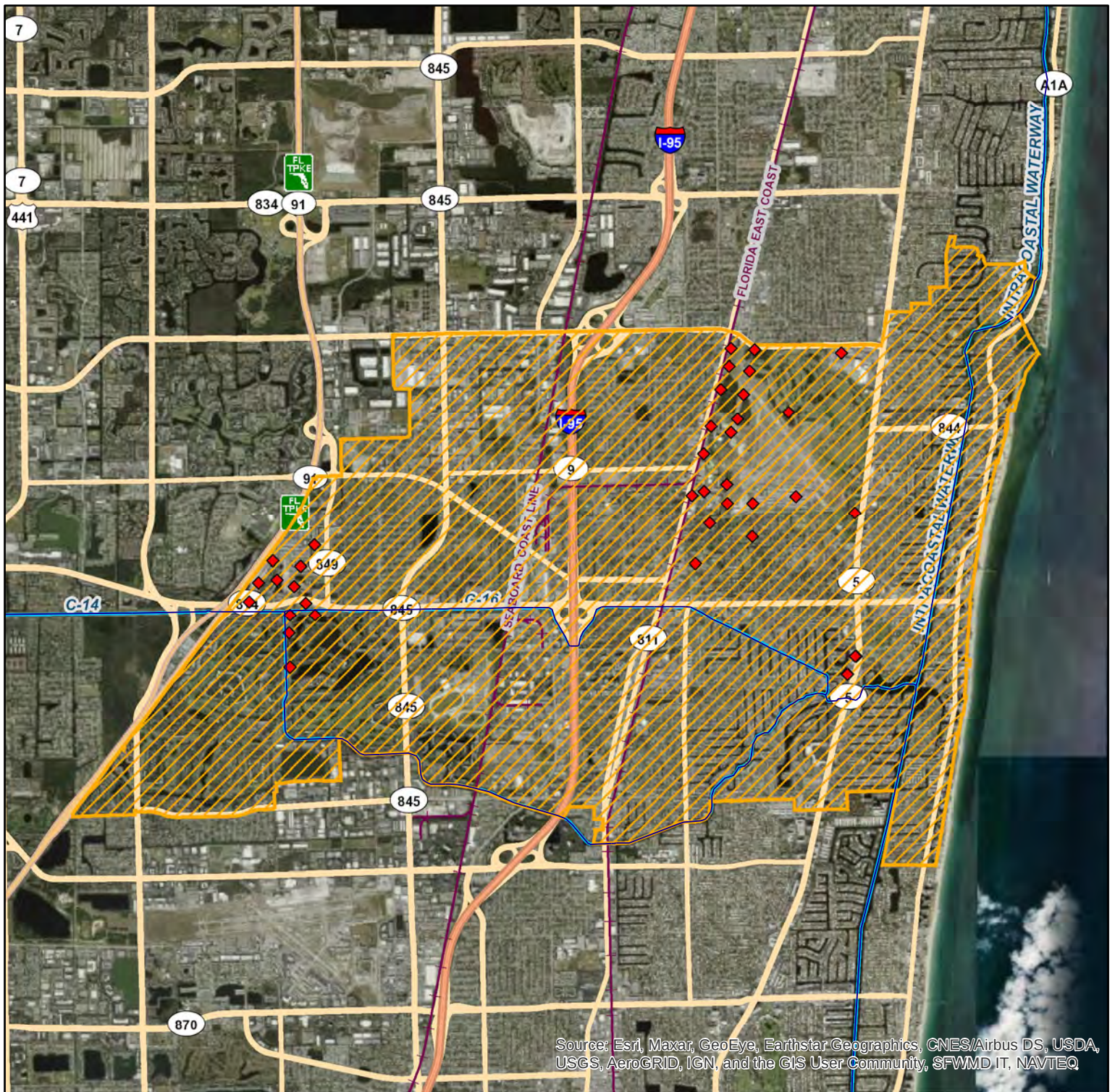


N



Map Date: 2020-10-21

Exhibit No: 1



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, SFWMD.IT, NAVTEQ

BROWARD COUNTY, FLORIDA

N



Map Date: 2020-10-21

- ◆ Well
- Application

Application No: 200930-9

Permit No: 06-00070-W

Sec 25-28,32-36 / Twp 48 / Rge 42

Sec 1-12 / Twp 49 / Rge 42

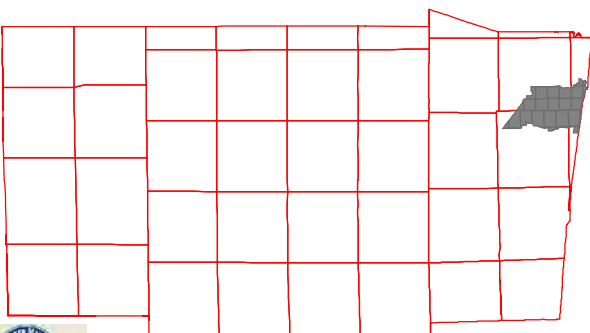
Sec 19,20,29-32 / Twp 48 / Rge 43

Sec 5-7 / Twp 49 / Rge 43

Project Name: CITY OF POMPANO BEACH

0 1.25 2.5
Miles

Exhibit No: 2





BROWARD COUNTY, FLORIDA

- ◆ Well
- /// Application

Application No: 200930-9
 Permit No: 06-00070-W
 Sec 25-28,32-36 / Twp 48 / Rge 42
 Sec 1-12 / Twp 49 / Rge 42
 Sec 19,20,29-32 / Twp 48 / Rge 43
 Sec 5-7 / Twp 49 / Rge 43

Project Name: CITY OF POMPANO BEACH

Map Date: 2020-10-21

WESTERN (PALM-AIRE) WELLFIELD

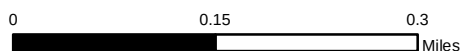
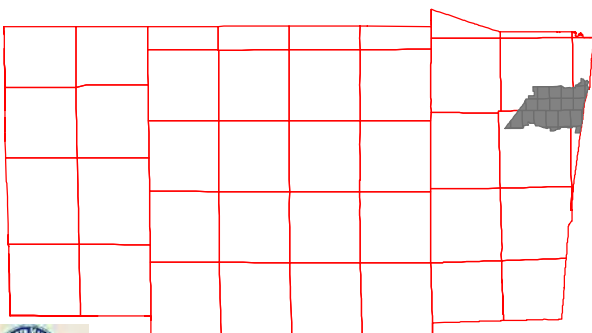
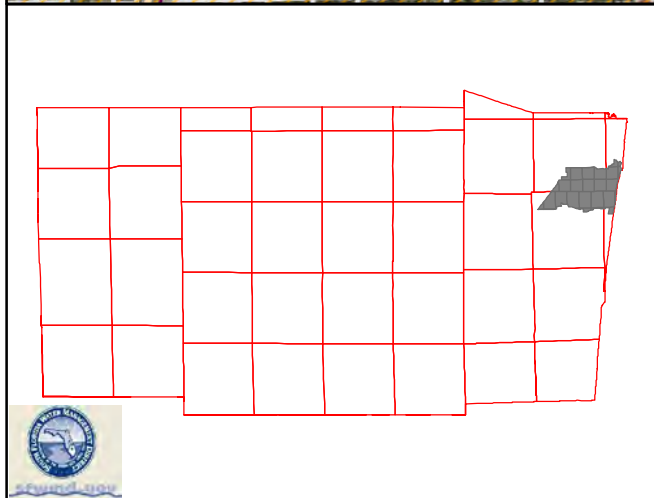


Exhibit No: 3A





BROWARD COUNTY, FLORIDA

◆ Well
/// Application

N

Map Date: 2020-10-21

Application No: 200930-9
 Permit No: 06-00070-W
 Sec 25-28,32-36 / Twp 48 / Rge 42
 Sec 1-12 / Twp 49 / Rge 42
 Sec 19,20,29-32 / Twp 48 / Rge 43
 Sec 5-7 / Twp 49 / Rge 43
 Project Name: CITY OF POMPANO BEACH

**EASTERN
(AIRPORT)
WELLFIELD**

Exhibit No: 3B

0 0.3 0.6
 Miles

City of Pompano Beach

Well Rehabilitation and Maintenance

Well Database

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2622	2623	284524	2624	2625	2626
Name	2 (Airport e wf)	3 (Airport e wf)	3R (Airport e wf)	4 (Airport e wf)	5 (Airport e wf)	6 (Airport e wf)
Map Designator	2	3	3R	4	5	6
FLUWID Number						
Well Field	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)
Existing/Proposed	E	A	P	E	E	E
Well Diameter(Inches)	16	16	16	16	16	14
Total Depth(feet)	136	107	107	140	108	156
Cased Depth(feet)			87			100
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0		0	0	0
To	0	0		0	0	0
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0		0	0	0
Pump Capacity(GPM)	1500	0	1500	1800	1500	2200
Year Drilled						
Planar Location						
Source	Migrate	Migrate		Migrate	Migrate	Migrate
Feet East	944525	944295	943829	944269	944547	944908
Feet North	693957	695195	695020	696626	697690	699133
Accounting Method	Flow Meter	Unspecified	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Abandoned	Primary	Primary	Primary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2627	2628	2629	2630	2631	2632
Name	7 (Airport e wf)	8 (Airport e wf)	9 (Airport e wf)	10 (Airport e wf)	11 (Airport e wf)	12 (Airport e wf)
Map Designator	7	8	9	10	11	12
FLUWID Number						
Well Field	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16	16	16	16	16
Total Depth(feet)	90	90	131	113	127	123
Cased Depth(feet)	90	90	97	93	88	90
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0	0	0	0	0
To	0	0	0	0	0	0
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0	0	0	0	0
Pump Capacity(GPM)	1500	1500	1500	1800	1500	1500
Year Drilled						
Planar Location						
Source	Migrate	Migrate	Migrate	Migrate	Migrate	Migrate
Feet East	945235	943968	945192	945173	945315	945573
Feet North	700037	692401	694729	695457	697457	697978
Accounting Method	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Primary	Primary	Primary	Primary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2633	2634	2635	2636	2637	2638
Name	13 (Airport e wf)	14 (Airport e wf)	15 (Airport e wf)	16 (Airport e wf)	17 (Palm-Aire w wf)	18 (Palm-Aire w wf)
Map Designator	13	14	15	16	17	18
FLUWID Number						
Well Field	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Western (Palm-Aire)	Western (Palm-Aire)
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16	18	18	16	16
Total Depth(feet)	115	114	140	130	150	130
Cased Depth(feet)	115	114	115	113.5	76	72
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0	0	0	0	0
To	0	0	0	0	0	0
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0	0	0	0	0
Pump Capacity(GPM)	1800	1500	2000	2000	2400	2400
Year Drilled						
Planar Location						
Source	Migrate	Migrate	Migrate	Migrate	Migrate	Migrate
Feet East	945805	946030	946224	945299	926649	927015
Feet North	698946	699866	700668	700713	690815	691544
Accounting Method	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Primary	Primary	Primary	Secondary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2639	2640	2641	2642	164567	164568
Name	19 (Palm-Aire w wf)	20 (Palm-Aire w wf)	21 (Palm-Aire w wf)	22 (Palm-Aire w wf)	23 (Palm-Aire w wf)	24 (Palm-Aire w wf)
Map Designator	19	20	21	22	23	24
FLUWID Number						
Well Field	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16	16	16	16	16
Total Depth(feet)	158	154	153	153	153	153
Cased Depth(feet)	78	80	80	79	80	80
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0	0	0		
To	0	0	0	0		
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0	0	0	0	0
Pump Capacity(GPM)	2100	2100	1600	2100	2100	2100
Year Drilled						
Planar Location						
Source	DIGITIZED	Migrate	Migrate	DIGITIZED	Migrate	Migrate
Feet East	927571	929181	928642	928402	929215	928237
Feet North	692396	693021	692193	691418	690310	690296
Accounting Method	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Primary	Primary	Primary	Primary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	164569	177414	136299	136193	136303	136302
Name	25 (Palm-Aire w wf)	26 (Palm-Aire w wf)	SWI1-S	SWI1-D	SWI2-S	SWI2-D
Map Designator	25	26	MW-1 (SWI1-S)	MW-1 (SWI1-D)	MW-2 (SWI2-S)	MW-2 (SWI2-D)
FLUWID Number						
Well Field	Western (Palm-Aire)	Western (Palm-Aire)	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16				
Total Depth(feet)	153	153	120	200	120	180
Cased Depth(feet)	80	80				
Facility Elev. (ft. NGVD)						
Screened Interval From To						
Pumped Or Flowing	P	P				
Pump Type	Turbine	Turbine	None	None	None	None
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0				
Pump Capacity(GPM)	2100	2100	0	0	0	0
Year Drilled						
Planar Location Source	Migrate	Migrate				
Feet East	928215	928252	947553	947553	946184	946184
Feet North	689598	688272	698253	698253	693443	693443
Accounting Method	Flow Meter	Flow Meter	None	None	None	None
Use Status	Primary	Primary	Monitor	Monitor	Monitor	Monitor
Water Use Type	Public Water Supply	Public Water Supply	Monitor	Monitor Water Shortage Monitoring Facility	Monitor	Monitor
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	136305	136304	136307	136306	136325	136308
Name	SWI3-S	SWI3-D	SWI4-S	SWI4-D	SWI5-S	SWI5-D
Map Designator	SW13-S	SWI3-D	MW-4 (SWI4-S)	MW-4 (SWI4-D)	MW-5 (SWI5-S)	MW-5 (SWI5-D)
FLUWID Number						
Well Field	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)						
Total Depth(feet)	120	180	120	200	120	200
Cased Depth(feet)						
Facility Elev. (ft. NGVD)						
Screened Interval						
From						
To						
Pumped Or Flowing						
Pump Type	None	None	None	None	None	None
Pump Int. Elev.						
Feet (NGVD)						
Feet (BLS)						
Pump Capacity(GPM)	0	0	0	0	0	0
Year Drilled						
Planar Location						
Source						
Feet East	950151	950151	949589	949589	946184	946184
Feet North	694391	694391	700570	700570	694742	694742
Accounting Method	None	None	None	None	None	None
Use Status	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Use Type	Monitor	Monitor	Monitor	Monitor Water Shortage Monitoring Facility	Monitor	Monitor
Aquifer	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	136327	136326	136333	136332	136301	136300
Name	SWI6-S	SWI6-D	SWI9-S	SWI9-D	SWI10-S	SWI10-D
Map Designator	MW-6 (SWI6-S)	MW-6 (SWI6-D)	MW-9 (SWI9-S)	MW-9 (SWI9-D)	MW-10 (SWI10-S)	MW-10 (SWI10-D)
FLUWID Number						
Well Field	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)						
Total Depth(feet)	120	200	130	140	130	140
Cased Depth(feet)						
Facility Elev. (ft. NGVD)						
Screened Interval						
From						
To						
Pumped Or Flowing						
Pump Type	None	None	None	None	None	None
Pump Int. Elev.						
Feet (NGVD)						
Feet (BLS)						
Pump Capacity(GPM)	0	0	0	0	0	0
Year Drilled						
Planar Location						
Source						
Feet East	947869	947869	949913	949904	950207	950239
Feet North	695023	695023	688160	688166	688843	688840
Accounting Method	None	None	None	None	None	None
Use Status	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Use Type	Monitor	Monitor Water Shortage Monitoring Facility	Monitor	Monitor	Monitor	Monitor
Aquifer	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	136319	136320
Name	PRW1 (Palm-Alire w wf	PRW8 (Palm-Alire w wf
Map Designator	PRW1	PRW8
FLUWID Number		
Well Field	Western (Palm-Aire)	Western (Palm-Aire)
Existing/Proposed	E	E
Well Diameter(Inches)		
Total Depth(feet)	178	
Cased Depth(feet)		
Facility Elev. (ft. NGVD)		
Screened Interval		
From		
To		
Pumped Or Flowing		
Pump Type	None	None
Pump Int. Elev.		
Feet (NGVD)		
Feet (BLS)		
Pump Capacity(GPM)	0	0
Year Drilled		
Planar Location		
Source		
Feet East	928857	927740
Feet North	690769	691658
Accounting Method	None	None
Use Status	Monitor	Monitor
Water Use Type	Monitor	Monitor
Aquifer	Surficial Aquifer System	Surficial Aquifer System

**TREATMENT****TREATMENT CAPACITY**

Treatment Capacity: 30 mgd Standby Power Capacity: 1,600 kw Treatment Firm Capacity: 30 mgd
 Maximum demand under 75% of operating capacity? ☒ Yes ☐ No *If not, what is the percentage?* N/A
 Firm capacity exceeds the average daily demand? ☒ Yes ☐ No Stand-by power capacity exceeds average daily demand? ☒ Yes ☐ No
 Comments:

CHEMICAL FEED SYSTEMS

Chemicals used? Line, Fluoride, Chlorine, Ammonia, Orthophosphosphate, Sodium Hydroxide, and CO₂
 Chemicals meet the NSF Standards? ☒ Yes ☐ No ☐ Unknown Chemical storage appear to be compliant? ☒ Yes ☐ No
 Facilities & chemicals properly labeled? ☒ Yes ☐ No Are all chemical feed systems tied to flow? ☒ Yes ☐ No
 Doses & quantities measured & recorded? ☒ Yes ☐ No Are injection points visible? ☒ Yes ☐ No
 Operators trained to use safety equipment? ☒ Yes ☐ No SOP for chemical handling? ☒ Yes ☐ No
 Redundant equipment & spare parts kept? ☒ Yes ☐ No Do treatment rooms have adequate room lighting? ☒ Yes ☐ No
 Corrosive vapors properly controlled? ☒ Yes ☐ No Safety comply with *Water Treatment Plant Design*, Table 15.5? ☒ Yes ☐ No
 Injection point proper & ensures mixing? ☒ Yes ☐ No Treated sample tap compliant? ☒ Yes ☐ No

Comments:

Source (Groundwater)**GROUNDWATER WELLS**

Well Name or Number	Well 2 (O.O.S.)	Well 4	Well 5	Well 6	Well 7	Well 8 (O.O.S.)
Florida Unique Well Identification	AAI5163	AAI9472	AAI9471	AAI9470	AAI9469	AAI4462
Year Drilled	1952	1955	1958	1958	1960	1961
Depth Drilled	136'	140'	108'	156'	90'	90'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	Unk 16"	Unk 16"	97' 16"	100' 14"	90' 16"	97' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	22	23	25	24	19	19
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	No	No	No	No
Potential pollution sources near?	Yes	Yes	Yes	Yes	Yes	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes	Yes	Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Housed	Housed	Housed	Housed
Pump Type	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine
Horse Power	50 hp	60 hp	40 hp	75 hp	50 hp	50 hp
Rated Pump Capacity (GPM@PSI)	1500	1800	1500	2200	1500	1500
Normal Yield (GPM @ PSI)	1500	875	550	2275	1600	1290
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	No	No	No	No	Yes	No
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments: Well 3 has been abandoned properly. There were 20 active wells at the time of the inspection. Wells 2, 8, and 12 were out for bacteriological issues. Well 23 was out for repairs. Well 1 is only used as a monitoring well for saltwater intrusion. The Department recommends scheduled cleaning around the packing on the vertical turbine well pump to remove any bio-growth/sludge buildup.

Source (Groundwater)
GROUNDWATER WELLS

Well Name or Number	Well 9	Well 10	Well 11	Well 12 (O.O.S.)	Well 13	Well 14
Florida Unique Well Identification	AAO5405	AAI9467	AAI9452	AAI9466	AAI9465	AAI9464
Year Drilled	1963	1961	1964	1967	1968	1969
Depth Drilled	131'	113'	127'	123'	115'	114'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	97' 16"	93' 16"	88' 16"	90' 16"	115' 16"	114' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	24	23	16	23	19	21
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	Yes	No	No	No
Potential pollution sources near?	Yes	Yes	Yes	No	No	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes		Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Vaulted	Housed	Housed	Housed
Pump Type	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine
Horse Power	50 hp	50 hp	50 hp	60 hp	75 hp	50 hp
Rated Pump Capacity (GPM@PSI)	1500	1800	1500	1500	1800	1500
Normal Yield (GPM @ PSI)	1450	1400	1850	1120	2200	1800
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	No	No	No	Yes	Yes	Yes
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments: Well 12 out of service for bacteriological issues.

**Source (Groundwater)****GROUNDWATER WELLS**

Well Name or Number	Well 15	Well 16	Well 17	Well 18	Well 19	Well 20
Florida Unique Well Identification	AAI9463	AAI9468	AAP2898	AAP2899	AAO5400	AAO5403
Year Drilled	1972	1972	1984	1981	1981	1981
Depth Drilled	140'	130'	150'	130'	158'	154'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	115' 18"	116' 18"	76' 16"	72' 16"	78' 16"	80' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	21	25	13	11	9	10
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	No	No	No	No
Potential pollution sources near?	Yes	Yes	No	Yes	Yes	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes	Yes	Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Housed	Housed	Housed	Housed
Pump Type	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Submersible	Vert. Turbine
Horse Power	75 hp	75 hp	100 hp	100 hp	100 hp	100 hp
Rated Pump Capacity (GPM@PSI)	2000	2000	2400	2400	2100	2100
Normal Yield (GPM @ PSI)	2100	1410	1450	1700	1300	1620
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	No	No	Yes	Yes	Yes	Yes
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments:

Source (Groundwater)
GROUNDWATER WELLS

Well Name or Number	Well 21	Well 22	Well 23 (O.O.S.)	Well 24	Well 25	Well 26
Florida Unique Well Identification	AAO5402	AAO5401	AAL5182	AAL5181	AAL5180	AAL5179
Year Drilled	1981	1981	2002	2002	2002	2002
Depth Drilled	153'	153'	153'	153'	153'	153'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	80' 16"	79' 16"	80' 16"	80' 16"	80' 16"	80' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	10	8	Unk	Unk	Unk	Unk
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	No	No	No	No
Potential pollution sources near?	Yes	Yes	Yes	No	No	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes	Yes	Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Fenced	Fenced	Fenced	Fenced
Pump Type	Submersible	Vert. Turbine	Submersible	Vert. Turbine	Vert. Turbine	Submersible
Horse Power	100 hp	100 hp	100 hp	100 hp	100 hp	100 hp
Rated Pump Capacity (GPM@PSI)	1600	2100	2100	2100	2100	2100
Normal Yield (GPM @ PSI)	1450	1450	2200	2120	2230	2200
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	Yes	Yes	Yes	Yes	Yes	Yes
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments: Well 23 out of service for repairs.



Engineers
Planners
Economists
Scientists

Jim Sandi

July 21, 1986

FC12327.H3

Frank D. Hoble
Assistant Utilities Director
City of Pompano Beach
P.O. Box 1300
Pompano Beach, Florida 33061

Dear Frank:

Subject: Treatability of Palm Aire Well Field Supply

The results of jar tests recently conducted on Palm Aire waters are enclosed. The primary purpose of the testing program was to confirm the ability of the Pompano Beach WTP to reduce organic color that occurs naturally in the Palm Aire supply to acceptable levels (less than 15 pcu). In general, the tests were successful. Using existing processes, color can easily be reduced to less than 15 pcu, the current maximum contaminant level (MCL). Furthermore, the treated waters exhibited a reasonable chlorine demand (less than 10 mg Cl_2/L) and a low rate of trihalomethane formation.

A second objective was to demonstrate that a stable (non-corrosive) product could be produced by converting excess lime to bicarbonate alkalinity by recarbonation. This would increase the buffer capacity of the finished water above levels experienced when lime is underdosed or fed at rates for optimum softening. Because we were unable to adequately control recarbonation, it was not possible to achieve this objective during our testing. However, since the plant can precisely control all chemical feed rates, including carbon dioxide, and in-line pH monitors will facilitate process control, we are confident that the plant can produce an acceptable finished water from the Palm Aire supply without modification.

The jar test report also includes results of using ferric chloride pretreatment to enhance color removal. While the tests clearly indicate that addition of ferric chloride is beneficial, the additional color removal may not justify the extra expense.

Frank D. Hoble
Page 2
July 21, 1986
FC12327.H3

When treating 100 percent Palm Aire waters, our recommendation is to add lime at approximately 275 mg/L as 90 percent CaO. This will give a settled water (Accelerator effluent) pH of 10.8 or higher; the hydroxide alkalinity (2P-T) should be +120 mg CaCO₃/L or greater. Approximately 10 mg/L of chlorine and a sufficient quantity of carbon dioxide should be added to produce a filter effluent with the following characteristics: pH equals approximately 7.0, alkalinity equals approximately 120 mg/L as CaCO₃, calcium hardness equals approximately 175 mg/L as CaCO₃. These conditions will yield a water with a pH of approximately 7.5 and a Ryzner Index value of approximately 8.0, which is less corrosive than the current finished water Ryzner Index value of approximately 8.5. Based on jar test experience, we would predict a finished water color of 10 pcu or less from this treatment scheme.

If a lower color value is desired, we recommend adding approximately 35 mg/L of ferric chloride to the raw water main at the Palm Aire well field prior to initiating the treatment described above. We suggest that a plant scale pilot study precede design of permanent facilities for ferric chloride application.

At your request, CH2M HILL can provide assistance for initiating either or both of the recommended treatment schemes. However, before beginning this program, we suggest that all mechanical and instrumentation systems be certified operational and that the operators be familiar with the operational features of each system in the process.

Respectfully,

Roger Yorton (mkm)

Roger Yorton

db/gnCR6/16

xc: Gary Fries/TPA
Dana Rippon/GNV

TREATABILITY OF PALM AIRE WELL FIELD WATER SUPPLY

The Palm Aire supply wells produce waters containing relatively large amounts of calcium hardness, organic color, and iron. While these constituents do not cause undesirable health effects, they do detract from the water's aesthetic character and tend to form deposits that sharply reduce the effectiveness of soaps, detergents, and water-using appliances. An analysis of water from Palm Aire wells No. 21 and 22 is provided in Table 1.

The treatment objectives for the Pompano Beach Water Treatment Plant (WTP) are to produce a softer, stable water that is pleasing to the eye and palate and is safe to drink. The unit processes provided at the Pompano Beach WTP include lime softening, recarbonation, filtration, chlorination, and ammoniation. Currently, the plant is producing an acceptable finished water by treating a blend of waters from the Palm Aire and Pompano well fields.

Treatment of 100 percent Palm Aire water was required by pumping tests conducted at the Palm Aire well field from April 14 through April 15, 1986. The finished waters produced on these dates had color values of 10 to 12 units in spite of a relatively large pre-chlorine dose (14 to 16 mg/L). The finished waters were also aggressive, and although no trihalomethane (THM) data were reported for these dates, one could confidently predict a higher than normal THM formation potential.

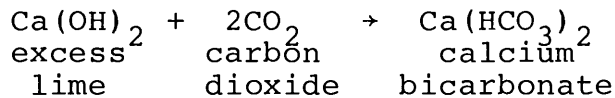
Because this episode brought the ability of the plant to treat the Palm Aire supply under question, a composite sample from Palm Aire supply wells No. 21 and 22 was collected for bench-scale testing to reconfirm treatability. The methods and results of the bench-scale testing (jar tests) are discussed below.

The bench-scale tests modeled two treatment processes. The first process used lime softening, recarbonation, and chlorination; the second preceded that treatment train with use of ferric chloride for preliminary color reduction. Ammoniation was not modeled in the tests; its purpose is to prevent THM formation in the distribution system and it has virtually no measurable effect on color or stability of the finished waters.

Experience has shown us that significant color reduction occurs during the lime softening process at a pH of 10 or above. This point usually coincides with the point of maximum softening and minimum residual bicarbonate alkalinity ($2P-T=0$). Minimum alkalinity, however, provides too little buffer capacity and the acidity resulting from

chlorination causes the finished waters to be corrosive to the distribution system.

It seems likely, however, that the criteria of low color and noncorrosiveness can be met by providing excess lime to reduce color, then converting that excess lime to bicarbonate alkalinity by means of recarbonation.



Jar Test Series No. 1 was designed to test this hypothesis using the following procedure:

1. Add 300 mg of calcium carbonate to each 1-liter aliquot of raw water to simulate preexisting solids in Accelerator.
2. Add lime in the form of pure calcium hydroxide (Ca(OH)_2) in amount sufficient to yield an excess of unreacted Ca(OH)_2 .
3. Rapid mix 1 minute.
4. Slow mix 30 minutes.
5. Settle 30 minutes.
6. Decant supernatant.
7. Recarbonate to pH 9.0.
8. Add 10 mg/L chlorine solution.
9. Filter--Whatman #40.

Aliquots were removed for analysis following steps 6, 7, 8, and 9. The data from this series are presented in Table 2. Jars 3, 4, and 5 were run in duplicate, although not at the same time. Samples of Jars 3a, 4a, and 5a were analyzed for total trihalomethane content after one hour of chlorine contact time.

The results of Jar Test Series No. 1 show that it is quite possible to reduce finished water color and chlorine demand to acceptable levels using only processes currently available at the Pompano Beach WTP. Furthermore, since the rate of THM formation is quite low, even greater flexibility in disinfection and color reduction with chlorine would be allowed than expected. Although the data indicate that the finished waters will be corrosive, we feel that pH_s values reported here were the result of overfeeding carbon dioxide

and overestimating the chlorine demand, and that the concept of feeding excess lime is valid. Both carbon dioxide and chlorine reduce alkalinity and it is not possible to control batch operations with the same precision attainable at the plant.

Experience in treating another Florida water with high color showed that pretreatment with ferric chloride before the softening process was beneficial in reducing organic color. Jar Test Series No. 2 was conducted to determine the optimum ferric chloride dose; results are presented in Table 3. A ferric chloride dose of 35 mg/L removed 83 percent of the original color without benefit of other treatment processes.

Subsequently, Jar Test Series No. 3 was designed to model a process employing ferric chloride pretreatment. The procedure followed was:

1. Add 35 mg/L of ferric chloride to 1-liter aliquots of raw water.
2. Rapid mix for 1 minute.
3. Slow mix for 1 hour.
4. At the end of 1 hour, steps 1 through 9 of Jar Test Series No. 1 were carried out on each jar.

Aliquots were removed for analysis as before. The data from this series are presented in Table 4. Jars 1, 2, and 3 were run in duplicate, although not on the same day. Samples from Jars 1a, 2a, and 3a were analyzed for total trihalomethane content after 1 hour of chlorine contact time.

The results of Jar Test Series No. 3 indicate that finished water color values using ferric chloride pretreatment are lower than color values obtained when treating with lime alone, all other treatment variables being constant. As with Jar Test Series No. 1, the inability to precisely control recarbonation and overdosing chlorine resulted in a corrosive finished water. We believe that these difficulties would not be a problem in actual plant operation where more precise control is possible.

The duplicate samples in Jar Test Series No. 1 and 3 were not in particularly good agreement. This is due in part to the difficulty in precisely controlling dosages in batch type processes. Also, since the duplicate tests were run several days after the original tests, changes in raw water quality may have occurred that were not accounted for.

**ENVIRONMENTAL LABORATORIES**

7201 N.W. Eleventh Place
P.O. Drawer 1647
Gainesville, Florida 32602
904/377-2442

Sample No. _____

Lab ID #82112

WATER ANALYSIS REPORTOwner Pompano Beach WTP

Project No. _____

Attention _____

Received 7/1/86

Address _____

Reported _____

SAMPLE LOCATION: Composite of Palm
Aire Supply Wells
Nos. 21 and 22

SOURCE OF SUPPLY: ☐ Surface, ☒ GroundTYPE OF SAMPLE: ☐ Composite, ☒ GrabSAMPLE COLLECTED BY: OwnerDATE: 6 / 30 / 86 TIME ☐ AM ☐ PM

Substance		milligrams per liter		Substance		milligrams per liter	
		MCL	present			as substance	as CaCO ₃
Arsenic	As	0.05		Alkalinity, phenolphthalein			0
Barium	Ba	1		Alkalinity, total			250
Cadmium	Cd	0.01		Carbon dioxide, free	CO ₂	63	143
Chloride ^{5.5 mL 50 mL}	Cl ⁻	250	54	Bicarbonates	HCO ₃ ⁻	305	250
Chromium	Cr	0.05		Carbonates	CO ₃ ⁼	0.11	0.19
Color, APHA color units		15	150	Hydroxides	OH ⁻	1.35x10 ⁻³	3.97x10 ⁻³
Copper	Cu	1		Calcium	Ca	117	292
Fluoride	F ⁻	*		Magnesium	Mg	2.91	12
Foaming agents	MBAS	0.5		Total hardness			304
Iron	Fe	0.3	3.27	Carbonate hardness			250
Lead	Pb	0.05		Noncarbonate hardness			54
Manganese	Mn	0.05		Conductivity		709 μ mhos/cm	@ 25° C
Mercury	Hg	0.002		Oxygen, dissolved (field)			mg/L O ₂
Nitrate (as N)	NO ₃ ⁻	10		Temperature (field)			° C
Odor, threshold odor number		3		pH (field) [6.5-8.5]			
Selenium	Se	0.01		pH (laboratory)	6.9	pH _s @	6.97 °C
Silver	Ag	0.05		Stability index (2 pH _s -pH)	7.03		
Sodium	Na	160	38	Saturation index (pH-pH _s)	-0.07		
Sulfate	SO ₄ ⁼	250	58	Aggressive index (pH + log AH)	11.76		
Total dissolved solids @ 180° C		500	419				
Turbidity, NTU		1					
Zinc	Zn	5					

THE INFORMATION SHOWN ON THIS SHEET IS TEST DATA ONLY AND NO INTERPRETATION OF THE DATA IS INTENDED OR IMPLIED

1. Except color, odor, pH and turbidity

MCL Maximum contaminant level

* MCL 1.4-2.4—depends upon avg. daily max. air temp.

< means less than detection limits

N.O.O. means no odor observed

Respectfully submitted,

Roger Yorton (mlem)
Chemist

Table 2
JAR TEST SERIES NO. 1

Jar No.	Applied Dosages, mg/L		Supernatant Quality			Applied Dose CO ₂ , mg/L	Recarbonated Water				Applied Dose Cl ₂ , mg/L	Finished Water Quality							
	CaCO ₃	Ca(OH) ₂	pH	P. Alk/T. Alk	OH=2P-T		pH	P. Alk/T. Alk	Ca as CaCO ₃	Color, pcu		pH	P. Alk/T. Alk	T.Cl ₂ Residual, mg/L	Color, pcu	pH _s	RI = 2pH _s -pH	SI = pH-pH _s	TTHM, µg/L
1	300	270	10.4	60/88	+32	?	8.5	16/88	140	35	10	7.0	--	2.9	15	--	--	--	--
2	300	290	10.5	76/106	+46	?	8.4	22/96	138	25	10	6.9	--	3.0	20	--	--	--	--
3	300	310	10.55	92/114	+70	?	8.7	14/122	164	25	10	7.08	--	3.2	17	--	--	--	--
3a	300	310	10.7	106/134	+78	?	8.8	12/68	148	27	10	6.35	0/137	3.4	22	7.52	--	--	18
4	300	330	10.75	146/174	+118	?	8.6	16/110	166	15	10	6.98	--	2.8	10	--	--	--	--
4a	300	330	10.8	132/162	+102	?	8.7	20/136	130	27	10	7.05	0/108	3.8	15	7.66	--	--	22
5	300	350	10.8	158/190	+126	?	9.0	8/118	174	15	10	7.0	--	2.8	7	--	--	--	--
5a	300	350	10.85	168/206	+130	?	8.95	22/86	166	22	10	7.0	0/100	4.6	15	7.61	--	--	17.5
6	300	370	10.8	164/190	+138	?	8.85	10/128	164	10	10	7.0	--	3.7	5	--	--	--	--

Table 3
JAR TEST SERIES NO. 2

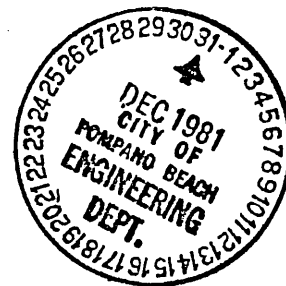
Jar No.	Applied Dose FeCl_3 mg/L ³	Supernatant Quality			Soluble Fe, mg/L
		pH	Total Alkalinity	Color	
1	25	7.1	256	130	
2	30	7.05	248	70	
3	35	6.75	218	25	
4	40	6.7	216	27	
5	45	6.72	208	32	
6	50	6.72	200	30	0.03

Table 4
JAR TEST SERIES NO. 3

Jar No.	Applied Dosages, mg/L			Supernatant Quality			Applied Dose	Recarbonated Water				Applied Dose	Finished Water Quality							
	FeCl ₃	CaCO ₃	Ca(OH) ₂	pH	P.Alk/T.Alk	OH=2P-T	CO ₂ , mg/L	pH	P. Alk/T. Alk	Ca as CaCO ₃	Color, pcu	Cl ₂ , mg/L	pH	P. Alk/T. Alk	T. Cl ₂ Residual, mg/L	Color, pcu	pH _s	RI = 2pH _s -pH	SI = pH-pH _s	TTHM, µg/L
1	35	300	230	10.3	24/56	-8	?	8.8	12/68	148	27	10	6.8	--	3.4	15	--	--	--	--
1a	35	300	230	10.25	38/56	+20	?	8.75	6/46	152	20	10	6.6	0/40	5.0	25	8.05	--	--	18.3
2	35	300	250	10.3	36/58	+14	?	8.7	20/136	130	27	10	7.1	--	3.4	10	--	--	--	--
2a	35	300	250	10.5	54/74	+34	?	8.9	8/58	138	20	10	6.65	0/48	5.6	15	8.01	--	--	15.9
3	35	300	270	10.55	56/82	+30	?	8.95	22/86	166	22	10	6.8	--	3.6	7	--	--	--	--
3a	35	300	270	10.62	80/94	+66	?	9.0	10/68	142	15	10	6.7	0/66	5.6	10	7.86	--	--	14.2
4	35	300	290	10.7	94/114	+74	?	8.85	24/104	186	17	10	6.86	--	3.4	5	--	--	--	--
5	35	300	310	10.85	138/174	+102	?	8.7	24/154	218	15	10	6.95	--	3.0	3	--	--	--	--
6	35	300	330	10.9	136/168	+104	?	8.3	18/162	248	10	10	7.08	--	2.8	2	--	--	--	--

Handwritten: JIM

Handwritten: NEW TOWN



December 23, 1981

FC12327.F2

City of Pompano Beach
P. O. Drawer 1300
Pompano Beach, Florida 33460

Attention: Mr. Richard C. Mills, P.E.

Gentlemen:

Subject: Palm-Aire Well Field - City Project No. 81-369

We have completed our review and analysis of data gathered during the pumping tests of the new water supply wells at the Palm-Aire wellfield. Based on this data, we recommend the following pumping rates for each well:

<u>Well No.</u>	<u>Recommended Pumping Rate (gpm)</u>
1-17	2,400
2-18	2,400
3-19	2,100
4-20	2,100
5-21	1,600
6-22	2,100
	<u>12,700 (or 18.3 gpm)</u>

The expected pumping water levels and recommended pump settings are as follows:

<u>Well No.</u>	<u>Pumping Water Level (feet below ground surface)</u>	<u>Pump Setting (feet below ground surface)</u>
1-17	24	50
2-18	23	50
3-19	51	59
4-20	46	53
5-21	42	52
6-22	41	65

Due to the low efficiencies of wells number 3, 4, and 5, the recommended pumping rates should be considered as maximum allowable rates.

City of Pompano Beach
Page 2
December 23, 1981
FC12327.F2

Until the time these wells become operational, we recommend that city staff chlorinate the wells on a periodic basis, approximately every three to six months. The purpose of this will be to inhibit growth of bacteria during the time in which these wells are not being pumped.

Enclosed are two complete sets of the Well Drilling Reports (Record Drawings) for your files.

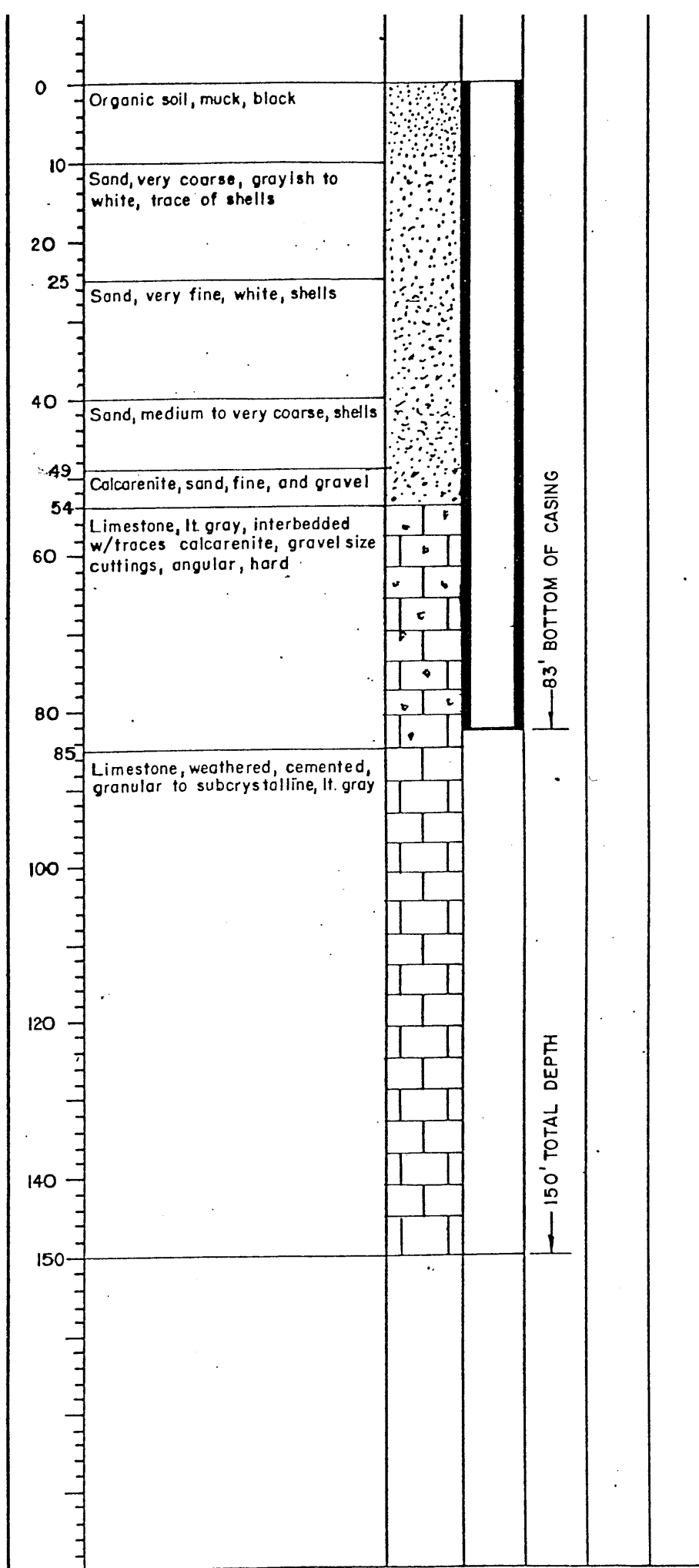
If you require further information or have any questions, please feel free to contact me.

Sincerely,


Stephen H. Riley

BC4:V:ae
Enclosures

cc: D. Rippon/GNV
R. Sproul/GNV



WELL DRILLING REPORT

Well: MONITOR WELL No. 1

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 150 FEET

Static Water Level: _____

Date: _____

Casing: 8 IN. - 83 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 6/27/81

Pumping Test

Specific Yield _____ gpm/

@ _____ gpm

Water Analysis (ppm)

TDS _____

Total Hardness¹ _____

M.O. Alkalinity¹ _____

Chloride Cl _____

Iron Fe _____

Sulfate SO₄ _____

Color (APHA) _____

Calcium¹ _____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



WELL DRILLING REPORT

Well: MONITOR WELL No. 2

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 145 FEET

Static Water Level: _____

Date: _____

Casing: 8 IN. — 66 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 7/2/81

Pumping Test

Specific Yield _____ gpm.

@ _____ gpm

Water Analysis (ppm)

TDS _____

Total Hardness¹ _____

M.O. Alkalinity¹ _____

Chloride Cl _____

Iron Fe _____

Sulfate SO₄ _____

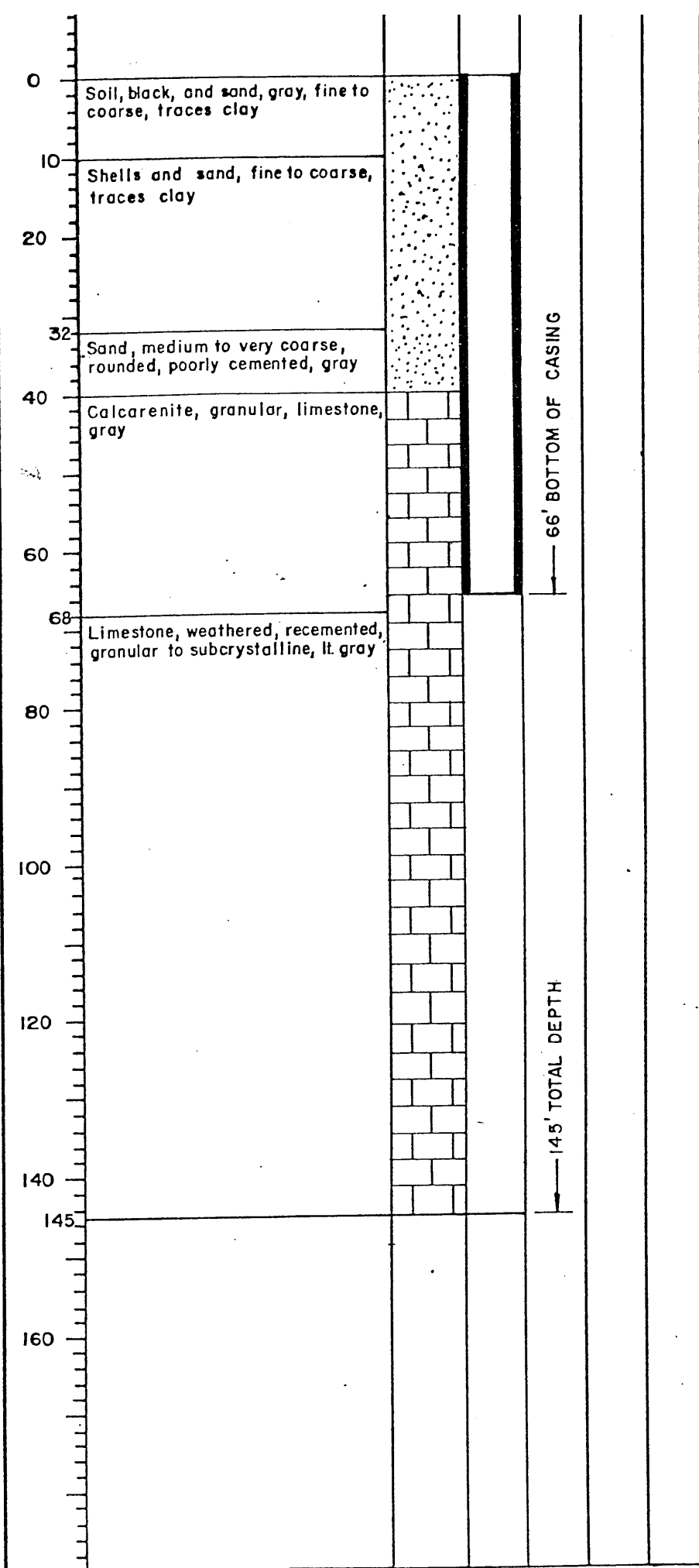
Color (APHA) _____

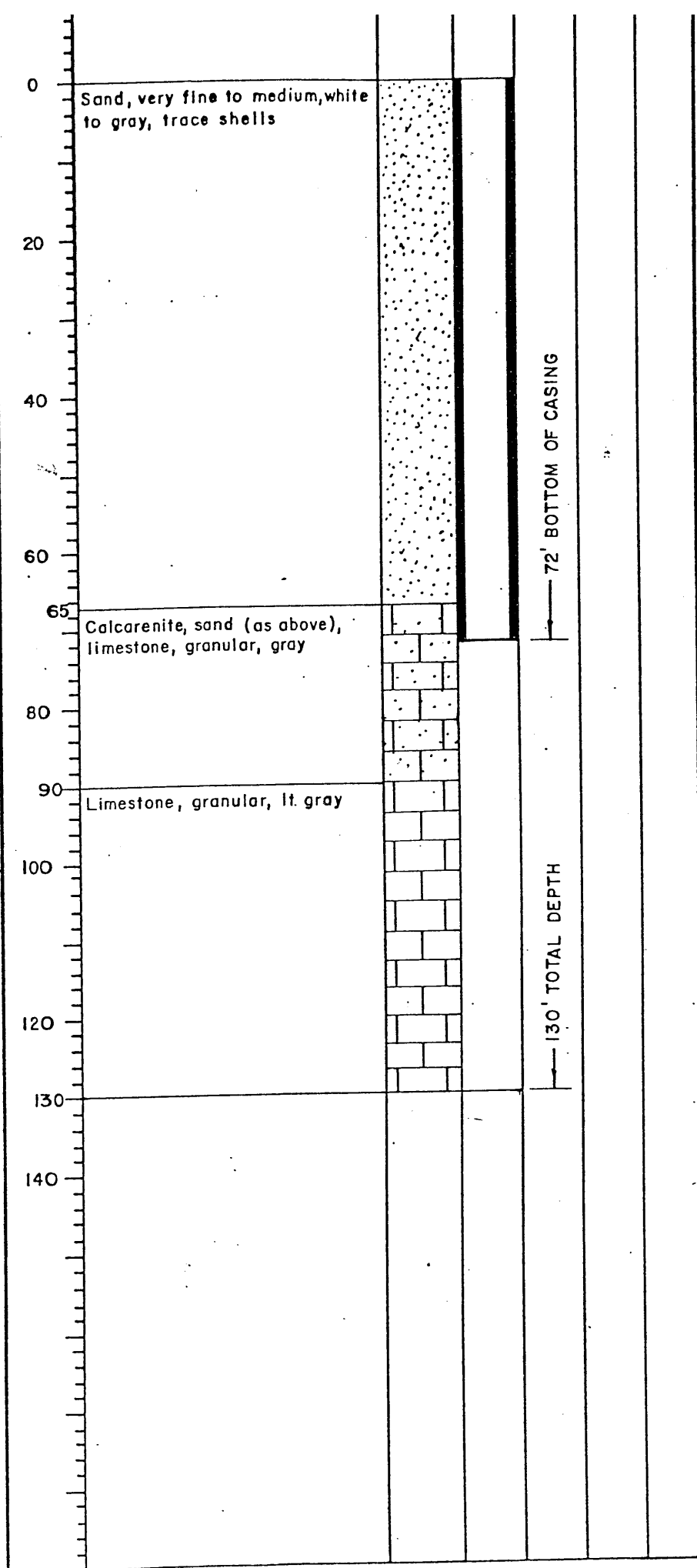
Calcium¹ _____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃





WELL DRILLING REPORT

Well: PRODUCTION WELL No. 2

Location: POMPANO BEACH, FLA.
PALM - AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 130 FEET

Static Water Level: 4.3 FEET

Date: 10/22/81

Casing: 16 IN. - 72 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 334 gpm/
@ 2,300 gpm

Water Analysis (ppm)

TDS	<u>DATA NOT AVAILABLE</u>
Total Hardness ¹	_____
M.O. Alkalinity ¹	_____
Chloride Cl	_____
Iron Fe	_____
Sulfate SO ₄	_____
Color (APHA)	_____
Calcium ¹	_____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

FC12327J2

WELL DRILLING REPORTWell: PRODUCTION WELL No. 3Location: POMPANO BEACH, FLA.PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCHDepth: 158 FEETStatic Water Level: 4.9 FEETDate: 7/30/81Casing: 16 IN. - 78 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 67 gpm/ft
@ 2,100 gpmWater Analysis (ppm)

TDS	<u>380</u>
Total Hardness ¹	<u>306</u>
M.O. Alkalinity ¹	<u>237</u>
Chloride Cl	<u>32</u>
Iron Fe	<u>3.95</u>
Sulfate SO ₄	<u>64</u>
Color (APHA)	<u>140</u>
Calcium ¹	<u>286</u>

Compiled by CH2M HILLDate 10/30/81¹ As CaCO₃.

0
20
40
60
62
80
100
120
140
158
160

Sand, very fine to coarse, white to gray, trace silt, clay, shells

Limestone, granular and calcarenite, weathered, lt. gray

60' TOP OF RISER PIPE

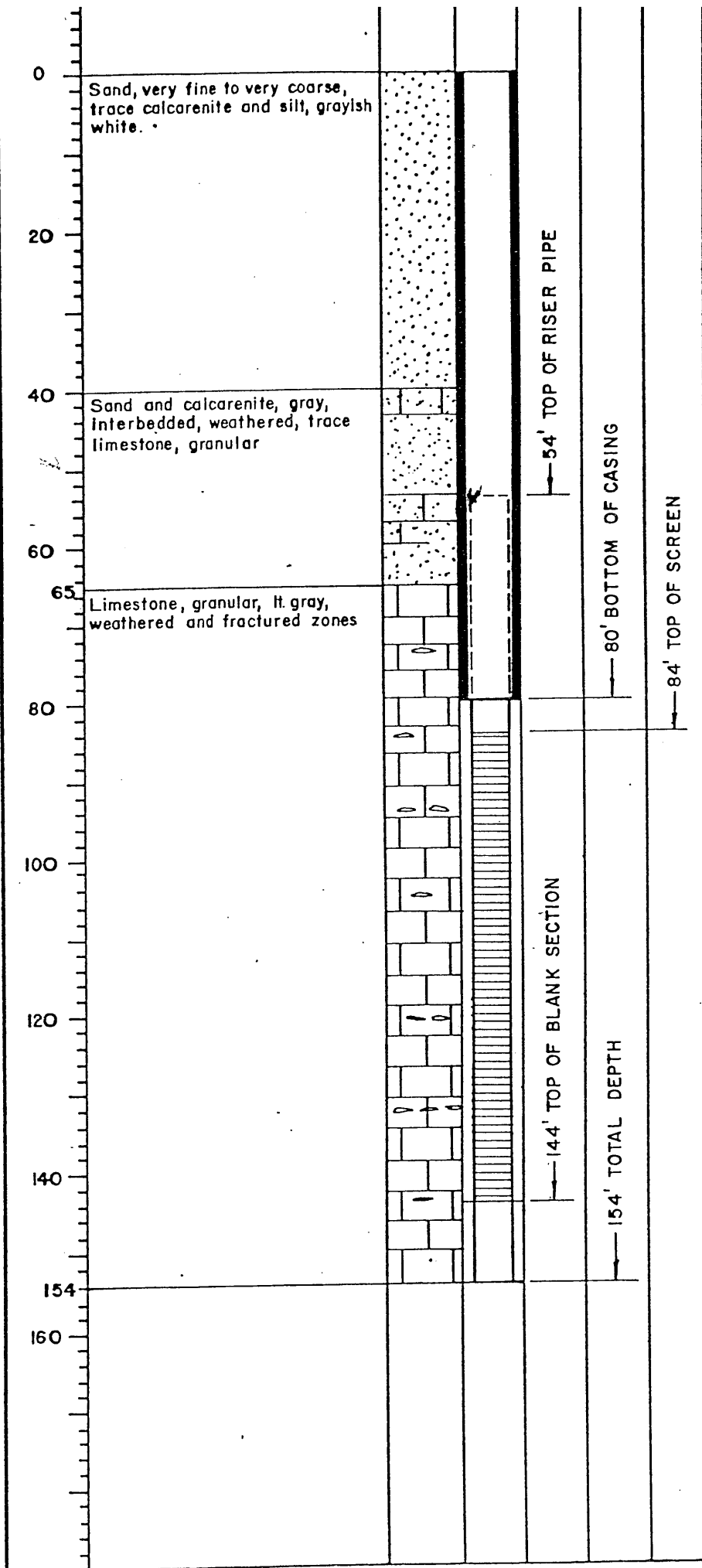
78' BOTTOM OF CASING

88' TOP OF SCREEN

148' TOP OF BLANK SECTION

158' TOTAL DEPTH

DRAWING No. 4



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 4

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 154 FEET

Static Water Level: 3.3 FEET

Date: 10/15/81

Casing: 16 IN. - 80 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 62 gpm/t
 @ 2,300 gpm

Water Analysis (ppm)

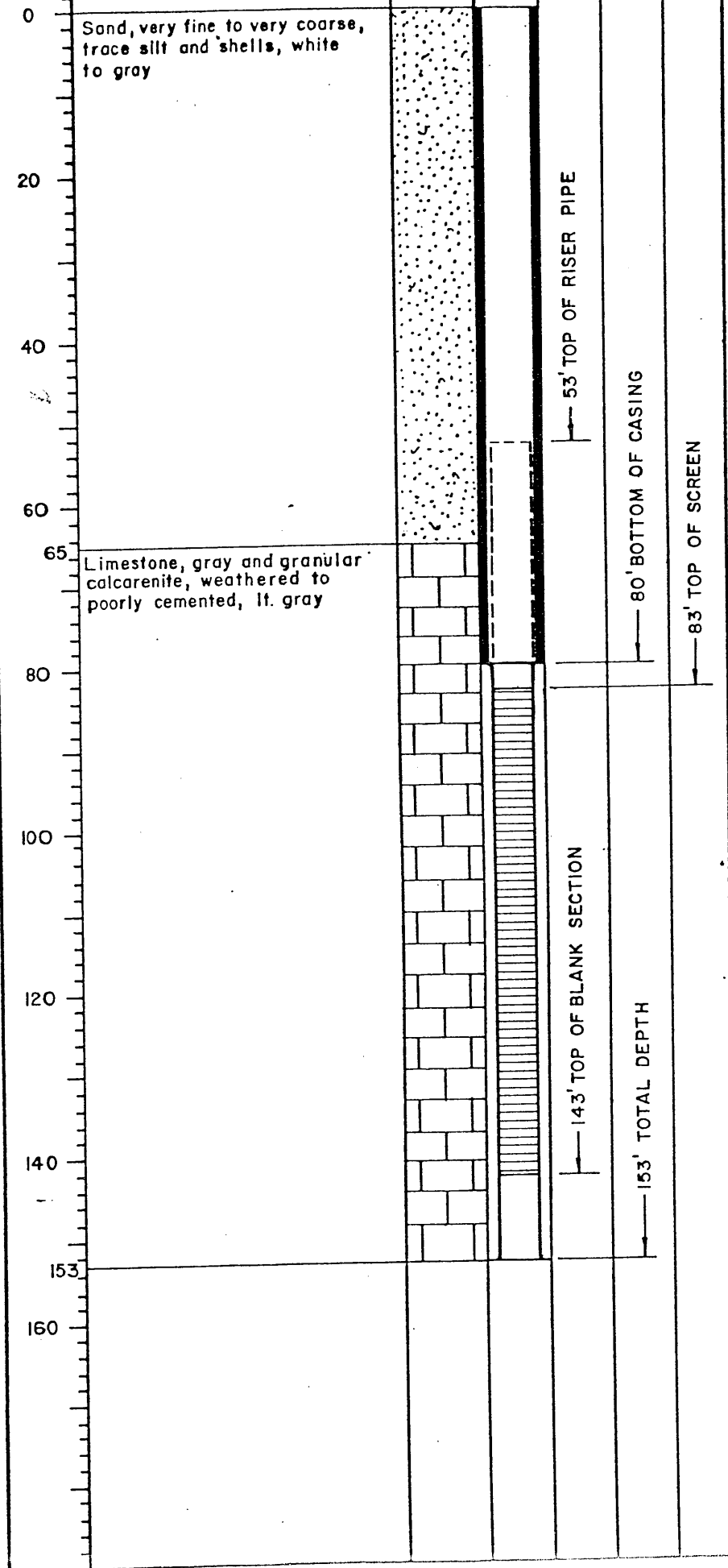
TDS	<u>419</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>219</u>
Chloride Cl	<u>53</u>
Iron Fe	<u>11.5</u>
Sulfate SO ₄	<u>82</u>
Color (APHA)	<u>200</u>
Calcium ¹	<u>308</u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

FC12327F2



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 5

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 153 FEET

Static Water Level: 2.5 FEET

Date: 10/12/81

Casing: 16 IN. - 80 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 60 gpm/
@ 1,800 gpm

Water Analysis (ppm)

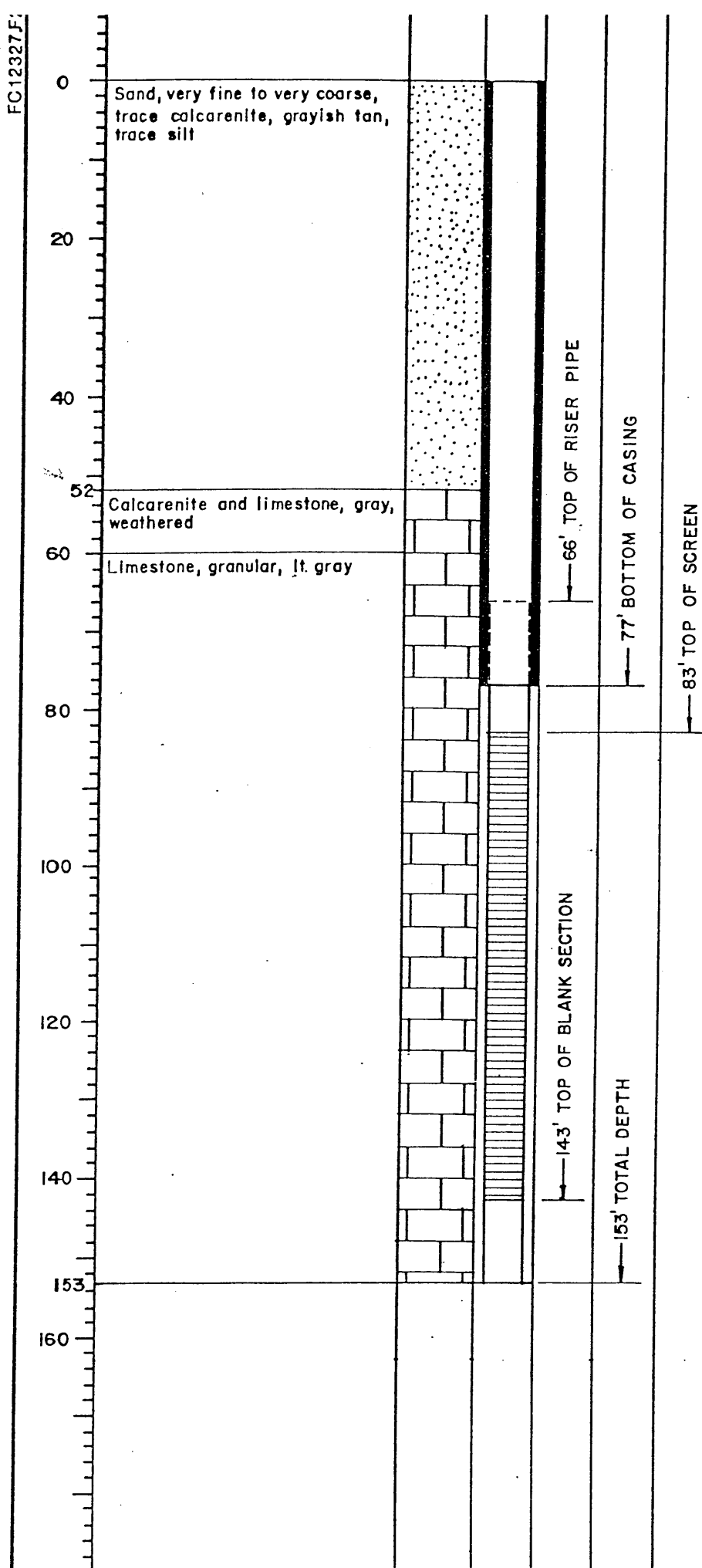
TDS	<u>442</u>
Total Hardness ¹	<u>343</u>
M.O. Alkalinity ¹	<u>281</u>
Chloride Cl	<u>51</u>
Iron Fe	<u>8.7</u>
Sulfate SO ₄	<u>56</u>
Color (APHA)	<u>150</u>
Calcium ¹	<u>334</u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

FC12327F



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 6

Location: POMPANO BEACH, FLA
PALM - AIRE GOLF COURSE

County: BROWARD State: FLA

Ground Elevation: _____

Diameter: 16 INCH

Depth: 153 FEET

Static Water Level: 2.9 FEET

Date: 10/24/81

Casing: 16 IN. - 77 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 76 gpm/
 @ 2,100 gpm

Water Analysis (ppm)

TDS	<u>454</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>257</u>
Chloride Cl	<u>74</u>
Iron Fe	<u>3.23</u>
Sulfate SO ₄	<u>53</u>
Color (APHA)	<u>120</u>
Calcium ¹	<u>297</u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

WELL DRILLING REPORTWell: MONITOR WELL No. 1Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

Ground Elevation: _____

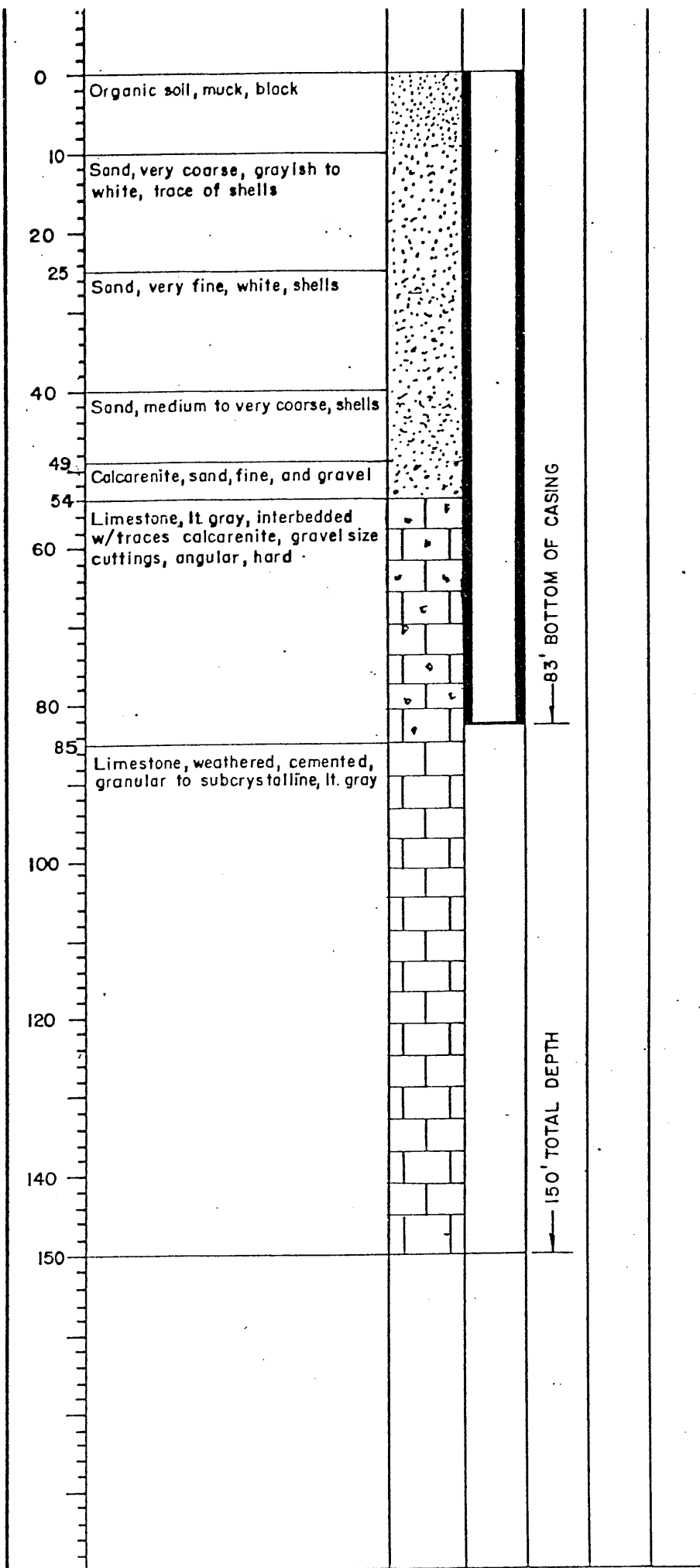
Diameter: 8 INCHDepth: 150 FEET

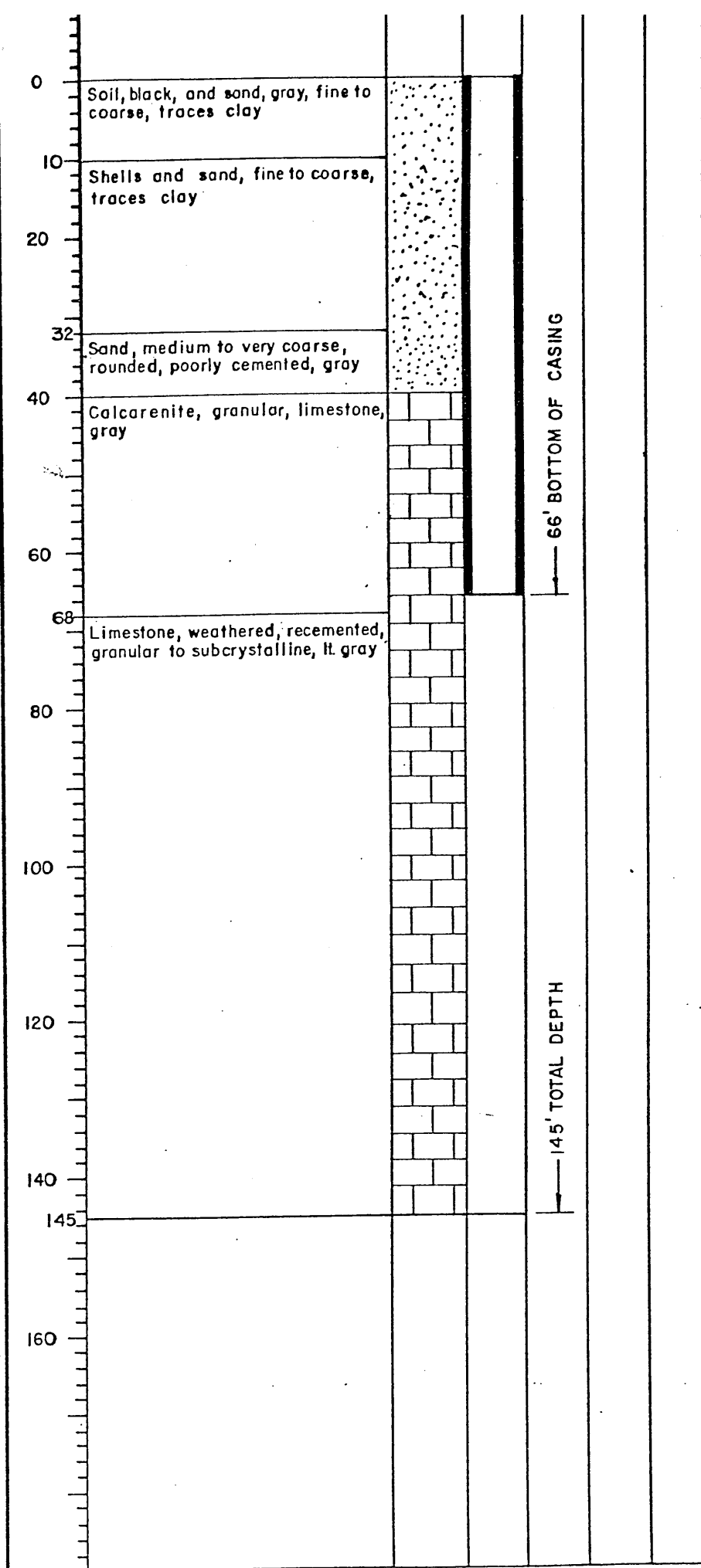
Static Water Level: _____

Date: _____

Casing: 8 IN. - 83 FT.Screen: NONEConstruction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 6/27/81Pumping TestSpecific Yield _____ gpm/ft
@ _____ gpmWater Analysis (ppm)

TDS	_____
Total Hardness ¹	_____
M.O. Alkalinity ¹	_____
Chloride Cl	_____
Iron Fe	_____
Sulfate SO ₄	_____
Color (APHA)	_____
Calcium ¹	_____

Compiled by CH2M HILLDate 10/30/81¹ As CaCO₃.



WELL DRILLING REPORT

Well: MONITOR WELL No. 2

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 145 FEET

Static Water Level: _____

Date: _____

Casing: 8 IN. — 66 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 7/2/81

Pumping Test

Specific Yield _____ gpm./ft

@ _____ gpm

Water Analysis (ppm)

TDS _____

Total Hardness¹ _____

M.O. Alkalinity¹ _____

Chloride Cl _____

Iron Fe _____

Sulfate SO₄ _____

Color (APHA) _____

Calcium¹ _____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 2

Location: POMPANO BEACH, FLA.
PALM - AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 130 FEET

Static Water Level: 4.3 FEET

Date: 10/22/81

Casing: 16 IN. - 72 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 334 gpm/ft
 @ 2,300 gpm

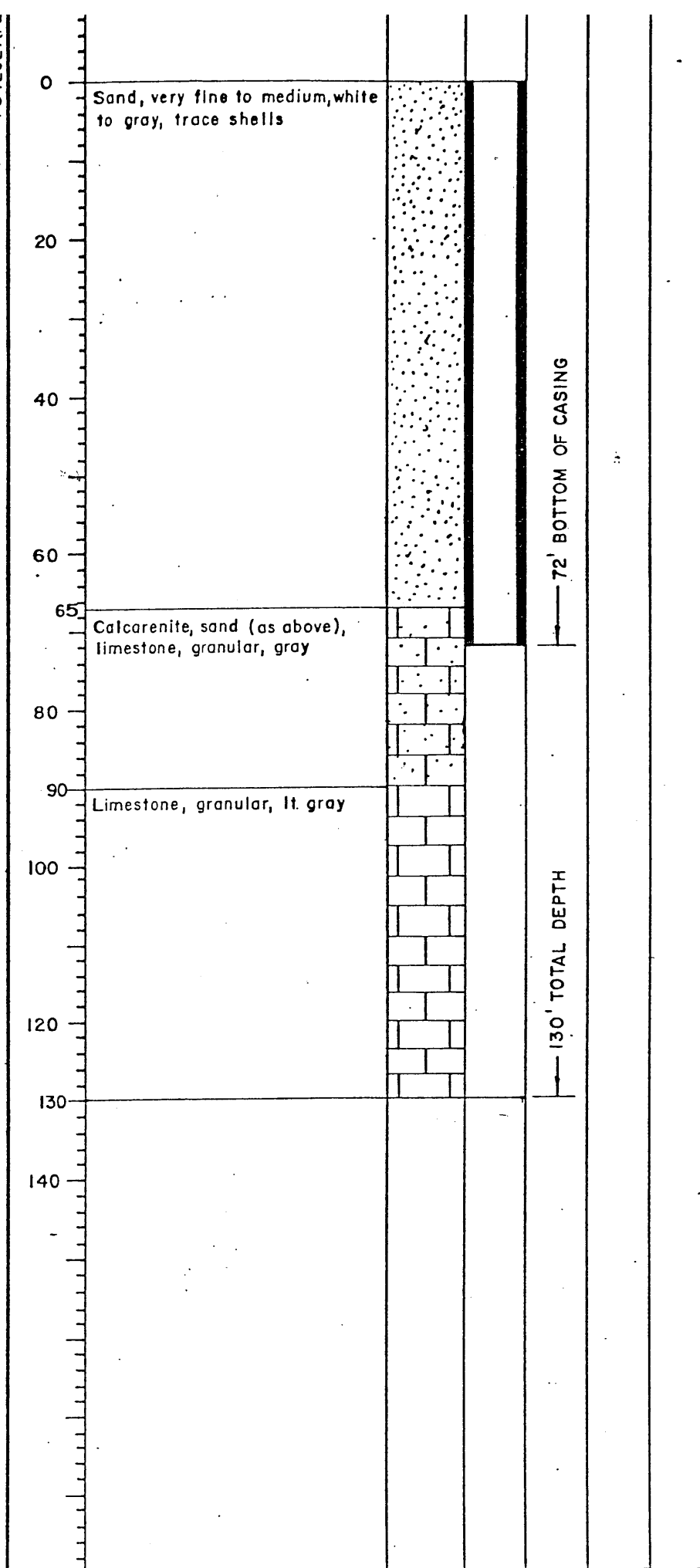
Water Analysis (ppm)

TDS	<u>DATA NOT AVAILABLE</u>
Total Hardness ¹	_____
M.O. Alkalinity ¹	_____
Chloride Cl	_____
Iron Fe	_____
Sulfate SO ₄	_____
Color (APHA)	_____
Calcium ¹	_____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



FC12327.F2



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 3

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 158 FEET

Static Water Level: 4.9 FEET

Date: 7/30/81

Casing: 16 IN. - 78 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 67 gpm/ft
 @ 2,100 gpm

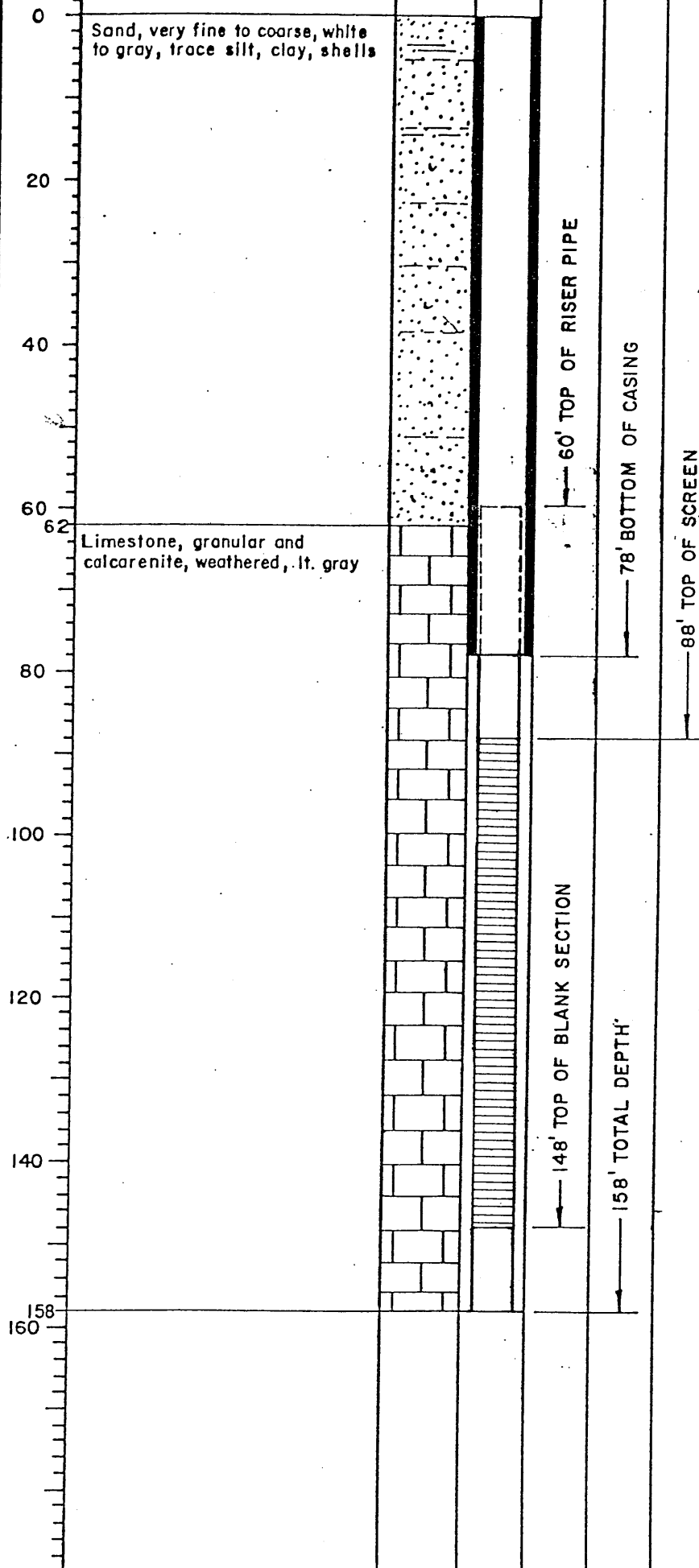
Water Analysis (ppm)

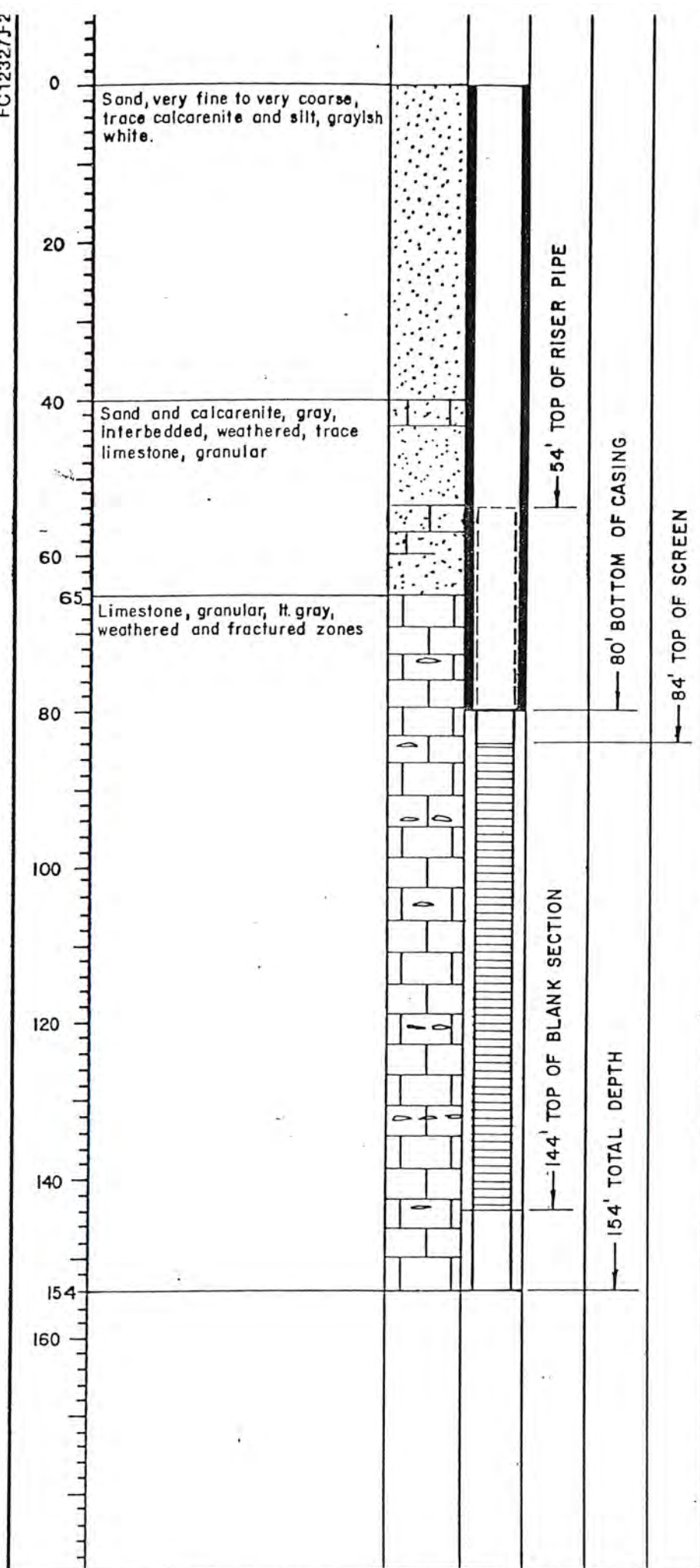
TDS	<u>380</u>
Total Hardness ¹	<u>306</u>
M.O. Alkalinity ¹	<u>237</u>
Chloride Cl	<u>32</u>
Iron Fe	<u>3.95</u>
Sulfate SO ₄	<u>64</u>
Color (APHA)	<u>140</u>
Calcium ¹	<u>286</u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



WELL DRILLING REPORTWell: PRODUCTION WELL No. 4Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

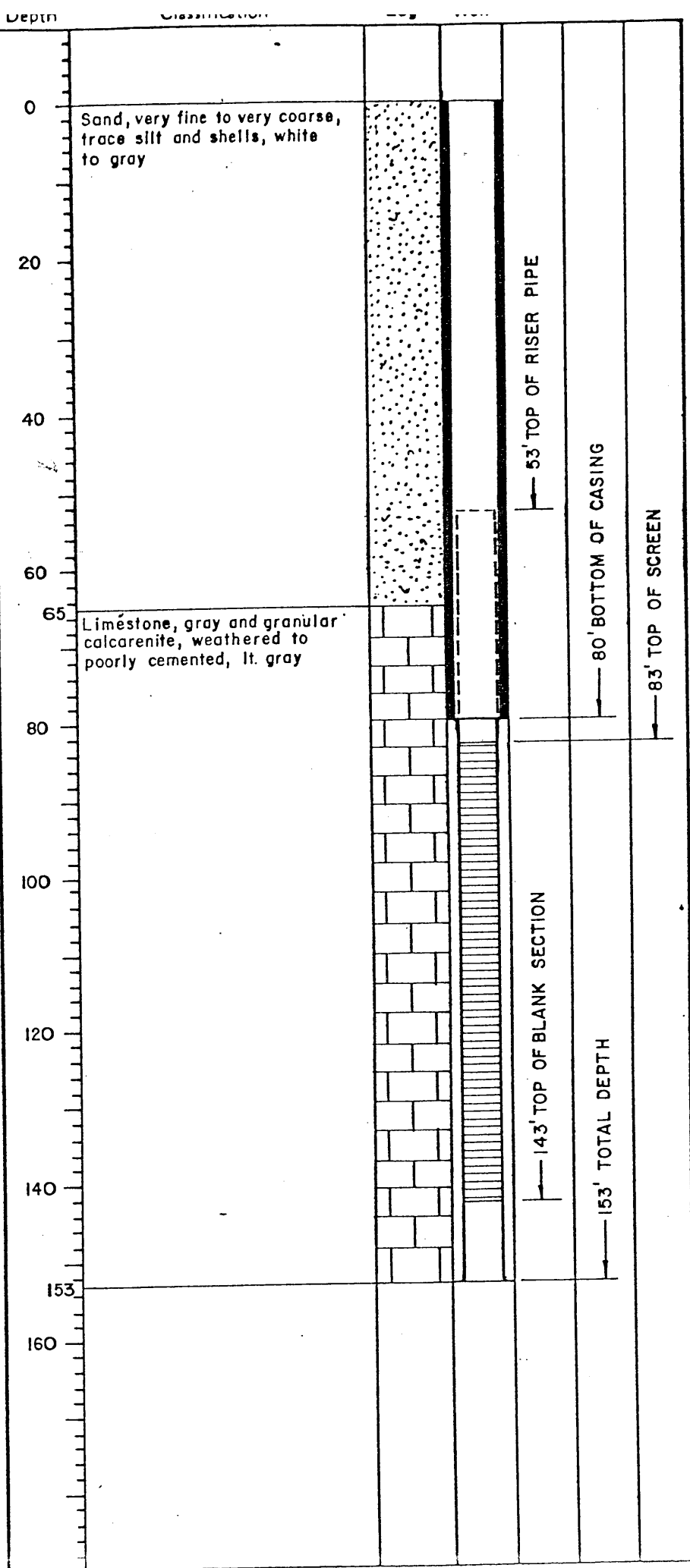
Ground Elevation: _____

Diameter: 16 INCHDepth: 154 FEETStatic Water Level: 3.3 FEETDate: 10/15/81Casing: 16 IN. - 80 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 62 gpm/ft
@ 2,300 gpmWater Analysis (ppm)

TDS	<u>419</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>219</u>
Chloride Cl	<u>53</u>
Iron Fe	<u>11.5</u>
Sulfate SO ₄	<u>82</u>
Color (APHA)	<u>200</u>
Calcium ¹	<u>308</u>

Compiled by CH₂M HILLDate 10/30/81¹ As CaCO₃.

FC12327F2



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 5

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 153 FEET

Static Water Level: 2.5 FEET

Date: 10/12/81

Casing: 16 IN. - 80 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 60 gpm/f
 @ 1,800 gpm

Water Analysis (ppm)

TDS	<u>442</u>
Total Hardness ¹	<u>343</u>
M.O. Alkalinity ¹	<u>281</u>
Chloride Cl	<u>51</u>
Iron Fe	<u>8.7</u>
Sulfate SO ₄	<u>56</u>
Color (APHA)	<u>150</u>
Calcium ¹	<u>334</u>

Compiled by CH2M HILL

Date 10/30/81

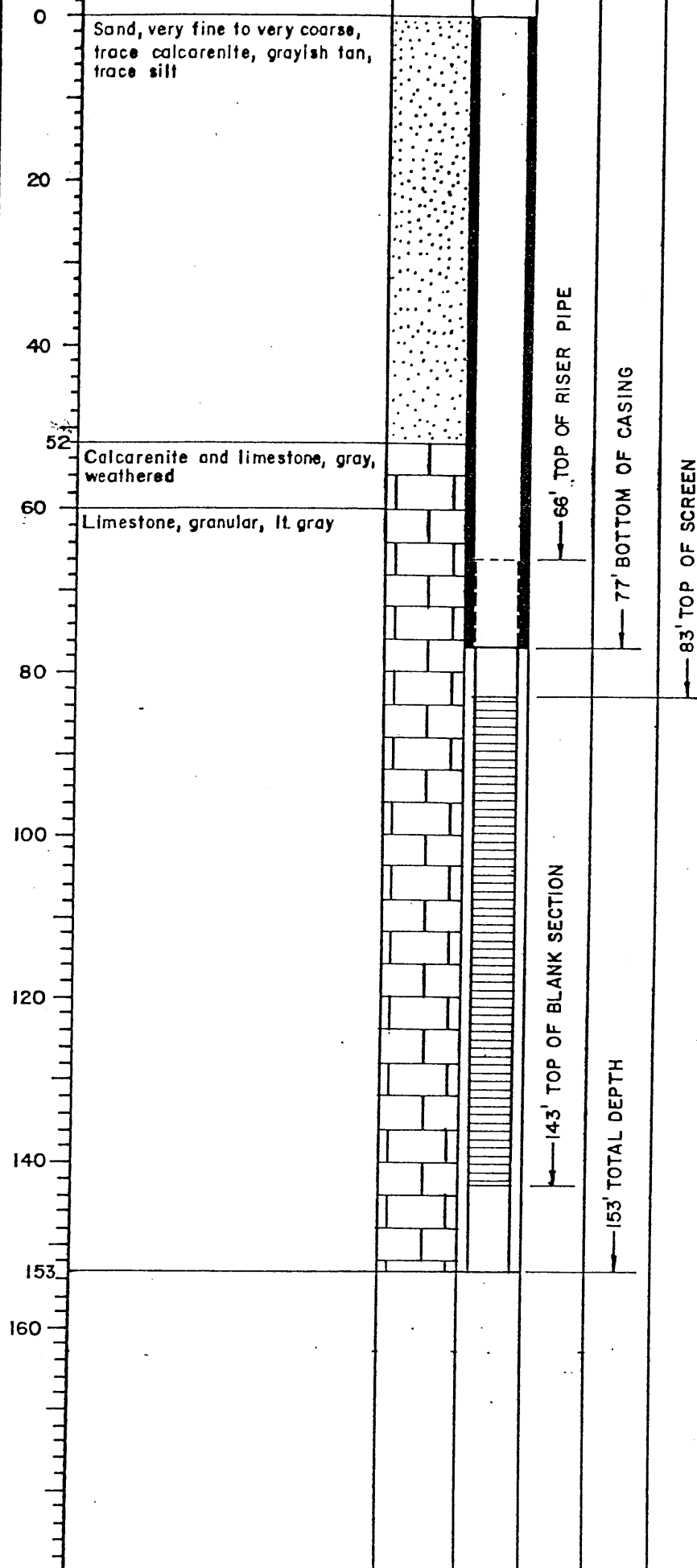
¹ As CaCO₃.

WELL DRILLING REPORTWell: PRODUCTION WELL No. 6Location: POMPANO BEACH, FLAPALM - AIRE GOLF COURSECounty: BROWARD State: FLA.

Ground Elevation: _____

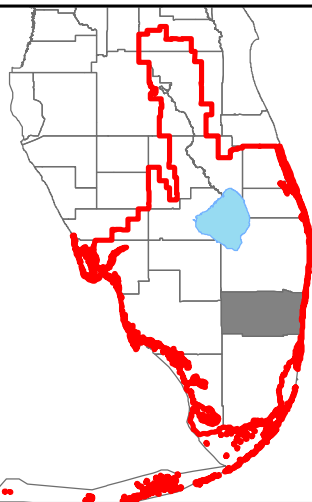
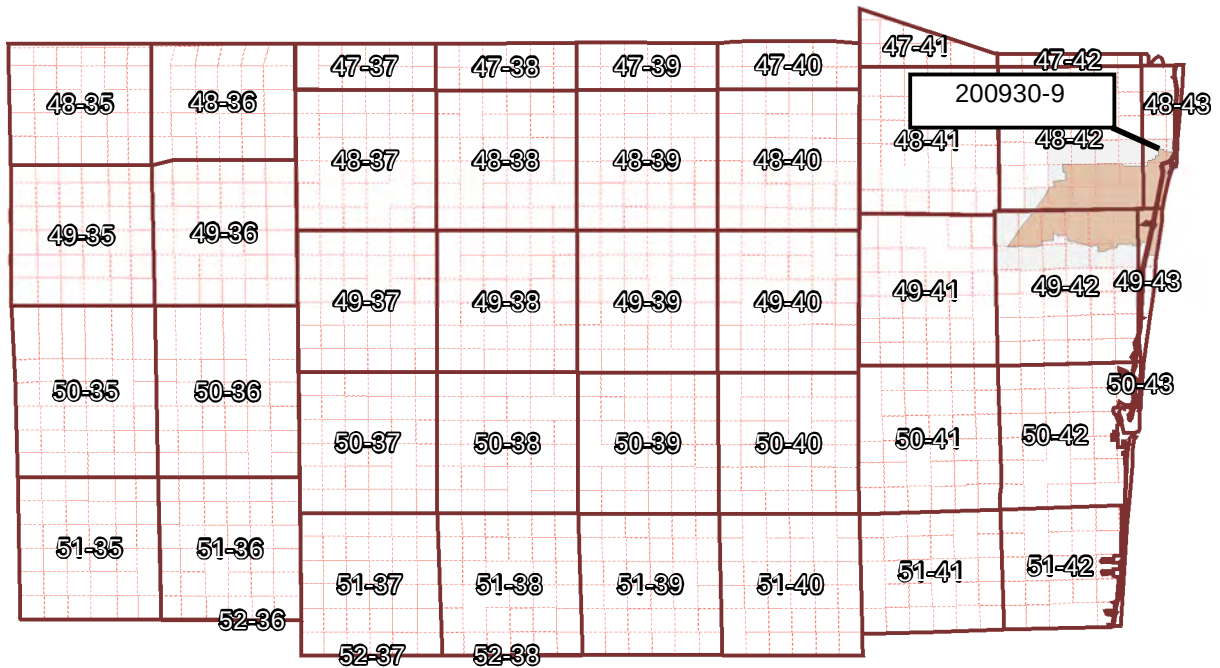
Diameter: 16 INCHDepth: 153 FEETStatic Water Level: 2.9 FEETDate: 10/24/81Casing: 16 IN. - 77 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 76 gpm/ft
@ 2,100 gpmWater Analysis (ppm)

TDS	<u>454</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>257</u>
Chloride Cl	<u>74</u>
Iron Fe	<u>3.23</u>
Sulfate SO ₄	<u>53</u>
Color (APHA)	<u>120</u>
Calcium ¹	<u>297</u>

Compiled by CH₂M HILLDate 10/30/81¹ As CaCO₃.

City of Pompano Beach
Well Rehabilitation and Maintenance
Maps

Attachment A-1



BROWARD COUNTY, FLORIDA

Application No: 200930-9

Permit No: 06-00070-W

Sec 25-28,32-36 / Twp 48 / Rge 42

Sec 1-12 / Twp 49 / Rge 42

Sec 19,20,29-32 / Twp 48 / Rge 43

Sec 5-7 / Twp 49 / Rge 43

Project Name: CITY OF POMPANO BEACH

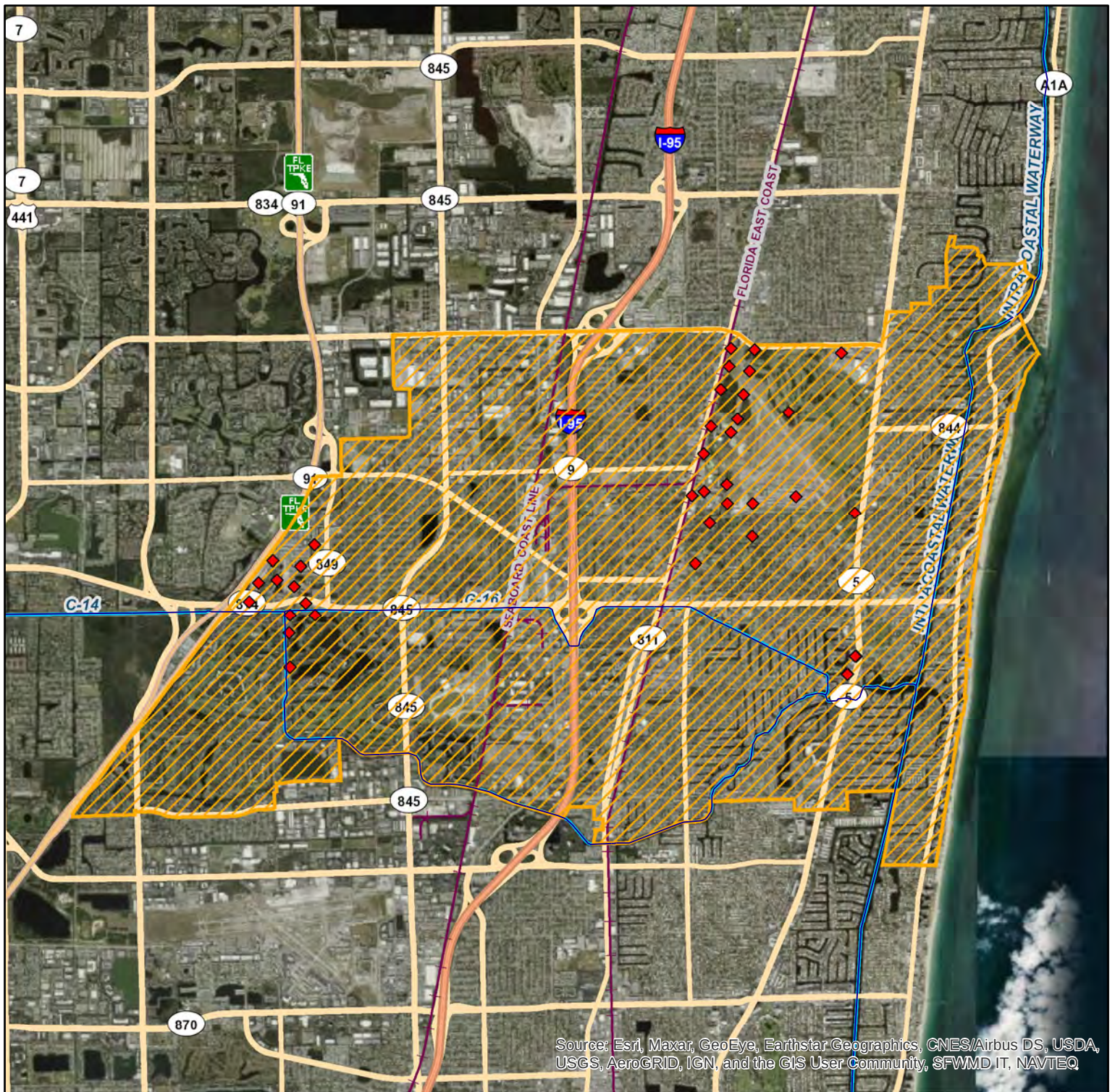
Map Date: 2020-10-21

N



0 10 20 Miles

Exhibit No: 1



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, SFWMD.IT, NAVTEQ

BROWARD COUNTY, FLORIDA

N



Map Date: 2020-10-21

- ◆ Well
- Application

Application No: 200930-9

Permit No: 06-00070-W

Sec 25-28,32-36 / Twp 48 / Rge 42

Sec 1-12 / Twp 49 / Rge 42

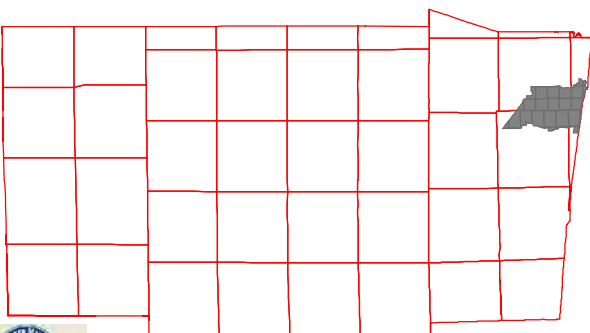
Sec 19,20,29-32 / Twp 48 / Rge 43

Sec 5-7 / Twp 49 / Rge 43

Project Name: CITY OF POMPANO BEACH

0 1.25 2.5
Miles

Exhibit No: 2





BROWARD COUNTY, FLORIDA

- ◆ Well
- /// Application

Application No: 200930-9
 Permit No: 06-00070-W
 Sec 25-28,32-36 / Twp 48 / Rge 42
 Sec 1-12 / Twp 49 / Rge 42
 Sec 19,20,29-32 / Twp 48 / Rge 43
 Sec 5-7 / Twp 49 / Rge 43

Project Name: CITY OF POMPANO BEACH

Map Date: 2020-10-21

WESTERN (PALM-AIRE) WELLFIELD

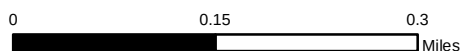
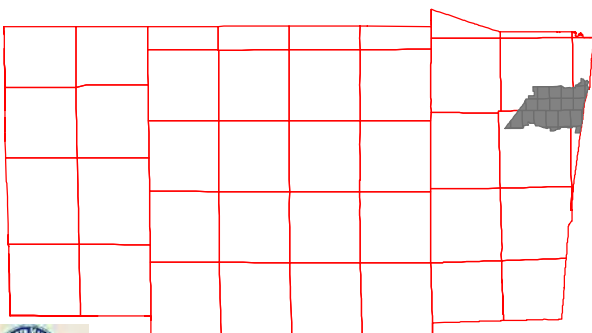
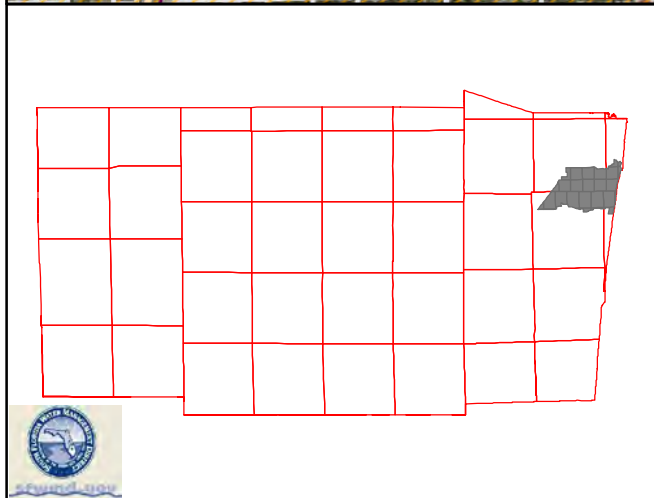


Exhibit No: 3A





BROWARD COUNTY, FLORIDA

◆ Well
/// Application

N

 Map Date: 2020-10-21

Application No: 200930-9
 Permit No: 06-00070-W
 Sec 25-28,32-36 / Twp 48 / Rge 42
 Sec 1-12 / Twp 49 / Rge 42
 Sec 19,20,29-32 / Twp 48 / Rge 43
 Sec 5-7 / Twp 49 / Rge 43
 Project Name: CITY OF POMPANO BEACH

**EASTERN
(AIRPORT)
WELLFIELD**

Exhibit No: 3B

0 0.3 0.6
 Miles

City of Pompano Beach
Well Rehabilitation and Maintenance
Well Database

Attachment A-2

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2622	2623	284524	2624	2625	2626
Name	2 (Airport e wf)	3 (Airport e wf)	3R (Airport e wf)	4 (Airport e wf)	5 (Airport e wf)	6 (Airport e wf)
Map Designator	2	3	3R	4	5	6
FLUWID Number						
Well Field	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)
Existing/Proposed	E	A	P	E	E	E
Well Diameter(Inches)	16	16	16	16	16	14
Total Depth(feet)	136	107	107	140	108	156
Cased Depth(feet)			87			100
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0		0	0	0
To	0	0		0	0	0
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0		0	0	0
Pump Capacity(GPM)	1500	0	1500	1800	1500	2200
Year Drilled						
Planar Location						
Source	Migrate	Migrate		Migrate	Migrate	Migrate
Feet East	944525	944295	943829	944269	944547	944908
Feet North	693957	695195	695020	696626	697690	699133
Accounting Method	Flow Meter	Unspecified	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Abandoned	Primary	Primary	Primary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2627	2628	2629	2630	2631	2632
Name	7 (Airport e wf)	8 (Airport e wf)	9 (Airport e wf)	10 (Airport e wf)	11 (Airport e wf)	12 (Airport e wf)
Map Designator	7	8	9	10	11	12
FLUWID Number						
Well Field	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16	16	16	16	16
Total Depth(feet)	90	90	131	113	127	123
Cased Depth(feet)	90	90	97	93	88	90
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0	0	0	0	0
To	0	0	0	0	0	0
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0	0	0	0	0
Pump Capacity(GPM)	1500	1500	1500	1800	1500	1500
Year Drilled						
Planar Location						
Source	Migrate	Migrate	Migrate	Migrate	Migrate	Migrate
Feet East	945235	943968	945192	945173	945315	945573
Feet North	700037	692401	694729	695457	697457	697978
Accounting Method	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Primary	Primary	Primary	Primary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2633	2634	2635	2636	2637	2638
Name	13 (Airport e wf)	14 (Airport e wf)	15 (Airport e wf)	16 (Airport e wf)	17 (Palm-Aire w wf)	18 (Palm-Aire w wf)
Map Designator	13	14	15	16	17	18
FLUWID Number						
Well Field	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Eastern (Airport)	Western (Palm-Aire)	Western (Palm-Aire)
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16	18	18	16	16
Total Depth(feet)	115	114	140	130	150	130
Cased Depth(feet)	115	114	115	113.5	76	72
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0	0	0	0	0
To	0	0	0	0	0	0
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0	0	0	0	0
Pump Capacity(GPM)	1800	1500	2000	2000	2400	2400
Year Drilled						
Planar Location						
Source	Migrate	Migrate	Migrate	Migrate	Migrate	Migrate
Feet East	945805	946030	946224	945299	926649	927015
Feet North	698946	699866	700668	700713	690815	691544
Accounting Method	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Primary	Primary	Primary	Secondary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	2639	2640	2641	2642	164567	164568
Name	19 (Palm-Aire w wf)	20 (Palm-Aire w wf)	21 (Palm-Aire w wf)	22 (Palm-Aire w wf)	23 (Palm-Aire w wf)	24 (Palm-Aire w wf)
Map Designator	19	20	21	22	23	24
FLUWID Number						
Well Field	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)	Western (Palm-Aire)
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16	16	16	16	16
Total Depth(feet)	158	154	153	153	153	153
Cased Depth(feet)	78	80	80	79	80	80
Facility Elev. (ft. NGVD)						
Screened Interval						
From	0	0	0	0		
To	0	0	0	0		
Pumped Or Flowing	P	P	P	P	P	P
Pump Type	Turbine	Turbine	Turbine	Turbine	Turbine	Turbine
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0	0	0	0	0
Pump Capacity(GPM)	2100	2100	1600	2100	2100	2100
Year Drilled						
Planar Location						
Source	DIGITIZED	Migrate	Migrate	DIGITIZED	Migrate	Migrate
Feet East	927571	929181	928642	928402	929215	928237
Feet North	692396	693021	692193	691418	690310	690296
Accounting Method	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter	Flow Meter
Use Status	Primary	Primary	Primary	Primary	Primary	Primary
Water Use Type	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply	Public Water Supply
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer	Biscayne Aquifer

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	164569	177414	136299	136193	136303	136302
Name	25 (Palm-Aire w wf)	26 (Palm-Aire w wf)	SWI1-S	SWI1-D	SWI2-S	SWI2-D
Map Designator	25	26	MW-1 (SWI1-S)	MW-1 (SWI1-D)	MW-2 (SWI2-S)	MW-2 (SWI2-D)
FLUWID Number						
Well Field	Western (Palm-Aire)	Western (Palm-Aire)	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)	16	16				
Total Depth(feet)	153	153	120	200	120	180
Cased Depth(feet)	80	80				
Facility Elev. (ft. NGVD)						
Screened Interval From						
To						
Pumped Or Flowing	P	P				
Pump Type	Turbine	Turbine	None	None	None	None
Pump Int. Elev. Feet (NGVD)						
Feet (BLS)	0	0				
Pump Capacity(GPM)	2100	2100	0	0	0	0
Year Drilled						
Planar Location						
Source	Migrate	Migrate				
Feet East	928215	928252	947553	947553	946184	946184
Feet North	689598	688272	698253	698253	693443	693443
Accounting Method	Flow Meter	Flow Meter	None	None	None	None
Use Status	Primary	Primary	Monitor	Monitor	Monitor	Monitor
Water Use Type	Public Water Supply	Public Water Supply	Monitor	Monitor Water Shortage Monitoring Facility	Monitor	Monitor
Aquifer	Biscayne Aquifer	Biscayne Aquifer	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	136305	136304	136307	136306	136325	136308
Name	SWI3-S	SWI3-D	SWI4-S	SWI4-D	SWI5-S	SWI5-D
Map Designator	SW13-S	SWI3-D	MW-4 (SWI4-S)	MW-4 (SWI4-D)	MW-5 (SWI5-S)	MW-5 (SWI5-D)
FLUWID Number						
Well Field	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)						
Total Depth(feet)	120	180	120	200	120	200
Cased Depth(feet)						
Facility Elev. (ft. NGVD)						
Screened Interval						
From						
To						
Pumped Or Flowing						
Pump Type	None	None	None	None	None	None
Pump Int. Elev.						
Feet (NGVD)						
Feet (BLS)						
Pump Capacity(GPM)	0	0	0	0	0	0
Year Drilled						
Planar Location						
Source						
Feet East	950151	950151	949589	949589	946184	946184
Feet North	694391	694391	700570	700570	694742	694742
Accounting Method	None	None	None	None	None	None
Use Status	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Use Type	Monitor	Monitor	Monitor	Monitor Water Shortage Monitoring Facility	Monitor	Monitor
Aquifer	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	136327	136326	136333	136332	136301	136300
Name	SWI6-S	SWI6-D	SWI9-S	SWI9-D	SWI10-S	SWI10-D
Map Designator	MW-6 (SWI6-S)	MW-6 (SWI6-D)	MW-9 (SWI9-S)	MW-9 (SWI9-D)	MW-10 (SWI10-S)	MW-10 (SWI10-D)
FLUWID Number						
Well Field	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF	Eastern (Airport) WF
Existing/Proposed	E	E	E	E	E	E
Well Diameter(Inches)						
Total Depth(feet)	120	200	130	140	130	140
Cased Depth(feet)						
Facility Elev. (ft. NGVD)						
Screened Interval						
From						
To						
Pumped Or Flowing						
Pump Type	None	None	None	None	None	None
Pump Int. Elev.						
Feet (NGVD)						
Feet (BLS)						
Pump Capacity(GPM)	0	0	0	0	0	0
Year Drilled						
Planar Location						
Source						
Feet East	947869	947869	949913	949904	950207	950239
Feet North	695023	695023	688160	688166	688843	688840
Accounting Method	None	None	None	None	None	None
Use Status	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
Water Use Type	Monitor	Monitor Water Shortage Monitoring Facility	Monitor	Monitor	Monitor	Monitor
Aquifer	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System	Surficial Aquifer System

TABLE - A
Description Of Wells.

Application Number: 200930-9

Well ID	136319	136320
Name	PRW1 (Palm-Alire w wf	PRW8 (Palm-Alire w wf
Map Designator	PRW1	PRW8
FLUWID Number		
Well Field	Western (Palm-Alire)	Western (Palm-Alire)
Existing/Proposed	E	E
Well Diameter(Inches)		
Total Depth(feet)	178	
Cased Depth(feet)		
Facility Elev. (ft. NGVD)		
Screened Interval		
From		
To		
Pumped Or Flowing		
Pump Type	None	None
Pump Int. Elev.		
Feet (NGVD)		
Feet (BLS)		
Pump Capacity(GPM)	0	0
Year Drilled		
Planar Location		
Source		
Feet East	928857	927740
Feet North	690769	691658
Accounting Method	None	None
Use Status	Monitor	Monitor
Water Use Type	Monitor	Monitor
Aquifer	Surficial Aquifer System	Surficial Aquifer System

TREATMENT

TREATMENT CAPACITY

Treatment Capacity: 30 mgd Standby Power Capacity: 1,600 kw Treatment Firm Capacity: 30 mgd
 Maximum demand under 75% of operating capacity? ☒ Yes ☐ No *If not, what is the percentage?* N/A
 Firm capacity exceeds the average daily demand? ☒ Yes ☐ No Stand-by power capacity exceeds average daily demand? ☒ Yes ☐ No
 Comments:

CHEMICAL FEED SYSTEMS

Chemicals used? Line, Fluoride, Chlorine, Ammonia, Orthopolyphosphate, Sodium Hydroxide, and CO₂
 Chemicals meet the NSF Standards? ☒ Yes ☐ No ☐ Unknown Chemical storage appear to be compliant? ☒ Yes ☐ No
 Facilities & chemicals properly labeled? ☒ Yes ☐ No Are all chemical feed systems tied to flow? ☒ Yes ☐ No
 Doses & quantities measured & recorded? ☒ Yes ☐ No Are injection points visible? ☒ Yes ☐ No
 Operators trained to use safety equipment? ☒ Yes ☐ No SOP for chemical handling? ☒ Yes ☐ No
 Redundant equipment & spare parts kept? ☒ Yes ☐ No Do treatment rooms have adequate room lighting? ☒ Yes ☐ No
 Corrosive vapors properly controlled? ☒ Yes ☐ No Safety comply with *Water Treatment Plant Design*, Table 15.5? ☒ Yes ☐ No
 Injection point proper & ensures mixing? ☒ Yes ☐ No Treated sample tap compliant? ☒ Yes ☐ No
 Comments:

Source (Groundwater)

GROUNDWATER WELLS

Well Name or Number	Well 2 (O.O.S.)	Well 4	Well 5	Well 6	Well 7	Well 8 (O.O.S.)
Florida Unique Well Identification	AAI5163	AAI9472	AAI9471	AAI9470	AAI9469	AAI4462
Year Drilled	1952	1955	1958	1958	1960	1961
Depth Drilled	136'	140'	108'	156'	90'	90'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	Unk 16"	Unk 16"	97' 16"	100' 14"	90' 16"	97' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	22	23	25	24	19	19
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	No	No	No	No
Potential pollution sources near?	Yes	Yes	Yes	Yes	Yes	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes	Yes	Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Housed	Housed	Housed	Housed
Pump Type	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine
Horse Power	50 hp	60 hp	40 hp	75 hp	50 hp	50 hp
Rated Pump Capacity (GPM@PSI)	1500	1800	1500	2200	1500	1500
Normal Yield (GPM @ PSI)	1500	875	550	2275	1600	1290
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	No	No	No	No	Yes	No
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments: Well 3 has been abandoned properly. There were 20 active wells at the time of the inspection. Wells 2, 8, and 12 were out for bacteriological issues. Well 23 was out for repairs. Well 1 is only used as a monitoring well for saltwater intrusion. The Department recommends scheduled cleaning around the packing on the vertical turbine well pump to remove any bio-growth/sludge buildup.

Source (Groundwater)
GROUNDWATER WELLS

Well Name or Number	Well 9	Well 10	Well 11	Well 12 (O.O.S.)	Well 13	Well 14
Florida Unique Well Identification	AAO5405	AAI9467	AAI9452	AAI9466	AAI9465	AAI9464
Year Drilled	1963	1961	1964	1967	1968	1969
Depth Drilled	131'	113'	127'	123'	115'	114'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	97' 16"	93' 16"	88' 16"	90' 16"	115' 16"	114' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	24	23	16	23	19	21
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	Yes	No	No	No
Potential pollution sources near?	Yes	Yes	Yes	No	No	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes		Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Vaulted	Housed	Housed	Housed
Pump Type	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine
Horse Power	50 hp	50 hp	50 hp	60 hp	75 hp	50 hp
Rated Pump Capacity (GPM@PSI)	1500	1800	1500	1500	1800	1500
Normal Yield (GPM @ PSI)	1450	1400	1850	1120	2200	1800
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	No	No	No	Yes	Yes	Yes
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments: Well 12 out of service for bacteriological issues.

**Source (Groundwater)****GROUNDWATER WELLS**

Well Name or Number	Well 15	Well 16	Well 17	Well 18	Well 19	Well 20
Florida Unique Well Identification	AAI9463	AAI9468	AAP2898	AAP2899	AAO5400	AAO5403
Year Drilled	1972	1972	1984	1981	1981	1981
Depth Drilled	140'	130'	150'	130'	158'	154'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	115' 18"	116' 18"	76' 16"	72' 16"	78' 16"	80' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	21	25	13	11	9	10
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	No	No	No	No
Potential pollution sources near?	Yes	Yes	No	Yes	Yes	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes	Yes	Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Housed	Housed	Housed	Housed
Pump Type	Vert. Turbine	Vert. Turbine	Vert. Turbine	Vert. Turbine	Submersible	Vert. Turbine
Horse Power	75 hp	75 hp	100 hp	100 hp	100 hp	100 hp
Rated Pump Capacity (GPM@PSI)	2000	2000	2400	2400	2100	2100
Normal Yield (GPM @ PSI)	2100	1410	1450	1700	1300	1620
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	No	No	Yes	Yes	Yes	Yes
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments:

Source (Groundwater)
GROUNDWATER WELLS

Well Name or Number	Well 21	Well 22	Well 23 (O.O.S.)	Well 24	Well 25	Well 26
Florida Unique Well Identification	AAO5402	AAO5401	AAL5182	AAL5181	AAL5180	AAL5179
Year Drilled	1981	1981	2002	2002	2002	2002
Depth Drilled	153'	153'	153'	153'	153'	153'
Aquifer Name	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne	Biscayne
Depth & Diameter of casing?	80' 16"	79' 16"	80' 16"	80' 16"	80' 16"	80' 16"
Depth of Screen & Material	Unk	Unk	Unk	Unk	Unk	Unk
Depth of grouting & type?	Unk	Unk	Unk	Unk	Unk	Unk
Depth to Static Water Level?	10	8	Unk	Unk	Unk	Unk
Is the drawdown measured?	No	No	No	No	No	No
Is the site subject to flooding?	No	No	No	No	No	No
Is the well below grade?	No	No	No	No	No	No
Potential pollution sources near?	Yes	Yes	Yes	No	No	Yes
Contaminated, UDI, or ASR Well?	No	No	No	No	No	No
Is lightning protection provided?	Yes	Yes	Yes	Yes	Yes	Yes
Is the well housed or fenced?	Housed	Housed	Fenced	Fenced	Fenced	Fenced
Pump Type	Submersible	Vert. Turbine	Submersible	Vert. Turbine	Vert. Turbine	Submersible
Horse Power	100 hp	100 hp	100 hp	100 hp	100 hp	100 hp
Rated Pump Capacity (GPM@PSI)	1600	2100	2100	2100	2100	2100
Normal Yield (GPM @ PSI)	1450	1450	2200	2120	2230	2200
Proper raw water tap?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing height?	Yes	Yes	Yes	Yes	Yes	Yes
Well head properly sealed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper casing vent?	Yes	Yes	Yes	Yes	Yes	Yes
Dumpline installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Check Valve?	Yes	Yes	Yes	Yes	Yes	Yes
Air-relief valve installed?	Yes	Yes	Yes	Yes	Yes	Yes
Proper Water Meter?	Yes	Yes	Yes	Yes	Yes	Yes
Meter check for accuracy?	Yes	Yes	Yes	Yes	Yes	Yes
Stand-by Capacity?	Yes	Yes	Yes	Yes	Yes	Yes
Overall Site Condition	Good	Good	Good	Good	Good	Good

Comments: Well 23 out of service for repairs.



Engineers
Planners
Economists
Scientists

Jim Sandi

July 21, 1986

FC12327.H3

Frank D. Hoble
Assistant Utilities Director
City of Pompano Beach
P.O. Box 1300
Pompano Beach, Florida 33061

Dear Frank:

Subject: Treatability of Palm Aire Well Field Supply

The results of jar tests recently conducted on Palm Aire waters are enclosed. The primary purpose of the testing program was to confirm the ability of the Pompano Beach WTP to reduce organic color that occurs naturally in the Palm Aire supply to acceptable levels (less than 15 pcu). In general, the tests were successful. Using existing processes, color can easily be reduced to less than 15 pcu, the current maximum contaminant level (MCL). Furthermore, the treated waters exhibited a reasonable chlorine demand (less than 10 mg Cl_2/L) and a low rate of trihalomethane formation.

A second objective was to demonstrate that a stable (non-corrosive) product could be produced by converting excess lime to bicarbonate alkalinity by recarbonation. This would increase the buffer capacity of the finished water above levels experienced when lime is underdosed or fed at rates for optimum softening. Because we were unable to adequately control recarbonation, it was not possible to achieve this objective during our testing. However, since the plant can precisely control all chemical feed rates, including carbon dioxide, and in-line pH monitors will facilitate process control, we are confident that the plant can produce an acceptable finished water from the Palm Aire supply without modification.

The jar test report also includes results of using ferric chloride pretreatment to enhance color removal. While the tests clearly indicate that addition of ferric chloride is beneficial, the additional color removal may not justify the extra expense.

Frank D. Hoble
Page 2
July 21, 1986
FC12327.H3

When treating 100 percent Palm Aire waters, our recommendation is to add lime at approximately 275 mg/L as 90 percent CaO. This will give a settled water (Accelerator effluent) pH of 10.8 or higher; the hydroxide alkalinity (2P-T) should be +120 mg CaCO₃/L or greater. Approximately 10 mg/L of chlorine and a sufficient quantity of carbon dioxide should be added to produce a filter effluent with the following characteristics: pH equals approximately 7.0, alkalinity equals approximately 120 mg/L as CaCO₃, calcium hardness equals approximately 175 mg/L as CaCO₃. These conditions will yield a water with a pH of approximately 7.5 and a Ryzner Index value of approximately 8.0, which is less corrosive than the current finished water Ryzner Index value of approximately 8.5. Based on jar test experience, we would predict a finished water color of 10 pcu or less from this treatment scheme.

If a lower color value is desired, we recommend adding approximately 35 mg/L of ferric chloride to the raw water main at the Palm Aire well field prior to initiating the treatment described above. We suggest that a plant scale pilot study precede design of permanent facilities for ferric chloride application.

At your request, CH2M HILL can provide assistance for initiating either or both of the recommended treatment schemes. However, before beginning this program, we suggest that all mechanical and instrumentation systems be certified operational and that the operators be familiar with the operational features of each system in the process.

Respectfully,

Roger Yorton (mkm)

Roger Yorton

db/gnCR6/16

xc: Gary Fries/TPA
Dana Rippon/GNV

TREATABILITY OF PALM AIRE WELL FIELD WATER SUPPLY

The Palm Aire supply wells produce waters containing relatively large amounts of calcium hardness, organic color, and iron. While these constituents do not cause undesirable health effects, they do detract from the water's aesthetic character and tend to form deposits that sharply reduce the effectiveness of soaps, detergents, and water-using appliances. An analysis of water from Palm Aire wells No. 21 and 22 is provided in Table 1.

The treatment objectives for the Pompano Beach Water Treatment Plant (WTP) are to produce a softer, stable water that is pleasing to the eye and palate and is safe to drink. The unit processes provided at the Pompano Beach WTP include lime softening, recarbonation, filtration, chlorination, and ammoniation. Currently, the plant is producing an acceptable finished water by treating a blend of waters from the Palm Aire and Pompano well fields.

Treatment of 100 percent Palm Aire water was required by pumping tests conducted at the Palm Aire well field from April 14 through April 15, 1986. The finished waters produced on these dates had color values of 10 to 12 units in spite of a relatively large pre-chlorine dose (14 to 16 mg/L). The finished waters were also aggressive, and although no trihalomethane (THM) data were reported for these dates, one could confidently predict a higher than normal THM formation potential.

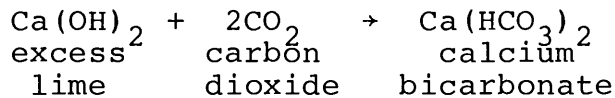
Because this episode brought the ability of the plant to treat the Palm Aire supply under question, a composite sample from Palm Aire supply wells No. 21 and 22 was collected for bench-scale testing to reconfirm treatability. The methods and results of the bench-scale testing (jar tests) are discussed below.

The bench-scale tests modeled two treatment processes. The first process used lime softening, recarbonation, and chlorination; the second preceded that treatment train with use of ferric chloride for preliminary color reduction. Ammoniation was not modeled in the tests; its purpose is to prevent THM formation in the distribution system and it has virtually no measurable effect on color or stability of the finished waters.

Experience has shown us that significant color reduction occurs during the lime softening process at a pH of 10 or above. This point usually coincides with the point of maximum softening and minimum residual bicarbonate alkalinity ($2P-T=0$). Minimum alkalinity, however, provides too little buffer capacity and the acidity resulting from

chlorination causes the finished waters to be corrosive to the distribution system.

It seems likely, however, that the criteria of low color and noncorrosiveness can be met by providing excess lime to reduce color, then converting that excess lime to bicarbonate alkalinity by means of recarbonation.



Jar Test Series No. 1 was designed to test this hypothesis using the following procedure:

1. Add 300 mg of calcium carbonate to each 1-liter aliquot of raw water to simulate preexisting solids in Accelerator.
2. Add lime in the form of pure calcium hydroxide (Ca(OH)_2) in amount sufficient to yield an excess of unreacted Ca(OH)_2 .
3. Rapid mix 1 minute.
4. Slow mix 30 minutes.
5. Settle 30 minutes.
6. Decant supernatant.
7. Recarbonate to pH 9.0.
8. Add 10 mg/L chlorine solution.
9. Filter--Whatman #40.

Aliquots were removed for analysis following steps 6, 7, 8, and 9. The data from this series are presented in Table 2. Jars 3, 4, and 5 were run in duplicate, although not at the same time. Samples of Jars 3a, 4a, and 5a were analyzed for total trihalomethane content after one hour of chlorine contact time.

The results of Jar Test Series No. 1 show that it is quite possible to reduce finished water color and chlorine demand to acceptable levels using only processes currently available at the Pompano Beach WTP. Furthermore, since the rate of THM formation is quite low, even greater flexibility in disinfection and color reduction with chlorine would be allowed than expected. Although the data indicate that the finished waters will be corrosive, we feel that pH_s values reported here were the result of overfeeding carbon dioxide

and overestimating the chlorine demand, and that the concept of feeding excess lime is valid. Both carbon dioxide and chlorine reduce alkalinity and it is not possible to control batch operations with the same precision attainable at the plant.

Experience in treating another Florida water with high color showed that pretreatment with ferric chloride before the softening process was beneficial in reducing organic color. Jar Test Series No. 2 was conducted to determine the optimum ferric chloride dose; results are presented in Table 3. A ferric chloride dose of 35 mg/L removed 83 percent of the original color without benefit of other treatment processes.

Subsequently, Jar Test Series No. 3 was designed to model a process employing ferric chloride pretreatment. The procedure followed was:

1. Add 35 mg/L of ferric chloride to 1-liter aliquots of raw water.
2. Rapid mix for 1 minute.
3. Slow mix for 1 hour.
4. At the end of 1 hour, steps 1 through 9 of Jar Test Series No. 1 were carried out on each jar.

Aliquots were removed for analysis as before. The data from this series are presented in Table 4. Jars 1, 2, and 3 were run in duplicate, although not on the same day. Samples from Jars 1a, 2a, and 3a were analyzed for total trihalomethane content after 1 hour of chlorine contact time.

The results of Jar Test Series No. 3 indicate that finished water color values using ferric chloride pretreatment are lower than color values obtained when treating with lime alone, all other treatment variables being constant. As with Jar Test Series No. 1, the inability to precisely control recarbonation and overdosing chlorine resulted in a corrosive finished water. We believe that these difficulties would not be a problem in actual plant operation where more precise control is possible.

The duplicate samples in Jar Test Series No. 1 and 3 were not in particularly good agreement. This is due in part to the difficulty in precisely controlling dosages in batch type processes. Also, since the duplicate tests were run several days after the original tests, changes in raw water quality may have occurred that were not accounted for.

Table 1

**ENVIRONMENTAL LABORATORIES**

7201 N.W. Eleventh Place
P.O. Drawer 1647
Gainesville, Florida 32602
904/377-2442

Sample No. _____

Lab ID #82112

WATER ANALYSIS REPORTOwner Pompano Beach WTP

Project No. _____

Attention _____

Received 7/1/86

Address _____

Reported _____

SAMPLE LOCATION: Composite of Palm
Aire Supply Wells
Nos. 21 and 22

SOURCE OF SUPPLY: ☐ Surface, ☒ GroundTYPE OF SAMPLE: ☐ Composite, ☒ GrabSAMPLE COLLECTED BY: OwnerDATE: 6 / 30 / 86 TIME ☐ AM ☐ PM

Substance		milligrams per liter		Substance		milligrams per liter	
		MCL	present			as substance	as CaCO ₃
Arsenic	As	0.05		Alkalinity, phenolphthalein			0
Barium	Ba	1		Alkalinity, total			250
Cadmium	Cd	0.01		Carbon dioxide, free	CO ₂	63	143
Chloride ^{5.5 m L 50 m L}	Cl ⁻	250	54	Bicarbonates	HCO ₃ ⁻	305	250
Chromium	Cr	0.05		Carbonates	CO ₃ ⁼	0.11	0.19
Color, APHA color units		15	150	Hydroxides	OH ⁻	1.35x10 ⁻³	3.97x10 ⁻³
Copper	Cu	1		Calcium	Ca	117	292
Fluoride	F ⁻	*		Magnesium	Mg	2.91	12
Foaming agents	MBAS	0.5		Total hardness			304
Iron	Fe	0.3	3.27	Carbonate hardness			250
Lead	Pb	0.05		Noncarbonate hardness			54
Manganese	Mn	0.05		Conductivity		709 $\mu\text{mhos/cm}$	@ 25° C
Mercury	Hg	0.002		Oxygen, dissolved (field)			mg/L O ₂
Nitrate (as N)	NO ₃ ⁻	10		Temperature (field)			° C
Odor, threshold odor number		3		pH (field) [6.5-8.5]			
Selenium	Se	0.01		pH (laboratory)	6.9	pH _s @	6.97 °C
Silver	Ag	0.05		Stability index (2 pH _s -pH)	7.03		
Sodium	Na	160	38	Saturation index (pH-pH _s)	-0.07		
Sulfate	SO ₄ ⁼	250	58	Aggressive index (pH + log AH)	11.76		
Total dissolved solids @ 180° C		500	419				
Turbidity, NTU		1					
Zinc	Zn	5					

THE INFORMATION SHOWN ON THIS SHEET IS TEST DATA ONLY AND NO INTERPRETATION OF THE DATA IS INTENDED OR IMPLIED

1. Except color, odor, pH and turbidity

MCL Maximum contaminant level

* MCL 1.4-2.4—depends upon avg. daily max. air temp.

< means less than detection limits

N.O.O. means no odor observed

Respectfully submitted,

Roger Yorton (mlm)
Chemist

Table 2
JAR TEST SERIES NO. 1

Jar No.	Applied Dosages, mg/L		Supernatant Quality			Applied Dose CO ₂ , mg/L	Recarbonated Water				Applied Dose Cl ₂ , mg/L	Finished Water Quality							
	CaCO ₃	Ca(OH) ₂	pH	P. Alk/T. Alk	OH=2P-T		pH	P. Alk/T. Alk	Ca as CaCO ₃	Color, pcu		pH	P. Alk/T. Alk	T.Cl ₂ Residual, mg/L	Color, pcu	pH _s	RI = 2pH _s -pH	SI = pH-pH _s	TTHM, µg/L
1	300	270	10.4	60/88	+32	?	8.5	16/88	140	35	10	7.0	--	2.9	15	--	--	--	--
2	300	290	10.5	76/106	+46	?	8.4	22/96	138	25	10	6.9	--	3.0	20	--	--	--	--
3	300	310	10.55	92/114	+70	?	8.7	14/122	164	25	10	7.08	--	3.2	17	--	--	--	--
3a	300	310	10.7	106/134	+78	?	8.8	12/68	148	27	10	6.35	0/137	3.4	22	7.52	--	--	18
4	300	330	10.75	146/174	+118	?	8.6	16/110	166	15	10	6.98	--	2.8	10	--	--	--	--
4a	300	330	10.8	132/162	+102	?	8.7	20/136	130	27	10	7.05	0/108	3.8	15	7.66	--	--	22
5	300	350	10.8	158/190	+126	?	9.0	8/118	174	15	10	7.0	--	2.8	7	--	--	--	--
5a	300	350	10.85	168/206	+130	?	8.95	22/86	166	22	10	7.0	0/100	4.6	15	7.61	--	--	17.5
6	300	370	10.8	164/190	+138	?	8.85	10/128	164	10	10	7.0	--	3.7	5	--	--	--	--

Table 3
JAR TEST SERIES NO. 2

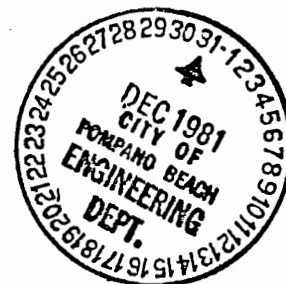
Jar No.	Applied Dose FeCl_3 mg/L ³	Supernatant Quality			Soluble Fe, mg/L
		pH	Total Alkalinity	Color	
1	25	7.1	256	130	
2	30	7.05	248	70	
3	35	6.75	218	25	
4	40	6.7	216	27	
5	45	6.72	208	32	
6	50	6.72	200	30	0.03

Table 4
JAR TEST SERIES NO. 3

Jar No.	Applied Dosages, mg/L			Supernatant Quality			Applied Dose	Recarbonated Water				Applied Dose	Finished Water Quality							
	FeCl ₃	CaCO ₃	Ca(OH) ₂	pH	P.Alk/T.Alk	OH=2P-T	CO ₂ , mg/L	pH	P. Alk/T. Alk	Ca as CaCO ₃	Color, pcu	Cl ₂ , mg/L	pH	P. Alk/T. Alk	T. Cl ₂ Residual, mg/L	Color, pcu	pH _s	RI = 2pH _s -pH	SI = pH-pH _s	TTHM, µg/L
1	35	300	230	10.3	24/56	-8	?	8.8	12/68	148	27	10	6.8	--	3.4	15	--	--	--	--
1a	35	300	230	10.25	38/56	+20	?	8.75	6/46	152	20	10	6.6	0/40	5.0	25	8.05	--	--	18.3
2	35	300	250	10.3	36/58	+14	?	8.7	20/136	130	27	10	7.1	--	3.4	10	--	--	--	--
2a	35	300	250	10.5	54/74	+34	?	8.9	8/58	138	20	10	6.65	0/48	5.6	15	8.01	--	--	15.9
3	35	300	270	10.55	56/82	+30	?	8.95	22/86	166	22	10	6.8	--	3.6	7	--	--	--	--
3a	35	300	270	10.62	80/94	+66	?	9.0	10/68	142	15	10	6.7	0/66	5.6	10	7.86	--	--	14.2
4	35	300	290	10.7	94/114	+74	?	8.85	24/104	186	17	10	6.86	--	3.4	5	--	--	--	--
5	35	300	310	10.85	138/174	+102	?	8.7	24/154	218	15	10	6.95	--	3.0	3	--	--	--	--
6	35	300	330	10.9	136/168	+104	?	8.3	18/162	248	10	10	7.08	--	2.8	2	--	--	--	--

Handwritten: JIM

Handwritten: NEW TOWN



December 23, 1981

FC12327.F2

City of Pompano Beach
P. O. Drawer 1300
Pompano Beach, Florida 33460

Attention: Mr. Richard C. Mills, P.E.

Gentlemen:

Subject: Palm-Aire Well Field - City Project No. 81-369

We have completed our review and analysis of data gathered during the pumping tests of the new water supply wells at the Palm-Aire wellfield. Based on this data, we recommend the following pumping rates for each well:

<u>Well No.</u>	<u>Recommended Pumping Rate (gpm)</u>
1-17	2,400
2-18	2,400
3-19	2,100
4-20	2,100
5-21	1,600
6-22	2,100
	<u>12,700 (or 18.3 gpm)</u>

The expected pumping water levels and recommended pump settings are as follows:

<u>Well No.</u>	<u>Pumping Water Level (feet below ground surface)</u>	<u>Pump Setting (feet below ground surface)</u>
1-17	24	50
2-18	23	50
3-19	51	59
4-20	46	53
5-21	42	52
6-22	41	65

Due to the low efficiencies of wells number 3, 4, and 5, the recommended pumping rates should be considered as maximum allowable rates.

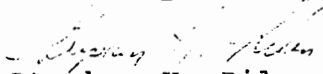
City of Pompano Beach
Page 2
December 23, 1981
FC12327.F2

Until the time these wells become operational, we recommend that city staff chlorinate the wells on a periodic basis, approximately every three to six months. The purpose of this will be to inhibit growth of bacteria during the time in which these wells are not being pumped.

Enclosed are two complete sets of the Well Drilling Reports (Record Drawings) for your files.

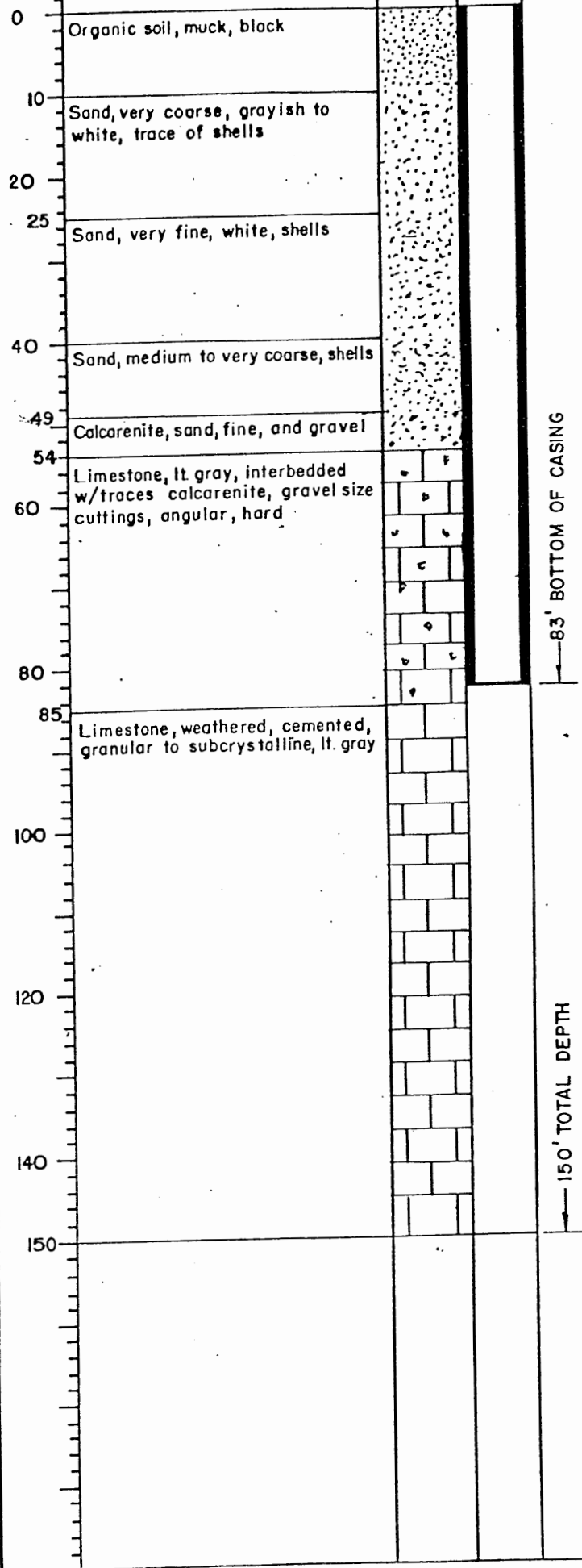
If you require further information or have any questions, please feel free to contact me.

Sincerely,


Stephen H. Riley

BC4:V:ae
Enclosures

cc: D. Rippon/GNV
R. Sproul/GNV



WELL DRILLING REPORT

Well: MONITOR WELL No. 1

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 150 FEET

Static Water Level: _____

Date: _____

Casing: 8 IN. - 83 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 6/27/81

Pumping Test

Specific Yield _____ gpm/
 @ _____ gpm

Water Analysis (ppm)

TDS	_____
Total Hardness ¹	_____
M.O. Alkalinity ¹	_____
Chloride Cl	_____
Iron Fe	_____
Sulfate SO ₄	_____
Color (APHA)	_____
Calcium ¹	_____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



WELL DRILLING REPORT

Well: MONITOR WELL No. 2

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 145 FEET

Static Water Level: _____

Date: _____

Casing: 8 IN. — 66 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 7/2/81

Pumping Test

Specific Yield _____ gpm.

@ _____ gpm

Water Analysis (ppm)

TDS _____

Total Hardness¹ _____

M.O. Alkalinity¹ _____

Chloride Cl _____

Iron Fe _____

Sulfate SO₄ _____

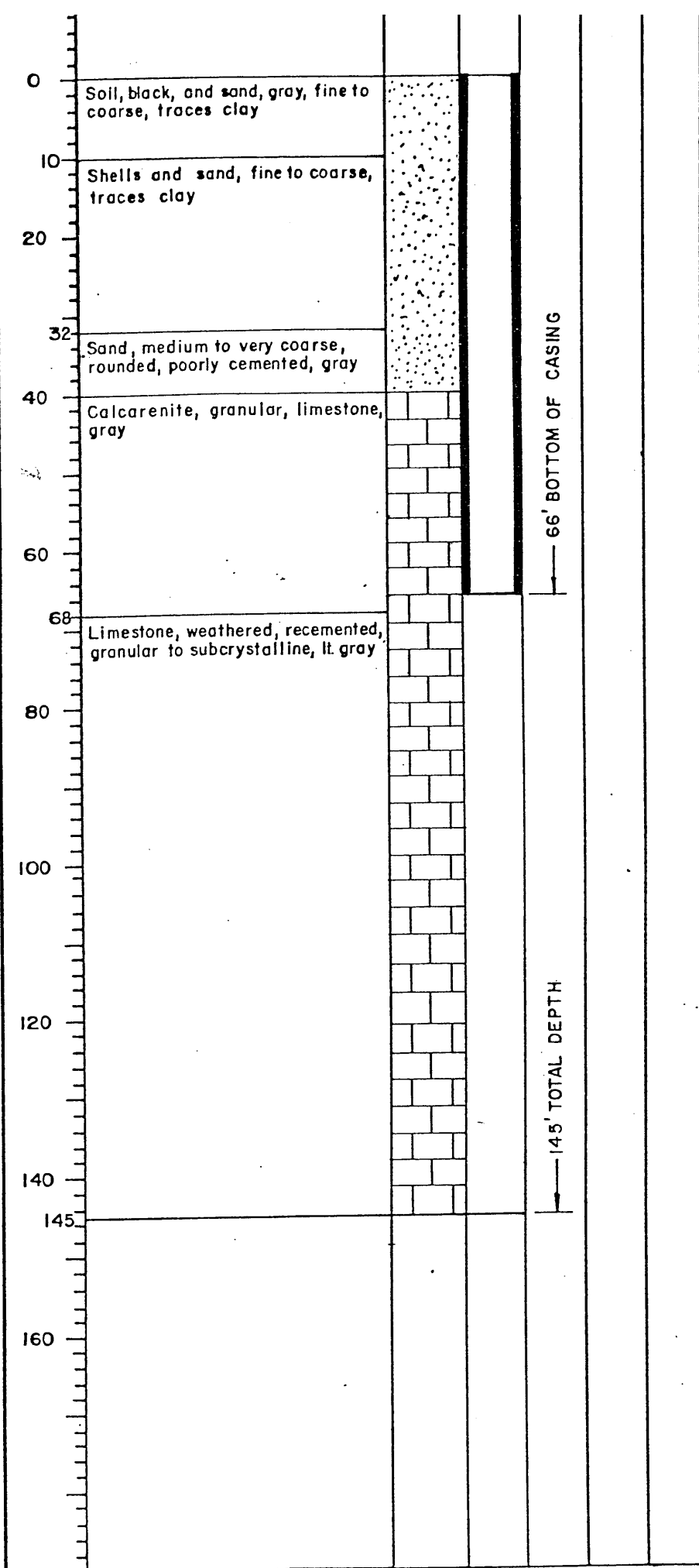
Color (APHA) _____

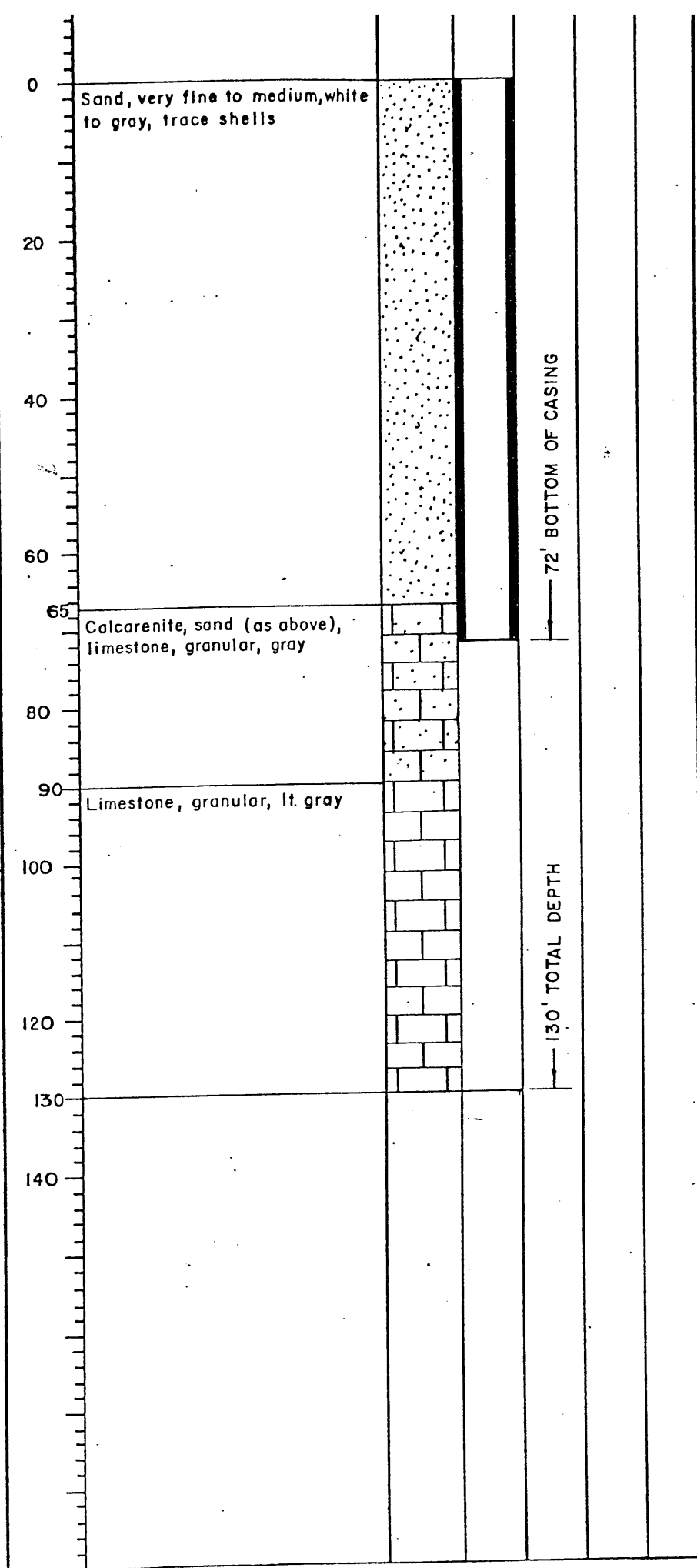
Calcium¹ _____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃





WELL DRILLING REPORT

Well: PRODUCTION WELL No. 2

Location: POMPANO BEACH, FLA.
PALM - AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 130 FEET

Static Water Level: 4.3 FEET

Date: 10/22/81

Casing: 16 IN. - 72 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 334 gpm/
@ 2,300 gpm

Water Analysis (ppm)

	DATA NOT AVAILABLE
TDS	_____
Total Hardness ¹	_____
M.O. Alkalinity ¹	_____
Chloride Cl	_____
Iron Fe	_____
Sulfate SO ₄	_____
Color (APHA)	_____
Calcium ¹	_____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

FC12327J2

WELL DRILLING REPORTWell: PRODUCTION WELL No. 3Location: POMPANO BEACH, FLA.PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCHDepth: 158 FEETStatic Water Level: 4.9 FEETDate: 7/30/81Casing: 16 IN. - 78 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 67 gpm/ft
@ 2,100 gpmWater Analysis (ppm)

TDS	<u>380</u>
Total Hardness ¹	<u>306</u>
M.O. Alkalinity ¹	<u>237</u>
Chloride Cl	<u>32</u>
Iron Fe	<u>3.95</u>
Sulfate SO ₄	<u>64</u>
Color (APHA)	<u>140</u>
Calcium ¹	<u>286</u>

Compiled by CH2M HILLDate 10/30/81¹ As CaCO₃.0
Sand, very fine to coarse, white to gray, trace silt, clay, shells

20

40

60

62

Limestone, granular and calcarenite, weathered, lt. gray

80

100

120

140

158

160

60' TOP OF RISER PIPE

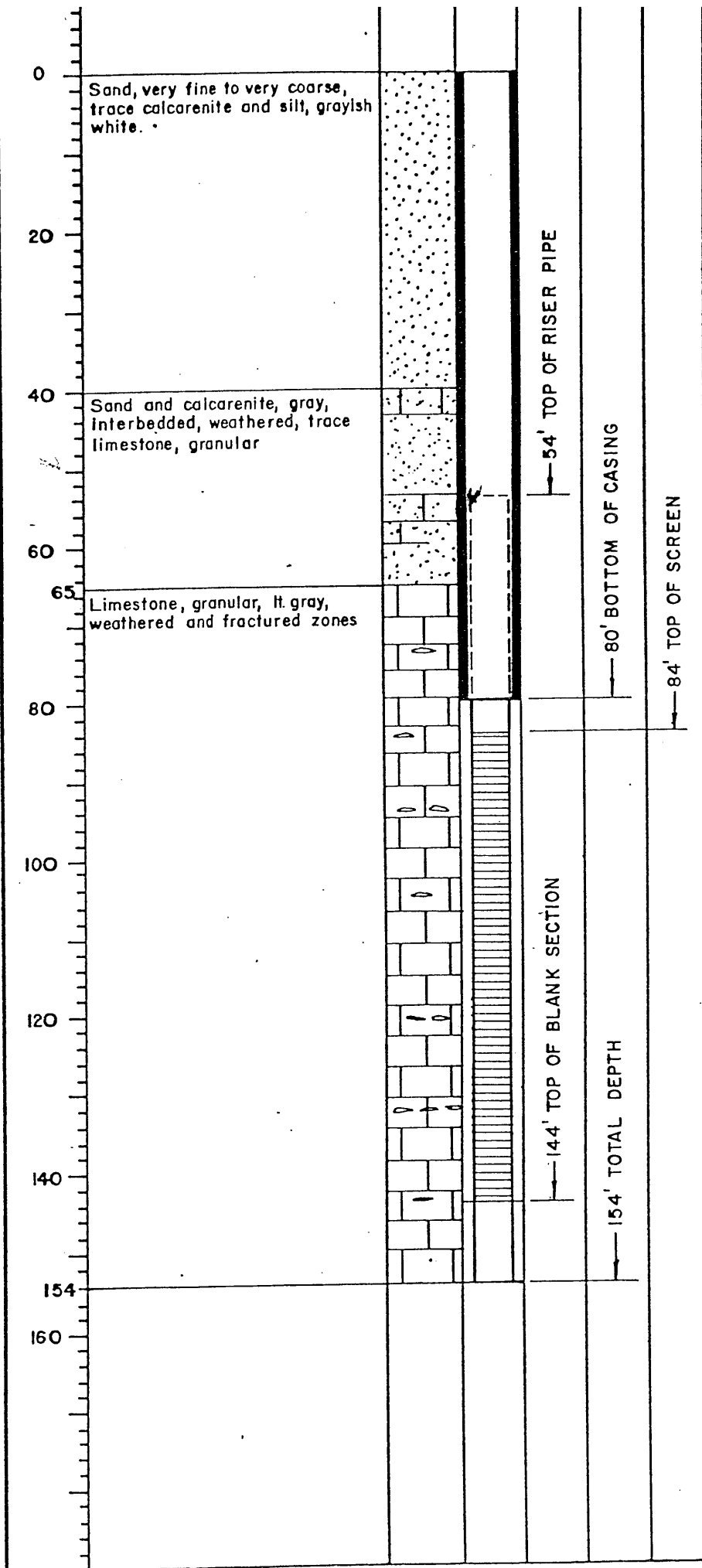
78' BOTTOM OF CASING

88' TOP OF SCREEN

148' TOP OF BLANK SECTION

158' TOTAL DEPTH

DRAWING No. 4



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 4

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 154 FEET

Static Water Level: 3.3 FEET

Date: 10/15/81

Casing: 16 IN. - 80 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 62 gpm/t
 @ 2,300 gpm

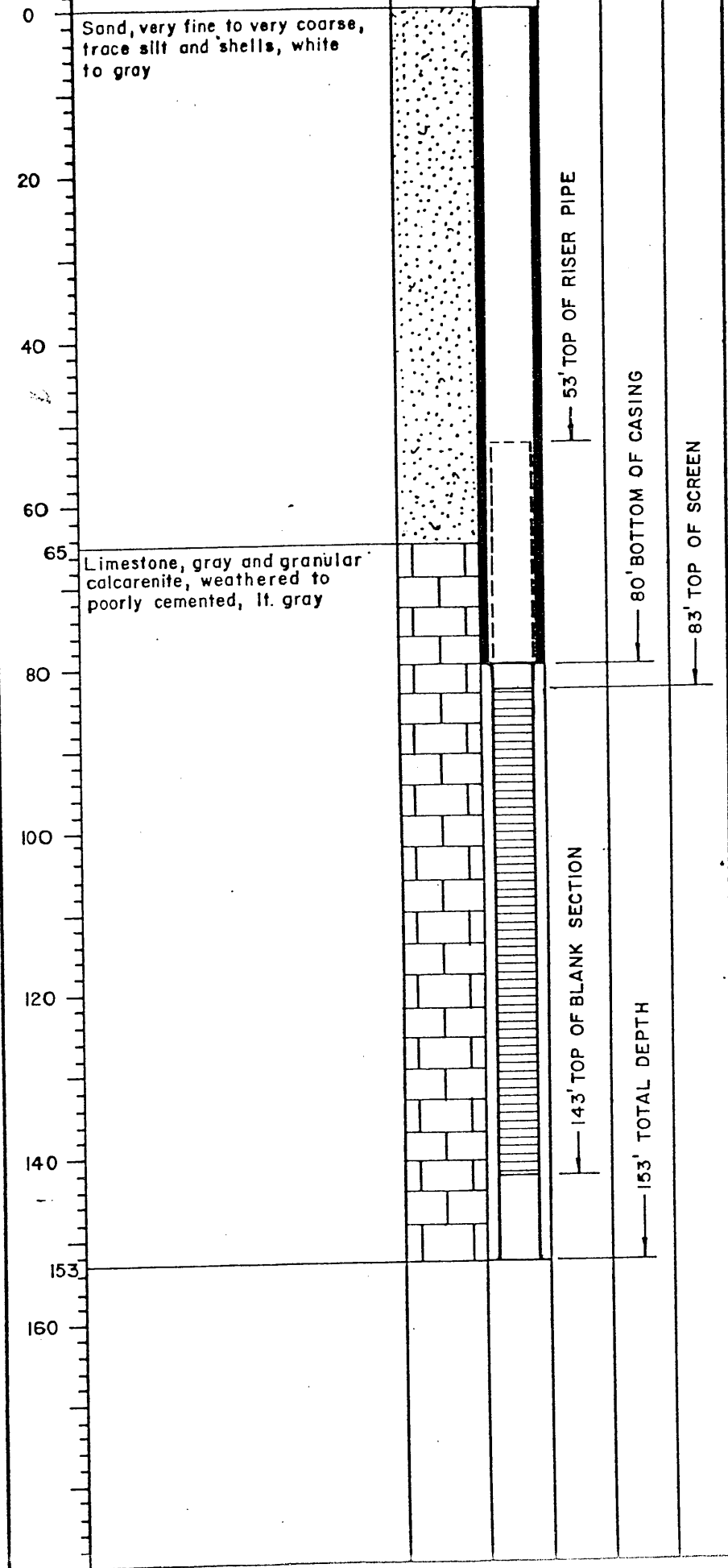
Water Analysis (ppm)

TDS	<u>419</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>219</u>
Chloride Cl	<u>53</u>
Iron Fe	<u>11.5</u>
Sulfate SO ₄	<u>82</u>
Color (APHA)	<u>200</u>
Calcium ¹	<u>308</u>

Compiled by CH2M HILL
 Date 10/30/81

¹ As CaCO₃.

FC12327F2



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 5

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 153 FEET

Static Water Level: 2.5 FEET

Date: 10/12/81

Casing: 16 IN. - 80 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 60 gpm/
 @ 1,800 gpm

Water Analysis (ppm)

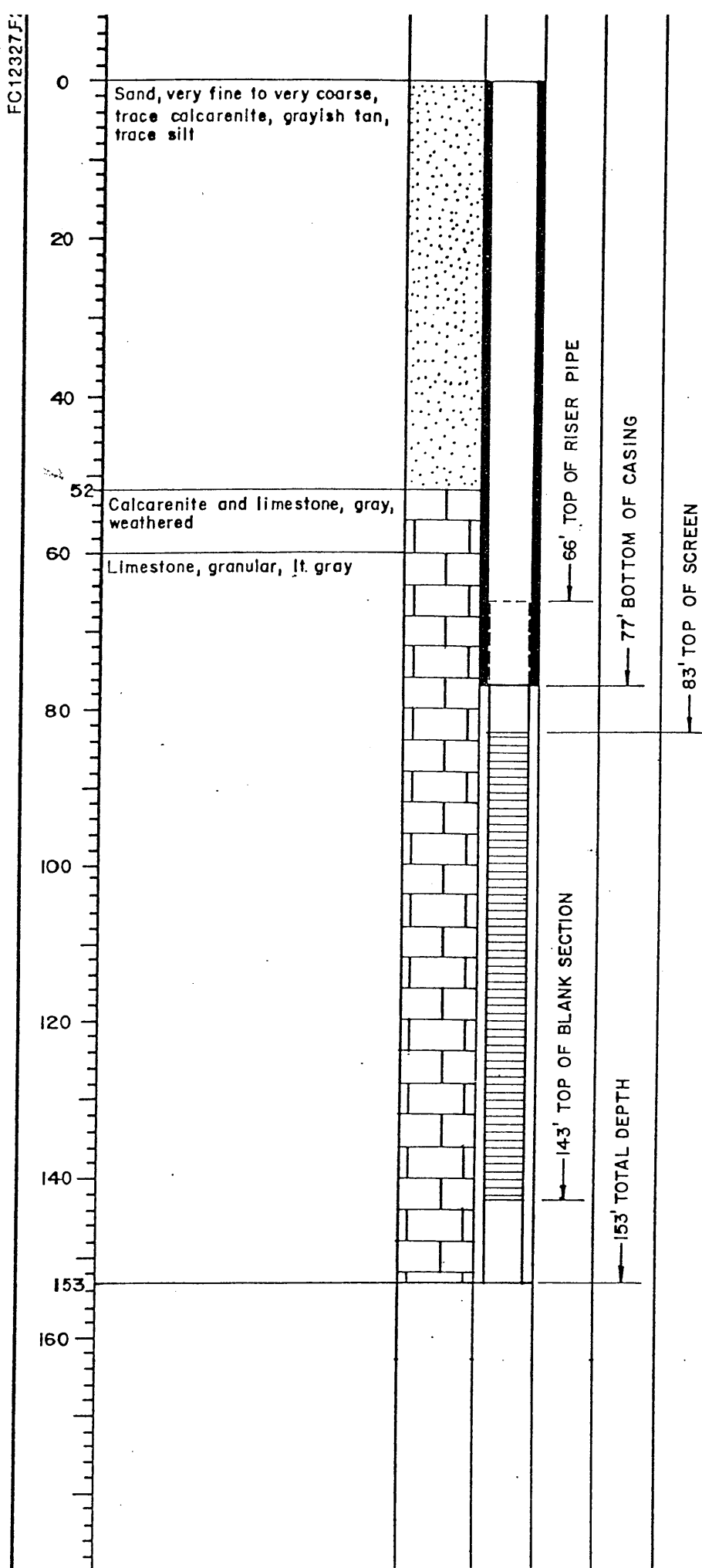
TDS	<u>442</u>
Total Hardness ¹	<u>343</u>
M.O. Alkalinity ¹	<u>281</u>
Chloride Cl	<u>51</u>
Iron Fe	<u>8.7</u>
Sulfate SO ₄	<u>56</u>
Color (APHA)	<u>150</u>
Calcium ¹	<u>334</u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

FC12327F



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 6

Location: POMPANO BEACH, FLA
PALM - AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 153 FEET

Static Water Level: 2.9 FEET

Date: 10/24/81

Casing: 16 IN. - 77 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 76 gpm/
 @ 2,100 gpm

Water Analysis (ppm)

TDS	<u>454</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>257</u>
Chloride Cl	<u>74</u>
Iron Fe	<u>3.23</u>
Sulfate SO ₄	<u>53</u>
Color (APHA)	<u>120</u>
Calcium ¹	<u>297</u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.

WELL DRILLING REPORTWell: MONITOR WELL No. 1Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

Ground Elevation: _____

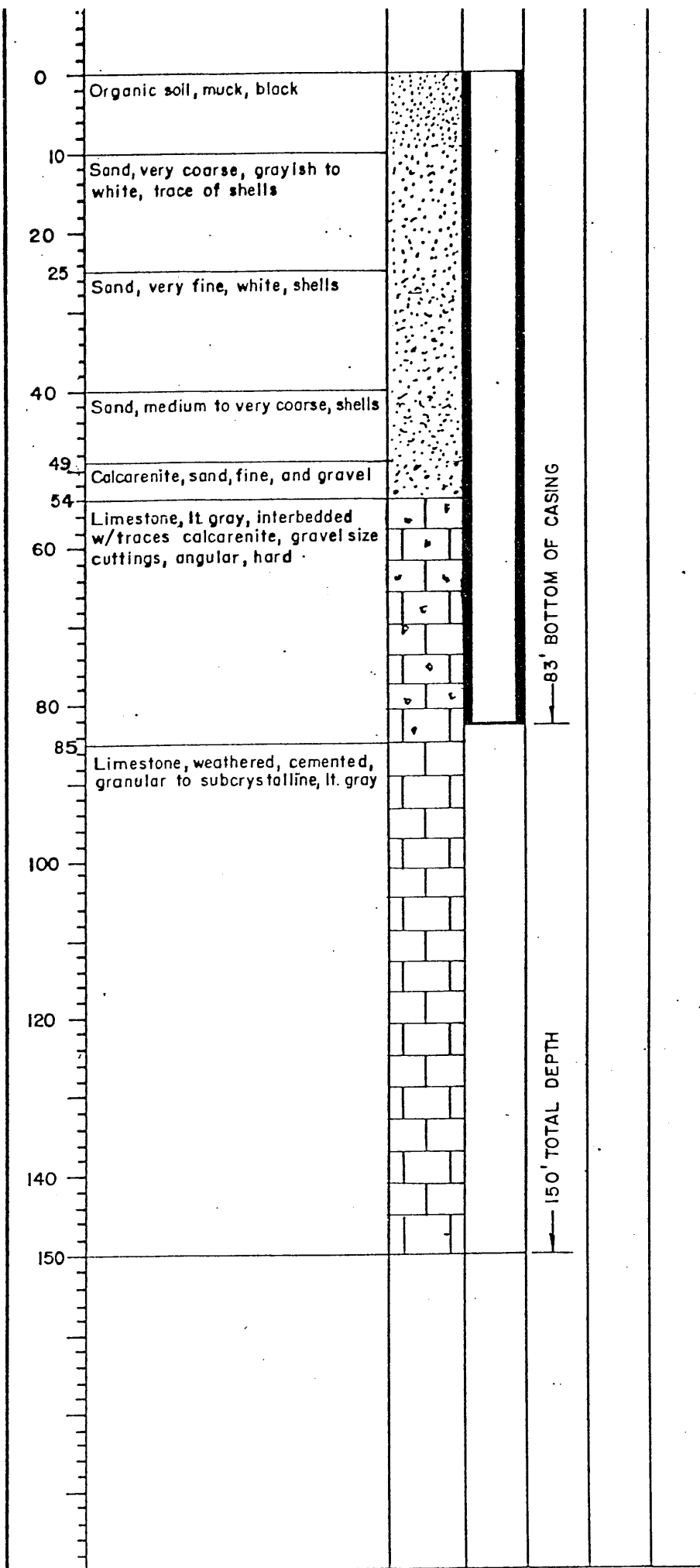
Diameter: 8 INCHDepth: 150 FEET

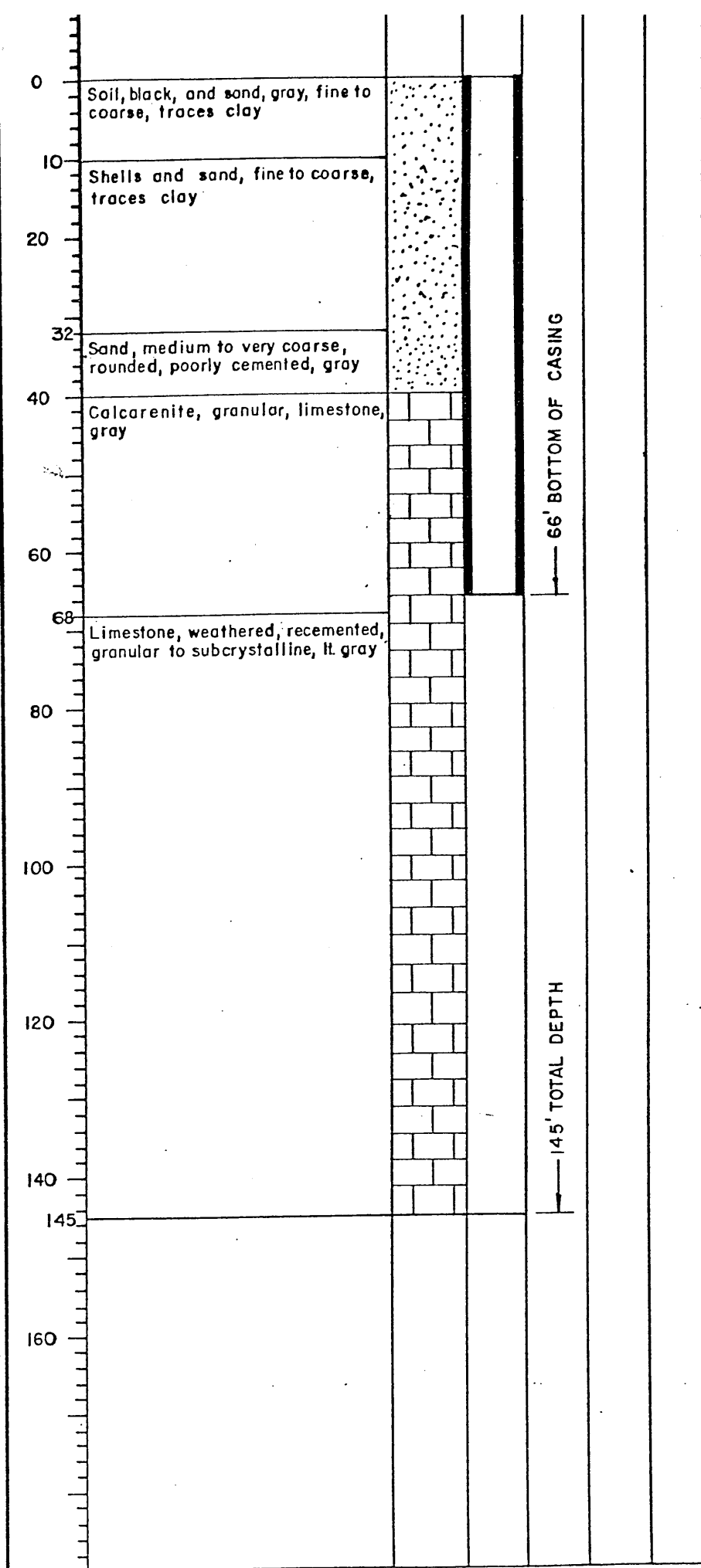
Static Water Level: _____

Date: _____

Casing: 8 IN. - 83 FT.Screen: NONEConstruction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 6/27/81Pumping TestSpecific Yield _____ gpm/ft
@ _____ gpmWater Analysis (ppm)

TDS	_____
Total Hardness ¹	_____
M.O. Alkalinity ¹	_____
Chloride Cl	_____
Iron Fe	_____
Sulfate SO ₄	_____
Color (APHA)	_____
Calcium ¹	_____

Compiled by CH2M HILLDate 10/30/81¹ As CaCO₃.



WELL DRILLING REPORT

Well: MONITOR WELL No. 2

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 8 INCH

Depth: 145 FEET

Static Water Level: _____

Date: _____

Casing: 8 IN. — 66 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 7/2/81

Pumping Test

Specific Yield _____ gpm./ft

@ _____ gpm

Water Analysis (ppm)

TDS _____

Total Hardness¹ _____

M.O. Alkalinity¹ _____

Chloride Cl _____

Iron Fe _____

Sulfate SO₄ _____

Color (APHA) _____

Calcium¹ _____

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 2

Location: POMPANO BEACH, FLA.
PALM - AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 130 FEET

Static Water Level: 4.3 FEET

Date: 10/22/81

Casing: 16 IN. - 72 FT.

Screen: NONE

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 334 gpm/ft
 @ 2,300 gpm

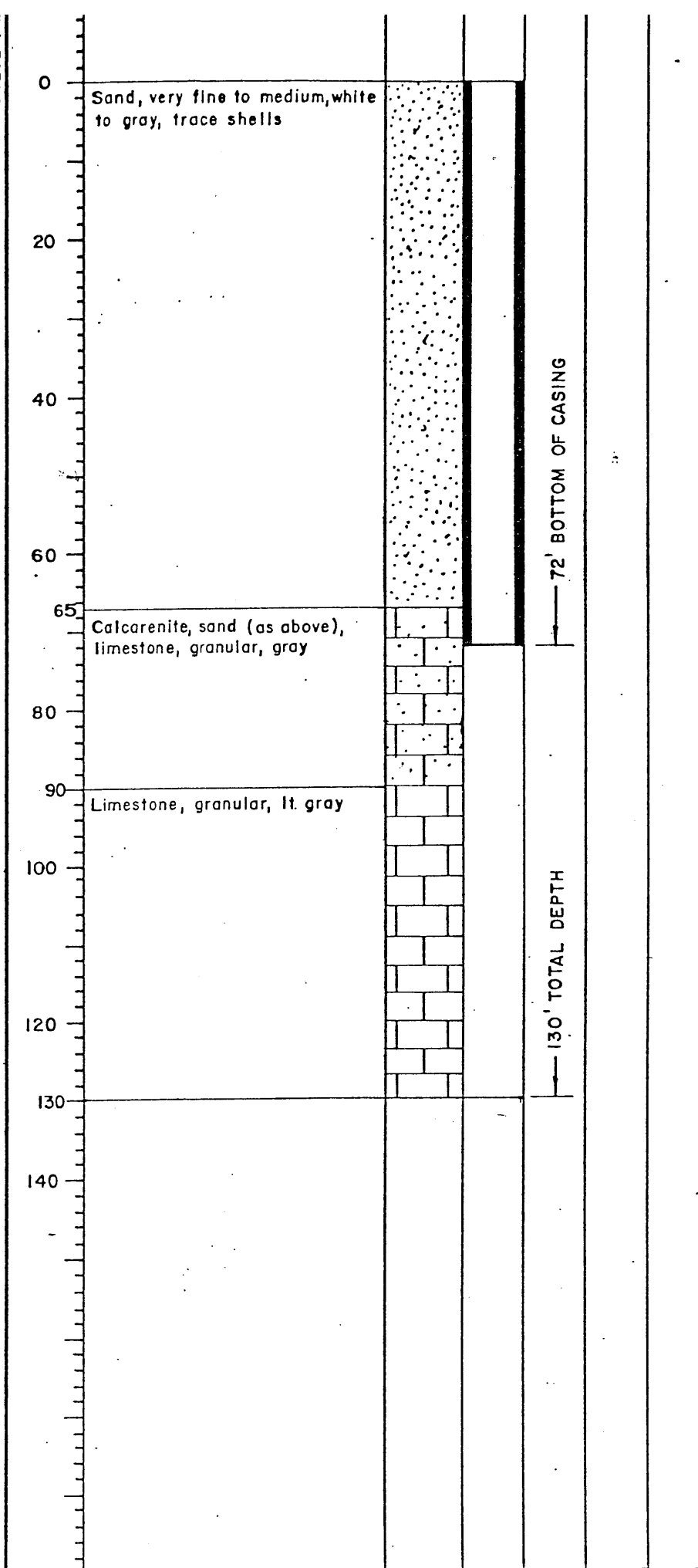
Water Analysis (ppm)

TDS	<u>DATA NOT AVAILABLE</u>
Total Hardness ¹	<u> </u>
M.O. Alkalinity ¹	<u> </u>
Chloride Cl	<u> </u>
Iron Fe	<u> </u>
Sulfate SO ₄	<u> </u>
Color (APHA)	<u> </u>
Calcium ¹	<u> </u>

Compiled by CH2M HILL

Date 10/30/81

¹ As CaCO₃.



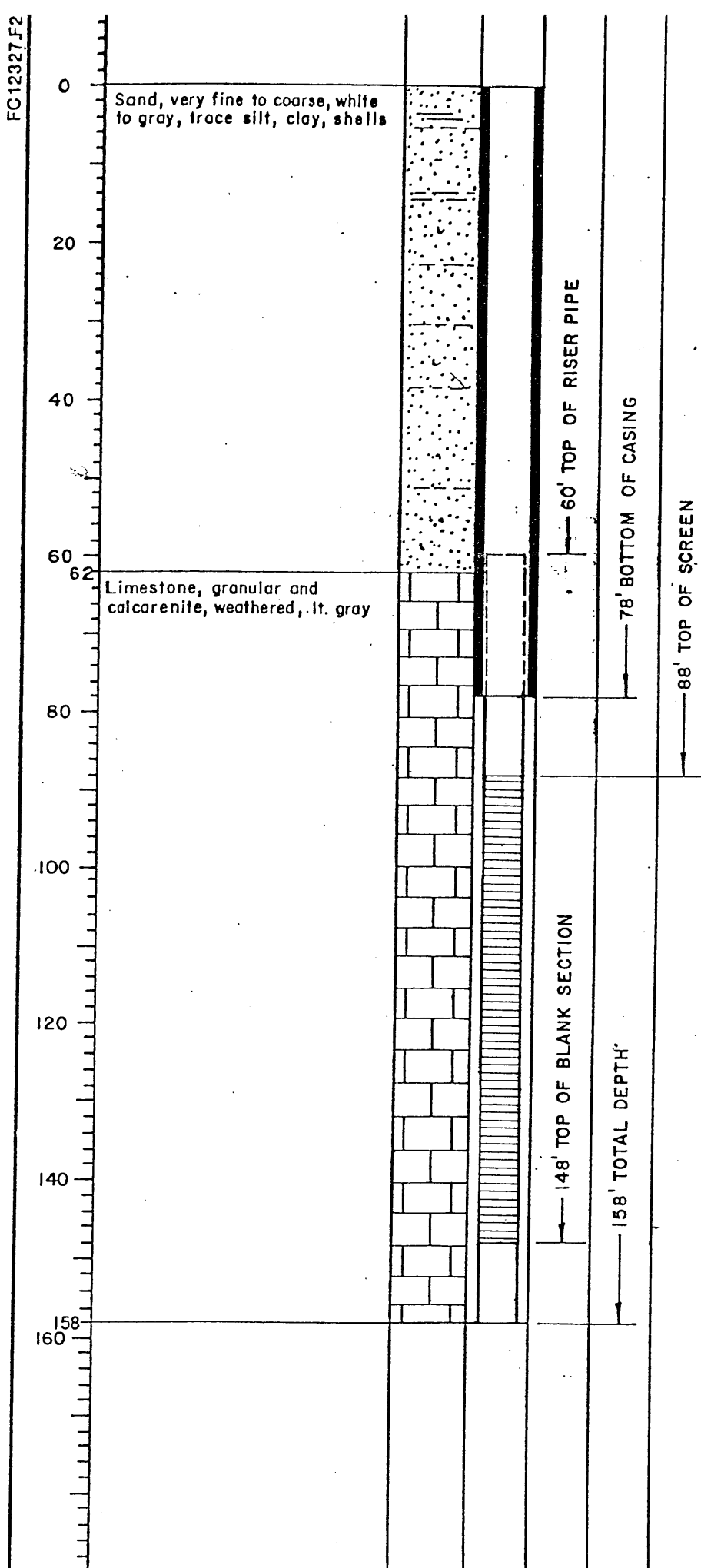
FC12327.F2

CH2M
HILLWELL DRILLING REPORTWell: PRODUCTION WELL No. 3Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

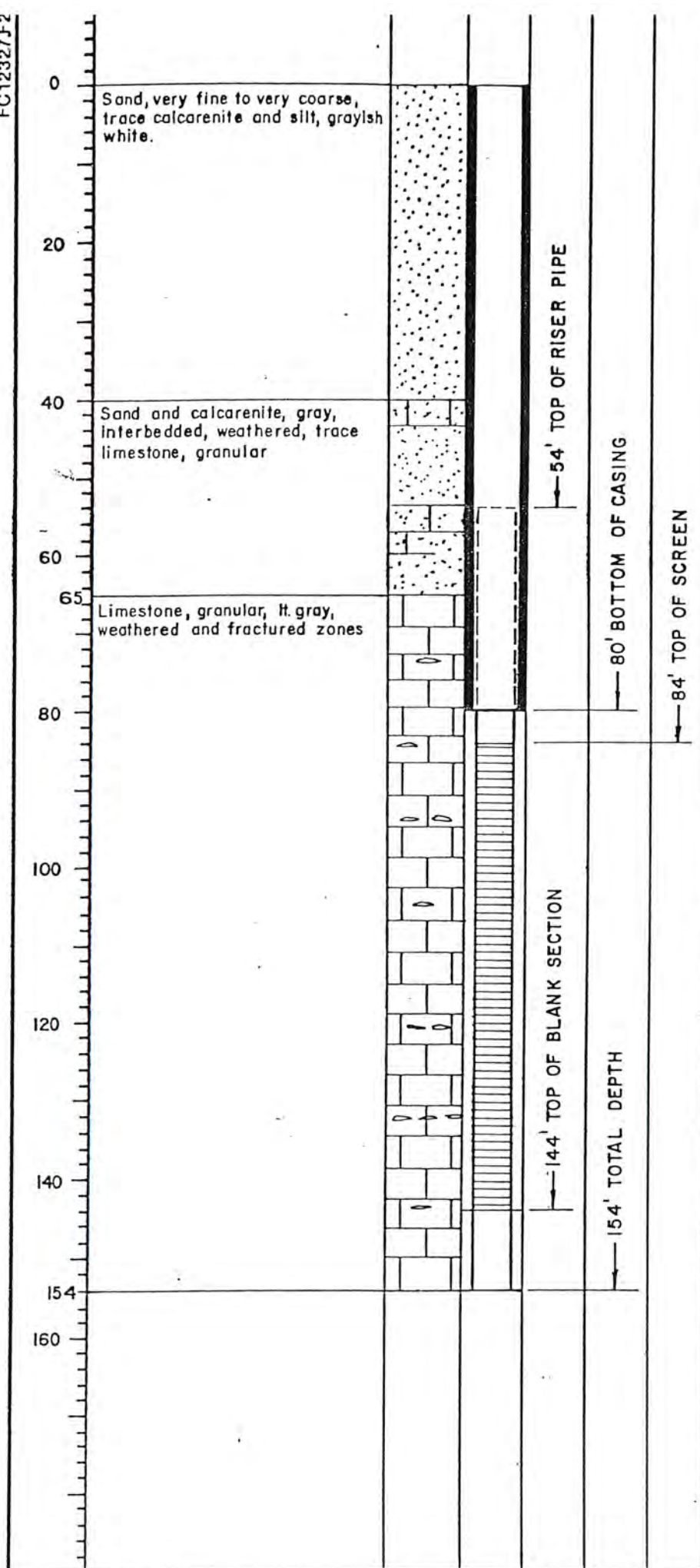
Ground Elevation: _____

Diameter: 16 INCHDepth: 158 FEETStatic Water Level: 4.9 FEETDate: 7/30/81Casing: 16 IN. - 78 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 67 gpm/ft
@ 2,100 gpmWater Analysis (ppm)

TDS	<u>380</u>
Total Hardness ¹	<u>306</u>
M.O. Alkalinity ¹	<u>237</u>
Chloride Cl	<u>32</u>
Iron Fe	<u>3.95</u>
Sulfate SO ₄	<u>64</u>
Color (APHA)	<u>140</u>
Calcium ¹	<u>286</u>

Compiled by CH2M HILLDate 10/30/81¹ As CaCO₃.

DRAWING No. 4

WELL DRILLING REPORTWell: PRODUCTION WELL No. 4Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSECounty: BROWARD State: FLA.

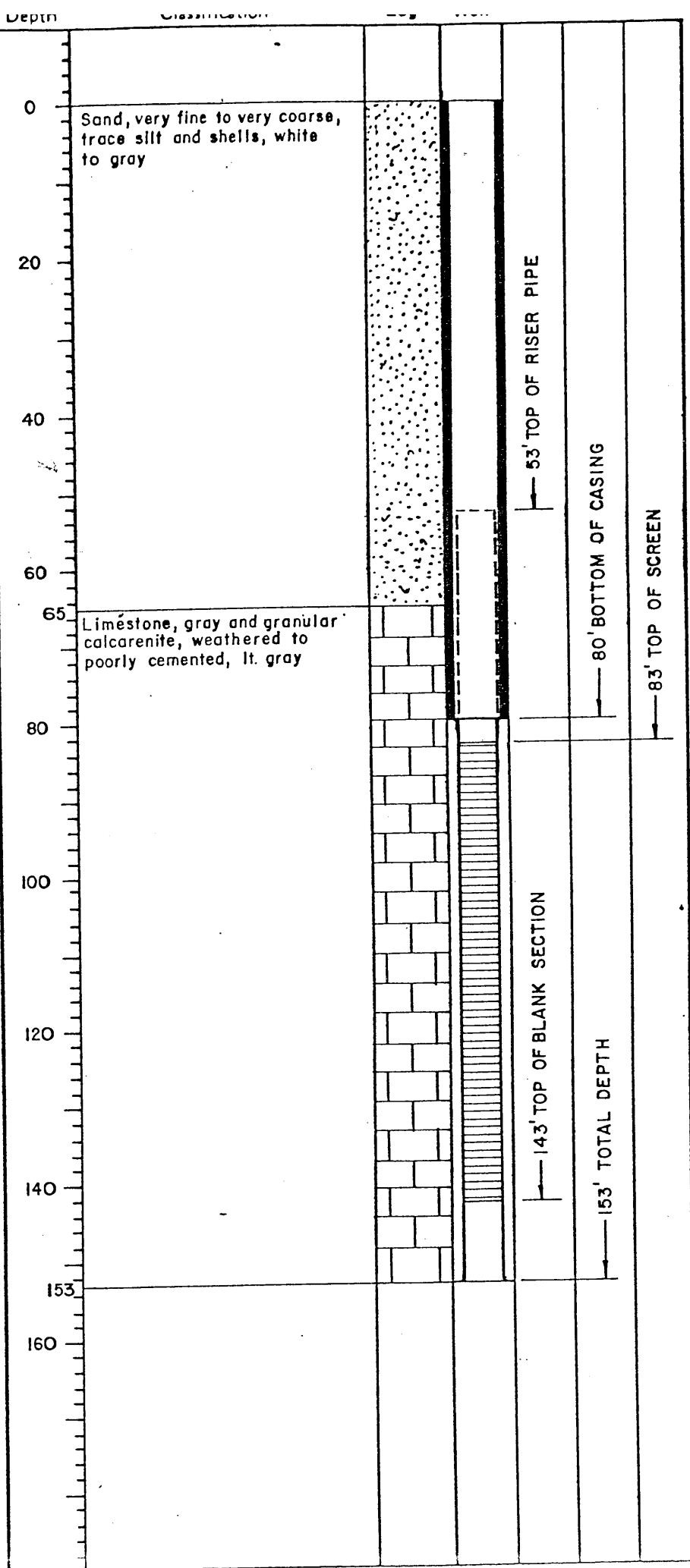
Ground Elevation: _____

Diameter: 16 INCHDepth: 154 FEETStatic Water Level: 3.3 FEETDate: 10/15/81Casing: 16 IN. - 80 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 62 gpm/ft
@ 2,300 gpmWater Analysis (ppm)

TDS	<u>419</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>219</u>
Chloride Cl	<u>53</u>
Iron Fe	<u>11.5</u>
Sulfate SO ₄	<u>82</u>
Color (APHA)	<u>200</u>
Calcium ¹	<u>308</u>

Compiled by CH2M HILLDate 10/30/81¹ As CaCO₃.

FC12327F2



WELL DRILLING REPORT

Well: PRODUCTION WELL No. 5

Location: POMPANO BEACH, FLA.
PALM-AIRE GOLF COURSE

County: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCH

Depth: 153 FEET

Static Water Level: 2.5 FEET

Date: 10/12/81

Casing: 16 IN. - 80 FT.

Screen: 10 IN.

Construction: ROTARY

Driller: YOUNGQUIST BROS., INC.

Date Finished: 10/23/81

Pumping Test

Specific Yield 60 gpm/f
 @ 1,800 gpm

Water Analysis (ppm)

TDS	<u>442</u>
Total Hardness ¹	<u>343</u>
M.O. Alkalinity ¹	<u>281</u>
Chloride Cl	<u>51</u>
Iron Fe	<u>8.7</u>
Sulfate SO ₄	<u>56</u>
Color (APHA)	<u>150</u>
Calcium ¹	<u>334</u>

Compiled by CH2M HILL

Date 10/30/81

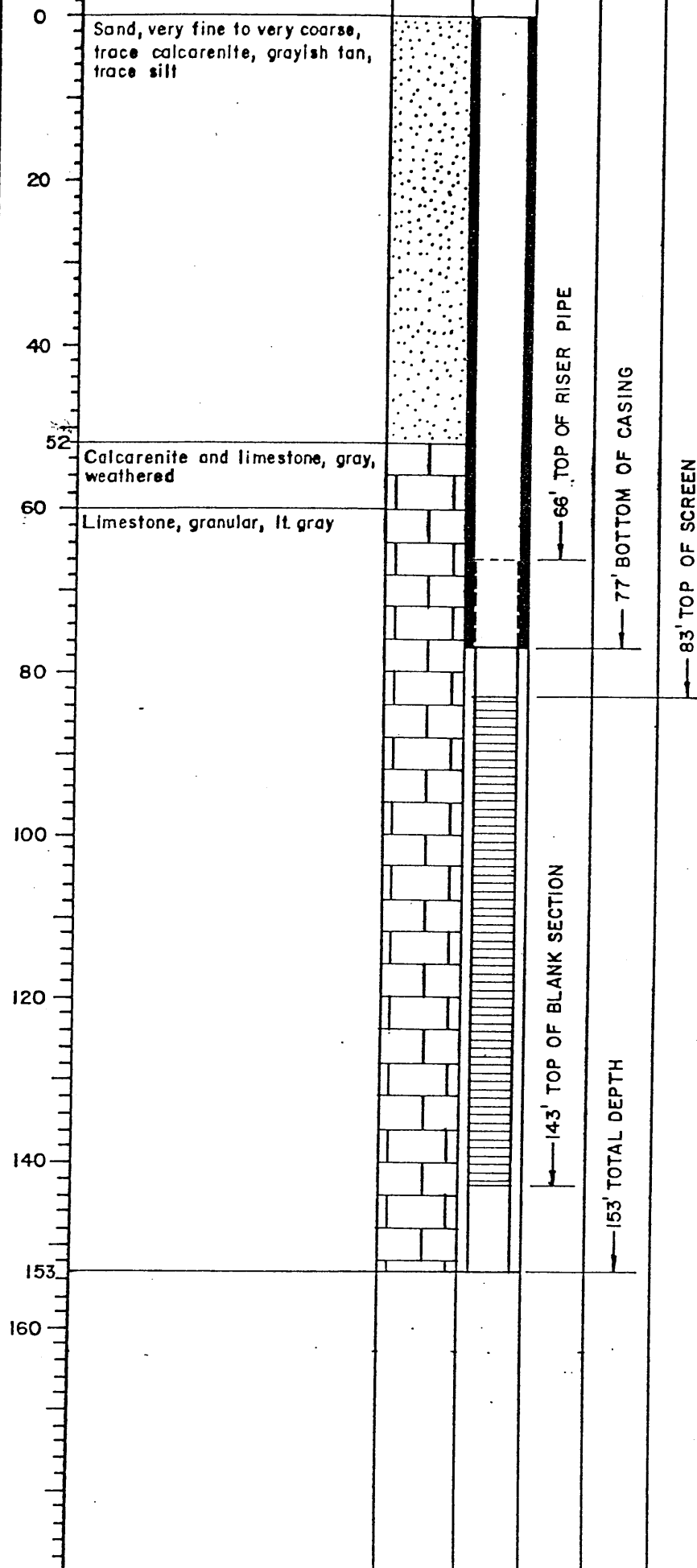
¹ As CaCO₃.

WELL DRILLING REPORTWell: PRODUCTION WELL No. 6Location: POMPANO BEACH, FLAPALM - AIRE GOLF COURSECounty: BROWARD State: FLA.

Ground Elevation: _____

Diameter: 16 INCHDepth: 153 FEETStatic Water Level: 2.9 FEETDate: 10/24/81Casing: 16 IN. - 77 FT.Screen: 10 IN.Construction: ROTARYDriller: YOUNGQUIST BROS., INC.Date Finished: 10/23/81Pumping TestSpecific Yield 76 gpm/ft
@ 2,100 gpmWater Analysis (ppm)

TDS	<u>454</u>
Total Hardness ¹	<u>316</u>
M.O. Alkalinity ¹	<u>257</u>
Chloride Cl	<u>74</u>
Iron Fe	<u>3.23</u>
Sulfate SO ₄	<u>53</u>
Color (APHA)	<u>120</u>
Calcium ¹	<u>297</u>

Compiled by CH₂M HILLDate 10/30/81¹ As CaCO₃.

City of Pompano Beach
Well Rehabilitation and Maintenance Bid Form

Items I-1 through I-6	\$0
Total for All Activities (Bid Items II thru IV)	\$0
Total Project	\$0

Bid Items I - General					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
I-1	Maintenance of Traffic Control (including permitting)	DY			\$0
I-2	Mobilization and Demobilization	LS			\$0
I-3	Drill Rig with Crew (service truck and all equipment included)	HR			\$0
I-4	Crane Truck with Crew (service truck and all equipment included)	HR			\$0
I-5	Site Restoration Allowance	AL			\$0
I-6	Individual Production Well Report Preparation Documenting Work Performed and Data	EA			\$0
SUBTOTAL					\$0.00

Bid Items II - Wellfield Maintenance: Monitoring Wells					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
II-1	Water Discharge and Disposal Setup and Removal	EA			\$0.00
II-2	Combined Static and Dynamic Down-hole View & Side View Color 360 Degree Video Survey with triplicate USB's (with Bidder's Pump: Pre- Rehabilitation video and Post-Rehabilitation video)	EA			\$0.00
II-3	Clear Debris/Obstructions from Monitoring Well	HR			\$0.00
II-4	Clean Monitoring Well Casing and Screen via Casing Scraper, Brushing and Swabbing; Cut and Remove Roots	EA			\$0.00
II-5	Monitoring Well Plugging and Abandonment (cost of cement grout not included)	EA			\$0.00
II-6	Neat Cement Grout for Well Plugging Abandonment	CF			\$0.00
II-7	Monitor Well Replacement, 4-inch Diameter Sch 40 PVC Installation -Shallow (complete)	EA			\$0.00
II-8	Monitor Well Replacement, 4-inch Diameter Sch 40 PVC Installation - Deep (complete)	EA			\$0.00
SUBTOTAL					\$0.00

Bid Items III - Wellfield Maintenance: Production Wells					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
III-1	Water Discharge and Disposal Setup and Removal	EA			\$0.00
III-2	Pump Curve Testing and Wire to Water Testing	EA			\$0.00
III-3	Remove Wellhead, Column Pipe, Pump, and Motor and Appurtenances	EA			\$0.00
III-4	Pre-Rehabilitation Specific Capacity Test and Post-Rehabilitation Specific Capacity Test	EA			\$0.00
III-5	Combined Static and Dynamic Down-hole View & Side View Color 360 Degree Video Survey with triplicate USB's (with Bidder's Pump: Pre- Rehabilitation video and Post-Rehabilitation video)	EA			\$0.00
III-6	Geophysical Logging: Includes the Cost for Each Individual Log to be Performed as Needed. Individual Logs are as follows: XYZ and GR.	EA			\$0.00
III-7	Clear Debris/Obstructions	HR			\$0.00
III-8	Well Acidization Mobilization	EA			\$0.00
III-9	Well Acidization Treatment w/ 32% HCL	EA			\$0.00
III-10	Clean Production Well Casing and Screen via Casing Scraper, Brushing and Swabbing	HR			\$0.00
III-11	Jetting to Redevelop Production Well	HR			\$0.00
III-12	Furnish and Install Additional Gravel into Well Screen Gravel Pack	CF			\$0.00
III-13	Well Plugging and Abandonment (cost of cement grout not included)	EA			\$0.00
III-14	Neat Cement Grout for Well Plugging Abandonment	CF			\$0.00
III-15	Backplugging of Production Well	CF			\$0.00

Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
III-16	Well Development and Redevelopment by Airlift with 600 to 1,000 CFM Air Compressor	HR			\$0.00
III-17	Well Development using Bidder's Pump and Flow Meter (capable of pumping a minimum of 2 times the design rate in gpm)	HR			\$0.00
III-18	Disposal of Development Solids that Need to be Containerized and Properly Disposed by Contractor	EA			\$0.00
III-19	Disposal of Development Water to Approved Location	EA			\$0.00
III-20	Sand Content Testing (by Rossum Sand Tester)	EA			\$0.00
III-21	Silt Density Index Testing (passing only, SDI <3)	EA			\$0.00
III-22	Step Drawdown Testing	EA			\$0.00
III-23	Disinfect Well/Chlorinate Well (and pump and pump assembly) per AWWA Standards	EA			\$0.00
III-24	Biological Activity Reaction Tests (BART™ Iron Related Bacteria, Slime Forming Bacteria, Sulfate Reducing Bacteria)	EA			\$0.00
III-25	Reinstall Wellhead, Column Pipe, Pump and Motor, and Appurtenances	EA			\$0.00
III-26	Bacteriological Sampling and Clearance for Health Department	EA			\$0.00
SUBTOTAL					\$0.00

Bid Items IV - Wellfield Maintenance: Additional As-Needed Work					
Item	Description	Unit	Estimated Quantity	Unit Price	Extended Price
IV-1	Furnish and Install Production Well Replacement Column Pipe	Cost Proposal			\$0.00
IV-2	Furnish and Install Production Well Stilling Well	Cost Proposal			\$0.00
IV-3	Furnish and Install Production Well New Pump, Motor, and SS Safety Cables and Accessories	Cost Proposal			\$0.00
IV-4	Disassembly, Inspection, and Reassembly of Pump in Shop	Cost Proposal			\$0.00
IV-5	Pump and Motor Maintenance in Shop	Cost Proposal			\$0.00
IV-6	Additional Well-Related Work not included above	Cost Proposal			\$0.00
SUBTOTAL					\$0.00

Bidder Name _____, Name of Firm _____

Firm's Address _____, Bidders Contact Information _____

Date: _____, Signature: _____

(The Total Bid Price is to be written in numerical figures above. In case of discrepancies or errors, the unit price shown for each bid item shall govern and the corrected Total Bid Price shall be calculated as such.)

ATTACHMENT E – REFERENCES

MUST BE COMPLETED BY ALL PROPOSERS

Company Name: _____

List the minimum number of required references as stated in the Special Conditions which show experience in similar work, to include nature and scope of work, which demonstrates an expertise in providing the services as stated herein. Provide scope of work, name of firm, contact name, E-mail, telephone number and date(s) of service.

REFERENCE 1

Name of Firm:			
Contact Person:			
Contact's Email:			
Contact's Phone:		Date(s) of Service:	
Scope of Work:			

REFERENCE 2

Name of Firm:			
Contact Person:			
Contact's Email:			
Contact's Phone:		Date(s) of Service:	
Scope of Work:			

REFERENCE 3

Name of Firm:			
Contact Person:			
Contact's Email:			
Contact's Phone:		Date(s) of Service:	
Scope of Work:			

ATTACHMENT E – REFERENCES

MUST BE COMPLETED BY ALL PROPOSERS

Company Name: _____

List the minimum number of required references as stated in the Special Conditions which show experience in similar work, to include nature and scope of work, which demonstrates an expertise in providing the services as stated herein. Provide scope of work, name of firm, contact name, E-mail, telephone number and date(s) of service.

REFERENCE 1

Name of Firm:			
Contact Person:			
Contact's Email:			
Contact's Phone:		Date(s) of Service:	
Scope of Work:			

REFERENCE 2

Name of Firm:			
Contact Person:			
Contact's Email:			
Contact's Phone:		Date(s) of Service:	
Scope of Work:			

REFERENCE 3

Name of Firm:			
Contact Person:			
Contact's Email:			
Contact's Phone:		Date(s) of Service:	
Scope of Work:			

BID BOND

BY THIS BOND, We _____,
as Principal ("PRINCIPAL") and _____, an entity duly organized
under the laws of the State of _____, as Surety ("SURETY"), are held
and firmly bound unto the City of Pompano Beach ("CITY") in the sum of five percent (5%) of
the Bid amount, for the payment of which PRINCIPAL and SURETY bind ourselves, our heirs,
executors, administrators, successors and assigns, jointly and severally, as set forth below.

WHEREAS, PRINCIPAL has submitted a bid for Bid No.
_____.

THE CONDITIONS OF THIS BOND are such that CITY accepts the bid of PRINCIPAL and
PRINCIPAL enters into a contract with CITY in accordance with the terms of such bid, and gives
such bond or bonds as may be specified in the bidding or Contract Documents with good and
sufficient surety for the faithful performance of such Contract and for the prompt payment of labor
and material furnished in the prosecution of the Contract.

THEN THIS OBLIGATION SHALL BE NULL AND VOID. However, if CITY accepts the bid
of PRINCIPAL and PRINCIPAL fails to timely satisfy the conditions set forth above, then
PRINCIPAL and SURETY, jointly and severally, shall be liable to CITY for the full sum of this
Bond which shall be forfeited to CITY as liquidated damages, not a penalty, as a result of
PRINCIPAL's failure to comply with the bid instructions and conditions, regardless of whether
CITY ultimately decides to change the Project requirements or resolicit bids.

The remedies are not to be construed as CITY exclusive remedies for PRINCIPAL's failure to
enter into a contract with CITY, but shall be deemed supplemental to all remedies available to
CITY at law or otherwise.

No right of action shall accrue on this Bond to or for the use of any person or entity other than
CITY.

THE REMAINDER OF THE PAGE IS INTENTIONALLY LEFT BLANK

Signed and sealed on _____

Bid Number _____

ATTEST:

(Name of Corporation)

Secretary

By _____
(Signature and Title)

(Print/Type Name)

(Print Name and Title Signed Above)

(Corporate Seal)

IN THE PRESENCE OF:

SURETY:

Signature

By _____
Agent and Attorney-in-Fact

(Print Name)

(Print/Type Name)

Signature

Address: _____
(Street)

(Print Name)

(City/State/Zip Code)

Telephone No.: _____



ITB25-56 Addendum 2

Well Rehabilitation and Maintenance

Issue Date: 10/9/2025

Questions Deadline: 11/7/2025 12:00 PM (ET)

Response Deadline: 12/3/2025 02:00 PM (ET)

Contact Information

Contact: Michael Lee

Address: Procurement and Contracts
1010 NE 3 Avenue
Pompano Beach, FL 33060

Phone: (954) 786-4098

Email: michael.lee@copbfl.com

Event Information

Number: ITB25-56 Addendum 2
Title: Well Rehabilitation and Maintenance
Type: Invitation To Bid
Issue Date: 10/9/2025
Question Deadline: 11/7/2025 12:00 PM (ET)
Response Deadline: 12/3/2025 02:00 PM (ET)
Notes: The City of Pompano Beach (the "City") is interested in receiving bids for Well Rehabilitation and Maintenance. The sole purpose and intent of this Invitation to Bid (ITB) is to secure firm, fixed pricing and establish a term contract for well maintenance for Water Utilities for the City of Pompano Beach.

Proposers must be registered on the City's eBid System to view the solicitation documents and respond to this solicitation. The complete solicitation document can be downloaded for free from the eBid System at <https://pompanobeachfl.ionwave.net/>. The CITY will consider the submittal of a bid as constituting an offer by the Bidder to perform the required services at the prices stated herein. The City is not responsible for the accuracy or completeness of any documentation the Bidder receives from any source other than the eBid System. The Bidder is solely responsible for downloading all required documents. Responses will be electronically unsealed in a public forum and read aloud.

Bids must be submitted electronically at <https://pompanobeachfl.ionwave.net>, referred to hereinafter as the eBid System, on or before the date here stated. Proposals received after 2:00:00 P.M. ET on the due date will not be considered, and late bids will not be accepted.

The Cone of Silence shall take effect once this solicitation is released to the General Public. Respondents to this solicitation or persons acting on their behalf may not contact, between the release of the solicitation and the end of the 72 hours following the agency posting the notice of intended award, excluding Saturdays, Sundays, and state holidays, any employee or officer of the executive or legislative branch concerning any aspect of this solicitation, except in writing to the procurement officer or as provided in the solicitation documents. Violation of this provision may be grounds for rejecting a response." [F.S. 287.057 (25)].

Any bidder or lobbyist for a bidder is prohibited from having any communications concerning any solicitation for a competitive procurement with any member of the City Commission, City Clerk, City Manager's Office, any Evaluation Committee Member, or any other City of Pompano Beach employee after Procurement and Contracts releases a solicitation to the General Public. All communications must go through the eBid System or the Purchasing Agent assigned to this solicitation in the Procurement and Contracts Department. No other member of the City Commission, City Clerk, City Manager's Office, any Evaluation Committee Member, or any other City of Pompano Beach employee should be contacted concerning this ITB. Any information that amends any portion of this ITB received by any method other than an Addendum issued to the ITB is not binding on the City of Pompano Beach.

Billing Information

Contact: City of Pompano Beach
Address: Accounts Payable
P.O. Box 1300
Pompano Beach, FL 33061

Bid Activities

Non-Mandatory - Prebidders Conference

10/21/2025 10:00:00 AM (ET)

Questions Due Date

11/7/2025 12:00:00 PM (ET)

Bid Attachments

Addendum 2 ITB25-056 Well Rehabilitation and Maintenance.pdf

[Download](#)

Addendum 2 ITB25-056 Well Rehabilitation and Maintenance

ATTACHMENT A - Scope of Work Specifications and Bidders Instructions - REVISED.pdf

[Download](#)

REVISED Scope of Work Specifications and Bidders Instructions

Attachment A2 Technical Specifications.pdf

[Download](#)

Technical Specifications

Attachment B2 Line-Item Pricing - Revised.xlsx

[Download](#)

REVISED Line-Item Pricing

Attachment B1 Maps and Well Database.pdf

[Download](#)

Maps and Well Database

Attachment E - References (4).pdf

[Download](#)

References Form

Attachment H - W9.pdf

[Download](#)

W9

Attachment I - Construction Agreement DRAFT.pdf

[Download](#)

Construction Agreement DRAFT

Exhibit B - General Conditions.pdf

[Download](#)

General Conditions of the Contract

Exhibit C - Insurance Requirements.pdf

[Download](#)

Insurance Requirements

Attachment J - Bid Bond Form.pdf

[Download](#)

Each bid requires a certified check or bid bond executed on the prescribed form, payable to the City of Pompano Beach, Florida, in an amount not less than 5 percent (5%) of the amount bid. Bidder shall upload a copy of their bid bond or a copy of the certified check to the Response Attachments tab in the eBid System. The awarded bidder will be required to submit the original executed bid bond or cashier's check prior to the execution of the contract and before the commencement of any work.

Local Business Program Forms.pdf

[Download](#)

Forms A, B, C, and D are to be completed and uploaded to the Response Attachments tab.

Requested Attachments

Attachment E - References

(Attachment required)

This form is to be completed and uploaded to the Response Attachments tab.

Attachment H - W9 Request for Taxpayer Identification Number and Certification

(Attachment required)

This form is to be completed and uploaded to the Response Attachments tab.

Attachment J - Bid Security Bond Form

(Attachment required)

Each bid requires a certified check or bid bond executed on the prescribed form, payable to the City of Pompano Beach, Florida, in an amount not less than 5 percent (5%) of the amount bid. Bidder shall upload a copy of their bid bond or a copy of the certified check to the Response Attachments tab in the eBid System. The awarded bidder will be required to submit the original executed bid bond or cashier's check prior to the execution of the contract and before the commencement of any work.

Local Business Program Forms

(Attachment required)

Local Business Program Forms (A, B, C, and D) from the attachments tab are to be completed and uploaded to this tab.

Attachment B2 Line-Item Pricing

(Attachment required)

Use this form to submit the Line-item pricing

Bid Attributes

1 Drug-Free Workplace

STATEMENT UNDER SECTION 287.087, FLORIDA STATUTES ON DRUG-FREE WORKPLACE

REQUESTED INFORMATION BELOW IS ON THE ATTRIBUTES TAB FOR THE RFP IN THE EBID SYSTEM. PROVIDE THIS INFORMATION ELECTRONICALLY.

Preference must be given to Contractors submitting certification with their bid or proposal, certifying they have a drug-free workplace in accordance with Section 287.087, Florida Statutes. This requirement affects all public entities of the State and becomes effective January 1, 1991.

Preference shall be given to businesses with drug-free workplace programs. Whenever two or more bids which are equal with respect to price, quality and service are received by the State or by any political subdivision for the procurement of commodities or contractual services, a bid received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process. Established procedures for processing tie bids will be followed if none of the tied vendors have a drug-free workplace program. In order to have a drug-free workplace program, a business shall:

- (1) Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.
- (2) Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.
- (3) Give each employee engaged in providing the commodities or contractual services that are under bid, a copy of the statement specified in subsection (1).
- (4) In the statement specified in subsection (1) notify the employees that as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace, no later than five (5) days after such conviction.
- (5) Impose a sanction on, or require the satisfactory participation in, a drug abuse assistance or rehabilitation program if such is available in the employee's community, by an employee who is so convicted.
- (6) Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that his company/firm complies with the above requirements.

By choosing YES, I hereby certify that the company/firm complies with all the above requirements

☐ Yes ☐ No

(Required: Check only one)

2 Conflict of Interest

For purposes of determining any possible conflict of interest, all bidders must disclose if any City of Pompano Beach employee is also an owner, corporate officer, or employee of their business. Indicate either "Yes" (a City employee is also associated with your business), or "No". (Note: If answer is "Yes", you must file a statement with the Supervisor of Elections, pursuant to Florida Statutes 112.313.) Indicate Yes or No below with the drop down menu.

☐ No ☐ Yes

(Required: Check only one)

3 Vendor Certification Regarding Scrutinized Companies Lists (Any Dollar Amount)

Section 215.4725, Florida Statutes, prohibits agencies from contracting (at any dollar amount) with companies on the Scrutinized Companies that Boycott Israel List, or with companies that are engaged in a boycott of Israel. As the person authorized to electronically sign on behalf of Respondent, I hereby certify by selecting the box below that the company responding to this solicitation is not listed on the Scrutinized Companies that Boycott Israel List. I also certify that the company responding to this solicitation is not participating in a boycott of Israel, and is not engaged in business operations in Syria or Cuba. I understand that pursuant to sections 287.135 and 215.4725, Florida Statutes, the submission of a false certification may subject company to civil penalties, attorney's fees, and/or costs.

☐ Certified

(Required: Check if applicable)

4 Terms & Conditions

Check the box indicating you agree to the terms and conditions of this solicitation.

☐ Agree

(Required: Check if applicable)

5 Acknowledgement of Addenda

Check this box to acknowledge that you have reviewed all addenda issued for this solicitation.

☐ Yes

(Required: Check if applicable)

6 Local Business Participation Percentage

If you have indicated local business participation on the Local Business Participation Form Exhibit A enter the percentage of the contract that will be performed by local Pompano Beach businesses.

%

(Required)

7 Extension of prices, terms and conditions to other governmental entities

If awarded the contract resulting from this bid, will your company agree to extend the same prices, terms and conditions to other governmental entities? (Note -- Optional, agreement not required for contract award.) All Purchases made by other governmental entities shall be understood to be transactions between that entity and the awarded vendor; the City of Pompano Beach shall not be a party to or be responsible for any such purchases. Indicate by selecting yes or no from the drop down menu.

☐ Yes ☐ No

(Required: Check only one)

Bid Lines

1 Package deleted as part of an Addendum

2 Package deleted as part of an Addendum

3 Package deleted as part of an Addendum

4 Package deleted as part of an Addendum

Supplier Information

Company Name:

Contact Name:

Address:

Phone:

Fax:

Email:

Supplier Notes

By submitting this Response I affirm I have received, read and agree to the all terms and conditions as set forth herein. I hereby recognize and agree that upon execution by an authorized officer of the City of Pompano Beach, this Response, together with all documents prepared by or on behalf of the City of Pompano Beach for this solicitation, and the resulting Contract shall become a binding agreement between the parties for the products and services to be provided in accordance with the terms and conditions set forth herein. I further affirm that all information and documentation contained within this response to be true and correct, and that I have the legal authority to submit this response on behalf of the named Supplier (Offeror).

Print Name

Signature

Exhibit B
General Conditions

ARTICLE 1. DEFINITIONS.

- 1.01 **The Contract Documents:** The Contract Documents consist of the Agreement Form, Addenda, Supplementary Conditions, General Conditions, Documents contained in the Project Manual, Drawings, Plans, Technical Specifications, and all modifications issued after execution of the Contract and all documents as defined in the Construction Agreement.
- 1.02 **The Owner, the Contractor, and the Project Consultant:** are those mentioned as such in the Contract Documents.
- 1.02.01 **Owner:** The City of Pompano Beach, Florida, (also referred to as the "City").
- 1.02.02 **Contractor:** The person, firm or corporation with whom a contract has been made with the Owner for the performance of the Work defined by the Contract Documents.
- 1.02.03 **Project Consultant:** The individual, partnership, corporation, association, joint venture, of properly registered professional architects, engineers or other design professionals who has entered into a contract with the Owner to provide design professional services for the Work of this Project and provide Construction Contract Administration as described in the Contract Documents.
- 1.02.04 **City Engineer:** City Engineer of the City of Pompano Beach, Florida.
- 1.03 **Final Completion:** The date subsequent to the date of Substantial Completion when the Contractor has completed all of the Work in accordance with the Contract Documents as certified by the Project Consultant and/or approved by the Owner. In addition, Final Completion shall not be deemed to have occurred until any and all governmental bodies, or boards, or entities, regulating or having jurisdiction over the Work, have inspected, approved and certified the Work.
- 1.04 **Inspector:** An employee(s) of The City of Pompano Beach, Florida, who(m) is/are assigned by the City Engineer to periodically inspect the Project during the construction process, and who assist(s) the City Engineer in reviewing field performance and its compliance with the Contract Documents.
- 1.04.01 **Resident Inspector:** An employee or subconsultant of the **Project Consultant** employed to perform either periodic or full-time specific inspection duties.
- 1.05 **Other Contractors:** Any person, firm or corporation with whom a Contract has been made by the Owner for the performance of any work on the site, which work is not a portion of the Work covered by the Contract.
- 1.06 **Owner's Representative:** The City Official who has been delegated responsibility by the City Manager to act as the City's project coordinator.
- 1.07 **Phase:** A designated subdivision of the Work, usually with its own requirements for Substantial and Final Completion, and liquidated damages. A Phase may be designated for completion by the Owner's own force, or by Other Contractors.
- 1.08 **The Project:** The total construction of the Work performed under the Contract Documents, whole or a part, that may include construction by the Owner or by separate contractors.
- 1.09 **Punch List:** A list of items of work required to render complete, satisfactory, and acceptable the construction services provided for in the Contract Documents and created pursuant to Florida Statute 218.735.
- 1.10 **Subcontractor:** A person or entity other than a materialman or laborer who enters into a Contract with Contractor for the performance of any part of Contractor's Work. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.
- 1.11 **Sub-subcontractor:** A person or entity other than a materialman or laborer who enters into a contract with a Subcontractor for the performance of any part of such Subcontractor's contract. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized

representative of the Sub-subcontractor. The term "Sub-subcontractor" does not include separate subcontractors of a separate contractor.

- 1.12 **Submittals:** Items prepared by the Contractor or those working on their behalf (subcontractors, material suppliers, and others) to show how a particular aspect of the Work is to be fabricated and installed. The Contractor's submittals include shop drawings, product data, samples, mock-ups, test results, warranties, maintenance agreements, workmanship bonds, project photographs, record documents, field measurement data, operating and maintenance manuals, reports, certifications, periodic and final "as-builts", surveys, videos and other types of information described in the specifications.
- 1.13 **Substantial Completion:** The term Substantial Completion, shall mean that point at which, as certified in writing by the Project Consultant, the Work or a designated portion, is at a level of completion in substantial compliance with the Contract Documents such that the Owner or its designee can enjoy use or occupancy and can use or operate it in all respects for its intended purpose. In the event the Work includes more than one Phase, the Owner, at its discretion, may set Substantial Completion dates for each Phase and may impose provisions for liquidated damages for each Phase.
- 1.14 **Subconsultant:** A person or organization of properly registered professional architects, engineers or other design professionals who has entered an agreement with the Project Consultant to furnish professional services in support of the Project Consultants agreement with the Owner.
- 1.15 **Superintendent:** The executive representative for the Contractor present on the work at all times during progress, authorized to receive and fulfill instructions from the Owner and the Project Consultant and capable of superintending the work efficiently.
- 1.16 **Work:** The totality of the obligations, including construction and other services, imposed on the Contractor by the Contract Documents, whether completed or partially completed, and including all labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.
- 1.17 **Written Notice:** Shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, if delivered at or sent by certified mail or other traceable delivery service to the last business address known to him who gives notice. Trackable electronic transmissions shall also be considered as written notice.

ARTICLE 2. THE WORK.

- 2.01 The Contractor shall perform all of the Work required by the Contract Documents and shall provide materials, supplies, tools, equipment, labor and services directly related to the Work, and shall perform the Work in a good and workmanlike manner with sufficient manpower to perform the Work in accordance with the time requirements set forth in the Contract Documents, and shall perform all other acts and supply all other things necessary to complete the Work in strict accordance with the Contract Documents.
- 2.02 When completed, the Work shall conform to the requirements of the Contract Documents and be completely ready for occupancy.
- 2.03 The Contractor represents and warrants to the Owner that:
 - 2.03.01 It is financially solvent and has sufficient working capital to perform the obligations under this Construction Contract;
 - 2.03.02 It is experienced and skilled in the construction of the type of project described in the Contract Document;
 - 2.03.03 It is able to provide the labor, materials, equipment and machinery necessary to complete the Work for the agreed upon price;
 - 2.03.04 It is fully licensed under all applicable laws and authorized to do business in the State of Florida in the name of the entity identified as the "Contractor" in the Construction Contract, and is legally permitted to perform all the work set forth in this Construction Contract.

- 2.03.05 It has visited the jobsite and examined its nature and location, including without limitation: the surface conditions of the site and any structure or obstruction both natural or man-made; the surface water conditions and water ways of the site and surrounding area; the subsurface conditions of the land as disclosed by soil test borings; and the location of electric and utility lines and water, sanitary, sewer and storm drain lines, as well as site ingress and egress. By submitting this bid, the Contractor acknowledges receipt and has reviewed the site geotechnical report provided for the Owner.
- 2.03.06 It will comply with all federal, state and local governmental laws, rules and regulations relating to its responsibilities as set forth in the Contract Documents.

ARTICLE 3. COORDINATION AND CORRELATION OF DRAWINGS AND SPECIFICATIONS.

- 3.01 The Contractor represents that:
 - 3.01.01 The Contractor and Subcontractors have fully examined and compared all Drawings, Specifications and other Contract Documents including but not limited to those relating to the architectural, structural, mechanical, electrical, civil engineering and plumbing elements and have compared and reviewed all general and specific details on the Drawings and the various technical and administrative requirements of the Specifications.
 - 3.01.02 All construction materials, labor, methods, means, techniques, sequences and procedures required to carry out the Work, all safety precautions and programs required in connection with carrying out the Work, all conflicts, discrepancies, errors and omissions that Contractor is aware of as a result of the examination and comparison of the Contract Documents have been either corrected or clarified to the satisfaction of the Contractor prior to execution of this Construction Contract.
 - 3.01.03 The Contract Sum is reasonable compensation and represents the total lump sum cost for the Work and that all systems and Work shall be functional and in accordance with the requirements of the Contract Documents.
 - 3.01.04 The Contract Time is adequate for the performance of the Work.
- 3.02 The Contractor is responsible for all means, methods, techniques and sequencing of construction.
- 3.03 If, after execution of this Construction Contract, the Contractor detects a conflict, discrepancy, error or omission in the Contract Documents then it shall immediately notify Project Consultant and Owner prior to proceeding with the specific portion of the Work.

ARTICLE 4. INTENT AND INTERPRETATION.

- 4.01 With the respect to the intent and interpretation of this Contract, the Owner and the Contractor agree as follows:
 - 4.01.01 The Contractor shall have a continuing duty to read, examine, review, compare and contrast each of the documents which make up this Contract and shall immediately give written notice to the Owner and the Project Consultant of any conflict, ambiguity, error or omission which the Contractor may find with respect to these documents before proceeding with the affected Work.
 - 4.01.02 The Contract Documents are complementary, and what is called for by one shall be as binding as if called for by all.
 - 4.01.03 The intent of the Contract Documents is to include all labor, materials, equipment services and transportation necessary for the proper execution of the Work. The Contractor shall continually refer to drawing, specifications and other Contract Documents in this regard.
 - 4.01.04 In the event of a conflict among the Contract Documents, the most stringent requirement to the Contractor shall control.
- 4.02 The Project Consultant shall be the initial interpreter of the requirements of the Contract Documents and the judge of the performance of any work pursuant to the Contract Documents.

- 4.02.01 The Project Consultant shall render interpretations necessary for the proper execution or progress of the Work with reasonable promptness on written request of either the Owner or the Contractor, and shall render written decisions, within a reasonable time, on all claims, disputes, change order requests, substitution requests, requests for interpretation and other matters in question between the Owner and the Contractor relating to the execution or progress of the Work or the interpretation of the Contract Documents.
- 4.02.02 Interpretations and decisions of the Project Consultant shall be consistent with the intent of and reasonably inferable from the Contract Documents.
- 4.02.03 In the capacity of interpreter the Project Consultant shall endeavor to secure faithful performance by both the Owner and the Contractor, and shall not show partiality to either.

ARTICLE 5. OWNERSHIP OF THE CONTRACT DOCUMENTS WHICH MAKE UP THE CONTRACT

- 5.01 Subject to any rights the Project Consultant may have, the Contract Documents, as well as any other documents, intellectual property, software, computer-assisted material or disks relating to or regarding the Work, shall be and remain the property of the Owner. This shall be the case even if prepared, created or provided by the Project Consultant, Contractor, Subcontractor or any other party.
- 5.02 The Contractor shall have the right to keep copies of contract documents upon completion of the Work; provided, however, that in no event shall the Contractor use, or permit to be used, any portion or all contract documents on other projects without the Owner's prior written authorization.
- 5.03 The Contractor agrees to provide any and all items referred to in this Paragraph to Owner upon demand by Owner. In the event Contractor fails to provide these items to Owner as demanded, Contractor acknowledges that the Owner will need these items, and will be irreparably harmed and be subject to an injunction to provide these items.

ARTICLE 6. TEMPORARY UTILITIES.

- 6.01 Water for Execution of the Work: The Contractor shall provide temporary water lines sufficient to supply all water needed for the construction and other services required by the Contract Documents and shall pay for all service connections and water used by the Contractor or Subcontractors unless the contrary is provided for elsewhere in the Contract Documents.
- 6.02 Electrical Energy: The Contractor shall provide temporary electrical energy and power lines sufficient to supply all electricity needed for the construction and other services required by the Contract Documents and shall pay for all service connections and electricity used by the Contractor or Subcontractors unless the contrary is provided for elsewhere in the Contract Documents.
- 6.03 Temporary Sanitary Facilities and Sewers:
 - 6.03.01 The Contractor shall provide and maintain in a neat and sanitary condition such accommodations and facilities for the use of his employees as may be necessary to comply with the regulations of any governmental agencies, departments, etc. which address or govern these issues.
 - 6.03.02 No nuisance will be permitted.
 - 6.03.03 Upon completion of Work, such facilities shall be removed and the premises left in a sanitary condition.
 - 6.03.04 Contractor is not permitted to use restrooms or other sanitary facilities within the Owner's existing building or on-site facilities unless the contrary is provided for elsewhere in the Contract Documents.

ARTICLE 7. PROGRESS.

- 7.01 Contractor shall provide the Owner with full information in advance as to its plans for performing each part of the Work. This shall include, but not be limited to, schedules provided to the Owner as Post-Award Information and subsequently updated schedules submitted to the Owner on a monthly basis as required, as a condition precedent to payment(s).
 - 7.01.01 Such schedule shall be in a form acceptable to the Owner.

- 7.01.02 The Contractor's schedule shall be updated no less frequently than monthly (unless the parties otherwise agree in writing) and shall be updated to reflect conditions encountered from time to time and shall apply to the total Project.
- 7.01.03 Each such revision shall be provided to the Owner and the Project Consultant.
- 7.01.04 Compliance with the requirements of this Subparagraph shall be a condition precedent to payment to the Contractor, and failure by the Contractor to comply with such requirements shall constitute a material breach of this Contract.
- 7.01.05 By providing these Schedules to Owner, Owner does not in any way acknowledge or consent that the Schedules are acceptable or reasonable, but it is simply reviewing same for its own informational purposes.
- 7.02 If at any time during the progress of Work, the Contractor's actual progress is inadequate to meet the requirements of the Contract Documents, such as the required completion dates, the Owner may direct Contractor to take such steps as may be necessary to improve its progress to complete the Work on or before the required Substantial Completion Date.
 - 7.02.01 If within a reasonable period, as determined by Owner, the Contractor does not improve performance to meet the requirements of the Contract Documents, such as the required completion dates, then the Owner may require an increase in any or all of the following: Contractor's Subcontractor crews and Contractor's own labor force, the number of shifts, overtime operation, Contractor's supervision and additional days of work per week, all without cost to Owner.
 - 7.02.02 Neither notice by Owner nor Owner's failure to issue such notice shall relieve Contractor of its obligation to achieve the quality of work and rate of progress required by the Contract Documents.
- 7.03 Failure of Contractor to comply with the instructions of the Owner may be grounds for determination by Owner that Contractor is not prosecuting its Work with such diligence as will assure completion within the time specified.
- 7.04 On such determination, Owner, in addition to any and all other rights set forth in the Contract Documents and remedies afforded Owner under the Contract Documents or at law, may:
 - 7.04.01 Elect to proceed with the Work with its own employees, agents, contractors, subcontractors, suppliers and assess all costs, expenses or fees for such work against Contractors; and/or
 - 7.04.02 Terminate for cause Contractor's right to proceed with the performance pursuant to the Contract Documents, or any separable part, in accordance with the applicable provisions of the Contract Documents.

ARTICLE 8. EXPEDITING

- 8.01 The Work, equipment and material provided under this Contract may be subject to expediting by Owner.
- 8.02 Owner shall be allowed reasonable access to the shops, factories and other places of business of the Contractor or Subcontractors for expediting purposes.
- 8.03 As required by Owner, Contractor shall supply schedules and progress reports for Owner's use in expediting, and Contractor shall cooperate with Owner and require Subcontractors to cooperate with Owner in such expediting.
- 8.04 Any expediting performance by Owner shall not relieve Contractor of its sole and primary responsibility for timeliness of delivery of the equipment and material to be provided under the Contract Document.

ARTICLE 9. COMPLETION

- 9.01 When the Contractor considers that the Work which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Project Consultant a comprehensive Punch List of items to be completed or corrected prior to final payment. Failure to include an item on the Punch List does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

- 9.01.01 For a Project with an estimated cost of less than \$10 million, the Punch List shall be completed within thirty (30) calendar days after Substantial Completion of the Project, as defined in the Contract Documents. If Substantial Completion is not defined in the Contract Documents, the list shall be completed upon reaching beneficial occupancy or use.
- 9.01.02 For a Project with an estimated cost of \$10 million or more, the Punch List shall be completed within thirty (30) calendar days, unless otherwise extended elsewhere in the Contract Documents, but not to exceed sixty (60) calendar days, after reaching Substantial Completion, as defined in the Contract Documents. If Substantial Completion is not defined in the Contract Documents, the list shall be completed upon reaching beneficial occupancy or use.
- 9.02 For a Project involving the construction of more than one building or structure, or involving a multi-phased project, a Punch List shall be created for each building, structure, or phase of the Project pursuant to the limitations provided for above in 9.01.01 and 9.01.02, as applicable.
- 9.03 The failure to include any corrective work or pending items not yet completed on the List does not alter the responsibility of the Contractor to complete all the construction services purchased pursuant to the contract. All items that require correction under the Contract Documents and that are identified after the preparation and delivery of the Punch List remain the obligation of the Contractor as defined by the Contract Documents.
- 9.04 Upon completion of all of the items on the Punch List, the Contractor may submit a payment request for all remaining retainage withheld by the local governmental entity pursuant to this section. If a good faith dispute exists as to whether one or more items identified on the list have been completed pursuant to the Contract Documents, the Owner may continue to withhold an amount not to exceed 150 percent of the total costs to complete the outstanding item.
- 9.05 In the event that the Contractor fails, in whole or in part, to comply with the obligations and responsibilities required in Paragraph 9.01, the Owner is not obligated to pay or process any payment request for the remaining retainage.

ARTICLE 10. CONTRACT PAYMENTS

- 10.01 Schedule of Values:
- 10.01.01 The Contractor shall maintain and update the Schedule of Values originally provided to the Owner as Post-Award Information.
- 10.01.02 The Contractor's Schedule of Values apportions the Contract Price among the different elements of the required Work for purposes of periodic and final payments and shall be submitted as detail in support of the Contractor's monthly Application for Payment.
- 10.01.03 The Schedule of values shall be presented with such detail, and supported with whatever information the Project Consultant or the Owner reasonably requests.
- 10.01.04 The Contractor shall not imbalance its Schedule of Values nor artificially inflate or exaggerate any element. Contractor's failure to comply with this provision shall be grounds for Owner to terminate Contractor, as provided for elsewhere in the Contract Documents.
- 10.02 The Owner shall pay the Contract Price to the Contractor in accordance with the procedures provided in the Contract Documents.
- 10.02.01 On or before the **15th** day of each month after commencement of performance, but no more frequently than once monthly, the Contractor may submit an Application for Payment to the Owner for the period ending the last day of the previous month or other pay period as mutually defined and agreed to by the Contractor and Owner and as provided for in the Contract Documents. The Contractor shall also deliver a copy of the Application for Payment to the Project Consultant.
- 10.02.02 Application for Payment shall be in the format required elsewhere in the Contract Documents and include whatever supporting information as may be required by the Project Consultant, the Owner, or both.
- 10.02.03 The Owner shall not be required to pay for stored materials or equipment except as set forth in Article 25 below.

10.02.04 Each Application for Payment shall be signed by the Contractor and shall constitute the Contractor's representation that the quantity of work has reached the level for which payment is requested, that the Work has been properly installed or performed in substantial compliance with the requirements of the Contract Documents, and that the Contractor knows of no reason why payment should not be made as requested.

10.02.05 Upon receipt of the Application for Payment, the Project Consultant shall:

- a. Within ten (10) days, review the Application for Payment and may also review the Work at the Project site or elsewhere to determine whether the quantity and quality of the Work is as represented in the Application for Payment and is as required by the Contract Documents.
- b. Approve in writing the amount which, in the opinion of the Project Consultant, is properly owing to the Contractor.

10.02.06 The Owner shall make payment to the Contractor within fifteen (15) days following the Project Consultant's written approval of the Application for Payment but in no event later than twenty-five (25) days after the invoice was received by the Owner.

10.02.07 The Owner may reject the Application for Payment within twenty (20) business days after the date on which the Application for Payment is stamped as received. The rejection shall be in writing and shall specify the deficiency in the payment request or invoice and the action necessary to make the payment request or invoice proper.

10.02.08 If the Owner disputes a portion of an Application for Payment, the undisputed portion must be timely paid.

10.02.09 The Contractor may submit a corrected Application for Payment which corrects the deficiency or deficiencies specified in writing by the Owner. The Owner shall either pay or reject the corrected Application for Payment within ten (10) business days after receipt of same.

10.02.10 If a dispute regarding the Application for Payment cannot be resolved pursuant to the process outlined in the Contract Documents, it must be resolved in accordance with the dispute resolution procedures outlined in Article 45.

10.02.11 The amount of each monthly payment shall be the amount approved for payment by the Project Consultant less such amounts, if any, otherwise owing by the Contractor to the Owner or which the Owner shall have the right to withhold as authorized by the Contract Documents or reasonable business practices. In the event of a dispute with regard to a portion of the Application for Payment, the Owner shall pay the undisputed portion pursuant to the timeline established in this Section.

10.02.12 The Project Consultant's approval of the Contractor's Applications for Payment shall not preclude the Owner from the exercise of any of its rights as set forth in the Contract Documents.

10.02.13 The submission by the Contractor of an Application for Payment also constitutes an affirmative representation and warranty that all Work for which the Owner has previously paid is free and clear of any lien, claim, or other encumbrance by any person whatsoever.

10.02.14 As a condition precedent to payment, the Contractor shall, as required elsewhere in the Contract Documents and as required by the Owner, also provide to the Owner documents relating to the Project, including but not limited to, updated schedules and daily logs, properly executed documents that all subcontractors, materialmen, suppliers or others having rights, acknowledge receipt of all sums due pursuant to all prior Payment Requests and waive and relinquish any rights or other claims of any nature relating to the Project.

10.02.15 Furthermore, the Contractor warrants and represent that, upon payment of the Application for Payment submitted, title to all work included in such payment shall be vested in the Owner.

10.03 When payment is received from the Owner, the Contractor shall within five (5) days pay all subcontractors, materialmen, laborers and suppliers the amounts they are due for all work covered by such payment. In the event such payments are not made in a timely manner the Owner may, in its discretion, invoke reasonable procedures in order to protect Owner's interest or Owner's desire to assist in having subcontractors, laborers, suppliers, materialmen or others paid.

- 10.04 It is mutually agreed that payments made under this Contract shall not constitute acceptance of defective or improper materials or workmanship nor shall same act as a waiver or release of future performance in accordance with the Contract Documents.

ARTICLE 11. WITHHOLDING PAYMENT TO CONTRACTOR

- 11.01 The Owner may withhold as retainage five (5) percent of the payment owed to the Contractor until completion of the Project.
- 11.02 If the City pays the retainage amount upon the Contractor's request which is attributable to the labor, services, or materials supplied by one or more contractors or suppliers, the Contractor shall timely remit payment of such retainage to those subcontractors or suppliers.
- 11.03 Regardless of the provisions in this Article, in no event shall the Owner be required to pay or release any amounts that are the subject of a good faith dispute, a claim brought pursuant to Fla. Stat. § 255.05, or otherwise the subject of a claim or demand by the Owner.
- 11.04 In addition to the Retainage, payments, including but not limited to Final Payment, may be withheld or reduced by the Owner in its sole discretion if any of the following exists:
- 11.04.01 The Work is not proceeding in accordance with the Construction Documents Schedule as anticipated by the Project Consultant or the Owner. In that event, the Project Consultant or the Owner will assess the anticipated delay and the Owner will use the amounts specified for Liquidated Damages as the basis for amounts withheld. Such funds shall be held until such time as the Project Consultant or Owner determine that the Work is back on schedule. By making such funds available to Contractor, Owner does not waive its right to assess liquidated damages at the completion of the Project;
 - 11.04.02 Liquidated Damages as set forth in this Contract;
 - 11.04.03 Defective Work unremedied;
 - 11.04.04 Punch-List items unremedied;
 - 11.04.05 Subject to Owner's written notice to Contractor in accordance with the Contract Documents back charge items for work performed by Owner or another contractor at the request of Owner, which work is within the scope of the Work under this Construction Contract;
 - 11.04.06 Claims filed by subcontractors, laborers, suppliers, materialmen or others;
 - 11.04.07 Failure to comply with any and all insurance requirements;
 - 11.04.08 Failure of the Contractor to make payment properly to Subcontractors or others;
 - 11.04.09 Damage to the Owner or another contractor;
 - 11.04.10 Reasonable evidence that the Work will not be completed on or before the Substantial Completion or Final Completion Date;
 - 11.04.11 Failure of the Contractor to carry out any of its obligations in accordance with the Contract Documents;
 - 11.04.12 Failure of the Contractor to submit the information or documents required by this Contract or reasonably required by Owner, including but not limited to schedules and daily logs.

ARTICLE 12. CONTRACTOR'S RIGHT UPON NONPAYMENT.

- 12.01 If within thirty (30) days of the date payment to the Contractor is due, the Owner, without cause or basis, fails to pay the Contractor any amounts then due and payable to the Contractor, the Contractor shall have the right to cease work until receipt of proper payment after first providing ten (10) days written notice of its intent to cease work to the Owner.

ARTICLE 13. INFORMATION AND MATERIAL SUPPLIED BY THE OWNER.

- 13.01 The Owner shall furnish to the Contractor, prior to the execution of the Contract, any and all written and tangible material, including but not limited to surveys and other information concerning existing conditions on the Site.
- 13.02 The Owner shall also furnish, if appropriate, the legal description of the Project site, and any required survey.

ARTICLE 14. LICENSES AND PERMITS.

- 14.01 All licenses and permits necessary to commence and prosecute the Work to completion shall be procured and paid for by the Contractor, unless expressly provided for elsewhere in the Contract Documents.
- 14.02 All easements and rights-of-way will be procured and paid for by the Owner unless otherwise specifically provided within the Contract Documents.

ARTICLE 15. CEASE AND DESIST ORDER.

- 15.01 In the event the Contractor fails or refuses to perform the Work as required under the Contract Documents, the Owner may instruct the Contractor to cease and desist from performing the Work in whole or in part. Upon receipt of such instruction, the Contractor shall immediately cease and desist as instructed by the Owner and shall not proceed further until the cause for the Owner's instructions has been corrected and the Owner instructs that the Work may resume.
- 15.02 In the event the Owner issues such instruction to cease and desist, and in the further event the Contractor fails and refuses within seven (7) days of receipt of such instructions to provide adequate assurance to the Owner that the cause of such instructions will be eliminated or corrected, then the Owner shall have the right, but not the obligation, to carry out the Work with its own forces, or with the forces of another contractor, and the Contractor shall be fully responsible and liable for the costs of performing such work by the Owner.
- 15.03 The rights set forth in the Contract Documents are in addition to, and without prejudice to, any other rights or remedies the Owner may have against the Contractor.

ARTICLE 16. DUTIES, OBLIGATIONS AND RESPONSIBILITIES OF THE CONTRACTOR.

- 16.01 The Contractor shall perform the Work in accordance with the Contract Documents.
- 16.02 The Contractor shall supervise the Work and bear full responsibility for any and all acts or omissions of those engaged in the Work on behalf of the Contractor.
- 16.03 The Contractor warrants that all labor provided under this Contract shall be competent to perform the tasks undertaken, that the product of such labor shall yield only first-class results, that all material and equipment provided shall be new and of high quality, that the Work will be complete, of high quality, without defects, and in compliance with the requirements of the Contract Documents. Any Work not complying with the requirements of this Subparagraph shall constitute a breach of the Contractor's warranty.
- 16.04 Unless expressly provided for elsewhere in the Contract Documents, the Contractor shall obtain and pay for all required permits, fees, and licenses and shall comply with all legal requirements applicable to the Work.
- 16.05 The Contractor shall prepare and submit schedules and supporting documentation as required elsewhere in the Contract Documents.
- 16.06 Record Keeping on Site:
 - 16.06.01 The Contractor shall keep a daily log, an updated copy of the Contract Documents, approved shop drawings and other submittals, and other documents and materials as required by the Contract Documents at the site.
 - 16.06.02 All of these items shall be available to the Owner and the Project Consultant at all regular business hours.

16.06.03 Upon final completion of the Work, all of these items shall be finally updated and provided to the Owner and shall become the property of the Owner.

16.07 Shop Drawings and Other Submittals:

16.07.01 The Contractor shall submit for approval with reasonable promptness and in a timely manner so as to cause no delay in the Work, various submittals including shop drawings as required for the Work of the various trades.

16.07.02 These shop drawings and other submittals shall be in accordance with the requirements of the Contract Documents and shall be carefully checked in every respect and signed by the Contractor before submitting same to the Project Consultant.

16.07.03 Shop drawings and other submittals from the Contractor are not part of the Contract Documents but are documents prepared and utilized by the Contractor to coordinate the Work.

16.07.04 The Contractor shall not do any Work requiring shop drawings or other submittals unless such have been approved in writing by the Project Consultant.

16.07.05 All Work requiring approved shop drawings or other submittal shall be done in compliance with such approved documents. However, approval by the Project Consultant or the Owner shall not be evidence that Work installed conforms with the requirements of the Contract Documents.

16.07.06 The Owner and the Project Consultant shall have no duty to review partial or incomplete submittals except as may be provided otherwise within the Contract Documents.

16.07.07 The Contractor shall maintain a submittal log which shall include, at a minimum, the date of each submittal, the date of any resubmittal, the date of any approval or rejection, and the reason for any approval or rejection.

16.07.08 The Contractor shall have the duty to carefully review, inspect and examine any and all submittal and resubmittals before submission of same to Owner or the Project Consultant.

16.08 The Contractor shall maintain the Project site in a reasonably clean condition during performance of the Work. Upon final completion, the Contractor shall thoroughly clean the Project site of debris, trash and excess materials or equipment. In the event the Project is located at or near occupied facilities, then Owner may establish additional rules and regulations regarding condition at the Project, including but not limited to, keeping the Project and the occupied premises clean, safe and secure.

16.09 At all times, the Contractor shall permit the Owner and the Project Consultant to enter upon the Project site and to review or inspect the Work.

ARTICLE 17. SUBCONTRACTS.

17.01 The Contract Documents make no attempt to fix the scope of the Work of any Subcontractor nor the responsibilities of any such Subcontractor, it being understood that the Contractor shall fix the scope of all Work and responsibilities of the Subcontractor. Contractor shall not replace Subcontractor without good cause.

17.02 The Contractor shall continuously update information concerning Subcontractors submitted to the Owner as Post-Award Information by submitting:

17.02.01 The general form of Subcontract Agreement used by the Contractor within thirty (30) days of execution of the Construction Contract.

17.02.02 Updated listings of Subcontractors denoting changes to the list submitted as Post-Award Information within ten (10) days of such change.

17.02.03 Copies of executed Subcontractor Contracts within ten (10) days of their execution.

17.02.04 A complete accounting of all payments made to Subcontractors and the balances owed to the Subcontractors with each Application for Payment submitted by the Contractor.

- 17.03 All contracts with Subcontractors shall incorporate by reference the terms and conditions of this Construction Contract.
- 17.04 The Contractor shall cause and require to be included in all Subcontracts a provision for the benefit of the Owner binding the Subcontractors to remain bound by the Subcontracts in the event the Contractor is replaced by another contractor pursuant to the terms of the Contract Documents. The Contractor shall also include in all Subcontracts a provision requiring the Subcontractor, in the event of the Contractor's termination, to consent to the assignment of their Subcontracts to the Owner.
- 17.05 The Owner may at any time request from the Subcontractors, or any of them, a sworn statement of account with the Contractor and the Contractor shall cause to be included in all Subcontracts a requirement that the Subcontractors provide sworn statement upon Owner's request.
- 17.06 Each Subcontractor and supplier must agree to assign all of its warranties to Owner. In addition, each Subcontractor and supplier must warrant all of its Work, equipment, materials and labor to Owner in accordance with the terms and provisions of its contractual obligations to Contractor and any legal or statutory provisions that apply to its work, materials or equipment.
- 17.07 Owner may at its discretion require Contractor to have major sub-subcontractors or suppliers comply with the requirements of this Article or other provisions of the Contract Documents.

ARTICLE 18. CONTRACTOR'S SUPERINTENDENT

- 18.01 Before starting the Work, Contractor shall designate an English speaking, competent, authorized representative (Superintendent), acceptable to the Owner, to represent and act for the Contractor. The Contractor shall:
- 18.01.01 Inform Owner, in writing, of the name and address of such representative together with a clear definition of the scope of his authority to represent and act for Contractor and shall specify any and all limitation on such authority.
- 18.01.02 Keep the Owner informed of any subsequent changes.
- 18.02 The Superintendent shall be present (or be temporarily represented by a person familiar with the project work activities and schedule) at the site of the Work at all times when the Work is actually in progress.
- 18.04 All notices, determinations, instructions and other communications given to the Contractor's Superintendent shall be binding upon the Contractor.
- 18.05 The Superintendent shall maintain a daily log/report which shall include at least the following information: weather conditions; trades at site; manpower totals by trade; heavy equipment in use; activities in progress; and inspections at site. Copies of the daily entries shall be provided to the Owner once per month, or as required elsewhere in the Contract Documents.

ARTICLE 19. COOPERATION WITH OTHERS.

- 19.01 The Owner and other contractors and subcontractors may be working at the site during the performance of the Construction Contract, and Contractor's work may be interfered with as a result of such concurrent activities. Contractor shall fully cooperate with Owner and other contractors to avoid any delay or hindrance of the Work. Owner may require that certain facilities be used concurrently by Contractor and other parties and Contractor shall comply with such requirements.
- 19.02 If any part of the Contractor's work depends on proper execution or results from any work performed by the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Owner any apparent discrepancies or defects in such work that render it unsuitable for such proper execution and results. Failure of the Contractor to so report shall constitute an acceptance of the Owner or separate contractor's work as fit and proper to receive Contractor's Work, except as to defects which may subsequently become apparent in such work performed by others.

ARTICLE 20. SITE CONDITIONS.

- 20.01 Contractor shall have the sole responsibility to conduct reasonable inspection of the site and to satisfy itself concerning the nature and location of the Work and the general and local conditions, and particularly, but without limitation, with respect to the following: those affecting transportation, access, disposal, handling and storage of material; availability and quality of

labor, water and electric power; availability and condition of roads; climatic conditions; location of underground utilities as depicted in the Contract Documents; governmental processes and requirements for obtaining permits other than issuance of the original building permits, certificates of occupancy and other regulatory/utility approvals; physical conditions at the work sites and the Project area as a whole; topography and ground surface conditions; subsurface geology, and nature and quality of surface and subsurface materials to be encountered; equipment and facilities needed preliminary to and during performance of the Construction Contract; and all other matter which can in any way affect performance of the Construction Contract, or the cost associated with such performance.

- 20.02 The failure of Contractor to acquaint itself with any applicable condition will not relieve it from the responsibility for properly estimating either the duration, difficulties, or the costs of successfully performing the Work.
- 20.03 Contractor may reasonably rely upon site documentation provided by the Owner. In the event that during the course of the Work Contractor encounters an underground utility facility that was not shown on the Contract Documents; or subsurface or concealed conditions at the Project site which differ materially from those shown on the Contract Documents and from those ordinarily encountered and generally recognized as inherent in work of the character called for in the Contract Documents; or unknown physical conditions of the Project site, of an unusual nature, which differ materially from that ordinarily encountered and generally recognized as inherent in work of the character called for in the Contract Documents, Contractor, without disturbing the conditions and before performing any work affected by such conditions, shall, within forty-eight (48) hours of their discovery, notify Owner and Project Consultant in writing of the existence of the conditions. Project Consultant and Owner shall, within two (2) business days after receipt of Contractor's written notice, investigate the site conditions identified by Contractor. If, in the sole opinion of Project Consultant, the conditions do materially differ and cause an increase or decrease in Contractor's cost of, or the time required for, the performance of any part of the Work, whether or not changed as a result of the conditions, Project Consultant shall recommend an equitable adjustment to the Contract Price, or the Contract Time, or both. If Owner and Contractor cannot agree on an adjustment in the Contract price or the Contract time, the adjustment shall be referred to Project Consultant for determination. Should Project Consultant determine that the conditions of the Project site are not so materially different to justify a change in the terms of the Contract, Project Consultant shall so notify Owner and Contractor in writing, stating the reasons, and such determination shall be final and binding upon the parties. No request by Contractor for an equitable adjustment to the Contract under this provision shall be allowed unless Contractor has given written notice in strict accordance with the provisions of this Article. No request for an equitable adjustment or change to the Contract Price or Contract Time for differing site conditions shall be allowed if made after the date certified by Project Consultant as the date of substantial completion.

ARTICLE 21. RESPONSIBILITY FOR WORK SECURITY.

- 21.01 Contractor shall at all times conduct, at its expense, all operations under the Construction Contract in a manner to avoid the risk of loss, theft or damage by vandalism, sabotage or other means to any property.
- 21.01.01 Contractor shall promptly take such reasonable precautions as are necessary and adequate against any conditions which involve risk of a loss, theft or damage to its property.
- 21.01.02 Contractor shall continuously inspect all of its Work, materials, equipment and facilities to discover and determine any such conditions and shall be solely responsible for discovery, determination and correction of any such condition.
- 21.02 Contractor shall comply with all applicable laws and regulations.
- 21.02.01 Contractor shall cooperate with Owner on all security matters as set forth elsewhere in the Contract Documents and shall promptly comply with any project security requirements established by Owner.
- 21.02.02 These security requirements may be more stringent in the event portions of the facilities or project are occupied or otherwise being used.
- 21.02.03 Such compliance with these security requirements shall not relieve Contractor of its responsibility for maintaining property security for the above noted items, nor shall it be constructed as limiting in any manner Contractor's obligation to undertake reasonable action as required to establish and maintain secure conditions at the site.
- 21.03 Contractor shall prepare and maintain accurate reports of incidents of loss, theft or vandalism and shall provide these reports to Owner in a timely manner.

ARTICLE 22. PROTECTION OF WORK IN PROGRESS, MATERIALS AND EQUIPMENT.

- 22.01 Contractor shall be responsible for and shall bear any and all risks of loss or damage to Work in progress, all materials delivered to the site, and all materials and equipment involved in the Work until completion and final acceptance of the Work under this Contract.
- 22.02 Permanent openings for the introduction of work and materials to the structure and construction site shall be protected so that upon completion, the Work will be delivered to the Owner in proper, whole and unblemished condition.

ARTICLE 23. ADMINISTRATION OF THE CONTRACT.

- 23.01 The Project Consultant will provide administration of the Contract.
 - 23.01.01 For those projects that the City Engineer serves as the Project Consultant, all references to the Project Consultant shall be considered to be the City Engineer.
 - 23.01.02 In the event the Owner should find it necessary to replace the Project Consultant, the Owner shall retain a replacement and the role of the replacement shall be the same as the role of the original Project Consultant.
- 23.02 Unless otherwise directed by the Owner in writing, the Project Consultant will perform those duties and discharge those responsibilities allocated to the Project Consultant by the Owner.
- 23.03 Neither the Project Consultant nor the Owner will be responsible for construction means, methods, techniques, sequences or procedures, safety precautions and programs in connection with the Work or for the acts of omission or commission of the Contractor, its Subcontractors or their agents or employees.
- 23.04 The Project Consultant and Owner will each have the authority to reject Work which does not conform to the Contract Documents and to require special inspection or testing with prior approval by the Owner. Neither the Project Consultant's nor the Owner's authority to act under this Paragraph, nor any decision made by them in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Project Consultant or the Owner to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.
- 23.05 The Contractor shall forward all communications to the Project Consultant, with simultaneous copies to the Owner.
- 23.06 The Project Consultant will review and certify the Contractor's Application for Payments which the Owner must subsequently approve prior to Payment of the Contractor.
- 23.07 The Project Consultant shall approve shop drawings for design only, the Contractor being responsible for all dimensions, quantities, etc., necessary to complete the Work in compliance with the Drawings and Specifications and other Contract Documents.
- 23.08 The duties, responsibilities and limitations of authority of the Project Consultant and the Owner will not be modified nor extended without written consent of the Contractor, the Project Consultant, and the Owner.
- 23.09 Notwithstanding anything to the Contrary in these General Conditions or any other "Contract Document" as that term is defined in the Agreement between the City of Pompano Beach, Florida and the Project Consultant, it is not the intention nor shall any of the provisions of those documents act as a release, limitation or discharge of the obligations or responsibilities of the Project Consultant pursuant to its agreement with the Owner.
- 23.10 The Project Consultant will utilize the Contractor Performance Report to monitor and record the Contractor's performance for the work specified by the contract. The Contractor Performance Report has been included as an exhibit to the contract.

ARTICLE 24. MATERIALS.

- 24.01 The Contractor shall provide materials and equipment as required in the Contract Documents. No substitution will be permitted except in the instance where a material is no longer available during the progress of the Work or is deemed by the

Owner to be no longer suitable or appropriate for incorporation into the Work or for obvious economic benefits accruable to the Owner.

24.01.01 Any such substitution must be approved by the Project Consultant and Owner prior to incorporation of the proposed substitution into the Work.

24.01.02 Proposed substitutions must be submitted for consideration from the Contractor to the Project Consultant and the Owner. Documentation for the proposed substitution must include, but is not limited to substantiation of the Contractor's efforts to obtain the originally specified materials including documentary evidence from the original materials' manufacturer that such materials are not available.

24.01.03 Product delivery lead times shall not serve as a basis for any substitution request except for where approved in advance by the Owner.

24.01.04 All additional costs incurred by the Owner as the result of any substitution will be the direct responsibility of and borne by the Contractor.

24.02 The Contractor shall make written request to the Project Consultant for and obtain his written approval of the use of any materials proposed for use when "approval" materials are specified or a performance type specification is utilized without mentioning any standard by name.

24.03 If, in the opinion of the Project Consultant, a specified product or equipment no longer meets the quality of the products or equipment required for the Work, Project Consultant shall request a Change Order Proposal from the Contractor for modifying the Contract to incorporate the respective changes to the Work required, the Contract amount, and the Contract Time as beneficial to the Owner.

ARTICLE 25. STORED MATERIALS.

25.01 Contractor shall, at its expense, receive, unload, store in a secure place, and deliver from storage to the construction site all materials and equipment required for the performance of the Contract.

25.01.01 Contractor is not entitled to payment for same except for those materials which in Owner's discretion are properly stored and are going to be installed or incorporated into the construction of the Project within thirty (30) days of delivery to the construction site.

25.01.02 The storage facilities and methods of storing shall meet Owner's approval and shall be in accordance with manufacturer's recommendations, or Owner will not be obligated to pay for same.

25.01.03 Materials and equipment subject to degradation by outside exposure shall be stored in a weather tight enclosure provided by Contractor at its expense.

25.01.04 Owner may at its discretion require material to be stored in an air-conditioned location.

25.02 Provided the above conditions are met, the stored materials may be included in a subsequent Application for Payment if the Contractor also complies with the following:

25.02.01 An applicable purchase order is provided listing the materials in detail and identifying the Contract Documents, by name, with verification that the total value of the purchase order amount reconciles with the corresponding application for payment stored materials line item value.

25.02.02 Evidence that proper storage security is provided.

25.02.03 The Owner is provided legal title (free of liens or encumbrances of any kind) to the material that is stored or stockpiled.

25.02.04 The Contractor and/or its Subcontractor have provided insurance for the Stored Materials against loss, damage (from whatever source), or disappearance, including loss or theft prior to incorporation into the Work. By execution of the Contract, Contractor releases Owner from any responsibility for Stored Materials and assumes

all liability for and risk of loss or damage, by whatever means, including Owner's alleged negligence, regardless of whether the Owner has paid for such Stored Materials.

- 25.03 Once any Stored Material is paid for by Owner, it shall not be removed from the designated storage area except for incorporation into the Project or upon subsequent written approval by Owner.
- 25.04 No Applications for Payment shall be submitted nor payments made based on the value of materials stored at locations other than the Project, unless otherwise approved in writing by the Owner.
- 25.05 It is further agreed between the parties that the transfer of title and the Owner's payment for any Stored Material pursuant to the Contract Documents shall in no way relieve the Contractor of the responsibility for providing and installing such material in accordance with the requirements of the Contract Documents.
- 25.06 The Contractor warrants that title to all of the Work or Stored Materials covered by the Application for Payment will pass to the Owner either by incorporation in the Project or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security, interest or encumbrance; and that none of the Work and none of the Stored Materials covered by the Application for Payments will have been acquired by the Contractor, or by any other person performing the Work at the site or providing materials and equipment to the Project, subject to an agreement under which an interest therein or encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such person.
- 25.07 In the event stored materials which Owner is paying for in advance of being installed or incorporated into the Project pursuant to this Paragraph are not installed or incorporated into the Project within thirty (30) days of delivery to the site, Contractor shall not be entitled to payment for any future stored materials on this Project and the amounts previously approved for payment for such materials shall be deducted from the Contractor's next application for payment..

ARTICLE 26. INSPECTION: REJECTION OF MATERIALS AND WORKMANSHIP.

- 26.01 All material and equipment provided and work performed shall be properly inspected by Contractor, at its expense, and shall at all times be subject to quality surveillance, inspections, observations or quality audit by Owner, Project Consultant and any inspectors conducting an inspection pursuant to code, law, regulations, etc.
 - 26.01.01 Contractor shall provide safe and adequate facilities, and all samples, drawings, lists and documents necessary for such quality surveillance, observation or quality audit.
 - 26.01.02 The Contractor shall permit and facilitate inspection of the Work by the Owner, Project Consultant, Inspectors for any governmental agency, authority or board.
 - 26.01.03 Owner also reserves the right to designate others such as consultants, commissioning authorities, test and balance agents, and forensic specialists, to conduct inspections during or subsequent to the Work as Owner in its discretion desires.
 - 26.01.04 Owner and Project Consultant shall be afforded full and free access to the shops, factories or places of business of Contractor and its Subcontractors for such quality surveillance, observation or quality audit and to determine the status of the Work.
 - 26.01.05 In the event the Project Consultant or Owner requires a factory inspection, the Contractor shall notify the suppliers that the material shall not be produced or fabricated without due notice to the Project Consultant and Owner and an opportunity for such inspection.
- 26.02 If any Work should be covered up without approval or consent of the Project Consultant or Owner, it must, if required by the Project Consultant or Owner, be uncovered for examination at the Contractor's expense.
- 26.03 If any material, equipment or workmanship is determined by Owner, City Engineer, Project Consultant or Inspector either during performance of the Work or on final quality surveillance, or during any applicable warranty period, to be defective or not complying with the requirements of this Construction Contract, Owner, City Engineer, Project Consultant or Inspector will notify Contractor in writing that such material, equipment or portions of the Work is rejected and Owner reserves the right to withhold payment on any such item or seek compensation from Contractor for same. Contractor shall, at its own expense, immediately remove, replace or correct such defective material, equipment or portions of the Work by making the same comply strictly with all requirements of the Contract Documents. The Contractor shall be responsible for the costs of

any additional site observations, special inspections and/or testing, or other activities of either the Project Consultant or the Owner made necessary by the correction of such defective materials, equipment or portions of the Work.

- 26.04 Neither the failure to make such quality surveillance, observation or quality audit, nor to discover defective workmanship, materials, or equipment, shall prejudice the rights of Owner to correct or reject the same.

ARTICLE 27. WARRANTY.

- 27.01 Unless otherwise provided in the Contract Documents, all material and equipment incorporated into any Work covered by the Contract Documents shall be new and, where not specified, of suitable grade for their intended use, and all workmanship shall be in accordance with construction practices acceptable to Owner and Project Consultant.
- 27.02 Unless otherwise provided in the Contract Documents, Contractor warrants all Work, equipment, materials and workmanship to be in accordance with the Contract Documents, any and all applicable codes, proper and workmanlike, first class and free from defects for a period of twelve (12) months (unless longer guarantees or warranties are provided for in the Contract Documents in which case the longer periods of time shall prevail) from and after Final Completion of the Work under the Contract Documents, regardless of whether the same were provided or performed by Contractor or by any Subcontractor.
- 27.03 Contractor's warranty with respect to latent defects shall be in accordance with Chapter 95, Florida Statutes, and other applicable provisions of State law.
- 27.04 In the event of damage or injury to persons or property or other consequential or resultant damages result from Contractor's breach of any warranties, then the Contractor will be responsible for same.

ARTICLE 28. OFFICE SPACE FOR THE OWNER'S PERSONNEL.

- 28.01 The Contractor shall provide, at Contractor's expense, for the duration of the Work, a suitable lockable office for any Owner designated personnel.

ARTICLE 29. PROJECT RECORD DOCUMENTS AND SURVEY.

- 29.01 A marked up record set of the Contract Documents and other project records as required within the Contract Documents will be kept up to date by the Contractor on the jobsite at all times. These documents will be given to the Project Consultant at the completion of the Work as required by the Contract Documents, and properly labeled as "Project Record Documents."
- 29.02 In addition to the "Project Record Documents", the Contractor will cause to have prepared by a Surveyor, registered in the State of Florida, a site survey clearly representing all Work done under this Contract and updating the original survey as may have been provided by the Owner.
- 29.03 The Contractor shall submit Project Record Documents and Survey in the manner and format specified in the Contract Documents.
- 29.04 This is a critical item and final payment will be withheld from the Contractor until "Project Record Documents" and survey are provided by the Contractor and approved by the Project Consultant.

ARTICLE 30. SALVAGE.

- 30.01 Any salvage resulting from clearing, grubbing, grading, draining, remodeling or altering any existing facilities on this site shall be the property of the Owner; and this material shall be piled or stacked on the site if the Owner desires this material.
- 30.02 If this material is not desired by the Owner, it shall be disposed of by the Contractor at his expense.

ARTICLE 31. CLAIMS BY THE CONTRACTOR.

- 31.01 Although Contractor acknowledges the No Damage for Delay clause set forth in the Agreement between Owner and Contractor, in the event the Contractor is entitled to assert any other claim against Owner for any reason, claims by the Contractor against the Owner (except for claims asserted under Article 20), are subject to the following terms and conditions:

- 31.01.01 All Contractor claims against the Owner shall be initiated by a written claim submitted to the Owner, c/o the City Engineer, or the Project Consultant. Such claim shall be received by the Owner and the Project Consultant no later than fifteen (15) calendar days after the event, or the first appearance of the circumstances causing the claim, and same shall set forth in detail all known facts and circumstances supporting the claim and the actual damages or injuries suffered;
- 31.01.02 The Contractor shall continue diligently with its performance regardless of the existence of any claims submitted by the Contractor;
- 31.01.03 In the event the Contractor seeks to make a claim, as a condition precedent to any such claim the Contractor shall strictly comply with the notice requirements above and such claim shall be made by the Contractor before proceeding to execute any additional or changed Work. Failure of the condition precedent to occur, (i.e., providing notice as required in this Article), shall constitute a complete waiver by the Contractor of any claim for additional compensation or extension of time. This written notice requirement may not be waived by verbal representations or the acts of representatives of the Owner or Project Consultant;
- 31.01.04 In connection with any claim by the Contractor against the Owner for compensation in excess of the Contract Price, any liability of the Owner for the Contractor's cost shall be strictly limited to direct cost of labor and materials incurred by the Contractor at the jobsite and shall in no event include indirect cost, overhead, loss of profit, or consequential damages of the Contractor. The Owner shall not be liable to the Contractor for claims of third parties including, but not limited to, subcontractors, suppliers, and laborers.

ARTICLE 32. CHANGE ORDERS.

- 32.01 One or more changes to the Work within the general scope of this Contract may be ordered by the Owner by Change Order, Project Consultant's Supplementary Instructions, and Construction Change Directives.
- 32.02 The Contractor shall proceed with any extra Work or changes which alter the Contract by adding to, or deducting from the Contract Sum or Contract Time in strict accordance with the following terms and conditions:
- 32.02.01 Change Order shall mean a written order to the Contractor executed by the Owner and the Project Consultant after execution of this Contract, directing a change in the Work and may include a change in the Contract Price or the time for the Contractor's performance or any combination;
- 32.02.02 Any change in the Contract Price or time resulting from a Change Order shall be determined as follows:
- a. By mutual agreement between the Owner and the Contractor as evidenced by (a) the change in the Contract Price or time being set forth in Change Order in accordance with this Article, and (b) the execution of the Change Order; or,
 - b. If no mutual agreement occurs between the Owner and the Contractor, the change in the Contract Price, if any, shall be derived based upon the Cost Plus Price basis (as set forth in this Article 32 below) by determining the "total actual costs" (in accordance with this Article w), incurred or savings achieved, resulting from revisions in the Work. Such total actual costs or savings shall include a component for direct jobsite overhead and profit but under no circumstances shall it include non-job site overhead expenses or costs or any other indirect costs or components. Any such costs or savings shall be documented in the format, and with such content and detail as the Owner or the Project Consultant requires. If agreement is not reached as to the change in time, Contractor shall be given a reasonable time based upon the scope of Work required by the change.
- 32.02.03 The execution of a Change Order by the Contractor shall constitute conclusive evidence of the Contractor's agreement to the ordered changes in the Work and the change in the Contract Price and the time for performance by the Contractor. The Contractor, by executing the Change Order, waives and forever releases any claim against the Owner for additional time or compensation for issues or matters relating to or arising out of or resulting from the Work included within or affected by the executed Change Order.
- 32.02.04 The Contractor shall notify and obtain the consent and approval of the Contractor's surety with reference to all Change Orders if such notice, consent or approval are required by the Owner, the Project Consultant, the Contractor's surety or by law. The Contractor's execution of the Change Order shall constitute the Contractor's warranty to the Owner that the surety has been notified of, and consents to, such Change Order and the surety

shall be conclusively deemed to have been notified of such Change Order and to have expressly consented and that the penal sums of the performance and payment bonds furnished by Contractor and Surety are adjusted coextensively with the amount of the Change Order.

32.02.05 The Owner, without invalidating the Contract, may require the change for any reason whatsoever. All such Work shall be executed under the terms of the original Contract.

32.02.06 All change orders and adjustments shall be in writing and executed by the Contractor and Owner; otherwise, no claim for additional compensation or time will be allowed.

32.02.07 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be the total actual cost (as set forth in this Article) saved as confirmed by the Project Consultant. The amount shall not include an amount for the overhead and profit of the Contractor which the Owner is not required to pay as a result of the deletion or decrease. When both additions and credits covering related Work or substitutions are involved in a change, the overhead and profit shall be calculated on the basis of net increase, if any, with respect to that change.

32.02.08 The value of any change ordered under the Contract for extra Work and/or any reductions in Work required, shall be determined under one or more of the following procedures before a written Change Order is issued.

- a. By **UNIT PRICES** named in the Contract or subsequently agreed upon by the Owner and the Contractor, which prices shall include Contractor's overhead and profit.
- b. By **LUMP SUM PRICE** agreed upon actual reasonable costs and direct job site overhead by the Owner and the Contractor, which price shall include Contractor's overhead and profit but under no circumstances shall it include non-job site overhead, expenses or costs or any other indirect costs; a breakdown of the estimated costs comprising the lump sum price may be required by the Project Consultant for his review. Percentage for overhead and profit shall be determined in accordance with the method listed for **COST PLUS PRICE**, subparagraph (c.) below.
- c. By a **COST PLUS PRICE** based on total actual costs as defined below, plus an added percentage, all determined as follows:

OVERHEAD AND PROFIT:

JOB SITE OVERHEAD, including supervision and the furnishing, use and maintenance of small tools and ordinary equipment incidental to and required for the work of subcontractors (whether performed by them or others) shall be considered to be just and fully compensated for, by adding an amount equal to five percent (5%) of the sum of material costs (as defined under Article 34.08.09(a) below) and labor costs (as defined under Article 34.08.09(b) below), and rentals (as defined under Article 32.08.09(c) below). There shall be no compensation for any non job site overhead, expenses or costs.

PROFIT, may then be added by the subcontractor to the above material costs and labor costs, including the **JOB SITE OVERHEAD** allowance, at the rate of 10% of the sum of those costs.

JOB SITE OVERHEAD, including general supervision and the furnishing, use and maintenance of small equipment incidental to and required for the Work of the General Contractor (including that of his subcontractors) shall be considered to be just and fully compensated for by adding an amount equal to ten percent (10%) of the sum of material costs (as defined under Article 32.08.09(a) below) and labor costs (as defined under Article 32.08.09(b) below) and rentals (as defined under Article 32.08.09(c) below). There shall be no compensation for any non job site overhead expenses or costs.

PROFIT may then be added by the Contractor to the above material costs and labor costs, including the **JOB-SITE OVERHEAD** allowance, at the rate of five percent (5%) of the sum of those costs.

- d. **BOND ALLOWANCE**, for maintaining the Performance Bond at 100% of the contract amount, a sum of one percent (1%) of the total cost of the change, (including material, labor, overhead and profit, and equipment rentals) shall be allowed on all change orders.

32.02.09 The total actual costs of materials, labor and equipment rentals may include the following only:

- a. Material costs actually recorded by the Contractor and/or subcontractors as they are delivered to the site and as evidenced from originally receipted invoices, listing appropriate quantities and unit prices. Records in proper form shall be maintained and available to the Project Consultant at all times.
- b. Labor costs represented by the actual wages paid to all laborers, apprentices, journeymen, and foremen involved in and necessary to completing the particular construction operations, for each day and every hour such labor teams and foremen are actually employed and on the extra Work required, including the net cost of insurance, Social Security and Workmen's Compensation. The furnishing, use and maintenance of small tools and ordinary equipment normal to the work of individual workmen in the trades will be considered part of the labor costs. Records in proper form shall be maintained and available to the Project Consultant at all times.
- c. Rentals for special equipment or machinery such as power-driven roller, tractors, trucks, shovels, drills, mixers, pumps, hoists, etc., required for the economic performance of the Work, at reasonable rental prices agreed upon before work commences, shall be allowed the Contractor and/or his subcontractors by the Project Consultant for each and every hour such special equipment is in use on the particular work.

32.02.10 The Contractor is obligated to proceed with the Work for a Change Order, even though there has not been an agreement reached with the Owner as to an adjustment to the Contract Price or time, and even if there is a dispute as to same. In such instances the Owner, City Engineer or Project Consultant will issue a Construction Change Directive to Contractor providing for the scope of work to be performed and the payment based on the above criteria. A Change Order or proposed Change Order shall not be the basis of the Contractor not performing pursuant to the Contract Documents.

32.02.11 The Contractor, Owner and Project Consultant shall administer and document the Change Order process by utilizing the documentation specified in the Contract Documents, including a Construction Change Directive.

32.03 The Project Consultant will have authority to order minor changes in the Work not involving an adjustment to the Contract Sum or Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be affected by written order of the Project Consultant and such changes shall be binding on the Owner and the Contractor.

32.04 The Owner has authorized the following approval thresholds for Change Orders in the name of The City of Pompano Beach, Florida under its General Services Manual, the rules of which are incorporated below:

- A. The City Manager is authorized to approve change orders up to the cumulative total of 10 percent of the original construction contract amount, not to exceed \$75,000 in the aggregate.
- B. When the cumulative total of all change orders on a project has exceeded the ceiling established in 32.04A above, all subsequent change orders will require prior City Commission approval, except in emergency cases as declared by the City Manager, or where the change order in question would be in the form of a credit, thereby reducing the adjusted contract amount.
- C. Approval of change orders under this policy shall be for the purposes of expediting the work in progress and shall be confirmed by City Commission action.

ARTICLE 33. DISCOVERING AND CORRECTING DEFECTIVE OR INCOMPLETE WORK.

33.01 In the event that the Contractor covers, conceals or obscures its work in violation of this Contract or in violation of a directive from the Owner or the Project Consultant, such work shall be uncovered and displayed for the Owner's or Project Consultant's inspection upon request, and shall be reworked at no cost in time or money to the Owner.

33.02 If any of the work is covered, concealed or obscured in a manner not covered above, it shall, if directed by the Owner or the Project Consultant, be uncovered and displayed for the Owner's or Project Consultant's inspection. If the uncovered work conforms substantially with this Contract, the costs incurred by the Contractor to uncover and subsequently replace such work shall be borne by the Owner; otherwise, such costs shall be borne by the Contractor.

33.03 The Contractor shall, at no additional cost in money to the Owner or extension of time correct work rejected by the Owner or by the Project Consultant as defective or failing to conform to this Contract. Additionally, the Contractor shall reimburse the Owner for all testing, inspections and other expenses incurred.

- 33.04 In addition to its warranty obligations, the contractor shall be specifically obligated to correct any and all defective or nonconforming work for a period of twenty-four (24) months following final completion upon written direction from the Owner.
- 33.05 The Owner may, but shall in no event be required to, choose to accept defective or nonconforming work.
- 33.05.01 In such event, the Contract Price shall be reduced, at Owner's option, by the greater of (i) the reasonable costs of removing and correcting the defective or nonconforming work, or (ii) the difference between the fair market value of the Project as constructed and the fair market value of the Project had it not been constructed in such a manner as to include defective or nonconforming work.
- 33.05.02 If the remaining portion of the unpaid Contract Price, if any, is insufficient to compensate the Owner for the acceptance of defective or nonconforming work, the Contractor shall, upon written demand from the Owner, pay the Owner such remaining compensation for accepting defective or nonconforming work.

ARTICLE 34. SAFETY, PROTECTION OF WORK AND PROPERTY.

- 34.01 Contractor shall be fully and solely responsible for conducting all operations under this Construction Contract at all times in such a manner as to avoid the risk of bodily harm to persons and damage to property. Contractor shall continuously and diligently inspect all Work, material and equipment to discover any conditions which might involve such risks and shall be solely responsible for discovery and correction of any such conditions.
- 34.02 Contractor shall instruct its personnel on the requirements of the Contractor's safety program and shall coordinate with other contractors and subcontractors on safety matters.
- 34.03 Contractor shall provide safety equipment and enforce the use of such equipment by its employees.
- 34.04 Contractor shall maintain accurate accident and injury reports and shall provide to Owner a monthly summary of injuries and man hours lost due to injuries.
- 34.05 Contractor shall maintain all portions of the Work in a neat, clean and sanitary condition at all times.
- 34.06 Contractor shall assure that all Subcontractors shall, without expense to Owner, comply with the foregoing.
- 34.07 Contractor shall comply with any and all rules, regulations, and laws, , which apply to safety requirements, including but not limited to OSHA requirements.
- 34.08 Safety Precautions and Programs:
- 34.08.01 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.
- 34.08.02 In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Project Consultant in writing. The Work in the affected area shall not thereafter be resumed except by written notice from the Owner. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner, Contractor and Project Consultant.
- 34.08.03 The Contractor shall not be required to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB).
- 34.09 Safety of Persons and Property
- 34.09.01 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:
- a. Employees on the Work and other persons who may be affected thereby;

- b. The Work and materials and equipment to be incorporated, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
 - c. Other property at the site or adjacent to the site, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
- 34.09.02 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of person or property or their protection from damage, injury or loss.
- a. The Contractor and his Subcontractors shall comply with and conform in all respects to the standard set forth in the Occupational Safety and Health Act (OSHA) of 1970.
 - b. The Contractor shall prominently post and maintain on the jobsite:
 - 1) OSHA 200: Log and summary of occupational injuries and illnesses.
 - 2) OSHA 2203: Provisions of the Act poster.
- 34.09.03 The Contractor shall implement and maintain a continuing safety program applicable to all Contractor employees, Subcontractors, and Sub-subcontractors, to include:
- a. Designating a responsible member of the Contractor's organization at the site as the Contractor's "Safety Officer" whose duty shall be the prevention of accidents, safety inspections, and accident documentation. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Project Consultant.
 - b. Holding weekly safety meetings with employees and Subcontractors.
 - c. Implementing OSHA Voluntary Protection Programs.
 - d. Ensuring the presence of an American Red Cross (or other organization acceptable to the Owner) certified Cardiopulmonary Resuscitation (CPR) and first-aid trained individual on site at all times.
 - e. Compliance with the Drug Free Work Place Act of 1988, the Federal Omnibus Transportation Employee Testing Act of 1991, and the certification of compliance with the same as required by the Owner in Document 00457, Drug-Free Workplace Certification.
 - f. Erecting and maintaining reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.
 - g. Ensuring that employees are not discriminated against or discharged for filing reasonable safety or health complaints or for otherwise exercising their rights in these regards.
- 34.09.04 When use of hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.
- 34.09.05 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to properly caused in whole or in part by the Contractor, a Subcontractor or a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is reasonable, except damage or loss attributable to acts or omissions of the Owner or Project Consultant or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault of negligence of the Contractor.
- 34.10 **Emergencies:** In an emergency affecting the safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss.

ARTICLE 35. ROYALTIES AND PATENTS.

- 35.01 The Contractor shall pay all royalties and license fees.
- 35.02 The Contractor shall be responsible for all infringement of patent rights and shall assume the defense, including payment of attorney fees and costs, of any suit brought against Contractor and/or Owner for infringement of any United States patent or for wrongful use of proprietary information of any third party.
- 35.03 Contractor indemnifies and shall defend and hold harmless Owner, its officers, its officials, its agents, its employees, and its representatives, respectively, from and against all claims, losses, costs, damages, and expenses, including attorney's fees, incurred by Owner and its representatives, respectively, as a result of or in connection with any claims or actions based upon infringement or alleged infringement of any patent, and arising out of the use of the equipment or materials provided under this Construction Contract by Contractor, or out of the process of actions employed by, or on behalf of Contractor in connection with the performances of this Construction Contract. Contractor shall, at its sole expense, promptly defend against any such claim or action unless directed otherwise by Owner or its representatives; provided that Owner or its representatives shall have notified Contractor upon becoming aware of such claims or actions, and provided further, that Contractor's aforementioned obligations shall not apply to equipment, materials, or processes furnished or specified by Owner or its representatives.
- 35.04 Contractor shall have the right, in order to avoid such claims or actions, to substitute at its expense non-infringing equipment, materials, or processes, or to modify such infringing equipment, materials and processes so they become non-infringing, or obtain the necessary licenses to use the infringing equipment, materials or processes, provided that such substituted and modified equipment, materials and processes shall meet all the requirements and be subject to all the provisions of the Contract Documents.
- 35.05 The indemnification pursuant to Florida Statute 725.06 and other Florida laws, shall have a separate consideration of \$1.00, receipt of which is acknowledged and incorporated into the project sum. This is incorporated by reference into the Bid Documentation and Specifications, if any.

ARTICLE 36. TAXES.

- 36.01 Contractor shall pay all taxes, levies, duties and assessments of every nature which may be applicable to any Work under this Contract.
- 36.02 The Contract Sum and any agreed changes shall include all taxes imposed by law. Contractor shall make any and all payroll deductions as required by law.
- 36.03 Contractor indemnifies and holds the Owner harmless from any liability on account of any such taxes, levies, duties, assessments and deductions.

ARTICLE 37. INDEMNITY AND HOLD HARMLESS.

- 37.01 To the fullest extent permitted by law, the Contractor shall defend, indemnify and hold harmless the Owner, its officers, its officials, its agents and employees (collectively referred to as the Owner), from and against any and all judgments, demands, claims, causes of action, liability, expenses, losses, costs, fines, and damages (including reasonable attorney's fees and expert's fees) of every kind and character brought against the Owner by any person, party or entity of any kind or nature whatsoever arising out of, incident to, relating or regarding the Contractor's performance under this Agreement, the condition of the premises, and/or the Contractor's acts of omission or commission. The above indemnification does not serve as a waiver by Owner of the statutory limits of liability set forth in Sec.768.28, Florida Statutes, nor does it serve as authorization for Owner or Contractor to be sued by any third parties.
- 37.02 Contractor, however, shall not be responsible to Owner for damages resulting out of bodily injury or damages to property which a Court of competent jurisdiction determines as being attributed to the negligence of Owner, its respective agents, servants, employees or officers.
- 37.03 Indemnifications by Contractor shall be extended to include all "Subcontractors", deliverers, suppliers, furnishers of material or anyone acting for, on behalf of, or at the request of the Contractor.

- 37.04 Contractor recognized the broad nature of this indemnifications and hold harmless clause and voluntarily makes this covenant and expressly acknowledge the receipt of Ten (\$10.00) Dollars, which payment is incorporated into the Contract Sum, and such other good and valuable consideration provided by Owner in support of this indemnification in accordance with the laws of the State of Florida.
- 37.05 This clause shall survive termination of this Agreement and pursuant to Florida Statute 725.06 be incorporated by reference into any and all Bid Documentation or Specifications.

ARTICLE 38. TERMINATION BY THE CONTRACTOR.

- 38.01 If the Owner repeatedly fails to perform its material obligations to the Contractor for a period of 30 days after receiving written notice from the Contractor of its intent to terminate, the Contractor may terminate performance under this Contract by written notice to the Owner and the Project Consultant.
- 38.02 In such event, the Contractor shall be entitled to recover from the Owner as though the Owner had terminated the Contractor's performance for convenience pursuant to the terms and conditions of this Contract.

ARTICLE 39. OWNER'S RIGHT TO SUSPEND CONTRACTOR'S PERFORMANCE.

- 39.01 The Owner shall have the right at any time to direct the Contractor to suspend its performance, or any designated part, for any reason whatsoever, or without reason. If any such suspension is directed by the Owner, the Contractor shall immediately comply with same;
- 39.02 In the event the Owner directs a suspension of performance under this Article through no fault of the Contractor, the Owner shall pay the Contractor as full compensation for such suspension the Contractor's reasonable costs, actually incurred and paid, of the following items only:
- 39.02.01 Demobilization and remobilization, including such costs paid to subcontractors;
- 39.02.02 Preserving and protecting Work in place;
- 39.02.03 Storage of materials or equipment purchased for the Project, including insurance;
- 39.02.04 Performing in a later, or during a longer, time frame than that contemplated by this Contract.

ARTICLE 40. TERMINATION BY THE OWNER.

- 40.01 The Owner may, at the Owner's option, for any reason and at any time terminate for convenience, any work under this Contract, in whole or, from time to time, in part, in accordance with the following terms and conditions:
- 40.02 The Owner shall give written notice of such termination to Contractor 7 days before it becomes effective.
- 40.02.01 The Contractor shall incur no further obligations in connection with the Work and the Contractor shall stop work when such termination becomes effective.
- 40.02.02 The Contractor shall also terminate outstanding orders and subcontracts.
- 40.02.03 The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders.
- 40.02.04 The Owner may direct the Contractor to assign the Contractor's right, title and interest under termination orders or subcontracts to the Owner or its designee.
- 40.02.05 The Contractor shall transfer title and deliver to the Owner such completed or partially completed Work and materials, equipment, parts, fixtures, information and Contract rights.
- 40.02.06 When terminated for convenience, the Contractor shall be compensated as follows:
- a. The Contractor shall submit a termination claim within one year to the Owner and the Project Consultant specifying the amounts due because of the termination for convenience together with costs, pricing or other data required by

the Owner or the Project Consultant. If the Contractor fails to file a termination claim with the Owner's Project Consultant within one (1) year from the effective date of termination, the Owner shall have no further obligation to the Contractor and Contractor waives any and all rights for compensation based upon the termination.

- b. The Owner and the Contractor may agree to the compensation, if any, due to the Contractor;
- c. Absent agreement to the amount due to the Contractor, the Owner shall pay the Contractor the following amounts:
 - 1. Contract prices for labor, materials, equipment and other services accepted under this Contract;
 - 2. Reasonable costs incurred in preparing to perform and in performing the terminated portion of the Work, and in terminating the Contractor's performance, plus a fair and reasonable allowance for direct jobsite overhead (and not home office or other overhead) and profit (such profit shall not include anticipated profit or consequential damages); provided, however, that if it appears that the Contractor would have not profited or would have sustained a loss if the entire Contract would have been completed, no profit shall be allowed or included and the amount of compensation shall be reduced to reflect the anticipated rate of loss, if any;
 - 3. Reasonable costs of settling and paying legitimate claims arising out of the termination of subcontractors or orders pursuant to this Article. These costs shall not include amounts paid in accordance with other provisions.
 - 4. The total sum to be paid the Contractor under this Subparagraph shall not exceed the total Contract Price, as properly adjusted, reduced by the amount of payments otherwise made, and shall in no event include duplication of payment.

40.03 The Owner may terminate this Contract for cause in accordance with the following terms and conditions:

40.03.01 If the Contractor does not perform the Work, or any part, in a timely manner, supply adequate labor, supervisory personnel or proper equipment or materials, or if it fails to timely discharge its obligations for labor, equipment and materials or proceeds to disobey applicable law, or otherwise commits a violation of a material provision of this Contract, then the Owner, in addition to any other rights it may have against the Contractor or others, may terminate the performance of the Contractor for cause upon seven (7) day written notice and assume possession of the Project site and of all materials and equipment at the site and may complete the Work.

40.03.02 In such case, the Contractor shall not be paid further until the Work is complete.

40.03.03 After final completion has been achieved, if any portion of the Contract Price (as it may be modified) remains after the cost to the Owner of completing the Work, including all costs and expenses of every nature incurred, has been deducted by the Owner, such remainder shall be paid to the Contractor. Otherwise, the Contractor shall pay the Owner any and all costs, fees, damages or expenses which the Owner has paid or is obligated to pay in excess of the contract price (as it may be modified consistent with the Contract Documents). This obligation for payment shall survive the termination of the Contract. In the event the employment of the Contractor is terminated by the Owner for cause pursuant to this Subparagraph and it is subsequently determined by a Court of competent jurisdiction that such termination was without cause, such termination shall thereupon be deemed a Termination for Convenience and the terms of Article 40.02 shall apply.

ARTICLE 41. CONTRACTOR'S INSURANCE

- 41.01 The Contractor shall maintain such insurance as will protect the Contractor and Owner from claims under Workmen's Compensation Acts, and from any other claims or damages for personal injury, including death and property damage, which may arise from operations under this Contract, whether such operations be by Contract by any subcontractor or anyone directly or indirectly employed by either, as more fully set forth below and in the amounts. Prior to commencement of the Work, all Certificates of Insurance executed by authorized representatives of the insurance company shall be filed with the Owner and shall be subject to its approval for accuracy of protection. In addition, the Owner may at any time require that Contractor or its insurer provide any other documentation regarding insurance to Owner including, but not limited to, the policy. The Contractor shall not commence Work under this Article until the provisions of this Article have been complied with. Owner may withhold payments due to Contractor in accordance with this Article or terminate or suspend this Contract with all costs or expenses associated with same to be paid by Contractor in the event Contractor fails to comply with any requirement in the Contract Documents regarding insurance.

In the event of cancellation of any policy, Contractor is obligated to immediately notify Owner of same and obtain policy(s) in accordance with the Contract Documents.

- 41.02 Contractor shall comply with any and all insurance obligation required by law, rules, or regulation.
- 41.03 The Contractor will be required to provide a Certificate of Insurance indicating that Workers' Compensation has been provided for all employees in compliance with Chapter 440, Florida Statutes.
- 41.04 The Contractor shall procure and carry Comprehensive General Liability insurance including contractual and indemnification liability covering this Contract and Products/Completed Operations Liability Insurance covering personal injury and bodily injury in limits of not less than \$1,000,000 for injury or death to any one person and not less than \$2,000,000 each occurrence; and shall carry insurance against property damage in limits of not less than \$1,000,000 per claimant and \$2,000,000 per occurrence as a minimum coverage. The Contractor shall also procure and carry Owner's and Contractor's protective liability insurance. In the event that work to be performed by Contractor involves the removal and disposal of asbestos-related materials, Contractor shall, in addition to the foregoing coverages, also provide and carry Asbestos Liability-Occurrence form only, with \$1,000,000 per occurrence, \$2,000,000 aggregate. All insurance shall name the Owner as an additional insured, and shall remain in full force and effect for two (2) years following Contractor's completion of the work.
- 41.05 The Contractor shall carry at no additional expense to the Owner, Builders' Risk Insurance for the perils of fire, vandalism, malicious mischief and those included in extended coverage in the amount of one hundred percent (100%) of the values at risk. Such policies shall be written to protect the Contractor and the Owner as their interest may appear.
- 41.06 All Contractors shall maintain automobile liability insurance against bodily injury and property damage in at least the amounts of one million dollars (\$1,000,000) per claimant, one million dollars (\$1,000,000) per occurrence.
- 41.07 The insurance coverage amounts provided for in this Section are the minimum required insurance amounts. The Owner may require additional insurance or coverage on a case-by-case basis. Any insurance or coverage amounts in addition to those provided for herein shall be specified in the Contract Documents.
- 41.08 The Owner is not maintaining any insurance on behalf of Contractor covering against loss or damage to the Work or to any other property of Contractor. In the event Contractor maintains insurance against physical loss or damage to Contractor's construction equipment and tools, such insurance shall include an insurer's waiver or rights of subrogation in favor of Owner.
- 41.09 The requirements as to types and limits, as well as Owner's approval of insurance coverage to be maintained by Contractor, are not intended to and shall not in any manner limit or qualify the liabilities and obligations assumed by Contractor under the Contract.
- 41.10 The policies of such insurance in force, shall be issued by companies qualified to do business in the State of Florida and be acceptable to the Owner and shall provide that the Owner be given thirty (30) days advance written notice of the cancellation, expiration or any material change in the coverage afforded thereunder. The companies must be rated at least A-VI by AM Best or Aa3 by Moody's Investor Service. All policies must remain in effect during performance of the Work and for a period of one year after final completion.
- 41.11 Uninsured Claims. If any action by any person, firm or corporation is brought or threatened against the Owner or against the Contractor and the Owner for any alleged loss, damage or injury arising out of or in the consequence of the performance or nonperformance of the Contract which, in the reasonable opinion of the Owner, may not be covered by the contingent liability, public liability or property damage insurance policy, or, which together with other such actions or claims seeks a recovery in excess of the amount payable under such policies, the amount of such recovery sought or so much as the Owner reasonably deems necessary, may be withheld by the Owner from any money due the Contractor. The Owner in its sole discretion may permit the Contractor to substitute other satisfactory security in lieu of the monies so withheld. If the liability of the Owner is determined by judgment or award of a court or other tribunal of competent jurisdiction, or if such recovery sought shall have been admitted by the Contractor to be valid, the Owner may pay such judgment, award of admitted recovery out of the monies retained by the Owner under the provisions of this Article and return the remaining balance, if any, to the Contractor.

- 41.12 Adequate funds shall be retained for the insurance costs listed in the Schedule of Values attached to the Contractor's respective Applications for Payment to account for insurance coverage renewals on multi-year projects coupled with invoices to substantiate the annual costs.

ARTICLE 42. PERFORMANCE BOND AND PAYMENT BOND

- 42.01 For a Project with an estimated cost of \$200,000.00 or more, the Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations as specifically required in the Contract Documents on the date of execution of the Contract.

ARTICLE 43. RIGHT TO AUDIT PROVISIONS

- 43.01 Contractor's records which shall include but not be limited to accounting records, written policies and procedures, computer records, disks and software, videos, photographs, subcontract files (including proposals of successful and unsuccessful bidders), originals estimates, estimating worksheets, correspondence, change order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to this contract (s "records") and shall be open to inspection and subject to audit and/or reproduction, during normal working hours, by Owner's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the contractor or any of his payees pursuant to the execution of the contract. Such records subject to examination shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with this contract.
- 43.02 For the purpose of such audits, inspections, examinations and evaluations, the Owner's agent or authorized representative shall have access to such records from the effective date of this contract, for the duration of the Work, and until 5 years after the date of final payment by Owner to Consultant pursuant to this contract.
- 43.03 Owner's agent or its authorized representative shall have access to the Contractor's facilities, shall have access to all necessary records, and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this article. Owner's agent or its authorized representative shall give auditees reasonable advance notice of intended audits.
- 43.04 Contractor shall require all subcontractors, insurance agents, and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements in any written contract agreement. Failure to obtain such written contracts which include such provisions shall be reason to exclude some or all of the related payees' costs from amounts payable to the Contractor pursuant to this contract.
- 43.05 If an audit inspection or examination in accordance with this article, discloses overcharges (of any nature) by the Contractor to the Owner in excess of 10% percent of the total contract billings, the actual cost of the Owner's audit shall be paid by the Contractor.

ARTICLE 44. LAWS AND REGULATIONS

- 44.01 Contractor and its employees and representative shall at all times, comply with all applicable laws, ordinances, statutes, rules and regulations in effect at the time Work is performed pursuant to the Contract Documents.
- 44.02 If, during the term of this Construction Contract, there are any changed or new laws, ordinances or regulations not in existence at the time of signing this Construction Contract which become effective and which affect the cost or time of performance of the Construction Contract, Contractor shall within fifteen (15) days of the discovery of such law, ordinance or regulation, notify Owner in writing and submit detailed documentation of such effect in terms of both time and cost of performing the Construction Contract. Upon concurrence by Owner as to the effect of such changes, an adjustment in the compensation and/or time of performance may be made at Owner's discretion.
- 44.03 If any discrepancy or inconsistency should be discovered between the Contract Documents and any law, ordinance, regulation, order or decree, Contractor shall within fifteen (15) days of such discovery report the same in writing to Owner who will issue such instructions as may be necessary.

ARTICLE 45. DISPUTE RESOLUTION.

- 45.01 The Owner and Contractor agree that, in the event of a dispute, the parties will attempt to resolve such dispute without litigation and that resolution through mediation procedures will be encouraged.

- 45.02 The existence of a dispute between the parties shall not be the basis of the Contractor unilaterally electing not to continue performance pursuant to the terms of the Contract Documents.

ARTICLE 46. GOVERNING LAW; VENUE; WAIVER OF TRIAL BY JURY AND ATTORNEYS FEES.

- 46.01 The Construction Contract shall be governed by the laws of the State of Florida.
- 46.02 In the event either party institutes litigation related in any manner to this Contract for any reason, the sole venue for all such litigation shall be in the 17th Judicial Circuit of Florida in Broward County, Florida or in the U.S. District Court for the Southern District of Florida, as well as the applicable appellate courts serving said venues.
- 46.03 To the fullest extent permitted by law, Owner, Contractor, and Contractor's Surety each waive the right to trial by jury in any action or proceeding, including any counterclaims/crossclaims/third (or more remote) party complaints which may be brought by Owner, Contractor, or Surety, jointly and/or severally, arising out of or in any way related to the Contract Documents and/or attendant suretyship including, without limiting the generality, any claim for damages resulting from any act or omission of Owner, Contractor, or Surety, jointly or severally, in any way connected with this Construction Contract.
- 46.04 In the event of any litigation involving the provisions of the Contract Document, both parties agree that the prevailing party in such litigation shall be entitled to recover from the non-prevailing party reasonable attorney fees as well as all out-of-pocket costs and expenses incurred by the prevailing party in such litigation through all appellate levels.

ARTICLE 47. RIGHTS AND REMEDIES.

- 47.01 The duties and obligations imposed by the Contract Documents and the available rights and remedies shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

ARTICLE 48. SUCCESSORS, ASSIGNS AND ASSIGNMENT.

- 48.01 The Owner and the Contractor each binds itself, its partners, successors, assigns and legal representatives to the other party in respect to all covenants, agreements and obligations contained in the Contract Documents. It is agreed that the Contractor shall not assign, transfer, convey or otherwise dispose of the contract or its right, title and interest in and to the same or any part thereof, without previous consent of the Owner and concurred to by the Sureties.
- 48.02 If requested by Owner, the Contractor agrees to assign all Subcontracts required for performance of this Contract to the Owner upon the Owner or Project Consultant's determination that Contractor has defaulted under the Contract Documents. The Contractor shall include in all Subcontracts, equipment leases and purchase orders a provision requiring the subcontractor, equipment lessor or supplier, in the event of Contractor's default under this Contract, to consent to the assignment of their subcontracts to the Owner.

ARTICLE 49. PUBLIC RECORDS.

- 49.01 A. The City of Pompano Beach is a public agency subject to Chapter 119, Florida Statutes. The Contractor shall comply with Florida's Public Records Law, as amended. Specifically, the Contractor shall:
- a. Keep and maintain public records required by the City in order to perform the service;
 - b. Upon request from the City's custodian of public records, provide the City with a copy of requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes or as otherwise provided by law;
 - c. Ensure that public records that are exempt or that are confidential and exempt from public record requirements are not disclosed except as authorized by law;
 - d. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the Contractor does not transfer the records to the City; and

- e. Upon completion of the contract, transfer, at no cost to the City, all public records in possession of the Contractor, or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of the contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records in a format that is compatible with the information technology systems of the City.

49.02 The failure of Contractor to comply with the provisions set forth in this Article shall constitute a Default and Breach of this Agreement and the City shall enforce the Default in accordance with the provisions set forth in Article 40.

PUBLIC RECORDS CUSTODIAN

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

CITY CLERK

100 W. Atlantic Blvd., Suite 253

Pompano Beach, Florida 33060

(954) 786-4611

RecordsCustodian@copbfl.com

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PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall at all times maintain at the site of the project a record copy of the following:

1. Drawings
2. Specifications
3. Addenda
4. Change Orders and other modifications to the Contract.
5. Approved Shop Drawings, Product Data and Samples.
6. Field Test Records.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. All applicable sections of the Specifications.

B. General Conditions.

1.03 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. File documents and samples in accordance with Construction Specifications Institute (CSI) format.

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

D. Make documents and samples available at all times for inspection by the City's Representatives.

1.04 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by Project Manager.

1.05 RECORDING

Definition: The Project Record is the updated and revised plans and specifications, including a running account of all known revisions and changes made to the original plans and specifications, complete with copies of any field sketches and clarifications, issued over the course of construction. The Project Record is the responsibility of the Contractor.

- A. The Contractor shall label each document, "Project Record" in neat large printed letters, or by rubber stamp.
- B. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
- C. Drawings: Legibly mark to record actual construction:
 - 1. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 2. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 3. Field changes of dimension and detail.
 - 4. Changes made by Field Order or by Change Order.
 - 5. Details not on original Contract Drawings.
 - 6. The Record Drawing set shall show benchmark positions and their vertical values. Benchmarks are optional for Plan Views, but required for Profile Views.
- D. Specifications and Addenda; Legibly mark each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each produce and item of equipment actually installed.
 - 2. Changes made by field order or by Change Order.

1.06 RECORD DRAWINGS

Definition: The Record Drawings are a revised set of drawings submitted by a Contractor upon completion of a project. They reflect all changes made in the specifications and working drawings during the construction process, and show the exact dimensions, geometry, and location of all elements of the work completed under the Contract.

- A. The Contractor shall maintain full size (24"X 36") project record to reflect the "record" items of work as the work progresses. Upon completion of the work, the Contractor shall prepare a set of record drawings on full-size, reproducible material and an electronic file in (DWG format, AutoCAD, Version 2011 or more recent version OR GIS). The record drawings will, in the greatest possible detail, reproduce the exact final conditions of the entire project. Including, but not limited to, final survey, utilities, architecture, structural, civil conditions, electrical, mechanical, paving, landscaping, irrigation, updating all details and all notes, parking, and any other plans related to a specific project. For the purpose of producing the final record drawings, based on the project record, the Consultant will furnish one set of full-size design drawings on reproducible material and

an electronic file (DWG format, AutoCAD, Version 2011 or more recent version OR GIS) to the Contractor on compact disk or any other electronic means.

Definition: Design drawings or construction drawings are subject to clarifications, but are complete with enough information (plan, sections, dimensions, details, and notes, etc.) to enable the depicted item's construction or replication without additional information.

- B. At a minimum the project record shall be reviewed on the 20th working day of every third month, or more often, as deemed necessary by Project Manager, after the month in which the final Notice-to Proceed is given as well as on completion of work. Failure to maintain the project record up-to-date shall be grounds for withholding monthly progress payments until such time as the record drawings are brought up-to date.
- C. The project record shall be accessible to the City at all times during construction period.
- D. The cost of maintaining record changes, and preparation of the record drawings shall be included in the unit prices bid for the affected items. Upon completion of the work, the Contractor shall furnish the Project Manager the set of record drawings on full-size, reproducible material and an electronic file in (DWG format, AutoCAD, Version 2011 or more recent version OR GIS) Pay request quantities must match this same set of record drawings. The completed Record drawings shall be delivered to the Program Manager at least forty-eight (48) hours prior to final inspection of the work. The Final Inspection will not be conducted unless the Record Drawings are in the possession of the Project Manager.
- E. The completed (or final) record drawings shall be certified by a Professional Land Surveyor, a registered and licensed Architect, a registered and licensed Engineer, a registered and licensed Landscape Architect, registered in the State of Florida. This certification shall consist of the professional discipline official's embossed seal bearing the professional discipline official's registration number, signature and date on each sheet of the drawing set. In addition, the key sheet, cover sheet or first sheet of the plans set shall list the business address and telephone number for all of the professional discipline officials.
- F. Representative items of work that should be shown on the record drawings as verified, changed or added are shown below:
 - 1. All deviations from condition shown in the Construction Documents including Change Orders, Field Orders and other varying conditions.
 - 2. Every utility (gas, telephone, power, water, force main, etc.) encountered and/or crossing drainage, water or sanitary sewer facilities (whether it is a conflict or has sufficient clearances) shall be located, both horizontally and vertically. The clearance between the facilities horizontal and vertical shall be noted. For instance, if a two inch (2") gas main crosses over the top of a six inch (6") potable water main, the bottom elevation of the gas main shall be noted and the top of the water main shall be noted. The difference between the two facilities will be the clearance between the two facilities. Parallel mains shall note the clearance between the outside of the mains. It shall be the Contractor's responsibility to note these

crossings on a daily basis and ensure that this information is reflected on the Record Drawing plan set. Crossings will not require state plane coordinates.

3. Pipelines that are "dead" or have been abandoned shall be located during construction and shall be annotated Record Drawing Plans.
4. As-built survey drawings shall meet applicable minimum technical standards for land surveys as outlined in Section 61G17 (<https://www.flrules.org/gateway/Division.asp?DivID=269>) of the Florida Administrative Code.

NOTE: For technical information on AutoCAD and GIS, please refer to the "Electronic As-Built Requirements" located on the City Engineering Website:

[https://cdn.pompanobeachfl.gov/city/pages/engineering/downloadslinks/06_Digital%20Record%20Drawing%20Standards%20and%20Requirements%20\(2019\).pdf](https://cdn.pompanobeachfl.gov/city/pages/engineering/downloadslinks/06_Digital%20Record%20Drawing%20Standards%20and%20Requirements%20(2019).pdf)

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MEB/JES/mcm

Rev. 2/24/25

L:agr/contractmanager/2025-409

EXHIBIT C – Insurance Requirements

The insurance described herein reflects the requirements deemed necessary for this contract by the City. The contractor is responsible for delivering to the City for timely review and written approval/disapproval Certificates of Insurance, which evidence that all insurance required hereunder is in full force and effect and which name the city as an additional insured on a primary basis on all such coverage.

CONTRACTOR shall not commence services under the terms of this Agreement until certification or proof of insurance detailing terms and provisions have been received and approved in writing by the City's Risk Manager. If you are responding to a bid and have questions regarding the insurance requirements hereunder, please contact the City's Purchasing Department at (954) 786-4098. If the contract has already been awarded, please direct any queries and proof of the requisite insurance coverage to the City staff

responsible for oversight of the subject project/contract.

CONTRACTOR is responsible for delivering to the CITY for timely review and written approval/disapproval Certificates of Insurance, which evidence that all insurance required hereunder is in full force and effect and which name on a primary basis, the CITY as an additional insured on all such coverage. Such policy or policies shall be issued by United States Treasury-approved companies authorized to do business in the State of Florida. The policies shall be written on forms acceptable to the City's Risk Manager, meet a minimum financial A.M. Best and Company rating of no less than Excellent, and be part of the Florida Insurance Guarantee Association Act. No changes are to be made to these specifications without prior written approval of the City's Risk Manager.

Throughout the term of the agreement/contract, the City, by and through its Risk Manager, reserves the right to review, modify, reject, or accept any insurance policies required by the agreement/contract, including limits, coverages, or endorsements. The City reserves the right, but not the obligation, to review and reject any insurer providing coverage because of poor financial condition or failure to operate legally.

Failure to maintain the required insurance shall be considered an event of default. The requirements herein, as well as the City's review or acceptance of insurance maintained by the Contractor, are not intended to and shall not in any way limit or qualify the liabilities and obligations assumed by the Contractor under the agreement/contract. Throughout the agreement/contract term, the Contractor and all subcontractors or other agents hereunder shall, at its sole expense, maintain in full force and effect the following insurance coverages and limits described herein, including endorsements.

- A. Worker's Compensation Insurance covering all employees and providing benefits as required by Florida Statute, Chapter 440, regardless of the size of the company/firm (number of employees) or the state in which the work is to be performed or of the state in which Contractor is obligated to pay compensation to employees engaged in the performance of the work. No exemption will be considered. The contractor further agrees to be responsible for the employment, control, and conduct of its employees and any injury sustained by such employees during their employment.
- B. Liability Insurance
 - 1. Naming the City of Pompano Beach as an additional insured as the City's interests may appear, on General Liability Insurance only, relative to

claims arising from the Contractor's negligent acts or omissions in connection with the Contractor's performance under this agreement/contract.

2. Such liability insurance shall include the following checked types of insurance and indicated minimum policy limits:

TYPE OF INSURANCE LIMITS OF LIABILITY

GENERAL LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$2,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

XX comprehensive form bodily injury and property damage

XX premises - operations bodily injury and property damage

XX explosion & collapse

XX hazard

XX underground hazard

XX products/completed bodily injury and property damage combined

XX operations hazard

XX contractual insurance bodily injury and property damage combined

XX broad form property damage, bodily injury, and property damage combined

XX independent contractor's personal injury

XX personal injury

___ sexual abuse/molestation

___ liquor legal liability

AUTOMOBILE LIABILITY:

Minimum \$ occurrence and \$1,000,000 Per aggregate

XX comprehensive form

XX owned

XX hired

XX non-owned

Please note that Florida Statutes Section 255.05 requires contractors who enter into a contract with the City to purchase a payment and performance bond when the contract is in excess of \$200,000.

REAL & PERSONAL PROPERTY:

___ Comprehensive form

Agent must show proof they have this coverage.

EXCESS LIABILITY:

Minimum \$5,000,000 Per Occurrence and \$5,000,000 Per Aggregate
XX other than umbrella bodily injury and property damage combined

ENVIRONMENTAL / POLLUTION LIABILITY: Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

XX environmental/pollution liability

CONTRACTOR is required to provide Environmental/Pollution Liability for damage(s) caused by hazardous waste material.

PROFESSIONAL LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis professional liability

CONTRACTOR is required to provide Professional Liability if engineering and design are used.

CYBER LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

___ Network Security / Privacy Liability
___ Breach Response / Notification Sublimit (minimum limit of 50% of policy aggregate)
___ Technology Products E&O - \$1,000,000 (only applicable for vendors supplying technology-related services and or products)
___ Coverage shall be maintained in effect during the period of the Agreement and for not less than four (4) years after termination/ completion of the Agreement.

CRIME LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

3. If Professional Liability is required, the Contractor agrees the indemnification and hold harmless provisions of the agreement/contract shall survive the termination or expiration of the agreement/contract for a period of three (3) years unless terminated sooner by the applicable statute of limitations.

- C. **Employer's Liability:** The contractor and all subcontractors shall, for the benefit of its employees, provide, carry, maintain, and pay for the Employer's Liability Insurance in the minimum amount of One Hundred Thousand Dollars (\$100,000.00) per employee and Five Hundred Thousand Dollars (\$500,000) per aggregate.

- D. **Policies:** Whenever, under the provisions of the agreement/contract, insurance is required of the Contractor, the Contractor shall promptly provide the following:
1. Certificates of Insurance evidencing the required coverage;
 2. Names and addresses of companies providing coverage
 3. Effective and expiration dates of policies; and
 4. A provision in all policies affording City thirty (30) days written notice by a Carrier of any cancellation or material change in any policy.
- E. **Insurance Cancellation or Modification:** Should any required insurance policies be canceled before the expiration date or modified or substantially modified, the issuing company/firm shall provide thirty (30) days written notice to the City.
- F. **Waiver of Subrogation:** The contractor hereby waives any and all rights of subrogation against the City, its officers, employees, and agents for each required policy. When required by the insurer, or should a policy condition not permit an insured to enter into a pre-loss agreement/contract to waive subrogation without an endorsement, then the contractor shall notify the insurer and request the policy be endorsed with a Waiver of Transfer of Rights of Recovery Against Others or its equivalent. This Waiver of Subrogation requirement shall not apply to any policy that includes a condition to the policy not specifically prohibiting such an endorsement or voids coverage should the Contractor enter into such agreement/contract on a pre-loss basis.
- G. The Contractor shall furnish to the City the certification or proof of insurance required by the provisions set forth above within ten (10) days after notification of the award of the agreement/contract. Certificate(s) to be issued to City of Pompano Beach, Attention Risk Manager, 100 West Atlantic Boulevard 060.
- H. Builder Risk insurance is not required.

EXHIBIT C – Insurance Requirements

The insurance described herein reflects the requirements deemed necessary for this contract by the City. The contractor is responsible for delivering to the City for timely review and written approval/disapproval Certificates of Insurance, which evidence that all insurance required hereunder is in full force and effect and which name the city as an additional insured on a primary basis on all such coverage.

CONTRACTOR shall not commence services under the terms of this Agreement until certification or proof of insurance detailing terms and provisions have been received and approved in writing by the City's Risk Manager. If you are responding to a bid and have questions regarding the insurance requirements hereunder, please contact the City's Purchasing Department at (954) 786-4098. If the contract has already been awarded, please direct any queries and proof of the requisite insurance coverage to the City staff

responsible for oversight of the subject project/contract.

CONTRACTOR is responsible for delivering to the CITY for timely review and written approval/disapproval Certificates of Insurance, which evidence that all insurance required hereunder is in full force and effect and which name on a primary basis, the CITY as an additional insured on all such coverage. Such policy or policies shall be issued by United States Treasury-approved companies authorized to do business in the State of Florida. The policies shall be written on forms acceptable to the City's Risk Manager, meet a minimum financial A.M. Best and Company rating of no less than Excellent, and be part of the Florida Insurance Guarantee Association Act. No changes are to be made to these specifications without prior written approval of the City's Risk Manager.

Throughout the term of the agreement/contract, the City, by and through its Risk Manager, reserves the right to review, modify, reject, or accept any insurance policies required by the agreement/contract, including limits, coverages, or endorsements. The City reserves the right, but not the obligation, to review and reject any insurer providing coverage because of poor financial condition or failure to operate legally.

Failure to maintain the required insurance shall be considered an event of default. The requirements herein, as well as the City's review or acceptance of insurance maintained by the Contractor, are not intended to and shall not in any way limit or qualify the liabilities and obligations assumed by the Contractor under the agreement/contract. Throughout the agreement/contract term, the Contractor and all subcontractors or other agents hereunder shall, at its sole expense, maintain in full force and effect the following insurance coverages and limits described herein, including endorsements.

- A. Worker's Compensation Insurance covering all employees and providing benefits as required by Florida Statute, Chapter 440, regardless of the size of the company/firm (number of employees) or the state in which the work is to be performed or of the state in which Contractor is obligated to pay compensation to employees engaged in the performance of the work. No exemption will be considered. The contractor further agrees to be responsible for the employment, control, and conduct of its employees and any injury sustained by such employees during their employment.
- B. Liability Insurance
 - 1. Naming the City of Pompano Beach as an additional insured as the City's interests may appear, on General Liability Insurance only, relative to

claims arising from the Contractor's negligent acts or omissions in connection with the Contractor's performance under this agreement/contract.

2. Such liability insurance shall include the following checked types of insurance and indicated minimum policy limits:

TYPE OF INSURANCE LIMITS OF LIABILITY

GENERAL LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$2,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

XX comprehensive form bodily injury and property damage

XX premises - operations bodily injury and property damage

XX explosion & collapse

XX hazard

XX underground hazard

XX products/completed bodily injury and property damage combined

XX operations hazard

XX contractual insurance bodily injury and property damage combined

XX broad form property damage, bodily injury, and property damage combined

XX independent contractor's personal injury

XX personal injury

___ sexual abuse/molestation

___ liquor legal liability

AUTOMOBILE LIABILITY:

Minimum \$ occurrence and \$1,000,000 Per aggregate

XX comprehensive form

XX owned

XX hired

XX non-owned

Please note that Florida Statutes Section 255.05 requires contractors who enter into a contract with the City to purchase a payment and performance bond when the contract is in excess of \$200,000.

REAL & PERSONAL PROPERTY:

___ Comprehensive form

Agent must show proof they have this coverage.

EXCESS LIABILITY:

Minimum \$5,000,000 Per Occurrence and \$5,000,000 Per Aggregate
XX other than umbrella bodily injury and property damage combined

ENVIRONMENTAL / POLLUTION LIABILITY: Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

XX environmental/pollution liability

CONTRACTOR is required to provide Environmental/Pollution Liability for damage(s) caused by hazardous waste material.

PROFESSIONAL LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis professional liability

CONTRACTOR is required to provide Professional Liability if engineering and design are used.

CYBER LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

___ Network Security / Privacy Liability
___ Breach Response / Notification Sublimit (minimum limit of 50% of policy aggregate)
___ Technology Products E&O - \$1,000,000 (only applicable for vendors supplying technology-related services and or products)
___ Coverage shall be maintained in effect during the period of the Agreement and for not less than four (4) years after termination/ completion of the Agreement.

CRIME LIABILITY:

Minimum \$1,000,000 Per Occurrence and \$1,000,000 Per Aggregate

* Policy to be written on a Claims incurred basis

3. If Professional Liability is required, the Contractor agrees the indemnification and hold harmless provisions of the agreement/contract shall survive the termination or expiration of the agreement/contract for a period of three (3) years unless terminated sooner by the applicable statute of limitations.

- C. **Employer's Liability:** The contractor and all subcontractors shall, for the benefit of its employees, provide, carry, maintain, and pay for the Employer's Liability Insurance in the minimum amount of One Hundred Thousand Dollars (\$100,000.00) per employee and Five Hundred Thousand Dollars (\$500,000) per aggregate.

- D. **Policies:** Whenever, under the provisions of the agreement/contract, insurance is required of the Contractor, the Contractor shall promptly provide the following:
1. Certificates of Insurance evidencing the required coverage;
 2. Names and addresses of companies providing coverage
 3. Effective and expiration dates of policies; and
 4. A provision in all policies affording City thirty (30) days written notice by a Carrier of any cancellation or material change in any policy.
- E. **Insurance Cancellation or Modification:** Should any required insurance policies be canceled before the expiration date or modified or substantially modified, the issuing company/firm shall provide thirty (30) days written notice to the City.
- F. **Waiver of Subrogation:** The contractor hereby waives any and all rights of subrogation against the City, its officers, employees, and agents for each required policy. When required by the insurer, or should a policy condition not permit an insured to enter into a pre-loss agreement/contract to waive subrogation without an endorsement, then the contractor shall notify the insurer and request the policy be endorsed with a Waiver of Transfer of Rights of Recovery Against Others or its equivalent. This Waiver of Subrogation requirement shall not apply to any policy that includes a condition to the policy not specifically prohibiting such an endorsement or voids coverage should the Contractor enter into such agreement/contract on a pre-loss basis.
- G. The Contractor shall furnish to the City the certification or proof of insurance required by the provisions set forth above within ten (10) days after notification of the award of the agreement/contract. Certificate(s) to be issued to City of Pompano Beach, Attention Risk Manager, 100 West Atlantic Boulevard 060.
- H. Builder Risk insurance is not required.

LOCAL BUSINESS EXHIBIT "A"
CITY OF POMPANO BEACH, FLORIDA
LOCAL BUSINESS PARTICIPATION FORM

Solicitation Number & Title: _____ Prime Contractor's Name: _____

<u>Name of Firm, Address</u>	<u>Contact Person, Telephone Number</u>	<u>Type of Work to be Performed/Material to be Purchased</u>	<u>Contract Amount or %</u>

LOCAL BUSINESS EXHIBIT "A"

LOCAL BUSINESS EXHIBIT "B"
LOCAL BUSINESS
LETTER OF INTENT TO PERFORM AS A LOCAL SUBCONTRACTOR

Solicitation Number _____

TO: _____
(Name of Prime or General Bidder)

The undersigned City of Pompano Beach business intends to perform subcontracting work in connection with the above contract as (check below)

_____ an individual

_____ a corporation

_____ a partnership

_____ a joint venture

The undersigned is prepared to perform the following work in connection with the above Contract, as hereafter described in detail:

at the following price: _____

(Date)

(Print Name of Local Business Contractor)

(Street Address)

(City, State Zip Code)

BY: _____
(Signature)

IMPORTANT NOTE: Signatures on this form MUST be by an authorized employee of Subcontractor and must be uploaded to the Response Attachment Tab

LOCAL BUSINESS EXHIBIT "B"

LOCAL BUSINESS
UNAVAILABILITY FORM

BID # _____

I, _____
(Name and Title)

of _____, certify that on the _____ day of

_____, _____, I invited the following LOCAL BUSINESSES to bid work
items to be performed in the City of Pompano Beach:

Business Name, Address	Work Items Sought	Form of Bid Sought (i.e., Unit Price, Materials/Labor, Labor Only, etc.)
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Said Local Businesses:

- _____ Did not bid in response to the invitation
- _____ Submitted a bid which was not the low responsible bid
- _____ Other: _____

Name and Title: _____

Date: _____

Note: Attach additional documents as available.

LOCAL BUSINESS EXHIBIT "D"
GOOD FAITH EFFORT REPORT
LOCAL BUSINESS PARTICIPATION

BID # _____

1. What portions of the contract have you identified as Local Business opportunities?

2. Did you provide adequate information to identified Local Businesses? Please comment on how you provided this information.

3. Did you send written notices to Local Businesses?

____ Yes ____ No

If yes, please include copy of the notice and the list of individuals who were forwarded copies of the notices.

4. Did you advertise in local publications?

____ Yes ____ No

If yes, please attach copies of the ads, including name and dates of publication.

5. What type of efforts did you make to assist Local Businesses in contracting with you ?

7. List the Local Businesses you will utilize and subcontract amount.

_____	\$ _____
_____	\$ _____
_____	\$ _____

8. Other comments: _____

LOCAL BUSINESS EXHIBIT "D" – Page 2
