REHABILITATION OF WELLS

WITHIN THE

CITY OF BEVERLY HILLS, CALIFORNIA

BID ADDENDUM NO. 1

ADDENDUM No. 1 for the above referenced project hereby modifies the bid documents, as follows:

Addendum Item 1.1 Add to Specifications

Addition of following Sections to the specifications as shown in Attachment No. 1:

- **Section 01782 OPERATION AND MAINTENANCE DATA**
- **Section 01783 WARRANTIES AND BONDS**
- **Section 15958 MECHANICAL EQUIPMENT TESTING**
- **Section 113131 SUBMERSIBLE VERTICAL TURBINE PUMPS**

ATTACHMENT NO. 1

SECTION 01782

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Preparation and submittal of Operation and Maintenance Manuals.

1.02 GENERAL

A. Submit Operation and Maintenance Manuals as specified in technical sections.

B. Make approved manuals available at project site for use by construction personnel and Owner.

1.03 SUBMITTALS

A. Draft Operation and Maintenance Manuals:
   1. Submit prior to shipment of equipment or system to site.
   2. Shipment will be considered incomplete without the draft Operation and Maintenance Manuals.
   3. Quantity:
      a. Hard copy: 4 sets.
      b. Electronic: 2 CD-ROM or DVD.

B. Final Operation and Maintenance Manuals:
   1. Make additions and revisions in accordance with Owner's and Engineer's review comments on draft manuals.
   2. Submit approved Operation and Maintenance Manuals at least 30 days prior to Functional Testing and at least 60 days prior to Owner Training.
   3. Quantity:
      a. Hard copy: 4 sets.
      b. Electronic: 2 CD-ROM or DVD.

1.04 PREPARATION

A. General requirements:
   1. Provide dimensions in English units.
   2. Assemble material, where possible, in the same order within each volume.
   3. Reduce drawings and diagrams to 8 1/2 by 11-inch size, if possible unless otherwise specified.
   4. Complete forms on computer, handwriting not acceptable.
   5. Delete items or options not provided in the supplied equipment or system.
   6. Provide package control system annotated ladder logic for PLC, if applicable.

B. Hard copy requirements:
   1. Binders: 3-ring with rigid covers.
      a. Break into separate binders as needed to accommodate large size.
   2. Utilize numbered tab sheets to organize information.

3. Provide original and clear text on reproducible non-colored paper, 8 1/2 by 11-inch size, 24 pound paper.
4. Drawings larger than 8 1/2 by 11 inch:
    a. Fold drawings separately and place in envelope bound into the manual.
    b. Label each drawing envelope on the outside regarding contents.

C. Electronic requirements:
1. File format:
    a. Entire manual in PDF format.
        1) Include text and drawing information.
        2) Provide a single PDF file even if the hard copy version is broken into separate binders due to being large.
        3) Create PDF from the native format of the document (Microsoft Word, graphics programs, drawing programs, etc.).
            a) If material is not available in native format and only available in paper format, remove smudges, fingerprints, and other extraneous marks before scanning to PDF format.
            b) Hard copy record drawing requirements:
                (1) Provide a single multipage PDF file of each set of the scanned drawings.
                (2) Page 1 shall be the cover of the drawing set.
            c) At file opening, display the entire cover.
                (1) Scan drawings at 200 to 300 dots per inch (DPI), black and white, Group IV Compression, unless otherwise specified.
                (2) Scan drawings with photos in the background at 400 dots per inch (DPI), black and white, Group IV Compression.
        4) Pagination and appearance to match hard copy.
        5) Searchable.
        6) Scanned images are not acceptable.
        7) Bookmarks:
            a) Bookmarks shall match the table of contents.
            b) Bookmark each section (tab) and heading.
            c) Drawings: Bookmark at a minimum, each discipline, area designation, or appropriate division.
            d) At file opening, display all levels of bookmarks as expanded.
        8) Thumbnails optimized for fast web viewing.
    b. Drawing requirements:
        1) Drawings shall have a white background.
        2) Drawing shapes shall not degrade when closely zoomed.
        3) Screening effects intended to de-emphasize detail in a drawing must be preserved.
        4) Delete items or options not provided in the supplied equipment or system.
2. Media:
    a. CD-ROM or DVD-ROM compatible with Microsoft Windows.
    b. Flash drive.
    c. Secure Electronic File Transfer (SEFT).
3. Label media with the following information:
    a. Operation and Maintenance Manual.
    b. Equipment name.
    c. Specification Section Number
    d. Equipment tag number.

e. Owner's name.
f. Project number and name.
g. Date.

4. If multiple submittals are made together, each submittal must have its own subdirectory that is named and numbered based on the submittal number.

1.05 CONTENTS

A. Label the spines:
1. Equipment name.
2. Tag number.
3. Project name.
4. Owner name.

B. Cover page:
1. Operation and Maintenance Manual.
2. Equipment name.
3. Specification Section Number
4. Equipment tag number.
5. Owner's name.
6. Project number and name.
7. Date.

C. Table of Contents: General description of information provided within each tab section.

D. Equipment Summary Form: Completed form as specified in Appendix A of this Section.

E. Equipment Maintenance Summary Form: Completed form as specified in Appendix B of this Section.

F. Electric Motor Technical Data Form: Completed form as specified in Appendix C of this Section.

G. Description of equipment function, normal operating characteristics, and limiting conditions.

H. Manufacturer's product data sheets:
1. Where printed material covers more than 1 specific model, indicate the model number, calibrated range, and other special features.

I. Assembly, installation, alignment, adjustment, and checking instructions.

J. Storage instructions: Control diagrams:
1. Internal and connection wiring, including logic diagrams, wiring diagrams for control panels, ladder logic for computer based systems, and connections between existing systems and new additions, and adjustments such as calibrations and set points for relays, and control or alarm contact settings.
2. Complete set of 11-inch by 17-inch drawings of the control system.
3. Complete set of control schematics.

K. Start-up procedures: Recommendations for installation, adjustment, calibration, and troubleshooting.

L. Operating procedures:
   1. Step-by-step instructions including but not limited to the following:
      a. Safety precautions.
      b. Guidelines.
      c. Manual keyboard entries.
      d. Entry codes.
      e. System responses.
      f. Other information as needed for safe system operation and maintenance.
   2. Modes:
      a. Startup.
      b. Routine and normal operation.
      c. Regulation and control.
      d. Shutdown under specified modes of operation.
      e. Emergency operating shutdown.

M. Preventative maintenance procedures:
   1. Recommended steps and schedules for maintaining equipment.
   2. Troubleshooting.

N. Lubrication information: Required lubricants and lubrication schedules.

O. Overhaul instructions: Directions for disassembly, inspection, repair and reassembly of the equipment; safety precautions; and recommended tolerances, critical bolt torques, and special tools that are required.

P. Parts list:
   1. Complete parts list for equipment including but not limited to the following information:
   2. Catalog data: Generic title and identification number of each component part of equipment.
   3. Include bearing manufacturer, model and ball or roller pass frequencies for every bearing.
   4. Availability.
   5. Service locations.

Q. Spare parts list: Recommended number of parts to be stored at the site and special storage precautions.

R. Engineering data:
   1. Drawings: Complete set of 11-inch by 17-inch equipment drawings.
   2. Exploded view or plan and section views with detailed callouts.
   3. Outline, cross-section, and assembly drawings.
   4. System drawings: Provide interconnection and wiring diagrams, plan views, panel layouts, bill of materials, etc.
   5. Packaged equipment system drawings: Provide instrumentation loop drawing, control schematic diagrams, interconnection and wiring diagrams, plan views, panel layouts, bill of materials, etc.
   6. System drawings and data sheets: Include drawings and data furnished by the Engineer and the Supplier; provide "as installed" version.
   7. Provide electrical and instrumentation schematic record drawings.

S. Test data and performance curves, when applicable.

T. Manufacturer's technical reference manuals.

U. Source (factory) Test results: Provide copies of Source Tests reports as specified in technical sections.

V. Functional Test results: After Functional Tests are completed, insert Functional Test reports as specified in technical sections.

1.06 ARCHIVAL DOCUMENTATION

A. Typically does not require updating to remain valid and should be stored in a format that preserves the document and limits one's ability to make changes.

B. Types of archival documents include the following:
   1. Record drawings.
   2. Reports.
   3. Specifications.
   4. Shop drawings.
   5. Vendor Equipment O & M Manuals.
   6. Photos.
   7. Demonstration and training videos.
   8. Other.

1.07 LIVING DOCUMENTATION

A. Requires periodic updates to remain valid and should be stored in formats that are easy to update.

B. Types of living documents include the following:
   1. Facility O&M Manuals.
   2. Standard Operating Procedures.
   3. Other.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

APPENDIX A
EQUIPMENT SUMMARY FORM

1. EQUIPMENT ITEM_____

2. MANUFACTURER _____

3. EQUIPMENT IDENTIFICATION NUMBER(S)_____
(maps equipment number)

4. LOCATION OF EQUIPMENT___

5. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____

_____

_____

_____

NAMEPLATE DATA -

Horsepower_____
Amperage_____
Voltage_____
Service Factor (S.F.)_____
Speed_____
ENC Type_____
Capacity_____
Other_____

7. MANUFACTURER'S LOCAL REPRESENTATIVE

Name_____

Address_____

Telephone Number_____

8. MAINTENANCE REQUIREMENTS_____

_____

_____

9. LUBRICANT LIST_____

_____

10. SPARE PARTS (recommendations)_____

_____

11. COMMENTS_____

APPENDIX B

EQUIPMENT MAINTENANCE SUMMARY

1. Equipment Item: _____
2. Manufacturer: _____
3. Serial No. (if applicable): _____
4. Manufacturer's Order No. (if applicable): _____
5. Nameplate Data (horsepower, voltage, speed, etc.): _____

   _____
6. Manufacturer's Local Representative:

   Name: _____

   Address: _

   Telephone: _____
7. Maintenance Requirements:

Maintenance Operation	Frequency	Lubricant (if applicable)	Comments
(List each operation required. Refer to specific information in Manufacturer's Manual, if applicable)	(List required frequency of each maintenance operation)	(Refer by symbol to lubricant list as required)	

8. Lubricant List:

Reference Symbol	Conoco Phillips	Exxon/Mobil	BP/Amoco	Other (List)
(Symbols used in Item 7 above)	(List equivalent lubricants, as distributed by each manufacturer for the specific use recommended)			

9. Spare Parts: (Include recommendation on what spare parts should be kept on the job):

_____

_____

APPENDIX C

ELECTRIC MOTOR TECHNICAL DATA

Technical Data for Each Motor:

Application:_____

Manufacturer: _____

Frame No.: _____ Type: _____

Code Letter:_____ Design Letter: _____

Rating:

Horsepower: _____ Voltage: _____ Phase: _____

Cycles: _____Full Load rpm: _____

(wound rotor secondary)

Volts: _____ Amperes: _____

Full Load Current: _____ amperes

Locked Rotor Current: _____ amperes

Locked Rotor or Starting Torque (percent of full load): _____ percent

Full Load Torque: _____ ft-lb

Breakdown Torque: _____ percent

Efficiency:		Power Factor:	
Full Load:	_____ percent	Full Load	_____ percent
3/4 Load:	_____ percent	3/4 Load:	_____ percent
1/2 Load:	_____ percent	1/2 Load:	_____ percent

Insulation:

Type: _____

Class: _____

Temperature Rise: _____ Above Ambient: _____

Enclosure: _____

Net Weight: _____ lbs

Wk^2: _____ lbs/sq ft

Type of Bearings: _____

Service Factor: _____

Noise Level in Decibels: _____

Heaters: _____ kW, _____ Phase, _____ volts

Altitude: _____

SECTION 01783

WARRANTIES AND BONDS

PART 4 GENERAL

4.01 SUMMARY

A. Section includes: Warranty and bonds requirements.

4.02 SUBMITTALS

A. For each item of material or equipment furnished under the Contract:
   1. Submit form of manufacturer's warranty prior to fabrication and shipment of the item from the manufacturer's facility.
   2. Submit form of manufacturer's special warranty when specified.

B. Provide consolidated warranties and bonds within 15 calendar days of Substantial Completion.
   1. Contents:
      a. Organize warranty and bond documents:
         1) Include Table of Contents organized by specification section number and the name of the product or work item.
      b. Include each required warranty and bond in proper form, with full information, are certified manufacturer as required, and are properly executed by Contractor, or subcontractor, supplier, or manufacturer.
      c. Provide name, address, phone number, and point of contact of manufacturer, supplier, and installer, as applicable.
   2. Electronic copy in PDF format:
      a. Submit 1 copy.

4.03 OWNER'S RIGHTS

A. Owner reserves the right to reject warranties.

B. Owner reserves the right to refuse to accept Work for the project if the required warranties have not been provided.

4.04 RELATIONSHIP TO GENERAL WARRANTY AND CORRECTION PERIOD

A. Warranties specified for materials and equipment shall be in addition to, and run concurrent with, both Contractor's general warranty and the correction period requirements.

B. Disclaimers and limitations in specific materials and equipment warranties do not limit Contractor's general warranty, nor does such affect or limit Contractor's performance obligations under the correction period.

4.05 MANUFACTURER'S WARRANTY MINIMUM REQUIREMENTS

A. Written warranty issued by item's manufacturer.

B. Project-specific information, properly executed by product manufacturer, and expressly states that its provisions are for the benefit of the Owner.

C. Covers all costs associated with the correction of the defect, including but not limited to removal of defective parts, new parts, labor, and shipping.
   1. When correcting warranted Work that has failed, remove and replace other Work that had been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

D. Provides a timely response to correct the defect.
   1. Manufacturer shall provide, in a timely fashion, temporary equipment as necessary to replace warranted items requiring repair or replacement, when warranted items are in use and are critical to the treatment process, as defined by Owner.
   2. In the case that Owner has to provide temporary equipment to replace function of warranted item requiring repair or replacement, manufacturer shall reimburse Owner for such costs associated with the temporary equipment.

E. Warranty commence running on the date of substantial completion.
   1. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit warranty within 10 calendar days after acceptance, listing date of acceptance as beginning of warranty period.

F. Duration of Warranty: 1 year.

4.06 WARRANTY WORK

A. Contractor's responsibilities:
   1. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the product, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.

B. Replacement cost:
   1. Upon determination that work covered by warranty has failed, replace or rebuild the work to an acceptable condition complying with requirement of the Contract Documents.
      a. Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether Owner has benefited from the use of the work through a portion of its anticipated useful service life.

C. Related damages and losses:
   1. When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

D. Owner's recourse:
   1. Written warranties are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitation on time in which Owner can enforce such other duties, obligations, rights, or remedies.

E. Reinstatement of warranty:

1. When work covered by a warranty has failed and has been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
    a. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

4.07 IMPLIED WARRANTIES

A. Warranty of title and intellectual rights:
    1. Except as may be otherwise indicated in the Contract Documents, implied warranty of title required by Laws and Regulations is applicable to the Work and to materials and equipment incorporated therein.
    2. Provisions on intellectual rights, including patent fees and royalties, are in the General Conditions, as may be modified by the Supplementary Conditions.

B. Implied warranties: Duration in accordance with Laws and Regulations.

4.08 BONDS

A. Bond requirements as specified in the technical sections.

B. Bonds commence running on the date of substantial completion.
    1. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit warranty within 10 calendar days after acceptance, listing date of acceptance as beginning of bond period.

PART 5 PRODUCTS

Not Used.

PART 6 EXECUTION

Not used.

END OF SECTION

SECTION 15958

MECHANICAL EQUIPMENT TESTING

PART 7 GENERAL

7.01 SUMMARY

A. Section includes: Testing of mechanical equipment and systems.

7.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. S1.4 Specification for Sound Level Meters.

B. Hydraulic Institute (HI).

C. National Institute of Standards and Technology (NIST).

7.03 SUBMITTALS

A. Project closeout documents:
   1. Provide vendor operation and maintenance manual as specified in Section 01782 - Operation and Maintenance Data.

PART 8 PRODUCTS

Not Used.

PART 9 EXECUTION

9.01 GENERAL

A. Commissioning of equipment as specified in:
   1. This Section.
   2. Equipment sections:
      a. If testing requirements are not specified, provide Level 1 Tests.

B. Provide necessary test instrumentation that has been calibrated within 1 year from date of test to recognized test standards traceable to the NIST or approved source.
   1. Properly calibrated field instrumentation permanently installed as a part of the Work may be utilized for tests.
   2. Prior to testing, provide signed and dated certificates of calibration for test instrumentation and equipment.

C. Test measurement and result accuracy:
   1. Use test instruments with accuracies as recommended in the appropriate referenced standards. When no accuracy is recommended in the referenced standard, use 1 percent or better accuracy test instruments.
      a. Improved (lower error tolerance) accuracies specified elsewhere prevail over this general requirement.

2. Do not adjust results of tests for instrumentation accuracy.
    a. Measured values and values directly calculated from measured values shall be the basis for comparing actual equipment performance to specified requirements.

9.02 VARIABLE SPEED EQUIPMENT TESTS

A. Establish performance over the entire speed range and at the average operating condition.

B. Establish performance curves for the following speeds:
1. The speed corresponding to the rated maximum capacity.
2. The speed corresponding to the minimum capacity.
3. The speed corresponding to the average operating conditions.

9.03 PUMP TESTS, ALL LEVELS OF TESTING

A. Test in accordance with the following:
1. Applicable HI Standards.
2. This Section.
3. Equipment sections.

B. Test tolerances: In accordance with appropriate HI Standards, except the following modified tolerances apply:
1. From 0 to plus 5 percent of head at the specified flows.
2. From 0 to plus 5 percent of flow at the rated design point head.
3. No negative tolerance for the efficiency at the specified flows.
4. No positive tolerance for vibration limits. Vibration limits and test methods in HI Standards do not apply, use limits and methods specified in this or other Sections of the Specifications.

9.04 DRIVERS TESTS

A. Test other drivers as specified in the equipment section.

9.05 PRESSURE TESTING

A. Hydrostatically pressure test pressure containing parts at the appropriate standard or code required level above the equipment component specified design pressure or operating pressure, whichever is higher.

9.06 INSPECTION AND BALANCING

A. Statically and dynamically balance each of the individual rotating parts as required to achieve the required field vibration limits.

B. Statically and dynamically balance the completed equipment rotating assembly and drive shaft components.

C. Furnish copies of material and component inspection reports including balancing reports for equipment system components and for the completed rotating assembly.

D. Critical speed of rotating equipment:

1. Satisfy the following:
    a. The first lateral and torsional critical speed of all constant, variable, and 2-speed driven equipment that is considered rigid such as horizontal pumps, all non-clog pumps, blowers, air compressors, and engines shall be at least 25 percent above the equipment's maximum operating speed.
    b. The first lateral and torsional critical speed of all constant, variable, and 2-speed driven equipment that is considered flexible or flexibly mounted such as vertical pumps (vertical in-line and vertical non-clog pumps excluded) and fans shall at least 25 percent below the equipment's lowest operating speed.
    c. The second lateral and torsional critical speed of all constant, variable, and 2-speed equipment that is considered flexible or flexibly mounted shall be at least 25 percent above the maximum operating speed.

9.07 TESTING LEVELS

A. Level 1 Tests:
    1. Level 1 General Equipment Performance Test:
        a. For equipment, operate, rotate, or otherwise functionally test for 15 minutes minimum after components reach normal operating temperatures.
        b. Operate at rated design load conditions.
        c. Confirm that equipment is properly assembled, equipment moves or rotates in the proper direction, shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
    2. Level 1 Pump Performance Test:
        a. Measure flow and head while operating at or near the rated condition; for factory testing, testing may be at reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.
        b. Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower or the applicable equipment section. Use actual driver for field tests.
        c. Record measured flow, suction pressure, discharge pressure, and make observations on bearing temperatures and noise levels.

B. Level 2 Tests:
    1. Level 2 General Performance Test:
        a. For equipment, operate, rotate, or otherwise functionally test for at least 2 hours after components reach normal operating temperatures.
        b. Operate at rated design load conditions.
        c. Confirm that equipment is properly assembled, equipment moves or rotates in the proper direction, shafting, drive elements, and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual power consumption, lubrication temperatures, bearing temperatures, or other conditions are observed.
    2. Level 2 Pump Performance Test:
        a. Test 2 hours minimum for flow and head at the rated condition; for factory testing, testing may be at a reduced speeds with flow and head

corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.

b. Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower. Use actual driver for field tests.

c. Test for flow and head at 2 additional conditions; 1 at 25 percent below the rated flow and 1 at 10 percent above the rated flow.

d. Record measured flow, suction pressure, discharge pressure, and observations on bearing temperatures and noise levels at each condition.

C. Level 3 Tests:

1. Level 3 General Equipment Performance Tests:

a. For equipment, operate, rotate, or otherwise functionally test for at least 4 hours after components reach normal operating temperatures.

b. Operate at rated design load conditions for 1/2 the specified time; operate at each of any other specified conditions for a proportionate share of the remaining test time.

c. Confirm that equipment is properly assembled, equipment rotates in the proper direction, shafting and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual noise, vibration, or temperatures are observed.

d. Take appropriate capacity, power or fuel consumption, torque, revolutions per minute, pressure, and temperature readings using appropriate test instrumentation to confirm equipment meets specified performance requirements at the design rated condition.

e. Bearing temperatures: During maximum speed or capacity performance testing, measure and record the exterior surface temperature of each bearing versus time.

2. Level 3 Pump Performance Test:

a. Test 4 hours minimum for flow and head at or near the rated condition; for factory testing, testing may be at a reduced speeds with flow and head corresponding to the rated condition when adjusted for speed using the appropriate affinity laws.

b. Use of a test driver is permitted for factory tests when actual driver is given a separate test at its point of manufacture as specified in Section 16222 - Low Voltage Motors up to 500 Horsepower. Use actual driver for field tests.

c. Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 15 minutes; for factory testing, test at other speeds may be omitted if test driver at reduced speeds is used for rated condition testing.

d. Record measured shaft revolutions per minute, flow, suction pressure, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices are not required by the equipment section) and record observations on noise levels.

D. Level 4 Tests:

1. Level 4 General Equipment Performance Test:

a. For equipment, operate, rotate, or otherwise functionally test for at least 8 hours after components reach normal operating temperatures.
b. Operate at rated design load conditions for 1/2 the specified time; operate at each of any other specified conditions for a proportionate share of the remaining test time.
c. Confirm that equipment is properly assembled, equipment rotates in the proper direction, shafting and bearings are installed and lubricated in accordance with proper tolerances, and that no unusual noise, vibration, or temperatures are observed.
d. Take appropriate capacity, power or fuel consumption, torque, revolutions per minute, pressure and temperature readings, using appropriate test instrumentation to confirm equipment meets specified performance requirements at the design rated condition.
e. Bearing temperatures: During maximum speed or capacity testing, measure and record the exterior surface temperature of each bearing versus time.

2. Level 4 Pump Performance Test:
   a. Test 8 hours minimum for flow and head; begin tests at or near the rated condition; for factory and field-testing, test with furnished motor at full speed.
   b. Test each specified flow and head condition at the rated speed and test at minimum as well as maximum specified speeds; operate at each test condition for a minimum of 20 minutes or longer as necessary to measure required performance, vibration, and noise data at each test condition.
   c. Record measured shaft revolutions per minute, flow, suction pressure, discharge pressure; record measured bearing temperatures (bearing housing exterior surface temperatures may be recorded when bearing temperature devices not required by the equipment section) and record observations on noise levels.
   d. Bearing temperatures: During maximum speed or capacity testing, measure and record the exterior surface temperature of each bearing versus time.
   e. Perform efficiency and/or Net Positive Suction Head Required (NPSHr) and/or priming time tests when specified in the equipment section in accordance with the appropriate HI standard and as follows:
      1) Perform NPSHr testing at maximum rated design speed, head and flow with test fluids at ambient conditions; at maximum rated speed, test at 15 percent above rated design flow, and 25 percent below rated design flow.
      2) Perform efficiency testing with test fluids at maximum rated speed.
      3) Perform priming time testing with test fluids at maximum rated speed.

END OF SECTION

SECTION 11313I

SUBMERSIBLE VERTICAL TURBINE PUMPS

PART 10 GENERAL

10.01 SUMMARY

A. Section includes: Vertical submersible well pumps.

B. Tag numbers: As specified in Pump Schedule.

10.02 REFERENCES

A. American Water Works Association (AWWA):
   1. C654 - Disinfection of Wells.

B. ASTM International (ASTM):
   1. A48 - Standard Specification for Gray Iron Castings.
   2. A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. A276 - Standard Specification for Stainless Steel Bars and Shapes.
   4. A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.
   5. A516 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.
   6. A536 - Standard Specification for Ductile Iron Castings.
   7. A582 - Standard Specification for Free Machining Stainless Steel Bars.
   8. B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
   9. F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
   10. F594 - Standard Specification for Stainless Steel Nuts.

C. The Hydraulic Institute (HI):
   1. 2.1-2.2 - Rotodynamic (Vertical) Pumps for Nomenclature and Definitions.
   2. 2.3 - Rotodynamic (Vertical) Pumps for Design and Applications.
   3. 2.4 - Rotodynamic (Vertical) Pumps for Manual Describing Installation, Operations, and Maintenance.
   4. 9.1-9.5 - Pumps - General Guidelines for Types, Definitions, Application, Sound Measurement and Decontamination.
   5. 14.6 - Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.

D. National Electrical Manufacturers Association (NEMA).

E. NSF International (NSF):
   1. Standard 61 - Drinking Water System Components - Health Effects.

10.03 DEFINITIONS

A. Pump head (total dynamic head, TDH), flow capacity, pump efficiency, net positive suction head available (NPSHa), and net positive suction head required (NPSHr) as

defined in HI 2.1-2.2, 2.3, 2.4, 9.1-9.5, and 14.6 and as modified in the Specifications. The pump head and efficiency are evaluated at the outlet of the discharge head and include the net losses in the pump column and discharge.

B. Flow, head, efficiency, and motor horsepower specified in this Section are minimums unless stated otherwise.

C. Suction head: Gauge pressure available at pump intake flange or bell in feet of fluid above atmospheric.

D. Tolerances: This Section and related sections contain tolerances that may be more stringent than Hydraulic Institute Standard tolerances. Where tolerances are not mentioned, Hydraulic Institute Standards 2.1-2.2, 2.3, 2.4, and 9.1-9.5 shall apply.

10.04 SUBMITTALS

A. Submit as specified below
   1. Certification: Contractor is responsible to determine and verify all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and check and coordinate each item with other applicable approved shop drawings and all Contract requirements.
   2. Provide submittals that are specified or reasonably required for construction, operation, and maintenance of the Work.
   3. Edit all submittals so that the submittal specifically applies to only the equipment furnished. Neatly cross out all extraneous text, options, models, etc. that do not apply to the equipment being furnished, so that the information remaining is only applicable to the equipment being furnished.
   4. Show dimensions, construction details, wiring diagrams, controls, manufacturers, catalog numbers, and all other pertinent details.
   5. Submittals in electronic media format:
      a. General: Provide all information in PC-compatible format using Windows® operating system as utilized by the Owner and Engineer.
      b. Text: Provide text documents and manufacturer's literature in Portable Document Format (PDF).

B. Product data:
   1. For each item of equipment:
      a. Design features.
      b. Load capacities.
      c. Efficiency ratings.
      d. Material designations by UNS alloy number or ASTM Specification and Grade.
      e. Data needed to verify compliance with the Specifications.
      f. Catalog data.
      g. Nameplate data.
      h. Clearly mark submittal information to show specific items, materials, and accessories or options being furnished.

C. For pumps in contact with Drinking Water application submit one of the following:
   1. Calculations/certifications in accordance with NSF 61 and 372 for materials in contact with drinking water.
   2. Certification by an independent ANSI accredited third party, including, but not limited to, NSF International, as being lead free.

3. Materials in contact with drinking waters: In accordance with California Health and Safety Code, Section 116875.

D. Shop drawings:
   1. Drawings for equipment:
      a. Drawings that include cut-away drawings, parts lists, material specification lists, and other information required to substantiate that proposed equipment complies with specified requirements.
   2. Outline drawings showing equipment, driver, driven equipment, pumps, seal, motor(s) or other specified drivers, variable frequency drive, shafting, U-joints, couplings, drive arrangement, gears, base plate or support dimensions, anchor bolt sizes and locations, bearings, and other furnished components.
   3. Installation instructions including leveling and alignment tolerances, grouting, lubrication requirements, and initial Installation Testing procedures.
   4. Wiring, control schematics, control logic diagrams and ladder logic or similar for computer-based controls.
   5. Recommended or normal operating parameters such as temperatures and pressures.
   6. Alarm and shutdown setpoints for all controls furnished.

E. Calculations:
   1. Structural:
      a. Substantiate equipment base plates, supports, bolts, anchor bolts, and other connections meet minimum design requirements and seismic design criteria.
   2. Mechanical:
      a. ABMA 9 or ABMA 11 L10 life for bearings calculation methods for drivers, pumps, gears, shafts, motors, and other driveline components with bearings.
      b. Substantiate that operating rotational frequencies meet the requirements of this Section.
      c. Torsional analysis of power transmission systems: When torsional analysis specified in the equipment sections, provide:
         1) Sketch of system components identifying physical characteristics including mass, diameter, thickness, and stiffness.
         2) Results of analysis including first and second critical frequencies of system components and complete system.
      d. Calculations shall be signed and stamped by a licensed engineer.

F. Vendor operation and maintenance manuals: As specified in Section 01782 - Operation and Maintenance Data.

G. Commissioning submittals:
   1. Provide Manufacturer’s Certificate of Source Testing.
   2. Provide Manufacturer’s Certificate of Installation and Functionality Compliance.

10.05 SYSTEM DESCRIPTION

A. Pumps to be install in existing wells. Match existing pump installation.

10.06 WARRANTY

A. As specified in Section 01783 - Warranties and Bonds.

PART 11 PRODUCTS

11.01 MANUFACTURERS

A. One of the following or equal:
   1. Flowserve.
   2. Goulds Pumps, VIS series.

11.02 MATERIALS

A. General:
   1. Materials in the Pump Schedule shall be the type and grade as specified in this Section.

B. Drinking water pumps: Provide materials in conformance with NSF 61 and 372.

C. Cast Iron: In accordance with ASTM A48, Class 30 minimum.

D. Ductile Iron: In accordance with ASTM A536, 65-45-12.

E. Tin Bronze: In accordance with ASTM B584, Alloy C90300.

F. Silicon Bronze: In accordance with ASTM B584, Alloy C87600.

G. Red Bronze: In accordance with ASTM B584, Alloy C83600.

H. Type 416 Stainless Steel: In accordance with ASTM A582.

I. Type 304 Stainless Steel: In accordance with ASTM A276.

J. HDPE: Polyethylene.

K. Steel: In accordance with ASTM A283, Grade D or ASTM A516 Grade 70.

L. Steel pipe: In accordance with ASTM A53, Grade B.

11.03 GENERAL PUMP CONSTRUCTION

A. Pumps are to be of the deep well, multi-stage, vertical turbine, and submersible type.

B. Provide discharge column and sealed well head.

C. Fasteners: Provide Type 304 stainless steel fasteners in accordance with ASTM F593 or ASTM F594.

11.04 IMPELLER BOWL ASSEMBLIES

A. Pump impeller assembly:
   1. Type: As scheduled in the Pump Schedule.
   2. Number of stages: As scheduled in the Pump Schedule.
   3. Material: 316 SST.
   4. Required balance: As specified to meet vibration criteria as specified in Section 15958 - Mechanical Equipment Testing.
   5. Method of securing impellers to shafts:
      a. Single keyed and securely fastened to the shaft by a Type 416 Stainless Steel collets.

B. Shafts:
   1. Material: Type 416 stainless steel.
   2. Turned, ground and polished.

C. Intermediate and discharge impeller cases:
   1. Material: Cast Iron with fusion epoxy lined water passages.
   2. Attached with bolting.

D. Pump impeller bowl bearings:
   1. Provide bearing for each impeller.
   2. Materials: Tin Bronze.

E. Discharge and suction bearing:
   1. Material: Tin Bronze.
   2. Lubricated with non-toxic grease approved by the Food and Drug Administration.
   3. Protected by Red Bronze sand collar.

F. Design with smooth water passages to reduce clogging by stringy or fibrous materials on impellers or shafting.

11.05 SUCTION ADAPTOR

A. Material: Cast Iron.

B. Provide a Type 304 stainless steel strainer.

C. Designed to prevent entrance of abrasive material into the top end of the motor.

11.06 COLUMN PIPE

A. Material: Seamless steel casing pipe, API 5CT Grade J55.

B. Size: As scheduled in the Pump Schedule.

C. Head connection: Design with and flange bolted connection to discharge head and flange bolted connection to impeller assembly.

D. Design Working Pressure: Design to withstand a design working pressure not less than 1.20 times the maximum shutoff total dynamic head with the maximum

diameter impeller at the maximum operating speed plus the maximum suction static head.

E. Pressure test: Design to withstand a 5 minute hydrostatic test pressure not less than 1.5 times the design working pressure; perform test at source.

F. Lengths and connections:
   1. Design with maximum 40-foot length.
   2. Flanged or threaded.

11.07 WELL HEAD

A. Manufacturers: The following or equal:
   1. Baker Manufacturing Co., Monitor Division.

B. General:
   1. The well head shall be a Pitless Adapter Assembly with well cap, lift-out bail, hold down hooks, lift out pipe, discharge body with support rings, spools and check valves.
   2. The pitless unit shall have a factory assembled hold-down mechanism that is capable of preventing rotation of the pitless spool at full locked rotor torque of the submersible motor.
      a. The spool shall have a lift-out pipe and bail that is designed of sufficient strength to remove the pumping unit with the column pipe full of water from the well.
   3. NSF 61 approved.

C. Well cap:
   1. The well cap shall be secured to the upper casing with a compression gasket.
   2. The top of the cap shall be capable of being removed without affecting the sealed conduit or wiring.
   3. The watertight cap shall have a separate protected, downward facing stainless steel screened well vent with pipe nipple.
   4. The well cap and well vent shall be constructed of heavy-duty gray cast iron and painted with an enamel finish.

D. Upper casing:
   1. Factory assembled to the discharge body and the lift-out pipe and hold-down mechanism shall be factory assembled to the spool.
   2. Provide a watertight connection from the discharge body to the well cap.
   3. The upper casing and hold-down pipe shall be constructed of steel and have a corrosion resistant coating approved by the Engineer.
   4. The discharge port location and upper casing shall match existing installation.

E. Spool and discharge body:
   1. The spool shall be constructed of ductile iron and the discharge body shall be constructed of ductile iron.
   2. The spool and discharge body shall be fusion bonded epoxy coated.
   3. The spool shall have o-ring grooves machined into the spool retaining the o-rings when setting or pulling the system.
   4. The discharge body shall be designed to prevent distortion due to vertical movement of the discharge pipe.

5. The I.D. of the discharge body shall be equal to or greater than the I.D. of the well surface casing.
6. The discharge connection shall be flanged connection to the service piping to match existing wellhead piping.

11.08 DRIVERS

A. Horsepower:
   1. As scheduled.
   2. Listed driver horsepower is the minimum to be supplied.
      a. Increase driver horsepower if required to prevent driver overload while operating at any point of the supplied pump operating head-flow curve including runout.
      b. When scheduled driver is a motor, increase motor horsepower if required to prevent operation in the service factor.
      c. Make all structural, mechanical, and electrical changes required to accommodate increased horsepower.

B. Motors:
   1. Manufactures: One of the following or equal:
      a. Hitachi.
      b. CentriPro.
   2. NSF Standard 61 certified.
   3. Revolutions per minute: 3,600.
   4. Enclosure: Submersible.
   5. Electrical characteristics: As scheduled in the Pump Schedule.
   6. Motor construction:
      a. Motor can: Type 304 stainless steel.
      b. Thrust bearing: Kingsbury type.
      c. Upper and lower radial bearings: Carbon sleeve.
      d. The motor coupling: Type 416 stainless steel either keyed or splined as required to fit the motor shaft.
      e. Temperature rating: Continuous duty in water at 30 degrees Celsius.

C. Cables:
   1. The flat cable shall be shielded and comprised of 4 separate conductors or a single cable assembly with 4 conductors.
   2. Each conductor shall be insulated by synthetic rubber or plastic insulation suitable for continuous immersion in water.
   3. The cable shall be protected with steel guard where it passes the bowl assembly to prevent damage from contact with the well casing.
   4. Type 304 stainless steel bands shall be provided to support the cable along the column pipe at intervals of not more than 20 feet.
   5. The power cable shall be sized such that the voltage drop will not exceed 5 percent at the motor rated full load current and voltage.

11.09 ACCESSORIES

A. Air-line tubing:
   1. Manufacturers: The following or equal:
      a. Eaton Control Systems.

2. Type 1005-44204 Dekoron, 1/4-inch O.D., 0.035-inch wall thickness, single line, stainless steel tubing with 0.032-inch wall thickness, PVC coating.
3. 1 unbroken continuous length from the bowl assembly discharge case through the discharge head base to the air-line gauge assembly.
4. Secured to each column pipe joint, a minimum of 1 location, utilizing vinyl filament tape, or approved equal.
5. Secured to the top side of the discharge head base utilizing a CGB connector, straight male thread, steel finish, 1-1/2-inch I.P. thread size, complete with gland nut and neoprene bushing.
    a. Manufacturers: The following or equal:
        1) Crouse-Hinds - catalog No. CGB 293.
6. 1 bossed vent hole in the discharge head shall be adapted for the 1-1/2-inch thread size connector on the top side of the discharge head base.

B. Air-line gauge:
1. Manufacturers: The following or equal.
    a. Marshalltown.
2. Size: 4-1/2-inch, dual scale, calibrated in feet of water and pounds per square inch with pressure gauge span from 0 to 200 pounds per square inch.

C. Pressure transmitter enclosing tube:
1. The pressure transmitter enclosing tube shall be 1-1/4-inch Schedule 80, NSF-PW PVC (polyvinyl chloride) plastic pipe.
    a. The PVC pipe shall be furnished in 1-1/4-inch I.D., color-gray, 20 feet - 0 inches foot joints with bell and spigot ends for PVC cement-solvent welding.

D. Submersible pressure transmitter:
1. The pump supplier shall furnish submersible pressure transmitters with each pump to measure well water level.
    a. The pressure transmitters shall be attached to pump assembly.
2. As specified in Section 17407 - Pressure Measurement: Submersible.
3. The pressure transmitter enclosing tube shall be 1 continuous length from the top of the pump bowl assembly to no more than 5 feet below the pitless adapter connection.
4. The cable shall be routed through the spool, upper casing and well cap and suspended by a method proposed by the Contractor and approved by the Engineer.

E. Column pipe check valves:
1. The column pipe check valves shall be all steel 1,000-pound test, equipped with a neoprene tube rounded upper cross bar to absorb seat-opening shock.
2. One shall be placed approximately 75 feet above the pump and equipped to bleed back through hinge openings when valve seats are closed.
    a. The other check valve shall be placed at a depth determined prior to pump installation.

11.10 CONTROLS

A. Pumps shall be connected to existing VFD.

11.11 SPARE PARTS AND SPECIAL TOOLS

A. Spare parts:
   1. Seal packing material: 1 set of each type supplied.
   2. Pump impeller/bowl assembly: 1 of each type supplied.

B. Special tools: Deliver 1 set for each furnished pump type and size needed to assemble and disassemble pump system.

PART 12 EXECUTION

12.01 STERILIZATION

A. Disinfection procedures shall be in accordance with AWWA C654.

B. Samples for bacteriological analysis shall be collected in a sterile container at the pump discharge, and a test made for coliform organisms.
   1. After sterilization, the well shall be pumped at open discharge until at least 100,000 gallons of water have been pumped before the samples are collected.
   2. Water samples shall be collected from the well on 3 successive days and analyzed for coliform organisms with each sample showing that no organisms were found before the well is accepted for showing the water is coliform free.
   3. The samples shall be collected by a laboratory approved by the Owner and the test for coliform organisms shall be made by the laboratory, and the Owner shall be furnished a copy of the laboratory report.
   4. If any coliform organisms are found present in the samples, the Contractor shall re-sterilize the pump and have the water resampled as stated above until such time as no coliform organisms are found present in a water samples collected after at least 100,000 gallons of water have been pumped from the well following sterilization, or until such time as the Owner becomes convinced that coliform organisms exist naturally in the water-bearing formation and are not present in water produced from the well as a result of the operations of the Contractor.
   5. All expenses of sterilization of the pump and laboratory analyses for coliform organisms shall be borne by the Contractor.

C. The water discharged by the pump following disinfection shall be dechlorinated to a level of 2.0 or less milligrams per liter chlorine before it is allowed to leave the site.

12.02 COMMISSIONING

A. Manufacturer services:
   1. Provide certificates:
      a. Manufacturer’s Certificate of Source Testing.
      b. Manufacturer’s Certificate of Installation and Functionality Compliance.
   2. Manufacturer’s Representative onsite requirements:
      a. Installation: 3 trips, 2-day minimum.
      b. Functional Testing: 3 trips, 2-day minimum each.
   3. Training:
      a. Maintenance: 4 hours per session, 2 sessions.
      b. Operation: 2 hours per session, 2 sessions.
   4. Process operational period:

a. As required by Owner or Contractor.

B. Source testing: As specified in Pump Schedule and specification section 15958.

C. Functional testing: As specified in Pump Schedule specification section 15958.

12.03 PUMPS SCHEDULE

Tag Numbers	Well No. 2	Well No. 4
General Characteristics:		
Application	Drinking Water	Drinking Water
Well No.	2	4
Service	Raw Well Water	Raw Well Water
Quantity	1	1
Inner/Outer Casing Diameter at land surface, inches	12.25 / 24	12.25 / 24
Estimated static water level, feet[1]	196	262
Estimated pumping water level, feet[1]	296	362
Estimated discharge head above ground at 500 gpm, feet of water	180	160
Estimated field head at 500 gpm, feet		
Column pipe, air line and pressure transducer setting, feet[1]	431	431
Maximum Pumped Fluid Degrees Fahrenheit	95	95
Pump Characteristics:		
Number of Stages	Per Manufacture	Per Manufacture
Impeller type	Enclosed	Enclosed
Maximum diameter of motor, inches	9	9
Maximum diameter pump bowl assembly, inches	9	9
Maximum Column Section Lengths, Feet	40	40
Column pipe internal diameter, inches	6 inches	6 inches
Speed Control	Variable Frequency Drive	Variable Frequency Drive
Maximum Pump rpm	3400	3400
Rated Design Point (at Maximum Revolutions per Minute):		
Flow, gpm	400	400
Head, Feet	532	532
Minimum Efficiency, Percent	70	70
Required Condition 2 (at Maximum Revolutions per Minute):		
Flow, gpm	240	240
Head Range, Feet	600	600

Tag Numbers	Well No. 2	Well No. 4
Minimum Efficiency, Percent	55	55
Required Condition 3 (at Maximum Revolutions per Minute):		
Flow, gpm	480	480
Head Range, Feet	476	476
Minimum Efficiency, Percent	75	75
Other Conditions:		
Minimum Shut Off Head, Feet	700	700
Maximum NPSHr at every Specified Flow, Feet	30	30
Motor Characteristics		
Driver Horsepower	75	75
Motor Voltage/Phase/Hertz	460/3/60	460/3/60
Service Factor	1.15	1.15
Full Load Current, Amperes	110	110
Locked Rotor Current, Amperes	650	650
Motor Efficiency (At 100 Percent Load) Minimum	80%	80%
Vendor Control Panel		
Required	Not Required	Not Required
Motor Control	Not Required	Not Required
Source Testing:		
Test Witnessing	Not Witnessed	Not Witnessed
Performance Test Level	1	1
Vibration Test Level	Not Required	Not Required
Noise Test Level	Not Required	Not Required
Functional Testing:		
Performance Test Level	3	3
Vibration Test Level	Not Required	Not Required
Noise Test Level	Not Required	Not Required
Notes: 1. Depth in feet below grade.		

Tag Numbers	Well No. 6
General Characteristics:	
Application	Drinking Water
Well No.	6
Service	Raw Well Water
Quantity	1
Inner/Outer Casing Diameter at land surface, inches	12.25 / 24
Estimated static water level, feet[1]	172
Estimated pumping water level, feet[1]	277
Estimated discharge head above ground at 500 gpm, feet of water	160
Estimated field head at 500 gpm, feet	
Column pipe, air line and pressure transducer setting, feet[1]	465
Maximum Pumped Fluid Degrees Fahrenheit	95
Pump Characteristics:	
Number of Stages	Per Manufacture
Maximum diameter of motor, inches	Enclosed
Maximum diameter pump bowl assembly, inches	9
Maximum Column Section Lengths, Feet	9
Column pipe internal diameter, inches	40
Speed Control	6 inches
Maximum Pump rpm	Variable Frequency Drive
Rated Design Point (at Maximum Revolutions per Minute):	
Flow, gpm	350
Head, Feet	510
Minimum Efficiency, Percent	70
Required Condition 2 (at Maximum Revolutions per Minute):	
Flow, gpm	210
Head Range, Feet	572
Minimum Efficiency, Percent	50
Required Condition 3 (at Maximum Revolutions per Minute):	
Flow, gpm	420
Head Range, Feet	470
Minimum Efficiency, Percent	75
Other Conditions:	

Tag Numbers	Well No. 6
Minimum Shut Off Head, Feet	660
Maximum NPSHr at every Specified Flow, Feet	30
Motor Characteristics	
Driver Horsepower	75
Motor Voltage/Phase/Hertz	460/3/60
Service Factor	1.15
Full Load Current, Amperes	110
Locked Rotor Current, Amperes	650
Motor Efficiency (At 100 Percent Load) Minimum	80%
Vendor Control Panel	
Required	Not Required
Motor Control	Not Required
Source Quality Control Testing:	
Test Witnessing	Not Witnessed
Performance Test Level	1
Vibration Test Level	Not Required
Noise Test Level	Not Required
Field Quality Control Testing:	
Test Witnessing	Not Witnessed
Performance Test Level	3
Vibration Test Level	Not Required
Noise Test Level	Not Required
Notes: 1. Depth in feet below grade.	

END OF SECTION