PROFESSIONAL SERVICES AGREEMENT

THIS AGREEMENT, is made and entered into to be effective the «EffectiveDate» day of «EffectiveMonth», «Year», by and between the ORANGE COUNTY SANITATION DISTRICT, hereinafter referred to as "OC SAN", and «Company», for purposes of this AGREEMENT hereinafter referred to as "CONSULTANT". OC SAN and CONSULTANT are referred to herein collectively as the "Parties" or individually as a "Party."

WITNESSETH:

WHEREAS, OC SAN desires to engage a consultant for **Programming Professional Services, PSA2021-001**, to provide qualified staff as described in Attachment “A”, Scope of Work; and Attachment “A1”, Rules of Engagement, and,

WHEREAS, CONSULTANT is qualified to provide the necessary services in connection with these requirements and has agreed to provide the requisite personnel and experience, and is capable of performing such services; and,

WHEREAS, OC SAN has adopted procedures for the selection of professional services and has proceeded in accordance with said procedures to select a CONSULTANT to perform this work; and,

WHEREAS, OC SAN shall manage selection of a Consultant for Task Order(s) and Task Directive(s) when requested after award of this AGREEMENT based on the most appropriate qualifications and fit; and,

WHEREAS, at its regular meeting on «BoardMeetingDate» the Board of Directors, by Minute Order, accepted the recommendation of the Operations Committee to approve this AGREEMENT between OC SAN and CONSULTANT.

NOW, THEREFORE, in consideration of the promises and mutual benefits, which will result to the parties in carrying out the terms of this AGREEMENT, it is mutually agreed as follows:

1. SCOPE OF WORK

CONSULTANT agrees to furnish necessary qualified staff to accomplish the Scope of Work attached hereto as "Attachment A". Attachment “A” is hereby incorporated into this AGREEMENT. In the event of a conflict between the Scope of Work and this AGREEMENT, the terms of this AGREEMENT shall prevail.

2. COMPENSATION

Total compensation shall be paid to CONSULTANT for services in accordance with the following provisions:

A. Time and Material: Not to Exceed Aggregate Amount

OC SAN shall compensate CONSULTANT for services performed under this AGREEMENT on a time and materials basis, not to exceed a maximum aggregate amount of «Grand Total Written Amount» Dollars ($«Grand Total Amount») ("Total Compensation") during the term of the AGREEMENT.

B. Hourly Rates

As a portion of the total compensation to be paid to CONSULTANT, OC SAN shall pay to CONSULTANT a sum equal to the burdened salaries (salaries plus benefits, overhead, and profit) actually paid by CONSULTANT charged on an hourly-rate basis and paid to the personnel of CONSULTANT per **Attachment "E"**. OC SAN shall also pay to CONSULTANT a sum equal to the premium costs for overtime, charged on an hourly-rate basis, actually paid by CONSULTANT to the non-exempt personnel of CONSULTANT plus profit. Premium costs for overtime will not include fringe and overhead. **Attachment "E"** is hereby incorporated by reference. Upon request of OC SAN, CONSULTANT shall provide OC SAN with certified payroll records of all employees' work that is charged to this AGREEMENT.

C. Overhead Rates

"Field Staff" are defined as project-assigned staff by CONSULTANT, working at OC SAN's facilities for a project-assigned period exceeding ninety (90) continuous calendar days. The overhead rates for Field Office Staff are included in **Attachment "E"**.

"Home Office Staff" are defined as staff assigned by CONSULTANT, supporting the project-assigned work, either by working at CONSULTANT's or Subconsultant's offices or at OC SAN's site for periods less than ninety (90) continuous calendar days. The overhead rates for Home Office Staff are included in **Attachment "E"**.

D. Profit

Profit for CONSULTANT and Subconsultants shall be five percent (5%). Addenda shall be governed by the same maximum Profit percentage.

As a portion of the total compensation to be paid to CONSULTANT and Subconsultants, OC SAN shall pay profit for all services rendered by CONSULTANT and Subconsultants for this AGREEMENT.

E. Subconsultants

For all Subconsultants, CONSULTANT may pay to Subconsultants total compensation on an hourly-rate basis per **Attachment "E**" – Fee Proposal Form and as specified in the Scope of Work. OC SAN shall pay to CONSULTANT the actual costs of Subconsultants, without markup.

F. Escalation

For purposes of calculating hourly billing rates of CONSULTANT employees and any Subconsultant employees performing services under this AGREEMENT, the Maximum Hourly Rate as defined in **Attachment "E"** shall be adjusted annually based on the Employment Cost Index (ECI) of Los Angeles-Long Beach-Riverside, California as of July 1 of each year. This rate is from the United States Department of Labor Bureau of Labor Statistics. The annual adjustments shall not exceed three percent (3%).

G. Reimbursable Direct Costs

OC SAN will reimburse the CONSULTANT for reasonable travel and business expenses as described in this section and further described in Attachment "D" - Allowable Direct Costs to this AGREEMENT. The reimbursement of the above mentioned expenses will be based on an "accountable plan" as considered by Internal Revenue Service (IRS). The plan includes a combination of reimbursements based upon receipts and a "per diem" component approved by IRS. The most recent schedule of the per diem rates utilized by OC SAN can be found on the U.S. General Service Administration website at http://www.gsa.gov/portal/category/104711#.

The CONSULTANT shall be responsible for the most economical and practical means or management of reimbursable costs inclusive but not limited to travel, lodging and meals arrangements. OC SAN shall apply the most economic and practical method of reimbursement which may include reimbursements based upon receipts and/or "per diem" as deemed the most practical.

CONSULTANT shall be responsible for returning to OC SAN any excess reimbursements after the reimbursement has been paid by OC SAN.

Travel and travel arrangements – Any travel involving airfare, overnight stays or multiple day attendance must be approved by OC SAN in advance.

Local Travel is considered travel by the CONSULTANT within OC SAN geographical area which includes Orange, Los Angeles, Ventura, San Bernardino, Riverside, San Diego, Imperial and Kern Counties. Automobile mileage is reimbursable if CONSULTANT is required to utilize personal vehicle for local travel.

Lodging – Overnight stays will not be approved by OC SAN for local travel. However, under certain circumstances overnight stay may be allowed at the discretion of OC SAN based on reasonableness of meeting schedules and the amount of time required for travel by the CONSULTANT. Such determination will be made on a case-by-case basis and at the discretion of OC SAN.

Travel Meals – Per-diem rates as approved by IRS shall be utilized for travel meals reimbursements. Per diem rates shall be applied to meals that are appropriate for travel times. Receipts are not required for the approved meals.

Additional details related to the reimbursement of the allowable direct costs are provided in the Attachment "D" - Allowable Direct Costs of this AGREEMENT.

OC SAN shall also pay to CONSULTANT actual costs for equipment rentals, leases or purchases with prior approval of OC SAN.

OC SAN will not pay per diem for Field Office Staff nor will it pay for any relocation of staff to be assigned under this AGREEMENT.

H. Limitation of Costs

If, at any time, CONSULTANT estimates the cost of performing the services described in CONSULTANT's Task Authorizations will exceed seventy-five percent (75%) of the not-to-exceed amount of the Task Authorization, CONSULTANT shall notify OC SAN immediately, and in writing. This written notice shall indicate the additional amount necessary to complete the services. Any cost incurred in excess of the approved not-to-exceed amount, without the express written consent of OC SAN's authorized representative shall be at CONSULTANT's own risk. This written notice shall be provided separately from, and in addition to any notification requirements contained in the CONSULTANT's invoice and monthly progress report. Failure to notify OC SAN that the services cannot be completed within the authorized not-to-exceed amount is a material breach of this AGREEMENT.

3. REALLOCATION OF TOTAL COMPENSATION

OC SAN, by its Director of Engineering, shall have the right to approve a reallocation of the incremental amounts constituting the Total Compensation, provided that the Total Compensation is not increased.

4. KEY POSITIONS

CONSULTANT shall notify OC SAN in advance changes to any key CONSULTANT employees performing services under this AGREEMENT. Positions considered to be Key Positions are Point of Contact and any staff leading Task Authorizations and Task Directives under the AGREEMENT. Should a CONSULTANT employee within one of these categories become no longer available to OC SAN, CONSULTANT shall submit the resume and qualifications of the proposed replacement to OC SAN for approval as soon as possible, but in no event later than seven (7) calendar days prior to the departure of the incumbent Key Position unless CONSULTANT is not provided with such notice by the departing staff.

5. PAYMENT

A. Monthly Invoice: CONSULTANT shall include in its monthly invoice, a detailed breakdown of costs associated with the performance of any work for that invoicing period, in a format acceptable to OC SAN. CONSULTANT shall warrant and certify the accuracy of these costs and provide all support documentation required by OC SAN. CONSULTANT understands that submitted costs are subject to Section 14 Audit Provisions.

B. Upon receipt of a properly prepared invoice, as described above, payment shall be made by OC SAN to CONSULTANT within sixty (60) calendar days.

C. Upon satisfactory completion of the work performed hereunder and prior to final payment under this AGREEMENT for such work, or prior settlement upon termination of this AGREEMENT, and as a condition precedent thereto, CONSULTANT shall execute and deliver to OC SAN a release of all claims against OC SAN arising under or by virtue of this AGREEMENT other than such claims, if any, as may be specifically exempted by CONSULTANT from the operation of the release in stated amounts to be set forth therein.

D. Pursuant to the California False Claims Act (Government Code sections 12650-12655), any CONSULTANT that knowingly submits a false claim to OC SAN for compensation under the terms of this AGREEMENT may be held liable for treble damages and up to a $10,000 civil penalty for each false claim submitted. This section shall also be binding on all Subconsultants.

A CONSULTANT or Subconsultant shall be deemed to have submitted a false claim when the CONSULTANT or Subconsultant: (a) knowingly presents or causes to be presented to an officer or employee of OC SAN a false claim or request for payment or approval; (b) knowingly makes, uses, or causes to be made or used a false record or statement to get a false claim paid or approved by OC SAN; (c) conspires to defraud OC SAN by getting a false claim allowed or paid by OC SAN; (d) knowingly makes, uses, or causes to be made or used a false record or statement to conceal, avoid, or decrease an obligation to OC SAN; or (e) is a beneficiary of an inadvertent submission of a false claim to OC SAN, and fails to disclose the false claim to OC SAN within a reasonable time after discovery of the false claim.

6. TERM

This AGREEMENT shall commence upon the effective date first written above, and shall continue in full force and effect through «Date», ("Initial Term") unless earlier terminated or extended as provided in the AGREEMENT. OC SAN, at its sole discretion, may elect to extend the term of this AGREEMENT up to an additional twelve (12) months, commencing «Date», and continuing through «Date», ("Option Term 1"), and thereupon require CONSULTANT to continue to provide services, and otherwise perform, in accordance with **Attachment "A"**, entitled "Scope of Work" and **Attachment "A1"**, entitled "Rules of Engagement".

OC SAN, at its sole discretion, may elect to extend the term of this AGREEMENT up to an additional twelve (12) months, commencing «Date», and continuing through «Date», ("Option Term 2"), and thereupon require CONSULTANT to continue to provide services, and otherwise perform, in accordance with **Attachment "A"**, entitled "Scope of Work" and **Attachment "A1"**, entitled "Rules of Engagement".

OC SAN's election to extend the AGREEMENT beyond the Initial Term shall not diminish its right to terminate the AGREEMENT for OC SAN's convenience or CONSULTANT's default as provided elsewhere in this AGREEMENT. The "maximum term" of this AGREEMENT shall be from the effective date first written above through «Date», which period encompasses the Initial Term and two (2) Option Terms.

7. PREVAILING WAGES

To the extent CONSULTANT intends to utilize employees who will perform work during the contract, as more specifically defined under Labor Code Section 1720, CONSULTANT shall be subject to prevailing wage requirements with respect to such employees.

8. CALIFORNIA DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION AND RECORD OF WAGES

A. To the extent CONSULTANT's employees and/or Subconsultants who will perform Work during the design and preconstruction phases of a construction contract for which Prevailing Wage Determinations have been issued by the DIR and as more specifically defined under Labor Code Section 1720 et seq, CONSULTANT and Subconsultants shall comply with the registration requirements of Labor Code Section 1725.5. Pursuant to Labor Code Section 1771.4, the Work is subject to compliance monitoring and enforcement by the DIR.

B. The CONSULTANT and Subconsultants shall maintain accurate payroll records and shall comply with all the provisions of Labor Code Section 1776, and shall submit payroll records to the Labor Commissioner pursuant to Labor Code Section 1771.4(a)(3). Penalties for non-compliance with the requirements of Section 1776 may be deducted from progress payments per Section 1776.

C. Pursuant to Labor Code Section 1776, the CONSULTANT and Subconsultants shall furnish a copy of all certified payroll records to OC SAN and/or general public upon request, provided the public request is made through OC SAN, the Division of Apprenticeship Standards or the Division of Labor Enforcement of the Department of Industrial Relations.

D. The CONSULTANT and Subconsultants shall comply with the job site notices posting requirements established by the Labor Commissioner per Title 8, California Code of Regulations Section 16461(e).

9. INDEPENDENT CONTRACTOR

The CONSULTANT and Subconsultants shall be independent contractors and not agents of OC SAN. Any provisions of this AGREEMENT that may appear to give OC SAN the right to direct the CONSULTANT concerning the details of performing the professional services, or to exercise any control over such performance, shall mean only that the CONSULTANT shall follow the direction of OC SAN concerning the end results of the performance.

10. DOCUMENT OWNERSHIP – CONSULTANT PERFORMANCE

A. Ownership of Documents for the Professional Services performed.

All documents in all forms (electronic, paper, etc.), including, but not limited to, studies, sketches, drawings, computer printouts, disk files, and electronic copies

prepared in connection with or related to the Scope of Work or Professional Services, shall be the property of OC SAN. OC SAN's ownership of these documents includes use of, reproduction or reuse of and all incidental rights, whether or not the work for which they were prepared has been performed.

OC SAN ownership entitlement arises upon payment or any partial payment for work performed and includes ownership of any and all work product completed prior to that payment. This Section shall apply whether the CONSULTANT's Professional Services are terminated: a) by the completion of the AGREEMENT, or b) in accordance with other provisions of this AGREEMENT. Notwithstanding any other provision of this paragraph or AGREEMENT, the CONSULTANT shall have the right to make copies of all such plans, studies, sketches, drawings, computer printouts and disk files, and specifications. OC SAN acknowledges that documents prepared through Professional Services must be revised and sealed by a professional engineer prior to their reuse on another project. OC SAN acknowledges that it assumes all risk associated with reuse of such documents, which are not undertaken by CONSULTANT.

B. CONSULTANT shall not be responsible for damage caused by subsequent changes to or uses of the study or deliverable where the subsequent changes or uses are not authorized or approved by CONSULTANT, provided that the service rendered by CONSULTANT was not a proximate cause of the damage.

11. INSURANCE

A. General

i. Insurance shall be issued and underwritten by insurance companies acceptable to OC SAN.

ii. Insurers must have an "A-" Policyholder's Rating, or better, and Financial Rating of at least Class VIII, or better, in accordance with the most current A.M. Best's Guide Rating. However, OC SAN will accept State Compensation Insurance Fund, for the required policy of Worker's Compensation Insurance subject to OC SAN's option to require a change in insurer in the event the State Fund financial rating is decreased below "B". Further, OC SAN will require CONSULTANT to substitute any insurer whose rating drops below the levels herein specified. Said substitution shall occur within twenty (20) days of written notice to CONSULTANT, by OC SAN or its agent.

iii. Coverage shall be in effect prior to the commencement of any work under this AGREEMENT.

B. General Liability

The CONSULTANT shall maintain during the life of this AGREEMENT, including the period of warranty, Commercial General Liability Insurance written on an occurrence basis providing the following minimum limits of liability coverage: Two Million Dollars ($2,000,000) per occurrence with Four Million Dollars ($4,000,000)

aggregate. If aggregate limits apply separately to this contract (as evidenced by submission of ISO form CG 25 03 or 25 04), then the aggregate limit may be equivalent to the per occurrence limit. Said insurance shall include coverage for the following hazards: Premises-Operations, blanket contractual liability (for this AGREEMENT), products liability/completed operations (including any product manufactured or assembled), broad form property damage, blanket contractual liability, independent contractors liability, personal and advertising injury, mobile equipment, owners and contractors protective liability, and cross liability and severability of interest clauses. A statement on an insurance certificate will not be accepted in lieu of the actual additional insured endorsement(s). If requested by OC SAN and applicable, XCU coverage (Explosion, Collapse and Underground) and Riggers/On Hook Liability must be included in the General Liability policy and coverage must be reflected on the submitted Certificate of Insurance. Where permitted by law, CONSULTANT hereby waives all rights of recovery by subrogation because of deductible clauses, inadequacy of limits of any insurance policy, limitations or exclusions of coverage, or any other reason against OC SAN, its or their officers, agents, or employees, and any other consultant, contractor or subcontractor performing work or rendering services on behalf of OC SAN in connection with the planning, development and construction of the project. In all its insurance coverages related to the work, CONSULTANT shall include clauses providing that each insurer shall waive all of its rights of recovery by subrogation against OC SAN, its or their officers, agents, or employees, or any other consultant, contractor or subcontractor performing work or rendering services at the project. Where permitted by law, CONSULTANT shall require similar written express waivers and insurance clauses from each of its Subconsultants of every tier. A waiver of subrogation shall be effective as to any individual or entity, even if such individual or entity (a) would otherwise have a duty of indemnification, contractual or otherwise, (b) did not pay the insurance premium, directly or indirectly, and (c) whether or not such individual or entity has an insurable interest in the property damaged.

C. Umbrella Excess Liability

The minimum limits of general liability and Automotive Liability Insurance required, as set forth herein, shall be provided for through either a single policy of primary insurance or a combination of policies of primary and umbrella excess coverage. Umbrella excess liability coverage shall be issued with limits of liability which, when combined with the primary insurance, will equal the minimum limits for general liability and automotive liability.

D. Automotive/Vehicle liability Insurance

The CONSULTANT shall maintain a policy of Automotive Liability Insurance on a comprehensive form covering all owned, non-owned, and hired automobiles, trucks, and other vehicles providing the following minimum limit of liability coverage: Combined single limit of Five Hundred Thousand Dollars ($500,000). A statement on an insurance certificate will not be accepted in lieu of the actual additional insured endorsement.

E. Drone Liability Insurance

If a drone will be used, drone liability insurance must be maintained by CONSULTANT in the amount of One Million Dollars ($1,000,000) in a form acceptable by OC SAN.

F. Worker's Compensation Insurance

The CONSULTANT shall provide such Workers' Compensation Insurance as required by the Labor Code of the State of California in the amount of the statutory limit, including Employer's Liability Insurance with a minimum limit of One Million Dollars ($1,000,000) per occurrence. Such Worker's Compensation Insurance shall be endorsed to provide for a waiver of subrogation in favor of OC SAN. A statement on an insurance certificate will not be accepted in lieu of the actual endorsements unless the insurance carrier is State of California Insurance Fund and the identifier "SCIF" and endorsement numbers 2570 and 2065 are referenced on the certificate of insurance. If an exposure to Jones Act liability may exist, the insurance required herein shall include coverage for Jones Act claims.

G. Errors and Omissions/Professional Liability

CONSULTANT shall maintain in full force and effect, throughout the term of this AGREEMENT, standard industry form professional negligence errors and omissions insurance coverage in an amount of not less than Two Million Dollars ($2,000,000) with limits in accordance with the provisions of this Paragraph. If the policy of insurance is written on a "claims made" basis, said policy shall be continued in full force and effect at all times during the term of this AGREEMENT, and for a period of five (5) years from the date of the completion of the services hereunder.

In the event of termination of said policy during this period, CONSULTANT shall obtain continuing insurance coverage for the prior acts or omissions of CONSULTANT during the course of performing services under the term of this AGREEMENT. Said coverage shall be evidenced by either a new policy evidencing no gap in coverage or by separate extended "tail" coverage with the present or new carrier.

In the event the present policy of insurance is written on an "occurrence" basis, said policy shall be continued in full force and effect during the term of this AGREEMENT or until completion of the services provided for in this AGREEMENT, whichever is later. In the event of termination of said policy during this period, new coverage shall be obtained for the required period to insure for the prior acts of CONSULTANT during the course of performing services under the term of this AGREEMENT.

CONSULTANT shall provide to OC SAN a certificate of insurance in a form acceptable to OC SAN indicating the deductible or self-retention amounts and the expiration date of said policy, and shall provide renewal certificates not less than ten (10) days prior to the expiration of each policy term.

H. Proof of Coverage

The CONSULTANT shall furnish OC SAN with original certificates and amendatory endorsements effecting coverage. Said policies and endorsements shall conform to the requirements herein stated. All certificates and endorsements are to be received and approved by OC SAN before work commences. OC SAN reserves the right to require complete, certified copies of all required insurance policies, including endorsements, effecting the coverage required, at any time. The following are approved forms that must be submitted as proof of coverage:

• Certificate of Insurance	ACORD Form 25 or other equivalent Certificate of Insurance form.
• Additional Insurance (General Liability)	The combination of (ISO Forms) CG 2010 and CG 2037 All other Additional Insured endorsements must be submitted for approval by OC SAN, and OC SAN may reject alternatives that provide different or less coverage to OC SAN.
• Additional Insured (Auto Liability)	Submit endorsement provided by carrier for OC SAN approval.
• Waiver of Subrogation	Submit workers' compensation waiver of subrogation endorsement provided by carrier for OC SAN approval.
• Cancellation Notice	No endorsement is required. However, CONSULTANT is responsible for notifying OC SAN of any pending or actual insurance policy cancellation, as described in Article I. Cancellation and Policy Change Notice, below.

I. Cancellation and Policy Change Notice

The CONSULTANT is required to notify OC SAN in writing of any insurance cancellation notice it receives or other knowledge of pending or actual insurance policy cancellation, within two (2) working days of receipt of such notice or acquisition of such knowledge. Additionally, the CONSULTANT is required to notify OC SAN in writing of any change in the terms of insurance, including reduction in coverage or increase in deductible/SIR, within two (2) working days of receipt of such notice or knowledge of same.

Said notices shall be mailed to OC SAN at:

ORANGE COUNTY SANITATION DISTRICT
10844 Ellis Avenue
Fountain Valley, CA 92708
Attention: Contracts, Purchasing & Materials Management Division

J. Primary Insurance

The General and Automobile Liability policies shall contain a Primary and Non Contributory Clause. Any other insurance maintained by OC SAN shall be excess and not contributing with the insurance provided by CONSULTANT.

K. Separation of Insured

The General and Automobile Liability policies shall contain a "Separation of Insureds" clause.

L. Non-Limiting (if applicable)

Nothing in this document shall be construed as limiting in any way, nor shall it limit the indemnification provision contained in this AGREEMENT, or the extent to which CONSULTANT may be held responsible for payment of damages to persons or property.

M. Deductibles and Self-Insured Retentions

Any deductible and/or self-insured retention must be declared to OC SAN on the Certificate of Insurance. All deductibles and/or self-insured retentions require approval by OC SAN. At the option of OC SAN, either: the insurer shall reduce or eliminate such deductible or self-insured retention as respects OC SAN; or the CONSULTANT shall provide a financial guarantee satisfactory to OC SAN guaranteeing payment of losses and related investigations, claim administration and defense expenses.

N. Defense Costs

The General and Automobile Liability policies shall have a provision that defense costs for all insureds and additional insureds are paid in addition to and do not deplete any policy limits.

O. Subconsultants

The CONSULTANT shall be responsible to establish insurance requirements for any Subconsultant hired by the CONSULTANT. The insurance shall be in amounts and types reasonably sufficient to deal with the risk of loss involving the Subconsultant's operations and work.

P. Limits Are Minimums

If the CONSULTANT maintains higher limits than any minimums shown above, then OC SAN requires and shall be entitled to coverage for the higher limits maintained by CONSULTANT.

12. CHANGES

In the event of a change in the Scope of Work or a change in Key Personnel, or change in hourly rates, as requested by OC SAN, the Parties hereto shall execute an Amendment to this AGREEMENT setting forth with particularity all terms of the new AGREEMENT. CONSULTANT's compensation for additional services authorized and performed in accordance with this AGREEMENT shall be agreed to OC SAN and CONSULTANT in writing prior to the time that the additional services are authorized. An Amendment shall be executed to document the change.

13. PROJECT TEAM AND SUBCONSULTANTS

Neither this AGREEMENT nor any interest herein nor claim hereunder may be assigned by CONSULTANT either voluntarily or by operation of law, nor may all or any part of the AGREEMENT be subcontracted by CONSULTANT, without the prior written consent of OC SAN. Consent by OC SAN shall not be deemed to relieve CONSULTANT of its obligation to comply fully with all terms and conditions of this AGREEMENT.

CONSULTANT shall provide to OC SAN, prior to execution of this AGREEMENT, the names and full description of all Subconsultants and CONSULTANT's project team members anticipated to be used on this Project under this AGREEMENT by CONSULTANT. CONSULTANT shall include a description of the work and services to be done by each Subconsultant and each of CONSULTANT's team member. CONSULTANT shall include the respective compensation amounts for CONSULTANT and each Subconsultant, broken down as indicated in Section 2- COMPENSATION.

There shall be no substitution of the listed Subconsultants and CONSULTANT's team members without prior written approval by OC SAN.

14. AUDIT PROVISIONS

A. OC SAN retains the reasonable right to access, review, examine, and audit, any and all books, records, documents and any other evidence of procedures and practices that OC SAN determines are necessary to discover and verify that the CONSULTANT is in compliance with all requirements under this AGREEMENT. The CONSULTANT shall include OC SAN's right as described above, in any and all of their subcontracts, and shall ensure that these rights are binding upon all Subconsultants.

B. OC SAN retains the right to examine CONSULTANT's books, records, documents and any other evidence of procedures and practices that OC SAN determines are necessary to discover and verify all direct and indirect costs, of whatever nature, which are claimed to have been incurred, or anticipated to be incurred or to ensure CONSULTANT's compliance with all requirements under this AGREEMENT during the term of this AGREEMENT and for a period of three (3) years after its termination.

C. CONSULTANT shall maintain complete and accurate records in accordance with generally accepted industry standard practices and OC SAN's policy. The CONSULTANT shall make available to OC SAN for review and audit, all project

related accounting records and documents, and any other financial data within 15 days after receipt of notice from OC SAN. Upon OC SAN's request, the CONSULTANT shall submit exact duplicates of originals of all requested records to OC SAN. If an audit is performed, CONSULTANT shall ensure that a qualified employee of the CONSULTANT will be available to assist OC SAN's auditor in obtaining all Project related accounting records and documents, and any other financial data.

15. LEGAL RELATIONSHIP BETWEEN PARTIES

The legal relationship between the parties hereto is that of an independent contractor and nothing herein shall be deemed to transform CONSULTANT, its staff, independent contractors, or Subconsultants into employees of OC SAN. CONSULTANT'S staff performing services under the AGREEMENT shall at all times be employees and/or independent contractors of CONSULTANT. CONSULTANT shall monitor and control its staff and pay wages, salaries, and other amounts due directly to its staff in connection with the AGREEMENT. CONSULTANT shall be responsible for hiring, review, and termination of its staff and shall be accountable for all reports and obligations respecting them, such as social security, income tax withholding, unemployment compensation, workers' compensation and similar matters.

16. NOTICES

All notices hereunder and communications regarding the interpretation of the terms of this AGREEMENT, or changes thereto, shall be effected by delivery of said notices in person or by depositing said notices in the U.S. mail, registered or certified mail, return receipt requested, postage prepaid and addressed as follows:

ORANGE COUNTY SANITATION DISTRICT
10844 Ellis Avenue
Fountain Valley, CA 92708-7018
Attention: Diane Marzano, Senior Contracts Administrator
Copy: Michael Dorman, Engineering Manager

CONSULTANT:

«Company»
«ConsultantsName»
«Address»
«CityStateZip»

All communication regarding the Scope of Work, will be addressed to the Engineering Manager. Direction from other OC SAN staff must be approved in writing by OC SAN's Project Manager prior to action from the CONSULTANT.

17. TERMINATION

OC SAN may terminate this AGREEMENT at any time, without cause, upon giving thirty (30) days written notice to CONSULTANT. In the event of such termination, CONSULTANT shall be entitled to compensation for work performed on a prorated basis through and including the effective date of termination.

CONSULTANT shall be permitted to terminate this AGREEMENT upon thirty (30) days written notice only if CONSULTANT is not compensated for billed amounts in accordance with the provisions of this AGREEMENT, when the same are due.

Notice of termination shall be mailed to OC SAN at the address listed in Section 16 - NOTICES.

18. DOCUMENTS AND STUDY MATERIALS

The documents and study materials for this Project shall become the property of OC SAN upon the termination or completion of the work. CONSULTANT agrees to furnish to OC SAN copies of all memoranda, correspondence, electronic materials, computation and study materials in its files pertaining to the work described in this AGREEMENT, which is requested in writing by OC SAN.

19. COMPLIANCE

A. Labor

CONSULTANT certifies by the execution of this AGREEMENT that it pays employees not less than the minimum wage as defined by law, and that it does not discriminate in its employment with regard to race, color, religion, sex or national origin; that it is in compliance with all federal, state and local directives and executive orders regarding non-discrimination in employment; and that it agrees to demonstrate positively and aggressively the principle of equal opportunity in employment.

B. Air Pollution

CONSULTANT and its subconsultants and subcontractors shall comply with all applicable federal, state and local air pollution control laws and regulations.

20. AGREEMENT EXECUTION AUTHORIZATION

Both OC SAN and CONSULTANT do covenant that each individual executing this document by and on behalf of each Party is a person duly authorized to execute this AGREEMENT for that Party.

21. DISPUTE RESOLUTION

In the event of a dispute arising between the parties regarding performance or interpretation of this AGREEMENT, the dispute shall be resolved by binding arbitration under the auspices of the Judicial Arbitration and Mediation Service (“JAMS”), or similar organization or entity conducting alternate dispute resolution services.

22. ATTORNEY'S FEES, COSTS AND NECESSARY DISBURSEMENTS

If any action at law or in equity or if any proceeding in the form of an Alternative Dispute Resolution (ADR) is necessary to enforce or interpret the terms of this AGREEMENT, the prevailing party shall be entitled to reasonable attorney's fees, costs and necessary disbursements in addition to any other relief to which he may be entitled.

23. INDEMNIFICATION AND HOLD HARMLESS PROVISION

CONSULTANT shall assume all responsibility for damages to property and/or injuries to persons, including accidental death, which may arise out of or be caused by CONSULTANT's services under this Agreement, or by its subconsultant(s) or by anyone directly or indirectly employed by CONSULTANT, and whether such damage or injury shall accrue or be discovered before or after the termination of the AGREEMENT. Except as to the sole active negligence of or willful misconduct of OC SAN, CONSULTANT shall indemnify, protect, defend and hold harmless OC SAN, its elected and appointed officials, officers, agents and employees, from and against any and all claims, liabilities, damages or expenses of any nature, including attorneys' fees: (a) for injury to or death of any person or damage to property or interference with the use of property, arising out of or in connection with CONSULTANT's performance under the AGREEMENT, and/or (b) on account of use of any copyrighted or uncopyrighted material, composition, or process, or any patented or unpatented invention, article or appliance, furnished or used under the AGREEMENT, and/or (c) on account of any goods and services provided under this AGREEMENT. This indemnification provision shall apply to any acts or omissions, willful misconduct, or negligent misconduct, whether active or passive, on the part of CONSULTANT or anyone employed by or working under CONSULTANT. To the maximum extent permitted by law, CONSULTANT's duty to defend shall apply whether or not such claims, allegations, lawsuits, or proceedings have merit or are meritless, or which involve claims or allegations that any of the parties to be defended were actively, passively, or concurrently negligent, or which otherwise assert that the parties to be defended are responsible, in whole or in part, for any loss, damage, or injury. CONSULTANT agrees to provide this defense immediately upon written notice from OC SAN, and with well qualified, adequately insured, and experienced legal counsel acceptable to OC SAN. This section shall survive the expiration or early termination of the AGREEMENT.

24. COMPLIANCE WITH OC SAN POLICIES AND PROCEDURES

CONSULTANT shall comply with all OC SAN policies and procedures including the Contractor Safety Standards, as applicable, all of which may be amended from time to time.

25. CLOSEOUT

When OC SAN determines that all Work authorized under the AGREEMENT is fully complete and that OC SAN requires no further work from CONSULTANT, or the AGREEMENT is otherwise terminated or expires in accordance with the terms of the AGREEMENT, OC SAN shall give the Consultant written notice that the AGREEMENT will be closed out. CONSULTANT shall submit all outstanding billings, work submittals, deliverables, reports or similarly related documents as required under the AGREEMENT within thirty (30) days of receipt of notice of AGREEMENT closeout.

Upon receipt of CONSULTANT’s submittals, OC SAN shall commence a closeout audit of the AGREEMENT and will either:

i. Give the CONSULTANT a final AGREEMENT Acceptance: or

ii. Advise the CONSULTANT in writing of any outstanding item or items which must be furnished, completed, or corrected at the CONSULTANT's cost.

CONSULTANT shall be required to provide adequate resources to fully support any administrative closeout efforts identified in the AGREEMENT Such support must be provided within the timeframe requested by OC SAN.

Notwithstanding the final AGREEMENT acceptance, the CONSULTANT will not be relieved of its obligations hereunder, nor will the CONSULTANT be relieved of its obligations to complete any portions of the work, the non-completion of which were not disclosed to OC SAN (regardless of whether such nondisclosures were fraudulent, negligent, or otherwise), and the CONSULTANT shall remain obligated under all those provisions of the AGREEMENT which expressly or by their nature extend beyond and survive final AGREEMENT Acceptance.

Any failure by OC SAN to reject the work or to reject the CONSULTANT's request for final AGREEMENT Acceptance as set forth above shall not be deemed to be acceptance of the work by OC SAN for any purpose nor imply acceptance of, or AGREEMENT with, the CONSULTANT's request for final AGREEMENT Acceptance.

26. PROHIBITION

During the term of this AGREEMENT, CONSULTANT and its Subconsultants may not propose on any construction work advertised by or on behalf of OC SAN, if such work presents actual or perceived conflict of interest with CONSULTANT's assignments with OC SAN.

CONSULTANT and its Subconsultants shall promptly disclose to OC SAN when such conflict exists prior to participating in any work as advertised by OC SAN or on its behalf.

CONSULTANT and its Subconsultants acknowledge and agree that OC SAN's determination regarding such conflicts, that may impact CONSULTANT's and its Subconsultants' ability to propose on the work as described herein, shall be final and cannot be appealed.

27. ENTIRE AGREEMENT

This AGREEMENT constitutes the entire understanding and AGREEMENT between the Parties and supersedes all previous negotiations between them pertaining to the subject matter thereof.

IN WITNESS WHEREOF, this AGREEMENT has been executed in the name of OC SAN, by its officers thereunto duly authorized, and CONSULTANT as of the day and year first above written.

CONSULTANT: COMPANY NAME

By _____
Date

_____
Printed Name & Title

ORANGE COUNTY SANITATION DISTRICT

By _____
John B. Withers Date
Board Chairman

By _____
Kelly A. Lore Date
Clerk of the Board

By _____
Ruth Zintzun Date
Purchasing & Contracts Manager

Attachments: Attachment "A" – Scope of Work
Attachment "A1" – Rules of Engagement
Attachment "B" – Not Used
Attachment "C" – Conflict of Interest Disclaimer
Attachment "D" – Allowable Direct Costs
Attachment "E" – Fee Proposal
Attachment "F" – Not Used
Attachment "G" – Not Used
Attachment "H" – Acknowledgement of Addenda Receipt
Attachment "I" – Acknowledgement of Contract Agreement
Attachment "J" – Not Used
Attachment "K" – Contractor Safety Standards

ATTACHMENT “A”

SCOPE OF WORK

ATTACHMENT A

SCOPE OF WORK

I. SUMMARY

The Orange County Sanitation District (OC SAN) is a special district responsible for wastewater conveyance and treatment for metropolitan Orange County, California. It has been in existence since 1954 and is the third largest wastewater treatment agency west of the Mississippi River. OC SAN is soliciting Proposals to provide Programming Professional Services (PPS) to support its engineering projects, which includes large and small capital projects and operationally funded repair projects. OC SAN's facilities consists of Water Reclamation Plant No. 1, Treatment Plant No. 2 and 15 pump stations.

II. BACKGROUND

OC SAN has budgeted for a 10-year $3.0 billion capital improvement program, the vast majority of which is managed by the Engineering Department. OC SAN also has an active asset management program which includes many repair projects that, due to their complexity, are managed by its Engineering Department.

OC SAN's Process Control Integration Group (PCI) performs all programming of programmable logic controllers (PLCs) and human machine interface (HMI) for all plant and pump station projects along with the associated commissioning. OC SAN utilizes Modicon Quantum PLC hardware and has recently migrated to Modicon M580 due to obsolescence. The HMI utilizes Copland Roland Interpreted Sequential Processor (CRISP), which is a VAX based system. OC SAN is in the process of finalizing the procurement of a new control system that will standardize on a new control and HMI system for the plants and pump stations. Starting in late 2021, Project No. J-120 Process Control System Upgrades will replace the existing HMI for the plants and pump stations. The existing PLCs will be replaced under future Capital Improvement Program (CIP) projects as part of a replacement or rehabilitation project. Over the next 5 years, there is a significant increase in the PCI workload due to construction projects and J-120, requiring the need for programming professional services.

III. PROFESSIONAL SERVICES REQUIRED

Following award of an agreement, OC SAN will determine when specific services are required. The mechanisms for requesting, reviewing, authorizing, and terminating services under this agreement are documented in Attachment "A1" – Rules of Engagement. As described in that attachment, work assignments will fall into one of the following types:

- Task Authorizations. Task Authorizations have formal scopes of work and firm upper limits.
- Task Directives. Task Directives are typically smaller than Task Authorizations, but do not have a firm upper limit.

The selected firm will assist PCI by providing highly skilled and experienced resources to program and commission PLCs and HMI graphics and shall provide qualified programming resources to execute work through Task Authorizations and Task Directives. The provided resources shall include the appropriate experience balance that provides a high-quality, cost-effective project execution. Task Authorizations will be developed for a specific scope of work such as the programming of a PLC or the development of HMI screens for a specific process area. Task Authorization duties include but are not limited to: Programming and documenting Modicon Quantum and M580 PLCs and CRISP or new HMI system screens using OC SAN programming standards, reviewing PLC and remote input/output (I/O) panel shop drawings, reviewing and updating I/O lists (also known as SCADA Administrative Tool (SAT)), coordinating the programming with PCI staff, coordinating with OC SAN commissioning coordinator, bench testing programs, and commissioning programs during Operational Readiness Test (ORT), Functional Acceptance Testing (FAT), and Reliability Acceptance Testing (RAT). See Section 17410 Programming Using OC SAN Standards and associated attachments for OC SAN's programming requirements.

The selected firm's staff shall have a thorough working knowledge and understanding of programmable logic controllers (using ladder logic and function block) and configuration of HMI systems and graphics. Staff shall be able to interpret engineering drawings and documents such as process and instrument diagrams (P&IDs), control strategies, motor control schematics, panel drawings, and PLC communication networks.

Estimated Full-Time Staff Required

The following staff levels are estimated based on projected programming and commissioning workloads. The actual number of staff will be based on the required hours for the selected firm to complete the assigned programming and commissioning scope of work.

	Staff Needed by Contract Year				
Function	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Fiscal Year	**FY21-22**	**FY22-23**	**FY23-24**	**FY24-25**	**FY25-26**
PLC/SCADA Programmer	6.0	6.0	6.0	6.0	5.0

IV. TASK ASSIGNMENTS

OC SAN will authorize specific tasks to be completed by CONSULTANT. These tasks will vary widely in size, cost, and complexity. Tasks will be authorized as either a Task Authorization or a Task Directive, as described in **Attachment "A1"** – Rules of Engagement.

Task Authorizations have a formal scope of work and a fixed upper limit. Task Directives also have an explicit scope of work, but the level of detail may be lower. Task Directives need a budgetary estimate, but not a firm upper limit.

V. PERSONNEL ASSIGNMENTS

OC SAN will require CONSULTANT to provide staff to fill specific roles on specific projects, and, in some cases, for its Engineering Program, as described in **Attachment "A1"** – Rules of Engagement.

Personnel Authorizations

Personnel Authorizations authorize a particular individual to work on Task Directives

VI. LOGISTICS AND CONTRACT MANAGEMENT

Work Location

CONSULTANT's on-site staff shall be located at OC SAN's facilities in Fountain Valley or Huntington Beach, California. At times, work may be required at other OC SAN facilities or at job site locations away from OC SAN facilities. At the CONSULTANT's discretion and concurrence with the OC SAN representative, the assigned CONSULTANT staff may be located at CONSULTANT's home office when performing programming. All bench testing and commissioning shall be performed at OC SAN's facilities. Advanced coordination with OC SAN may be required for CONSULTANT staff working at OC SAN facilities on OC SAN holidays.

Point of Contact/Supervision

CONSULTANT shall designate an individual as the single point of contact to direct efforts in fulfilling contracted obligations under this Agreement. The selected designee shall be responsible for the direct supervision of assigned staff, including such activities as work schedules, quality of work performed, technical oversight, vacation requests, discipline, etc. The selected designee shall not be changed without prior written notification to the OC SAN representative.

CONSULTANT is responsible for supervision of its entire staff, including the requirements defined in **Attachment "A1"** – Rules of Engagement:

OC SAN Project Procedures

CONSULTANT's staff assigned to work on OC San projects shall save project related deliverables, documents and/or records in OC San accessible locations i.e., OC San SharePoint servers and/or OC San licensed cloud-based applications such as Bluebeam, PMWeb or One Drive, as applicable to the project assignment, to comply with Public Records Act requirements. Accessibility to these locations shall be provided by OC San.

Provided Facilities & Equipment

OC SAN will provide the following for CONSULTANT's on-site staff:

- Furnished office space at OC SAN
- Computers, software, network, and printing capabilities

- Office telephone

Personal Protective Equipment

CONSULTANT staff assigned to OC SAN facilities may be exposed to known plant process and work hazards and therefore will be required to have appropriate Personal Protective Equipment (PPE) such as: eye and face protection (safety glasses), head protection (hard hat), hand protection (gloves), foot protection (safety toed shoes), high visibility clothing (Class 3 vests), hearing protection, personal gas monitor (4 gas), and other forms of PPE. CONSULTANT shall provide all equipment and training necessary to comply with OC SAN safety polices. Refer to Contractor Safety Standards – Attachment "K".

Time Tracking & Invoicing

CONSULTANT shall submit invoices, including cost and hours, monthly. Invoice shall be submitted no later than the 15th of each month. OC SAN maintains a project controls system containing detailed cost and hours information for all Engineering projects. The format for reporting hours shall be in an importable format, such as Microsoft Excel, and contain, at a minimum, the following items:

Column	Description
Project Number	OC SAN will provide a list of project numbers. These numbers are subject to change as new projects are added and existing projects are completed.
Work Package Number	OC SAN will provide a list of work package numbers. The work package numbers are subject to change as a project transitions from one phase to the next.
Employee ID	Each employee included in the hours report must contain a unique identification number.
Employee Name	Employee name.
Work Date	The week ending date when work was performed.
Hours by Week	The total number of hours worked for the week. In addition, it may be necessary to report overtime hours which will require a separate report.
Total Burdened Cost	The total burdened cost shall include actual salary, fringe costs, overhead, and profit by person.

Performance Requirements

Assigned staff must perform their duties to OC SAN's satisfaction. OC SAN reserves the right to reject any proposed staff or replace any assigned staff at any time. The Point of Contact shall replace staff upon OC SAN's request.

Work Quality

CONSULTANT shall be responsible for the professional quality and technical competence of assigned staff supplied to OC SAN. Additionally, the firm shall be responsible for the coordination of all efforts and other services furnished under the agreement.

Management of Resource Assignments

OC SAN will maintain a cloud-based workflow tool to request, review, authorize, and close resource assignments. That workflow tool is currently PMWeb. CONSULTANT's Point of Contact will be required to utilize this tool to track all requests through their life cycles. OC SAN will use this workflow tool to verify that any invoiced costs have been duly approved through the workflow tool. Section 01701 Resource Assignment Management System for requirements.

Attachments

- Section 01701 Resource Assignment Management System
- Section 17410 Programming Using OC SAN Standards
- Section 17410 Attachment A – SAT Data Dictionary
- Section 17410 Attachment B – Sample Technical Memorandum
- Section 17410 Attachment C – Sample Test Report
- Section 17410 Attachment D – Sample Program Flowchart

Section 01701

RESOURCE ASSIGNMENT MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. OC SAN will request, review, authorize, and closeout Resource Assignments under the Programming Professional Services (PPS) Agreement utilizing a Resource Assignment Management System (RAMS) using PMWeb. Resource Assignments include Task Authorizations and Task Directives.

B. The RAMS uses the same workflow engine as OC SAN uses to manage its construction contracts. The PMWeb application is a cloud-based solution used to facilitate the electronic exchange of information. PMWeb runs inside most internet browsers - see "PMWeb Operating Requirements" described herein. OC SAN will provide CONSULTANT with user account and web address. Internet access is required to use PMWeb.

C. Use the PMWeb for all required documentation and correspondence related to Resource Assignments as described in article "System Use."

1.2 SYSTEM USE

A. Utilize PMWeb for the following:

1. Proposing staff for Resource Assignments on Task Directives
2. Submitting Task Authorization Proposals
3. Receiving and tracking OC SAN approvals of Resource Assignments
4. Revising authorized Resource Assignments
5. Closing out completed and terminated Resource Assignments.

1.3 PMWEB OPERATING REQUIREMENTS

A. In order to process correspondence via PMWeb as detailed herein, maintain the minimum requirements outlined in this article.

1. Internet service requirements are as follows:
   a. Provide broadband internet access to Project staff utilizing PMWeb.
   b. Document upload and download speeds depend on internet speed. A fast internet service is highly recommended.
2. Provide the computer and networking hardware to access PMWeb.

B. Software requirements are as follows:

1. Modern internet browser maintained with current versions/security patches such as:
   a. Internet Explorer (latest released version)
   b. Mozilla Firefox (latest released version)
   c. Google Chrome (latest released version)
   d. iOS Safari (latest released version)
2. Microsoft Office 2019 or newer
3. Adobe Acrobat or BlueBeam Vu/Revu (latest version)

1.4 RAMS ACCESS AND LIMITATIONS

A. OC SAN will maintain the RAMS and serve as the administrator for the duration of this Project.

B. OC SAN will provide up to two PMWeb license(s) for use on this agreement only.

C. OC SAN will provide CONSULTANT with user access for approved personnel as needed for the duration of the Project. OC SAN shall control access to PMWeb by assigning user profiles and login credentials.

1. OC SAN will create user accounts for CONSULTANT provided list of personnel that will be utilizing PMWeb.

2. Notify OC SAN of any changes to personnel. Access modifications shall be coordinated as needed throughout the Project.

3. Subconsultants shall not be provided access to PMWeb. Transmittal of information between CONSULTANT and its Subconsultants is not within the scope of PMWeb and shall be the responsibility of the CONSULTANT.

D. Routine maintenance of PMWeb may be required during the Project. Access to PMWeb may be restricted or unavailable at these times and will be scheduled outside of typical working hours whenever possible.

E. Should PMWeb become unavailable for an unanticipated period of time, the CONSULTANT shall notify OC SAN accordingly. Upon OC SAN's direction, correspondence shall proceed via email or other electronic means in accordance with the General Requirements until PMWeb access is restored.

1.5 CONNECTIVITY PROBLEMS

A. PMWeb is a web-based environment and is therefore subject to the inherent speed and connectivity problems of the Internet. CONSULTANT is responsible for its own connectivity to the Internet. PMWeb response time is dependent on the CONSULTANT's equipment, including processor speed, Internet access speed, Internet traffic, etc.

B. OC SAN will not be liable for any delays associated with the utilization of PMWeb including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information.

1.6 CONSULTANT'S RESPONSIBILITY

A. Provide personnel to support RAMS activities.

B. Responsible for the validity and accuracy of information placed within RAMS by CONSULTANT personnel.

1. Users shall be proficient in the use of computers, including internet browsers, email programs, Microsoft Word, Microsoft Excel, and Adobe or Bluebeam Portable Document Format (PDF) document distribution program.

2. PDF documents shall be created through electronic conversion rather than being optically scanned whenever possible.

3. PDF documents shall be searchable. Should electronic conversion not be possible, optically scan at a resolution of 200 dots per inch and convert the scanned text using optical character recognition (OCR) capable software prior to uploading.

4. PDF document security restrictions shall be set to enable commenting so that ENGINEER's comments can be added to the document using Adobe Reader or BlueBeam Vu/Revu.

C. Responsible for the training of its personnel in the use of the RAMS (outside what is provided by the ENGINEER) and the other programs indicated above as needed.

1.7 TRAINING

A. The ENGINEER will provide a one-time training session of up to 2 hours to train up to 4 of the CONSULTANT's designated staff on general system requirements, procedures, and methods.

1. CONSULTANT is responsible for training all other staff not included in ENGINEER's session including any replacement personnel.

2. The ENGINEER will communicate the locations, date and time of training session. Training will occur within 14 days after the effective date of the Notice to Proceed (NTP).

B. CONSULTANT shall be required to train their personnel on the principles and operation of all other software utilized for this Contract.

1.8 COMMUNICATION PROCESS

A. All RAMS related documents requiring formal signatures shall be digital, and all copies digitally distributed.

1. PMWeb conforms to the requirements set forth in California Government Code section 16.5 regarding digital signatures; therefore, digital signatures are in full force and effect and are legally the same as a hand-written signature.

2. At least one RAMS account shall have the authority to approve Resource Assignments.

3. Take care not to share PMWeb account passwords.

B. Official logs of assignments shall be maintained within RAMS.

1.9 AUTOMATED SYSTEM NOTIFICATION

A. Automated system notifications generated via PMWeb (e.g. in-system notices, system generated email, or email with attachment) shall constitute a formal written notification in compliance with the Contract Documents.

Section 17410

PROGRAMMING USING OC SAN STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Programming of PLC's using OC SAN's programming standards.

2. Programming of HMI's screens using OC SAN's programming standards.

3. I/O to be programmed will be defined by the following project Contract Documents associated with a construction project:

a. SAT database

b. P&IDs

c. Elementary/control schematic

d. Control Strategies

e. Programming flowchart.

1.2 DEFINITIONS

A. Bench Test: A critical evaluation of the PLC and HMI and OIT interaction prior to installation in the field to ensure that all functions perform as intended.

B. Functional Acceptance Test (FAT): Tests equipment and instrument operation and shutdowns under load (in REMOTE MANUAL mode of operation) using process fluid (water, air, etc.) to verify proper functionality. Test equipment and systems in REMOTE AUTOMATIC and AUTOMATIC modes of operation with software and water (as defined in the procedure or Part 3) and other process fluid to simulate normal operating conditions. Test automatic transfer switches with normal and standby power sources. Test medium-voltage and low-voltage switchgear by simulating incoming voltage to the protective devices. For non-process systems, test the functionality of the system using actual conditions (i.e. fire alarm system, access control system, HVAC, battery chargers, automatic transfer switches, uninterruptible power supplies, generators, etc.).

C. Human/Machine Interface (HMI): A graphical user interface linked to PLC registers allowing the monitoring and control of the process. CRISP is the HMI software used on servers and workstations in the ICS network to display PLC data using the plant wide network.

D. Modify: Additions, deletions, rearrangement, change alteration, appendage, or any other change.

E. Operator Interface Terminal (OIT): A local touch screen Industrial PC panel used to display and control a process associated with a single PLC or group of PLCs.

F. Operational Readiness Test (ORT): Tests equipment, instrumentation, wiring, hardware, and software without water or any other process fluid in the LOCAL, HAND and REMOTE MANUAL modes of operation.

G. OC SAN Process Control Integration (PCI) Group: The group responsible for the ongoing SCADA system maintenance and enhancements. The group includes programmers and has access to other support personnel, program documentation, and other vital documents. PCI is a subunit of the ENGINEER.

H. OC SAN PLC Programming Standards: The OC SAN PLC Programming Standards are comprised of software templates to accomplish common functions such as variable

speed pump control and a set of rules to guide programmers on how to organize programs, perform tagging, develop custom programming, etc.

I. OC SAN PLC Software Templates: The OC SAN PLC Software Templates are provided to the programmer by OC SAN. Software Templates shall be used as provided. The programmer shall not modify the code contained within a Software Template. Custom versions of Software Templates shall be requested in writing from ENGINEER.

J. Programming Flowchart (PF): The Programming Flowchart is a tool that is used to outline all the sections required for a complete PLC program. The flowchart must include programming for all Real I/O, SCADA I/O, Templates, custom programming, including descriptions for how each point, Software Template or custom code block behaves.

K. Process Control Software: SCADA, PLC and SAT software packages with any integrated operator interfaces or monitor/controllers.

L. Programmer: The programmer is the person or team responsible for producing Process Control Software. The programmer is a subunit of the CONSULTANT.

M. Reliability Acceptance Test (RAT): A test to check that the system can operate continuously in the intended manner for an extended period without failure. During the RAT, the system under test shall be operated within design parameters reflecting the day-to-day operation of the facilities for an uninterrupted period.

N. Real Input/Output (Real I/O): Real I/O refers to the physical (hardwired) input and output points of the PLC.

O. SCADA Administration Tool (SAT): The term SAT will at times refer to two separate but related items depending on the context.

1. A database (in MS Access) that is the source for both PLC and HMI descriptions. This database also contains internal PLC points and is used as a data repository for other functions.

2. A custom desktop application that helps create and validate the SAT database as well as produce output files to import into PLC's and HMI's.

P. Supervisory Control and Data Acquisition System (SCADA): The SCADA system includes PLCs online through process data communications networks to a server that services HMI workstations used for control.

Q. SCADA Input/Output (SCADA I/O): SCADA I/O refers to virtual input and output to/from the HMI. Process Control Software. SCADA, PLC, and SAT software packages with any integrated operator interfaces or monitor/controllers.

1.3 SUBMITTALS

A. Submittals shall be made as specified herein.

B. Submittals are required during the programming process as described in this section. Further detailed information regarding steps and submittal details can be found in Part 3 – EXECUTION.

1. Initial Program Development (Step 2)

a. I/O Information Documented in the SAT Database: Submit the real I/O records portion of the SAT database.

b. Preliminary Program Flowchart: Programmer shall start the preliminary PF during the onsite orientation session. Submit a preliminary PF.

c. Draft HMI Graphics: Submit draft HMI graphics for review. This shall include process overviews, process graphics, equipment detail screens, configuration screens, sequence screens, control stations, diagnostic screens, etc.

d. P&ID Drawings: Redline PDF P&ID drawings per changes during the initial program development

2. Final Program Development. (Step 3)

a. Updated PF: Submit the updated PF for review.

b. PLC Program: The final version of the untested, fully documented, PLC program that is to be bench tested shall be fully documented and complete. All parameters, routines, subroutines, variables, etc. are complete. The logic of the process operation is tested in Step 5. Submit a PDF copy of the PLC program as well as a copy of the PLC program in its native format for review.

c. SAT Database: Submit a copy of the completed SAT database records with current information for review.

d. HIM Graphics: Include complete set of HMI graphic screens (color printout PDF screen captures).

e. HMI Program: The final version of the untested, fully documented, HMI program that is to be bench tested shall be fully documented and complete. The HMI screens are tested in Step 5. Submit the HMI program in its native format for review.

e. Test Sheets and Test Procedures: Submit the bench test sheets and bench test procedures for review.

3. Bench Test:

a. Bench Test Sheet and Procedure Sign Off Sheets: Submit the completed bench test sheets and procedure sign off sheets for review. Resubmit bench test sheets and procedure sign off sheets after correcting errors found during the bench testing for review. Attachment 1 shows a Sample Test Sheet.

4. Bench Tested Accepted Software Submittal

a. Submit Bench Tested Accepted Software in both native software and printout in searchable pdf formats.

b. Submitted software shall be loaded into the PLC and HMI workstation to start the testing and commissioning.

5. As-Built Documentation

a. Submit Final Documentation: Submit all as-built documentation updated to reflect all deviations from the design and submittal documents that occurred during installation, startup, and acceptance testing for review.

1.4 QUALITY ASSURANCE

A. Review programming progress with PCI monthly.

PART 2 - PRODUCTS

2.1 PLC PROGRAMMING

A. Perform the PLC programming using the OC SAN-accepted ProWORX NXT or Control Expert.

B. Develop a programming flowchart using the latest version of Microsoft Excel software. Microsoft Office Professional software, the latest version, is used for word processing, spreadsheets and for SAT.

2.2 HMI PROGRAMMING

A. An HMI will be available at OC SAN for the programmer to use during graphics development and bench testing.

PART 3 - EXECUTION

3.1 GENERAL

A. All PLC's and HMIs shall be programmed to the latest version of the OC SAN PLC Programming Standards. The PLC programming standards will be provided upon request.

B. All OC SAN programming tools shall be utilized in accordance with their standards and requirements.

C. The programming goal is to create an integrated, standardized control program for all SCADA system devices. The multiple steps and milestones described below are designed to achieve this goal with a minimum amount of rework, compromise, or wasted effort.

D. If changes, additions or deletions are made to an existing PLC, repeat the bench test of all process control software and real I/O connected to the PLC. The testing shall be performed in accordance with this Specification and Section 01810, Commissioning. PCI will identify all minor program changes not subject to this requirement.

E. Electronic versions of PLC programs are available from PCI in PDF format.

F. The P&ID Drawings used to develop the programs do not show all the SCADA I/O required for a complete and operable program. For example, confirming signals are not shown.

3.2 PROGRAMMING PROCESS (SCHEDULE)

A. The following is a high-level overview of the programming process. Each of the steps is described in more detail in this section.

B. A step in the programming process below is considered complete when all the submittals required for that step have been accepted by the ENGINEER. The selected firm may not proceed to the next step until the previous step is complete.

1. Step 1: Orientation. Completion of this step constitutes 5 percent of programming completion).

a. Programmers shall participate in a 2-week OC SAN onsite orientation session under direction of PCI. During this session, the programmer(s) will be trained on PLC and HMI standards, SAT, Flowchart, and Technical Memorandum development. No submittal is required to complete this step.

2. Step 2: Initial Program Development (Completion of this step constitutes 10 percent of programming completion).

a. Real I/O Information Documented in the SAT Database: Update the real input and output records of the SAT database develop. The real I/O SAT database is developed by the design engineer. Refer to "SAT Database" paragraphs in this Specification for more information on the SAT.

b. Preliminary Program Flowchart: Programmer to start the preliminary PF during the 2-week onsite orientation session. Submit the preliminary PF.

c. Graphics Sketches: Provide a pdf and native version of all unique graphics of the proposed HMI graphics. This shall include process overviews, process graphics, configuration screens, sequence screens, control stations, etc.

3. Step 3: Final Program Development. All submittals to be completed prior to bench testing. (Completion of this step constitutes 30 percent of programming completion. All submittals to be completed prior to bench test.)

a. Updated PF: The PF shall be updated to show Work to date.

b. PLC Program: The final version of the untested PLC program shall be complete. All parameters, routines, subroutines, variables, etc. are complete and fully documented. NOTE: PLC Logic and SAT database is reviewed for conformance to standard. The logic of the process operation is tested in Step 5.

c. SAT Database: All appropriate SAT database records shall be completed with current information.

d. HMI Graphics: The final set of HMI graphic screens shall be complete.

e. Test Sheets and Test Procedures: Develop the proposed testing procedures with accompanying test sheets for the bench test. The test sheets and test procedures to be submitted and acceptance obtained prior to bench testing. Refer to Attachment C to this Specification section for format.

4. Step 4: Bench Test (Completion of this step constitutes 15 percent of programming completion):

a. Bench Test: Commission and execute a bench test at OC SAN Plant 1. The bench test consists of loading the SAT database, the HMI graphics and the PLC program into a standalone workstation networked to a test PLC, then testing all functions. NOTE: The bench test is to assure coordination between PLC logic and HMI graphics, not the logical operation of the program. Changes made to the program in Step 5 may require a repeat of the bench test for all software, at the PCI's discretion.

5. Step 5: Project Completion (Completion of this step constitutes 25 percent of programming completion).

a. Startup: Load the SAT database, the HMI graphics, and the PLC program into the process workstation and appropriate PLC.

b. Provide commissioning support in accordance with Section 01810, Commissioning.

c.

6. Step 6: As-Built Documentation (Completion of this step constitutes 15 percent of programming completion).

a. Resubmit final documentation: Submit all as-built documentation updates to reflect all deviations from the design and submittal documents that occurred during installation, startup, and acceptance testing.

3.3 OC SAN IN-HOUSE ORIENTATION

A. Each programmer shall participate in a 2-week (5-day workweek) onsite orientation session under direction of PCI. The orientation is to familiarize the programmer with the OC SAN Process Control Software Standards, program flowchart, programming tools and PCI methods and procedures.

3.4 PROGRAM FLOWCHART

A. The Program Flowchart (PF) is a sequential outline of the PLC program. The PF is a planning tool to be used throughout the programming effort as a map to create the program. The PF shall be updated regularly and submitted at two programming steps. The Step 2 PF submittal shall include all known programming steps; all programming subsystems; and

all subsystems laid out but not finalized. The Step 3 PF shall be complete except for modifications required during the subsequent programming steps. The PF is part of the final as-built deliverable set of Project documentation. Attachment D contains a Sample Program Flowchart.

B. The programmer shall consider construction sequencing in creating the PF. Several PFs with associated programming may be required to support continuing process operation during construction. The programmer may need to write code to temporarily bypass portions of the final program. Overall control programs shall be created early in the programming process and shall be modified to support construction sequencing.

C. OC SAN's acceptance of the PF is for verification of conformance to the OC SAN's Process Control Software Standards only. Provide sufficient detail to deliver all specified functionality.

3.5 SAT DATABASE

A. The SAT database is used as the data source for both the PLC and the HMI databases. The programmer cannot change/add/delete from the database's structure and is responsible for understanding and obeying the field rules as published.

B. Obtain "Seed" Database: During the orientation, obtain from OC SAN an electronic file of a partially filled-out "seed" SAT database for the Project. Approximately (8) of the (23) fields in this "seed" database have been filled out by the design engineer to support the design. These data fields include design information such as alarm points, engineering units, tag names, etc. as indicated in Attachment A in this Specification section.

C. Complete the Project SAT Database: For each PLC affected by the Project, perform the following:

1. Update/modify the existing information in the Project SAT database to correct erroneous information and to reflect the actual/changed Project conditions. Identify each I/O that is changing from active use to spare; from spare to active use; and/or all other modifications to the I/O. Delete records removed by Project programming.

2. Add new records and fill out respective data fields (data cells) to reflect new Project equipment.

3. Fill out the remaining data fields (data cells) for all the records in the complete 23-field Project-specific SAT database. Refer to Attachment A SAT Data Dictionary for more information.

4. Submit the resulting Project-specific SAT database to PCI for acceptance, testing, acceptance, and integration into the OC SAN master software as specified elsewhere in this Specification section.

D. Verify Accuracy: The final submitted SAT database shall provide accurate I/O data and shall reflect the final, tested installation.

3.6 PLC PROGRAM SUBMITTAL

A. Create the development version of the PLC program. All parameters, routines, subroutines, variables, etc. shall be complete. The process control software submittals shall be reviewed only for conformance to the OC SAN's Standards. The logical process shall be fully tested at acceptance testing.

3.7 BENCH TEST

A. The bench test consists of loading the SAT database, the HMI graphics and the PLC program into a standalone workstation and PLC, then testing all functions. Perform a network-by-network review of program interaction. PCI staff may witness the bench test. Value changes, alarms, HMI graphics, limited simulation of logic and function, and data

links are reviewed. Errors shall be repaired, and the software shall be certified by PCI for field installation. Note: Software changes after the bench test are subject to the following conditions: 1) All changes shall be accepted by PCI in writing before execution. 2) The bench test is to assure coordination between the PLC logic and the HMI graphics. 3) Any changes to the process control software after the bench test may result in PCI requiring a partial or complete retest. PCI involvement will be limited to verifying the linking between the PLC and HMI graphics and the logic matches the agreed to PF and the SAT database. PCI may also perform limited functional testing of the software. The software bench test may be rejected if a pattern of errors is found. Correct all errors and perform an Unwitnessed bench test internally before resubmitting for the bench test.

B. Create and/or modify the bench test procedures into the acceptance testing procedures. Create and/or modify the bench test sheets for use during the bench test and acceptance testing to document the test procedures. ENGINEER will not fully check the logic or functionality of the software. Attachment C is a Sample Test Sheet.

3.8 COMMISSIONING SUPPORT

A. Provide commissioning support in accordance with Specification 01810, Commissioning. This specification describes the step-by-step commissioning process performed by the contractor and includes PCI's role in commissioning during Pre-ORT, ORT, Pre-FAT, FAT and PAT. The Programming Professional Services CONSULTANT will be performing the services performed by PCI.

3.9 FINAL DOCUMENTATION

A. Review and update all documentation to reflect as-built conditions. Remove documentation that is not current or relevant to the Project. Provide direction on the method for integrating Project documentation with existing OC SAN documentation systems.

B. All documentation shall comply with the latest OC SAN Software Standards.

C. Provide electronic files for PCI. All documentation organized in logical sub-directories.

3.10 ATTACHMENTS

A. Attachment A – SAT Data Dictionary

B. Attachment B - Sample Technical Memorandum

C. Attachment C - Sample Test Sheet

D. Attachment D – Sample Program Flowchart

E. Attachment E – Section 01810 Commissioning

* * * * * *

SAT DATA FIELD DESCRIPTION TABLE (DATA DICTIONARY)

A. The following listing is a data field description table (data dictionary) for the SAT database. SAT stands for SCADA Administration Tool. SAT is the tool that helps create and validate the SAT database itself. This database is the source for both ENGINEER's and CONTRACTOR's Real I/O list and programs. The table describes 26 fields (data cells) that comprise part of the record set in the SAT database. The text in the Field Description column describes the field data values (data cell values) expected by OCSD in the finalized database.

B. The Real I/O column with an "X" shall be filled out during the design phase by the ENGINEER or in the case of a CONTRACTOR programmed PLC, during the construction phase by the CONTRACTOR during the Step 2 development phase (as defined by Specification 17410 and 17411). The CONTRACTOR shall use this information to generate the construction drawings and loop diagrams, as well as calibration and setup of instrumentation ranges. Refer to the OCSD Tagging Procedure (Exhibit D8) for Loop Tag Numbers and OCSD Process Control Software Standards for further information or contact the OCSD Process Controls Integration (PCI) group for detailed explanation and examples.

C. The Development column with an "X" shall be filled out during the construction phase by the programmer. For CONTRACTOR programmed PLCs, fields with an "X" in the Development column indicate the fields that are updated by the CONTRACTOR.

D. In the case of OCSD programmed PLCs, the SAT Database shall be filled out during the design phase by the ENGINEER and is given to the CONTRACTOR. The Chapter 13 Attachment A – Exhibit D8 OCSD Tagging Procedure for Equipment shall be provided upon request.

Real I/O	Development	SAT Data Field Description Table (Data Dictionary)	
		Field Name	**Field Description**
X	X	DropIndex	Drop index number on a CRISP Data Highway
X	X	Building	Process area name to be defined in consultation with PCI (note: this value also appears in the alarm summary page for each active and acknowledged alarm)
X	X	Reg	PLC register number (For Quantum I/O: DO = 0xxxxx, DI = 1xxxxx, AI = 3xxxxx or AO = 4xxxxx; for x80 I/O: DO = -3, DI = -4, AI = -2, or AO = -1)
X	X	Tag	OCSD Loop Tag Number = AASXXXXLLLM_PPP, where AA = Area (10, 11, …), S = Sub-area (A, B, …), XXXX = Function Code (LSHH, PMP, …), LLL = Block Number (101, 102, …), M = Suffix (A, B, …), _PPP = PCI modifier (_LVL, _ALM, …(note: real I/O points do not have the PCI modifier))
X	X	Desc2	Equipment descriptive name (e.g. FILTER PMP 3 (note: 14-character max.))
X	X	Desc3	Description, action, or function of the record (e.g. ON, OPENED, MODE DISPLAY, … (note: 15-character max.), may also be used to complete Desc2)
X	X	RawUnitMin	Raw units low for PLC and CRISP analog inputs & outputs (PLC real I/O typically ranged 0-4095, CRISP typically ranged 0, matches device minimum range, or a restriction on input or output value)

Real I/O	Development	SAT Data Field Description Table (Data Dictionary)	
		Field Name	**Field Description**
X	X	RawUnitMax	Raw units high for PLC and CRISP analog inputs & outputs (PLC real I/O typically ranged 0-4095, CRISP typically ranged to match device minimum range, or a restriction on input or output value)
X	X	EngUnitMin	Engineering units low for PLC and CRISP analog inputs & outputs (PLC real I/O minimum output of device, i.e. 4mA value, CRISP ranged to device or function)
X	X	EngUnitMax	Engineering units high for PLC and CRISP analog inputs & outputs (PLC real I/O minimum output of device, i.e. 20mA value, CRISP ranged to device or function))
X	X	EngUnit	Engineering Units (e.g. GPM, CFM, …)
	X	Priority	Value used for alarm display on CRISP (typically set to '1' for all standard process alarms, set to '2' for PLC & communications alarms, and '3' for highly critical process or electrical alarms (note: set to 0 for all non-alarm records))
	X	Security	Value used for security in CRISP (typically set to a value of '4' for all standard process selections and setpoints, though there are other levels of security (See PCN for additional details) note: only used for records that are CRISP outputs to PLCs, set to 0 for all other records)
	X	Alarm	The bit that configures CRISP to alarm (set to 'TRUE' for alarms, set to 'FALSE' for all other records)
	X	History	The bit that designates a tag to be historized on the Enterprise Historian (set to 'TRUE' for all records required to historized, set to 'FALSE' for all other records (note: alarms, as well as operator process selections and setpoints are automatically added to the Enterprise Historian, do not set these records to 'TRUE'))
	X	Trend	The bit that designates a tag made available for trending in CRISP (set to 'TRUE' for all values that appear on a CRISP trend window, set to 'FALSE' for all other records)
X		PIDNumber	Informational field, displaying on which P&ID a real I/O is point is identified (e.g. 20E-NP-110)
X		Panel Number	Informational field, displaying at which RIO panel a real I/O point is terminated (e.g. 15LFCP949C)
X		PLCDrop	Informational field, displaying at which RIO drop a real I/O point is terminated (typically 1)
X		PLCRack	Informational field, displaying at which RIO rack a real I/O point is terminated
X		PLCSlot	Informational field, displaying on which RIO card a real I/O point is terminated
X		PLC Point	Informational field, displaying at which RIO card point a real I/O point is terminated (set to the point number on the card (e.g. 1-16 on a 16-point card DI card, 1-4 on a four-point card AO card, 1-9 on an eight-point AI card (note: AI cards typically reserve the 9th point (and corresponding register) for a "MODULE STATUS CHANNEL", and will be reserved in SAT)))
X		CardType	Informational field, displaying which Real I/O point Unity Card Type is identified as (e.g. BMXDAI1614 - 16 point digital input - 120VAC card)

Real I/O	Development	SAT Data Field Description Table (Data Dictionary)	
		Field Name	**Field Description**
	X	CRISPRegType	Defines an record as it relates to its CRISP I/O type (set to '4' for all CRISP DO points (typically 002001-004000 registers), '3' for all CRISP DI points (typically 004001-005000), '2' for all CRISP AI points (typically 404001-406000), and '1' for all CRISP AO points (typically 402001-404000) (note: set to '0' for all non-CRISP I/O records))
X	X	PLCRegType	Defines an record as it relates to its PLC register type (set to '1' for all real analog inputs (typically 100001-101999 registers), '2' for all real analog outputs (typically 400001-402000 registers), '3' for all real digital inputs (typically 300001-301999 registers), '4' for all digital outputs (typically 400001-402000 registers), '5' for special communications registers (typically 006609-007000 & 406601-407000 registers), '6' for all internal registers (typically 007001-009999 & 407001-409999 registers) (note: set to '0' for all CRISP I/O records))
X		CMMS Desc	Informational field, displays the information contained in EID for the real I/O registers (a concatenation of several fields within EID)

M E M O R A N D U M

To: Frank Steiger/OCSD

From: GEA Westfalia Separator Division

Subject: Technical Memorandum for P1-101 Dewatering Centrifuge Control Software Configuration

Date: September 2, 2020 Redacted

Summary

This Technical Memorandum has been redacted to remove proprietary information and shall only be used as an example for preparation of similar documentation. It describes the control implementation and software configuration for the new Dewatering Centrifuge system. The software portion of the project will include PLC ladder logic written using the District's existing Software Standards, as well as new operator interface screens using the District's Graphics Standards.

Control Strategy Overview

Each of the three Dewatering Centrifuges will be provided with a free-standing programmable logic controller (PLC) based control cabinet to contain the machines' start/stop, and sequencing controls as well as monitoring and safety/shutdown systems. Each centrifuge will operate independently, and all three will be programmed to function identically.

The centrifuges can be operated in two modes. The two control modes are LOCAL and REMOTE. In both modes, the system protection will be provided by monitoring centrifuge parameters (vibration, temperature, etc.) for safety/shutdown set points. A LOCAL/REMOTE selector switch on each control panel selects between these two options.

LOCAL Mode
In LOCAL mode, centrifuge control is only available at the CCP. And centrifuge Start/Stop is only available at the CCP

REMOTE Mode
In REMOTE mode, centrifuge control is only available at the CCP. But Start/Stop is only available from SCADA.

DEWATERING CENTRIFUGE DETAILS

1. Introduction

1.1. CONTROL PANELS

The CA-1035 Control System will consist of the following control panels:

Three (3) - Centrifuge Motor Control Center (CMCC) Panels - NEMA 12, fan/filter enclosure
Three (3) - Centrifuge Control Panels (CCP) - NEMA 12, fan/filter enclosure

Note: Lube oil pump motor starters are located in the Customer supplied MCC

1.2. PROGRAMMABLE LOGIC CONTROLLER (PLC)

The PLC is configured for the following:

- Full automation of the Centrifuge system
- The PLC shall be programmed to operate on an independent basis, regardless of the communication status of the Plant Dewatering PLC.
- Each PLC shall include integrally, or with additional modules, communication ports for the programming device, I/O hardware, and any required remote communication modules and retransmission as required, to provide fully functional links to I/O hardware and SCADA.
- I/O communications shall employ the manufacturer's standard design for transmission speed, media length, and cabling.

2. PRODUCTS AND SYSTEM DESIGN

2.1. PLC HARDWARE/SOFTWARE

- The centrifuge PLC shall be programmed using Proworx NXT programming software, version 2.20 or later.
- The centrifuge OIT shall be programmed using Modicon Vijeo Designer programming software, version 6.2, Service Pack 5.
- The PLC shall be programmed to operate on an independent basis, regardless of the communication status of SCADA.
- The PLC will be a Modicon Quantum 140CPU53414B processor module.
- The PLC power supply will be selected based on the total PLC I/O count.
- The PLC rack/chassis will consist of three (3) 10-slot chassis.
- Discrete input modules shall be 120 VAC, 16 inputs, isolated.
- Discrete output modules shall be relay, 8 outputs.
- Analog input modules shall be 8-channels, isolated.
- Analog output modules shall be 4-channel, isolated.
- RTD input modules shall be 8-channel, isolated, and wired for 3-wire, PT 100 RTD's.
- Three (3) Ethernet network interface modules, NOE 771 11, shall be provided. Two shall be dedicated for interfacing to SCADA and one shall be dedicated for interfacing to the Centrifuge OIT, Bowl and Scroll VFDs.
- The Operator Interface Terminal (OIT) shall be a Magelis Panel PC, model HMI PPH9A0701, 19", color, touch screen, with built-in Ethernet 10/100 Mbps communications port.

2.2. SYSTEM ARCHITECTURE

- The CCP shall be designed to:

  - Assist plant operating personnel by noting and announcing off-normal operating conditions and equipment failures
  - Perform calculations based on sensor inputs
  - Communicate with SCADA via Modbus TCP/IP Ethernet network
- The PLC program will be divided into subroutines for each specific function of the system.

2.3. COMMUNICATIONS

The Quantum PLC system utilizes separate communications modules for the required network interfaces as follows:

- The CCP shall communicate with the owner's SCADA via two dedicated NOE 771 11 modules, utilizing an Modbus TCP/IP Ethernet network interface
- The CCP shall communicate with the Centrifuge OIT and VFDs via a dedicated NOE 771 11 module and 8-port Ethernet switch utilizing a Modbus TCP/IP Ethernet network interface.
- The CCP shall utilize one of the spare ports on the Ethernet switch for connecting a pc programming terminal.

2.4. PLC DATABASE AND I/O LIST

- The structure of the system PLC database shall be hierarchical, and initial configuration of the database shall be performed by GEA. Signals required for interface with SCADA shall be organized into a separate subroutine, in which discrete and analog I/O addresses can be read from and written to the CCP.
- I/O List - The I/O list will be provided with the GEA "as built" electrical drawing package.

3. CENTRIFUGE SEQUENCE

3.1. CENTRIFUGE START

A LOCAL/REMOTE selector switch is located on the CCP. In either mode, centrifuge control is only available at the CCP. In LOCAL mode, centrifuge Start and Stop is only available at the CCP. In REMOTE mode, Centrifuge Start and Stop is only available from SCADA. When the selector switch is in the Remote position, the CCP issues a SYSTEM REMOTE confirmation to SCADA. Note: The centrifuge SYSTEM READY (Power on and no shutdown alarms) signal must be active in order to start the centrifuge.

The Centrifuge control system verifies that no fault conditions exist and maintenance mode is not active. The start-up sequence of the centrifuge is initiated by pushing the CENTRIFUGE START button on the CCP (LOCAL) or SCADA (REMOTE). The user may cancel the operation, if the start button was pressed accidentally, by pushing the CENTRIFUGE STOP button on the CCP (LOCAL) or SCADA (REMOTE).

- The centrifuge is in the READY state and the CCP issues a hard-wired SYSTEM READY permissive signal to SCADA.
- Depressing the CENTRIFUGE START pushbutton will de-energize and open the feed tube, seal water valve to begin seal water flow to the centrifuge.
- After confirming seal water flow is established, a 10-minute (operator set point) pre-lube cycle begins, and lube motor run commands are issued. Both lube systems will be commanded to run at the same time.
- After confirming that the lube motors are operational, the cooling water solenoid valves for each lube system's heat exchanger are energized. This will open the valves to allow cooling water to each heat exchanger.

- After the Pre-lube cycle is finished the bowl motor run command is issued to the bowl VFD, and the bowl begins to rotate. The bowl will be ramped up to setpoint speed by the VFD in approx. 25 minutes.
- After confirmation that the bowl VFD is running, and the bowl speed is above 370 RPM (operator set point), the scroll motor run command is issued, and the scroll begins to rotate.
- The centrifuge is now running and the CCP issues a SYSTEM ON confirmation to SCADA.
- Normally the diverter gate is closed if centrifuge is not processing. With the diverter gate CLOSED the cake pump is bypassed.
- Normally the diverter gate flush valve is closed. When the bowl motor speed greater than zero, CCP will open the diverter gate flush valve, if the diverter gate is in the closed position. Note: SCADA will control the operation of the screw feeder and cake piston pump.
- During this start cycle, the scroll will convey any remaining solids out of the bowl before the bowl has reached full speed, and therefore the Centrifuge torque will drop to low torque value (less than 10%) indicating that the bowl has very little solids remaining.
- Once the centrifuge has reached speed and there are no faults, the Centrifuge is ready to accept sludge feed (Ready for Feed signal activated) and issues a hard-wired SYSTEM FEED permissive signal to SCADA.
- SCADA will transmit a PLANT FEED hard-wired signal to the CCP when the sludge feed system components (sludge pump, polymer pump, grinder, etc.) are confirmed in operation. Refer to **Process Sequence** for the process start sequence and ancillary operation.

Note 1: If there is no sludge fed to the Centrifuge for 30 minutes (operator set point), then Idle mode is active until sludge feed is started. Refer to 3.5 Feed System Off for additional detail.

3.2. CONTROLLED SHUTDOWN

A controlled shutdown will be initiated when the user presses the CENTRIFUGE STOP button on the CCP (LOCAL) or SCADA (REMOTE), if Flush and Shutdown is Disabled. It will also be triggered by some alarm shutdown conditions. See **Appendix A** for a list of alarm conditions that cause a shutdown.

- Refer also to **Flush & Shutdown and CIP Sequences**
- SYSTEM FEED permissive signal removed by centrifuge PLC (Ready for Feed signal off). Note: The SYSTEM FEED permissive signal can also be removed, without shutting down the centrifuge, by actuating the Feed Off pushbutton from the centrifuge OIT.
- The PLANT FEED signal (derived from grinder, polymer pump, sludge feed pump, and sludge feed valve) at the PLANT Dewatering PLC, to the CCP is removed.
- Bowl motor shuts off, allowing the bowl to coast to a stop. The scroll motor will continue to run.
- Flush water valve opens immediately when bowl motor shuts off.
- Flush water valve closes when bowl speed falls below 200 rpm.
- Scroll motor shuts off when bowl speed is below 289 rpm.
- Bowl and scroll come to rest.
- The CCP removes the SYSTEM ON signal confirmation signal to SCADA, when bowl is off, scroll is off, and CIP is complete.
- Lube pumps continue to run during post lube cycle (approx. 5 minutes).
- When post lubrication is complete, seal water solenoid valve is energized and closes to shut off feed tube seal water.

3.3. IMMEDIATE SHUTDOWN

An immediate shutdown is triggered by scroll motor alarms. See **Appendix A** for a list of all alarm conditions that cause an immediate shutdown. An Immediate Shutdown will function similar to a controlled shutdown; except that the scroll motor will be turned off at the same time as the bowl motor.

3.4. EMERGENCY SHUTDOWN

The Emergency Shutdown is issued with any of the E-stop pushbuttons at the CCP, Bowl CMCC, Scroll CMCC, or station near stairs. All equipment associated with the system will be stopped instantaneously with no flush water. All centrifuge E-stop's will require a manual reset of first the E-stop push button pressed and then also the E-stop safety relay located in the CCP. A bowl speed high condition will also trigger the E-stop safety relay.

NOTE: Seal water will remain on until the bowl and scroll come to a rest (less than 25 rpm).

3.5. FEED SYSTEM OFF

3.5.1. Feed System Off – Idle Mode (Non-Alarm)

When the centrifuge has been requesting feed from the PLANT Thickening PLC for 30 minutes without being fed, the centrifuge will begin an idle flush sequence. The centrifuge continues to request sludge feed, but opens the flush water valve for an operator configurable duration (typically 2 minutes). This flush water valve open sequence will repeat every 30 minutes until sludge feed begins.

3.5.2. Feed System Off – Idle Mode (Alarm)

After 2 minutes of no-feed, with FEED A/M station in Auto, the centrifuge generates a NO Feed Alarm.

After 60 minutes of no-feed, with FEED A/M station in Off, generates a "System Feed Control Station is OFF" Alarm.

Certain system alarms or an operator request will require that the feed system stop, while the centrifuge continues to run. See **Appendix A** for a list of all alarm conditions that cause a Feed Off condition.

- The sludge feed to the centrifuge is stopped via an alarm or activating the Feed Off pushbutton from the centrifuge OIT.
- SYSTEM FEED permissive signal removed by centrifuge PLC (Ready for Feed signal off).
- The PLANT FEED signal (derived from grinder, polymer pump, sludge feed pump, and sludge feed valve) at the PLANT Dewatering PLC, to the CCP is removed.
- If the centrifuge continues to run, but sludge feed is not active, the flush water valve will open for 5 minutes every 30 minutes (typically, operator adjustable).
- Upon restarting (if applicable), the Centrifuge PLC re-issues the SYSTEM FEED permissive signal to SCADA.
- Grinder, Sludge feed and Polymer feed are restarted by SCADA. Sludge feed valve also reopened by SCADA. SCADA re-issues the PLANT FEED signal to the CCP.

  Note: Torque Alarm HI and Vibration Alarm HI will initiate a Feed System Off (SYSTEM FEED permissive removed) sequence as noted above. The flush valve will remain open for 5 minutes (typical, operator adjustable). If the torque or vibration level drops below the alarm setpoints during the flush cycle, these alarms can be reset by the operator, thus allowing the

flush water valve to close. The sludge feed will then be permitted to be restarted.

3.6. FLUSH & SHUTDOWN SEQUENCE

If the process sequence is completed and it is desired to shut down the centrifuge, then press the centrifuge Stop button (Local or Remote). If the Flush & Shutdown sequence, is Enabled from the OIT (LOCAL) or SCADA (REMOTE), then the flush and shutdown sequence will be performed with a stop command. If flush and shutdown is disabled, then the equipment will stop without flushing and cleaning. The sequence is as follows:

- Centrifuge currently running process
- Operator ensures the ***Flush & Shutdown*** is Enabled on the OIT or Centrifuge Stop at SCADA. Once stop is initiated, flush and shutdown will proceed automatically.
- SYSTEM FEED signal removed by the CCP to SCADA.
- Sludge Pumps, Polymer Feed Pumps and Grinder are sequenced off by SCADA as described under ***Process Sequence.*** PLANT FEED signal removed by SCADA to the CCP.
- Scroll runs at a preset fixed speed.
- Centrifuge Flush Valve is opened.
- When torque drops below the FLUSH WATER OFF torque setpoint (typically 25%), the centrifuge flush valve will close.
- The CCP will remove the SYSTEM OPEN command to SCADA and the diverter gate will close and CCP will open the diverter gate flush valve.
- The centrifuge will then automatically sequence into the CIP cleaning cycle described below.

3.7. CLEAN IN PLACE (CIP)

The centrifuge will execute a cleaning sequence, also known as CIP (Clean-In-Place), after the flush and shutdown sequence has been completed, or the operator initiates the CIP sequence by pressing the CIP Start pushbutton on the OIT. Note: This function is not available from SCADA. The sequence for one cycle is as follows:

- Number of CIP cycles is set to greater than zero (typically 3).
- The ***Flush & Shutdown*** sequence is completed or the <CIP START> pushbutton is activated from the OIT or SCADA.
- Flush valve is opened, until the bowl speed drops below 200 rpm.
- The centrifuge bowl decelerates to a preset CIP Lower Bowl Speed Limit (approx. 100 rpm, operator adjustable).
- Differential Speed is set to run 50% of range.
- Centrifuge Flush Valve is closed below 200 rpm bowl speed.
- Once the bowl speed reaches the CIP Lower Bowl Speed Limit, the bowl flush valve is opened above 200 rpm.
- Once the CIP Upper Bowl Speed Limit (approx. 500 rpm, operator adjustable) is reached, the bowl decelerates to the preset CIP Lower Bowl Speed Limit level and the cycle will repeat itself as many times as the operator has configured the per the CIP cycle SP
- Upon completion of the last CIP cycle, the centrifuge will coast down to a stop and follow a normal shutdown, including post-lube.

4. Centrifuge Equipment

4.1. BOWL MOTOR (15MCEN121/221/321)

Starting and stopping of the bowl motor will be from the centrifuge PLC at the CCP.

Manual Operation (Maintenance Mode):

The bowl motor can be started/stopped from the OIT bowl motor control A/M station. When the Centrifuge is stopped or off, Maintenance mode can be selected. Then, pressing the START button will start the bowl motor. Note: Due to machine safety reasons, the bowl motor will only be permitted to run for a maximum of 10 seconds before shutting off. Pressing the STOP button will stop the scroll motor.

Automatic Operation (Normal Mode):

First ensure that Normal Mode and AUTO has been selected from the OIT bowl motor control A/M station. The bowl will start when the pre lube is complete. It will run until the centrifuge stop button has been pressed and the process is off. Refer also to Centrifuge Sequence.

The bowl motor will stop when:

- Controlled stop is issued
- Immediate stop is issued
- Emergency stop is issued

4.2. SCROLL MOTOR (15MCEN131/231/331)

Starting and stopping of the scroll motor will be from the centrifuge PLC at the CCP.

Manual Operation (Maintenance Mode):

The scroll motor can be started/stopped from the OIT scroll motor control A/M station. When the Centrifuge is stopped or off, Maintenance mode can be selected. Then, pressing the START button will start the scroll motor. Note: Due to machine safety reasons, the scroll motor will only be permitted to run for a maximum of 10 seconds before shutting off. Pressing the STOP button will stop the scroll motor.

Automatic Operation (Normal Mode):

First ensure that Normal mode and AUTO has been selected from the OIT scroll motor control A/M station. The scroll motor will start when the pre lube is complete and bowl speed has reached 289 rpm. It will run until the centrifuge stop button has been pressed and bowl speed is less than 289 rpm. Refer also to **Centrifuge Sequence**.

The scroll motor will stop when:

- Immediate stop is issued
- Controlled stop is issued and bowl speed is less than 289 rpm
- Emergency stop is issued

4.3. FLUSH WATER SOLENOID VALVE (15MFY157/257/357)

Opening and closing of the flush water valve will be from the centrifuge PLC at the CCP.

Manual Operation:

The flush water valve can be opened/closed from the OIT flush water valve control A/M station. Pressing the OPEN button will open the flush water valve and pressing the CLOSE button will close the flush water valve. Emergency stop will close the valve.

Automatic Operation:

First ensure that AUTO has been selected from the OIT flush water valve control A/M station. The flush water will turn on when:

- Centrifuge Start-up – the valve will open for a set amount of time (typically 5 minutes, operator adjustable), when bowl speed has reached a set level, (typically 700 rpm, operator adjustable).
- Idle mode – when the centrifuge is running at speed, but process is not active (not feeding), the flush water valve will open for 5 minutes every 30 minutes.
- Centrifuge Shutdown (Controlled or Immediate) – the valve will open when a shutdown has been initiated and will remain on until the bowl speed drops below the FLUSH WATER OFF setpoint.
- Flush & Shutdown – the valve will open when Flush & Shutdown is enabled and the feed is stopped, and torque is above the preset level. Refer also to **Flush & Shutdown Sequence**.
- CIP – the valve will open when CIP is active above the FLUSH WATER OFF setpoint. Refer also to **CIP Sequence**.
- High Torque alarm – the valve will open for a set amount of time (typically 120 seconds, operator adjustable). Refer also to **Appendix D – PRESETS AND SECURITY SETUP** for alarm settings.
- High Vibration alarm – the valve will open for a set amount of time (typically 120 seconds, operator adjustable). Refer also to **Appendix D – PRESETS AND SECURITY SETUP** for alarm settings.

Note: Emergency stop will position the valve closed in Automatic operation.

4.4. SEAL WATER SOLENOID VALVE (15MFY155/255/355)

Opening and closing of the seal water valve will be from the centrifuge PLC at the CCP. It should be noted the seal water valve is fail-open, energize to close.

Manual Operation (Maintenance Mode):

In Maintenance Mode, the seal water valve can be opened/closed from the OIT seal water valve control A/M station. Pressing the OPEN button will open (de-energize) the seal water valve and pressing the CLOSE button will close (energize) the seal water valve.

Automatic Operation (Normal Mode):

First ensure that Normal Mode and AUTO has been selected from the OIT seal water valve control A/M station. The seal water will open (de-energize) when:

- Centrifuge Start-up – the valve will open when the centrifuge START button has been pressed.

The seal water will close (energize) when:

- Centrifuge Shutdown (Controlled or Immediate) – the valve will close when bowl speed is zero and after an off delay timer is complete.
- Refer also to **Centrifuge Sequence**.

4.5. LUBE OIL PUMP MOTORS (SOLIDS – 15MPMP140/240/340, LIQUIDS – 15MPMP147/247/347)

Starting and stopping of the lube oil pumps will be from the centrifuge PLC at the CCP.

Manual Operation (Maintenance Mode):

Each of the two lube pump motors can be individually started/stopped from the OIT lube pump motor control A/M station (liquids-side or solids-side). Selecting Maintenance mode, then pressing the START button will start the lube pump motor. Pressing the STOP button will stop the lube pump motor.

Automatic Operation (Normal Mode):

First ensure that Normal Mode and AUTO has been selected from the appropriate OIT lube pump motor control A/M station. The lube pump motors will start and associated cooling water solenoid valves will open when the centrifuge start button has been pressed. Both pump motors will continue to run until the post lube timer is done. Refer also to **Centrifuge Sequence**.

The lube pump motors will stop when:

- Emergency stop is issued
- Lube pump motor fault (overload or fail to run)
- Note: Lube oil instrumentation alarms noted in **Appendix A** will cause a centrifuge controlled shutdown

4.6. LUBE OIL SYSTEM COOLING SOLENOID VALVES (SOLIDS – 15MFY146/246/346, LIQUIDS – 15MFY153/253/353)

Opening and closing of the lube oil, cooling valves will be from the centrifuge PLC at the CCP.

Manual Operation (Maintenance Mode):

Each of the lube oil cooling water valves can be opened/closed from the OIT from the lube oil cooling water valve control A/M station (liquids-side or solids-side) when in Maintenance mode. Pressing the OPEN button will open the lube oil cooling water valve and pressing the CLOSE button will close the lube oil cooling water valve.

Automatic Operation (Normal Mode):

First ensure that Normal Mode and AUTO has been selected from the appropriate OIT lube oil cooling water valve control A/M station. The lube oil cooling water valves will open when:

- Centrifuge Start-up – the valves will open when the centrifuge START button has been pressed and confirmation that the lube oil pump is running has been received by the centrifuge PLC.

The lube oil cooling water valves will close when:

- Centrifuge Shutdown (Controlled or Immediate) – the valve will close when the post lube timer is done and the lube has turned off.
- Refer also to **Centrifuge Sequence**.

5. SCROLL CONTROL LOGIC

The Centrifuge control system is designed with a proprietary SJM Scroll Control Module (SCM). This module allows the centrifuge to operate in either torque control or fixed differential speed control.

5.1. SJM SCROLL CONTROL

The Westfalia SJM control algorithm is used to compute the necessary differential speed to maintain the torque setpoint. It can also be used to run at a fixed differential speed

The following set points are used for SJM control:

- Control Begin (starting torque)
- Basic Differential Speed
- Control Gradient

Refer also to **APPENDIX E – CENTRIFUGE FORMULAS AND CALCULATIONS** for additional info.

6. PROCESS SEQUENCE (NORMAL MODE ONLY)

The ancillary equipment is supplied by others and controlled by the CCP or SCADA, with certain interlocks as noted below. The centrifuge must first be up to speed and ready for feed before the process start sequence is initiated.

The ancillary equipment includes:

a) Grinders
b) Polymer Feed Pumps
c) Sludge Feed Pumps
d) Diverter Gate
e) Diverter Gate Flush Valve
f) Screw Feeder/Cake Piston Pump

6.1. PROCESS START SEQUENCE

Centrifuge ancillary equipment can be started when the centrifuge is ready for feed. The centrifuge is at speed and transmits a hard-wired, SYSTEM FEED permissive signal to SCADA to start all ancillary equipment in the proper sequence. Sludge and Polymer feed rates will be controlled by SCADA. Sludge and Polymer feed rate setpoints are entered from SCADA.

- Diverter gate is closed.
- Diverter gate flush valve is open.
- Centrifuge ready for feed signal is indicated on the OIT. CCP transmits a hard-wired, SYSTEM FEED permissive signal transmitted to SCADA.
- Polymer system, grinder and sludge feed pump sequenced on by SCADA. Note: SCADA will ensure that the sludge feed valve is in the open position prior to starting the sludge feed pump.
- SCADA confirms all ancillary equipment is running and transmits a hard-wired, PLANT FEED confirmation to the CCP.
- Sludge feed rate is set at SCADA, and PID flow control is performed by SCADA. Sludge flow rate feedback is displayed on the OIT via hard-wired signal from the sludge feed flow meter.
- Scroll Torque is above the TORQUE/DIVERTER GATE OPEN set point on the OIT for a preset time.
- CCP transmits a SYSTEM OPEN hard-wired signal to SCADA and the diverter gate is opened. Note: If the diverter gate fails to open, SCADA will generate a diverter gate fail to open alarm and remove the PLANT FEED confirmation to the CCP. This will stop the grinder, polymer pump and sludge feed pump from continuing to feed the centrifuge.
- CCP closes the diverter gate flush valve.

- The Sludge Feed Density Meter will provide a solids concentration signal, via SCADA, for display on the OIT.

6.2. PROCESS STOP SEQUENCE

Pressing the OFF button, on the OIT System Feed Control Station will stop the ancillary equipment from running. This does not stop the Centrifuge, only the sludge processing. Refer also to **Flush & Shutdown Sequence** as the recommended sequence for process stopping.

- CCP removes the SYSTEM FEED permissive signal to SCADA.
- SCADA sequences off the polymer system, grinder and sludge feed pump. The sludge feed valve is also closed.
- SCADA removes the PLANT FEED confirmation signal to the CCP.
- Scroll Torque is below the TORQUE/DIVERTER GATE CLOSE set point for a preset time.
- CCP removes the SYSTEM OPEN hard-wired signal to SCADA and the diverter gate is closed.
- CCP opens the diverter gate flush valve.
- SCADA will control the operation of the screw feeder/cake piston pump.

7. PROCESS EQUIPMENT

7.1. GRINDERS (BY OTHERS) (15MGDR010/020)

SCADA will control the operation of the Grinder.

Manual Operation:
From SCADA

Automatic Operation:
When the CCP transmits the SYSTEM FEED signal to SCADA, SCADA will sequence on the grinder after an adjustable preset time delay. It will shut down when Feed Off button is actuated, the SYSTEM FEED permissive is removed, flush & shutdown is activated, normal shutdown, or if any feed-off or shutdown alarms are active.

Interlocks:
The grinder will stop when:

- The SYSTEM FEED signal is not active
- Emergency Stop

7.2. POLYMER FEED PUMPS (BY OTHERS) (15MPMP910/920/930)

SCADA will control the operation of the Polymer Feed Pumps. Polymer ratio setpoint is entered from SCADA.

Manual Operation:
From SCADA.

Auto Operation:
When the CCP transmits the SYSTEM FEED signal to SCADA, SCADA will sequence on the polymer pump after an adjustable preset time delay. It will shut down when the Feed Off button is actuated, the SYSTEM FEED permissive is removed, flush & shutdown is activated, normal shutdown, or if any feed-off or shutdown alarms are active. Polymer ratio control will be performed by SCADA.

Interlocks:

The polymer feed pump will stop when:

- The SYSTEM FEED signal is not active
- Emergency Stop

7.3. POLYMER FEED FLOW METERS (BY OTHERS) (15MFIT159/259/359)

SCADA will use the polymer feed flow meters to control polymer flow to the centrifuge. The polymer flow meters are provided with an additional hard-wired connection to the CCP for display on the OIT.

7.4. SLUDGE FEED PUMPS (BY OTHERS) (15MPMP100/200/300)

SCADA will control the operation of the Sludge Feed Pumps. Sludge feed flow rate setpoint is entered from SCADA.

Manual Operation:

From SCADA.

Auto Operation:

When the CCP transmits the SYSTEM FEED signal to SCADA, SCADA will sequence on the sludge pump after an adjustable preset time delay. It will shut down when the Feed Off button is actuated, the SYSTEM FEED permissive is removed, flush & shutdown is activated, normal shutdown, or if any feed-off or shutdown alarms are active. Sludge feed PID flow control will be performed by SCADA.

Interlocks:

The sludge feed pump will stop when:

- The SYSTEM FEED signal is not active
- Emergency Stop

7.5. SLUDGE FEED FLOW METERS (BY OTHERS) (15MFIT119/219/319)

SCADA will use the sludge feed flow meters to control sludge flow to the centrifuge. The sludge flow meters are provided with an additional hard-wired connection to the CCP for display on the OIT.

7.6. DIVERTER GATES (BY OTHERS) (15MGAT506/526/546)

Automatic operation of the opening/closing of the Diverter Gate will be from the centrifuge PLC at the CCP. There will be no manual operation of the diverter gate from the OIT. Local manual operation is performed by SCADA or from the local control station.

Manual Operation:

From SCADA.

Automatic Operation:

The diverter gate is automatically started in the closed position when the centrifuge starts. When the torque is above the TORQUE/DIVERTER GATE OPEN set point for a preset time, the CCP will transmit a SYSTEM OPEN request to SCADA and the diverter gate will open. CCP will then remove the open command to the diverter gate flush water valve. When the process is stopped or on shutdown, and the torque falls below the TORQUE/DIVERTER GATE CLOSE set point for a preset time, after an operator adjustable timer, the CCP will remove the SYSTEM

OPEN command to SCADA and the diverter gate will close. CCP will then open the diverter gate flush valve. The diverter gate will remain closed and the diverter gate flush valve will close when the centrifuge is off.

Interlocks:

The diverter gate will close when:

- Centrifuge is off
- Emergency Stop
- PLANT FEED signal not active

7.7. DIVERTER GATE FLUSH WATER SOLENOID VALVES (BY OTHERS) (15MFY502/522/542)

Opening and closing of the diverter gate flush water valve will be from the centrifuge PLC at the CCP.

Manual Operation:

The diverter gate flush water valve can be opened/closed from the OIT diverter gate flush water valve control A/M station. Pressing the OPEN button will open the diverter gate flush water valve and pressing the CLOSE button will close the diverter gate flush water valve.

Automatic Operation:

First ensure that AUTO has been selected from the OIT diverter gate flush water valve control A/M station. The diverter gate flush valve will open when the diverter gate is closed and close when the diverter gate is open.

7.8. SCREW FEEDER/CAKE PISTON PUMP (BY OTHERS) (15MPMP500/520/540)

Operation of the Screw Feeder and Cake Piston Pump will be by SCADA.

OPERATOR INTERFACE GRAPHIC SCREENS

A total of sixty-two (62) OIT graphics will be created for the P1-101 Dewatering Centrifuge System project. These screens are shown in this description. The types of screens and their quantities are as follows:

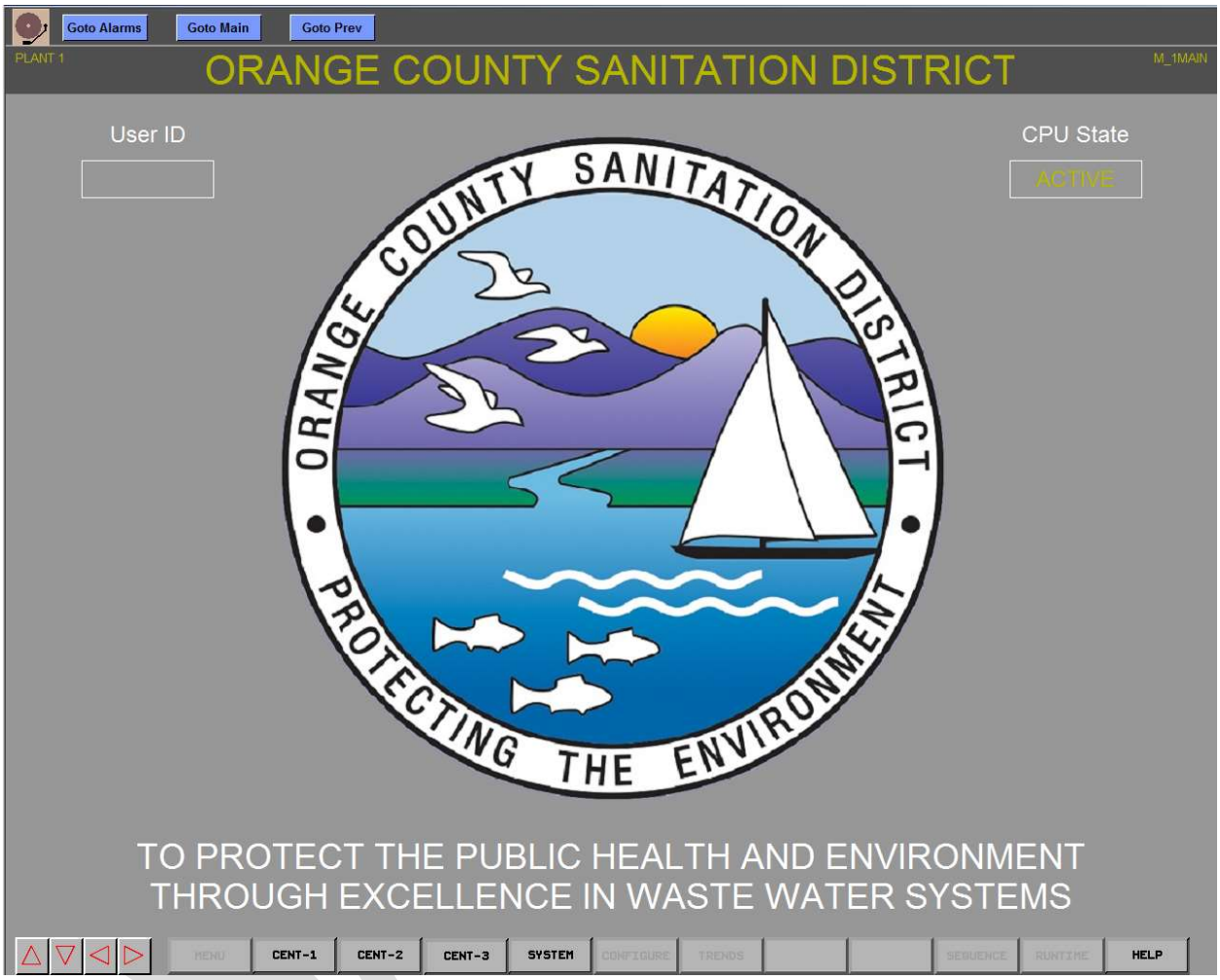
Number of Screens	Screen Description
1	OCSD Main Menu Screen
3	Process Graphics Menu Screen
1	Process Graphic Overview
3	Process Graphic Screens (1 each, Centrifuge)
3	Process Graphic Screens (1 each, Lube System)
1	Centrifuge Select Menu Screen
3	Centrifuge Detail
27	Centrifuge Control Station Screens (9 ea. Cent.)
3	Centrifuge Trend Screen (1 ea. Cent.)
3	Runtime Screen (1 ea. Cent.)

1	Alarm Screen
9	Configuration and Set Point Screens (3 ea. Cent.)
1	System Menu Screen
1	PLC Status Screen
1	Help Screen
1	Manufacturer's Information Screen

Note: For this submittal 1 of each screen for Centrifuge 1 is included. The remaining screens are duplicates from Centrifuge 1 and look the same.

Dewatering Centrifuge OIT OCSD Main Menu Screen

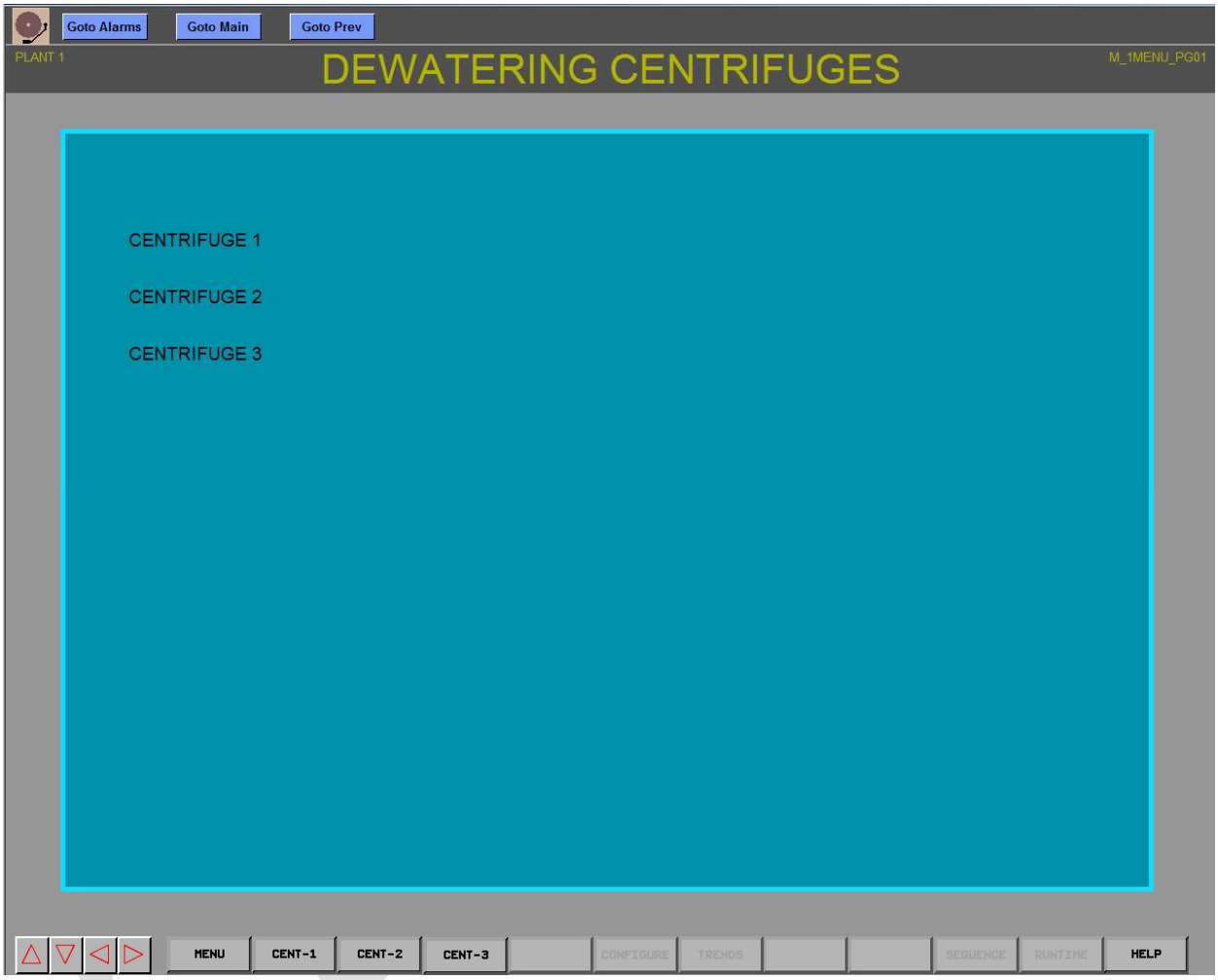
The screen below represents the OCSD Main Menu screen.



From this screen the operator can navigate to:

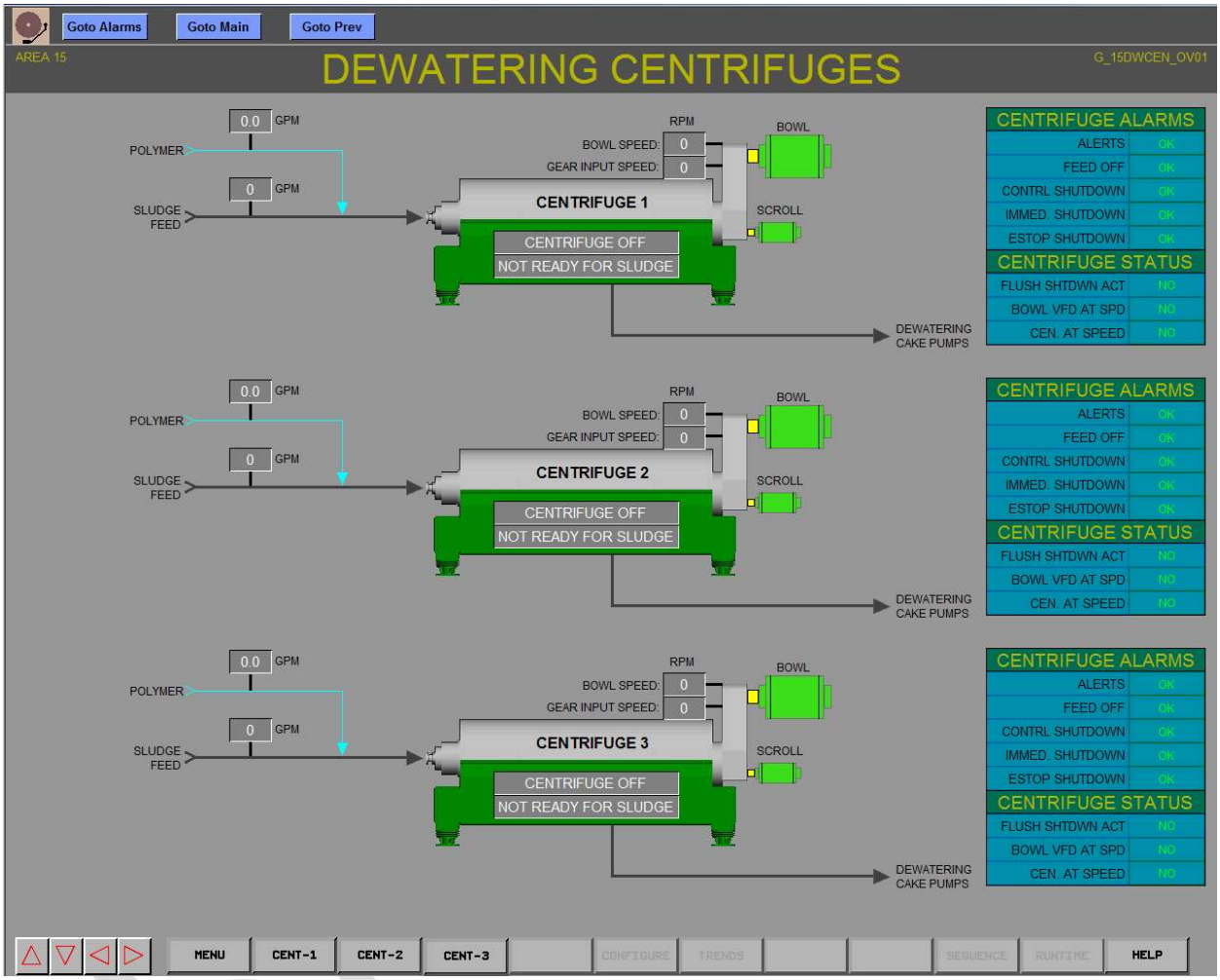
- Process Graphics Menu Screen for each Centrifuge.
- System Menu Screen
- Help Screen

This screen allow selection of displaying Centrifuge 1, 2, or 3.



Dewatering Centrifuge Overview Screen

This screen displays the status of all 3 centrifuges.

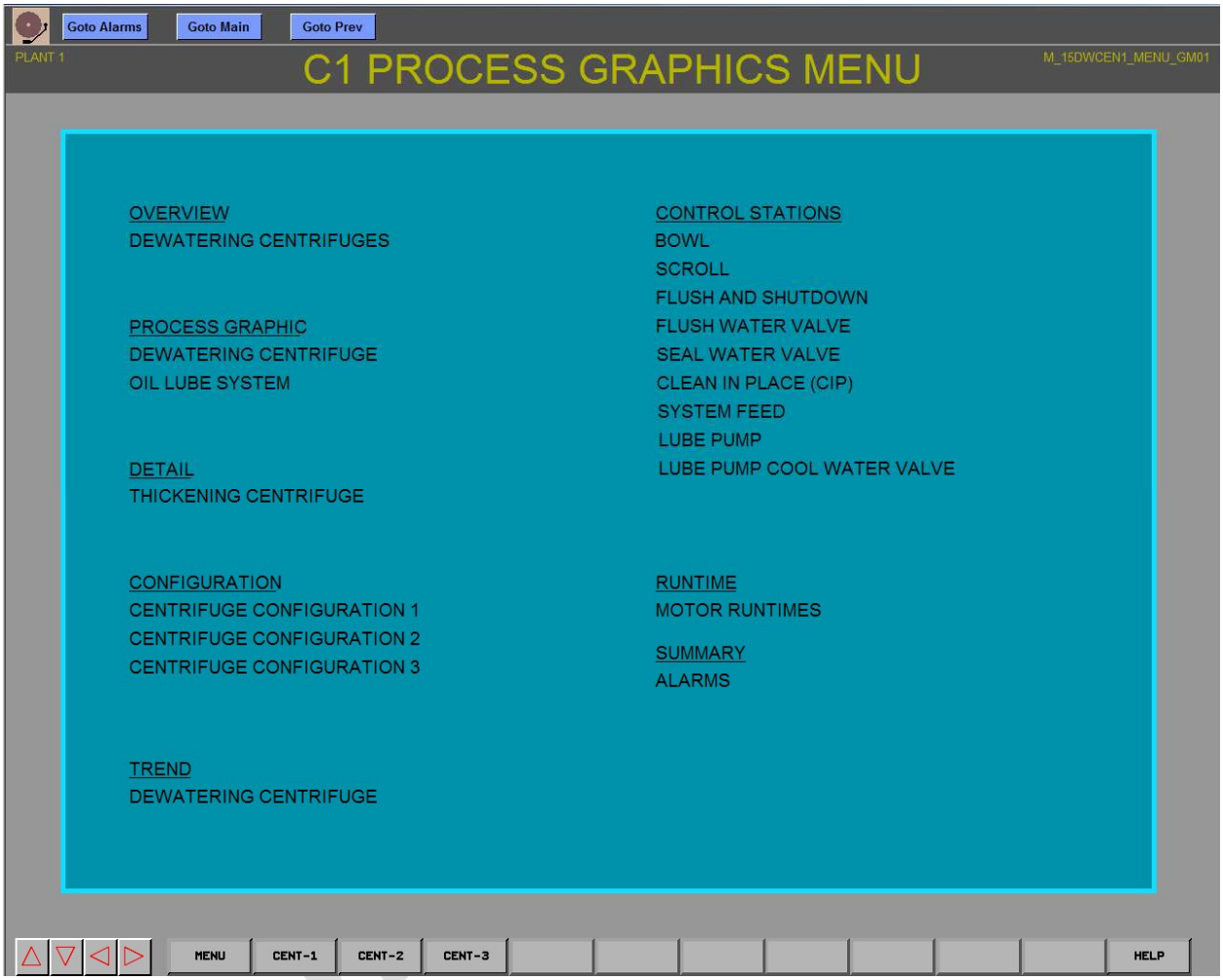


From this screen the operator can navigate to:

- Process Graphics Menu Screen for each Centrifuge.
- System Menu Screen
- Help Screen

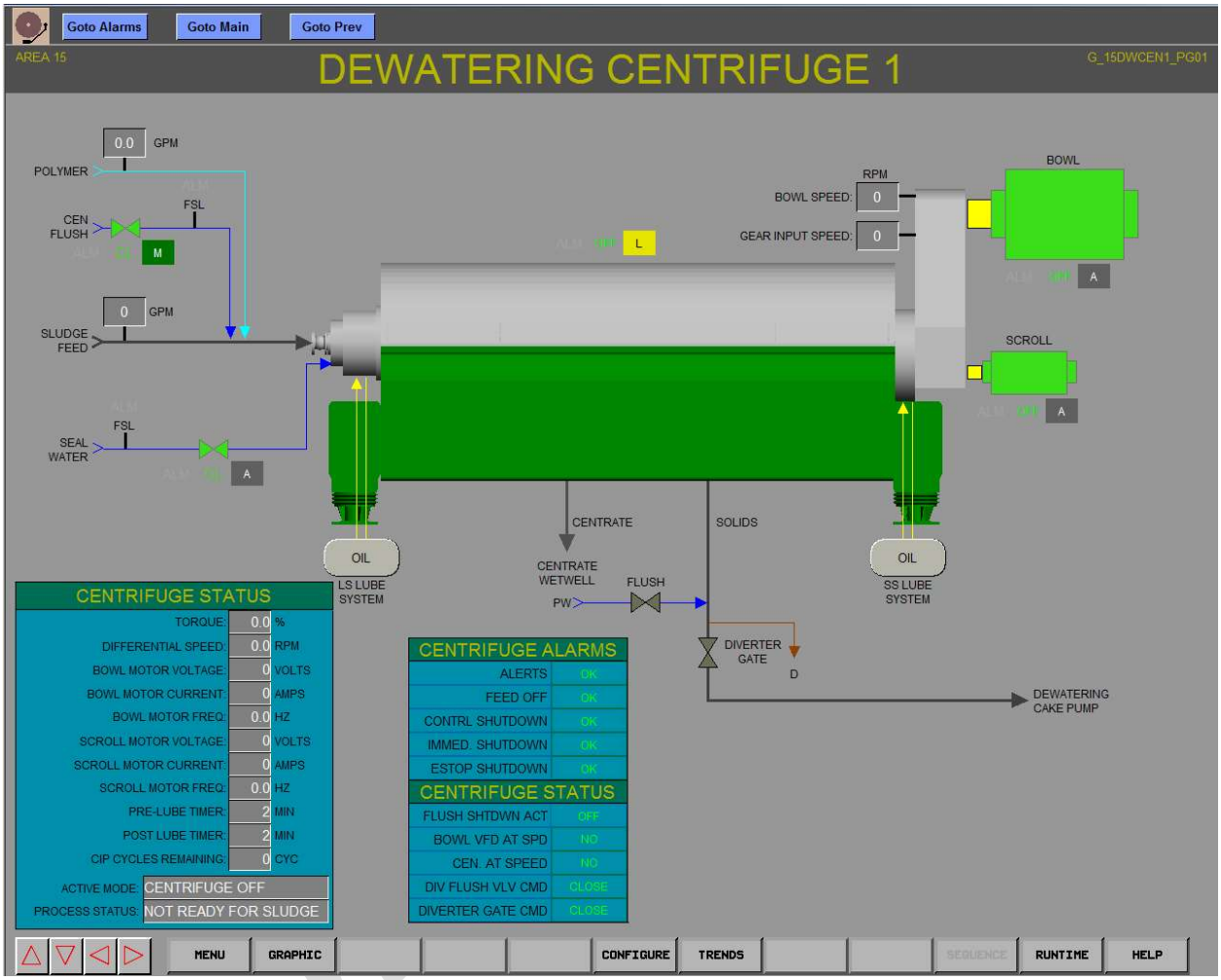
Process Graphics Menu Screen

The screen below represents the menus screen which allows quick navigation to the screens identified on the screen list.



Centrifuge Process Graphic Screen

The Dewatering Graphics Screen is shows the centrifuge with data from the primary components.

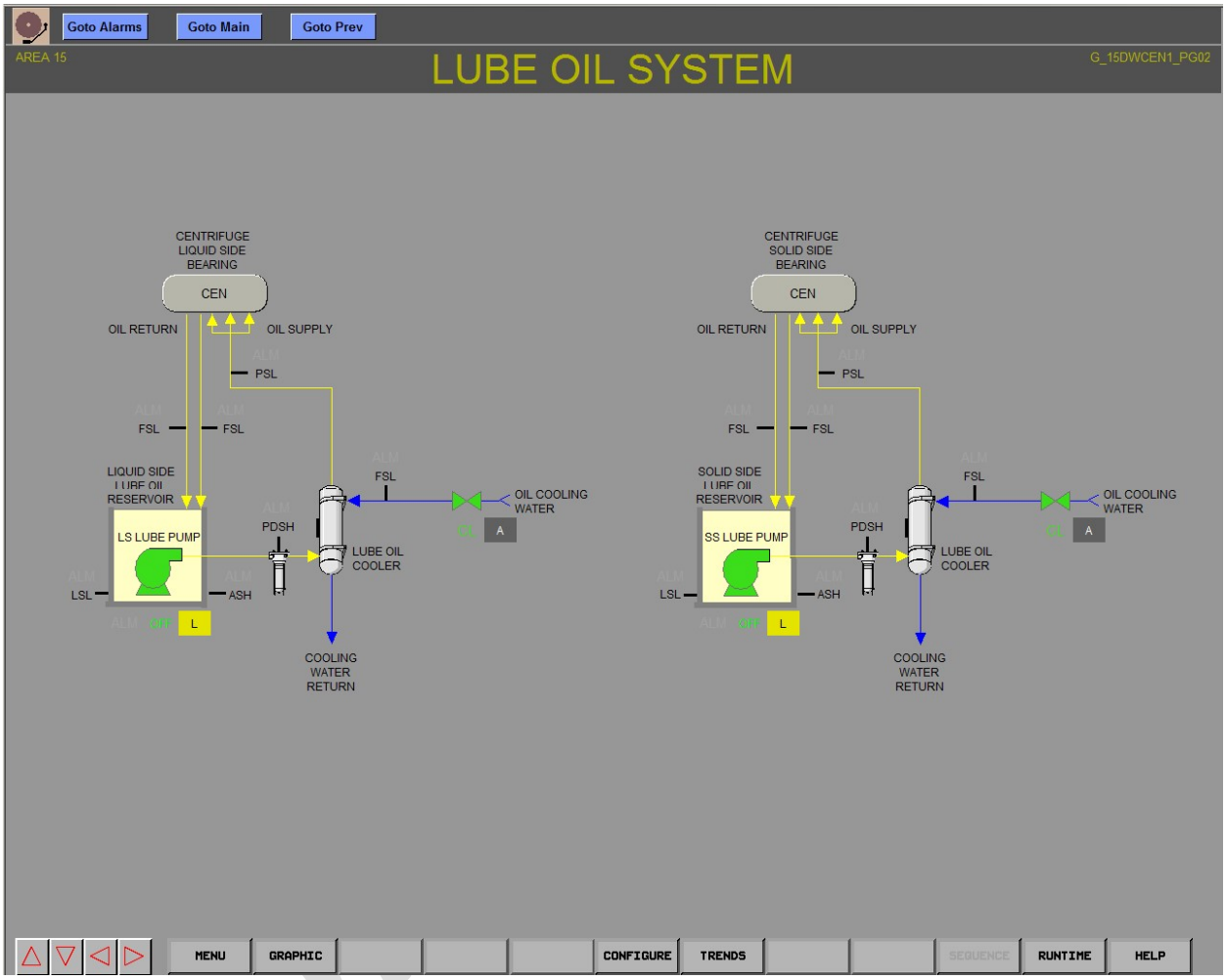


This example screen shows several conditions which could exist for the centrifuge, but would not necessarily exist simultaneously.

The symbols for the screen are animated with standard District color codes to show their status (red = on, green = off, blue = out of service).

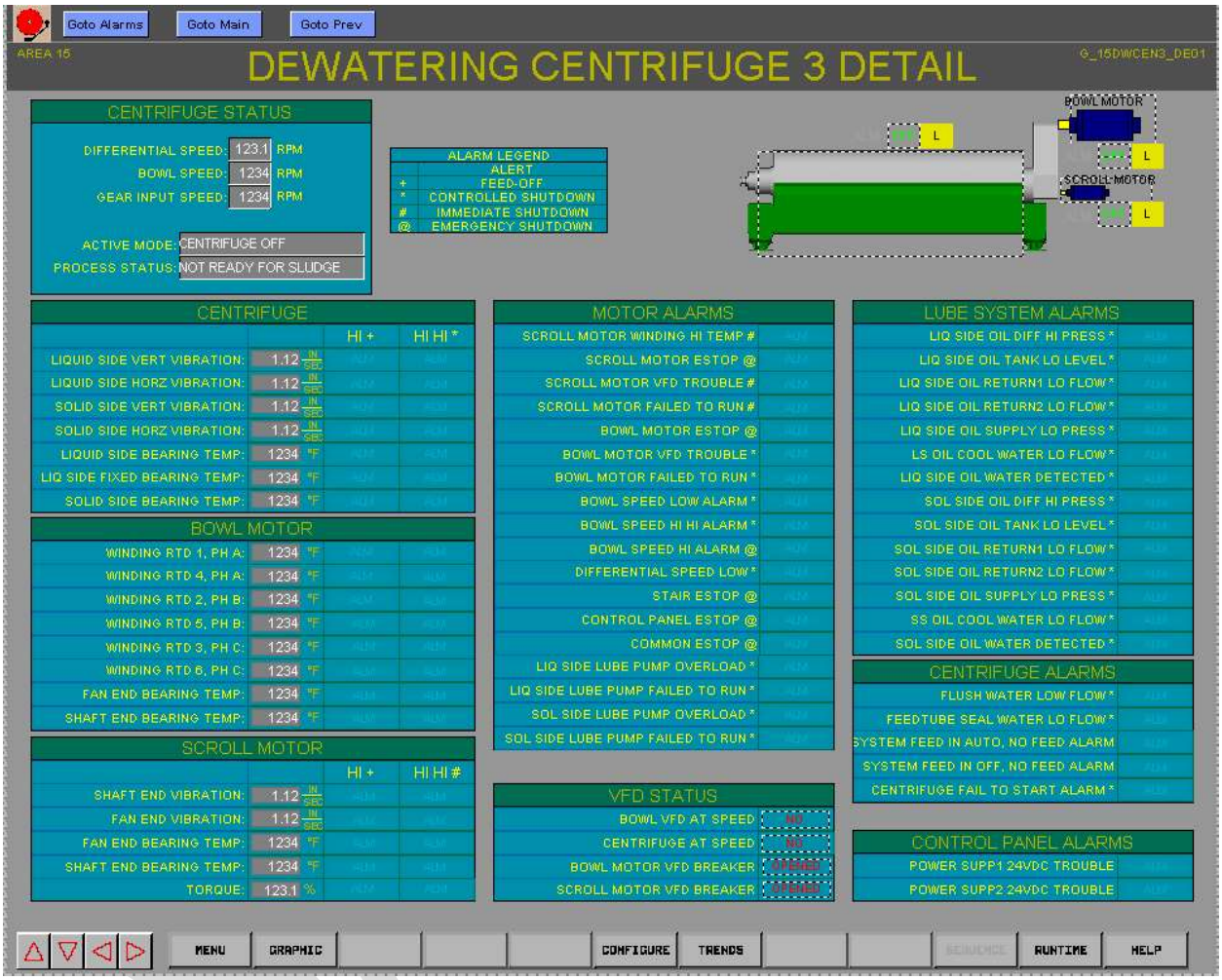
Lube Oil System Graphic

The Oil Lube System Overview displays the oil lube pumps and the oil cooling water valves. The sample is shown below.



Centrifuge Detail

The centrifuge detail screen will display the current parameter readings of the centrifuge. A sample of this display is shown below.

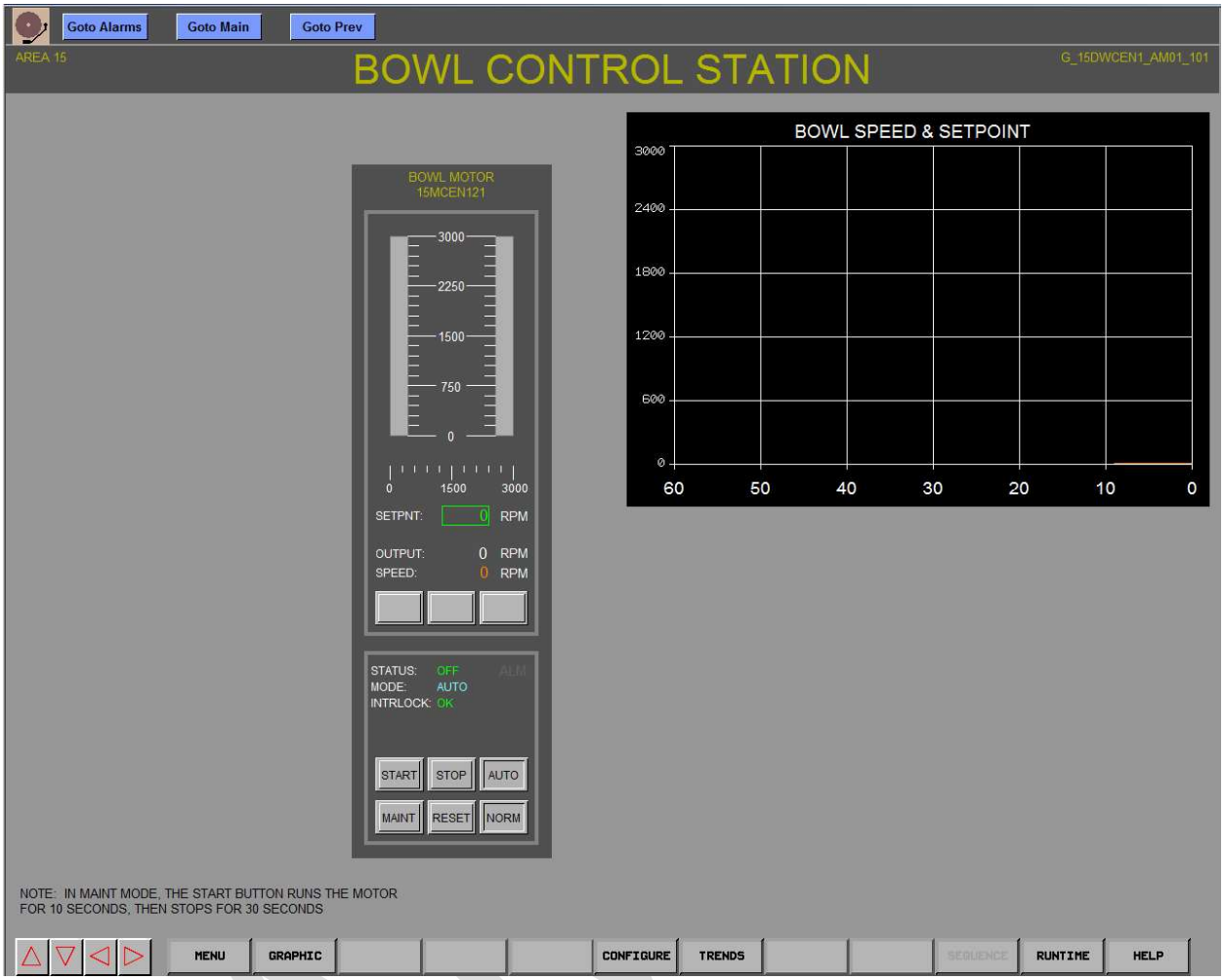


This detail screen displays the following:

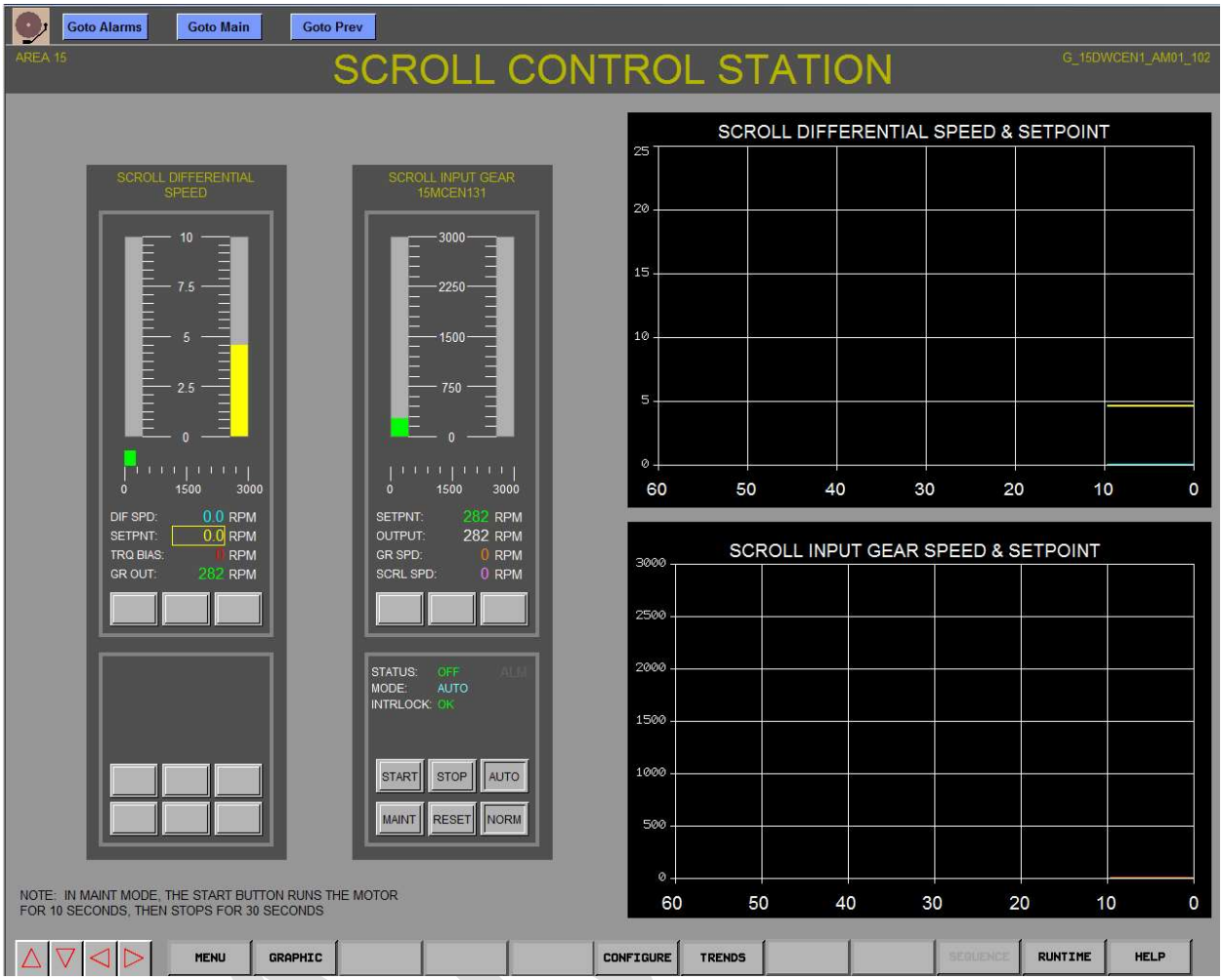
- Centrifuge Bearing Vibrations and Temperatures
- Bowl Motor Winding and Bearing Temperatures
- Scroll Motor Bearing Vibrations and Temperatures
- Scroll Motor Discrete Alarms
- Bowl Motor Discrete Alarms
- Control Panel Alarms
- Lube System Discrete Alarms
- Centrifuge Discrete Alarms

Centrifuge Control Station Screens

The centrifuge control stations screens allow operator control of the system. Nine (9) screens are represented below.



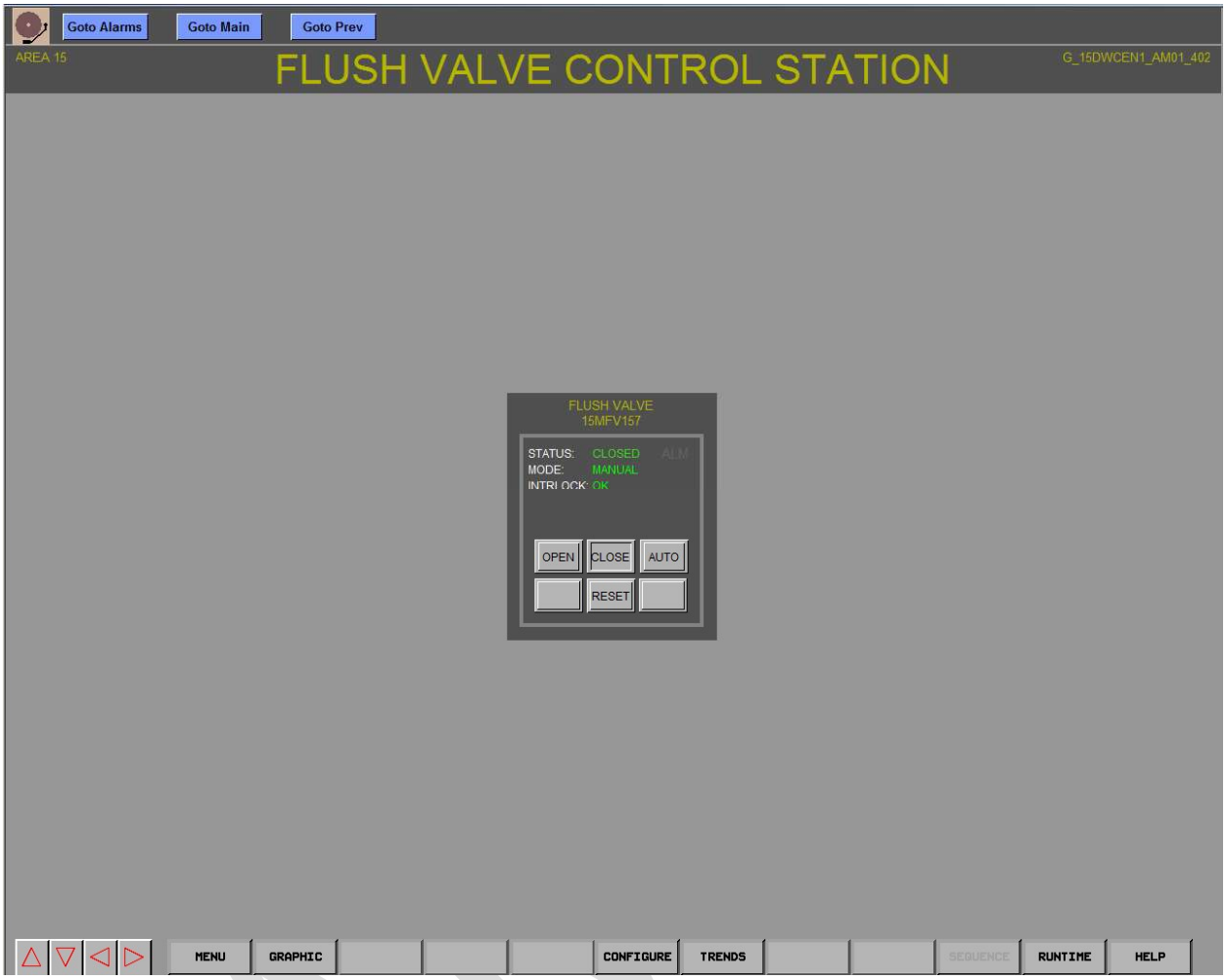
This screen shows START/STOP/AUTO control of the bowl motor. The operations of these components are described in the component subsections of this memo.



This screen shows START/STOP/AUTO control of the scroll motor. The operations of these components are described in the component subsections of this memo.

This screen shows START/STOP control of the flush and shutdown mode. The operations of these components are described in the component subsections of this memo.

This screen shows START/STOP control of clean in place (CIP) mode. The operations of these components are described in the component subsections of this memo.

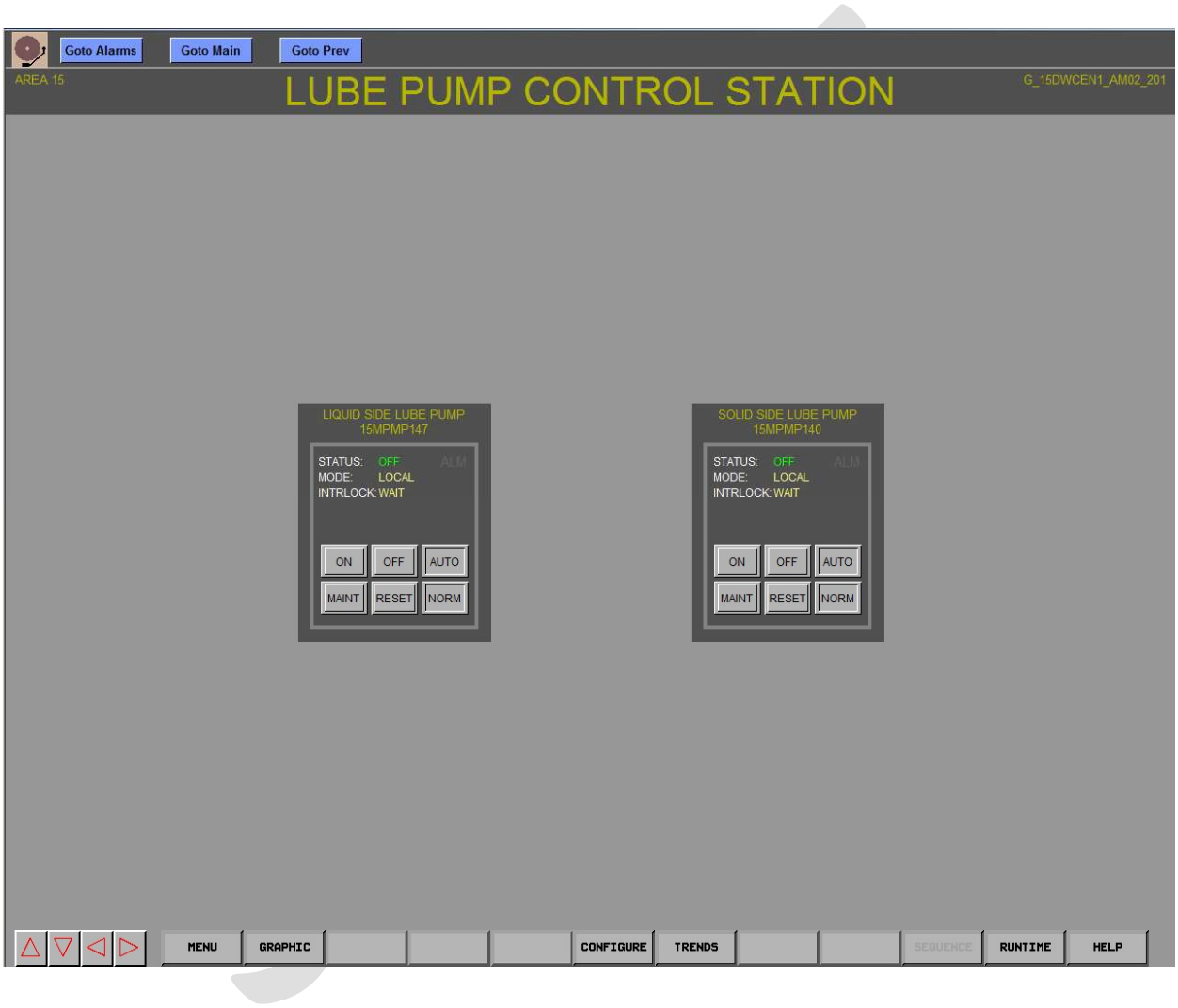


This screen shows OPEN/CLOSE/AUTO control of the flush water solenoid valves The operations of these components are described in the component subsections of this memo.

This screen shows OPEN/CLOSE/AUTO control of the seal water solenoid valve. The operations of these components are described in the component subsections of this memo.

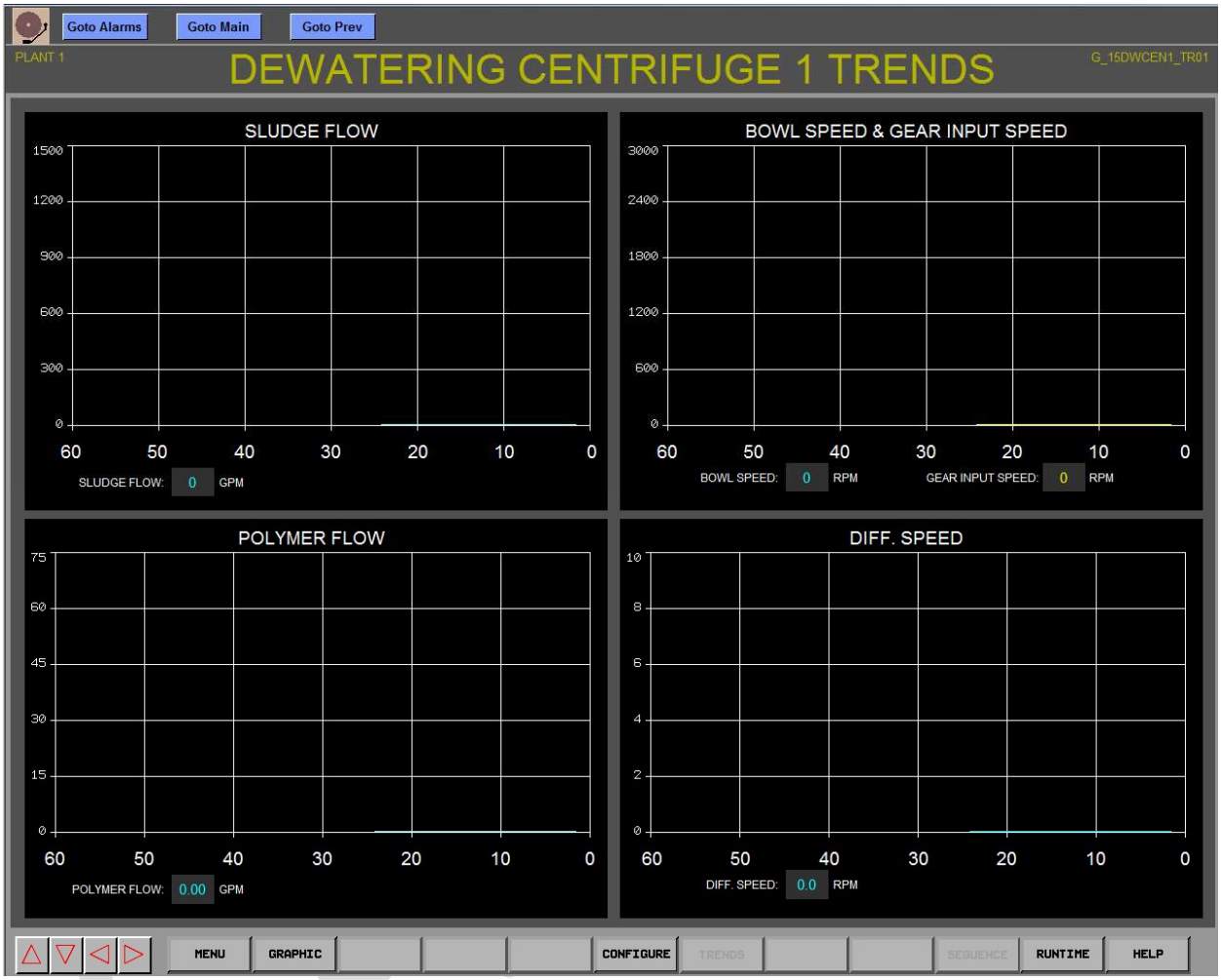
Lube System Control Stations

This screen displays the control stations for the liquid side and solid side pumps associated with the centrifuge lube system. The operations of these components are described in the component subsections of this memo.



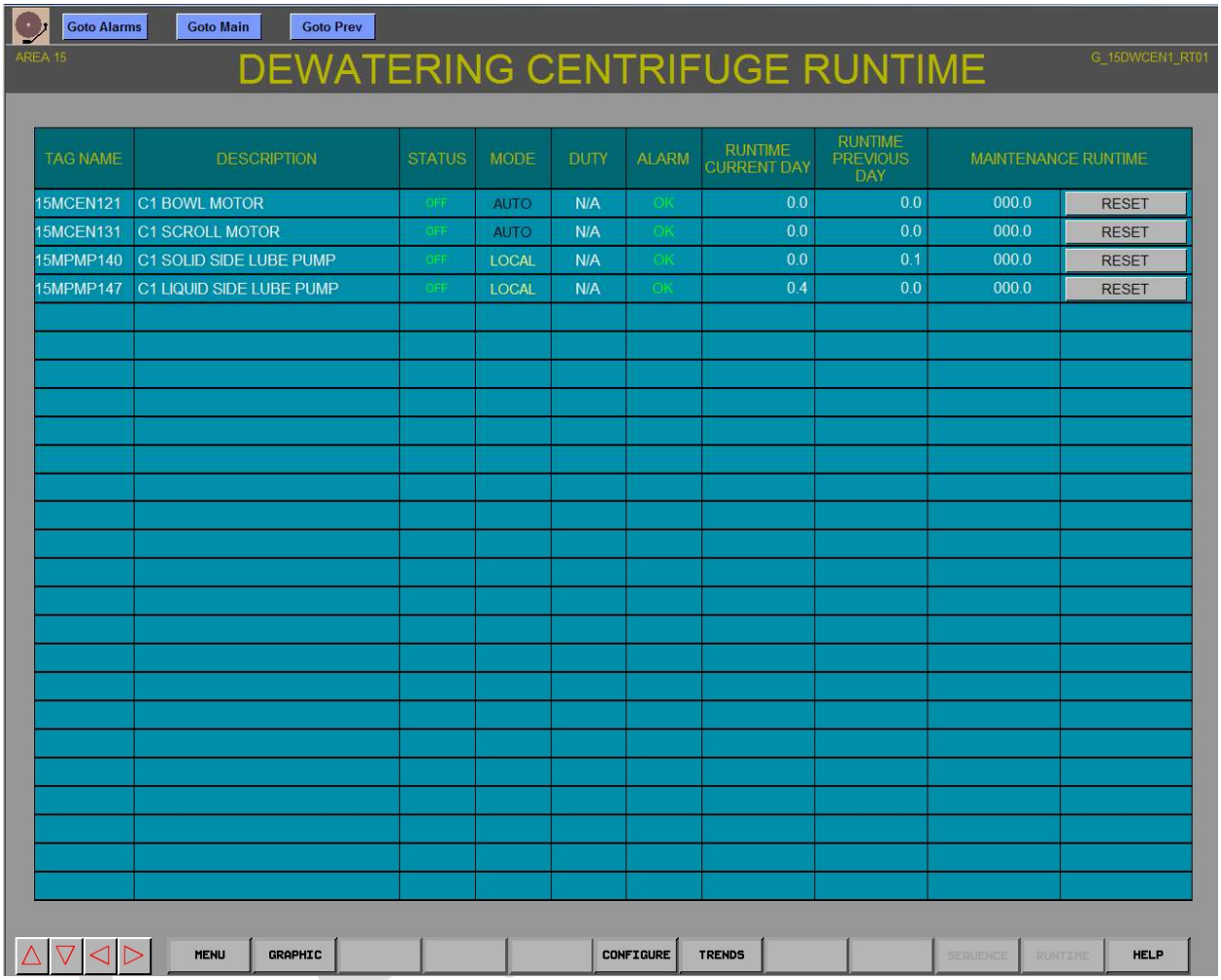
This screen displays the control stations for the liquid side and solid side pumps associated with the centrifuge lube system. The operations of these components are described in the component subsections of this memo.

Trend Screen



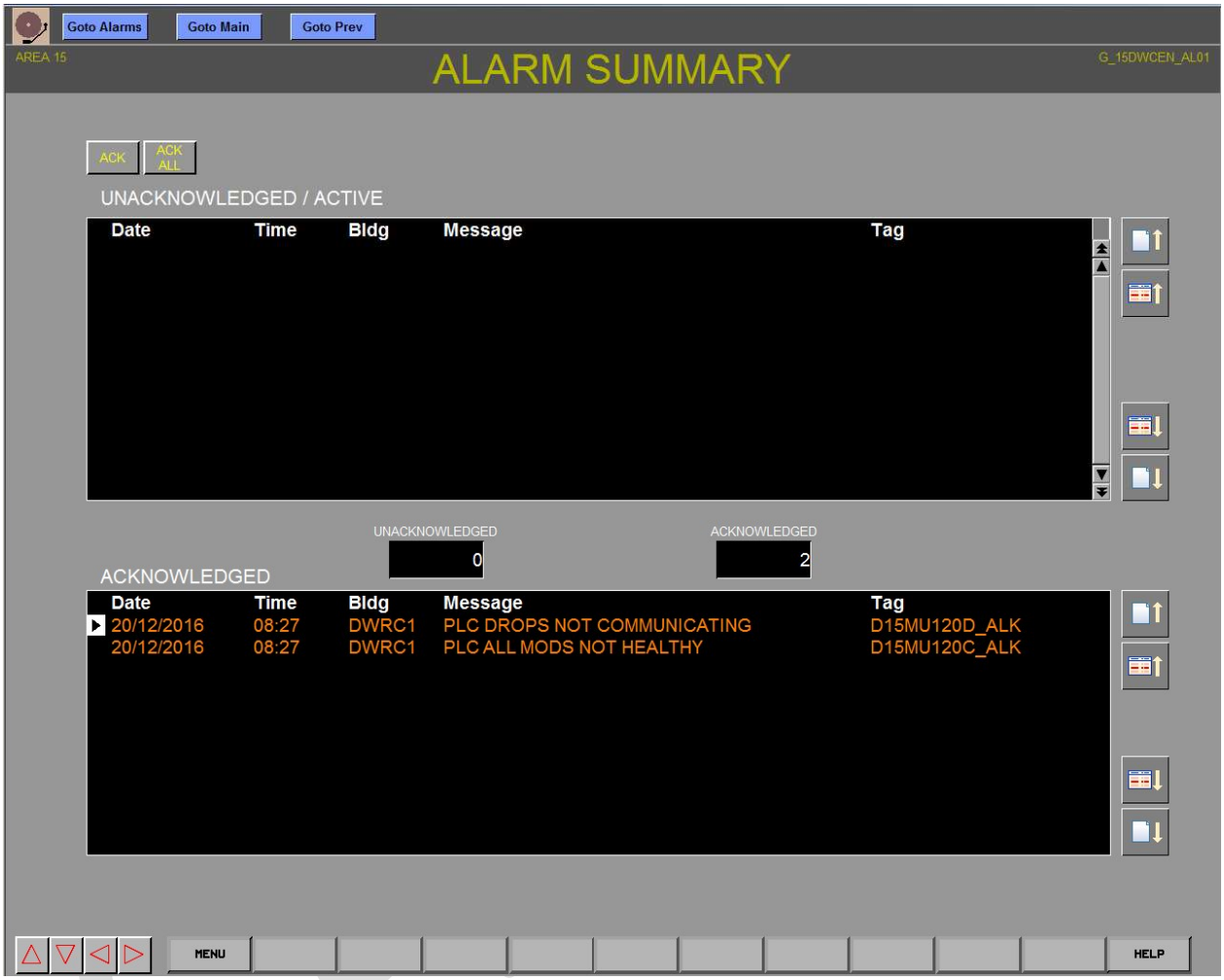
This screen displays the trends centrifuge sludge flow, polymer flow, bowl speed and gear speed, and differential speed.

Runtime Screen



This screen displays the runtimes of the equipment along with status, mode, and alarm condition. For this system Duty (Lead/Lag conditions are not applicable).

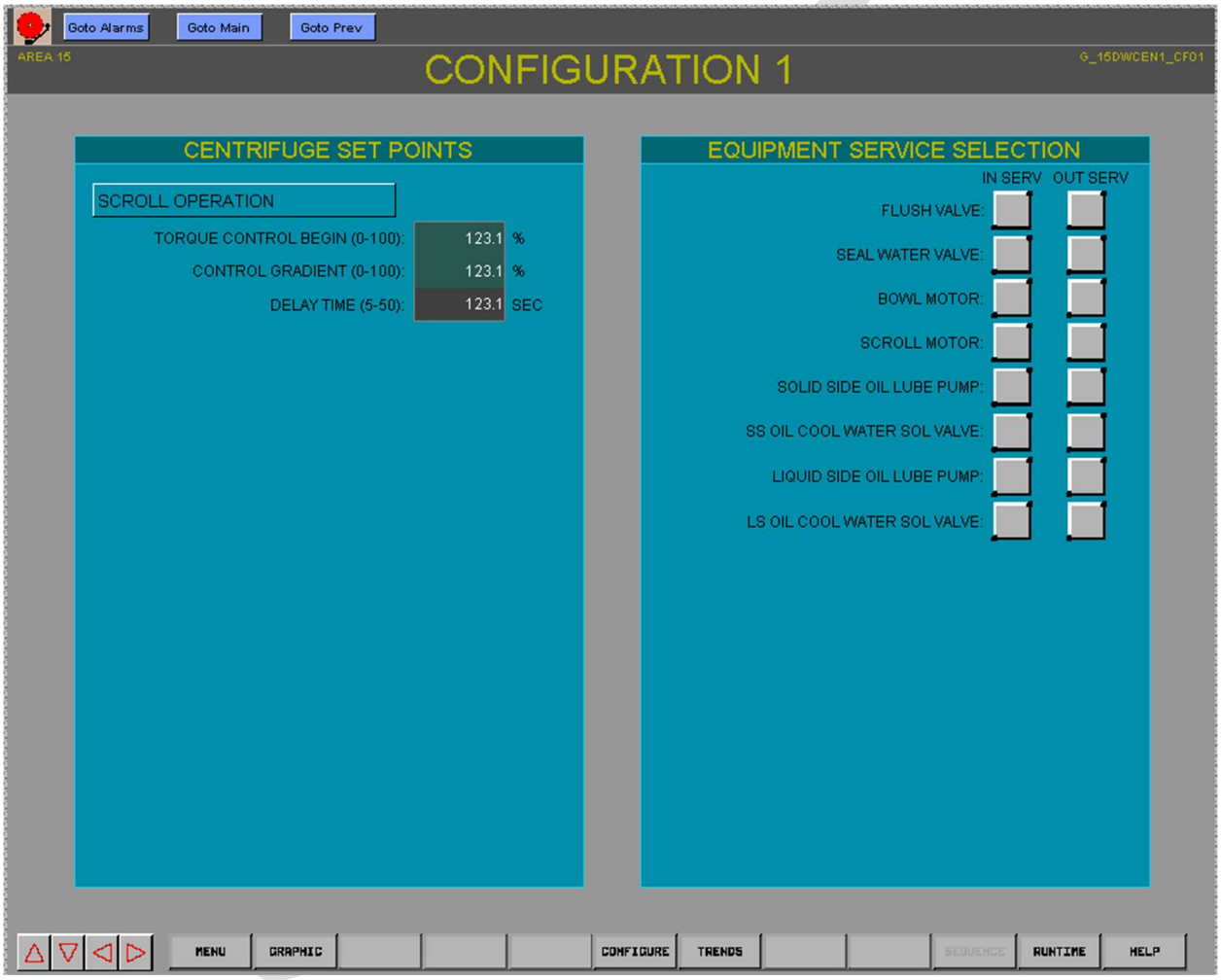
Alarm Screen



Any alarms will appear on this display screen in either the unacknowledged or acknowledged window. The sample text shows format of the alarm conditions. See Appendix A for a list of possible alarms.

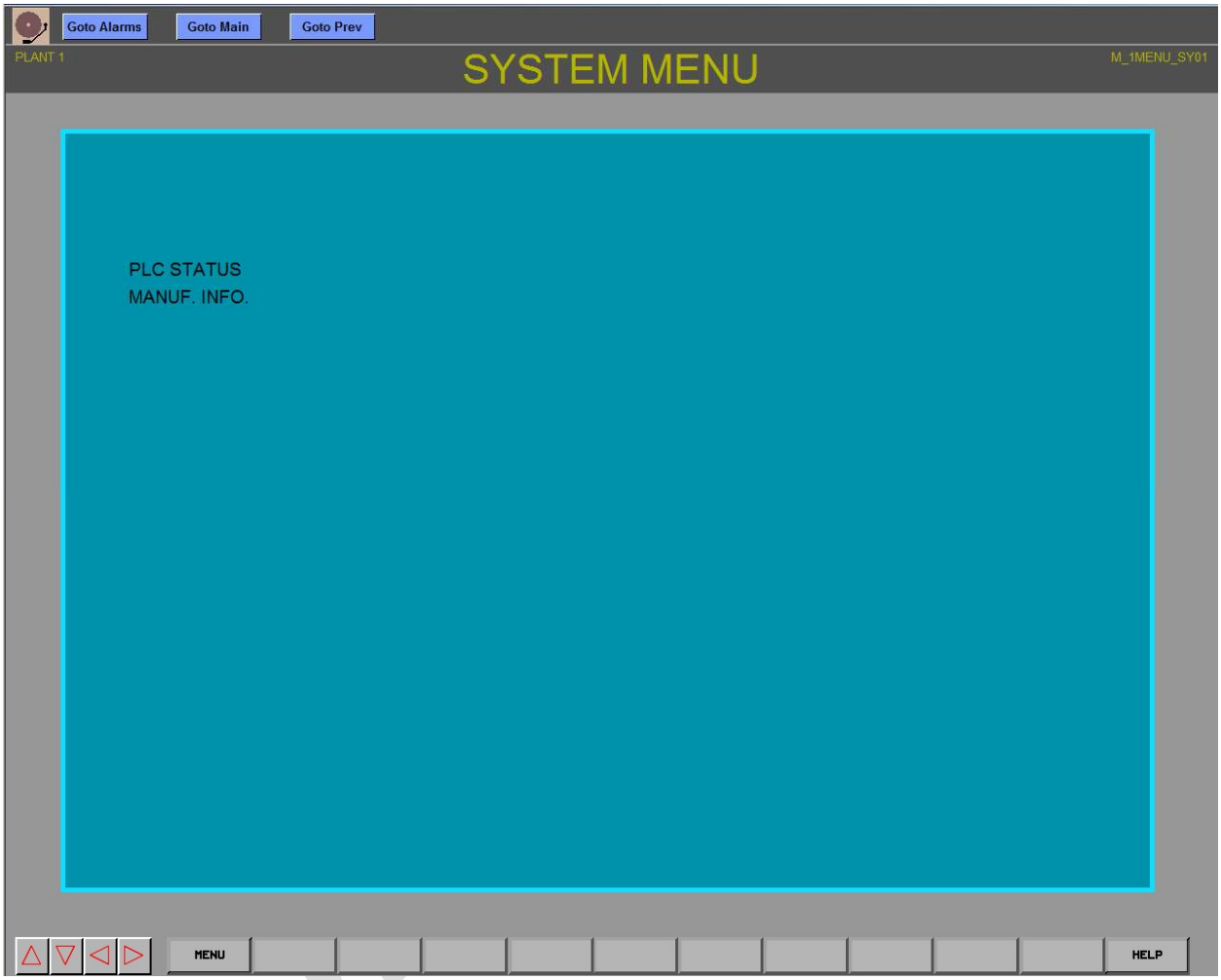
Configuration and Set Point Screens

This screen allows operator setpoint entry and in service and out of service selection of equipment. The set points with green background are configurable. And those with a brown background are hardcoded. In service or out of service are displayed by a check mark.

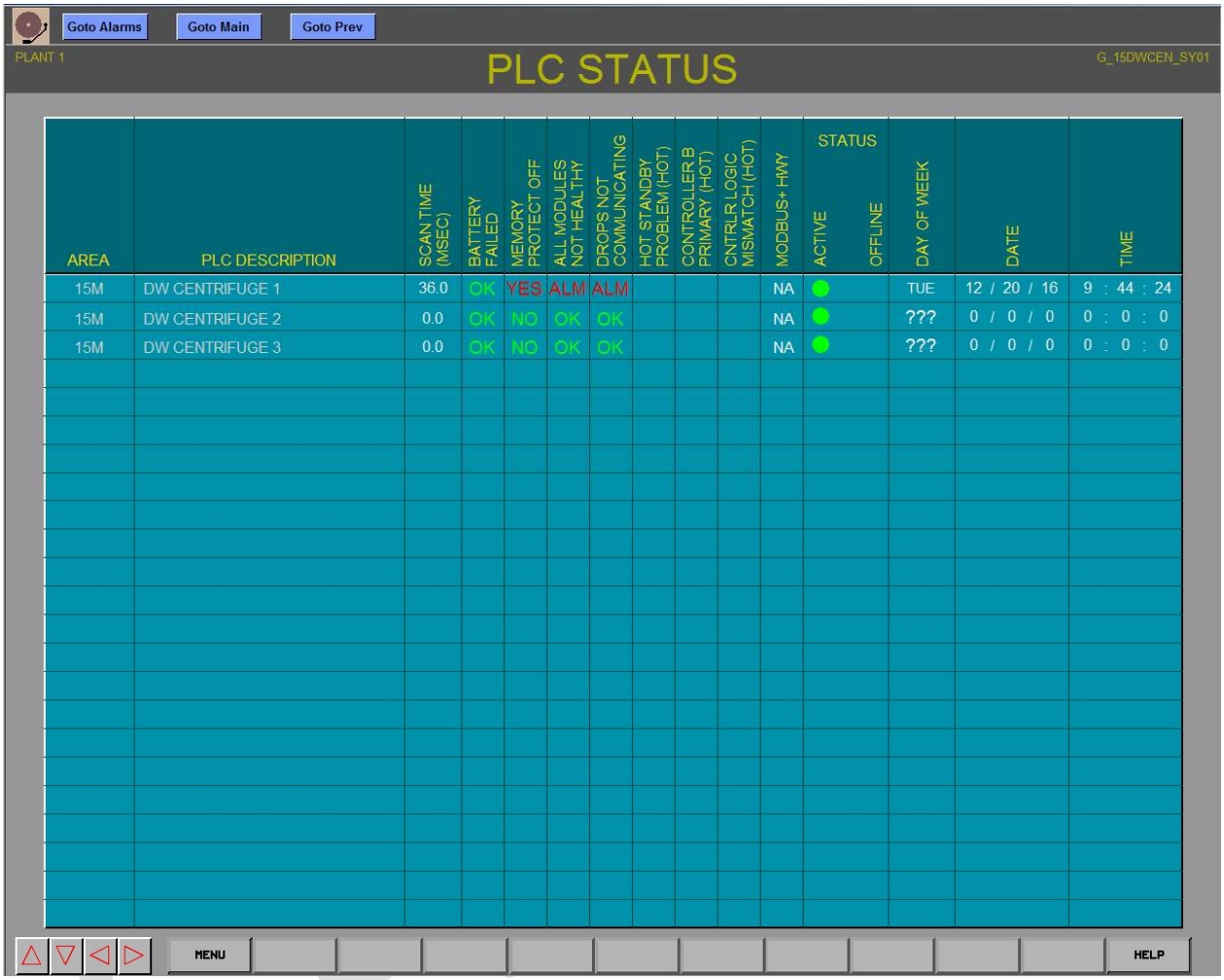


System Menu

This system menu allows display of PLC status, and Manufacturer's information.

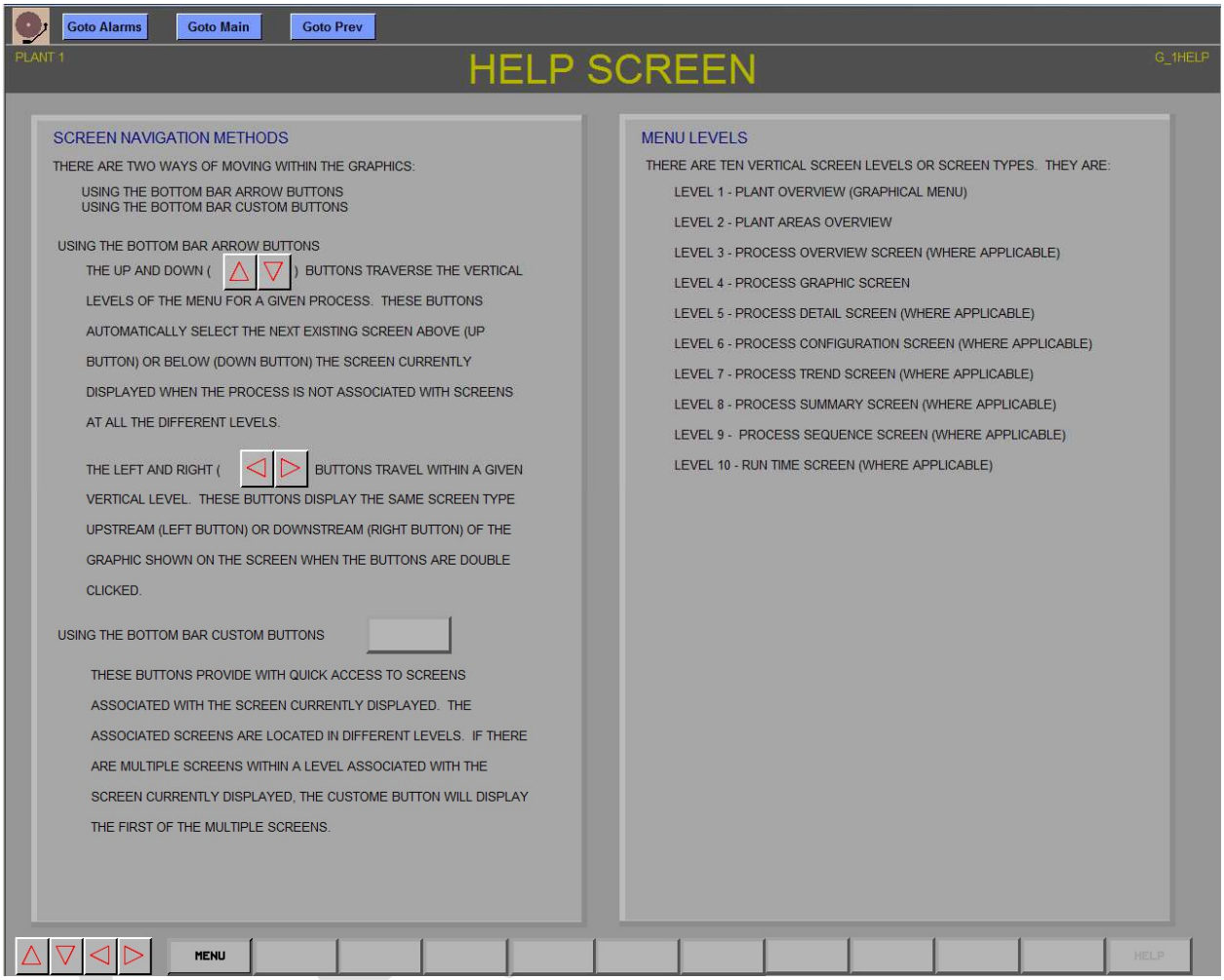


PLC Status Screen



Manufacturer's Information

Help Screen


Goto Alarms
Goto Main
Goto Prev
PLANT 1
HELP SCREEN
G_1HELP
SCREEN NAVIGATION METHODS
THERE ARE TWO WAYS OF MOVING WITHIN THE GRAPHICS:
USING THE BOTTOM BAR ARROW BUTTONS
USING THE BOTTOM BAR CUSTOM BUTTONS
USING THE BOTTOM BAR ARROW BUTTONS
THE UP AND DOWN ( ) BUTTONS TRAVERSE THE VERTICAL LEVELS OF THE MENU FOR A GIVEN PROCESS. THESE BUTTONS AUTOMATICALLY SELECT THE NEXT EXISTING SCREEN ABOVE (UP BUTTON) OR BELOW (DOWN BUTTON) THE SCREEN CURRENTLY DISPLAYED WHEN THE PROCESS IS NOT ASSOCIATED WITH SCREENS AT ALL THE DIFFERENT LEVELS.
THE LEFT AND RIGHT ( ) BUTTONS TRAVEL WITHIN A GIVEN VERTICAL LEVEL. THESE BUTTONS DISPLAY THE SAME SCREEN TYPE UPSTREAM (LEFT BUTTON) OR DOWNSTREAM (RIGHT BUTTON) OF THE GRAPHIC SHOWN ON THE SCREEN WHEN THE BUTTONS ARE DOUBLE CLICKED.
USING THE BOTTOM BAR CUSTOM BUTTONS
THESE BUTTONS PROVIDE WITH QUICK ACCESS TO SCREENS ASSOCIATED WITH THE SCREEN CURRENTLY DISPLAYED. THE ASSOCIATED SCREENS ARE LOCATED IN DIFFERENT LEVELS. IF THERE ARE MULTIPLE SCREENS WITHIN A LEVEL ASSOCIATED WITH THE SCREEN CURRENTLY DISPLAYED, THE CUSTOME BUTTON WILL DISPLAY THE FIRST OF THE MULTIPLE SCREENS.
MENU LEVELS
THERE ARE TEN VERTICAL SCREEN LEVELS OR SCREEN TYPES. THEY ARE:
LEVEL 1 - PLANT OVERVIEW (GRAPHICAL MENU)
LEVEL 2 - PLANT AREAS OVERVIEW
LEVEL 3 - PROCESS OVERVIEW SCREEN (WHERE APPLICABLE)
LEVEL 4 - PROCESS GRAPHIC SCREEN
LEVEL 5 - PROCESS DETAIL SCREEN (WHERE APPLICABLE)
LEVEL 6 - PROCESS CONFIGURATION SCREEN (WHERE APPLICABLE)
LEVEL 7 - PROCESS TREND SCREEN (WHERE APPLICABLE)
LEVEL 8 - PROCESS SUMMARY SCREEN (WHERE APPLICABLE)
LEVEL 9 - PROCESS SEQUENCE SCREEN (WHERE APPLICABLE)
LEVEL 10 - RUN TIME SCREEN (WHERE APPLICABLE)
MENU
HELP

APPENDIX A – ALARM CONDITIONS AND SHUTDOWNS

Alarm condition	Alert	Feed Off	Controlled Shutdown	Immediate Shutdown	Emergency Shutdown
Liquids Side Bearing Temp – HI		✓			
Liquids Side Bearing Temp – HIHI			✓		
Liquids Side Fixed Bearing Temp – HI		✓			
Liquids Side Fixed Bearing Temp – HIHI			✓		
Solids Side Bearing Temp – HI		✓			
Solids Side Bearing Temp – HIHI			✓		
Bowl Motor Shaft End Bearing Temp – HI		✓			
Bowl Motor Shaft End Bearing Temp – HIHI			✓		
Bowl Motor Fan End Bearing Temp – HI		✓			
Bowl Motor Fan End Bearing Temp – HIHI			✓		
Scroll Motor Shaft End Bearing Temp – HI		✓			
Scroll Motor Shaft End Bearing Temp HIHI				✓	
Scroll Motor Fan End Bearing Temp – HI		✓			
Scroll Motor Fan End Bearing Temp – HIHI				✓	
Bowl Motor Winding Temp – HI (6 x RTD's)		✓			
Bowl Motor Winding Temp – HIHI (6 x RTD's)			✓		
Scroll Motor Winding Temp HI				✓	
Bowl Speed HiHi			✓		
Bowl Speed Hi					✓
Bowl Speed Low				✓	
Differential Speed Low				✓	
Centrifuge CCP Emergency Stop					✓
Centrifuge Station (near stairs) Emergency Stop					✓
Centrifuge Bowl CMCC Emergency Stop					✓
Centrifuge Scroll CMCC Emergency Stop					✓
Bowl Motor VFD Fault			✓		
Bowl Motor VFD Fail to Run			✓		
Scroll Motor VFD Fault				✓	
Scroll Motor VFD Fail to Run				✓	
Torque HI		✓			
Torque HIHI				✓	
Liquids Side Horizontal Vibration HI		✓			
Liquids Side Horizontal Vibration HIHI			✓		
Liquids Side Vertical Vibration HI		✓			
Liquids Side Vertical Vibration HIHI			✓		
Solids Side Horizontal Vibration HI		✓			
Solids Side Horizontal Vibration HIHI			✓		
Solids Side Vertical Vibration HI		✓			
Solids Side Vertical Vibration HIHI			✓		
Scroll Motor Vibration HI		✓			
Scroll Motor Vibration HIHI			✓		
Liquids Side Lube Oil Pressure Low			✓		

Alarm condition	Alert	Feed Off	Controlled Shutdown	Immediate Shutdown	Emergency Shutdown
Liquids Side A Lube Oil Flow Low			✓		
Liquids Side B Lube Oil Flow Low			✓		
Liquids Side Lube Oil Cooling Flow Low			✓		
Liquids Side Lube Oil Level Low			✓		
Liquids Side Lube Oil Diff. Press High			✓		
Liquids Side Lube Oil Water Sensor Fault			✓		
Liquids Side Lube Oil Pump Motor Overload			✓		
Liquids Side Lube Oil Pump Motor Fail to Run			✓		
Solids Side Lube Oil Pressure Low			✓		
Solids Side A Lube Oil Flow Low			✓		
Solids Side B Lube Oil Flow Low			✓		
Solids Side Lube Oil Cooling Flow Low			✓		
Solids Side Lube Oil Level Low			✓		
Solids Side Lube Oil Diff. Press High			✓		
Solids Side Lube Oil Water Sensor Fault			✓		
Solids Side Lube Oil Pump Motor Overload			✓		
Solids Side Lube Oil Pump Motor Fail to Run			✓		
Plant System Fail to Feed	✓				
System Feed Control Station is Off	✓				
Flush Water Low Flow		✓			
Seal Water Low Flow			✓		
PNL FCP120 PS1 24VDC Trouble Alarm	✓				
PNL FCP120 PS2 24VDC Trouble Alarm	✓				

4 APPENDIX B – ANALOG SCALING

Scaling methods: All analog values will be scaled from the raw data to their respective Engineering units.

ANALOG INPUTS			
DESCRIPTION	**INPUT TYPE**	**RANGE (Eng. Units)**	**ALARM SET POINTS**
Bowl Motor Amps (Note 1)	4-20 mA	0 ~ 931.5 Amps	N/A
Bowl Motor Volts (Note 1)	4-20 mA	0 ~ 480 Volts	N/A
Bowl Motor Frequency (Note 1)	4-20 mA	0 ~ 60 Hz	N/A
Scroll Motor Amps (Note 1)	4-20 mA	0 ~ 131.8 Amps	N/A
Scroll Motor Volts (Note 1)	4-20 mA	0 ~ 480 Volts	N/A
Scroll Motor Torque (Note 1)	4-20 mA	0 ~ 150%	80% = HI 90% = HHI
Scroll Motor Frequency (Note 1)	4-20 mA	0 ~ 60 Hz	N/A
Centrifuge Bearing Temperatures	RTD, PT 100	0 ~ 1562°F	212°F = HI 230°F = HHI
Motor Bearing Temperatures	RTD, PT 100	0 ~ 1562°F	225°F = HI 235°F = HHI
Bowl Motor Winding Temperatures	RTD, PT 100	0 ~ 1562°F	293°F = HI 311°F = HHI
Bowl Speed	4-20 mA	0 ~ 3000 RPM	2200 RPM
Cyclo Gear Input Speed	4-20 mA	0 ~ 3000 RPM	N/A
Centrifuge Vibration	4-20 mA	0 ~ 2.0 in/s (RMS)	0.8 in/s = HI 1.0 in/s = HIHI
Sludge Flow Rate	4-20 mA	0 ~ 2000 GPM	N/A
Polymer Flow Rate	4-20 mA	0 ~ 50 GPM	N/A

Notes:
1. These signals are also monitored by SCADA via the Ethernet network.

ANALOG OUTPUTS		
DESCRIPTION	**OUTPUT TYPE**	**RANGE (Engineering Units)**
Bowl Motor VFD Speed Adjust	4-20 mA	0 ~ 100%
Scroll Motor VFD Speed Adjust	4-20 mA	0 ~ 100%

APPENDIX C – TIMERS / COUNTERS AND SETPOINTS

SCROLL CONTROL OPERATING SETPOINTS

These parameters are commonly modified to fine tune the process and are not password protected

- Control Begin
  Control Begin is the torque setpoint (%) at which the SJM control starts to operate. Above the Control Begin threshold, a rising torque results in a differential speed increase and a reduced torque in a differential speed decrease.
- Basic Differential Speed
  The basic differential speed is the differential speed at which the decanter works below the Control begin threshold.
- Control Gradient
  Slope of characteristic curve after exceeding the Control Begin threshold. The greater the control gradation value, the greater the differential speed change per torque unit and the more the control systems tends to override. The differential speed starts oscillating.
- Delay Time
  The delay time adjusts the reaction time of the decanter. A long delay time results in a slow decanter reaction. A short delay time results in a fast decanter reaction.

PROCESS PARAMETERS

These are parameters that users change depending on the type of sludge being processed. Some parameters in this group are password protected or secured.

- Flush Water Off Bowl Speed (secured)
  This is the bowl speed value at which the flush water will turn off during shutdown.
- Flush Water On Bowl Speed (secured)
  This is the bowl speed value at which the flush water will turn on during start-up.
- CIP Cycles
  This is the number of cycles required to clean the centrifuge.
- CIP Low Bowl Speed (secured)
  During the CIP sequence, this is the bowl speed at which the wall of liquid inside of the bowl will collapse.
- CIP High Bowl Speed (secured)
  During the CIP sequence, this is the bowl speed at which the bowl will accelerate to for a period of time, with flush water turned on, before costing down to the CIP Low Bowl speed.

PROCESS TIMERS

These timers control the starting and stopping of the equipment and will not usually need modification once commissioning is complete. Most of these parameters are either hard-coded or password protected.

- Torque / Open Diverter Gate
  This is the torque value at which the diverter gate will open. When the machine torque is greater than this set point for a preset time period, the diverter gate will open.
- Torque / Open Diverter Gate delay
  This is the time the torque must be above the set point before the diverter gate will open.
- Torque / Close Diverter Gate
  This is the torque value at which the diverter gate will close. When the machine torque is less than this set point for a preset time period, the diverter gate will close.
- Torque / Close Diverter Gate delay
  This is the time the torque must be above the set point before the diverter gate will close
- Bowl Motor Start-Up Timer
  This is the time that the main bowl motor is given to ramp up to operating speed. If the bowl speed is within the operating limits when this timer expires, then the centrifuge is ready to process sludge. If the bowl speed is above or below operating limits when this timer expires, then an alarm is issued and the controlled shutdown sequence is initiated
- Flush Water – Start-up
  This is the time that the flush water cycle is active during start-up
- Flush Water – Torque High
  This is the time that the flush water cycle is active, when triggered by a Torque High Alarm.
- Flush Water – Vibration High
  This is the time that the flush water cycle is active, when triggered by a Vibration High Alarm.
- Idle Mode - Flush Interval
  This is the time that centrifuge will remain in idle mode before the flush water valve will open
- Idle Mode - Flush Duration
  This is the time duration that valve will open during an idle mode flush
- Pre-Lube Timer
  This is the time duration that the lube oil system is required to run prior to starting the centrifuge.
- Post-Lube Timer
  This is the time duration that the lube oil system is required to run after the centrifuge has shut down.

MACHINE CONFIGURATION PARAMETERS

These parameters are set during commissioning and should not be modified except by qualified personnel. These parameters are password protected.

- Primary Gear Factor
  This is the gearbox ratio for the primary gear.
- Secondary Gear Factor
  This is the gearbox ratio for the secondary gear.
- Minimum Differential Speed
  This is the minimum differential speed for centrifuge operation. If the differential speed is below this setpoint, then a differential speed low alarm is issued.
- Maximum Differential Speed
  This is the maximum differential speed for centrifuge operation.
- Torque Suppression Value
  This is a bias value for the torque that is determined by operating the centrifuge with no load at the highest differential speed. This value is used to determine the true zero point of the torque with no load on the machine.
- Bowl Minimum Operating Speed
  This is the minimum bowl speed at which the centrifuge is designed to operate.
- Bowl Maximum Operating Speed
  This is the maximum bowl speed at which the centrifuge is designed to operate.
- Bowl at Speed (Ready for Feed)
  This is the operating bowl speed for processing.
- Restart Interlock
  During a shutdown cycle, the centrifuge can be restarted when the bowl speed drops below this setpoint.
- Torque High
  This is the setpoint of the torque high alarm.
- Torque High-High
  This is the setpoint of the torque high-high alarm.
- Vibration High
  This is the setpoint of the vibration high alarm.
- Vibration High-High
  This is the setpoint of the vibration high-high alarm.
- Bearing Temperature High
  This is the setpoint of the bearing temperature high alarms.
- Bearing Temperature High-High
  This is the setpoint of the bearing temperature high-high alarms.

4 APPENDIX D – PRESETS AND SECURITY SETUP

Description	Preset	Units	Range
Scroll Operation			
Control Begin	30	%	0-100
Basic Differential Speed	5	Rpm	1.0-9.8
Gradient	13	%	0-100
Delay Time	5	seconds	0-100
Process Parameters			
Torque/diverter gate close	15	%	0 – 100
Torque/diverter gate open	25	%	0 – 100
Flush Water Off Bowl Speed	200	Rpm	0-500
Flush Water On Start-up Bowl Speed	500	Rpm	0-1850
Flush Water Off Torque (Flush & Shutdown)	15	%	0-100
CIP Cycles	3	-	0-99
CIP Bowl Speed High	500	Rpm	0-1850
CIP Bowl Speed Low	100	Rpm	0-1850

4 APPENDIX E – CENTRIFUGE FORMULAS AND CALCULATIONS

Enter calculations required

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1																																									
2	02001	55FU079_CLK	ROCKY PLC CLCK	WIDE CLK UPDATE																																					
3	04001	55FU079_BAT	PLC BATTERY	FAILED																																					
4	04002	55FU079_MEM	PLC MEMORY	PROTECT OFF																																					
5	04003	55FU079_MOD	PLC ALL MODS	NOT HEALTHY																																					
6	04004	55FU079_COM	PLC DROPS NOT	COMMUNICATING																																					
7	04011	55FU079_PRO	PLC HOT STNDBY	PROBLEM (HOT)																																					
8	04012	55FU079_B	PLC CNTRLLER B	PRIMARY (HOT)																																					
9	04013	55FU079_MIS	PLC CNTR LOGIC	MISMATCH (HOT)																																					
10	44001	55FU079_SCN	ROCKY PLC PROG	SCAN TIME	0-999.9 MSEC																																				
11	44002	55FU079_DOW	ROCKY PLC CLCK	DAY OF WEEK	0-7 DOW																																				
12	44003	55FU079_MON	ROCKY PLC CLCK	MONTH	0-12 MONTH																																				
13	44004	55FU079_DAY	ROCKY PLC CLCK	DAY	0-31 DAY																																				
14	44005	55FU079_YR	ROCKY PLC CLCK	YEAR	0-99 YEAR																																				
15	44006	55FU079_HR	ROCKY PLC CLCK	HOUR	0-24 HOUR																																				
16	44007	55FU079_MIN	ROCKY PLC CLCK	MINUTE	0-60 MINUTE																																				
17	44008	55FU079_SEC	ROCKY PLC CLCK	SECOND	0-60 SECOND																																				
18																																									
19	10018	55FLSH040	WW FLOAT	HI LEVEL						D03-R01-S03-P02																																
20	00042	55FLAH040	WW FLOAT	HI LEVEL ALM						D02-R01-S06-P10																																
21	04022	55FLSH040_ALA	WW FLOAT	HI LEVEL ALARM																																					
22	02021	55FLSH040_ALH	WW FLOAT	ALARM ACK HMI																																					
23	04023	55FLSH040_ALK	WW FLOAT	ALARM ACK																																					
24																																									
25	30022	55FLIT038	WW SONIC 2	LEVEL	0-300 INCHES					D06-R01-S07-P04																																
26	44023	55FLIT038_LVL	WW SONIC 2	LEVEL	0-300 INCHES																																				
27																																									
28	02032	55FLF038_ISH	WW SONIC 2	INS HMI																																					
29	04041	55FLF038_ISM	WW SONIC 2	INS MODE																																					
30	02031	55FLF038_OSH	WW SONIC 2	OOS HMI																																					
31	04040	55FLF038_OSM	WW SONIC 2	OOS MODE																																					
32																																									
33	10161	55FYS038B	WW SONIC 2	XMTR TRBL						D05-R01-S05-P01																																
34	04036	55FYS038B_ALA	WW SONIC 2	XMTR TRBL ALM																																					
35	02028	55FYS038B_ALH	WW SONIC 2	ALARM ACK HMI																																					
36	04037	55FYS038B_ALK	WW SONIC 2	ALARM ACK																																					
37	00051	55FYA038B	WW SONIC 2	XMTR TRBL ALM						D02-R01-S07-P03																																
38																																									
39	02034	55FLE038J_S2H	WW SONIC 2	HMI SELECT																																					
40	10003	55FHS038J	WW SONIC 2	SELECT						D02-R01-S03-P03																																
41	04043	55FLE038J_S2M	WW SONIC 2	SELECTED																																					
42	00002	55FYL038J	WW SONIC 2	SELECTED						D02-R01-S04-P02																																
43																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
44	30002	55FLIT035	WW SONIC 1	LEVEL	0-300 INCHES					D04-R01-S05-P02																														
45	44022	55FLIT035_LVL	WW SONIC 1	LEVEL	0-300 INCHES																																			
46																																								
47	02030	55FLF035_ISH	WW SONIC 1	INS HMI																																				
48	04039	55FLF035_ISM	WW SONIC 1	INS MODE																																				
49	02029	55FLF035_OSH	WW SONIC 1	OOS HMI																																				
50	04038	55FLF035_OSM	WW SONIC 1	OOS MODE																																				
51																																								
52	10019	55FLSL035	WW SONIC 1	LO LEVEL						D03-R01-S03-P03																															
53	04032	55FLSL035_ALA	WW SONIC 1	LO LEVEL ALARM																																				
54	02026	55FLSL035_ALH	WW SONIC 1	ALARM ACK HMI																																				
55	04033	55FLSL035_ALK	WW SONIC 1	ALARM ACK																																				
56	00043	55FLAL035	WW SONIC 1	LO LEVEL ALM						D02-R01-S06-P11																															
57																																								
58	10065	55FLSMA035	WW SONIC 1 P1	START						D03-R01-S06-P01																															
59	04024	55FLSMA035_ALA	WW SONIC 1 P1	START ALARM																																				
60	02022	55FLSMA035_ALH	WW SONIC 1 P1	ALARM ACK HMI																																				
61	04025	55FLSMA035_ALK	WW SONIC 1 P1	ALARM ACK																																				
62	10066	55FLSMB035	WW SONIC 1 P2	START						D03-R01-S06-P02																															
63	04026	55FLSMB035_ALA	WW SONIC 1 P2	START ALARM																																				
64	02023	55FLSMB035_ALH	WW SONIC 1 P2	ALARM ACK HMI																																				
65	04027	55FLSMB035_ALK	WW SONIC 1 P2	ALARM ACK																																				
66	10081	55FLSMC035	WW SONIC 1 P3	START						D03-R01-S07-P01																															
67	04028	55FLSMC035_ALA	WW SONIC 1 P3	START ALARM																																				
68	02024	55FLSMC035_ALH	WW SONIC 1 P3	ALARM ACK HMI																																				
69	04029	55FLSMC035_ALK	WW SONIC 1 P3	ALARM ACK																																				
70	10082	55FLSMD035	WW SONIC 1 P4	START						D03-R01-S07-P02																															
71	04030	55FLSMD035_ALA	WW SONIC 1 P4	START ALARM																																				
72	02025	55FLSMD035_ALH	WW SONIC 1 P4	ALARM ACK HMI																																				
73	04031	55FLSMD035_ALK	WW SONIC 1 P4	ALARM ACK																																				
74																																								
75	10017	55FYS035B	WW SONIC 1	XMTR TRBL						D03-R01-S03-P01																															
76	04034	55FYS035B_ALA	WW SONIC 1	XMTR TRBL ALM																																				
77	02027	55FYS035B_ALH	WW SONIC 1	ALARM ACK HMI																																				
78	04035	55FYS035B_ALK	WW SONIC 1	ALARM ACK																																				
79	00050	55FYA035B	WW SONIC 1	XMTR TRBL ALM						D02-R01-S07-P02																															
80																																								
81	02033	55FLE035J_S1H	WW SONIC 1	HMI SELECT																																				
82	10002	55FHS035J	WW SONIC 1	SELECT						D02-R01-S03-P02																															
83	04042	55FLE035J_S1M	WW SONIC 1	SELECTED																																				
84	00001	55FYL035J	WW SONIC 1	SELECTED						D02-R01-S04-P01																															
85																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
86	44024	55FLIT035_ACT	WW ACT	LEVEL	0-300 INCHES																																		
87	40001	55FLI034	WW ACT LCP	LEVEL	0-300 INCHES					D02-R01-S10-P01																															
88	40013	55FLI034D	WW ACT LCPA	LEVEL	0-300 INCHES					D04-R01-S09-P01																															
89	40007	55FLI034B	WW ACT ELEC RM	LEVEL	0-300 INCHES					D04-R01-S07-P03																															
90	40010	55FLI034A	WW ACT DRYWELL	LEVEL	0-300 INCHES					D04-R01-S08-P02																															
91																																									
92	42024	55FLT035_LLS	WW ACT	LOLO LVL SET	0-300 INCHES																																				
93	44028	55FLT035_LLP	WW ACT	LOLO LVL SP	0-300 INCHES																																				
94	04052	55FLT035_LLA	WW ACT	LOLO LVL ALM																																				
95	02039	55FLT035_LLH	WW ACT	LOLO LVL ACKHMI																																				
96	04053	55FLT035_LLK	WW ACT	LOLO LVL ALMACK																																				
97	00040	55FLALL034	WW ACT	LOLO LEVEL ALM						D02-R01-S06-P08																															
98																																									
99	42023	55FLT035_LS	WW ACT	LO LVL SET	0-300 INCHES																																				
100	44027	55FLT035_LP	WW ACT	LO LVL SP	0-300 INCHES																																				
101	04050	55FLT035_LA	WW ACT	LO LVL ALM																																				
102	02038	55FLT035_LH	WW ACT	LO LVL ACKHMI																																				
103	04051	55FLT035_LK	WW ACT	LO LVL ALMACK																																				
104	00039	55FLAL034	WW ACT	LO LEVEL ALM						D02-R01-S06-P07																															
105																																									
106	42022	55FLT035_HS	WW ACT	HI LVL SET	0-300 INCHES																																				
107	44026	55FLT035_HP	WW ACT	HI LVL SP	0-300 INCHES																																				
108	04048	55FLT035_HA	WW ACT	HI LVL ALM																																				
109	02037	55FLT035_HH	WW ACT	HI LVL ACKHMI																																				
110	04049	55FLT035_HK	WW ACT	HI LVL ALMACK																																				
111	00038	55FLAH034	WW ACT	HI LEVEL ALM						D02-R01-S06-P06																															
112																																									
113	42021	55FLT035_HHS	WW ACT	HIHI LVL SET	0-300 INCHES																																				
114	44025	55FLT035_HHP	WW ACT	HIHI LVL SP	0-300 INCHES																																				
115	04046	55FLT035_HHA	WW ACT	HIHI LVL ALM																																				
116	02036	55FLT035_HHH	WW ACT	HIHI LVL ACKHMI																																				
117	04047	55FLT035_HHK	WW ACT	HIHI LVL ALMACK																																				
118	00037	55FLAHH034	WW ACT	HIHI LEVEL ALM						D02-R01-S06-P05																															
119																																									
120	04054	55FLT035_COA	WW ACT	COMMON ALARM																																				
121	04055	55FLT035_COK	WW ACT	COMMON ALM ACK																																				
122																																									
123	10004	55FHS034J	WW ACT LCP	LVL SETPT UP						D02-R01-S03-P04																															
124	10005	55FHS034K	WW ACT LCP	LVL SETPT DOWN						D02-R01-S03-P05																															
125	40002	55FLI034C	WW ACT LCP	LEVEL SETPT	0-300 INCHES					D02-R01-S10-P02																															
126																																									
127	04045	55FLDSH035_ACK	WW ACT	ALARM ACK																																				
128	02035	55FLDSH035_ALH	WW ACT	ALARM ACK HMI																																				
129	04044	55FLDSH035_ALM	WW ACT	DEVIATION ALARM																																				
130																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
131	02072	55FPMP100_OSH	PUMP 1	OOS HMI																																			
132	04110	55FPMP100_OSM	PUMP 1	OOS MODE																																			
133	02073	55FPMP100_ISH	PUMP 1	INS HMI																																			
134	04111	55FPMP100_ISM	PUMP 1	INS MODE																																			
135																																								
136	02069	55FPMP100_ONH	PUMP 1	ON HMI																																			
137	04107	55FPMP100_ONM	PUMP 1	ON MODE																																			
138	02070	55FPMP100_OFH	PUMP 1	OFF HMI																																			
139	04108	55FPMP100_OFM	PUMP 1	OFF MODE																																			
140	02071	55FPMP100_AUH	PUMP 1	AUTO HMI																																			
141	04109	55FPMP100_AUM	PUMP 1	AUTO MODE																																			
142																																								
143	10034	55FHS100B	PUMP 1	REMOTE						D03-R01-S04-P02																															
144	10035	55FHS100J	PUMP 1	HAND						D03-R01-S04-P03																															
145	04113	55FPMP100_HND	PUMP 1	HAND																																			
146																																								
147	04105	55FPMP100_DIS	PUMP 1	DISABLE MODE																																			
148	04106	55FPMP100_WAT	PUMP 1	WAIT																																			
149																																								
150	04112	55FPMP100_ON	PUMP 1	ON																																				
151	00007	55FYL100L	PUMP 1	ON						D02-R01-S04-P07																															
152	00086	55FYL100P	PUMP 1 LCPA	ON						D03-R01-S10-P06																															
153																																								
154	44058	55FPMP100_MOD	PUMP 1	MODE DISPLAY	0-4095 MODE																																			
155	44057	55FPMP100_SYM	PUMP 1	SYMBOL DISPLAY	0-4095 SYMBOL																																			
156	44048	55FPB100_DUT	PUMP 1	DUTY DISPLAY	0-4095 DUTY																																			
157																																								
158	04117	55FPMP100_FAA	PUMP 1	FAIL ALARM																																			
159	02075	55FPMP100_FAH	PUMP 1	FAIL ACK HMI																																			
160	04118	55FPMP100_FAK	PUMP 1	FAIL ALM ACK																																			
161																																								
162	10033	55FYS100M	PUMP 1	PROTECT ON						D03-R01-S04-P01																															
163	04056	55FYS100M_ALA	PUMP 1	PROTECT ON ALM																																			
164	02040	55FYS100M_ALH	PUMP 1	ALARM ACK HMI																																			
165	04057	55FYS100M_ALK	PUMP 1	ALARM ACK																																			
166																																								
167	04119	55FPMP100_COA	PUMP 1	COMMON ALARM																																			
168	04120	55FPMP100_COK	PUMP 1	COMMON ALM ACK																																			
169	00019	55FYA100B	PUMP 1	TROUBLE ALM						D02-R01-S05-P03																															
170																																								
171	02074	55FPMP100_ALR	PUMP 1	ALARM RESET HMI																																			
172	00099	55FPMP100H	PUMP 1	PLC RESET						D04-R01-S03-P03																															
173																																								
174	44061	55FPMP100_RTC	PUMP 1	RUNTME CURR DAY	0-999.9 HOURS																																			
175	44062	55FPMP100_RTP	PUMP 1	RUNTME PREV DAY	0-999.9 HOURS																																			
176	44059	55FPMP100_RTM	PUMP 1	RUNTME CUMM MSD	0-9999 HRS x100																																			
177	44060	55FPMP100_RTL	PUMP 1	RUNTME CUMM LSD	0-999.9 HOURS																																			
178	02076	55FPMP100_RTR	PUMP 1	RUNTIME RESET																																			
179																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
180	10038	55FYS100A	PUMP 1 VS	READY						D03-R01-S04-P06																															
181	04115	55FYS100A_RDY	PUMP 1 VS	READY																																					
182	10037	55FYS100	PUMP 1 VS	ON						D03-R01-S04-P05																															
183																																								
184	30001	55FST100	PUMP 1 VS	SPEED	0-100 PERCENT					D04-R01-S05-P01																															
185	44056	55FPMP100_SPD	PUMP 1 VS	SPEED	0-100 PERCENT																																				
186	44093	55FST100_RPM	PUMP 1	SPEED	0-1188 RPM																																				
187																																								
188	40005	55FSC100	PUMP 1 VS	SPEED	0-100 PERCENT					D04-R01-S07-P01																															
189																																								
190	10036	55FHS100K	PUMP 1 VS	SELECT						D03-R01-S04-P04																															
191	04114	55FPMP100_VSS	PUMP 1 VS	SELECTED																																					
192																																								
193	42042	55FPMP100_SRS	PUMP 1 VS	SPEED RAMP SET	0.1-100 RAMP																																				
194	44055	55FPMP100_SRP	PUMP 1 VS	SPEED RAMP SP	0.1-100 RAMP																																				
195																																								
196	00097	55FPMP100	PUMP 1 VS	RUN						D04-R01-S03-P01																															
197																																								
198	02067	55FPA100_AAH	PUMP 1	A/M AUTO HMI																																					
199	04103	55FPA100_AAM	PUMP 1	A/M AUTO MODE																																					
200	02068	55FPA100_AMH	PUMP 1	A/M MANUAL HMI																																					
201	04104	55FPA100_AMM	PUMP 1	A/M MANUAL MODE																																					
202																																								
203	42041	55FPA100_AMS	PUMP 1	A/M MAN SPD SET	0-100 PERCENT																																				
204	44053	55FPA100_AMP	PUMP 1	A/M SPEED SP	0-100 PERCENT																																				
205	44054	55FPA100_AMB	PUMP 1	A/M SPEED BAR	0-100 PERCENT																																				
206																																								
207	10039	55FYS100B	PUMP 1 VS	TROUBLE						D03-R01-S04-P07																															
208	04062	55FYS100B_ALA	PUMP 1 VS	TROUBLE ALARM																																					
209	02043	55FYS100B_ALH	PUMP 1 VS	ALARM ACK HMI																																					
210	04063	55FYS100B_ALK	PUMP 1 VS	ALARM ACK																																					
211																																								
212	10040	55FHS100H	PUMP 1 VS	RESET						D03-R01-S04-P08																															
213																																								
214	10104	55FHS100L	PUMP 1 VS LCPA	START						D03-R01-S08-P08																															
215	10105	55FHS100M	PUMP 1 VS LCPA	STOP						D03-R01-S08-P09																															
216																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
217	44194	55FIIT100A_AMP	PUMP 1 VFD	AMPS PHASE A																																				
218	44195	55FIIT100B_AMP	PUMP 1 VFD	AMPS PHASE B																																				
219	44196	55FIIT100C_AMP	PUMP 1 VFD	AMPS PHASE C																																				
220																																									
221	04342	55FISH100L_ALA	PUMP 1 VFD	OVERLD TRIP ALM																																				
222	02190	55FISH100L_ALH	PUMP 1 VFD	ALARM ACK HMI																																				
223	04343	55FISH100L_ALK	PUMP 1 VFD	ALARM ACK																																				
224																																									
225	04344	55FTSH100J_ALA	PUMP 1 VFD	INV OVRHEAT ALM																																				
226	02191	55FTSH100J_ALH	PUMP 1 VFD	ALARM ACK HMI																																				
227	04345	55FTSH100J_ALK	PUMP 1 VFD	ALARM ACK																																				
228																																									
229	04346	55FESL100J_ALA	PUMP 1 VFD	LO DC VOLT ALM																																				
230	02192	55FESL100J_ALH	PUMP 1 VFD	ALARM ACK HMI																																				
231	04347	55FESL100J_ALK	PUMP 1 VFD	ALARM ACK																																				
232																																									
233	04348	55FYS100Q_ALA	PUMP 1 VFD	HARDWAR FLT ALM																																				
234	02193	55FYS100Q_ALH	PUMP 1 VFD	ALARM ACK HMI																																				
235	04349	55FYS100Q_ALK	PUMP 1 VFD	ALARM ACK																																				
236																																									
237	04350	55FESH100J_ALA	PUMP 1 VFD	HI DC VOLT ALM																																				
238	02194	55FESH100J_ALH	PUMP 1 VFD	ALARM ACK HMI																																				
239	04351	55FESH100J_ALK	PUMP 1 VFD	ALARM ACK																																				
240																																									
241	04383	55FPMP100_ALM	PUMP 1 VFD	COMM FAIL ALARM																																				
242																																									
243	10042	55FYS100L	PUMP 1 CS	READY						D03-R01-S04-P10																														
244	04116	55FYS100L_RDY	PUMP 1 CS	READY																																				
245	00098	55FPMP100B	PUMP 1 CS	RUN						D04-R01-S03-P02																														
246	10041	55FYS100J	PUMP 1 CS	ON						D03-R01-S04-P09																														
247																																									
248	10043	55FISH100	PUMP 1 CS	OVERLOAD						D03-R01-S04-P11																														
249	04064	55FISH100_ALA	PUMP 1 CS	OVERLOAD ALARM																																				
250	02044	55FISH100_ALH	PUMP 1 CS	ALARM ACK HMI																																				
251	04065	55FISH100_ALK	PUMP 1 CS	ALARM ACK																																				
252																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
253	10044	55FMSH104	PUMP 1 MTR	HI MOISTURE						D03-R01-S04-P12																														
254	04060	55FMSH104_ALA	PUMP 1 MTR	HI MOISTURE ALM																																			
255	02042	55FMSH104_ALH	PUMP 1 MTR	ALARM ACK HMI																																			
256	04061	55FMSH104_ALK	PUMP 1 MTR	ALARM ACK																																			
257	00017	55FMAH104	PUMP 1 MTR	HI MOISTURE ALM						D02-R01-S05-P01																														
258																																							
259	10045	55FTSH103	PUMP 1 MTR	HI WIND TMP						D03-R01-S04-P13																														
260	04058	55FTSH103_ALA	PUMP 1 MTR	HI WIND TMP ALM																																			
261	02041	55FTSH103_ALH	PUMP 1 MTR	ALARM ACK HMI																																			
262	04059	55FTSH103_ALK	PUMP 1 MTR	ALARM ACK																																			
263	00018	55FTAH103	PUMP 1 MTR	HI WIND TMP ALM						D02-R01-S05-P02																														
264																																							
265	10046	55FZSC105	PUMP 1 CHK VLV	CLOSED						D03-R01-S04-P14																														
266	44097	55FZSC105_STA	PUMP 1 CHK VLV	STATUS DISPLAY	0-4095 STATUS																																			
267	00011	55FZLO105	PUMP 1 CHK VLV	OPENED						D02-R01-S04-P11																														
268	00090	55FZLO105A	PUMP 1 CV LCPA	OPENED						D03-R01-S10-P10																														
269																																							
270	04175	55FZSC105_ALA	PUMP 1 CHK VLV	CLOSED ALARM																																			
271	02107	55FZSC105_ALH	PUMP 1 CHK VLV	ALARM ACK HMI																																			
272	04176	55FZSC105_ALK	PUMP 1 CHK VLV	ALARM ACK																																			
273																																							

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
274	02082	55FPMP200_OSH	PUMP 2	OOS HMI																																			
275	04128	55FPMP200_OSM	PUMP 2	OOS MODE																																			
276	02083	55FPMP200_ISH	PUMP 2	INS HMI																																			
277	04129	55FPMP200_ISM	PUMP 2	INS MODE																																			
278																																								
279	02079	55FPMP200_ONH	PUMP 2	ON HMI																																			
280	04125	55FPMP200_ONM	PUMP 2	ON MODE																																			
281	02080	55FPMP200_OFH	PUMP 2	OFF HMI																																			
282	04126	55FPMP200_OFM	PUMP 2	OFF MODE																																			
283	02081	55FPMP200_AUH	PUMP 2	AUTO HMI																																			
284	04127	55FPMP200_AUM	PUMP 2	AUTO MODE																																			
285																																								
286	10050	55FHS200B	PUMP 2	REMOTE						D03-R01-S05-P02																															
287	10051	55FHS200J	PUMP 2	HAND						D03-R01-S05-P03																															
288	04131	55FPMP200_HND	PUMP 2	HAND																																			
289																																								
290	04123	55FPMP200_DIS	PUMP 2	DISABLE MODE																																			
291	04124	55FPMP200_WAT	PUMP 2	WAIT																																			
292																																								
293	04130	55FPMP200_ON	PUMP 2	ON																																				
294	00008	55FYL200L	PUMP 2	ON						D02-R01-S04-P08																															
295	00087	55FYL200P	PUMP 2 LCPA	ON						D03-R01-S10-P07																															
296																																								
297	44068	55FPMP200_MOD	PUMP 2	MODE DISPLAY	0-4095 MODE																																			
298	44067	55FPMP200_SYM	PUMP 2	SYMBOL DISPLAY	0-4095 SYMBOL																																			
299	44049	55FPB200_DUT	PUMP 2	DUTY DISPLAY	0-4095 DUTY																																			
300																																								
301	04135	55FPMP200_FAA	PUMP 2	FAIL ALARM																																			
302	02085	55FPMP200_FAH	PUMP 2	FAIL ACK HMI																																			
303	04136	55FPMP200_FAK	PUMP 2	FAIL ALM ACK																																			
304																																								
305	10049	55FYS200M	PUMP 2	PROTECT ON						D03-R01-S05-P01																															
306	04066	55FYS200M_ALA	PUMP 2	PROTECT ON ALM																																			
307	02045	55FYS200M_ALH	PUMP 2	ALARM ACK HMI																																			
308	04067	55FYS200M_ALK	PUMP 2	ALARM ACK																																			
309																																								
310	04137	55FPMP200_COA	PUMP 2	COMMON ALARM																																			
311	04138	55FPMP200_COK	PUMP 2	COMMON ALM ACK																																			
312	00024	55FYA200B	PUMP 2	TROUBLE ALM						D02-R01-S05-P08																															
313																																								
314	02084	55FPMP200_ALR	PUMP 2	ALARM RESET HMI																																			
315	00107	55FPMP200H	PUMP 2	PLC RESET						D04-R01-S04-P03																															
316																																								
317	44071	55FPMP200_RTC	PUMP 2	RUNTME CURR DAY	0-999.9 HOURS																																			
318	44072	55FPMP200_RTP	PUMP 2	RUNTME PREV DAY	0-999.9 HOURS																																			
319	44069	55FPMP200_RTM	PUMP 2	RUNTME CUMM MSD	0-9999 HRS x100																																			
320	44070	55FPMP200_RTL	PUMP 2	RUNTME CUMM LSD	0-999.9 HOURS																																			
321	02086	55FPMP200_RTR	PUMP 2	RUNTIME RESET																																			
322																																								

ITEM	REGISTER	TAG	= NOT APPLICABLE DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
323	10054	55FYS200A	PUMP 2 VS	READY						D03-R01-S05-P06																															
324	04133	55FYS200A_RDY	PUMP 2 VS	READY																																					
325	10053	55FYS200	PUMP 2 VS	ON						D03-R01-S05-P05																															
326																																								
327	30010	55FST200	PUMP 2 VS	SPEED	0-100 PERCENT					D04-R01-S06-P01																															
328	44066	55FPMP200_SPD	PUMP 2 VS	SPEED	0-100 PERCENT																																				
329	44094	55FST200_RPM	PUMP 2	SPEED	0-1188 RPM																																				
330																																								
331	40009	55FSC200	PUMP 2 VS	SPEED	0-100 PERCENT					D04-R01-S08-P01																															
332																																								
333	10052	55FHS200K	PUMP 2 VS	SELECT						D03-R01-S05-P04																															
334	04132	55FPMP200_VSS	PUMP 2 VS	SELECTED																																					
335																																								
336	42044	55FPMP200_SRS	PUMP 2 VS	SPEED RAMP SET	0.1-100 RAMP																																				
337	44065	55FPMP200_SRP	PUMP 2 VS	SPEED RAMP SP	0.1-100 RAMP																																				
338																																								
339	00105	55FPMP200	PUMP 2 VS	RUN						D04-R01-S04-P01																															
340																																								
341	02077	55FPA200_AAH	PUMP 2	A/M AUTO HMI																																					
342	04121	55FPA200_AAM	PUMP 2	A/M AUTO MODE																																					
343	02078	55FPA200_AMH	PUMP 2	A/M MANUAL HMI																																					
344	04122	55FPA200_AMM	PUMP 2	A/M MANUAL MODE																																					
345																																								
346	42043	55FPA200_AMS	PUMP 2	A/M MAN SPD SET	0-100 PERCENT																																				
347	44063	55FPA200_AMP	PUMP 2	A/M SPEED SP	0-100 PERCENT																																				
348	44064	55FPA200_AMB	PUMP 2	A/M SPEED BAR	0-100 PERCENT																																				
349																																								
350	10055	55FYS200B	PUMP 2 VS	TROUBLE						D03-R01-S05-P07																															
351	04072	55FYS200B_ALA	PUMP 2 VS	TROUBLE ALARM																																					
352	02048	55FYS200B_ALH	PUMP 2 VS	ALARM ACK HMI																																					
353	04073	55FYS200B_ALK	PUMP 2 VS	ALARM ACK																																					
354																																								
355	10056	55FHS200H	PUMP 2 VS	RESET						D03-R01-S05-P08																															
356																																								
357	10106	55FHS200L	PUMP 2 VS LCPA	START						D03-R01-S08-P10																															
358	10107	55FHS200M	PUMP 2 VS LCPA	STOP						D03-R01-S08-P11																															
359																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
360	44197	55FIIT200A_AMP	PUMP 2 VFD	AMPS PHASE A																																				
361	44198	55FIIT200B_AMP	PUMP 2 VFD	AMPS PHASE B																																				
362	44199	55FIIT200C_AMP	PUMP 2 VFD	AMPS PHASE C																																				
363																																									
364	04352	55FISH200L_ALA	PUMP 2 VFD	OVERLD TRIP ALM																																				
365	02195	55FISH200L_ALH	PUMP 2 VFD	ALARM ACK HMI																																				
366	04353	55FISH200L_ALK	PUMP 2 VFD	ALARM ACK																																				
367																																									
368	04354	55FTSH200J_ALA	PUMP 2 VFD	INV OVRHEAT ALM																																				
369	02196	55FTSH200J_ALH	PUMP 2 VFD	ALARM ACK HMI																																				
370	04355	55FTSH200J_ALK	PUMP 2 VFD	ALARM ACK																																				
371																																									
372	04356	55FESL200J_ALA	PUMP 2 VFD	LO DC VOLT ALM																																				
373	02197	55FESL200J_ALH	PUMP 2 VFD	ALARM ACK HMI																																				
374	04357	55FESL200J_ALK	PUMP 2 VFD	ALARM ACK																																				
375																																									
376	04358	55FYS200Q_ALA	PUMP 2 VFD	HARDWAR FLT ALM																																				
377	02198	55FYS200Q_ALH	PUMP 2 VFD	ALARM ACK HMI																																				
378	04359	55FYS200Q_ALK	PUMP 2 VFD	ALARM ACK																																				
379																																									
380	04360	55FESH200J_ALA	PUMP 2 VFD	HI DC VOLT ALM																																				
381	02199	55FESH200J_ALH	PUMP 2 VFD	ALARM ACK HMI																																				
382	04361	55FESH200J_ALK	PUMP 2 VFD	ALARM ACK																																				
383																																									
384	04384	55FPMP200_ALM	PUMP 2 VFD	COMM FAIL ALARM																																				
385																																									
386	10058	55FYS200L	PUMP 2 CS	READY						D03-R01-S05-P10																														
387	04134	55FYS200L_RDY	PUMP 2 CS	READY																																				
388	00106	55FPMP200B	PUMP 2 CS	RUN						D04-R01-S04-P02																														
389	10057	55FYS200J	PUMP 2 CS	ON						D03-R01-S05-P09																														
390																																									
391	10059	55FISH200	PUMP 2 CS	OVERLOAD						D03-R01-S05-P11																														
392	04074	55FISH200_ALA	PUMP 2 CS	OVERLOAD ALARM																																				
393	02049	55FISH200_ALH	PUMP 2 CS	ALARM ACK HMI																																				
394	04075	55FISH200_ALK	PUMP 2 CS	ALARM ACK																																				
395																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
396	10060	55FMSH204	PUMP 2 MTR	HI MOISTURE						D03-R01-S05-P12																														
397	04070	55FMSH204_ALA	PUMP 2 MTR	HI MOISTURE ALM																																				
398	02047	55FMSH204_ALH	PUMP 2 MTR	ALARM ACK HMI																																				
399	04071	55FMSH204_ALK	PUMP 2 MTR	ALARM ACK																																				
400	00022	55FMAH204	PUMP 2 MTR	HI MOISTURE ALM						D02-R01-S05-P06																														
401																																						
402	10061	55FTSH203	PUMP 2 MTR	HI WIND TMP						D03-R01-S05-P13																														
403	04068	55FTSH203_ALA	PUMP 2 MTR	HI WIND TMP ALM																																				
404	02046	55FTSH203_ALH	PUMP 2 MTR	ALARM ACK HMI																																				
405	04069	55FTSH203_ALK	PUMP 2 MTR	ALARM ACK																																				
406	00023	55FTAH203	PUMP 2 MTR	HI WIND TMP ALM						D02-R01-S05-P07																														
407																																						
408	10062	55FZSC205	PUMP 2 CHK VLV	CLOSED						D03-R01-S05-P14																														
409	44098	55FZSC205_STA	PUMP 2 CHK VLV	STATUS DISPLAY	0-4095 STATUS																																			
410	00012	55FZLO205	PUMP 2 CHK VLV	OPENED						D02-R01-S04-P12																														
411	00091	55FZLO205A	PUMP 2 CV LCPA	OPENED						D03-R01-S10-P11																														
412																																						
413	04177	55FZSC205_ALA	PUMP 2 CHK VLV	CLOSED ALARM																																				
414	02108	55FZSC205_ALH	PUMP 2 CHK VLV	ALARM ACK HMI																																				
415	04178	55FZSC205_ALK	PUMP 2 CHK VLV	ALARM ACK																																				
416																																						

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
417	02092	55FPMP300_OSH	PUMP 3	OOS HMI																																				
418	04146	55FPMP300_OSM	PUMP 3	OOS MODE																																				
419	02093	55FPMP300_ISH	PUMP 3	INS HMI																																				
420	04147	55FPMP300_ISM	PUMP 3	INS MODE																																				
421																																									
422	02089	55FPMP300_ONH	PUMP 3	ON HMI																																				
423	04143	55FPMP300_ONM	PUMP 3	ON MODE																																				
424	02090	55FPMP300_OFH	PUMP 3	OFF HMI																																				
425	04144	55FPMP300_OFM	PUMP 3	OFF MODE																																				
426	02091	55FPMP300_AUH	PUMP 3	AUTO HMI																																				
427	04145	55FPMP300_AUM	PUMP 3	AUTO MODE																																				
428																																									
429	10130	55FHS300B	PUMP 3	REMOTE						D05-R01-S03-P02																														
430	10131	55FHS300J	PUMP 3	HAND						D05-R01-S03-P03																														
431	04149	55FPMP300_HND	PUMP 3	HAND																																				
432																																									
433	04141	55FPMP300_DIS	PUMP 3	DISABLE MODE																																				
434	04142	55FPMP300_WAT	PUMP 3	WAIT																																				
435																																									
436	04148	55FPMP300_ON	PUMP 3	ON																																				
437	00009	55FYL300L	PUMP 3	ON						D02-R01-S04-P09																														
438	00088	55FYL300P	PUMP 3 LCPA	ON						D03-R01-S10-P08																														
439																																									
440	44078	55FPMP300_MOD	PUMP 3	MODE DISPLAY	0-4095 MODE																																				
441	44077	55FPMP300_SYM	PUMP 3	SYMBOL DISPLAY	0-4095 SYMBOL																																				
442	44050	55FPB300_DUT	PUMP 3	DUTY DISPLAY	0-4095 DUTY																																				
443																																									
444	04153	55FPMP300_FAA	PUMP 3	FAIL ALARM																																				
445	02095	55FPMP300_FAH	PUMP 3	FAIL ACK HMI																																				
446	04154	55FPMP300_FAK	PUMP 3	FAIL ALM ACK																																				
447																																									
448	10129	55FYS300M	PUMP 3	PROTECT ON						D05-R01-S03-P01																														
449	04076	55FYS300M_ALA	PUMP 3	PROTECT ON ALM																																				
450	02050	55FYS300M_ALH	PUMP 3	ALARM ACK HMI																																				
451	04077	55FYS300M_ALK	PUMP 3	ALARM ACK																																				
452																																									
453	04155	55FPMP300_COA	PUMP 3	COMMON ALARM																																				
454	04156	55FPMP300_COK	PUMP 3	COMMON ALM ACK																																				
455	00029	55FYA300B	PUMP 3	TROUBLE ALM						D02-R01-S05-P13																														
456																																									
457	02094	55FPMP300_ALR	PUMP 3	ALARM RESET HMI																																				
458	00115	55FPMP300H	PUMP 3	PLC RESET						D06-R01-S03-P03																														
459																																									
460	44081	55FPMP300_RTC	PUMP 3	RUNTME CURR DAY	0-999.9 HOURS																																				
461	44082	55FPMP300_RTP	PUMP 3	RUNTME PREV DAY	0-999.9 HOURS																																				
462	44079	55FPMP300_RTM	PUMP 3	RUNTME CUMM MSD	0-9999 HRS x100																																				
463	44080	55FPMP300_RTL	PUMP 3	RUNTME CUMM LSD	0-999.9 HOURS																																				
464	02096	55FPMP300_RTR	PUMP 3	RUNTIME RESET																																				
465																																									

ITEM	REGISTER	TAG	= NOT APPLICABLE DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
466	10134	55FYS300A	PUMP 3 VS	READY						D05-R01-S03-P06																															
467	04151	55FYS300A_RDY	PUMP 3 VS	READY																																					
468	10133	55FYS300	PUMP 3 VS	ON						D05-R01-S03-P05																															
469																																								
470	30019	55FST300	PUMP 3 VS	SPEED	0-100 PERCENT					D06-R01-S07-P01																															
471	44076	55FPMP300_SPD	PUMP 3 VS	SPEED	0-100 PERCENT																																				
472	44095	55FST300_RPM	PUMP 3	SPEED	0-1188 RPM																																				
473																																								
474	40021	55FSC300	PUMP 3 VS	SPEED	0-100 PERCENT					D06-R01-S09-P01																															
475																																								
476	10132	55FHS300K	PUMP 3 VS	SELECT						D05-R01-S03-P04																															
477	04150	55FPMP300_VSS	PUMP 3 VS	SELECTED																																					
478																																								
479	42046	55FPMP300_SRS	PUMP 3 VS	SPEED RAMP SET	0.1-100 RAMP																																				
480	44075	55FPMP300_SRP	PUMP 3 VS	SPEED RAMP SP	0.1-100 RAMP																																				
481																																								
482	00113	55FPMP300	PUMP 3 VS	RUN						D06-R01-S03-P01																															
483																																								
484	02087	55FPA300_AAH	PUMP 3	A/M AUTO HMI																																					
485	04139	55FPA300_AAM	PUMP 3	A/M AUTO MODE																																					
486	02088	55FPA300_AMH	PUMP 3	A/M MANUAL HMI																																					
487	04140	55FPA300_AMM	PUMP 3	A/M MANUAL MODE																																					
488																																								
489	42045	55FPA300_AMS	PUMP 3	A/M MAN SPD SET	0-100 PERCENT																																				
490	44073	55FPA300_AMP	PUMP 3	A/M SPEED SP	0-100 PERCENT																																				
491	44074	55FPA300_AMB	PUMP 3	A/M SPEED BAR	0-100 PERCENT																																				
492																																								
493	10135	55FYS300B	PUMP 3 VS	TROUBLE						D05-R01-S03-P07																															
494	04082	55FYS300B_ALA	PUMP 3 VS	TROUBLE ALARM																																					
495	02053	55FYS300B_ALH	PUMP 3 VS	ALARM ACK HMI																																					
496	04083	55FYS300B_ALK	PUMP 3 VS	ALARM ACK																																					
497																																								
498	10136	55FHS300H	PUMP 3 VS	RESET						D05-R01-S03-P08																															
499																																								
500	10108	55FHS300L	PUMP 3 VS LCPA	START						D03-R01-S08-P12																															
501	10109	55FHS300M	PUMP 3 VS LCPA	STOP						D03-R01-S08-P13																															
502																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
503	44200	55FIIT300A_AMP	PUMP 3 VFD	AMPS PHASE A																																				
504	44201	55FIIT300B_AMP	PUMP 3 VFD	AMPS PHASE B																																				
505	44202	55FIIT300C_AMP	PUMP 3 VFD	AMPS PHASE C																																				
506																																									
507	04362	55FISH300L_ALA	PUMP 3 VFD	OVERLD TRIP ALM																																				
508	02200	55FISH300L_ALH	PUMP 3 VFD	ALARM ACK HMI																																				
509	04363	55FISH300L_ALK	PUMP 3 VFD	ALARM ACK																																				
510																																									
511	04364	55FTSH300J_ALA	PUMP 3 VFD	INV OVRHEAT ALM																																				
512	02201	55FTSH300J_ALH	PUMP 3 VFD	ALARM ACK HMI																																				
513	04365	55FTSH300J_ALK	PUMP 3 VFD	ALARM ACK																																				
514																																									
515	04366	55FESL300J_ALA	PUMP 3 VFD	LO DC VOLT ALM																																				
516	02202	55FESL300J_ALH	PUMP 3 VFD	ALARM ACK HMI																																				
517	04367	55FESL300J_ALK	PUMP 3 VFD	ALARM ACK																																				
518																																									
519	04368	55FYS300Q_ALA	PUMP 3 VFD	HARDWAR FLT ALM																																				
520	02203	55FYS300Q_ALH	PUMP 3 VFD	ALARM ACK HMI																																				
521	04369	55FYS300Q_ALK	PUMP 3 VFD	ALARM ACK																																				
522																																									
523	04370	55FESH300J_ALA	PUMP 3 VFD	HI DC VOLT ALM																																				
524	02204	55FESH300J_ALH	PUMP 3 VFD	ALARM ACK HMI																																				
525	04371	55FESH300J_ALK	PUMP 3 VFD	ALARM ACK																																				
526																																									
527	04385	55FPMP300_ALM	PUMP 3 VFD	COMM FAIL ALARM																																				
528																																									
529	10138	55FYS300L	PUMP 3 CS	READY						D05-R01-S03-P10																														
530	04152	55FYS300L_RDY	PUMP 3 CS	READY																																				
531	00114	55FPMP300B	PUMP 3 CS	RUN						D06-R01-S03-P02																														
532	10137	55FYS300J	PUMP 3 CS	ON						D05-R01-S03-P09																														
533																																									
534	10139	55FISH300	PUMP 3 CS	OVERLOAD						D05-R01-S03-P11																														
535	04084	55FISH300_ALA	PUMP 3 CS	OVERLOAD ALARM																																				
536	02054	55FISH300_ALH	PUMP 3 CS	ALARM ACK HMI																																				
537	04085	55FISH300_ALK	PUMP 3 CS	ALARM ACK																																				
538																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
539	10140	55FMSH304	PUMP 3 MTR	HI MOISTURE						D05-R01-S03-P12																														
540	04080	55FMSH304_ALA	PUMP 3 MTR	HI MOISTURE ALM																																			
541	02052	55FMSH304_ALH	PUMP 3 MTR	ALARM ACK HMI																																			
542	04081	55FMSH304_ALK	PUMP 3 MTR	ALARM ACK																																			
543	00027	55FMAH304	PUMP 3 MTR	HI MOISTURE ALM						D02-R01-S05-P11																														
544																																							
545	10141	55FTSH303	PUMP 3 MTR	HI WIND TMP						D05-R01-S03-P13																														
546	04078	55FTSH303_ALA	PUMP 3 MTR	HI WIND TMP ALM																																			
547	02051	55FTSH303_ALH	PUMP 3 MTR	ALARM ACK HMI																																			
548	04079	55FTSH303_ALK	PUMP 3 MTR	ALARM ACK																																			
549	00028	55FTAH303	PUMP 3 MTR	HI WIND TMP ALM						D02-R01-S05-P12																														
550																																							
551	10142	55FZSC305	PUMP 3 CHK VLV	CLOSED						D05-R01-S03-P14																														
552	44099	55FZSC305_STA	PUMP 3 CHK VLV	STATUS DISPLAY	0-4095 STATUS																																			
553	00013	55FZLO305	PUMP 3 CHK VLV	OPENED						D02-R01-S04-P13																														
554	00092	55FZLO305A	PUMP 3 CV LCPA	OPENED						D03-R01-S10-P12																														
555																																							
556	04179	55FZSC305_ALA	PUMP 3 CHK VLV	CLOSED ALARM																																			
557	02109	55FZSC305_ALH	PUMP 3 CHK VLV	ALARM ACK HMI																																			
558	04180	55FZSC305_ALK	PUMP 3 CHK VLV	ALARM ACK																																			
559																																							

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
560	02102	55FPMP400_OSH	PUMP 4	OOS HMI																																				
561	04164	55FPMP400_OSM	PUMP 4	OOS MODE																																				
562	02103	55FPMP400_ISH	PUMP 4	INS HMI																																				
563	04165	55FPMP400_ISM	PUMP 4	INS MODE																																				
564																																									
565	02099	55FPMP400_ONH	PUMP 4	ON HMI																																				
566	04161	55FPMP400_ONM	PUMP 4	ON MODE																																				
567	02100	55FPMP400_OFH	PUMP 4	OFF HMI																																				
568	04162	55FPMP400_OFM	PUMP 4	OFF MODE																																				
569	02101	55FPMP400_AUH	PUMP 4	AUTO HMI																																				
570	04163	55FPMP400_AUM	PUMP 4	AUTO MODE																																				
571																																									
572	10146	55FHS400B	PUMP 4	REMOTE						D05-R01-S04-P02																														
573	10147	55FHS400J	PUMP 4	HAND						D05-R01-S04-P03																														
574	04167	55FPMP400_HND	PUMP 4	HAND																																				
575																																									
576	04159	55FPMP400_DIS	PUMP 4	DISABLE MODE																																				
577	04160	55FPMP400_WAT	PUMP 4	WAIT																																				
578																																									
579	04166	55FPMP400_ON	PUMP 4	ON																																				
580	00010	55FYL400L	PUMP 4	ON						D02-R01-S04-P10																														
581	00089	55FYL400P	PUMP 4 LCPA	ON						D03-R01-S10-P09																														
582																																									
583	44088	55FPMP400_MOD	PUMP 4	MODE DISPLAY	0-4095 MODE																																				
584	44087	55FPMP400_SYM	PUMP 4	SYMBOL DISPLAY	0-4095 SYMBOL																																				
585	44051	55FPB400_DUT	PUMP 4	DUTY DISPLAY	0-4095 DUTY																																				
586																																									
587	04171	55FPMP400_FAA	PUMP 4	FAIL ALARM																																				
588	02105	55FPMP400_FAH	PUMP 4	FAIL ACK HMI																																				
589	04172	55FPMP400_FAK	PUMP 4	FAIL ALM ACK																																				
590																																									
591	10145	55FYS400M	PUMP 4	PROTECT ON						D05-R01-S04-P01																														
592	04086	55FYS400M_ALA	PUMP 4	PROTECT ON ALM																																				
593	02055	55FYS400M_ALH	PUMP 4	ALARM ACK HMI																																				
594	04087	55FYS400M_ALK	PUMP 4	ALARM ACK																																				
595																																									
596	04173	55FPMP400_COA	PUMP 4	COMMON ALARM																																				
597	04174	55FPMP400_COK	PUMP 4	COMMON ALM ACK																																				
598	00034	55FYA400B	PUMP 4	TROUBLE ALM						D02-R01-S06-P02																														
599																																									
600	02104	55FPMP400_ALR	PUMP 4	ALARM RESET HMI																																				
601	00123	55FPMP400H	PUMP 4	PLC RESET						D06-R01-S04-P03																														
602																																									
603	44091	55FPMP400_RTC	PUMP 4	RUNTME CURR DAY	0-999.9 HOURS																																				
604	44092	55FPMP400_RTP	PUMP 4	RUNTME PREV DAY	0-999.9 HOURS																																				
605	44089	55FPMP400_RTM	PUMP 4	RUNTME CUMM MSD	0-9999 HRS x100																																				
606	44090	55FPMP400_RTL	PUMP 4	RUNTME CUMM LSD	0-999.9 HOURS																																				
607	02106	55FPMP400_RTR	PUMP 4	RUNTIME RESET																																				
608																																									

ITEM	REGISTER	TAG	= NOT APPLICABLE DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
609	10150	55FYS400A	PUMP 4 VS	READY						D05-R01-S04-P06																															
610	04169	55FYS400A_RDY	PUMP 4 VS	READY																																					
611	10149	55FYS400	PUMP 4 VS	ON						D05-R01-S04-P05																															
612																																								
613	30028	55FST400	PUMP 4 VS	SPEED	0-100 PERCENT					D06-R01-S08-P01																															
614	44086	55FPMP400_SPD	PUMP 4 VS	SPEED	0-100 PERCENT																																				
615	44096	55FST400_RPM	PUMP 4	SPEED	0-1188 RPM																																				
616																																								
617	40025	55FSC400	PUMP 4 VS	SPEED	0-100 PERCENT					D06-R01-S10-P01																															
618																																								
619	10148	55FHS400K	PUMP 4 VS	SELECT						D05-R01-S04-P04																															
620	04168	55FPMP400_VSS	PUMP 4 VS	SELECTED																																					
621																																								
622	42048	55FPMP400_SRS	PUMP 4 VS	SPEED RAMP SET	0.1-100 RAMP																																				
623	44085	55FPMP400_SRP	PUMP 4 VS	SPEED RAMP SP	0.1-100 RAMP																																				
624																																								
625	00121	55FPMP400	PUMP 4 VS	RUN						D06-R01-S04-P01																															
626																																								
627	02097	55FPA400_AAH	PUMP 4	A/M AUTO HMI																																					
628	04157	55FPA400_AAM	PUMP 4	A/M AUTO MODE																																					
629	02098	55FPA400_AMH	PUMP 4	A/M MANUAL HMI																																					
630	04158	55FPA400_AMM	PUMP 4	A/M MANUAL MODE																																					
631																																								
632	42047	55FPA400_AMS	PUMP 4	A/M MAN SPD SET	0-100 PERCENT																																				
633	44083	55FPA400_AMP	PUMP 4	A/M SPEED SP	0-100 PERCENT																																				
634	44084	55FPA400_AMB	PUMP 4	A/M SPEED BAR	0-100 PERCENT																																				
635																																								
636	10151	55FYS400B	PUMP 4 VS	TROUBLE						D05-R01-S04-P07																															
637	04092	55FYS400B_ALA	PUMP 4 VS	TROUBLE ALARM																																					
638	02058	55FYS400B_ALH	PUMP 4 VS	ALARM ACK HMI																																					
639	04093	55FYS400B_ALK	PUMP 4 VS	ALARM ACK																																					
640																																								
641	10152	55FHS400H	PUMP 4 VS	RESET						D05-R01-S04-P08																															
642																																								
643	10110	55FHS400L	PUMP 4 VS LCPA	START						D03-R01-S08-P14																															
644	10111	55FHS400M	PUMP 4 VS LCPA	STOP						D03-R01-S08-P15																															
645																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
646	44203	55FIIT400A_AMP	PUMP 4 VFD	AMPS PHASE A																																				
647	44204	55FIIT400B_AMP	PUMP 4 VFD	AMPS PHASE B																																				
648	44205	55FIIT400C_AMP	PUMP 4 VFD	AMPS PHASE C																																				
649																																									
650	04372	55FISH400L_ALA	PUMP 4 VFD	OVERLD TRIP ALM																																				
651	02205	55FISH400L_ALH	PUMP 4 VFD	ALARM ACK HMI																																				
652	04373	55FISH400L_ALK	PUMP 4 VFD	ALARM ACK																																				
653																																									
654	04374	55FTSH400J_ALA	PUMP 4 VFD	INV OVRHEAT ALM																																				
655	02206	55FTSH400J_ALH	PUMP 4 VFD	ALARM ACK HMI																																				
656	04375	55FTSH400J_ALK	PUMP 4 VFD	ALARM ACK																																				
657																																									
658	04376	55FESL400J_ALA	PUMP 4 VFD	LO DC VOLT ALM																																				
659	02207	55FESL400J_ALH	PUMP 4 VFD	ALARM ACK HMI																																				
660	04377	55FESL400J_ALK	PUMP 4 VFD	ALARM ACK																																				
661																																									
662	04378	55FYS400Q_ALA	PUMP 4 VFD	HARDWAR FLT ALM																																				
663	02208	55FYS400Q_ALH	PUMP 4 VFD	ALARM ACK HMI																																				
664	04379	55FYS400Q_ALK	PUMP 4 VFD	ALARM ACK																																				
665																																									
666	04380	55FESH400J_ALA	PUMP 4 VFD	HI DC VOLT ALM																																				
667	02209	55FESH400J_ALH	PUMP 4 VFD	ALARM ACK HMI																																				
668	04381	55FESH400J_ALK	PUMP 4 VFD	ALARM ACK																																				
669																																									
670	04386	55FPMP400_ALM	PUMP 4 VFD	COMM FAIL ALARM																																				
671																																									
672	10154	55FYS400L	PUMP 4 CS	READY						D05-R01-S04-P10																																
673	04170	55FYS400L_RDY	PUMP 4 CS	READY																																				
674	00122	55FPMP400B	PUMP 4 CS	RUN						D06-R01-S04-P02																														
675	10153	55FYS400J	PUMP 4 CS	ON						D05-R01-S04-P09																														
676																																									
677	10155	55FISH400	PUMP 4 CS	OVERLOAD						D05-R01-S04-P11																														
678	04094	55FISH400_ALA	PUMP 4 CS	OVERLOAD ALARM																																				
679	02059	55FISH400_ALH	PUMP 4 CS	ALARM ACK HMI																																				
680	04095	55FISH400_ALK	PUMP 4 CS	ALARM ACK																																				
681																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
682	10156	55FMSH404	PUMP 4 MTR	HI MOISTURE						D05-R01-S04-P12																														
683	04090	55FMSH404_ALA	PUMP 4 MTR	HI MOISTURE ALM																																				
684	02057	55FMSH404_ALH	PUMP 4 MTR	ALARM ACK HMI																																				
685	04091	55FMSH404_ALK	PUMP 4 MTR	ALARM ACK																																				
686	00032	55FMAH404	PUMP 4 MTR	HI MOISTURE ALM						D02-R01-S05-P16																														
687																																								
688	10157	55FTSH403	PUMP 4 MTR	HI WIND TMP						D05-R01-S04-P13																														
689	04088	55FTSH403_ALA	PUMP 4 MTR	HI WIND TMP ALM																																				
690	02056	55FTSH403_ALH	PUMP 4 MTR	ALARM ACK HMI																																				
691	04089	55FTSH403_ALK	PUMP 4 MTR	ALARM ACK																																				
692	00033	55FTAH403	PUMP 4 MTR	HI WIND TMP ALM						D02-R01-S06-P01																														
693																																								
694	10158	55FZSC405	PUMP 4 CHK VLV	CLOSED						D05-R01-S04-P14																														
695	44100	55FZSC405_STA	PUMP 4 CHK VLV	STATUS DISPLAY	0-4095 STATUS																																				
696	00014	55FZLO405	PUMP 4 CHK VLV	OPENED						D02-R01-S04-P14																														
697	00093	55FZLO405A	PUMP 4 CV LCPA	OPENED						D03-R01-S10-P13																														
698																																								
699	04181	55FZSC405_ALA	PUMP 4 CHK VLV	CLOSED ALARM																																				
700	02110	55FZSC405_ALH	PUMP 4 CHK VLV	ALARM ACK HMI																																				
701	04182	55FZSC405_ALK	PUMP 4 CHK VLV	ALARM ACK																																				
702																																								
703	44052	55FPB500_DUT	PUMP 5	DUTY DISPLAY	0-4095 DUTY																																				
704																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
705	02062	55FPB100_S1H	PUMPS	DUTY SEQ1 HMI																																			
706	10006	55FHS049J	PUMP SEQ 1234	SELECT						D02-R01-S03-P06																															
707	04098	55FPB100_S1M	PUMPS	DUTY SEQ1 MODE																																			
708	00003	55FYL049J	PUMP SEQ 1234	SELECTED						D02-R01-S04-P03																															
709																																									
710	02063	55FPB100_S2H	PUMPS	DUTY SEQ2 HMI																																			
711	10007	55FHS049M	PUMP SEQ 2341	SELECT						D02-R01-S03-P07																															
712	04099	55FPB100_S2M	PUMPS	DUTY SEQ2 MODE																																			
713	00004	55FYL049M	PUMP SEQ 2341	SELECTED						D02-R01-S04-P04																															
714																																									
715	02064	55FPB100_S3H	PUMPS	DUTY SEQ3 HMI																																			
716	10008	55FHS049N	PUMP SEQ 3412	SELECT						D02-R01-S03-P08																															
717	04100	55FPB100_S3M	PUMPS	DUTY SEQ3 MODE																																			
718	00005	55FYL049N	PUMP SEQ 3412	SELECTED						D02-R01-S04-P05																															
719																																									
720	02065	55FPB100_S4H	PUMPS	DUTY SEQ4 HMI																																			
721	10009	55FHS049P	PUMP SEQ 4123	SELECT						D02-R01-S03-P09																															
722	04101	55FPB100_S4M	PUMPS	DUTY SEQ4 MODE																																			
723	00006	55FYL049P	PUMP SEQ 4123	SELECTED						D02-R01-S04-P06																															
724																																									
725	02066	55FPB100_S5H	PUMPS	DUTY SEQ5 HMI																																			
726	04102	55FPB100_S5M	PUMPS	DUTY SEQ5 MODE																																			
727																																									
728	42031	55FPB100_LSS	PUMPS	LD STRT LVL SET	0-300 INCHES																																		
729	44038	55FPB100_LSP	PUMPS	LD STRT LVL SP	0-300 INCHES																																		
730	42032	55FPB100_LTS	PUMPS	LD STOP LVL SET	0-300 INCHES																																		
731	44039	55FPB100_LTP	PUMPS	LD STOP LVL SP	0-300 INCHES																																		
732	42033	55FPB100_1SS	PUMPS	L1 STRT SPD SET	50-100 PERCENT																																		
733	44040	55FPB100_1SP	PUMPS	L1 STRT SPD SP	50-100 PERCENT																																		
734	42034	55FPB100_1TS	PUMPS	L1 STOP SPD SET	50-100 PERCENT																																		
735	44041	55FPB100_1TP	PUMPS	L1 STOP SPD SP	50-100 PERCENT																																		
736	42035	55FPB100_2SS	PUMPS	L2 STRT SPD SET	50-100 PERCENT																																		
737	44042	55FPB100_2SP	PUMPS	L2 STRT SPD SP	50-100 PERCENT																																		
738	42036	55FPB100_2TS	PUMPS	L2 STOP SPD SET	50-100 PERCENT																																		
739	44043	55FPB100_2TP	PUMPS	L2 STOP SPD SP	50-100 PERCENT																																		
740																																									
741	42038	55FPB100_3TS	PUMPS	L3 STOP SPD SET	0-100 PERCENT																																		
742	44045	55FPB100_3TP	PUMPS	L3 STOP SPD SP	0-100 PERCENT																																		
743	42037	55FPB100_3SS	PUMPS	L3 STRT SPD SET	0-100 PERCENT																																		
744	44044	55FPB100_3SP	PUMPS	L3 STRT SPD SP	0-100 PERCENT																																		
745	42040	55FPB100_4TS	PUMPS	L4 STOP SPD SET	0-100 PERCENT																																		
746	44047	55FPB100_4TP	PUMPS	L4 STOP SPD SP	0-100 PERCENT																																		
747	42039	55FPB100_4SS	PUMPS	L4 STRT SPD SET	0-100 PERCENT																																		
748	44046	55FPB100_4SP	PUMPS	L4 STRT SPD SP	0-100 PERCENT																																		

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
749																																								
750	42025	55FPE100_MLS	PUMPS	M/L MAN LVL SET	0-300 INCHES																																		
751	44029	55FPE100_MLP	PUMPS	M/L LEVEL SP	0-300 INCHES																																		
752	44030	55FPE100_MLB	PUMPS	M/L LEVEL BAR	0-300 INCHES																																		
753	44035	55FPD100_PPV	PUMPS	PID PROC VAR	0-300 INCHES																																		
754																																								
755	02060	55FPC100_AAH	PUMPS	A/M AUTO HMI																																				
756	04096	55FPC100_AAM	PUMPS	A/M AUTO MODE																																				
757	02061	55FPC100_AMH	PUMPS	A/M MANUAL HMI																																				
758	04097	55FPC100_AMM	PUMPS	A/M MANUAL MODE																																				
759	42030	55FPC100_AMS	PUMPS	A/M MAN SPD SET	50-100 PERCENT																																		
760	44036	55FPC100_AMP	PUMPS	A/M SPEED SP	0-100 PERCENT																																		
761	44037	55FPC100_AMB	PUMPS	A/M SPEED BAR	0-100 PERCENT																																		
762																																								
763	42026	55FPD100_PRS	PUMPS	PID RMPRATE SET	0.1-100 RAMP																																		
764	44031	55FPD100_PRP	PUMPS	PID RAMPRATE SP	0.1-100 RAMP																																		
765	42027	55FPD100_PPS	PUMPS	PID PROP SET	5-500 PROP																																		
766	44032	55FPD100_PPP	PUMPS	PID PROP SP	5-500 PROP																																		
767	42028	55FPD100_PIS	PUMPS	PID INTEG SET	0-99.99 INTG																																		
768	44033	55FPD100_PIP	PUMPS	PID INTEG SP	0-99.99 INTG																																		
769	42029	55FPD100_PDS	PUMPS	PID DERV SET	0-99.99 DERV																																		
770	44034	55FPD100_PDP	PUMPS	PID DERV SEP	0-99.99 DERV																																		
771																																								
772	30012	55FFIT075	DISCHARGE	FLOW	0-10 MGD					D04-R01-S06-P03																														
773	44106	55FFIT075_FLO	DISCHARGE	FLOW	0-10 MGD																																		
774	40003	55FFI075	DISCHARGE LCP	FLOW	0-10 MGD					D02-R01-S10-P03																														
775	40015	55FFI075A	DISCHARGE LCPA	FLOW	0-10 MGD					D04-R01-S09-P03																														
776																																								
777	44109	55FFIT075_CAF	DISCHARGE	CUR AVERAGE FLO	0-10 MGD																																		
778	44110	55FFIT075_CHF	DISCHARGE	CUR HIGHEST FLO	0-10 MGD																																		
779	44111	55FFIT075_CLF	DISCHARGE	CUR LOWEST FLO	0-10 MGD																																		
780	44107	55FFIT075_CTM	DISCHARGE	CUR TOT FLO MSD	0-9999 MGD x10																																		
781	44108	55FFIT075_CTL	DISCHARGE	CUR TOT FLO LSD	0-9.999 MGD																																		
782	44114	55FFIT075_PAF	DISCHARGE	PRV AVERAGE FLO	0-10 MGD																																		
783	44115	55FFIT075_PHF	DISCHARGE	PRV HIGHEST FLO	0-10 MGD																																		
784	44116	55FFIT075_PLF	DISCHARGE	PRV LOWEST FLO	0-10 MGD																																		
785	44112	55FFIT075_PTM	DISCHARGE	PRV TOT FLO MSD	0-9999 MGD x10																																		
786	44113	55FFIT075_PTL	DISCHARGE	PRV TOT FLO LSD	0-9.999 MGD																																		
787																																								
788	10070	55FYS075B	DISCHARGE FLOW	XMTR TRBL						D03-R01-S06-P06																														
789	04193	55FYS075B_ALA	DISCHARGE FLOW	XMTR TRBL ALM																																				
790	02115	55FYS075B_ALH	DISCHARGE FLOW	ALARM ACK HMI																																				
791	04194	55FYS075B_ALK	DISCHARGE FLOW	ALARM ACK																																				
792	00108	55FYS075	DISCHARGE FLOW	XMTR ZERO						D04-R01-S04-P04																														
793																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
794	30004	55FPIT070	DISCHARGE	PRESSURE	0-50 PSI					D04-R01-S05-P04																														
795	44101	55FPIT070_PRS	DISCHARGE	PRESSURE	0-50 PSI																																		
796																																								
797	42052	55FPIT070_LLS	DISCHARGE	LOLO PRS SET	0-50 PSI																																		
798	44105	55FPIT070_LLP	DISCHARGE	LOLO PRS SP	0-50 PSI																																		
799	04189	55FPIT070_LLA	DISCHARGE	LOLO PRS ALM																																		
800	02114	55FPIT070_LLH	DISCHARGE	LOLO PRS ACKHMI																																		
801	04190	55FPIT070_LLK	DISCHARGE	LOLO PRS ALMACK																																		
802																																								
803	42051	55FPIT070_LS	DISCHARGE	LO PRS SET	0-50 PSI																																		
804	44104	55FPIT070_LP	DISCHARGE	LO PRS SP	0-50 PSI																																		
805	04187	55FPIT070_LA	DISCHARGE	LO PRS ALARM																																		
806	02113	55FPIT070_LH	DISCHARGE	LO PRS ACKHMI																																		
807	04188	55FPIT070_LK	DISCHARGE	LO PRS ALMACK																																		
808																																								
809	42050	55FPIT070_HS	DISCHARGE	HI PRS SET	0-50 PSI																																		
810	44103	55FPIT070_HP	DISCHARGE	HI PRS SP	0-50 PSI																																		
811	04185	55FPIT070_HA	DISCHARGE	HI PRS ALM																																		
812	02112	55FPIT070_HH	DISCHARGE	HI PRS ACKHMI																																		
813	04186	55FPIT070_HK	DISCHARGE	HI PRS ALMACK																																		
814	00045	55FPAH070	DISCHARGE	HI PRS ALM						D02-R01-S06-P13																														
815																																								
816	42049	55FPIT070_HHS	DISCHARGE	HIHI PRS SET	0-50 PSI																																		
817	44102	55FPIT070_HHP	DISCHARGE	HIHI PRS SP	0-50 PSI																																		
818	04183	55FPIT070_HHA	DISCHARGE	HIHI PRS ALM																																		
819	02111	55FPIT070_HHH	DISCHARGE	HIHI PRS ACKHMI																																		
820	04184	55FPIT070_HHK	DISCHARGE	HIHI PRS ALMACK																																		
821	00044	55FPAHH070	DISCHARGE	HIHI PRS ALM						D02-R01-S06-P12																														
822																																								
823	04192	55FPIT070_COK	DISCHARGE	COMMON ALM ACK																																		
824	04191	55FPIT070_COA	DISCHARGE	COMMON ALARM																																		
825																																								
826	10071	55FZSC175	FORCEMAIN VLV1	CLOSED						D03-R01-S06-P07																														
827	44117	55FZSC175_STA	FORCEMAIN VLV1	STATUS DISPLAY	0-4095 STATUS																																		
828	44118	55FZSC175_SYM	FORCEMAIN VLV1	SYMBOL DISPLAY	0-4095 STATUS																																		
829																																								
830	10084	55FZSC176	FORCEMAIN VLV2	CLOSED						D03-R01-S07-P04																														
831	44119	55FZSC176_STA	FORCEMAIN VLV2	STATUS DISPLAY	0-4095 STATUS																																		
832	44120	55FZSC176_SYM	FORCEMAIN VLV2	SYMBOL DISPLAY	0-4095 STATUS																																		
833																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
834	02120	55FFV556_OSH	RECYC VLV	OOS HMI																																				
835	04203	55FFV556_OSM	RECYC VLV	OOS MODE																																				
836	02121	55FFV556_ISH	RECYC VLV	INS HMI																																				
837	04204	55FFV556_ISM	RECYC VLV	INS MODE																																				
838																																									
839	10067	55FHS556B	RECYC VLV	REMOTE						D03-R01-S06-P03																																
840																																									
841	10068	55FYS556	RECYC VLV	ON						D03-R01-S06-P04																																
842																																									
843	04201	55FFV556_WAT	RECYC VLV	WAIT																																				
844																																									
845	30003	55FZT556	RECYC VLV	POSITION	0-100 PERCENT					D04-R01-S05-P03																																
846	44131	55FFV556_POS	RECYC VLV	POSITION	0-100 POSITION																																				
847	40017	55FZI556	RECYC LCPA	POSITION	0-100 PERCENT					D04-R01-S10-P01																																
848																																									
849	40006	55FFV556	RECYC VLV	POSITION	0-100 PERCENT					D04-R01-S07-P02																																
850																																									
851	44132	55FFV556_SYM	RECYC VLV	SYMBOL DISPLAY	0-4095 SYMBOL																																				
852																																									
853	04202	55FFV556_OPD	RECYC VLV	OPENED																																				
854	04205	55FFV556_ON	RECYC VLV	ON																																				
855	44133	55FFV556_MOD	RECYC VLV	MODE DISPLAY	0-4095 MODE																																				
856																																									
857	04206	55FFV556_FMA	RECYC VLV	FAIL2MOVE ALARM																																				
858	02123	55FFV556_FMH	RECYC VLV	FAL2MOV ACK HMI																																				
859	04207	55FFV556_FMK	RECYC VLV	FAIL2MOVE ACK																																				
860																																									
861	10069	55FYS556B	RECYC VLV	TROUBLE						D03-R01-S06-P05																																
862	04208	55FFV556_TRA	RECYC VLV	TROUBLE ALARM																																				
863	02124	55FFV556_TAH	RECYC VLV	TROUBLE ACK HMI																																				
864	04209	55FFV556_TRK	RECYC VLV	TROUBLE ALM ACK																																				
865	00055	55FYA556B	RECYC VLV	TROUBLE ALM						D02-R01-S07-P07																																
866																																									
867	04211	55FFV556_COK	RECYC VLV	COMMON ALM ACK																																				
868	04210	55FFV556_COA	RECYC VLV	COMMON ALARM																																				
869																																									
870	02122	55FFV556_ALR	RECYC VLV	ALARM RESET HMI																																				
871																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
872	42053	55FVC556_MLS	RECYC VLV	M/L MAN LVL SET	0-300 INCHES																																		
873	44122	55FVC556_MLP	RECYC VLV	M/L LEVEL SP	0-300 INCHES																																		
874	44123	55FVC556_MLB	RECYC VLV	M/L LEVEL BAR	0-300 INCHES																																		
875																																								
876	44128	55FVB556_PPV	RECYC VLV	PID PROC VAR	0-300 INCHES																																		
877																																								
878	42054	55FVB556_PRS	RECYC VLV	PID RMPRATE SET	0.1-100 RAMP																																		
879	44124	55FVB556_PRP	RECYC VLV	PID RAMPRATE SP	0.1-100 RAMP																																		
880	42055	55FVB556_PPS	RECYC VLV	PID PROP SET	5-500 PROP																																		
881	44125	55FVB556_PPP	RECYC VLV	PID PROP SP	5-500 PROP																																		
882	42056	55FVB556_PIS	RECYC VLV	PID INTEG SET	0-99.99 INTG																																		
883	44126	55FVB556_PIP	RECYC VLV	PID INTEG SP	0-99.99 INTG																																		
884	42057	55FVB556_PDS	RECYC VLV	PID DERV SET	0-99.99 DERV																																		
885	44127	55FVB556_PDP	RECYC VLV	PID DERV SP	0-99.99 DERV																																		
886																																								
887	42058	55FVA556_AMS	RECYC VLV	A/M MAN POS SET	0-100 PERCENT																																		
888	44129	55FVA556_AMP	RECYC VLV	A/M POS SP	0-100 PERCENT																																		
889	44130	55FVA556_AMB	RECYC VLV	A/M POS BAR	0-100 PERCENT																																		
890																																								
891	02119	55FVA556_AMH	RECYC VLV	A/M MANUAL HMI																																				
892	04200	55FVA556_AMM	RECYC VLV	A/M MANUAL MODE																																				
893	02118	55FVA556_AAH	RECYC VLV	A/M AUTO HMI																																				
894	04199	55FVA556_AAM	RECYC VLV	A/M AUTO MODE																																				
895																																								
896	10102	55FHS556J	RECYC VLV LCPA	POS SETPT OPEN						D03-R01-S08-P06																															
897	10103	55FHS556K	RECYC VLV LCPA	POS SETPT CLOSE						D03-R01-S08-P07																															
898																																								
899	30011	55FFIT555	RECYC	FLOW	0-5 MGD					D04-R01-S06-P02																															
900	44121	55FFIT555_FLO	RECYC	FLOW	0-5 MGD																																		
901	40004	55FFI555	RECYC LCP	FLOW	0-5 MGD					D02-R01-S10-P04																															
902	40016	55FFI555A	RECYC LCPA	FLOW	0-5 MGD					D04-R01-S09-P04																															
903																																								
904	10083	55FYS555B	RECYC FLOW	XMTR TRBL						D03-R01-S07-P03																															
905	04195	55FYS555B_ALA	RECYC FLOW	XMTR TRBL ALM																																				
906	02116	55FYS555B_ALH	RECYC FLOW	ALARM ACK HMI																																				
907	04196	55FYS555B_ALK	RECYC FLOW	ALARM ACK																																				
908	00100	55FYS555	RECYC FLOW	XMTR ZERO						D04-R01-S03-P04																															
909																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
910	00078	55FYL560P	CLEANING LCP	DISABLED						D02-R01-S08-P14																														
911	10010	55FHS560J	CLEANING LCP	ACTIVATE						D02-R01-S03-P10																														
912	00077	55FYL560J	CLEANING LCP	ACTIVATED						D02-R01-S08-P13																														
913																																									
914	00081	55FYL560A	CLEANING LCPA	READY						D03-R01-S10-P01																														
915	00082	55FYL560N	CLEANING LCPA	ACTIVATED						D03-R01-S10-P02																														
916	10097	55FHS560K	CLEANING LCPA	PREPARE						D03-R01-S08-P01																														
917	00083	55FYL560K	CLEANING LCPA	PREPARED						D03-R01-S10-P03																														
918	10098	55FHS560L	CLEANING LCPA	START						D03-R01-S08-P02																														
919	00084	55FYL560L	CLEANING LCPA	STARTED						D03-R01-S10-P04																														
920	10099	55FHS560M	CLEANING LCPA	END						D03-R01-S08-P03																														
921	00085	55FYL560M	CLEANING LCPA	ENDED						D03-R01-S10-P05																														
922																																									
923	10101	55FHS560P	PUMPS VS LCPA	SPEED SETPT DN						D03-R01-S08-P05																														
924	10100	55FHS560N	PUMPS VS LCPA	SPEED SETPT UP						D03-R01-S08-P04																														
925	40014	55FSI560	PUMPS VS LCPA	SPEED						D04-R01-S09-P02																														
926																																									
927	04021	55FPK100_CAM	PUMPS	CLEANING MODE																																				
928	44021	55FPL100_STA	PUMPS	CLEANING STATUS																																				
929																																									
930	10180	55FLSH024	DRYWELL	HI LEVEL						D05-R01-S06-P04																														
931	04212	55FLSH024_ALA	DRYWELL	HI LEVEL ALARM																																				
932	02125	55FLSH024_ALH	DRYWELL	ALARM ACK HMI																																				
933	04213	55FLSH024_ALK	DRYWELL	ALARM ACK																																				
934	00052	55FLAH024	DRYWELL	HI LEVEL ALM						D02-R01-S07-P04																														
935																																									
936	10163	55FLSH029	SUMP	HI LEVEL						D05-R01-S05-P03																														
937	04214	55FLSH029_ALA	SUMP	HI LEVEL ALARM																																				
938	02126	55FLSH029_ALH	SUMP	ALARM ACK HMI																																				
939	04215	55FLSH029_ALK	SUMP	ALARM ACK																																				
940	00053	55FLAH029	SUMP	HI LEVEL ALM						D02-R01-S07-P05																														
941																																									
942	10162	55FYS020	SUMP PUMP 1	ON						D05-R01-S05-P02																														
943	04216	55FYS020_ON	SUMP PUMP 1	ON																																				
944	44134	55FYS020_SYM	SUMP PUMP 1	SYMBOL DISPLAY	0-4095																																			
945	00015	55FYL020A	SUMP PUMP 1	ON						D02-R01-S04-P15																														
946																																									
947	44137	55FYS020_RTC	SUMP PUMP 1	RUNTME CURR DAY	0-999.9 HOURS																																			
948	44138	55FYS020_RTP	SUMP PUMP 1	RUNTME PREV DAY	0-999.9 HOURS																																			
949	44135	55FYS020_RTM	SUMP PUMP 1	RUNTME CUMM MSD	0-9999 HRS x100																																			
950	44136	55FYS020_RTL	SUMP PUMP 1	RUNTME CUMM LSD	0-999.9 HOURS																																			
951	02127	55FYS020_RTR	SUMP PUMP 1	RUNTIME RESET																																			
952																																									

ITEM	REGISTER	TAG	= NOT APPLICABLE DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
953	10178	55FYS025	SUMP PUMP 2	ON						D05-R01-S06-P02																															
954	04217	55FYS025_ON	SUMP PUMP 2	ON																																					
955	44139	55FYS025_SYM	SUMP PUMP 2	SYMBOL DISPLAY	0-4095																																				
956	00016	55FYL025A	SUMP PUMP 2	ON						D02-R01-S04-P16																															
957																																								
958	44142	55FYS025_RTC	SUMP PUMP 2	RUNTME CURR DAY	0-999.9 HOURS																																				
959	44143	55FYS025_RTP	SUMP PUMP 2	RUNTME PREV DAY	0-999.9 HOURS																																				
960	44140	55FYS025_RTM	SUMP PUMP 2	RUNTME CUMM MSD	0-9999 HRS x100																																				
961	44141	55FYS025_RTL	SUMP PUMP 2	RUNTME CUMM LSD	0-999.9 HOURS																																				
962	02128	55FYS025_RTR	SUMP PUMP 2	RUNTIME RESET																																				
963																																								
964	10179	55FYS028B	SUMP PUMPS	TROUBLE						D05-R01-S06-P03																															
965	04218	55FYS028B_ALA	SUMP PUMPS	TROUBLE ALARM																																				
966	02129	55FYS028B_ALH	SUMP PUMPS	ALARM ACK HMI																																				
967	04219	55FYS028B_ALK	SUMP PUMPS	ALARM ACK																																				
968	00054	55FYA028B	SUMP PUMPS	TROUBLE ALM						D02-R01-S07-P06																															
969																																								
970	10164	55FHS059	DRYWELL FANS	PAUSE						D05-R01-S05-P04																															
971																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
972	02134	55FFAN053_OSH	DRYWELL SF1	OOS HMI																																				
973	04227	55FFAN053_OSM	DRYWELL SF1	OOS MODE																																				
974	02135	55FFAN053_ISH	DRYWELL SF1	INS HMI																																				
975	04228	55FFAN053_ISM	DRYWELL SF1	INS MODE																																				
976																																								
977	02131	55FFAN053_ONH	DRYWELL SF1	ON HMI																																				
978	04224	55FFAN053_ONM	DRYWELL SF1	ON MODE																																				
979	02132	55FFAN053_OFH	DRYWELL SF1	OFF HMI																																				
980	04225	55FFAN053_OFM	DRYWELL SF1	OFF MODE																																				
981	02133	55FFAN053_AUH	DRYWELL SF1	AUTO HMI																																				
982	04226	55FFAN053_AUM	DRYWELL SF1	AUTO MODE																																				
983																																								
984	10165	55FHS053B	DRYWELL SF1	REMOTE						D05-R01-S05-P05																														
985	10167	55FYS053A	DRYWELL SF1	READY						D05-R01-S05-P07																														
986																																								
987	04222	55FFAN053_DIS	DRYWELL SF1	DISABLE MODE																																				
988	04223	55FFAN053_WAT	DRYWELL SF1	WAIT																																				
989																																								
990	10166	55FYS053	DRYWELL SF1	ON						D05-R01-S05-P06																														
991	04229	55FFAN053_ON	DRYWELL SF1	ON																																				
992																																								
993	00116	55FFAN053	DRYWELL SF1	RUN						D06-R01-S03-P04																														
994																																								
995	44145	55FFAN053_MOD	DRYWELL SF1	MODE DISPLAY	0-4095 MODE																																				
996	44144	55FFAN053_SYM	DRYWELL SF1	SYMBOL DISPLAY	0-4095 SYMBOL																																				
997																																								
998	04230	55FFAN053_FAA	DRYWELL SF1	FAIL ALARM																																				
999	02137	55FFAN053_FAH	DRYWELL SF1	FAIL ACK HMI																																				
1000	04231	55FFAN053_FAK	DRYWELL SF1	FAIL ALM ACK																																				
1001																																								
1002	10168	55FISH053	DRYWELL SF1	OVERLOAD						D05-R01-S05-P08																														
1003	04232	55FFAN053_DRA	DRYWELL SF1	DRIVE ALARM																																				
1004	02138	55FFAN053_DAH	DRYWELL SF1	DRIVE ACK HMI																																				
1005	04233	55FFAN053_DRK	DRYWELL SF1	DRIVE ALM ACK																																				
1006																																								
1007	04235	55FFAN053_COK	DRYWELL SF1	COMMON ALM ACK																																				
1008	04234	55FFAN053_COA	DRYWELL SF1	COMMON ALARM																																				
1009	02136	55FFAN053_ALR	DRYWELL SF1	ALARM RESET HMI																																				
1010																																								
1011	44148	55FYS053_RTC	DRYWELL SF1	RUNTME CURR DAY	0-999.9 HOURS																																				
1012	44149	55FYS053_RTP	DRYWELL SF1	RUNTME PREV DAY	0-999.9 HOURS																																				
1013	44147	55FYS053_RTL	DRYWELL SF1	RUNTME CUMM LSD	0-999.9 HOURS																																				
1014	44146	55FYS053_RTM	DRYWELL SF1	RUNTME CUMM MSD	0-9999 HRS x100																																				
1015	02139	55FYS053_RTR	DRYWELL SF1	RUNTIME RESET																																				
1016																																								
1017	10169	55FFSL054	DRYWELL SF1	LO FLOW						D05-R01-S05-P09																														
1018	04236	55FFSL054_ALA	DRYWELL SF1	LO FLOW ALARM																																				
1019	02140	55FFSL054_ALH	DRYWELL SF1	ALARM ACK HMI																																				
1020	04237	55FFSL054_ALK	DRYWELL SF1	ALARM ACK																																				
1021																																								
1022	00059	55FFAL054	DRYWELL SF1	TROUBLE ALM						D02-R01-S07-P11																														
1023																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1024	02144	55FFAN051_OSH	DRYWELL EF1	OOS HMI																																			
1025	04243	55FFAN051_OSM	DRYWELL EF1	OOS MODE																																			
1026	02145	55FFAN051_ISH	DRYWELL EF1	INS HMI																																			
1027	04244	55FFAN051_ISM	DRYWELL EF1	INS MODE																																			
1028																																								
1029	02141	55FFAN051_ONH	DRYWELL EF1	ON HMI																																			
1030	04240	55FFAN051_ONM	DRYWELL EF1	ON MODE																																			
1031	02142	55FFAN051_OFH	DRYWELL EF1	OFF HMI																																			
1032	04241	55FFAN051_OFM	DRYWELL EF1	OFF MODE																																			
1033	02143	55FFAN051_AUH	DRYWELL EF1	AUTO HMI																																			
1034	04242	55FFAN051_AUM	DRYWELL EF1	AUTO MODE																																			
1035																																								
1036	10181	55FHS051B	DRYWELL EF1	REMOTE						D05-R01-S06-P05																													
1037	10183	55FYS051A	DRYWELL EF1	READY						D05-R01-S06-P07																													
1038																																								
1039	04238	55FFAN051_DIS	DRYWELL EF1	DISABLE MODE																																			
1040	04239	55FFAN051_WAT	DRYWELL EF1	WAIT																																			
1041																																								
1042	10182	55FYS051	DRYWELL EF1	ON						D05-R01-S06-P06																													
1043	04245	55FFAN051_ON	DRYWELL EF1	ON																																			
1044																																								
1045	00124	55FFAN051	DRYWELL EF1	RUN						D06-R01-S04-P04																													
1046																																								
1047	44151	55FFAN051_MOD	DRYWELL EF1	MODE DISPLAY	0-4095 MODE																																			
1048	44150	55FFAN051_SYM	DRYWELL EF1	SYMBOL DISPLAY	0-4095 SYMBOL																																			
1049																																								
1050	04246	55FFAN051_FAA	DRYWELL EF1	FAIL ALARM																																			
1051	02147	55FFAN051_FAH	DRYWELL EF1	FAIL ACK HMI																																			
1052	04247	55FFAN051_FAK	DRYWELL EF1	FAIL ALM ACK																																			
1053																																								
1054	10184	55FISH051	DRYWELL EF1	OVERLOAD						D05-R01-S06-P08																													
1055	04248	55FFAN051_DRA	DRYWELL EF1	DRIVE ALARM																																			
1056	02148	55FFAN051_DAH	DRYWELL EF1	DRIVE ACK HMI																																			
1057	04249	55FFAN051_DRK	DRYWELL EF1	DRIVE ALM ACK																																			
1058																																								
1059	04250	55FFAN051_COA	DRYWELL EF1	COMMON ALARM																																			
1060	04251	55FFAN051_COK	DRYWELL EF1	COMMON ALM ACK																																			
1061	02146	55FFAN051_ALR	DRYWELL EF1	ALARM RESET HMI																																			
1062																																								
1063	44152	55FYS051_RTM	DRYWELL EF1	RUNTME CUMM MSD	0-9999 HRS x100																																			
1064	44153	55FYS051_RTL	DRYWELL EF1	RUNTME CUMM LSD	0-999.9 HOURS																																			
1065	44154	55FYS051_RTC	DRYWELL EF1	RUNTME CURR DAY	0-999.9 HOURS																																			
1066	44155	55FYS051_RTP	DRYWELL EF1	RUNTME PREV DAY	0-999.9 HOURS																																			
1067	02149	55FYS051_RTR	DRYWELL EF1	RUNTIME RESET																																			
1068																																								
1069	10185	55FFSL052	DRYWELL EF1	LO FLOW						D05-R01-S06-P09																													
1070	04252	55FFSL052_ALA	DRYWELL EF1	LO FLOW ALARM																																			
1071	02150	55FFSL052_ALH	DRYWELL EF1	ALARM ACK HMI																																			
1072	04253	55FFSL052_ALK	DRYWELL EF1	ALARM ACK																																			
1073																																								
1074	00060	55FFAL052	DRYWELL EF1	TROUBLE ALM						D02-R01-S07-P12																													
1075																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1076	10197	55FASH580	DRYWELL	SMOKE						D05-R01-S07-P05																															
1077	04220	55FAAH580_ALA	DRYWELL	SMOKE ALARM																																			
1078	02130	55FAAH580_ALH	DRYWELL	ALARM ACK HMI																																			
1079	04221	55FAAH580_ALK	DRYWELL	ALARM ACK																																			
1080	00056	55FAAH580	DRYWELL	SMOKE ALM						D02-R01-S07-P08																															
1081																																										
1082	30031	55FAIT050	WW GAS MONITOR	% LEL	0-100 %LEL					D06-R01-S08-P04																															
1083	44156	55FAIT050_LEL	WW GAS MONITOR	LEL	0-100 %LEL																																		
1084																																										
1085	42062	55FAIT050_LLS	WW GAS MONITOR	LOLO LEL SET	0-100 %LEL																																		
1086	44160	55FAIT050_LLP	WW GAS MONITOR	LOLO LEL SP	0-100 %LEL																																		
1087	04262	55FAIT050_LLA	WW GAS MONITOR	LOLO LEL ALM																																			
1088	02155	55FAIT050_LLH	WW GAS MONITOR	LOLO LEL ACKHMI																																			
1089	04263	55FAIT050_LLK	WW GAS MONITOR	LOLO LEL ALMACK																																			
1090																																										
1091	42061	55FAIT050_LS	WW GAS MONITOR	LO LEL SET	0-100 %LEL																																		
1092	44159	55FAIT050_LP	WW GAS MONITOR	LO LEL SP	0-100 %LEL																																		
1093	04260	55FAIT050_LA	WW GAS MONITOR	LO LEL ALM																																			
1094	02154	55FAIT050_LH	WW GAS MONITOR	LO LEL ACKHMI																																			
1095	04261	55FAIT050_LK	WW GAS MONITOR	LO LEL ALMACK																																			
1096																																										
1097	42060	55FAIT050_HS	WW GAS MONITOR	HI LEL SET	0-100 %LEL																																		
1098	44158	55FAIT050_HP	WW GAS MONITOR	HI LEL SP	0-100 %LEL																																		
1099	04258	55FAIT050_HA	WW GAS MONITOR	HI LEL ALM																																			
1100	02153	55FAIT050_HH	WW GAS MONITOR	HI LEL ACKHMI																																			
1101	04259	55FAIT050_HK	WW GAS MONITOR	HI LEL ALMACK																																			
1102	00048	55FAAH050	WW GAS MONITOR	HI LEL ALM						D02-R01-S06-P16																															
1103																																										
1104	42059	55FAIT050_HHS	WW GAS MONITOR	HIHI LEL SET	0-100 %LEL																																		
1105	44157	55FAIT050_HHP	WW GAS MONITOR	HIHI LEL SP	0-100 %LEL																																		
1106	04256	55FAIT050_HHA	WW GAS MONITOR	HIHI LEL ALM																																			
1107	02152	55FAIT050_HHH	WW GAS MONITOR	HIHI LEL ACKHMI																																			
1108	04257	55FAIT050_HHK	WW GAS MONITOR	HIHI LEL ALMACK																																			
1109	00047	55FAAHH050	WW GAS MONITOR	HIHI LEL ALM						D02-R01-S06-P15																															
1110																																										
1111	04265	55FAIT050_COK	WW GAS MONITOR	COMMON ALM ACK																																			
1112	04264	55FAIT050_COA	WW GAS MONITOR	COMMON ALARM																																			
1113																																										
1114	10177	55FYS050B	WW GAS MONITOR	XMTR TRBL						D05-R01-S06-P01																															
1115	04254	55FYS050B_ALA	WW GAS MONITOR	XMTR TRBL ALM																																			
1116	02151	55FYS050B_ALH	WW GAS MONITOR	ALARM ACK HMI																																			
1117	04255	55FYS050B_ALK	WW GAS MONITOR	ALARM ACK																																			
1118	00049	55FYA050B	WW GAS MONITOR	XMTR TRBL ALM						D02-R01-S07-P01																															
1119																																										
1120	00117	55FYL042	PUMP STATION	ENTRY SAFE						D06-R01-S03-P05																															
1121																																										

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1122	10170	55FYS160	ELEC RM ACU-1	ON						D05-R01-S05-P10																														
1123	04266	55FYS160_ON	ELEC RM ACU-1	ON																																				
1124																																								
1125	44161	55FYS160_RTM	ELEC RM ACU-1	RUNTME CUMM MSD																																				
1126	44162	55FYS160_RTL	ELEC RM ACU-1	RUNTME CUMM LSD																																				
1127	44163	55FYS160_RTC	ELEC RM ACU-1	RUNTME CURR DAY																																				
1128	44164	55FYS160_RTP	ELEC RM ACU-1	RUNTME PREV DAY																																				
1129	02157	55FYS160_RTR	ELEC RM ACU-1	RUNTIME RESET																																				
1130																																								
1131	10171	55FYS160B	ELEC RM ACU-1	TROUBLE						D05-R01-S05-P11																														
1132	04267	55FYS160B_ALA	ELEC RM ACU-1	TROUBLE ALARM																																				
1133	02156	55FYS160B_ALH	ELEC RM ACU-1	ALARM ACK HMI																																				
1134	04268	55FYS160B_ALK	ELEC RM ACU-1	ALARM ACK																																				
1135																																								
1136	10198	55FYS162	ELEC RM ACU-2	ON						D05-R01-S07-P06																														
1137	04269	55FYS162_ON	ELEC RM ACU-2	ON																																				
1138																																								
1139	44165	55FYS162_RTM	ELEC RM ACU-2	RUNTME CUMM MSD																																				
1140	44166	55FYS162_RTL	ELEC RM ACU-2	RUNTME CUMM LSD																																				
1141	44167	55FYS162_RTC	ELEC RM ACU-2	RUNTME CURR DAY																																				
1142	44168	55FYS162_RTP	ELEC RM ACU-2	RUNTME PREV DAY																																				
1143	02159	55FYS162_RTR	ELEC RM ACU-2	RUNTIME RESET																																				
1144																																								
1145	10199	55FYS162B	ELEC RM ACU-2	TROUBLE						D05-R01-S07-P07																														
1146	04270	55FYS162B_ALA	ELEC RM ACU-2	TROUBLE ALARM																																				
1147	02158	55FYS162B_ALH	ELEC RM ACU-2	ALARM ACK HMI																																				
1148	04271	55FYS162B_ALK	ELEC RM ACU-2	ALARM ACK																																				
1149																																								
1150	00058	55FYA160B	ELEC RM ACU	TROUBLE ALM						D02-R01-S07-P10																														
1151																																								
1152	10186	55FTSH064	ELEC RM	HI TMP						D05-R01-S06-P10																														
1153	04272	55FTSH064_ALA	ELEC RM	HI TMP ALARM																																				
1154	02160	55FTSH064_ALH	ELEC RM	ALARM ACK HMI																																				
1155	04273	55FTSH064_ALK	ELEC RM	ALARM ACK																																				
1156	00057	55FTAH064	ELEC RM	HI TMP ALM						D02-R01-S07-P09																														
1157																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1158	10174	55FZSC126	CKT BKR UTIL	CLOSED						D05-R01-S05-P14																														
1159	04274	55FZSC126_STA	CKT BKR UTIL	CLOSED																																				
1160																																								
1161	10190	55FZSC126A	CKT BKR MAIN	CLOSED						D05-R01-S06-P14																														
1162	04275	55FZSC126A_STA	CKT BKR MAIN	CLOSED																																				
1163																																								
1164	10175	55FZSC129	CKT BKR MCC A	CLOSED						D05-R01-S05-P15																														
1165	04276	55FZSC129_STA	CKT BKR MCC A	CLOSED																																				
1166																																								
1167	10191	55FZSC130	CKT BKR MCC B	CLOSED						D05-R01-S06-P15																														
1168	04277	55FZSC130_STA	CKT BKR MCC B	CLOSED																																				
1169																																								
1170	10194	55FHS126B	ATS	AUTO						D05-R01-S07-P02																														
1171	04302	55FHS126B_STA	ATS	AUTO																																				
1172																																								
1173	10195	55FYS126B	ATS	STANDBY						D05-R01-S07-P03																														
1174	04303	55FYS126B_STA	ATS	STANDBY																																				
1175																																								
1176	10196	55FESL126	ATS BUS DPN-A	UNDER VOLT						D05-R01-S07-P04																														
1177	04304	55FESL126_ALA	ATS BUS DPN-A	UNDER VOLT ALM																																				
1178	02173	55FESL126_ALH	ATS BUS DPN-A	ALARM ACK HMI																																				
1179	04305	55FESL126_ALK	ATS BUS DPN-A	ALARM ACK																																				
1180																																								
1181	10187	55FYS060J	UPS BYPASS	ON						D05-R01-S06-P11																														
1182	00067	55FYA060J	UPS BYPASS	ON ALM						D02-R01-S08-P03																														
1183	04280	55FYS060J_ALA	UPS BYPASS	ON ALARM																																				
1184	02162	55FYS060J_ALH	UPS BYPASS	ALARM ACK HMI																																				
1185	04281	55FYS060J_ALK	UPS BYPASS	ALARM ACK																																				
1186																																								
1187	10188	55FJSL060J	UPS AC LINE	TROUBLE						D05-R01-S06-P12																														
1188	04278	55FJSL060J_ALA	UPS AC LINE	TROUBLE ALARM																																				
1189	02161	55FJSL060J_ALH	UPS AC LINE	ALARM ACK HMI																																				
1190	04279	55FJSL060J_ALK	UPS AC LINE	ALARM ACK																																				
1191																																								
1192	10173	55FYS060B	UPS INVERTER	TROUBLE						D05-R01-S05-P13																														
1193	00068	55FYA060B	UPS	TROUBLE ALM						D02-R01-S08-P04																														
1194	04282	55FYS060B_ALA	UPS INVERTER	TROUBLE ALARM																																				
1195	02163	55FYS060B_ALH	UPS INVERTER	ALARM ACK HMI																																				
1196	04283	55FYS060B_ALK	UPS INVERTER	ALARM ACK																																				
1197																																								
1198	10189	55FESL060	UPS BATTERY	LOW						D05-R01-S06-P13																														
1199	00069	55FEAL060	UPS BATTERY	LOW ALM						D02-R01-S08-P05																														
1200	04284	55FESL060_ALA	UPS BATTERY	LO ALARM																																				
1201	02164	55FESL060_ALH	UPS BATTERY	ALARM ACK HMI																																				
1202	04285	55FESL060_ALK	UPS BATTERY	ALARM ACK																																				
1203																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1204	10011	55FJSL068	INST PWR LCP	TROUBLE						D02-R01-S03-P11																															
1205	04286	55FJSL068_ALA	INST PWR LCP	TROUBLE ALARM																																				
1206	02165	55FJSL068_ALH	INST PWR LCP	ALARM ACK HMI																																				
1207	04287	55FJSL068_ALK	INST PWR LCP	ALARM ACK																																				
1208	00072	55FJAL068	INST PWR LCP	TROUBLE ALM						D02-R01-S08-P08																															
1209																																									
1210	10085	55FJSL068A	INST PWR RIO A	TROUBLE						D03-R01-S07-P05																															
1211	04288	55FJSL068A_ALA	INST PWR RIO A	TROUBLE ALARM																																				
1212	02166	55FJSL068A_ALH	INST PWR RIO A	ALARM ACK HMI																																				
1213	04289	55FJSL068A_ALK	INST PWR RIO A	ALARM ACK																																				
1214	00073	55FJAL068A	INST PWR RIO A	TROUBLE ALM						D02-R01-S08-P09																															
1215																																									
1216	10172	55FJSL068B	INST PWR RIO B	TROUBLE						D05-R01-S05-P12																															
1217	04290	55FJSL068B_ALA	INST PWR RIO B	TROUBLE ALARM																																				
1218	02167	55FJSL068B_ALH	INST PWR RIO B	ALARM ACK HMI																																				
1219	04291	55FJSL068B_ALK	INST PWR RIO B	ALARM ACK																																				
1220	00074	55FJAL068B	INST PWR RIO B	TROUBLE ALM						D02-R01-S08-P10																															
1221																																									
1222	10225	55FTSH084	GEN RM	HI TMP						D05-R01-S09-P01																															
1223	04306	55FTSH084_ALA	GEN RM	HI TMP ALARM																																				
1224	02174	55FTSH084_ALH	GEN RM	ALARM ACK HMI																																				
1225	04307	55FTSH084_ALK	GEN RM	ALARM ACK																																				
1226	00066	55FTAH084	GEN RM	HI TMP ALM						D02-R01-S08-P02																															
1227																																									
1228	10227	55FISH084	GEN RM EF3	OVERLOAD						D05-R01-S09-P03																															
1229	04309	55FISH084_ALA	GEN RM EF3	OVERLOAD ALARM																																				
1230	02176	55FISH084_ALH	GEN RM EF3	ALARM ACK HMI																																				
1231	04310	55FISH084_ALK	GEN RM EF3	ALARM ACK																																				
1232	00061	55FYA084B	GEN RM EF3	TROUBLE ALM						D02-R01-S07-P13																															
1233																																									
1234	10226	55FYS084	GEN RM EF3	ON						D05-R01-S09-P02																															
1235	04308	55FYS084_ON	GEN RM EF3	ON																																				
1236	44169	55FYS084_SYM	GEN RM EF3	SYMBOL DISPLAY																																				
1237																																									
1238	44170	55FYS084_RTM	GEN RM EF3	RUNTME CUMM MSD																																				
1239	44171	55FYS084_RTL	GEN RM EF3	RUNTME CUMM LSD																																				
1240	44172	55FYS084_RTC	GEN RM EF3	RUNTME CURR DAY																																				
1241	44173	55FYS084_RTP	GEN RM EF3	RUNTME PREV DAY																																				
1242	02175	55FYS084_RTR	GEN RM EF3	RUNTIME RESET																																				
1243																																									

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1244	10213	55FHS080B	GEN	AUTO						D05-R01-S08-P05																														
1245	04311	55FHS080B_STA	GEN	AUTO																																				
1246																																								
1247	10212	55FYS087	GEN ENG	ON						D05-R01-S08-P04																														
1248	04312	55FYS087_ON	GEN ENG	ON																																				
1249																																								
1250	44176	55FYS087_RTC	GEN ENG	RUNTME CURR DAY																																				
1251	44175	55FYS087_RTL	GEN ENG	RUNTME CUMM LSD																																				
1252	44174	55FYS087_RTM	GEN ENG	RUNTME CUMM MSD																																				
1253	44177	55FYS087_RTP	GEN ENG	RUNTME PREV DAY																																				
1254	02177	55FYS087_RTR	GEN ENG	RUNTIME RESET																																				
1255																																								
1256	10214	55FYS087K	GEN ENG	OVERCRANK						D05-R01-S08-P06																														
1257	04313	55FYS087K_ALA	GEN ENG	OVERCRANK ALARM																																				
1258	02178	55FYS087K_ALH	GEN ENG	ALARM ACK HMI																																				
1259	04314	55FYS087K_ALK	GEN ENG	ALARM ACK																																				
1260																																								
1261	10215	55FYS080K	GEN	COM SHUTDN						D05-R01-S08-P07																														
1262	04315	55FYS080K_ALA	GEN	COM SHUTDN ALM																																				
1263	02179	55FYS080K_ALH	GEN	ALARM ACK HMI																																				
1264	04316	55FYS080K_ALK	GEN	ALARM ACK																																				
1265	00064	55FYA080B	GEN	TROUBLE ALM						D02-R01-S07-P16																														
1266																																								
1267	10216	55FYS087B	GEN MECH	TROUBLE						D05-R01-S08-P08																														
1268	04317	55FYS087B_ALA	GEN MECH	TROUBLE ALM																																				
1269	02180	55FYS087B_ALH	GEN MECH	ALARM ACK HMI																																				
1270	04318	55FYS087B_ALK	GEN MECH	ALARM ACK																																				
1271																																								
1272	10217	55FTSH181	GEN STATOR	HI TMP						D05-R01-S08-P09																														
1273	04319	55FTSH181_ALA	GEN STATOR	HI TMP ALARM																																				
1274	02181	55FTSH181_ALH	GEN STATOR	ALARM ACK HMI																																				
1275	04320	55FTSH181_ALK	GEN STATOR	ALARM ACK																																				
1276																																								
1277	10218	55FZSC080A	GEN CKT BKR	CLOSED						D05-R01-S08-P10																														
1278	04321	55FZSC080A_STA	GEN CKT BKR	CLOSED																																				
1279																																								
1280	10219	55FISH080A	GEN CKT BKR	TRIPPED						D05-R01-S08-P11																														
1281	04322	55FISH080A_ALA	GEN CKT BKR	TRIPPED ALARM																																				
1282	02182	55FISH080A_ALH	GEN CKT BKR	ALARM ACK HMI																																				
1283	04323	55FISH080A_ALK	GEN CKT BKR	ALARM ACK																																				
1284																																								
1285	10209	55FLSH091	GEN TANK	LEAK						D05-R01-S08-P01																														
1286	04324	55FLSH091_ALA	GEN TANK	LEAK ALARM																																				
1287	02183	55FLSH091_ALH	GEN TANK	ALARM ACK HMI																																				
1288	04325	55FLSH091_ALK	GEN TANK	ALARM ACK																																				
1289																																								
1290	10210	55FESL083	GEN BATT	LO VOLT						D05-R01-S08-P02																														
1291	04326	55FESL083_ALA	GEN BATT	LO VOLT ALARM																																				
1292	02184	55FESL083_ALH	GEN BATT	ALARM ACK HMI																																				
1293	04327	55FESL083_ALK	GEN BATT	ALARM ACK																																				
1294																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1295	10211	55FYS083B	GEN BATT CHRG	TROUBLE						D05-R01-S08-P03																														
1296	04328	55FYS083B_ALA	GEN BATT CHRG	TROUBLE ALARM																																			
1297	02185	55FYS083B_ALH	GEN BATT CHRG	ALARM ACK HMI																																			
1298	04329	55FYS083B_ALK	GEN BATT CHRG	ALARM ACK																																			
1299																																								
1300	04330	55FGEN080_COA	GEN	COMMON ALARM																																			
1301	04331	55FGEN080_COK	GEN	COMMON ALM ACK																																			
1302																																								
1303	04387	55FGEN080_ALM	GEN	COMM FAIL ALARM																																			
1304																																								
1305	30020	55FIT080A	GEN	PHASE A AMPS						D06-R01-S07-P02																															
1306	44178	55FIT080A_CUR	GEN	PHASE A AMPS																																			
1307	30030	55FIT080B	GEN	PHASE B AMPS						D06-R01-S08-P03																															
1308	44179	55FIT080B_CUR	GEN	PHASE A AMPS																																			
1309	30021	55FIT080C	GEN	PHASE C AMPS						D06-R01-S07-P03																															
1310	44180	55FIT080C_CUR	GEN	PHASE A AMPS																																			
1311																																								
1312	30029	55FLIT090	GEN TANK	LEVEL						D06-R01-S08-P02																															
1313	44181	55FLIT090_LVL	GEN TANK	LEVEL																																			
1314	40022	55FLI090	GEN TANK	LEVEL						D06-R01-S09-P02																															
1315																																								
1316	42063	55FLIT090_HHS	GEN TANK	HIHI LVL SET																																			
1317	44182	55FLIT090_HHP	GEN TANK	HIHI LVL SP																																			
1318	04332	55FLIT090_HHA	GEN TANK	HIHI LVL ALM																																			
1319	02186	55FLIT090_HHH	GEN TANK	HIHI LVL ACKHMI																																			
1320	04333	55FLIT090_HHK	GEN TANK	HIHI LVL ALMACK																																			
1321																																								
1322	42064	55FLIT090_HS	GEN TANK	HI LVL SET																																			
1323	44183	55FLIT090_HP	GEN TANK	HI LVL SP																																			
1324	04334	55FLIT090_HA	GEN TANK	HI LEVEL ALM																																			
1325	02187	55FLIT090_HH	GEN TANK	HI LVL ACKHMI																																			
1326	04335	55FLIT090_HK	GEN TANK	HI LVL ALMACK																																			
1327	00062	55FLAH090	GEN TANK	HI LEVEL ALM						D02-R01-S07-P14																															
1328	00118	55FLAH090A	GEN TANK	HI LEVEL ALM						D06-R01-S03-P06																															
1329																																								
1330	42065	55FLIT090_LS	GEN TANK	LO LVL SET																																			
1331	44184	55FLIT090_LP	GEN TANK	LO LVL SP																																			
1332	04336	55FLIT090_LA	GEN TANK	LO LVL ALM																																			
1333	02188	55FLIT090_LH	GEN TANK	LO LVL ACKHMI																																			
1334	04337	55FLIT090_LK	GEN TANK	LO LVL ALMACK																																			
1335	00063	55FLAL090	GEN TANK	LO LEVEL ALM						D02-R01-S07-P15																															
1336																																								
1337	42066	55FLIT090_LLS	GEN TANK	LOLO LVL SET																																			
1338	44185	55FLIT090_LLP	GEN TANK	LOLO LVL SP																																			
1339	04338	55FLIT090_LLA	GEN TANK	LOLO LVL ALM																																			
1340	02189	55FLIT090_LLH	GEN TANK	LOLO LVL ACKHMI																																			
1341	04339	55FLIT090_LLK	GEN TANK	LOLO LVL ALMACK																																			
1342																																								
1343	04340	55FLIT090_COA	GEN TANK	COMMON ALARM																																			
1344	04341	55FLIT090_COK	GEN TANK	COMMON ALM ACK																																			
1345																																								

= NOT APPLICABLE

ITEM	REGISTER	TAG	DESCRIPTION		Range	ALARM SUMMARY	INPUT FIELD 0% or ON	INPUT FIELD 50%	INPUT FIELD 100%	REAL I/O DROP-RACK-SLOT-POINT	OUTPUT LCP 0% or Panel ON	OUTPUT LCP 50% or Ann. BLINK	OUTPUT LCP 100% or Ann. ON	OUTPUT LCPA\FIELD 0% or ON	OUTPUT LCPA\FIELD 50%	OUTPUT LCPA\FIELD 100%	PROCESS OVERVIEW 0% or ON	PROCESS OVERVIEW 50% or ALM Blink	PROCESS OVERVIEW 100% or ALM Solid	CONFIG 0% or ON	CONFIG 50% or ALM Blink	CONFIG 100% or ALM Solid	PUMPS GROUP A/M 0% or ON	PUMPS GROUP A/M 50% or ALM Blink	PUMPS GROUP A/M 100% or ALM Solid	PUMP # DETAIL 0% or ON	PUMP # DETAIL 50% or ALM Blink	PUMP # DETAIL 100% or ALM Solid	PUMP # / VLV A/M 0% or ON	PUMP # / VLV A/M 50% or ALM Blink	PUMP # / VLV A/M 100% or ALM Solid	PUMP/VLV TUNING 0%	PUMP/VLV TUNING 50%	PUMP/VLV TUNING 100%	TREND 0%	TREND 50%	TREND 100%	RUNTIME OR SUM. 0% or ON	RUNTIME OR SUM. 50% or ALM Blink	RUNTIME OR SUM. 100% or ALM Solid	COMMENT	SIGN-OFF
1346	10193	55FJSL039	PUMP STATION	POWER FAIL						D05-R01-S07-P01																															
1347	04292	55FJSL039_ALA	PUMP STATION	POWER FAIL ALM																																				
1348	02168	55FJSL039_ALH	PUMP STATION	ALARM ACK HMI																																				
1349	04293	55FJSL039_ALK	PUMP STATION	ALARM ACK																																				
1350																																									
1351	04382	55FPMON039_ALM	POWER MONITOR	COMM FAIL ALARM																																				
1352																																									
1353	44187	55FEIT039_VLT	POWER MONITOR	VOLTS																																				
1354	44188	55FIIT039_AMP	POWER MONITOR	AMPS																																				
1355	44189	55FJIT039_KW	POWER MONITOR	KILOWATTS																																				
1356	44190	55FQJIT039_KWM	POWER MONITOR	KILOWATT-HR MSD																																				
1357	44191	55FQJIT039_KWL	POWER MONITOR	KILOWATT-HR LSD																																				
1358	44192	55FQJIT039A_KVM	POWER MONITOR	KILOVAR-HR MSD																																				
1359	44193	55FQJIT039A_KVL	POWER MONITOR	KILOVAR-HR LSD																																				
1360																																									
1361	10086	55FZSC062	ELECTRIC RM	INTRUSION						D03-R01-S07-P06																																
1362	04294	55FZSC062_ALA	ELECTRIC RM	INTRUSION ALARM																																				
1363	02169	55FZSC062_ALH	ELECTRIC RM	ALARM ACK HMI																																				
1364	04295	55FZSC062_ALK	ELECTRIC RM	ALARM ACK																																				
1365																																									
1366	10087	55FZSC062A	DRYWELL	INTRUSION						D03-R01-S07-P07																																
1367	04296	55FZSC062A_ALA	DRYWELL	INTRUSION ALARM																																				
1368	02170	55FZSC062A_ALH	DRYWELL	ALARM ACK HMI																																				
1369	04297	55FZSC062A_ALK	DRYWELL	ALARM ACK																																				
1370	00070	55FZA062A	DRYWELL	INTRUSION ALM						D02-R01-S08-P06																																
1371																																									
1372	10088	55FZSC062C	GEN RM	INTRUSION						D03-R01-S07-P08																																
1373	04298	55FZSC062C_ALA	GEN RM	INTRUSION ALARM																																				
1374	02171	55FZSC062C_ALH	GEN RM	ALARM ACK HMI																																				
1375	04299	55FZSC062C_ALK	GEN RM	ALARM ACK																																				
1376	00065	55FZA062C	GEN BUILDING	INTRUSION ALM						D02-R01-S08-P01																																
1377																																									
1378	10089	55FZSC062B	EXTERNL PANELS	INTRUSION						D03-R01-S07-P09																																
1379	04300	55FZSC062B_ALA	EXTERNL PANELS	INTRUSION ALARM																																				
1380	02172	55FZSC062B_ALH	EXTERNL PANELS	ALARM ACK HMI																																				
1381	04301	55FZSC062B_ALK	EXTERNL PANELS	ALARM ACK																																				
1382	00071	55FZA062B	EXTERNL PANELS	INTRUSION ALM						D02-R01-S08-P07																																
1383																																									
1384	10001	55FHS037J	LCP PANEL	LAMP TEST						D02-R01-S03-P01																																
1385																																									
1386	00076	55FYA079B	PLC	TROUBLE ALM						D02-R01-S08-P12																																
1387																																									
1388	44186	55FU079_STA	PUMP STATION	STATUS																																				
1389																																									

BLOCK NUMBER	TEMPLATE NAME	TEMPLATE PAGE TITLE DESCRIPTION	MOD	COMMENT	REGISTER NUMBER	LOOP TAG NUMBER (DESC1)	EQUIPMENT NAME (DESC2)	REGISTER STARTING ADDRESS					
								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
1	SWS-C08	DIAGNOSTICS TEMPLATE LOGIC(SWS-C08 V2.41)				10EU079		02001	04001	06001	42001	44001	46001
2	CUSTOM	CUSTOM LOGIC - LOCAL PANEL INPUTS TEST PUSH BUTTON		Combine the test push button with an off delay timer so that the test logic remains on for a hard coded time delay once the Operator releases the button. This coil is connected to each of the panel and annunciator lights to allow the operator to activate all PLC controlled lights on the FCP panel by pressing the test push button.	10254	10EHS037J	DIV FCP PANEL			07001			47001
		DIVERSION BOX LEVELS, FLOWS AND POWER LOSS											
3	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Ultrasonic Fail	10241	10EYS672B	DIV BOX SONIC	02021	04021				47002
4	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Diversion Box Ultrasonic Level, use Ultrasonic Fail alarm for external alarm input.	30037	10ELIT672	DIV BOX SONIC	02022	04023	07003	42021	44021	47003
5	CUSTOM	CUSTOM LOGIC - KNOTT VALVE POSITIONS FOR HOURS 0 - 15		Block move operator entered setpoints for Knott Valve positions from HMI input to output for hours 0 to 15.		10EVB671	DIV KNOT VLV				42025	44026	
6	CUSTOM	CUSTOM LOGIC - KNOTT VALVE POSITIONS FOR HOURS 16 - 23		Block move operator entered setpoints for Knott Valve positions from HMI input to output for hours 16 to 23.		10EVB671	DIV KNOT VLV				42041	44042	
7	CUSTOM	CUSTOM LOGIC - KNOTT TABLE TO REGISTER MOVE FOR AUTOMATIC CTRL		Copy hour from time of day clock to Table to Register Move index register. Table to register move which transfers valve position to output register based on hour time of day (0 - 23) with top and middle inputs tied to power so instruction doesn't increment itself (change in hours moves pointer).		10EVB671	DIV KNOT VLV			07008			47018
8	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(SWS-C15A V1.01)		Knott Valve		10EVA671	DIV KNOT VLV	02026	04033	07010	42049	44050	47020
9	SWS-C06B	VALVE CONTROL, MODULATING TEMPLATE LOGIC(SWS-C06B V2.01)		Knott Valve, modify so that loss of power (latched trouble alarm) does not close valve. Change Wait Mode BLKM so that Position Buffer is feed back into itself instead of a value of 0.	40019	10EFV671	DIV KNOT VLV	02028	04035	07012		44052	47021
10	CUSTOM	CUSTOM LOGIC - BUSHARD VALVE POSITIONS FOR HOURS 0 - 16		Block move operator entered setpoints for Bushard Valve positions from HMI input to output for hours 0 to 16.		10EVB676	DIV BUSH VLV				42050	44055	
11	CUSTOM	CUSTOM LOGIC - BUSHARD VALVE POSITIONS FOR HOURS 17 - 23		Block move operator entered setpoints for Bushard Valve positions from HMI input to output for hours 17 to 23.		10EVB676	DIV BUSH VLV				42066	44071	
12	CUSTOM	CUSTOM LOGIC - BUSHARD TABLE TO REGISTER MOVE TO AUTOMATIC CTRL		Copy hour from time of day clock to Table to Register Move index register. Table to register move which transfers valve position to output register based on hour time of day (0 - 23) with top and middle inputs tied to power so instruction doesn't increment itself (change in hours moves pointer).		10EVB676	DIV BUSH VLV			07017			47042
13	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(SWS-C15A V1.01)		Bushard Valve		10EVA676	DIV BUSH VLV	02033	04046	07019	42074	44079	47044
14	SWS-C06B	VALVE CONTROL, MODULATING TEMPLATE LOGIC(SWS-C06B V2.01)		Bushard Valve, modify so that loss of power (latched trouble alarm) does not close valve. Change Wait Mode BLKM so that Position Buffer is feed back into itself instead of a value of 0.	40021	10EFV676	DIV BUSH VLV	02035	04048	07021		44081	47045
15	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Knott 1 Flow Transmitter Trouble, inhibit if Knott Valve is not open.	10246	10EYS674B	DIV KNOT 1 FLO	02040	04059				47066
16	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Knott 1 Flowmeter, inhibit Low and Low Low flow alarms when Knott Vavle is closed, use Tranmsitter Trouble Alarm for external alarm input.	30040	10EFIT674	DIV KNOT 1	02041	04061	07026	42075	44084	47067
17	SWS-C19	TOTALIZER TEMPLATE LOGIC(SWS-C19 V1.11)		Knott 1 Flowmeter, inhibit when Knott Valve is not open.	30040	10EFIT674	DIV KNOT 1			07031		44089	47082
18	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Knott 1 Level (from Flow Meter).	30041	10ELIT674	DIV KNOT 1					44099	47108
19	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Knott 1 Velocity (from Flow Meter).	30042	10ESIT674	DIV KNOT 1					44100	47115
20	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Knott 2 Flow Transmitter Trouble, inhibit if Knott Valve is not open	10261	10EYS675B	DIV KNOT 2 FLO	02045	04071				47122
21	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Knott 2 Flowmeter, inhibit Low and Low Low flow alarms when Knott Vavle is closed, use Tranmsitter Trouble Alarm for external alarm input.	30049	10EFIT675	DIV KNOT 2	02046	04073	07032	42079	44101	47123
22	SWS-C19	TOTALIZER TEMPLATE LOGIC(SWS-C19 V1.11)		Knott 2 Flowmeter, inhibit when Knott Valve is not open.	30049	10EFIT675	DIV KNOT 2			07037		44106	47138
23	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Knott 2 Level (from Flow Meter).	30050	10ELIT675	DIV KNOT 2					44116	47164
24	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Knott 2 Velocity (from Flow Meter).	30052	10ESIT675	DIV KNOT 2					44117	47171
25	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Bushard Flow Transmitter Trouble, inhibit if Bushard Valve is not open.	10260	10EYS673B	DIV BUSH FLO	02050	04083				47178
26	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Bushard Flowmeter, inhibit Low and Low Low flow alarms when Bushard Vavle is closed, use Tranmsitter Trouble Alarm for external alarm input.	30047	10EFIT673	DIV BUSH	02051	04085	07038	42083	44118	47179

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
27	SWS-C19	TOTALIZER TEMPLATE LOGIC(SWS-C19 V1.11)		Bushard Flowmeter, inhibit when Bushard Valve is not open.	30047	10EFIT673	DIV BUSH			07043		44123	47194
28	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Bushard Level (from Flow Meter).	30048	10ELIT673	DIV BUSH					44133	47220
29	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Bushard Velocity (from Flow Meter).	30051	10ESIT673	DIV BUSH					44134	47227
		DIVERSION BOX CONTROLS											
30	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Gas Monitor Trouble Alarm	10242	10EYS677B	DIV BOX GAS	02055	04095				47234
31	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Diversion Box Gas Monitor Level inhibit Hi and HiHi when Trouble Alarm is active and deactivate Lo and LoLo Alarms, use Transmitter Trouble Alarm for external alarm input.	30038	10EAIT677	DIV BOX GAS	02056	04097	07044	42087	44135	47235
32	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room Hi Sump Level	10247	10ELSH684	DIV SUMP	02060	04107				47250
33	CUSTOM	CUSTOM LOGIC - SUPPLY FAN ON TO HMI		Diversion Box Electrical Room Suppy Fan, send On signal to HMI.	10248	10EYS691	DIV SF1		04109				
34	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Diversion Box Electrical Room Supply Fan Runtime	10248	10EYS691	DIV SF1	02061		07049		44140	47251
35	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room Supply Fan Overload	10249	10EISH691	DIV SF1	02061	04110				47251
36	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room Supply Fan Low Flow, inhibit when Supply Fan is not On.	10250	10EFSL692	DIV SF1	02062	04112				47252
37	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room UPS Trouble	10252	10EYS678B	DIV UPS	02063	04114				47253
38	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room UPS AC Fail	10262	10EJSL678	DIV UPS AC	02064	04116				47254
39	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room UPS Bypass Alarm	10263	10EYS678J	DIV UPS BYPASS	02065	04118				47255
40	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room UPS Low Battery	10264	10EESL678	DIV UPS BATT	02066	04120				47256
41	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room LCP Panel Instrument Power Supply Trouble	10265	10EJSL687	DIV INST POWER	02067	04122				47257
42	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room Power Fail	10253	10EYS695	DIV	02068	04124				47258
43	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Diversion Box Electrical Room Intrusion	10251	10EZSC686	DIV ELEC RM	02069	04126				47259
44	CUSTOM	CUSTOM LOGIC - DIV KNOTT VLV AND KNOTT 1 FLO XMTR ANNUNCIATOR ALM		Diversion Box Knott Valve Trouble Alarm output to annunciator. Note: All Alarms going to the annunciator are setup so that the Alarm contact is in series with the 1 second toggle coil causing the alarm to blink, then in parallel connect the acknowledge with no toggle so the output stays on until the acknowledge clears and in parallel with the alarm and acknoledge connect the lamp test contact.	49	10EYA671B	DIV KNOT VLV						
45	CUSTOM	CUSTOM LOGIC - DIV KNOTT VLV AND KNOTT 1 FLO XMTR ANNUNCIATOR ALM		Diversion Box Knott 1 Flow XMTR Trouble Alarm output to annunciator.	50	10EYA674B	DIV KNOT 1 FLO						
46	CUSTOM	CUSTOM LOGIC - DIV KNOTT 2 FLO XMTR AND PLC TRBL ANNUNCIATOR ALM		Diversion Box Knott 2 Flow XMTR Trouble Alarm output to annunciator.	51	10EYA675B	DIV KNOT 2 FLO						
47	CUSTOM	CUSTOM LOGIC - DIV KNOTT 2 FLO XMTR AND PLC TRBL ANNUNCIATOR ALM		Diversion Box PLC Trouble Alarm output to annunciator. Sum up, PLC Battery Fail, Memory Protect Off, PLC All Modules Not Healthy, PLC Drops Not Communicating, PLC Hot Standby Problem, PLC Controller B Primary, PLC Controller Logic Mis-match. Output is energized for normal condition, so series all contacts using normally closed contacts. Lamp Test is in series instead of parallel.	52	10EYA079	PLC						
48	CUSTOM	CUSTOM LOGIC - DIV BUSHARD VALVE AND FLOW XMTR ANNUNCIATOR ALARM		Diversion Box Bushard Valve Trouble Alarm output to annunciator.	53	10EYA676B	DIV BUSH VLV						
49	CUSTOM	CUSTOM LOGIC - DIV BUSHARD VALVE AND FLOW XMTR ANNUNCIATOR ALARM		Diversion Box Bushard Flow XMTR Trouble Alarm output to annunciator.	54	10EYA673B	DIV BUSH FLO						
50	CUSTOM	CUSTOM LOGIC - SONIC HI AND HIHI LEVEL COMMON ALARM		Diversion Box Sonic HI and HI HI Level Alarms are summed together to produce a common alarm signal for the HI and HI HI.		10ELIT672	DIV BOX SONIC			07050			
51	CUSTOM	CUSTOM LOGIC - DIV BOX SONIC HI LEVEL AND XMTR ANNUNCIATOR ALARM		Diversion Box Sonic High Level Common Alarm output to annunciator.	55	10ELAH672	DIV BOX SONIC						
52	CUSTOM	CUSTOM LOGIC - DIV BOX SONIC HI LEVEL AND XMTR ANNUNCIATOR ALARM		Diversion Box Sonic XMTR Trouble Alarm output to annunciator.	56	10EYA672B	DIV BOX SONIC						
53	CUSTOM	CUSTOM LOGIC - DIV BOX GAS HIHI AND HI ANNUNCIATOR ALARM		Diversion Box Gas Transmitter HI HI LEL Alarm output to annunciator.	57	10EAAHH677	DIV BOX GAS						
54	CUSTOM	CUSTOM LOGIC - DIV BOX GAS HIHI AND HI ANNUNCIATOR ALARM		Diversion Box Gas Transmitter HI LEL Alarm output to annunciator.	58	10EAAH677	DIV BOX GAS						
55	CUSTOM	CUSTOM LOGIC - DIV BOX GAS XMTR TRBL AND HI SUMP ANNUNCIATOR ALM		Diversion Box Gas XMTR Trouble Alarm output to annunciator.	59	10EYA677B	DIV BOX GAS						
56	CUSTOM	CUSTOM LOGIC - DIV BOX GAS XMTR TRBL AND HI SUMP ANNUNCIATOR ALM		Diversion Box HI Sump Level Alarm output to annunciator.	60	10ELAH684	DIV SUMP						
57	CUSTOM	CUSTOM LOGIC - DIV BOX UPS BYPASS ON AND TROUBLE ANNUNCIATOR ALM		Diversion Box UPS Bypass On Alarm output to annunciator.	61	10EYA678J	DIV UPS BYPASS						
58	CUSTOM	CUSTOM LOGIC - DIV BOX UPS BYPASS ON AND TROUBLE ANNUNCIATOR ALM		Diversion Box UPS Trouble Alarm output to annunciator.	62	10EYA678B	DIV UPS						
59	CUSTOM	CUSTOM LOGIC - DIV UPS BATT LO AND INST PWR FAIL ANNUNCIATOR ALM		Diversion Box UPS Battery LO Alarm output to annunciator.	63	10EEAL678	DIV UPS BATT						
60	CUSTOM	CUSTOM LOGIC - DIV UPS BATT LO AND INST PWR FAIL ANNUNCIATOR ALM		Diversion Box Instrumenation Power Fail Alarm output to annunciator.	64	10EJAL687	DIV INST POWER						

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
61	CUSTOM	CUSTOM LOGIC - DIV BOX SONIC LEVEL DISPLAY		Diversion Box Sonic Level display, move analog input signal to analog output register for display on panel front analog display. Note: For all front panel displays move input to output until the Lamp Test button is pressed, when the Lamp Test is pressed suspend moving the analog input to the analog output and instead alternate the display every 2 seconds, using the 2 second toggle contact, between 0 and 4095.	40017	10ELI672	DIV BOX SONIC						
62	CUSTOM	CUSTOM LOGIC - DIV BOX GAS LEL DISPLAY		Diversion Box Gas Monitor LEL Level display, move analog input signal to analog output register for display on panel front analog display.	40018	10EAI677	DIV BOX GAS						
63	CUSTOM	CUSTOM LOGIC - DIV BOX KNOTT VALVE POSITION DISPLAY		Diversion Box Knott Valve Position display, move analog input signal to analog output register for display on panel front analog display.	40020	10EZI671	DIV KNOT VLV						
64	CUSTOM	CUSTOM LOGIC - DIV BOX BUSHARD VALVE POSITION DISPLAY		Diversion Box Bushard Valve Position display, move analog input signal to analog output register for display on panel front analog display.	40022	10EZI676	DIV BUSH VLV						
65	CUSTOM	CUSTOM LOGIC - DIV BOX KNOTT 1 FLOW DISPLAY		Diversion Box Knott 1 Flow Meter Flow display, move analog input signal to analog output register for display on panel front analog display when flow meter Flow Total coil is enabled, when coil is off move a value of 0 to the display.	40023	10EFI674	DIV KNOT 1						
66	CUSTOM	CUSTOM LOGIC - DIV BOX KNOTT 1 LEVEL DISPLAY		Diversion Box Knott 1 Flow Meter Level display, move analog input signal to analog output register for display on panel front analog display.	40024	10ELI674	DIV KNOT 1						
67	CUSTOM	CUSTOM LOGIC - DIV BOX BUSHARD FLOW DISPLAY		Diversion Box Bushard Flow Meter Flow display, move analog input signal to analog output register for display on panel front analog display when flow meter Flow Total coil is enabled, when coil is off move a value of 0 to the display.	40025	10EFI673	DIV BUSH						
68	CUSTOM	CUSTOM LOGIC - DIV BOX BUSHARD LEVEL DISPLAY		Diversion Box Bushard Flow Meter Level display, move analog input signal to analog output register for display on panel front analog display.	40026	10ELI673	DIV BUSH						
69	CUSTOM	CUSTOM LOGIC - DIV BOX KNOTT 2 FLOW DISPLAY		Diversion Box Knott 2 Flow Meter Flow display, move analog input signal to analog output register for display on panel front analog display when flow meter Flow Total coil is enabled, when coil is off move a value of 0 to the display.	40027	10EFI675	DIV KNOT 2						
70	CUSTOM	CUSTOM LOGIC - DIV BOX KNOTT 2 LEVEL DISPLAY		Diversion Box Knott 2 Flow Meter Level display, move analog input signal to analog output register for display on panel front analog display.	40028	10ELI675	DIV KNOT 2						
		PUMP STATION PUMP CONTROLS											
71	CUSTOM	CUSTOM LOGIC - LOCAL PANEL INPUTS CLEANING PANEL ACTIVATE		If the internal cleaning cycle disable is off and the operator pushes the Cleaning Panel Activate push button on the LCP panel, then seal-in the logic until the cleaning cycle is completed. The cleaning cycle is completed when the internal end cycle coil turns on. The cleaning cycle will abort and end prematurely if the internal cleaning cycle disable coil subsequently turns on.	10065	10EHS560J	CLEANING LCP						
72	CUSTOM	CUSTOM LOGIC - LOCAL PANEL INPUTS PUMPS RESET		Combine each of the VFD mounted reset pushbuttons for pumps 1 and 2 with the individual CRISP A/M station resets using internal coils which will be fed into the three SWS-C02s to reset the logic for each pump.	10021	10EHS100H	PUMP 1						
73	CUSTOM	CUSTOM LOGIC - LOCAL PANEL INPUTS PUMPS RESET		Combine each of the VFD mounted reset pushbuttons for pumps 3 and 4 with the individual CRISP A/M station resets using internal coils which will be fed into the three SWS-C02s to reset the logic for each pump.	10149	10EHS300H	PUMP 3						

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
74	CUSTOM	CUSTOM LOGIC - PANEL LCP-A PUMPS SPEED UP/DOWN PUSHBUTTON		The Pumps Speed Up and Down push buttons and logic are only enabled once the Operator presses the Start Cleaning Cycle Push button. Once enabled combine the Pump 1 Speed Up and Down push buttons from LCP-A with timer circuits so that one press of the button results in a single pulse of the internal speed up or down coil, while holding the button causes the coil to pulse repeatedly after a short time delay.	10132	10EHS560N	PUMPS LCPA						
75	CUSTOM	CUSTOM LOGIC - PANEL LCP-A PREPARE CLEANING CYCLE PUSHBUTTON		If the Operator has enabled the cleaning cycle at the LCP panel and then presses the Prepare to Clean push button on the LCP-A panel, then seal-in the logic until the cleaning cycle ends. The Prepare to Clean logic causes control to transfer from the normal wetwell level control PID to manual pump speed control. It also results in any wetwell level alarms being disabled.	10129	10EHS560K	CLEANING LCPA						
76	CUSTOM	CUSTOM LOGIC - PANEL LCP-A START CLEANING CYCLE PUSHBUTTON		When the Operator presses the LCP-A Start Clean Cycle push button the logic is sealed-in only if the Prepare to Clean is already active.	10130	10EHS560L	CLEANING LCPA						
77	CUSTOM	CUSTOM LOGIC - PANEL LCP-A END CLEANING CYCLE PUSHBUTTON		If the Operator presses the End Cycle push button on the LCP-A panel then seal-in the logic to end the cleaning cycle. The seal-in is released once the internal end cycle coil activates. The cleaning cycle also ends automatically if the operator fails to push the Start Cleaning Cycle push button within a hard coded time delay after the Cleaning Panel Activate is sealed-in.	10131	10EHS560M	CLEANING LCPA						
78	CUSTOM	CUSTOM LOGIC - INTERNAL END CLEANING CYCLE		If both the End Cycle logic from the previous network is sealed-in and the Wetwell Low Level Alarms inhibit logic turns off then the coil is activated, which then ends the cleaning cycle and causes all panel related lights to turn off and the system returns to normal operation.	10131	10EHS560M	CLEANING LCPA						
79	CUSTOM	CUSTOM LOGIC - CLEANING CYCLE ACTIVE STATUS WORD		Generate a status word for CRISP to indicate which step of the cleaning cycle is active. CRISP will display: STANDBY, DISABLE, ACTIVATE, PREPARE, START and END. Tag Ext: _STA		10EPL100	PUMPS						
80	CUSTOM	CUSTOM LOGIC - CLEANING CYCLE ACTIVE MODE		A mode coil is generated and sent to CRISP for display on the pumps' A/M stations to indicate a cleaning cycle is in progress. Tag Ext: _CAM Use CRISP A/M ON and OFF symbols.		10EPK100	PUMPS						
		WETWELL LEVEL SCALING AND DEVIATION LOGIC											
81	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Wetwell High Level Float	10001	10ELSH040	WW FLOAT	02070	04128				47260
82	CUSTOM	CUSTOM LOGIC - BUBBLER PURGE LOGIC		Bubbler purge. Purge Bubbler after the completion of a cleaning cycle or if Operator Initiated from HMI.	3	10EFCP030	WW BUBBLER						
83	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Bubbler Low Air Pressure Alarm	10008	10EPSL030	WW BUBBLER	02071	04130				47261
84	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Bubbler	30002	10ELIT030	WW BUBBLER					44144	47262
85	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Ultrasonic	30011	10ELIT035	WW SONIC						
86	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(MOD SWS-C12F V1.10)	Y	Ultrasonic Level Switch Low (LSL), inhibit when Ultrasonic is not In-Service and during cleaning cycle.	10002	10ELSL035	WW SONIC	02072	04132				47269
87	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(MOD SWS-C12F V1.10)	Y	Ultrasonic Level Switch Low Low (LSLL), inhibit when Ultrasonic is not In-Service and during cleaning cycle.	10003	10ELSLL035	WW SONIC	02073	04134				47270
88	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Ultrasonic Fail (Displayed on configuration screen). Inhibit when XMTR is Out of Service.	10004	10EYS035B	WW SONIC						
89	CUSTOM	CUSTOM LOGIC - LEVEL TRANSMITTERS OOS AND INS SELECTION		Allow the operator to place the bubbler or ultrasonic Out Of Service via CRISP only if the transmitter is not selected as the active level transmitter. Tag Ext: _ISM _OSM		10ELF030	WW ACT						
90	CUSTOM	CUSTOM LOGIC - ACTIVE LEVEL TRANSMITTER SELECT		Select either ultrasonic or bubbler as active level transmitter provided the transmitter is not out of service.		10ELE030	WW ACT						
91	CUSTOM	CUSTOM LOGIC - MOVE RAW VALUE FOR SELECTED TRANSMITTER		Block move the raw input value for the selected level transmitter into a common register for SWS-C12A's use.		10ELD030	WW ACT						
92	CUSTOM	CUSTOM LOGIC - ACTIVE LEVEL DEVIATION ALARM		Measure the deviation between the two level transmitters to see if the reading exceeds the hard coded setpoint only if both transmitters are in service.		10ELC030	WW ACT						
93	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Alarm when a deviation occurs.		10ELDSH030	WW ACT	02074	04136				47271

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
94	CUSTOM	CUSTOM LOGIC - CLEANING CYCLE LOW WETWELL LEVEL ALARMS INHIBIT		If the prepare to clean logic is active and the End Cycle logic is off and the Ultrasonic's wetwell level reading is below the Active Level transmitter's Low Wetwell Level setpoint then keep alarm inhibit coil on. Once the alarm inhibit coil turns off a delay timer keeps the alarm inhibit on for an additional time delay. This logic is used to both inhibit all wetwell low level alarms and is used by the internal end cycle logic to complete the cleaning cycle.		10ELB030	WW ACT						
95	CUSTOM	CUSTOM LOGIC - ACTIVE LEVEL EXTERNAL ALARM SIGNALS		Combine the Deviation Alarm and when the Ultrasonic is selected the Ultrasonic Fail Alarm and when the Bubbler is selected the Bubbler Low Pressure Alarm to generate the External Common Alarm signals for the Active Level Transmitter SWS-C12A.		10ELA030	WW ACT						
96	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Inhibit Low and Low Low Alarms during the cleaning cycle. Use external alarm from previous network. Tag Ext: either _ACT _LVL		10ELT030	WW ACT						
97	CUSTOM	CUSTOM LOGIC - PUMPS POWER FAIL RESTART LOGIC		After a power fail the pumps are placed into Wait Mode until an Operator initiated Restart is issued from the Configuration Graphic. Once the Restart is issued individual timers will relase the pumps to run. Tag Ext: _RST		10EPJ100	PUMPS						
		PUMP STATION PUMP 1 ALARMS											
98	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 Winding High Temperature, inhibit if pump 1 is out of service.				02075	04138				47272
99	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 RTD High Temperature, inhibit if pump 1 is out of service.	10023	10ETSH110	PUMP 1 MTR	02076	04140				47273
100	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 Bearing Over Temp, inhibit if pump 1 is out of service.	10024	10ETSH102	PUMP 1 MTR	02077	04142				47274
101	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 Stator High Moisture, inhibit if pump 1 is out of service.	10025	10EMSH104	PUMP 1 MTR STR	02078	04144				47275
102	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 Oil Chamber High Moisture, inhibit if pump 1 is out of service.	10026	10EMSH104A	PUMP 1 OIL CHM	02079	04146				47276
103	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 High Vibration, inhibit if pump 1 is out of service.	10027	10EVSH108	PUMP 1	02080	04148				47277
104	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 Multilin Trouble, inhibit if pump 1 is out of service.	10028	10EYS100D	PUMP 1 MULTLIN	02081	04150				47278
105	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 Multilin Tripped, inhibit if pump 1 is out of service.	10029	10EYS100E	PUMP 1 MULTLIN	02082	04152				47279
106	CUSTOM	CUSTOM LOGIC - EXTERNAL WAIT MODE FOR PUMP 1		Place pump 1 into the Wait Mode if the High Winding Temp or High RTD Temp or High Bearing Temp or High Stator Moisture or High Vibration or Multilin Trouble or Check Valve Fail to Open or Close Alarm are active.		10EPH100	PUMP 1						
107	CUSTOM	CUSTOM LOGIC - EXTERNAL COMMON ALARM FOR PUMP 1		Combine High Winding Temp, High RTD Temp, High Bearing Temp, High Stator Moisture, High Oil Chamber Moisture, High Vibration, Multilin Trouble, Multilin Tripped and Check Valve Fail to Open or Close Alarms into a common alarm for pump 1 SWS-C02.		10EPG100	PUMP 1						
		PUMP STATION PUMP 2 ALARMS											
108	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 Winding High Temperature, inhibit if pump 2 is out of service.	10038	10ETSH203	PUMP 2 MTR	02083	04154				47280
109	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 RTD High Temperature, inhibit if pump 2 is out of service.	10039	10ETSH210	PUMP 2 MTR	02084	04156				47281
110	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 Bearing Over Temp, inhibit if pump 2 is out of service.	10040	10ETSH202	PUMP 2 MTR	02085	04158				47282
111	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 Stator High Moisture, inhibit if pump 2 is out of service.	10041	10EMSH204	PUMP 2 MTR STR	02086	04160				47283
112	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 Oil Chamber High Moisture, inhibit if pump 2 is out of service.	10042	10EMSH204A	PUMP 2 OIL CHM	02087	04162				47284
113	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 High Vibration, inhibit if pump 2 is out of service.	10043	10EVSH208	PUMP 2	02088	04164				47285
114	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 Multilin Trouble, inhibit if pump 2 is out of service.	10044	10EYS200D	PUMP 2 MULTLIN	02089	04166				47286
115	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 Multilin Tripped, inhibit if pump 2 is out of service.	10045	10EYS200E	PUMP 2 MULTLIN	02090	04168				47287
116	CUSTOM	CUSTOM LOGIC - EXTERNAL WAIT MODE FOR PUMP 2		Place pump 2 into the Wait Mode if the High Winding Temp or High RTD Temp or High Bearing Temp or High Stator Moisture or High Vibration or Multilin Trouble or Check Valve Fail to Open or Close Alarm are active.		10EPD200	PUMP 2						
117	CUSTOM	CUSTOM LOGIC - EXTERNAL COMMON ALARM FOR PUMP 2		Combine High Winding Temp, High RTD Temp, High Bearing Temp, High Stator Moisture, High Oil Chamber Moisture, High Vibration, Multilin Trouble, Multilin Tripped and Check Valve Fail to Open or Close Alarms into a common alarm for pump 2 SWS-C02.		10EPC200	PUMP 2						

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
		PUMP STATION PUMP 3 ALARMS											
118	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 Winding High Temperature, inhibit if pump 3 is out of service.	10150	10ETSH303	PUMP 3 MTR	02091	04170				47288
119	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 RTD High Temperature, inhibit if pump 3 is out of service.	10151	10ETSH310	PUMP 3 MTR	02092	04172				47289
120	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 Bearing Over Temp, inhibit if pump 3 is out of service.	10152	10ETSH302	PUMP 3 MTR	02093	04174				47290
121	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 Stator High Moisture, inhibit if pump 3 is out of service.	10153	10EMSH304	PUMP 3 MTR STR	02094	04176				47291
122	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 Oil Chamber High Moisture, inhibit if pump 3 is out of service.	10154	10EMSH304A	PUMP 3 OIL CHM	02095	04178				47292
123	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 High Vibration, inhibit if pump 3 is out of service.	10155	10EVSH308	PUMP 3	02096	04180				47293
124	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 Multilin Trouble, inhibit if pump 3 is out of service.	10156	10EYS300D	PUMP 3 MULTLIN	02097	04182				47294
125	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 Multilin Tripped, inhibit if pump 3 is out of service.	10157	10EYS300E	PUMP 3 MULTLIN	02098	04184				47295
126	CUSTOM	CUSTOM LOGIC - EXTERNAL WAIT MODE FOR PUMP 3		Place pump 3 into the Wait Mode if the High Winding Temp or High RTD Temp or High Bearing Temp or High Stator Moisture or High Vibration or Multilin Trouble or Check Valve Fail to Open or Close Alarm are active.		10EPD300	PUMP 3						
127	CUSTOM	CUSTOM LOGIC - EXTERNAL COMMON ALARM FOR PUMP 3		Combine High Winding Temp, High RTD Temp, High Bearing Temp, High Stator Moisture, High Oil Chamber Moisture, High Vibration, Multilin Trouble, Multilin Tripped and Check Valve Fail to Open or Close Alarms into a common alarm for pump 3 SWS-C02.		10EPC300	PUMP 3						
		PUMP STATION PUMP 4 ALARMS											
128	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 Winding High Temperature, inhibit if pump 4 is out of service.	10166	10ETSH403	PUMP 4 MTR	02099	04186				47296
129	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 RTD High Temperature, inhibit if pump 4 is out of service.	10167	10ETSH410	PUMP 4 MTR	02100	04188				47297
130	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 Bearing Over Temp, inhibit if pump 4 is out of service.	10168	10ETSH402	PUMP 4 MTR	02101	04190				47298
131	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 Stator High Moisture, inhibit if pump 4 is out of service.	10169	10EMSH404	PUMP 4 MTR STR	02102	04192				47299
132	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 Oil Chamber High Moisture, inhibit if pump 4 is out of service.	10170	10EMSH404A	PUMP 4 OIL CHM	02103	04194				47300
133	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 High Vibration, inhibit if pump 4 is out of service.	10171	10EVSH408	PUMP 4	02104	04196				47301
134	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 Multilin Trouble, inhibit if pump 4 is out of service.	10172	10EYS400D	PUMP 4 MULTLIN	02105	04198				47302
135	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 Multilin Tripped, inhibit if pump 4 is out of service.	10173	10EYS400E	PUMP 4 MULTLIN	02106	04200				47303
136	CUSTOM	CUSTOM LOGIC - EXTERNAL WAIT MODE FOR PUMP 4		Place pump 4 into the Wait Mode if the High Winding Temp or High RTD Temp or High Bearing Temp or High Stator Moisture or High Vibration or Multilin Trouble or Check Valve Fail to Open or Close Alarm are active.		10EPD400	PUMP 4						
137	CUSTOM	CUSTOM LOGIC - EXTERNAL COMMON ALARM FOR PUMP 4		Combine High Winding Temp, High RTD Temp, High Bearing Temp, High Stator Moisture, High Oil Chamber Moisture, High Vibration, Multilin Trouble, Multilin Tripped and Check Valve Fail to Open or Close Alarms into a common alarm for pump 4 SWS-C02.		10EPC400	PUMP 4						
		PUMP STATION PUMPS 1 THRU 4 CLEANING CYCLE LOGIC											

BLOCK NUMBER	TEMPLATE NAME	TEMPLATE PAGE TITLE DESCRIPTION	MOD	COMMENT	REGISTER NUMBER	LOOP TAG NUMBER (DESC1)	EQUIPMENT NAME (DESC2)	REGISTER STARTING ADDRESS					
								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
138	CUSTOM	CUSTOM LOGIC - PUMP 1 MANUAL MODE LOGIC DURING CLEANING CYCLE		During cycles pump 1 is directly controlled from the field, the A/M station is not in control during cleaning cycles. Once the Cleaning Cycle begins the SWS-C15A and SWS-C02 templates will display Auto/Auto mode on the CRISP HMI display but the templates will internally be controlled by the LCP-A pushbuttons. The CRISP Pump 1 Auto/Manual buttons and the On/Off/Auto button are transferred through this block of logic to the pump 1 SWS-C15A and SWS-C02 templates. During cleaning cycles pump 1 is internally locked into Manual Mode (for On/Off/Auto). At the start of the cleaning cycle when the Operator presses the Prepare to Clean Pushbutton on LCP-A, Pump 1 is initially locked into the On mode. Once the Operator presses the Start Cleaning cycle Pushbutton the Pump 1 Start/Stop pushbuttons on LCP-A can manually control the operation of Pump 1. When the cleaning cycle is not active the HMI speed setpoint is passed to the Pump 1 A/M Station, when the cleaning cycle is in Prepare To Clean mode lock Pump 1 to 60% speed. When the cleaning cycle switches to the Start Cleaning Cycle mode, the 60% speed setpoint stops transferring to the A/M station so that the LCP-A push buttons can manipulate the speed of the pump. If at anytime the pump is turned off the a 0 value is loaded into the speed setpoint.		10EPF100	PUMP 1						
139	CUSTOM	CUSTOM LOGIC - PUMP 2 MANUAL MODE LOGIC DURING CLEANING CYCLE		Cleaning cycle manual control for Pump 2, see Pump 1 above for detailed description with the exception that Pump 2 is initially off when the cleaning cycle begins, it can be manually started once the Operator initiates the Start Cleaning Cycle operation.		10EPB200	PUMP 2						
140	CUSTOM	CUSTOM LOGIC - PUMP 3 MANUAL MODE LOGIC DURING CLEANING CYCLE		Cleaning cycle manual control for Pump 3, see Pump 1 above for detailed description with the exception that Pump 3 is initially off when the cleaning cycle begins, it can be manually started once the Operator initiates the Start Cleaning Cycle operation.		10EPB300	PUMP 3						
141	CUSTOM	CUSTOM LOGIC - PUMP 4 MANUAL MODE LOGIC DURING CLEANING CYCLE		Cleaning cycle manual control for Pump 4, see Pump 1 above for detailed description with the exception that Pump 4 is initially off when the cleaning cycle begins, it can be manually started once the Operator initiates the Start Cleaning Cycle operation.		10EPB400	PUMP 4						
		PUMP STATION LEVEL CONTROL LOGIC											
142	SWS-C15C	MANUAL LOADING STATION TEMPLATE LOGIC(SWS-C15C V1.10)				10EPE100	PUMPS			07053	42091	44145	47304
143	SWS-C09	PID CONTROL, CLOSED LOOP TEMPLATE LOGIC(SWS-C09 V2.00)				10EPD100	PUMPS				42092	44147	47305
144	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(SWS-C15A V1.01)				10EPC100	PUMPS	02107	04202	07055	42096	44152	47348
145	SWS-C11	LEAD/LAG1/LAG2/LAG3/LAG4, VAR SPD TEMPLATE LOGIC(SWS-C11 V1.12)		Allow pump sequence to start only if the Knott Valve is not closed.		10EPB100	PUMPS	02109	04204	07057	42097	44154	47349
146	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(MOD SWS-C15A V1.01)	Y	Pump 1		10EPA100	PUMP 1	02114	04209	07134	42107	44169	47410
147	SWS-C02	PUMP CONTROL, VARIABLE SPEED TEMPLATE LOGIC (SWS-C02 V1.20)		Pump 1	1	10EPMP100	PUMP 1	02116	04211	07136	42108	44171	47411
148	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Pump 1	10018	10EYS100	PUMP 1	02124		07143		44175	47432
149	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(MOD SWS-C15A V1.01)	Y	Pump 2		10EPA200	PUMP 2	02125	04225	07144	42109	44179	47433
150	SWS-C02	PUMP CONTROL, VARIABLE SPEED TEMPLATE LOGIC (SWS-C02 V1.20)		Pump 2	9	10EPMP200	PUMP 2	02127	04227	07146	42110	44181	47434
151	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Pump 2	10034	10EYS200	PUMP 2	02135		07153		44185	47455
152	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(SWS-C15A V1.01)	Y	Pump 3		10EPA300	PUMP 3	02136	04241	07154	42111	44189	47456
153	SWS-C02	PUMP CONTROL, VARIABLE SPEED TEMPLATE LOGIC (SWS-C02 V1.20)		Pump 3	33	10EPMP300	PUMP 3	02138	04243	07156	42112	44191	47457
154	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Pump 3	10146	10EYS300	PUMP 3						
155	SWS-C15A	AUTO/MANUAL STATION TEMPLATE LOGIC(SWS-C15A V1.01)	Y	Pump 4		10EPA400	PUMP 4	02146	04257	07163	42113	44195	47478
156	SWS-C02	PUMP CONTROL, VARIABLE SPEED TEMPLATE LOGIC (SWS-C02 V1.20)		Pump 4	41	10EPMP400	PUMP 4	02148	04259	07165	42114	44197	47479

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
157	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Pump 4	10162	10EYS400	PUMP 4						
158	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Convert the pump 1 speed signal to RPMs for display on the detail graphic. Tag Ext: _RPM	30001	10EST100	PUMP 1					44201	47500
159	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Convert the pump 2 speed signal to RPMs for display on the detail graphic. Tag Ext: _RPM	30010	10EST200	PUMP 2					44202	47507
160	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Convert the pump 3 speed signal to RPMs for display on the detail graphic. Tag Ext: _RPM	30019	10EST300	PUMP 3					44203	47514
161	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Convert the pump 4 speed signal to RPMs for display on the detail graphic. Tag Ext: _RPM	30028	10EST400	PUMP 4					44204	47521
		PUMP CHECK VALVE STATUS INDICATION LOGIC											
162	CUSTOM	CUSTOM LOGIC - PUMP 1 CHECK VALVE STATUS DISPLAY		Converts the pump 1 check valve closed limit switch to a display word.	10030	10EZSC105	PUMP 1 CHK VLV						
163	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Pump 1 check valve fail to open or close alarm. Inhibited when pump is Out of Service.	10030	10EZSC105	PUMP 1 CHK VLV	02156	04273				47528
164	CUSTOM	CUSTOM LOGIC - PUMP 2 CHECK VALVE STATUS DISPLAY		Converts the pump 2 check valve closed limit switch to a display word.	10046	10EZSC205	PUMP 2 CHK VLV						
165	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Pump 2 check valve fail to open or close alarm. Inhibited when pump is Out of Service.	10046	10EZSC205	PUMP 2 CHK VLV	02158	04275				47529
166	CUSTOM	CUSTOM LOGIC - PUMP 3 CHECK VALVE STATUS DISPLAY		Converts the pump 3 check valve closed limit switch to a display word.	10158	10EZSC305	PUMP 3 CHK VLV						
167	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Pump 3 check valve fail to open or close alarm, enabled when pump starts. Inhibited when pump is Out of Service.	10158	10EZSC305	PUMP 3 CHK VLV	02160	04277				47530
168	CUSTOM	CUSTOM LOGIC - PUMP 4 CHECK VALVE STATUS DISPLAY		Converts the pump 4 check valve closed limit switch to a display word.	10174	10EZSC405	PUMP 4 CHK VLV						
169	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Pump 4 check valve fail to open or close alarm, enabled when pump starts. Inhibited when pump is Out of Service.	10174	10EZSC405	PUMP 4 CHK VLV	02162	04279				47531
170	CUSTOM	CUSTOM LOGIC - PUMP RUNNING		Sum all 4 pump runs to create an internal coil to indicate that at least 1 pump is running.		10EPMP100	PUMPS						
		CUSTOM DRAIN PUMPS LOGIC											
171	CUSTOM	CUSTOM LOGIC - DRAIN PUMPS LEAD/STANDBY SELECT LOGIC		Lead/Standby select logic allows Drain Pump 1 or 2 to be selected for lead duty.		10EPD880	DRN PUMPS						
172	CUSTOM	CUSTOM LOGIC - DRAIN PUMPS START/STOP AUTORUN LOGIC		When the Wetwell level is above the lead start setpoint, start the leard Drain Pump. When the wetwell level is below the lead stop level, stop the lead Drain Pump.		10EPC880	DRN PUMPS						
173	CUSTOM	CUSTOM LOGIC - DRAIN PUMPS AUTORUN LOGIC		Start the Lead Drain pump (or Standby if Lead is unavailable) if none of the main pumps are running and the Knott Gate is closed and the level in the wetwell exceeds the lead pump start level.		10EPC880	DRN PUMPS						
174	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drain pump 1 Winding High Temperature, inhibit if Drain pump 1 is out of service.	10053	10ETSH883	DRN P1 MTR	02164	04281				47532
175	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drain pump 1 High Moisture, inhibit if Drain pump 1 is out of service.	10054	10EMSH884	DRN P1 MTR	02165	04283				47533
176	CUSTOM	CUSTOM LOGIC - EXTERNAL WAIT MODE FOR DRAIN PUMP 1		Place Drain pump 1 into the Wait Mode if the High Winding Temp or High Moisture or Check Valve Fail to Open or Close Alarm are active.		10EPB880	DRN P1						
177	CUSTOM	CUSTOM LOGIC - EXTERNAL COMMON ALARM FOR DRAIN PUMP 1		Combine High Winding Temp, High Moisture and Check Valve Fail to Open or Close Alarms into a common alarm for Drain Pump 1 SWS-C01.		10EPA880	DRN P1						
178	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Drain Pump 1.	13	10EPMP880	DRN P1	02166	04285	07172		44205	47534
179	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Drain Pump 1.	10050	10EYS880	DRN P1	02174		07173		44207	47535
180	CUSTOM	CUSTOM LOGIC - PUMP 1 CHECK VALVE STATUS DISPLAY		Converts the drain pump 1 check valve closed limit switch to a display word.	10055	10EZSC885	DRN P1 CHK VLV						
181	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Drain pump 1 check valve fail to open or close alarm. Inhibited when pump is Out of Service.	10055	10EZSC885	DRN P1 CHK VLV	02175	04299				47536

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
182	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drain pump 2 Winding High Temperature, inhibit if Drain pump 2 is out of service.	10181	10ETSH893	DRN P2 MTR	02177	04301				47537
183	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drain pump 2 High Moisture, inhibit if Drain pump 2 is out of service.	10182	10EMSH894	DRN P2 MTR	02178	04303				47538
184	CUSTOM	CUSTOM LOGIC - EXTERNAL WAIT MODE FOR DRAIN PUMP 2		Place Drain pump 2 into the Wait Mode if the High Winding Temp or High Moisture or Check Valve Fail to Open or Close Alarm are active.		10EPB890	DRN P2						
185	CUSTOM	CUSTOM LOGIC - EXTERNAL COMMON ALARM FOR DRAIN PUMP 2		Combine High Winding Temp, High Moisture and Check Valve Fail to Open or Close Alarms into a common alarm for Drain pump 2 SWS-C01.		10EPA890	DRN P2						
186	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Drain Pump 2.	45	10EPMP890	DRN P2	02179	04305	07174		44211	47539
187	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Drain Pump 2.	10178	10EYS890	DRN P2	02187		07175		44213	47540
188	CUSTOM	CUSTOM LOGIC - PUMP 1 CHECK VALVE STATUS DISPLAY		Converts the drain pump 2 check valve closed limit switch to a display word.	10183	10EZSC895	DRN P2 CHK VLV						
189	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Drain pump 2 check valve fail to open or close alarm. Inhibited when pump is Out of Service.	10183	10EZSC895	DRN P2 CHK VLV	02188	04319				47541
		DISCHARGE PRESSURE AND FLOW LOGIC											
190	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Discharge pressure meter High and High High operate continuously, Low and Low Low only operate when a main sewage pump is running.	30029	10EPIT070	DISCHARGE						
191	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Discharge flow meter trouble alarm	10199	10EYS075B	DISCHARGE FLOW						
192	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Discharge flow meter.	30020	10EFIT075	DISCHARGE					44217	47542
193	SWS-C19	TOTALIZER TEMPLATE LOGIC(SWS-C19 V1.11)		Discharge flow meter totalizer.	30020	10EFIT075	DISCHARGE			07176		44218	47549
		DRYWELL SUMP PUMPS LOGIC											
194	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drywell High Level Alarm	10114	10ELSH024	DRYWELL FLOAT	02190	04321				47575
195	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drywell Sumps 1 & 2 High Level Alarm	10099	10ELSH029	SUMP 1&2 FLOAT	02191	04323				47576
196	CUSTOM	CUSTOM LOGIC - SUMP PUMP 1 RUN TO HMI		Send On signal from Sump Pump 1 to HMI for display.	10097	10EYS020	SUMP PUMP 1						
197	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Sump Pump 1 runtime.	10097	10EYS020	SUMP PUMP 1	02192		07177		44228	47577
198	CUSTOM	CUSTOM LOGIC - SUMP PUMP 2 RUN TO HMI		Send On signal from Sump Pump 2 to HMI for display.	10209	10EYS025	SUMP PUMP 2						
199	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Sump Pump 2 runtime.	10209	10EYS025	SUMP PUMP 2						
200	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Sump Pumps 1 & 2 combined Trouble Alarms.	10098	10EYS023B	SUMP PUMPS 1&2	02193	04325				47578
201	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drywell Sumps 3 & 4 High Level Alarm	10227	10ELSH229	SUMP 3&4 FLOAT	02194	04327				47579
202	CUSTOM	CUSTOM LOGIC - SUMP PUMP 3 RUN TO HMI		Send On signal from Sump Pump 3 to HMI for display.	10113	10EYS220	SUMP PUMP 3						
203	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Sump Pump 3 runtime.	10113	10EYS220	SUMP PUMP 3	02195		07178		44232	47580
204	CUSTOM	CUSTOM LOGIC - SUMP PUMP 4 RUN TO HMI		Send On signal from Sump Pump 4 to HMI for display.	10225	10EYS225	SUMP PUMP 4						
205	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Sump Pump 4 runtime.	10225	10EYS225	SUMP PUMP 4	02196		07179		44236	47581
206	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Sump Pumps 3 & 4 combined Trouble Alarms.	10226	10EYS219B	SUMP PUMPS 3&4	02197	04329				47582
207	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Drywell Smoke Alarm.	10085	10EASH063	DRYWELL	02198	04331				47583
		SUPPLY AND EXHAIST FANS LOGIC											
208	CUSTOM	CUSTOM LOGIC - SUPPLY AND EXHAUST FANS PAUSE		Use the pause pushbuttons to create a pause signal for the supply and exhaust fans External Wait mode circuit, include an off delay timer to hold keep fans off for an additional 10 seconds after the button is released.	10197	10EHS059	DRYWELL FANS						
209	CUSTOM	CUSTOM LOGIC - SUPPLY FANS LEAD/STANDBY SELECT LOGIC		Lead/Standby select logic allows Supply Fan 1 or 2 to be selected for lead duty.		10EFC053	DRYWELL FANS						
210	CUSTOM	CUSTOM LOGIC - SUPPLY FANS LEAD/STANDBY AUTORUN LOGIC		Based on HMI selection generate an auto run signal for the lead supply fan. If the lead supply fan is in Wait Mode start the standby supply fan.		10EFB054	DRYWELL FANS						
211	CUSTOM	CUSTOM LOGIC - SUPPLY FAN 1 INLET DAMPER STATUS DISPLAY		Converts the supply fan 1 inlet damper opened and closed limit switches to a display word.	10093	10EZSC099	SF1 DMPR INLT						

BLOCK NUMBER	TEMPLATE NAME	TEMPLATE PAGE TITLE DESCRIPTION	MOD	COMMENT	REGISTER NUMBER	LOOP TAG NUMBER (DESC1)	EQUIPMENT NAME (DESC2)	REGISTER STARTING ADDRESS					
								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
212	CUSTOM	CUSTOM LOGIC - SUPPLY FAN 1 EXTERNAL WAIT MODE		Activate the Supply Fan 1 External Wait Mode if the Supply Fan's Low Flow Alarm is active or if the Smoke Detector Alarm is active or if neither Exhaust Fan's On signal indicates runninng or if both Exhaust Fans' Low Flow Alarms are active.		10EFA053	DRYWELL SF1						
213	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Drywell Supply Fan SF1 (remove buttons from graphic always in auto)	4	10EFAN053	DRYWELL SF1	02199	04333	07180		44240	47584
214	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Drywell Supply Fan SF1 Runtime	10089	10EYS053	DRYWELL SF1	02207		07181		44242	47585
215	CUSTOM	CUSTOM LOGIC - SUPPLY FAN 1 OUTLET DAMPER STATUS DISPLAY		Converts the supply fan 1 outlet damper opened and closed limit switches to a display word.	10073	10EZSC118	SF1 DMPR OUTLT						
216	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Drywell Supply Fan SF1 Low Flow Alarm, inhibit if fan in not On.	10092	10EFSL054	DRYWELL SF1	02208	04347				47586
217	CUSTOM	CUSTOM LOGIC - SUPPLY FAN 2 INLET DAMPER STATUS DISPLAY		Converts the supply fan 2 inlet damper opened and closed limit switches to a display word.	10205	10EZSC098	SF2 DMPR INLT						
218	CUSTOM	CUSTOM LOGIC - SUPPLY FAN 2 EXTERNAL WAIT MODE		Activate the Supply Fan 2 External Wait Mode if the Supply Fan's Low Flow Alarm is active or if the Smoke Detector Alarm is active or if neither Exhaust Fan's On signal indicates runninng or if both Exhaust Fans' Low Flow Alarms are active.		10EFA057	DRYWELL SF2						
219	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Drywell Supply Fan SF2 (remove buttons from graphic always in auto)	35	10EFAN057	DRYWELL SF2	02210	04349	07182		44246	47587
220	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Drywell Supply Fan SF2 Runtime	10201	10EYS057	DRYWELL SF2	02218		07183		44248	47588
221	CUSTOM	CUSTOM LOGIC - SUPPLY FAN 2 OUTLET DAMPER STATUS DISPLAY		Converts the supply fan 2 outlet damper opened and closed limit switches to a display word.	10207	10EZSC117	SF2 DMPR OUTLT						
222	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Drywell Supply Fan SF2 Low Flow Alarm, inhibit if fan in not On.	10204	10EFSL058	DRYWELL SF2	02219	04363				47589
223	CUSTOM	CUSTOM LOGIC - EXHAUST FANS LEAD/STANDBY AUTORUN LOGIC		Based on HMI selection generate an auto run signal for the lead exhaust fan. If the lead exchaust fan is in Wait Mode start the standby exhaust fan.									
224	CUSTOM	CUSTOM LOGIC - EXHAUST FAN 1 INLET DAMPER STATUS DISPLAY		Converts the exhaust fan 1 inlet damper opened and closed limit switches to a display word.	10125	10EZSC122	EF1 DMPR INLT						
225	CUSTOM	CUSTOM LOGIC - EXHAUST FAN 1 EXTERNAL WAIT MODE		Activate the Exhaust Fan 1 External Wait Mode if the Exhaust Fan's Low Flow Alarm is active or if the Smoke Detector Alarm is active.									
226	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Drywell Exhaust Fan EF1 (remove buttons from graphic always in auto)	12	10EFAN051	DRYWELL EF1	02221	04365	07184		44252	47590
227	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Drywell Exhaust Fan EF1 Runtime	10105	10EYS051	DRYWELL EF1	02229		07185		44254	47591
228	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Drywell Exhaust Fan EF1 Low Flow Alarm, inhibit if fan in not On.	10108	10EFSL052	DRYWELL EF1	02230	04379				47592
229	CUSTOM	CUSTOM LOGIC - EXHAUST FAN 2 INLET DAMPER STATUS DISPLAY		Converts the exhaust fan 2 inlet damper opened and closed limit switches to a display word.	10228	10EZSC123	EF2 DMPR INLT						
230	CUSTOM	CUSTOM LOGIC - EXHAUST FAN 2 EXTERNAL WAIT MODE		Activate the Exhaust Fan 2 External Wait Mode if the Exhaust Fan's Low Flow Alarm is active or if the Smoke Detector Alarm is active.									
231	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Drywell Exhaust Fan EF2 (remove buttons from graphic always in auto)	44	10EFAN055	DRYWELL EF2	02232	04381	07186		44258	47593
232	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Drywell Exhaust Fan EF2 Runtime	10217	10EYS055	DRYWELL EF2	02240		07187		44260	47594
233	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Drywell Exhaust Fan EF2 Low Flow Alarm, inhibit if fan is not On.	10220	10EFSL056	DRYWELL EF2	02241	04395				47595
		FOUL AIR BOOSTER FANS LOGIC											
236	SWS-C01	PUMP CONTROL, CONSTANT SPEED TEMPLATE LOGIC(SWS-C01 V1.30)		Foul Air Booster Fan, add Low Flow Alarm to External Wait mode and External Common Alarm inputs.	5	10EFAN170	BOOSTER FAN	02243	04397	07188		44264	47596
237	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Foul Air Booster Fan	10121	10EYS170	BOOSTER FAN	02251		07189		44266	47597
238	SWS-C12G	DISCRETE ALARM W/RESET TEMPLATE LOGIC(MOD SWS-C12G V1.00)	Y	Foul Air Booster Fan Low Flow Alarm, inhibit when fan is off.	10124	10EFSL171	BOOSTER FAN	02252	04411				47598
239	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Gas Monitor High High Level alarm.	10005	10EASHH050	WW GAS MONITOR	02254	04413				47599
240	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Gas Monitor High Level alarm.	10006	10EASH050	WW GAS MONITOR	02255	04415				47600
241	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Gas Monitor Trouble alarm.	10007	10EYS050B	WW GAS MONITOR	02256	04417				47601
242	CUSTOM	CUSTOM LOGIC - GAS MONITOR COMMON TROUBLE ALARM		Gas Monitor common alarm, combine the High High and the High for the SWS-C12A.									
243	SWS-C12A	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12A V1.30)		Gas Monitor, uses Hi and Hi Hi only. Inhibit alarms on failure.	30003	10EAIT050	WW GAS MONITOR	02257	04419	07190	42115	44270	47602

BLOCK NUMBER	TEMPLATE NAME	TEMPLATE PAGE TITLE DESCRIPTION	MOD	COMMENT	REGISTER NUMBER	LOOP TAG NUMBER (DESC1)	EQUIPMENT NAME (DESC2)	REGISTER STARTING ADDRESS					
								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
244	CUSTOM	CUSTOM LOGIC - SAFE TO ENTER PUMP STATION WARNING LIGHTS		Combine the Gas Monitor Trouble Alarm, Hi Level Alarm, Hi Hi Level Alarm, Supply Fan 1 On or Supply Fan 2 On, Exhaust Fan 1 On or Exhaust Fan 2 On, Supply Fan 1 Low Flow Alarm or Supply Fan 2 Low Flow Alarm, Exhaust Fan 1 Low Flow Alarm or Exhaust Fan 2 Low Flow Alarm and Smoke Detector signals so that if any of these conditions change from their normal state the Safe to Enter output coil is turned off, resulting in the green light on the outside of the station turning off and the red light turning on.	11	10EYL042	PUMP STATION						
		ROOM AC LOGIC											
245	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		A/C System Temperature High	10067	10ETSH064	ACU SYSTEM	02261	04429				47617
246	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Control Room A/C Unit 1 Overload Alarm.	10069	10EYS065B	ACU-1 SYSTEM	02262	04431				47618
247	CUSTOM	CUSTOM LOGIC - AC UNIT 1 ON STATUS DISPLAY		A/C Unit 1 On Status Display to HMI.	10068	10EYS065	ACU-1 SYSTEM						
248	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Control Room A/C Unit 1 Runtime.	10068	10EYS065	ACU-1 SYSTEM	02263		07195		44275	47619
249	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Control Room A/C Unit 2 Overload Alarm.	10096	10EYS066B	ACU-2 SYSTEM	02264	04433				47620
250	CUSTOM	CUSTOM LOGIC - AC UNIT 2 ON STATUS DISPLAY		A/C Unit 2 On Status Display to HMI.	10095	10EYS066	ACU-2 SYSTEM						
251	SWS-C13	MOTOR RUNTIME TEMPLATE LOGIC(SWS-C13 V1.02)		Control Room A/C Unit 2 Runtime.	10095	10EYS066	ACU-2 SYSTEM	02265		07196		44279	47621
		BREAKER, TRANSFORMER, SWITCHGEAR AND UPS LOGIC											
252	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Breaker F37 Funct Fault/Trouble	10110	10EYS115	BREAKER F37	02266	04435				47622
253	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Breaker F37 Lockout Trip	10111	10EYS115A	BREAKER F37	02267	04437				47623
254	CUSTOM	CUSTOM LOGIC - BREAKER F37 CLOSED STATUS DISPLAY		Breaker F37 Closed Status to HMI	10109	10EZSC115	BREAKER F37						
255	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Transformer F37 Blown Fuse	10101	10EYS119	XFMR F37 DC SW	02268	04439				47624
256	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Transformer F37 Common Trouble	10100	10EYS115B	XFMR F37	02269	04441				47625
257	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Breaker F38 Funct Fault/Trouble	10222	10EYS120	BREAKER F38	02270	04443				47626
258	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Breaker F38 Lockout Trip	10223	10EYS120A	BREAKER F38	02271	04445				47627
259	CUSTOM	CUSTOM LOGIC - BREAKER F38 CLOSED STATUS DISPLAY		Breaker F38 Closed Status to HMI	10221	10EZSC120	BREAKER F38						
260	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Transformer F38 Blown Fuse	10211	10EYS124	XFMR F38 DC SW	02272	04447				47628
261	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Transformer F38 Common Trouble	10210	10EYS120B	XFMR F38	02273	04449				47629
262	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear 125VDC Charger Trouble	10212	10EYS115C	SWG 125VDC CHG	02274	04451				47630
263	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear HRGU1 Trouble	10082	10EYS125	SWG HRGU1	02275	04453				47631
264	CUSTOM	CUSTOM LOGIC - SWITCHGEAR MAIN BREAKER A STATUS DISPLAY		Switchgear Circuit Breaker A Closed Status to HMI.	10083	10EZSC125	SWG CKT BKR A						
265	CUSTOM	CUSTOM LOGIC - SWITCHGEAR TIE-BREAKER A STATUS DISPLAY		Switchgear Tie-Breaker A Closed Status to HMI.	10084	10EZSC125A	SWG TIE BKR A						
266	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear HRGU2 Trouble	10194	10EYS125A	SWG HRGU2	02276	04455				47632
267	CUSTOM	CUSTOM LOGIC - SWITCHGEAR MAIN BREAKER B STATUS DISPLAY		Switchgear Circuit Breaker B Closed Status to HMI.	10195	10EZSC125C	SWG CKT BKR B						
268	CUSTOM	CUSTOM LOGIC - SWITCHGEAR TIE-BREAKER B STATUS DISPLAY		Switchgear Tie-Breaker B Closed Status to HMI.	10196	10EZSC125B	SWG TIE BKR B						
269	CUSTOM	CUSTOM LOGIC - SWITCHGEAR TRANSFER MODE STATUS DISPLAY		Switchgear Transfer Mode Auto Status to HMI.	10115	10EYS125B	SWG TRANS MOD						
270	CUSTOM	CUSTOM LOGIC - SWITCHGEAR POWER SOURCE BUS A STATUS DISPLAY		Switchgear Power Source Bus A Status to HMI.	10116	10EYS125C	SWG PWR SOURCE						
271	CUSTOM	CUSTOM LOGIC - SWITCHGEAR POWER SOURCE NORMAL STATUS DISPLAY		Switchgear Power Source Normal Status to HMI.	10117	10EYS125D	SWG PWR SOURCE						
272	CUSTOM	CUSTOM LOGIC - SWITCHGEAR POWER SOURCE BUS B STATUS DISPLAY		Switchgear Power Source Bus B Status to HMI.	10118	10EYS125E	SWG PWR SOURCE						
273	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear Power Monitor Bus A Power Failure Status to HMI	10081	10EYS125B	PWR MON BUS A	02277	04457				47633
274	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear Power Monitor Bus B Power Failure Status to HMI	10193	10EYS126B	PWR MON BUS B	02278	04459				47634
275	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear Power Monitor MCC A Power Failure Status to HMI	10057	10EYS129B	PWR MON MCC A	02279	04461				47635
276	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear Power Monitor MCC B Power Failure Status to HMI	10184	10EYS130B	PWR MON MCC B	02280	04463				47636
277	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Switchgear Power Monitor Future Power Failure Status to HMI	10058	10EYS165B	PWR MON FUTURE	02281	04465				47637
278	CUSTOM	CUSTOM LOGIC - SWITCHGEAR MCC-A FEEDER BREAKER STATUS DISPLAY		Switchgear MCC-A Feeder Breaker Status to HMI	10102	10EZSC129	SWG FDR MCC A						
279	CUSTOM	CUSTOM LOGIC - SWITCHGEAR MCC-B FEEDER BREAKER STATUS DISPLAY		Switchgear MCC-B Feeder Breaker Status to HMI	10214	10EZSC130	SWG FDR MCC B						
280	CUSTOM	CUSTOM LOGIC - SWITCHGEAR FUTURE FEEDER BREAKER STATUS DISPLAY		Switchgear Future Feeder Breaker Status to HMI	10103	10EZSC165	SWG FDR SPARE						
281	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		UPS AC Line Fail Alarm	10071	10EJSL060J	UPS AC LINE	02282	04467				47638
282	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		UPS Bypass Alarm	10070	10EYS060J	UPS BYPASS	02283	04469				47639
283	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		UPS Trouble Alarm	10056	10EYS060B	UPS INV	02284	04471				47640
		PANEL ALARM LOGIC											

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
284	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		UPS Low Battery Alarm	10072	10EESL060	UPS BATTERY	02285	04473				47641
285	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		LCP panel Instrument Power Supply Fail Alarm	10066	10EJSL068J	INST PWR PLC	02286	04475				47642
286	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		RIO A panel Instrument Power Supply Fail Alarm	10086	10EJSL068K	INST PWR RIO A	02287	04477				47643
287	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		RIO B panel Instrument Power Supply Fail Alarm	10198	10EJSL068L	INST PWR RIO B	02288	04479				47644
		PUMPS 1 THRU 4 CLEANING CYCYLE LOGIC											
288	CUSTOM	CUSTOM LOGIC - INTERNAL CLEANING CYCLE DISABLE		First create three coils to ensure each of the three pumps is in the correct mode for the cleaning cycle. Pump 1 must be in the Auto(Auto/Manual)/Auto(On/Off/Auto) mode with no Wait Mode conditions. Pumps 2 and 3 must be in the Off Mode or the Auto(On/Off/Auto) Mode or the Out Of Service Mode. The Wetwell must not have a High Float Level Alarm or Hi Hi or Hi Active Level Alarm. The Ultrasonic Transmitter cannot have a Trouble Alarm or be Out of Service or have any of the Pump 1 to 3 Start Alarms active. The Recycle Valve cannot be Out Of Service. The station flow through the discharge flowmeter must be less than the hard coded cutoff. If any condition becomes active after the cleaning cycle begins (except the high flow cutoff) the internal disable is energized and the cleaning cycle aborted.	18	10EYL560P	CLEANING LCP						
289	CUSTOM	CUSTOM LOGIC - CLEANING CYCLE STATUS DISPLAYS ON LCP PANEL		Display the Activated light if the Cleaning Cycle Activate logic is on. Display the Cleaning Cycle Disabled status on the LCP Panel if the internal cleaning cycle disabled logic from the previous network is on.	17	10EYL560J	CLEANING LCP						
290	CUSTOM	CUSTOM LOGIC - CLEANING CYCLE STATUS DISPLAYS ON LCP-A PANEL		Display the Activated and Ready statuses based on the associated logic at the beginning of this program on the LCP-A Panel.	19	10EYL560N	CLEANING LCPA						
291	CUSTOM	CUSTOM LOGIC - CLEANING CYCLE STATUS DISPLAYS ON LCP-A PANEL		Display the Prepared to Clean, Started Clean Cycle and Ended Cycle based on the associated logic at the beginning of this program on the LCP-A Panel.	20	10EYL560K	CLEANING LCPA						
292	CUSTOM	CUSTOM LOGIC - PUMP 1 ON STATUS DISPLAYED ON LCP-A PANEL		Display the Pump 1 On status at the LCP-A cleaning panel.	24	10EYL100L	PUMP 1 LCPA						
293	CUSTOM	CUSTOM LOGIC - PUMP 2 ON STATUS DISPLAYED ON LCP-A PANEL		Display the Pump 2 On status at the LCP-A cleaning panel.	25	10EYL200L	PUMP 2 LCPA						
294	CUSTOM	CUSTOM LOGIC - PUMP 3 ON STATUS DISPLAYED ON LCP-A PANEL		Display the Pump 3 On status at the LCP-A cleaning panel.	26	10EYL300L	PUMP 3 LCPA						
295	CUSTOM	CUSTOM LOGIC - PUMP 4 ON STATUS DISPLAYED ON LCP-A PANEL		Display the Pump 4 On status at the LCP-A cleaning panel.	27	10EYL400L	PUMP 4 LCPA						
296	CUSTOM	CUSTOM LOGIC - ANALOG ACTIVE LEVEL DISPLAY TO DRYWELL		Output the Active Level value to a display in the Drywell.	40002	10ELI034A	WW ACT DRYWELL						
297	CUSTOM	CUSTOM LOGIC - ANALOG ACTIVE LEVEL DISPLAY TO ELECTRICAL ROOM		Output the Active Level value to a display in the Electrical Room.	40006	10ELI034B	WW ACT ELEC RM						
298	CUSTOM	CUSTOM LOGIC - ANALOG ACTIVE LEVEL DISPLAY TO LCP-A		Output the Active Level value to a display on the front of the LCP-A panel.	40003	10ELI034D	WW ACT LCPA						
299	CUSTOM	CUSTOM LOGIC - ANALOG DISCHARGE FLOW DISPLAY TO LCP-A		Output the Discharge Flow value to a display on the front of the LCP-A panel.	40004	10EFI075A	DISCHARGE LCPA						
300	CUSTOM	CUSTOM LOGIC - CONVERT ENGINEERING UNITS PUMP SPEED TO RAW		Convert the Pumps Speed Setpoint from engineering units to a raw value that can be sent to the LCP-A display.									
301	CUSTOM	CUSTOM LOGIC - PUMPS SPEED DISPLAY TO LCP-A		Output the Pumps Speed value to a display on the front of the LCP-A panel.	40007	10ESI560	PUMPS LCPA						
		POWER MONITOR READING FOR INFORMATION DISPLAY AND ALARMING											
302	CUSTOM	CUSTOM LOGIC - SEND BUS-A VOLTAGE READING FROM POWER MONITOR TO HMI		Transfer the Voltage reading from the power monitor to the HMI									
303	CUSTOM	CUSTOM LOGIC - SEND BUS-A CURRENT READING FROM POWER MONITOR TO HMI		Transfer the Current reading from the power monitor to the HMI									
304	CUSTOM	CUSTOM LOGIC - SEND BUS-A WATTS READING FROM POWER MONITOR TO HMI		Transfer the Watts reading from the power monitor to the HMI									
305	CUSTOM	CUSTOM LOGIC - SEND BUS-A WATT-HR READING FROM POWER MONITOR TO HMI		Transfer the accumulated Watt-HR reading from the power monitor to the HMI									
306	CUSTOM	CUSTOM LOGIC - SEND BUS-A VA-HR READING FROM POWER MONITOR TO HMI		Transfer the VA-HR reading from the power monitor to the HMI									
307	CUSTOM	CUSTOM LOGIC - SEND BUS-B VOLTAGE READING FROM POWER MONITOR TO HMI		Transfer the Voltage reading from the power monitor to the HMI									
308	CUSTOM	CUSTOM LOGIC - SEND BUS-B CURRENT READING FROM POWER MONITOR TO HMI		Transfer the Current reading from the power monitor to the HMI									
309	CUSTOM	CUSTOM LOGIC - SEND BUS-B WATTS READING FROM POWER MONITOR TO HMI		Transfer the Watts reading from the power monitor to the HMI									
310	CUSTOM	CUSTOM LOGIC - SEND BUS-B WATT-HR READING FROM POWER MONITOR TO HMI		Transfer the accumulated Watt-HR reading from the power monitor to the HMI									

BLOCK NUMBER	TEMPLATE NAME	TEMPLATE PAGE TITLE DESCRIPTION	MOD	COMMENT	REGISTER NUMBER	LOOP TAG NUMBER (DESC1)	EQUIPMENT NAME (DESC2)	REGISTER STARTING ADDRESS					
								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
311	CUSTOM	CUSTOM LOGIC - SEND BUS-B VA-HR READING FROM POWER MONITOR TO HMI		Transfer the VA-HR reading from the power monitor to the HMI									
312	CUSTOM	CUSTOM LOGIC - SEND MCC-A VOLTAGE READING FROM POWER MONITOR TO HMI		Transfer the Voltage reading from the power monitor to the HMI									
313	CUSTOM	CUSTOM LOGIC - SEND MCC-A CURRENT READING FROM POWER MONITOR TO HMI		Transfer the Current reading from the power monitor to the HMI									
314	CUSTOM	CUSTOM LOGIC - SEND MCC-A WATTS READING FROM POWER MONITOR TO HMI		Transfer the Watts reading from the power monitor to the HMI									
315	CUSTOM	CUSTOM LOGIC - SEND MCC-A WATT-HR READING FROM POWER MONITOR TO HMI		Transfer the accumulated Watt-HR reading from the power monitor to the HMI									
316	CUSTOM	CUSTOM LOGIC - SEND MCC-A VA-HR READING FROM POWER MONITOR TO HMI		Transfer the VA-HR reading from the power monitor to the HMI									
317	CUSTOM	CUSTOM LOGIC - SEND MCC-B VOLTAGE READING FROM POWER MONITOR TO HMI		Transfer the Voltage reading from the power monitor to the HMI									
318	CUSTOM	CUSTOM LOGIC - SEND MCC-B CURRENT READING FROM POWER MONITOR TO HMI		Transfer the Current reading from the power monitor to the HMI									
319	CUSTOM	CUSTOM LOGIC - SEND MCC-B WATTS READING FROM POWER MONITOR TO HMI		Transfer the Watts reading from the power monitor to the HMI									
320	CUSTOM	CUSTOM LOGIC - SEND MCC-B WATT-HR READING FROM POWER MONITOR TO HMI		Transfer the accumulated Watt-HR reading from the power monitor to the HMI									
321	CUSTOM	CUSTOM LOGIC - SEND MCC-B VA-HR READING FROM POWER MONITOR TO HMI		Transfer the VA-HR reading from the power monitor to the HMI									
322	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 1 VFD phase A current.								44283	47645
323	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 1 VFD phase B current.								44284	47652
324	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 1 VFD phase C current.								44285	47659
325	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 VFD Trouble Alarm (remove from logic at later date if identical to hard wired alarm)				02289	04481				47666
326	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 VFD Overtemperature Alarm				02290	04483				47667
327	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 VFD Low DC Voltage Alarm				02291	04485				47668
328	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 VFD Output SCR Fail				02292	04487				47669
329	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 1 VFD Input Overvoltage				02293	04489				47670
330	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 2 VFD phase A current.								44286	47671
331	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 2 VFD phase B current.								44287	47678
332	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 2 VFD phase C current.								44288	47685
333	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 VFD Trouble Alarm (remove from logic at later date if identical to hard wired alarm)				02294	04491				47692
334	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 VFD Overtemperature Alarm				02295	04493				47693
335	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 VFD Low DC Voltage Alarm				02296	04495				47694
336	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 VFD Output SCR Fail				02297	04497				47695
337	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 2 VFD Input Overvoltage				02298	04499				47696
338	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 3 VFD phase A current.								44289	47697
339	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 3 VFD phase B current.								44290	47704
340	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 3 VFD phase C current.								44291	47711
341	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 VFD Trouble Alarm (remove from logic at later date if identical to hard wired alarm)				02299	04501				47718
342	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 VFD Overtemperature Alarm				02300	04503				47719
343	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 VFD Low DC Voltage Alarm				02301	04505				47720
344	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 VFD Output SCR Fail				02302	04507				47721
345	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 3 VFD Input Overvoltage				02303	04509				47722
346	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 4 VFD phase A current.								44292	47723
347	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 4 VFD phase B current.								44293	47730
348	SWS-C12C	TRANSMITTER SIGNALS TEMPLATE LOGIC(SWS-C12C V1.02)		Pump 4 VFD phase C current.								44294	47737
349	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 VFD Trouble Alarm (remove from logic at later date if identical to hard wired alarm)				02304	04511				47744
350	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 VFD Overtemperature Alarm				02305	04513				47745
351	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 VFD Low DC Voltage Alarm				02306	04515				47746
352	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 VFD Output SCR Fail				02307	04517				47747
353	SWS-C12F	DISCRETE SIGNAL TEMPLATE LOGIC(SWS-C12F V1.10)		Pump 4 VFD Input Overvoltage				02308	04519				47748
354	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM BUS-A POWER MONITOR		Read the Power Monitor electrical parameters that need to be monitored.									
355	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM BUS-B POWER MONITOR		Read the Power Monitor electrical parameters that need to be monitored.									
356	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM MCC-A POWER MONITOR		Read the Power Monitor electrical parameters that need to be monitored.									
357	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM MCC-B POWER MONITOR		Read the Power Monitor electrical parameters that need to be monitored.									

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								DO 02xxx	DI 04xxx	INT 07xxx	AO 42xxx	AI 44xxx	INT 47xxx
358	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM PUMP 1 VFD		Read the Pump 1 VFD electrical parameters that need to be monitored.									
359	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM PUMP 2 VFD		Read the Pump 2 VFD electrical parameters that need to be monitored.									
360	CUSTOM	CUSTOM LOGIC - MODBUS+ MSTR READ FROM PUMP 3 VFD		Read the Pump 3 VFD electrical parameters that need to be monitored.									

17410 Attachment E

Section 01810 Commissioning

PART 1 - GENERAL

1.1 SUMMARY

A. This section identifies the requirements for pre-commissioning and commissioning activities for all electrical, mechanical, instrumentation, control and process equipment. This section ties together the many activities defined in other Specifications sections that are required to be performed and completed during pre-commissioning and commissioning and provides the overall requirements for the pre-commissioning and commissioning process.

B. Provide all personnel, tools, labor, equipment, materials, documentation, testing piping, devices, and equipment for testing, pre-commissioning, and commissioning activities. The CONTRACTOR shall provide proper planning, notification, scheduling, and coordination for all activities.

1.2 RELATED WORK SPECIFIED UNDER OTHER SECTIONS:

A. The requirements of the following sections and divisions apply to the Work of this section. Other sections and divisions of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01300, Contractor's Construction Schedule and Reports
2. Section 01783, Equipment Service Manuals
3. Section 01811, Commissioning Dashboard
4. Section 01820, Training of OC SAN Personnel
5. Division 08710, Finish Hardware
6. Section 10400, Identifying Devices
7. Division 11, Equipment
8. Section 11910, Diesel-Fueled Standby Engine-Generator Set
9. Section 13500, Closed Circuit Television CCTV
10. Section 13700, Access Control and Alarm Monitoring System
11. Section 13850, Fire Alarm System
12. Division 14, Conveying System
13. Division 15, Mechanical
14. Section 16080, Electrical Testing

15. Division 16, Electrical, other applicable sections

16. Division 17, Instrumentation and Control

1.3 DEFINITIONS

A. Certificate of Proper Installation (COPI): A written report signed by a trained and qualified representative of the manufacturer certifying that each equipment specified in Divisions 8, 10, 11, 13, 14, 15, 16 and 17 is installed properly in accordance with the manufacturer's installation instructions.

B. Certificate of Proper Operation (COPO): A written report signed by a trained and qualified representative of the manufacturer certifying that each equipment specified in Divisions 8, 10, 11, 13, 14, 15, 16 and 17 is properly installed and lubricated, accurately aligned, free from any undue stress imposed by connecting piping or anchor bolts, has been operated under full load conditions and operates in accordance with specified requirements.

C. Commissioning: All pre-operational, operational, functional, reliability and field performance tests, including pre-ORT, ORT, FAT, RAT, and PAT, that demonstrate the proper function, operation, performance and configuration of the equipment and systems.

D. Commissioning Dashboard: A spreadsheet tracking tool developed, used and maintained by the CONTRACTOR, as defined in Section 01811, and shared with the ENGINEER to track that status and progress of all pre-commissioning and commissioning activities identified in this section and in Tables 1a and 1b.

E. Commissioning Package: A group of equipment, devices, and accessories that have dependencies on one another, operate together to perform a function, will be pre-commissioned and commissioned together, and will be tested as a system during operational readiness testing (ORT), functional acceptance testing (FAT) and reliability acceptance testing (RAT). All equipment installed, modified or connected under this Contract (including connections to existing equipment) shall be part of a commissioning package.

F. Functional Acceptance Test (FAT): Tests equipment and instrument operation and shutdowns under load (in REMOTE MANUAL mode of operation) using process fluid (water, air, etc.) to verify proper functionality. Tests equipment and systems in REMOTE AUTOMATIC and AUTOMATIC modes of operation with software and water (as defined in the procedure or Part 3) or other process fluid to simulate normal operating conditions. Test automatic transfer switches with normal and standby power sources. Test medium-voltage and low-voltage switchgear by simulating incoming voltage to the protective devices. For non-process systems, test the functionality of the system using actual conditions (i.e., fire alarm system, access control system, HVAC, battery chargers, automatic transfer switches, uninterruptible power supplies, generators, etc.).

G. Gate Report: A report that documents the results of pre-commissioning and commissioning and is accepted by the ENGINEER prior to the CONTRACTOR's authorization to proceed to the next phase of commissioning. See Part 1, Article entitled "Gate Reports" of this section for content requirements.

H. Operational Readiness Test (ORT): Tests equipment, instrumentation, wiring, hardware, and software without water or any other process fluid in the LOCAL, HAND and REMOTE MANUAL modes of operation.

I. Performance Acceptance Test (PAT): A test executed by OC SAN after substantial completion to verify that the process system operates in accordance with the designed minimum and maximum performance requirements.

J. Pre-Commissioning: All activities that are required to be completed prior to the start of commissioning. This includes all equipment checks and testing, loop checks (witnessed and unwitnessed) and the pre-commissioning Gate Report.

K. Reliability Acceptance Test (RAT): A test to check that the system can operate continuously in the intended manner for an extended period without failure. During the RAT, the system under test shall be operated within design parameters reflecting the day-to-day operation of the facilities for an uninterrupted period.

L. System: A group of equipment, instruments, devices, and piping that is part of an overall process, electrical distribution, or a portion thereof, and performs a specific function.

1.4 SUBMITTALS

A. Submit the following information in addition to instrument, device, and equipment testing reports and submittals required in other Specifications sections:

1. Resumes for the Commissioning Coordinator and Commissioning Team Leaders.

2. Manufacturer Services: Submit a letter from the manufacturers (forty-five (45) days prior to performing the service) stating that each proposed manufacturers' representative who will perform services is qualified, trained and has experience performing the required services.

3. FDT procedures

4. Final sample test and certification documentation forms

5. Commissioning Overview

   a. Commissioning Plans for each commissioning package

   b. Calibration:

      (1) Credentials and certification of the person proposed by the CONTRACTOR for calibration of all instruments.

      (2) Sample calibration forms, showing pass/fail ranges, that will be used as a template.

      (3) Calibration documentation for test equipment. Calibration documentation must be submitted and accepted by the ENGINEER prior to use of test equipment and after each annual calibration.

   c. Meeting minutes (via e-mail only, not as a construction submittal)

   d. Schedule:

      (1) Commissioning schedule with required updates

(2) Three (3)-week commissioning activity look ahead schedule with required updates

6. Record Keeping System and Tracking Tools: Submit sample for acceptance and updates on the required intervals the following tracking spreadsheets:

a. Lock-out and tag-out procedures

b. 480V and greater conductor testing/torquing/energization

c. Instrumentation, control and alarm circuit conductor testing

d. Wire tag/loop check

e. Instrumentation calibration

f. Manufacturer services

g. Electronic configuration files

h. Individual equipment service manuals

i. Post-energization electrical testing

7. Lock-out and Tag-out Procedures and Policies that will be used by the CONTRACTOR during pre-commissioning and commissioning. Procedures shall be updated to reflect any changes.

8. Gate Reports: Submit within thirty (30) days after completion of the last required for the associated Gate Report.

B. Submit instrument, device, and equipment testing reports required in other Specifications sections within thirty (30) days after completion of testing.

C. Final punch list items.

D. Final as-built drawings.

1.5 PROJECT COMMISSIONING GROUP

A. CONTRACTOR'S Project Commissioning Group

1. Assemble a Commissioning Group consisting of the Commissioning Coordinator, Commissioning Team Leaders for ORT and FAT (see ENGINEER responsibilities below for the maximum number of Commissioning Teams allowed), commissioning team members, support staff, technical support personnel from the CONTRACTOR and Subcontractor, CONTRACTOR'S Training Representative (in accordance with Section 01820, Training of OC SAN Personnel), and separate leads for mechanical, electrical and instrumentation.

2. CONTRACTOR's Commissioning Teams shall perform commissioning activities and procedures with the ENGINEER.

3. Working with the Commissioning Coordinator, the mechanical, electrical and instrumentation leads shall be responsible for confirming Work is complete and ready for witnessed loop checks and commissioning, overseeing pre-commissioning and troubleshooting activities, and verifying the resolution of punch list items and issues.

4. Commissioning Teams shall be available at the Work site during normal working hours (eight (8) hours a day, five (5) days a week, except Saturdays, Sundays and OC SAN holidays) and shall be available onsite within two (2) hours after being notified at all other times. This team shall be equipped and always ready to provide emergency repairs and make required adjustments and corrections to the equipment and systems installed and modified by this Contract.

B. CONTRACTOR's Commissioning Coordinator

1. Qualifications

a. The Commissioning Coordinator shall be **[independent of the CONTRACTOR and any of the suppliers, hired by the CONTRACTOR and]** accepted by the ENGINEER within sixty (60) days from the effective date of the Notice to Proceed. The Commissioning Coordinator will be interviewed upon acceptance of the Commissioning Coordinator's resume as part of the acceptance process. The Commissioning Coordinator shall be experienced in all activities related to pre-commissioning and commissioning, including all facility operations, tests, adjustments and measurements. The Commissioning Coordinator shall have a minimum of **[five (5)] [ten (10)]** years of experience in operations and commissioning of facilities of similar type, size, and capacity. The Commissioning Coordinator shall be experienced in all aspects of planning, documentation, testing, pre-commissioning, and commissioning.

2. Responsibilities:

a. Be authorized by the CONTRACTOR to manage, lead, schedule, and direct the Commissioning Team and all testing, pre-commissioning and commissioning activities.

b. Pre-Commissioning and Commissioning Plan and Documents:

(1) Develop and implement the Commissioning Plan.

(2) Update the Commissioning Plan and associated field copies with any changes that occur.

(3) Review and finalize pre-ORT, ORT and FAT procedures provided by OC SAN in Attachment A.

(4) Develop pre-ORT, ORT, FAT and RAT procedures for equipment that have not been provided by OC SAN.

(5) Review and finalize test and certification documentation forms provided by OC SAN so they are specific to each item of equipment and system installed, modified, or rewired under this Contract. The CONTRACTOR shall request forms from the ENGINEER. The CONTRACTOR shall meet with the ENGINEER to review all final forms and submit them for acceptance.

(6) Develop test and certification documentation forms specific to each equipment, instrument, and device that have not been provided by OC SAN that were installed, modified, or rewired under this Contract. The CONTRACTOR shall meet with the ENGINEER to review all final forms and submit them for acceptance.

(7) Develop test documentation forms specific to each item of equipment that have not been provided by OC SAN that were installed, modified, or rewired under this Contract.

(8) Update the Commissioning Dashboard in accordance with Specifications Section 01811, Commissioning Dashboard.

(9) Develop and utilize a record keeping system and tracking tools.

c. Develop and utilize pre-startup checklists. Schedule:

(1) Develop and update a detailed pre-commissioning and commissioning schedule and incorporate it into the Construction Schedule.

(2) Develop and update a weekly Three-Week Look-Ahead schedule during the pre-commissioning and commissioning phases.

d. Manufacturer Services:

(1) Schedule and coordinate manufacturer's services required in accordance with Manufacturer's Field Services in this section and the individual equipment Specifications sections.

(2) Notify the ENGINEER when any manufacturer services are to be performed.

e. Pre-Commissioning and Commissioning:

(1) Provide technical oversight during the pre-commissioning and commissioning activities.

(2) Be responsible for preparing pre-commissioning and commissioning submittals.

(3) Provide all documentation that equipment, instrumentation and devices are ready for testing.

(4) Track NETA acceptance testing required in accordance with Specifications Section 16080, Electrical Testing.

(5) Coordinate pre-commissioning tests, pre-commissioning activities, and loop checks.

(6) Coordinate commissioning activities.

(7) Support OC SAN with troubleshooting during RAT if requested by the ENGINEER and coordinate any repairs. OC SAN will direct operations during RAT to protect public health, safety and water quality.

(8) Provide all gate reports, per commissioning package, after the pre-commissioning phase and each phase of commissioning. The report shall include the collection of data and documentation during that portion of the Work as described in Article entitled “Gate Reports” herein.

f. OC SAN Training:

(1) Formally request training facilities for the classroom portion of the operator and maintenance training thirty (30) days prior to use.

(2) Oversee and coordinate the activities and duties of the CONTRACTOR’s Training Representative.

g. Equipment Service Manuals:

(1) Oversees the submittal process of the Equipment Service Manuals, which are required in accordance with Specifications Section 01783, Equipment Service Manuals.

h. Meetings:

(1) Conduct monthly commissioning meetings from the date of ENGINEER’s acceptance of the Commissioning Coordinator through the start of Unwitnessed Loop Checks. The meeting shall cover the Commissioning Plan development, pre-commissioning progress and activities, and preparation of loop checks. The meeting shall be documented with meeting minutes. Draft meeting minutes shall be submitted to the ENGINEER within seven (7) days after the meeting for review and comment. Final meeting minutes shall be submitted within fourteen (14) days after the meeting.

(2) Conduct **[bi-weekly] [weekly]** commissioning meetings from the start of Unwitnessed Loop Checks through the completion of the Reliability Acceptance Test. The meeting shall cover the Three-Week Look-Ahead schedule and track actions and punch-list items. The meeting shall be documented with meeting minutes. Draft meeting minutes shall be submitted to the ENGINEER within seven (7) days after the meeting for review and comment. Final meeting minutes shall be submitted within fourteen (14) days after the meeting.

(3) Conduct daily kick-off meetings in the morning (discuss the activities and sequencing planned for the day) and debrief meetings at the end of the day (discuss progress, issues and concerns) when pre-commissioning witnessed loop checks and commissioning activities are being performed. These meetings shall be brief and last approximately fifteen (15) minutes.

C. CONTRACTOR’s Commissioning Team Leader

1. Qualifications

a. Resumes of the Commissioning Team Leaders shall be submitted for acceptance. The Commissioning Team Leader shall be accepted by the ENGINEER during the acceptance process of the Commissioning Coordinator. The Commissioning Team Leader shall have experience on at least three projects performing equipment startup and commissioning activities.

2. Responsibilities:

a. Lead and direct the Commissioning Team in the field during the ORT and FAT procedures for their respective team and sign the completed procedure steps.

b. The Commissioning Coordinator may serve as a Commissioning Team Leader for one of the Commissioning Teams provided all Commissioning Coordinator duties are being successfully performed in a timely manner.

D. ENGINEER

1. Responsibilities

a. Inspect equipment and wiring and observe the following tests for compliance with the Contract Documents.

(1) Factory Demonstration Test – Part 2 (no more than one FDT at a time)

(2) Witnessed Loop Checks. The CONTRACTOR shall base their bid on having no more than two witnessed loop check teams at a time when no commissioning activities are being performed or one witnessed loop check team when commissioning activities are being performed.

b. Complete Permission to Energize Electrical Equipment Forms and authorize the initial energization of electrical equipment.

c. Observe the following tests for compliance with the Contract Documents. The CONTRACTOR shall base their bid on having no more than **[one team] [two teams]** to perform any combination of commissioning activities (electrical equipment energization, pre-ORT, ORT, FAT and RAT) at a time.

(1) Electrical Equipment Energization

(2) Pre-ORT

(3) Operational Readiness Test

(4) Functional Acceptance Test

(5) Reliability Acceptance Test

(6) **[Performance Acceptance Test]**

d. Furnish and install process control software **[unless specified in Section 17410, Programming by Contractor]** and download the process control software starting with ORT.

e. Provide labor and services to inspect and support the integration of OC SAN-furnished process control software with the Project equipment, instrumentation, devices, and control system during all commissioning phases.

f. Provide operators for the RAT.

g. Provide classroom facilities for operator and maintenance training.

h. Review of all test data and results.

1.6 FACTORY DEMONSTRATION TEST (FDT) PROCEDURES

A. Develop and submit step-by-step written procedures for the systematic testing of pumps, process equipment, mechanical equipment, electrical equipment, and control panels at the factory where required in individual Specifications sections. The submittal shall include the following:

1. The setup requirements for the test and the steps required to complete the test.

2. A description of what is being verified at each individual step of the test with the associated passing criteria.

3. A list of all test equipment to be used for the tests.

4. When process testing of equipment is required, a diagram shall be provided showing the equipment, test setup arrangement, equipment and piping interconnections, and any special test equipment.

5. Test schedule.

6. The FDT checkout procedures shall be reviewed and approved by the respective equipment manufacturers and be acceptable to the ENGINEER. FDT procedures shall be accepted by the ENGINEER 30 days prior to FDT1.

B. FDT 1 – Factory Demonstration Test – Part 1: The purpose of this test is for the CONTRACTOR to inspect and witness the testing of the Contract equipment at the manufacture's facility in accordance with.an accepted procedure.

C. FDT 2 – Factory Demonstration Test – Part 2: The purpose of this test is for the CONTRACTOR and ENGINEER to inspect and witness the testing of the Contract equipment at the manufacture's facility in accordance with an accepted procedure.

1.7 COMMISSIONING OVERVIEW AND PLANS

A. Provide a commissioning overview and a separate Commissioning Plan for each commissioning package. These items shall be submitted separately for review and acceptance by the ENGINEER.

B. Once the ENGINEER has accepted a Commissioning Plan, the Commissioning Coordinator shall reproduce the plans in sufficient number for the Commissioning Coordinator's purposes and provide two (2) hard copies of the plan in the field for the CONTRACTOR's commissioning team and the ENGINEER to use. One copy will be used by the field staff and one copy (master) will be used by OC SAN's programming staff. The

plans shall be kept up to date on a regular basis. No Work, as described in this section, shall begin until the Commissioning Plan has been accepted by the ENGINEER.

C. A Commissioning Overview submittal shall be provided and shall include the following:

1. Tab 1 - Staff

a. Organization chart of the Commissioning Team for conducting the pre-commissioning and commissioning activities.

b. Description of Commissioning Team members relevant experience on similar projects, their role on each of these projects, and a list of three (3) references with contact information (e-mail and phone numbers).

c. Roles and responsibilities of Commissioning Team members.

d. Email and cell phone numbers for the Commissioning Team members. The ENGINEER shall be informed of any change in commissioning staff or contact information through the duration of Pre-Commissioning and Commissioning.

2. Tab 2: List of commissioning packages

a. The CONTRACTOR shall develop a list of commissioning packages. The CONTRACTOR shall include redline P&IDs to better define which equipment is part of a commissioning package when a large system is constructed and commissioned in phases or when equipment cannot easily be defined by a system description (e.g., a sump pump system, supply or exhaust fan, or plant air system is being commissioned with a larger system).

D. A Commissioning Plan shall be provided for each commissioning package and shall include the following:

1. Tab 1: Calibration Forms

a. Develop instrumentation calibration forms that include calculated calibration values and acceptable plus/minus calibration ranges in engineering units for each test point.

2. Tab 2: Tracking Reports

a. Include tracking reports as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” with all information filled out, except for information under the tracking columns. Only tasks to be completed in the future shall be left blank.

3. Tab 3: Pre-Test Checklist

a. Develop a checklist for all equipment in a commissioning package that must be verified prior to testing. The purpose of this checklist is to verify that all valves, breakers, motors, etc. are in their proper position (i.e., open, closed, energized, de-energized, etc.) to ensure a safe and efficient test. The CONTRACTOR shall submit a separate checklist for ORT and FAT testing for each commissioning package. Each instrument, device, and piece of equipment shall be referred to by its English description and by its tag number.

4. Tab 4: Testing Piping Plan

a. The Contractor shall identify all water used in each test, and how, where, and at what conditions it is supplied and discharged. Testing piping shall be provided as necessary to operate equipment at all test conditions. The CONTRACTOR shall develop all testing piping plans required to perform FAT.

(1) **[The following is the supply point for water and the available flow conditions:**

Supply Point of Connection/Drawing	Test Procedure	Available Supply Flow (gpm)	Available Pressure (psig)

(2) **The following is the discharge point and the maximum discharge flow:]**

Discharge Point of Connection/Drawing	Test Procedure	Maximum Discharge Flow (gpm)

b. For each testing pipe, the plan shall include the required flow criteria, sizing calculations, plan drawings, redlines of P&IDs, and all piping details required for testing. The plan shall also include what new and existing mechanical equipment will be manipulated during testing.

c. The testing piping system shall include the following key components:

(1) A flow metering instrument when flow is needed for measurement and control, and the controlling flow meter is bypassed by the testing piping. The flow metering instrument may be an orifice plate, magmeter, insertion magmeter, ultrasonic or another device proposed by the CONTRACTOR and accepted by the ENGINEER. All instruments shall be factory or field calibrated. The full range accuracy of the flow metering device shall be plus or minus one (1) percent.

(2) A throttling valve that creates a back pressure on the pumps to replicate the full and reduced performance/capacity operating range of the equipment if required.

(3) Necessary piping connections and accessories such as air release valves, vacuum relief valves, pressure control valves, drains, and instrumentation connections. Accessories shall be shown on the testing piping plan and redlined P&IDs.

5. Tab 5: Pre-ORT Procedures

a. Develop Pre-ORT testing checklist to verify valves, gates, motors and appurtenances are ready to test as described in the paragraph entitled “Commissioning – Phase 2, Pre-ORT Activities” in Part 3 of this section.

b. Standard pre-check procedures for vendor packaged equipment.

6. Tab 6: Packaged Equipment ORT and FAT Procedures:

   a. Use the vendor's standard testing procedures for testing their packaged equipment during ORT and FAT. The test procedures shall demonstrate equipment performance, all operational requirements, all modes of operation (local and automatic) and all interlocks. The following information shall be provided with the vendor's ORT and FAT procedures:

      (1) Control strategy

      (2) Setpoint list

      (3) Shutdown list

      (4) Alarm list

   b. Develop ORT and FAT procedures to supplement the vendor's standard testing procedures when the vendor's procedures do not cover the overall system operations and commissioning package interfaces, interlocks and shutdowns with other systems.

   c. Develop ORT and FAT procedures for packaged equipment and systems when the manufacturer does not have a standard testing procedure. The ORT and FAT procedures shall conform to the ORT and FAT procedures described in the tabs below. The CONTRACTOR shall have the respective equipment manufacturer review and approve the procedure and provide a written letter of acceptance in this tab.

   d. If there is no packaged equipment in this Project, provide a placeholder for this tab and indicate that it is "Not Applicable."

7. Tab 7: ORT Procedures:

   a. OC SAN has developed a select number of the ORT procedures for the Project in Attachment A. CONTRACTOR shall review and finalize these procedures based on the actual equipment and systems being provided.

   b. Develop step-by-step procedures to systematically test every control circuit for all equipment, instruments, devices, and wiring installed or modified under this Contract where OC SAN has not provided a procedure. A procedure shall be submitted for each piece of equipment with a control or I/O circuit. The procedure shall test equipment in LOCAL, HAND, and REMOTE MANUAL modes of operation. CONTRACTOR shall match the format of the procedures provided by OC SAN, which includes a description of the action to be performed and anticipated result, the register number for the associated PLC input and output point to be verified, action to be verified with comments, and signatures for the CONTRACTOR and ENGINEER for each procedure step. Procedures shall use the appropriate testing method for instruments and devices, as specified in Part 3, Article entitled "Commissioning – Phase 3, ORT Activities" of this section, to verify that the circuit is operating properly and connected to the correct device. The following is a typical list of equipment or systems that needs a procedure developed:

      (1) HVAC systems

c. ORT procedures shall verify the following:

(1) I/O signals to/from the field device, motor starters or control panels, through all cabling, to the PLC and HMI and the application software properly operates.

(2) Proper installation, operation and adjustment of all devices, instrumentation, and equipment on a loop by loop and component by component basis. Functionality shall be checked from the primary element in the field through all cabling to the PLC and HMI.

(3) Proper operation of equipment controls, devices, and indicating lamps.

(4) All hardwired interlocks properly shutdown the equipment.

(5) All alarms are triggered at the HMI.

(6) All status signals are monitored at the HMI.

d. The electrical ORT procedures shall include the following:

(1) Steps to test and check the LOCAL mode of operation, verify all required switching scenarios and functions, and verify that precluded switching scenarios do not occur.

(2) Methodology for supplying temporary power (when required).

(3) Steps to coordinate administrative controls of Project electrical equipment that interfaces with existing OC SAN electrical equipment to ensure that inadvertent energization of existing OC SAN equipment does not occur.

e. Provide a list of all test equipment that will be used to perform each test.

8. Tab 8: Pre-FAT Procedures

a. In REMOTE MANUAL, this procedure shall test the functionality of level instruments (verify operation from minimum to maximum level) and flow instruments with water, operation of gates with maximum water level upstream side, each water shutdown interlock (i.e., pump shuts down on high discharge pressure when discharge valve is throttled closed), and any other tests that require water to verify proper equipment and instrument operation prior to FAT. The shutdown interlocks are described in Commissioning – Phase 3, FAT Activities in Part 3, properly performs the function and verify the shutdown setpoint is the correct setpoint to properly protect the equipment and system.

b. OC SAN has developed a select number of pre-FAT procedures for the Project in Attachment A. The CONTRACTOR shall review and finalize these procedures based on the actual equipment and systems being provided.

c. The CONTRACTOR shall develop step-by-step procedures to systematically test the functionality of select equipment and instruments installed under this Contract with water where OC SAN has not provided a procedure. The procedures shall verify the equipment and instrument operation with water. The procedures shall describe the initiation of shutdowns and the expected results that are to be verified. A procedure shall be submitted for each equipment and instrument requiring a pre-FAT. The CONTRACTOR shall match the format of the procedures provided by OC SAN.

8. Tab: FAT Procedures

a. OC SAN has developed a select number of FAT procedures for the Project in Attachment A. CONTRACTOR shall review and finalize these procedures based on the actual equipment and systems being provided.

b. Develop step-by-step procedures to systematically test the functionality of all equipment and systems installed or modified under this Contract where OC SAN has not provided a procedure. The procedure shall test equipment in LOCAL AUTO and REMOTE AUTOMATIC modes of operation. The procedure shall test all equipment and systems in REMOTE AUTOMATIC and AUTO modes to verify that the equipment and systems operate as described in the control strategies of the Specifications sections. The procedures shall describe the initiation of shutdowns and the expected results that are to be verified and shall test all startup and shutdown conditions for each piece of equipment and the system or process train to test the complete program functionality. The procedure shall include all testing scenarios. A procedure shall be submitted for each equipment and system. A system FAT shall be provided for all equipment that function together with programming interlocks. The CONTRACTOR shall match the format of the procedures provided by OC SAN. The following is a typical list of equipment or systems that needs a procedure developed procedures the:

(1) HVAC systems

(2) Fire alarm systems

(3) Access control systems

(4) Public address system

(5) Closed circuit television system

(6) Telephone

(7) Elevators

(8) Cranes and hoists

c. Performance testing of each individual item of mechanical, electrical and instrumentation equipment shall be performed to duplicate the operating conditions described in the Contract Documents, as closely as possible.

d. System tests shall be designed to duplicate operating conditions of the system as described in the Contract Documents, as closely as possible.

e. Provide a list of all test equipment that will be used to perform each test.

f. The electrical FAT procedures shall include the following:

(1) Steps to test the REMOTE (automatic and PLC controls) mode of operation, verify all required switching scenarios and functions, verify that precluded switching scenarios do not occur, and proper functionality of all interlocks.

(2) Methodology for supplying temporary power (when required).

(3) Steps to coordinate administrative controls of Project electrical equipment that interfaces with existing OC SAN electrical equipment to ensure that inadvertent energization of existing OC SAN equipment does not occur.

g. The control strategies describe the general operation, interlocking and sequencing of a system, but do not describe every shutdown and logical sequence in exact detail. For procedures that reflect OC SAN programming, the CONTRACTOR shall allow the ENGINEER to revise the FAT procedures based on the final programming to incorporate equipment interlocks, shutdowns, and operating sequences. Provides that reflect the CONTRACTOR's programming shall be revised to reflect the final program that will be tested during FAT. These revisions may include formal revisions to the procedure or ad-hoc revisions in the field as required.

9. Tab 10: RAT Procedures

a. OC SAN will develop and execute the RAT procedures for the Project.

b. Incorporate these procedures into the Commissioning Plan for each commissioning package. During the RAT procedures, the equipment and systems will be operated under various scenarios of normal operating conditions. Where possible the system will be tested to verify dry and wet weather design operating conditions and confirm system capacity. Failures will be simulated to test the fail-over logic, equipment shutdown sequencing, and equipment startup sequencing.

c. CONTRACTOR does not need to be present unless required in an equipment Specifications section, but shall be available to troubleshoot and repair when requested.

10. Tab 11: PAT Procedures

a. OC SAN will develop and execute the PAT procedures for the Project.

b. Incorporate these procedures into the Commissioning Plan for each commissioning package. During the PAT procedures, the equipment and systems will be operated under different operating conditions to verify dry and wet weather design operating conditions and confirm system capacity.

c. CONTRACTOR does not need to be present unless required in an equipment Specifications section, but shall be available to troubleshoot and repair when requested.

11. Tab 12: Drawings

a. Include the following drawings associated with the commissioning package. Markup the drawings showing the limits of Work associated with the commissioning package.

(1) Single line diagrams

(2) P&IDs

(3) Control panel shop drawings

(4) Control schematics from equipment shop drawings

(5) Accepted loop drawings

1.8 SCHEDULE

A. The Commissioning Coordinator shall develop a commissioning schedule for pre-commissioning and commissioning activities for all equipment and systems. The schedule shall include OC SAN personnel training. The pre-commissioning schedule shall be organized by remote input/output (RIO) panel and equipment. The commissioning schedule shall be organized by commissioning package and shall show the chronological order of all commissioning activities by test. The commissioning schedule shall incorporate the following restrictions in addition to the requirements identified in Tables 1a and 1b:

1. Witnessed loop checks shall not be performed for an RIO panel until all field and panel wire terminations associated with that RIO panel have been completed.

2. The electrical equipment energization process shall be complete and written authorization to energize shall be provided by the ENGINEER prior to the electrical equipment being allowed to be used for the associated equipment ORTs.

3. A commissioning package Pre-ORT shall be successfully performed before moving to ORT.

4. ORT procedures shall not be performed until:

a. All witnessed loop checks have been successfully performed for all panels associated with the commissioning package ORT(s)

b. Required electrical distribution equipment is energized

c. A Pre-ORT has been successfully performed for the commissioning package

d. All pre-ORT punch list items have been signed off by the ENGINEER

e. The commissioning package pre-commissioning gate report has been accepted by the ENGINEER.

5. FAT shall not be performed until all ORT procedures and requirements for the commissioning package and pre-FAT punch list items have been signed off by the ENGINEER.

6. RAT shall not be performed until all FAT procedures and requirements for the commissioning package and pre-RAT punch list items have been signed off by the ENGINEER.

B. CONTRACTOR's Baseline Construction Schedule as specified in Division 01 of the Specifications shall incorporate the commissioning schedule.

C. The commissioning schedule shall show the start date, duration and completion date of each pre-commissioning and commissioning activity. The schedule shall include FDT, COPI, NETA testing, Unwitnessed and Witnessed Loop Checks, electrical equipment energization, Pre-ORT, ORT, FAT, RAT, and COPO, as a minimum.

D. The commissioning schedule shall include all operations and maintenance training activities.

E. The schedule shall include pre-commissioning and commissioning submittal dates and OC SAN review and acceptance time for each submittal prior to moving to the next phase of pre-commissioning and commissioning.

F. Within sixty (60) days of the ENGINEER's acceptance of the Commissioning Overview submittal and all Commissioning Plans and ninety (90) days prior to any pre-commissioning and commissioning activity, the CONTRACTOR shall integrate the schedule into the Construction Schedule and submit a Construction Schedule revision for review by the ENGINEER as specified in Specifications Section 01300, Contractors Construction Schedule and Reports.

G. The commissioning schedule shall be updated monthly in accordance with Specifications Section 01300, Contractors Construction Schedule and Reports, indicating schedule changes and which activities have been successfully completed.

H. Three-Week Look-Ahead Schedule

1. Develop a three-week look-ahead schedule, that is updated on a weekly basis, starting three (3) weeks before the first unwitnessed loop check is performed through the completion of the last RAT.

1.9 RECORD KEEPING SYSTEM AND TRACKING TOOLS

A. The Commissioning Coordinator shall develop and update a record keeping system to document compliance with the requirements of this Specifications section and the other Specifications sections for pre-commissioning and commissioning activities. The recording keeping system and tracking tools shall use different colors or separate columns to track acceptance by the CONTRACTOR and acceptance by the ENGINEER. The CONTRACTOR shall make the recording keeping system and tracking tools available to the ENGINEER at all times and shall provide the ENGINEER weekly updates of all record keeping systems and tracking tools from the point when information is first logged until all activities are complete. The recording keeping system shall be submitted for ENGINEER'S acceptance prior to their use.

B. Conduct a workshop with the ENGINEER to review their approach to the record keeping system and tracking tools prior to implementation. The workshop shall also discuss electrical equipment energization and permission to energize tracking as part of the tracking spreadsheets and the Commissioning Dashboard.

C. The following tracking spreadsheets shall be developed as a minimum for the entire project. The tracking spreadsheets shall include a commissioning package column for sorting and filtering. The spreadsheets shall be submitted with the monthly progress report until the first pre-commissioning Gate report is submitted. After the pre-commissioning Gate report is submitted, commissioning package tracking spreadsheets shall be submitted on a bi-weekly basis.

1. Lock-out and Tag-out Procedures: Tracks the lock-out and tag-out procedure description, acceptance date, commissioning package, and comments.

2. 480V and Greater Conductor Testing/Torquing/Energization: Tracks the cable tag, commissioning package, equipment fed description, equipment fed tag, name of electrical equipment the cable is being fed from (switchgear, MCC, panelboard, etc.), source switchgear/MCC cubicle tag or panel circuit number, continuity check for each conductor, insulation resistance value for each conductor, source end information (performed by (CONTRACTOR), completion date, checked by (ENGINEER), torque value for each conductor and comments), and load end information (performed by (CONTRACTOR), completion date, checked by (ENGINEER), torque value for each conductor and comments). Include a NETA testing complete column for medium-voltage cables and cable bus. Also track the ENGINEER's permission to energize date for each circuit.

3. Instrumentation, Control and Alarm Circuit Conductor Testing: Tracks the cable tag, commissioning package, fed from description and tag, fed to description and tag, continuity check for each conductor, and insulation resistance value for each conductor.

4. Wire Tag/Loop Check: Tracks the loop drawing number, loop drawing title, RIO panel number, commissioning package, Unwitnessed Loop Check information (check by and check date), Wire Tag Check information (check by, check date and comments (ENGINEER)), and Witnessed Loop Check information (check by, check date and comments (CONTRACTOR and ENGINEER)).

5. Instrumentation Calibration: Tracks the instrumentation tag, description, calibration method, completion of calibrations, and commissioning package.

6. Manufacturer Services (tracks the following):

   a. Completion of training plans, COPI, COPO, training of OC SAN personnel, and commissioning package.

   b. Submittal of a letter stating that the proposed manufacturers' personnel are qualified, trained and have experience performing the required services for all equipment, instruments and devices that require manufacturer services.

7. Electronic Configuration File: Tracks the equipment tag, description, commissioning package, and the submittal date of electronic native files with software, and PDF printouts of configuration settings highlighting changes to default settings. PDF shall be searchable.

8. Individual Equipment Service Manuals: Track the Specifications section, equipment description, equipment loop tag numbers (instrument, mechanical, electrical, etc.), commissioning package, acceptance date, and comments.

9. Post-Energization Electrical Testing: Tracks the Specifications section and article, test description, commissioning package, date when test is required, completion date and comments.

D. The Commissioning Coordinator shall be responsible for setting up and updating a Commissioning Dashboard to track the completion of all pre-commissioning and commissioning activities. This dashboard shall be used to verify all items are complete prior to moving to the next phase. The CONTRACTOR may use the Commissioning Dashboard provided by OC SAN as defined in Section 01811, Commissioning Dashboard, or may use its own tracking tool. If the CONTRACTOR uses its own tool, it shall be submitted for ENGINEER's acceptance prior to its use.

1.10 GATE REPORTS

A. Submit Gate Reports for each commissioning package to the ENGINEER for acceptance to continue through the Commissioning process. Gate Reports are a collection of all test reports, test data, certificates and forms for all equipment, instruments and systems, that are produced during the pre-commissioning and commissioning phases for each commissioning package. The Commissioning Coordinator is responsible for producing these reports.

B. Pre-commissioning Gate Report

1. The Pre-Commissioning Gate Report shall include the following:

a. Tab 1 – Completion Statement: A formal statement that the CONTRACTOR has completed the following requirements and is ready to move to the next phase of commissioning:

(1) All requirements and punch list items associated with pre-commissioning.

(2) RFIs and responses up to date and all approved changes complete associated with the Work

(3) Tags for equipment and instrument are properly installed

(4) All electrical equipment, devices, instruments, enclosures, pull boxes, field control panels and control panels and secure all panel and wire covers associated with the loop checks have been inspected and cleaned.

(5) Electrical rooms are clean and all construction work in the electrical room is complete (Wiring may be remaining for equipment not being energized).

b. Tab 2 – Pre-commissioning Activities:

(1) An index of pre-commissioning submittals indicated in Table 1a and specified in other Specifications sections that are required to be complete during pre-commissioning, with the associated accepted submittal number. At a minimum, the index shall include the following list with a "not applicable (N/A)" for any submittal that is not required for the associated commissioning package:

(a) CONTRACTOR's lock-out tag-out and safety procedures

(b) Factory Demonstration Test procedures

(c) Factory performance tests

(d) Factory Demonstration Test - Part 1 Report (unwitnessed)

(e) Factory Demonstration Test - Part 2 Report (Witnessed)

(f) Electrical system analyses and measurements information (Section 16431)

(g) Mechanical alignment reports

(h) Metallurgical test reports

(i) Pressure test reports

(j) Electrical equipment tests (Section 16080 and Div. 16)

(k) Motors tested by CONTRACTOR (Section 16080)

(l) Conductor test reports

(m) Conductor torque logs

(n) EID Data (Manufacturer and Model Number)

(o) Approval of Section 17410, Programming by Contractor, Step 4 – Bench Test

(p) Operating permits

(q) Operator & Maintenance Training Plan

(r) All draft individual equipment service manuals (Identify submittals in Individual Equipment Service Manuals Tracking Report)

(2) This tab shall also include the following completed tracking reports as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section. Include a printout of the Commissioning Dashboard:

(a) CONTRACTOR’s Lock-Out and Tag-Out Procedures Tracking Report

(b) 480V and Greater Conductor Testing/Torquing/Energization Tracking Report

(c) Instrumentation, Control and Alarm Circuit Conductor Tracking Report

(d) Manufacturer Services Tracking Report showing completion of training plans

(e) Individual Equipment Service Manuals Tracking Report

c. Tab 3 – Instrumentation Calibrations: The completed Instrumentation Calibration Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section. All instrument calibrations shall be complete except instruments on packaged equipment. Completed and signed instrument calibration forms and factory calibration certificates. Documentation shall be grouped for each instrument with the commissioning package Instrumentation Checklist, sorted in ascending order of the loop number (15L-101, 15L-102, 15M-100…), showing that all documentation has been completed.

d. Tab 4 – Configuration Files: A PDF printout of the configuration files highlighting all changes from the standard default configuration, including any jumper or internal switch settings, for every device, instrument or piece of equipment (i.e., valve actuators, gate actuators, analyzers, level instruments, pressure transmitters, indicators, VFDs, soft starters, etc.) with user defined settings. PDF shall be searchable. Electronic configuration files in their native format with the associated software to open, view and modify the native file shall also be provided. The Electronic Configuration File Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section showing that all configuration files have been provided.

e. Tab 5 – COPI: All manufacturer certificates of proper installation. The Manufacturer Services Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section shall be provided showing that all COPIs have been performed.

f. Tab 6 – Wire Tag/Witnessed Loop Check: The completed Wire Tag/Loop Check Tracking Report, as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section, with CONTRACTOR and ENGINEER initials on the tracking report and highlighted and signed off loop drawings.

g. Tab 7 – Redlined Drawings: Up to date redlined drawings:

(1) Redlined single line diagrams

(2) Redlined P&ID’s.

(3) Redlined loop drawings signed by the ENGINEER.

(4) Redlined schematics / control diagrams

(5) Redlined control panel drawings

(6) Redlined wiring drawings

C. Commissioning – Phase 1 Gate Report, Electrical Equipment Energization

1. At a minimum, the Commissioning – Phase 1 Gate Report shall include the following:

a. Tab 1 – Completion Statement: A formal statement that the CONTRACTOR has completed all requirements and punch list items associated with this commissioning phase and is ready to move to the next phase of commissioning.

b. Tab 2 – ORT: Signed and completed ORT procedures.

c. Tab 3 – FAT: Signed and completed FAT procedures.

d. Tab 4 – COPO: All manufacturer certificates of proper operation, when required for this phase. The Manufacturer Services Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section shall be provided showing that all electrical COPOs have been provided.

e. Tab 5 – Configuration Files: A PDF printout of the configuration file highlighting all changes from the standard default configuration, including any jumper or internal switch settings, for every device, instrument or piece of equipment (i.e., automatic transfer switches, protective relays, battery chargers, power monitors, etc.) with user defined settings. PDF shall be searchable. Electronic configuration files in their native format with the associated software to open, view and modify the native file shall also be provided. The Electronic Configuration File Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section showing any revised or new configuration files that have been provided.

f. Tab 6 – Permission to Energize: Completed permission to energize equipment forms for all electrically powered equipment and signed and completed motor pre-energization forms for all motors above 3 horsepower. This form shall be signed by the CONTRACTOR and the ENGINEER prior to equipment energization indicating that all pre-energization activities are completed.

g. Tab 7 – Post-Energization Electrical Tests: Completed and signed test reports.

h. Tab 8 – Redlined Drawings: Up to date redlined drawings:

(1) Redlined single line diagrams

(2) Redlined P&ID’s

(3) Redlined loop drawings signed by the ENGINEER

(4) Redlined schematics and elementary diagrams

(5) Redlined control panel drawings

(6) Redlined wiring drawings

D. Commissioning – Phase 2 Gate Report, Pre-ORT

1. At a minimum, the Commissioning – Phase 2 Gate Report shall include the following:

a. Tab 1 - Completion Statement: A formal statement that the CONTRACTOR has completed all requirements and punch list items associated with this commissioning phase and is ready to move to the next phase of commissioning.

b. Tab 2 – Pre-ORT: Pre-ORT activities checklist documenting activities performed with their results.

c. Tab 3 – Vibration Tests: Mechanical equipment vibration test results.

d. Tab 4 – Motor Tests: Uncoupled motor test results.

e. Tab 5 – Packed Equipment Pre-Check List: Manufacturer pre-check test results for packaged equipment (if applicable).

f. Tab 6 – Packaged Equipment Instrumentation Calibration: Completed and signed instrument calibration forms for vendor instruments (if applicable).

E. Commissioning – Phase 3 Gate Report, ORT and FAT

1. At a minimum, the Commissioning – Phase 3 Gate Report shall include the following:

a. Tab 1 – Completion Statement: A formal statement that the CONTRACTOR has completed the following requirements and is ready to move to the next phase of commissioning:

(1) All requirements and punch list items associated with pre-commissioning.

(2) EID data (serial no., purchase price, startup date, project phase, and misc. info) (include reference to EID submittal number).

b. Tab 2 – ORT: Signed and completed ORT procedures.

c. Tab 3 – Pre-FAT and FATFAT: Signed and completed Pre-FAT and FAT procedures.

d. Tab 4 – Field Performance Tests: Field performance test results.

e. Tab 5 – Operator Training: The Manufacturer Services Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section shall be provided showing that all operator training has been provided.

f. Tab 6 – Configuration Files: Any revisions to PDF printouts of configuration files highlighting all changes from the standard default configuration and revisions to electronic configuration files in their native format as required in the Commissioning – Phase 1 Gate Report. Include the Electronic Configuration File Tracking Report as specified in Part 1, Article entitled “Record Keeping System and Tracking Tools” of this section showing which setting information has been revised.

g. Tab 7 – Redlined Drawings: Up to date redlined drawings:

(1) Redlined single line diagrams

(2) Redlined P&ID’s

(3) Redlined loop drawings signed by the ENGINEER

(4) Redlined schematics and elementary diagrams

(5) Redlined control panel drawings

(6) Redlined wiring drawings

F. Commissioning – Phase 4 Gate Report, RAT

1. At a minimum, the Commissioning – Phase 4 Gate Report shall include the following:

a. Tab 1 – Completion Statement: A formal statement that the CONTRACTOR has completed all requirements and punch list items associated with the current commissioning phase and is ready for Substantial Completion.

b. Tab 2 – RAT: Signed and completed RAT procedures.

c. Tab 3 – COPO: All non-electrical manufacturer certificates of proper operation. The Manufacturer Services Tracking Report as specified in Part 1, Article entitled "Record Keeping System and Tracking Tools" of this section shall be provided showing that all COPOs have been provided.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Pre-commissioning is made up of all the activities that shall be completed before the CONTRACTOR is permitted to begin Commissioning.

B. Commissioning is composed of the following four (4) phases:

1. Phase 1: This phase performs electrical commissioning and energization.

2. Phase 2: This phase performs Pre-ORT and readiness tests on equipment to make sure that they are properly installed and configured and are ready to be commissioned.

3. Phase 3: This phase performs the ORT and FAT.

4. Phase 4: This phase performs the RAT and PAT.

C. Tables 1a and 1b illustrate many of the tasks to be completed in each phase.

D. Testing and Tie-in Coordination

1. Notify the ENGINEER in writing not less than fourteen (14) days in advance of the planned start date of equipment testing and tie ins to coordinate with plant operations and maintenance staff.

E. Field Testing Information

1. Preliminary copies of testing data in field report form shall be made available to the ENGINEER within two (2) days after completion of each test. This information shall remain available to the ENGINEER for the duration of the Project.

F. Materials and Equipment

1. Provide all testing and recording devices required for specified tests. Test equipment shall be calibrated annually.

2. Provide all lubricating oil, hydraulic oil, grease, packing, and insulating and lubricating fluids and filters required to clean, blow out, flush, and initially charge equipment and systems.

G. The Commissioning Coordinator shall maintain one (1) set of the following documentation in the field for the ENGINEER:

1. All Drawings, Specifications, addenda and Change Orders;

2. Updated Commissioning Plans for each commissioning package; and

3. Copy of drawings and hardware submittals for equipment being tested.

4. Redlined or updated loops, P&ID's, instrument configuration parameters, calibration sheets, single line diagrams, control panel drawings, schematics, elementary diagrams, and interconnect diagrams.

H. Daily Schedule for Testing

1. The Commissioning Coordinator shall begin each day of witnessed testing by meeting with the ENGINEER.

2. The meeting purpose is to review the test schedule, the test results from the previous day, and where applicable, to coordinate the testing schedule with Plant Operations.

3. Commissioning Coordinator may need to schedule some testing outside normal working hours because of plant operational requirements.

4. The Commissioning Coordinator shall be prepared to rearrange portions of the commissioning schedule under short notice due to unanticipated plant conditions, equipment failure or unusually high sewage flows caused by wet weather.

I. Retesting

1. When testing or operation of the equipment demonstrates that the equipment does not meet the specified requirements, CONTRACTOR shall repeat or perform all additional tests as necessary and required by the ENGINEER.

J. Continuous Operation

1. After successful Reliability Acceptance Test of a specific equipment or portion of a system, OC SAN may elect to operate the specific equipment or portion of a system for continuous operation. Such operation will not interfere with the testing of other equipment and systems that may still be underway and shall not preclude the need to start up the portion operated in combination with the rest of the facility when all testing is completed.

TABLE 1a

PRE-COMMISSIONING (Construction)
Equipment Submittal Process Complete
Commissioning Plan
CONTRACTOR's Lock-out Tag-out and Safety Procedures
Factory Demonstration Test Procedures
Factory Performance Tests
Factory Demonstration Test - Part 1 (Unwitnessed) (Divisions 11, 15, 16 and 17)
Factory Demonstration Test - Part 2 (Witnessed) (Divisions 11, 15, 16 and 17)
All Factory Demonstration Test (FDT) Reports (Divisions 11, 15, 16 and 17)
RFIs and Responses up to Date and all Approved Changes Complete Associated with the Work
Electrical System Analyses and Measurements Information (Section 16431)
Seismic Calculations
Mechanical Alignment Reports
Metallurgical Test Reports
Pressure Test Reports
Electrical Equipment Tests (Section 16080 and Div. 16)
Motors Tested by CONTRACTOR (Section 16080)
Conductor Test Reports
Conductor Torque Logs
Equipment and Instrument Tags Are Properly Installed
EID Data (Manufacturer and Model Number) (received 90 days prior to Phase 1)
[Approval of Section 17410, Programming by Contractor, Step 4 – Bench Test]
All Operating Permits
Operator & Maintenance Training Plan
All Draft Individual Equipment Service Manuals (received 90 days prior to Phase 1)
Inspect and clean all electrical equipment, devices, instruments, enclosures, pull boxes, field control panels and control panels and secure all panel and wire covers associated with the loop checks
Electrical Rooms are Clean and all Construction Work in the Electrical Room is Complete (Wiring may be remaining for equipment not being energized)
Unwitnessed Loop Check
*Indexed Summary of the Completed Pre-Commissioning Requirements (tests, certificates and reports)
*All Instrument Calibration Reports (factory and field) (Section 17010 and Div. 17)
*All Electronic Devices Configuration Files in PDF (default value changes highlighted) and Native Formats
*All Manufacturer Certificates of Proper Installation (COPI)
*Wire Termination/Tag Check and Witnessed Loop Check
*All Redline As-Built Drawings for the Commissioning Package (as required in the Gate Report)
Pre-commissioning Gate Report
Obtain ENGINEER's authorization to Proceed

***** Required for the Gate Report

TABLE 1b

COMMISSIONING
PHASE 1 – ELECTRICAL EQUIPMENT ENERGIZATION
*HVAC for Electrical Equipment is Commissioned and Operational (HVAC shall be commissioned and initially operated using temporary power its associated electrical distribution equipment is commissioned and energized)
*Permission to Energize Electrical Equipment
*Electrical Operational Readiness Test (ORT)
*Electrical Functional Acceptance Test (FAT)
*Post-Energization Electrical Testing (Section 16080 and Div. 16)
*All Manufacturer Certificates of Proper Operation (COPO)
*All Electronic Devices Configuration Printout in PDF Format (highlight changes to default values)
*All Redline As-Built Drawings for the Commissioning Package (as required in the Gate Report)
Commissioning – Phase 1 Gate Report
Obtain ENGINEER's authorization to Proceed
PHASE 2 – PRE-ORT
*Pre-ORT Activities and Tests
*Equipment Vibration Tests
*Motor Uncoupled Run Test (Section 16080)
*All Instrument Calibration Reports (factory and field) (Packaged Equipment)
*Manufacturer Pre-Checks for Packaged Equipment
Commissioning – Phase 2 Gate Report
Obtain ENGINEER's authorization to Proceed
PHASE 3 – ORT AND FAT
*Operational Readiness Test - (ORT)
*Pre-Function Acceptance Testing (Pre-FAT)
*Functional Acceptance Test (FAT)
*Field Performance Tests
*Operator Training received 30 days prior to Phase 4
*Revised Device Settings and Configuration Files
*All Redline As-Built Drawings for the Commissioning Package (as required in the Gate Report)
EID Data (Serial No., Purchase Price, Startup Date, Project Phase, and Misc. Info)
Commissioning – Phase 3 Gate Report
Obtain ENGINEER's authorization to Proceed
PHASE 4 – RAT
*Reliability Acceptance Test (RAT)
*All Manufacturer Certificates of Proper Operation (COPO)
Commissioning – Phase 4 Gate Report
Substantial Completion
Performance Acceptance Test (PAT)
Final Equipment Service Manuals
Final Punch List
Final As-Built Drawings
Final Completion

* Required for the Gate Report

3.2 MANUFACTURER'S FIELD SERVICES

A. It is the CONTRACTOR's responsibility to provide the services of the appropriate manufacturer's personnel during equipment installation, facilities testing, pre-commissioning, commissioning and training of OC SAN personnel. Where manufacturer's services are specified in this section and other Specifications sections, the CONTRACTOR shall furnish authorized manufacturer personnel who are factory-trained, knowledgeable, and experienced in the technical aspects of their products and systems supplied on the project and qualified to provide these services.

B. Manufacturer Certifications

1. After installation and before equipment energization, each manufacturer's personnel shall prepare a written Certificate of Proper Installation (COPI), certifying that the equipment specified in Divisions 8, 10, 11, 13, 14, 15, 16 and 17 is properly installed and lubricated, has been properly maintained by the CONTRACTOR, is in accurate alignment, and is free from any undue stress imposed by connecting piping or anchor bolts in accordance with the manufacturer's installation instructions.

2. During Phase 4 of Commissioning, each manufacturer's personnel shall prepare a written Certificate of Proper Operation (COPO), certifying that the equipment specified in Divisions 8, 10, 11, 13, 14, 15, 16 and 17 is properly lubricated; has been properly maintained by the CONTRACTOR; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under all design conditions and meets the performance criteria in accordance with the requirements in the Specifications section and the manufacturer's operating requirements. Electrical COPOs for switchgear, automatic transfer switches, battery chargers, generators, panelboards, transformers, and uninterruptible power supplies shall be submitted after the electrical FAT. Electrical COPOs for motor control centers, motor starters, and variable frequency drives and all system, equipment, instruments, and device COPOs shall be submitted after RAT.

C. Submit a letter from the manufacturer stating that the proposed manufacturers' representatives who will perform these services is qualified, trained and experienced in performing the required services.

D. Scheduling of Manufacturer's Field Services

1. The scheduling of all visits to the site by the manufacturer's field services personnel shall be determined by the CONTRACTOR. The CONTRACTOR shall notify the ENGINEER in advance of all visits, so the ENGINEER can be available to observe the activities and coordinate with OC SAN Operation staff if required.

2. Manufacturers' personnel shall resolve assembly problems associated with their products and equipment.

3. During the testing, the manufacturer's personnel shall assist, as applicable, with performing equipment and device adjustments and calibrations.

3.3 PRE-COMMISSIONING ACTIVITIES

A. Pre-commissioning is made up of all the activities that shall be completed before the CONTRACTOR is permitted to begin Commissioning. Table 1a illustrates many of the tasks.

B. The primary pre-commissioning activities consist of construction, factory testing, documentation, component testing, calibration, stand-alone equipment testing, electrical testing, conductor torquing, pipe pressure testing, unwitnessed loop checks, wire tag checks and witnessed loop checks associated with a commissioning package. The intent is to test isolated equipment and components.

C. In addition to the items identified in Table 1a, the following activities shall be completed during pre-commissioning:

1. FDT 1 – Factory Demonstration Test Part 1 – Refer to section 17405 for more information on control panel FDTs.

2. FDT 2 – Factory Demonstration Test Part 2 – Refer to section 17405 for more information on control panel FDTs.

3. Instrument Calibration: CONTRACTOR shall calibrate non-factory-calibrated instruments and verify calibration of factory calibrated instruments in the presence of the ENGINEER. The CONTRACTOR shall use only qualified people trained and familiar with the calibration testing equipment and instruments being calibrated. The CONTRACTOR shall have available at the testing location the individual instrument cut sheets with manufacturer tolerances, factory calibration certificates (where available), and ISA data sheets for the ENGINEER. The CONTRACTOR shall use the pre-filled-out instrumentation calibration forms developed in the Commissioning Plan at the time of testing. Once complete, the ENGINEER will sign the calibration form. This signature does not imply ENGINEER acceptance, rather it indicates that the ENGINEER has witnessed the activity. Instrument calibration is still subject to the ENGINEER's acceptance during the review of Pre-Commissioning Gate Report. All instruments shall have been calibrated within a year prior to starting RAT. Testing shall be done as follows:

a. Analog Instruments:

(1) A five-point calibration check (unless otherwise specified in the individual instrument Specifications sections) shall be performed and results shall be recorded on individual calibration sheets with three (3) significant digits. All testing shall be done with a calibrated test instrument. Each hardwired analog signal shall be tested to verify proper performance within specified tolerances. Specified accuracy tolerances for each analog signal is defined as the root-mean-square-summation of individual component accuracy requirements. Individual component accuracy requirements shall be based on the more stringent value between the tolerance specified in the Contract Documents and the published manufacturer specifications.

(a) Factory wet calibrated magnetic flow instruments do not require field calibration. Verification of proper operation shall be verified during FAT.

b. For discrete instruments, a calibration check shall be performed with a calibrated test instrument. The 'set' and 'reset' values shall be recorded as well as the dead band repeated through three (3) cycles.

4. Inspect and clean all electrical equipment, devices, instruments, enclosures, pull boxes, field control panels and control panels associated with the loop checks, so they

are free of dirt, debris, and foreign materials and verify all wireway covers and panel doors are properly installed and secure.

5. Industrial Control System (ICS) Network:

   a. CONTRACTOR shall not utilize the ICS network to perform loop checks. Computer and non-Project equipment connections to the ICS network are only allowed by OC SAN.

   b. Complete the installation of all equipment, fiber optics, and cabling associated with the ICS network, including fiber optic and cabling to the RIO panels. The CONTRACTOR shall complete the testing of all fiber and copper cabling, submit test reports, and obtain the ENGINEER's acceptance. All Work within the ICS network rooms shall be complete where the ICS network equipment is installed in perforated enclosures. The HVAC system shall be complete and operational. Temporary power or permanent power shall be provided for the ICS network and control system equipment for configuration and testing.

   c. Once all ICS network activities are complete, the CONTRACTOR shall notify the ENGINEER and shall provide OC SAN a minimum of **[three (3)] [six (6)] [twelve (12)]** weeks to perform the ICS network configuration and testing.

   d. After the ICS network configuration and testing are complete, the ENGINEER will notify the CONTRACTOR in writing.

   e. CONTRACTOR shall not begin commissioning for a commissioning package until the ICS network associated with the commissioning package is complete. The CONTRACTOR shall coordinate the required level of completion and connection of the ICS network with the ENGINEER. Only control system equipment that is ready for commissioning will be connected to the ICS network.

   f. CONTRACTOR may request to have OC SAN perform the ICS network configuration and testing during Pre-ORT to utilize permanent power for the ICS network and control system equipment, provided OC SAN is given the required time to configure and test the ICS network and the control system equipment required to perform the ORT and FAT procedures for electrical equipment energization is provided with temporary power until permanent power is available.

6. Unwitnessed Loop Check:

   a. CONTRACTOR shall use accepted loop drawings to perform unwitnessed loop checks.

   b. Unwitnessed loop checks shall not begin until the following Work is complete for the associated commissioning package:

      (1) All equipment, instrumentation, and accessories are properly labeled and installed.

      (2) All instruments are calibrated.

      (3) All field and panel wiring associated with a commissioning package is complete, including all wiring to the associated RIO panels.

c. Perform an unwitnessed loop check, testing the continuity of all control and signal circuits shown on the accepted loop drawings for the RIO panel, including all associated motor starter, equipment, control panel, and field wiring. The loop check shall confirm and document the complete loop wiring, including I/O to/from PLC register (excluding the application software) is ready for operation. The CONTRACTOR shall use the PLC programming software to check all inputs and outputs to and from the temporary PLC at the RIO.

d. Highlight each successfully tested conductor using a “yellow” highlighter. Once the loop check is complete for each loop drawing, the CONTRACTOR shall initial the loop drawing indicating the unwitnessed loop check, wire terminations and tags are correct and shall sign off the unwitnessed verification columns in the Wire Tag/Loop Check Tracking Spreadsheet.

e. OC SAN will provide a maximum of two (2) temporary PLCs for the Project. The CONTRACTOR shall provide OC SAN one (1) day to set up and configure a temporary PLC at each location it is provided.

f. All redline changes to the loop drawings identified during the unwitnessed loop check shall be documented. The field loop drawings shall be field reviewed and accepted by the ENGINEERENGINEER’s prior to performing the associated wire termination/tag check and witnessed loop check.

g. Signals shall be tested per signal type as described in Tables 2a though 2g. If one of these tables does not apply to a circuit, the CONTRACTOR shall request an acceptable testing method from the ENGINEER. Loop checks shall be performed by RIO panel, and all terminations and labeling shall be complete to this panel on both the field and panel side before commencing with the activity.

h. All loop signals shall be tested from the field sensing element, device contract or signal generating device (PLC output module) to the final receiving device (indicator, variable frequency drive, starter, etc.) or PLC input module through all devices in the loop for accuracy and performance.

7. Wire Termination and Tag Check:

a. All equipment, instrumentation, and accessories are properly tagged.

b. ENGINEER will use the accepted redlined loop drawings provided after the unwitnessed loop check to perform the wire termination and tag check.

c. This activity is a joint effort between the CONTRACTOR and the ENGINEER and shall take place between the unwitnessed loop check and the witnessed loop check. The CONTRACTOR shall work with the ENGINEER to verify that redlined as-built loop drawing wire terminations and tags match those in the field, RIO, PLC and electrical equipment. The CONTRACTOR shall assist the ENGINEER throughout the duration of the wire tag check, which includes opening motor starters, control panels, electrical equipment, panels, valves, equipment, instruments, devices, terminal junction boxes, junction boxes, etc. as requested by the ENGINEER to verify wire terminations and tags in accordance with the loop drawings.

d. The ENGINEER will highlight each complete conductor termination and wire tag during the wire termination and tag check using a “blue” highlighter. Once verified as complete and accurate, the ENGINEER will initial the loop drawing indicating the wire terminations and tags are correct and will sign off the wire tag verification columns in the Wire Tag/Loop Check Tracking Spreadsheet.

e. Any deficiencies noted at this stage shall be recorded by the ENGINEER as punch-list items. Each punch-list item shall be assigned a priority such as pre-witnessed loop check, pre-ORT, pre-FAT, pre-RAT, and post-RAT. Punch-list items identified as pre-witnessed loop check shall be completed by the CONTRACTOR and verified by the ENGINEER prior to witnessed loop checks.

f. The CONTRACTOR shall not proceed to witnessed loop check until the wire tag check activity is complete and acceptable to the ENGINEER and all pre-witnessed loop check punch list items are complete.

8. Witnessed Loop Check:

a. Provide temporary 120VAC power, if required, to loop check all conductors.

b. Use the PLC programming software to check all inputs and outputs to and from the PLC.

c. OC SAN will provide a maximum of two (2) temporary PLCs for the Project. The CONTRACTOR shall provide OC SAN one (1) day to set up and configure a temporary PLC.

d. Perform a witnessed loop check using the same procedures as the unwitnessed loop check, but witnessed by the ENGINEER to demonstrate proper operation. All redline changes to the loop drawings identified during the witnessed loop check shall be documented and submitted for ENGINEER’s acceptance prior to moving to ORT.

e. ENGINEER will highlight each successfully tested conductor using a “blue” highlighter. Once the loop check is complete for each loop drawing, the CONTRACTOR shall initial the loop drawing indicating the loop check is correct and shall sign off the witnessed verification columns in the Wire Tag/Loop Check Tracking Spreadsheet.

f. All wiring changes or modifications to equipment, RIO panels, electrical equipment, instruments, devices, etc., after any witnessed loop checks have been completed, shall be witnessed by the ENGINEER to verify none of the previously tested wiring is disturbed.

g. PLC and RIO control panels associated with the commissioning package shall be locked at the end of each day and when loop checks are not being performed. Panels shall remain locked using CONTRACTOR and ENGINEER locks from loop checks through RAT. Any field modifications to the control panels shall be agreed upon by the CONTRACTOR and ENGINEER.

TABLE 2a LOOP CHECK TESTING - DISCRETE INPUT (NORMALLY OPEN)

Index	Action	Verification
1	Do one of the following:	Verify the input is ON using a laptop networked to the PLC.

	Trigger a close field switch/contact from the device Place a temporary jumper between the terminals	
2	Do one of the following: Trigger an open field switch/contact from the device Remove temporary jumper	Verify the input is OFF using a laptop networked to the PLC.

TABLE 2b LOOP CHECK TESTING - DISCRETE INPUT (NORMALLY CLOSED)

Index	Action	Verification
1	Do one of the following: Trigger an open field switch/contact from the device Disconnect one of the wires at the field device to open the circuit	Verify the input is OFF using a laptop networked to the PLC.
2	Do one of the following: Trigger a closed field switch/contact from the device Reconnect the disconnected wire	Verify the input is ON using a laptop networked to the PLC.

TABLE 2c LOOP CHECK TESTING - DISCRETE OUTPUT

Index	Action	Verification
1	Force the output ON using a laptop networked to the PLC.	Do one of the following: Verify the field device receives the output responding to a closed circuit (i.e., relay closes, solenoid closes, etc.) Wire field leads to a multimeter and verify continuity
2	Force the output OFF using a laptop networked to the PLC.	Do one of the following: Verify the field device loses the output responding to an open circuit (i.e., relay opens, solenoid opens, etc.) Wire field leads to a multi meter and verify that there is no continuity

TABLE 2d LOOP CHECK TESTING - DISCRETE INTERCONNECT (NORMALLY OPEN)

Index	Action	Verification
1	Do one of the following: Trigger a closed field switch/contact from the device	Do one of the following: Verify device/panel/equipment/motor starter receives the signal indicating a closed circuit

	Place a temporary jumper between the terminals	Wire field leads to a multimeter and verify continuity
2	Do one of the following: Trigger an open field switch/contact from the device Remove temporary jumper	Do one of the following: Verify device/panel/equipment/motor starter receives the signal indicating an open circuit Wire field leads to a multimeter and verify that there is no continuity

TABLE 2e LOOP CHECK TESTING - DISCRETE INTERCONNECT (NORMALLY CLOSED)

Index	Action	Verification
1	Do one of the following: Trigger an open field switch/contact from the device Remove one of the wires to open the circuit	Do one of the following: Verify device/panel/equipment/motor starter receives the signal indicating an open circuit Wire field leads to a multimeter and verify that there is no continuity
2	Do one of the following: Trigger a closed field switch/contact from the device Reconnect the disconnected wire	Do one of the following: Verify device/panel/equipment/motor starter receives the signal indicating a closed circuit Wire field leads to a multimeter and verify continuity

TABLE 2f LOOP CHECK TESTING - ANALOG INPUT

Index	Action	Verification
1	Do one of the following after confirming correct source for field device (loop or external power): Use the field device to simulate a 50% signal (12.000 mA). Record the value of the signal in mA to three decimal places on the witness loop check form. Connect wires to a transmitter simulator to simulate 50% signal (12.000 mA). Record the value of the signal in mA to three decimal places on the witness loop check form.	Verify 2048 counts at the appropriate input using a laptop networked to the PLC. Confirm that the value for the individual channel is not greater than 2051 counts and not less than 2045 counts. Note any values that fall outside of this range. Confirm that the signal is steady (no noise).

TABLE 2g LOOP CHECK TESTING - ANALOG OUTPUT

Index	Action	Verification
1	Force the output to 50% or 2048 counts using a laptop networked to the PLC.	Do one of the following: Verify field device response is at 50% of scale. Wire field leads to a multi meter. Confirm that the value is not greater than 12.032 mA or less than 11.968 mA. Note any values that fall outside of this range. Confirm that the signal is steady (no noise).
2	Remove simulation.	Do one of the following: Verify field device response is 0% of scale. Wire field leads to a multi meter and verify that the value is not less than -.032 mA and not greater than .032 mA. Note any values that fall outside of this range. Confirm that the signal is steady (no noise).

D. Electrical Equipment Preparation for Energization:

1. Check for proper equipment installation and grounding.

2. Check all electrical connections are properly tagged and torqued.

3. Verify electrical equipment has been properly tested.

E. A post-witnessed loop check inspection shall be performed by the ENGINEER.

F. CONTRACTOR shall not proceed to Phase 1 electrical equipment energization until the witnessed loop check activities are complete and acceptable to the ENGINEER and all pre-electrical equipment energization punch list items are complete.

G. Once all pre-commissioning activities are complete for a commissioning package and the required submittals, including all items identified under pre-commissioning in Table 1a and the Pre-Commissioning Gate Report, are acceptable to the ENGINEER, the CONTRACTOR shall request to begin commissioning Phase 1 for the associated commissioning package and shall request permission to energize the electrical equipment associated with the commissioning package. If the ENGINEER agrees that the CONTRACTOR has successfully completed all pre-commissioning requirements, the ENGINEER will notify the CONTRACTOR in writing that the CONTRACTOR may begin Phase 1 commissioning for the commissioning package and will provide permission to energize.

3.4 COMMISSIONING – PHASE 1, ELECTRICAL EQUIPMENT ENERGIZATION

A. All Pre-Electrical Equipment Energization activities for a commissioning package shall be completed before the CONTRACTOR is permitted to begin commissioning Phase 1 for that commissioning package.

B. Obtain the ENGINEER's written authorization to energize each piece of electrical equipment for the first time.

C. Electrical ORT/FAT Activities

1. Electrical ORTs shall be performed for all electrical equipment in accordance with Part 3, Article entitled "Commissioning – Phase 3, ORT Activities" below, after completion of pre-commissioning activities, NETA testing and after receipt of vendor certificate of proper installation.

2. Electrical FATs shall be performed for all electrical switchgear systems, generators, uninterruptible power supplies (UPS), battery charging systems, and automatic transfer switches in accordance with Article entitled "Commissioning – Phase 3, FAT Activities" below. This test shall check, demonstrate, and document that all local manual, remote and automatic interlocks, switching scenarios, I/O and controls are functional and meet the specified requirements. Any temporary power for testing of breakers, switchgear and battery charger system (125 V dc), if required, shall be provided by the CONTRACTOR. This test will be witnessed by the ENGINEER. Qualified CONTRACTOR and vendor personnel capable of operating and troubleshooting electrical equipment shall be available during this test. Test shall be directed by the CONTRACTOR's Commissioning Coordinator.

3. ORTs and FATs for motor control centers and variable frequency drives shall be performed during commissioning Phases 3. The Pre-Commissioning activities and Phase 1 Electrical Equipment Energization shall ensure that the electrical equipment is safe, functional, and ready for energization and use during commissioning Phases 2, 3 and 4.

D. Electrical Equipment Energization

1. The electrical equipment energization process shall be performed in accordance with manufacturer procedures.

2. Check power supply for correct voltage and rotation.

3. Check for correct connections, operation, and performance of electrical power distribution equipment such as switchgear, motor control centers, uninterruptible power system, and dc system specified in Specifications Section 16080, Electrical Testing, and elsewhere in Division 16.

4. 12kV and 480V switchgear shall be energized after their associated ORTs and FATs are complete.

5. Post-energization testing shall be performed as described in the other Specifications sections. CONTRACTOR shall use the list developed as specified in Part 1, Article entitled "" Record Keeping System and Tracking Tools" of this section.

6. Electrical RAT shall be performed during the facility RAT.

E. Vendor training of electrical equipment for OC SAN personnel shall be completed prior to the completion of the associated commissioning package FAT.

F. A post-Phase 1 commissioning inspection shall be performed by the ENGINEER.

G. CONTRACTOR shall not proceed to Phase 2 commissioning until the electrical equipment energization activities are complete and acceptable to the ENGINEER and all pre-Phase 2 commissioning punch list items are complete.

H. Once all Phase 1 commissioning activities are complete for a commissioning package and the required submittals, including all items identified under commissioning in Table 1b and the Commissioning Phase 1 Gate Report, are acceptable to the ENGINEER, the CONTRACTOR may request to begin Phase 2 commissioning for the associated commissioning package. If the ENGINEER agrees that the CONTRACTOR has successfully completed all commissioning Phase 1 requirements, the ENGINEER will notify the CONTRACTOR in writing that the CONTRACTOR may begin Phase 2 commissioning for the commissioning package.

3.5 COMMISSIONING – PHASE 2, PRE-ORT ACTIVITIES

A. All pre-ORT activities for a commissioning package shall be completed before the CONTRACTOR is permitted to begin commissioning Phase 3 for that commissioning package.

B. Cleaning and Checking: Prior to testing of all equipment:

1. Inspect and clean all process and mechanical equipment, devices, and connected piping associated with the commissioning package, so they are free of dirt, debris, and foreign material.

2. Clean the area associated with the commissioning package.

C. Equipment Preparation for Testing and Operation

1. Lubricate equipment in accordance with manufacturer’s instructions.

2. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.

3. Check power supply to electric-powered equipment for correct voltage and phase rotation.

4. Check for proper equipment alignment.

5. Verify piping systems and associated appurtenances are complete and piping systems are pressure tested.

6. Verify pipe supports are complete.

7. Verify proper anchorage and grounding of equipment.

D. Pre-ORT Activities:

1. Perform tests recommended by the manufacturer’s field service representatives and/or as required by manufacturer's catalogs or specifications.

2. Test gates and valves under dry conditions using manual controls. Operate between end of travel limits and verify stop position. Repeat operation and adjust as necessary. Verify proper programming and operation of actuator signals to the PLC

(e.g., alarm contact configuration, operation on power fail, etc.). Place gates and valves in their normal position.

3. Bump all motor-driven devices and equipment in the manual/local mode, independent of the PLC system, to verify proper operation and motor rotation.

4. Operate pump and motor systems (e.g., motor cooling, seal water, lubrication, etc.) to verify proper operation.

5. Operate manual gates and valves to verify they properly open and close with no binding.

6. Operate all mechanical systems to verify proper operation:

   a. Plumbing and drainage systems

   b. Ventilation systems

   c. Plant water, industrial water, City water and plant air systems.

7. Check and operate pipeline accessories such as air valves and blow-off valves.

8. Verify electrical operation of auxiliaries including:

   a. Solenoids

   b. Manual valve limit switches

9. Vendor equipment pre-check testing and instrumentation calibration.

E. A post-Phase 2 commissioning inspection shall be performed by the ENGINEER.

F. CONTRACTOR shall not proceed to Phase 3 commissioning until the Phase 2 commissioning activities are complete and acceptable to the ENGINEER and all Pre-Phase 3 commissioning punch list items are complete.

G. Once all Phase 2 commissioning activities are complete for a commissioning package and the required submittals, including all items identified under commissioning in Table 1b and the Commissioning Phase 2 Gate Report, are acceptable to the ENGINEER, the CONTRACTOR may request to begin Phase 3 commissioning for the associated commissioning package. If the ENGINEER agrees that the CONTRACTOR has successfully completed all commissioning Phase 2 requirements, the ENGINEER will notify the CONTRACTOR in writing that the CONTRACTOR may begin Phase 3 commissioning for the commissioning package.

3.6 COMMISSIONING – PHASE 3, ORT ACTIVITIES

A. The ORT shall test and document that all equipment and associated systems properly operate in LOCAL, HAND and REMOTE MANUAL modes of operation using the developed test procedures.

B. ORT tests shall be directed by the Commissioning Team Leader to determine that all equipment, systems and subsystems are properly manufactured, installed, adjusted, and functioning as specified.

C. The ORT is a combined effort between ENGINEER and the CONTRACTOR. This is a complete check of instrumentation, wiring, hardware, and software without water or any other process fluid.

D. Notify the ENGINEER fourteen (14) days in advance of the need to have OC SAN operate existing equipment that is part of an active treatment process (e.g., testing the replacement of an existing motor starter, an existing pump, or operation of existing valves or equipment).

E. Troubleshoot all field, panel wiring, device, instrument and equipment problems.

F. All equipment shown connected to the control system and integrated as part of the system in accordance with the Contract Documents, whether or not supplied and/or installed by the CONTRACTOR, shall be tested as part of the ORT procedures. The CONTRACTOR shall notify the ENGINEER in writing if equipment tested, but not supplied by the CONTRACTOR, is faulty.

G. CONTRACTOR shall not perform a partial ORT on a commissioning package. All equipment within a commissioning package shall undergo ORT together without any significant delay in subsequent testing unless approved by the ENGINEER.

H. CONTRACTOR shall not perform an ORT on a RIO panel until all panel and field wiring is complete and all devices and equipment associated with that RIO panel have gone through pre-commissioning, including instrument calibration and witnessed loop checks.

I. Software:

1. This is a combined test involving the hardware and the software. The combined software/hardware system is tested from this point forward. OC SAN will load their developed human machine interface (HMI) graphics and PLC programs prior to the test. CONTRACTOR shall provide OC SAN one (1) day to download the HMI and PLC programs. The CONTRACTOR shall provide the ENGINEER time to test and troubleshoot their program during ORT. Testing shall utilize the installed project PLC.

2. Load any of their PLC programs at this time and shall be responsible for all troubleshooting, modifications and corrections associated with their software program. The ENGINEER will assist with the testing of the CONTRACTOR's program and shall be notified of all changes being made to the programs. All changes shall be well documented and submitted to the ENGINEER.

J. ORT Execution:

1. The Commissioning Team Leader shall conduct a pre-test, walk-through/field meeting and pre-startup checklist with the ENGINEER prior to performing an ORT for each commissioning package to verify all valving, gates, disconnect switches and selector switches are in the proper position for testing.

2. Energize all equipment that is part of the test.

3. The Commissioning Team shall follow the accepted ORT procedures.

4. If a test step is successful, the step shall be signed by the CONTRACTOR and the ENGINEER.

5. If a test step fails, the Commissioning Team (ENGINEER and/or CONTRACTOR) shall be allowed ten (10) minutes to troubleshoot the item. If the troubleshooting period exceeds ten (10) minutes, the Commissioning Team shall clearly document the failure on the ORT procedure and move on to the next available independent test step.

6. Once all tests in a procedure are complete, the CONTRACTOR shall investigate the failures, make repairs, and notify the ENGINEER how the repairs were performed. Tests shall be repeated on all failed tests and previously completed tests that were impacted by the troubleshooting or repair activity, as decided by ENGINEER.

7. Testing shall continue until all tests are signed by the CONTRACTOR and ENGINEER as successful.

8. Test discrete and analog instrumentation from the field device to I/O or other destination by simulation. Analog instrument signals must be tested at 0%, 25%, 50%, 75% and 100%. CONTRACTOR shall simulate each instrument using the methods described in TABLE 3. If instrument type is not listed here, the CONTRACTOR shall use a method approved by the ENGINEER. The CONTRACTOR shall not use a multimeter or the transmitter to simulate a signal unless given permission by the ENGINEER or it is permitted in TABLE 3.

TABLE 3 - Instrument Simulation for Loop Check / ORT

Instrument Type	Simulation Action
Level	Simulate from Transmitter
Flow	Simulate from Transmitter
Pressure	Hand Pump
Temperature	Water/oil Bath
Gas (i.e., LEL, CO, H2S, etc.)	Calibration Gas – Single Point
Ph	Calibration Solution
Chlorine	Calibration Solution
Weight	Test Load
ORP	Calibration Solution
Sludge Density	Known Sample
Vibration	Simulation Equipment (Shaker or Wobbulator)
Motor Winding/Bearing Temperature	Verify ambient, Compare to Adjacent
Electrical Parameters (Voltage, Current, etc.)	Test Power Source
Motor High Temperature Switch	Disconnect the field wire at the motor
Limit switch	Operate valve (manual valve) Operate limit switch (check valve)

9. Test of all hardwired controlled functions including interconnects, hand stations, and pilot devices.

10. Test motorized, solenoid or pneumatic operated equipment local and remote manual modes to verify that the operator can start and stop the equipment locally and view its status using local pilot lights and the PLC/HMI.

11. Test each interlock for each piece of equipment in the commissioning package(s) while the equipment is running in HAND and REMOTE MANUAL to verify that it shuts off and indication is received. For interlock checkout the following applies:

a. If the equipment requires water to run the CONTRACTOR shall test it uncoupled if it is motor driven.

b. If the equipment requires water to run but cannot be uncoupled or mechanically manipulated to operate without water, interlock testing can be performed with the power disconnected or in FAT with approval by the ENGINEER.

12. In addition to the tests described herein, OC SAN reserves the right to request additional testing and retesting of equipment.

13. ORT inspection by the ENGINEER has been performed and all punch list items that are prioritized as pre-FAT are complete.

K. A post-ORT commissioning inspection shall be performed by the ENGINEER.

L. The CONTRACTOR shall not proceed to Phase 3 FAT commissioning until the Phase 3 ORT commissioning activities are complete and acceptable to the ENGINEER and all Pre-FAT commissioning punch list items are complete.

3.7 COMMISSIONING – PHASE 3, PRE-FAT AND FAT ACTIVITIES

A. The pre-FAT shall test that equipment and instruments properly operate with water.

B. The FAT shall test and document that all equipment and systems are properly operated and controlled in the REMOTE AUTOMATIC mode of operation by the PLC and human machine interface (HMI) software and the AUTOMATIC mode of operation by local control panels as intended using the developed test procedures. This test is accomplished with the system on-line under normal operating conditions. Equipment will operate under load with water when possible or the designed process (non-water process) (e.g., air, gas, etc.).

C. Pre-FAT and FAT shall be directed by the Commissioning Team Leader and performed as specified herein.

D. The pre-FAT and FAT is a combined effort between the ENGINEER and the CONTRACTOR.

E. The CONTRACTOR shall furnish and install all required testing piping and appurtenances to verify pump and system performance and operation over the full operating range. All testing piping and appurtenances shall be removed at the completion of FAT testing.

F. The CONTRACTOR shall notify the ENGINEER fourteen (14) days in advance of the need to have OC SAN operate existing equipment that is part of an active treatment process (e.g., testing the replacement of an existing motor starter, an existing pump, or operation of existing valves or equipment).

G. The CONTRACTOR shall troubleshoot all field, panel wiring, device, instrument and equipment problems.

H. Software:

1. Provide the ENGINEER time to test and troubleshoot their program during pre-FAT and FAT and shall provide the ENGINEER time to tune each process control loop and each process control system the optimize the operation.

2. Use the permanent PLC to perform the pre-FAT and FAT procedures.

3. CONTRACTOR shall be responsible for all troubleshooting, modifications and corrections associated with their software program. The ENGINEER will support the testing of the CONTRACTOR's program and shall be notified of all changes being made to the programs. All changes shall be well documented and submitted to the ENGINEER.

I. Pre-FAT and FAT Execution:

1. Conduct a pre-test, walk-through/field meeting and pre-startup checklist with the ENGINEER prior to performing a pre-FAT and FAT for each commissioning package to verify all valving, gates, disconnect switches and selector switches are in the proper position for testing all valving, gates, disconnect switches and selector switches are in the proper position for testing to prevent a wastewater spill.

2. Disinfect any non-potable water that will remain in a tank for a period longer than twenty-four (24) hours to prevent it from going septic.

3. The Commissioning Team shall follow the accepted pre-FAT and FAT procedures.

4. If a test step is successful, the step shall be signed by the CONTRACTOR and the ENGINEER.

5. If a test step fails, the Commissioning Team (ENGINEER and/or CONTRACTOR) shall be allowed ten (10) minutes to troubleshoot the item. If the troubleshooting period exceeds ten (10) minutes, the Commissioning Team shall clearly document the failure on the Pre-FAT and FAT procedure and move on to the next available test step.

6. Once all tests in a procedure are complete, the CONTRACTOR shall investigate the failures, make repairs, and notify the ENGINEER how the repairs were performed. Tests shall be repeated on all failed tests and previously completed tests that were impacted by the troubleshooting or repair activity, as decided by ENGINEER.

7. Testing shall continue until all tests are signed by the CONTRACTOR and ENGINEER as successful.

J. In addition to the tests described herein, OC SAN reserves the right to request additional testing and retesting of equipment.

K. A post-FAT commissioning inspection shall be performed by the ENGINEER.

L. CONTRACTOR shall not proceed to Phase 4 commissioning until the Phase 3 commissioning activities are complete and acceptable to the ENGINEER and all Pre-RAT commissioning punch list items are complete.

M. Once all Phase 3 commissioning activities are complete for a commissioning package and the required submittals, including all items identified under commissioning in Table 1b and the Commissioning Phase 3 Gate Report, are acceptable to the ENGINEER, the CONTRACTOR may request to begin Phase 4 commissioning for the associated

commissioning package. If the ENGINEER agrees that the CONTRACTOR has successfully completed all commissioning Phase 3 requirements, the ENGINEER will notify the CONTRACTOR in writing that the CONTRACTOR may begin Phase 4 commissioning for the commissioning package.

3.8 COMMISSIONING - PHASE 4, RAT ACTIVITIES

A. The Reliability Acceptance Test (RAT) is designed to functionally test the facility as an integrated system under normal operating conditions using wastewater, foul air, or other process fluid or gas.

B. Reliability Acceptance Test: This test shall be directed by OC SAN personnel. Equipment shall be operated only by OC SAN personnel with support from the CONTRACTOR when requested. The purpose of this test is to demonstrate that all systems operate continuously in the intended manner for an extended period without failing. During the RAT, the system under test will be operated within design parameters reflecting the day-to-day operation of the facilities for an uninterrupted period. The RAT will be considered complete, in the opinion of ENGINEER, when the entire Project or specified portion thereof has operated properly for **[seven (7)] continuous days]** without significant interruption. Any failure of a process equipment unit (mechanical, electrical, instruments, etc.) shall extend the RAT for ten (10) hours to confirm it is not a significant interruption.

1. “Significant interruption” during the Reliability Acceptance Test may include any of the following events:

   a. Failure of a system (process, control, etc.) that is not permanently corrected within six (6) hours after such failure occurs.

   b. Failure of a process equipment unit (mechanical, electrical, instruments, etc.) that is not permanently corrected within eight (8) hours after such failure occurs.

2. “Permanently corrected” means without a repeat failure during the remaining duration of Phase 4 and shall consist of the following:

   a. Work repaired and replaced to conform with specified requirements

   b. Parts and components replaced as recommended by original manufacturer without impacting the warranty, and conforming with reviewed submittals

   c. Piping and valves properly installed and connected

   d. Wiring properly terminated

   e. Accessories, including spare parts and lubricants, furnished as specified

   f. The facility is back online and operating within normal operating parameters.

3. Occurrence of a significant interruption shall require RAT to be stopped and restarted at time equals zero (begin at Day 1 again) after permanent corrections are made.

C. Upon completion of the RAT, the CONTRACTOR shall conduct a field meeting with the ENGINEER and operations staff, if the system is to be shut down or taken out of

services, to verify that all valves, bleed-off valves, etc. are in the proper position to prevent a wastewater spill when the system is placed back into service.

D. A post-RAT commissioning inspection shall be performed by the ENGINEER.

E. After successful completion of the RAT and acceptance of all Manufacturers' Certificates of Proper Operation and the Commissioning Phase 4 Gate Report by the ENGINEER, the CONTRACTOR may request that the facility is Substantially Complete (refer to the General Conditions).

F. Final Completion is achieved by the CONTRACTOR and certified by the ENGINEER when all final documents and activities as described in Table 1b are complete and accepted by the ENGINEER (refer to the General Conditions).

G. Continuous Operation

1. After successful Reliability Acceptance Test of a specific equipment or system, OC SAN may elect to operate a portion of the equipment or system for continuous operation. Such operation will not interfere with testing of other equipment and systems that may still be underway and shall not preclude the need to start up the portion operated in combination with the rest of the facility when all testing is completed.

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ATTACHMENT A1

RULES OF ENGAGEMENT

This document describes options for OC San to utilize a Programming Professional Services (PPS) agreement to maintain the Engineering Project program while complying with Independent Contractor expectations.

There are two mechanisms by which professional services can be supplied through the PPS agreement:

- Task Authorizations
- Task Directives

Task Directives assignments require that anyone working under the mechanism also have an approved Personnel Authorization.

These Terms of Engagement are intended to document how services are to be requested, authorized, and managed.

Task Authorizations

Task Authorizations have a formal scope of work, and a fixed upper limit. Distinguishing aspects of Task Authorizations include the following:

- Requests for Task Authorization Proposals (RFTAPs) require a scope of work prepared by OC San staff.
- RFTAPs and Task Authorizations must be approved by the Director of Engineering (DOE).
- The scope of work should have the same level of detail as used for a Design Task Order or Planning Study Task Order, including schedule requirements, task, deliverables, and assumptions.
- Task Authorization must specify a firm negotiated upper limit which may not be exceeded. If changes require a revision to that upper limit, it must be processed as a formal Task Authorization Amendment prior to the work being authorized and performed.
- The PPS Consultant shall report costs incurred for the Task Authorization in their monthly invoices, with the total costs incurred to date, and the unused budget remaining.
- The PPS Consultant may use any of their staff, whether they have an approved Personnel Authorization or not.
- The time that PPS Consultant staff charge to Task Authorizations does not count against their approved number of hours for Personnel Authorizations.

Task Directive

Task Directives also have an explicit scope of work, but the level of detail may be lower. Task Directives need a negotiated budgetary estimate, but it is not a firm upper limit.

- The scope of work for Task Directives may be less detailed than what is required for a Task Authorization.
- A schedule to complete the work should generally be specified but is not always required.
- Costs are tracked separately on invoices.

- Personnel Authorizations are required for any staff working on a Task Directive.

Personnel Authorizations

Personnel authorizations (PA's) provide the DOE's approval for a particular individual to work on Task Directives. They also designate the following:

- The Project Role
- Their location as either Home Office or Site. This impacts the overhead rate to be used for billing.
- The number of hours per week, or just a set number of hours as needed.
- The total bill rate, including actual salary, overhead, and profit.
- Any reimbursable expenses. This is typically used when travel is required or when a staff member needs a vehicle assigned to them due to the nature of their assignments.

The following apply to Personnel Authorization:

- They require approval by the DOE.
- They are specific to one person.
- They need not be project specific.
- For on-site PA's, the PA authorizes key cards.

Staff Supervision

The PPS Consultant is responsible for supervision of its entire staff, including the following:

- Administrative Supervision (PPS Consultant staff only)
    - Performance Reviews
    - Timecard Approvals
    - Work Hours
- Supervision of Assigned Scope Deliverables
    - Work Prioritization
    - Technical input, guidance, and direction
- Quality Control for
    - Task Authorizations
    - Task Directives, when Quality Control is specified in the scope of work

OC San will not be responsible for supervision of PPS Consultant staff. OC San will however provide direction as an Owner. Examples include the following:

- Project decisions and priorities
- Design standards
- OC San's preferences
- Financial considerations
- Risk considerations
- Review for compliance with OC San Policies and Procedures
- Coordination with other OC San projects and activities