

OHIO ENVIRONMENTAL PROTECTION AGENCY
DRINKING WATER STATE REVOLVING FUND (DWSRF)
AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (ARRA)
GREEN PROJECT INFORMATION

FFY 2009 ARRA GREEN PROJECT INFORMATION FORM

The Federal American Recovery and Reinvestment Act of 2009 (ARRA) requires a minimum amount of funding be used toward Green Infrastructure, Energy Efficiency, Water Efficiency, or other Environmentally Innovative activity. To ensure that this requirement is met, Ohio EPA is requiring ARRA recipients to provide additional information about potential green components of their project(s).

In many instances, a Business Case is required for justification to consider an item or activity "green". The US Environmental Protection Agency (EPA) has provided guidance for help in evaluating the green elements of a project. Please complete this cover sheet and appropriate page(s), as noted below for each project that will incorporate a "green" component(s). More guidance is provided on the back of each form.

PWS Name: Cleveland PWSID: 1800311

Project Name: Baldwin Residuals & Fairmount Reservoir PPL #: 75
(as assigned by OEPA-- refer to project list on web)

Total Estimated Project Cost: \$14,000,000 Total Est. Green Amount: \$ 3,011,500

Type of "Green" Element(s) included in this project. For each box that is checked the corresponding page of this form must be completed and submitted with this cover page. Attach additional pages as necessary:

- Green Infrastructure (porous pavement, bioretention, trees, green roofs, and other practices that mimic natural hydrology and reduce effective imperviousness)
- Energy Efficiency (energy audit, water pump system improvements or replacements, variable frequency drives, SCADA, on-site clean power, solids treatment or handling, replacement or rehabilitation of distribution lines)
- Water Efficiency (water meter installation or replacement, leak detection equipment, water line replacement, water audit, water efficient fixtures)
- Other Environmentally Innovative Activity

Completed by:

Name: Karen M. Lisowski Title: Consulting Engineer
(please print)

Signature: Karen M. Lisowski Date: 10.16.09

For OEPA use only:

Project #: FS 390560-01 DWSRF #: PPL #75

OHIO ENVIRONMENTAL PROTECTION AGENCY
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 GREEN PROJECT INFORMATION

Energy Efficiency (energy audit, leak detection equipment, water pump system improvements or replacements, variable frequency drives, on-site clean power for treatment systems, replacement or rehabilitation of distribution lines)

PWS Name: Cleveland PWSID: 1800311

Project Name: Baldwin Residuals & Fairmount Reservoir PPL #: 75

Total Est. Project Cost: \$14,000,000 Total Est. Green Reserve Amount: \$498,500

Project Summary:

This project will update the 25 year old pumps and motors with high-efficiency pumps and motors with variable frequency drives. The existing HVAC systems will also be replaced with water cooled air conditioning units.

Pump Facilities

Age of existing pumps or pumping facilities?	25 years old
Existing pump/motor efficiency rating, if known?	
New pump/motor efficiency rating.	NEMA Class High Efficiency Motors with VFDs
Estimated Annual Electrical Savings	\$8,000
Estimated Annual Costs Savings	

Business Case Narrative: (Calculate Energy Efficiency Improvements and costs savings)

See attached Energy Efficiency Business Cases.

Attach Supporting Documentation:

See Attached Business Cases – “Energy Efficiency – Variable Frequency Drives” and “Energy Efficiency – HVAC Equipment Selection”

ENERGY EFFICIENCY - VARIABLE FREQUENCY DRIVES

SUMMARY

- The Baldwin Residuals Fairmount Reservoir Project will rehabilitate 25 year old pumps with new high efficiency pumps and variable frequency drives to optimize energy efficiency across a wide range of operational conditions.
- Loan Amount - \$14,000,000
- Energy Efficiency (Variable Frequency Drives) portion of loan – \$277,000

BACKGROUND

- The Residuals Handling Facilities at Baldwin are 25 years old. The pumping systems include Backwash Sludge Transfer (3 pumps), Sludge Recirculation (3 pumps) and Sludge Discharge (4 pumps).
- Each existing pump is single speed. Some pumps have had impellers trimmed to meet actual (versus designed) flow conditions. This reduces the efficiency of the pumps and motors.

RESULTS

- New high-efficiency pumps and motors were selected to better meet the flow requirements of the processes. Variable Frequency drives will be installed to provide additional improvements to operational flexibility.
- Variable Frequency Drives (VSD) were installed with the following pumping systems:
 - Backwash Sludge Transfer (3 VSDs)
 - Sludge Recirculation (3 VSDs)
 - Sludge Discharge (4 VSDs)
 - Each VSD installed as part of the B-RFR includes:
 - Training for the utility's staff which operates this equipment.
 - Integration of current limiting and auto restart features.
 - Intuitive controls.

BENEFITS

- The use of variable frequency drives will permit the operations staff to better match pumping to the needed flow conditions, reducing energy usage and unnecessary cycling of equipment.

CONCLUSION

- The modernization of the pumping systems to utilize high-efficiency motors combined with variable frequency drives will allow flexibility for the operational staff to optimize energy efficiency while meeting daily operational demands.

Attachments: Project Specification 16921 Variable Speed Drives
Project Drawings E-14, E-27, and E-28

**SECTION 16921
VARIABLE SPEED DRIVES**

PART 1 GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install variable speed AC drives.
 - 2. Where indicated, the Variable Speed Drives shall be furnished integral to Motor Control Centers (MCCS)
- B. Coordination:
 - 1. Review installation procedures under other Sections and coordinate the installation of items that must be installed with or before variable speed AC drives.
- C. Variable speed drives are specified in this Section but are provided as part of an overall system package by the driven equipment manufacturer.
- D. Related Sections:
 - 1. Division 11
 - 2. Division 15
 - 3. Section 16480, Low Voltage Motor Control Centers

1.2 QUALITY ASSURANCE

- A. Reference Standards: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise shown or specified:
 - 1. ANSI/IEEE 519, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
 - 2. NEMA 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 3. NEMA ICS 7.1, Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems.
 - 4. UL 508, Industrial Control Equipment.
- B. General
 - 1. Each variable speed drive shall be totally compatible with the driven equipment and motors. The variable speed drives shall be matched to the specific load requirements for each system. Operation of the variable speed drive shall not overstress the motor insulation.
 - 2. In order to centralize responsibility and to ensure that all equipment is properly coordinated, the variable speed drives

VARIABLE SPEED DRIVES

specified under this section shall be obtained from the driven equipment suppliers.

3. All variable speed drives that comprise a given system shall be similarly equipped. Similar components of each system shall be products of the same manufacturer.

C. Manufacturer Qualifications:

1. Manufacturer shall have minimum five (5) years experience in designing, manufacturing and servicing equipment for installations of the size and type specified under this section. When requested by the ENGINEER, a list of installations in satisfactory operation shall be provided.
2. The variable speed drive manufacturer shall use a shop test facility that has recently calibrated testing apparatus and qualified, experienced technicians, for all shop tests. Calibrations of testing apparatus shall be within one year. When requested by the ENGINEER, a copy of calibration certificates and technician resumes shall be provided.

D. Field Tests:

1. Retain the services of the variable speed drive manufacturer for field service during commissioning and testing.

E. Variable speed drives shall meet all requirements as outlined in the 1992 edition of IEEE 519 for each individual and total harmonic voltage and current distortion and as indicated in this specification. As per Table 10.2 of IEEE 519-1992, individual or simultaneous operation of the drives shall not add more than 3 percent total harmonic voltage distortion while operating at full load and speed from the utility source.

1. The drive manufacturer is not responsible for pre-existing voltage distortion on the line or distortion from sources supplied by others. Maximum input voltage unbalance shall be 0.5 percent as defined in NEMA MG 1 section 14.35.2.
2. As per Table 10.3 of IEEE 519-1992, maximum allowable total harmonic *current* demand distortion limits for each drive operating at full load and speed shall not exceed 5 percent as calculated and measured at the point of common coupling.
3. For available short circuit current at the point of common coupling refer to the report produced under Section 16011, Short Circuit/Coordination Study.
4. The point of common coupling for all harmonic calculations and field measurements for both voltage and current distortion shall be defined as the bus to which the drive is connected.
5. A preliminary harmonic analysis must be submitted by the drive manufacturer, which includes all voltage and *current* harmonics up to the 25th.
6. Harmonic compliance shall be verified with onsite field measurements of both the voltage and current harmonic distortion

VARIABLE SPEED DRIVES

at the point of common coupling with and without the variable speed drives operating.

1.3 SUBMITTALS

- A. Comply with Section 01300, Submittals, and the additional requirements below: Submit the following for approval:
 - 1. Product Data:
 - a. Manufacturer's cut sheets, specifications, dimensions and technical data for all products proposed to be furnished under this Section.
 - b. Copies of the drive user manual shall be provided for each drive.
 - 2. Shop Drawings:
 - a. Component and unit layout drawings and wiring diagrams. Shop drawings shall include:
 - 1.) Dimensional information and construction details of enclosures. Enclosure details shall consist of exterior and interior front door with nameplate legends, interior door front and rear views and terminal block layout.
 - 2.) Three-line power and control schematic diagrams.
 - 3.) Technical specifications.
 - 4.) Catalog cuts.
 - 5.) Wiring diagrams showing the interconnection of conductors to remote devices with terminal assignments.
 - b. List of recommended repair parts, and complete parts list.
 - c. Copies of all drive characteristic curves, and computer generated data.
 - d. Certificates of compliance:
 - 1.) Submit letters from each of the respective manufacturers certifying that the variable speed drive, the driven equipment and the motor are compatible with each other and the installation and the equipment shall be provided in accordance with the requirements specified.
 - e. Copies of harmonic analysis for the installation.
- B. Quality Assurance/Control Submittal:
 - 1. Test reports: Submit inspection and test reports generated from the following:
 - a. Factory Test Report.
 - b. Equipment Factory Test Report.
 - c. Information on test equipment proposed for use in field tests.
 - d. Field Test Report.
- C. Maintenance and Operating Instructions:

VARIABLE SPEED DRIVES

1. Submit complete Operation and Maintenance manuals in accordance with Section 01730, Maintenance and Operating Instruction.

D. Instruction of Operating Personnel:

1. Comply with Section 01690, Instruction of Operating Personnel.
2. Submit information for Factory Training.
3. Submit information for On-site Training.

E. Closeout Submittals:

1. Comply with Section 01760, Project Closeout.
2. Submit Record Drawings in accordance with Section 01720, Project Record Documents.
 - a. Record drawings shall reflect as-built conditions including all field modifications after the equipment has left the factory.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:

1. Refer to Section 01610, Transportation and Handling of Materials and Equipment, and the supplementary requirements below.
2. Coordinate maximum shipping size with available room access.

B. Storage of Materials:

1. Refer to Section 01620, Storage and Protection, and the supplementary requirements below:
2. Store equipment in a clean, dry locations in which a uniform temperature is maintained. Protect equipment with coverings and maintain air circulation.
3. Where dampness or condensation may be encountered, provide heaters for equipment to prevent moisture damage.

C. Handling of Materials:

1. Refer to Section 01610, Transportation and Handling of Materials and Equipment.

1.5 OWNER'S INSTRUCTIONS

- ### A. Conduct training as specified in Section 01730, Maintenance and Operating Instruction, in the following sessions.

B. Factory Training:

1. The supplier of the drive shall provide classroom training sessions for two OWNER personnel.
2. Each training session shall be equal to Allen-Bradley 1336 Plus AC Drive Course No. CCA12, System Maintenance and Troubleshooting.

VARIABLE SPEED DRIVES

- a. Course shall consist of a minimum of three days of maintenance training by the manufacturer.
- C. On-site Instruction of designated plant electrical and instrumentation personnel:
1. Course shall cover all components and functions of each type/size variable speed drive. Maintenance, repair, adjustment, troubleshooting, and operation shall be covered in detail with "hands-on" sessions for each topic.
 2. Operator Training: Four (4) sessions total, one session per shift, two (2) hours per session.
 3. Electrical and Instrumentation Training: One (1) session, two (2) hours per session.

1.6 SPARE PARTS

- A. Provide manufacturer's recommended spare parts.
- B. In addition to the manufacturer's recommended spare parts furnish the following:
 1. Provide 1 set of fuses for each drive furnished.
 2. Provide 1 set of circuit boards for each horsepower class of drive.
 3. Provide 1 set of power devices (includes power switching modules, bus capacitors, diode bridge, and MOV or snubber assembly) for each horsepower class of drive.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cutler-Hammer.
- B. Allen Bradley.
- C. Or equal.

2.2 MANUFACTURED UNITS

- A. Controller:
 1. The variable frequency AC drive shall convert 3 phase, 60 Hertz input power to an adjustable AC frequency and voltage for controlling the speed of AC squirrel cage motors.
 2. The converter shall be of the voltage source design with a sine-coded Pulse Width Modulated (PWM) inverter section. The control voltage is to vary proportionally with the output frequency to maintain a constant Volts/Hertz value up to 60 Hz. The output voltage shall remain constant above 60 Hz.

VARIABLE SPEED DRIVES

3. The controller shall include power conversion components, power control logic device and regulator circuitry. The regulator shall provide full digital control of frequency and voltage.
 4. All components are to be mounted in a NEMA Type 1 ventilated and filtered enclosure with padlockable door or in an MCC, all as shown on the Contract Drawings. VFDs furnished as part of an MCC shall be of the same manufacture as the MCC.
 5. The drive shall have sufficient capacity to provide speed control of the motor throughout the specified operating range.
 6. The controller shall have an overload rating of 115 percent variable torque, 150 percent constant torque for one minute.
 7. RMS harmonic content of output current shall be less than 5 percent of fundamental current.
 8. The input section switching devices shall have a 1600 volt PIV rating.
- B. Main Power and Control Components:
1. Main circuit breaker.
 2. Input fusing.
 3. Input diode bridge rectifier to supply fixed DC bus voltage.
 4. Smoothing network for DC bus.
 5. Diode bridge MO protection.
 6. DC bus capacitors.
 7. Control transformer.
 8. Power semiconductor section for generation of a Sine-Weighted PWM output waveform. Main semiconductors are to be transistors or IGBTs.
 9. Input line reactor.
- C. Drive Operating Characteristics:
1. Frequency regulation of ± 4 percent of maximum output frequency with analog speed command.
 2. 0 to 120 Hertz operating frequency range.
 3. Active current limit function to provide nominal 150 percent torque.
 4. Minimum efficiency of 95 percent at rated load and speed.
 5. Minimum input displacement power factor of 0.95 throughout the speed range.
 6. Environmental and system criteria:
 - a. Ambient temperature range: 0 to 40 degrees C.
 - b. Operational humidity: up to 90 percent non-condensing.
 - c. Minimum altitude without derating - 3300 feet.
 - d. Nominal voltage: 480 volts, plus 10 percent or minus 10 percent, 3 phase, 3 wire.
 - e. Nominal frequency: 60 Hertz.
 7. Power loss feature shall allow ride through of up to a 2 second input power interruption.
 8. Time delay automatic restart shall allow restart after controller fault conditions with programmable attempts.

VARIABLE SPEED DRIVES

9. Coasting motor restart shall permit the controller to restart into a coasting motor without damage or tripping.
10. Analog control inputs and outputs shall be isolated.

D. Drive Protection Features:

1. Overcurrent protection.
2. Short circuit protection.
3. Fast acting supply fuses.
4. Supply voltage phase loss.
5. Input line undervoltage and overvoltage trip protection.
6. Ground fault trip protection.
7. DC bus undervoltage and overvoltage protection.
8. Over-temperature protection.
9. Power semiconductor protection.
10. Controlled shut down of the drive with no component failure in the event of an output phase-to-phase or phase-to-ground short circuit and annunciation of the fault condition.
11. Input line metal oxide varistor transient protection.

E. Drive Operator Control shall include the following:

1. Each variable speed drive system shall be equipped with all relays, switches, fuses, indicating lights and other components required for a complete functional system.
2. Each variable speed drive control shall be powered from a suitably sized and protected control power transformer.
3. Digital keypad and display module shall provide parameter setting, adjustments and monitoring of control functions and faults. Display messages shall be in English.
 - a. Access to change parameter settings shall be password protected.
4. An ethernet communications port and a serial communications port shall allow connecting to a programmable controller interface.
5. Pilot control devices shall comply with Section 17640, Control Panel Instrumentation and Devices.
6. Two (2) dry contacts rated for 5A @ 120VAC for remote fault and remote run status indication.
7. 4-20 ma speed control and speed feedback signals.
8. Start, stop and preset speed digital inputs.
9. Motor "RUNNING" indicating light.
10. Motor "STOPPED" indicating light.
11. "Control Power On" indicating light.
12. "High Discharge Pressure" indicating light, where indicated.
13. "Emergency Stop" - pushbutton, push-pull type.
14. See Process and Instrumentation Diagrams and elementary diagrams shown on the Drawings for additional requirements.

F. Drive Parameter Adjustments:

1. The following set-up adjustments shall be provided:
 - a. Minimum speed (frequency 0-120 Hz).

VARIABLE SPEED DRIVES

- b. Maximum speed (frequency 25-400 Hz).
- c. Acceleration rate (0 - 3600 seconds for 0-60 Hz).
- d. Deceleration rate (0 - 3600 seconds for 0-60 Hz).
- e. Adjustable DC boost (IR compensation).

G. Harmonic Filters:

- 1. At minimum, provide input line reactor
- 2. Where six-pulse systems with line reactors do not meet the requirements of paragraph 1.2.E, provide 12 pulse (or greater) drives shall be furnished when any of the following are true:
 - a. The drive full load rating exceeds 15 percent of the immediately upstream transformer.
 - b. The drive rating is greater than 200 horsepower.
 - c. The drive is suitable for operations from an on-site generator.

H. Output Filter:

- 1. Output filters or reactors shall be provided in all other cases, based upon the recommendations of the variable speed drive and motor manufacturers, whenever the voltage peaks at the motor terminals might exceed the NEMA-MG1 limits.
- 2. If Filters are required:
 - a. The filter shall be three phase, 600 volt class motor-protecting type consisting of suitable values of inductance, capacitance and resistance to form a damped, low pass filter.
 - b. The filter shall be a low-loss type specifically designed to reduce the voltage wave form dV/dT . The filter shall allow cable lengths at a minimum exceeding the actual application distances with a waveform resulting in voltage spikes at the motor terminal which are within the NEMA-MG1-Part31 voltage stress levels.
 - c. The filter shall be suitable for mounting within the variable speed drive enclosure.

2.3 SOURCE QUALITY CONTROL

A. Factory Testing: Provide the following in addition to any standard factory test procedures.

- 1. Perform shop test on each unit prior to shipping. Test shall consist of simulating the load to be driven, by operating the load through the speed ranges specified for the driven equipment until the drive reaches full-rated temperature.
- 2. Provide a factory control and alarm test on each drive unit by simulating each control signal and each alarm function to verify proper and correct drive unit action.

B. Driven Equipment Manufacturer Testing:

VARIABLE SPEED DRIVES

1. If the driven equipment specification requires factory testing of the equipment with the variable speed drive then the drive shall be shipped to the driven equipment manufacturer's facilities after the drive manufacturer's factory testing is completed and approved.

PART 3 EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine the conditions under which the Work is to be installed and notify the ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Variable speed drive equipment shall be wall mounted or installed on 4 inch raised concrete pads as shown on the Drawings.
 1. Concrete shall comply with Section 03300, Cast-in-place Concrete.
 2. Concrete pad shall extend 2 inches beyond the outline of the enclosure and shall have chamfered edges.

3.3 FIELD QUALITY CONTROL

- A. Refer to Section 01650, Starting of Systems/Commissioning, Section 01660, Testing, Adjusting and Balancing, and Section 01670, Operational Demonstration.
- B. Manufacturer Field Services: Retain a qualified representative of the manufacturer for a minimum period of 8 hours per variable speed drive to perform the following services:
 1. Equipment Installation:
 - a. Inspect the completed installation and note deficiencies.
 - b. Be present and assist the CONTRACTOR during start-up, adjusting, and field testing of the completed installation.
 2. Furnish all test forms and procedures for field testing.
 3. The manufacturer's representative shall revisit the job site as often as necessary until the installation is entirely satisfactory to the ENGINEER.
 - a. Additional site visits shall be provided at no additional expense to the OWNER.
- C. Variable speed drive field adjustments and tests will be performed on each drive after all piping, power, and control connections have been completed. Each drive shall be adjusted and tested under actual load conditions.

VARIABLE SPEED DRIVES

D. Field Tests:

1. Provide all test gear required at no extra cost to OWNER.
2. Calibration certificates, dated within one year, shall be available at request of ENGINEER.
3. Perform any tests recommended by the manufacturer of the driven equipment or by the manufacturer of the variable speed drive.
4. Perform the following inspection and testing:
 - a. Verify all device settings and drive adjustments.
 - b. Verify all mechanical and electrical interlocks and controls for proper operation.
 - c. Test each drive through the specified speed ranges and loads for a minimum of two hours.
 - d. Test each drive by using the actual control signals for remote and local operation.
 - e. Test each drive alarm function.
5. Perform the following testing at each drive:
 - a. After operating for one hour at maximum speed and load imposed by the driven equipment, reduce speed in 6 equal increments between 60 hertz and minimum speed.
 - b. Using the power recorder specified below record the resultant fundamental and harmonic voltages and currents and the total rms voltage, watts and rms current at both the drive input and at the drive output to the motor at each operating point.
 - c. Disconnect the motor from the VSD and connect it to a temporary magnetic starter and operate the motor. Record the resultant fundamental and harmonic voltages and currents and the total rms voltage, watts and rms current.
 - d. If the total harmonic distortion introduced to the system by the variable speed drive while operating at any of the six points does not comply with the requirements of paragraph 1.2.E. (using the values obtained from operating across-the-line from the utility source as baseline) then adjustments or modifications shall be made to the variable speed drive to remedy the situation.
 - e. Repeat field testing and adjustment of the variable speed drive until the requirements are met.
 - f. Submit copies of the reports and graphs generated during the testing which show compliance with the specifications.
6. Perform the following at each motor connected to a variable speed drive:
 - a. Using the power recorder specified below record the voltage waveforms at the motor terminals or at the motor disconnect, if the disconnect is located within 10 feet of the motor. Demonstrate that the peak value of the waveform does not exceed 1000 volts.
 - b. If the peak voltage does exceed 1000 volts then adjustments or modifications to the variable speed drive

VARIABLE SPEED DRIVES

shall be made to remedy the situation. Any modification installed to attenuate the peak voltage, shall be installed at the drive, not at the motor.

- c. Repeat field testing and adjustment of the variable speed drive unit until the requirements are met.
- d. Submit copies of the reports and graphs generated during the testing which show compliance with the specifications.

E. Test equipment:

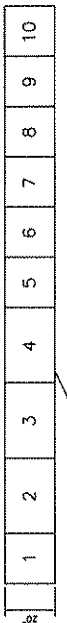
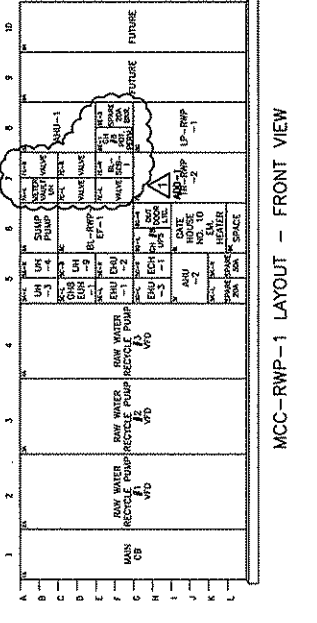
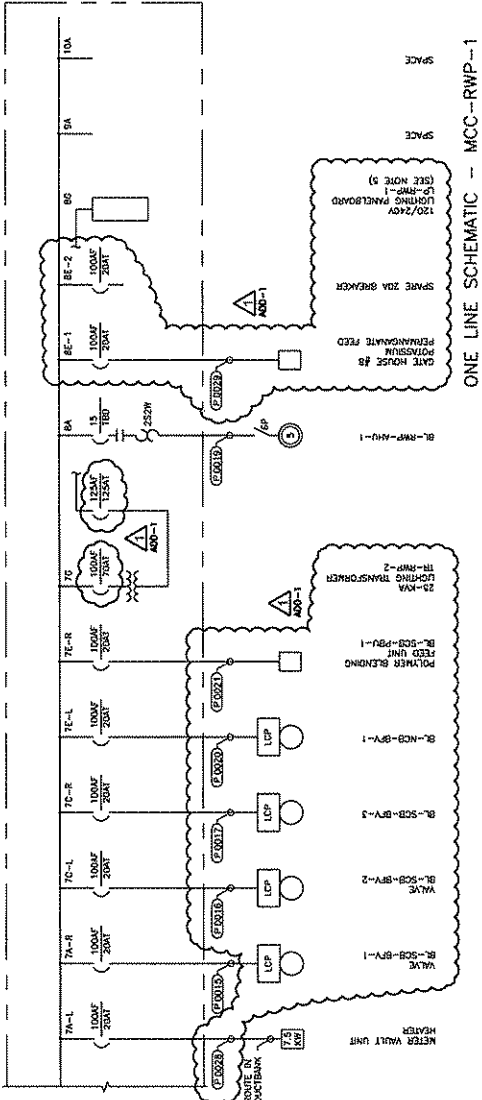
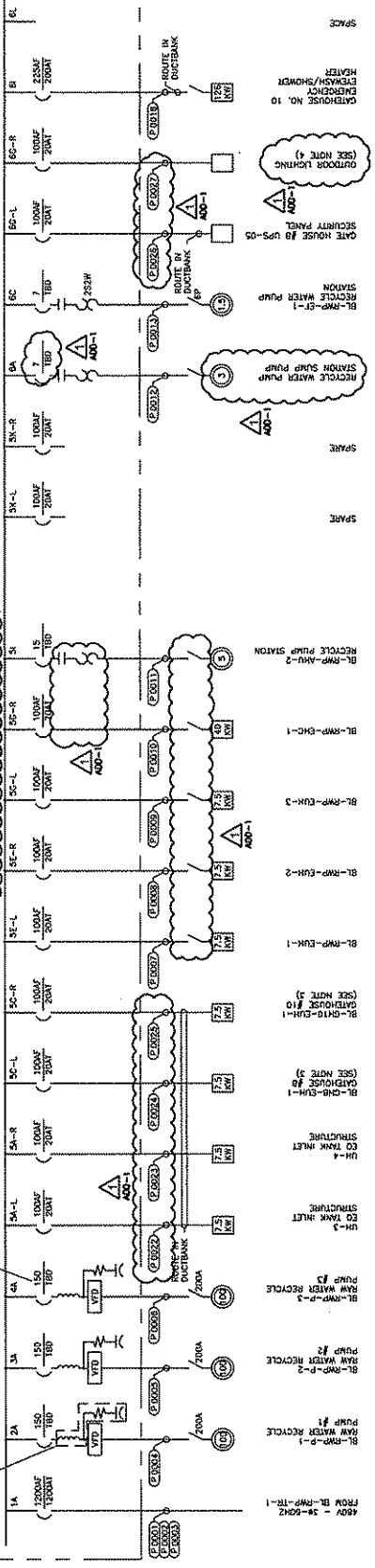
1. Unit shall monitor, record, and display voltage, current, ground current, imbalance, frequency, harmonics, flicker, power quality (sags, swells, impulses), and power consumption (energy, demand, power factor, and reactive power).
2. Unit shall have at least 4 voltage channels and 5 current channels and utilize a 7.8 kHz sampling rate on all channels.
3. Product and manufacturer:
 - a. Power Recorder by Reliable Power Meters.
 - b. Or equal.

END OF SECTION

480V, 3PH, 3W, 1200A BUSS

SEE NOTE 1 (TYPICAL)

PROTECT HARMFUL FILTER (TYPICAL)



CONFORMED TO CONTRACT

REVISIONS	
NO.	DATE
1	3/20/09
2	
3	
4	
5	
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7	
8	
9	
10	

REVISIONS

BALDWIN RESIDUALS AND PARAMOUNT RESERVOIR PROJECT
 DEPARTMENT OF PUBLIC UTILITIES
 DIVISION OF WATER
 CLEVELAND, OHIO

SUBJECT: RECYCLE WATER PUMP STATION ELECTRICAL
 MCC-RWP-1

DESIGNED BY: JLS
 CHECKED BY: JLS

DRAWN BY: JLS
 SCALE: NTS
 SHEET NO. E-14
 CWP NO. 108527

ISSUE DATE: MAY-09

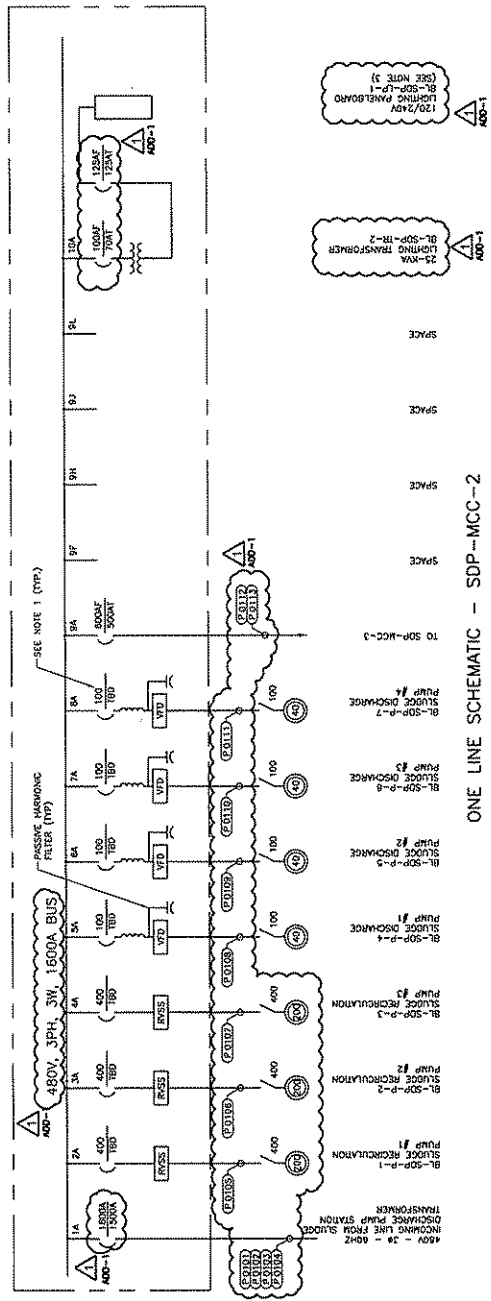
- GENERAL NOTES
1. MAIN CIRCUIT PROTECTION INSTANTANEOUS TRIP SETTING LOAD CURRENT.
 2. TRANSFORMED FROM EXISTING MCC.
 3. CONDUCT UNIT WIRE TO EXISTING WIRE AND CONDUIT.
 4. CONNECT NEW ACCESS ROAD LIGHTING CIRCUIT TO EXISTING OUTDOOR LIGHTING CONTROLLER.
 5. REFER TO DRAWING ED-1 FOR PANELBOARD SCHEDULE.



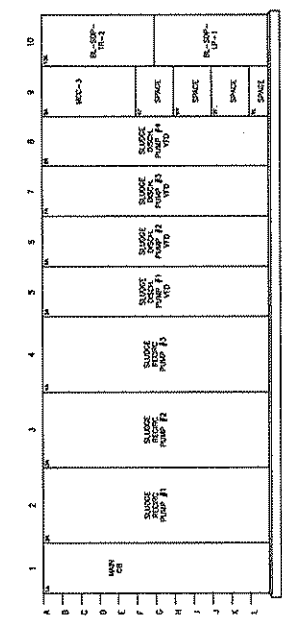
BRUNNEN & CALDWELL
 CLEVELAND, OHIO

GENERAL NOTES

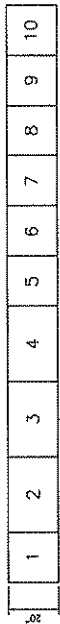
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2. TRANSFERRED FROM EXISTING MCC.
3. REFER TO DRAWING ED-1 FOR PANELBOARD SCHEDULE.



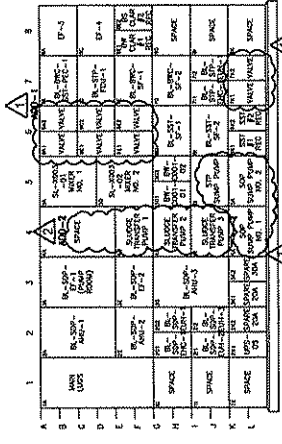
ONE LINE SCHEMATIC - SDP - MCC-2



MCC-2 LAYOUT - FRONT VIEW



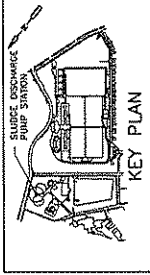
MCC-2 LAYOUT - TOP VIEW



MCC-3 LAYOUT - FRONT VIEW



MCC-3 LAYOUT - TOP VIEW



CONFORMED TO CONTRACT

NO.	DATE	REV.	BY
1	10/27/09	ADD-1	AKM
2	3/27/08	ADD-2	PKM

REVISIONS

BALDWIN RESIDUALS AND FAIRMOUNT RESERVOIR PROJECT
 DEPARTMENT OF WATER UTILITIES
 DIVISION OF WATER
 CLEVELAND, OHIO

SUBJECT: ELECTRICAL
 SLUDGE DISCHARGE PUMP STATION
 SDP-MCC-2

DRAWN BY: JAL
 DESIGNED BY: BSA
 CHECKED BY: JJC

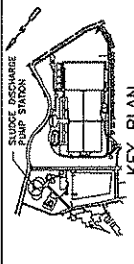
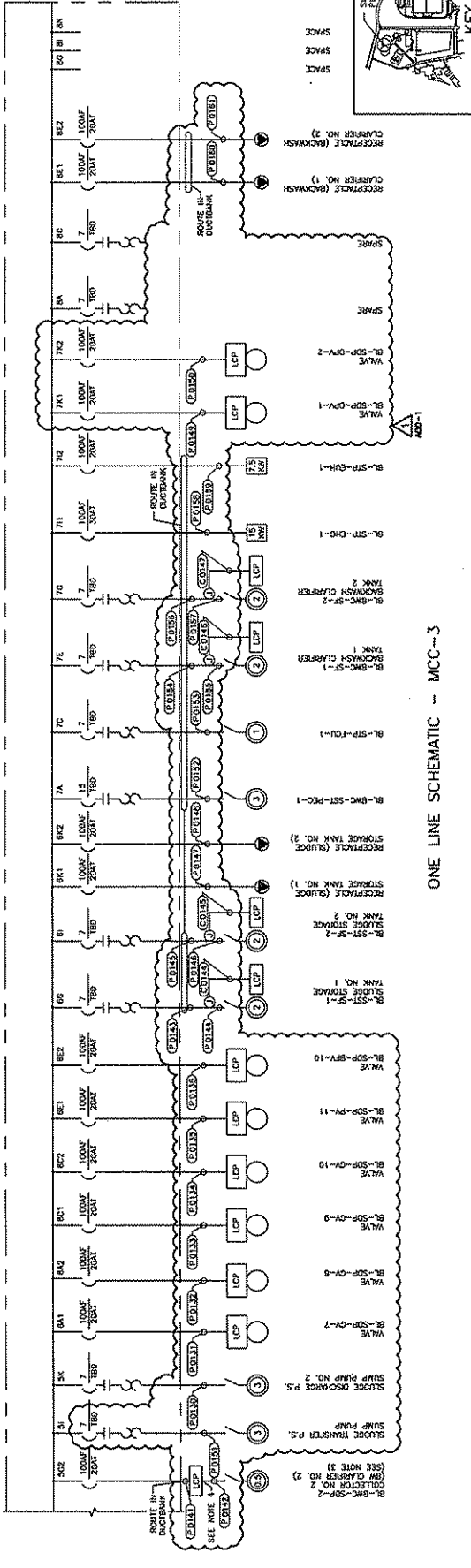
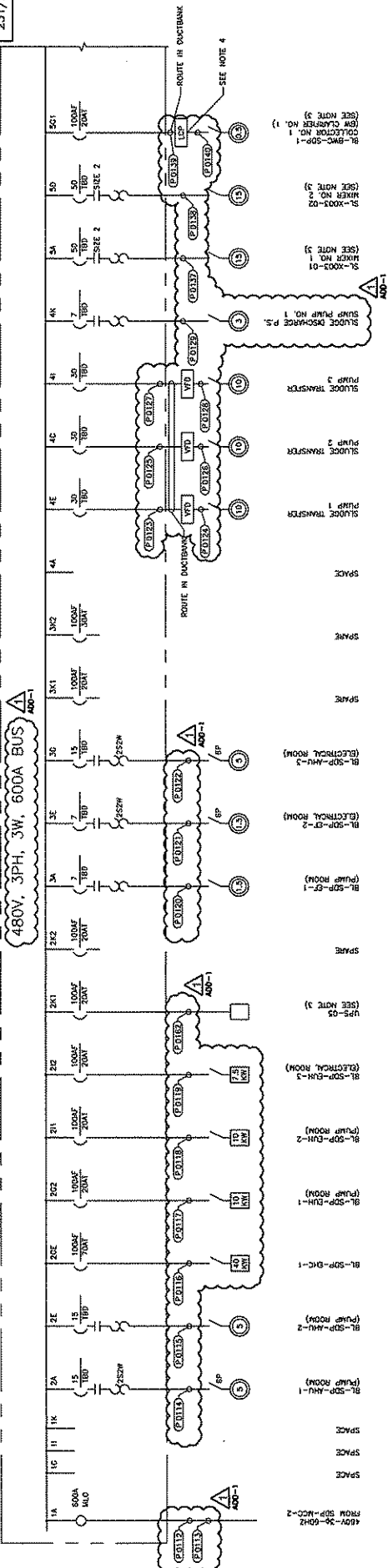
SCALE: NTS
 SHEET NO. E-23
 CWO NO. 108540
 ISSUE DATE: 10/27/09

WARNING
 0 1/2
 1
 NOT TO SCALE



BROWN CALDWELL
 CLEVELAND, OHIO

480V, 3PH, 3W, 600A BUS



CONFORMED TO CONTRACT

REVISIONS	
NO.	DATE
1	BY/APP'D
2	REV-1
3	REV-2

BALDWIN WATER WORKS PLANT
BALDWIN RESIDUALS AND FERRICUM RESERVOIR PROJECT
DEPARTMENT OF PUBLIC UTILITIES
DIVISION OF WATER
CLEVELAND, OHIO

SUBJECT: ELECTRICAL
SLUDGE DISCHARGE PUMP STATION
SDP-MCC-3 ONE-LINE DIAGRAM

DESIGNED BY: J.S.
CHECKED BY: J.S.
SCALE: NTS
SHEET NO. E-28
CWD NO. 108541
ISSUE DATE: MAY-59

GENERAL NOTES

- REFER TO DRAWING E-27 FOR MCC ELEVATION AND TOP VIEW.
- MOTOR CIRCUIT PROTECTOR INSTANTANEOUS TRIP SETTING LOAD CURRENT.
- TRANSFORMED FROM EXISTING MCC.
- REFER TO DRAWING E-33 FOR LOCAL CONTROL PANEL DETAIL.



BROWN & CALDWELL
CLEVELAND, OHIO

ONE LINE SCHEMATIC -- MCC--3

ENERGY EFFICIENCY - HVAC EQUIPMENT SELECTION

SUMMARY

- The Baldwin Residuals Fairmount Reservoir Project will modernize the Heating and Ventilation (HVAC) systems at four buildings with new energy efficient water cooled units to reduce energy consumption and provide improved interior air quality.
- Loan Amount - \$14,000,000
- Energy Efficiency (HVAC Equipment) portion of loan – \$221,500
- Estimated annual energy savings is 15% (\$8,000) per year.

BACKGROUND

- The existing HVAC and Dehumidification equipment is 25 years old and in poor, inefficient condition.
- The four buildings affected by this project are below grade and humidity control is a significant issue.

RESULTS

- When renovating the HVAC systems as Baldwin, water-cooled air conditioning units were selected for a 15% increase in efficiency over traditional air conditioning units.
 - Traditional air conditioning for the four Baldwin facilities would require 128 kW per hour.
 - The air-cooled air conditioning selected as part of the B-RFR requires only 113 kW per hour.
 - The air conditioning is assumed to operate 16 hours per day, every day of the year.
 - Total annual energy savings with the air-cooled units is 87,600 kW.
- The average energy cost at the Baldwin/Fairmount facilities is \$0.087 / kWh.
- The estimated annual energy savings from the HVAC selection is \$8,000 per year.

BENEFITS

- The selected water cooled air conditioning systems will require less electricity than standard systems.
- Improvements in indoor air quality will also reduce equipment maintenance and the future need to repaint.

CONCLUSION

- The conversion of the HVAC systems at the four buildings involved in this project will provide reduced energy consumption and improved air quality compared to traditional air conditioning or dehumidification systems.