SECTION 13XXX
DISPERSAL PUMP STATION
(3500 DiPS)

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Under this section of the specifications, the contractor shall furnish and install a shop-fabricated 3500 Dispersal Pump Station (DiPS). The 3500 DiPS shall have the capacity to disperse 3500 gallons in nominal dosing operation per day and 14,000 gallons in extended 12-hour operation. All work is to be in accordance with the plans and specifications.

1.01 QUALITY ASSURANCE

A. A Registered Engineer shall certify the design, specify the materials and define a testing procedure for verifying the operational status of the DiPS once installed. The shop-fabricated DiPS shall initially be tested and certified for functionality prior to shipment.
B. The supplier of the DiPS shall furnish a warranty of 12 months on all Materials and Workmanship from the date of shipment.

1.02 SUBMITTALS

A. The contractor shall submit to the Engineer for approval ___ copies of shop drawings for the fabricated DiPS. All shop drawings submitted shall bear the contractor's stamp of approval.

PART 2: OPERATION

2.01 ELECTRICAL WIRING INTERFACE FOR OPERATION

A. The Dispersal Pump Station shall require a minimum number of interface points. Power to the Pump Station shall be sized properly and protected by a circuit breaker or fused disconnect switch. The site contractor shall protect the incoming circuit from lightning and surges.
B. A terminal or fuse block shall be installed for each listed conductor:
   - Two conductors (terminal handles minimum #10 AWG) for supply of 120 Vac power from the incoming power source to operate the control panel and pumps.
   - One ground conductor (terminal handles minimum #10 AWG) from the incoming power source.
   - Seven conductors (terminal handles minimum #16 AWG) for interfacing with the five floats in the holding tank.
   - Six conductors (terminal handles minimum #16 AWG) for the individual 24 Vac "open zone solenoid" signal for up to 6 zones.

- One common conductor (terminal handles minimum #16 AWG) for carrying the 24 Vac common return-signal for up to 6 zone valve solenoids.
- One conductor (terminal handles minimum #12 AWG) for supplying a 120Vac power signal to an alarm light.
- One conductor (terminal handles minimum #12 AWG) for supplying a 120Vac power signal to an alarm horn.
- One common conductor (terminal handles minimum #12 AWG) for carrying the 120Vac common return-signal from the alarm horn and light.

C. The control panel shall be operated on a single 120 Vac power circuit which shall energize all other control voltages (24 Vac & 24 Vdc).

D. The pump motors, individually or simultaneously, shall be operated by power supplied over a single 120 - 240 Vac power circuit.

E. All solenoid valves in the pump station and in the zones shall be operated by 24 Vac signals, which shall be supplied from the control panel.

F. All digital status inputs shall be detected using either 120 Vac or 24 Vdc.

2.02 PIPING INTERFACE FOR OPERATION

A. The Dispersal Pump Station shall require a minimum of interface points with the piping systems. All piping to the Pump Station shall attach at one end of the Station.

B. The Pump Station shall have a 1½" female connector for interfacing with the following piping:
- Suction pipe from the holding tank.
- Main discharge pipe for dosing and flushing zones

G. The Pump Station shall have a 1" female connector for interfacing with the following piping
- Return pipe for field flushing zones
- Wastewater pipe for wastewater created during filter back flushes and zone field flushing

2.03 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. The Dispersal Pump Station shall utilize a PLC, which is in use nationally in multiple industries.

B. The PLC shall automatically control the following output activities:
- Alternating dosing pumps
- Back-flushing filters
- Dosing a maximum of six zones
- Field-flushing all zones individually
- Activating a facility alarm light
- Activating a facility alarm horn
- Activating an alarm on an Autodialer/Modem

C. The PLC shall receive the following inputs:
- Flow pulses from a flow meter, installed in the Pump Station, which measures flow to the zones.

- High differential pressure from an adjustable differential pressure gage/switch, installed in the Pump Station, measuring the pressure drop across the filters.
- A "pump starter activated" for each dosing pump.
- Float level condition from five floats installed in the holding tank.
- Silence horn from a "touch input" on the Operator Interface Console (OIC).
- Reset alarms from a "touch input" on the OIC.
- Software HOA inputs for zones and pumps from a "touch input" on the OIC.
- Set point value inputs from a "touch input" on the OIC.

D. The PLC shall have programmed logic to isolate failures in floats, pumps, and zone solenoids and shall continue to operate automatically around such failures. The alarm logic shall include:
- Low level in the Wetwell
- High level in the Wetwell
- Float "fail to operate" properly
- Loss of 24Vac power supply to operate coils and pump starters
- Pump fail to produce flow
- A zone valve "fail to open"
- A flow failure blocking bit from a "touch input" on the OIC
- Reset alarms from a "touch input" on the OIC
- Reset alarms by manual operation of system
- Alarm light "flashing" is varied by "type" of alarm
- Alarm output to signal the Autodialer to call-out an alarm
- A backup "Non-PLC" call-out signal for high level

E. The PLC and its Applications Software Program shall be specifically designed for communicating data by Internet phone modem, spread spectrum or Ethernet radio and leased-line modem and shall be designed for remote control by a SCADA system.

2.04 FLOAT CONTROL SYSTEM OPERATION

A. The Pump Station shall employ a five-float system of level control for the holding tank. All floats shall be "normally-open", "closed-upon-rising".
- Low-level alarm float (bottom float)
- Zone-dosing-off float (next lowest)
- Zone-dosing-enabled float (middle float)
- High-duty/high-level-alarm float (second highest)
- Emergency alarm float (top float)

B. The PLC shall utilize two-out-of-three failure logic to detect failure-to-close on the lowest three floats and failure-to-open on the zone-dosing-enabled and high-duty/high-level-alarm floats.

C. The floats shall be utilized to display on the Operator Interface Console the approximate liquid level in the holding tank.

D. The low-level-alarm float, when open, shall trigger an Autodialer alarm and will stop Dosing Pumps from running in "software" HAND mode or in AUTO mode even if a filter back-flush has been initiated.
E. The zone-dosing-off float shall stop pumps from dosing zones.
F. The zone-dosing-enabled float shall latch "on" the zone dosing logic.
G. The high-duty/high-level-alarm float shall increase dosing frequency by 50% on the 3500 DiPS by reducing rest times of the zones, and shall initiate the high-level alarm and Autodialer call-out.
H. The emergency alarm float, when closed, shall trigger an Autodialer alarm.
I. The inputs from the individual floats shall be routed through an HOA switch so that various levels in the holding tank can be simulated for testing purposes or float failures can be temporarily overridden.
J. In the event of a float failure, the failed float shall be removed from the operating logic and the remaining floats shall assume the tasks of the failed float.

2.05 DOSING PUMP OPERATION

A. The Pump Station shall employ two Dosing Pumps.
B. The Dosing Pumps shall be adequately sized to dose the expected daily volume of liquid in a twelve-hour period.
C. The Dosing Pumps shall be alternated by the PLC when dosing has stopped.
D. Each Dosing Pump, whether submersible or centrifugal, shall be protected by either:
   - An individual motor circuit overload, or
   - An overload circuit internal to the motor, and
   - A circuit fuse
E. Each Dosing Pump starter shall have a "normally-open" auxiliary contact to indicate when the starter contacts are "pulled-in."
F. The PLC shall detect and send an alarm to the Autodialer when a Dosing Pump has:
   - A starter contact that has failed to pull in
   - Failed to produce flow
G. The PLC shall automatically remove the failed pump from service and utilize the one remaining pump.
H. Normal operation in pump mode, the PLC shall:
   - Run one Dosing Pump to dose one zone
   - Run one Dosing Pump during back flush of filters
   - Run two Dosing Pumps to field-flush a zone
   - Delay field flushing until a disabled pump is returned to service
   - Stop pumping if the currently selected zone is in rest mode
   - Block PLC operation of a Dosing Pump if no zone is open
I. The PLC shall automatically calculate and store the elapsed run times for each pump in minutes and hours.
J. Each Dosing Pump shall have its own "software" HOA in the PLC and its own "hardware" HOA on the signal output from the PLC to the starter.

K. The operator shall be able to force, by use of the HAND setting on the "hardware" HOA, a Dosing Pump to run disregarding all non-electrical operating conditions.

2.06 FILTER OPERATION

A. The Pump Station shall utilize two filter modules.
B. The filters shall be of the 3-D ring disc filter design combined with a tangential spray flushing system. Ring discs shall have a minimum level of filtration equal to 120 micron.
C. Flushing of a filter module shall require flow from the other filter module. Each filter shall be equipped with reversing valves before and after the filter unit. This shall allow one filter to come off-line and be flushed by the other filter via the centrally located spray tube and support spine.
D. A master valve located on the discharge line to the zones shall be utilized during filter flushes to block flow to the zones and force the filtered water from one filter to be used to flush the other filter. Dosing of the zones shall be interrupted for the period of time required to backflush both filter modules twice.
E. Each filter shall be flushed, rings scoured, using water that has passed through the opposite filter. High-pressure water shall move in reverse to the normal direction of flow and through the filter spine. Such forced reverse flow shall lift the spine and release the disks. The water shall pass through spray nozzles located along the filter spine creating a turbulent scouring to remove debris trapped between the rings and material stuck to the rings. A flush cycle involves flushing each filter twice.
F. Filter flushes shall be initiated by:
    - Manual signal from the OIC
    - Differential pressure signal from the filter modules
    - Exceeding a specified accumulated run time of zone dosing since the last filter flush.
G. The PLC shall automatically initiate filter flush after receiving an initiating signal. The PLC shall initiate the flush sequence by first energizing the master valve solenoid. Next, the PLC shall energize the two reversing solenoid valves for each filter module to flush the module. The operator shall be able to vary the duration of the filter flush time (in seconds) and the time between flushes (in minutes) through the OIC.
H. The high differential pressure signal to the PLC from the filter modules shall be routed through an HOA switch to allow the signal to be disabled or tested.
I. The filter flush signals from the PLC to the master valve solenoid and to the flush valve solenoids for each filter module shall be routed through an HOA switch to allow the signal to be disabled or to allow manual flush of individual filter modules.

2.07 ZONE OPERATIONS

A. The DiPS shall utilize up to six dosing zones based on the required daily volume of reuse water to be dosed and the size of the receiving field.

B. Each zone shall be fed through a valve controlled by an output from the PLC. The zone valves shall be controlled by a 24 VAC signal. The "open zone valve" output signal from the PLC to each zone's valve solenoid shall be routed through an HOA switch to allow the signal to be disabled or the zone valve to be manually opened.

C. Software HOA switches shall be created for zones in the PLC logic. The operator shall be able to operate the zone "software" HOA switch through the OIC. The operator shall be able to take a zone out of service or operate the zone in HAND through the PLC.

D. Each zone shall have a rest and a dose timer in the PLC. Each zone shall have a gallons-per-dose accumulator in the PLC. Each zone shall have an elapsed dosing time meter and a totalizer for gallons dosed in the PLC.

E. The operator shall be able to enter into the PLC through the OIC set point values for the zone rest and run times and gallons per run. The operator shall be able to read the elapsed dosing time meters and the totalizer meters for gallons dosed on the OIC.

F. The PLC shall operate the zones as follows:
   - Alternate the zones in sequence
   - Skip zones that are not in service or that have failed
   - Test the flow to each zone to determine if a valve has failed to open
   - Send an alarm to the Autodialer in the event of a zone failure
   - Dose zones when enabled by the system of floats
   - Stop dosing when the PLC selects a zone that has not completed its rest period.
   - Dose zones based on their specified dosing time (Time Mode) or on their specified gallons per dose (Volume Mode)

G. The PLC shall receive a digital pulse signal from a flow meter measuring the flow to the zones. The PLC shall calculate the flows from the pulses and shall allocate the flows to the correct registers. The PLC shall have an internal switch, which shall activate a timer, which will simulate flow pulses. The PLC shall have an internal switch, which shall disable all flow failure alarms. The operator shall be able to activate the timer pulse or disable the flow alarms through the OIC.

H. The flow meter pulse input signal to the PLC shall be routed through an HOA switch to allow the signal to be disabled or the flow pulse to be manually simulated.

I. The PLC shall be able to automatically flush the zones on a periodic basis or via an initiating signal from the OIC. The PLC shall operate a field flush valve to allow high-velocity flows to run through individual zones and back to the wastewater processing system.

J. The open signal from the PLC to the zone field flush valve solenoid shall be routed through an HOA switch to allow the signal to be disabled or the field flush to be manually operated.

K. The PLC will treat the zone field flush in the same alternating manner as the zone dosing operation.

L. Zone dosing flow accumulators shall accumulate flows during field flushing periods based on an assumption of half the flow going to actual dosing and half going to flushing.

2.08 OPERATOR INTERFACE CONSOLE (OIC) AND SCADA

A. The Dispersal Pump Station shall have a mono touch-screen OIC.
- 6" mono LCD touch screen
- 320x240 pixel resolution
- 25,000 hour expected bulb half-life
- 48 touch cells allowing data entry
- 0 to 45° C (32 to 113° F) operating temperature
- Flash card option for memory backup/transfer
- Screen saver
- RS-232/RS-422/RS-485 ports

B. The operator shall be able to input the following configurations and initiate the following actions into the PLC through the OIC:
- Number of dosing zones installed at the site (1 to 6)
- Length of flush time in seconds for back flush of each filter
- Maximum dosing time in minutes between each flush of the filter modules
- Number of days between each field flush
- Flow timer simulation activation
- Flow alarms disabled
- Manual initiation of filter flush
- Manual initiation of zone field flush
- HOA settings for pumps and zones
- Time and gallon set points for each zone

C. The OIC shall automatically adjust its screens to display the correct number of zones and filters once configuration data has been inputted.

D. The OIC shall display the following details:
- Float and zone operation status.
- Holding tank level.
- Float failure alarms.
- Dosing pump run status.
- "Software" HOA switch status for each dosing pump
- Dosing pump failure alarms.
- Dosing pump elapsed run time meters.
- Each zone's operating status.
- "Software" HOA status for each zone
- Each zone's failure alarm.
- Each zone's specified length of run time.
- Each zone's specified length of rest time after dosing.
- Each zone's specified volume to be dosed each run.
- Current length of time each zone has rested.
- Each zone's accumulated dosed gallons meter.
- Time from last filter back flush.

- Operational status of each filter.
- Time from last field flush.

E. The PLC shall be programmed to operate with a Supervisory Control and Data Acquisition System (SCADA). The PLC/SCADA interface shall be capable of performing remotely the same functions as the PLC/OIC interface.

PART 3: MATERIALS

3.01 DISPERSAL PUMP STATION

A. Designed with the following components:
- Two Pumps: Standard units to be 115V 1Ø High Head Filtered effluent "Downhole" Model 2NFL pumps or optional Self-Priming centrifugal pump 120V 1Ø Quick Prime model. Pumps manufactured by Myers or an approved equal.
- Check Valves: Clear SPA spring check valve model #1055C20 (½HP to 3HP pumps) as manufactured by Flo Control or an approved equal.
- Filters (two): Advanced Cleaning Technology (ACT) filtration unit as manufactured by JNM Technologies or an approved equal.
- Flow Meter: ARAD 1½" axial turbine digital flow meter model #M40-1.5T as supplied by JNM Technologies or an approved equal.
- Field Flush Valve: 3-Way 1" hydraulic valve, Dorot w/24 Vac solenoid. Part number 61EL1PL-24VAC as supplied by NETAFIM USA or an approved equal.
- Control Panel: Dispersal control panel model # DDPS 6-Zone, with mono screen Operator Interface Controller (OIC) as supplied by TEI Controls or an approved equal.
- Pipe: Scheduled 40 PVC as manufactured by George Fisher or an approved equal.
- Clear Pipe: Field flush line may be schedule 40 type # 4000H020 as manufactured by Harvel or an approved equal.
- Fittings: All 90°, T's, Couplings, shall be schedule 40 PVC as manufactured by Spears or an approved equal.
- Skid: Shall be 3'x 4' structural Poly Base.
- Differential Pressure Switch: Diaphragm-actuated switch with built–in electrical switch model # A20DP-15 as manufactured by FW Murphy or an approved equal.
- Electrical Conduit and Connectors: Shall be schedule 40 PVC.

PART 4: INSTALLATION

A. DiPS shall be located in a building, or provided with optional _____ cover, as shown on sheet _____ of _____.

B. Field piping shall be brought under the slab or through the outer-sleeved wall. Field piping shall not be incased in concrete. Final connections shall be made with the proper PVC Schedule 40 fittings. Teflon tape shall be used on all threaded fittings.

C. Terminate the incoming electrical feeder to the terminals in the Control Panel.
D. Terminate float switch wiring to the terminals as shown per the electrical plans.
E. Terminate all zones wiring to the terminals as shown per the electrical plans.
F. All filters, pumps, flow meter, field flush valves, and switches shall be wired and tested before delivery.

PART 5: MANUFACTURER

Furnish a complete 3500 Dispersal Pump Station, as described in this section as manufactured by SURFLO Soil Absorption Systems, PO Box 200122 Austin, Texas 78720 (512-259-1993) or an approved equal.

PART 6: PAYMENT

Measurement and payment shall be made for the unit onsite. Provide proof of payment prior to the unit being commissioned.

END OF SECTION 13XXX