NHDES Wastewater Engineering Operations and Maintenance Manuals Review Checklist for Pump Stations

Directions for the Preparation of Pump Station Operation and Maintenance (O&M) Manuals

Any upgrades or new facility construction to pump stations or treatment works require that an Operation and Maintenance manual be provided as part of the project and approved by the Department of Environmental Services according to the following rules. This checklist is specific to pump stations only.

The New Hampshire Code of Administrative Rules, Chapter Env-Wq 700 Standards of Design and Construction for Sewerage and Wastewater Treatment Facilities, Part Env-Wq 706.07(k), requires that *"Operation and Maintenance Manuals providing information and guidance for day-to-day operation of the WWTP and pump stations shall be submitted within 60 days following completion of construction of the WWTP or sewage pumping station(s)."* Part Env-Wq 706.07(l) lists, at a minimum, what should be included in an O&M manual. These rules apply to all projects, regardless of funding source.

The standard **Engineering Construction Phase Contract** for Professional Services for Treatment Works, Part I.A.2.c, requires the *"Preparation of an Operation and Maintenance Manual for approval by the DIVISION. After DIVISION approval, the ENGINEER agrees to supply four (4) sets of the completed manual to the OWNER, and an electronic version of the document for the DIVISION."*

Manual Format

The attached Pump Station checklist provides a preferred format in terms of chapter arrangement and structure. Consultants are encouraged to follow this format as much as possible and are directed to contact DES to suggest an alternative format, if needed, to accommodate unique pump station requirements. Consultants should provide draft copies to the owner as well as DES for review.

The following items address the preferred format for both draft manuals and final copies:

- The manual should be assembled using a three ring binder for ease of updating.
- Chapters should be separated with numbered tabs for ease ofidentification.
- Double sided pages where feasible.
- Drafts for review and approval may be submitted in paper or electronically.
- A copy of the final approved manual shall be submitted electronically. The following conditions can be used as guidelines to determine how extensive the manual must be:
- For **new pump stations,** the manual must address all pertinent items in the checklist.
- For **significant pump station upgrades** involving an increase in capacity, new pumps, control systems, alarms, etc., a new manual is warranted and must address all pertinent items in the checklist.
- For **minor pump station upgrades** such as pump replacement, screening, or grinding improvements, SCADA, VFDs, odor control, emergency power, air handling improvements, etc., the manual may be developed as a stand-alone manual or may be incorporated as an addendum into the existing O&M manual. At a minimum, the manual or addendum must include the project description, design criteria of the upgraded equipment, system operation and control as it relates to the upgraded equipment, drawings or schematics, maintenance, alarm & notification system, and safety as it applies to the upgraded equipment. The manual must describe the upgraded equipment's relationship to other unit processes currently being used in the pump station. References should be made to the existing O&M manual where appropriate.
- In all cases, an up-to-date Emergency Operating Plans & Procedures section as outlined in Chapter 8 of the checklist must be included in its entirety.
- For any upgrades to a pump station that does not already have an approved O&M manual on file, regardless of significance, a new O&M manual will need to be developed incorporating all of the pertinent elements listed in the checklist.

Yes	No	n/a	Item
☐	☐	☐	Table of Contents
			Chapter 1: Introduction
☐	☐	☐	1. Purpose of Manual
☐	☐	☐	2. Use and Updating Information for this Manual
☐	☐	☐	3. Project Description
☐	☐	☐	Type, capacity and unit processes
☐	☐	☐	New or Upgrade
☐	☐	☐	If upgrade, describe work done and identify equipment upgraded
☐	☐	☐	Collection system work, if any
☐	☐	☐	Source of construction funding
☐	☐	☐	4. Site location map
☐	☐	☐	5. Service area
☐	☐	☐	Text description
☐	☐	☐	Residential, industrial and commercial contributions
☐	☐	☐	Service area map showing force mains, gravity sewers and related pump stations
☐	☐	☐	6. Design Criteria
☐	☐	☐	Average daily flow in MGD
☐	☐	☐	Peak flow in MGD
☐	☐	☐	Pump sizing and capacities, operating heads/inlet and outlet pressures
☐	☐	☐	Wet well dimensions and capacities
☐	☐	☐	Flow storage capabilities, if any in volume (i.e. gallons)
☐	☐	☐	7. Chain of Command Structure
☐	☐	☐	Organizational chart
☐	☐	☐	8. Managerial Responsibilities
☐	☐	☐	Providing and preparing adequate budgeting
☐	☐	☐	Ensuring adequate staffing and preparing job descriptions
☐	☐	☐	Providing good and safe working conditions
☐	☐	☐	Implementing an ongoing operator training program
☐	☐	☐	Providing incentives for employees
☐	☐	☐	Maintaining efficient facility operation and maintenance
☐	☐	☐	Maintaining adequate records
☐	☐	☐	Provide proper equipment and tools
☐	☐	☐	Maintaining good public relations
☐	☐	☐	Planning for future facility financial or Capital Replacement Fund (CRF)
☐	☐	☐	Developing standard operating procedures
☐	☐	☐	Other areas of managerial or supervisory responsibilities
☐	☐	☐	9. Operator Responsibilities
☐	☐	☐	Using proper operational and maintenance procedures
☐	☐	☐	Keeping accurate records
☐	☐	☐	Managing operating funds properly

Yes	No	n/a	Item
☐	☐	☐	Keeping supervisors informed
☐	☐	☐	Keeping informed of current operation and maintenance practices
☐	☐	☐	Observing all safety procedures
☐	☐	☐	Ensure cleanliness of the facility
☐	☐	☐	Other areas of operational importance
☐	☐	☐	10. Designer & Engineer's Responsibilities
☐	☐	☐	Coordination with operating and maintenance personnel
☐	☐	☐	Training & start-up support
☐	☐	☐	Preparation of O&M manual and record drawings
			Chapter 2: System Operation and Control
☐	☐	☐	1. Identification, location and detailed description of each unit process and their relationship to each other, including photos of equipment and controls.
☐	☐	☐	Screening, automatic and /or manual, bypass channel
☐	☐	☐	Grinding
☐	☐	☐	Grit removal
☐	☐	☐	Flow measurement and calibration
☐	☐	☐	Pumps
☐	☐	☐	Motors
☐	☐	☐	VFD's
☐	☐	☐	Standby power (include a comprehensive list of what equipment is powered or not powered by stand-by power)
☐	☐	☐	HVAC (air changes, controls, etc.)
☐	☐	☐	Continuous monitoring for oxygen deficiency and combustible gas (include locations of sensors and readouts)
☐	☐	☐	Sump pumps
☐	☐	☐	SCADA or other instrumentation
☐	☐	☐	Level control system (description, diagram and set points)
☐	☐	☐	Alarm conditions and set points for all equipment
☐	☐	☐	Hoisting equipment
☐	☐	☐	Odor control
☐	☐	☐	2. Detailed operating procedures for each unit process under normal and alternate operation
☐	☐	☐	Start-up and shut-down procedures/draining (include control panel graphics or pictures to illustrate)
☐	☐	☐	Bypassing procedures
☐	☐	☐	Emergency operation
☐	☐	☐	Expected unit process performance
☐	☐	☐	Manual and automatic operation
☐	☐	☐	Control settings
☐	☐	☐	Controller locations (remote and local HOA switches, MCC panels, etc.)
☐	☐	☐	3. Operational Problems
☐	☐	☐	Mechanical problems
☐	☐	☐	Troubleshooting guides
☐	☐	☐	High flow procedures

Yes	No	n/a	Item
☐	☐	☐	4. Diagrams and illustrations (no larger than 11 x 17)
☐	☐	☐	Piping, valve and pump layout
☐	☐	☐	Wet well layout, plans and elevations
☐	☐	☐	Alternate flow paths
☐	☐	☐	Dry well layout
☐	☐	☐	Valve identification and normal operational settings
☐	☐	☐	Digital pictures of MCC panels and actual equipment
☐	☐	☐	Instrumentation
☐	☐	☐	5. Lab tests, if applicable
☐	☐	☐	6. Service area collection system, if new
☐	☐	☐	Layout
☐	☐	☐	Cleanouts, air relief valves
☐	☐	☐	Operation and maintenance
☐	☐	☐	Inspection and cleaning schedule
☐	☐	☐	Cleaning procedure
☐	☐	☐	Identification of low lying manholes or other areas subject to flooding or overflowing
			Chapter 3 Maintenance
☐	☐	☐	1. Provide summaries of routine preventative maintenance activities based upon manufacturer's recommendations for each specific major piece of equipment (simply referring to the manufacturer's O&M manual will not suffice)
☐	☐	☐	Lubrication schedule and type of lubricant
☐	☐	☐	Special tools
☐	☐	☐	Valve and equipment exercising
☐	☐	☐	Belt and packing replacement
☐	☐	☐	Mechanical seals
☐	☐	☐	2. Generator
☐	☐	☐	Exercise under load & provide an exercise schedule
☐	☐	☐	Check transfer switch
☐	☐	☐	Oil and coolant specifications
☐	☐	☐	Generator log with O&M records
☐	☐	☐	3. Spare parts list (simply referring to the manufacturer's O&M manual will not suffice)
☐	☐	☐	Are spare parts interchangeable with other pump stations?
☐	☐	☐	4. Preventative maintenance program
☐	☐	☐	Existing system
☐	☐	☐	Recommended system
☐	☐	☐	Equipment numbering system
☐	☐	☐	Maintenance record system
☐	☐	☐	Computerized maintenance management
☐	☐	☐	Planning and scheduling
☐	☐	☐	5. General maintenance practices and procedures
☐	☐	☐	Mechanical maintenance
☐	☐	☐	Electrical maintenance

Yes	No	n/a	Item
☐	☐	☐	6. Inventory system
☐	☐	☐	7. Housekeeping
			Chapter 4 Personnel
☐	☐	☐	1. Personnel requirements
☐	☐	☐	Staffing plan
☐	☐	☐	Estimate of operational time
☐	☐	☐	Frequency of visits
☐	☐	☐	2. Job titles, job descriptions, qualifications and experience for required positions
☐	☐	☐	3. Training & certification
			Chapter 5 Alarm & Notification System
☐	☐	☐	1. Summary of all alarms
☐	☐	☐	2. Where are alarms displayed?
☐	☐	☐	3. Transmission of alarm signal to operations personnel
☐	☐	☐	4. Periodic testing of alarm conditions and transmission devices
			Chapter 6 Recordkeeping
☐	☐	☐	1. Importance of recordkeeping
☐	☐	☐	2. Location of records
☐	☐	☐	3. Review of recording keeping procedure
☐	☐	☐	4. Types of records and example forms
☐	☐	☐	Daily logs or station checklists
☐	☐	☐	Maintenance records
☐	☐	☐	Utilities records i.e. Fuel, gas, chemical, etc. usage
☐	☐	☐	Unusual events or emergency conditions
☐	☐	☐	Accident reports
☐	☐	☐	5. Reporting procedures
			Chapter 7 Safety
☐	☐	☐	1. Management and operator responsibilities
☐	☐	☐	2. Sewer hazards
☐	☐	☐	Common gases with acceptable and harmful concentrations
☐	☐	☐	3. Mechanical hazards
☐	☐	☐	4. Electrical hazards
☐	☐	☐	5. Chemical hazards and proper handling and storage
☐	☐	☐	6. Tripping and falling hazards/improper lifting
☐	☐	☐	7. Personal hygiene
☐	☐	☐	Infections
☐	☐	☐	Health hazards
☐	☐	☐	Immunization programs & recommended shots
☐	☐	☐	8. Explosion and fire hazards
☐	☐	☐	9. Road hazards & traffic control
☐	☐	☐	10. Confined space entry procedures (one must be provided, either existing or an example)
☐	☐	☐	11. Lock-out /tag-out procedures and program

Yes	No	n/a	Item
☐	☐	☐	12. Proper housekeeping
☐	☐	☐	13. MSDS sheets for bulk chemicals
☐	☐	☐	14. List of recommended and existing safety equipment
☐	☐	☐	15. Training
☐	☐	☐	16. Safety reference library
			Chapter 8 Emergency Operating Plans and Procedures
☐	☐	☐	1. Vulnerability analysis for the following emergency conditions
☐	☐	☐	Power failure
☐	☐	☐	Equipment failure
☐	☐	☐	Natural disasters
☐	☐	☐	• Flooding
☐	☐	☐	• Hurricane or strong winds
☐	☐	☐	• Earthquake
☐	☐	☐	• Freezing conditions
☐	☐	☐	Hydraulic overloading
☐	☐	☐	• Identify low lying manholes or other areas of concern and provide elevations
☐	☐	☐	• Provide locations of nearby wells or surface waters
☐	☐	☐	Ruptures
☐	☐	☐	Bypassing options
☐	☐	☐	• Upstream/downstream manholes
☐	☐	☐	• Emergency pumping connections
☐	☐	☐	Sewer blockages
☐	☐	☐	Spills of oils, toxics, or hazardous materials into the sewer system or at the pump station
☐	☐	☐	Explosion
☐	☐	☐	Fire
☐	☐	☐	Failure of emergency warning system
☐	☐	☐	Labor strikes
☐	☐	☐	Personnel injury
☐	☐	☐	Other emergency situations
☐	☐	☐	2. Methods to reduce vulnerability
☐	☐	☐	3. Emergency response plan and procedure for each condition
☐	☐	☐	4. Follow-up investigation and prevention plan
☐	☐	☐	5. EPA/DES Sewer Overflow Reporting Procedure (provided by DES)
☐	☐	☐	6. Emergency notification system
☐	☐	☐	7. Notification of downstream water users
☐	☐	☐	8. Complete emergency contact telephone list
☐	☐	☐	State agencies
☐	☐	☐	Town or city officials
☐	☐	☐	State Police
☐	☐	☐	Chemical spill response units
☐	☐	☐	Hazardous waste/oil spill cleanup firms

Yes	No	n/a	Item
☐	☐	☐	Local hospitals
☐	☐	☐	Fire department
☐	☐	☐	Emergency pumping equipment suppliers
☐	☐	☐	Emergency power equipment suppliers
☐	☐	☐	Utility providers
☐	☐	☐	General contractors
☐	☐	☐	Septage hauling firms
☐	☐	☐	Electricians
☐	☐	☐	SCADA technicians
☐	☐	☐	Downstream water users
☐	☐	☐	9. Emergency equipment inventory and location of equipment
			10. Personnel training & interaction with local emergency response entities
☐	☐	☐	Mutual Aid Agreements or WARN System Member
☐	☐	☐	Authority Structure for Emergency Response
			Chapter 9 Utilities
☐	☐	☐	1. Suppliers and contact information for all utilities
☐	☐	☐	Electrical
☐	☐	☐	Gas, propane, fuel oil
☐	☐	☐	Water
☐	☐	☐	Telephone
☐	☐	☐	Alarm communications/SCADA
☐	☐	☐	2. Provide exact locations of emergency shut-off valves, backflow preventers, etc.
☐	☐	☐	3. Provide sizes and locations of bulk storage tanks
☐	☐	☐	4. Provide a Spill Prevention Containment and Control Plan for bulk storage tanks
			Chapter 10 Electrical and Control Systems
☐	☐	☐	1. General description of electrical and control system
☐	☐	☐	2. Describe MCC panels including schematics or simple drawings
			Chapter 11 SCADA (if applicable)
☐	☐	☐	1. Detailed description including SCADA graphics
			Appendices
☐	☐	☐	1. Schematics and flow diagrams showing all pertinent equipment and major piping (11x17max)
☐	☐	☐	2. Sample forms including daily operational checklists
☐	☐	☐	3. Piping color codes
☐	☐	☐	4. Equipment suppliers information
☐	☐	☐	5. List of all manufacturers manuals
☐	☐	☐	6. Other pertinent information
☐	☐	☐	7. SCADA graphics overview