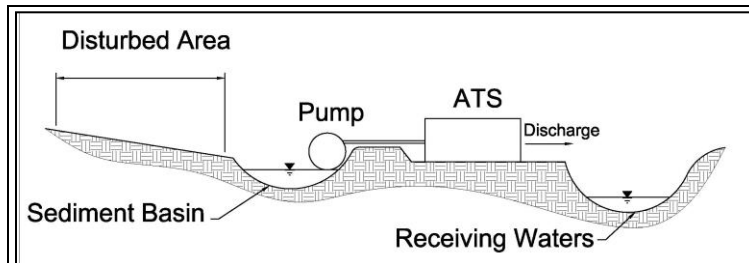


3.0 Sediment Controls

3.1 Active Treatment System (ATS)

Sediment Control



Description: An Active Treatment System (ATS) is a small, onsite, water treatment plant used to produce discharge water quality that is better than can be achieved by traditional sediment controls. Common ATS methods are filtration and chemical-aided coagulation/flocculation.

KEY CONSIDERATIONS

DESIGN CRITERIA:

- ATS designed based on site conditions, stormwater characteristics, and required discharge quality
- ATS shall be designed in coordination with the system provider and operator

ADVANTAGES / BENEFITS:

- Provides consistent, high quality, stormwater discharges

DISADVANTAGES / LIMITATIONS:

- Most expensive treatment method
- Retention structures required to capture the design storm for treatment
- Filtration requires pre-treatment with a sediment trap or basin
- Highly dependent on operator knowledge and skill level

MAINTENANCE REQUIREMENTS:

- Daily monitoring and maintenance while in operation, including influent characteristics and chemical dosage
- Backwash filters and dispose of waste from backwashing
- Monitor discharge for residual chemicals
- Repair erosion or other damage on stormwater retention structures that precede the ATS

TARGETED POLLUTANTS

- Sediment
- Nutrients & Toxic Materials
- Oil & Grease
- Floatable Materials
- Other Construction Wastes

APPLICATIONS

Perimeter Control

Slope Protection

Sediment Barrier

Channel Protection

Temporary Stabilization

Final Stabilization

Waste Management

Housekeeping Practices

Fe=0.99

IMPLEMENTATION CONSIDERATIONS

- Capital Costs
- Maintenance
- Training
- Suitability for Slopes > 5%

Other Considerations:

- *Operator training*
- *Site access to operate the ATS during wet conditions*
- *Worker safety and spill response procedures*

3.1.1 Primary Use

Active treatment systems (ATS) are used when traditional sediment controls cannot achieve the necessary level of sediment removal for discharges from a construction site. They are primarily used to remove fine silt and clay soil particles, for which traditional sediment controls are the least effective. These fine particles are small enough to pass through the pores or void spaces of sediment barriers. They are also not removed by sediment basins, because their settling velocities require a detention time of days or weeks, not hours.

3.1.2 Applications

Active treatment systems are applicable on sites that have a large percentage of fine silt and clay soils. The systems are most useful where special aquatic sites or sensitive receiving waters result in specific limits on discharges or regulations require a higher level of treatment. An ATS may be used when a turbidity effluent limit is established for a construction activity or where the activity discharges to:

- Wetlands regulated under Section 404 of the Clean Water Act;
- Spring-fed receiving waters;
- Receiving water with a Total Maximum Daily Load;
- Receiving water bodies with a Water Quality Standard that could be exceeded by the discharge; or
- Receiving water utilized by a species protected under the Federal Endangered Species Act or the State of Texas Threatened and Endangered Species Regulations.

3.1.3 Design Criteria

Active treatment systems are a specialized application that requires skill in designing, operating, and maintaining the systems. When the designer has determined that an ATS is needed for a project, the designer should select a supplier of ATSS and work with their technical experts. The criteria contained in this section are general guidelines. It is essential that the designer of controls for a construction activity work with an ATS supplier and operator to develop an effective system based on site conditions and anticipated characteristics of the stormwater runoff.

General

- A source of electricity is required for an ATS. Diesel generators are required until the electrical distribution system is extended to the site. In some cases, it may be advisable to maintain the generators onsite for the duration of the project in case of power outages.
- An ATS requires a sediment basin, tank, or other structure to capture the temporary control design storm (2-year, 24-hour) and retain it to be pumped to the ATS. The retention structure should be designed to pass larger storm events without damage to the structure.
- An ATS can be either a batch flow or flow-through (continuous flow) design.
- ATS designs are specific to each site, the stormwater runoff characteristics, and the required discharge water quality. The designer should consult with suppliers and operators of ATSS and consider the following when designing the ATS:
 - Available stormwater detention space for the storm event being treated and for another event that could occur during treatment.
 - Turbidity, pH, and suspended solids concentrations of the stormwater to be treated.
 - Size of soil particles to be removed.
 - Required discharge concentrations.
 - Flow rate through the ATS.

- Available space.
- Cost.
- Electrocoagulation is available as an ATS for sediment removal; however, it is not recommended for construction sites.
- The design should include requirements for operator training and/or required skill and experience for the lead operator. Unlike other sediment control devices, improper operation can result in a discharge that is more damaging to the receiving water than the construction activity. The recommended minimum skill level is 5 years experience operating stormwater ATSs or a combination of training and experience equivalent to a Class C Surface Water Operators license in the State of Texas.
- The ATS operator selected for the project shall have written plans for the following:
 - Operation and maintenance manual for all equipment in the ATS.
 - Monitoring, sampling and reporting, including Quality Assurance/Quality Control (QA/QC).
 - Worker health and safety.
 - Spill prevention and response.
- The ATS shall be equipped with instrumentation that automatically measures and records the following:
 - Influent and effluent turbidity.
 - Influent and effluent pH.
 - Influent and effluent flow rate.
- The ATS should be designed with a recirculation mode or a safe shut down mode that will be automatically activated upon system upset, power failure, or other catastrophic event.
- A velocity dissipation device is required at the ATS discharge point.

Filtration

- Filtration is accomplished by pumping water through vessels filled with granular filter media. The media may be sand, gravel, anthracite or a combination. Single media, sand filters are most common in construction applications.
- Bag or cartridge filters may be used after the media filter to provide the highest level of sediment removal. They are typically only needed when extremely low turbidity values (<10 NTU) are required for discharges to clear, cool-water streams, such as spring-feed creeks flowing over a limestone channel bed.
- For temporary installations at construction sites, filtration units are frequently hauled to the site and operated on flat bed trailers.
- The designer shall specify the filter media to be used based on the particle size to be removed and desired reduction in turbidity and suspended solids concentrations.
- Filtration can be effective in removing other pollutants from construction sites, such as sheen on stormwater surfaces; however, the filter media must then be classified and handled as the appropriate type of waste.
- Filtration may be used as an ATS by itself on sites where the suspended soils are primarily coarser silts and sands and a higher quality discharge is required than can be achieved by traditional sediment controls.
- Filtration systems are most commonly used after chemical-aided flocculation to remove flocs that do not settle within the detention time available while maintaining the design flow rate.

- When used without chemical-aided flocculation, stormwater requires pre-treatment with a sediment trap or basin before being pumped to the filter. Pre-treatment extends the operating life of the filter and decreases maintenance requirements.
- Filters shall be equipped with gauges to measure differential pressure across the filter to monitor filter loading.
- Filtration designs shall contain a means for backwashing the filters and collection and disposal of the backwash water.

Chemical-Aided Flocculation

- Chemicals are added as coagulation agents in an ATS. The coagulants destabilize the charged soil particles. As a result, the particles form flocs that can be settled or filtered from the stormwater.
- The ATS typically consists of the following, each of which requires its own design parameters:
 - Retention basin or other structure to capture the design storm.
 - Water pump to convey stormwater from the retention structure to the settling tank.
 - Chemical injection and metering pump.
 - Settling tank or chamber.
 - Filters (optional).
- Commonly used chemicals for stormwater treatment are chitosan, polyacrylamide (PAM), aluminum sulfate (alum), and polyaluminum chloride.
- Chemicals must be applied in proper doses and for the proper contact times to avoid potential toxicity in the ATS effluent. The effluent should be monitored for both turbidity and residual concentration of the treatment chemical.
- Where feasible, chemical injection should occur on the intake side of the stormwater pump to provide for maximum mixing.
- Chemical dosing should be designed based on flow rate, pH, and suspended solids concentration. Adjustments to dosage are common as the stormwater characteristics vary for different storm events and changing conditions on the construction site.
- Jar tests should be used to determine the chemical dosage. Jar tests should be conducted in accordance with ASTM D2035 Standard Practice for Coagulation-Flocculation Jar Test of Water. Tests shall be performed 15 minutes after start-up and every 8 hours of operation.
- The settling tank or chamber should be designed to prevent the accidental discharge of settled floc during floc pumping and related cleaning operations. Include specifications for disposal of settled floc.
- When chitosan is used, the discharge from the ATS should be tested for residual concentration of the chemical using commercially available residual field tests. Tests should be performed 15 minutes after start-up, every 8 hours of operation, and 15 minutes after each change in dosage. Return period of the test results depends on the sensitivity of the receiving water, but in no case should be longer than 24 hours. Return period may be as short as one hour if the receiving water has a species that is threatened, endangered, or of concern.
- The residual concentration of chitosan should be limited to 10 percent or less of the following for the aquatic species most sensitive to the chemical being used:
 - Geometric mean of the No Observed Effect Concentration (NOEC).
 - Acute toxicity concentration.
 - Chronic toxicity concentration.

- For PAM and other coagulation agents without a residual field test, a daily bioassay shall be performed on an effluent sample. The methods used for acute toxicity testing shall be those outlined for a 96-hour acute test in Methods for Measuring the Acute Toxicity of Effluents and Receiving Water to Freshwater and Marine Organisms (USEPA-841-R-02-012) for Fathead minnow, *Pimephales promelas*.
- PAM has a documented record of low toxicity. For all other chemical coagulants without a residual field test, batch operation of the ATS is encouraged to delay discharge of the treated stormwater until results of the toxicity tests are available.
- Toxicity testing should be done by an independent, third-party laboratory that is accredited in Texas according to the standards of the National Environmental Laboratory Accreditation Conference (NELAC).

3.1.4 Design Guidance and Specifications

No specification for construction of this item is currently available in the Standard Specifications for Public Works Construction – North Central Texas Council of Governments.

3.1.5 Inspection and Maintenance Requirements

Active treatment systems must be maintained and monitored by trained, onsite personnel that observe the system at all times while it is in operation. Inspection and maintenance should be according to the system's operations and maintenance manual.

The overall system should be inspected regularly (at least as often as required by the TPDES Construction General Permit) to ensure stormwater is not bypassing the ATS. The basin or other structure used to collect and pre-treat stormwater should be inspected for damage and repaired as needed.

During operation of chemical-aided flocculation, the chemical dosage should be monitored and changed according to characteristic of the stormwater inflow. The discharge from the ATS should be sampled and analyzed regularly to verify that chemical residuals are acceptable levels.

3.1.6 Example Schematics

The following schematics are example applications of the construction control. They are intended to assist in understanding the control's design and function.

The schematics are **not for construction**. They may serve as a starting point for creating a construction detail, but they must be site adapted by the designer. In addition, dimensions and notes appropriate for the application must be added by the designer.

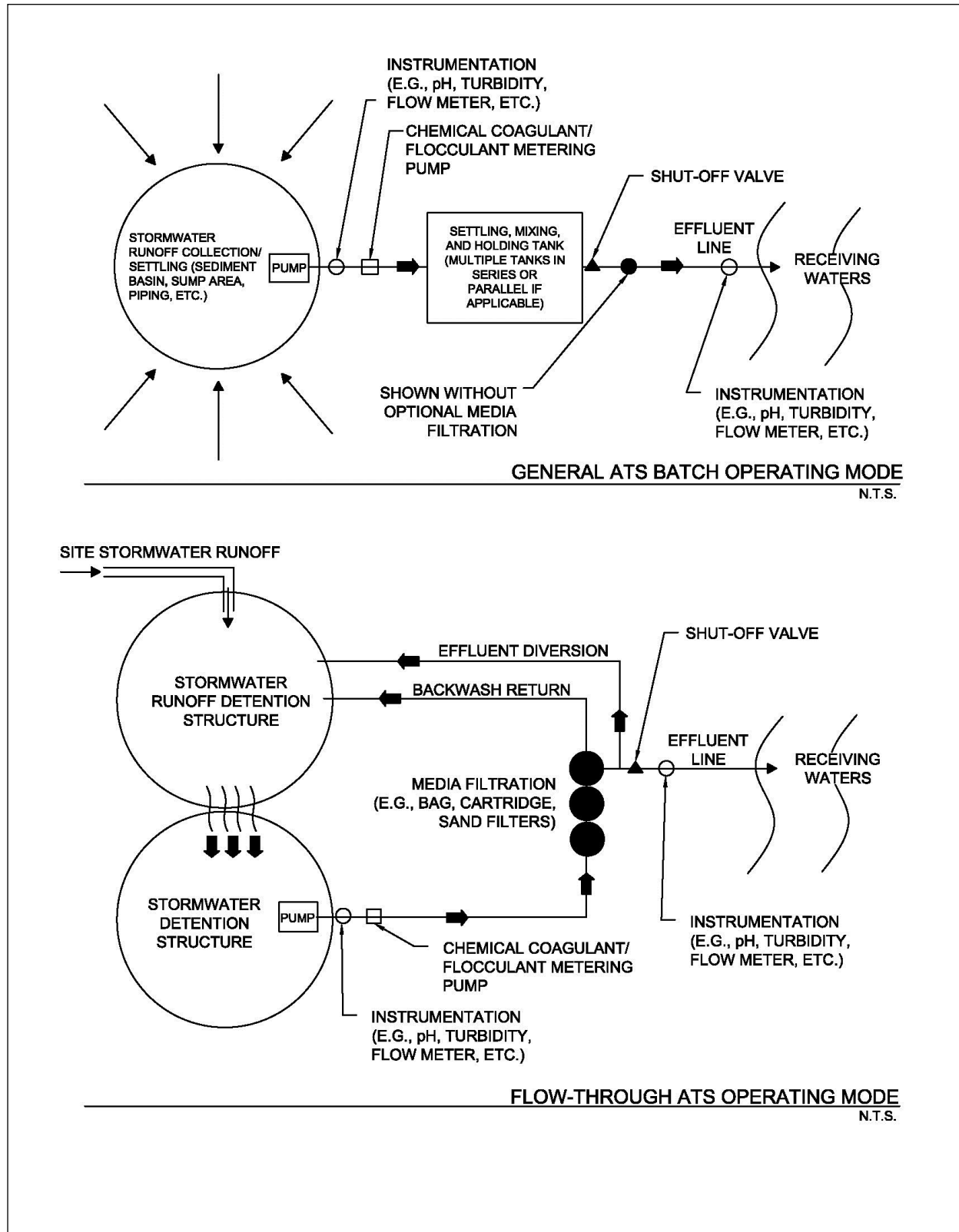


Figure 3.1 Schematics of Active Treatment System

(Source: EPA Development Document for Final Effluent Guidelines and Standards for the Construction & Development Category)