**IRON AND MANGANESE CONTROL CHECKLIST**

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| Project Name: |       |
| Reviewed By: |       | Date: |       |

Describe proposed treatment:

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| **General (12 VAC 5-590-920 A, E, F, and G)**  |
| Pilot study completed and approved by ODW if required by ODW?Date of approval:  | Yes [ ]  No [ ]  N/A [ ]   |
| Sampling taps provided for control purposes? Taps located on each source water, each treatment unit influent, and each treatment unit effluent? | Yes [ ]  No [ ]  Yes [ ]  No [ ]  |
| Iron and manganese testing equipment provided? Iron testing equipment capable of accurately measuring iron concentration as low as 0.1 mg/L? Manganese testing equipment capable of accurately measuring manganese concentration as low as 0.05 mg/L? | Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  |
| The department may approve proprietary treatment processes for the removal of iron and manganese on an individual basis. Operational data from actual full-scale facilities treating waters of similar quality or pilot tests may be required. The provisions of 12VAC5-590-290 may apply. | Yes [ ]  No [ ]  N/A [ ]   |
| **Aeration (12 VAC 5-590-910) N/A** [ ]  |
| The aerated water chlorinated following aeration? | Yes [ ]  No [ ]  |
| The equipment incorporates materials resistant to deterioration and corrosion?Designed to eliminate the potential for fouling problems from calcium carbonate and iron precipitation and from algae, slime, and bacteriological growth?Disinfection capability provided before the aeration treatment units? | Yes [ ]  No [ ]  Yes [ ]  No [ ] Yes [ ]  No [ ]  |
| The equipment easily accessed and serviced? | Yes [ ]  No [ ]  |
| The air introduced into the treatment units is filtered and free of insects, obnoxious fumes, dust, dirt, and other contaminants?If blowers are located inside a building, then the air intakes extend to the outside and furnished with appropriate air filters? | Yes [ ]  No [ ]  Yes [ ]  No [ ]   |
| Air exhaust outlets are located to avoid induced contaminants, particularly at or near occupied areas or blower intakes? | Yes [ ]  No [ ]   |
| Duplicate blowers, motors, or multiple treatment units provided for treatment processes designed to meet the drinking water quality standards in 12VAC5-590-340? | Yes [ ]  No [ ]  |
| Natural, forced, or induced draft aeration units provide an adequate liquid distribution and countercurrent of air through the enclosed aeration column, and adequately seal the water outlet to prevent unwanted loss of air. | Yes [ ]  No [ ]  |
| Pressure aeration means the injection of compressed air into the water to be treated, typically for oxidation. Pressure aeration shall not be approved for removal of dissolved gases. Filters following pressure aeration have adequate exhaust devices for the release of air?Pressure aeration devices provide thorough mixing of compressed air with the water being treated? | Yes [ ]  No [ ]  N/A [ ] Yes [ ]  No [ ]  N/A [ ]  |

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| Packed tower aeration for removing VOCs, THMs, carbon dioxide, and radon:* Justification is provided for the selected design parameters (e.g., height and diameter of the unit, air-to-water ratio, packing depth, surface loading rate, and other features)?
* The design considers the effects of temperature change and the resulting impact in contaminant removal efficiency? Pilot plant studies may be required to substantiate the design.
* The packing material is resistant to the aggressiveness of the water, dissolved gases, and cleaning materials, and meets requirements of 12VAC5-590-810?
* Water is evenly distributed at the top of the tower using spray nozzles or orifice-type distributor trays that will prevent short circuiting? A mist eliminator above the water distribution system may be required.
* A means to allow for discharge and wasting of water or chemicals used to clean the tower is provided?
* Sample taps shall be provided in the influent and effluent piping.
* The design prevents freezing of the influent riser and effluent piping?
* An overflow pipe discharging 12 to 24 inches above the ground and over a drainage inlet structure or splash pad is provided?
* A sufficient number of access ports with a minimum diameter of 24 inches is provided to facilitate inspection, media replacement, media cleaning, and maintenance of the unit interior?
* A positive air flow sensing device and a pressure gauge is installed on the air influent line?
* If the aeration unit is designed to remove a contaminant with a PMCL, then the positive air flow sensing device is an integral part of an automatic control system that will turn off the influent water if positive air flow is not detected?
 | Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ] Yes [ ]  No [ ]  |
| Other methods of aeration are designed to meet the particular needs of the water to be treated? These are subject to the approval of the department. | Yes [ ]  No [ ]  N/A [ ]  |
| **Chemical Oxidation (12 VAC 5-590-920 B) N/A** [ ]  |
| Oxidation by aeration or by chemicals, such as chlorine, potassium permanganate, sodium permanganate, or a combination thereof. | Yes [ ]  No [ ]  |
| Consider:* pH adjustment to promote rapid oxidation
* pre-settling tank located ahead of the filters to remove oxidized iron and increase filter run times;
 | Yes [ ]  No [ ]  N/A [ ] Yes [ ]  No [ ]  N/A [ ]  |
| Dry or liquid chemical feed checklist provided | Yes [ ]  No [ ]  |
| Flow proportional chemical feeders are provided, and the feed rate is adequately controlled by using feeders that are paced by water meters to prevent an over-dosage of chemical?A flow switch in place of a flow proportional feeder is proposed (justification must be provided). | Yes [ ]  No [ ]  Yes [ ]  No [ ]  |
| Sample taps are provided before the application of the oxidant, immediately ahead of filtration, and at the filter effluent? | Yes [ ]  No [ ]  |

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| **Pressure Filter (12 VAC 5-590-920 B) N/A** [ ]  |
| * Manganese-oxide coated filter media?
* The total depth of media is not less than 30 inches?
* Media has an effective size from 0.3 to 0.35 mm and a uniformity coefficient of no more than 1.6?
* An anthracite cap layer over the manganese-oxide coated media with a depth of six to 18 inches?
* Following initial placement of the media, care taken to remove fines by backwashing and skimming the surface?
 | Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  Yes [ ]  No [ ]  |
| Pressure gauges on the inlet and outlet pipes of each filter or a differential pressure gauge on each filter | Yes [ ]  No [ ]  |
| An easily readable meter or flow indicator on each battery of filters. A flow indicator for each filtering unit (recommended) | Yes [ ]  No [ ]  Yes [ ]  No [ ]  |
| Filtration, backwashing, and filter-to-waste of each filter individually:(1) Backwash water is evenly distributed in an adequate quantity to achieve at least a 30% media bed expansion during backwashing. The backwash rate shall be based on the media;(2) The top of the backwash water collection trough is at least 18 inches above the media surface;(3) An underdrain system to efficiently collect the filtered water and to distribute an adequate quantity of backwash water to achieve at least a 30% media bed expansion during backwashing; | Yes [ ]  No [ ]  |
| Flow indicators and controls are located so that they are easily readable while operating the control valves? | Yes [ ]  No [ ]  |
| An air release valve on the highest point of each filter? | Yes [ ]  No [ ]  |
| An accessible manhole to facilitate inspections and repairs for filters greater than 36 inches in diameter? | Yes [ ]  No [ ]  |
| A means to observe the wastewater during backwashing? | Yes [ ]  No [ ]  |
| Construction to prevent cross-connection? | Yes [ ]  No [ ]  |
| **Ion Exchange (12 VAC 5-590-920 C) N/A** [ ]  |
| Ion exchange checklist provided (12 VAC 5-590-900)? | Yes [ ]  No [ ]  |
| Combined iron and manganese is less than 0.5 mg/L?Iron and manganese removal by ion exchange shall only be approved for removing low concentrations (less than 0.5 mg/L) of combined iron and manganese. | Yes [ ]  No [ ]  |
| **Sequestration (12 VAC 5-590-920 D) N/A** [ ]  |
| Dry or liquid chemical feed checklist provided | Yes [ ]  No [ ]  |
| Combined iron and manganese is less than or equal to 1.0 mg/L?Sequestration with polyphosphates shall be considered for polishing filtered water; however, it shall not be used where the residual iron, manganese, or combination thereof exceeds 1.0 mg/L. | Yes [ ]  No [ ]  N/A [ ]  |
| Phosphate dose does not exceed 10 mg/L?Phosphate feed rates shall be determined by the product manufacturer and shall not exceed 10 mg/L. | Yes [ ]  No [ ]  N/A [ ]  |
| Stock phosphate solution is disinfected in accordance with manufacturer recommendations unless the phosphate solution is fed directly from the covered shipping container? | Yes [ ]  No [ ]  N/A [ ]  |
| Sodium silicate or other silicate-based chemicals for the sequestration of iron and manganese shall be approved by the department on an individual basis. Operational data from actual full-scale facilities treating waters of similar quality or pilot tests may be required. | Yes [ ]  No [ ]  N/A [ ]  |