



# Water Quality Permitting Program Monitoring Matrix <sup>1,2,3</sup>

This matrix has been developed in coordination with internal and external DEQ stakeholders to assist the permit writer in identifying the appropriate pollutants and frequencies for monitoring in the permit. The recommended pollutants and frequencies are based on requirements from federal and state rules, best management practices, and best professional judgement.

| Table 1<br>NPDES Domestic Treatment Facilities: Activated Sludge, Trickling Filter and Lagoon Treatment Facilities<br>(effluent monitoring unless otherwise indicated, applies to all facilities unless otherwise indicated) |                                      |   |                            |  |
|--|--------------------------------------|---|----------------------------|--|
| PARAMETER  | Units                                | AVERAGE DRY WEATHER DESIGN CAPACITY, MGD <sup>4</sup> |                            |  |
|  |                                      | Minor < 0.10 <sup>5</sup>                             | Minor 0.10-1.00            | Major >1.0                             |
| Total Flow<br>(influent and/or effluent) <sup>6</sup>  | MGD                                  | Daily, Metered  |                            |  |
| BOD / CBOD <sup>7</sup> /TSS   |                                      |   |                            |  |
| BOD and TSS: Activated Sludge/Trickling Filter<br>(influent and effluent conc.)  | mg/l                                 | 2/month,<br>24-hr composite                           | 2/week,<br>24-hr composite | 3/week,<br>24-hr<br>composite          |
| BOD and TSS: Activated Sludge/<br>Trickling Filter<br>(lbs discharged)   | lbs/day                              | 2/ month,<br>calculation                              | 2/week,<br>calculation     | 3/week,<br>calculation                 |
| BOD and TSS: Lagoons<br>(influent and effluent conc.)  | mg/l                                 | 1/month,<br>24-hr composite                           | 1/week,<br>24-hr composite | 3/week,<br>24-hr<br>composite          |
| BOD and TSS: Lagoons<br>(lbs discharged)   | lbs/day                              | 1/month, calculation                                  | 1/week,<br>24-hr composite | 3/week, calculation                    |
| BOD and TSS Average % Removal<br>Efficiency <sup>8</sup> : Activated Sludge/<br>Trickling Filter and Lagoons   | Percentage<br>(%)                    | Monthly,<br>calculation                               |                            |  |
| Other Conventional Parameters  |                                      |   |                            |  |
| pH (influent and effluent)   | standard<br>units                    | 3/ week Grab  |                            | Daily, Grab or Continuous <sup>9</sup> |
| Bacteria: <i>E. coli</i> , enterococcus,<br>and/or fecal coliform <sup>10</sup>  | # Org.<br>/100mL or<br>MPN/100<br>mL | 2/ month<br>Grab                                      | 2/week,<br>Grab            | 3/week,<br>Grab                        |

**Table 1**  
**NPDES Domestic Treatment Facilities: Activated Sludge, Tricking Filter and Lagoon Treatment Facilities**  
 (effluent monitoring unless otherwise indicated, applies to all facilities unless otherwise indicated)

| PARAMETER   | Units                    | AVERAGE DRY WEATHER DESIGN CAPACITY, MGD <sup>4</sup> |  |   |
|---|--------------------------|---|--|---|
|   |                          | Minor < 0.10 <sup>5</sup>                             | Minor 0.10-1.00  | Major >1.0  |
| Effluent Temperature <sup>11</sup>  | °C                       | 3/ week<br>Grab or Continuous                         |  | Daily, Continuous   |
| NH <sub>3</sub> -N for toxicity   | mg/L                     | Not required  | With limit: 1/week, 24 hr composite<br><br>Without limit: 1/month, 24 hr composite | With limit: 2/week <sup>12</sup> , 24 hr composite<br><br>Without limit: 1/month, 24 hr composite   |
| Alkalinity <sup>13</sup>  | mg/L                     | 1/quarter, Grab                                       |  | 1/month, Grab   |
| <b>Disinfection: Chlorine – required only if Chlorine is used for disinfection</b>  |                          |   |  |   |
| Chlorine, Total Residual: Effluent  | mg/L                     | Daily, Grab   |  | Daily, Grab or Continuous   |
| Chlorine Residual: Pre De-chlorination <sup>14</sup>  | mg/L                     | Daily, Grab   |  | Daily, Grab or Continuous   |
| Chlorine Used   | lbs/day                  | Daily, Measurement                                    |  |   |
| <b>Disinfection: UV – required only if UV used for disinfection</b>   |                          |   |  |   |
| <b>UV Dose<sup>15</sup></b>   | <b>mJ/cm<sup>2</sup></b> | <b>Daily average, calculation</b>                     |  |   |
| <b>Pretreatment – required only when permit holder is under a formal pretreatment program.</b>                                |                          |   |  |   |
| EPA's pretreatment POCs and any other pollutants identified by pretreatment coordinator (influent and effluent) <sup>16</sup> | µg/L                     | Not Applicable  |  | Major <5 MGD Semi-annual, on 3 consecutive days <sup>17</sup> , 24-hr composite<br><br>Major >5MGD Quarterly, on 3 consecutive days <sup>17</sup> 24-hr composite |
| <b>Biosolids and Recycled Water – See NPDES Permit Template for requirements.</b>   |                          |   |  |   |
| <b>Receiving Water Monitoring- See NPDES Permit Template for requirements</b>   |                          |   |  |   |
| <b>WET (Whole Effluent Toxicity) Testing</b>  |                          |   |  |   |
| WET Testing   | --                       | Not applicable, unless toxics are known issue         |  | 4 per permit cycle, must be in conjunction with Tier I toxics monitoring <sup>18</sup>  |
| <b>Toxics<sup>19</sup> – See Permit Template, Schedule B for requirements.</b>  |                          |   |  |   |

**Table 1**  
**NPDES Domestic Treatment Facilities: Activated Sludge, Trickling Filter and Lagoon Treatment Facilities**  
 (effluent monitoring unless otherwise indicated, applies to all facilities unless otherwise indicated)

| PARAMETER                   | Units                           | AVERAGE DRY WEATHER DESIGN CAPACITY, MGD <sup>4</sup> |                 |   |
|-----------------------------|---------------------------------|---|-----------------|---|
|                             |                                 | Minor < 0.10 <sup>5</sup>                             | Minor 0.10-1.00 | Major >1.0  |
| Tier I Toxics <sup>20</sup> | µg/L unless otherwise specified | Not Applicable <sup>21</sup>                          |                 | <b>Characterization Monitoring:</b> Quarterly for 3 years of permit cycle<br><br><b>For pollutants with limits:</b> 1/week, 24 hr composite or composite of discrete grabs depending on parameter (Refer to Schedule B) |
| Copper and Aluminum BLM     | µg/L                            | Not Applicable <sup>21</sup>                          |                 | Determined on case-by-case basis by Copper BLM Subject Matter Experts   |

**Table 2<sup>22</sup>**  
**WPCF and NPDES Domestic Treatment Facilities**  
**Conventional Sand Filter and Recirculating Gravel Filter Treatment Facility Monitoring Requirements**  
**(effluent monitoring unless otherwise indicated)**

| ITEM OR PARAMETER   | WPCF FACILITIES  |                         | NPDES FACILITIES   |               |
|---|--|-------------------------|--|---------------|
|   | ≤ 30,000 GPD   | > 30,000 GPD            | ≤ 30,000 GPD   | > 30,000 GPD  |
| Flow <sup>6</sup>   | Daily, Metered   |                         | Daily, Metered   |               |
| <b>BOD / CBOD<sup>7</sup>/TSS</b>                         |  |                         |  |               |
| BOD & TSS:<br>Influent & Effluent                         | Quarterly Grab (influent)                                    | Monthly Grab (influent) | Frequency for influent and effluent to be determined by design flow, see Table 1. Grab sample for systems ≤ 30,000 GPD; composite sample for ≥ 30,000 GPD. |               |
| BOD & TSS Average %<br>Removal Efficiency <sup>8,23</sup> | N/A  | N/A                     | Monthly, Calculation   |               |
| pH  | N/A  | N/A                     | Frequency to be determined by design flow, see Table 1. Grab Sample.   |               |
| NH <sub>3</sub> -N, NO <sub>3</sub> +NO <sub>2</sub> -N   | Quarterly, Grab  | Monthly, Grab           | Quarterly, Grab  | Monthly, Grab |
| TKN   | Quarterly, Grab  | Monthly, Grab           | --   | Monthly, Grab |
| <i>E. coli</i> bacteria                                   | Not required for systems discharging to subsurface disposal. |                         | Frequency to be determined by design flow, see Table 1. Grab sample.   |               |
| Chlorine Residual   | Not required for systems discharging to subsurface disposal. |                         | Daily, Grab  |               |
| Tank Inspection<br>(Dosing, Septic &<br>Recirculation)    | Annual,<br>Record observation                                |                         | Annual,<br>Record observation  |               |
| Inspect Grease Traps                                      | Semi-annual,<br>Record observation                           |                         | Semi-annual,<br>Record observation   |               |
| Inspect Pump Screens                                      | Quarterly,<br>Record observation                             |                         | Quarterly,<br>Record observation   |               |
| Depth of Effluent in<br>Disposal Trench                   | Semi-annual <sup>24</sup> ,<br>Measurement                   |                         | N/A  |               |

**Table 3**  
**WPCF Domestic Treatment Facilities**  
**Lagoon Treatment Facilities (evaporative and/or with recycled water irrigation)**

| ITEM OR PARAMETER  | Units                        | DESIGN CAPACITY, MGD                   |                    |  |
|--|------------------------------|--|--------------------|--|
|  |                              | Minor < 0.10                           | Minor 0.10 - 1.00  | Major >1.0                             |
| Total Flow (influent and effluent) <sup>6</sup>                                  | MGD                          | Daily or 5 days/week, Measurement      |                    | Daily, Measurement by totalizing meter |
| BOD <sub>5</sub> & TSS (influent only)   | mg/L                         | Quarterly or Annual, composite or grab | Monthly, composite | 3/week, 24-hr composite                |
| pH (influent & effluent)   | standard units               | 2/week, Grab                           | 3/week, Grab       | Daily, Grab                            |
| Disinfection: Chlorine   |                              |  |                    |  |
| Chlorine, Total Residual: Effluent when irrigating                               | mg/L                         | Daily, Grab                            |                    | Continuous                             |
| Chlorine Residual: Pre De-chlorination <sup>14</sup>                             | mg/L                         | Daily, Grab                            |                    | Continuous                             |
| Disinfection: UV   |                              |  |                    |  |
| UV Dose <sup>15</sup>  | mJ/cm <sup>2</sup>           | Daily avg., calculation                |                    |  |
| Lagoon Monitoring  |                              |  |                    |  |
| Perimeter Inspection   | N/A                          | Daily or 5 days/week                   |                    |  |
| Depth of Wastewater per Lagoon   | Gauge Units (feet or inches) | Weekly                                 |                    | Daily                                  |
| Lagoon Solids Accumulation   | Record Observations          | Once/Permit Cycle                      |                    |  |
| <b>Biosolids and Recycled Water – See WPCF Permit Template for requirements.</b> |                              |  |                    |  |

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- <sup>1</sup> This matrix is intended for characterization and compliance monitoring; Characterization monitoring provides the permit writer with the best available information to determine reasonable potential to exceed water quality criteria. Compliance monitoring supports permit limits and ensures facility compliance with beneficial uses, water quality based effluent limits, and technology based effluent limits
  - <sup>2</sup> Matrix does not include monitoring requirements for recycled water or biosolids. These may be found in the permit template.
  - <sup>3</sup> Deviations from monitoring frequencies must be approved by Direct Support and justification documented in the Fact Sheet. Note that the monitoring frequencies are based on Dry Weather Design Flow. Exceptions may not be made for lower reported flows unless approved.
  - <sup>4</sup> Consult direct support or management when average dry weather design flow is not available or unknown
  - <sup>5</sup> When the required monitoring frequency is greater than once during the monitoring period (e.g. 2/week), the permit should specify that monitoring events must be on separate days. When the required monitoring frequency is 2/ month, the monitoring events should be in separate calendar weeks.
  - <sup>6</sup> Total flow reported is to be representative of flow(s) received, treated and discharged from the facility. In general, the monitoring location should be on both the influent and effluent for facilities with storage such as lagoon treatment systems and on either the influent or the effluent for flow-through facilities. In evaluating the appropriateness of the flow measurement location to characterize the wastewater flows, the permit writer should take into consideration: 1) recirculation flows and diversions which may occur upstream of the flow measurement device, 2) waste streams which may enter the treatment process after the flow measurement device, 3) diversions of the treatment process which occur after the influent measurement device, 4) discharges of effluent to irrigation or other uses which may not be recorded, 5) systems where flow measurement does not account for evaporation and rainfall (lagoons and other storage systems) and 6) systems that have significant off-line storage capacity. It may be necessary to have the permittee submit to DEQ a plan and schedule for implementing the changes necessary to provide accurate flow characterization or evaluate methods and procedures to provide the flow information requested. Note that flow meter calibration is a narrative requirement under Schedule B, item 2.
  - <sup>7</sup> Frequency of analysis must be the same as it would have been for BOD. See DEQ “*Instruction for BOD5 to CBOD5 Substitution in NPDES Permits*”
  - <sup>8</sup> In the development of the Federal Regulations pertaining to implementation of 85% BOD and TSS removal efficiency, septic tank treatment was not considered. Therefore, when a percent removal limitation for BOD and TSS is required by permit utilizing septic tanks, a 200 mg/ liter assumed influent concentration is to be used in the calculation to credit treatment resulting from the septic tanks.
  - <sup>9</sup> If continuous pH monitoring is allowed, the permit must specify that 1) The permittee must keep on file either daily calibration logs or an instrument manual showing that less than daily calibration is required along with calibration logs that comply with manufacturer instructions and 2) any Proficiency (PT) or Water Pollution (WP) tests must be done using the continuous pH monitor.
  - <sup>10</sup> Type of bacteria that is monitored should be consistent with the criteria for the receiving stream. See Bacteria IMD for more information.
  - <sup>11</sup> Frequency of temperature analysis should be the same as pH, except when the facility has water quality based effluent limit based on an excess thermal load calculation, and then sampling may be continuous for minor permittees at the discretion of the permit writer. Temperature monitoring is required even if a permittee does not have a limit for temperature.
  - <sup>12</sup> If a permittee cannot demonstrate stable ammonia control then increased monitoring of 3/week or more can be required.
  - <sup>13</sup> If permittee is already reporting alkalinity due to other required monitoring (e.g. Copper BLM requirements) then separate alkalinity monitoring is not required.
  - <sup>14</sup> If de-chlorination is used, then total residual chlorine should be monitored pre and post de-chlorination.
  - <sup>15</sup>  $UV\ dose = UV\ Intensity \times Residence\ Time.$
  - <sup>16</sup> The POCs (Pollutants of Concern) identified by EPA for pretreatment monitoring are: arsenic, cadmium, chromium, copper, cyanide, lead, mercury, molybdenum, nickel, selenium, silver, zinc, 5 day BOD, TSS and Ammonia (for plants that accept non-domestic sources of ammonia).

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- <sup>17</sup> This monitoring is done to develop local limits as well as demonstrate compliance as required in schedule E. The advantage of 3 days is that it can capture variability.
- <sup>18</sup> Tier I toxics monitoring only needs to occur once over the course of sampling for the WET test.
- <sup>19</sup> While this table explicitly refers to Domestic Permittees, a similar schedule should be used for Industrial Permittees where Priority Pollutants and Copper/Aluminum BLM apply (see EPA Form 2C for industrial monitoring requirements).
- <sup>20</sup> If the permittee has a pretreatment program, the permit writer should remove any overlapping parameters from Tier I testing. However, care should be taken to ensure that the only analytes with overlapping fractions should be removed (e.g. if total recoverable arsenic is being collected for pretreatment then only the Tier I requirements for total recoverable arsenic should be removed, the Tier I monitoring requirements for inorganic arsenic would remain).
- <sup>21</sup> Toxics may apply in certain circumstances to minor permittees (see RPA IMD). Consult with Direct Support in these cases.
- <sup>22</sup> Deviations from monitoring frequencies must be approved by management and justification documented in the Fact Sheet..
- <sup>23</sup> Reporting of BOD and TSS Average Percent Removal Efficiency is only required when the facility discharges.
- <sup>24</sup> Measurements should be taken prior to and during the peak discharge period(s) in the case of seasonal dischargers (e.g. RV parks) or during other critical periods for continuous dischargers.