# 3. Entering Data in a Customized SWMOR Workbook

Each day, SWTP personnel must monitor and record information related to plant operations and performance. This chapter explains how to enter compliance data in the SWMOR workbook. The workbook's data validation features help determine if you have omitted any required data, thereby preventing you from submitting an incomplete report and incurring a reporting violation.

The MOR workbook is designed so that you can migrate data directly from a Supervision Control and Data Acquisition (SCADA) system or digital data files instead of manually entering data into every workbook cell. Although this option requires advanced knowledge and experience in spreadsheet applications, it can help with data entry errors, and save time in the long run. (See Section 3.6.)

> Some or all this chapter will apply to your water treatment plant. Plants that use alternative treatment should see Chapter 5 for additional instructions. 2-filter plants should see Chapter 6 for additional instructions. When additional instructions apply, they are noted, and you are directed to one of these other chapters.

## 3.1 Creating a Monthly Workbook File

When you are ready to begin entering data for a reporting month, open your saved master file workbook and select [enable contents], if applicable. The programming dialog boxes appear automatically. If you would like to adjust the reporting information by re-customizing the form, select that the form has been customized and that there have been changes when the **Customize Form** dialog box appears. If nothing at your plant has changed and you would prefer to enter the reporting information on the **P.2 Turbidity Data** worksheet, select that there have been no changes.

If you do not enter the reporting information by re-customizing the form, select the **P.2 Turbidity Data** worksheet tab to begin entering the reporting month and year, number of connections, and population at the top of the page as shown in Figure 3.1. The workbook automatically copies the information from these cells onto the other SWMOR worksheets.

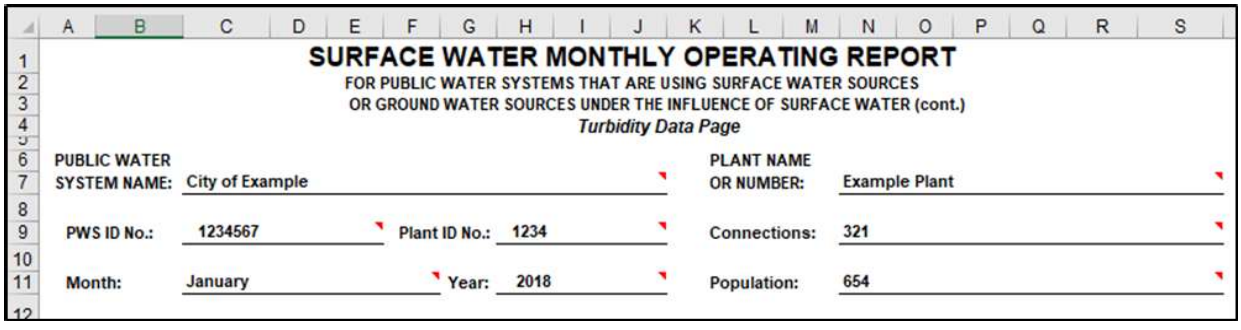



**Figure 3.1. Plant Information Section of the P.2 Worksheet**

## Month and Year

Using the drop-down menu, select the [month] and the [year] of the reporting month. *Note:* The value of the first year in the list can be changed by changing the value shown in cell AQ2 located on the right-hand side of the **P.2** worksheet. This may be important if you use the workbook for an extended number of years and you need to update the year drop-down list.

## Connections

If you have a community water system that does not sell water to other systems, enter the {number of residential connections}. Non community systems, like RV parks and industrial facilities, or wholesale systems with no residential connections do not have to complete this cell.

## Population

Enter the {total number of customers} served by your system during the reporting month. The number should include the entire population of your distribution system or the entire population of the any wholesale systems and should match what is in Drinking Water Watch (DWW). This is important because the turbidity and disinfection requirements for SWTPs are based on the total population served by a plant. If you know your total system population is different than what is shown in DWW, you should contact us to update your population.

> The number of connections and population must match what we have on file. Check DWW if you are unsure. You should update this information as needed, and at least annually to ensure it matches.

## Saving Your Monthly Workbook

To help you establish a standardized file structure when you begin each month, select [Save As . . .] on the customized workbook toolbar. When you select this button, the workbook will ask you if the plant information is correct. Select [OK] and the workbook will format a filename as follows:

FileType_Year_Month_PWSID Number_PlantName

If you prefer to use another filename structure, enter it instead and then save.

> To avoid overwriting data, always start each MOR using your customized master file workbook. Do not use the previous month's workbook as a starting point.

# 3.2 Turbidity and Disinfectant Residual Performance Data (P.2)

The **Performance Data** table on the **P.2 Turbidity Data** worksheet of the SWMOR workbook is shown in Figure 3.2. To open, select the **P.2 Turbidity Data** worksheet tab. This table is used to report turbidity and disinfectant residual data to summarize your plant's performance each day. You must enter data on this worksheet daily, including days when your plant does not treat water.

> **P.2** for conventional plants and plants that use alternative treatment technologies are the same. The only difference in **P.2** of the workbook for 2-Filter plants is where you enter finished water (i.e., CFE) turbidity data. You enter CFE data on **P.6-9** (see Chapter 6) instead of **P.2**.

The **Performance Data** table in this section contains data for the plant referenced in the CT Study approval letter in Appendix A. As we explain how to complete this table, we refer to the shaded entries in this figure.

**PERFORMANCE DATA**

| Date | Raw Water Pumpage (MGD) | Treated Water Pumpage (MGD) | RAW WATER ANALYSES | | SETTLED WATER TURBIDITY (Mandatory Data) | | | | | | FINISHED WATER QUALITY | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Basin No. | | | | | | Turbidity | | | | | | Lowest | |
| | | | NTU | Alk. | 1 | 2 | 3 | 4 | 5 | 6 | NTU1 | NTU2 | NTU3 | NTU4 | NTU5 | NTU6 | Residual | Time[a] |
| 1 | 1.411 | 1.322 | 49 | 52 | 2.4 | 1.9 | | | | | X | 0.19 | 0.07 | 0.03 | 0.31 | ND | 2.4 | |
| 2 | 1.484 | 1.444 | 26 | 68 | 2.8 | 1.8 | | | | | X | 0.33 | 0.24 | 0.27 | 0.15 | 0.12 | 3.4 | |
| 3 | 1.598 | 1.511 | 12 | 59 | 2.1 | 2.2 | | | | | X | 0.23 | 0.08 | 0.12 | 0.17 | 0.26 | 3.1 | |
| 4 | 1.154 | 1.064 | 80 | 92 | 5.2 | 4.3 | | | | | X | 0.34 | 0.46 | 0.78 | 1.06 | 1.17 | 2.3 | |
| 5 | 0.000 | 0.889 | X | X | X | X | | | | | X | X | X | X | X | X | 1.1 | |
| 6 | 2.650 | 1.103 | 15 | 61 | 1.8 | 1.4 | | | | | X | X | 0.26 | 0.32 | 0.21 | 0.10 | 2.8 | |
| 7 | 1.302 | 1.239 | 73 | 55 | 2.3 | 2.0 | | | | | X | 0.13 | 0.28 | 0.38 | 0.34 | 0.30 | 3.0 | |
| 8 | 1.377 | 1.280 | 10 | 47 | 1.7 | 1.9 | | | | | X | 0.27 | 0.24 | 0.17 | 0.19 | 0.04 | 2.7 | |
| 9 | 1.701 | 1.687 | 24 | 53 | 1.9 | 1.6 | | | | | X | 0.24 | 0.32 | 0.25 | 0.18 | 0.12 | 0.3 | 0.75 |
| 10 | 1.408 | 1.397 | 16 | 44 | 1.2 | 1.1 | | | | | X | 0.33 | 0.08 | 0.07 | 0.21 | 0.11 | 1.9 | |
| 11 | 1.457 | 1.402 | 70 | 62 | 1.8 | 1.5 | | | | | X | 0.30 | 0.06 | 0.20 | 0.23 | 0.34 | 2.2 | |
| 12 | 1.537 | 1.522 | 98 | 43 | 3.2 | 2.3 | | | | | X | 0.29 | 0.08 | 0.16 | 0.14 | 0.27 | 3.1 | |
| 13 | 1.092 | 1.084 | 16 | 57 | 2.2 | 1.8 | | | | | X | 0.33 | 0.28 | 0.10 | 0.27 | 0.29 | 2.0 | |
| 14 | 1.564 | 1.506 | 68 | 48 | 2.0 | 1.7 | | | | | X | 0.23 | 0.26 | 0.31 | 0.28 | 0.03 | 1.4 | |
| 15 | 1.361 | 1.278 | 93 | 69 | 25.6 | 2.1 | | | | | X | 0.30 | 0.20 | 0.23 | 0.05 | 0.25 | 1.8 | |
| 16 | 1.879 | 1.794 | 10 | 55 | 2.1 | 1.9 | | | | | X | 0.31 | 0.21 | 0.17 | 0.28 | 0.22 | 1.5 | |
| 17 | 0.109 | 0.000 | 91 | 58 | 2.2 | X | | | | | X | 0.20 | 0.31 | 0.24 | 0.34 | 0.20 | X | |
| 18 | 0.230 | 0.050 | 95 | 64 | 2.5 | X | | | | | X | 0.17 | 0.13 | 0.16 | 0.32 | 0.28 | md | |
| 19 | | | | | | | | | | | | | | | | | | |

**Figure 3.2. Section of Performance Data Table on P.2 with Example Data**

# *Raw and Treated Water Pumpage Data*

## Raw Water Pumpage

For each day of the month, enter the {volume of raw water (in MGD)} pumped to the plant that day. The volume of raw water pumped to the plant may not be the same as the volume of water pumped to distribution (i.e., treated water pumpage).

If raw water was not pumped to the plant on a specific date, enter {0.000}. If water was pumped, but you didn't record how much, enter {ND}.

In Figure 3.2, the entry for Day 5 shows that raw water was not pumped to the plant; therefore, the operator entered 0.000 in the **Raw Water Pumpage** cell for that date. Since no water was treated, the operator was not required to monitor or enter turbidity results for raw, settled, or finished water.

## Treated Water Pumpage

For each day of the month, enter the {volume of water treated (in MGD)}. Do not enter the meter reading; instead, enter the total volume of water pumped to the distribution system during the day.

If the plant did not pump treated water to distribution on a specific day, enter {0.000}. If the plant pumped treated water to the distribution system, but you didn't record how much, enter {ND}.

In Figure 3.2, the entry on Day 17 shows that the plant treated 0.109 MGD of raw water but did not pump treated water to the distribution system. Since treated water was not pumped to distribution, the plant was not required to enter disinfectant residual data entering the distribution system.

## Pumpage Summaries CALC

Figure 3.3 shows the section of the **Performance Data** table where it automatically reports the total amounts of raw and treated water pumped during the month as well as the average, maximum, and minimum daily pumpage rates. The table calculates these results using the values for raw and treated water pumpage that you entered each day.

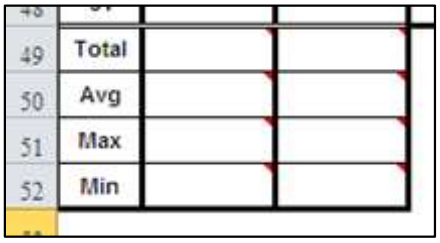



**Figure 3.3. Pumpage Summary Section of the Performance Data Table**

## *Raw Water Analyses*

You must measure the turbidity and the alkalinity of the raw water at least once each day when your plant treats water.

For each day of the month, enter the {raw water turbidity in nephelometric turbidity unit (NTU)} in the **NTU** column. Enter the {raw water alkalinity in milligrams per liter of calcium carbonate (mg/L of $CaCO_3$)} in the **Alk**. column.

If you conduct more than one set of tests during the day, record the average reading for each parameter. If your plant did not treat water on a specific day, enter {X} in both the **NTU** column and the **Alk**. column. If your plant treated water but did not collect turbidity or alkalinity data on a specific day, enter {ND} in each column.

## *Settled Water Turbidity*

If we require you to monitor settled water turbidity, you must do so as specified in your CT Study approval letter. Even if we don't require that you monitor settled water turbidity, we still recommend you measure it at the effluent of each sedimentation basin at least once each day. Data on settled-water turbidity allows for valuable analysis of sedimentation performance; and in particular, the performance of each basin.

The **Performance Data** table on **P.2** contains six columns to record the turbidity of the settled water from Basins No. 1 through 6. If your plant has more than six basins; six additional columns for Basins No. 7 to 12 will appear on an addendum page.

If your plant collects settled water turbidity data from each sedimentation basin every day, enter the {settled water turbidity (in NTU)} of each basin for each date. If you conduct more than one set of tests during the day, enter the maximum or highest value from each basin.

If a basin is not in operation on a specific day, enter {X}. If settled water turbidity is mandatory and you did not collect the turbidity for an operational basin, enter {ND}. If settled water turbidity monitoring is optional, either leave the cell blank or enter {ND}.

In Figure 3.2, the example entries in the **Settled Water Turbidity** columns indicate the following:

- The SWMOR workbook was customized to require settled water turbidity data.
- The operators monitored and reported settled water turbidity at least daily when it was in service.
- The plant was offline on Day 5.
- Basin No. 2 was not in operation on Days 17 and 18.

# *Finished Water Quality*

## Turbidity

You must measure and record CFE turbidity each day that your plant treats water. This means you must record CFE turbidity results each day that you show a raw water pumpage above 0.000 MGD.

> As specified previously, 2-Filter plants enter CFE data on the **P.6-9 CFE Turbidity Data** worksheet. These plants should skip the information in this subsection related to CFE turbidity and refer to Chapter 6. All the other information in this section (i.e., Lowest Residual and Time) apply to all customizations of the combined SWMOR.

### *CFE Turbidity Monitoring Requirements*

In most cases, you must collect CFE turbidity samples at the filter outlet header or the clearwell inlet line. However, we occasionally approve other sampling sites, such as the clearwell outlet line and the service pump discharge line.

The frequency and timing of your CFE turbidity measurements depend on the number of people that your water system serves as explained in the following sections.

#### Systems Serving 500 or Fewer Persons

If your system serves 500 or fewer persons, you must measure CFE turbidity at least once each day.

#### Systems Serving More than 500 Persons

If your system serves more than 500 persons, you must measure CFE turbidity at regular, 4-hr intervals whenever the plant is in operation. Use the same schedule each day. If you measure CFE turbidity more frequently than once every four hours, only report the readings collected at the scheduled times.

#### Reporting Periods

TCEQ sets six standard 4-hr CFE reporting periods each day. NTU1 is 12:00 a.m. to 4:00 a.m.; NTU2 is 4:00 a.m. to 8:00 a.m.; and so forth. Systems serving more than 500 persons must identify six compliance times throughout the day, one within each reporting period; and report CFE turbidity at those same compliance times each day. For example, if you identify 1:00 a.m., 5:00 a.m., 9:00 a.m., 1:00 p.m., 5:00 p.m., and 9:00 p.m. as your compliance times, you must report the CFE turbidity at those exact times each day. Systems serving fewer than 500 persons must report their daily reading in the reporting period block that reflects when their sample was collected.

If your plant is offline for an entire reporting period (i.e., between 12:00 a.m. and 4:00 a.m.), you are not required to report CFE turbidity under NTU 1 for that day. However, if your plant is online for any part of a 4-hr reporting period, but not at the scheduled compliance time, you must report the CFE turbidity right before your plant shuts down, or after the filters come back online within that reporting period. Intervals

between compliance measurements can be less than four hours; however, they should not exceed four hours.

## Special Cases

If you are using automated systems to operate or monitor your plant, there are some special requirements to consider as discussed below.

**Auto-cycling:** If your plant automatically cycles off and on, we consider the plant to be in continuous operation unless you turn off the raw water pumps with the manual override. If your plant is not treating water when the sample is supposed to be collected, you must use the last 15-min. reading that was collected when the plant was in operation. The clearwell and the service pump station may however, continue to operate when the plant is not in operation because these facilities can continue to operate even if the plant is not filtering water.

**Online turbidimeters:** If your plant uses a continuous turbidity analyzer, you may either take the turbidity data from the recorder chart or use the results of grab samples.

If you choose to use data from the recorder chart, you must verify the accuracy of the turbidity monitor at least once each week.

You should always avoid calibrating your online turbidimeters immediately before a sample is scheduled to be collected. If there is a problem during calibration, you could record an erroneous result. You should also allow at least 15 to 20 minutes to complete a calibration procedure so that you don't miss a sample or accidentally report the turbidity of the calibration standard, rather than the sample. If you are calibrating an online turbidimeter when a sample is supposed to be collected, you can report CFE turbidity using one of the following methods:

- Grab samples and a benchtop turbidimeter.
- The turbidity reading from the online meter recorded 15 minutes after the calibration process finished.
- The last turbidity reading recorded by the online turbidimeter before taken offline for calibration.

See Appendix G for additional information on calibration and verification of instruments.

### *CFE Turbidity Data Entry*

The **Performance Data** table contains six columns for entering CFE turbidity data (see Figure 3.2). If your plant is in operation during any portion of a 4-hr period, enter the {turbidity (in NTU)} in the appropriate column. If your plant was offline during the entire 4-hr period, enter {X} in the corresponding column. If the plant treated water at any time during a 4-hr period but turbidity was not measured during the entire 4-hr period, enter {ND} in the appropriate cell.

In Figure 3.2, †he example CFE turbidity entries in the **NTU1** column through the **NTU6** column indicate the following:

- The plant was offline between 12:00 a.m. and 4:00 a.m. each day.

- The plant was offline for the entire day on Day 5.
- The plant was offline between 4:00 a.m. and 8:00 a.m. on Day 6.
- The plant was in operation between 8:00 p.m. and midnight on Day 1, but CFE turbidity was not measured during that reporting period.

## Lowest Residual

The **Lowest Residual** column is used for entering the lowest disinfectant residual entering the distribution system (see Figure 3.2). You must enter each day's lowest disinfectant residual whenever treated water pumpage is above 0.000 MGD.

### *Disinfectant Residual Monitoring Requirements*

You can measure your disinfectant residuals at any location in the plant where the quality is representative of the water entering the distribution system. Common sampling sites include the clearwell outlet line and the service pump discharge line. The timing and number of measurements depends on the population your water system serves. The specific requirements are explained below.

### Systems Serving 3,300 or Fewer Persons

If your system serves 3,300 or fewer persons each day, you can collect grab samples to measure the disinfectant residual of the water entering the distribution system. You must collect the residual data at regular intervals throughout the daily period of operation. Table 3.1 shows the number of daily residual measurements required based on population served.

For systems maintaining a free chlorine residual in the distribution system, the minimum acceptable level is 0.2 mg/L, measured as free chlorine. For systems maintaining a chloramine residual, the minimum acceptable level is 0.5 mg/L, measured as total chlorine. If the residual entering the distribution system falls below the acceptable level, systems collecting grab samples must measure the residual entering the distribution system at least once every four hours. This increased monitoring frequency must continue until the plant restores an acceptable residual.

**Table 3.1. Point of Entry Disinfectant Residual Measurement Requirements**

| Population Served | Number of samples required per day |
|---|---|
| 500 or fewer | 1 |
| 501–1,000 | 2 |
| 1,001–2,500 | 3 |
| 2,501–3,300 | 4 |

### Systems Serving More than 3,300 Persons

If your system serves more than 3,300 persons, you must install equipment to continuously monitor disinfectant residuals. The continuous analyzer must monitor the residual entering the distribution system at least once every 30 minutes. Systems

using continuous analyzers to monitor the disinfectant residual must take the data from the recorder chart.

*Note*: These analyzers must be verified at least once every seven days and recalibrated if expected results differ by greater than 15% (see Appendix G).

A plant that experiences a failure in the continuous monitoring equipment may collect grab samples every four hours for no more than five working days. The plant must collect these samples at the same time it collects the CFE turbidity samples.

### *Lowest Residual Data Entry*

For each day, enter one of the following:

- {Lowest disinfectant residual (in mg/L)} of water entering the distribution system if you collected all the required readings.
- {X} if your plant did not pump treated water to distribution on a specific day.
- {ND} if your plant pumped treated water to the distribution system at any time during the day but you did not collect any finished water disinfectant residual data.

If you recorded some, but not all required readings, then for each day enter one of the following:

- {Lowest disinfectant residual (in MGD)} measured if it was below the acceptable level of 0.2 mg/L free chlorine or 0.5 mg/L chloramines, measured as total chlorine.
- {MD} if all the measurements were above the minimum required level.

## Time

The **Time** column is used to report the amount of time each day that the disinfectant residual entering the distribution system level was below the minimum acceptable level. For each day, enter the {longest consecutive period (in hours)} that the disinfectant residual entering the distribution system was below the minimum acceptable level.

When calculating the duration of an event, it begins when the reading falls below the acceptable level and concludes when the reading is equal to or greater than the acceptable level. For example, if the 4 p.m. free chlorine reading was 0 mg/L, the 8:00 p.m. reading was 0.1 mg/L, and the midnight reading was 0.3 mg/L, then the duration of the event was 8 hours (i.e., 4:00 p.m. to midnight).

A plant may increase the monitoring frequency to more accurately determine the duration of an event. For example, if you collect residual data every 15 or 30 minutes after getting a low reading, you may report the duration of the event in ¼-hr or ½-hr increments. Therefore, an event lasting only 15 minutes is reported as 0.25 hours, and one lasting 2 hours, 45 minutes is reported as 2.75 hours.

The time entered in the **Time** column may not be the period in which the lowest residual occurred. However, it should always be the longest period in which residuals below the minimum were measured. For example, if your lowest measured residual was 0.0 mg/L at midnight, but you had a 5-hr event between 2:00 and 7:00 PM when

your residual was 0.1 mg/L, then your entries in the **Lowest Residual** column and the **Time** column will not represent the same event.

If you did not record the time period that the disinfectant residual was below the acceptable level on a specific day, enter {ND} for that day.

Leave the cell blank, if the residual entering the distribution system was always above the acceptable level on a specific day. Also, leave the cell blank if you entered ND or MD for a specific date in the **Lowest Residual** column.

The Lowest Residual example entries in Figure 3.2 indicate all of the following:

- The plant did not pump any treated water to distribution on Day 17.
- The disinfectant residual entering the distribution system fell below the minimum acceptable level of 0.5 mg/L for total chlorine at least one time on Day 9. The longest duration of time that the residual was below the acceptable level was 45 minutes, or 0.75 hours.
- The plant pumped water to distribution on Day 18, but the plant failed to continuously monitor the chlorine residual entering the distribution system. However, some of the data was recorded and all of those readings were above 0.5 mg/L.

# 3.3 IFE Turbidity Performance Data (P.3)

You must measure and enter IFE turbidity data on the **P.3 Filter Data** worksheet every day that your plant treats water. You must also enter additional information at the end of the month about the performance of individual filters during previous months. Select the **P.3 Filter Data** worksheet tab to open this worksheet.

> This section also applies to plants that use alternative treatment. 2-Filter plants should refer to Chapter 6 – Entering Daily IFE Turbidity Data and CFE Summary Data.

## *Daily IFE Turbidity Data*

The **Individual Filter Turbidity** section of the **Performance Data** table shown in Figure 3.4 contains columns for entering the turbidity of the filtered water from Filters No. 1-10. If your plant has more than 10 filters, additional columns for up to 50 filters are provided on addendum pages.

| | PERFORMANCE DATA | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | INDIVIDUAL FILTER TURBIDITY | | | | | | | | | | | | | | | |
| | | Filter No. 1 | | Filter No. 2 | | Filter No. 3 | | Filter No. 4 | | Filter No. 5 | | Filter No. 6 | | Filter No. 7 | | Filter No. 8 | | Filte |
| Date | | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max |
| 1 | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |

**Figure 3.4. Data Section for IFE Turbidity on P.3**

The two examples at the end of this subsection demonstrate how to complete and interpret the information related to daily IFE turbidity data.

## IFE Turbidity Monitoring and Calibration Requirements

You must measure the turbidity of the water produced by a filter whenever it is sending water to the clearwell. That means that you must enter at least one IFE turbidity result each day when you show a raw water pumpage above 0.000 MGD. IFE turbidity must be measured every 15 minutes at the outlet of each filter before that water is mixed with the water from any other filter. These readings must be collected on the quarter hour; for example, at 1:00 p.m., 1:15 p.m., 1:30 p.m., and so forth.

The calibration of each continuous turbidity monitor must be verified at least once each week. A plant that experiences a failure in the continuous monitoring equipment may collect grab samples every four hours, for no more than five working days; or 14 days, if you have a small system less than 10,000 population. If the result of a grab sample is greater than 1.0 NTU, the plant must collect a confirmation sample 15 minutes later.

Avoid calibrating your online turbidimeters immediately before a sample is scheduled to be collected. If there is a problem during the calibration procedure, an erroneous result might be recorded. If you have a calibration problem that affects two consecutive 15-min. readings, you must either document that these readings were collected during a calibration procedure or complete an FPR (see Chapter 7).

*Note*: A filter is in operation when it is discharging water that contributes to the CFE. A filter is not in operation if it is offline or filtering to waste. Whenever maintenance activities are conducted, SWTP operators must make a record in the plant's operational logs for reference to verify why IFE turbidity monitoring was not conducted or reported.

## IFE Turbidity Data Entry

### *Max*

For each day of the month, enter the {maximum turbidity (in NTU)} recorded from each filter.

Enter {X} if a filter is not in operation on a specific day. Enter {ND} if you did not collect any of the required IFE 15-min. turbidity readings for a specific filter.

If you recorded some, but not all required 15-min. readings in a day, enter one of the following:

- {Highest turbidity (in NTU)} if it was confirmed to be above 1.0 NTU.
- {MD} if all readings were 1.0 NTU or less.

Systems may be required to conduct additional monitoring if the turbidity level from a filter exceeds the 1.0 NTU or 2.0 NTU trigger levels. Readings above these trigger levels must be confirmed in two consecutive 15-min. readings for the readings to count towards compliance. Do not report any turbidity reading above either trigger level unless a filter exceeds the trigger level in two consecutive 15-min. readings. If the turbidity level does not exceed either trigger level in two consecutive 15-min. readings, report the maximum reading that was less than or equal to 1.0 NTU.

### *4 Hrs*

If your system serves fewer than 10,000 persons each day, leave the cell in the **4 Hrs** columns blank.

If your system serves 10,000 or more persons, enter the {turbidity (in NTU)} measured at the end of four hours of continuous filter operation after the filter is returned to service from backwash or shutdown. If this occurs more than once a day for a given filter, enter the {turbidity (in NTU)} measured for the event with the maximum turbidity level at four hours. If no such event occurs for a filter on a specific day, enter {X}.

If you failed to measure the required 4-hr turbidity readings for a specific filter, enter {ND}.

If you recorded some, but not all required readings on a given day, enter one of the following:

- {Highest turbidity (in NTU)} of the day if any of the 4-hr readings that you do have were above 0.5 NTU.
- {MD} if you recorded some, but not all required readings, but all of the readings that you do have were 0.5 NTU or less.

*Note*: Systems serving fewer than 10,000 people are not required to report 4-hr data. However, the worksheet allows you to report the data if you wish. If you decide to include the data, the **P.3** worksheet will calculate the number of days when the **4 Hrs** column contains readings above 0.5 NTU but it automatically excludes the information when determining whether additional monitoring is required. As a result, there are no negative consequences to including the additional information.

Systems serving 10,000 or more persons may be required to conduct additional monitoring if the turbidity level from a filter exceeds 0.5 NTU in two consecutive 15-min. readings at the end of four hours of continuous filter operation.

Do not report any turbidity reading above 0.5 NTU unless a filter exceeds 0.5 NTU in two consecutive 15-min. readings at the end of four hours into a filter run. If the turbidity level from a filter is greater than 0.5 NTU at 4 hours, report that reading only if the preceding reading (i.e., the reading at 3 hours, 45 minutes), or the following reading (i.e., the reading at 4 hours, 15 minutes) is also greater than 0.5 NTU. Otherwise, report the subsequent reading; that is, the reading at 4 hours and 15 minutes.

# IFE Turbidity Data Entry Examples

## *IFE Turbidity Data Example 1*

This example demonstrates how to enter data in the **Max** and **4 hrs** cells. It is based on turbidity measurements for samples collected at the effluent of hypothetical Filter No. 2 shown in Figure 3.5.

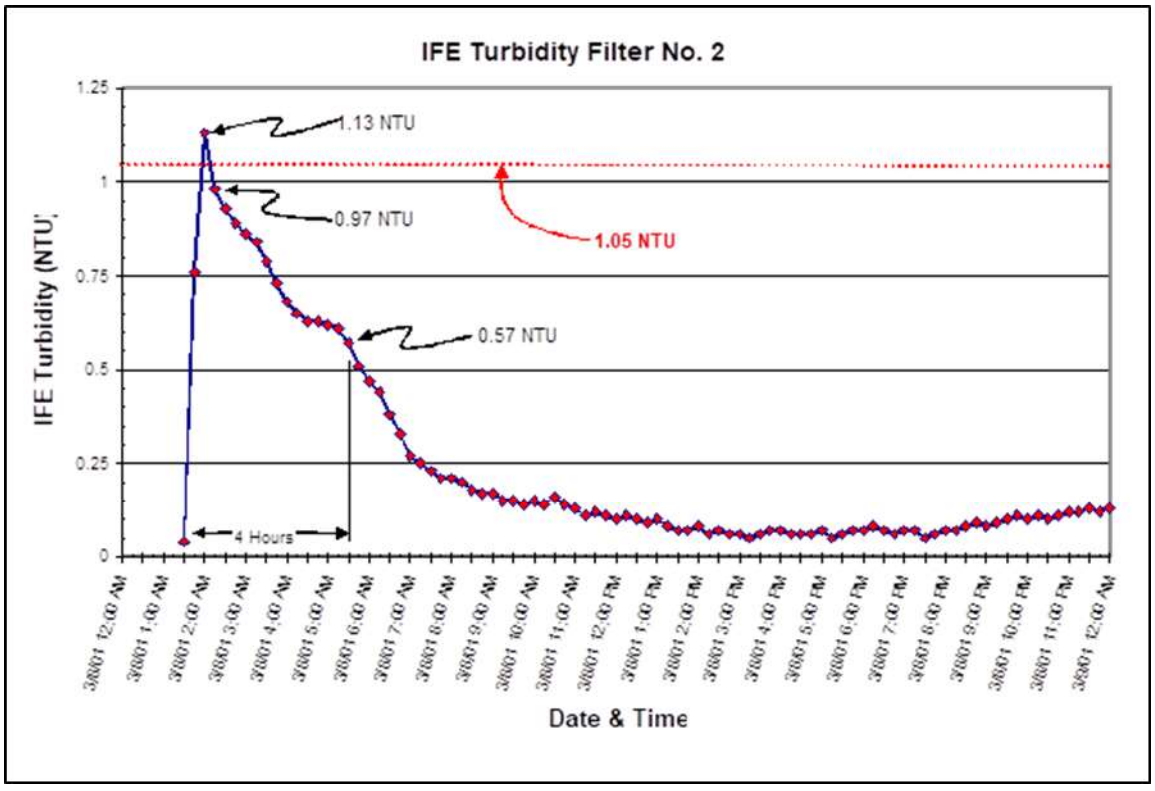



**Figure 3.5. Example Graph of IFE Turbidity Readings**

Filter No. 2 was backwashed the previous day and allowed to sit idle for three hours to "pre-ripen." It was returned to service at 1:20 a.m. Since turbidity readings must be collected on the quarter hour, the first turbidity reading of the filter run occurs at 1:30 a.m.

**Max:** Although the maximum daily turbidity reading from this filter was 1.13 NTU, the value was not confirmed by a second consecutive reading which is required when turbidity readings are 1.05 NTU or higher. Consequently, when completing **P.3** of the SWMOR workbook, the operator should enter 0.97 NTU in the **Max** cell for the day.

**4Hrs:** At 5:30 a.m., four hours after the first turbidity measurement, the operator documented a turbidity level of 0.57 NTU. Since this reading is above 0.50 NTU, the operator must check both the previous and subsequent turbidity measurements to confirm the 5:30 a.m. reading. In this case, both measurements exceeded 0.5 NTU, thus the 5:30 reading is confirmed. The operator must enter 0.57 NTU in the **4Hrs** cell.

## *IFE Turbidity Data Example 2*

This example demonstrates how we interpret IFE data. Figure 3.6 shows the **Individual Filter Turbidity** section of a **Performance Data** table, as might be reported by a SWTP.

| PERFORMANCE DATA | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INDIVIDUAL FILTER TURBIDITY | | | | | | | | | | | | | |
| | Filter No. 1 | | Filter No. 2 | | Filter No. 3 | | Filter No. 4 | | Filter No. 5 | | Filter No. 6 | | Filter No. 7 | |
| Date | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs | Max | 4 Hrs |
| 1 | 0.52 | X | 0.66 | 0.11 | 0.93 | 0.17 | 0.33 | X | 0.45 | X | 0.34 | X | | |
| 2 | 0.40 | 0.14 | 0.35 | 0.30 | ND | ND | 0.86 | 0.37 | 0.78 | 0.28 | X | X | | |
| 3 | 0.23 | ND | 0.65 | X | MD | 0.22 | 0.27 | X | 0.31 | X | 0.45 | 0.09 | | |
| 4 | 1.60 | 0.57 | 0.73 | 0.09 | 0.43 | X | 0.59 | 0.19 | 1.10 | ND | 0.26 | X | | |
| 5 | X | X | X | X | X | X | X | X | X | X | X | X | | |

**Figure 3.6. Example IFE Turbidity Data**

The individual IFE data from Figure 3.6 indicates the following occurred:

- On Day 1:
  - All six of the plant's filters were operated for some period of time.
  - There are no 4-hr readings for Filters No. 1, 4, 5, and 6. Consequently, they were either operated all day long, or they were taken offline at some point during the day and not restarted.
  - Filters No. 2 and 3 were either taken offline or backwashed at least once during the day. The filters were then restarted and operated for a period of at least four hrs.
- On Day 2:
  - No data was recorded for Filter No.3.
  - Filter No.6 was not operated at all.
- On Day 3:
  - Filter No.1 was taken out of service, backwashed, and then restarted at least once during the day. However, the operator did not record the turbidity level of the water four hours after beginning one of the production runs.

  - The SCADA system failed to record all required 15-min. IFE turbidity readings from Filter No. 3. However, we know that none of the readings that were recorded were above 1.0 NTU; otherwise, the operator would have entered the exceedance.

- On Day 4:
  - The turbidity levels from Filters No. 1 and 5 exceeded 1.0 NTU in two consecutive 15-min. readings.
  - The turbidity level from Filter No. 1 exceeded 0.5 NTU in two consecutive 15-min. readings at 4 hours after the filter was returned to service.
  - The SCADA system failed to record the turbidity level produced by Filter No.5 four hours after it began a filter run.
- On Day 5, the plant was completely offline as reflected in the raw water flow rate on **P.2** of 0.000 MGD.

*Note:* The workbook will not let you enter X for any filter unless the flow rate is 0.000 MGD.

> If your water system serves at least 10,000 people, you are required to take 4-hr turbidity readings. The missing 4-hr turbidity readings, reported as ND, during the first 4 days of the month in the example above may result in a monitoring or reporting (M/R) violation.
>
> If your water system serves less than 10,000 people, 4-hr turbidity data is not required and the worksheet does not treat empty spaces as missing data. In this situation, you would not incur a M/R violation.

## *Summary and Compliance Actions*

The **Summary and Compliance Actions** table at the bottom of the **P.3 Filter Data** worksheet has columns for summarizing the historical performance of Filters No. 1–10 (see Figure 3.7). If your plant has more than 10 filters, additional columns for recording the IFE turbidity data turbidity for up to 50 filters are available on addendum pages.

| | | | Filter No. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 47 | | | | | | | | | |
| 48 | SUMMARY & COMPLIANCE ACTIONS | Criteria | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 49 | | Number of days with event(s) above 0.5 NTU at 4.0 hrs this mon | | | | | | | |
| 50 | | Number of days with event(s) above 1.0 NTU this month | | | | | | | |
| 51 | | Number of days with event(s) above 1.0 NTU last month | | | | | | | |
| 52 | | Number of days with event(s) above 1.0 NTU two months ago | | | | | | | |
| 53 | | Total number of days with event(s) above 1.0 NTU in three mon | | | | | | | |
| 54 | | Number of events above 2.0 NTU this month | | | | | | | |
| 55 | | Number of events above 2.0 NTU last month | | | | | | | |
| 56 | | Does the filter/plant have an approved Corrective Action Plan? | | | | | | | |
| 57 | | Is the plant required to submit a Filter Profile Report? | | | | | | | |
| 58 | | Is the plant required to submit a Filter Assessment Report? | | | | | | | |
| 59 | | Is the plant required to submit a Request for Compliance CPE? | | | | | | | |

**Figure 3.7. Summary and Compliance Actions Section on P.3**

The example at the end of this subsection demonstrates how to complete and interpret the **Summary and Compliance Actions** section on **P.3,** and what compliance actions are required.

## Entering Summary Information

### *Number of Days with Event(s) Above 0.5 NTU at 4.0 Hours this Month* CALC

For each filter at the plant, the worksheet automatically reports the number of days you entered a turbidity reading above 0.5 NTU.

### *Number of Days with Event(s) Above 1.0 NTU this Month* CALC

For each filter at the plant, the worksheet automatically reports the number of days you entered a turbidity reading above 1.0 NTU.

### *Number of Days with Event(s) Above 1.0 NTU last Month*

For each filter at the plant, enter the {number of days} during the last month you entered a turbidity level above 1.0 NTU. Get this information from the previous month's worksheet cell labeled **Number of days with event(s) above 1.0 NTU this month**.

### *Number of Days with Event(s) Above 1.0 NTU Two Months Ago*

For each filter at the plant, enter the {number of days} you entered a turbidity level above 1.0 NTU during the reporting period two months ago. Get this information from the cell labeled **Number of days with event(s) above 1.0 NTU last month** on the worksheet from two months ago.

### *Total Number of Days with Event(s) Above 1.0 NTU in Three Months* CALC

For each filter at the plant, the worksheet automatically reports the total number of days you entered a turbidity level above 1.0 NTU during the last three reporting months.

### *Number of Days with Event(s) Above 2.0 NTU this Month* CALC

The worksheet automatically reports how many days there was at least one turbidity reading for any filter above 2.0 NTU.

### *Number of Days with Event(s) Above 2.0 NTU last Month*

Enter the {number of days} during the last month that you entered one or more turbidity readings above 2.0 NTU. Get this information from the cell on the previous month's worksheet labelled **Number of days with event(s) above 2.0 NTU this month**.

### *Approved Corrective Action Plan at the Filter or Plant*

For each filter at the plant, use the drop-down list to indicate whether we have approved a CAP that waives the additional monitoring requirements for a specific filter. If the filter has a TCEQ approved CAP, select [Y]. If the filter does not have a TCEQ approved CAP, select [N].

*Note*: You do not have an approved CAP unless we have written you a letter identifying the filter or plant that is covered in the CAP and describing the actions that must be completed by the compliance deadline. We generally do not approve a CAP for the plant unless the system has participated in a Mandatory Comprehensive Performance Evaluation (mCPE).

### *Filter Profile Report Requirement* CALC

For each filter, the worksheet automatically reports if you are required to conduct a filter profile on the filter and submit an FPR with your monthly report.

> Unless a filter has an approved CAP that waives the filter from additional monitoring requirements, you must either identify the cause of exceedance or produce a filter profile on the filter each time that the IFE turbidity level in the water produced by that filter exceeds 1.0 NTU in two consecutive 15-min. readings.
>
> If your system serves 10,000 people or more, you must also identify the cause of exceedance or produce a filter profile each time that the IFE turbidity level exceeds 0.5 NTU in two consecutive 15-min. readings at four hours after the filter is returned to service.

### *Filter Assessment Report(s) Requirement* CALC

For each filter at the plant, the worksheet automatically reports if you are required to conduct a filter assessment on the filter and submit one or more FARs with your MOR.

> Unless a filter has an approved CAP that waives the filter from additional monitoring requirements, you must conduct an assessment on it each time that a filter exceeds 1.0 NTU in two consecutive 15-min. readings on three separate occasions during the last three reporting months.

### *CPE Request Form Requirement* CALC

The worksheet automatically reports if you are required submit a CPE Request with your monthly report and participate in an mCPE.

> Unless your plant has an approved CAP that waives the mCPE requirement, you must participate in an mCPE each time a filter or any combination of filters exceeds 2.0 NTU in two consecutive 15-min. readings during the last two reporting months.

## Summary and Compliance Actions Example

This example demonstrates how to use a previous month's MOR to complete the **Summary and Compliance Actions** section of the current month's **P.3** worksheet, and what additional reporting is required. Figure 3.8 shows the two worksheet sections from a hypothetical treatment plant for July, the current reporting month and June, the previous reporting month.

July (Current Month)

| | | Criteria | Filter No. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Plant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | | | | | | | | | | | | | |
| 48 | SUMMARY & COMPLIANCE ACTIONS | | | | | | | | | | | | |
| 49 | | Number of days with event(s) above 0.5 NTU at 4.0 hrs this mon | 0 | 0 | 0 | 1 | | | | | | | |
| 50 | | Number of days with event(s) above 1.0 NTU this month | 1 | 0 | 0 | 0 | | | | | | | |
| 51 | | Number of days with event(s) above 1.0 NTU last month | 1 | 1 | 2 | 0 | | | | | | | |
| 52 | | Number of days with event(s) above 1.0 NTU two months ago | 1 | 1 | 1 | 0 | | | | | | | |
| 53 | | Total number of days with event(s) above 1.0 NTU in three mon | 3 | 2 | 3 | 0 | | | | | | | |
| 54 | | Number of events above 2.0 NTU this month | | | | | | | | | | | 0 |
| 55 | | Number of events above 2.0 NTU last month | | | | | | | | | | | 1 |
| 56 | | Does the filter/plant have an approved Corrective Action Plan? | N | N | Y | N | | | | | | | N |
| 57 | | Is the plant required to submit a Filter Profile Report? | Y | N | N | Y | | | | | | | |
| 58 | | Is the plant required to submit a Filter Assessment Report? | Y | N | N | N | | | | | | | |
| 59 | | Is the plant required to submit a Request for Compliance CPE? | | | | | | | | | | | N |

June (Previous Month)

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49 | SUMMARY & COMPLIANCE ACTION | Number of days with event(s) above 0.5 NTU at 4.0 hrs this mon | 0 | 0 | 0 | 0 | | | | | | | |
| 50 | | Number of days with event(s) above 1.0 NTU this month | 1 | 1 | 2 | 0 | | | | | | | |
| 51 | | Number of days with event(s) above 1.0 NTU last month | 1 | 1 | 1 | 0 | | | | | | | |
| 52 | | Number of days with event(s) above 1.0 NTU two months ago | 0 | 0 | 0 | 0 | | | | | | | |
| 53 | | Total number of days with event(s) above 1.0 NTU in three mon | 2 | 2 | 3 | 0 | | | | | | | |
| 54 | | Number of events above 2.0 NTU this month | | | | | | | | | | | 1 |
| 55 | | Number of events above 2.0 NTU last month | | | | | | | | | | | 0 |
| 56 | | Does the filter/plant have an approved Corrective Action Plan? | N | N | Y | N | | | | | | | N |
| 57 | | Is the plant required to submit a Filter Profile Report? | Y | Y | N | N | | | | | | | |
| 58 | | Is the plant required to submit a Filter Assessment Report? | N | N | N | N | | | | | | | |
| 59 | | Is the plant required to submit a Request for Compliance CPE? | | | | | | | | | | | N |

**Figure 3.8. Summary and Compliance Sections of the P.3 Worksheet**

This example shows where to find the following information in the June worksheet for the July worksheet:

- Number of days with events above 1.0 NTU last month.
- Number of days with events above 1.0 NTU two months ago.
- Number of days with events above 2.0 NTU last month.

A FPR for Filters No. 1 and 4 was required with the July MOR because:

- There was one day when the maximum turbidity reported on Filter No. 1 was above 1.0 NTU.
- There was one day when the turbidity level on Filter No. 4 was above 0.5 NTU exactly four hours after it was placed online.
- We have not approved a CAP for either of these filters.

A FAR for Filter No.1 was required in July because:

- The maximum turbidity level exceeded 1.0 NTU on a total of at least three days during the past three months.
- It does not have an approved CAP.

A FAR for Filter No. 3 was not required in July because:

- There is an approved CAP for Filter No. 3. Therefore, an FAR for that filter was not required even though there was a total of three days when the turbidity level rose above 1.0 NTU.
- None of the three readings above 1.0 NTU occurred during the month of July.

# 3.4 Disinfection Process Performance Data (P.4 & 5)

Disinfection process performance data is used to determine if a plant achieved an adequate level of disinfection each day. This data is entered on the **P.4&5 Disinfection Data** worksheet. Select the tab to open the worksheet.

The **P.4&5** information in this section applies to all plant types.

## *Disinfection Process Parameters*

### CT Study Parameters and Performance Standards CALC

Figure 3.9 shows the section of the **Disinfection Process Parameters** table on **P.4&5**. In this section of the table, the worksheet automatically reports the plant's approved CT Study parameters and performance standards that you previously entered in the **Disinfection Process Parameters** dialog box when you customized your workbook.

The table contains five columns for the CT Study parameters for Disinfection Zones 1 through 5 (or any combination of five zones or trains). If your plant has more than five zones, the program will automatically create addendum pages and add up to five additional columns for Zones 6–10.

Figure 3.9 includes hypothetical data from the CT Study approval letter in Appendix A. The figure, the following information, and the example helps explain this section.

| | | Disinfection Zones | | | | | Log Inactivations | |
|---|---|---|---|---|---|---|---|---|
| 15 | Parameters | D1 | D2 | D3 | D4 | D5 | Giardia lamblia Cysts | Viruses |
| 16 | Flow Rate (MGD) | 1.440 | 0.480 | 96.000 | | | 0.5 | 2.0 |
| 17 | $T_{10}$ (minutes) | 46.7 | 11.7 | 222.1 | | | | |

**Figure 3.5. Disinfection Process Parameters Section on the P.4&5 Worksheet**

# Disinfection Process Performance Data

You must monitor the effectiveness of the disinfection process by measuring the following operational parameters through each disinfection zone whenever you report a raw water pumpage above 0.000 MGD:

- disinfectant residual concentration
- flow rate
- temperature
- pH

> If the calculated inactivation ratio for *Giardia* and viruses, as described later in this chapter, is less than 1.00, you must collect the disinfection process data at least once every four hours until the inactivation ratio is no longer less than 1.00.

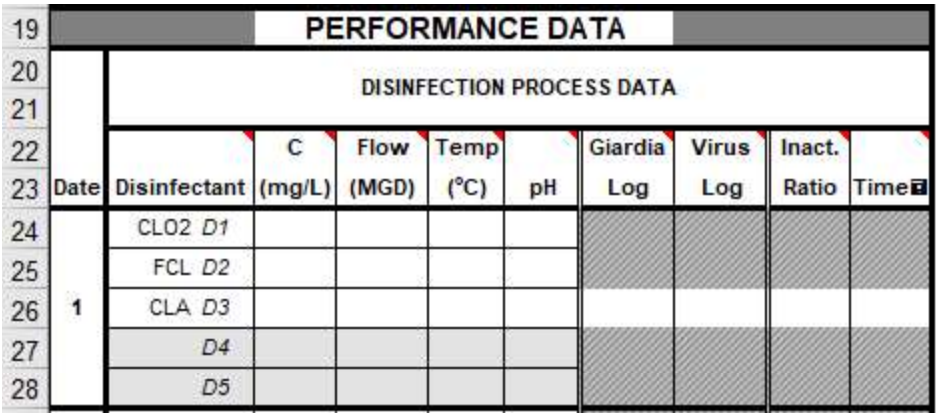
## *Disinfection Process Performance Data Monitoring Requirements*

You must collect the disinfection process performance data at the end of each disinfection zone described in your CT Study approval letter. We require that you monitor each disinfection zone even if you can meet the minimum inactivation requirements using a fewer number of zones. This is so we can assess the overall impact of any changes you propose to make in the disinfection process.

You must measure each of the required parameters when the plant is operating at peak hourly flow rate for the day. The peak hourly flow occurs at the plant's highest point production, when the maximum volume of water flows through the plant during a 1-hr period. If you reduce the flow rate during the day, you do not have to recollect performance data. However, if you increase the flow rate during the day, you must recollect all the data.

## *Disinfection Process Performance Data Entry*

Figure 3.10 shows the section of the **P.4&5** worksheet where you enter the disinfection process data for your plant. If you collect more than one set of disinfection process data during the day, enter the set of readings that corresponds to the lowest total inactivation ratio for *Giardia* and viruses. Do not mix the data collected from two or more data sets. For example, if you get one set of data at 10:00 a.m. and another set at 4:00 p.m., you must either use all the morning data or all the afternoon data.



| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 19 | PERFORMANCE DATA | | | | | | | | |
| 20 | | DISINFECTION PROCESS DATA | | | | | | | |
| 21 | | | | | | | | | |
| 22 | | | C | Flow | Temp | | Giardia | Virus | Inact. | |
| 23 | Date | Disinfectant | (mg/L) | (MGD) | (°C) | pH | Log | Log | Ratio | Time |
| 24 | 1 | CLO2 *D1* | | | | | | | | |
| 25 | | FCL *D2* | | | | | | | | |
| 26 | | CLA *D3* | | | | | | | | |
| 27 | | *D4* | | | | | | | | |
| 28 | | *D5* | | | | | | | | |

**Figure 3.10. Disinfection Process Performance Data Section of the P.4&5 Worksheet**

## Disinfectant

The SWMOR workbook automatically reports the type of disinfectant in each zone based on the information you entered when customizing your workbook. You can change the disinfectant residual if it is different from the type of disinfectant you entered at that time. Use the drop-down list and select the correct [disinfectant residual]. The abbreviations for the possible disinfectants are shown in Table 3.2.

**Table 3.2. Abbreviations for Disinfectants**

| Abbreviation | Disinfectant |
|---|---|
| FCL | Free chlorine |
| CLO2 | Chlorine dioxide |
| O3 | Ozone |
| CLA | Chloramines |
| NA | Applies if the disinfection zone was not used during the day (i.e., the flow rate in the zone was 0.000 MGD, or there was no disinfectant applied at or upstream of the zone). You can select NA for a disinfection zone only if the treatment train was not in operation, or disinfectant had not yet been applied in the treatment process. |

Under certain operating conditions, the **P.4&5** worksheet limits the options for selecting a disinfectant in one or more of the disinfection zones because you entered one or more of the following:

- Flow of 0.000 MGD in the **Raw Water Pumpage** column on **P.2**.
- Flow of 0.000 MGD in the **Flow** column for that zone.
- Values in the **C** column, the **Temp** column, or the **pH** column.
- A disinfectant residual in an upstream disinfection zone.

## C (mg/L)

Enter the {disinfectant residual concentration, (in mg/L)} measured from the end of each disinfection zone. If you failed to measure the disinfectant residual, enter {ND} in the applicable cell.

The worksheet does not allow you to enter a disinfectant residual for a zone where you selected NA from the drop-down list of disinfectants. It also does not allow you to enter a disinfect residual where the Raw Water Pumpage entered on **P.2** is 0.000 MGD. If you try to enter a residual in these zones, you will get an error message.

**Special Information for Chloramine Users:** The DPD test for total chlorine measures more than just monochloramine. Other combined chlorine compounds such as dichloramine, trichloramine, and organic chloramines can interfere with the colorimetric DPD test. Consequently, chloramine users that use DPD tests for reporting should periodically run process-control tests that are specific for monochloramine. Even if the results cannot be used for reporting, they can be used to adjust the treatment so that the desired monochloramine residual is maintained.

**Special Information for Ozone Users:** Plants that use ozone have some important special reporting requirements. The ozone concentration that you use for CT calculations depends on several factors which are explained in Table 3.3.

**Table 3.3. CT Calculation Factors for Ozone**

| If: | and the water flows: | the reported concentration is: |
|---|---|---|
| ozone is applied in the contactor cell | in the same direction that the ozone rises (concurrent flow) | the same as the measured concentration at the outlet of the cell |
| ozone is applied in the contactor cell | in the opposite direction as the ozone rises (countercurrent flow) | one-half of the measured concentration at the outlet of the cell |
| no ozone is applied in the contactor cell | any direction (reactive flow) | the same as the measured concentration at the outlet of the cell |

## Flow (MGD)

Enter the {flow rate (in MGD)} of water through the disinfection zone at the time you collected the performance parameter data set. If your plant has more than one treatment train, enter the {flow rate (in MGD)} through each of the individual trains. *Note:* If your plant does not have flowmeters on each train, you must use an alternate method we have approved in writing.

If, on a specific day, your plant does not treat any water, or a disinfectant is not used in a disinfection zone, leave this column blank. If you failed to measure the flow rate through a disinfection zone on a day you treated water, enter {ND} in the applicable cell.

The flow rate values that you enter on **P.4&5** are the instantaneous flow rates (calculated to MGD) occurring in each disinfection zone when the measurements were made. Unless your plant operates at a constant production rate for an entire 24-hr day, the daily raw water flow shown on **P.2** will not match the flow rate shown on **P.4&5** for that day. If your plant operated for less than 24 hours during the day, the flow rates on **P.4&5** will usually be greater than flow rate shown on **P.2**, unless the flow is split between two or more trains.

### Temp (°C)

Enter the {water temperature (in °C)} of each disinfection zone

If, on a specific day, your plant does not treat any water or a disinfectant is not used in a disinfection zone, leave this column blank. However, if you treated water but failed to measure the temperature of the water, enter {ND} in the applicable cell.

### pH

Enter the {pH} of the water measured in each disinfection zone.

If, on a specific day, your plant does not treat any water or disinfectant is not used in a disinfection zone, leave this column blank. However, if you treated water but failed to measure the pH of the water at the end of a disinfection zone, enter {ND} in the applicable cell.

## *Giardia* and Viral Log Inactivations CALC

The worksheet uses a series of mathematical equations to determine the levels of *Giardia* and viral inactivation obtained in each of the disinfection zones. It then totals the log inactivations of each and automatically reports the results in the **Giardia Log** column and the **Virus Log** column, respectively.

An asterisk after the number indicates the value is not representative of the total log inactivation for all disinfection zones because you failed to enter disinfection process data for all zones, or entered ND in one or more cells. Use the circle button to identify missing data.

### Inactivation Ratio CALC

The worksheet calculates the inactivation ratio for both *Giardia* and viruses, and then automatically reports the lower inactivation ratio in the **Inact. Ratio** column. The letter beneath the number tells you if the lower inactivation ratio is the one for *Giardia* or for viruses

If the inactivation ratio is greater than, or equal to 1.00, your plant met both the minimum *Giardia* and viral inactivation requirements for the day.

### Time

Enter {time (in hours)} that the inactivation ratio was less than 1.00. If the inactivation ratio was 1.00 or greater during the day, leave this column blank. If the inactivation ratio fell below 1.00 more than once during the day, enter the longest period of time that it was below 1.00.

If the inactivation ratio fell below 1.00 during the day and you failed to determine how long it remained below 1.00, enter {ND} in the applicable cell.

A plant may increase the monitoring frequency to more accurately determine the duration of an event. For example, if you collect disinfection process data every 15 or 30 minutes after getting a low inactivation ratio, you may report the duration of the event in ¼-hr or ½-hr increments. Therefore, an event lasting only 15 minutes is reported as 0.25 hours. An event lasting 2 hours, 45 minutes is reported as 2.75 hours.

*Note*: If you collect a data set that produces an inactivation ratio below 1.0, you must take action to raise your inactivation ration within four hours. The **Time** column will represent the length of time that you were below 1.0. If you have any questions about how to report this data, contact a SWTR Coordinator.

## *Log Inactivation Summaries CALCcon*

Figure 3.11 shows the section of the worksheet where it uses the disinfection data you enter daily to automatically report the average, maximum, and minimum, daily inactivation ratios for both viruses and *Giardia*. It also calculates the standard deviation for the two averages.

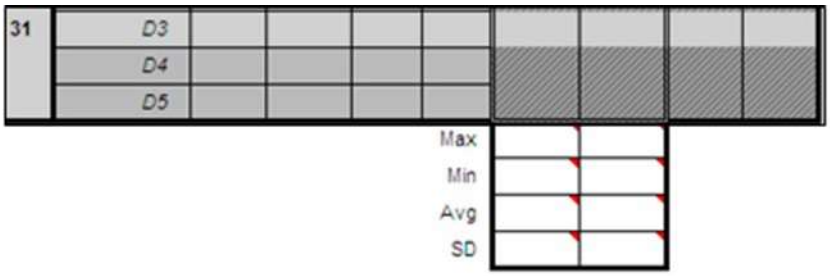



**Figure 3.11. Log Inactivation Summary Section of the Disinfection Data Worksheet**

The worksheet limits the amount of inactivation credit that your plant receives if one or more of the disinfection zones contain a free chlorine residual above 4.0 mg/L. If you exceed this level on any day, the worksheet displays the following note in the **Log Inactivation Summary** cell: *The LRCs for this plant were restricted on at least 1 day this month due to high free-chlorine levels in 1 or more zones or trains.*

## *Disinfection Process Performance Data Example*

The example in Figure 3.12 contains disinfection process data for a SWTP for the first three days of a month. The information below the table explains what this data indicates.

| PERFORMANCE DATA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DISINFECTION PROCESS DATA | | | | | | | | |
| Date | Disinfectant | C (mg/L) | Flow (MGD) | Temp (°C) | pH | Giardia Log | Virus Log | Inact. Ratio | Time= |
| 1 | NA *D1* | | | | | | | | |
| | CLA *D2A* | 3.0 | 3.000 | 12.0 | 7.2 | | | | |
| | CLA *D2B* | 3.0 | 3.000 | 12.0 | 7.4 | 0.81 | 1.97 | 0.85 | 1.40 |
| | CLA *D3* | 3.5 | 6.000 | 12.0 | 7.4 | | | (V) | |
| | *D4* | | | | | | | | |
| 2 | NA *D1* | | | | | | | | |
| | NA *D2A* | | | | | | | | |
| | NA *D2B* | | | | | NA | NA | NA | |
| | NA *D3* | | | | | | | | |
| | *D4* | | | | | | | | |
| 3 | CLO2 *D1* | 0.2 | 3.000 | 12.0 | 7.2 | | | | |
| | CLA *D2A* | 2.8 | 3.000 | 12.0 | 7.5 | | | | |
| | NA *D2B* | | | | | 1.78 | 4.83 | 2.39 | |
| | CLA *D3* | 3.5 | 3.000 | 12.0 | 7.5 | | | (V) | |
| | *D4* | | | | | | | | |

**Figure 3.12. Performance Data Example**

This example indicates the following information:

- There are three disinfection zones and two treatment trains in zone D2.
- On Day 1:
  - The plant was not feeding a disinfectant in zone D1 when this set of data was collected.
  - The plant was achieving0.81 log of *Giardia* inactivation and 1.97 log of viral inactivation when this set of data was collected.
  - The minimum inactivation ratio for the day was 0.85 and was limited by the viral inactivation requirements.
  - The longest period of time that the inactivation ratio was below 1.00 was 1.4 hours.
- On Day 2 the plant did not treat any water.
- On Day 3, Train D2B was not in operation when the operator collected this set of data.

# 3.5 TOC Data (P.6, 7, 8, and SUVA)

If your plant has sedimentation or clarification treatment processes, you are required to collect and report total organic carbon (TOC) data each month. The worksheets described in this section are used to meet the TOCMOR reporting requirement.

This section applies to all plant types, if your plant is subject to TOC monitoring requirements.

Depending on your specific treatment processes, you enter TOC information and data on one or more of the worksheets identified by the tabs in Figure 3.13. These worksheets tabs are visible if you entered at least one sedimentation basin when you completed the **Plant Parameters** dialog box when you customized your workbook; otherwise, they are hidden.


**Figure 3.13. Worksheet Tabs for Reporting Results of TOC Monitoring**

## *P.6 TOCMOR Worksheet*

Every SWTP with at least one sedimentation or clarification basin must submit a **P.6 TOCMOR** worksheet each month. The worksheet contains cells reporting both information about the type of treatment, and TOC data.

### Conventional or Unconventional Plants

The boxes in Figure 3.14 are used to report whether your treatment plant is conventional or unconventional. Enter {X}, as applicable, in the appropriate box.

A plant is conventional if it has gravity or pressure (granular media) filters, and any of the following:

- Flocculators and sedimentation basins.
- Conventional solid-contact clarifiers such as slurry-recirculation clarifiers and sludge blank clarifiers.
- High-rate clarifiers.

If you select Unconventional, then you must also explain why. A plant is unconventional if it uses membrane filters, regardless of whether there is a clarifier to pretreat membrane feed water. A plant with granular media filters may also be unconventional, if we have approved an exception allowing you to use alternative treatment technologies with extremely high surface overflow rates and very short detention times. If your plant uses an exception to use an unconventional clarifier, you must still comply with raw water TOC monitoring requirements.

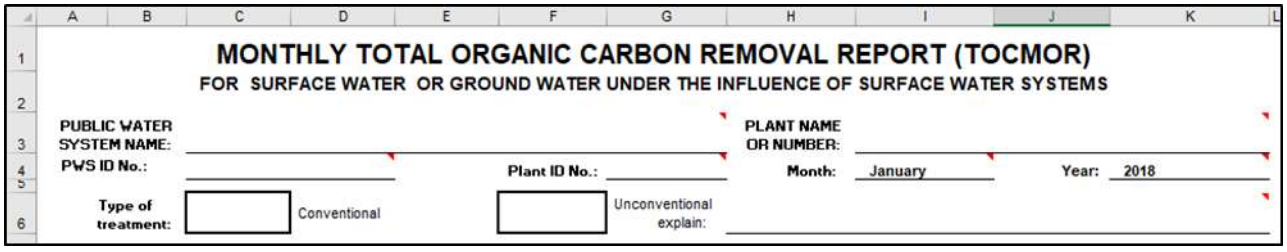



**Figure 3.14. Conventional or Unconventional Plant Selection**

## TOC Monitoring Requirements

You must collect at least one complete TOC sample set each month under normal operating conditions. A complete TOC sample set contains the following three samples:

- raw water alkalinity
- raw water TOC
- treated water TOC

You must collect treated water TOC samples between 1 and 8 hours after collecting the raw water sample. This time will vary based on detention time of the water. The goal is to collect the same water at your treated water sample point that you collected at your raw water sample point. If it takes the water six hours to flow from your raw sample point to the treated sample point, then that is the time you should wait between collecting those samples. These samples should also all be collected near the end of a long production run so the plant has time to reach normal operating conditions.

Raw water samples must be collected prior to any treatment, including those for taste and odor control, pre-disinfection, and coagulation. They must also be collected upstream of the site where you recycle reclaimed water, such as decant water from a lagoon or spent backwash water.

Treated water samples may be collected at the effluent of clarifiers, at the influent or effluent of filters, or at the entry point to the distribution system.

The TOC sample set results must reflect the typical operating conditions during the month. For example, if you change water sources, switch coagulants, or significantly alter the coagulant dose on the tenth day of the month, you must collect at least one complete TOC sample set after making the change. This is because data collected during the first 10 days of the month do not reflect the typical conditions that existed when you produced most of the water.

*Note*: We recommend that you evaluate raw water or treated water TOC levels each time source water quality or the treatment process change, even if you decide not to run a complete TOC sample set. Although incomplete data sets may not be reported, the information is still valuable for making process-control decisions.

## TOC Data Entry

Figure 3.15 shows the TOC data entry area of the **P.6 TOCMOR** worksheet. Although you are only required to collect one complete TOC sample set each month, the **P.6** worksheet provides cells for you to enter sample set results once each day. The form will calculate the averages of all the sample sets you enter. As stated previously, you must enter the results of all the complete TOC sample sets you collect during the month. Do not enter the results unless you collected a complete sample set.

| Test No. | Test Date | Monthly TOC Sample Set | | | Actual % TOC Removed | Step 1 Required % Removal | Step 1 Removal Ratio | Optional data | | INDIVIDUAL SAMPLE COMPLIANCE REMOVAL RATIO |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Raw Alkalinity | Raw TOC | Treated TOC | | | | Step 2 Required % Removal | Step 2 Removal Ratio | |
| | | Enter the Sample Set results | | | calculated | calculated from matrix | calculated | | | calculated |
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |

**Figure 3.15. TOC Data Entry Area in the P.6-TOCMOR Worksheet**

## *Test Date*

In the **Test Date** column, enter the {date} you collected a complete TOC sample set. If you failed to collect a complete TOC sample set during the month, enter the first day of the month on the first row.

## *Monthly TOC Sample Set Results*

Enter the {raw water alkalinity concentration (in mg/L)}, the {raw water TOC concentration (in mg/L)}, and the {treated water TOC concentration (in mg/L)} in the cells corresponding to their test date. Enter the complete sample set results from the first date in the first row, the second set in the second row, and so on.

If you failed to collect a complete sample set during the month, enter {ND} in each of the three cells on the first row.

## *Actual % TOC Removed, Required Step 1 % Removal, Step 1 Removal Ratio CALC*

The worksheet uses the Step 1 Removal Ratio results to automatically populate these cells first. If you entered data on **P.8 TOC Step 2**, and the Step 2 Removal Ratio is higher, the form will use this removal ratio. Doing so ensures you will always receive the highest credit possible for each complete sample set. If you have indicated that your facility uses Unconventional treatment, the worksheet automatically reports NA in this cell.

## *Optional Data, Step 2 Required % Removal, and Step 2 Removal Ratio CALC*

If you want to use the results of a Step 2 jar test to ensure you meet the TOC treatment technique requirements, you must complete the **P.8 TOC Step2** worksheet. The workbook will use the data recorded on that worksheet to complete these two cells.

## *Compliance Removal Ratio CALC*

The worksheet uses the TOC sample results to complete these cells. If you have not completed the **P.8 TOC Step2** worksheet, the compliance-removal ratio for each sample set will be copied from the corresponding **Step 1 Removal Ratio** cell. If you entered data on **P.8**, the compliance removal ratio will be based on the higher of the two step 1 and step 2 removal ratios. This ensures that you will always receive the highest credit possible for each complete sample set.

# TOC Removal Summary

The **P.6 TOCMOR** worksheet automatically reports a summary of the TOC data in the **TOC Summary** section shown in Figure 3.16.

| 50 | TOTAL ORGANIC CARBON (TOC) REMOVAL SUMMARY | | | | | |
|---|---|---|---|---|---|---|
| 51 | TOC Summary | | | | | Monthly Compliance Ratio |
| 52 | Raw Water Alkalinity | Raw Water TOC | Treated Water TOC | TOC % Removal | ACC # used | |
| 53 | | | | | | |
| 54 | | | | | | |

**Figure 3.16. TOC Data Summary Area on the P.6-TOCMOR Worksheet**

## *Raw Water Alkalinity, Raw Water TOC, Treated Water TOC, TOC % Removal* CALC

The worksheet automatically reports theses values based on a single TOC sample set or the averages of all the TOC sample sets reported.

## *ACC # Used* CALC

If your plant failed to meet the Step 1 Removal Ratio and qualifies for one of the ACCS, the worksheet uses the information you entered on the **P.7 TOC ACC** worksheet to give you an automatic 1.00 removal ratio. If you do not need to qualify for an ACC because you met the Step 1 Removal Ratio, or you indicated your facility uses Unconventional treatment, the worksheet automatically reports NA in this cell.

## *Monthly Compliance Ratio* CALC

If the average removal ratio for all of the complete sample sets reported is 1.00 or higher, the worksheet will automatically report that value in this cell. If the average is less than 1.00, then **P.6** will use the information you entered on **P.7 TOC ACC** to determine if you have met one of the ACCs. If you have, **P.6** will automatically report a monthly compliance ratio of 1.00. If you indicated your facility uses Unconventional treatment, the worksheet automatically reports NA in this cell.

Compliance with TOC treatment technique requirements is based on a RAA calculated at the end of each quarter. For example, at the end the second quarter (i.e., April, May, and June), we determine compliance by calculating the average removal ratio achieved between July of the previous year and June of the current year. You are in compliance with treatment technique requirements if that annual average removal ratio is 1.00 or greater.

Since treatment technique compliance is based on four quarters, you may still be in compliance if you get a removal ratio of less than 1.00 occasionally. However, you may want to investigate ways to improve your removal ratios by qualification with one of the ACCs, or running a Step 2 Jar Test to identify a more appropriate removal goal.

## *P.7-TOC ACC Worksheet*

If you use one of the ACCs to meet your TOC removal requirements, you will also need to complete and submit the **P.7 TOC ACC** worksheet with your MOR. Table 3.4 lists and briefly describes each of the eight ACCs and their compliance options.

**Table 3.4. Description of TOC ACCs and Compliance Options**

| ACC No. | Compliance Options | | Description |
|---|---|---|---|
| | Monthly | Yearly (Based on RRA) | |
| 1 | Yes | Yes | Raw water TOC less than 2.0 mg/L |
| 2 | Yes | Yes | Treated water TOC less than 2.0 mg/L |
| 3 | No | Yes | All apply:<br>• Raw water TOC less than 4.0 mg/L<br>• Alkalinity greater than 60 mg/L<br>• TTHM less than or equal to0.040 mg/L<br>• HAA5 less than or equal to 0.030 mg/L |
| 4 | No | Yes | All apply:<br>• TTHM less than or equal to 0.040 mg/L<br>• HAA5 less than or equal to 0.030 mg/L<br>• Free chlorine is the only disinfectant used in the plant and in the distribution |
| A5 | Yes | Yes | Raw water SUVA less than or equal to 2.0 L/mg-m |
| 6 | Yes | Yes | Treated water SUVA less than or equal to 2.0 L/mg-m |
| 7 | Yes | Yes | Treated water alkalinity less than 60 mg/L |
| 8 | Yes | Yes | Magnesium hardness removal greater than or equal to 10 mg/L as CaCO3 |

Most plants use the same ACC each month, especially at plants using one of the annual compliance options. However, plants may switch between ACCs when appropriate.

The **P.7 TOC ACC** worksheet is hidden unless it helps with the TOC removal compliance. In other words, **P.7** is hidden based on one of the following:

- The average raw water TOC results for all the sample sets collected during the month is less than 2.0 mg/l.
- The average treated water TOC results for all the sample sets collected during the month is less than 2.0 mg/L.

# ACC Selection

Before you enter performance data on the **P.7 TOC ACC** worksheet, you must select the ACC you want credit for during the reporting month (see Figure 3.17). Enter {X} in one of eight ACC boxes at the top of the worksheet. After you select the ACC for the month, **P.7** will remove the data entry areas for the other ACC options.

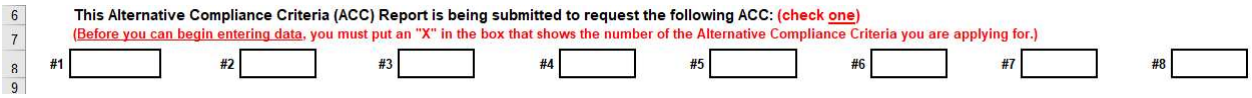



**Figure 3.17. ACC Selection Boxes on the P.7-TOC ACC Worksheet**

# ACC Data Entry

After you select the ACC, you need to enter the data for that ACC option.

Except for ACC #3 and ACC #4, you can meet the ACC based on the data collected during the reporting month or the data you collected during each of the previous four calendar quarters. If you meet the ACC requirement on either a monthly or annual basis, the worksheet will automatically make appropriate changes to the **ACC # Used** and the **Monthly Compliance Ratio** cells on the current month's **P.6 TOCMOR** worksheet.

## *Current Month Data*

If you collected the data needed to evaluate compliance with an ACC requirement for the month covered by the report, enter the results in the applicable **Current Month TOC** cell. If the monthly data meets the ACC requirement, the worksheet will hide the data entry area for the annual data.

## *Historical Data*

The **P.7 TOC ACC** worksheet will only let you enter data for previous months if either of the following is true:

- You did not enter any data in the **Current Month** cell.
- Data for the current reporting period does not meet the ACC requirement.

The worksheet will automatically populate the **Month and Year** cells with the months used to evaluate compliance with the ACC requirement on an annual basis. After you have entered historical data for each of the three months for a quarter, the worksheet will record the average value in the **Quarterly Average** cell. Once you have entered the historical data for all four quarters, the worksheet will report the RRA in the **RAA** cell.

Once you have entered 12 months of historical data, the worksheet will not allow you to enter data in the **Current Month** cell unless the value in the **RAA** cell does not meet the ACC requirement.

## *ACC #1 and ACC #2*

As Figure 3.18 indicates, ACC #1 and ACC #2 are available on both a monthly and an annual basis.

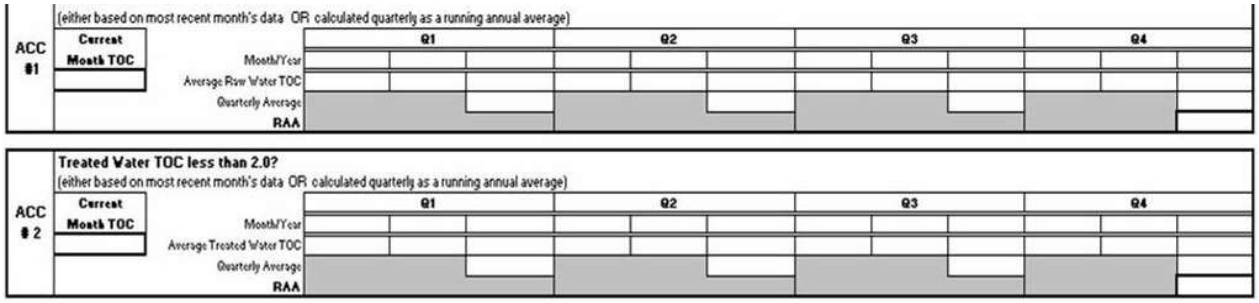



**Figure 3.18. TOC ACC #1 and ACC #2 Data Entry Areas**

The average monthly values for both raw and treated water TOC are copied into the table from the **TOC Summary** area at the bottom of the **P.6 TOCMOR** worksheet. If either of these monthly results meets the respective ACC criterion, the workbook will hide the **P.7 TOC ACC** worksheet. Otherwise, the data-entry area will be displayed for the historical data corresponding to the ACC you selected.

To complete the historical data table, you need your **P.6 TOCMOR** worksheets for the past 12 months. Enter the values from each of the **Month/Year** rows at the bottom of **P.6** into the applicable cells on **P.7**.

## *ACC # 3*

As Figure 3.19 indicates, ACC #3 can only be evaluated on an annual basis.

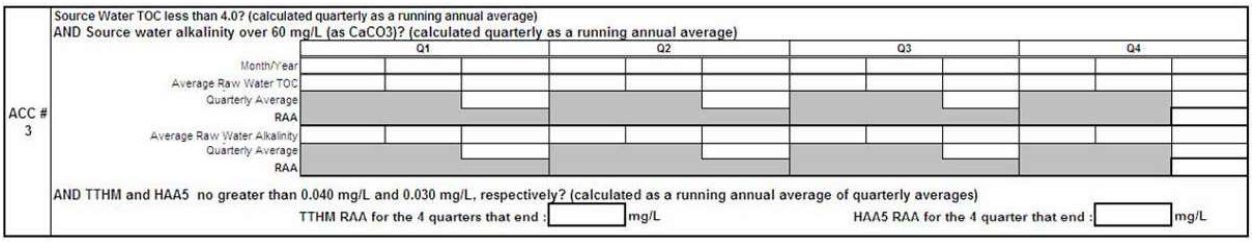



**Figure 3.19. TOC ACC #3 Data Entry Area**

To complete the historical data table, you need your **P.6 TOCMOR** worksheets for the past 12 months. Enter the historical values from each of the **Raw Water TOC** and the **Raw Water Alkalinity** cells in the **TOC Summary** area into the appropriate cells.

You also need the TTHM and HAA5 results collected during the 12 months identified in the **Month/Year** row of the past tables. Use the following procedure to calculate the RAAs for the TTHM and HAA5 results and enter the results in the appropriate cells:

1. Add results for all TTHM samples collected during a given quarter.
2. Calculate the quarterly TTHM average by dividing the results from step 1 by the number of samples collected during the quarter.
3. Repeat steps 1 and 2 to calculate the quarterly TTHM average for the other three quarters.

4. Add the four quarterly TTHM averages together and divide by four to get the TTHM RAA for the 12-month period.
5. Repeat steps 1–4 using the HAA5 results.

## *ACC #4*

As Figure 3.20 indicates, ACC #4 can only be evaluated on an annual basis.

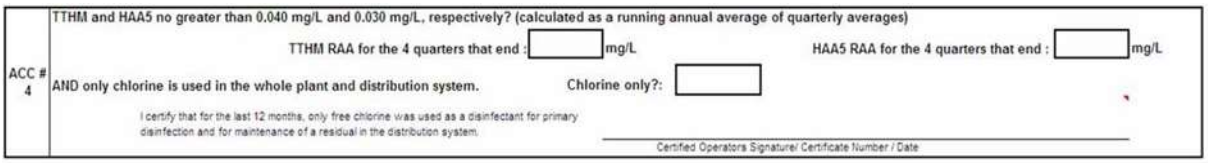



**Figure 3.20. TOC ACC #4 Data Entry Area**

To complete this portion of the report, you need the results from all TTHM and HAA5 samples that were collected during the previous four calendar quarters. Use the five steps outlined for ACC #3 to calculate the TTHM and HAA5 RAA values and enter them in the appropriate cells in the data-entry area.

You must also certify whether free chlorine was the only disinfectant that your system used during this 12-month period. Enter {Yes} or {No} in the **Chlorine only?** cell and sign the form on the line provided.

## *ACC #5*

As Figure 3.21 indicates, ACC #5 is available both monthly and annually.

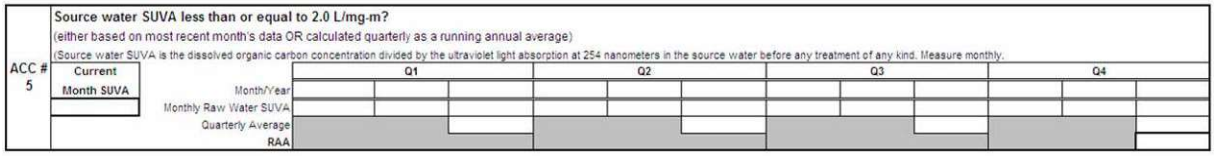



**Figure 3.21. TOC ACC #5 Data Entry Area**

If you ran a raw water SUVA test during the reporting period, enter the {SUVA (in L/mg-m)} in the **Current Month SUVA** cell. If the value meets the ACC #5 criterion, the worksheet hides the historical data table, since you do not need historical data to meet the requirement.

To complete the historical data table, you need your historical data results for the past 12 months. Enter the historical SUVA results into the appropriate **Monthly Raw Water SUVA** cells.

## *ACC #6*

As Figure 3.22 indicates, ACC #6 is available both monthly and annually.

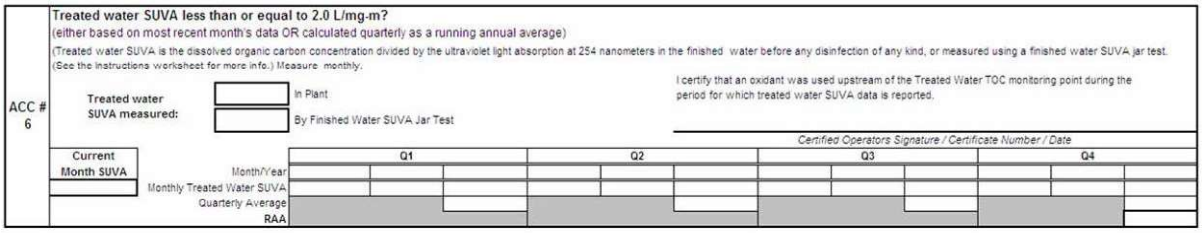



**Figure 3.22. TOC ACC #6 Data Entry Area**

If you ran a treated-water SUVA test during the reporting period, enter the results in the **Current Month SUVA** cell. If the meets the criterion, the worksheet hides the historical-data table.

To complete the historical data table, you need your historical data results for the past 12 months. Enter the treated water SUVA results into the appropriate **Monthly Treated Water SUVA** cells.

You must also certify whether you performed the SUVA test on treated water produced by the plant or on water in a SUVA jar test. If the test was run on a sample of plant treated water, enter {X} in the **In Plant** cell. If the test was run on a sample of water obtained after running a SUVA jar test, enter {X} in the **By Finished Water SUVA Jar Test** cell. Sign the form on the line provided.

If you place an X in the **By Finished Water SUVA Jar Test** cell, a **SUVA Jar Test Worksheet** tab will appear. This worksheet provides a convenient place for you to record the SUVA jar test results and the plant conditions at the time you ran the test. You don't have to include this worksheet with your MOR.

## *ACC #7*

As Figure 3.23 indicates, ACC #7 is available on both a monthly and an annual basis to plants that perform lime softening.

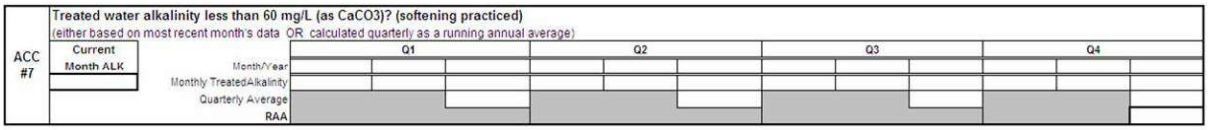



**Figure 3.23. TOC ACC #7 Data Entry Area**

If you ran treated water alkalinity tests during the reporting period, enter the {average alkalinity (in mg/L)} in the **Current Month ALK** cell. If the value is less than 60 mg/L, the worksheet hides the unneeded historical-data table.

To complete the historical data table, you need your **P.6 TOCMOR** worksheets for the past 12 months. Enter the monthly alkalinity values from each of the **Month/Year** rows to into the appropriate **Monthly Treated Alkalinity** cells.

## *ACC #8*

As Figure 3.24 indicates, ACC #8 is available both monthly and annually to plants that practice lime softening.

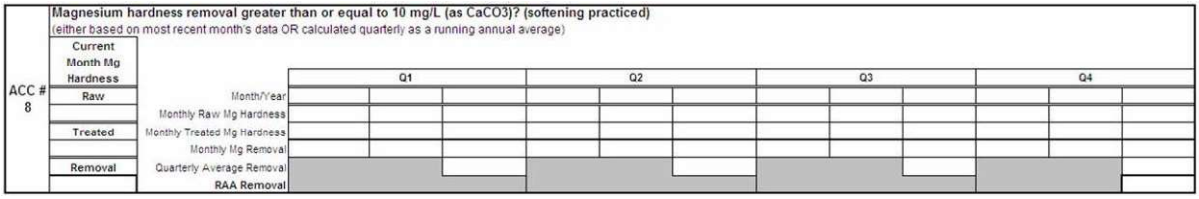



**Figure 3.24. TOC ACC #8 Data Entry Area**

If you measured the magnesium levels in both the raw and treated water during the reporting period, enter the {magnesium (Mg concentration (in mg/L)} in the **Raw** and **Treated** cells, located under the **Current Month Mg Hardness** cell. The worksheet automatically reports the amount of magnesium removed. If you removed at least 10 mg/L, the worksheet will hide the historical-data table.

To complete the historical data table, you need your historical raw and treated Mg hardness results for the past 12 months. Enter the results into the appropriate **Monthly Raw Mg Hardness** cells and the **Monthly Treated Mg Hardness** cells. The worksheet will then automatically report the amount of magnesium hardness removed each month and each quarter as well as the RRAs.

## *P.8 TOC Step2 Worksheet*

You only need to complete the **P.8 TOC Step 2** worksheet if you ran a Step 2 Jar Test and you want to use the results to help meet your TOC treatment technique requirement.

The results of a Step 2 Jar Test are valid for six consecutive months beginning with the first month of the calendar quarter when you ran the test and ending with the last month of the following calendar quarter. For example, the results of a Step 2 Jar Test conducted in March can be used from January through June.

We may require you to conduct another Step 2 Jar Test if your raw water conditions change significantly during the six-month period. For example, we may require a new jar test if you switch to a new water source and the chemical matrices (TOC, alkalinity, etc.) of the two sources differ significantly.

For more information about how to conduct a Step 2 Jar Test, please refer the *TOC Guidance Manual* (TCEQ publication RG-379).

### Date of Jar Test

Before you can enter any other data on the worksheet, enter the {date} that you ran your Step 2 Jar Test in the report header as shown in Figure 3.25. This date may be no earlier than the first day of the month at the beginning of the previous calendar quarter, and no later than the last day of the current reporting period. This is because the plant may use this test to meet the alternative TOC requirement for each month in both the quarter when the test was performed and the following quarter, for six months total. For example, if you are submitting a report for March, 2022, the date you enter may not be earlier than October 1, 2021 (i.e., the first day of the month at the beginning of the previous quarter) and no later than March 31 (i.e., the last day of the current reporting period).

.

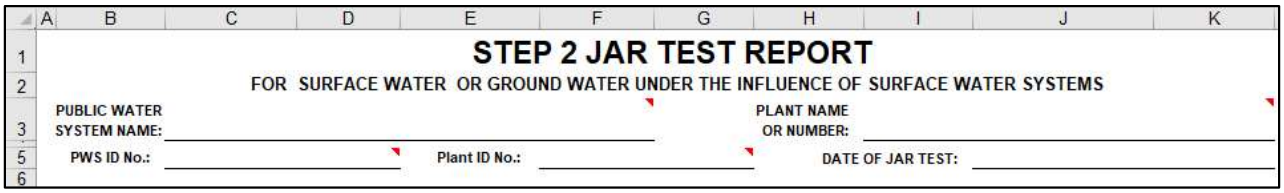



**Figure 3.25. Jar Test Report Header**

## Plant Conditions

Enter information about the operating conditions at your treatment plant in the **Plant Conditions** area of the worksheet as shown in Figure 3.26. This includes raw water source(s), and type and dose of coagulant, coagulant aid, etc.

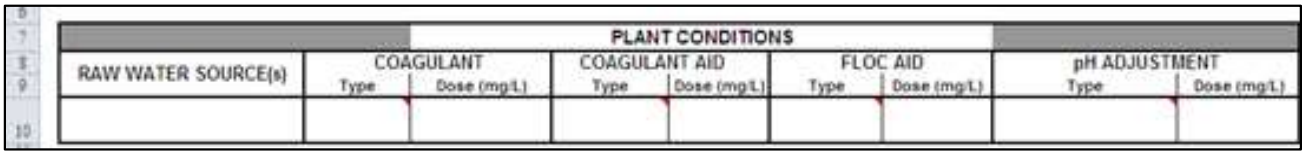



**Figure 3.26. Plant Conditions Area of TOC Step 2 Jar Test Worksheet**

If you conducted your Step 2 Jar Test during the current reporting period, enter the operating conditions and information for the day you ran the test. However, if you conducted your test during some other month, record the conditions from the date when you collected your TOC sample set. If you collected more than one TOC sample set, report the conditions that most accurately reflect typical operational practices for the month.

If you were not using one or more of the treatment chemicals identified in table above when you collected the operating data, enter {NA} in the **Type** cell and leave the corresponding **Dose (mg/L)** cell blank.

## Step 2 Jar Test Parameters

Enter the information about the dosing solutions, jars, and test conditions you used to conduct the test in the **Step 2 Jar Test Parameters** section of the worksheet as shown in Figure 3.27.

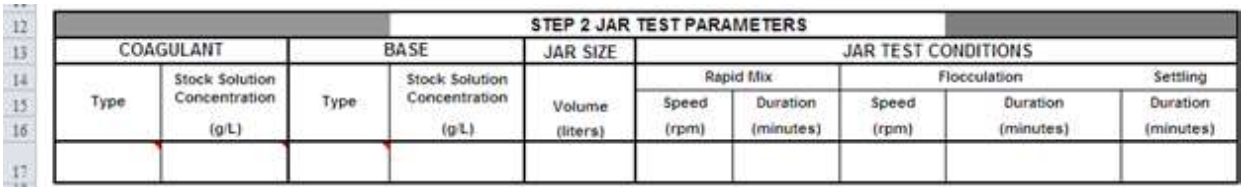


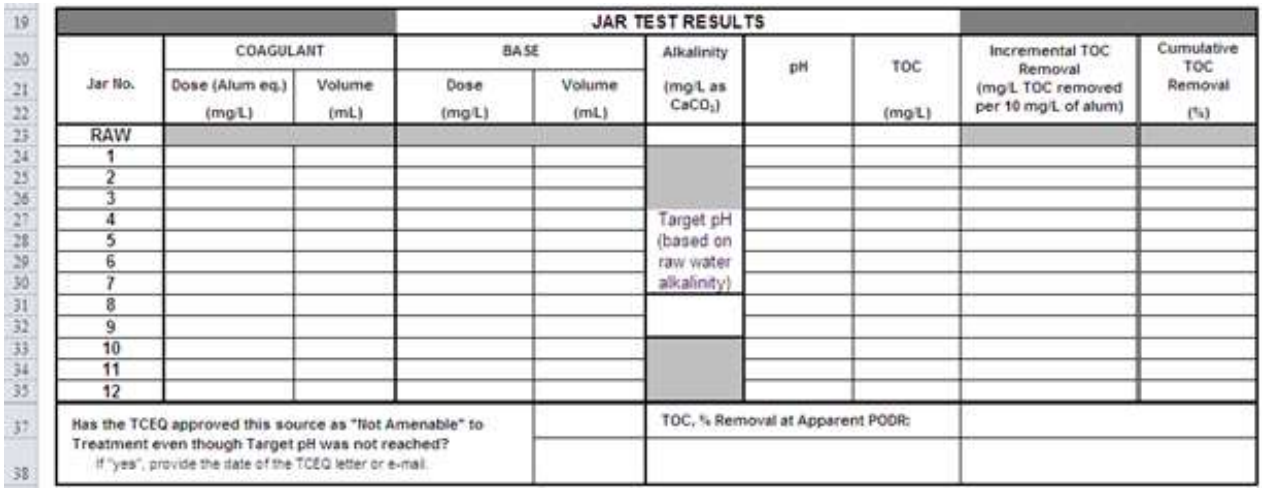

**Figure 3.27. Jar Test Parameters Area of the TOC Worksheet**

If you did not adjust the pH when you conducted the Step 2 Jar Test, enter {NA} in the **Base Type** cell and leave the corresponding **Stock Solution Concentration** cell blank.

*Note*: Many Texas SWTPs do not need to add a base during their Step 2 Jar Test because they have source water with relatively high alkalinity. We may, however, require that you use a base when conducting your jar test if the pH drops rapidly in the first two or three jars, or if the first jar contains a relatively high alum dose.

## Jar Test Results

Record the results of your Step 2 Jar Test in the **Jar Test Results** section of the worksheet as shown in Figure 3.28.



| JAR TEST RESULTS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Jar No. | COAGULANT | | BASE | | Alkalinity (mg/L as $CaCO_3$) | pH | TOC (mg/L) | Incremental TOC Removal (mg/L TOC removed per 10 mg/L of alum) | Cumulative TOC Removal (%) |
| | Dose (Alum eq.) (mg/L) | Volume (mL) | Dose (mg/L) | Volume (mL) | | | | | |
| RAW | | | | | | | | | |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | Target pH (based on raw water alkalinity) | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |
| 11 | | | | | | | | | |
| 12 | | | | | | | | | |
| Has the TCEQ approved this source as "Not Amenable" to Treatment even though Target pH was not reached? If "yes", provide the date of the TCEQ letter or e-mail. | | | | | TOC, % Removal at Apparent PODR: | | | | |

**Figure 3.28. Jar Test Results Data Entry Area**

The table has enough room for you to enter the results for up to 12 jars; however, you may not need to run such an exhaustive test. You only need to test enough coagulant doses to reach both of the following:

- a point of diminishing return
- your target pH

### *Coagulant Dose and Volume*

Enter the {coagulant dose (as mg/L of dry alum)} used in each jar and the {volume of dosing solution (in mL)} that you added to achieve that dose. If you used a coagulant other than dry alum to prepare your stock solution, be sure to report the dose in the proper units.

### *Base Dose and Volume*

If you adjusted the pH in any of the jars, enter the {base dose (in mg/L)} used in each jar and the {volume of dosing solution (in mL)} that you added to achieve that dose. If you did not add base to one or more of the jars, leave the applicable cells blank.

### *Alkalinity and Target pH*

Enter the {alkalinity (in mg/L)} of the raw water. After you enter the alkalinity concentration, the worksheet will automatically enter the {pH} in **Target pH** cell.

### *pH and TOC*

Enter the {pH} and {TOC (in mg/L)} of the settled water in each of the jars.

### *Incremental TOC Removal* CALC

After you enter the TOC concentration of the settled water from each jar, the worksheet automatically reports the incremental reduction achieved in each jar. The incremental value reported for each jar is the difference between the TOC levels in that jar and the previous one divided by one tenth of the increase in alum dose in those same two jars.

If results indicate that the TOC level in a given jar is higher than the TOC level in the preceding jar, the incremental removal will be reported as a negative value.

### *Cumulative TOC Removal* CALC

After you enter the TOC level of the settled water in each jar, the worksheet will also report the cumulative TOC reduction achieved in each jar, expressed as percent reduction. The cumulative value recorded for a given jar is the difference between the TOC level in that jar and the TOC level in the raw water divided by the raw water TOC level.

If the incremental TOC removal value for a jar is a negative number, the worksheet will display the words, bad data point in the **Cumulative TOC Removal** cell.

### *TOC, % Removal at Apparent PODR* CALC

Based on the test data entered, the worksheet will automatically report the information for the cell shown in Figure 3.29 with one of five results explained in the following subsections.

| TOC, % Removal at Apparent PODR: | |
|---|---|
| | |

**Figure 3.29. TOC, % Removal at Apparent PODR Cell**

### Numerical Value

If the worksheet automatically reports a numerical value, it means the Step 2 Jar Test identified only one PODR. If this happens, the worksheet will copy the appropriate value from the cumulative TOC removal data to the cell and use the result to determine your TOC removal ratio for each TOC sample set.

### Bad Data Point

This result means the Step 2 Jar Test also identified only one PODR; however, the PODR occurred in a jar that had negative incremental TOC reduction. If this happens, contact a SWTR Coordinator to help determine what follow-up is required.

### Not Found

This result means your Step 2 Jar Test did not identify a PODR. Usually, this is because you failed to reach the target pH in any of your jars. It could also mean the highest coagulant dose you used in the jar test produced a TOC reduction of 0.3 mg/L or higher for each 10 mg/L of alum in the last two jars. If you get this result, you will need to repeat the test using higher alum doses.

### More than 1 Point of Diminishing Returns

This result means your Step 2 Jar Test produced a PODR in two or more jars. If you get this result, you need to determine which of the values best characterizes the jar test findings; and copy the appropriate value from the **Cumulative TOC Removal** cell to the empty cell below the **More than 1 PODR** notice. Contact a SWTR Coordinator if you have any questions about which PODR value to use.

### Not Amenable

This result means your Step 2 Jar Test revealed that you reached your target pH in at least one of the jars but that all the of the jars produced TOC reductions of less than 0.3 mg/L for each 10 mg/L of alum applied.

If you get this result, contact a SWTR Coordinator so that we can review your jar test results. If we concur that the TOC in your source water is not amenable to treatment, we will send you a letter or email confirming the finding. Once you have consulted with us, use the drop-down menu and enter {Yes} in the upper highlighted cell and enter the {date} of our correspondence in the lower one.

## *SUVA Jar Test Worksheet*

As indicated previously, if you entered an X in the **By Finished Water SUVA Jar Test** cell on the **P.7-TOC ACC** worksheet, a **SUVA Jar Test** worksheet will be available. We have included this worksheet for you to record the test results and the plant conditions at the time of testing. Since the **SUVA Jar Test** worksheet is not used for compliance, it is not protected and contains no automated calculations or formulas. This worksheet is provided for your convenience; you do not have to include it when you submit your MOR. If you have questions about filling out the SUVA Jar Test Worksheet, contact a SWTR Coordinator.

## General Information about SUVA Jar Tests

A SUVA jar test estimates the relative amount of humic substances present in the water. SUVA is an indirect indicator of whether the organic carbon in water is humic or non-humic. It is calculated by dividing a sample's UV absorption at a wavelength of 254 nm by its concentration of dissolved organic carbon.

Water that contains higher amounts of humic material is generally more amenable to enhanced coagulation. Plants that produce treated water with SUVA levels below 2.0 L/mg-m are unlikely to remove significantly more TOC.

It is generally better to test the SUVA levels of the treated water actually produced by your plant. However, it is not possible to measure treated water SUVA levels at plants that use iron-based coagulants (such as ferric chloride and ferric sulfate) or chemical preoxidants (such as chlorine and sodium or potassium permanganate), because these compounds interfere with the SUVA analytical method. In order to estimate the level of humic materials in the treated water they produce, these plants must conduct a SUVA jar test.

The following conditions apply to SUVA Jar Tests:

- You cannot add any iron-based chemicals (such as ferric chloride or ferrous sulfate) or any oxidant (such as chlorine or permanganate).
- You can (and should) add organic polymers and pH adjustment chemicals currently used in your plant prior to the sedimentation basin or clarifier. These chemicals include coagulant aid polymers, flocculant aid polymers, or acids and bases you add to adjust the pH or alkalinity of the coagulation process.
- You should not add any chemicals applied to settled or filtered water in your plant. These chemicals include filter aid polymers, corrosion control chemicals such as caustic or phosphates, and fluoride.

# 3.6 Imported Data

The **Imported Data** tab is useful for plants that want to migrate data directly from a SCADA system or their digital data files into the SWMOR workbook instead of manually entering data into every cell each month.

You will need to determine the capabilities of your SCADA system or data files to perform the initial migration of data into the **Imported Data** tab. You will also need to develop a formatted table arrangement for the data once it is in the **Imported Data** tab. Having a predetermined table arrangement to migrate data into each month will limit the number of formulas that you will have to change within other reported data tabs.

Once you have your data in the Imported Data tab in an arrangement that you can recreate each month, you can begin to program formulas into data cells of the other tabs. For example, in Day 1 of the **Raw Water Pumpage** column on **P.2 Turbidity Data**, enter the formula, ='Imported Data'!A1. This formula will tell the **P.2 Turbidity Data** worksheet to find the Raw Water Pumpage data point for this cell on the **Imported Data** tab in cell A1. If you have questions about building your workbook to operate using the Imported Data tab, contact a SWTR Coordinator.