



Colorado Department
of Public Health
and Environment

Discharge Monitoring Report Guidance



Revised 06/2012

Water Quality Control Division

4300 Cherry Creek Drive South Denver, Colorado 80246

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SECTION 1 – OVERVIEW

Purpose and Disclaimer: The purpose of this guidance document is to provide instruction and assistance to the regulated community on how to properly prepare, complete, and submit discharge monitoring reports (“DMRs”). The procedures and/or methods described in this document are provided for information only. This guidance is not meant to modify or replace permit language or applicable laws and regulations. In the event of a conflict between this guidance and permit language or applicable laws and regulations, the permit and/or laws and regulations shall govern. It remains the responsibility of the permittee to read and fully understand the terms and requirements of all permits, laws and regulations.

Introduction: The sample collection and analytical results required by the Colorado Discharge Permit System (“CDPS”) permits must be reported to the Water Quality Control Division (the “Division”) through the submission of DMRs (EPA Form 3320-1). Original copies of the DMRs must be submitted to the Division by the 28th day of the month following the monitoring period, as required by the permit. This data is then entered into a national database (“ICIS”) and is available to the public through the U.S. Environmental Protection Agency’s Enforcement and Compliance History Online (“ECHO”) website at <http://www.epa-echo.gov/echo/>.

It is extremely important that the data reported on the DMR be complete, accurate, timely, and legible to ensure that the facility’s compliance status is correctly reflected. The reported data will be compared with the current limits contained in the permit to determine the facility’s compliance. Since DMRs and permits contain limits and information specific to an individual facility, the responsible person completing the DMR needs to ensure they are using the correct DMR and that the information on the DMR matches their permit.

It should be noted that DMR submittal is required even if the facility did not have a discharge during the reporting period. (See “No Discharge” on page 4 for more information.)

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SECTION 2

UNDERSTANDING THE FORM

See the on Page 7 for further illustration of the terms below.

Note: You can click on any bolded term below to be taken to the Sample DMR.

Permittee Name/ Address

The permittee name and address is obtained and recorded from information in the permit and as provided with the permit application. Please check to verify that the mailing address, facility name, and facility contact are correct on the DMRs. Contact the Division if any changes need to be made to the DMRs. (See Appendix A for a list of contacts.)

Facility Location

This identifies the physical location of the wastewater treatment facility. Contact the Division if any changes need to be made to the DMRs. (See Appendix A for a list of contacts.)

Permit Number

The permit number is the unique number assigned to a treatment facility. If the permit number begins with a “CO” prefix, it is an individual permit specific to that facility only. If the number begins with “COG,” “COX,” or “COR” prefix, it represents a facility specific certification issued under a general permit that may apply to many facilities.

Discharge Number

The discharge number (e.g. 001A, 002A, 300I, etc) represents a specific monitoring point or outfall, as described and identified in the permit. If the facility has more than one monitoring point, make sure the information reported on the DMR corresponds with the correct discharge number.

Monitoring Period

The monitoring period corresponds with the reporting requirements of the permit and is listed on the DMR as the first day of the monitoring period through the last day of the monitoring period. The monitoring period can be monthly, quarterly, seasonal, or annual. The information reported on the DMR must correspond with the specific monitoring period listed on the DMR.

No Discharge

Mark this box if your facility has no discharge for a specific outfall (discharge number) during the monitoring period. Do not mark the box if the facility had a discharge but you failed to sample.

Parameter

The effluent parameters specified in the permit are listed in this column. Each box will display the parameter name followed by a numeric code used for data entry by the Division.

It is the permittee’s responsibility to verify that each parameter specified in the permit is included on the DMR form. Contact the Division if any discrepancies are found. (See Appendix A for a list of contacts.)

Permit Requirement

These rows list the effluent limitation(s) for the corresponding parameter. The facility's discharge is required to meet the effluent limitations specified in the permit and listed here.

Sample Measurement

Sample measurement data for each parameter is reported under the "Quantity or Loading" or "Quality or Concentration" columns in accordance with the facility permit. Enter the sample measurement data in the blank white boxes. Asterisks (*****) in any box indicate that no entry is required in that box. Do not leave blank spots on the DMR unless that information is not available. Any white box that does not have asterisks (*****) must contain a reported value.

Units

The DMR includes the units (e.g., mg/l, MGD, lbs/day, etc.) in which the sample measurement must be reported, as specified by the permit. It may be necessary to convert the data to the required units prior to entering it on the DMR.

No. Ex (Number of Exceedances or Exceptions)

Enter the number of sample measurement values that exceeded the permit requirement for each parameter. This number represents the sum total of all sample exceedances/exceptions measured during the monitoring period (i.e., how many times a limit was not met). In the case of a maximum or minimum limit, each sample analysis that violates either limit shall be counted. For an average (7-day, 30-day average, etc.) limit, each average in excess of the limit should be counted. If all sample analyses for a parameter are measured at or below the effluent limit, enter "0" (zero) in the "No. Ex" box for that parameter.

Frequency of Analysis

The frequency of analysis represents the number of times the discharge was actually sampled and analyzed during the reporting period. This frequency must be at least the minimum required by the permit. Any additional monitoring must be included in the DMR calculations and reported in the "Frequency of Analysis" box for that parameter.

- The frequency of analysis should be reported in the same units as the permit specified monitoring frequency. (Example: weekly monitoring requirement should be reported with weekly units - "1/7" or "weekly." Monthly monitoring requirement should be reported with monthly units - "1/30" or "monthly.")
- If a different frequency of analysis for each monitoring period is performed by the permittee, the permittee must report the least frequent number of samples collected and include an asterisk (*) indicating that a comment is attached outlining actual monitoring for each period. (Example comment: "week one - 1/7, week two - 5/7, week three - 2/7, week four - 1/7")

Sample Type

The permittee must report the actual sample type (method) used to collect the sample(s) during the monitoring period. (Example: Enter "GRAB" for individual grab samples, "CONT" for continuous monitoring, "COMP" for composite sampling, etc.)

Name/Title Principle Executive Officer

The name and title of the responsible person should be printed at the bottom of the form. This person should sign and date the form in the Signature section. A description of an authorized signatory official can be found in your permit and in the CDPS regulations at 5 CCR 1002-61. It includes:

- In the case of corporations, a principal executive officer of at least the level of vice-president or his or her duly authorized representative, if such representative is responsible for the overall operation of the facility from which the discharge described in the application originates.
- In the case of a proprietorship, a general partner.
- In the case of a sole proprietorship, the proprietor.
- In the case of a municipal, state, or other public facility, either the principal executive officer, ranking elected official, or duly authorized employee.

Signatory authority may be delegated to a duly authorized representative if such authorization has been made in writing by an authorized signatory official. The authorization must specify either an individual or a position having responsibility for the overall operation of the regulated facility or activity. The authorization must be submitted in writing to the Division and comply with the requirements of 5 CCR 1002-61, §§61.4(1)(f) .

Signature

Every page of the DMR must be signed by the Principle Executive Officer or duly authorized representative. It is important to read and understand the certification statement. By signing the DMR, the Principle Executive Officer or duly authorized representative is certifying to the Division, under penalty of law, that the information on the DMR is true and accurate.

Telephone

The telephone number of the Principal Executive Officer must be printed in this section.

Date

Must be the actual date that the DMR is signed by the Principal Executive Officer or duly authorized representative certifying and authenticating the data submitted on the DMR.

Comments and Explanation of Any Violations

Information must be included to explain or clarify any permit violations that occurred during the monitoring period. If additional space is required, please attach a written explanation of the violations and reference it in this section of the DMR.

In the event a revised or corrected DMR is necessary, a new, original, authorized signature and date of the signature is required on each page. The word "REVISED" should be written and clearly visible on each page of the form. (Also See "Revised/ Corrected DMRs" on page 10)

INTERACTIVE SAMPLE DMR FORM

PERMITTEE NAME/ADDRESS (Include Facility Name/Location if Different)
 NAME
 ADDRESS

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
 DISCHARGE MONITORING REPORT (DMR)

PERMIT NUMBER
DISCHARGE NUMBER

NOTE: You can click on any colored box below to be taken to the term definitions listed above.

FACILITY LOCATION

MONITORING PERIOD

FROM	YEAR	MO	DAY	TO	YEAR	MO	DAY
------	------	----	-----	----	------	----	-----

Check here if No Discharge
 NOTE: Read Instructions before completing this form

PARAMETER	X	QUANTITY OR LOADING			QUALITY OR CONCENTRATION				NO. EX	FREQUENCY OF ANALYSIS	SAMPLE TYPE
		VALUE	VALUE	UNITS	VALUE	VALUE	VALUE	UNITS			
pH 00400 1 0 Effluent Gross	SAMPLE MEASUREMENT	****	****	****				SU			
	PERMIT REQUIREMENT	****	****		6.5 Minimum	****	9.0 Maximum			Weekly	In-situ
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
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	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER TYPED OR PRINTED	I CERTIFY UNDER PENALTY OF LAW THAT THIS DOCUMENT AND ALL ATTACHMENTS WERE PREPARED UNDER MY DIRECTION OR SUPERVISION IN ACCORDANCE WITH A SYSTEM DESIGNED TO ASSURE THAT QUALIFIED PERSONNEL PROPERLY GATHER AND EVALUATE THE INFORMATION SUBMITTED. BASED ON MY INQUIRY OF THE PERSON OR PERSONS WHO MANAGE THE SYSTEM, OR THOSE PERSONS DIRECTLY RESPONSIBLE FOR GATHERING THE INFORMATION, THE INFORMATION SUBMITTED IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS.	TELEPHONE AREA CODE NUMBER	DATE YEAR MO DAY
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT			

COMMENTS AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

SECTION 3

SAMPLING AND REPORTING INFORMATION

Sampling and analytical procedures must comply with EPA approved methods listed in 40 CFR §136. On the DMR, the permit limits are printed in the gray boxes.

Understanding Averages and Maximum/Minimum Limitations

“Average” is normally the arithmetic average (geometric mean for bacterial parameters) of all sample data for each parameter obtained during the specified monitoring period. Examples of common reporting averages include 30-day average (i.e., monthly average) and 7-day average. For DMR reporting purposes, the 30-day average is based on a calendar month, regardless of how many days are in the month. For the purpose of this guidance, “monthly average” and “30-day average” are used interchangeably.

The averages for bacteria concentrations shall be determined by using the geometric mean instead of the arithmetic mean. For information on how to calculate the geometric mean, refer to SECTION 4.

“Maximum” and “Minimum” are the highest and lowest measurements obtained during the specified monitoring period (*usually* a calendar month). Additionally, the “Daily Maximum Limitation” means the limitation for a specific parameter shall be applied as an instantaneous maximum (and/or, for pH or DO, instantaneous minimum) value. The instantaneous value is the analytical result of any individual sample. The DMR shall report the maximum (and/or minimum, as applicable) instantaneous value within the reporting period. Any instantaneous value beyond the noted daily maximum limitation (or minimum, as applicable) for the indicated parameter shall be considered a violation of the permit. Note: the “Daily Maximum Limitation” as it relates to pollutants with limitations expressed in units of mass (e.g. lbs/day), shall be determined by summing the total mass of the pollutant discharged over the day in which sampling occurs. For information on how to calculate daily loading values, refer to section 4.



When a permit contains both an average and a maximum limit for a parameter (for example, a 30-day average limitation and a daily max limitation), and sampling is performed only once in the monitoring period, the value must be placed in BOTH the average and maximum boxes on the DMR.



When a permit requires quarterly reporting and contains an average and a maximum limit for a parameter with monthly monitoring, the highest 30-day average and monthly maximum of the quarter are placed in the appropriate boxes on the DMR.

For DMR reporting purposes, a calendar week begins on Sunday and ends on Saturday. In the specific instance where a calendar week begins in one month and ends in the next month, the weekly monitoring results shall be included in the calculation and reported on the DMR in which the calendar week ends. For purposes of reporting “Daily” values, “Daily” is the discharge of pollutant measured during a calendar day of any 24-hour period that *reasonably* represents the calendar day for purposes of sampling.

BDL/PQL: Reporting Data Below the Detection Limit or less than the PQL

The present lowest Practical Quantitation Limits (“PQLs”) for specific parameters, as determined by the State Laboratory, are provided in your permit. If all specified analytical methods and corresponding PQLs are greater than the numeric effluent limit specified in the permit, then the analytical method with the lowest PQL shall be used. A listing of PQLs for organic parameters that must meet the above requirement, as well as other information and definitions, can be found in the Division’s [Practical Quantitation Limitation Guidance Document, July 2008](#).

When the analytical method has a PQL greater than the permit limit, and the permittee’s analytical result is less than the PQL, the permittee shall report “BDL” (Below Detection Limit) on the DMR. Such reports will not be considered as violations of the permit limit, as long as an EPA approved method with the lowest available PQL is used for the analysis. When the analytical method which complies with the above requirements has a PQL that is equal to or less than the permit limit, and the permittee’s analytical result is less than the PQL, “<X” (where X is the actual PQL achieved by the laboratory) shall be reported on the DMR. For parameters that have a report only limitation, and when the analytical result is less than the PQL, “<X” (where X is the actual PQL achieved by the laboratory) shall be reported on the DMR.



In the calculation of average concentrations (e.g., 7-day average, 30-day average, 2-year average), any individual analytical result that is less than the PQL shall be considered to be zero for calculation purposes. When reporting:

If all individual analytical results are less than the PQL, the permittee shall report either “BDL” or “<X” following the guidance above.

If one or more individual analytical result is greater than the PQL, an average shall be calculated and reported. Note that it does not matter if the final calculated average is greater or less than the PQL – it must be reported as a value.

Note: When calculating Total Inorganic Nitrogen (“T.I.N.”) for a single sampling event, any value of less than the PQL (for total ammonia and/or total nitrate plus nitrite) shall be treated as zero. The T.I.N. concentration for a single sampling event shall then be determined as the sum of the analytical results (zeros if applicable) of same-day sampling for total ammonia and total nitrate plus nitrite. From these calculated T.I.N. concentrations, the daily maximum and 30-day average concentrations shall be calculated and must be reported as a value.

Rounding-off Rules

All data reported on DMRs must contain the same number of significant digits set in the permit limit. Therefore, some analytical data may require the rounding off of numbers. If rounding-off is necessary, use the following procedure:

- If the digit following those to be retained is less than 5, the digit is dropped and the preceding digit is kept unchanged. As an example, 11.443 is rounded off to 11.44.
- If the digit following those to be retained is greater than 5, the digit is dropped and the preceding digit is raised by 1. As an example, 11.446 is rounded off to 11.45.
- If the digit following those to be retained is 5, the 5 is dropped and the preceding digit is increased by one if it is an odd number or it is kept unchanged if an even number. As an example, 11.435 is rounded off to 11.44, while 11.425 is rounded off to 11.42.

Reporting Permit Exceedances, Failures to Sample, or Other Permit Violations

A cover letter must accompany your DMR when the DMR includes a violation of a permit condition, including failure to sample. The cover letter must explain the cause(s) of the violation and the actions that the facility has taken and/or plan to take to remedy the violations.

Revised/ Corrected DMRs

Sometimes it will be necessary for the facility to submit a revised or corrected DMR either because the Division has requested it or the facility has discovered an error. In this instance, the information should be updated with the submittal of a revised DMR. To submit a revised DMR, follow this procedure:

- Revised DMRs must have a new, original authorized signature and date of signature;
- Revised data should be highlighted;
- DMRs must be clearly marked as a revised DMR. At the top of the DMR, write "Revised";
- Provide a short cover page describing the changes to the DMR.

Transmittal

One copy of the DMR must be received by the Division no later than the 28th day of the month following the end of the monitoring period. This copy must contain the original signature from the Principle Executive Officer (or the authorized representative), and must be complete in form. You are required to retain at least one copy of the DMR in your records for at least three (3) years. The DMRs must be mailed to:

Colorado Department of Public Health and Environment
Water Quality Control Division, B-2
4300 Cherry Creek Drive South
Denver, CO 80246-1530

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SECTION 4

HOW TO CALCULATE SAMPLE VALUES

Calculating a Geometric Mean

For bacteria (*E. coli*) concentrations, the 30-day and 7-day averages shall be determined by using the geometric mean instead of the arithmetic average. The geometric mean may be calculated using two different methods. For the methods shown, “a, b, c, d...” are individual sample results and “n” is the total number of samples.

Method 1: Geometric Mean = $(a*b*c*d*...)^{(1/n)}$ (* = multiply)

Method 2: Geometric Mean = $\text{antilog} ([\log(a)+\log(b)+\log(c)+\log(d)+...] / n)$

In calculating the geometric mean, any analytical result of “0” shall be converted to “1.” Additionally, for any analytical result reported by the laboratory as “less than” a numeric value shall be converted to “1” in the calculations. If all individual analytical results for the month are reported to be less than numeric values, then report “less than” the largest of those numeric values on the DMR. Otherwise, report the calculated value.

Any individual analytical result of “too numerous to count” (TNTC) is considered invalid and another sample shall be promptly collected for analysis. If another sample cannot be collected within the same sampling period for which the invalid sample was collected (same month if monthly sampling is required, same week if weekly sampling is required, etc.), then the following procedures apply:

- A minimum of two samples shall be collected for bacterial analysis within the next sampling period.
- If the sampling frequency is monthly or less frequent: For the period with the invalid sample results, leave the spaces on the corresponding DMR for reporting coliform results empty and attach a letter to the DMR noting that a result of TNTC was obtained for that period, and explain why another sample for that period had not been collected.
- If the sampling frequency is more frequent than monthly: Eliminate the result of TNTC from any further calculations, and use all the other results obtained within that month for reporting purposes. Attach a letter noting that a result of TNTC was obtained, and list all individual analytical results and corresponding sampling dates for that month.

BOD₅ and TSS Percent Removal Calculations

The monthly average percent removal is not calculated by averaging the daily percent removal values. Instead, the monthly average percent (%) removal is calculated from two numbers: the monthly average influent concentration and the monthly average effluent concentration. The percent removal calculations are performed using the following formula:

$$\% \text{ Removal} = [(\text{monthly average influent concentration} - \text{monthly average effluent concentration}) \div \text{monthly average influent concentration}] \times 100$$

Loading Calculation

To determine representative 30-day average loading values, use the total daily influent wastewater flow (MGD) on the day that the BOD composite sample is collected in the calculation. The loading calculation is performed using the following formula:

$$\text{Loading} = (\text{total daily influent flow in MGD} \times \text{BOD concentration in mg/l}) \times 8.34 = \text{Loading in lbs/day}$$

Systems monitoring one time per week or more during the monitoring period shall calculate daily loading values using the formula outlined above and average all loading values for the week. For DMR reporting purposes, the 7-day average loading is the highest of the 7-day averages calculated during the monitoring period. For DMR reporting purposes, the 30-day average loading value is an average of each daily loading value during the month.

Note: Representative loadings are *not* obtained by using the 30-day average flow and the average of all concentration results for the corresponding 30-day period. This same concept applies to the 7-day average calculation.

Percent Design Capacity Calculations

Pursuant to §25-8-501, C.R.S., domestic wastewater treatment works are required to 1) initiate engineering and financial planning for expansion whenever throughput and treatment reaches 80% of design capacity, and 2) commence construction of such expansion whenever throughput and treatment reaches 95% of design capacity. The hydraulic and organic design capacities for a specific facility are identified in the permit and/or certification to the permit. The percent capacity calculations for hydraulic and organic loading are performed using the following formulas:

$$\% \text{ Hydraulic Capacity} = \text{monthly hydraulic loading (MGD)} \div \text{hydraulic design capacity (MGD)} \times 100$$

$$\% \text{ Organic Capacity} = \text{monthly organic loading (lbs BOD}_5\text{/day)} \div \text{organic design capacity (lbs BOD}_5\text{/day)} \times 100$$

Rolling Average

A rolling average is calculated by using data results from the current monitoring period and the respective designated interval prior to the current monitoring period.

Example: 12 month rolling average. Calculate the current monthly average and the previous 11 monthly averages and divide the total by 12.

$$12 \text{ MRA} = (\text{MA}_c + \text{MA}_1 + \text{MA}_2 + \dots + \text{MA}_{11}) \div 12$$

MA_c = Current monthly average

MA₁ = First prior month's monthly average

MA₂ = Second prior month's monthly average

MA₁₁ = Eleventh prior month's monthly average

Composite Sampling/ Flow Proportioned Sample Calculations

Procedures for Calculating Flow Proportioned Sampling:

- 1) Determine required composite sample volume by contacting analytical lab
- 2) Obtain five (5) containers of the required composite sample size
- 3) Collect four (4) grab samples at predetermined intervals and store samples at $\leq 6^{\circ}\text{C}$, but above freezing
 - a) **Hour 0:** Record totalized flow (if not there at Hr 0, utilize chart recorder or totalizer history read out to find totalized flow)
 - b) **Hour 2:** Read totalized flow and grab first sample
 - c) **Hour 4:** Read totalized flow and grab second sample
 - d) **Hour 6:** Read totalized flow and grab third sample
 - e) **Hour 8:** Read totalized flow and grab fourth sample
- 4) Calculate grab sample proportion ($Q \div \text{Total } Q$) of each grab sample to be added to the composite:
 - a) Calculate volume of flows between each of the 2-hour increments (e.g., Hour 2 totalized Flow – Hour 0 totalized Flow)
 - b) Calculate volume of Total Flow (Q) by subtracting the Hour 0 totalizer reading from the Hour 8 totalizer reading
 - c) Calculate grab sample proportion by dividing 2-hour Flows by the total Q and then record in Grab Sample Proportion Column
- 5) Calculate grab sample volumes into composite =
Volume of Composite sample required \times Grab Sample Proportion
- 6) Measure out proportioned grab sample volume for each grab sample and place in Container Five (5), the “Composite Sample”
- 7) Duplicate samples will double the required sample volume.

Example: Influent Composite Sample

Total Composite Sample Volume Required by Lab = 4,000 ml

Composite Sample Start Time = 06:00 to 14:00

Composite Time (Hours)	Time of Day (Hours)	Read Flow Meter Totalizer (gal)	Flow (Q) (gal)	Grab Sample Time	Grab Sample Proportion (ratio)	Volume of Grab Sample Taken (ml)	Grab Sample Volume into Composite (ml)
0	6:00	7,000					
1	7:00		5,000				
2	8:00	12,000		X	0.556	4,000	2224
3	9:00		1,000				
4	10:00	13,000		X	0.11	4,000	440
5	11:00		500				
6	12:00	13,500		X	0.056	4,000	224
7	13:00		2,500				
8	14:00	16,000		X	0.278	4,000	1112
		Total Q = 9,000		Totals = 1.000		Total = 4,000	

Sodium Adsorption Ratio (SAR), Adjusted SAR, and Electrical Conductivity (EC)

The sodium adsorption ratio (SAR) and electrical conductivity (EC) limitations are implemented in permits as measures of salts in the effluent to protect irrigated crops and soils downstream of the discharge. Each permit with SAR and EC monitoring and reporting requirements has unique SAR and EC limitations based on the agricultural usages of water downstream of the facility's discharge. The fact sheet and water quality assessment associated with the facility's permit explain the rationale for the SAR and EC limitations in depth and should be referred to for more facility specific information on SAR and EC.

SAR, adjusted SAR, and permit compliance shall be determined using the following procedure:

- 1) Determine the EC of your effluent
- 2) Calculate the SAR of your effluent using the EC value from your effluent with the following equation:

$$\text{SAR} = [(7.1 * \text{EC}) - 2.48]$$

- This calculated SAR value is reported on the DMR as the "Sodium Absorption Ratio at Monitoring Location 'EG'"
- 3) Determine the adjusted SAR of your effluent using the sodium (Na^+), magnesium (Mg^{++}), calcium (Ca^{++}), and bicarbonate (as HCO_3) concentrations in your effluent, and the "Modified Calcium Determination for Adjusted Sodium Adsorption Table" found in your permit. Adjusted SAR is calculated with the following equation:

$$\text{SAR-adj} = \frac{\text{Na}^+}{\sqrt{\frac{\text{Ca}_x + \text{Mg}^{++}}{2}}}$$

- This adjusted SAR value is reported on the DMR as the "Sodium Absorption Ratio at Monitoring Location 'P'"
- 4) The permit limit for SAR is expressed as a Pass/ Fail limit, with "0" indicating "pass" and "1" indicating "fail." If the adjusted SAR is less than or equal to the calculated SAR, report "0" on the DMR as the SAR at Monitoring Location "1." If the adjusted SAR is greater than the calculated SAR, report "1" on the DMR as the SAR at Monitoring Location "1."

For additional information on SAR, please refer to the Division's policy and procedures for [Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops.](#)



Daily Maximum Temperature (DM)

DM is the highest 2-hour average water temperature measured by a continuous recorder during a given 24-hour period. This is determined using a rolling 2-hour maximum temperature. For example, if the recorder collects data every 15 minutes, a 2-hour maximum can be determined on every data point after the initial 2 hours of collection. Note that the time periods that overlap days (e.g., Wednesday night to Thursday morning) are inconsequential to calculating and reporting because the value on the DMR is the greatest of all the 2-hour averages.

For example data points collected at:

- 08:15, 08:30, 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, would be averaged for a single 2 hour average data point
- 08:30, 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, 10:15, would be averaged for a single 2 hour average data point
- 08:45, 09:00, 09:15, 09:30, 09:45, 10:00, 10:15, 10:30, would be averaged for a single 2 hour average data point

This would continue throughout the course of a calendar day. The highest of these 2-hour averages over a month would be reported on the DMR as the daily maximum temperature. At the end/beginning of a month, the collected data should be used for the month that contains the greatest number of minutes in the 2-hour maximum. Data from 11 pm to 12:59 am, would be included in the calculations for the previous month. Data collected from 11:01 pm to 1:00 am would be included in the calculations for the new month.

Maximum Weekly Average Temperature (MWAT)

The MWAT is the largest mathematical mean of multiple, equally spaced, daily temperatures over a seven-day consecutive period, with a minimum of three data points spaced equally through the day. The MWAT is calculated by averaging all temperature data points collected during a calendar day, and then averaging the daily average temperatures for 7 consecutive days. This 7 day averaging period is a rolling average, i.e. on the 8th day, the MWAT is the average of the daily averages of days 2-8. The MWAT value reported on the DMR is the highest of all the rolling 7-day averages throughout the month. For those days that are at the end/beginning of the month, the data shall be reported for the month that contains 4 of the 7 days.

Day 1: Average of all temperature data collected during the calendar day.

Day 2: Average of all temperature data collected during the calendar day.

Day 3: Average of all temperature data collected during the calendar day.

Day 4: Average of all temperature data collected during the calendar day.

Day 5: Average of all temperature data collected during the calendar day.

Day 6: Average of all temperature data collected during the calendar day.

Day 7: Average of all temperature data collected during the calendar day.

1st MWAT Calculation as average of previous 7 days

Day 8: Average of all temperature data collected during the calendar day.

2nd MWAT Calculation as average of previous 7 days

Day 9: Average of all temperature data collected during the calendar day.

3rd MWAT Calculation as average of previous 7 days

For additional information on MWAT, see the Division's [Procedures for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits](#).



Additional Definitions

Field Replicates (Field Splits): Field replicates are independent samples that are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. Field replicates are averaged into calculations reported on the DMRs.

Field Duplicates: A field duplicate is a second, ideally identical, aliquot of an environmental sample (i.e., one field sample poured into two sample containers while in the field) analyzed in the same batch and in exactly the same manner as the original aliquot. Field duplicate results provide an indication of the precision of the sampling procedure. Field duplicates are *not* averaged into calculations reported on the DMRs.

Lab Duplicates: Similar to a field duplicate, a lab duplicate is a second, ideally identical, aliquot of an environmental sample (i.e., one field sample poured into two sample containers in the laboratory) analyzed in the same batch and in exactly the same manner as the original aliquot. Lab duplicate results provide an indication of the precision of the analytical procedure. Lab duplicates are *not* averaged into calculations reported on the DMRs.

APPENDIX A – DIVISION CONTACTS

Compliance Questions and Problems		
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For Discrepancies Between DMR and Permit		
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Permit Questions		
General Line	303.692.3517	
Records Requests / Copies of Previously Submitted DMRs		
Records Center	303.692.3565	