CHAPTER 1.2 - Receiving Water Used to Make WET Determinations

The purpose of this chapter is to aid in the selection of the appropriate receiving water to use when determining dilution ratios, calculating the IWC, and for use as dilution waters.

NOTICE: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

Receiving Water Use in WET Determinations

Since the initial promulgation of ch. NR 106, Wis. Adm. Code, in the late 1980's, the Department has been reviewing surface water discharges to determine the need for WET testing to assess the effluent's potential for impacts to fish and aquatic life communities. Receiving water type, location, and dilution are important factors that are considered when determining the appropriate WET requirements for a given situation. Since the magnitude of toxic effect usually increases as effluent concentration increases, one of the most important factors affecting WET potential is the dilution available in the receiving water. A very toxic effluent with an extremely large dilution may cause less environmental damage than a less toxic effluent with very little dilution. Since dilution and mixing are important considerations, the WET Checklist process described in Chapter 1.3 includes an evaluation of the relationship between receiving water flow and effluent flow. (See http://dnr.wi.gov/topic/wastewater/WETguidance.html)

When completing the WET Checklist, it is important to use the appropriate effluent and receiving water flow information to calculate receiving water to effluent flow ratios ($Q_{7,10}$:Q_e) and instream waste concentrations (IWC). Generally, coldwater, warmwater sport fish, and warmwater forage fish waters support a more diverse aquatic life community and warrant a higher level of protection. Conversely, waters historically referred to as "variance" waters (limited forage fish, limited aquatic life) usually have less diverse fish populations or macroinvertebrate-only communities. In recognition of this, the following approach is recommended which provides protection from acute toxicity impacts to all waters, moderate protection from chronic impacts to variance waters, and full protection from chronic impacts to all waters classified as coldwater, warmwater sport fish, or warmwater forage fish.

Since the aquatic communities that WET testing is designed to protect are always present in coldwater, warmwater sport fish, and warmwater forage fish communities, the receiving water used for making chronic WET determinations should be the first waterbody that the effluent encounters which supports any of these communities. If Department staff have information showing that the immediate waterbody supports a coldwater, warmwater sport fish, or warmwater forage fish community, chronic WET requirements such as the instream waste concentration should be determined using that receiving water.

In situations where the effluent is discharged into a waterbody that supports a limited forage fish or limited aquatic life community, the distance to the first waterbody that the effluent encounters which supports a coldwater, warmwater sport fish, or warmwater forage fish community (or the distance between the discharge and where the direct receiving water supports any of these populations) should be determined. When this distance is less than 4 miles, the receiving water flow to be used for chronic WET determinations should be that of the coldwater, warmwater sport fish, or warmwater forage fish waterbody downstream of the confluence, minus the effluent flow contributed by the discharger. If the distance to that waterbody is $\geq$ 4 miles, chronic WET testing is not usually recommended, unless information is available that shows a potential exists for impacts due to chronic toxicity (for example, if there have been chronic WET failures).

Staff should use their best professional judgment to select the appropriate receiving water flow to be used when making chronic WET determinations that will be protective of the appropriate aquatic life communities. Some example scenarios are illustrated at the end of this chapter. Once staff have chosen the appropriate waterbody to be used, the same waterbody should be used for stream flow to effluent flow ratios and IWC determinations.

As specified in s. NR 106.06(3)(b)2, Wis. Adm. Code, when an effluent is discharged to a waterbody without unidirectional flow (e.g., lakes, bays, impoundments), the default stream flow to effluent flow ratio is 10:1 and the IWC is 9%. These default values should also be used whenever a "variance" stream empties into a waterbody without unidirectional flow (i.e., when the first downstream coldwater, warmwater sport fish, or warmwater forage fish waterbody is a lake or pond). See Attachment 1 of this chapter for some examples of appropriate receiving water use in different discharge situations.

Requirements For Discharges to Wetlands

All wetlands in the state are currently classified as variance waters. To determine the $Q_{7,10}$:Q_e ratio and IWC for a facility that discharges to a wetland, staff should determine the point where the stream discharging from the wetland becomes a non-variance classification and use the flow characteristics at this point in WET determinations. If the wetland/stream does not change to a non-variance waterbody within 4 miles, judgments similar to those discussed above should be made to determine which waterbody is most appropriate for use. To calculate the IWC for facilities that discharge to wetlands that do not then discharge to other surface waters, staff should treat the discharge similar to a lake situation, as described above (i.e., the $Q_{7,10}$:Q_e = 10:1, IWC = 9%).

Receiving Water Diluent in WET Tests

According to Section 4.4 of the "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*" (Methods Manual; http://dnr.wi.gov/topic/wastewater/documents/WETMethodsManualEdition2.pdf), receiving water must be used in all chronic tests (unless otherwise specified in the permit) and in acute tests where a zone of initial dilution (ZID) has been approved. In acute tests that measure toxicity at the end of pipe (i.e., where no acute mixing zone/ZID has been approved), the use of receiving water for dilution is optional - a standard laboratory water may be used instead.

Correct identification of an appropriate receiving water sample location is important in cases where permittees are required to use receiving water as the diluent, because the objective of the WET test in those cases is to estimate the effect on the receiving water after the effluent has been mixed in and the extent to which the chemicals are biologically available to aquatic organisms. The Methods Manual requires the use of receiving water as diluent because this increases the environmental relevance of WET testing by more directly representing real-world effluent and receiving water interactions in the test. Use of receiving water for dilution improves the ability of WET tests to predict in-stream effects.

As required by the Methods Manual, a minimum of one representative grab sample of the receiving water is necessary for use in a WET test. In stream and river situations, the receiving water sample should be collected upstream of the discharge, with every attempt made to avoid contact with the permittee's and any other discharges' mixing zones. In situations where a lake, impoundment, bay, or other waterbody without unidirectional flow has been identified as the receiving water to be used for WET tests, a sampling location should be chosen that is outside of the influence of all known discharges.

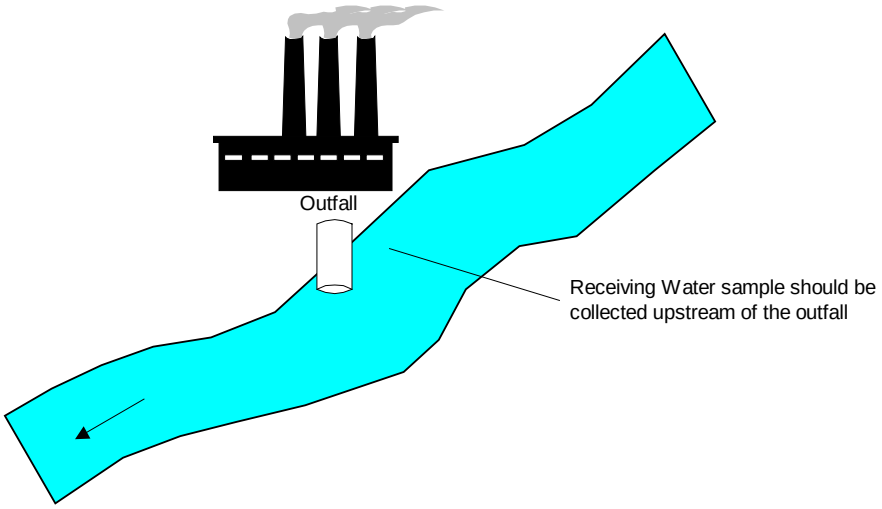
In situations where the water that is discharged into becomes a coldwater, warmwater sport fish, or warmwater forage fish waterbody within 4 miles, receiving water samples should be collected upstream of the outfall, as described above. In situations where a separate downstream waterbody was used for WET determinations, the receiving water sample should be collected from a site upstream of the confluence of the waterbody that is discharged into and the waterbody that was used for WET determinations.

What if the Samples Cannot Be Collected in the Receiving Water?

Under some conditions, like a lack of river flow during dry periods or icy conditions in winter months, it may be necessary to use a different dilution water. In situations where the direct receiving water is unavailable, the next best option might be another surface water with similar characteristics (i.e., in the same watershed, similar water chemistry and physical characteristics). If no alternate surface water can be identified, it may be necessary to use laboratory water for dilution. However, using lab water for dilution should be a last resort. Naturally occurring materials that complex with and potentially detoxify some compounds are absent from lab waters, therefore tests using lab water may overstate effluent toxicity effects on the receiving water environment. (See Chapter 2.11 for more guidance regarding the use of alternate dilution waters: http://dnr.wi.gov/topic/wastewater/WETguidance.html).

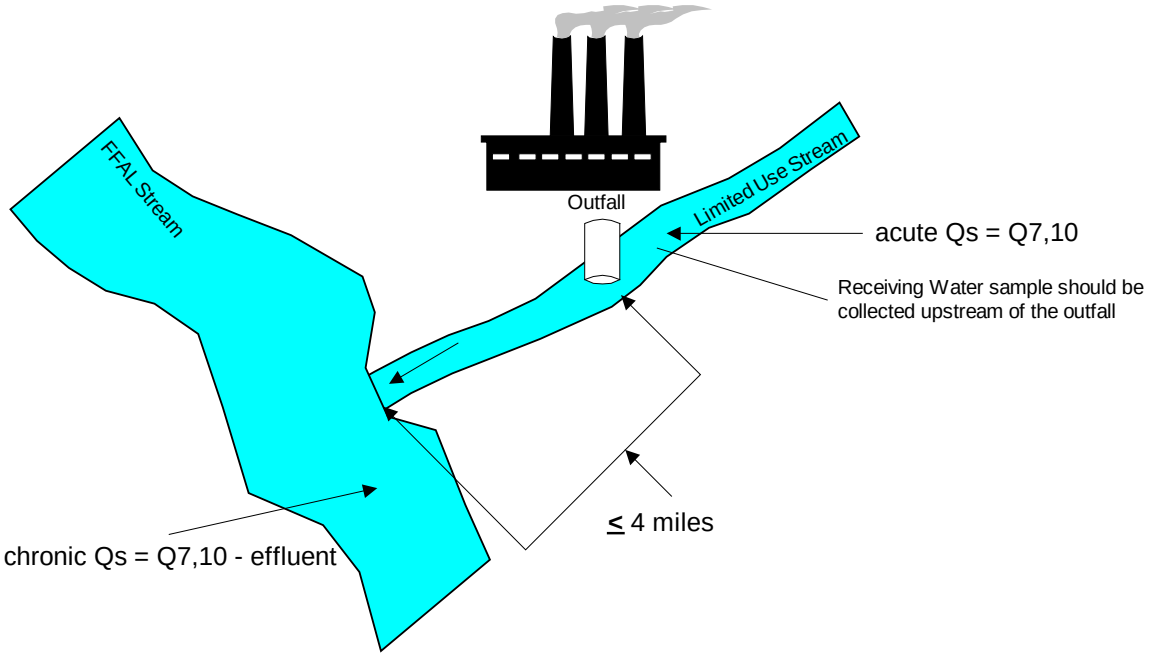
If an alternate receiving water or a lab water is identified in the permit as the required diluent, permit drafters should document the reason for this deviation in the fact sheet. If decisions about alternate dilution waters are necessary during the permit term, permittees (or their labs) must contact the Biomonitoring Coordinator (Kari.Fleming@wisconsin.gov or 608-267-7663) for permission to deviate from method requirements. Reasons for deviations from permit or WET method requirements must also be clearly described on the "WET Test Report Form" (see Section 6 of the Methods Manual).

Example #1: Fish and Aquatic Life (FFAL) Stream



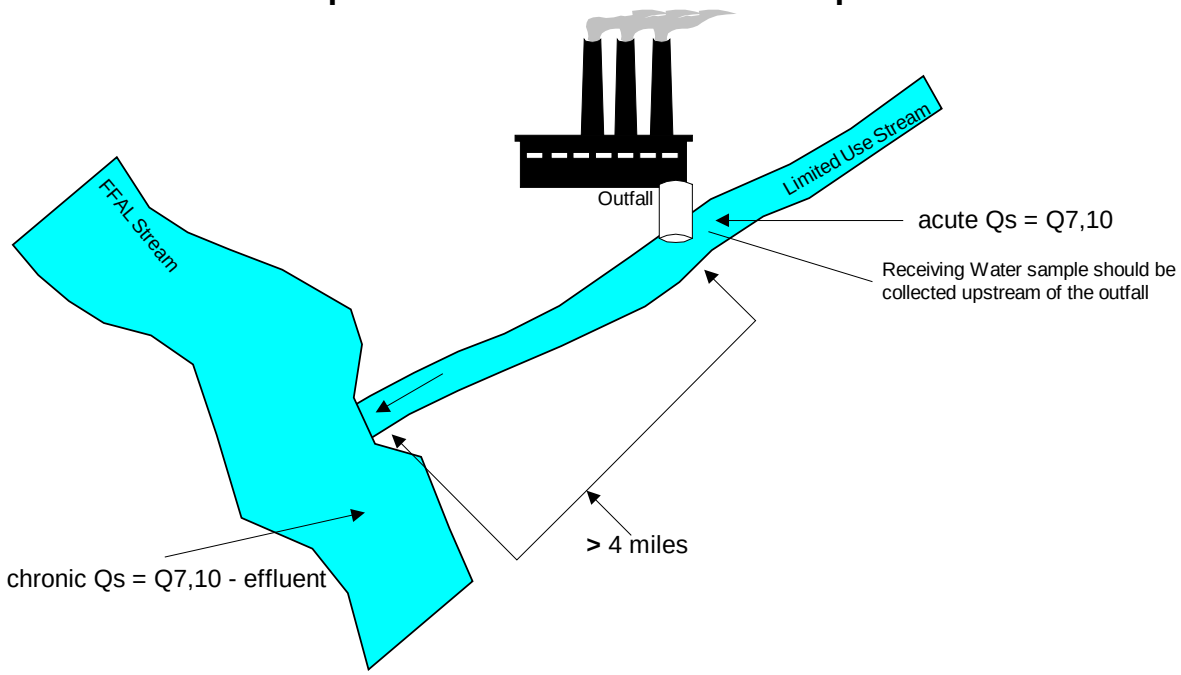
acute & chronic Qs = Q7,10 of receiving water
Need for acute and chronic testing evaluated using the WET Checklist:
Q7,10:Qe > 1,000:1 No WET usually recommended
Q7,10:Qe ≤ 1,000:1 & >100:1, Acute WET only usually recommended
Q7,10 ≤ 100:1 Acute & Chronic testing recommended

Example #2: Limited Use Stream w/Upstream Flow



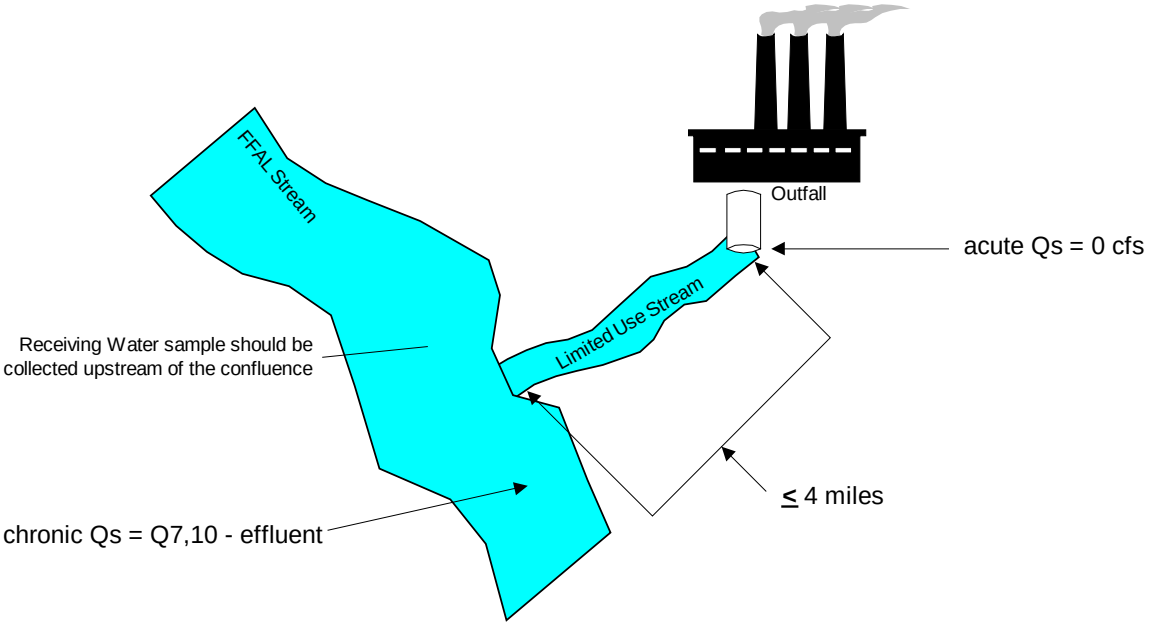
chronic Qs = Q7,10 of 1st downstream FFAL or higher
Need for acute and chronic testing evaluated using the WET Checklist:
Q7,10:Qe > 1,000:1 No WET usually recommended
Q7,10:Qe ≤ 1,000:1 & >100:1, Acute WET only usually recommended
Q7,10 ≤ 100:1 Acute & Chronic testing recommended

Example #3: Limited Use Stream w/Upstream Flow



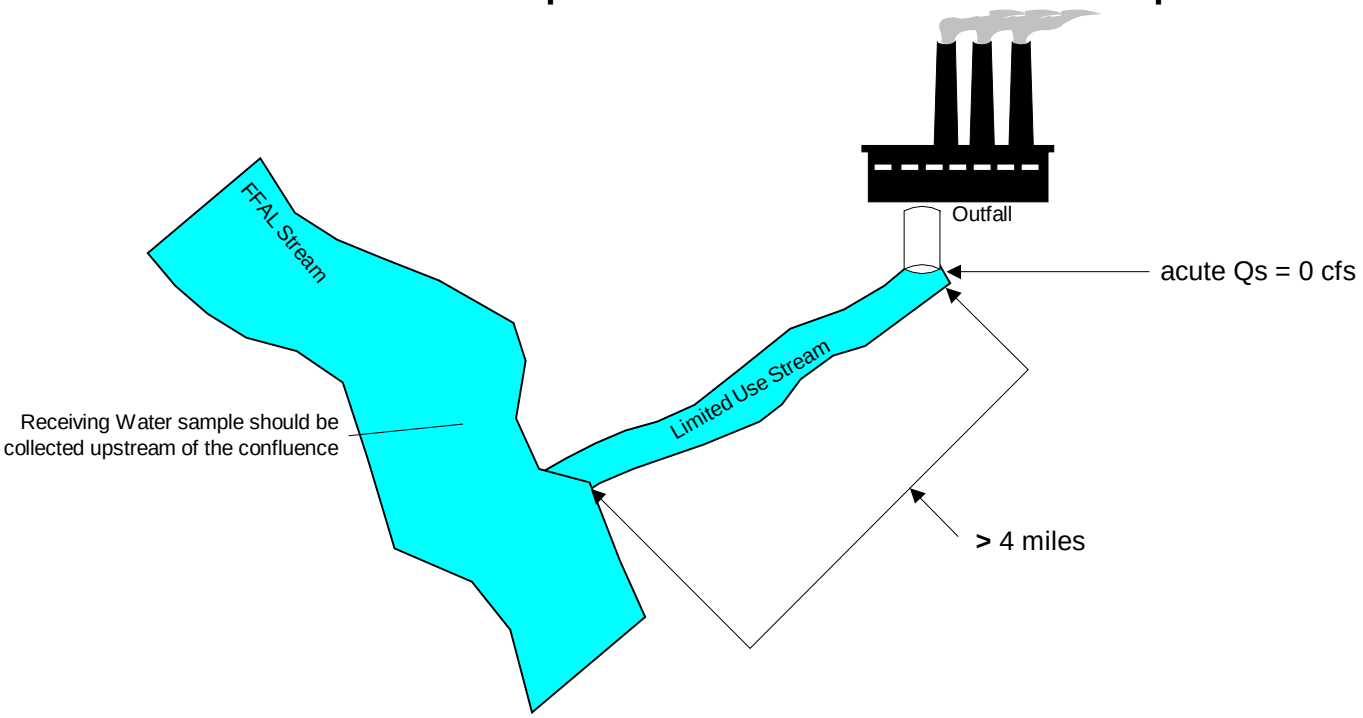
chronic Qs = Q7,10 of 1st downstream FFAL or higher
Need for acute and chronic testing evaluated using the WET Checklist:
Q7,10:Qe > 1,000:1 No WET usually recommended
Q7,10:Qe ≤ 1,000:1 Acute WET only usually recommended
No chronic recommended, unless historical toxicity problems are known.

Example #4: Limited Use Stream w/No Upstream Flow



chronic Qs = Q7,10 of 1st downstream FFAL or higher
Need for acute and chronic testing evaluated using the WET Checklist:
Q7,10:Qe >100:1, Acute WET only usually recommended
Q7,10 ≤ 100:1 Acute & Chronic testing recommended

Example #5: Limited Use Stream w/No Upstream Flow



Need for acute and chronic testing evaluated using the WET Checklist:
Qs = 0 cfs Acute WET usually recommended
No Chronic testing recommended unless historical toxicity problems are known