

a) Unknown background concentration data or available data is impacted by sources that have not yet achieved water quality based limits.

$$Limit_1 = (DF) * (Criteria) * (80\%)$$

Where: DF = acute or chronic dilution factor, as appropriate

b) Using available background concentration data<sup>1</sup>.

$$Limit_1 = (DF) * (Criteria) * 90\% - (Background) * (DF - 1)$$

Where: DF = acute or chronic dilution factor, as appropriate

The formulas noted above were applied with the following exceptions:

- A) Pollutants that based on the acute and chronic dilution factors have a higher allowable chronic limit than allowable acute limit. For this situation, both the "Monthly Average" and "Daily Maximum" limits were set at the allowable acute limit. For all others, the "Monthly Average" limits were set equal to the allowable chronic limit and the "Daily Maximum" limits were set equal to the allowable acute limit.
- B) Pollutants subject to Antidegradation Requirements. For this situation, the "Antidegradation criteria" were used in place of the chronic water quality criteria from the Rhode Island Water Quality Regulations.

Prior to calculating the water quality-based limitations, it was necessary to first identify the appropriate chronic and acute dilution factors.

#### Mixing Zones and Dilution Factors

The Applicant has proposed a submerged outfall with a multi-port diffuser, consisting of eight (8) ¾ inch diffuser ports, which terminates in 23 feet of water 20 feet from the shoreline and has modeled the available dilution in a report titled *Mixing Zone Analysis of a Proposed Hypersaline Reverse Osmosis Effluent Discharge to the Sakonnet River at the Sakonnet Point Club in Little Compton, RI* (Applied Science Associates, Incorporated, 2002). Based upon the results of this mixing zone analysis, it was identified that the Ebb Slack tide yields the least dilution and is the limiting tide. As a result, all dilution calculations were conducted using the Ebb Slack tide condition.

Rule 8.D(1)(f) allows the Director to recognize, where appropriate a limited acute and/or chronic mixing zone(s) on a case by case basis. The locations, size, and shape of these zones shall provide for the maximum protection of fish and wildlife. Rule 8.D(1)(g) of the Water Quality Regulations also requires that all mixing zones "meet the criteria for aesthetics"; "be limited to an area or volume that will prevent interference with the existing and designated uses in the associated water body segment and beyond"; "allow for an appropriate zone of safe passage for migrating fish and other organisms, prohibit lethality to organisms passing through the mixing zone, and protect for spawning and nursery habitat"; and "not allow substances to accumulate in sediments, fish and wildlife or food chains such that known or predicted safe exposure levels for the health of humans or fish and wildlife will be exceeded". In addition, one of the criteria for aesthetics, under Rule 8.D(1)(b)(iv) is that the discharges not result in the "dominance of species of fish and wildlife to such a degree as to create a nuisance or interfere with the existing or designated uses".

<sup>1</sup>Source of background data is the average of data from Stations 20 and 22 (see Figure #2) of the *Water Quality Survey of Narragansett Bay - A Summary of Results from the SINBADD 1985-1986*; Pilson, Michael E.Q. and Hunt, Carlton, D.; March 1989; Report #NBP-89-22.