June 26, 1998
SFR-58

# State of Texas 1998 Clean Water Act Section 303(d) List and Schedule for Development of Total Maximum Daily Loads

Water Quality

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

# State of Texas
# 1998 Clean Water Act
# Section 303(d) List and
# Schedule for Development of
# Total Maximum Daily Loads

Prepared by the
Water Quality Division

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TNRCC





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# Introduction

This document contains the Texas Natural Resource Conservation Commission's (TNRCC's) submission of its 1998 Clean Water Act Section 303(d) List of Texas water bodies that do not meet or are not expected to meet applicable water quality standards. This document fulfills the requirements of the federal Clean Water Act, Section 303(d) and 40 Code of Regulations (CFR), Section 130.7, as well as applicable EPA guidance. This submission addresses all comments received from EPA Region 6 and the public regarding draft versions of the List.

As required by 40 CFR §130.7(b)(6), this document includes:

- *Section I: State of Texas 1998 Clean Water Act Section 303(d) List and Schedule for Development of Total Maximum Daily Loads*. This section includes the state's list of impaired and threatened water bodies and its draft schedule for development of total maximum daily loads (TMDLs).
- *Section II: Methodology for Establishing Surface Water Quality Priorities for Texas River Basins*. This section describes the methodology used to develop the list and describes what was considered as "existing and readily available data and information" in developing the list.
- *Section III: Guidance for Assigning Priority for TMDL Development*. This section explains the TNRCC's methodology for determining priority ranking of water bodies on the 1998 303(d) List.
- *Section IV: Guidance for Screening and Assessing Texas Surface and Finished Water Quality Data*. This section describes the data used to compile the 1998 Clean Water Act Section 305(b) Water Quality Inventory and the 1998 303(d) List. Also described are the screening and assessment methodologies used in evaluating the data.
- *Section V: Water Bodies and Constituents Considered But Not Listed and Water Bodies Removed from the List*. This section describes the relevant water bodies and constituents considered and the reasons for not listing them. This section also identifies 1996-listed water bodies removed from the 1998 303(d) List, with the rationale for de-listing.
- *Section VI: Response to Public Comment on the State of Texas 1998 Clean Water Act Section 303(d) List*. This section summarizes the comments received on the published drafts of the 1998 303(d) List, with TNRCC's responses, including a description of actions taken, where appropriate.

The TNRCC appreciates the participation of the public in the preparation of the 1998 303(d) List; many valuable suggestions were received at public meetings and in written comments. The TNRCC hopes to improve opportunities for public participation in subsequent listing cycles.

# Section I:

# 1998 Clean Water Act Section 303(d) List and Schedule for Development of Total Maximum Daily Loads

# State of Texas 1998 Clean Water Act Section 303(d) List (06/26/98)

**Note:** The 1996 State of Texas Water Quality Inventory [Clean Water Act §305(b) Report] and the 1998 State of Texas Water Quality Inventory are the primary sources of data used to compile the 1998 List if Impaired and Threatened Water Bodies (Clean Water Act §303(d) List). Copies of the 1996 and 1998 Water Quality Inventories may be requested by contacting Louanne Jones, Water Quality Division, Texas Natural Resource Conservation Commission, MC150, P.O. Box 13087, Austin, Texas 78711-3087, call (512) 239-2310, or e-mail lojones@tnrcc.state.tx.us

**Legend for codes used in columns (3, 4, and 5):**

Overall Priority (3) : Where there are multiple parameters, the highest priority will be shown in this column.
*Impaired waters:* H = high; M = medium; L = low; U = a total maximum daily load (TMDL) analysis is underway or scheduled for development. Where TMDLs underway do not address all listed parameters, the overall priority will show the highest priority single parameter not addressed by the TMDL, but will also show a "U" to indicate that one or more constituents of concern are being addressed through a TMDL.
*Threatened waters:* T-h = threatened-high; T-m, threatened-medium.

Basin Group (4): Letter code (A - E) indicates which group of river basins the segment is associated with in the TNRCC basin planning cycle.
- Group A - Canadian River, Red River, Sulphur River, Cypress Creek, Sabine River, Sabine Pass, Neches River
- Group B - Trinity River
- Group C - San Jacinto River, Neches-Trinity Coastal, Trinity-San Jacinto Coastal, San Jacinto-Brazos Coastal, Bays and Estuaries
- Group D - Brazos River, Brazos-Colorado Coastal, Lavaca River, Colorado River, Bays and Estuaries
- Group E - Guadalupe River, San Antonio River, Rio Grande, Nueces River, San Antonio-Nueces Coastal, Colorado-Lavaca Coastal, Lavaca-Guadalupe Coastal, Nueces-Rio Grande Coastal, Bays and Estuaries, Gulf of Mexico

Source (5 and 6): A checkmark indicates whether the source of the impairment is point or nonpoint. This includes unknown and/or potential point or nonpoint sources. An asterisk indicates the source is tidal mixing of salt water.

Segment Summary (7): The priority level for each pollutant parameter is shown in parentheses, as in the overall priority column (H=High, M= Medium, etc.). Following the priority level will be the designation "NS" for water bodies that are not supporting their uses as designated in the Texas Surface Water Quality Standards, or the designation "PS" for water bodies that are partially supporting their designated uses. For water bodies listed for nonattainment or partial attainment of numeric or narrative criteria, the designation "CN" or "CP" will follow the priority ranking.

| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0103 | Canadian River Above Lake Meredith | L | A | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 0205 | Red River Below Pease River | L | A | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the area near Burkburnett (L/NS). |
| 0207 | Lower Prairie Dog Town Fork Red River | L | A | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the upstream portion of the segment (L/NS). |
| 0211 | Little Wichita River | M | A | ✓ | | Dissolved oxygen levels are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (M/NS). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0221 | Middle Fork Pease River | L | A | ✓ | | Average chloride, sulfate, and total dissolved solids levels in water exceed segment criteria to protect aquatic life, water supply, and other water quality uses (L/CN). |
| 0228 | Mackenzie Reservoir | L | A | ✓ | | The average level of total dissolved solids in water exceeds the criterion to protect aquatic life, water supply, and other water quality uses (L/CN). |
| 0229 | Upper Prairie Dog Town Fork Red River | L | A | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life in the upper part of the segment (L/NS). Average levels of sulfate exceed the criterion to protect aquatic life, water supply, and other water quality uses (L/CN). A draft waste load evaluation for dissolved oxygen has been completed. |
| 0302 | Wright Patman Lake | M | A | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life near the dam and in the upper end of the reservoir around State Highway 8 (M/NS). |
| 0303 | Sulphur/South Sulphur River | M | A | ✓ | ✓ | In the lower portion of the segment, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life (L/PS), and dissolved aluminum concentrations in water are occasionally higher than the criterion established to protect aquatic life (M/PS). In the upper portion of the segment, dissolved cadmium concentrations in water are sometimes higher than the aquatic life criterion (M/NS). |
| 0303-A | Big Creek Lake | T-m | A | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-m). |
| 0401 | Caddo Lake | M | A | ✓ | ✓ | A restricted consumption advisory for the general population, children, and women of child bearing age was issued by the Texas Department of Health in November of 1995 for Caddo Lake due to elevated levels of mercury in fish tissue (M/NS). Largemouth bass and the freshwater drum are the affected species. There are periodic exceedances of the criterion for pH established to protect aquatic life and other water quality uses (L/CN). Water temperature values occasionally exceed the criterion to protect aquatic life and other water quality uses (L/CN). High temperatures are believed to be due to natural conditions, since there are no permitted discharges to the lake. In the middle portion of the lake, dissolved zinc concentrations in water sometimes exceed the criterion established to protect aquatic life (M/NS). In the upper end of the lake, a water sample collected in 1986 indicated that dissolved mercury has occasionally exceeded the criterion established to protect aquatic life (L/PS). |
| 0402 | Big Cypress Creek Below Lake O' the Pines | M | A | ✓ | | A restricted consumption advisory for the general population, children, and women of child bearing age was issued by the Texas Department of Health in November of 1995 for Caddo Lake due to elevated levels of mercury in fish tissue (M/NS). Largemouth bass and the freshwater drum are the affected species. |

# State of Texas 1998 Clean Water Act Section 303(d) List (06/26/98)

| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0403 | Lake O' the Pines | U | A | ✓ | ✓ | Concentrations of dissolved zinc in water occasionally exceed the criterion established to protect aquatic life in approximately ½ of the reservoir extending upstream from the dam (U/PS). A TMDL project is scheduled to begin in FY 1998. |
| 0404 | Big Cypress Creek Below Lake Bob Sandlin | H/U | A | ✓ | ✓ | A restricted consumption advisory for the general population and a no consumption advisory for children younger than seven and women of childbearing age were issued by the Texas Department of Health in May 1992 for Welsh Reservoir in Titus County. The advisory was issued due to elevated levels of selenium in fish tissue. All fish species tested have shown elevated selenium levels (H/NS). A July 1996 Texas Parks and Wildlife Department survey attributed absence of mussels and clams from Big Cypress Creek to effects of discharge associated with the chicken-packing industry. Historical data from the Clean Rivers Program suggest that depressed dissolved oxygen levels are not unusual, although data processed for this listing did not reveal such problems. Low dissolved oxygen levels, possibly related to wastewater discharges, may be an intermittent but chronic problem in local waters and are of concern to regional interests (U/PS). A TMDL project is scheduled to begin in FY 1998. |
| 0406 | Black Bayou | L | A | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (L/NS). |
| 0409 | Little Cypress Bayou (Creek) | M | A | ✓ | ✓ | Concentrations of dissolved cadmium and lead in water sometimes exceed the criteria established to protect aquatic life in the lower 25 miles of the segment (M/NS). |
| 0503 | Sabine River Below Toledo Bend Reservoir | M | A | ✓ | ✓ | In the lower 25 miles of the segment, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). In the lower 25 miles of the segment, concentrations of dissolved lead in water sometimes exceed the criterion established to protect aquatic life (M/NS). |
| 0504 | Toledo Bend Reservoir | M | A | ✓ | ✓ | Due to mercury in fish tissue, the Texas Department of Health issued restricted consumption advisories in November 1995 for the general population, children, and women of child bearing age (M/NS). |
| 0505 | Sabine River Above Toledo Bend Reservoir | M | A | ✓ | ✓ | A restricted consumption advisory for the general population and a no consumption advisory for children younger than seven and women of child-bearing age were issued by the Texas Department of Health in May 1992 for Martin Creek Reservoir in Rusk County and for Brandy Branch Reservoir in Harrison County. The advisory was issued due to elevated levels of selenium in fish tissue which have been detected in all species tested (M/NS). In the lower 25 miles of the segment, concentrations of dissolved lead in water sometimes exceed the criterion established to protect aquatic life (M/NS). |
| 0507 | Lake Tawakoni | T-m | A | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-m). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0508 | Adams Bayou Tidal | L | A | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (L/NS), and bacterial levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 0513 | Big Cow Creek | M | A | ✓ | ✓ | Concentrations of dissolved aluminum in water occasionally exceed the criterion established to protect aquatic life in the lower 25 miles of the segment (M/PS). |
| 0603 | B.A. Steinhagen Reservoir | M | A | ✓ | | Due to mercury in fish tissue, the Texas Department of Health issued restricted consumption advisories in November 1995 for the general population, children, and women of child bearing age (M/NS). |
| 0606 | Neches River Above Lake Palestine | M | A | | ✓ | Zinc levels in water exceed the chronic criterion established to protect aquatic life use (M/NS). Dissolved oxygen concentrations were occasionally below the standard established to assure optimum habitat quality for aquatic life (L/PS). Dissolved oxygen levels in the segment are typically depressed during low flow periods in the summer months and are partially attributable to sluggish flow conditions. Implementation of advanced wastewater treatment at the City of Tyler's facilities has contributed to improved water quality conditions in the segment. Total dissolved solids criterion to protect aquatic life, water supply, and other water quality uses are not supported (M/CN). |
| 0610 | Sam Rayburn Reservoir | M | A | ✓ | ✓ | Due to mercury in fish tissue, the Texas Department of Health issued restricted consumption advisories in November 1995 for the general population, children, and women of child bearing age (M/NS). A project to address mercury is underway. In the upper portion of the reservoir, dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (M/NS), and bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). |
| 0701 | Taylor Bayou Above Tidal | L | C | ✓ | ✓ | Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life in the lower 25 miles of the segment (L/PS). |
| 0702-A | Alligator Bayou | L | C | ✓ | ✓ | The water body does not support the designated intermediate aquatic life use as a result of significant effects in ambient toxicity tests (L/NS). The water body does not meet the segment criterion for sulfates to protect aquatic life, water supply, and other water quality uses (L/CN). Alligator Bayou is effectively isolated from tidal influence by a hurricane barrier. Criteria for segment 0701, Taylor Bayou Above Tidal, were used as screening criteria for this water body. |
| 0704 | Hillebrandt Bayou | L | C | ✓ | ✓ | Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life (L/PS). Measured pH values exceed the segment criterion to protect aquatic life and other water quality uses (L/CN). |
| 0802 | Trinity River Below Lake Livingston | L | B | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the lower 25 miles of the segment (L/NS). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0803 | Lake Livingston | M | B | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (M/NS). Measured pH values in water are sometimes higher than the segment criterion to protect aquatic life and other water quality uses (L/CN). |
| 0804 | Trinity River Above Lake Livingston | M | B | ✓ | ✓ | Mean dissolved cadmium and lead concentrations in water exceed the criteria established to protect aquatic life from chronic exposure, through a 25-mile portion centering on State Highway 7 (M/NS). Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the upper 25 miles of the segment (L/NS). |
| 0805 | Upper Trinity River | M | B | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). The fish consumption use is not supported through the upper 19 miles, based on an aquatic life closure issued by the Texas Department of Health in 1990 due to elevated levels of chlordane in fish tissue (M/NS). |
| 0806 | West Fork Trinity River Below Lake Worth | M | B | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation through a 17-mile portion extending from 5 miles upstream to 12 miles downstream of Beach Street (L/NS). The fish consumption use is not supported through the lower 22 miles, based on an aquatic life closure issued by the Texas Department of Health in 1990 due to elevated levels of chlordane in fish tissue (M/NS). |
| 0806-A | Fosdic Lake | M | B | ✓ | | The fish consumption use is not supported through the entire reservoir, based on an aquatic life closure issued by the Texas Department of Health in 1995 due to elevated levels of chlordane, dieldrin, DDE, and PCBs in fish tissue (M/NS). Dieldrin has not been banned for use, as have the other contaminants found in fish tissue for this water body. Although the levels of dieldrin alone are not enough to result in an advisory, dieldrin levels in fish tissue contribute to the overall health risk for consumers (M/NS). This water body was listed in 1996 in the description of segment 0806. |
| 0806-B | Echo Lake | M | B | ✓ | | The fish consumption use is not supported through the entire reservoir, based on an aquatic life closure issued by the Texas Department of Health in 1995 due to elevated levels of PCBs in fish tissue (M/NS). This water body was listed in 1996 in the description of segment 0806. |
| 0810 | West Fork Trinity River Below Bridgeport Reservoir | L | B | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation through the lower 25 miles (L/NS). |
| 0812 | West Fork Trinity River Above Bridgeport Reservoir | M | B | ✓ | ✓ | Through the lower 25 miles, dissolved oxygen concentrations are sometimes lower than the standard established to ensure optimum habitat conditions for aquatic life (M/NS). In the same portion, average chloride and total dissolved solids concentrations exceed segment criteria to protect aquatic life, water supply, and other water quality uses (L/CN). |
| 0814 | Chambers Creek | L | B | ✓ | ✓ | In the portion of the segment upstream of the confluence with Cummins Creek, dissolved oxygen concentrations are occasionally lower than the standard established to ensure optimum habitat conditions for aquatic life (L/PS). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0815 | Bardwell Reservoir | T-h | B | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-h). |
| 0816 | Lake Waxahachie | T-m | B | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-m). |
| 0819 | East Fork Trinity River | L | B | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation through the lower 14 miles (L/NS). |
| 0821 | Lake Lavon | T-m | B | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-m). |
| 0822 | Elm Fork Trinity River Below Lewisville Lake | M | B | ✓ | ✓ | Through the upper 15 miles, dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life (M/PS). The average lead concentration in water exceeds the human health criterion for freshwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to lead from fish consumption has not been assessed. The mean dissolved lead concentration in water exceeds the criterion established to protect aquatic life from chronic exposure (M/NS). |
| 0824 | Elm Fork Trinity River Above Ray Roberts Lake | M | B | ✓ | | In the lower 8 miles of the segment, mean dissolved cadmium and lead concentrations exceed the criteria established to protect aquatic life from chronic exposure (M/NS). |
| 0829 | Clear Fork Trinity River Below Benbrook Lake | M | B | ✓ | | The fish consumption use is not supported through the lower mile, based on an aquatic life closure issued by the Texas Department of Health in 1990 due to elevated levels of chlordane in fish tissue (M/NS). |
| 0829-A | Lake Como | M | B | ✓ | | The fish consumption use is not supported through the entire reservoir, based on an aquatic life closure issued by the Texas Department of Health in 1995 due to elevated levels of chlordane, dieldrin, DDE, and PCBs in fish tissue (M/NS). Although the levels of dieldrin alone are not enough to result in an advisory, dieldrin levels in fish tissue contribute to the overall health risk for consumers (M/NS). This water body was listed in 1996 in the description of segment 0829. |
| 0831 | Clear Fork Trinity River Below Lake Weatherford | M | B | ✓ | ✓ | In the lower 3.3 miles of the segment, the mean dissolved lead concentration in water exceeds the criterion established to protect aquatic life from chronic exposure (M/NS). Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life in the upper 15.7 miles of the segment (L/PS). |
| 0833 | Clear Fork Trinity River Above Lake Weatherford | L | B | ✓ | | Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life (L/PS). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 0836 | Richland-Chambers Reservoir | T-m | B | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-m). |
| 0838 | Joe Pool Lake | T-h | B | ✓ | | Average sulfate and total dissolved solids concentrations exceed segment criteria to protect aquatic life, water supply, and other water quality uses throughout the reservoir (L/CN). All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-h). |
| 0841 | Lower West Fork Trinity River | M | B | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation through the lower 21 miles of the segment (L/NS). The fish consumption use is not supported through the entire segment, based on an aquatic life closure issued by the Texas Department of Health in 1990 due to elevated levels of chlordane in fish tissue (M/NS). Toxicity in ambient water and sediment occasionally exceeds the levels established to provide optimum habitat conditions for aquatic life (L/PS). |
| 0841-A | Mountain Creek Lake | M | B | ✓ | | The fish consumption use is not supported through the entire reservoir, based on an aquatic life closure issued by the Texas Department of Health in 1996 due to elevated levels of PCBs in fish tissue (M/NS). This water body was listed in 1996 in the description of segment 0841. |
| 0901 | Cedar Bayou Tidal | M | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the lower 19 miles of the segment (M/NS). |
| 0902 | Cedar Bayou Above Tidal | M | C | ✓ | ✓ | Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life (M/PS). A recent draft waste load evaluation addressed dissolved oxygen. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). The criterion for total dissolved solids to protect aquatic life, water supply, and other water quality uses is not met in the segment (L/CN). |
| 1001 | San Jacinto River Tidal | M | C | ✓ | ✓ | The average mercury concentration in water exceeded the human health criterion for saltwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 1002 | Lake Houston | M | C | ✓ | | The average mercury concentration in water exceeded the human health criterion for freshwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1005 | Houston Ship Channel/San Jacinto River Tidal | M/U | C | ✓ | ✓ | The average mercury concentration in water exceeded the human health criterion for saltwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. A restricted-consumption advisory for the general population and a no-consumption advisory for children and women of childbearing age were issued by the Texas Department of Health due to elevated levels of dioxin in blue crabs and catfish (M/NS). A TMDL for nickel [listed in the 1996 303(d) list] is in preparation for this water body. |
| 1006 | Houston Ship Channel Tidal | M/U | C | ✓ | ✓ | The average mercury concentration in water exceeded the human health criterion for saltwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. A restricted-consumption advisory for the general population and a no-consumption advisory for children and women of childbearing age were issued by the Texas Department of Health due to elevated levels of dioxin in blue crabs and catfish (M/NS). A TMDL for nickel [listed in the 1996 303(d) list] is in preparation for this water body. |
| 1006-A | Patrick Bayou | H | C | ✓ | ✓ | Dissolved copper concentrations in water sometimes exceed the chronic criterion to protect aquatic life (H/NS). Ambient water toxicity sometimes exceeds the screening levels established to provide optimum habitat conditions for aquatic life (H/CN). Water temperature values sometimes exceed the criterion to protect aquatic life and other water quality uses (M/CN). Sediment toxicity sometimes exceeds the screening levels established to provide optimum habitat for aquatic life (H/CN). This is substantiated by a degraded benthic macroinvertebrate community structure observed in the segment. In addition, some metals and organics in sediment were elevated in comparison with screening levels for estuarine sediments. These screening levels are designed to evaluate concerns related to narrative standards for the protection of water quality. A voluntary source identification survey is currently being carried out by four dischargers to Patrick Bayou. |
| 1007 | Houston Ship Channel/Buffalo Bayou Tidal | M/U | C | ✓ | ✓ | The average mercury concentration in water exceeded the human health criterion for saltwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. A restricted-consumption advisory for the general population and a no-consumption advisory for children and women of childbearing age were issued by the Texas Department of Health due to elevated levels of dioxin in blue crabs and catfish (M/NS). A TMDL for nickel [listed in the 1996 303(d) list] is in preparation for this water body. |
| 1007-A | Vince Bayou | M | C | ✓ | ✓ | Ambient sediment toxicity occasionally exceeds the levels established to provide optimum habitat conditions for aquatic life (M/CP). Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1008 | Spring Creek | M | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). In the portion upstream from the Kuykendahl Road bridge, dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (M/NS). |
| 1009 | Cypress Creek | M/ U | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Average total dissolved solids values exceeded the segment criterion to protect aquatic life, water supply, and other water quality uses (M/CN). A TMDL for dissolved oxygen is in preparation for this water body. |
| 1012 | Lake Conroe | T-m | C | ✓ | | The average mercury concentration in water exceeded the human health criterion for freshwater fish (T-m/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. However, samples of fish do not indicate that this mercury is accumulating in fish tissue. A Texas Department of Health analysis of fish tissue data concluded that there is no additional health risk from the consumption of fish. Mercury does not exceed primary or secondary drinking water standards. |
| 1013 | Buffalo Bayou Tidal | M | C | ✓ | | The average mercury concentration in water exceeded the human health criterion for saltwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Mean copper concentration in water exceeded the criterion established to protect aquatic life from chronic exposure (M/NS). |
| 1014 | Buffalo Bayou Above Tidal | L | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 1016 | Greens Bayou Above Tidal | M/ U | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Mean lead concentration in water exceeded the criterion established to protect aquatic life from chronic exposure (M/NS). A TMDL for dissolved oxygen is in preparation for this water body (U). |
| 1017 | Whiteoak Bayou Above Tidal | M | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Mean lead in water concentration exceeded the criterion established to protect aquatic life from chronic exposure (M/NS). |
| 1101 | Clear Creek Tidal | M | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). A no-consumption advisory was issued by the Texas Department of Health in 1993 for Clear Creek (L/NS). The advisory applies to an 8.3 mile portion upstream of SH 3 in Clear Creek Tidal, and warns against consumption of any fish and blue crabs taken from the affected area. Test results reveal dichloroethane, trichloroethane, carbon disulfide, and chlordane in fish and crab tissues. Management strategies are in place for industrial contaminants. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1102 | Clear Creek Above Tidal | L | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the lower 25 miles of the segment (L/NS). A no-consumption advisory was issued for the general population by the Texas Department of Health in November 1993 for Clear Creek (L/NS). The advisory applies to all of Clear Creek Above Tidal, and warns against consumption of any fish or blue crabs taken from the affected area. Test results reveal dichloroethane, trichloroethane, carbon disulfide, and chlordane in fish and crab tissues. Management strategies are in place for industrial contaminants. |
| 1103 | Dickinson Bayou Tidal | M/ U | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life, from IH-45 southeast of Dickinson downstream to one-half mile upstream of SH 6 (U/PS). A TMDL for dissolved oxygen is in preparation for this water body. |
| 1104 | Dickinson Bayou Above Tidal | L/ U | C | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). A TMDL for dissolved oxygen is in preparation in conjunction with the TMDL for Segment 1103. |
| 1108 | Chocolate Bayou Above Tidal | L | C | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 1109 | Oyster Creek Tidal | M | C | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). |
| 1110 | Oyster Creek Above Tidal | M | C | ✓ | | In the lower 25 miles of the segment, southwest of the City of Angleton in Brazoria County, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS), and dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (M/NS). |
| 1111 | Old Brazos River Channel Tidal | M | C | ✓ | ✓ | The average mercury concentration in water exceeded the human health criterion for saltwater fish (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. |
| 1113 | Armand Bayou Tidal | M/ U | C | ✓ | ✓ | Dissolved oxygen concentrations are sometimes below the standard established to assure optimum habitat conditions for aquatic life, in the upper two miles of the segment (U/NS). These low dissolved oxygen levels may be due to natural conditions associated with poor flushing capability and high sediment oxygen demand. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). A TMDL to address low dissolved oxygen levels is in preparation for this water body. |
| 1113-A | Armand Bayou Above Tidal | L/ U | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS), and dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (U/NS) in a three-mile, perennial, freshwater portion of Armand Bayou upstream of tidal. This water body (not part of segment 1113) was not evaluated in 1996. A TMDL to address low dissolved oxygen levels in Armand Bayou is under development and will include Armand Bayou Above Tidal. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1202 | Brazos River Below Navasota River | L | D | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 1213 | Little River | L | D | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation from the City of Cameron downstream to the end of the segment (L/NS). |
| 1218 | Nolan Creek/South Nolan Creek | M | D | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). |
| 1221 | Leon River Below Proctor Lake | M | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the middle and lower portion downstream of the South Leon River (M/NS). |
| 1226 | North Bosque River | L/ U | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Nitrite plus nitrate nitrogen, and ortho- and total phosphorus greater than the screening levels occur in the upper portion of the segment in the area of Highway 6 and the city of Iredale (U). Excessive nutrient levels are occurring in the lower portion near the city of Clifton. The excessive nutrient levels are entering the river from tributary watersheds and are contributing to excessive plankton growth (U). The Texas Institute for Applied Environmental Research (TIAER) has monitored agricultural nonpoint source runoff since 1991. TIAER, the Brazos River Authority, and the TNRCC are participating in intensive monitoring surveys to determine nonpoint source loading. A TMDL is in preparation for this water body. Local studies will support control programs in the near future. |
| 1233 | Hubbard Creek Reservoir | L | D | ✓ | | Average sulfate levels greater than the reservoir criterion to protect aquatic life, water supply, and other water quality uses occur in the Big Sandy Creek arm of the reservoir (L/CN). |
| 1240 | White River Lake | L | D | ✓ | | Average total dissolved solid levels exceed the segment criterion to protect aquatic life, water supply, and other water quality uses (L/CN). |
| 1242 | Brazos River Below Whitney Lake | M | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the portion of the segment from the City of Marlin to the FM 979 crossing east of Cameron (M/NS). |
| 1242-A | Marlin City Lake System | T-h | D | ✓ | | All water quality measurements currently support use as a public water supply; however, atrazine concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-h). The lake system includes Old Marlin City Lake and New Marlin Reservoir. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1245 | Upper Oyster Creek | M | D | ✓ | ✓ | Dissolved oxygen concentrations are sometimes below the standard established to assure optimum habitat conditions for aquatic life in the area from the Texas Department of Corrections Jester Unit downstream to the confluence of Stafford Run (M/NS). Dissolved oxygen levels have been historically depressed in the segment due to a complex series of diversion dams, oxygen demanding wastes, high sediment oxygen demand, low re-aeration rates, and nearly stagnant velocities. A draft waste load evaluation, based on intensive survey data, indicates that the dissolved oxygen criterion supportive of the intermediate use should be attainable at the recommended effluent limits (advanced treatment with nitrification). |
| 1254 | Aquilla Lake | H | D | ✓ | | Atrazine concentrations in finished drinking water violate the Maximum Contaminant Level for primary drinking water standards (H/NS). Origin of the contamination is source water and represents a failure of the water body to support the public water supply use. Alachlor concentrations in finished drinking water indicate contamination of source water and represent a threat to future use (T-m). |
| 1255 | Upper North Bosque River | L/ U | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the headwater of the river upstream of the City of Stephenville (L/NS). Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life (U/PS). Average chloride, sulfate, and total dissolved solids levels exceed segment criteria to protect aquatic life, water supply, and other water quality uses (L/CN). Nitrogen and phosphorus levels are elevated and contribute to excessive phytoplankton and attached algal growths (U). A TMDL is in preparation for this water body. A wasteload evaluation conducted on the segment requires advanced waste treatment for the attainment of stream standards. Local studies will support control programs in the near future. The Texas Institute for Applied Environmental Research (TIAER) has monitored agricultural nonpoint source runoff in the segment since 1991. TIAER, the Brazos River Authority, and the TNRCC are conducting intensive monitoring surveys in the Lake Waco watershed to determine nonpoint source loading. |
| 1301 | San Bernard River Tidal | M | D | ✓ | | Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life (M/PS), and bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 1304 | Caney Creek Tidal | M | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). |
| 1403 | Lake Austin | L | D | | ✓ | Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life, in the first few miles below Lake Travis (L/PS). This segment receives low-oxygen bottom water from Lake Travis during the summer months. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1411 | E.V. Spence Reservoir | U | D | ✓ | | Average levels of sulfate and total dissolved solids exceed segment criteria to protect aquatic life, water supply, and other water quality uses (U/CN). Excessive dissolved solids, especially chloride, are attributed to brine seepage from abandoned and improperly capped or cased oil wells located along the Colorado River (Segment 1412) and tributaries immediately downstream from Lake J.B. Thomas. There is a concern for the public water supply use for this segment because the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standard in finished water. Public water supply systems have experienced increased costs for demineralization due to high dissolved solids. A TMDL is scheduled for FY 1998. |
| 1414 | Pedernales River | M | D | ✓ | ✓ | Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life, downstream of the confluence with Barons Creek below Fredricksburg, during summertime low flow conditions (L/PS). A waste load evaluation has addressed dissolved oxygen. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation, in the lower part of the segment (M/NS). |
| 1421 | Concho River | L | D | ✓ | | Dissolved oxygen variations and elevated levels of chlorophyll *a* above the screening levels occur during the summer months in the City of San Angelo river impoundments. In the North Concho Fork below Lake O.C. Fisher in San Angelo, dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life (L/PS), and bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). A waste load evaluation has addressed dissolved oxygen. |
| 1427 | Onion Creek | L | D | ✓ | ✓ | The average level of total dissolved solids exceeds the segment criterion to protect aquatic life, water supply, and other water quality uses (L/CN). Very stringent effluent limits are in place. |
| 1428 | Colorado River Below Town Lake | M | D | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation below Austin (M/NS). |
| 1429 | Town Lake | M | D | ✓ | | Fish and sediments collected from Town Lake have elevated levels of chlordane (M/NS). The Texas Department of Health has issued a restricted consumption advisory for the general population. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Nonpoint source pollution demonstration projects have been implemented by the City of Austin. |
| 1430 | Barton Creek | M | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (M/NS). |
| 1602 | Lavaca River Above Tidal | L | D | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). The Texas Railroad Commission has identified oil field wastes as a problem in the segment (Summary Report: Regional Assessments of Water Quality Pursuant to the Texas Clean Rivers Act, Senate Bill 818, TNRCC 1992). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 1906 | Lower Leon Creek | M | E | ✓ | ✓ | Dissolved cadmium concentrations in water sometimes exceed the criterion established to protect aquatic life (M/NS). Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the upper 21 miles (L/NS). |
| 1910 | Salado Creek | U | E | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life in a 2-mile portion from 1 mile downstream of Rigsby Avenue to Southcross Boulevard, and in a 5-mile portion from NE Loop 410 to Pershing Road (U/NS). In the lower half of the segment, bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (U/NS). A TMDL is scheduled for FY 1998. Dissolved oxygen has been addressed by a waste load evaluation. |
| 1911 | Upper San Antonio River | L | E | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in a 12-mile portion from 1 mile upstream of South Alamo Street to 2 miles upstream of Blue Wing Road (L/NS). |
| 2002 | Mission River Above Tidal | L | E | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 2004 | Aransas River Above Tidal | L | E | ✻ | ✻ | The average level of total dissolved solids is elevated above the criterion to protect aquatic life, water supply, and other water quality uses in the lower part of the segment (L/CN). |
| 2106 | Nueces/Lower Frio River | L | E | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 2107 | Atascosa River | L | E | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat quality for aquatic life (L/NS). Field observations suggest that low dissolved oxygen concentrations are not associated with discharges, but occur as pools stagnate during intermittent flow conditions. |
| 2116 | Choke Canyon Reservoir | M | E | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation in the upper portion of the reservoir (M/NS). |
| 2117 | Frio River Above Choke Canyon Res | L | E | ✓ | | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 2201 | Arroyo Colorado Tidal | U | E | ✓ | ✓ | Dissolved oxygen concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life (U/NS). Comments received from the Texas Parks and Wildlife Department suggest that depressed dissolved oxygen impairs aquatic life in the upper 16 miles of the segment, and point out that the segment provides important habitat for many economically, ecologically, and recreationally valuable species. A TMDL is underway. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 2202 | Arroyo Colorado Above Tidal | U | E | ✓ | ✓ | The Texas Department of Health issued a restricted consumption advisory for the general population in September 1980 due to elevated levels of chlordane, toxaphene, and DDE in fish tissue (U/NS). The advisory, which applies to the entire segment, recommends that consumption be limited to one meal per month for any type of fish. Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (U/NS). A TMDL is in preparation for this water body. The Texas Department of Health issued an aquatic life closure for Donna Reservoir, an unclassified, 333-acre lake which stores water pumped from the Rio Grande, in February 1994, due to elevated levels of PCBs in fish tissue (U/NS). The closure applies to the entire reservoir and the canal system that connects it to the Rio Grande. |
| 2302 | Rio Grande Below Falcon Reservoir | L | E | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). All other uses and water quality standards are supported. |
| 2304 | Rio Grande Below Amistad Reservoir | L | E | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). |
| 2307 | Rio Grande Below Riverside Diversion | L | E | ✓ | ✓ | Average chloride, sulfate, and total dissolved solids concentrations exceed the segment criteria to protect aquatic life, water supply, and other water quality uses (L/CN). River flow in the segment is reduced due to irrigation withdrawals in the El Paso area and evaporation throughout the segment. |
| 2310 | Lower Pecos River | M | E | ✓ | | Average chloride, sulfate, and total dissolved solids levels exceed the segment criteria to protect aquatic life, water supply, and other water quality uses (M/CN). Natural contributions of salts from the soil, as well as saline groundwater seeps and springs, contribute to these elevated levels. |
| 2421 | Upper Galveston Bay | M | C | ✓ | ✓ | The fish consumption use was not supported in the 22 square miles ($mi^2$) from Red Bluff Point to Five Mile Cut Marker to Houston Point, north to Morgan's Point. A restricted-consumption advisory for the general population and a no-consumption advisory for children and women of childbearing age were issued by the Texas Department of Health due to elevated levels of dioxin in blue crabs and catfish (M/NS). Based on Texas Department of Health shellfish maps, 55% of the bay (59.5 $mi^2$ of the outer perimeter) does not support and 19% of the bay (20.6 $mi^2$ of the area adjacent to the nonsupporting area) partially supports the oyster water use (L/NS/PS). The remaining 26% (40.6 $mi^2$) fully supports the oyster water use. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential water quality concerns. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 2422 | Trinity Bay | M | C | ✓ | | The average mercury concentration in water exceeded the human health criterion for saltwater fish in eight square miles north of Exxon C-1 platform (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. Based on Texas Department of Health shellfish maps, 69.3% of the bay (90.2 $mi^2$ of the outer perimeter) does not support and 13.8% of the bay (17.9 $mi^2$ of the area adjacent to the nonsupporting area) partially supports the oyster water use (L/NS/PS). The remaining 16.9% (22 $mi^2$) fully supports the oyster water use. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential water quality concerns. |
| 2423 | East Bay | M | C | ✓ | | The average mercury concentration in water exceeded the human health criterion for saltwater fish in eight square miles between Marsh and Elm Grove Points (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. Based on Texas Department of Health shellfish maps, 22.1% of the bay (11.5 $mi^2$ at the east end of the bay near East Bay Bayou and Intracoastal Waterway) does not support (L/NS) and 77.9% of the bay (the remaining 40.6 $mi^2$) fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2424 | West Bay | M | C | ✓ | | The average mercury concentration in water exceeded the human health criterion for saltwater fish in eight square miles near Carancahua Reef (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish. Risk of exposure to mercury from fish consumption has not been assessed. Due to elevated mercury (chronic) and copper (chronic) in water, the high aquatic life use was not supported in eight square miles of the bay near Carancahua Reef (M/NS). Based on Texas Department of Health shellfish maps, 35.2% of the bay (24.4 $mi^2$ at the east end near the Galveston and Texas City) does not support (L/NS) and 64.8% of the bay (the remaining 44.9 $mi^2$) fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2425 | Clear Lake | L | C | ✓ | | Tri-butyl tin concentrations in water are occasionally higher than the EPA screening level (1.0 $\mu$g/L) and the standard for protection of aquatic life (L/PS). The Federal Organotin Antifouling Paint Control Act of 1988 imposed restrictions on the formulation and use of tri-butyl tin paint, and took full effect in 1990. Due to the relatively short half-life of tri-butyl tin in seawater, ambient concentrations near marinas and boat repair operations are expected to decline over time, and studies have already documented such declines in the Gulf of Mexico and Chesapeake Bay. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 2426 | Tabbs Bay | M | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). The fish consumption use is not supported through the entire segment, based on a fish consumption advisory issued by the Texas Department of Health in 1990 due to elevated levels of dioxin in fish and crab tissue (M/NS). |
| 2427 | San Jacinto Bay | M | C | | ✓ | The fish consumption use is not supported through the entire segment, based on a fish consumption advisory issued by the Texas Department of Health in 1990 due to elevated levels of dioxin in fish and crab tissue (M/NS). |
| 2428 | Black Duck Bay | M | C | | ✓ | The fish consumption use is not supported through the entire segment, based on a fish consumption advisory issued by the Texas Department of Health in 1990 due to elevated levels of dioxin in fish and crab tissue (M/NS). |
| 2429 | Scott Bay | M | C | ✓ | ✓ | Bacteria levels sometimes exceed the criterion established to assure the safety of contact recreation (L/NS). Municipal wastewater discharges are a probable contributor to this condition. The fish consumption use is not supported through the entire segment, based on a fish consumption advisory issued by the Texas Department of Health in 1990 due to elevated levels of dioxin in fish and crab tissue (M/NS). |
| 2430 | Burnett Bay | M | C | | ✓ | The fish consumption use is not supported through the entire segment, based on a fish consumption advisory issued by the Texas Department of Health in 1990 due to elevated levels of dioxin in fish and crab tissue (M/NS). |
| 2432 | Chocolate Bay | L | C | ✓ | ✓ | Based on Texas Department of Health shellfish maps, the entire bay does not support the oyster water use (L/NS). Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2436 | Barbours Cut | M | C | | ✓ | The fish consumption use is not supported through the entire segment, based on a fish consumption advisory issued by the Texas Department of Health in 1990 due to elevated levels of dioxin in fish and crab tissue (M/NS). |
| 2437 | Texas City Ship Channel | L | C | | ✓ | Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life (L/PS). |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 2439 | Lower Galveston Bay | M | C | ✓ | ✓ | The average mercury concentration exceeded the human health criterion for saltwater fish in 16 square miles near Redfish Island and the Galveston Channel-FLR 2 (M/NS). This criterion was established to protect consumers from bioaccumulation of toxicants in fish tissue. Risk of exposure to mercury from fish consumption has not been assessed. The mean dissolved copper concentration in water exceeds the criterion established to protect aquatic life from chronic exposure (M/NS). Based on Texas Department of Health shellfish maps, 43.5% of the bay (60.7 $mi^2$ of the outer perimeter, Galveston and Texas City) does not support and 9.9% of the bay (13.8 $mi^2$ of the area adjacent to the nonsupporting area) partially supports the oyster water use (L/NS/PS). The remaining 46.6% (65 $mi^2$) fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. |
| 2441 | East Matagorda Bay | L | D | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 2.6%of the bay (1.5 $mi^2$ near the Caney Creek confluence with the bay, Intracoastal Waterway, marsh and fishing cabins) does not support and 2.9% of the bay (1.7 $mi^2$ near the Live Oak Bayou confluence) partially supports the oyster water use (L/NS/PS). The remaining 94.5% (55.8 $mi^2$) fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. |
| 2442 | Cedar Lakes | L | D | ✓ | | Based on Texas Department of Health shellfish maps, the entire area does not support the oyster water use (L/NS). Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2451 | Matagorda Bay/Powderhorn Lake | L | E | ✓ | | Based on Texas Department of Health shellfish maps, 8.3% of the bay (21.7 $mi^2$ at the west end) does not support and 1.7% of the bay (4.4 $mi^2$ of Powderhorn Lake) partially supports the oyster water use (L/NS/PS). The remaining 90% (235.5 $mi^2$) fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. |
| 2452 | Tres Palacios Bay | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 49% of the bay (7.2 $mi^2$ of the upper half) does not support and 51% of the bay (7.5 $mi^2$ of the lower half) partially supports the oyster water use (L/NS/PS). Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. Probable cause for nonsupport is Tres Palacios Creek. |

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| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 2453 | Lavaca Bay/Chocolate Bay | M | E | ✓ | ✓ | The Texas Department of Health has issued an aquatic life closure for 2.5 square miles of the segment due to elevated mercury levels in finfish and crab tissue. Mercury contamination is residual from historical sources (M/NS). Based on Texas Department of Health shellfish maps, 34.1% of the bay (18.7 $mi^2$ the north-northwest end of the bay near the Lavaca River confluence and the area around Port Lavaca, including Chocolate Bay) does not support and 37.7% of the bay (20.7 $mi^2$ of the area adjacent to the nonsupporting area on the west side of the bay) partially supports the oyster water use (L/NS/PS). The remaining 28.2% (15.4 $mi^2$) fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. |
| 2454 | Cox Bay | M | E | ✓ | ✓ | The Texas Department of Health has issued an aquatic life closure for 1.7 square miles of the segment due to elevated mercury levels in fish and crab tissue (M/NS). Based on Texas Department of Health shellfish maps, 16.2% of the bay (0.5 $mi^2$ at the north end of the bay and Cox Creek) does not support the oyster water use (L/NS). The remaining 83.8% (2.4 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2456 | Carancahua Bay | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 48.4% of the bay (9.2 $mi^2$ at the north end of the bay and Carancahua Creek) does not support the oyster water use (L/NS). The remaining 51.6% (9.8 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2462 | San Antonio Bay/Hynes Bay/Guadalupe Bay | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 8.5% of the bay (10.2 $mi^2$ at the north end of the bay near the San Antonio and Guadalupe River confluences and the area adjacent to Seadrift) does not support and 50.9% (60.8 $mi^2$ of the area south of the nonsupporting area, including Hynes Bay up to the Intracoastal Waterway) of the bay partially supports the oyster water use (L/NS/PS). The remaining 40.6% (48.5 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. Partially supporting areas are conditionally approved for the growing and harvesting of shellfish. |
| 2471 | Aransas Bay | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 7.8% of the bay (6.8 $mi^2$ along the northern edge of the bay and Rockport) does not support the oyster water use (L/NS). The remaining 92.2% (81.0 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |

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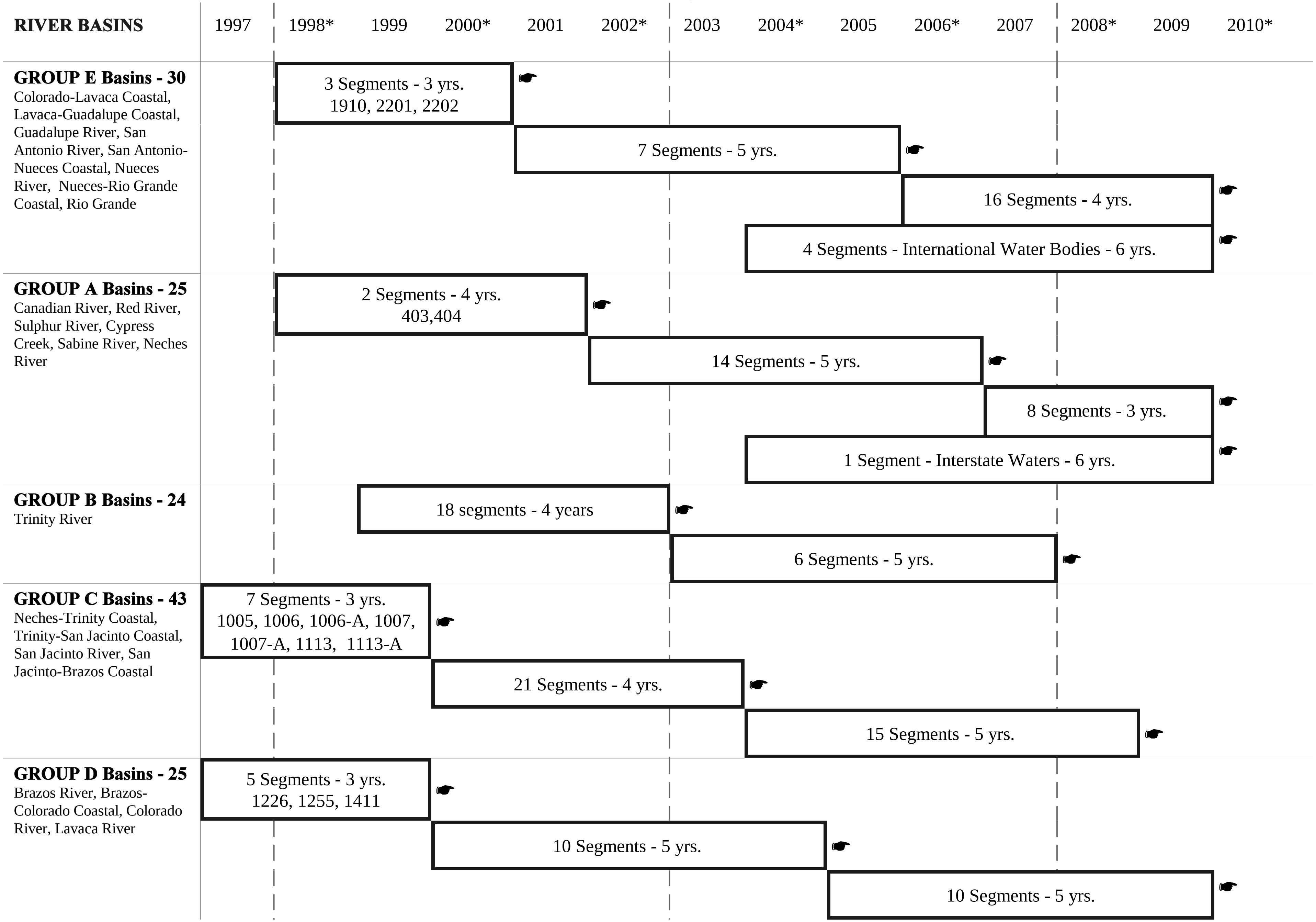
| Segment Number | Segment Name | Overall Priority | Basin Group | Nonpoint Source | Point Source | Segment Summary |
|---|---|---|---|---|---|---|
| 2472 | Copano Bay | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 20.6% of the bay (13.4 $mi^2$ near the Intracoastal Waterway, shoreline and Aransas/Mission Rivers) does not support the oyster water use (L/NS). The remaining 79.4% (51.8 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2473 | St. Charles Bay | L | E | ✓ | | Based on Texas Department of Health shellfish maps, 51.5% of the bay (6.7 $mi^2$ of the northern half, tributary and marsh drain) does not support the oyster water use (L/NS). The remaining 48.5% (6.4 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2481 | Corpus Christi Bay | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 13.0% of the bay (16.0 $mi^2$ near Corpus Christi) does not support the oyster water use (L/NS). The remaining 87.0% (107.1 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to potential microbial contamination. |
| 2482 | Nueces Bay | M | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 100% of the bay (28.9 $mi^2$) does not support the oyster water use (M/NS). Nonsupporting areas are restricted or prohibited for the growing and harvesting of shellfish for direct marketing due to zinc in oyster tissue. |
| 2484 | Corpus Christi Inner Harbor | L | E | ✓ | ✓ | Dissolved oxygen concentrations are occasionally below the standard established to assure optimum habitat conditions for aquatic life in the Avery and Viola Turning Basins (L/PS). |
| 2485 | Oso Bay | L | E | ✓ | ✓ | Dissolved oxygen concentrations are occasionally lower than the standard established to assure optimum habitat conditions for aquatic life in the lower portion of the bay (L/PS). Based on Texas Department of Health shellfish maps, 100% of the bay (7.2 $mi^2$) does not support the oyster water use (L/NS). Nonsupporting areas are restricted for the growing and harvesting of shellfish for direct marketing, or prohibited due to potential microbial contamination. Studies and analyses are underway or pending. |
| 2491 | Laguna Madre | L | E | ✓ | ✓ | Based on Texas Department of Health shellfish maps, 5.2% of the bay (18.1 $mi^2$ near the Arroyo Colorado) does not support the oyster water use (L/NS), and 38.8% (134.8 $mi^2$) of the bay fully supports the oyster water use. The remaining 56% (194.6 $mi^2$) of Laguna Madre, from Port Mansfield to Corpus Christi, has not been assessed. Nonsupporting areas are restricted for the growing and harvesting of shellfish for direct marketing, or prohibited due to potential microbial contamination. |
| 2501 | Gulf of Mexico | L | E | ✓ | | The fish consumption use is partially supported in the entire segment (3,879 $mi^2$) (L/PS). A restricted-consumption advisory for the general population was issued by the Texas Department of Health in June 1997 due to elevated levels of mercury in king mackerel. |

# DRAFT TNRCC Statewide Schedule for TMDL Candidates

*June 15, 1998*




* Start of Biennium ☛Implementation begins

# Section II:

# Methodology for Establishing Surface Water Quality Priorities for Texas River Basins

# Methodology for Establishing Surface Water Quality Priorities for Texas River Basins

June 26, 1998

The Texas Natural Resource Conservation Commission (TNRCC) has established the following methodology for identifying water bodies that may require a total maximum daily load (TMDL) allocation to address the cause and source of a water quality impairment. This methodology meets the requirements of the Clean Water Act (CWA) under §303(d)(1)(A) and 40 Code of Federal Regulations (CFR) §130.7, as well as the "EPA Region 6 303(d) Listing Regional Guidance" (draft, 2/17/98). The development of the 1998 CWA 303(d) List and this methodology began in October 1997 and culminated with a final list submitted to the U.S. Environmental Protection Agency (EPA) Region 6 in April 1998. The following methodology summarizes how the 1998 List evolved and includes the following sections:

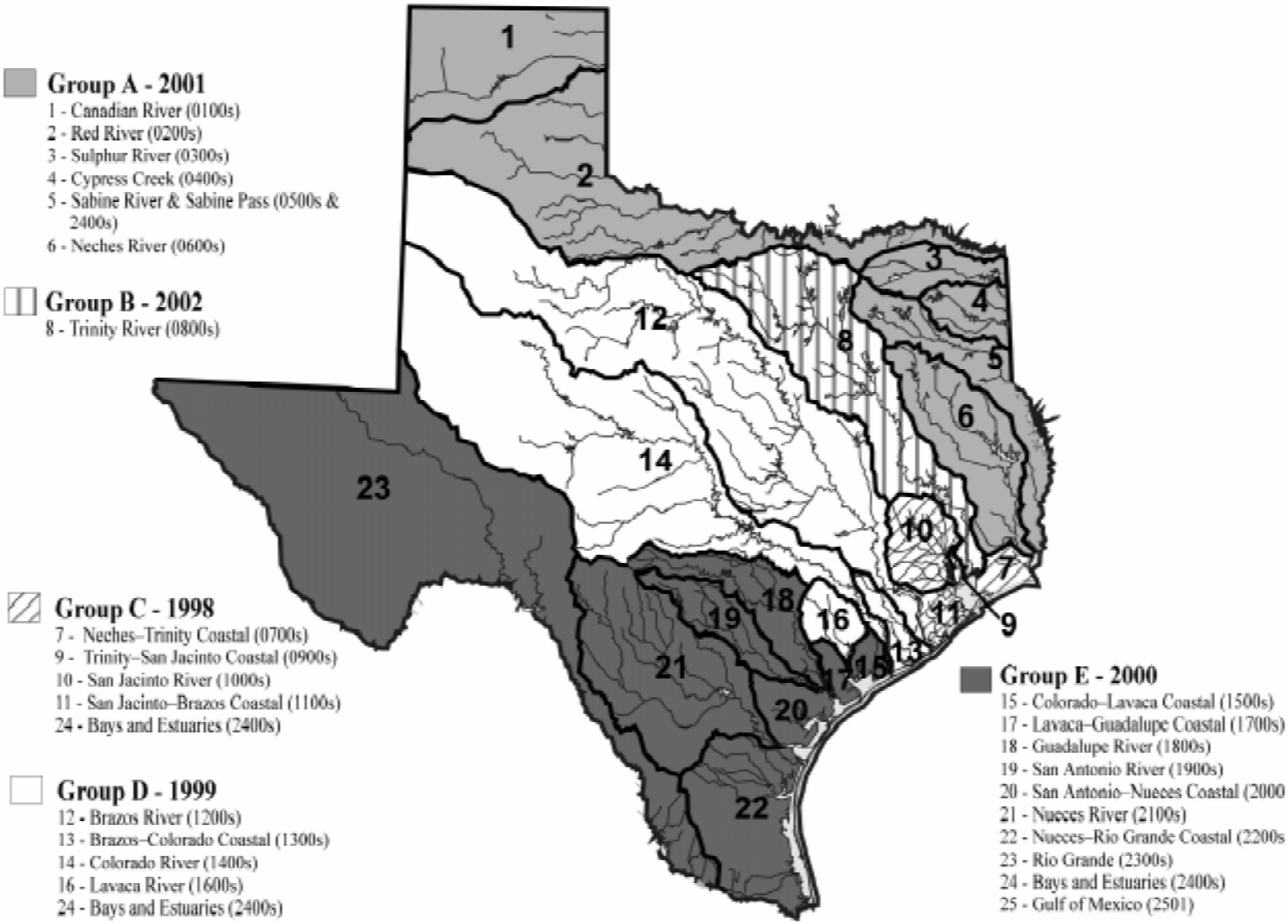
- Coordination with the Watershed Management Cycle
- The Listing Process
- Targeting of Listed Water Bodies
- Appendices

## Coordination with the Watershed Management Cycle

The TNRCC made a strategic change from the 1996 listing process by choosing to concentrate the majority of its water quality assessment activities [CWA Section 305(b)] for the 1998 §303(d) List in a specific geographic area of the state. This focus of resources will, over time, result in a more intensive and comprehensive assessment of water quality for all regions of the state. Therefore, beginning with the 1998 List, the TNRCC will perform water quality assessments annually within one of the five basin groups established by the TNRCC for permitting and watershed management purposes, following a rotating five-year cycle (see Figure 1, TNRCC Watershed Management Planning Areas). Annual updates to the 303(d) list will follow these assessments and coincide with the strategy development phase of the watershed management cycle for each respective basin group (see Appendix 1, The Statewide Watershed Management Schedule). Thus, the TNRCC and basin stakeholders will be allowed at least four years to address issues identified by a 303(d) listing before the priorities are changed or adjusted in the next listing cycle for a basin group. This time period is the minimum needed for addressing the complexity of TMDL analyses, and for tracking the status and trends of surface water quality throughout each river basin.

The TNRCC permit-by-basin groups were defined programmatically to equalize permit counts (i.e., for each of the five groups to comprise roughly one-fifth of the state's permits). As a result, there are some hydrologically-defined river basins that are divided into two different (but adjacent) permit basin groups. However, the 303(d) data review and listing process uses the hydrologically-defined basins so that data analyses and TMDL development can be conducted on hydrologically-linked watersheds. This discrepancy between the programmatically- and hydrologically-defined basin groups results in some minor inconsistencies between permit-by-basin groups and

Figure 1. TNRCC Watershed Management Planning Areas



303(d)/TMDL planning groups, but will not adversely affect or limit analyses or permitting programs.

The 1998 303(d) cycle focused on two basin groups (rather than one as the management cycle would suggest) because 1998 marks the transition from the previous approach of revising the entire state list every two years. Since the last listing cycle in 1996, two basin groups, B and C, have advanced to or beyond the list revision point in their respective cycles, so both basin groups are addressed this year to bring the various program cycles into synchronization. The same situation will occur in Groups D and E in FY 1999; consequently, both groups will be assessed for the FY 1999 update in order to bring all basins into synchronization with the watershed management cycle.

Groups B and C consist of the Trinity River basin, the San Jacinto River basin, the Neches–Trinity Coastal basin, the Trinity–San Jacinto Coastal basin, the San Jacinto–Brazos Coastal basin, and the estuaries associated with those basins (See Figure 2, Planning Basin Groups B and C). The Houston and Dallas–Fort Worth metropolitan areas, with a major portion of the state population, are located within these basins. Most of the coastal heavy industry areas of southeast Texas are also contained within the river basins assessed for the 1998 List.

## The Listing Process

The listing process involved the selection of data and information used to develop the state's 1998 §303(d) List, the development of criteria and guidance for listing and prioritization, the assessment of water bodies, the preparation of various drafts of the list, and the solicitation of public input.

### *Data and Information Used*

As required by CWA §303(d) and CFR §130.7(B)(5), the TNRCC considered "all existing and readily available water quality-related data and information" during the development of the 1998 List. Compared to the 1996 listing process, the TNRCC embarked on a much more extensive search for data and information, relying on both the established public outreach mechanisms of the Texas Clean Rivers Program (CRP) and on the posting of various draft 303(d) lists on the Internet. All data and information received were considered for additional monitoring efforts to identify impaired water bodies. However, the TNRCC and EPA recognize that there are some boundaries that must be established in the use of data and information necessary for listing impaired water bodies. These boundaries are:

< Time limitations. Data collected prior to the most recent five years of data do not reflect actual conditions and as a result were not considered.

< Geographic focus. In an effort to focus limited available resources more intensively, the TNRCC focused this assessment on part of the state (in the case of the 1998 List, Groups B and C). By targeting assessment activities, the TNRCC and the CRP partners will, over time, be able to perform a better evaluation of waters in the state. This kind of intensive assessment requires more than the obvious resources related to data analysis; it also requires resources related to the solicitation of and response to public

input. The trade-off between a less intensive statewide assessment every two years and a more intensive assessment on part of the state every year was evaluated, and the geographic focus was adopted as part of the statewide watershed management cycle.

- Data quality objectives. In order to increase the data available to the TNRCC for water quality management, the Clean Rivers Program has worked closely over the last three years with local and regional agencies and other interest groups to develop and implement data collection efforts under an established quality assured/quality control program. Although not initiated solely for the 303(d) listing process, the CRP has increased the monitoring resources in Texas and will increase the amount of available water quality data for identifying impaired water bodies. During the development of this program, data quality issues were raised that are relevant to the 303(d) listing process. Chief among these issues was the potential unreliability of data collected without strong quality assurance/quality control measures. Given the technical complexities associated with determining whether a water body is actually impaired, assessment of data based on consistent and scientifically rigorous water quality sampling methods ensures a level playing field for all stakeholders. Furthermore, given the regulatory implications associated with the use of water quality data, greater emphasis should be placed on requiring the highest quality data feasible. For this reason, the TNRCC requires that data used for the initial step in the listing process (data screening and assessment) must have been collected under a TNRCC-approved Quality Assurance Project Plan.

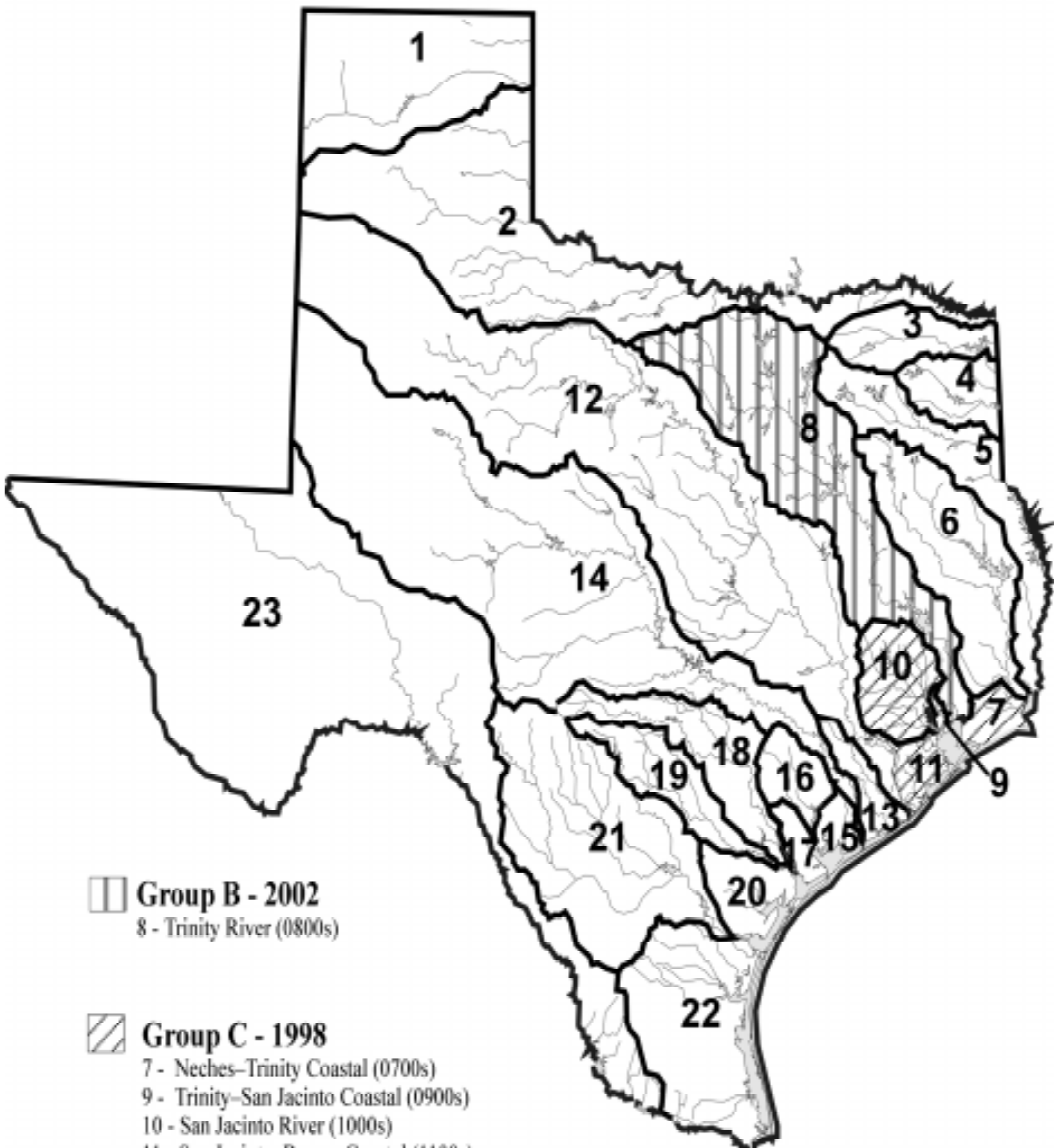
### Readily Available Data

Data resident in the TNRCC integrated database (surface water quality monitoring module) were used to compile the 1998 List. Other data that could be readily obtained electronically from other sources were also considered. The data resident in the TNRCC surface water quality monitoring integrated database consist of water quality data collected by the TNRCC, the U.S. Geological Survey, the International Boundary Water Commission, and various planning agencies under contract through the Texas Clean Rivers Program. Data must also be available in a form that does not require extensive data manipulation to be useable for decision making. To provide additional consistency and scientific dependability to the 303(d) listing process, emphasis was placed on the need for data to meet minimum quality assurance/quality control procedures established by the TNRCC. Descriptions of the types of data and information used for the listing procedure, and the use made of that data and information, are provided in Appendix 2, Water Quality Data and Information.

Other important sources of data and information were:

- Texas Department of Health (TDH) for fish consumption advisories, aquatic life and shellfish waters closures, and fecal coliform data for oyster waters.
- TNRCC's Water Utilities Division Chemical Monitoring System database on finished drinking water quality for constituents related to surface water quality. Drinking water system samples are collected under quality assurance project plans in compliance with regulations passed in support of the federal Safe Drinking Water Act.

Figure 2. Planning Basin Groups B and C



## Other Data and Information

The commission chose to rely on the formal public comment periods (see Public Participation) to solicit additional data and information to support the listing process. This approach makes the most efficient use of the state's limited resources. Other data and information were used to support results of the initial screening analysis to verify partial or nonsupport of a designated use and to determine the priority ranking of water bodies. Data and information identifying water quality concerns which are not part of the TNRCC integrated database will also be used to direct future water quality monitoring. The value and accuracy of these data used must be confirmed by TNRCC water quality staff on a case-by-case basis. As the state's watershed management cycle matures and becomes institutionalized, the listing process will become more comprehensive as other state, regional, or local entities learn about the schedule and submit additional quality-assured data in a timely manner.

## Consideration of Additional Lists

As mentioned above, the 303(d) listing process is based on, and begins with, the same guidance and data screening developed for the 305(b) Water Quality Inventory. In essence, the 305(b) report is the first step in the 303(d) listing process, so the two documents or assessments are consistent at the most basic level. Subsequent steps in the 303(d) process may result in minor differences that can be explained by the differing purposes and perspectives of the two documents. The 305(b) inventory, in many cases, may mention water quality concerns that are worthy of note and technical investigation but do not constitute use impairments. Other concerns arise due to the lack of adopted water quality standards for certain constituents (for example, nutrients, sediments) needed to gauge an impairment, to data sets that are too small to support impairment determinations, or to subjective information and speculation that can not reliably support impairment determinations.

The 303(d) list, on the other hand, is meant to identify known and reasonably verifiable impairments or threats. This determination requires a higher level of quality assurance for data, information, or analyses used to identify such conditions. Consequently, the 305(b) inventory and 303(d) list are consistent with each other but are not necessarily identical. This consistent-but-not-identical concept has been discussed with EPA staff, who verbally agreed that it is consistent with their understanding of CWA §303(d)(1)(A) and 40 CFR §130.7 requirements.

In addition to linking the 305(b) Water Quality Inventory and the 303(d) listing process with the statewide watershed management schedule, the TNRCC has also adjusted its procedures for updating the CWA §319 Assessment Report. The §319 assessment is derived from the 305(b) Water Quality Inventory and the 303(d) list. Within the 1998 update (and subsequent updates) of the 305(b) Water Quality Inventory for basin Groups B and C, the TNRCC will identify those water bodies where nonpoint source pollutants are judged to contribute to the impairment of designated uses. This information will also be incorporated in the final 303(d) list. The CWA §319 Assessment Report will be updated on an annual basis, subsequent to preparation of the 303(d) list, and will focus on the same portion of the state as the 303(d) list each year. The consistency between the 305(b) Water Quality Inventory, the 319 Assessment Report, and the 303(d) List will allow the state to focus on a common set of water quality priorities.

For the 1998 303(d) List, the TNRCC did not give specific consideration to the CWA 314 list. The TNRCC considers the assessment of reservoirs using numeric criteria for evaluating specific designated uses, and narrative criteria for identifying nutrient concerns, a more thorough and defensible method for determining impairments than the traditional methods used in preparing the 314 list, which relies on a statewide comparison of the trophic levels in reservoirs.

The 304(l) lists (which identified waters impaired by toxic substances, sources of those substances, and control measures) have become elements of the TNRCC 305(b) and 303(d) listing and wastewater permitting procedures, and thus they no longer have separate identities. The substances and screening levels that would be addressed by 304(l) lists are included in the 305(b) data screening and assessment. Any waters impaired by toxic substances are identified in the 305(b) report and the 303(d) list. In addition, the TNRCC wastewater permitting process now includes steps for identifying which discharges may be sources of toxic substances, via chemical concentrations and biomonitoring tests, and methods for establishing control measures when needed. The permitting procedures will support and become part of any TMDLs that address relevant parameters.

### Consideration of Antidegradation Policy

The antidegradation policy in the Texas Surface Water Quality Standards (30 TAC §307.5) is considered in the development of the 303(d) list, development of TMDLs, and implementation of pollutant controls on listed water bodies. Tier 1 of the antidegradation policy contains provisions to protect existing uses for all water bodies, and Tier 2 contains additional provisions to protect high quality waters from degradation. The policy applies to regulatory actions that potentially allow an increase in pollutant loading to waters in the state, and such actions include the development and implementation of TMDLs. In the 303(d) list, water bodies listed as "impaired" are targeted for TMDLs so that appropriate water-quality-related uses can be restored and then maintained in accordance with Tier I of the antidegradation policy. Water bodies listed as "threatened" are targeted so that existing uses can be maintained (Tier 1) and so that applicable high quality waters are protected from degradation (Tier 2). For this revision of the 303(d) list, TNRCC has added "threatened" as an explicit reason for listing water bodies. For future revisions, additional trend analyses to identify threatened water bodies will be conducted as data availability improves.

## *Preparation of the First Draft*

The 1998 303(d) List began with revision of the 1996 303(d) List. The following steps were taken by the TNRCC to prepare the first draft of the 1998 303(d) List:

- update the 1996 List by assessing water bodies in basin Groups B and C for all designated uses and numeric and narrative criteria;
- update the 1996 List for all state water bodies by assessing fish and shellfish advisories and oyster waters criteria;
- determine if any water bodies on the 1996 List could be removed based on changes to the guidance protocols developed in cooperation with EPA;

< review additional data and information;
< assess threatened water bodies;
< consider additional lists of water bodies;
< consider the antidegradation policy;
< assign initial priority ranking to listed water bodies; and
< solicit public comment.

### Removal of Water Bodies from the 1996 List

All water bodies included on the 1996 List were reviewed to determine if removal from the list (de-listing) was appropriate. Recent changes in the screening procedures and assessment for listing water bodies were the basis for de-listing several water bodies. These new procedures were developed jointly by the TNRCC, the CRP, and the EPA and are described in the "Guidance for Screening and Assessing Texas Surface and Finished Water Quality Data" (4/21/98). Specifically, the EPA agreed that:

< it is not appropriate to list waters for partial support of the contact recreation use when fewer than 25% of the screened samples exceeded relevant criteria, and
< at least nine samples or measurements are needed to support listing decisions for conventional pollutants, and at least five samples are required for toxic substances and ambient toxicity tests.

In addition, Texas Department of Health information was reviewed to determine if any listed water bodies were affected by changes in consumption advisories or aquatic life closures.

Twenty-seven (27) water bodies were de-listed due to changes in the screening and assessment methodology to determine nonsupport of contact recreation use and because fish consumption advisories were rescinded by the TDH. Ten (10) other waters were de-listed due to insufficient samples or because further assessment indicated that the original designation of impairment was erroneous (see Section V, Water Bodies Removed from the List).

### Assessment of Water Bodies in Basin Groups B and C

The TNRCC Water Quality Division assessed water bodies in Groups B and C for attainment of all designated uses and numeric and narrative criteria. Conventional and toxic pollutants data were screened against numeric surface water quality standards.

These assessments identified impaired water bodies and were compiled in the initial 303(d) list. TNRCC staff also assessed water quality described by narrative criteria for which associated numeric data exist. In particular, ambient water and sediment toxicity data that help determine support of the narrative criterion that surface waters shall not be toxic to aquatic life were examined. Important water quality data exist for which water quality standards have not been developed, for example, for nutrients in water (associated with narrative criterion concerning aquatic plant growth) and toxicants in sediment and fish tissue. Assessment of available data resulted in a list of water bodies where elevated levels of these constituents may be cause for concern. Water bodies with these water quality concerns were compiled in a separate list labeled

Addendum 2. Water bodies listed on Addendum 2 required additional data or information related to an actual impairment to support listing on the 303(d) list.

Water bodies on the 303(d) list and the addenda were identified by a designated segment number and name. In cases where the water body listed is a tributary of a classified segment, the identifying number used in the list is the designated segment number with an alphabetic extension (for example, 0806-B, 1242-A). Each letter extension is used only once under a single parent segment number. This practice allows the list to show more precisely that some impairments have been identified only in the tributary waters. However, since only Groups B and C were assessed for this listing, there are still some impaired tributary waters described within the segment summary for the parent segment (such as Donna Reservoir, which is identified in the listing for Segment 2202, Arroyo Colorado above Tidal). Ultimately, as discussed later in this document, the TNRCC intends to delineate and identify subwatersheds of segments to enhance watershed management activities. Additional tributaries may be identified and listed in subsequent updates to the list as each basin group is addressed in sequence.

The data screening was consistent with the guidance and procedures used for compiling the 1998 §305(b) Water Quality Inventory (see "Guidance for Screening Assessing Texas Surface and Finished Water Quality Data"). Data used to support the preparation of the 1998 §303(d) List can be obtained through a request to the TNRCC Surface Water Quality Monitoring Team (attention: Louanne Jones, by mail at TNRCC, MC150, P.O. Box 13087, Austin, Texas 78711-3087; by phone at 512-239-2310, or by e-mail to *lojones@tnrcc.state.tx.us*).

### Assessment of All Water Bodies for Selected Designated Uses and Parameters

The TNRCC assessed all state water bodies for fish consumption advisories, and aquatic life and shellfish closures. These uses and criteria were selected because they signal a potential risk to human health and therefore were analyzed for the entire state. These assessments identified impaired water bodies and were compiled in the initial draft of the 303(d) list.

The annual update issued by TDH for aquatic life closures, fish consumption advisories, and shellfish harvesting restrictions was used in this assessment (see *Fish Advisories and Bans,* TDH 1997). Review of TDH data was consistent with the guidance and procedures used for compiling the 1998 §305(b) Water Quality Inventory (see "Guidance for Screening and Assessing Texas Surface and Finished Water Quality Data"). Data or information used for this assessment can be obtained by mail from Mike Ordner, Texas Department of Health, Seafood Safety Division, 1100 West 49th Street, Austin, Texas 78756; by phone at 512-719-0215; or fax 512-719-0220.

### Review of Additional Data and Information

An additional assessment considered data for all basin groups that was collected by the Water Utilities Division of TNRCC. This assessment was done to determine if surface drinking water sources were impaired or threatened based on samples from finished (treated) water supplies. Screening criteria for this analysis were based on:

- Primary Drinking Water Standards. Only data on organic chemicals is used at this time for two reasons: the data on inorganic chemicals in finished drinking water are not readily available for analysis, and exceedances of inorganic chemicals tend to be associated with groundwater sources, rather than surface waters.

< Secondary Drinking Water Standards for treated water [chlorides, sulfates and total dissolved solids (TDS)].

Exceedances of organic constituents were considered for either impaired [violation of the maximum contaminant level (MCL)] or threatened status (exceedances of 50% of the MCL). TDS, chloride, and sulfate exceedances were used to identify water quality concerns. Water bodies associated with public water supply systems that have increased demineralization were also identified. All of these water bodies were compiled on a list labeled Addendum 1. Water bodies listed on Addendum 1 required additional data or information related to an actual impairment to support listing on the 303(d) list.

### Assessment of Threatened Water Bodies

As outlined in 40 CFR Section 130.2(j) and in EPA guidance, states are required to identify water-quality limited segments "where it is known that water quality . . . is *not expected to meet* applicable water quality standards." Such water bodies, that are supporting their designated uses and have no exceedances of criteria, are considered "threatened." The TNRCC defined threatened water bodies as those water bodies where specific pollutants have been identified which may cause nonsupport of uses and/or criteria within the next four years.

After completing the initial screening analyses of the Water Quality and Water Utilities Divisions' data bases, the TNRCC outlined one method for listing a water body as threatened. This method relies on data from treated drinking water for pollutants whose only source is surface water. Data (organics only) were screened against 50% of the MCL for primary drinking water standards. Water bodies with exceedances of 50% of the MCLs were listed in Addendum 1. These water bodies required additional data or information to support listing on the 303(d) list.

### Priority Ranking of Listed Water Bodies

The first draft list was reviewed by an interagency panel consisting of technical staff representing the TNRCC (both Austin and regional offices), the Texas Water Development Board (TWDB), the Texas State Soil and Water Conservation Board (TSSWCB), and the Texas Parks and Wildlife Department (TPWD). Water bodies were prioritized for TMDL development using the criteria and logic identified in Section III, Guidance for Assigning Priority for TMDL Development (4/21/98).

Exceedances of water quality standards and criteria were considered. Additional conditions were appraised, including the level of public concern as judged, in part, by the interest of local groups in addressing the issue. The panel assigned initial priority rankings for each pollutant or stressor in that water body, following specific discussion of the listed parameters in each water body. An overall priority for each water body was also assigned, based on the highest priority assigned to any specific stressor or pollutant listed for that water body.

### Public Participation

Those waters, or portions of waters, identified as not supporting a designated use, or as not meeting numeric water quality standards, were placed on the first draft 303(d) list. This draft 303(d) list (1/23/98) and the two addenda were posted on the TNRCC Internet site in mid-January and presented at a January 23, 1998, CRP meeting. This meeting was attended by representatives of numerous local, state, and federal agencies (including EPA Region 6 TMDL staff), and other organizations and interest groups. This presentation initiated the second round of public input. The presentation described the process used to develop the list to that point, and solicited public comments, data, or any other information relevant to the listing process, the contents of the draft list, and the status of water bodies on the two addenda lists. An additional basin steering committee meeting was held in the Trinity River basin on February 9, 1998, to discuss the addenda lists, rankings, monitoring strategies, timetables, and threatened waters.

Participants at these meetings were asked to provide all comments and submissions in written form, via letter, facsimile transmission, or e-mail, to provide for an accurate record of the commentor's own words and concerns.

Attendees were informed that comments or information received by early February 1998 could affect the draft list submitted for initial EPA staff review. Any comments or information received between the submission of the first draft list to the EPA and the end of the Texas Register final public notice comment period would be considered before submission of the final list in April.

## *Refinement of the First Draft List*

Numerous written comments, and many requests for more information, were received over the ensuing few weeks. TNRCC staff compared the comments with staff interpretations of scientific principles and the Texas Surface Water Quality Standards to revise the January 23 draft list. Waters included on the two addenda lists were either added to, or omitted from, the draft list.

### Consideration of Addenda 1 and 2

Water bodies on Addendum 1 (drinking water use only) and Addendum 2 (narrative criteria) required additional data or information to justify inclusion on the 303(d) list. For the water bodies listed on Addendum 1, the TNRCC had initially proposed using exceedances of secondary standards in both finished and raw water. However, based on stakeholder input as well as TNRCC's concerns that exceedance of these drinking water criteria at the levels detected do not pose a risk to public health or safety, this proposal was withdrawn.

TNRCC re-evaluated the water bodies on Addendum 2 to determine exceedances of screening levels for narrative criteria resulting in the impairment of a designated use. In addition to the review of numeric data, comments addressing narrative criteria were also considered. Additional segments were listed based on narrative criteria when the water bodies also demonstrated nonsupport of an associated designated uses or numeric criteria.

### Refinement of List Based on Public Comment

Based on the comments and data received during the first two rounds of public comment, TNRCC made appropriate adjustments to listing. For example:

- USGS data submitted on mean dissolved lead in Clear Fork of the Trinity River Below Lake Weatherford was used to recalculate the criterion for lead, resulting in the removal of this constituent from the draft list.
- Information submitted on temperature violations in Lake Arlington suggested that the monitoring locations were in the mixing zone for the power plant's hot water discharge. TNRCC agreed with this information and the conclusion that the temperature data did not reflect ambient conditions, and so removed this impairment from the draft list.

### Refinement of Criteria for Threatened Designation

Additional consideration was given for determining if a water body was threatened. Water bodies moved from Addendum 1 onto the 303(d) list and classified as threatened were water bodies with exceedances of 50% of the MCL for organic compounds. The additional data and information used to justify this move was:

- Best professional judgment of the Water Utilities Division that treated water was nearing an MCL violation for particular pollutants whose only source is surface water. Exceedances of 50% of the MCL was chosen based on workgroup discussions for revising the National Primary Drinking Water Regulations;
- Best professional judgment of Water Quality Division that levels of atrazine found in treated water approximate the levels found in surface water; and
- Direct confirmation of the impending impairment of one water body listed as threatened using the methodology of exceedances of 50% of the MCL. With one additional sample taken in early February 1998, Aquilla Lake, which had been listed as threatened in January 1998, was in violation of the MCL for atrazine and became impaired. The threatened status was based on two samples taken in 1997, both of which actually exceeded the MCL (not just 50% of the MCL). The one additional sample in early February 1998 raised the annual running average over the MCL, which is a violation of drinking water standards. The water body was then reclassified as impaired.

At this stage, a second method was adopted for categorizing a water body as threatened. This method involves those water bodies where the human health criteria (for toxicants in water) for consumption of fish are exceeded, but available fish/shellfish tissue data have been evaluated by the Texas Department of Health, and through a risk assessment, fish/shellfish are determined to be safe for consumption. In this context, the fish consumption use is still supported but is threatened based on water column data indicating the potential for bioaccumulation in fish tissue.

Other reliable, available data and information, such as statistically valid trend analyses, that indicate an apparent declining water quality trend would have been considered; however, no trend analyses were carried out by TNRCC nor were any submitted by stakeholders. The TNRCC and the CRP will continue to bolster efforts in the future to collect and identify additional sources of available data and information that could be used to determine if a water body's uses are threatened. Links to other TNRCC program areas (for example, source water protection) will be strengthened, and greater use will be made of data and information from other agencies (TSSWCB, TWDB, TPWD, TDH, and federal agencies).

Dilution calculations or predictive models are routine parts of individual TNRCC permitting actions to develop effluent limits that will prevent potential future impairment, so the use of such analyses of permitted discharges for 303(d) list development would be redundant and would not provide any new perspectives.

### Refinement of Priority Ranking

In addition to changes in listing made in response to public comment, changes were also made to some of the initial priority rankings. TNRCC agreed with certain recommendations that better reflected local concerns expressed in comment letters. The revised priorities were based on the severity of pollution (whether greater or lesser than initially thought), the adequacy of data sets, and the uses of the water bodies. For example, all water bodies not meeting their contact recreation use were initially ranked as a low priority, pending the results of an ongoing fecal coliform study. This study is investigating the use of fecal coliform as the indicator of contact recreation use. Based on concerns about water bodies that are currently listed for nonsupport and are heavily used for recreation, TNRCC gave these water bodies higher priority.

### Completion of Second Draft

Descriptions of the listed water body stressors were edited to better describe the nature of apparent water quality problems or concerns and to make the list more understandable to a general audience. Agency analyses of comments and revisions of the draft list were coordinated with the executive management of TNRCC. A revised draft 303(d) list (2/19/98) was then submitted in mid-February for review and comment by EPA Region 6 staff. This revised draft list was also posted on the Internet, replacing the earlier (1/23/98) version.

## *Preparation of the Final 303(d) List*

After receiving EPA staff comments regarding the 2/19/98 draft list, the TNRCC modified the list as appropriate, considering sound science, state policies and priorities, and legal requirements. An announcement of the availability of the proposed final list for review and comment was published in the Texas Register on March 13, 1998. The revised (3/13/98) draft was made available for public review via Internet posting and by mail upon request by telephone, mail, or e-mail. Comments were accepted for 30 days following the Texas Register posting, with the comment period ending on April 13, 1998. This period constituted the third round of public input.

When the final comment period closed, any comments received were synthesized with the previous comments from the public and EPA, and evaluated by comparison with staff interpretations of scientific principles and the Texas Surface Water Quality Standards. Appropriate revisions to the draft list were made and coordinated with TNRCC executive management. The resulting final list is consistent with sound science, state policies and priorities, and legal requirements. The final list and supporting materials and documents for the list were submitted to EPA Region 6 on April 23, 1998. The supporting materials included:

< "Methodology for Establishing Surface Water Quality Priorities for Texas River Basins" (this document);
< "Guidance for Screening and Assessing Texas Surface and Finished Water Quality Data;"
< "Guidance for Assigning Priority for TMDL Development;"
< Documentation to explain the status of formerly listed water bodies that are no longer included on the final 1998 CWA 303(d) List; and a
< List of other water bodies considered for 1998 listing.

A summary of TNRCC responses to comments received during the listing process will be prepared following the submission of the final list and will be submitted to EPA and posted in the Texas Register as soon as possible.

## Targeting of Listed Water Bodies

Criteria were developed to establish priorities for TMDL development (summarized in Section III, Guidance for Assigning Priority for TMDL Development). While designated uses and severity of pollution were the basis for structuring the criteria, it should be noted that the prioritization methodology was not an attempt to determine the economic or aesthetic value of a water body or the value of its designated use. The priority ranking criteria are meant to include elements of risk assessment (that is, place higher priority on more severe water quality problems) and allow for programmatic needs (that is, distinguish between situations that are known to require immediate TMDL development and those where more information is required to verify that impairments exist).

The TNRCC intends to delineate watersheds and subwatersheds statewide to allow better resolution when defining and confronting water quality issues. Delineation of watersheds will also provide a geographic reference for water bodies on the list that are more detailed than the current designated segment numbers. Where possible, impairments will be addressed at the subwatershed level, unless evidence shows that constituents from other subwatersheds contribute to the impairment of the targeted water body. In general, TMDL analyses and activities will be designed to include all subwatersheds necessary to adequately define or address the issues at hand, but will be limited to those subwatersheds where a TMDL is truly needed and appropriate. That scope may sometimes require that pre-defined subwatersheds be even further subdivided to address very localized issues. As the subwatershed delineation proceeds, a scheme for numbering or identifying the subwatersheds will be developed and implemented. The delineation of watersheds and subwatersheds throughout the state is evolving through the Watershed Planner, a tool that will greatly enhance Texas' ability to target water quality impairments at the scale necessary to address nonpoint source pollution.

### *Statewide Schedule for Developing and Implementing Total Maximum Daily Loads*

Section I provides a schematic layout of where and when each water body on the 1998 CWA §303(d) List will be targeted for action over an eleven year period. To the extent possible, multiple pollutants will be addressed concurrently as TMDLs are developed for listed water bodies. As the schedule conveys, TNRCC expects that it will require a minimum of three years and a maximum of six years to address any particular water body. However, some TMDLs may be completed sooner than the proposed time line, and some water bodies may take longer than anticipated for a variety of unforeseeable reasons. The EPA, the TNRCC, and the watershed interest groups participating in the development of TMDLs must collaborate in an efficient manner, but must also allow some acceptable level of flexibility in the process.

As a general rule, the TNRCC will address impaired water bodies with the highest priority assignments first, within the constraints of the watershed management cycle. If there are no water bodies listed with a high priority within a basin, then TMDL activities will focus on those listed as medium, then on those listed as low, and finally on those listed as threatened. This prioritization is not absolute, and can be changed with significant stakeholder information to support the need to target a threatened segment first. Each basin group will begin a cluster of TMDL actions at five-year intervals; statewide, a different basin will be initiating TMDLs each year of the five-year cycle.

### *Management Activities Currently Underway*

TMDLs, or other water quality management initiatives that address pollutants of concern, are currently underway in certain water bodies on the 1998 303(d) List.

To date, the TNRCC has submitted a total of eight TMDLs to the EPA for technical review, in the form of five separate reports, within about the last five years. None of these eight have received final approval by the EPA. These TMDLs are described below.

< Cypress Creek, Segment 1009. A draft of this TMDL for dissolved oxygen was sent to EPA for technical review and was approved. The TNRCC is planning to conduct a public hearing for this TMDL within the next six months in conjunction with a public hearing for another TMDL in the Houston Ship Channel (described below). The TNRCC is using the Cypress Creek TMDL model in review of new wastewater permits.

< Houston Ship Channel System (HSC), multiple segments. Two drafts of a TMDL for dissolved nickel have been submitted. The EPA approved the first draft, but it was unacceptable to area stakeholders. The EPA did not approve the second draft, but with minor, resolvable objections. A third draft is being prepared and should be submitted for EPA review after receipt of stakeholder comment and TNRCC management review. After EPA approval, a public hearing will be conducted in conjunction with the hearing on the Cypress Creek TMDL.

< Houston Ship Channel System, multiple segments (same as those for nickel). TMDLs for six other dissolved metals (zinc, copper, lead, arsenic, mercury, and silver) were submitted in three separate reports for EPA review, and were approved. However, the TMDLs were opposed by stakeholders, and have been delayed. The process currently underway to resolve issues related to the nickel TMDLs will be used to reach agreement on the TMDLs for these other metals. However, recent sampling and

assessment for the 1998 303(d) List suggest that the problems from these metals may not actually exist, and significant revision or elimination of some of these TMDLs may be needed.

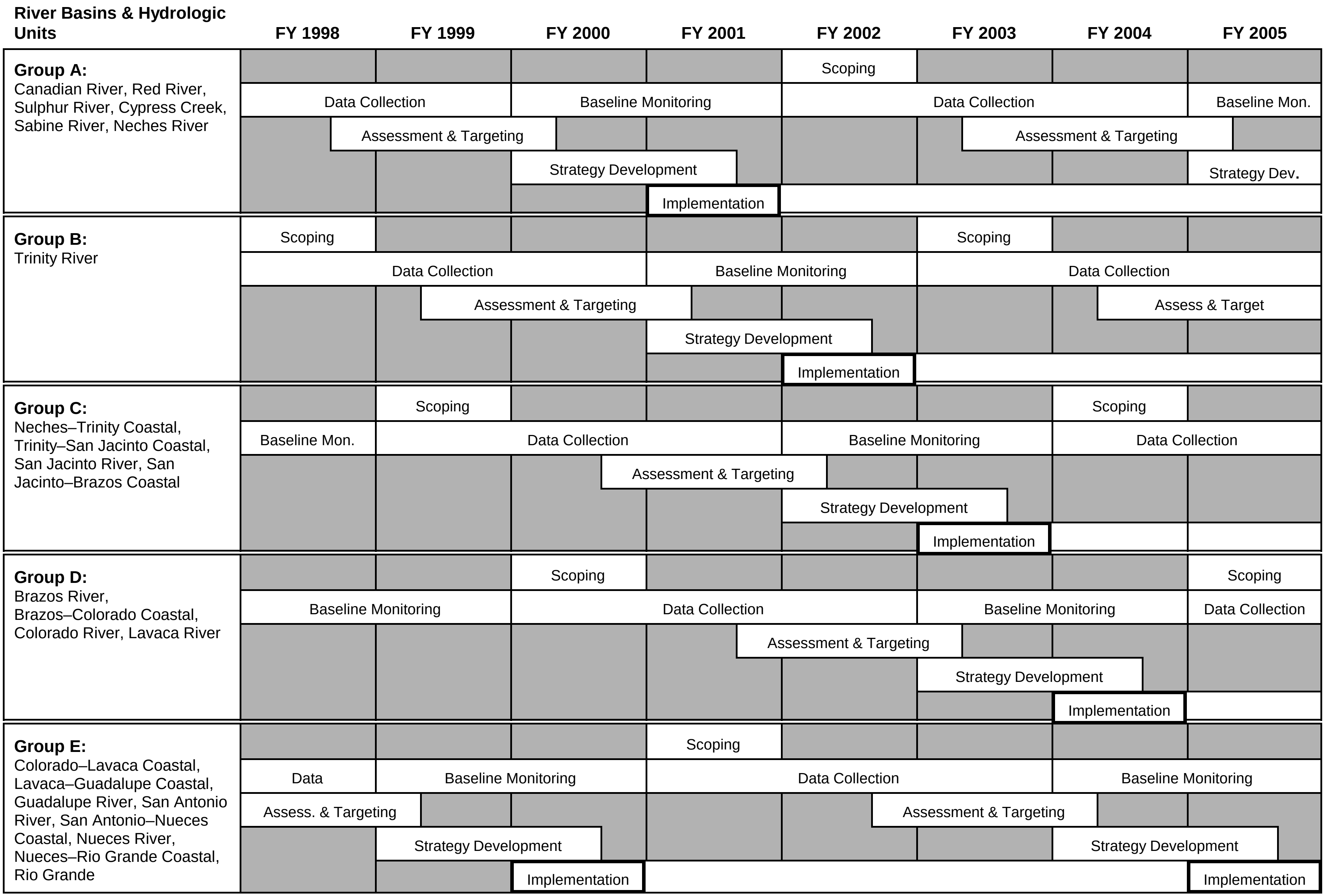
TMDLs or related management activities are underway in eight more watersheds, as described below.

- Armand Bayou, Segment 1113. Development of a TMDL for dissolved oxygen is in the initial stages. TNRCC staff have developed a water quality model of the bayou system, and are developing a geographic information system model of the watershed using techniques similar to those used in the nearby Dickinson Bayou watershed. Additional field studies have been performed to gather hydraulic characterization data for Armand Bayou and tributaries. Stakeholder meetings have been held in the watershed to introduce project plans and begin involving local interests in planning further developments. A watershed study may be financed by the General Land Office to better assess water and biological community quality in the watershed, and to determine the appropriate standards for undesignated tributaries or tidal fringes.
- Arroyo Colorado, Segments 2201 and 2202. Chemical, hydrologic, and spatial data is being acquired and compiled for the water quality modeling effort associated with this project. Analysis of existing data is currently underway. Coordination of stakeholder and public participation for the project is also progressing, and a functional participation mechanism is expected to be in place by the beginning of the summer (1998). The first meetings of the Stakeholder Committee and the Science and Technical Advisory Committee are scheduled for June, 1998.
- Big Cypress Creek and Lake O' the Pines, Segments 0404 and 0403. TNRCC, in partnership with the CRP, is currently performing a study of poultry operations to determine any impact to water quality. This study is being conducted under a mandate of the Texas Legislature. Three river basins are involved in the study, including the Big Cypress, the Angelina River, and the Guadalupe–Blanco. The results of that study may support or become part of a subsequent TMDL specifically for the Big Cypress Creek (segment 0404) and Lake O' the Pines (segment 0403) watersheds. The Clean Rivers Program is developing a monitoring plan to collect data on other water quality issues (such as dissolved oxygen and metals) that will be used in the TMDL planned for these watersheds.
- Dickinson Bayou, Segments 1103 and 1104. TNRCC is developing a method for using geographic information system software in conjunction with water quality models for performing TMDLs, using the Dickinson Bayou watershed as the test case. After the method is developed adequately and usable, recent data on watershed land use is available, a TMDL for dissolved oxygen will be developed for Dickinson Bayou.
- E.V. Spence Reservoir, Segment 1412. The Colorado River Municipal Water District and the TNRCC are currently collaborating to produce a work plan for this project. The work plan will include detailed descriptions of all individual project efforts,

including data collection, water quality modeling, quality assurance, and stakeholder and public participation. A funding agreement for the project is expected to be in place by early summer (1998). Compilation and analysis of existing water quality data and (other data) is currently underway.

- Greens Bayou Above Tidal, Segment 1016. A TMDL for dissolved oxygen is being developed. A model to analyze point source impacts has been calibrated, and preliminary estimates of nonpoint source loads have been developed with a simple spreadsheet model. Representatives for the City of Houston have proposed performing a study in the watershed to characterize nonpoint source loading and effects, and TNRCC is awaiting specifics on the proposed study.
- North Bosque River, Segments 1226 and 1255. Various state, federal, and regional agencies have been studying nutrient loading issues, especially as related to intensive dairy operations, for several years. The Texas Institute for Applied Environmental Research (TIAER) at Tarleton State University has collected data and developed a model of the upper part of the North Bosque River watershed. TIAER and other agencies are working to extend the model into the lower watershed, where land use patterns are different, with the hope of including Lake Waco in the modeled watershed. The Texas Institute for Applied Environmental Research and the Brazos River Authority continue to collect water quality data in the watershed to support development of the TMDL. TIAER is also conducting a project in the Upper North Bosque watershed to evaluate loading from waste application fields and the effect of implementation of best management practices to reduce impact from runoff from these areas. TIAER and the Brazos River Authority are in the final stages of completing a report on water quality in the watershed, efforts to develop and apply water quality models to evaluate the water quality in the river, and the potential impact on the water quality in Lake Waco. TNRCC has monitored the studies and developments in the Bosque River watershed, and is providing guidance to the participants, with the intent that the analyses and plans that ultimately result will become a TMDL.
- Salado Creek, Segment 1910. The San Antonio River Authority and the TNRCC are currently collaborating to produce a work plan for this project. The work plan will include detailed descriptions of all individual project efforts, including data collection, water quality modeling, quality assurance, and stakeholder and public participation. A funding agreement for the project is expected to be in place by early summer (1998). Compilation and analysis of existing water quality data and model evaluation is currently underway. TNRCC staff met with representatives from the San Antonio River Authority on March 26, 1998 to discuss the components of the TMDL. Under the current Clean Rivers Program contract (FY98-99) the San Antonio River Authority will conduct several activities which will contribute to the development of the TMDL for this segment. This effort will include additional data collection to evaluate the presence and levels of diazinon, which has been found in historical samples collected in this segment. Other issues related to fecal coliform bacteria and dissolved oxygen levels will also be evaluated.

# Appendix 1. The Statewide Watershed Management Schedule




March 1998

# Appendix 2. Water Quality Data and Information

## Used by the TNRCC for the 1998 305(b) Assessment and 303(d) Listing

June 26, 1998

| Type of data/information | Category | To determine | For waterbodies in which basins? |
|---|---|---|---|
| **1. Water quality data** (numeric values) | A. Instream water quality data collected under a TNRCC-approved Quality Assurance Project Plan (QAPP). Under the existing system, these data are routinely submitted to TNRCC by Clean Rivers Program basin planning agencies, USGS, or TNRCC's monitoring program, & then entered into TNRCC's database. | 1) Partial or nonsupport of a designated use determined by computer scan.<br>2) Segment ranking (H,M,L)**<br>3) Monitoring plans | Basin groups B & C |
| | B. Instream fecal coliform bacteria data collected under a TNRCC-approved QAPP (as in A) & used to develop 1996 305(b) inventory & 1996 303(d) list. More recent fecal coliform data from basins B & C will be used in Category A. | 1) Partial or nonsupport of designated use based on re-evaluation of 1996 305(b) summary data using new EPA guidelines<br>2) Segment ranking (H,M,L)**<br>3) Monitoring plans | All basins |
| | C. Instream water quality data other than Category A or B (above). Value & accuracy confirmed by TNRCC. | 1) Support results of computer scan (in A) to verify partial or nonsupport of a designated use<br>2) Segment ranking (H,M,L)**<br>3) Monitoring plans | Basin groups B & C |
| **2. Information** (may be based on numeric values but is summary or evaluative in nature) | D. Evaluative (modeling) analyses, water quality studies, anecdotal information. Value & accuracy confirmed by TNRCC. | 1) Segment ranking (H,M,L,T)**<br>2) Monitoring plans | Basin groups B & C |
| | E. Aquatic life closure or consumption advisory & closing of shellfish waters (both from Texas Department of Health). | 1) Partial or nonsupport of a designated use<br>2) Segment ranking (H,M,L)**<br>3) Monitoring plans | All basins |
| | F. Information from TNRCC Water Utilities on levels of chemicals (exceedances of drinking water standards and detections below the standards) in treated water. | 1) Nonsupport of a PWS use<br>2) Segment ranking (H,M,L,T)**<br>3) Monitoring plans | Basin groups B & C |

** H=High, M=Medium, L=Low, T=Threatened. The public input process will help develop the criteria to determine these rankings.

# Section III:

# Guidance for Assigning Priority for TMDL Development

# Guidance for Assigning Priority for TMDL Development in 1998-Listed Water Bodies

June 26, 1998

| Priority Rank | Ranking Criteria | |
|---|---|---|
| | **Texas Surface Water Quality Standards Impairments and . . .** | **. . . Additional Conditions That Must Be Met** |
| **HIGH**<br><br>Utility and feasibility of TMDL development high | *Any one of the following*: | *For all impairments classified as HIGH*: Nonsupport also represents potentially correctable and/or serious problem *and one of the following:*<br>● sufficient data exist to justify and/or support TMDL development<br>● immediate programmatic needs or planning cycle coordination require action<br>● legislative initiatives or court orders/decisions must be met. |
| | **1. Designated use not supported** | |
| | A. Aquatic Life use not supported due to exceedance of numeric criteria (DO, toxic substances) or ambient toxicity | |
| | B. Public Water Supply use not supported due to exceedances in source water of human health criteria, or violation in treated water of primary MCL and (b) | (b) Drinking water MCL violation is a result of surface water contamination from human activities. |
| | C. Contact Recreation use not supported and (c) | (c) Water body is heavily used for contact recreation and illnesses caused by waterborne pathogens have been confirmed. |
| | D. TDH Aquatic Life Closure for non-legacy pollutants (e.g., Se, dioxin) | |
| | E. Oyster Waters harvesting not supported, based on permanent closure by TDH due to monitored indicators of pathogens or toxic substances | |
| | **2. TSWQS criteria exceeded** | |
| | F. Numeric criteria exceeded for human health (for bioaccumulation in fish) and (f) | (f) Fish tissue data indicate human health risk from consumption of fish. |
| | G. Numeric criteria for TDS, chloride, etc,. . . (Not applicable) | |
| | H. Narrative criteria (e.g., excessive plant growth) are not met and (h) | (h) Problem also represents significant public concern (e.g. nutrient levels & effects are excessive & local entities have taken actions to address them). |
| | **3. Designated uses supported and TSWQS criteria met** (“threatened”) | |
| | I. No MCL violation, but exceedances of 50% of MCL and (i) | (i) Levels result of human activities to surface water. (See Note 2A) |
| | J. Numeric criteria exceeded for human health, etc . . . (Not applicable) | |
| | K. Available data & information evaluated by TNRCC suggests that uses or criteria may not continue to be maintained in following 4 years and (k) | (k) Threatened water body also represents a significant public concern (e.g., local entities or groups have taken significant action to address issue). |

DO=Dissolved oxygen  Se=Selenium  Hg=Mercury  TSWQS=Texas Surface Water Quality Standards  PCBs=polychlorinated biphenyls  TDS=Total dissolved solids
TDH=Tx. Dept. of Health  MCL=Maximum Contaminant Level

| Priority Rank | Ranking Criteria | |
|---|---|---|
| | **Texas Surface Water Quality Standards Impairments and . . .** | **. . . Additional Conditions That Must Be Met** |
| **MEDIUM**<br><br>Need more data to verify extent and/or severity of impairment | *Any one of the following*: | *For all impairments classified as MEDIUM*: Partial or nonsupport also represents potentially correctable and/or serious problem, where additional data collection is necessary to verify the extent and/or severity of impairment. |
| | **1. Designated use not supported or partially supported** | |
| | A. Aquatic Life use not supported or partially supported due to exceedances of numeric criteria (DO, toxic substances) or ambient toxicity and (a) | (a) Additional data required to verify extent and/or causes of nonsupport of use. |
| | B. Public Water Supply use not supported, etc. . . . (Not applicable) | |
| | C. Contact Recreation use not supported and (c) | (c) Water body is heavily used for contact recreation and there is considerable local support for addressing problem. |
| | D. TDH Aquatic Life Closure or Consumption Advisory for legacy pollutant (e.g., chlordane) or non-legacy pollutant as a secondary contaminant; or Consumption Advisory for non-legacy pollutants. | |
| | E. Oyster Waters harvesting not supported based on permanent closure by TDH and (e) | (e) Sources of contamination and exclusion represents significant public concern (i.e., concern about exclusion from harvesting). |
| | **2. TSWQS criteria exceeded** | |
| | F. Numeric criteria exceeded for human health (for bioaccumulation in fish) and (f) | (f) Fish tissue data not available or insufficient for determining human health risk from fish consumption. |
| | G. Numeric criteria for TDS, chloride, sulfate, temperature, pH or enterococcus bacteria exceeded | |
| | H. Narrative criteria (e.g., excessive plant growth) not met and (h) | (h) Problem represents a potential but not verified public concern. |
| | **3. Designated uses supported and TSWQS criteria met** (“threatened”) | |
| | I. No MCL violation, but exceedances of 50% of MCL and (i) | (i) Levels result of human activities to surface water. (See Note 2A) |
| | J. Numeric criteria exceeded for human health (for bioaccumulation in fish, but (j) | (j) Fish tissue data indicates no human health risk from consumption of fish. |
| | K. Available data & information evaluated by TNRCC suggests that uses or criteria may not continue to be maintained in following 4 years and (k) | (k) Threat to water body requires verification. |

DO=Dissolved oxygen Se=Selenium Hg=Mercury TSWQS=Texas Surface Water Quality Standards PCBs=polychlorinated biphenyls TDS=Total dissolved solids
TDH=Tx. Dept. of Health MCL=Maximum Contaminant Level

| Priority Rank | Ranking Criteria | |
| --- | --- | --- |
| | **Texas Surface Water Quality Standards Impairments and . . .** | **. . . Additional Conditions That Must Be Met** |
| **LOW**<br><br>Utility or feasibility of TMDL development is low | *Any one of the following*: | *For all impairments classified as LOW*: Partial or nonsupport also represents<br>● potentially correctable problem and:<br>TMDLs require international or interstate collaboration<br>● problem occasional or intermittent *and one of the following*:<br>i) problem not correctable (natural causes, physical factors)<br>ii) problem has minor consequences and/or would not severely limit uses (e.g., minimal temperature exceedances in unshaded prairie streams) |
| | **1. Designated use not supported or partially supported** | |
| | A. Aquatic life not supported or partially supported due to exceedances of numeric criteria (DO, toxic substances) or ambient toxicity | |
| | B. Public Water Supply use not supported , etc. . . (Not applicable) | |
| | C. Contact Recreation use not supported due to exceedance of fecal coliform bacteria criteria | |
| | D. TDH Fish Consumption Advisory | |
| | E. Oyster Waters harvesting partially supported, based on temporary closure by TDH and (e) | (e) Closure due to preemptive response to weather conditions (runoff) or red tide and exclusion does not represent significant public concern |
| | **2. TSWQS criteria exceeded** | |
| | F. Numeric criteria exceeded for human health, etc . . . (Not applicable) | |
| | G. Numeric criteria for TDS, chloride, sulfate, temperature, pH or enterococcus bacteria exceeded and (g) | (g) Criteria exceeded but with no significant public impact |
| | H. Narrative criteria not met and (h) | (h) No known public concern |
| | **3. Designated uses supported and TSWQS criteria met** ("threatened") | |
| | I. No MCL violation, but exceedances of 50% of MCL and (i) | (i) Levels result of natural conditions in surface water. (See Note 2A) |
| | J. Numeric criteria exceeded for human health, etc. . . (Not applicable) | |
| | K.Available data & information, etc . . . (Not applicable) | |

DO=Dissolved oxygen  Se=Selenium  Hg=Mercury  TSWQS=Texas Surface Water Quality Standards  PCBs=polychlorinated biphenyls  TDS=Total dissolved solids
TDH=Tx. Dept. of Health  MCL=Maximum Contaminant Level

NOTES:

1. Water bodies with *a significant & immediate threat to human health or ecosystem integrity* will be considered *critical* and addressed immediately, through programs and procedures (other than the TMDL process) to remove the immediate threat or exposure. These critical conditions do not lend themselves to the cyclical nature of the 303(d) listing process and the often time-consuming development of the TMDL. However, once the immediate threat is addressed, and if conditions persist that could result in a future occurrence of the critical problem, the water body could then be a candidate for the High category (or Medium, Low, or Threatened if appropriate) in the next listing cycle. For example, (1) Violation of a drinking water MCL in the treated drinking water would be addressed immediately (e.g., boil water notice); if the exceedance is identified as a source water contaminant, then the water body could be a candidate for listing. (2) Illnesses contracted through contact recreation; the immediate exposure would be addressed through closure of the water body to swimming; if conditions persist or reoccur, the water body would also be a candidate for listing. (3) Major fish kills caused by a spill or illegal discharge; the spill or discharge would be addressed immediately; if the water body remains contaminated, then it could also be a candidate for listing.

2. For the 1998 303(d) List, the data and information to determine if a water body falls into the threatened category (#3 under HIGH, MEDIUM or LOW) will come from three sources:
   A. Data provided by TNRCC's Water Utilities Division for organic chemicals that are above 50% of the maximum contaminant level (MCL) for primary drinking water standards (and may also exceed the MCL, but do not cause an MCL violation). These chemicals must also represent contamination of a surface water source that are the result of human activities. Only data on organic chemicals is used at this time for two reasons: the data on inorganic chemicals in finished drinking water are not readily available for analysis, and exceedances of inorganic chemicals tend to be associated with groundwater sources, rather than surface waters. To distinguish between source waters that are a high priority for TMDL development (Threatened-high) and those that are a medium priority (Threatened-medium), the following criteria were used:
      Threatened-high: Systems with 9 or fewer samples, 3 or more samples of organic chemicals exceed 50% of MCL; systems with > 9 samples, >25% of samples of organic chemicals exceed 50% of MCL.
      Threatened-medium: Systems with 9 or fewer samples, 2 samples of organic chemicals exceed 50% of MCL; systems with > 9 samples, 11-25% of samples of organic chemicals exceed 50% of MCL.
   B. Data from TNRCC's Surface Water Quality database were screened against numeric criteria for human health (for bioaccumulation in fish). Exceedances of these criteria, coupled with a TDH human health risk analysis for fish consumption based on fish data from the same water body for the same constituent of concern which indicates NO additional risk would lead to ranking of the water body as Threatened-medium.
   C. Verifiable information provided by stakeholders and other agencies that establishes an impairment of water quality standards would occur in the next 4 years. Such information consists of evaluative (modeling) analyses or water quality studies, whose value and accuracy have been confirmed by TNRCC.

3. "Legacy pollutants" are those pollutants that have been banned by EPA or those pollutants emanating from a known legacy source.

4. "TMDLs underway" refers to TMDLs or other water quality management initiatives currently in process that address the pollutant of concern.

# Section IV:

# Guidance for Screening and Assessing Texas Surface and Finished Water Quality Data

# Guidance for Screening and Assessing Texas Surface and Finished Drinking Water Quality Data

June 26, 1998

## General Assessment Methodology

The Texas Natural Resource Conservation Commission (TNRCC) administers water quality management programs with the goal of protecting, maintaining, and restoring Texas water resources. The Texas Surface Water Quality Standards (TSWQS), adopted by the TNRCC on March 19, 1997, recognize the regional and geologic diversity of the state by dividing major river basins, bays, and estuaries into defined segments (referred to as classified segments). Appropriate water uses (aquatic life, contact recreation, oyster waters, etc.) are designated to each of the classified segments. Numerical criteria (concentrations) established in the TSWQS provide a quantitative basis for evaluating use support and managing point and nonpoint loadings in Texas surface waters. These criteria are used as maximum instream concentrations that may result from permitted discharges and nonpoint sources. The procedure for comparing instream water quality conditions to numerical criteria is specified in the TSWQS. For example, dissolved oxygen measurements monitored in a water body may be compared to numerical criteria to determine if the designated aquatic life use is supported.

Texas Drinking Water Standards (TDWS), adopted by the TNRCC on June 4, 1977 and revised on November 25, 1994, assure the safety of public water supplies. Numerical criteria established in the TDWS for finished water (after treatment) provide a quantitative basis for evaluating support of the public water supply use.

In most instances, this guidance describes how numerical criteria can be compared to instream conditions as specified in the TSWQS/TDWS. In many cases, however, sufficient monitoring data for exact comparisons to numerical criteria cannot be reasonably obtained. For example, fecal coliform criteria in the TSWQS are based on five measurements within 30-days and dissolved oxygen criteria are based in part on 24-hour averages. These conditions are not met by most monitoring efforts, which are based on "instantaneous" measurements at monthly or quarterly intervals. Compliance with the TSWQS/TDWS is therefore sometimes estimated from instream monitoring data using screening levels, which establish compliance targets that can be directly compared with monitoring data. Screening levels are intended to provide the best comparisons that can be reasonably attained with available data and numerical criteria in the TSWQS/TDWS.

Some of the numerical criteria in the TSWQS, such as water temperature, pH, chloride, sulfate, and total dissolved solids, are not associated with single specific uses. Instead, they were established in the TSWQS to ensure support of multiple uses, and as tools to identify and manage the influences of point and nonpoint sources of pollution.

Instream levels of nutrients and chlorophyll *a,* toxic substances in sediment, and toxic substances in fish tissue are useful in identifying water quality concerns and evaluating the causes of nonsupport of the narrative standards. Numerical criteria for these constituents have not been established in the TSWQS. Screening levels for these parameters were statistically developed from long-term monitoring data for this guidance. More recent monitoring data are compared to the screening levels to identify parameters and areas of concern.

The TSWQS also contain narrative criteria which apply to all waters of the state. Narrative criteria include general information such as existence of excessive aquatic plant growths, foaming of surface waters, taste and odor producing substances, eroding sediment, and toxic materials. Narrative criteria are evaluated using numeric criteria if they are available. Other information consisting of water quality studies, existence of fish kills or contaminant spills, photographic evidence, local knowledge, and best professional judgment is also used to evaluate support of narrative criteria and associated designated uses.

To conduct the assessment, the most recent five years of surface water quality monitoring and finished drinking water data are assembled, ordered by parameter, and evaluated by analysts. In most cases, individual values for each parameter are compared to either numerical water quality criteria or screening levels, and the percentage of all values in exceedance is computed. The percent exceedance is then compared to categorical ranges (supporting, 0-10%; partially supporting, 11-25%; and not supporting, > 25%) to determine the degree of use support or criteria support. For those parameters where only narrative criteria have been established in the TSWQS, the same categorical ranges are used to identify water bodies with no concerns, potential concerns, or concerns for impairment. In a few cases where numeric criteria are established as averages (chloride, sulfate, and total dissolved solids criteria, chronic criteria for toxic substances, public drinking water criteria, and human health criteria), individual values for each parameter are summed and an average is computed. The average is then directly compared to criteria in the TSWQS/TDWS to determine the degree of use support or criteria support.

### *Sources of Data*

Surface water quality monitoring (SWQM) data resident in the TNRCC Regulatory Activities and Compliance System (TRACS) database, finished drinking water quality data in the TNRCC's Water Utilities Division databases, Clean Rivers Program (CRP) databases, and/or other quality assured data may be considered for evaluation. In addition to SWQM data collected by the TNRCC, the TRACS database contains quality assured data from other state and federal agencies, river authorities, cities, and volunteer monitoring groups. SWQM data are collected at fixed stations during routine monitoring and from many other sites selected for special studies and intensive surveys. Finished drinking water data resident in the organic substances database of the TNRCC's Water Utilities Division are considered in assessment of the public water supply use. Inorganic substances in finished drinking water are not utilized in public water supply use assessment, since data are not readily available for analysis and elevated levels tend to be associated with groundwater sources rather than surface water. These data are collected under quality assurance plans that ensure data are of known and appropriate quality for assessment. Individual measurements, especially exceedances of the water quality criteria and screening levels, are reviewed by water quality analysts to determine if samples are representative and accurate.

### *Period of Record*

All quality assured SWQM and finished water data collected during the most recent five-year period may be considered for assessment. Most monitoring groups collect data at fixed sites at recurring monthly or quarterly frequencies. In some cases, particularly for toxicants, samples may be collected annually at these sites.

### *Minimum Number of Samples*

For all field measurements (dissolved oxygen, pH, and temperature) and routine water quality constituents (nutrients, fecal coliforms, chlorophyll *a*, dissolved solids, and salts) in surface water, at least nine samples over the five-year period of record are required for assessment. Monitoring sites with fewer than nine measurements/samples for any of the referenced parameters are not considered for assessment. An exception can be made for streams or reaches of streams that are 25 miles or less in length and for reservoirs or estuarine waters, or portions of reservoirs or estuarine waters (5,210 acres or eight square miles or less, respectively), where water quality conditions are similar. For these water bodies or portions of water bodies, field measurements and water quality constituents collected at multiple sites may be aggregated to meet the nine sample minimum requirement. For all toxicants in water, sediment, fish tissue, or ambient water and sediment toxicity tests, at least five samples over the five-year period are required for assessment. Samples for toxicants and toxicity may also be aggregated as described above. In finished drinking water, an average of at least four samples is required for comparison to the primary and secondary standards. These minimum sample numbers were chosen to allow confidence in the assessment while making the best use of the limited monitoring data available.

### *Values Below Limits of Detection*

Many individual values in SWQM and finished drinking water databases are reported as less than a minimum detection limit (nondetects). There is no generalized way to determine the true value for an individual nondetect in the range between zero and the reported minimum detection limit. For assessments, 50 percent of a minimum detection limit is computed for these nondetects and used for special reporting purposes. This is done to include as many individual data points in the analysis as possible and to indicate the level of monitoring effort. In many areas of the state, much of the nutrient and toxicant data for individual parameters are reported as nondetects. These occurrences in themselves are particularly noteworthy, because they may indicate levels are below those for concern. Values computed from 50 percent of minimum detection limits that exceed criteria or screening levels are not counted as exceedances. However, the 50 percent value reported for these nondetects is used in developing screening levels and in calculation of summary statistics (minimum, maximum, and mean).

An exception to the above guidance regarding nondetects is made when evaluating chronic toxicant and human health criteria for water. The criteria for these constituents are expressed as mean values. In these cases, the smaller of the following measurements is used in calculation of the mean: the 50 percent value reported for nondetects; or 50 percent of the chronic criterion/human health criterion.

### *Waters Covered in Assessments*

All stream, reservoir, estuary, and oceanic sites with sufficient water quality data are to be included in an assessment. This includes sites within defined classified segments as specified in the TSWQS. Water quality data collected at sites off classified segments (unclassified waters) are also evaluated. The general criteria in the TSWQS pertaining to aquatic life use and dissolved oxygen criteria are applied to unclassified waters for assessment purposes unless site-specific criteria derived from receiving water assessments are available. Toxicant and other conventional criteria for unclassified waters are the same as those for the downstream classified segment.

## *Spatial Coverage*

Water quality data are reviewed station by station within classified and unclassified waters to determine geographical extent of use and criteria support and water quality concerns. The geographic extent is estimated based on review of existing data, spatial distribution of monitoring sites having the required minimum number of samples, known sources of pollution, influence of tributaries and hydrological modifications, and best professional judgment of TNRCC/CRP assessment personnel. Streams are measured in miles, reservoirs are measured in acres, and estuaries and oceans are measured in square miles. For large water bodies that have only one monitoring site, the data from that one station are not used to generate a monitored assessment for the entire reach or area. A single monitoring site is considered to be representative of no more than 25 miles in freshwater and tidal streams. A single monitoring site in reservoirs, estuaries, and oceans is considered representative of 25 percent of the total reservoir acres and estuary or ocean square miles, but not more than 5,120 acres or eight square miles. Major hydrological features, such as the confluence of a major tributary or an instream dam, may also limit the spatial extent of an assessment based on one station. The remaining area not covered by a single site will be reported as not assessed.

## *Assignment of Causes and Sources of Pollutants*

Whenever possible, analysts link causes of pollution with their sources for the analysis. Causes are those pollutants and other stressors that contribute to actual nonsupport or partial support of designated uses in a water body (Table 1). Stressors are factors or conditions (low dissolved oxygen, stream flow, siltation, habitat alterations, etc.) other than specific pollutants that cause nonsupport of uses. Activities, facilities, or conditions that contribute pollutants or stressors are sources that result in nonsupport of designated uses in a water body (Table 2).

For each water body or portion of a water body where a designated use is partially supported or not supported, the cause(s) and source(s) are identified from available information (SWQM data, field observations, land use, CRP assessments, nonpoint source assessment reports, special studies, and intensive surveys).

## *Depth of Water Quality Measurements*

Surface measurements (typically collected at a depth of one foot) of water temperature, chloride, sulfate, total dissolved solids, nutrients, chlorophyll *a*, fecal coliform, *E. coli*, enteroccocus, and toxicants in water are utilized in an assessment. In the cases of dissolved oxygen and pH, measurements over the entire mixed surface layer are evaluated.

## *Determination of the Mixed Surface Layer*

Monitoring personnel often make vertical field measurement profiles in deep freshwater streams that are generally mixed from the surface to the bottom. In these cases, all of the dissolved oxygen measurements made in the profile during each individual sampling event are averaged, and the mean compared to the criterion. Individual pH measurements made in the profile are compared to the minimum/maximum criteria. Only one exceedance is counted in cases where more than one pH measurement in the profile does not meet the minimum/maximum criteria.

| Table 1. List of Causes/Stressors | | | |
|---|---|---|---|
| **Code** | **Cause/Stressor** | **Code** | **Cause/Stressor** |
| 0000 | Cause Unknown | 1000 | pH |
| 0100 | Unknown Toxicity | 1100 | Siltation |
| 0200 | Pesticides | 1200 | Organic Enrichment |
| 0300 | Priority Organics | 1300 | Salinity/TDS/Chloride/Sulfate |
| 0400 | Nonpriority Organics | 1400 | Thermal Modifications |
| 0410 | PCBs | 1500 | Flow Alterations |
| 0420 | Dioxins | 1600 | Habitat Alterations |
| 0500 | Metals | 1700 | Pathogens |
| | 0510 Arsenic | 1800 | Radiation |
| | 0520 Cadmium | 1900 | Oil and Grease |
| | 0530 Copper | 2000 | Taste and Odor |
| | 0540 Chromium | 2100 | Suspended Solids |
| | 0550 Lead | 2200 | Noxious Aquatic Plants |
| | 0560 Mercury | 2400 | Total Toxics |
| | 0570 Selenium | 2500 | Turbidity |
| 0600 | Ammonia | 2600 | Exotic Species |
| 0700 | Chlorine | 2800 | Excessive Algal Growth |
| 0800 | Other Inorganics | 2900 | Inappropriate Littoral Vegetation |
| 0900 | Nutrients | | |
| | 0910 Phosphorus | | |
| | 0920 Nitrogen | | |
| | 0930 Other | | |

| Table 2. List of Sources | |
|---|---|
| **Code** | **Source Category** |
| 0100 | Industrial Point Sources |
| | 0110 Major Industrial Point Sources |
| | 0120 Minor Industrial Point Sources |
| 0200 | Municipal Point Sources |
| | 0210 Major Municipal Point Sources--dry and/or wet weather discharges |
| | 0212 Major Municipal Point Sources--dry weather discharges |
| | 0214 Major Municipal Point Sources--wet weather discharges |
| | 0220 Minor Municipal Point Sources---dry and/or wet weather discharges |
| | 0222 Minor Municipal Point Sources--dry weather discharges |
| | 0224 Minor Municipal Point Sources--wet weather discharges |
| 0400 | Combined Sewer Overflow |
| 0500 | Collection System Failure |
| 0900 | Domestic Wastewater Lagoon |
| 1000 | Agriculture |
| | 1050 Crop-Related Sources<br>1100 Non-irrigated Crop Production<br>1200 Irrigated Crop Production<br>1300 Speciality Crop Production (e.g., horticulture, citrus, nuts, fruits)<br><br>1350 Grazing-Related Sources<br>1400 Pasture Grazing--riparian and/or upland<br>1410 Pasture Grazing--riparian<br>1420 Pasture Grazing--riparian and/or upland<br>1500 Range Grazing--riparian and/or upland<br>1510 Range Grazing--riparian<br>1520 Range Grazing--upland<br><br>1600 Intensive Animal Feeding Operations<br>1620 Concentrated Animal Feeding Operations (CAFOs); permitted point sources<br>1640 Confined Animal Feeding Operations Nonpoint Sources<br>1700 Aquaculture |

| Table 2. List of Sources | |
|---|---|
| **Code** | **Source Category** |
| 2000 | Silviculture |
| | 2100 Harvesting, Restoration, Residue Management<br>2200 Forest Management (e.g., pumped drainage, fertilization, pesticide application)<br>2300 Logging Road Construction/Maintenance<br>2400 Silvicultural Point Sources |
| 3000 | Construction |
| | 3100 Highway/Road/Bridge Construction<br>3200 Land Development |
| 4000 | Urban Runoff/Storm Sewers |
| | 4100 Non-industrial Permitted Sources<br>4200 Industrial Permitted Sources<br>4300 Other Urban Runoff<br>4400 Illicit Connections/Illegal Hook-ups/Dry Weather Flows<br>4500 Highway/Roadway/Bridge Runoff<br>4600 Erosion and Sedimentation |
| 5000 | Resources Extraction |
| | 5100 Surface Mining<br>5200 Subsurface Mining<br>5300 Placer Mining<br>5400 Dredge Mining<br>5500 Petroleum Activities<br>5700 Mill Tailings<br>5800 Acid Mine Drainage<br>5900 Abandoned Mining<br>5950 Inactive Mining |
| 6000 | Land Disposal |
| | 6100 Sludge<br>6200 Wastewater<br>6300 Landfills<br>6400 Industrial Land Treatment<br>6500 Onsite Wastewater Systems (septic tanks)<br>6600 Hazardous Waste<br>6700 Septage Disposal |

| Table 2. List of Sources | |
|---|---|
| **Code** | **Source Category** |
| 7000 | Hydromodification |
| | 7100 Channelization<br>7200 Dredging<br>7300 Dam Construction<br>7350 Upstream Impoundment<br>7400 Flow Regulations/Modification |
| 7550 | Habitat Modification (other than hydromodification) |
| | 7600 Removal of Riparian Vegetation<br>7700 Bank or Shoreline Modification/Destabilization<br>7800 Drainage/Filling or Wetlands |
| 7900 | Marinas and Recreation Boating |
| | 7910 In-water Releases<br>7920 On-land Releases |
| 8050 | Erosion from Derelict Land |
| 8100 | Atmospheric Deposition |
| 8200 | Waste Storage/Storage Tank Leaks (above ground) |
| 8250 | Leaking Underground Storage Tanks |
| 8300 | Highway Maintenance and Runoff |
| 8400 | Spills (accidental) |
| 8500 | Contaminated Sediments |
| 8520 | Debris and Bottom Deposits |
| 8530 | Internal Nutrient Cycling (primary lakes) |
| 8540 | Sediment Re-suspension |
| 8600 | Natural Sources |
| 8700 | Recreation and Tourism Activities |
| | 8710 Releases From Boats<br>8750 Golf Courses |
| 8900 | Salt Storage Sites |
| 8910 | Groundwater Loadings |
| 8920 | Groundwater Withdrawal |

| Table 2. List of Sources | |
|---|---|
| **Code** | **Source Category** |
| 8950 | Other |
| 9000 | Unknown Source |
| 9050 | Sources Outside State Jurisdiction or Borders |

The mixed surface layer for tidally influenced water bodies is defined as the portion of the water column from the surface to the depth at which the specific conductance is 6,000 $\mu$mhos greater than the conductance at the surface. Dissolved oxygen and pH criteria apply to the entire mixed water column, or only to measurements made in the mixed surface layer if the water column is stratified.

For reservoirs, the mixed surface layer is defined as the portion of the water column from the surface to the depth at which water temperature is 0.5°C less than the water temperature at the surface. Dissolved oxygen and pH criteria apply to the entire mixed water column, or only to measurements made in the mixed surface layer if the water column is stratified.

# Methodology for Screening and Assessing Use Support

## *Aquatic Life Use*

Support of aquatic life uses is based on assessment of dissolved oxygen criteria, toxic substances in water criteria, and ambient water and sediment toxicity tests. Each set of criteria is evaluated independently of each other, and nonsupport of aquatic life uses results if any are not attained.

### Dissolved Oxygen Criteria

An exceptional, high, intermediate, or limited aquatic life use is assigned to each classified water body in the TSWQS based on physical, chemical, and biological characteristics. Dissolved oxygen criteria (24-hour means) to protect these aquatic life uses for freshwater are 6.0, 5.0, 4.0, and 3.0 mg/L, respectively. Each of the aquatic life use dissolved oxygen criteria is 1 mg/L lower for tidally influenced water bodies due to differences between oxygen solubility in fresh and salt water. There is no limited use for tidally influenced waters. Unclassified perennial water bodies are presumed to have a high aquatic life use and corresponding dissolved oxygen criteria. The exception to this general rule is where site-specific aquatic life use and associated dissolved oxygen criteria have been assigned to a perennial unclassified water body through a receiving water assessment. Most of the dissolved oxygen data collected at fixed monitoring stations are instantaneous measurements, so direct comparison to the 24-hour criteria is not possible. Due to these data limitations, dissolved oxygen levels of 6.0, 5.0, 4.0, and 3.0 mg/L from the mixed surface layer are established in this guidance as single measurement minimum screening levels to evaluate support of respective exceptional, high, intermediate, and limited aquatic life uses. Dissolved oxygen measurements made during the day are considered representative of the 24-hour mean. Support of assigned aquatic life uses is based on ranges for the percent of exceedances among dissolved oxygen measurements specified in Table 3.

### Toxic Substances in Water Criteria

Support of the aquatic life use is also based on an evaluation of the prevalence and magnitude of toxic chemicals in water. The SWQM Database contains sufficient data for analysis of 12 metals and 132 organic substances (39 pesticides, 30 volatile organics, and 63 semivolatile organics). The TNRCC has developed water quality criteria in the TSWQS for the 12 metals, but for only 17 of the organic substances (Tables 4 and 5). Support of the aquatic life use, based on toxic chemicals in water, includes an evaluation of those metals and organic substances for which criteria have been developed.

Individual measurements of the 12 metals and 17 organic substances are compared against acute criteria established in the TSWQS (Tables 4 and 5). Selection of which set of criteria (freshwater or saltwater) to use in the comparison is based on the location of the station; for example, for a station located in tidally influenced water, the marine criteria are applicable. For several toxic substance parameters where the relationship of toxicity is defined as a function of pH or hardness, acute criteria are expressed as an equation based on this relationship. Appropriate pH and hardness values of long-term SWQM fixed station network data by basin (Table 2 in the TSWQS) are used to compute criteria during the initial screening. Where exceedances are identified, a secondary screening is conducted using segment-specific or site-specific data. If 30 or more ambient samples are available, pH and hardness values are ranked from the lowest to the highest and the 15th percentiles are used to compute criteria for the entire segment or for a specific site. Segment-specific pH and hardness values that have been generated from long term monitoring data can be used in the secondary screening when less than 30 ambient samples are available (Table 6 in *Implementation of the TNRCC Standards via Permitting,* Report RG-194).

The TSWQS express the criterion for silver in the free ionic form. Silver data in the SWQM Database are reported as the dissolved fraction. The percentage of dissolved silver that is present in the free ionic form is calculated and compared to the criterion. Silver data collected from a variety of water bodies throughout the United States indicate that a correlation exists between the dissolved chloride concentration and the percent free ionic silver.

The TNRCC developed a regression equation ($R^2$ of 87 percent) that calculates the percentage of dissolved silver that is in the free ionic form. The following equation is used to determine what percentage of dissolved silver is in the free ionic form:

$$\mathbf{Y = exp\ [\ exp\ (1/(0.6559 + 0.0044\ (Cl)\ )\ )]}$$

where,

Y = percent of dissolved silver in the free ionic form
Cl = dissolved chloride

The percentage obtained from the above equation is then multiplied by the dissolved fraction to obtain the free ionic silver concentration. For this equation, chloride values are obtained from the TNRCC's SWQM database. The 50th percentile value of the dissolved chloride concentration for each basin is used unless sufficient chloride values are available within the water body. The

## Table 3. Framework for Evaluating Use Support

| Use/Impact | Parameter/Criteria or Screening Levels | Fully Supporting | Partially Supporting | Not Supporting |
|---|---|---|---|---|
| Overall Use Support | | All uses are fully supported if: | One or more uses are partially supported and remaining uses are fully supported if: | One or more uses are not supported if: |
| Aquatic Life Support | Dissolved Oxygen | 0-10 % do not meet screening level. | 11-25 % do not meet screening level. | >25 % do not meet screening level. |
| | Toxicants | For any individual parameter, 0-10% exceed acute criterion,<br>and/or<br>the mean does not exceed the chronic criterion. | For any individual parameter, 11-25% exceed acute criterion. | For any individual parameter, >25% exceed acute criterion,<br>and/or<br>the mean exceeds the chronic criterion. |
| | Ambient Water and Sediment Toxicity | If nine or fewer samples, no toxicity is observed in either acute or chronic tests compared to controls;<br>or<br>if more than nine samples, 0-10% have acute or chronic toxicity. | If nine or fewer samples, acute and/or chronic toxicity is observed in one or two separate samples;<br>or<br>if more than nine samples, 11-25% have acute or chronic toxicity. | If nine or fewer samples, acute and/or chronic toxicity is observed in three or more separate samples;<br>or<br>if more than nine samples, >25% have acute or chronic toxicity |
| Contact Recreation | Fecal coliform 400 colonies/ 100 mL or *E. coli* 252 colonies/100 mL | 0-25% exceed screening level. | Partial support is not assessed for the contact recreation use. | >25% exceed screening level. |
| Noncontact Recreation | Fecal coliform 400 colonies/100 mL or *E. coli* 252 colonies/100 mL<br>or<br>4,000 fecal coliform colonies/100mL (Segment 2308 only) | 0-25% exceed screening level. | Partial support is not assessed for the noncontact recreation use. | >25% exceed screening level. |

| Table 3. Framework for Evaluating Use Support | | | | |
|---|---|---|---|---|
| **Use/Impact** | **Parameter/Criteria or Screening Levels** | **Fully Supporting** | **Partially Supporting** | **Not Supporting** |
| Public Water Supply | Finished Water Primary Drinking Water Standards | No violation of the MCL. | Partial support is not assessed. | Violation of the MCL. |
| Fish Consumption | Consumption Adviories/Aquatic Life Closurers | No fish/shellfish consumption advisories or aquatic life closures in effect. | Restricted-consumption advisory (limits on number or size of meals) in effect for general population or a subpopulation that could be at greater risk (e.g., pregnant women, children). | Aquatic life closure (no taking of aquatic life) in effect;<br><br>fish/shellfish "no-conumption" advisory in effect for one or more species for the general population or subpopulation that could be at greater risk;<br>or<br>commerical fishing/shellfish harvesting ban in effect. |
| | Human Health Criteria for Water and Fish, Freshwater Fish Only and Saltwater Fish Only (toxic substances) | Mean does not exceed human health criteria. | Partial support is not assessed. | Mean exceeds human health criteria. |
| Oyster Waters | TDH Shellfish Maps | Area approved for growing and harvesting shellfish. | Area conditionally approved for the growing and harvesting of shellfish. | Area is restricted for the growing and harvesting of shellfish or prohibited due to water quality concerns. |

| Table 4. Criteria for Specific Metals in Water for Protection of Aquatic Life<br>(All values listed or calculated in $\mu$g/L)<br>(Hardness concentrations are input as mg/L) | | | | | |
|---|---|---|---|---|---|
| **Parameter Code** | **Parameter** | **Freshwater Acute** | **Freshwater Chronic** | **Marine Acute** | **Marine Chronic** |
| 01106 | Aluminum (d) | 991 | --- | --- | --- |
| 01000 | Arsenic (d) | 360 | 190 | 149 | 78 |
| 01025 | Cadmium (d) | $e^{(1.128[\ln(\text{hardness})] - 1.6774}$ | $e^{(0.7852[\ln(\text{hardness})] - 3.490}$ | 45.62 | 10.02 |
| 01030 | Chromium (Tri)(d) | $e^{(0.8190)(\ln(\text{hardness})) + 3.688}$ | $e^{(0.8190)(\ln(\text{hardness})) + 1.561}$ | ---- | ---- |
| 01040 | Copper (d) | $e^{(0.9422[\ln(\text{hardness})] - 1.3844}$ | $e^{(0.8545[\ln(\text{hardness})] - 1.386}$ | 16.27 | 4.37 |
| 00722 | Cyanide (free) | 45.78 | 10.69 | 5.6 | 5.6 |
| 01049 | Lead (d) | $e^{(1.273 [\ln(\text{hardness})] - 1.460}$ | $e^{(1.273 [\ln(\text{hardness})] - 4.705}$ | 140 | 5.6 |
| 71900 | Mercury (t) | 2.4 | 1.3 | 2.1 | 1.1 |
| 01065 | Nickel (d) | $e^{(0.8460[\ln(\text{hardness})] + 3.3612}$ | $e^{(0.8460[\ln(\text{hardness})] + 1.1645}$ | 119 | 13.2 |
| 01147 | Selenium (t) | 20 | 5 | 564 | 136 |
| 01075 | Silver (d)(f) | 0.92 | ---- | 2.3 | ---- |
| 01090 | Zinc (d) | $e^{(0.8473[\ln(\text{hardness})] + 0.8604}$ | $e^{(0.8473[\ln(\text{hardness})] + 0.7614}$ | 98 | 89 |

(d)–dissolved fraction; (t)–total metal; (f)–criteria corrected to free ionic form for individual samples.

| Table 5. Criteria in Water for Specific Organic Substances for Protection of Aquatic Life (All values listed or calculated in $\mu$g/L) | | | | | |
|---|---|---|---|---|---|
| **Parameter Code** | **Parameter** | **Freshwater Acute** | **Freshwater Chronic** | **Marine Acute** | **Marine Chronic** |
| | **Pesticides** | | | | |
| 39330 | Aldrin | 3.0 | --- | 1.3 | --- |
| 39350 | Chlordane | 2.4 | 0.0043 | 0.09 | 0.004 |
| 39370 | DDT | 1.1 | 0.0010 | 0.13 | 0.0010 |
| 39780 | Dicofol (Kelthane) | 59.3 | 19.8 | ---- | ---- |
| 39380 | Dieldrin | 2.5 | 0.0019 | 0.71 | 0.0019 |
| 39388 | Endosulfan | 0.22 | 0.056 | 0.034 | 0.0087 |
| 39390 | Endrin | 0.18 | 0.0023 | 0.037 | 0.0023 |
| 39782 | gamma-Hexachlorocyclohexane | 2.0 | 0.08 | 0.16 | --- |
| 39410 | Heptachlor | 0.52 | 0.0038 | 0.053 | 0.0036 |
| 39530 | Malathion | --- | 0.01 | --- | 0.01 |
| 39480 | Methoxychlor | --- | 0.03 | --- | 0.03 |
| 39755 | Mirex | --- | 0.03 | --- | 0.03 |
| 39540 | Parathion (ethyl) | 0.065 | 0.013 | --- | --- |
| 39516 | PCBs, total | 2.0 | 0.014 | 10 | 0.03 |
| 39032 | Pentachlorophenol | $e^{[1.005(pH) - 4.830]}$ | $e^{[1.005(pH) - 5.290]}$ | 15.14 | 9.56 |
| 39400 | Toxaphene | 0.78 | 0.0002 | 0.21 | 0.0002 |
| | **Semivolatile Organic Substances** | | | | |
| 34461 | Phenanthrene | 30 | 30 | 7.7 | 4.6 |

degree of aquatic life use support is based on ranges for the percent of exceedances among toxicant measurements specified in Table 3.

Support of the aquatic life use is also based on toxic substance chronic criteria. Selection of either freshwater or marine criteria for a given station is guided by the influence of tidal activity. Chronic criteria that are pH- or hardness-dependent are computed in the manner described above for acute criteria. For each parameter at each site, the mean of all values collected during a five-year period is compared against the chronic criterion to determine aquatic life use support. If the mean exceeds the criterion, the use is not supported (Table 3).

### Ambient Water and Sediment Toxicity Tests

Aquatic life use support is also evaluated based on ambient water and sediment toxicity tests. The TNRCC, in cooperation with EPA Region 6 and the CRP, routinely collect water and sediment samples for ambient toxicity testing to assess potential toxicity in water bodies, and to evaluate the effectiveness of implemented toxicity control measures. Water bodies that have shown recurrent ambient water or sediment toxicity are candidates for more intensive special studies to confirm the occurrence of toxic conditions or nonsupport of aquatic life uses, and to determine the causes and sources of the toxicity. The EPA Region 6 Laboratory conducts standard 7-day chronic toxicity tests on ambient water and sediment elutriates using *Ceriodaphnia dubia* (water flea) and *Pimephales promelas* (fathead minnow) in freshwater. For estuarine or saline waters and sediment a standard 9-day chronic toxicity test is conducted using *Cyprinodon variegatus* (Sheepshead minnow). In addition to this type of testing, the CRP also conducts short-term acute ambient water toxicity tests. Support of the aquatic life use using ambient water and sediment toxicity data is based on the occurrence of toxicity shown in Table 3.

### Biological Monitoring

A more direct approach for assessment of the aquatic life use may be made by sampling biological communities and determining physical habitat quality. The TNRCC and Texas Parks and Wildlife Department are developing assessment methods for the use of indices of biological integrity for fish and macrobenthos communities and for indices of habitat quality in Texas. When the methods are fully developed, they will be incorporated into the screening and assessment guidance.

## *Contact Recreation Use*

Contact recreation is a use that is assigned to all water bodies except in special cases. A designation of contact recreation is not a guarantee that the water is completely free of disease-causing organisms. A fecal coliform criterion of 200 colonies/100 mL (30-day, five-sample geometric mean) is assigned in the TSWQS to protect contact recreational uses. Similarly, an *E. coli* screening level of 126 colonies/100 mL (30-day, five sample geometric mean) may also protect the contact recreation use. Most of the fecal coliform and *E. coli* data collected at SWQM fixed stations are not collected at a frequency that would allow direct comparison to the criterion or screening level. For this guidance, a fecal coliform density of 400 colonies/100 mL and an *E. coli* density of 252 colonies/100 mL are established as screening levels, and support of the contact recreation use is based on ranges for the percent of exceedances among fecal coliform/*E. coli* samples specified in Table 3. A method for determining support of the contact recreation use from more frequent (30-day, five samples) sampling is under development by the TNRCC/CRP/EPA staff.

### *Noncontact Recreation Use*

A noncontact recreation use is assigned to water bodies where ship and barge traffic makes contact recreation unsafe (Segments 1005, 1701, 2437, 2438, 2484, and 2494). The noncontact recreation use for these water bodies is protected by the same fecal coliform/*E. coli* screening levels assigned to contact recreational waters (400/100 mL and 252/100 mL, respectively). The noncontact recreation use is also assigned to certain other water bodies. For example, fecal coliform densities are elevated and recurrent in Segment 2308 of the Rio Grande near El Paso, and they are caused by pollution that cannot be reasonably controlled. A criterion of 2,000 colonies/100 mL (30-day, five-sample geometric mean) is assigned in the TSWQS to protect the noncontact recreation use in this segment.

For this guidance, a fecal coliform density of 4,000/100 mL is established as a screening level for water bodies designated for noncontact recreation. Support of the noncontact recreation use is based on ranges for the percent of exceedances among fecal coliform/*E. coli* samples specified in Table 3. Some water bodies (for example, Segments 1006 and 1007 of the Houston Ship Channel) are not assigned either contact or noncontact recreation uses due to local statutes which preclude recreational uses for safety reasons.

### *Public Water Supply Use*

In the TSWQS, 219 segments are designated for the public supply use. The use for these water bodies is protected by the TDWS. The primary drinking water criteria for organic chemicals are shown in Table 6 and criteria for inorganic chemicals are shown in Table 7. The criteria apply to finished (after treatment) drinking water that is sampled at the point of entry to distribution systems. Public water supply use support is based on exceedance of maximum contaminant levels (MCLs) for primary drinking water standards. An annual mean of samples (minimum of four) is computed and compared to the primary standards.

### *Fish Consumption Use*

A fish consumption use is protected by the designation of human health criteria in the TSWQS. For each toxicant parameter at each site, the mean of all values collected during a five-year period is computed. The means are compared to human health criteria shown in Table 8. Column A is used for freshwater bodies designated for public water supply. Column B is used for freshwaters which are not designated for public water supply, and ten times this level is used for unclassified perennial water bodies which are greater than third order streams. Column C is used for classified and unclassified marine water bodies. Selection of either freshwater (column B) or saltwater (column C) criteria for a given station is guided by the influence of tidal activity.

Water bodies were also assessed as not supporting the fish consumption use if they are listed by the Texas Department of Health (TDH) for aquatic life closures or “no-consumption” fish/shellfish advisories for the general population or a more vulnerable subpopulation (Table 3).

## *Oyster Waters Use*

The TDH has authority to administer the National Shellfish Sanitation Program for the state. This authority allows the TDH to classify shellfish growing areas and issue certificates for the interstate shipment of shellfish. The Texas Parks and Wildlife Department (TPWD) has the responsibility for enforcement of laws concerning harvesting of shellfish. The TDH annually publishes maps that depict the classification of shellfish growing areas in Texas estuaries. These maps do not provide the current status of shellfish growing areas. Status (open or closed) of shellfish growing areas is subject to change by the TDH at any time. These changes may be due to high rainfall and runoff, flooding, hurricanes and other extreme weather conditions, major spills, red tides, or the failure or inefficient operation of wastewater treatment facilities. Assessment of the oyster waters use is made using the TDH Seafood Safety Division *Classification of Shellfish Harvesting Area Maps*, dated November 1, 1997. Water bodies are classified as supporting, partially supporting, or not supporting according to the classification guidance provided in Table 3. Water bodies that are classified as prohibited for reasons other than water quality impairment are reported as not assessed. The TDH classifies shellfish growing areas into one of four categories:

### Approved Area

An approved area is a shellfish growing area approved by the TDH for growing and harvesting shellfish for direct marketing. The approved area is not subject to contamination from human and/or animal fecal matter in amounts that may present an actual or potential hazard to public health. The approved area is not contaminated with pathogenic organisms, poisonous substances,or marine biotoxins. The classification of an approved area is determined by a sanitary survey conducted by the TDH. An approved area meets criteria except under extreme conditions.

### Conditionally Approved Area

A conditionally approved area is determined by the TDH to meet approved criteria for a predictable period. Events causing the degraded water quality must be predictable and definable (river stage, wastewater treatment plant effluents, run-off conditions). A conditionally approved shellfish growing area is closed when the area does not meet the approved criteria.

### Restricted Area

Restricted areas are shellfish growing areas with threatened poor water quality classified by the TDH from which shellfish may be harvested only if permitted and subjected to a suitable and effective cleansing process. The harvested shellfish must be cleaned by depuration (moved to processing plants for cleansing in clean water) or by relaying (moved to estuarine waters in a clean area).

### Prohibited Area

A prohibited area is where there is no current sanitary survey, or where the sanitary survey or other monitoring program data indicate that fecal material, pathogenic microorganisms, poisonous or deleterious substances, marine toxins, or radionuclides may reach the area in excessive

| Table 6. Maximum Contaminant Levels for Organic Chemicals in Public Drinking Water Supplies | | | |
|---|---|---|---|
| **Contaminant** | **mg/L** | **Contaminant** | **mg/L** |
| Alachlor | 0.002 | Ethylbenzene | 0.7 |
| Aldicarb | 0.003 | Ethylene dibromide (EDB) | 0.00005 |
| Aldicarb sulfone | 0.002 | Glyphosate | 0.7 |
| Alicarb sulfoxide | 0.004 | Heptachlor | 0.0004 |
| Atrazine | 0.003 | Heptachlor epoxide | 0.0002 |
| Benzene | 0.005 | Hexachlorobenzene | 0.001 |
| Benzo(a)pyrene | 0.0002 | Hexachlorocyclopentadiene | 0.05 |
| Carbofuran | 0.04 | Lindane | 0.0002 |
| Carbon tetrachloride | 0.005 | Methoxychlor | 0.04 |
| Chlordane | 0.002 | Monochlorobenzene | 0.1 |
| 2,4-D | 0.07 | Oxamyl (vydate) | 0.2 |
| Dalapon | 0.2 | Pentachlorophenol | 0.001 |
| Dibromochloropropane (DBCP) | 0.0002 | Picloram | 0.5 |
| Di(2-ethylhexyl) adipate | 0.4 | Polychlorinated biphenyls (PCB) | 0.0005 |
| Di(2-ethylhexyl) pthalate | 0.006 | Simazine | 0.004 |
| o-Dichlorobenzene | 0.6 | Styrene | 0.1 |
| p-Dichlorobenzene | 0.075 | 2,3,7,8-TCDD (Dioxin) | 0.00000003 |
| 1,2-Dichloroethane | 0.005 | Tetrachloroethylene | 0.005 |
| 1,1-Dichloroethylene | 0.007 | Toluene | 1.0 |
| cis-1,2-Dichloroethylene | 0.07 | Toxaphene | 0.003 |
| trans-1,2-Dichloroethylene | 0.1 | 2,4,5-TP (Silvex) | 0.05 |
| Dichloromethane | 0.005 | 1,2,4-Trichlorobenzene | 0.07 |
| 1,2-Dichloropropane | 0.005 | 1,1,1-Trichloroethane | 0.2 |
| Dinoseb | 0.007 | 1,1,2-Trichloroethane | 0.005 |
| Diquat | 0.02 | Trichloroethylene | 0.005 |
| Endothall | 0.1 | Vinyl chloride | 0.002 |
| Endrin | 0.002 | Xylenes (total) | 10.0 |

| Table 7. Maximum Contaminant Levels for Inorganic Chemicals in Public Drinking Water Supplies | | |
|---|---|---|
| **Contaminant**[1] | **mg/L** | **Applicable System**[2] |
| Antimony | 0.006 | CN |
| Arsenic | 0.05 | CN |
| Asbestos | 7 million fibers/liter (longer than 10 $\mu$m) | CN |
| Barium | 2.0 | CN |
| Beryllium | 0.004 | CN |
| Cadmium | 0.005 | CN |
| Chromium | 0.1 | CN |
| Cyanide | 0.2 (as free cyanide) | CN |
| Fluoride | 4.0 | C |
| Mercury | 0.002 | CN |
| Nickel | 0.1 | CN |
| Nitrate | 10.0 (as nitrogen) | CNT |
| Nitrite | 1.0 (as nitrogen) | CNT |
| Nitrate + Nitrite (total) | 10.0 (as nitrogen) | CNT |
| Selenium | 0.05 | CN |
| Thallium | 0.002 | CN |

[1] Dissolved fraction analyzed for metals

[2] C = Community; N = Non-transient, non-community; T = Transient, non-community

## Table 8. Human Health Criteria in Water

| Parameter Code | Parameter | Column A Water and Fish $\mu$g/L | Column B Freshwater Fish Only $\mu$g/L | Column C Saltwater Fish Only $\mu$g/L |
|---|---|---|---|---|
| 39330 | Aldrin | 0.0312 | 0.0327 | 0.0218 |
| 39337 | Alpha hexachlorocyclohexane | 0.645 | 0.997 | 0.665 |
| 01000 | Arsenic (d) | 50[1] | ---- | ---- |
| 01005 | Barium (d) | 2,000[1] | ---- | ---- |
| 34030 | Benzene | 5[1] | 312 | 208 |
| 39120 | Benzidine[2] | 0.0011 | 0.0035 | 0.0023 |
| 34526 | Benzo(a)anthracene | 0.0011 | 0.0035 | 0.0023 |
| 34247 | Benzo(a)pyrene | 0.0261 | 0.0265 | ---- |
| 39338 | Beta hexachlorocyclohexane | 2.26 | 3.49 | 2.33 |
| 34268 | Bis(chloromethyl)ether | 0.0207 | 1.59 | 1.06 |
| 01025 | Cadmium (d) | 5[1] | ---- | ---- |
| 32102 | Carbon tetrachloride | 5[1] | 182 | 121 |
| 39350 | Chlordane[3] | 0.0210 | 0.0213 | 0.0213 |
| 34301 | Chlorobenzene | 1,305 | 4,947 | 3,298 |
| 32106 | Chloroform | ---- | 12,130 | 8,087 |
| 01030 | Chromium (d) | 100[1] | ---- | ---- |
| 34320 | Chrysene | 0.0261 | 0.0265 | ---- |
| 79778 | Cresols | 4,049 | 46,667 | 31,111 |
| 00720 | Cyanide (free)[4] | 200[1] | ---- | ---- |
| 39360 | 4',4'-DDD | 0.297 | 0.299 | 0.199 |
| 39365 | 4',4'-DDE | 0.0544 | 0.0545 | 0.0363 |
| 39370 | 4',4'-DDT | 0.0527 | 0.0528 | 0.0352 |
| 39730 | 2,4-D | 70[1] | ---- | ---- |
| ------ | Danitol | 0.709 | 0.721 | 0.481 |
| 34306 | Chlorodibromomethane | 100[1] | 15,354 | 10,236 |
| 77651 | 1,2,-Dibromoethane | 0.0518 | 1.15 | 0.769 |
| 39380 | Dieldrin[2] | 0.0012 | 0.0012 | 0.0008 |

# Table 8. Human Health Criteria in Water

| Parameter Code | Parameter | Column A<br>Water and Fish<br>$\mu$g/L | Column B<br>Freshwater Fish Only<br>$\mu$g/L | Column C<br>Saltwater Fish Only<br>$\mu$g/L |
|---|---|---|---|---|
| 34571 | *p*-Dichlorobenzene (1,4 Dichlorobenzene) | 75[1] | ---- | ---- |
| 34531 | 1,2-Dichloroethane | 5[1] | 1,794 | 1,196 |
| 34501 | 1,1-Dichloroethylene | 7[1] | 87.4 | 58.3 |
| 39780 | Dicofol | 0.215 | 0.217 | 0.144 |
| ------ | Dioxins/Furans (TCDD Equivalents)[2]<br><br>Compound — Equivalency Factors<br><br>2,3,7,8 TCDD — 1.0<br>1,2,3,7,8 PeCDD — 0.5<br>2,3,7,8 HxCDD's — 0.1<br>2,3,7,8 TCDF — 0.1<br>1,2,3,7,8 PeCDF — 0.05<br>2,3,4,7,8 PeCDF — 0.5<br>2,3,7,8 HxCDF's — 0.1 | 0.0000010 | 0.0000010 | 0.0000007 |
| 39390 | Endrin | 2[1] | ---- | ---- |
| 00951 | Fluoride (mg/L) | 4.0[1] | ---- | ---- |
| 39782 | Gamma hexachlorocyclohexane (Lindane) | 0.2[1] | 16.0 | 10.7 |
| 39410 | Heptachlor[2] | 0.0177 | 0.0181 | 0.0120 |
| 39420 | Heptachlor epoxide | 0.2[1] | 7.39 | 4.92 |
| 39700 | Hexachlorobenzene | 0.0129 | 0.0129 | 0.0086 |
| 34391 | Hexachlorobutadiene | 9.34 | 11.2 | 7.48 |
| 34396 | Hexachloroethane | 84.4 | 94.1 | 62.7 |
| 88813 | Hexachlorophene | 0.0531 | 0.0532 | 0.0355 |
| 01049 | Lead (d) | 5 | 25 | 3.85 |
| 71900 | Mercury[4] | 0.0122 | 0.0122 | 0.0250 |
| 39480 | Methoxychlor | 40[1] | ---- | ---- |
| 81595 | Methyl ethyl ketone | 4,411 | 886,667 | 591,111 |
| 39755 | Mirex | 0.0171 | 0.0189 | 0.0126 |

| Table 8. Human Health Criteria in Water | | | | |
|---|---|---|---|---|
| Parameter Code | Parameter | Column A | Column B | Column C |
| | | Water and Fish $\mu$g/L | Freshwater Fish Only $\mu$g/L | Saltwater Fish Only $\mu$g/L |
| 00620 | Nitrate-nitrogen (mg/L) | 10.0[1] | ---- | ---- |
| 34447 | Nitrobenzene | 41.8 | 721 | 481 |
| 73611 | *N*-Nitrosodiethylamine | 0.0382 | 7.68 | 5.12 |
| 73609 | *N*-Nitroso-di-*n*-Butylamine | 1.84 | 13.5 | 8.98 |
| 39516 | PCBs (Polychlorinated Biphenyls)[5] | 0.0013 | 0.0013 | 0.0009 |
| 77793 | Pentachlorobenzene | 1.09 | 1.11 | 0.739 |
| 39032 | Pentachlorphenol | 129 | 136 | 90.5 |
| 77045 | Pyridine | 88.1 | 13,333 | 8,889 |
| 01147 | Selenium (d) | 50[1] | ---- | ---- |
| 77734 | 1,2,4,5-Tetrachlorobenzene | 1.43 | 1.52 | 1.01 |
| 34475 | Tetrachloroethylene | 5[1] | 1832 | 1221 |
| 39400 | Toxaphene[2] | 0.0440 | 0.0445 | 0.0297 |
| 39760 | 2,4,5-TP (Silvex) | 50[1] | ---- | ---- |
| 77687 | 2,4,5-Trichlorophenol | 2,767 | 4,021 | 2,681 |
| 39180 | Trichloroethylene | 5[1] | ---- | ---- |
| 34506 | 1,1,1-Trichloroethane | 200[1] | ---- | ---- |
| 82080<br><br>32101<br>34306<br>32104<br>32106 | TTHM (Sum of total trihalomethanes)<br><br>bromodichloromethane<br>dibromochloromethane<br>tribromomethane (bromoform)<br>trichloromethane (chloroform) | 100[1] | ---- | ---- |
| 39175 | Vinyl Chloride | 2[1] | 94.5 | 63.0 |

[1] Based on Maximum Contaminant Levels (MCLs) specified in 30 TAC §290 (relating to Water Hygiene).
[2] Calculations based on measured bioconcentration factors with no lipid correction factor applied.
[3] Calculations based on USEPA action levels in fish tissue.
[4] Compliance will be determined using the analytical method for cyanide amenable to chlorination or weak-acid dissociable cyanide.
[5] Calculated as the sum of seven PCB congeners: 1016, 1221, 1232, 1242, 1254, 1248, and 1260.
(d) Indicates the criteria are for the dissolved fraction in water. All other criteria are for total recoverable concentrations.

concentrations. The taking of shellfish for any human food purposes from such areas is prohibited. Shellfish from a prohibited area may not be taken for cleaning by depuration or relaying.

### *Threatened Water Bodies*

As outlined in 40 CFR section 130.2(j) and in EPA guidance, states are required to identify water-quality limited segments "where it is known that water quality does not meet applicable water quality standards, and/or is *not expected to meet* applicable water quality standards." Those water bodies *not expected to meet* applicable water quality standards are considered "threatened." As a result, water bodies that are supporting their designated uses and have no exceedances of criteria may be categorized as threatened. A water body is considered threatened if:

(1) Information provided by TNRCC's Water Utilities Division indicates detections in treated water of organic chemicals that are above 50 percent of the maximum contaminant level (MCL) for primary drinking water standards. For water utility systems with nine or fewer samples, two or more must exceed 50 percent of the MCL for the associated water body to be considered threatened; for systems with more than nine samples, 11 percent or more of the samples must exceed 50 percent of the MCL. For a water body to be classified as threatened, individual organic substances may actually exceed the MCL (i.e., values are not restricted to the range between 50 percent of the MCL and the MCL). A water body is considered nonsupportive of the water supply use when the annual average (minimum of four samples) for organic substances exceeds the MCL (see Methodology for Screening and Assessing Use Support). These chemicals must also represent possible source water contaminants from a surface water source.

(2) Human health (toxicants in water) criteria for consumption of fish are exceeded and available fish/shellfish tissue data have been evaluated by the TDH, through a risk assessment, indicating fish/shellfish are safe for consumption; or

(3) Other reliable, available data and information indicate an apparent declining water quality trend (i.e., water quality conditions have deteriorated, compared to earlier assessments, but the waters still support uses). The information must demonstrate that in the next two to four years, uses or criteria will not be supported unless additional pollution controls are implemented. Threatened water bodies, in this context, are those where specific pollutants are identified and documented as probable contributors to nonsupport of uses and/or criteria in the future.

For future 305(b) assessments, the TNRCC/CRP will continue to identify additional sources of available data and information which could be used to determine whether a water body's uses are threatened. Links to other TNRCC program areas (e.g., source water protection) will be strengthened, and greater use will be made of data and information from other agencies (Texas State Soil and Water Conservation Board, Texas Water Development Board, Texas Parks and Wildlife, Texas Department of Health, and federal agencies).

# Methodology for Screening and Assessing Water Quality Concerns

Water quality criteria for nutrients and chlorophyll *a* in water have not been developed for Texas by the TNRCC. The EPA is developing procedures to generate criteria for selected toxicants in sediment; however, they have targeted only a few parameters, and the criteria have not been adopted. Criteria for toxicants in fish tissue have also not been developed. In the absence of established criteria, the TNRCC/CRP developed screening levels for these three water quality indicator groups in order to identify areas where elevated levels may constitute cause for concern. The screening levels do not represent adopted state criteria and should not be considered as such. Waters are classified as having no concerns, potential concerns, or concerns based on comparisons of water quality data to screening levels and application of rating criteria (Table 9). The geographical extent of concern within each water body follows the same basis as that for determining use support. Waterbodies with concerns and potential concerns are candidates for further evaluation to determine if the narrative criteria in the TSWQS are violated.

## *Nutrients and Chlorophyll a Screening Levels*

The screening levels listed for nutrients and chlorophyll *a* in Table 9 were statistically derived from long-term SWQM monitoring data (September 1, 1985-August 31, 1995). The 85th percentile values for each parameter in freshwater streams, tidal streams, reservoirs, and estuaries are shown in Table 9. Determination of the level of concern for each water body is determined by ranges for the percent of exceedances among nutrient and chlorophyll *a* measurements shown in Table 9.

## *Sediment Quality Screening Levels*

Screening levels for toxicants in sediment were statistically derived by the TNRCC from long-term SWQM data (September 1985-August 1995). The SWQM Database was first screened for specific metals and organic substances with at least 25 observations statewide within four types of water bodies: freshwater streams, reservoirs, tidally influenced streams, and estuaries. This screen resulted in the selection of 12 specific metals and 131 specific organic substances (38 pesticides, 30 volatile organics, and 63 semivolatile organics). The 85th percentile values for each parameter in the four different water body types are shown in Tables 10 and 11. Determination of the level of concern for each water body is determined by ranges for the percent of exceedances among sediment levels as shown in Table 9.

## *Fish Tissue Screening Levels*

The screening levels for concentrations of toxicants in fish tissue were developed from human health criteria in the TSWQS. TDH screening levels were used for arsenic, cadmium, chromium, copper, and selenium. TDH screening levels for these metals are slightly lower than the levels used to issue consumption advisories.

The human health criteria in the standards are expressed as allowable concentrations of toxicants in surface waters. This allowable concentration in water is determined by calculating an allowable concentration in fish tissue and then dividing by the bioaccumulation factor for that particular toxicant. The formulas for deriving human health criteria were developed by the EPA.

The following procedures and assumptions were used to calculate allowable fish tissue concentrations.

For noncarcinogens: $$RTC = \frac{RFD \times WT}{FC}$$

For carcinogens: $$RTC = \frac{(RL)/q1^*) \times WT}{FC}$$

Definitions:

RTC = Reference Tissue Concentration (as mg of toxicant/kg of fish tissue), which is the allowable concentration of the toxicant in edible fish tissue.

RFD = Reference Dose (as mg of toxicant/kg human body weight/day), which is the allowable exposure of the toxicant (through ingestion of fish) on a daily basis. Reference doses were obtained from the USEPA Integrated Risk Information System (IRIS), which is an updated computer database for assessing human health effects of toxicants.

WT = Weight of an average human adult (70 kg).

FC = Average amount of fish consumed per person (as kg of fish per day). This amount was 0.010 kg/day for freshwaters, and 0.015 kg/day for marine waters.

RL = Risk level for carcinogens (= 1/100,000). This is the potential risk of cancer for each person exposed at the allowable dose over a 70-year period.

q1* = Cancer potency slope factor (as the reciprocal of mg/kg/day). This factor is the relationship (slope) of cancer risk and dose, and it is indicative of a chemical's potential to cause cancer in humans. Values for q1* are extrapolated from data on cancer rates in laboratory animals that are exposed at very high dose rates. The q1* values were obtained from the EPA IRIS database.

Additional procedures and assumptions:

(1) The ratio of average body weights was used to convert data on laboratory test animals to human scale. When the weight of test animals was not specified, the average weights were considered to be 0.35 kg for rats, 0.03 kg for mice, and 70 kg for humans.

(2) If the concentration of a substance in fish tissue used for these calculations was greater than the applicable U.S. Food and Drug Administration Action Level for edible fish and shellfish tissue, then the acceptable concentration in fish tissue was lowered to the Action Level for calculation of criteria.

Using this approach, screening levels were developed for two metals and 31 organic substances (Tables 12 and 13). Screening levels developed by the TDH are used for the other five metals. Five years of data are screened using these levels. Support of the fish consumption use is based on ranges for the percent of exceedances among toxicants specified in Table 9.

### *Public Water Supply Concerns*

All finished water samples (minimum of four) collected over the most recent five-year period are used to compute a mean to compare to the secondary standards in the TDWS. Secondary MCLs that are evaluated are limited to chloride (300 mg/L), sulfate (300 mg/L), and total dissolved solids (1,000 mg/L). These criteria were developed to ensure that water supply utilities can treat and deliver water that is free of objectionable tastes and odor, for reasonable costs, to consumers.

Public water supply concerns are also evaluated in surface water bodies that are designated for the public water supply use in the TSWQS by comparing chloride, sulfate, and total dissolved solids data to the secondary drinking water criteria. Samples (minimum of nine) from all sites within a water body are averaged for the comparisons.

## Table 9. Framework for Identifying Water Quality Concerns for Evaluating Pollution Impacts

| Category | Parameter/Screening Levels | No Concern | Potential Concern | Concern |
|---|---|---|---|---|
| Nutrients<br>Freshwater<br>Streams | $NH_3$-N - 0.3 mg/L<br>$NO_2$-N +<br>$NO_3$-N - 3.1 mg/L<br>OP - 1.4 mg/L<br>TP - 1.6 mg/L<br>Chl *a* - 16.5 ug/L | For any one parameter, 0-10% of values exceed the screening level. | For any one parameter, 11-25% of values exceed the screening level. | For any one parameter, more than 25% of values exceed the screening level. |
| Reservoirs | $NH_3$-N - 0.13 mg/L<br>$NO_2$-N +<br>$NO_3$-N - 0.41 mg/L<br>OP - 0.1 mg/L<br>TP - 0.2 mg/L<br>Chl *a* - 20.0 ug/L | | | |
| Saltwater<br>Tidal Streams | $NH_3$-N - 0.72 mg/L<br>$NO_2$-N +<br>$NO_3$-N - 1.86 mg/L<br>OP - 1.25 mg/L<br>TP - 1.72 mg/L<br>Chl *a* - 23.0 ug/L | For any one parameter, 0-10% of values exceed the screening level. | For any one parameter, 11-25% of values exceed the screening level. | For any one parameter, more than 25% of values exceed the screening level. |
| Estuaries | $NH_3$-N - 0.15 mg/L<br>$NO_2$-N +<br>$NO_3$-N - 0.3 mg/L<br>OP - 0.24 mg/L<br>TP - 0.3 mg/L<br>Chl *a* - 15.2 ug/L | For any one parameter, 0-10% of values exceed the screening level. | For any one parameter, 11-25% of values exceed the screening level. | For any one parameter, more than 25% of values exceed the screening level. |

| Table 9. Framework for Identifying Water Quality Concerns for Evaluating Pollution Impacts | | | | |
|---|---|---|---|---|
| **Category** | **Parameter/Screening Levels** | **No Concern** | **Potential Concern** | **Concern** |
| Toxicants in Sediment | 12 Metals and 131 Organic Substances (85th Percentiles; see Tables 10 and 11) | For any one parameter, 0-10% of values exceed the screening level. | For any one parameter, 11-25% of values exceed the screening level. | For any one parameter, more than 25% of values exceed the screening level. |
| Toxicants in Fish Tissue | 7 Metals and 31 Organic Substances (85th Percentiles; see Tables 12 and 13) | For any one parameter, 0-10% of values exceed the screening level. | For any one parameter, 11-25% of values exceed the screening level. | For any one parameter, more than 25% of values exceed the screening level. |
| Public Water Supply | Finished Water Secondary Drinking Water Standards | Mean does not exceed criteria. | Partial support is not assessed. | Mean exceeds criteria. |
| | Surface Water Secondary Drinking Water Standards | Mean does not exceed criteria. | Partial support is not assessed. | Mean exceeds criteria. |

| Table 10. Screening Levels for Metals in Sediment (All values in mg/kg dry weight) | | | | | |
|---|---|---|---|---|---|
| **Parameter Code** | **Parameter** | **Type of Water Body** | | | |
| | | **Freshwater Stream** | **Tidal Stream** | **Reservoir** | **Estuary** |
| 01003 | Arsenic | 6.9 | 5.7 | 17.6 | 6.9 |
| 01008 | Barium | 189.0 | 290.0 | 287.0 | 397.0 |
| 01028 | Cadmium | 1.024 | 1.000 | 2.000 | 0.830 |
| 01029 | Chromium | 20.0 | 45.0 | 34.0 | 29.0 |
| 01043 | Copper | 19.2 | 38.5 | 33.0 | 24.0 |
| 01052 | Lead | 40.0 | 96.0 | 61.5 | 32.0 |
| 01053 | Manganese | 490.0 | 490.0 | 1210.0 | 630.0 |
| 71921 | Mercury | 0.115 | 0.240 | 0.160 | 0.324 |
| 01068 | Nickel | 15.0 | 20.0 | 25.2 | 18.0 |
| 01148 | Selenium | 1.30 | 1.30 | 1.73 | 1.70 |
| 01078 | Silver | 1.6 | 1.6 | 1.6 | 1.6 |
| 01093 | Zinc | 83.0 | 191.0 | 120.0 | 110.0 |

| Table 11. Screening Levels for Organic Substances in Sediment (All values in $\mu$g/kg dry weight) | | | | | |
|---|---|---|---|---|---|
| | | Type of Water Body | | | |
| Parameter Code | Parameter | Freshwater Stream | Tidal Stream | Reservoir | Estuary |
| **Pesticides** | | | | | |
| 39731 | 2,4-D | 33.0 | 33.5 | 25.0 | 47.0 |
| 39741 | 2,4,5-T | 7.0 | 6.7 | 5.0 | 9.0 |
| 39761 | 2,4,5-TP (silvex) | 5.5 | 5.5 | 5.0 | 9.5 |
| 39333 | Aldrin | 0.63 | 0.9 | 0.56 | 0.8 |
| 39076 | *alpha*-Hexachlorocyclohexane | 0.80 | 1.00 | 1.25 | 0.95 |
| 46290 | *beta*-Hexachlorocyclohexane | 4.8 | 8.8 | ---- | 2.01 |
| 46292 | *delta*-Hexachlorocyclohexane | 4.8 | 6.1 | ---- | 1.5 |
| 39783 | *gamma*-Hexachlorocyclohexane (lindane) | 0.65 | 1.05 | 1.25 | 0.65 |
| 39351 | Chlordane, total | 7.5 | 17.8 | 7.5 | 6.0 |
| 81404 | Chloropyrifos (dursban) | 5.0 | ---- | ---- | 5.0 |
| 39363 | DDD, total | 3.0 | 3.0 | 3.8 | 3.0 |
| 39365 | DDE, total | 7.55 | 2.2 | 5.0 | 1.5 |
| 39373 | DDT, total | 4.0 | 4.02 | 3.0 | 3.0 |
| 82400 | Demeton | 100.0 | ---- | ---- | ---- |
| 39571 | Diazinon | 3.3 | 5.0 | 6.86 | 3.55 |
| 79799 | Dicofol (kelthane) | 25.0 | ---- | ---- | 25.0 |
| 39383 | Dieldrin | 1.0 | 1.45 | 1.0 | 1.0 |
| 39389 | Endosulfan | 6.05 | 9.3 | 14.5 | 3.0 |
| 34354 | Endosulfan sulfate | 4.05 | 22.10 | 7.50 | 3.75 |
| 39393 | Endrin | 1.5 | 1.5 | 1.5 | 1.5 |
| 39581 | Guthion | 25.0 | ---- | ---- | 53.0 |
| 39413 | Heptachlor | 0.5 | 0.65 | 0.75 | 0.45 |
| 39423 | Heptachlor epoxide | 0.65 | 1.0 | 0.73 | 0.9 |
| 39701 | Hexachlorobenzene | 0.5 | 1.77 | 0.91 | 0.5 |
| 39531 | Malathion | 2.9 | 3.35 | 2.50 | 3.68 |

| Table 11. Screening Levels for Organic Substances in Sediment<br>(All values in $\mu$g/kg dry weight) | | | | | |
|---|---|---|---|---|---|
| Parameter Code | Parameter | Type of Water Body | | | |
| | | Freshwater Stream | Tidal Stream | Reservoir | Estuary |
| 39481 | Methoxychlor | 5.0 | 5.0 | 5.0 | 5.0 |
| 79800 | Mirex | 2.0 | ---- | ---- | 3.85 |
| 39541 | Parathion | 3.0 | 1.70 | 1.6 | 2.00 |
| 39514 | PCB-1016 | 25.0 | 36.5 | 108.0 | 30.0 |
| 39491 | PCB-1221 | 25.0 | 36.5 | 199.5 | 35.0 |
| 39495 | PCB-1232 | 25.0 | 36.5 | 108.0 | 30.0 |
| 39499 | PCB-1242 | 25.0 | 36.5 | 199.5 | 30.0 |
| 39503 | PCB-1248 | 25.0 | 36.5 | 108.0 | 35.0 |
| 39507 | PCB-1254 | 25.0 | 36.5 | 108.0 | 30.0 |
| 39511 | PCB-1260 | 25.0 | 72.0 | 108.0 | 35.0 |
| 39519 | PCB, total | 10.0 | 31.0 | 10.0 | 10.0 |
| 39118 | Pentachlorobenzene | 0.55 | 0.9 | 1.25 | 0.6 |
| 39403 | Toxaphene | 29.0 | 33.5 | 25.0 | 44.5 |
| **Volatile Organic Substances** | | | | | |
| 34218 | Acrylonitrile | 1250.0 | 2250.0 | ---- | 2250.0 |
| 34237 | Benzene | 300.0 | 450.0 | ---- | 400.0 |
| 34290 | Bromoform | 300.0 | 500.0 | ---- | 400.0 |
| 88802 | Bromomethane | 500.0 | 1100.0 | ---- | 1000.0 |
| 34299 | Carbon tetrachloride | 300.0 | 450.0 | ---- | 400.0 |
| 34304 | Chlorobenzene | 300.0 | 500.0 | ---- | 400.0 |
| 34309 | Chlorodibromomethane | 300.0 | 450.0 | ---- | 400.0 |
| 34314 | Chloroethane | 600.0 | 1100.0 | ---- | 1000.0 |
| 34579 | 2-Chloroethyl vinyl ether | 1850.0 | 4350.0 | ---- | 3910.0 |
| 34318 | Chloroform | 390.0 | 450.0 | ---- | 400.0 |
| 88835 | Chloromethane | 500.0 | 1100.0 | ---- | 1000.0 |
| 34330 | Dichlorobromomethane | 250.0 | 450.0 | ---- | 400.0 |

**Table 11. Screening Levels for Organic Substances in Sediment**
(All values in $\mu$g/kg dry weight)

| Parameter Code | Parameter | Type of Water Body | | | |
|---|---|---|---|---|---|
| | | Freshwater Stream | Tidal Stream | Reservoir | Estuary |
| 88805 | 1,2-Dibromomethane | 235.0 | ---- | ---- | 450.0 |
| 34499 | 1,1-Dichloroethane | 300.0 | 450.0 | ---- | 400.0 |
| 34534 | 1,2-Dichloroethane | 300.0 | 450.0 | ---- | 400.0 |
| 34504 | 1,1-Dichloroethylene | 250.0 | 500.0 | ---- | 450.0 |
| 34549 | 1,2-trans-Dichloroethylene | 285.0 | 450.0 | ---- | 450.0 |
| 34544 | 1,2-Dichloropropane | 300.0 | 450.0 | ---- | 400.0 |
| 34702 | cis-1,3-Dichloropropylene | 285.0 | 450.0 | ---- | 400.0 |
| 34697 | trans-1,3-Dichloropropylene | 285.0 | 450.0 | ---- | 400.0 |
| 34374 | Ethylbenzene | 300.0 | 500.0 | ---- | 400.0 |
| 34426 | Methylene chloride | 435.0 | 550.0 | ---- | 465.0 |
| 34478 | Tetrachloroethylene | 285.0 | 550.0 | ---- | 400.0 |
| 34519 | 1,1,2,2-tetrachloroethane | 300.0 | 500.0 | ---- | 400.0 |
| 34483 | Toluene | 400.0 | 500.0 | ---- | 400.0 |
| 34509 | 1,1,1-trichloroethane | 285.0 | 450.0 | ---- | 400.0 |
| 34514 | 1,1,2-trichloroethane | 285.0 | 435.0 | ---- | 400.0 |
| 34487 | Trichloroethylene | 250.0 | 500.0 | ---- | 400.0 |
| 45510 | Xylenes, total | 700.0 | 1300.0 | ---- | 1150.0 |
| 34495 | Vinyl chloride | 600.0 | 1100.0 | ---- | 1000.0 |
| **Semivolatile Organic Substances** | | | | | |
| 34208 | Acenaphthene | 670.0 | 1000.0 | ---- | 750.0 |
| 34203 | Acenaphthylene | 670.0 | 1000.0 | ---- | 750.0 |
| 34223 | Anthracene | 660.0 | 1000.0 | ---- | 800.0 |
| 39121 | Benzidine | 1150.0 | 1150.0 | ---- | 900.0 |
| 34529 | Benzo(a)anthracene | 670.0 | 1000.0 | ---- | 750.0 |
| 34250 | Benzo(a)pyrene | 670.0 | 1150.0 | ---- | 750.0 |
| 34233 | Benzo(b)fluoranthene | 670.0 | 1500.0 | ---- | 810.0 |

| Table 11. Screening Levels for Organic Substances in Sediment (All values in $\mu$g/kg dry weight) | | | | | |
|---|---|---|---|---|---|
| | | Type of Water Body | | | |
| Parameter Code | Parameter | Freshwater Stream | Tidal Stream | Reservoir | Estuary |
| 34524 | Benzo(ghi)perylene | 670.0 | 1000.0 | ---- | 750.0 |
| 34245 | Benzo(k)fluoranthene | 670.0 | 1150.0 | ---- | 750.0 |
| 34639 | 4-Bromophenyl phenyl ether | 670.0 | 1000.0 | ---- | 750.0 |
| 88811 | Cresols, total | 670.0 | ---- | ---- | 900.0 |
| 34281 | Bis(2-chloroethoxy)methane | 670.0 | 1000.0 | ---- | 750.0 |
| 34276 | Bis(2-chloroethyl)ether | 670.0 | 1000.0 | ---- | 750.0 |
| 34286 | Bis(2-chloroisopropyl)ether | 670.0 | 1000.0 | ---- | 750.0 |
| 34584 | 2-Chloronaphthalene | 670.0 | 1000.0 | ---- | 750.0 |
| 34589 | 2-Chlorophenol | 1150.0 | 1950.0 | ---- | 1500.0 |
| 34644 | 4-Chlorophenyl phenyl ether | 660.0 | 1000.0 | ---- | 750.0 |
| 34323 | Chrysene | 670.0 | 1200.0 | ---- | 750.0 |
| 34559 | Dibenz(a,h)anthracene | 670.0 | 1000.0 | ---- | 750.0 |
| 34295 | n-Butyl benzyl phthalate | 683.0 | 1000.0 | ---- | 750.0 |
| 39112 | Di-n-butyl phthalate | 700.0 | 850.0 | 1045.0 | 750.0 |
| 34599 | Di-n-octyl phthalate | 670.0 | 1000.0 | ---- | 750.0 |
| 34539 | 1,2-Dichlorobenzene | 500.0 | 1000.0 | ---- | 750.0 |
| 34569 | 1,3-Dichlorobenzene | 500.0 | 1000.0 | ---- | 750.0 |
| 34574 | 1,4-Dichlorobenzene | 543.0 | 1000.0 | ---- | 715.0 |
| 34634 | 3,3'-Dichlorobenzidine | 1100.0 | 1000.0 | ---- | 750.0 |
| 34604 | 2,4-Dichlorophenol | 1207.5 | 1950.0 | ---- | 1500.0 |
| 34339 | Diethyl phthalate | 670.0 | 1000.0 | ---- | 750.0 |
| 34609 | 2,4-Dimethylphenol | 1150.0 | 1950.0 | ---- | 1500.0 |
| 34344 | Dimethyl phthalate | 660.0 | 1150.0 | ---- | 750.0 |
| 34660 | 4,6-Dinitro-o-cresol | 2050.0 | 3850.0 | ---- | 3000.0 |
| 34619 | 2,4-Dinitrophenol | 2475.0 | 3850.0 | ---- | 3000.0 |
| 34614 | 2,4-Dinitrotoluene | 670.0 | 1000.0 | ---- | 750.0 |
| 34629 | 2,6-Dinitrotoluene | 670.0 | 1000.0 | ---- | 750.0 |

| Table 11. Screening Levels for Organic Substances in Sediment (All values in $\mu$g/kg dry weight) | | | | | |
|---|---|---|---|---|---|
| | | Type of Water Body | | | |
| Parameter Code | Parameter | Freshwater Stream | Tidal Stream | Reservoir | Estuary |
| 34349 | 1,2-Diphenylhydrazine | 683.0 | 1000.0 | ---- | 900.0 |
| 39102 | Bis(2-Ethylhexyl)phthalate | 750.0 | 1170.0 | 1000.0 | 750.0 |
| 34379 | Fluoranthene | 670.0 | 1709.0 | ---- | 750.0 |
| 34384 | Fluorene | 660.0 | 1000.0 | ---- | 750.0 |
| 39705 | Hexachlorobutadiene | 500.0 | 1000.0 | ---- | 750.0 |
| 34389 | Hexachlorocyclopentadiene | 660.0 | 1150.0 | ---- | 750.0 |
| 34399 | Hexachloroethane | 660.0 | 1000.0 | ---- | 750.0 |
| 73120 | Hexachlorophene | 450.0 | ---- | ---- | 885.0 |
| 34406 | Indeno(1,2,3-cd)pyrene | 670.0 | 1000.0 | ---- | 750.0 |
| 34411 | Isophorone | 670.0 | 1000.0 | ---- | 750.0 |
| 34455 | 3-Methyl-4-chlorophenol | 975.0 | 1950.0 | ---- | 1500.0 |
| 34445 | Naphthalene | 500.0 | 1000.0 | ---- | 750.0 |
| 34450 | Nitrobenzene | 670.0 | 1000.0 | ---- | 750.0 |
| 34594 | 2-Nitrophenol | 1150.0 | 1950.0 | ---- | 1500.0 |
| 34649 | 4-Nitrophenol | 2475.0 | 3850.0 | ---- | 3000.0 |
| 88817 | N-Nitrosodiethylamine | 450.0 | ---- | ---- | 750.0 |
| 34441 | N-Nitrosodimethylamine | 750.0 | 1150.0 | ---- | 750.0 |
| 73159 | N-Nitrosodi-n-butylamine | 450.0 | ---- | ---- | 750.0 |
| 34431 | N-Nitrosodi-n-propylamine | 670.0 | 1000.0 | ---- | 750.0 |
| 34436 | N-Nitrosodiphenylamine | 670.0 | 1000.0 | ---- | 750.0 |
| 39061 | Pentachlorophenol | 1450.0 | 1650.0 | 2.5 | 1800.0 |
| 34464 | Phenanthrene | 660.0 | 1000.0 | ---- | 750.0 |
| 34695 | Phenol | 1150.0 | 1950.0 | ---- | 1500.0 |
| 34472 | Pyrene | 670.0 | 1700.0 | ---- | 880.0 |
| 88823 | Pyridine | 450.0 | ---- | ---- | 750.0 |
| 88826 | 1,2,4,5-tetrachlorobenzene | 450.0 | ---- | ---- | 750.0 |
| 34554 | 1,2,4-trichlorobenzene | 450.0 | 1000.0 | ---- | 750.0 |

**Table 11. Screening Levels for Organic Substances in Sediment**
(All values in μg/kg dry weight)

| Parameter Code | Parameter | Type of Water Body: Freshwater Stream | Tidal Stream | Reservoir | Estuary |
|---|---|---|---|---|---|
| 78401 | 2,4,5-trichlorophenol | 1200.0 | 1950.0 | ---- | 1650.0 |
| 34624 | 2,4,6-trichlorophenol | 1150.0 | 1950.0 | ---- | 1500.0 |

**Table 12. Screening Levels for Metals in Tissue**
(All values listed as mg/kg Wet Weight)

| Parameter Code | Parameter | Freshwater | Saltwater |
|---|---|---|---|
| 01004 | Arsenic * | 3.0 | 3.0 |
| 71940 | Cadmium * | 0.5 | 0.5 |
| 71939 | Chromium * | 100.0 | 100.0 |
| 71937 | Copper * | 40.0 | 40.0 |
| 71936 | Lead | 1.25 | 8.333 |
| 71930 | Mercury | 1.0 | 1.0 |
| 01149 | Selenium * | 2.0 | 2.0 |

* Texas Department of Health screening level

| Table 13. Screening Levels for Organic Substances in Tissue<br>(All Values in mg/kg Wet Weight) | | | |
|---|---|---|---|
| **Parameter Code** | **Parameter** | **Freshwater** | **Saltwater** |
| **Pesticides** | | | |
| 34680 | Aldrin | 0.1360 | 0.0904 |
| 39074 | *alpha*-Hexachlorocyclohexane | 0.3660 | 0.2440 |
| 34258 | *beta*-Hexachlorocyclohexane | 1.2810 | 0.8540 |
| 39075 | *gamma*-Hexachlorocyclohexane (lindane) | 5.8520 | 3.9010 |
| 34682 | Chlordane | 0.3000 | 0.3000 |
| 81897 | DDD | 9.6060 | 6.4040 |
| 81896 | DDE | 5.4500 | 3.6340 |
| 39376 | DDT | 5.2770 | 3.5180 |
| 85684 | Dicofol (Kelthane) | 5.239 | 3.493 |
| 39406 | Dieldrin | 0.0570 | 0.0379 |
| 34687 | Heptachlor | 0.2020 | 0.1350 |
| 34686 | Heptachlor epoxide | 0.2530 | 0.1690 |
| 34688 | Hexachlorobenzene | 0.6090 | 0.4060 |
| 81645 | Mirex | 0.0355 | 0.0236 |
| 39515 | PCBs | 0.1340 | 0.0891 |
| 85679 | Pentachlorobenzene | 14.1870 | 9.4580 |
| 34691 | Toxaphene | 0.8270 | 0.5520 |
| **Semivolatile Organic Substances** | | | |
| 34241 | Benzidine | 0.0003 | 0.0002 |
| 34530 | Benzo(a)anthracene | 0.3150 | ---- |
| 34251 | Benzo(a)pyrene | 0.3150 | ---- |
| **Parameter Code** | **Parameter** | **Freshwater** | **Saltwater** |
| 88812 | Cresols, total | 886.667 | 591.111 |
| 34324 | Chrysene | 0.3150 | ---- |

| Table 13. Screening Levels for Organic Substances in Tissue (All Values in mg/kg Wet Weight) | | | |
|---|---|---|---|
| **Parameter Code** | **Parameter** | **Freshwater** | **Saltwater** |
| 34395 | Hexachlorobutadiene | 11.140 | 7.427 |
| 34400 | Hexachloroethane | 164.6670 | 109.7780 |
| 88815 | Hexachlorophene | 5.3200 | 3.5470 |
| 34451 | Nitrobenzene | 8.8670 | 5.9110 |
| 88818 | N-Nitrosodiethylamine | 0.0077 | 0.0051 |
| 88821 | N-Nitrosodi-n-butylamine | 0.4270 | 0.2850 |
| 39060 | Pentachlorophenol | 532.0000 | 354.6670 |
| 88824 | Pyridine | 17.7330 | 11.8220 |
| 88827 | 1,2,4,5-Tetrachlorobenzene | 5.3200 | 3.5470 |

## Methodology for Screening and Assessing Water Temperature, pH, Chloride, Sulfate, Total Dissolved Solids, and Enterococcus Criteria

Water quality criteria for several constituents are established in the TSWQS to safeguard general water quality, rather than for protection of a specific use. Water temperature, pH, chloride, sulfate, total dissolved solids, and enterococcus bacteria are the parameters in this grouping. Enterococcus criteria are assigned only to two Houston Ship Channel segments. Specific criteria for each of the other parameters are assigned to each classified segment in the TSWQS based on physical, chemical, and biological characteristics (Table 14).

Water temperature and pH are field measurements that are made at each site. Data from a five-year period are compared to specific segment criteria in order to determine compliance. Only surface water temperature values are evaluated. Values of pH are evaluated over the mixed surface layer. The degree of criteria support is based on ranges for the percent of exceedances among dissolved oxygen and pH measurements specified in Table 14.

Chloride, sulfate, and total dissolved solids criteria in the TSWQS represent annual averages of all values that were collected when streamflow exceeded the seven-day, two-year low-flow value established for each segment. Due to infrequent monitoring and absence of stream flow information at many sites, all of the chloride, sulfate, and total dissolved solids values measured during the five-year period are averaged for all sites within the water body and compared to the criterion for each parameter. For cases where total dissolved solids was not measured, a value is calculated by multiplying specific conductance measured at the surface by a factor of 0.65. The chloride, sulfate, and total dissolved solids criteria are not supported if the average value exceeds the criteria (Table 14).

An enterococcus bacterial screening level (500 colonies/100 mL) is established for two Houston Ship Channel (Segments 1006 and 1007) to provide indication of contamination rather than protection of a recreational use. Due to heavy ship and barge traffic on the Houston Ship Channel, local statutes have been enacted to discourage any kind of water-based recreation. The degree of criteria support is based on ranges for the percent of exceedances of enteroccocus samples specified in Table 14.

**Table 14. Framework for Evaluating Water Temperature, pH, Chloride, Sulfate, Total Dissolved Solids and Enteroccocus Criteria**

| Parameter | Units/Criteria | Fully Supporting | Partially Supporting | Not Supporting |
|---|---|---|---|---|
| Water temperature | °C, segment-specific | 0-10% exceed criterion | 11-25% exceed criterion | > 25% exceed criterion |
| pH | Standard units, segment-specific | 0-10% do not meet criteria | 11-25% do not meet criteria | > 25% do not meet criteria |
| Chloride | mg/L, segment-specific | Segment average less than criterion | Partial support is not assessed | Segment average exceeds criterion |
| Sulfate | mg/L, segment-specific | Segment average less than criterion | Partial support is not assessed | Segment average exceeds criterion |
| Total dissolved solids | mg/L, segment-specific | Segment average less than criterion | Partial support is not assessed | Segment average exceeds criterion |
| Enteroccocus bacteria | 500 colonies/100 mL | 0-10% exceed criterion | 11-25% exceed criterion | >25% exceed criterion |

## Methodology for Screening and Assessing Narrative Criteria

In addition to numeric criteria and screening levels, designated uses are also protected by narrative criteria. Narrative criteria include:

(1) Concentrations of taste and odor producing substances;

(2) Floating debris and suspended solids;

(3) Settleable solids (eroding sediment);

(4) Surface waters shall be maintained in an aesthetically attractive condition;

(5) Waste discharges which cause substantial and persistent changes from ambient conditions or turbidity or color;

(6) Foaming of a persistent nature;

(7) Oil, grease, or related residue which produce a visible film of oil or globules of grease on the water surface;

(8) Surface waters shall not be toxic to man from ingestion of water, consumption of aquatic organisms, or contact with the skin, or to terrestrial or aquatic life;

and

(9) Nutrients from permitted discharges or other controllable sources shall not cause excessive growth of aquatic vegetation which impairs an existing, attainable, or designated use.

The analysis and determination of narrative criteria support is inherently less objective and consistent than that for numeric criteria. Therefore, narrative standards are assessed using narrative criteria for which associated numeric data exist (e.g., excessive aquatic plant growths associated with instream nutrient concentrations). All water bodies with nutrient, contaminated sediment, contaminated fish tissue, and public water supply concerns identified by screening numeric criteria are automatically evaluated to determine if they also fail to support narrative criteria.

Additional information is solicited from CRP partners, TNRCC central and regional office staffs, and other basin stakeholders to document conditions that may contribute to nonsupport of narrative criteria. The information about nonsupport of narrative criteria is used to strengthen or validate water quality concerns identified using numeric screening techniques. Such information may consist of water quality studies, existence of fish kills or contaminant spills, photographic evidence, local knowledge, and best professional judgment. Ambient water and sediment toxicity tests are used to determine support of the narrative criterion that surface waters shall not be toxic to aquatic life (see also aquatic life use in Table 3). These tests are also used in determining support of designated aquatic life uses.

# Section V:

# Water Bodies and Constituents Considered But Not Listed and Water Bodies Removed from the List

# List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

***Note: It is possible that these water bodies may be included on the 1998 List for other parameters.***

*Water bodies which are on the 1998 list for other parameters are denoted with an asterisk (✻). Water bodies de-listed from the 1996 List are denoted with a star (★).*

This list identifies water quality parameters for water bodies that were considered for inclusion in the 1998 List, but were excluded for the reasons shown below. Where the decision not to list is based on lack of sufficient data, additional monitoring will be conducted in conjunction with the next data collection phase of the basin management cycle for that water body to verify attainment of uses.

**Legend for coded column (3):**

Basin Group: Letter code (A - E) indicates which group of river basins the segment is associated with in the TNRCC basin management cycle.

- Group A - Canadian River, Red River, Sulphur River, Cypress Creek, Sabine River, Sabine Pass, Neches River
- Group B - Trinity River
- Group C - San Jacinto River, Neches-Trinity Coastal, Trinity-San Jacinto Coastal, San Jacinto-Brazos Coastal, Bays and Estuaries
- Group D - Brazos River, Brazos-Colorado Coastal, Lavaca River, Colorado River, Bays and Estuaries
- Group E - Guadalupe River, San Antonio River, Rio Grande, Nueces River, San Antonio-Nueces Coastal, Colorado-Lavaca Coastal, Lavaca-Guadalupe Coastal, Nueces-Rio Grande Coastal, Bays and Estuaries, Gulf of Mexico

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 0102 | Lake Meredith | A | Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. Exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 0203 | Lake Texoma | A | Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. |
| 0205 ✻ | Red River below Pease River | A | This water body was included in the 1996 CWA 303(d) list for exceedance of the chronic criterion for average cadmium in water. Because a question arose about the accuracy of the cadmium listing, the cadmium criteria were recalculated using hardness data collected from the water body. This raised the site-specific cadmium criterion and the aquatic life use is supported. |
| 0222 ★ | Salt Fork Red River | A | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies.<br>Water temperatures are also occasionally elevated; however, the temperature variation is seasonal and does not contribute to use impairment. |
| 0304 ★ | Days Creek | A | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 0403 ✻ | Lake O' the Pines | A | Only one out of 4 samples showed concentrations of copper in water above the acute criterion established to ensure the safety of aquatic life. This is not enough samples to accurately characterize water quality conditions for use impairment. |

## List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 0409 ✻ | Little Cypress Creek | A | One sample (out of 10 total samples) for free ionic silver exceeded the acute criterion established to ensure the safety of aquatic life. This percentage of silver samples is below the amount that would constitute use impairment. |
| 0503 ✻ | Sabine River below Toledo Bend Reservoir | A | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. A small number of samples (4) indicate a concern for dissolved lead in water in the upper 25 miles. However, this is not enough samples to accurately characterize water quality conditions for use impairment. (Only 4 samples for dissolved lead; 1 detects; mean exceeds the chronic criterion.)<br>In the upper 25 miles of the segment, concentrations of dissolved cadmium in water appeared to exceed the criterion established to protect aquatic life. However, more recent data was submitted during the public comment period, and the average cadmium level, computed using this new data, was below the criterion for use impairment. |
| 0505 ✻ | Sabine River Above Toledo Bend Reservoir | A | This water body was included on the 1996 303(d) List for occasional depressed dissolved oxygen concentrations in a portion of the water body. Because a question arose about the accuracy of the dissolved oxygen listing, additional data was reviewed. Only 6.2% of dissolved oxygen readings were less than the segment criterion and the lowest value was only 0.1 mg/L below the criterion. EPA guidance suggests that partial impairment may exist if 10% or more of the dissolved oxygen readings are less than the criterion.<br>In the lower 25 miles of the segment, concentrations of dissolved cadmium in water appeared to exceed the criteria established to protect aquatic life. However, more recent data was submitted during the public comment period, and the average cadmium level, computed using this new data, was below the criterion for use impairment. |
| 0513 ✻ | Big Cow Creek | A | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 4 samples were available for fecal coliform; 2 exceed criterion. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 0601 ★ | Neches River Tidal | A | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 0602 ★ | Neches River below B.A. Steinhagen Lake | A | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 4 samples were available for cadmium and for lead at one monitoring station, and only 2 samples were available at a second station. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 0604 ★ | Neches River below Lake Palestine | A | The 1996 List indicated a concern for cadmium in water in an area near Rockland. However, correction of a error discovered in the database indicates no acute or chronic exceedances in 10 samples. Therefore, cadmium does not cause nonsupport of the aquatic life use. |
| 0606 ✻ | Neches River above Lake Palestine | A | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 7 samples were available for sulfate. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 0607 ★ | Pine Island Bayou | A | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 6 samples for dissolved oxygen and fecal coliform were available. This is not enough samples to accurately characterize water quality conditions for use impairment. A use attainability analysis by the TNRCC has been scheduled for this segment to evaluate applicability of the high aquatic life use and the causes of depressed dissolved oxygen. |

## List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 0610 ✻ | Sam Rayburn Reservoir | A | One sample (out of 3 total samples) indicated a concern for dissolved lead in water in the lower 25 miles. However, this is not enough samples to accurately characterize water quality conditions for use impairment. |
| 0610-A | Paper Mill Creek | A | There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 0611 ★ | Angelina River above Sam Rayburn Reservoir | A | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 7 samples for dissolved oxygen and 4 for aluminum were available. This is not enough samples to accurately characterize water quality conditions. The TNRCC has updated the wasteload evaluation for the segment and advanced waste treatment was recommended at major dischargers in order to maintain the dissolved oxygen criteria. |
| 0701-A | Privately-owned reservoir in Taylor Bayou watershed | C | Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. |
| 0702-A ✻ | Alligator Bayou | C | There are some concerns for chlorophyll *a* and ammonia in water and for chromium, copper, lead, mercury, selenium, and zinc in sediments in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0704 ✻ | Hillebrandt Bayou | C | There is some concern for ammonia in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for this parameter have not been developed. |
| 0801 ★ | Trinity River Tidal | B | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in the lower 7 miles, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 0803 ✻ | Lake Livingston | B | There is a concern for orthophosphorus in water in 18.6% of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0804 ✻ | Trinity River Above Lake Livingston | B | There is some concern for nitrite + nitrate in water in 25 miles of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |

## List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 0805 ✻ | Upper Trinity River | B | There is some concern for nitrite + nitrate in water in 90 miles of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0806 ✻ | West Fork Trinity River Below Lake Worth | B | There is some concern for chlorophyll *a* in water in 17 miles of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0821 ✻ | Lavon Lake | B | There is some concern for nitrite + nitrate in water in 23.9% of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0822 ✻ | Elm Fork Trinity below Lewisville Lake | B | Initial screening indicated that dissolved zinc concentrations exceed the acute aquatic life criterion. However, correction of a problem discovered in the database revealed the actual percentage of zinc concentrations exceeding the acute criterion was less than 10%. Therefore, listing for zinc is unwarranted. |
| 0824 ✻ | Elm Fork Trinity River Above Lake Ray Roberts | B | There are some concerns for nitrite + nitrate and orthophosphorus in water in 8 miles of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0828 | Lake Arlington | B | Initial screening indicated that temperature exceeds the segment criterion in the middle portion of the reservoir due to thermal effects of power plant effluent. However, further examination of station locations indicates that some samples were collected in the discharge canal and mixing zone where water quality standards do not apply. |
| 0838 ✻ | Joe Pool Lake | B | There are some concerns for cadmium and chromium in sediment in 40% of the segment, and for nickel in sediment in 80% of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 0841 ✻ | Lower West Fork Trinity River | B | There are some concerns for nitrite + nitrate, total phosphorus, and chlorophyll *a* in water in 21 miles of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1001 ✻ | San Jacinto River Tidal | C | There are some concerns for manganese and mercury in sediment in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |

## List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 1003 ★ | East Fork San Jacinto River | C | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in the lower 20 miles of the segment, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1004 ★ | West Fork San Jacinto River | C | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1005 ✻ | Houston Ship Channel/San Jacinto River Tidal | C | There is some concern for nickel in sediment in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1006 ✻ | Houston Ship Channel Tidal | C | There are some concerns for arsenic, manganese, mercury, and nickel in sediment in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1006-A ✻ | Patrick Bayou | C | Though data from the Houston Ship Channel Toxicity Study Project Report (July 1995) indicate a concern for dioxin, supporting data are insufficient to support a listing for dioxin. |
| 1007 ✻ | Houston Ship Channel/Buffalo Bayou Tidal | C | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. While the 1996 List showed copper in water exceeded the chronic criterion, some of the data were not collected using clean methods. The criterion was recalculated using more recent data, and copper did not exceed the criterion.<br>There are concerns for nitrite + nitrate in water; arsenic, zinc, flouranthene, bis-2 ethylhexyl phthalate, and benzo-b-flouranthene in sediment; however, no aquatic life impairments are observed. There are also concerns for chlordane and dieldrin in fish tissue in the segment; however, no human health impacts are observed, nor are any implied by Texas Department of Health consumption advisories. Available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1009 ✻ | Cypress Creek | C | There are some concerns for nitrite + nitrate, orthophosphorus, and total phosphorus in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1010 ★ | Caney Creek | C | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |

# List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 1012 ✻ | Lake Conroe | C | There is some concern for chlorophyll *a* in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1013 ✻ | Buffalo Bayou Tidal | C | There is some concern for nitrite + nitrate in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1014 ✻ | Buffalo Bayou Above Tidal | C | There is some concern for nitrite + nitrate in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1016 ✻ | Greens Bayou Above Tidal | C | There is some concern for nitrite + nitrate, orthophosphorus, and total phosphorus in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1017 ✻ | White Oak Bayou Above Tidal | C | There is some concern for nitrite + nitrate in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 1102 ✻ | Clear Creek Above Tidal | C | There is some concern for nitrite + nitrate and orthophosphorus in water in 25 miles of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed.<br>Initial screening indicated that in the lower 25 miles, one in six water samples of 1,1,2-trichloroethane exceeded the acute criterion for aquatic life use. However, subsequent review of data revealed an error in screening for organic substances in water. This error caused the segment to be improperly listed for exceedance of the 1,1,2-trichloroethane acute criterion. |
| 1105 ★ | Bastrop Bayou Tidal | C | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Bacteria levels appeared sometimes to exceed the criterion established to assure the safety of contact recreation. Assessment of new data lowered the exceedance to less that 25% of samples, which is less than the level constituting nonsupport of the contact recreation use. |
| 1107 ★ | Chocolate Bayou Tidal | C | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1113 ✻ | Armand Bayou Tidal | C | There is some concern for chlorophyll *a* in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |

# List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 1201 ★ | Brazos River Tidal | D | The 1996 List was re-evaluated for fish consumption advisories. This segment was listed in 1996 for a restricted consumption advisory for the general population and a no consumption advisory for children and women of child bearing age, which were issued by the Texas Department of Health September 1990 due to elevated dioxin levels in fish tissue. The affected reach is south of FM 521 to the mouth of the Brazos River in Brazoria County. However, the TDH fish consumption advisory due to organics was rescinded in 1997.<br>While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in the lower-most seven miles of the segment, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1205 | Lake Granbury | D | Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. |
| 1207 | Possum Kingdom Lake | D | Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. |
| 1208 ★ | Brazos River above Possum Kingdom Lake | D | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 6 samples for fecal coliform were available. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 1209-A | Bryan Municipal Lake | D | There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 1210 ★ | Lake Mexia | D | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 4 measurements were available for dissolved oxygen. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 1224-A | Lake Olden | D | Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. |
| 1235 | Lake Stamford | D | Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. Exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1237 | Lake Sweetwater | D | Initial data screening showed that the mean sulfate concentration exceed the secondary drinking water standards in finished water. Exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1239 ★ | White River | D | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Only 4 samples were available for average chloride, sulfate, and total dissolved solids. This is not enough samples to accurately characterize water quality conditions for use impairment. |

# List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 1241 ★ | Double Mountain Fork Brazos River | D | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1242 ✻ | Brazos River Below Whitney Lake | D | Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. |
| 1401 ★ | Colorado River Tidal | D | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1402 | Colorado River below La Grange | D | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1412 ★ | Colorado River below Lake JB Thomas | D | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in the lower 25 miles, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies.<br>Elevated salinity levels, although not in excess of numeric standards, contribute to water use problems in E.V. Spence Reservoir downstream. This elevated salinity can be considered in the TMDL scheduled for E.V. Spence Reservoir. |
| 1412-A | Moss Lake | D | Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1412-B | Lake Colorado City | D | Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1413 | Lake J.B. Thomas | D | Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1415 ★ | Llano River | D | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in the lower part of the segment below Llano, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1421 ✻ | Concho River | D | Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |

# List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 1426-A | Oak Creek Reservoir | D | Initial data screening showed that the sulfate concentration exceeds the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1426-B | Mountain Creek Reservoir | D | Initial data screening showed that the mean sulfate and chloride concentrations exceed the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |
| 1429 ✻ | Town Lake | D | There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 1434 ★ | Colorado River above La Grange | D | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1501 ★ | Tres Palacios Creek Tidal | E | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Insufficient samples (<9) were available for fecal coliform bacteria and dissolved oxygen. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 1502 ★ | Tres Palacios Creek above Tidal | E | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. Insufficient samples (<9) were available for fecal coliform bacteria and dissolved oxygen. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 1803 ★ | Guadalupe River below San Marcos | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in a five-mile portion of the segment, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1805 | Canyon Lake | E | Initial screening indicated that the mean sulfate concentration exceeds the secondary drinking water standards in finished water. However, further examination of the data indicates that drinking water samples were taken from a distribution system that mixed lake water with high TDS groundwater. Sulfate concentrations in the lake are low. |
| 1808 ★ | Lower San Marcos River | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in a 50-mile portion of the segment, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1814 ★ | Upper San Marcos River | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 1903 ★ | Medina River Below Medina Diversion Lake | E | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. While the 1996 List showed that diazinon concentrations sometimes exceed the criterion established to protect aquatic life in the lower 5.5 miles. Subsequent review of data revealed an error in screening for organic substances in water. This error caused the segment to be improperly listed for exceedance of the diazinon criterion. |

## List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 1910 ✻ | Salado Creek | E | While the 1996 List showed that diazinon concentrations sometimes exceed the criterion established to protect aquatic life in the lower 35 miles, subsequent review of data (the 1996 List was reassessed to determine if all listed constituents had enough samples to support listing) revealed an error in screening for organic substances in water. This error caused the segment to be improperly listed for exceedance of the diazinon criterion. |
| 1911 ✻ | Upper San Antonio River | R | While the 1996 List showed that diazinon concentrations sometimes exceed the criterion established to protect aquatic life in a 25-mile portion beginning at the Medina River confluence, subsequent review of data (the 1996 List was reassessed to determine if all listed constituents had enough samples to support listing) revealed an error in screening for organic substances in water. This error caused the segment to be improperly listed for exceedance of the diazinon criterion. |
| 1912 ★ | Medio Creek | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 2004 ✻ | Aransas River above Tidal | E | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. There are only 8 samples for fecal coliform. This is not enough samples to accurately characterize water quality conditions for use impairment. |
| 2102 ★ | Nueces River below Lake Corpus Christi | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 2104 ★ | Nueces River above Frio River | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 2201 ✻ | Arroyo Colorado Tidal | E | There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 2202 ✻ | Arroyo Colorado Above Tidal | E | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. While the 1996 List showed that concentrations of nitrobenzene, isophorone, and bis(2-ethylhexyl) phthalate in water occasionally exceed the criteria established to protect aquatic life in the lower 4 miles, subsequent review of data revealed an error in screening for organic substances in water. This error caused the segment to be improperly listed for exceedance of the nitrobenzene, isophorone, and bis(2-ethylhexyl) phthalate criteria. |
| 2301 ★ | Lower Pecos River | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 2302 ✻ | Rio Grande Below Falcon Reservoir | E | Initial data screening showed that the mean sulfate and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. Exceedance of these criteria at the levels detected do not pose a risk to public health or safety. |

## List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 2304 ✻ | Rio Grande Below Amistad Reservoir | E | There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 2307 ✻ | Rio Grande below Riverside Diversion | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation in the upper third of the segment, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies. |
| 2308 | Rio Grande Below International Dam | E | There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported.Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 2314 ★ | Rio Grande above International Dam | E | While bacteria levels occasionally exceed the criterion established to assure the safety of contact recreation, there is no demonstrated correlation between these levels and a threat to human health. Consequently, EPA eliminated the category of partial support for the contact recreation use and no longer requires listing of these water bodies.<br>There is a concern for ambient toxicity. However, further assessment is necessary to determine use impairment, thus listing is not supported. Ambient toxicity data and other information will be considered in a comprehensive assessment targeted for this water body in the next two years as defined by the statewide watershed management schedule to determine if subsequent listing is necessary. |
| 2411 | Sabine Pass | A | While the TDH classifies Sabine Pass as a prohibited area that does not support the oyster waters use, this is an administrative listing based on TDH's inability to regulate shell fishing in the waters shared with Louisiana. There is no sanitary survey for this water body. Therefore, nonsupport of the oyster waters use is not due to poor water quality conditions. Available data indicate that other uses and criteria for this water body are attained. |
| 2412 ★ | Sabine Lake | A | While the TDH classifies Sabine Lake as a prohibited area that does not support the oyster waters use, this is an administrative listing based on TDH's inability to regulate shell fishing in the waters shared with Louisiana. There is no sanitary survey for this water body. Therefore, nonsupport of the oyster waters use is not due to poor water quality conditions. There is a concern for manganese in sediment in 11.6% of the segment. |
| 2421 ✻ | Upper Galveston Bay | C | There is some concern for nitrite + nitrate in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 2422 ✻ | Trinity Bay | C | There is some concern for nitrite + nitrate in water in 75% of the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |

# List of Water Bodies and Constituents Considered But Not Listed on the 1998 List of Impaired and Threatened Water Bodies (6/15/98)

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 2425 ★ | Clear Lake | C | There are concerns for nitrite + nitrate, chlorophyll a, orthophosphorus, and total phosphorus in water in the segment, because those parameters exceeded the 85th percentile screening levels. However, no other evidence of actual use impairment due to nutrient concentrations is available. The current data is interpreted as indicating that Clear Lake continues to serve as a highly productive estuary, not that it is impaired by its trophic state.<br>Examination of fecal coliform data for preparation of the 1998 305(b) Inventory and 303(d) List found that fewer than 25% of the samples exceeded the screening criterion for contact recreation. EPA criteria for listing contact recreation use impairments changed and no longer require listing of segments that partially support contact recreation due to elevated fecal coliform bacteria levels, because there is no demonstrated correlation between these levels and a threat to human health. Thus, Clear Lake is no longer listed for contact recreation impairment. New data on localized nonsupport of the contact recreation use described on the 1996 303(d) List found that the bacteria criterion is not exceeded, and the use is supported.<br>Dissolved oxygen data indicate that concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life in or near marinas. Low dissolved oxygen concentrations are most likely to occur in marinas and dead-end canals that were not designed in accordance with minimum criteria delineated in EPA guidance for marina design. The existing effects of marinas on dissolved oxygen are very localized and have not resulted in impairment of aquatic life outside marinas. Existing programs for regulating marina development are adequate to minimize such impacts, and TMDL development is not warranted unless a significant impairment outside the scope of existing programs becomes apparent. Targeted monitoring will be conducted in this water body to better assess dissolved oxygen effects on aquatic life use. |
| 2426 ✻ | Tabbs Bay | C | There are some concerns for nitrite + nitrate, ammonia, orthophosphorus, and total phosphorus in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 2427 ✻ | San Jacinto Bay | C | There are some concerns for nitrite + nitrate, ammonia, orthophosphorus, and total phosphorus in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 2429 ✻ | Scott Bay | C | There are some concerns for nitrite + nitrate, chlorophyll *a*, orthophosphorus, and total phosphorus in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 2430 ✻ | Burnett Bay | C | There are some concerns for nitrite + nitrate, chlorophyll *a*, orthophosphorus, and total phosphorus in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |

| Segment Number | Segment Name | Basin Group | Reason water body/ constituent was not listed |
|---|---|---|---|
| 2433 ★ | Bastrop Bay/Oyster Lake | E | The 1996 List showed that bacteria levels occasionally exceed the criterion established to assure the safety of oyster/shellfish harvesting. However, based on more recent Texas Department of Health shellfish maps, the entire bay is open for harvesting and thus fully supports the oyster water use. |
| 2435 ★ | Drum Bay | E | The 1996 List showed that bacteria levels occasionally exceed the criterion established to assure the safety of oyster/shellfish harvesting. However, based on more recent Texas Department of Health shellfish maps, the entire bay is open for harvesting and thus fully supports the oyster water use. |
| 2437 ✻ | Texas City Ship Channel | C | There is some concern for ammonia in water in the segment. However, available information is insufficient to determine if a designated use is impaired; thus listing is not supported. Numeric criteria in the Surface Water Quality Standards for these parameters have not been developed. |
| 2455 ★ | Keller Bay | E | Based on TDH shellfish maps, 13.4% of the bay (1.0 $mi^2$ near the Keller Creek confluence) does not support the oyster water use. The remaining 86.6% (6.5 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted for the growing and harvesting of shellfish or prohibited due to potential microbial contamination. However, closed areas fall within the 1,000 foot buffer zone [TSWQS 307.7 (B)(I) and (ii)]. Shellfish standards do not apply in the buffer zone. |
| 2461 | Espiritu Santo Bay | E | Based on TDH shellfish maps, 1.0% of the bay (0.6 $mi^2$ near Port O'Connor and Intracoastal Waterway) does not support the oyster water use. The remaining 99.0% (60.2 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted for the growing and harvesting of shellfish or prohibited due to microbial contamination. However, closed areas fall within the 1,000 foot buffer zone [TSWQS 307.7 (B)(I) and (ii)]. Shellfish standards do not apply in the buffer zone. |
| 2463 | Mesquite Bay | E | Based on TDH shellfish maps, 5.0% of the bay (0.6 $mi^2$ near the Intracoastal Waterway) does not support the oyster water use. The remaining 95.0% (12.0 $mi^2$) of the bay fully supports the oyster water use. Nonsupporting areas are restricted for the growing and harvesting of shellfish or prohibited due to potential microbial contamination. However, closed areas fall within the 1,000 foot buffer zone [TSWQS 307.7 (B)(I) and (ii)]. Shellfish standards do not apply in the buffer zone. |
| 2483 | Redfish Bay | E | Based on TDH shellfish maps, 100% of the bay (28.8 $mi^2$) is classified as a prohibited area and does not support the oyster waters use. The prohibited classification is due to lack of a current sanitary survey by the TDH. Therefore, nonsupport of the oyster waters use is not due to poor water quality conditions. |
| 2484 ✻ | Corpus Christi Inner Harbor | E | The 1996 List was reassessed to determine if all listed constituents had enough samples to support listing. The 1996 List indicated that the aquatic life use was not supported because the mean dissolved copper concentration in water exceeds the chronic criterion. However, dissolved copper in water was elevated (12$\mu$/L) in only one of six samples. This one sample was obtained near the bottom and clean methods were not utilized in its collection. The mean concentration of the remaining five samples is less than the criterion.<br>While EPA comments expressed concern for zinc in sediment, TNRCC supporting data are insufficient to support listing of zinc. |

# Water Bodies Removed from the List

4/21/98

A total of 39 segments were removed.

Twenty-six segments were removed (de-listed) from the list because because of changes in the screening methodology to determine contact recreation use or shellfish use due to elevated fecal coliform bacteria levels, or because new data for fecal coliform data lowered the criteria exceedance below the level of nonsupport of the contact recreation use. One of the 27 segments (#1201) was also removed from the list because TDH fish consumption advisory due to organics was lifted.

Segments removed:

222, Salt Fork Red River
304, Days Creek
601, Neches River Tidal
801, Trinity River Tidal
1003, East Fork San Jacinto River
1004, West Fork San Jacinto River
1010, Caney Creek
1107, Chocolate Bayou Tidal
1201, Brazos River Tidal
1241, Double Mountain Fork Brazos River
1401, Colorado River Tidal
1402, Colorado River below La Grange
1412, Colorado River Below Lake J.B. Thomas
1415, Llano River
1434, Colorado River above La Grange
1803, Guadalupe River Below San Marcos
1808, Lower San Marcos River
1814, Upper San Marcos River
1912, Medio Creek
2102, Nueces River below Lake Corpus Christi
2104, Nueces River above Frio River
2301, Lower Pecos River
2314, Rio Grande above International Dam
2425, Clear Lake
2433, Bastrop Bay/Oyster Lake
2435, Drum Bay

Thirteen additional segments were deleted because of additional qualitative assessments of data sets, programmatic considerations, and/or other information received through public comments.

Segments removed:

0602, Neches River below B.A. Steinhagen Lake, insufficient samples of cadmium
0604, Neches River below Lake Palestine, further data analysis indicates no chronic exceedances
0607, Pine Island Bayou, insufficient samples for fecal coliform bacteria and dissolved oxygen
0611, Angelina River above Sam Rayburn Reservoir, insufficient data for dissolved oxygen and aluminum
1105, Bastrop Bayou Tidal, new data shows contact recreation use supported
1208, Brazos River above Possum Kingdom Lake, insufficient samples for fecal coliform bacteria
1210, Lake Mexia, insufficient samples for dissolved oxygen

1239, White River, insufficient samples for average chloride, sulfate, and total dissolved solids
1501, Tres Palacios Creek Tidal, insufficient samples for fecal coliform bacteria and dissolved oxygen
1502, Tres Palacios Creek above Tidal, insufficient samples for fecal coliform bacteria and dissolved oxygen
1903, Medina River below Medina Diversion Lake, subsequent review of data shows data screening error
2412, Sabine Lake, administrative TDH closing—no water quality data
2455, Keller Bay, lies within 1000-foot buffer zone of coastal waters where shellfish standards do not apply

# Section VI:

# Response to Public Comment on the State of Texas 1998 Clean Water Act Section 303(d) List

# Response to Public Comment on the State of Texas 1998 Clean Water Act Section 303(d) List

Texas Natural Resource Conservation Commission (TNRCC)

June 26, 1998

| TRACKING # | DATE | ENTITY | SUMMARY OF COMMENTS | SUMMARY OF ACTION OR EXPLANATION |
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| 01<br>07<br>11<br>19 | 04/14/98<br>04/13/98<br>04/09/98<br>02/24/98 | Sabine River Authority<br>Alan Plummer Associates<br>Eastman Chemical Co.<br>Eastman Chemical Co. | •Support de-listing of Sabine River (0503 and 0505) for cadmium and lead.<br><br>•States that measurements are not within analytically reliable range. | •In the lower 25 miles of the segment, concentrations of dissolved cadmium in water exceeded the criteria established to protect aquatic life. However, more recent data was submitted during the public comment period, and the average cadmium level, computed using this new data, was below the criterion for use impairment. Segments 0503 and 0505 were removed from the 303(d) List and added to the Considered List for cadmium in water. Therefore, Segments 0503 and 0505 remain on the list as a medium priority for lead.<br><br>•TNRCC reviewed data in question and maintains that data are highly reliable. |
| 02<br>06 | 04/13/98<br>04/13/98 | Shell Chemical Co.<br>OxyChem | •Should not use sediment screening levels to cause nonsupport in Patrick Bayou (1006-A).<br><br>•Should not list individual metals and organics in sediment for Patrick Bayou (1006-A).<br><br>•Want the Voluntary Source Identification study mentioned. | •An earlier draft of the 303(d) List cited sediment contaminants as a reason for nonsupport of the aquatic life use. However, characterization of sediment concentrations as elevated were based on screening levels and not actual numeric criteria. In the final list, sediment contaminants were used as additional verification of the nonsupport of narrative criteria due to sediment toxicity.<br><br>•The listing of individual metals and organics in sediment was changed to "some metals and organics in sediment exceed the estuarine screening levels".<br><br>•Mention of the Voluntary Source Identification Study was added to the 303(d) List segment summary for Patrick Bayou. |

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| 25 | 02/05/98 | Eastman Chemical Co. | •Concern regarding use of screening levels for 303(d) listing in the absence of numeric standards. | •The TNRCC identified a list of water bodies based on screening levels for nutrients, toxics in fish tissue and sediments, and ambient toxicity. These water bodies were considered possible candidates for 303(d) listing. While TNRCC agrees that further study of water bodies is often necessary to effectively quantify if a narrative standard is not being met, the guidance also points out that if additional data is submitted during the 303(d) listing process which strengthens or validates the fact that the pollutants of concern are contributing to impairment of a designated use, this is sufficient cause for listing the water body. Additional data was for certain waterbodies submitted for consideration and after additional evaluation, the TNRCC concurred that listing was warranted. This is an important new procedure in the 1998 listing process which was not conducted in the 1996 listing process. TNRCC is required to evaluate numeric and narrative water quality standards. The screening levels used are in no way to be construed as default water quality standards. The TNRCC will work closely with stakeholders through the Clean Rivers Program to improve the methods used to assess waters for narrative standards in subsequent preparations of the 303(d) list. |
| 14 | 04/07/98 | Texas Center for Policy Studies | •Draft list failed to identify sources of contamination. | •Final list did identify if source of contamination is point source, nonpoint source or both. More detailed information on sources of contamination is not consistently available. Sources will be identified during the development of the TMDL. |
| | | | •Texas Department of Health (TDH) fish tissue data was used in the listing process, but not TNRCC fish tissue data which indicates additional pollutants. Data from the TDH Fish Tissue Sampling program and special studies such as the Binational Rio Grande Toxic Substances Study were not considered. | •TNRCC elected to use the TDH system (which bases fish consumption bans and aquatic life closures on human health risk analyses) as the most consistent, scientifically sound methodology for determining impairment of the water body related to fish consumption. TNRCC data and other TDH data is useful for screening, but is not adequate for analyzing human health risks. Data from the Binational study will be considered in detail for the 1999 303(d) list which focuses on basins in the western half of the state, including the Rio Grande. |
| | | | •Create a separate "candidate" list of water bodies that warrant further study for inclusion by a pre-established date. | •Many water bodies *already listed* on the final 303(d) list actually fall into a category that requires "more data to verify the extent and or severity of the impairment" (see MEDIUM-ranked water bodies). In addition, the "Considered" list serves to identify a second tier of water bodies for targeted monitoring. |
| | | | •Texas Watch data should be used in developing the 303(d) list. | •Very little Texas Watch data was available (i.e., in the TNRCC data base) for Basin Groups B and C at the time of the initial data screening. Volunteer monitoring data will be considered as support information in the determination of partial or nonsupport of designated uses. It will also be used to determine priority ranking and direct future monitoring efforts. |

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| 03 | 04/13/98 | Lone Star Chapter - Sierra Club | •Concern regarding availability of a written methodology for making listing decisions. | •The methodology and criteria for all listing and delisting decisions was included in the submittal of final 303(d) list to EPA. These materials are available on the TNRCC web site http://www.tnrcc.state.tx.us/water/quality/data/wmt/tmdl.html. The TNRCC considers the 303(d) list and the methodology to be dynamic, and the agency anticipates future refinements to the process in an effort to improve public participation and the scientific basis for listing decisions. |
| | | | •Suggest broader acceptance of data and the inclusion of water bodies on the 303(d) list where data are not definitive; or the creation of a "candidate list" that requires additional data collection to verify impairment; if additional data are not collected, then the water body is automatically listed. TNRCC stifles public participation by using only data meeting QA/QC criteria. | •To strengthen the scientific foundation for 303(d) listing decisions, the data and information used are bound by certain conditions, including time limitations (data collected within the last 5 years), geographic focus (from areas targeted for assessment) and data quality (data must be collected under a TNRCC-approved Quality Assurance Project Plan). TNRCC encourages the public to submit relevant data that falls outside these conditions since these data may be used to verify partial or nonsupport of designated uses, determine priority ranking of water bodies, and target future monitoring. Many water bodies *already listed* on the final 303(d) list actually fall into a category that requires "more data to verify the extent and or severity of the impairment" (see MEDIUM-ranked water bodies). In addition, the "Considered" list serves to identify a second tier of water bodies for targeted monitoring. |
| | | | •The list assigns priority but does not clarify how actual scheduling for developing TMDLs will be determined. | • The priority ranking in the 303(d) list was assigned during the listing process and is the primary consideration in the scheduling process. TNRCC is working with stakeholders to develop secondary considerations (e.g., proximity of watersheds, common or related pollutants, local priorities, data availability, and international/interstate waters) that will result in a more detailed schedule. |
| | | | •Segments previously identified as partially supporting contact recreation use are not listed on the 1998 list. | •New procedures developed by EPA and TNRCC removed the category for partial support for contact recreation. |
| | | | •Concern for disparities between the *1996* 305(b) inventory and the *1998* 303(d) list. | • Disparities result primarily from changes in assessment methodologies between 1996 and 1998 and differences in data sets used (the most recent 5 years in each case). In addition, while the 305(b) report is the first step in the 303(d) listing process, the two are consistent, but not identical because the 305(b) inventory includes water quality concerns that may not constitute actual impairments. |

| TRACKING # | DATE | ENTITY | SUMMARY OF COMMENTS | SUMMARY OF ACTION OR EXPLANATION |
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| 04<br>05<br>09<br>12<br>17<br>23<br><br>25<br>34<br>38 | 04/13/98<br>04/13/98<br>04/10/98<br>04/08/98<br>03/24/98<br>02/20/98<br><br>02/05/98<br>02/03/98<br>01/28/98 | City of Cedar Hill<br>City of Dallas<br>City of Grand Prairie<br>City of Midlothian<br>Novartis Crop Protection<br>North Texas Municipal Water District<br>Eastman Chemical Co.<br>Trinity River Authority<br>East Harris County Manufacturers Association | •Support removal of segments listed for atrazine; Bardwell Reservoir (0815); Lake Waxahachie (0816); Lavon Lake (0821); Richland-Chambers Reservoir (0836); Joe Pool Lake (0838); Lake Tawakoni (0507). | •TNRCC agrees that Bardwell Reservoir, Lake Waxahachie, Lavon Lake, Richland-Chambers Reservoir, Joe Pool Lake and Lake Tawakoni currently meet water quality standards for drinking water supply. However, finished drinking water data from water utilities using these lakes demonstrate levels of atrazine that represent a strong potential for standards violation in the near future. Listing these water bodies as “threatened” indicates that a TMDL may be necessary to *prevent* standards violation. Regulations in 40 Code of Federal Regulations (CFR) 130.2(j) require that states list water bodies “ … where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards.” Therefore, these water bodies remain on the list as threatened.<br><br>•TNRCC agrees that City of Dallas Water Utilities data do not support listing Lake Tawakoni as “threatened” due to exceedances of 50% of the Maximum Contaminant Level (MCL) for atrazine. However data from finished drinking water from another water system also drawing from Lake Tawakoni supports listing. Therefore, Lake Tawakoni remains on the list, with the ranking Threatened-medium. |
| | | | | •Two of the four samples used to arrive at the “threatened” status for Joe Pool Lake actually exceeded the MCL for atrazine and can not be considered “extremely low” levels. In fact, only one additional sample at these levels would result in a violation of the MCL and result in a classification of nonsupport. |
| | | | •Disagreed with use of 50% MCLs for atrazine. | •A recalculation of the exceedance of 50% of the MCL, based on the rolling average, gave the same results as the original method. |
| | | | •Argues that use of drinking water standards for “threatened” listing attempts to establish new standards. | •Use of drinking water standards in finished drinking water supports a methodology to determine the threat to surface water standards exceedances, not the exceedance of the standard itself; the methodology does not establish new standards for surface water. |
| | | | •Disagreed with use of 50% MCLs for atrazine. | •Using exceedances of 50% of the MCL was based on best professional judgment of the Water Utilities technical staff in TNRCC’s Water Utilities Division. However, during the listing process, one water body (Aquilla Lake) listed as threatened using this methodology was reclassified to nonsupport based on one additional sample, thus validating the use of 50% of the MCL as a predictive indicator. This additional sample, taken in early February 1998, raised the annual running average over the MCL, which is a violation of drinking water standards. The water body was then reclassified as impaired. For Joe Pool Lake, only one additional sample at levels of atrazine already measured would result in a violation of the MCL in a classification of nonsupport. Therefore, Joe Pool Lake remains on the list, with the ranking Threatened-high. |

| TRACKING # | DATE | ENTITY | SUMMARY OF COMMENTS | SUMMARY OF ACTION OR EXPLANATION |
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| (continued) | (cont.) | (cont.)<br>City of Cedar Hill<br>City of Dallas<br>City of Grand Prairie<br>City of Midlothian<br>Novartis Crop Protection<br>North Texas Municipal Water District<br>Eastman Chemical Co.<br>Trinity River Authority<br>East Harris County Manufacturers Association | (cont.)<br>•General comments on the listing of drinking water supply segments.<br><br>•Disagree with list of secondary drinking water standards. | (cont.)<br>•TNRCC will NOT be duplicating ongoing work or projects, but rather will be using these efforts as a TMDL equivalent whenever possible. Moreover, under the law, ongoing projects that may be addressing the identified impairment do not exempt a water body from listing.<br>•The suggestion to put these lakes on a separate list is not possible, since Texas has not adopted the policy of a seXÅte list (the so-called "Candidate List" discussed at the federal level). Therefore, these water bodies remain on the list as threatened.<br>•Restrictions to wastewater permits as a result of listing will only apply to the listed pollutants.<br>•Possible misunderstanding by the general public about the meaning of the term "threatened" does not exempt a water body from being listed.<br>•TNRCC agrees that one of the implications of listing a water body is that control measures may be required to minimize the listed pollutant; that is the intent of the legislation and the purpose of the list.<br>•For the water bodies listed on Addendum 1 (drinking water use only), the TNRCC had initially proposed using exceedances of secondary standards in both finished and raw water. However, based on stakeholder input as well as TNRCC's opinion that exceedance of these drinking water criteria at the levels detected do not pose a risk to public health or safety, this proposal was withdrawn. |
| 08<br>34 | 04/13/98<br>02/03/98 | Trinity River Authority<br>Trinity River Authority | •Lake Livingston (0803) should not be listed for pH and dissolved oxygen (DO); if it remains on the list, the priority should be reduced to "low".<br>•Overall priority for Lake Livingston should be low.<br>•Clear Fork below Weatherford (0831) should not be listed for DO. | •The data supports listing of Segment 0803 for DO and pH. Therefore, it remains on the 303(d) List. The priority for DO was lowered from high to medium and pH was given a low priority.<br>•The overall priority for Lake Livingston was lowered from high to medium.<br>•The data supports listing of Segment 0813 for DO. Therefore, it remains on the 303(d) List. |

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| 34<br>31<br><br>29<br><br>38 | 02/03/98<br>02/03/98<br><br>02/03/98<br><br>01/28/98 | Trinity River Authority<br>Espey-Huston & Associates<br>Houston Lighting & Power<br>East Harris County Manufacturers Association | • Concerns about Addendum 1. | •Water bodies on Addendum 1 (drinking water use only) and Addendum 2 (narrative criteria) were not listed unless additional supporting data or information justified inclusion. For water bodies listed on Addendum 1, the TNRCC had initially proposed using exceedances of secondary standards in both finished and raw water. However, based on stakeholder input, as well as TNRCC opinion that exceedance of these drinking water criteria at the levels detected do not pose a risk to public health or safety, this proposal was withdrawn. |
| | | | •Disagree with use of screening levels for 303(d) listing for narrative criteria nonsupport. Concerns about Addendum 2. | •TNRCC re-evaluated the water bodies on Addendum 2 to determine if exceedances of screening levels for narrative criteria resulted in the impairment of a designated use. In addition to the review of numeric data, comments addressing narrative criteria were considered. |
| | | | •Disagree with listing of nutrient concerns. Specific segments noted Trinity River above Lake Livingston (0804); Upper Trinity (0805); Lower West Fork Trinity (0841). | •Nutrient concerns have been moved to the Considered List unless associated with nonsupport of narrative criteria. |
| | | | •Disagree with listings based on sediment metal and organic compound concerns. | •Sediment concerns have been moved to the Considered List unless associated with nonsupport of narrative criteria. |
| 08<br>10<br>17<br>34 | 04/13/98<br>04/10/98<br>03/24/98<br>02/03/98 | Trinity River Authority<br>International Paper<br>Novartis Crop Protection<br>Trinity River Authority | •NPS impaired waters should not be listed on 303(d) List.<br><br>•Too many segments on the 303(d) listing to implement in TMDL process in high quality effective way - 72% of Trinity River Basin. | •Under current federal regulations and guidance for section 303(d), these concerns are not considered justification for not listing impaired or threatened waters. EPA has always interpreted this portion of the Clean Water Act include nonpoint source impaired waters. TNRCC is expected to comply with this interpretation. |
| 08<br>12 | 04/13/98<br>04/08/98 | Trinity River Authority<br>City of Midlothian | •Object to listing of Joe Pool Lake (0838) for total dissolved solids (TDS) and Sulfate. | •The data supports listing of Joe Pool Lake for TDS and sulfate. Therefore, it remains on 303(d) List for TDS and sulfate. |
| | | | •Joe Pool Lake should not be listed for metals in sediment. | •Elevated sediment concentrations were based on screening levels and not actual criteria. Therefore, metals in sediment concerns were removed from the 303(d) List and added to the Considered List. |
| | | | •Priority for Joe Pool should be low. | •The priority for Joe Pool Lake is Threatened-high since levels of atrazine > MCL have been measured. |

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| 13<br><br>16 | 04/08/98<br><br>04/02/98 | San Jacinto River Authority<br>Houston Galveston Area Council | •Disagree with listing of entire segment for low dissolved oxygen (DO) in Spring Creek (1008).<br><br>•Support the removal of "upper half" language to be replaced with a more specific location. | •The listing of the entire segment on the initial list for low DO was an error on initial list. The data supports listing the upper portion of the segment. This was corrected on final 303(d) List.<br><br>•The wording was amended to "In the portion upstream from the Kuykendahl Road bridge…". |
| 15 | 04/06/98 | City of Fort Worth | • In the Trinity River Basin fecal coliform and toxics should not be listed where data is inconclusive or of questionable quality and should be put on a high priority monitoring list. | •Data used in the 303 (d) listing process was considered reliable. Questionable data is excluded from the assessment process. Data used of the Trinity River Basin was considered valid and supported the listings.<br><br>•Texas has not adopted the policy of a separate list (the so-called "Candidate List" discussed at the federal level). Therefore, where the data supports listing, these water bodies remain on the 303 (d) List. |
| 18<br>21<br>24 | 03/03/98<br>02/23/98<br>02/06/98 | City of Sherman<br>City of Denison<br>Greater Texoma Utility Authority | •Supports the de-listing of total dissolved solids (TDS) in Lake Texoma (0203). | •Elevated levels of dissolved solids in source water have been observed. However, water systems are meeting the secondary drinking water standards through demineralization treatment and levels of dissolved solids in source water are not high enough to exceed surface water quality standards. Therefore, TDS was removed from 303(d) List and added to the Considered List. |
| 20 | 02/23/98 | Save Barton Creek Association | •Comparison of 96 ➛ 98 303(d) List.<br><br>•Concerned about contact recreation /nutrients in Barton Creek/Onion Creek. | •EPA eliminated the category of partial support for the contact recreation use because there is no demonstrated correlation between these levels and a threat to human health, and no longer requires listing of these water bodies.<br><br>•This segment is in Basin Group D; consequently, a full assessment was not done for 1998 303(d) List. |
| 23 | 02/12/98 | Texas Parks and Wildlife Department | •General Comments; Suggest need to assess total suspended solids (TSS) data. | •The TSS data was reviewed. Since no narrative screening levels are widely accepted for TSS, no action was taken during this listing cycle. The TNRCC will work closely with stakeholders through the CRP to improve the methods used to assess waters for narrative standards in subsequent preparations of the 303(d) list. |
| 24 | 02/06/98 | Greater Texoma Utility Authority | •Need to verify that Moss (1412-A) Lake is in Howard County not Cooke County. | •Verified location of Moss Lake in Howard County and not in Cooke County. |

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| 26 | 02/04/98 | San Marcos River Foundation | •Concerned San Marcos River was not on 303(d) List for contact recreation. | •EPA eliminated the category of partial support for the contact recreation use because there is no demonstrated correlation between these levels and a threat to human health, and no longer requires listing of these water bodies. Therefore, the San Marcos River was moved to Considered List. This segment is in Basin Group E; consequently, a full assessment was not done for the 1998 303(d) List. A full assessment will be completed in Fiscal Year 1999. |
| 27<br>29<br>31<br>38 | 02/04/98<br>02/03/98<br>02/03/98<br>01/28/98 | City of Houston Public Works Department<br>Houston Lighting & Power<br>Espey-Huston and Associates<br>East Harris County Manufacturers Association | •General comments on listing of San Jacinto River Basin Segments for lead and mercury. If they remain on list would like a low to medium priority.<br><br>•Mercury should not be listed without supporting tissue data.<br><br>•Disagree with listing of segments based on human health criteria for mercury. | •The average lead concentrations exceeded the chronic criteria for the protection of aquatic life. The average mercury concentration exceeded the chronic criteria for the protection of human health. The data supports the listing of eleven Houston area bayou, lake and bay segments for lead and/or mercury. Therefore, these water bodies remain on the 303(d) List for mercury and lead with medium priority. |
| 28 | 02/03/98 | Red River Authority | •Support de-listing of cadmium in the Red River (0205). | •This water body was included in the 1996 Clean Water Act 303(d) List for exceedance of the chronic criterion for average cadmium in water. Because a question arose about the accuracy of the cadmium listing, the cadmium criteria were recalculated using hardness data collected from the water body. This raised the site-specific cadmium criterion and the aquatic life use is supported. Therefore, Segment 0205 was removed from the 303(d) List for cadmium and added to the Considered List. |
| 29<br>30<br>34<br>36 | 02/03/98<br>02/03/98<br>02/02/98<br>01/30/98<br>04/13/98 | Houston Lighting & Power<br>Texas Chemical Council<br>Greater Houston Partnership<br>Alan Plummer Associates<br>Alan Plummer Associates | •General comments on methodology.<br><br>•Argue that use of drinking water standards for "threatened" listing attempts to establish new standards | • Some of these suggestions for improving both the assessment and listing process are being discussed both internally at the TNRCC and with other stakeholders, primarily through the Clean Rivers Program. Some progress was made in these areas in 1998 and TNRCC plans to continue to improve the assessment and listing processes. The TNRCC also participates in a national work group to review the 303 (d) process and how it is to be implemented.<br><br>Other suggestions have not been incorporated because:<br>•Use of drinking water standards in finished drinking water supports a methodology to determine the threat to surface water standards exceedances, not the exceedance of the standard itself; the methodology does not establish new standards for surface water. |

| TRACKING # | DATE | ENTITY | SUMMARY OF COMMENTS | SUMMARY OF ACTION OR EXPLANATION |
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| (continued) | (cont.) | (cont.)<br>Houston Lighting & Power<br>Texas Chemical Council<br>Greater Houston Partnership<br>Alan Plummer Associates<br>Alan Plummer Associates | (cont.)<br>•The classification of "threatened" water bodies requires extensive trend analysis. | (cont.)<br>•TNRCC agrees that a statistically sound trend analysis is an appropriate methodology for identifying "threatened" water bodies and is working towards establishing such a methodology for future listings. However, except for conventional parameters for some water bodies, the data requirements preclude such analyses in most cases (practically all metals and organics). Therefore, TNRCC has adopted consistent, defensible alternative methodologies based on available data and best professional judgment. |
| | | | •Water bodies should not be listed for naturally-occurring substances with no chance for getting off the list. | •EPA guidance requires listing for exceedances of the standards even when exceedance may be caused by naturally-occurring substances. TNRCC is establishing the strategies for removing all types of impaired water bodies from the list, whether by a conventional TMDL or by other strategy. |
| | | | •Opposes expanding the list into areas not required by EPA (e.g., sediment concentrations of metals or organics ). | •TNRCC has worked with EPA-Region 6 to develop a 303(d) List based on available data and information, using a valid and replicable methodology, incorporating meaningful public input and consistent with EPA guidance. However, EPA official guiidance does not cover all details required to develop the 303(d) List; some issues were worked out jointly by TNRCC as they arose. In the case of exceedances of sediment screening criteria, EPA strongly encouraged listing, but TNRCC listed only if the water body had corroborating toxicity or benthics impairment. |
| | | | •Not sound policy to require TMDLs on certain segments only because they are more intensively monitored than others. | •TNRCC is required to use all available water quality data after judging it to be accurate and representative of the water body. |
| | | | •TNRCC should not disregard evaluation methods set forth in the Texas Surface Water Quality Standards (TSWQS). | •In most instances the 303(d) listing methodology compares numerical criteria to instream conditions as specified in the TSWQS. In many cases, however, sufficient monitoring data for exact comparisons to numerical criteria cannot be reasonably obtained. Compliance with the TSWQS is estimated from in-stream monitoring data using "screening levels"and minimum requirements for sample frequency and geographic distribution. Screening levels are intended to provide the best comparisons with numerical criteria that can be reasonably attained with available monitoring resources. |
| 33 | 02/03/98 | City of Fort Worth | •Wanted lead in water reduced from High to Medium priority in Clear Fork Trinity River (0829). | •Data did not support listing of this water body. Removed from draft list (1/23/98). |

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| 35 | 01/30/98 | Colorado River Municipal Utility District | •Supports listing of E.V. Spence Reservoir (1411) as a medium priority. | •E.V. Spence Reservoir is listed as "U" for TMDL under development. |
| | | | •Supports listing of the Colorado River below Lake J.B. Thomas (1412) as a medium priority. | •Elevated salinity levels, although not in excess of numeric standards, contribute to water use problems in E.V. Spence Reservoir downstream. This elevated salinity can be considered in the TMDL scheduled for E.V. Spence Reservoir. Therefore, Segment 1412 was removed from the 303(d) List and added to the Considered List. |
| | | | •Do not list Moss Lake (1412-A) ; water from Spence impairs Moss Lake. | •Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. Therefore, Segment 1412-A was removed from the 303(d) List and added to the Considered List. |
| | | | •Do not list Lake J.B. Thomas (1413) or the Concho River (1421). | •Initial data screening showed that the mean sulfate, chloride, and total dissolved solids concentrations exceed the secondary drinking water standards in finished water in Segments 1413 and 1421. However, exceedance of these criteria at the levels detected do not pose a risk to public health or safety. Therefore, Segments 1413 and 1421 were removed from the 303(d) List and added to the Considered List. |
| 37 | 01/28/98 | Texas Utilities | •Does not support listing of Lake Arlington (0828) for temperature. | •Additional information supplied during the comment period indicated that the temperature data was collected within the mixing zone of a power plant Therefore, Segment 0828 was removed from the 303(d) List and added to the Considered List. |
| 39 | 01/27/98 | Guadalupe - Blanco River Authority | •Wants Canyon Lake (1805) off the list for elevated sulfate. | •A mixture of groundwater and surface water, used for drinking water supply, was cited as the cause for elevated sulfate. Therefore, this segment was removed from the 303(d) List and added to Considered List. |
| 40 | 01/23/98 | Brazos River Authority | •Comments on segments listed in the Brazos River Basin - suggested additional information. | •The Brazos River Basin will be addressed with Basin Groups D and E. No action required. Additional information supplied will be considered in the 1999 update to the 303(d) List. |
| 41 | 01/18/98 | San Jacinto River Association | •Main comment was the low priority given to contact recreation nonsupport instead of high for the San Jacinto River Tidal (1001). | •All contact recreation nonsupporting water bodies were initially given a low priority pending the outcome of a statewide fecal coliform study which is underway. The TNRCC agreed with this recommendation and refined the priority assignment methodology for contact recreation. This change allowed water bodies which had considerable local contact recreation use to be considered medium priority. |
| 42 | 12/11/97 | TNRCC Region 10 Office - Beaumont | •Suggest the 303(d) listing of Angelina River below Paper Mill Creek Confluence (0611) for narrative criteria. | •The 1996 303 (d) List was reassessed to determine if all listed constituents had enough samples to support listing. Only 7 samples for dissolved oxygen and 4 for aluminum were available. This is not enough samples to accurately characterize water quality conditions for use impairment. The TNRCC has updated the wasteload evaluation for the segment and advanced waste treatment was recommended at major dischargers in order to maintain the dissolved oxygen criteria. |

| TRACKING # | DATE | ENTITY | SUMMARY OF COMMENTS | SUMMARY OF ACTION OR EXPLANATION |
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| 43 | 4/9/98 | US Environmental Protection Agency (EPA) Region 6 | • Want Clear Lake (2425) listed for low dissolved oxygen; dissolved oxygen (DO) data shows that the standard is not always met | • Dissolved oxygen data indicate that concentrations are sometimes lower than the standard established to assure optimum habitat conditions for aquatic life in or near marinas. Low DO concentrations are most likely to occur in marinas and dead-end canals that were not designed in accordance with minimum criteria delineated in EPA guidance for marina design. The existing effects of marinas on dissolved oxygen are very localized and have not resulted in impairment of aquatic life outside marinas. Existing programs for regulating future marina development are adequate to minimize such impacts, and TMDL development is not warranted unless a significant impairment outside the scope of existing programs becomes apparent. Therefore, the listing of Clear Lake for low dissolved oxygen is not warranted at this time. Targeted monitoring will be conducted in this water body to better assess dissolved oxygen effects on aquatic life use. |
| | | | • Clear Lake (2425) should be listed for elevated levels of tri-butyltin in water. | • Tri-butyl tin concentrations in water were occasionally higher than the EPA screening level (1.0 $\mu$g/L) and the standard for protection of aquatic life (0.24 $\mu$g/L for marine acute, 0.043 $\mu$g/L for marine chronic). The Federal Organotin Antifouling Paint Control Act of 1988 imposed restrictions on the formulation and use of tri-butyl tin paint, and took full effect in 1990. Due to the relatively short half-life of tri-butyl tin in seawater, ambient concentrations near marina and boat repair operations are expected to decline over time, and studies have already documented such declines in the Gulf of Mexico and Chesapeake Bay. However, after significant discussion with EPA Region 6 after the close of the public comment period, Clear Lake was added to the 1998 List for tri-butyltin. EPA's position is that although efforts are in progress to reduce the effects of tri-butyltin, there is insufficient evidence to show that these efforts have remediated the impact on aquatic life, and therefore, under applicable statute and regulations, the water body must be listed. |
| | | | • Clear Lake should be listed for elevated levels of copper in sediment. | • Available information is insufficient to determine if a use impairment exists according to the currecnt assessment guidelines. Available data for the current assessment did not show copper in sediment as a concern. |
| | | | • Patrick Bayou (1006-A) should be listed for water temperature, water and sediment toxicity, copper, mercury, hexachlorobenzene (HCB), polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs) and dioxins. | • Water temperature was added to the List as not meeting the criterion. Dissolved copper concentrations in water which sometimes exceed the chronic criterion to protect aquatic life is also on the 303(d) List. Water and sediment toxicity are listed as the cause of the narrative criteria nonsupport; the constituents of concern are supporting information for the water and sediment toxicity. The suggested constituents will be included in the investigation to determine the cause of water and sediment toxicity. Listing each of these constituents would limit the focus of the investigation. The permittees discharging to Patrick Bayou are already conducting a voluntary source water study. |

| TRACKING # | DATE | ENTITY | SUMMARY OF COMMENTS | SUMMARY OF ACTION OR EXPLANATION |
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| (continued) | (cont.) | (cont.)<br>USEPA Region 6 | (cont.)<br>• Houston Ship Channel (1007) should be listed for copper in sediment.<br><br>• EPA's Regional Ambient Toxicity Monitoring Program data did not appear to be used in the listing process for Vince Bayou (1007-A) and Lower West Fork Trinity River in Grand Prairie (0841).<br><br>• Segments not in Basin Groups B and C should be listed when available data supports listing. | (cont.)<br>• Several metals and organics in sediment were found to be a concern. However, no aquatic life impairments are observed. Available information is insufficient to determine if a use impairment exists according to the current assessment guidelines. Available data for the current assessment did not show copper in sediment as a concern.<br><br>• Vince Bayou (1007-A) and Lower West Fork Trinity River (0841) are both on the 303(d) List for toxicity in ambient water and/or sediment.<br><br>• The segments mentioned in the EPA's comments that fall within Basin Groups A, D and E will be considered in subsequent updates to the 303(d) List in conjunction with the statewide basin management cycle. |