TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

AGENDA ITEM REQUEST

Consideration of an Implementation Plan
For Approval

AGENDA REQUESTED: **December 11, 2013**

DATE OF REQUEST: **November 22, 2013**

INDIVIDUAL TO CONTACT REGARDING CHANGES TO THIS REQUEST, IF NEEDED: Charlotte Horn, (512) 239-0779

CAPTION: Docket No. 2012-2574-TML. Consideration for approval of an Implementation Plan for Seventeen Total Maximum Daily Loads for Bacteria corresponding to seventeen assessment units (AUs) in the Greater Trinity River and Tributaries (Segments 0805, 0822A, 0822B, 0841, 0841B, 0841C, 0841E, 0841G, 0841H, 0841J, 0841L, 0841M, 0841R, 0841T, and 0841U) of the Trinity River Basin in Dallas and Tarrant Counties.
(Ron Stein, Robert Brush) (Project No. 2013-011-TML-NR)

Kelly Holligan
Kelly Holligan, Director,
Water Quality Planning Division

L'Oreal W. Stepney, P.E.
L'Oreal W. Stepney, P.E., Deputy,
Office of Water

Charlotte Horn
Agenda Coordinator

Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Commissioners **Date:** November 22, 2013

Thru: Bridget C. Bohac, Chief Clerk
Zak Covar, Executive Director

From: L'Oreal Stepney, P.E., Deputy Director KW for LS 10/31/13
Office of Water

Subject: Docket No. 2012-2574-TML; Project No. 2013-011-TML-NR
Proposal of *Implementation Plan for the Seventeen Total Daily Maximum Loads for Bacteria in the Greater Trinity River and Tributaries*

Background and Current Practice

Three bacteria total maximum daily load (TMDL) documents (Table 1) have been prepared as required by Clean Water Act, §303(d).

Table 1. TMDLs in Greater Trinity River I-Plan

TMDL Title	Segment Numbers	Assessment Units (AUs)	TCEQ Adoption Date	EPA Approval Date
Two Total Maximum Daily Loads for Indicator Bacteria in the Upper Trinity River, Dallas, Texas	0805	0805_03 0805_04	May 11, 2011	August 3, 2011
Two Total Maximum Daily Loads for Indicator Bacteria in Cottonwood Branch and Grapevine Creek	0822A 0822B	0822A_02 0822B_01	September 21, 2011	May 30, 2012
Draft Thirteen Total Maximum Daily Loads for Indicator Bacteria in the Lower West Fork Trinity River Watershed	0841 0841B 0841C 0841E 0841G 0841H 0841J 0841L 0841M 0841R 0841T 0841U	0841_01 0841_02 0841B_01 0841C_01 0841E_01 0841G_01 0841H_01 0841J_01 0841L_01 0841M_01 0841R_01 0841T_01 0841U_01	September 24, 2013	tbd

This TMDL implementation plan (I-Plan) was developed by a stakeholder group from the local watersheds. The I-Plan addresses three bacteria TMDL watersheds and was developed concurrently with the TMDL document for the Lower West Fork Trinity watershed. The I-Plan describes the strategy and activities the TCEQ and watershed

partners will carry out to improve water quality in the affected watersheds (known collectively as the Greater Trinity I-Plan watersheds).

Comments on the I-Plan

Nine comments were received from four organizations during the TCEQ public comment period. Four of the comments required modification of the draft I-Plan. The changes made to the I-Plan clarified and improved the document.

The Water Quality Planning Division now requests that the commission consider approval of the final I-Plan as fulfilling the requirements of the "Implementation and Reasonable Assurances" sections of the TMDLs covered by this I-Plan. Combined with the TMDLs, the I-Plan provides local, regional, and state organizations with a comprehensive strategy for restoring and maintaining water quality in the impaired water bodies.

Scope

Consideration for final approval of the I-Plan for seventeen TMDLs corresponding to seventeen assessment units (AUs) in fifteen segments for indicator bacteria in the Upper Trinity River, Grapevine Creek and Cottonwood Branch, and Lower West Fork Trinity River watersheds of the Trinity River Basin in Dallas and Tarrant Counties.

The I-Plan developed by the stakeholders describes the steps the TCEQ and its watershed partners will take to achieve the pollutant reductions identified in the TMDL reports, and outlines the schedule for implementation activities.

Effect on the

A) Regulated community. Wastewater treatment facilities (WWTFs) in the watersheds will receive effluent limits and will monitor for bacteria on a regular basis. Effluent limits would be set at 50% of the instream geometric mean water quality criterion. This gives 63 most probable number/100 milliliter (mL) as the *Escherichia coli* (*E. coli)* effluent concentration limit for WWTFs.
B) Public. The public are participants in the stakeholder process.
C) Agency programs. TCEQ TMDL Program will continue to work with other TCEQ programs and stakeholders to review the progress towards implementing activities in the I-Plan.

The ultimate goal of this I-Plan is the reduction of bacteria concentrations in the TMDL waters to levels established in the TMDL. This I-Plan includes eight implementation strategies that will be used to reduce the level of bacteria in the Greater Trinity I-Plan watershed. The TMDL identifies potential regulated and unregulated sources of bacteria.

Stakeholder Involvement

The North Central Texas Council of Governments (NCTCOG) is providing coordination for public participation and facilitating the development of the I-Plan. The NCTCOG initiated the I-Plan efforts in spring 2011. The I-Plan effort includes a Coordination Committee and

eight technical subcommittees. The Coordination Committee membership represents many interests, including city and county government, non-governmental and environmental organizations, and WWTFs. Between May 2011 and July 2012, NCTCOG facilitated four stakeholder meetings, four Coordination Committee meetings, and 43 technical subcommittee meetings. The eight technical subcommittees included:

- Education and Outreach;
- Monitoring Coordination;
- On-site Sewage Facilities;
- Parks and Recreation;
- Pets, Livestock, and Wildlife;
- Planning and Development;
- Stormwater; and
- Wastewater.

The members of the technical subcommittees developed sections of the I-Plan, which were then compiled into a single document by NCTCOG. The I-Plan has eight stakeholder-developed strategies that will be used to reduce bacteria contributions. The strategies include management measures (voluntary activities) and control actions (regulatory activities). The I-Plan strategies include:

Wastewater Implementation

1.0 Waste water treatment plant effluent limits
1.1 Evaluation of non-participants in Sanitary Sewer Overflow Initiative (SSOI) and capacity management, operation and maintenance (C-MOM) programs
1.2 Lift station evaluation
1.3 Regional participation in Fats, Oils and Grease program
1.4 Sanitary sewer overflow (SSO) reporting
1.5 Funding opportunities for repair/replacement of sanitary sewer lines
1.6 Relocation of sewer mains from waterways
1.7 Liquid waste management and hauler program expansion

Stormwater Implementation

2.0 Municipal separate storm sewer system (MS4) participation in Regional Stormwater Management Program
2.1 Local Supplemental Environmental Projects
2.2 Land use, business, and regulatory review

Planning and Development Implementation

3.0 Adoption of Green Infrastructure and Low Impact Development Standards
3.1 Recognition program participation
2.2 Construction sites

Pets, Livestock and Wildlife Implementation
- 4.0 Feral hog management
- 4.1 Ordinance evaluation for livestock waste management and stocking rates
- 4.2 Pet and Livestock waste control measures
- 4.3 Waterfowl management plan
- 4.4 Model ordinance development
- 4.5 Pet waste collections stations and best management practices (BMPs) at parks
- 4.6 Distribution of pet waste education materials

Onsite Sewage Facility (OSSF) Implementation
- 5.0 Funding for failing OSSFs
- 5.1 Aerobic Treatment Unit maintenance
- 5.2 OSSF education efforts
- 5.3 Property inspections and document review
- 5.4 Services to annexed areas
- 5.5 Replacement and conversion of poorly functioning OSSFs

Monitoring Coordination Implementation
- 6.0 Routine sampling
- 6.1 Monitoring coordination forum
- 6.2 Source identification and monitoring review

Education and Outreach Implementation
- 7.0 Ongoing stormwater public outreach education
- 7.1 Education and outreach forum
- 7.2 Curriculum for Texas Education Agency
- 7.3 Education and outreach funding
- 7.4 Partnerships
- 7.5 Development of river-specific bacteria TMDL materials
- 7.6 Bacteria-specific outreach to volunteer service groups

Best Management Practices Library Implementation
- 2.0 Best Management Practice Library
- 2.1 BMP project funding and evaluation

Information on I-Plan development and related material are on the NCTCOG Web site at *http://www.nctcog.org/envir/SEEclean/wq/tmdl/index.asp*. An I-Plan Web page has also been developed by NCTCOG with the latest I-Plan documents, maps, and future meeting information. The I-Plan page is at *http://www.nctcog.org/envir/SEEclean/wq/tmdl/TMDLI-Plan.asp*.

Potential controversial concerns and legislative interest

There are no controversial concerns or legislative interest at this time.

Docket No. 2013-2574-TML

Key dates in the TMDL I-Plan schedule
The I-Plan identifies responsible entities, technical and financial needs, monitoring and outreach efforts, and a schedule of activities for each implementation strategy. It describes the process that the TCEQ and stakeholders will use to assess progress and adjust the plan periodically. The TCEQ and stakeholders will track the progress of the I-Plan using both programmatic and water quality indicators. The TCEQ will report results and evaluations from implementation tracking to stakeholders as needed.

Key Points in the TMDL I-Plan Schedule
Public meeting date: July 25, 2013
Public comment period: June 21, 2013 - August 2, 2013
Anticipated approval date: December 11, 2013

Agency contacts:
Dania Grundmann, Project Manager, 239-3449, Water Quality Planning Division
Robert Brush, Staff Attorney, 239-5600, Environmental Law Division
Charlotte Horn, Texas Register Coordinator, 239-0779

Attachments

cc: Chief Clerk, 7 copies

Approved December 11, 2013

Implementation Plan for Seventeen Total Maximum Daily Loads for Bacteria in the Greater Trinity River Region

Upper Trinity River

Segment 0805

Assessment Units 0805_03 and 0805_04

Cottonwood Branch and Grapevine Creek

Segments 0822A and 0822B

Assessment Units 0822A_02 and 0822B_01

Lower West Fork Trinity River

Segments 0841, 0841B, 0841C, 0841E, 0841G, 0841H, 0841J, 0841L, 0841M, 0841R, 0841T, and 0841U

Assessment Units 0841_01, 0841_02, 0841B_01, 0841C_01, 0841E_01, 0841G_01, 0841H_01, 0841J_01, 0841L_01, 0841M_01, 0841R_01, 0841T_01, and 0841U_01

Prepared by the:
Environment and Development Department

North Central Texas Council of Governments

Distributed by the

Total Maximum Daily Load Team
Texas Commission on Environmental Quality
MC-203
P.O. Box 13087
Austin, Texas 78711-3087
E-mail: tmdl@tceq.texas.gov

TMDL implementation plans are also available on the TCEQ website at:
www.tceq.texas.gov/waterquality/tmdl/

The preparation of this report was financed in part through grants from the U.S. Environmental Protection Agency.

In compliance with the Americans with Disabilities Act, this document may be requested in alternate formats by contacting the TCEQ at 512-239-0028, Fax 512-239-4488, or 1-800-RELAY-TX (TDD), or by writing P.O. Box 13087, Austin, TX 78711-3087.

This Implementation Plan report was prepared by the North Central Texas Council of Government's Environment and Development Department in collaboration with the Coordination Committee of the Greater Trinity River Bacteria TMDL Implementation Project and the members of Subcommittees on Education and Outreach; Monitoring Coordination; Onsite Sewage Facilities; Parks and Recreation; Pets, Livestock, and Wildlife; Planning and Development; Stormwater; and Wastewater.

Tables 8

Figures 12

List of Acronyms and Abbreviations 13

Executive Summary 15

Introduction 19

Watershed Summary 19

Designated Uses and Water Quality Standards 24

Seasonal Variation 24

Summary of the TMDLs 24

Potential Sources of Bacteria 28

Methods for Estimating Bacteria Loads 29

Pollutant Sources and Loads 30

Waste Load Allocations 30

Wastewater Treatment Facilities 32

Regulated Stormwater 33

Nonpoint Sources 33

Allowances for Future Growth 34

Implementation Strategies 36

Wastewater Implementation Strategies 38

Implementation Strategies 1.0: Wastewater treatment facility effluent limits 38

Implementation Strategy 1.1: Evaluation of non-participants in Sanitary Sewer Overflow Initiative (SSOI) and Capacity Management, Operation, and Maintenance (C-MOM) programs 42

Implementation Strategy 1.2: Lift station evaluation 45

Implementation Strategy 1.3: Regional participation in Fats, Oils, and Grease program 46

Implementation Strategy 1.4: Sanitary sewer overflow reporting 47

1.4.1: Wastewater and wastewater collection licensing 47

1.4.2: Electronic reporting 47

1.4.3: Reporting form changes 47

Implementation Strategy 1.5: Funding opportunities for repair/replacement of sanitary sewer lines 49

Implementation Strategy 1.6: Relocation of sewer mains from waterways 50

Implementation Strategy 1.7: Liquid waste management and liquid waste hauler program expansion 50

1.7.1: Liquid waste hauler inspection program 51
1.7.2: TCEQ and liquid waste haulers 51
1.7.2.1: Liquid waste hauler registration form addition 51
1.7.2.2: Requested change to liquid waste hauler regulations to include municipal notification 51
1.7.3: Implementation of standards for portable/chemical toilets 51

Stormwater Implementation Strategies 54

Implementation Strategy 2.0: MS4 participation in Regional Stormwater Management Program 55

2.0.1: Request Regional Stormwater Management Coordinating Council include bacteria in RSWMP program efforts and materials 55
2.0.1.1: IDDE program participation 55
2.0.1.2: Inclusion of bacteria load reduction in Pollution Prevention Peer-to-Peer program and evaluation of modified Peer-to-Peer program for five years 56

Implementation Strategy 2.1: Local Supplemental Environmental Projects 57

Implementation Strategy 2.2: Land use, business, and regulatory review 59

2.2.1: Business risk evaluation and enforcement 59
2.2.2: Request to TCEQ for Industrial Stormwater Multi-Sector General Permit classification review and benchmark bacteria monitoring 59

Planning and Development Implementation Strategies 66

Implementation Strategy 3.0: Adoption of green infrastructure and low impact development standards by municipalities 69

3.0.1: Reevaluation of development standards based on monitoring data 69
3.0.2: Municipal ordinance evaluation for water quality impediments 69
3.0.3: Internal policy and procedure integration and improved communication for municipalities 69

Implementation Strategy 3.1: Recognition program participation 71

3.1.1: Local policy and regulation evaluation for impediments for participation 71
3.1.2: Promotional efforts for recognition programs 71

Implementation Strategy 3.2: Construction sites 72

3.2.1: Construction site inspection programs 72
3.2.2: Educational materials for contractors, site owners, developers, and MS4 operators 72
3.2.3: Citizen participation and education efforts 73
3.2.4: Training workshops 73
3.2.5: Use of BMPs for infrastructure maintenance 73
3.2.6: Reevaluation of construction site education programs and possible voluntary certification program 73

Pets, Livestock, and Wildlife Implementation Strategies 75

Implementation Strategy 4.0: Feral hog management 76

4.0.1: Annual feral hog management workshop 77
4.0.2: Feral hog management forum 77
4.0.3: Feral hog management program 77
4.0.4: Feral hog management funding opportunities 77

Implementation Strategy 4.1: Ordinance evaluation for livestock waste management, stocking rates, and related measures 78

Implementation Strategy 4.2: Pet waste control measures 80

Implementation Strategy 4.3: Waterfowl management plan 81

Implementation Strategy 4.4: Model ordinance development 82

Implementation Strategy 4.5: Pet waste collection stations and BMPs at parks 83

Implementation Strategy 4.6: Distribution of pet waste education materials 84

Onsite Sewage Facility Implementation Strategies 86

Implementation Strategy 5.0: Funding for failing OSSFs 86

Implementation Strategy 5.1: Aerobic treatment unit maintenance 87
5.1.1: Request to TCEQ for enforcement 87
5.1.2: Continuing education opportunities 87
5.1.3: Sample ordinance development 87
5.1.4: Standardized service maintenance contract and inspection form 87

Implementation Strategy 5.2: OSSF education efforts for real estate agents, property inspectors, and homeowners 89
5.2.1: H-GAC curriculum 89
5.2.2: Training module evaluation and regional availability 89

Implementation Strategy 5.3: Property inspections and document review 90

Implementation Strategy 5.4: Services to annexed areas 91

Implementation Strategy 5.5: Replacement and conversion of poorly functioning OSSFs 92

Monitoring Coordination Implementation Strategies 94

Implementation Strategy 6.0: Routine sampling 95

Implementation Strategy 6.1: Monitoring coordination forum 96
6.1.1: Existing *E. coli* monitoring network evaluation 96
6.1.2: New source review for data 96
6.1.3: Data assessment of overall trends for BMP efficacy 96
6.1.4: Funding in relation to gaps in sampling data 96
6.1.5: Reevaluating monitoring technologies for pilot projects and/or research partnerships 96
6.1.6: Evaluate need for online data consolidation and access 96

Implementation Strategy 6.2: Source identification and monitoring review 98

Education and Outreach Implementation Strategies 100

Implementation Strategy 7.0: Ongoing stormwater public education participation and inclusion of bacteria-specific materials 100

Implementation Strategy 7.1: Education and outreach forum 101

Implementation Strategy 7.2: Curriculum for Texas Education Agency 102

7.2.1: Local school district outreach 102

7.2.2: Reevaluation of TEA materials and effectiveness 102

Implementation Strategy 7.3: Education and outreach funding 103

Implementation Strategy 7.4: Partnerships 104

Implementation Strategy 7.5: Development of river-specific bacteria TMDL materials 106

Implementation Strategy 7.6: Bacteria-specific outreach to volunteer service groups 107

Best Management Practices Library Implementation Strategies 109

Implementation Strategy 8.0: Best management practices library 109

8.0.1: Stormwater 109

8.0.1.1: BMP pilot projects and funding 109

8.0.2: Construction BMPs 109

8.0.2.1: Inclusion of construction BMPs in ordinances, including LID, GI, and iSWM 109

8.0.2.1: Post construction BMP review in conjunction with MS4 permit requirements 110

8.0.3: Online resource for construction and development-related BMPs, including cost/benefit information and educational materials 110

8.0.4: Use of demonstration projects and GI in municipal projects 110

8.0.5: BMPs for animal-related topics 110

8.0.5.1: Educational materials 110

8.0.5.2: Pilot project evaluation 110

8.0.6: Park-specific BMPs 110

8.0.7: OSSF BMPs 111

8.0.7.1: Web-based homeowner education 111

8.0.7.2: Additional educational materials 111

8.0.8: Monitoring coordination BMPs 111

8.0.9: Public education BMPs 111

Implementation Strategy 8.1: BMP project funding and evaluation 113

Implementation Strategy Evaluation 115

Implementation Strategies 9.0: Implementation strategy evaluation 115

References 117

Appendix A: Coordination Committee and Technical Subcommittee Membership 119

Coordination Committee 119

Technical Subcommittee Members 121

Education and Outreach 121
Monitoring Coordination 121
Onsite Sewage Facilities 121
Parks and Recreation 122
Pets, Wildlife, and Livestock 122
Planning and Development 122
Stormwater 123
Wastewater 123

Appendix B: Allocated Loads for TMDLs 124

Upper Trinity River, Segments 0805_03 and 0805_04 125

Cottonwood Creek and Grapevine Branch, Segments 0822A_02 and 0822B_01 127

Lower West Fork Trinity and Impaired Tributaries, Segments 0841, 0841B, 0841C, 0841E, 0841G, 0841H, 0841J, 0841L, 0841M, 0841R, 0841T, and 0841U 129

Appendix C: Segments and assessment units in project area 136

Appendix D: Public comments and responses 138

Appendix E: Formal support for I-Plan 146

Tables

Table 1. Summary of Implementation Strategies 17

Table 2. Sampling Data, Segment 0805 25

Table 3. Sampling Data, 0822 Segments 26

Table 4. Sampling Data, 0841 Segments 27

Table 5. TPDES Permitted Wastewater Dischargers 31

Table 6. Permitted WWTFs in the Greater Trinity Watershed 39

Table 7. Implementation Strategy 1.0 Summary — Wastewater treatment facility effluent limits 40

Table 8. SSOI Participants 43

Table 9. Implementation Strategy 1.1 Summary — Evaluation of non-participants in SSOI and C-MOM programs 44

Table 10. Implementation Strategy 1.2 Summary—Lift station evaluation 45

Table 11. Implementation Strategy 1.3 Summary — Regional participation in Fats, Oils, and Grease program 46

Table 12. Implementation Strategy 1.4 Summary — Sanitary sewer overflow reporting 47

Table 13. Implementation Strategy 1.5 Summary — Funding opportunities for repair/replacement of sanitary sewer lines 49

Table 14. Implementation Strategy 1.6 Summary — Relocation of sewer mains from waterways 50

Table 15. Implementation Strategy 1.7 Summary — Liquid waste management and liquid waste hauler program expansion 51

Table 16. Implementation Strategy 2.0 Summary — MS4 participation in Regional Stormwater Management Program 56

Table 17. Implementation Strategy 2.1 Summary — Local Supplemental Environmental Projects 58

Table 18. Implementation Strategy 2.2 Summary — Land use, business, and regulatory review 59

Table 19. MS4 Permittees by AU for 0805 and 0822 Segments 61

Table 20. MS4 Permittees by AU for 0841 Segments 62

Table 21. RSWMP Participation in Project Area as of FY2012 64

Table 22. Implementation Strategy 3.0 Summary — Adoption of GI and LID standards by municipalities 69

Table 23. Implementation Strategy 3.1 Summary — Recognition program participation 71

Table 24. Implementation Strategy 3.2 Summary — Construction sites 73

Table 25. Dog and Cat Population by Impaired Segment 76

Table 26. Implementation Strategy 4.0 Summary — Feral hog management 77

Table 27. Implementation Strategy 4.1 Summary — Ordinance evaluation for livestock waste management, stocking rates, and related measures 79

Table 28. Implementation Strategy 4.2 Summary — Pet waste control measures 80

Table 29. Implementation Strategy 4.3 Summary — Waterfowl management plan 81

Table 30. Implementation Strategy 4.4 Summary — Model ordinance development 82

Table 31. Implementation Strategy 4.5 Summary — Pet waste collection stations and BMPs at parks 83

Table 32. Implementation Strategy 4.6 Summary — Distribution of pet waste education materials 84

Table 33. Implementation Strategy 5.0 Summary — Funding for failing OSSFs 86

Table 34. Implementation Strategy 5.1 Summary — Aerobic treatment unit maintenance 88

Table 35. Implementation Strategy 5.2 Summary — OSSF education efforts for real estate agents, property inspectors, and homeowners 89

Table 36. Implementation Strategy 5.3 Summary — Property inspections and document review 90

Table 37. Implementation Strategy 5.4 Summary — Services to annexed areas 91

Table 38. Implementation Strategy 5.5 Summary — Replacement and conversion of poorly functioning OSSFs 92

Table 39. Implementation Strategy 6.0 Summary — Routine sampling 95

Table 40. Implementation Strategy 6.1 Summary — Monitoring coordination forum 97

Table 41. Implementation Strategy 6.2 Summary — Source identification and monitoring review 98

Table 42. Implementation Strategy 7.0 Summary — Ongoing stormwater public education, participation, and inclusion of bacteria-specific materials 100

Table 43. Implementation Strategy 7.1 Summary — Education and outreach forum 101

Table 44. Implementation Strategy 7.2 Summary — Curriculum for Texas Education Agency 102

Table 45. Implementation Strategy 7.3 Summary — Education and outreach funding 104

Table 46. Implementation Strategy 7.4 Summary — Partnerships 105

Table 47. Implementation Strategy 7.5 Summary — Development of river-specific bacteria TMDL materials 106

Table 48. Implementation Strategy 7.6 Summary — Bacteria-specific outreach to volunteer service groups 107

Table 49. Implementation Strategy 8.0 Summary — Best management practices library 112

Table 50. Implementation Strategy 8.1 Summary — BMP project funding and evaluation 113

Table 51. Implementation Strategy 9.0 Summary — Implementation strategy evaluation 115

Table 52. Summary of TMDL and upstream load allocation calculations for each AU 125

Table 53. Wasteload allocations for TPDES permitted facilities 126

Table 54. Future capacity calculations for impaired AUs 126

Table 55. Future growth calculations for AUs 0805_04 and 0805_03 126

Table 56. *E. coli* TMDL summary calculations for the Upper Trinity River AUs 0805_04 and 0805_03 126

Table 57. Summary of TMDL calculations for Cottonwood Branch and Grapevine Creek 127

Table 58. Future growth computations for Cottonwood Branch and Grapevine Creek 127

Table 59. Regulated stormwater computations for Cottonwood Branch (0822A_02) and Grapevine Creek (0822B_01) 128

Table 60. Non-regulated stormwater computations for Cottonwood Branch and Grapevine Creek 128

Table 61. TMDL allocation summary for Cottonwood Branch and Grapevine Creek 128

Table 62. Final TMDL allocations for Cottonwood Branch and Grapevine Creek 128

Table 63. Summary of TMDL and load allocations from upstream and tributaries (LA_{USL}) calculations 131

Table 64. Regulated wastewater treatment facility computations 131

Table 65. Future Wastewater Service Area (WWSA) growth computations for the TMDL watersheds 132

Table 66. Regulated stormwater computation for TMDL Watersheds 133

Table 67. Computed unregulated stormwater term for AUs within TMDL watersheds 133

Table 68. TMDL allocation summary for impaired AUs within the Lower West Fork Trinity River Watershed 134

Table 69. Final TMDL allocations for impaired AUs 135

Table 70. Segment number with physical description and year listed 136

Figures

Figure 1. Greater Trinity Bacteria TMDL Project Area 18

Figure 2. Segment 0805, Upper Trinity Area 21

Figure 3. 0822 Segments, Cottonwood Branch and Grapevine Creek 22

Figure 4. 0841 Segments, Lower West Fork Trinity with Impaired Tributaries 23

Figure 5. WWTF Location and Coverage Map with Permitted Dischargers 41

Figure 6. Map — SSOs Occurring between September 2006 – August 2011 53

Figure 7. MS4s in Project Area 65

Figure 8. Land Use in Project Area 67

Figure 9 - Population Density from 2010 US Census Data 67

Figure 10. OSSF Distribution Map with Impaired Segments 93

Figure 11. Monitoring Locations on Impaired Segments Map 99

All figures are available at greater resolution online at:
<www.nctcog.org/envir/SEEclean/wq/tmdl/TMDLI-Plan.asp>.

List of Acronyms and Abbreviations

ALU	aquatic life use
ATU	aerobic treatment unit
AU	assessment unit
BMP	best management practice
CAFO	concentrated animal feeding operation
CFR	Code of Federal Regulations
CFU	colony-forming units
cfs	cubic feet per second
cms	cubic meters per second
CGP	Construction General Permit (TX)
C-MOM	capacity management, operation, and maintenance program
CRP	clean rivers program
DART	Dallas Area Rapid Transit
DFW	Dallas – Fort Worth International Airport
dL	deciliter
DMR	discharge monitoring report
DO	dissolved oxygen
E. coli	*Escherichia coli*
EPA	Environmental Protection Agency (U.S.)
FC	fecal coliform
FDC	flow duration curve
FWSD	fresh water supply district
FOG	fats, oils, and grease
FY	fiscal year
GI	green infrastructure
GIS	geographic information system
gpcd	gallons per capita per day
H-GAC	Houston-Galveston Area Council of Governments
IDDE	illicit discharge detection and elimination
I/I	inflow and infiltration
I-Plan	implementation plan
IS	implementation strategy
iSWM	*integrated* Stormwater Management
LA	load allocation
LID	low impact development
LDC	load duration curve
mL	milliliter
MGD	million gallons per day
MOS	margin of safety
MPN	most probable number
MS4	municipal separate storm sewer system
MSGP	Multi-Sector General Permit
MUD	municipal utility district
NCTCOG	North Central Texas Council of Governments
NELAC	National Environmental Laboratory Accreditation Conference

NELAP	National Environmental Laboratory Accreditation Program
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NRCS	Natural Resources Conservation Service
NTGAC	North Texas Grease Abatement Council
NTTA	North Texas Tollway Authority
OSSF	onsite sewage facility
P2	pollution prevention
POTW	publicly owned treatment work
QAPP	quality assurance project plan
RSWMP	Regional Stormwater Management Program
RSWMCC	Regional Stormwater Management Coordinating Council
RWWCP	Regional Wet Weather Characterization Program
SEP	supplemental environmental project
SSO	sanitary sewer overflow
SSOI	sanitary sewer overflow initiative
SSS	sanitary sewer system
STATSGO	State Soil Geographic Database
SWCD	soil and water conservation district
SWMP	Stormwater Management Plan
SWPPP	stormwater pollution prevention plan
TAC	Texas Administrative Code
TEA	Texas Education Agency
TCEQ	Texas Commission on Environmental Quality
TMDL	total maximum daily load
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TRA	Trinity River Authority
TREC	Texas Real Estate Commission
TREES	Trinity River Environmental Education Society
TSSWCB	Texas State Soil and Water Conservation Board
TxDOT	Texas Department of Transportation
USACE	United States Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
WBD	Watershed boundary dataset
WLA	wasteload allocation
WQMP	Water Quality Management Plan
WWF	wet weather facility
WWTF	wastewater treatment facility
x	occurrences — as in 5x/week (5 occurrences per week)

Executive Summary

In 1996 portions of the Upper Trinity River and Lower West Fork Trinity River were listed as impaired for elevated bacteria in the *Texas Water Quality Inventory and 303(d) List* (now known as *Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d))*. In 2006, two tributaries of the Elm Fork Trinity River and multiple tributaries of the Lower West Fork Trinity were also added to the 303(d) list of impaired water bodies (TCEQ, 2010a). These bacteria-impaired segments cover the heart of the Dallas-Fort Worth metropolitan area and impact 1.33 million people. (Figure 1)

On May 11, 2011, the Texas Commission on Environmental Quality (TCEQ) adopted *Two Total Maximum Daily Loads for Indicator Bacteria in the Upper Trinity River, Dallas, Texas (*Segment 0805, Assessment Units 0805_03 and 0805_04). The Total Maximum Daily Loads (TMDLs) were approved by the U.S. Environmental Protection Agency (EPA) on August 3, 2011. On September 21 of that same year, the TCEQ adopted *Two Total Maximum Daily Loads for Indicator Bacteria in Cottonwood Branch and Grapevine Creek* (Segments 0822A and 0822B, Assessment Units 0822A_02 and 0822B_01). The EPA approved them on May 30, 2012. The TMDLs for the Lower West Fork Trinity River, Segment 0841 and its tributaries, were adopted September 24, 2013.

This implementation plan (I-Plan) describes the steps watershed stakeholders and the TCEQ will take toward achieving the pollutant reductions identified in the TMDLs and technical reports and outlines the schedule for implementation activities. The I-Plan uses an adaptive management approach where measures will be periodically assessed for efficiency and effectiveness. This iterative process of evaluation and adjustment ensures continuing progress toward achieving water quality goals, and expresses stakeholder commitment to the process. At annual meetings, the I-Plan's managing body, the Coordination Committee (Appendix A), will assess progress using the schedule of implementation, interim measurable milestones, water quality data, and the communication plans included in this document. If these assessments find that insufficient progress has been made or that implementation activities have improved water quality, the implementation strategy will be adjusted.

Many of the implementation strategies in this I-Plan are directed towards meeting bacteria loading (Appendix B) from possible point and nonpoint sources identified by the TCEQ during development of the TMDLs. The activities are intended to achieve the goals identified in the TMDL reports necessary to comply with established water quality standards. The possible sources of bacteria identified include permitted storm sewer sources, dry weather discharges (illicit discharges), sanitary sewer overflows, and unregulated sources such as wildlife, unmanaged feral animals, and pets.

The ultimate goal of this I-Plan is to restore the primary contact recreation use in the 17 bacteria impaired segments (Appendix C) in the Project area by reducing concentrations of the indicator bacteria *Escherichia coli (E. coli)* to levels established in the TMDLs. Based on the TMDL reports and the technical support document, the following reduction goals are identified for the segments to meet the criteria defined in the state water quality standards:

- For the Upper Trinity TMDL bacteria loading reductions of 44 percent to 67 percent;
- For Cottonwood Creek and Grapevine Branch TMDL bacteria loading reductions of 64 percent to 84 percent; and
- For the Lower West Fork Trinity and associated impaired tributaries TMDL bacteria loading reductions of 25 percent to 98 percent.

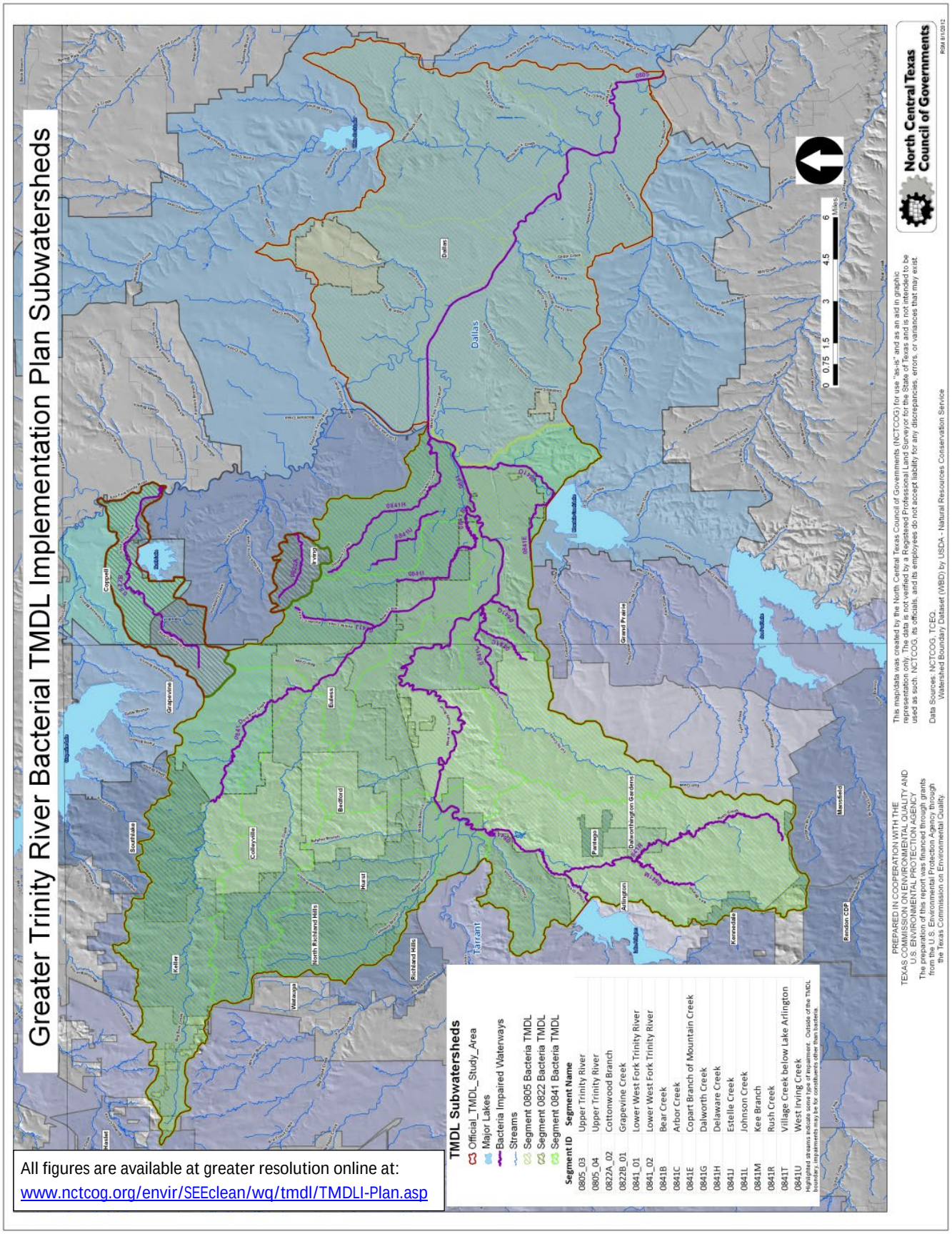
With these goals in mind, the implementation strategies in this I-Plan are presented in sections describing the various sources of bacterial pollution identified through stakeholder and TMDL processes. These include a description of activities, identification of the parties responsible for implementing the activities, a schedule for implementation, the goals associated with the activities, and a process for tracking, evaluating, and reporting progress. A process of implementation, monitoring, analyses, adaptation, and review is also outlined so the I-Plan is intended for regular updates. The I-Plan provides a pragmatic and scientifically based approach to meet water quality goals within a reasonable timeframe. A broad summary of the implementation activities in each section can be found in Table 1.

Table 1. Summary of Implementation Strategies

I-Plan Section	Activity Category	Focus of Implementation Activities*
Implementation Strategy 1.0	Wastewater	SSO prevention, effluent monitoring, FOG program participation, liquid waste programs, and infrastructure funding and management.
Implementation Strategy 2.0	Stormwater	BMP pilot projects and funding, regional stormwater management program participation, local SEPs, and land use and business operation risk analysis.
Implementation Strategy 3.0	Planning and Development	Green infrastructure and low impact development standards adoption by municipalities for internal projects and ordinances, municipal ordinance evaluation, and construction site standards.
Implementation Strategy 4.0	Pets, Livestock and Wildlife	Feral hog management, livestock evaluation, pet and livestock waste control measures, waterfowl management plan, and public outreach.
Implementation Strategy 5.0	Onsite Sewage Facilities	OSSF education for homeowners and real estate agents, funding for and conversion from failing OSSFs, and ATU maintenance.
Implementation Strategy 6.0	Monitoring Coordination	Routine sampling and data assessment for BMP efficacy, source identification, and monitoring coordination forum.
Implementation Strategy 7.0	Education and Outreach	Modification of existing programs for bacteria-specific information, online BMP library, TEA curriculum, funding and partnerships, and bacteria-specific outreach.
Implementation Strategy 8.0	Best Management Practices Library	Online BMP Library for stakeholders including provisions for Implementation Strategies 1.0 – 7.0.
Implementation Strategy 9.0	Implementation Strategy Evaluation	Annual review by technical subcommittees of respective Implementation Strategies with recommendations to Coordination Committee for potential changes, additions, or deletions to I-Plan.

*See pages 14-15, table of acronyms, for full acronym definitions.

Figure 1. Greater Trinity Bacteria TMDL Project Area



All figures are available at greater resolution online at:
www.nctcog.org/envir/SEEclean/wq/tmdl/TMDLI-Plan.asp

Introduction

The Clean Water Act requires that states identify uses for the state's surface waters such as aquatic life, recreation, and sources of public water supply. The criteria or standard for evaluating support of those uses include dissolved oxygen, bacteria, and toxic substances, among others. The primary contact recreation use is designed to ensure that water is safe for swimming, waterskiing, wading by children, or other activities that involve direct contact with the water. Most water bodies in Texas and in the Dallas-Fort Worth area have a presumed primary contact recreation use. The TCEQ determines whether water quality in a water body meets the primary contact recreation use by measuring the levels of indicator bacteria. *E. coli* are the preferred indicator bacteria for assessing for recreational use in fresh water, and were used for analysis to support TMDL development on water bodies in this region. High concentrations of indicator bacteria have been associated with an increased risk of becoming ill from recreational activities.

When a waterway is determined to be impaired (Category 5a of the 303(d) List), a TMDL is developed. As defined by the EPA, a TMDL "is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards." In addition to the TMDL, an I-Plan is developed, which describes the regulatory and voluntary management measures necessary to improve water quality and restore the water body to its designated use. TMDLs are developed at the assessment unit (AU) level to focus on the areas of impairment. An AU is a sub-area of a segment and is the smallest geographic area of use support reported in the Texas Integrated Report. Thus, some waterways may have more than one AU but not all may be listed as impaired.

This I-Plan is the result of work by the stakeholders convened by the North Central Texas Council of Governments (NCTCOG) for the Greater Trinity River Bacteria TMDL Implementation Project (frequently referred to in this I-Plan as 'the Project') and in particular the efforts and input of the Project Coordination Committee and the Technical Subcommittees of Education and Outreach; Monitoring Coordination; Onsite Sewage Facilities; Parks and Recreation; Pets, Livestock, and Wildlife; Planning and Development; Stormwater; and Wastewater. The Coordination Committee and subcommittee members represent city and county governments, resource agencies, business and agriculture interests, transportation interests, conservation organizations, water supply and treatment agencies, and recreational interests (see Appendix A).

Because several of the waterways within, near, or adjacent to the Greater Trinity Project Area are either listed or may be listed on the 303(d) list for bacteria impairments, this I-Plan has been developed with the flexibility to allow for the addition of segments and watersheds in the event that new TMDLs are adopted by the TCEQ in the future.

Watershed Summary

The watershed(s) for the Greater Trinity River Bacteria TMDL Implementation Project encompass a total area of about 406 square miles. The total human population is 1.33 million with a population density of approximately 3,232 people per square mile. The Project addresses watersheds covered by three separate TCEQ TMDL projects:

- Upper Trinity River Segment 0805,

- Elm Fork River Tributaries of Grapevine Creek and Cottonwood Branch, and
- Lower West Fork Trinity River Segment 0841 and 11 of its tributaries.

Appendix C details the segment descriptions and years listed for the 17 segments included in this I-Plan.

Located in central Dallas County, the Upper Trinity River (Segment 0805) flows through the center of the City of Dallas. It continues in a southeasterly direction through Ellis, Kaufman, Navarro, and Henderson Counties. Encompassing a large portion of the City of Dallas, the overall watershed drains an area of about 1,045 square miles, although the impaired portion covers only about 129 square miles.

Two of the five AUs of the Upper Trinity (Segment 0805) are addressed by a TMDL, covering the area from the confluence of the Elm Fork Trinity River and Lower West Fork Trinity River, downstream to the confluence of the Upper Trinity River with Five Mile Creek. Both impaired AUs (0805_03 and 0805_04) lie entirely within Dallas County in highly urbanized watersheds. The cities within the watershed include the cities of Dallas, Cockrell Hill, and University Park and the Town of Highland Park TCEQ, 2011a). (Figure 2)

Cottonwood Branch and Grapevine Creek (Segments 0822A and 0822B) are urban creeks located in the north central portion of the Dallas-Fort Worth Metroplex. Both are tributaries of the Elm Fork Trinity River below Lake Lewisville (Segment 0822). Grapevine Creek (0822B) is the larger of the two creeks with a drainage area of about 15 square miles, while Cottonwood Branch (0822A) has a drainage area of about three square miles. Cottonwood Branch is divided into two AUs while Grapevine Creek consists of a single AU. Only the upper AU of Cottonwood Branch (0822A_02) is impaired. The drainage area of both AUs for Cottonwood Branch and the single AU for Grapevine Creek lie within Dallas County with the exception of the upstream portion of the AU for Grapevine Creek that lies within Tarrant County. The cities within the Grapevine Creek watershed include Irving, Coppell, and Grapevine in addition to the presence of the Dallas-Fort Worth International Airport (DFW). The Cottonwood Branch watershed lies largely within the City of Irving. A small portion lies within DFW Airport property, and a portion of the unimpaired downstream AU is also within the jurisdiction of the Dallas County Utility and Reclamation District (TCEQ, 2011b). (Figure 3)

The Lower West Fork Trinity River (Segment 0841) is located in Dallas and Tarrant Counties and begins at the confluence of the Lower West Fork Trinity and Village Creek in Arlington and continues downstream to the confluence with the Elm Fork Trinity River. The Lower West Fork Trinity River is divided into two AUs (0841_01 and 0841_02). The watershed of the Lower West Fork Trinity and the 11 impaired tributaries addressed in this I-Plan — Arbor Creek, Bear Creek, Copart Branch Mountain Creek, Dalworth Creek, Delaware Creek, Estelle Creek, Johnson Creek, Kee Branch, Rush Creek, Village Creek, and West Irving Branch are located within the urbanized area of the Metroplex's mid cities and Fort Worth. Each of the impaired tributaries of the Lower West Fork Trinity River consists of a single AU.

The watershed for Segment 0841 — which includes the individual watersheds of the 11 tributaries — is the largest of the three TMDLs and encompasses parts or all of the cities of Arlington, Bedford, Colleyville, Dallas, Dalworthington Gardens, Euless, Fort Worth, Grand Prairie, Grapevine, Haslet, Hurst, Irving, Keller, Kennedale, North Richland Hills, Richland Hills, and Southlake, and Town of Pantego. The total area covered for this segment is about 259 square miles (TCEQ, 2013). (Figure 4)

Figure 2. Segment 0805, Upper Trinity Area

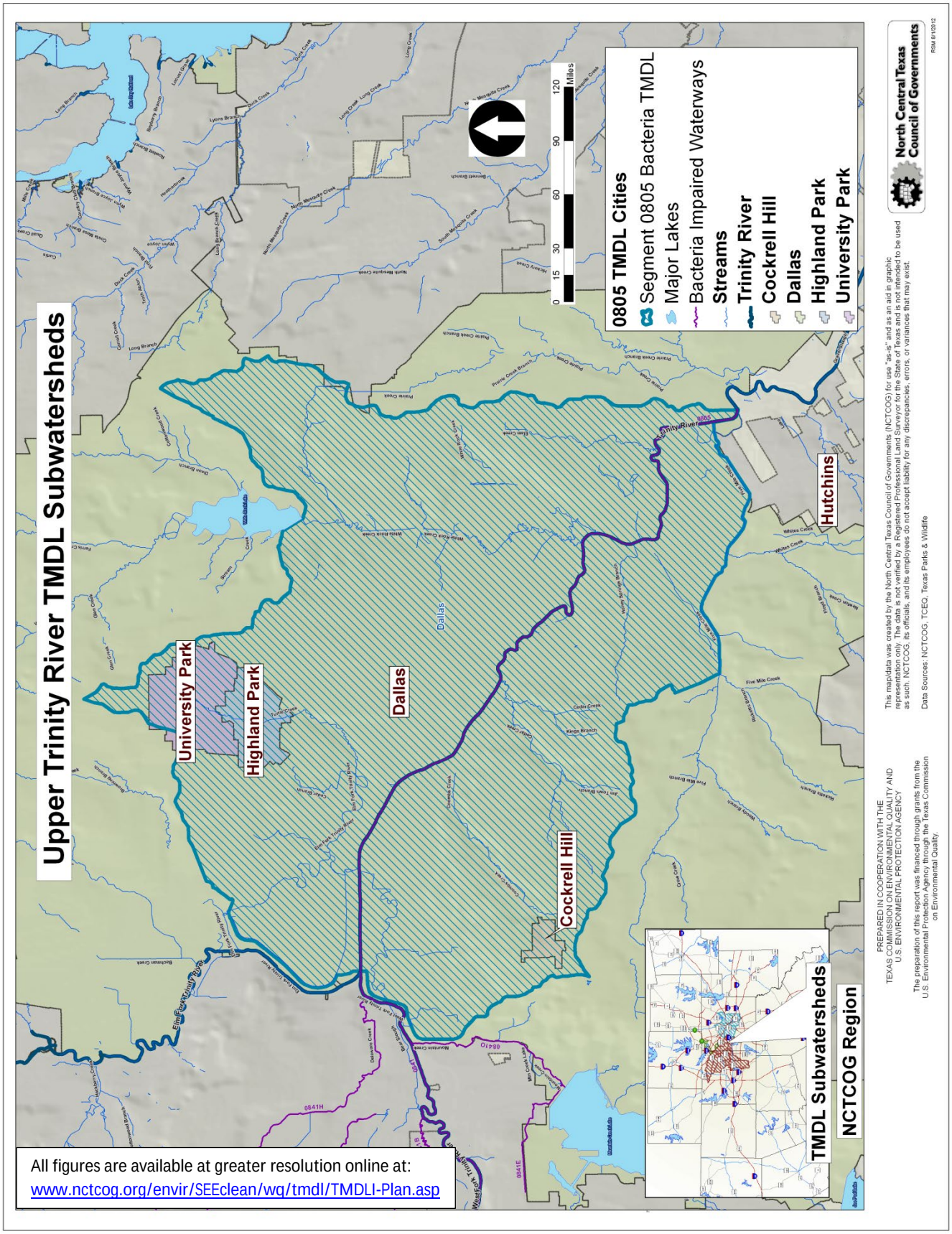


Figure 3. 0822 Segments, Cottonwood Branch and Grapevine Creek

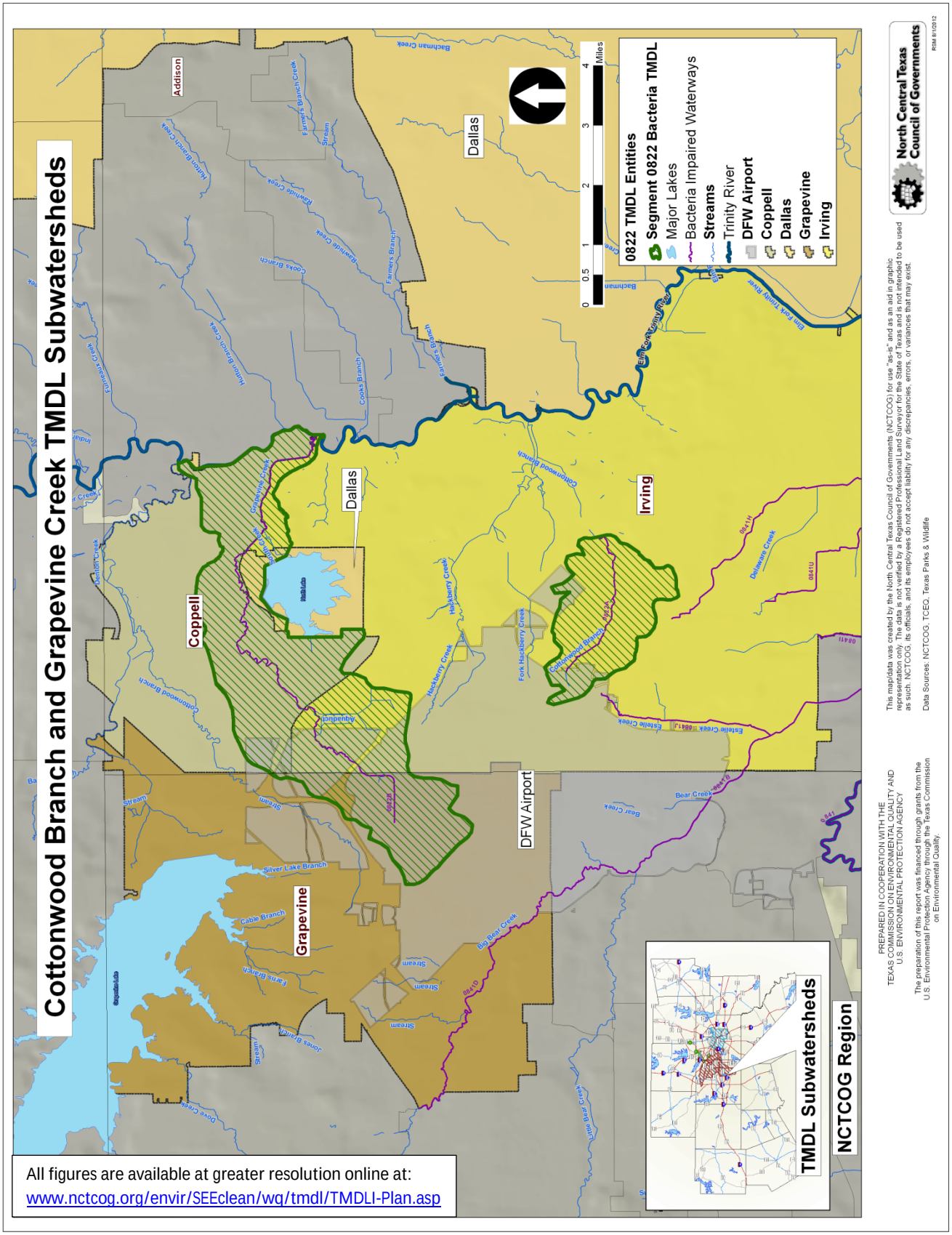
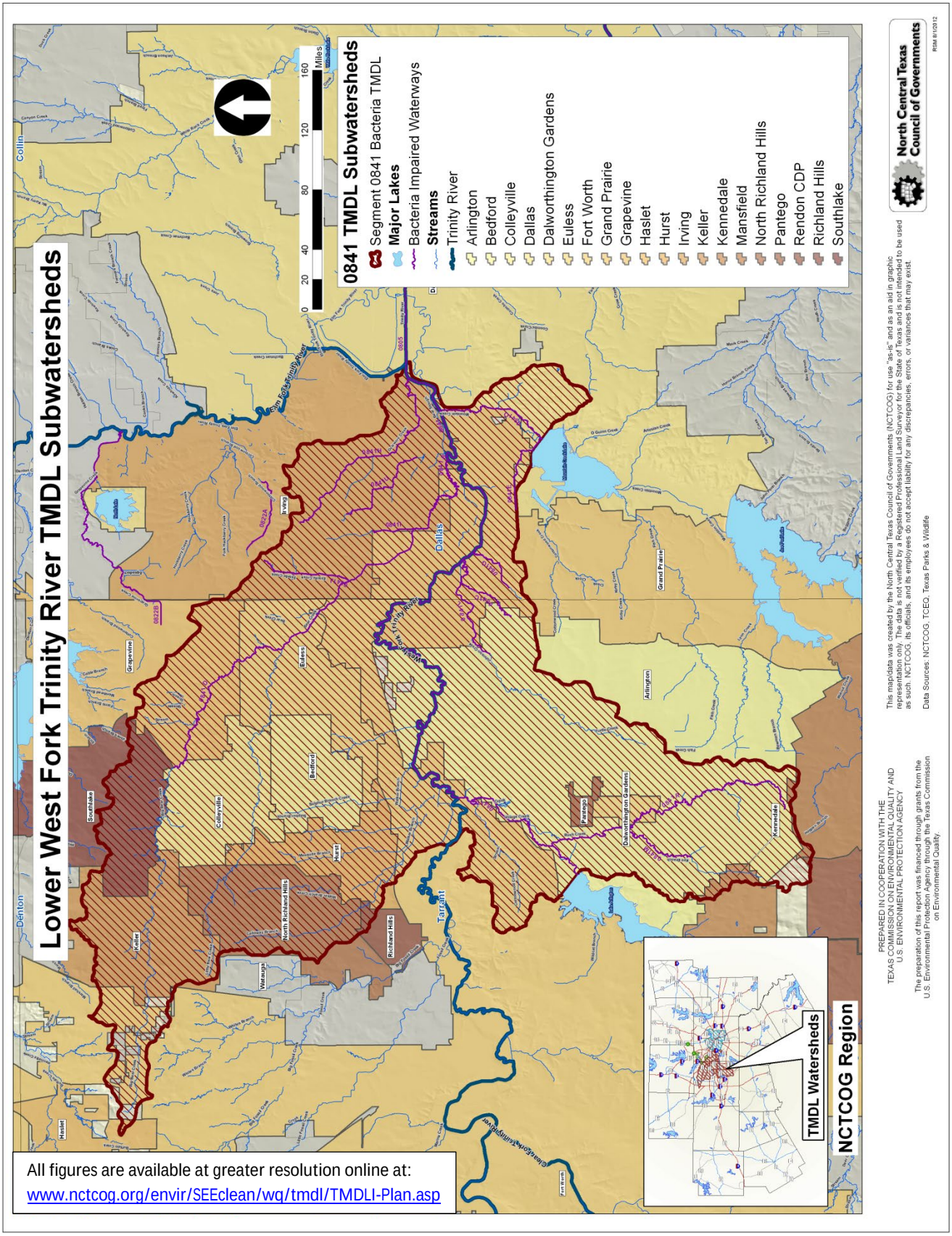


Figure 4. 0841 Segments, Lower West Fork Trinity with Impaired Tributaries



Designated Uses and Water Quality Standards

The basis for assessing attainment of the primary contact recreation use is expressed as the number (or 'counts') of *E. coli* bacteria, given as the most probable number (MPN). In order to meet numeric criterion defined in the TCEQ water quality standards for support of the primary contact recreation use, the geometric mean of *E. coli* in freshwater should not exceed 126 MPN per 100 milliliters (mL).

Although this criterion represents the standards for primary contact recreation adopted by the TCEQ on June 30, 2010 (TCEQ, 2010b), other criteria may have been in place prior to that date that led to a stream initially being identified as impaired for bacteria.

Seasonal Variation

Federal regulations (40 CFR §130.7(c)(1)) require that TMDLs account for seasonal variation in watershed conditions and pollutant loading. According to TCEQ in their adopted TMDLs for the Upper Trinity (Segment 0805) (TCEQ, 2011a) and Cottonwood Branch and Grapevine Creek (Segments 0822A and 0822B) (TCEQ, 2011b), and Lower West Fork Trinity (Segment 0841) and impaired tributaries (TCEQ, 2013), no statistically significant seasonal variation was found in *E. coli* data examined. Consequently, seasonal variation was not considered in the TMDL calculations or this I-Plan.

Summary of the TMDLs

Upper Trinity Segment 0805 TMDL

According to TCEQ's TMDL for Segment 0805, *Two Total Maximum Daily Loads for Indicator Bacteria in the Upper Trinity River, Dallas, Texas,* adopted in 2011, impairment to the primary contact recreation use for this segment was first listed in the 1996 303(d) List. The impairments were identified more precisely as AUs 0805_03 and 0805_04 in the *2008 Texas Water Quality Integrated Report for Clean Water Sections 305(b) and 303(d).* The goal, or endpoint, for the Upper Trinity River TMDL is to maintain concentrations of *E. coli* below the geometric mean criterion of 126 MPN/100 mL.

Table 2 presents a historical summary of ambient indicator bacteria data from the TCEQ surface water database, Surface Water Quality Monitoring Information System (SWQMIS), from February 2001 through November 2008 for all AUs in Segment 0805. As indicated in Table 2, only TCEQ stations 10937 (in AU 0805_04) and 10934 (in AU 0805_03) exceeded the geometric mean criterion of 126 MPN/100 mL (TCEQ, 2011a).

Table 2. Sampling Data, Segment 0805

AU	Station ID	Location	No. of Samples (02/2001-11/2008)	Range of measured *E. coli* (MPN/100mL)	Geometric mean
0805_04	10937	Mockingbird Ln./ Dallas Co.	75	12 – 24,200	224
0805_03	10934	South Loop 12/ Dallas Co.	75	17 – 39,700	384
0805_06	10932	Dowdy Ferry Rd./ Dallas Co.	13	11 – 980	85
0805_06	10930	Belt Line Rd./ Dallas Co.	60	3 – 1,540	54
0805_02	10925	Downstream of SH 34/ Kaufman Co.	82	2 – 4,840	122
0805_01	10924	Near FM 85/ Henderson Co.	6	8 – 770	56

Elm Fork Tributaries Segments 0822A and 0822B TMDL

In TCEQ's TMDL for the Elm Fork tributaries, *Two Total Maximum Daily Loads for Indicator Bacteria in Cottonwood Branch and Grapevine Creek,* impairment to the primary contact recreation use for Cottonwood Branch (Segment 0822A) and Grapevine Creek (Segment 0822B) were first identified in the 2006 *Texas Water Quality Integrated Report for Clean Water Sections 305(b) and 303(d)*. All or part of each water body was subsequently included on the 2008 and 2010 303(d) Lists. The impaired AUs in Segments 0822A and 0822B on the 303(d) List are 0822A_02 and 0822B_01. The goal, or endpoint, for the Cottonwood Branch and Grapevine Creek TMDL is to maintain concentrations of *E. coli* below the geometric mean criterion of 126 MPN/100 mL.

Table 3 presents a historical summary of ambient indicator bacteria data from the TCEQ SWQMIS database for November 2001 through October 2004. All AUs in Segments 0822A and 0822B are included in the data summary. As indicated in Table 3, only the AUs associated with TCEQ stations 17165 and 17166 in AU 0822A_02 and stations 17531 and 17939 in AU 0822B_01 exceeded the geometric mean criterion of 126 MPN/100 mL (TCEQ, 2011b).

Table 3. Sampling Data, 0822 Segments

AU	Station ID	Location	No. of Samples (02/2001-11/2008)	Range of measured *E. coli* (MPN/100mL)	Station Geometric Mean (MPN/100mL)	AU Geometric Mean (MPN/100mL)
0822A_01	18359	433 m upstream of N. MacArthur Blvd / Dallas Co	76	2 – 2,600	37	47
0822A_01	17167	N. MacArthur Blvd / Dallas Co.	7	3 – >2,400	154	47
0822A_01	17168	Spur 348 (Northwest Hwy) / Dallas Co.	31	<1 – 977	41	47
0822A_02	17165	N. Beltline Rd. / Dallas Co.	32	19 – >4,838	764	786
0822A_02	17166	N. Story Rd. / Dallas Co.	30	99 – >4,840	811	786
0822B_01	17531	Airfield North upstream of bridge / Tarrant Co.	12	21 – >2,419	121	411
0822B_01	17939	210 m upstream of Regent Blvd. and 535 m upstream of I-635 / Dallas Co.	22	48 – 4,838	799	411

Lower West Fork Trinity, Segment 0841 and Tributaries

The bacteria impairments within the Lower West Fork Trinity River were first identified in the 1996 and each subsequent version through 2012 of the *Texas Water Quality Integrated Report for Clean Water Sections 305(b) and 303 (d).* Bacteria impairments within Bear Creek, Arbor Creek, Copart Branch Mountain Creek, Dalworth Creek, Delaware Creek, Estelle Creek, Johnson Creek, Kee Branch, Rush Creek, Village Creek, and West Irving Branch were all first identified in the 2006 303(d) List and each subsequent List through 2012 (TCEQ, 2013).

Table 4, based on the *Thirteen Total Maximum Daily Loads for Indicator Bacteria in the Lower West Fork Trinity River Watershed* (TCEQ, 2013), presents the historical data for Lower West Fork Trinity Segment 0841 and its tributaries. The goal or endpoint for the Lower West Fork Trinity TMDL is to maintain concentrations of *E. coli* below the geometric mean criterion of 126 MPN/100 mL.

Table 4. Sampling Data, 0841 Segments

Water Body	AU	Station	No. of Samples	Data Date Range	Station Geometric Mean (MPN/100 mL)	AU Geometric Mean (MPN/100 mL)
Lower West Fork Trinity	0841_01	11079	4	2002	36	177
Lower West Fork Trinity	0841_01	11080	33	2001-2004	170	177
Lower West Fork Trinity	0841_01	11081	71	2001-2008	216	177
Lower West Fork Trinity	0841_01	11089	7	2005-2006	70	177
Lower West Fork Trinity	0841_02	17669	90	2001-2008	164	135
Lower West Fork Trinity	0841_02	11084	11	2001-2002	56	135
Lower West Fork Trinity	0841_02	11087	1	2002	97	135
Lower West Fork Trinity	0841_02	17160	4	2002	23	135
Bear Creek	0841B	10864	5	2002	224	152
Bear Creek	0841B	10865	27	2005-2008	78	152
Bear Creek	0841B	10866	31	2001-2004	225	152
Bear Creek	0841B	10867	81	2001-2008	209	152
Bear Creek	0841B	10868	27	2001-2007	77	152
Bear Creek	0841B	10869	12	2005-2008	66	152
Bear Creek	0841B	17663	83	2001-2008	192	152
Bear Creek	0841B	18313	25	2002-2004	136	152
Bear Creek	0841B	18315	25	2002-2004	106	152
Arbor Creek	0841C	17666	68	2001-2007	139	139
Copart Branch Mountain Creek	0841E	17672	79	2001-2008	156	156
Dalworth Creek	0841G	17671	52	2001-2008	720	720
Delaware Creek	0841H	10871	7	2001-2002	1,055	383
Delaware Creek	0841H	17175	31	2001-2004	1,120	383
Delaware Creek	0841H	17176	32	2001-2004	227	383
Delaware Creek	0841H	17177	30	2001-2004	504	383
Delaware Creek	0841H	17178	43	2001-2008	178	383
Delaware Creek	0841H	18314	25	2002-2004	405	383
Estelle Creek	0841J	17174	32	2001-2004	342	342
Johnson Creek	0841L	17174	32	2001-2004	342	128
Johnson Creek	0841L	10719	37	2001-2008	179	128
Johnson Creek	0841L	10721	26	2002-2008	291	128

Water Body	AU	Station	No. of Samples	Data Date Range	Station Geometric Mean (MPN/100 mL)	AU Geometric Mean (MPN/100 mL)
Johnson Creek	0841L	17664	80	2001-2008	136	128
Johnson Creek	0841L	17665	22	2001-2005	93	128
Johnson Creek	0841L	18311	57	2003-2008	73	128
Kee Branch	0841M	10792	26	2002-2008	188	196
Kee Branch	0841M	15103	6	2007-2008	261	196
Kee Branch	0841M	16896	6	2007-2008	173	196
Rush Creek	0841R	10791	25	2002-2008	101	148
Rush Creek	0841R	17190	25	2002-2008	207	148
Rush Creek	0841R	17191	24	2002-2008	156	148
Village Creek	0841T	10778	5	2005	142	137
Village Creek	0841T	17189	27	2002-2008	136	137
West Irving Branch	0841U	17179	35	2002-2008	357	357

Potential Sources of Bacteria

According to the 2011 *Two Total Maximum Daily Loads for Indicator Bacteria in the Upper Trinity River, Dallas, Texas*, the 2011 *Two Total Maximum Daily Loads for Indicator Bacteria in Cottonwood Branch and Grapevine Creek*; and the 2013 *Thirteen Total Maximum Daily Loads for Indicator Bacteria in the Lower West Fork Trinity River Watershed*, the potential sources of *E. coli* pollution can be divided into two primary categories: regulated and unregulated. Pollution sources that are regulated have permits under the Texas Pollutant Discharge Elimination System (TPDES) and the National Pollution Discharge Elimination System (NPDES). Examples of regulated sources include:

- municipal and private domestic wastewater treatment facility (WWTF) discharges;
- industrial facilities with individual stormwater permits and/or discharging treated industrial wastewater and/or groundwater; and
- stormwater discharges from industries, construction, and municipal separate storm sewer systems (MS4s).

Commonly used abbreviations:

AU = assessment unit
cms = cubic meters per second
Criterion = 126 MPN/100 mL
FDA_{SWP} = fractional proportion of drainage area under jurisdiction of stormwater permits
FG = future growth loads from potential permitted facilities
gpcd = gallons per capita per day
LA = allowable load from unregulated sources (predominately nonpoint sources)
LA_{USL} = upstream load allocations entering the AU
LA_{AU}= allowable loads from unregulated sources within the AU
MGD = millions of gallons per day
MOS = margin of safety load
MPN = most probable number of bacteria forming units
Q_{inlet} = median value of the high flow regime entering the AU
Q_{Trib} = median value of the very high flow regime at the tributary or upstream AU outlet(s) to an impaired AU
TMDL = total maximum daily load
WL_{ASW} = waste load from all permitted stormwater sources
WLA_{WWTF} = waste load allocation from WWTFs

Unregulated sources of pollution are generally nonpoint. Nonpoint source pollution originates from multiple locations and is usually carried to surface waters by rainfall runoff. It is not regulated by permit under the TPDES or NPDES. Nonpoint sources include pets, livestock, and wildlife, and failing onsite sewage facilities (OSSFs).

Methods for Estimating Bacteria Loads

Establishing the relationship between instream water quality and the source of loadings is an important component in developing a TMDL. It allows for the evaluation of management options that will achieve the desired endpoint — in this case attaining *E. coli* concentrations below 126 MPN/100 mL. The relationship may be established through a variety of techniques.

Generally, if high bacteria concentrations are measured in a water body at low to median flow in the absence of runoff events, the main contributing sources are likely to be point sources or direct deposition. During ambient flows, these constant inputs to the system will increase pollutant concentrations depending on the magnitude and concentration of the sources. As flows increase in magnitude, the effect of point sources is typically diluted, therefore making point sources a smaller part of the overall concentration.

Bacteria contributions from regulated and unregulated stormwater sources are greatest during runoff events. Rainfall runoff, depending upon the severity of the storm, has the capacity to carry indicator bacteria from the land surface into the receiving stream. Generally, this loading follows a pattern of low concentration in the water body just before the rain event, followed by a rapid increase in bacteria concentrations in the water body as the first flush of storm runoff enters the receiving stream. Over time, the concentrations diminish because the sources of indicator bacteria are attenuated as runoff washes them from the land surface and the volume of runoff decreases following the rain event (TCEQ, 2011a).

Pollutant Sources and Loads

The TMDL represents the maximum amount of a pollutant that the stream can receive in a single day without exceeding water quality standards. Detailed load allocation analysis can be found in Appendix C.

As stated in 40 CFR, 130.2(1), TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measures. For *E. coli*, TMDLs are expressed as MPN/day. The TMDLs developed use the same methodologies.

- Load Duration Curves (LDCs) were developed for the outlet of each AU. The estimated maximum allowable loads of *E. coli* for each of the AUs was determined as that corresponding to the median flow within the high flow regime.

- An explicit Margin of Safety (MOS) was incorporated by setting a target for indicator bacteria loads that is 5 percent lower than the geometric mean criterion. For primary contact recreation, this equates to a geometric mean target of 120 MPN/100 mL of *E. coli*. The net effect of the TMDL with MOS is that the assimilative capacity or allowable pollutant loading of each water body is slightly reduced.

The pollutant load allocation for the selected scenarios was calculated using the following equation:

TMDL = ΣWLA + ΣLA + ΣFG + MOS

Where:

WLA: wasteload allocation, the amount of pollutant allowed by permitted or regulated dischargers

LA: load allocation, the amount of pollutant allowed by unregulated sources

FG: loadings associated with future growth from potential permitted facilities

MOS: margin of safety load

- Median flows were derived using the median flow (or 5% flow) within the very high flow regime of the LDC developed for the outlet of each AU.

Waste Load Allocations

The WLA is the waste load allocation for regulated source contributions in the watershed. The WLA component is generally split into a WLA_{WWTF} for discharges from wastewater treatment facilities (WWTFs), and a WLA_{SW} for regulated stormwater.

There are 12 permitted wastewater dischargers in the Greater Trinity TMDL Project area (Table 5). Of those, only four, all domestic WWTFs, may discharge bacteria as part of normal operations (highlighted in grey in Table 5).

Table 5. TPDES Permitted Wastewater Dischargers

Segment Watershed	Discharges to:	TPDES Permit No. (WQ00--)	Permittee*	Effluent Type[a]	Permitted Flow (MGD)[c]
0822B	Grapevine Creek (0822B)	01441-059	Dallas/Fort Worth International Airport	SW	[b]
0841	0841_02	10494-013	City of Fort Worth Village Creek WWTP	WW	166
0841	0841_01	03446-000	Hanson Pipe & Precast, Inc.	IW/SW	[b]
0841	0841_01	10303-001	Trinity River Authority (TRA) Central WWTP	WW	189
0841	Big Bear Creek (0841D)	11032-001	Chester Alan Andrews – Alta Vista Mobile Home Park	WW	0.008
0841	Bear Creek Big Bear Creek Trigg Lake	01441-001 -014, -019, -025, -023	Dallas/Fort Worth International Airport	SW	[b]
0841	Mountain Creek	01250-003	Extex LaPorte LP – Mountain Creek Lake Steam Electric Station	SW	[b]
0805	0805_04	04161-000	Hines Reit 2200 Ross LP (Chase Tower)	GW	0.155
0805	0805_04	04663-001 and -002	Buckley Oil Company	SW	[b]
0805	0805_04	04765-000	2100 Ross Realty LP (San Jacinto Tower)	GW	0.0291
0805	Old Channel of Elm Fork Trinity	14699-001	Dallas County Park Cities MUD Water Treatment Plant	FB	0.72
0805	0805_03	10060-001	City of Dallas Central WWTP	WW	200

[a] WW = domestic wastewater treatment plant; IW = industrial wastewater; SW = stormwater; GW = groundwater; FB = filter backwash water
[b] Flow is permitted as *intermittent and variable* with a requirement to measure and report the actual amount.
[C] MGD=millions of gallons per day
*See Figure 5 for locations

Wastewater Treatment Facilities

TPDES-permitted WWTFs are allocated a daily wasteload (WLA_{WWTF}) calculated as their full permitted discharge flow rate multiplied by one-half of the instream geometric mean criterion. One-half of the water quality criterion (63 MPN/100mL) is used as the WWTF target to provide instream and downstream load capacity.

In segment 0805_03 of the Upper Trinity River, there is only one facility, Dallas Central WWTF (TPDES WQ0010060-001), and it represents the entire WLA_{WWTF} allocation in that AU. AU 0805_04 of the Upper Trinity River contains no WWTFs, but does contain three permitted industrial facilities and one permitted domestic water treatment plant. Based on the effluent type of these facilities, daily waste loads were not allocated for these permits and permit limits for bacteria are not anticipated to be necessary for them (TCEQ, 2011a). The Elm Fork tributaries, Cottonwood Creek and Grapevine Branch have no WWTFs (TCEQ, 2011b).

Equation for daily wasteload allocation for TPDES wastewater treatment facilities:

$\mathbf{WLA_{WWTF}}$= Criterion/2 * flow (MGD) * conversion factor

Where:

Criterion:	126 MPN/100 mL
Flow (MGD):	full permitted flow
Conversion factor:	37,854,000 100 mL /MGD

Three facilities that treat domestic wastewater are located within the Lower West Fork Trinity River watershed. Along the main stem of the Lower West Fork Trinity River is the City of Fort Worth Village Creek WWTF (WQ0010949-013) located within AU 0841_02, and the Trinity River Authority (TRA) Central Regional WWTF (WQ0010303-001) located within AU 0841_01. The Chester Alton Andrews Alta Vista Mobile Home Park WWTF (WQ0011032-001) is located within the watershed of non-impaired Big Bear Creek (0841D), a tributary to Bear Creek (0841B). Loadings arising from the Alta Vista Mobile Home Park WWTF are incorporated into the upstream loading entering Bear Creek rather than allocated as a separate WLA_{WWTF} loading. Loadings arising from the two facilities located in AUs 0841_01 and 0841_02 represent the WLA_{WWTF} allocation in the AU in which each facility is located. The remaining 10 impaired tributary AUs have no facilities regulated for discharge to include in the WLA_{WWTF} term (TCEQ, 2013). See Figure 5 for WWTF areas of service.

Regulated Stormwater

Stormwater discharges from MS4, industrial, and construction areas are considered permitted point sources. Therefore, the WLA calculations must also include an allocation for permitted stormwater discharges (WLA_{SW}). A simplified approach for estimating the WLA for these areas was used in the development of these TMDLs due to the limited amount of data available, the complexities associated with simulating rainfall runoff, and the variability of stormwater loading. The percentage of each watershed that is under the jurisdiction of MS4 stormwater permits is used to estimate the amount of the overall runoff load that should be allocated to the WLA_{SW} as the permitted stormwater contribution.

The allocation of permitted stormwater discharges (WLA_{SW}) is the sum of loads from regulated (or permitted) stormwater sources and is calculated as:

$$\mathbf{\Sigma WLA_{SW}} = (TMDL - \Sigma WLA_{WWTF} - LA_{USL} - \Sigma FG - MOS) * FDA_{SWP}$$

Where:

$\mathbf{\Sigma WLA_{SW}}$:	sum of all permitted stormwater loads
TMDL:	total maximum allowable load
$\mathbf{\Sigma WLA_{WWTF}}$:	sum of all WWTF loads
$\mathbf{LA_{USL}}$:	upstream load allocations entering AU (see LA_{USL} formula in text box below)
ΣFG:	sum of future growth loads from potential permitted facilities
MOS:	margin of safety load
$\mathbf{FDA_{SWP}}$:	fractional proportion of drainage area under jurisdiction of stormwater permits

Nonpoint Sources

The load allocation (LA) is the sum of loads from unregulated sources. The LA component of the TMDL corresponds to direct nonpoint runoff and is the difference between the total load from stormwater runoff and the portion allocated to WLA_{SW}. The LA is the sum of the upstream bacteria load (LA_{USL}) entering the AU and all remaining loads in the AU from unregulated sources (LA_{AU}):

$$\mathbf{LA = LA_{AU} + LA_{USL}}$$

Where:

LA = allowable load from unregulated sources (predominately nonpoint sources)

$\mathbf{LA_{AU}}$= allowable loads from unregulated sources within the AU

$\mathbf{\Sigma LA_{USL}}$ = upstream load allocations entering the AU

The LA_{USL} is calculated as:
LA_{USL} = Q_{inlet} * criterion

Where:
Criterion: 126 MPN/100 mL
Q_{inlet}: median value of the high flow regime entering the AU

The LA_{AU} is calculated as:
$LA_{AU} = TMDL - \Sigma WLA_{WWTF} - \Sigma WLA_{SW} - LA_{USL} - \Sigma FG - MOS$

Where:
LA_{AU}: allowable load from unregulated sources within the AU
TMDL: total maximum allowable load
ΣWLA_{WWTF}: sum of all WWTF loads
ΣWLA_{SW}: sum of all permitted stormwater loads
LA_{USL}: upstream load allocations entering AU
ΣFG: sum of future growth loads from potential permitted facilities
MOS: margin of safety load

The TMDL equation can thus be expanded to show the components of WLA and LA:
$TMDL = \Sigma WLA_{WWTF} + \Sigma WLA_{SW} + LA_{AU} + LA_{USL} + \Sigma FG + MOS$

Allowances for Future Growth

The Future Growth component of the TMDL equation addresses the requirement of TMDLs to account for future loadings that may occur as a result of population growth, changes in community infrastructure, and development. The assimilative capacity of streams increases as the amount of flow increases. Increases in flow allow for additional indicator bacteria loads if the concentrations are at or below the primary contact recreation standard.

Future growth was considered in the developing the TMDL for the Upper Trinity. To account for the probability that additional flows from WWTF discharges may occur in both 0805 AUs, a provision for future growth was included in the TMDL calculations based on the population increase from year 2005 estimates to year 2030 projections and an estimate of the amount of wastewater generated per person per day or gallons per capita per day (gpcd). Wastewater treatment for the City of Dallas is provided by two large facilities—the Central WWTF in AU 0805_03 and the Southside WWTF, which discharges into the Upper Trinity River downstream of the impaired AUs. The sewered collection areas of both facilities include an area greater than the 0805_04 and 0805_03 drainage areas. The collection areas also include a significant area serviced jointly by both facilities, which complicates the estimate of additional WWTF discharges due to future growth.

Using a conservative approach for the TMDL, it is assumed that all estimated future growth associated with the sewered collection area of the Dallas Central WWTF results in future growth in both AUs. The

future growth computation includes: calculating the estimated increase in future capacity required for the sewered collection area of the present Dallas Central WWTF using available data; proportioning the future capacity between AUs 0805_04 and 0805_03; and the final computation to determine an *E. coli* loading for future capacity.

In the next step, the computed future capacity is apportioned to the two impaired AUs based on the fraction of the drainage area of each AU to the combined drainage area of the two AUs resulting in the estimated future growth term (TCEQ 2011a).

Additional stormwater dischargers represent additional flow that is not accounted for in the current allocations. Changes in MS4 jurisdiction or additional development associated with population increases in the watershed can be accommodated by shifting allotments between the WLA and the LA. This can be done without the need to reserve future-capacity WLAs for stormwater. In non-urbanized areas, growth can be accommodated by shifting loads between the LA and the WLA (for stormwater) (TCEQ, 2011b).

Currently, no permitted WWTFs discharge into Segments 0822A and 0822B. Wastewater generated within Cottonwood Branch and Grapevine Creek is transported out of both watersheds to the TRA Central Regional WWTF located on the Lower West Fork Trinity River (Segment 0841).

Since both impaired watersheds lie within the much larger wastewater collection service area for the TRA Central Regional WWTF, the approach taken was to determine the service population of the TRA WWTF and the year 2005 average daily discharge for the TRA Central Regional WWTF based on its discharge monitoring reports (DMRs). The wastewater flow per capita was then determined by dividing the TRA Central Regional WWTF 2005 annual daily discharge by its service population giving a wastewater flow of 107 gpcd.

Additional stormwater dischargers represent additional flow that is not accounted for in the current allocations. Changes in MS4 jurisdiction or additional development associated with population

Upper Trinity River TMDL - Future capacity is calculated as:

$FC = Flow_{2005} * Pop_{05/30} * [DC_{permit} / (DC_{permit} + DS_{permit})] *$ conversion factor

Where:

$Flow_{2005}$= gpcd based on the average combined discharges of Dallas Central and Dallas Southside WWTFs from year 2005 DMR data divided by the year 2005 Dallas wastewater collection area population estimate

$Pop_{05/30}$= Dallas wastewater collection area population increase for 2005 to 2030

DC_{permit}= Full permitted discharge of Dallas Central WWTF

DS_{permit}= Full permitted discharge of Dallas Southside WWTF

Conversion factor = 0.000001 MGD/gpcd

Cottonwood Branch and Grapevine Creek TMDL - Future growth term is calculated:

$FG = Criterion/2 * Flow2005 * (Pop_{30} – Pop_{05})$

Where:

Criterion = 126 MPN/100 mL

Flow2005 = 107 gpcd based on the average daily discharge of TRA WWTF from year 2005 DMR data divided by year 2005 TRA WWTF wastewater collection area population estimate

Pop_{30} = estimated watershed population for year 2030

Pop_{05} = estimated watershed population for year 2005

Conversion factor = 37.854 100 mL/gallon

Lower West Fork Trinity Watershed TMDL - Future growth (FG) is calculated as:

FG = Target * [$POP_{2010-2040}$ * Use] * Conversion Factor

Where:

Target = 63 MPN/100 mL

$POP_{2010-2040}$ = estimated percent increase in population between 2010 and 2040

Use = 101.777 gpcd

Conversion factor = 37.854 100 mL / gallon

increases in the watershed can be accommodated by shifting allotments between the WLA and the LA. This can be done without the need to reserve future-capacity WLAs for stormwater. In non-urbanized areas, growth can be accommodated by shifting loads between the LA and the WLA (for stormwater) (TCEQ, 2011b).

Within the Lower West Fork Trinity watershed, there are currently two facilities that treat domestic wastewater and discharge into impaired AUs. The City of Fort Worth Village Creek WWTF discharges into AU 0841_02, and the TRA Central Regional WWTF discharges into 0841_01. The Village Creek WWTF is built out with no capacity for expansion beyond its current size, while the Central Regional WWTF has additional capacity for expansion.

The majority of the Lower West Fork Trinity River watershed is serviced by the TRA Central Regional WWTF (Figure 5). Planned expansions of the TRA Central Regional WWTF will increase the permitted discharge from 189 MGD to 232 MGD based on long term projections to the year 2040, an increase of 43 MGD. This additional 43 MGD serves as the future growth component for those areas serviced by the TRA Central Regional WWTF and is applied to the TMDL of AU 0841_01 since the discharge occurs into that section of the Lower West Fork Trinity River. Since all wastewater collected within the watersheds of AUs 0841C, 0841E, 0841G, 0841H, 0841J, 0841L, 0841M, and 0841U are sent to the TRA Central Regional WWTF and subsequently discharged into AU0841_01, the future growth component for these eight AUs was not explicitly derived and was set to a value of zero (TCEQ, 2013).

The future growth term of AU 0841_01 was calculated using the identical equation applied to determine the WLA_{WWTF} term.

To account for the probability that new flows from WWTF discharges may occur in areas within the TMDL watersheds that are outside of the TRA Central Regional WWTF service area, a provision for future growth was included in the TMDL calculations based on population projections and per capita wastewater use. Current population projections for areas not serviced by the TRA Central Regional Facility were obtained from the 2010 U.S. Census (USCB, 2010), and 2040 projected population increases. Per capita wastewater use was obtained from the TRA and represents population projected for the year 2040.

For the remaining four AUs in the Lower West Fork Trinity River watershed (0841_02, 0841B, 0841R, and 0841T), the future growth component for the areas within each AU that are not serviced by the TRA Central Regional WWTF were calculated based on estimated population increases from 2010 to 2040 multiplied by the per capita wastewater usage by the projected population increase. The resulting future wastewater flow was then converted into a loading.

Implementation Strategies

This I-Plan documents nine implementations strategies to reduce bacteria loading in the Project area. The implementation strategies cover a variety of areas and include provisions for:

- wastewater,
- stormwater,
- planning and development,

- pets, livestock and wildlife,
- onsite sewage facilities,
- monitoring coordination,
- education and outreach,
- best management practices library, and
- implementation strategy evaluation.

The strategies include voluntary activities designed to improve water quality while establishing antidegradation procedures through regular evaluation of I-Plan components. Within each of the activities are:

- potential load reductions,
- technical and financial assistance needed,
- an education component,
- schedule of implementation,
- interim milestones,
- progress indicators,
- a monitoring component, and
- responsible entities.

Wastewater Implementation Strategies

Wastewater management encompasses a broad range of efforts that promote effective and responsible water use, treatment, and disposal while encouraging the protection and restoration of the region's — and this Project's — watersheds. Properly designed, operated, and maintained sanitary sewer systems collect and transport all sewage that flows into them to a publicly owned treatment works (POTW). Wastewater treatment facility operators bear a large responsibility for converting the sewage into water that can be safely released back into the Trinity River. Table 6 lists the permitted WWTFs in the Greater Trinity Watershed. For the waste not handled as part of a sanitary sewer system, liquid waste haulers provide services to OSSFs and portable/chemical toilets. Given the bacteria-laden nature of wastewater (Lusk, 2011), broad attention in this I-Plan will be given to the wastewater system. WWTFs, sanitary sewer systems, lift stations, and liquid waste haulers all have the potential to impact bacteria loading in impaired waterways (see Implementation Strategies 5.0 – 5.5 for OSSFs).

Implementation Strategies 1.0: Wastewater treatment facility effluent limits

In November 2009, TCEQ commissioners approved Rule Project No. 2009-005-309-PR. This rule requires the addition of bacteria limits for *E. coli* in fresh water discharges for all TPDES domestic wastewater permits during their next permit amendment or revision. This rule is defined in Title 30 Administrative Code Chapter (TAC) 309.3(h) and the frequency of testing required is defined in 30 TAC Chapter 319.5(b). Through this control action, responsible entities will continue to monitor *E. coli* concentrations in WWTF effluent as required by individual WWTF permits and any subsequent permit amendments or revisions.

Currently, four permitted WWTFs (Table 6) have direct impact in the Greater Trinity Project area watershed(s) and three of those are currently required to monitor *E. coli* levels in their effluent. The remaining plant will be required to monitor for *E. coli* upon renewal of the permit. For TCEQ bacteria TMDLs in the Dallas-Fort Worth area, TPDES-permitted WWTFs are allocated a daily waste load allocation (WLA_{WWTF}) calculated as their full permitted discharge flow rate multiplied by one half the instream geometric mean criterion. One-half of the water quality criterion (63 MPN/100mL) is used as the WWTF target to provide instream and downstream load capacity. Changes to effluent *E. coli* limits will occur following the approval of the TMDLs and during the next amendment or revision to an individual permit. Table 7 summarizes this implementation strategy.

Table 6. Permitted WWTFs in the Greater Trinity Watershed

Facility Name	Permit Number	Permit Daily Average *E. coli*[a]	Permit Effective Date	*E. coli* Permit Monitoring Frequency
Dallas Central WWTF	WQ0010060-001	63 MPN/100 mL	8/13/2012	5x/week
FTW Village Creek WWTF	WQ0010949-013	126 MPN/100 mL[b]	12/29/2011	5x/week
TRA Central Regional WWTF	WQ0010303-001	n/a[c]	2/4/2008	n/a[c]
Alta Vista WWTF	WQ0011032-001	126 MPN/100 mL[b]	9/15/2011	1x/quarter

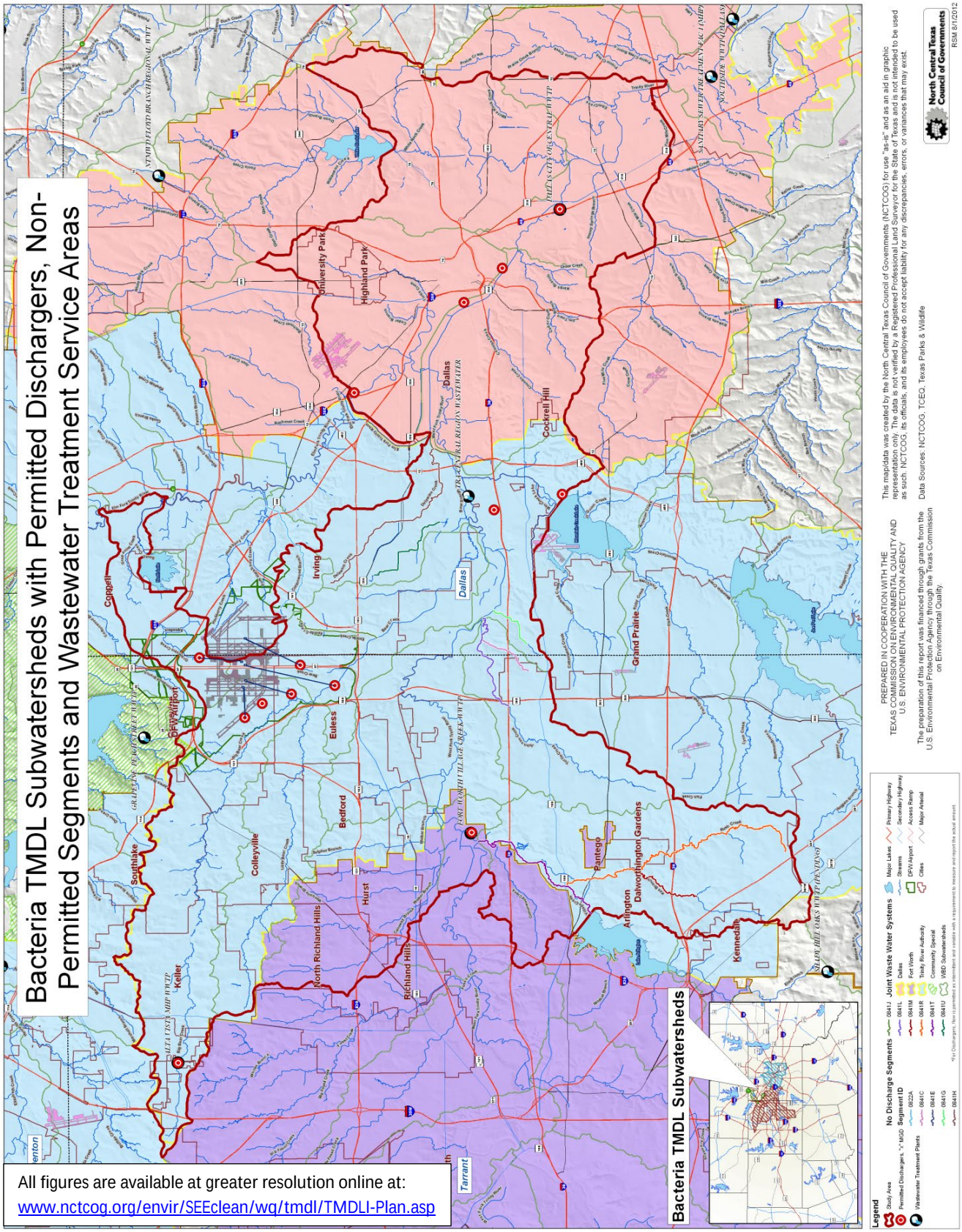
[a] There is also a daily maximum of 394 MPN/100mL.
[b] Subsequent renewals will include an *E. coli* limit of 63 MPN/100mL.
[c] Permit currently in renewal process. Renewed permit will include an *E. coli* limit of 126 MPN/100 mL and a monitoring frequency of 5x/week. Subsequent renewals will include an *E. coli* limit of 63 MPN/100 mL.

Each of the entities listed in Table 6 is responsible for adhering to the requirements of their specific permits only. The terms and conditions in each individual permit are agreed upon by both the TCEQ and the permittee. Each permit specifically outlines the effluent constituents that require monitoring as well as the monitoring and reporting frequency to which the permittee must adhere. The TCEQ reviews and documents compliance with individual permits. WWTF permits are issued on a five year cycle and must be renewed by the permittee. A map of WWTF coverage in the Project area can be found in Figure 5.

Table 7. Implementation Strategy 1.0 Summary — Wastewater treatment facility effluent limits

Targeted Source(s)	WWTF effluent
Estimated Potential Load Reduction	Implementation Strategy (IS) 1.0 may result in a 2% reduction of calculated bacteria loading from WWTF effluent
Technical and Financial Assistance Needed	Technical: none — permit requirements are already being met Financial: none — permit requirements are already being met
Education Component	None
Schedule of Implementation	Immediate. New requirements for WWTF permits would come from TCEQ
Interim, Measurable Milestone	The number of permits requiring bacteria monitoring with reduced daily average limits
Progress Indicators	Allowable daily average will be reduced from 126 MPN/100 mL to no more than 63 MPN/100 mL for all WWTF discharging to impaired waterways
Monitoring Component	An annual report to Coordination Committee from NCTCOG to include information on the progress of implementation strategies, in addition to self-reporting by WWTF to TCEQ
Responsible Entity	WWTFs will meet permit requirements and monitor *E. coli* as appropriate NCTCOG will contact TCEQ to secure the necessary permit information pertaining to bacteria limits NCTCOG will provide Coordination Committee with information on WWTF effluent limits

Figure 5. WWTF Location and Coverage Map with Permitted Dischargers



All figures are available at greater resolution online at:
www.nctcog.org/envir/SEEclean/wq/tmdl/TMDLI-Plan.asp

Implementation Strategy 1.1: Evaluation of non-participants in Sanitary Sewer Overflow Initiative (SSOI) and Capacity Management, Operation, and Maintenance (C-MOM) programs

Sanitary sewer systems that are properly designed, operated, and maintained will collect and transport all of the sewage and industrial wastewater that flow into them to a wastewater treatment facility for appropriate treatment. If, however, there is significant inflow/infiltration (I/I) to the collection system; the system is not properly operated and maintained; or its capacity is inadequate, then sanitary sewers can overflow (Figure 6). The goals of the TCEQ SSOI are to reduce the number of sanitary sewer overflows (SSOs) that occur each year in Texas and to address SSOs before they harm human health, safety, or the environment and before they become enforcement issues (TCEQ, 2008).

Wastewater treatment facilities with sanitary sewer systems and subscribers within collection systems are eligible to participate in the TCEQ SSOI which provides benefits in that, a participating facility will not be subject to formal enforcement for most continuing SSO violations, as long as the SSOs are addressed by the SSO plan. Participation also allows the facility to spend resources on correction as opposed to having to pay penalties associated with an enforcement order, in addition to the money required to complete corrective action; and participation ensures that SSOs addressed by the SSO plan will not affect the facility's compliance history rating.

C-MOM is a self-adopted program for owners and operators of sanitary sewer systems and involves proper management, operations, and maintenance of the collection system. Additionally, C-MOM programs ensure adequate capacity for peak flows, and take steps to prevent or mitigate SSOs.

Both SSOI and C-MOM programs have the potential to decrease bacteria loading by reducing SSOs. Table 8 lists SSOI participants and non-participants as of February 2013. As summarized in Table 9, the Coordination Committee or their appointees will evaluate the entities that do not participate in either the SSOI or C-MOM programs and as appropriate, encourage participation in one of those two programs.

Table 8. SSOI Participants

Currently Participating as of 2/28/2013	Not Currently Participating
City of Arlington	City of Cockrell Hill
City of Bedford	City of Colleyville
City of Dallas	City of Coppell
City of Euless	City of Dalworthington Gardens
City of Fort Worth	City of Haslet
City of Grand Prairie	City of Keller
City of Grapevine	City of Kennedale
City of Hurst	City of Mansfield
City of Irving	City of Richland Hills
City of North Richland Hills	City of Southlake
Trinity River Authority – Central WWTP System	City of University Park
	Town of Highland Park
	Town of Pantego

Table 9. Implementation Strategy 1.1 Summary — Evaluation of non-participants in SSOI and C-MOM programs

Targeted Source(s)	Sanitary sewer system (SSS) failures and SSOs
Estimated Potential Load Reduction	IS 1.1, over 25 years, may result in a 35% reduction of calculated bacteria loading from SSSs and SSOs
Technical and Financial Assistance Needed	Technical: non-participants may need some level of technical assistance to begin SSOI and/or C-MOM participation Financial: grant funding, loans, and existing local funding as appropriate
Education Component	Outreach to SSS operators that are non-SSOI/non-C-MOM participants
Schedule of Implementation	By 2018, all non-participating MS4s will have been contacted by Coordination Committee members, either as a whole or individually By 2028, SSOI/C-MOM participation will increase by 15%
Interim, Measurable Milestone	By 2018, 100% contact of non-participants
Progress Indicators	The number of participants in SSOI and/or C-MOM
Monitoring Component	An annual report to Coordination Committee from NCTCOG to include information on the progress of implementation strategies
Responsible Entity	NCTCOG will gather and distribute information about SSOI and C-MOM participation and use to the Coordination Committee Wastewater subcommittee and Coordination Committee will conduct outreach to non-participants NCTCOG will contact TCEQ Office of Compliance and Enforcement Program Support Section annually to obtain a current list of SSOI participants for use in education and outreach efforts

Implementation Strategy 1.2: Lift station evaluation

For a variety of reasons, lift stations may occasionally cease functioning and may discharge sewage into waterways. One example is lift stations ceasing to function during extensive power outages following severe weather. Lift stations may also fail to function during circumstances other than power outages, such as due to mechanical failure or during repair. However, unlike many SSOs, lift station failures can result in the discharge of large volumes of untreated wastewater into waterways.

The stakeholders encourage entities with lift stations to survey and evaluate existing stations by 2018 to determine the appropriateness of implementing best management practices (BMPs) to prevent SSOs caused by lift stations. Using this information, the Coordination Committee will re-evaluate the need for identifying or developing lift station BMPs for the BMP Library (see Implementation Strategy 8.0). Table 10 provides a summary of components necessary for lift station evaluation.

Table 10. Implementation Strategy 1.2 Summary—Lift station evaluation

Targeted Source(s)	SSS failures and SSOs from lift station failures
Estimated Potential Load Reduction	IS 1.2 may result in a 2% reduction in bacteria loading
Technical and Financial Assistance Needed	Technical: technical assistance may be necessary for lift station assessment and any potential repairs or alternations Financial: if technical assistance is not available internally to lift station owners and/or operators, then grant, loans, or local funding may be necessary for both evaluation and any potential repairs or alternations
Education Component	Outreach to SSS lift station operators
Schedule of Implementation	By 2018, all entities with lift stations will have evaluated the need for maintenance programs to reduce SSOs caused by non or malfunctioning lift stations
Interim, Measurable Milestone	None
Progress Indicators	Number of lift stations being evaluated by station owners and/or operators
Monitoring Component	Reports containing lift station owners and/or operators and their progress on evaluation will be made available to Wastewater technical subcommittee and Coordination Committee annually
Responsible Entity	Lift station owners and/or operators will evaluate lift stations and report progress to NCTCOG NCTCOG will report on progress indicator to the Wastewater technical subcommittee and Coordination Committee

Implementation Strategy 1.3: Regional participation in Fats, Oils, and Grease program

Fats, oils, and grease (FOG) are considered to be the leading cause of blockages in sanitary sewers, and the EPA estimates that blockages account for nearly 50 percent of all SSOs (USEPA, 2007). The North Texas Grease Abatement Council (NTGAC) and NCTCOG have partnered to provide the cities and other agencies with public education materials related to FOG. Many organizations within the bacteria TMDL watersheds, such as Arlington, Bedford, Dallas, Fort Worth, Grand Prairie, Irving, North Richland Hills, Southlake, and the TRA already use these materials to reduce FOG in the SSS and with it, SSOs. As summarized in Table 11, the stakeholders encourage organizations and wastewater plant operators to continue participation in the regional FOG education program. As resources are available, NTGAC is encouraged to expand educational materials to include the impact of FOG and SSOs on bacteria levels.

Table 11. Implementation Strategy 1.3 Summary — Regional participation in Fats, Oils, and Grease program

Targeted Source(s)	SSO and SSS failures
Estimated Potential Load Reduction	IS 1.3 may result in a 20% reduction in bacteria loading from SSOs and SSS failures
Technical and Financial Assistance Needed	Technical: technical assistance with FOG is available through existing programs Financial: participation in some FOG programs may require cost sharing, in addition to costs associated with educational materials; training for grease trap operators may also be necessary through grant funding, loans, and existing local funding as appropriate
Education Component	Outreach to RSWMP participants to ensure participation and outreach to non-RSWMP participants to encourage participation in regional FOG program(s) Public education is a primary component in FOG programs and an existing program is already in place Separate education programs may be necessary for grease trap operators
Schedule of Implementation	Existing FOG public education participants will begin immediately and continue their programs as feasible. By 2018, outreach will be conducted to all MS4s with SSSs not participating in the regional FOG program
Interim, Measurable Milestone	Over 25 years, all SSS owners and/or operators will actively participate in FOG programs
Progress Indicators	Number of FOG program participants
Monitoring Component	NCTCOG will collect FOG participant information and report to Wastewater technical subcommittee and Coordination Committee

Responsible Entity	NCTCOG will gather and distribute information of FOG program participation and report results to the Coordination Committee and Wastewater technical subcommittee Wastewater technical subcommittee and Coordination Committee will conduct outreach to non-participants

Implementation Strategy 1.4: Sanitary sewer overflow reporting

State law and TCEQ regulations specify reporting requirements for SSOs in Texas Water Code Chapter 26.039 and 30 TAC 305.125(9). Without accurate and available information on SSOs, gauging the effectiveness of SSO BMPs becomes difficult. Figure 6 provides a four-year representation of SSOs in the Project area categorized by the amount of released sewage. Table 12 summarizes the implementation strategies for SSOs.

1.4.1: Wastewater and wastewater collection licensing

The Coordination Committee recommends TCEQ increase understanding of reporting requirements for SSOs and SSO mitigation by ensuring such information is included in wastewater licensing classes, including those for wastewater collection.

1.4.2: Electronic reporting

The Coordination Committee encourages TCEQ to adopt electronic SSO reporting in addition to maintaining current methods. The TCEQ should further develop its system to allow electronic collection, analysis, and dissemination of this information. This action is not intended to increase the data-entry requirements for TCEQ staff; instead, it is intended to streamline reporting and analysis. Given technological disparities, however, the Committee encourages TCEQ to maintain the existing faxed SSO report for some time while electronic reporting is instituted.

1.4.3: Reporting form changes

Current "source" descriptions on TCEQ's reporting form are subject to interpretation. More accurate source descriptions would provide necessary information in future prevention of SSOs. TCEQ is encouraged to change the reporting form to better reflect actual cause of SSOs, for example specifying cause of blockage, and provide some type of education for those entities reporting.

Table 12. Implementation Strategy 1.4 Summary — Sanitary sewer overflow reporting

Targeted Source(s)	SSOs
Estimated Potential Load Reduction	IS 1.4. – 1.4.3 will contribute to the improved handling of SSOs and may result in a 2% reduction in calculated bacteria loading from SSOs over 25 years

Technical and Financial Assistance Needed	Technical: TCEQ may require technical assistance to develop appropriate database and reporting technologies as well as for wastewater licensing course materials SSS owners and/or operators may need high speed internet access or equivalent Financial: Existing and grant funding and loans as available
Education Component	TCEQ will provide appropriate instructions to SSS operators for using statewide SSO database TCEQ will provide appropriate educational materials for wastewater licensing course participants
Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue for the entire implementation process
Interim, Measurable Milestone	Deployment of an appropriate database for tracking SSOs Wastewater licensing classes emphasizing accurate SSO reporting Reporting form changed for more accurate SSO cause description
Progress Indicators	Creation of a database Wastewater licensing course materials emphasizing SSO reporting Changed reporting form
Monitoring Component	NCTCOG will collect information from TCEQ regarding any updates to educational materials for wastewater licensing course participants, as well as any progress on database improvements
Responsible Entity	NCTCOG will coordinate with TCEQ on exploration of options for developing appropriate materials for use in wastewater licensing courses conducted through the TCEQ. NCTCOG will also coordinate with TCEQ to identify desired modifications to the SSO reporting form that would result in more effective SSO cause identification. SSS owners and/or operators will report SSOs as appropriate and ensure employee SSO reporting training NCTCOG will collect and share information with the Wastewater technical subcommittee and Coordination Committee

Implementation Strategy 1.5: Funding opportunities for repair/replacement of sanitary sewer lines

Summarized below in Table 13, NCTCOG and stakeholders will pursue funding opportunities for rehabilitation or replacement of sanitary sewer lines, including Texas Water Development Board funding and regional supplemental environmental projects (SEPs) to repair, maintain, or extend wastewater infrastructure. NCTCOG will share information on funding opportunities to interested parties by web posting to a new or existing web page.

Table 13. Implementation Strategy 1.5 Summary — Funding opportunities for repair/replacement of sanitary sewer lines

Targeted Source(s)	SSO and SSS failures
Estimated Potential Load Reduction	IS 1.5 may result in a 5% reduction in calculated bacteria loading over 25 years by reducing the portion of the wasteload contributed by leaking or broken sewer lines
Technical and Financial Assistance Needed	Technical: engineering and technical expertise may be necessary Financial: existing or new grants, SEPs, or other funding mechanisms available at the local, state, or federal level
Education Component	NCTCOG will make new funding opportunities known to SSS owners and operators via web postings
Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue for the entire implementation process
Interim, Measurable Milestone	Available funding opportunities identified on a NCTCOG web page
Progress Indicators	Creation of a new or modification of an existing web page for funding opportunities and the number of successful grant or funding applications for wastewater infrastructure received in the Project Area
Monitoring Component	Web page use reports for Coordination Committee and annual Water Quality Management Plan Update, which details some wastewater funding in the Project area
Responsible Entity	NCTCOG will create or modify existing web page and maintain current information SSS stakeholders will utilize information and seek funding opportunities to upgrade wastewater infrastructure

Implementation Strategy 1.6: Relocation of sewer mains from waterways

Although waterways are convenient locations for sewer mains in terms of access rights and elevation, failures in the system in such locations have a direct impact on water quality and bacteria levels. The Coordination Committee encourages MS4s to relocate sewer mains out of waterways as practicable, as part of infrastructure replacement programs. Table 14 outlines the details of this implementation strategy.

Table 14. Implementation Strategy 1.6 Summary — Relocation of sewer mains from waterways

Targeted Source(s)	SSO and SSS failures
Estimated Potential Load Reduction	IS 1.6 may result in a 4% reduction over 25 years of calculated bacteria loading by reducing the potential for additional loading from leaking or collapsed sewer lines
Technical and Financial Assistance Needed	Technical: engineering and other technical expertise will be necessary in order to relocate wastewater lines from waterways Financial: grant funding, loans, and existing local funding as available
Education Component	Public education regarding relocation benefits may be needed Additionally, education for decision-makers, such as city councils, may also be necessary
Schedule of Implementation	Beginning immediately as appropriate, SSS owners and/or operators will consider relocation of sewer lines out of waterways as part of infrastructure repair and replacement
Interim, Measurable Milestone	Over 25 years, as many sewer lines as practicable will be relocated from waterways
Progress Indicators	Number of sewer lines relocated
Monitoring Component	Voluntary reports from SSS owners and/or operators to NCTCOG on relocations
Responsible Entity	SSS owners and/or operators will relocate sewer mains from waterways as feasible

Implementation Strategy 1.7: Liquid waste management and liquid waste hauler program expansion

Waste haulers routinely transport bacteria-laden materials, including septic, grease trap, and grit trap wastes. When this highly concentrated, untreated waste is discharged into waterways instead of being properly disposed of or treated, it may represent a significant local increase in bacterial loading.

NCTCOG and the Coordination Committee encourage MS4 permittees to maintain existing liquid waste hauler permit and inspection programs and expand them if necessary. Because liquid waste hauler

regulation also takes place at the state level, the stakeholders request that TCEQ increase educational efforts to haulers, modify the registration form, and change regulations to include local notification. Table 15 summarizes the implementation strategies for liquid waste.

1.7.1: Liquid waste hauler inspection program

Using sample ordinances available through the online BMP Library (see Implementation Strategy 8.0), municipal MS4s are encouraged to evaluate liquid waste hauler operations within their jurisdictions and create or expand inspection programs to include permitting, inspections, and tracking of liquid waste haulers; with a goal of having inspection programs in 100 percent of large MS4s by 2028 and 25 percent of small MS4s by 2033.

1.7.2: TCEQ and liquid waste haulers

The Coordination Committee encourages TCEQ to increase its educational efforts toward liquid waste haulers, especially in regards to operations in areas with bacteria impaired waterways, illegal discharge penalties, and mitigation procedures.

1.7.2.1: Liquid waste hauler registration form addition

The Coordination Committee also requests TCEQ add a check box on liquid waste hauler registration forms for the operator to acknowledge that they know they are operating within an area with bacteria TMDL-listed waterways.

1.7.2.2: Requested change to liquid waste hauler regulations to include municipal notification

Request TCEQ amend regulatory guidance document to have waste haulers notify any municipalities, counties, and other jurisdictions that they are transporting through or where they are serving.

1.7.3: Implementation of standards for portable/chemical toilets

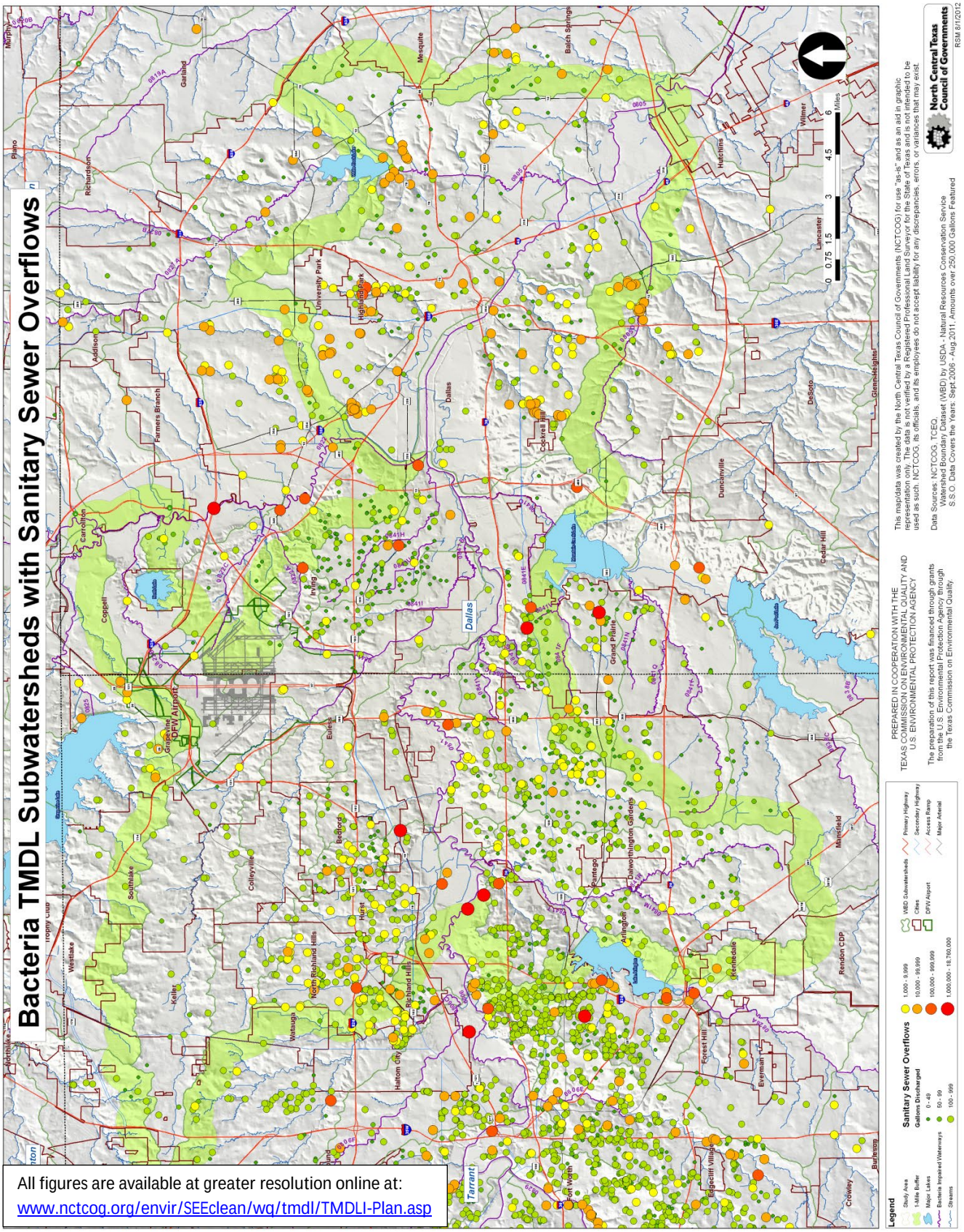
MS4s are encouraged to implement standards concerning waste management on all sites requiring use of portable/chemical toilets to ensure placement as far from stormwater inlets, gutter lines, and water bodies as feasible and to ensure regular service scheduling of onsite waste facilities.

Table 15. Implementation Strategy 1.7 Summary — Liquid waste management and liquid waste hauler program expansion

Targeted Source(s)	Improperly disposed waste from liquid waste haulers
Estimated Potential Load Reduction	IS 1.7 – 1.7.2 may result in a 5% reduction of calculated bacteria loading over 25 years by reducing the portion of the waste load contributed by improper handling, transportation, and disposal of liquid wastes
Technical and Financial Assistance Needed	Technical: some technical assistance may be necessary for MS4s without liquid waste hauler inspection and tracking programs to implement standards for portable and/or chemical toilets Financial: grants and/or existing funding and loans as available

Education Component	Outreach to MS4s without inspection and tracking programs may be necessary Educational efforts by TCEQ for liquid waste haulers regarding operations and any changes to registration form
Schedule of Implementation	100% of large MS4s will have inspection and tracking programs in place by 2028 25% of small MS4s will have inspection and tracking programs in place by 2033 Beginning immediately as feasible, TCEQ will consider changes to liquid waste hauler registration forms and changes to notification requirements
Interim, Measurable Milestone	By 2028, 100% of large MS4s will have liquid waste hauler inspection and tracking programs in place by 2033, 25% of small MS4s will have liquid waste hauler inspection and tracking programs in place
Progress Indicators	Number of MS4s with inspection and tracking programs Number of MS4s with standards for portable and/or chemical toilets Changes to liquid waste hauler registration form(s)
Monitoring Component	Reports to Coordination Committee and Stormwater technical subcommittee regarding MS4 programs and TCEQ program/form changes for liquid waste haulers
Responsible Entity	MS4s will adopt liquid waste hauler inspection and tracking programs NCTCOG will coordinate with stakeholders and TCEQ staff to identify potential changes to the liquid waste hauler registration forms that will enhance their effectiveness. NCTCOG will compile information on programs and forms for annual report to Coordination Committee and Stormwater technical subcommittee

Figure 6. Map — SSOs Occurring between September 2006 – August 2011



Stormwater Implementation Strategies

In the watershed areas covered by the Greater Trinity River Bacteria TMDL I-Plan Project, as in most urban areas, stormwater runoff is a major cause of water pollution. When rain falls on less developed areas, the water is absorbed and filtered by soil and plants. When rain falls on the roofs, streets, and parking lots of the Dallas-Fort Worth metropolitan area, however, the water cannot soak into the ground. Here, like most urban areas, stormwater is drained through engineered collection systems and discharged into nearby lakes and streams. The stormwater carries trash, heavy metals, other pollutants, and notably for this project, bacteria, from the urban landscape, degrading the quality of the receiving waters. Higher flows can also cause erosion and flooding in urban streams, damaging habitat, property, and infrastructure.

Bacteria sources, such as wastes from pets, wildlife, and even humans, can be washed into storm drains and then discharged into local waterways. Because stormwater systems are designed to quickly and efficiently remove stormwater from developments, stormwater often bypasses the natural vegetative barriers that filter sheet flow over the land, thus, exacerbating bacteria loading. Infrastructure, such as pipes, inlets, culverts, interceptors, basins, reservoirs, outfalls, and channelized waterways, can also increase direct bacterial loading. The TMDLs for the project area indicate that stormwater from permitted MS4s is thought to be a significant source of bacteria loading (TCEQ 2011a and 2011b).

Effective stormwater management is often achieved from a management systems approach, as opposed to one that focuses on individual practices. That is, the pollutant control achievable from any given management system is viewed as the sum of the parts, taking into account the range of effectiveness associated with each single practice, the costs of each practice, and the resulting overall cost and effectiveness. Some individual practices may not be very effective alone but, in combination with others, may provide a key function in highly effective systems and, in the case of the Dallas-Fort Worth metropolitan area, reduce bacteria levels in area waterways.

About the Regional Stormwater Management Program

NCTCOG works with local governments and other stakeholders to develop and implement a regional strategy to address stormwater quality issues impacting the region. Created in 1999 by the Regional Stormwater Management Coordinating Committee (RSWMCC), the *Regional Policy Position on Managing Urban Stormwater Quality* provides guidance for the regional strategy, setting out the key elements for a cooperative and comprehensive regional approach to stormwater management. Among the goals of the Regional Program are to:

- Protect the health and welfare of citizens and the environment;
- Effectively address state and federal regulations;
- Share professional knowledge and experience; and
- Provide training to governmental staff and the development community.

The program is built upon a series of cooperative initiatives in the following areas:

- Public education;
- Control of construction site stormwater runoff;
- Management of stormwater impacts associated with post-construction;
- Illicit discharge detection and elimination; and
- Municipal pollution prevention.

Once high levels of bacteria are present in a water body, it is more difficult and expensive to restore it to a less impacted condition. The widespread use of BMPs for pollution prevention, illicit discharge detections, and elimination (IDDE), erosion and sediment control, and outreach and education are critical in meeting water quality goals for the Trinity River and its tributaries.

Existing requirements of MS4 permits address some important elements of bacteria loading in stormwater, offering an adaptive rather than prescriptive approach to bacteria reduction. Structural BMPs, such as modifications to stormwater outfalls that may reduce bacteria through aeration, treatment by sunlight, or physical removal of contaminants, have the potential to reduce bacteria loading into waterways. Because there is limited data regarding how well such BMPs might reduce bacteria loading, the Coordination Committee has identified the evaluation of the effectiveness of stormwater implementation activities as one of the top research priorities. Any research, particularly research relevant to the Greater Trinity area, should be reported and shared with Project stakeholders, so that stakeholders can devise appropriate strategies for integrating structural stormwater BMPs into their activities (see Implementation Strategy 8.0).

A map of MS4s in the project area is shown in Figure 7. A list of stormwater permits in the project area is provided in tables 19 and 20.

Implementation Strategy 2.0: MS4 participation in Regional Stormwater Management Program

Local and state governments along with transportation entities with MS4 permits currently employ extensive and innovative stormwater programs, and many participate in the Regional Stormwater Management Program (RSWMP). The RSWMP already includes several programs relevant to bacteria loading and this I-Plan. The programs include Construction, Illicit Discharge, Monitoring, Pollution Prevention, and Public Education. Additionally, regionally developed initiatives and cooperative purchases are also part of the program. Because of the extensive involvement of the RSWMP in existing stormwater efforts, as well as its regional scope and contacts, partnering with the program and supporting the inclusion of bacteria-specific elements is the logical choice and takes advantage of existing knowledge and infrastructure. A list of RSWMP participants can be found in Table 21, while a summary of this implementation strategy can be found in Table 16.

2.0.1: Request Regional Stormwater Management Coordinating Council include bacteria in RSWMP program efforts and materials

Given the broad scope of RSWMP programs and tools, the Coordination Committee requests the Regional Stormwater Management Coordinating Council (RSWMCC) direct their committees to review each program's materials for inclusion of relevant information on bacteria load reduction.

2.0.1.1: IDDE program participation

An illicit discharge is defined as any discharge to the MS4 that is not composed entirely of stormwater (except for discharges allowed under a TPDES permit). Non-stormwater discharges can originate from direct connections to the storm drain system, from business or commercial establishments (illicit connections), or indirectly as improper surface discharges to the storm drain system.

Illicit plumbing connections may be intentional or may be unknown to a property owner and often are due to the connection of floor drains to the storm sewer system. As a result of these illicit connections, wastewater that should receive treatment from a WWTF directly enters storm drains and local surface waters and subsequently negatively impacts bacteria loading.

Additional sources of illicit discharges may come from failing septic systems, illegal dumping practices, and the improper disposal of sewage from recreational practices such as boating or camping.

NCTCOG and the Coordination Committee encourage all MS4s within the Project area to participate in the RSWMP and continue and expand where necessary, their programs for IDDE through participation in existing training and educational initiatives. Stakeholders also encourage the RSWMP's IDDE Task Force to introduce or add bacteria-enhancing pollutant detection training and materials with examples from slaughter facilities, pet training/housing, farmers markets, sewage processors, zoos, etc.

2.0.1.2: Inclusion of bacteria load reduction in Pollution Prevention Peer-to-Peer program and evaluation of modified Peer-to-Peer program for five years

Peer-to-Peer is a program of the RSWMP's Pollution Prevention (P2) Task Force. The program provides site visits to assess good housekeeping procedures in MS4s which can result in cost savings in production, materials, and disposal; increase public awareness of local water quality issues; and provide safer working conditions for city/county staff.

The Coordination Committee requests the RSWMCC direct the P2 Task Force to expand the existing Peer-to-Peer review program to include awareness about good housekeeping procedures that may help reduce bacteria loading. Additionally, the Committee requests the P2 Task Force continue the modified Peer-to-Peer program over a five-year permit term allowing for reevaluation of program effectiveness.

Table 16. Implementation Strategy 2.0 Summary — MS4 participation in Regional Stormwater Management Program

Targeted Source(s)	Stormwater
Estimated Potential Load Reduction	IS 2.0 – 2.0.1.2 may result in a 10% reduction over 25 years by contributing to the reduction of the stormwater bacteria load through education and cooperative efforts among various stakeholders
Technical and Financial Assistance Needed	Technical: participation in the RSWMP provides technical assistance for MS4s under several areas including construction, illicit discharge, monitoring, pollution prevention, and public education; some technical assistance may be necessary for the RSWMP to incorporate bacteria in their programs Financial: participation in the RSWMP is based on cost share and varies depending on MS4 size; inclusion of bacteria information is unlikely to exceed existing funding sources

Education Component	Outreach to non-participating MS4s regarding benefits of participation in the RSWMP Outreach to RSWMP's RSWMCC for inclusion of bacteria in their existing programs
Schedule of Implementation	Beginning immediately as appropriate Coordination Committee members, technical subcommittee members, and NCTCOG will conduct outreach to non-participants regarding benefits of RSWMP Beginning immediately as appropriate Coordination Committee and technical subcommittee members already involved in RSWMP and/or the RSWMCC will approach the RSWMCC regarding inclusion of bacteria in existing programs and materials
Interim, Measurable Milestone	Non-RSWMP MS4s approached RSWMCC approached for inclusion of bacteria in materials and programs
Progress Indicators	Number of RSWMP participants increases Bacteria-specific information included in RSWMP programs and materials
Monitoring Component	NCTCOG will collect data on RSWMP participation and programs and materials
Responsible Entity	Coordination Committee and technical subcommittee members with ties to RSWMP and/or RSWMCC will conduct outreach to non-participating MS4s and RSWMCC RSWMCC will consider inclusion of bacteria-specific information in RSWMP outreach materials and programs NCTCOG will assist the Coordination Committee and Stormwater technical subcommittee with outreach and will present participation data and material and program updates annually to the Coordination Committee and Stormwater technical subcommittee

Implementation Strategy 2.1: Local Supplemental Environmental Projects

At the state level, the TCEQ defines supplemental environmental projects (SEPs) as, "[A] project that prevents pollution, reduces the amount of pollution reaching the environment, enhances the quality of the environment, or contributes to public awareness of environmental matters. A respondent in an enforcement action may negotiate an agreement to perform a SEP in return for an offset of the administrative penalty. The proposal to include a particular SEP in an agreed order will be presented to the Commission or Executive Director for consideration and final approval. Potential SEPs include such diverse projects as cleanups of abandoned tire sites or illegal dump sites, community collections of household hazardous waste, and pollution prevention projects that exceed regulatory requirements. SEPs that have a direct benefit allow a respondent to offset one dollar of its penalty for every dollar spent on the SEP (TCEQ, 2012a)."

Detailed in Table 17, the purpose of Implementation Strategy 2.1 is to bring the idea of SEPs to the local level — outside of the scope of the state and solely the purview of the individual local jurisdiction. Local SEPs are intended for watershed improvements and other environmentally beneficial projects that a respondent agrees to undertake in settlement of an enforcement action, but which the respondent is not otherwise legally required to perform, and for which he/she does not receive any other benefit. The local SEPs can be negotiated through the regulatory enforcement process with the city or other regulated MS4s with enforcement capabilities.

The Coordination Committee encourages local municipalities to adopt or continue using local SEPs — separate, but not to the exclusion of the state SEP program — in addition to fines, as part of escalating enforcement programs for unfunded local stormwater projects to reduce bacteria loading. As such, a goal of 75 percent of large municipal MS4s within bacteria-impaired watersheds will have local SEPs as part of stormwater enforcement by 2028 and 25 percent of small municipal MS4s will have such a program by 2033.

Table 17. Implementation Strategy 2.1 Summary — Local Supplemental Environmental Projects

Targeted Source(s)	Stormwater
Estimated Potential Load Reduction	IS 2.1 may result in a 4% reduction over 25 years by providing an additional source of funds that can be used for projects that will reduce bacterial loads. Use of local SEPs may also better engage violators in the process of improving water quality locally
Technical and Financial Assistance Needed	Technical: technical assistance may be necessary for entities to implement their own local SEP program Financial: existing funding as appropriate
Education Component	Information will be made available for local SEP implementation
Schedule of Implementation	75% of large municipal MS4s will have local SEP programs in place by 2028 25% of small municipal MS4s will have local SEP programs in place by 2033
Interim, Measurable Milestone	By 2023, 50% of large municipal MS4s will have local SEP programs in place By 2028, 15% of small municipal MS4s will have local SEP programs in place
Progress Indicators	Number of municipal MS4s with local SEP programs
Monitoring Component	NCTCOG will collect data on municipal MS4 local SEP programs

Responsible Entity	Municipal MS4s will adopt local SEP programs as feasible NCTCOG will compile information on SEP programs for an annual report to Coordination Committee and Stormwater technical subcommittee

Implementation Strategy 2.2: Land use, business, and regulatory review

Analyses by the Project's technical review subcommittee members revealed a potential gap in many existing stormwater codes and regulations with respect to addressing discharges with the potential to carry bacteria. As currently written, many rules, including the base stormwater discharge permits, focus on chemical or physical constituents, such as toxic chemicals or sediment, but may not completely address bacterial sources or discharges. Examples of facilities that may pose a risk for bacterial discharge include, but are not limited to: slaughter houses and meat-processing facilities, stables and pet-boarding facilities, sewage processors, produce packing facilities, and farmer's markets. Implementation strategies for land use and business evaluation are summarized in Table 18.

2.2.1: Business risk evaluation and enforcement

Municipalities will review their respective codes and ordinances and, as feasible, revise as necessary to address the discharge of bacteria, nutrients, and other substances that could contribute to bacterial growth in the environment.

2.2.2: Request to TCEQ for Industrial Stormwater Multi-Sector General Permit classification review and benchmark bacteria monitoring

TCEQ is encouraged to review, and as necessary amend the TPDES No. TXR050000, Multi-Sector General Permit (MSGP) to require facilities located in bacteria-impaired watersheds with operations having the potential to discharge bacteria, (such as the current Sector U, Food and Kindred Products Facilities), to perform benchmark sampling for bacteria.

Table 18. Implementation Strategy 2.2 Summary — Land use, business, and regulatory review

Targeted Source(s)	Businesses/facilities at risk for bacterial discharge
Estimated Potential Load Reduction	IS 2.2 – 2.2.2 may result in a 2% reduction in bacteria loading as problems are identified and corrected over 25 years
Technical and Financial Assistance Needed	Technical: technical assistance may be necessary for MS4s to develop and study their own land use and evaluate businesses with potential to discharge bacteria Financial: loans, grant funding and existing funding as appropriate

Education Component	Outreach to MS4s concerning land use and business evaluation may be necessary Educational efforts by MS4s regarding operations and land use to businesses with potential to discharge bacteria Outreach to impacted businesses should TCEQ amend MSGP requirements
Schedule of Implementation	As resources are available, the implementation of this activity will begin immediately and will continue for the entire implementation process
Interim, Measurable Milestone	Number of local evaluations completed Number of site visits to businesses with potential to discharge bacteria
Progress Indicators	Number of reported program expansion and/or modifications to address high risk businesses Changes to MSGP requirements
Monitoring Component	NCTCOG will collect data on local efforts and any changes to the TCEQ MSGP
Responsible Entity	MS4s will evaluate local land use and businesses for potential for bacteria discharges NCTCOG will coordinate dialogue between MS4s, stakeholders and TCEQ to identify potential modifications to the MSGP that will aid in addressing bacteria as a pollutant and benchmark bacteria monitoring NCTCOG will compile data collected on local efforts and any changes to the TCEQ MSGP and present it annually to Coordination Committee and Stormwater technical subcommittee

Table 19. MS4 Permittees by AU for 0805 and 0822 Segments

AU	MS4 Permittees	TPDES Permit Number
0805_03	City of Dallas	WQ0004396
0805_03	TxDOT – Dallas	WQ0004521
0805_03	North Texas Tollway Authority	WQ0004400
0805_03	Dallas Area Rapid Transit	TXR040000
0805_04	City of Dallas	WQ0004396
0805_04	City of Irving and co-permittees: Dallas Co. Flood Control District #1, Dallas County Utility & Reclamation District, Irving Flood Control District Sections I & III	WQ0004691
0805_04	TxDOT – Dallas	WQ0004521
0805_04	North Texas Tollway Authority	WQ0004400
0805_04	City of University Park	TXR040000
0805_04	Town of Highland Park	TXR040000
0805_04	City of Cockrell Hill	TXR040000
0805_04	Dallas Area Rapid Transit	TXR040000
0805_04	Buckley Oil Company [b]	WQ0004663
0822A	City of Irving and co-permittees: Dallas Co. Flood Control District #1, Dallas County Utility & Reclamation District, Irving Flood Control District Sections I & III	WQ0004691
0822A	North Texas Tollway Authority	WQ0004400
0822A	DFW International Airport [a]	TXR040000
0822B	City of Irving and co-permittees: Dallas Co. Flood Control District #1, Dallas County Utility & Reclamation District, Irving Flood Control District Sections I & III	WQ0004691
0822B	City of Dallas	WQ0004396
0822B	TxDOT– Dallas	WQ0004521
0822B	City of Coppell	TXR040000
0822B	DFW International Airport [a]	TXR040000

[a] Includes five outfalls covered under an individual industrial stormwater permit (WQ0001441).
[b] Individual industrial stormwater permit included as part of the MS4 allocation.

Table 20. MS4 Permittees by AU for 0841 Segments

AU	MS4 Permittees	TPDES Permit Number
0841_01	City of Irving and co-permittees: Dallas Co. Flood Control District #1, Dallas County Utility & Reclamation District, Irving Flood Control District Sections I & III	WQ0004691
0841_01	City of Arlington and co-permittees: University of Texas at Arlington and TxDOT-Fort Worth	WQ0004635
0841_01	City of Dallas	WQ0004396
0841_01	City of Fort Worth and co-permittees: Tarrant Regional Water District, and TxDOT-Fort Worth	WQ0004350
0841_01	North Texas Tollway Authority	WQ0004400
0841_01	TxDOT – Dallas	WQ0004521
0841_01	City of Grand Prairie	TXR040000
0841_01	City of Keller	TXR040000
0841_01	City of Colleyville	TXR040000
0841_01	City of Southlake	TXR040000
0841_01	City of Grapevine	TXR040000
0841_01	City of Euless	TXR040000
0841_01	City of North Richland Hills	TXR040000
0841_01	City of Bedford	TXR040000
0841_01	City of Hurst	TXR040000
0841_01	Tarrant County	TXR040000
0841_01	Dallas County	TXR040000
0841_01	TxDOT – Fort Worth	TXR040000
0841_01	DFW International Airport [a]	TXR040000
0841_01	Dallas Area Rapid Transit	TXR040000
0841_01	North Texas Tollway Authority	TXR040000
0841_01	Dallas Co. Flood Control Dist. No. 1	TXR040000
0841_01	Extex LaPorte LP [b]	WQ0001250

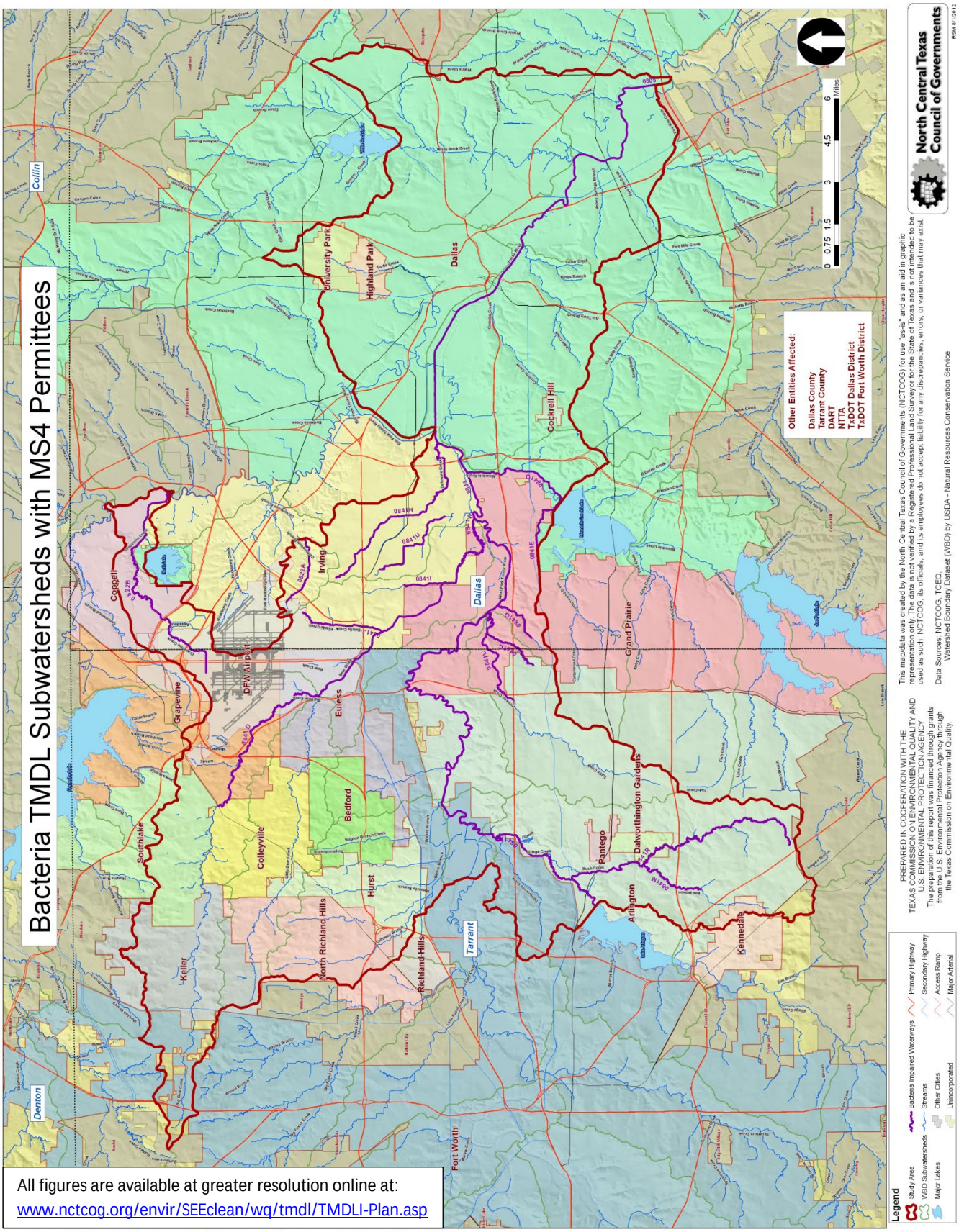
[a] Includes five outfalls covered under an individual industrial stormwater permit (WQ0001441).
[b] Individual industrial stormwater permit included as part of the MS4 allocation.

AU	MS4 Permittees	TPDES Permit Number
0841_02	City of Arlington and co-permittees: University of Texas at Arlington and TxDOT-Fort Worth	WQ0004635
0841_02	City of Fort Worth and co-permittees: Tarrant Regional Water District, and TxDOT-Fort Worth	WQ0004350
0841_02	TxDOT – Dallas	WQ0004521
0841_02	City of North Richland Hills	TXR040000
0841_02	City of Hurst	TXR040000
0841_02	City of Bedford	TXR040000
0841_02	City of Grand Prairie	TXR040000
0841_02	City of Euless	TXR040000
0841_02	City of Dalworthington Gardens	TXR040000
0841_02	Town of Pantego	TXR040000
0841_02	City of Kennedale	TXR040000
0841_02	City of Colleyville	TXR040000
0841_02	Tarrant County	TXR040000
0841_02	Tarrant County College NE	TXR040000
0841_02	TxDOT-Fort Worth	TXR040000
0841_02	Dallas Area Rapid Transit	TXR040000

Table 21. RSWMP Participation in Project Area as of FY2012

Participants in RSWMP	Non-Participants
City of Arlington	City of Cockrell Hill
City of Bedford	City of Dalworthington Gardens
City of Colleyville	City of Haslet
City of Coppell	DFW Airport
City of Dallas	Town of Pantego
City of Euless	
City of Fort Worth	
City of Grand Prairie	
City of Grapevine	
City of Hurst	
City of Irving	
City of Keller	
City of Kennedale	
City of North Richland Hills	
City of Southlake	
City of University Park	
Dallas Area Rapid Transit	
Dallas County	
North Texas Tollway Authority	
Tarrant County	
TxDOT Dallas District	
TxDOT Fort Worth District	
Town of Highland Park	

Figure 7. MS4s in Project Area



All figures are available at greater resolution online at:
www.nctcog.org/envir/SEEclean/wq/tmdl/TMDLI-Plan.asp

Planning and Development Implementation Strategies

The Greater Trinity River Bacteria TMDL I-Plan Project area has experienced rapid population growth resulting in increased land development, which in turn has led to challenges in maintaining waterways as areas for recreation. According to the 2010 US Census, the project area is home to 1.33 million people and given its mostly urban, suburban, and industrial land uses, the aggregate impact of so many people and impervious surfaces has the ability to impact bacteria levels in the waterways. Figure 8 shows land use in the Project area based on 2005 data, while Figure 9 shows population density based on 2010 US Census information (NCTCOG, 2012a).

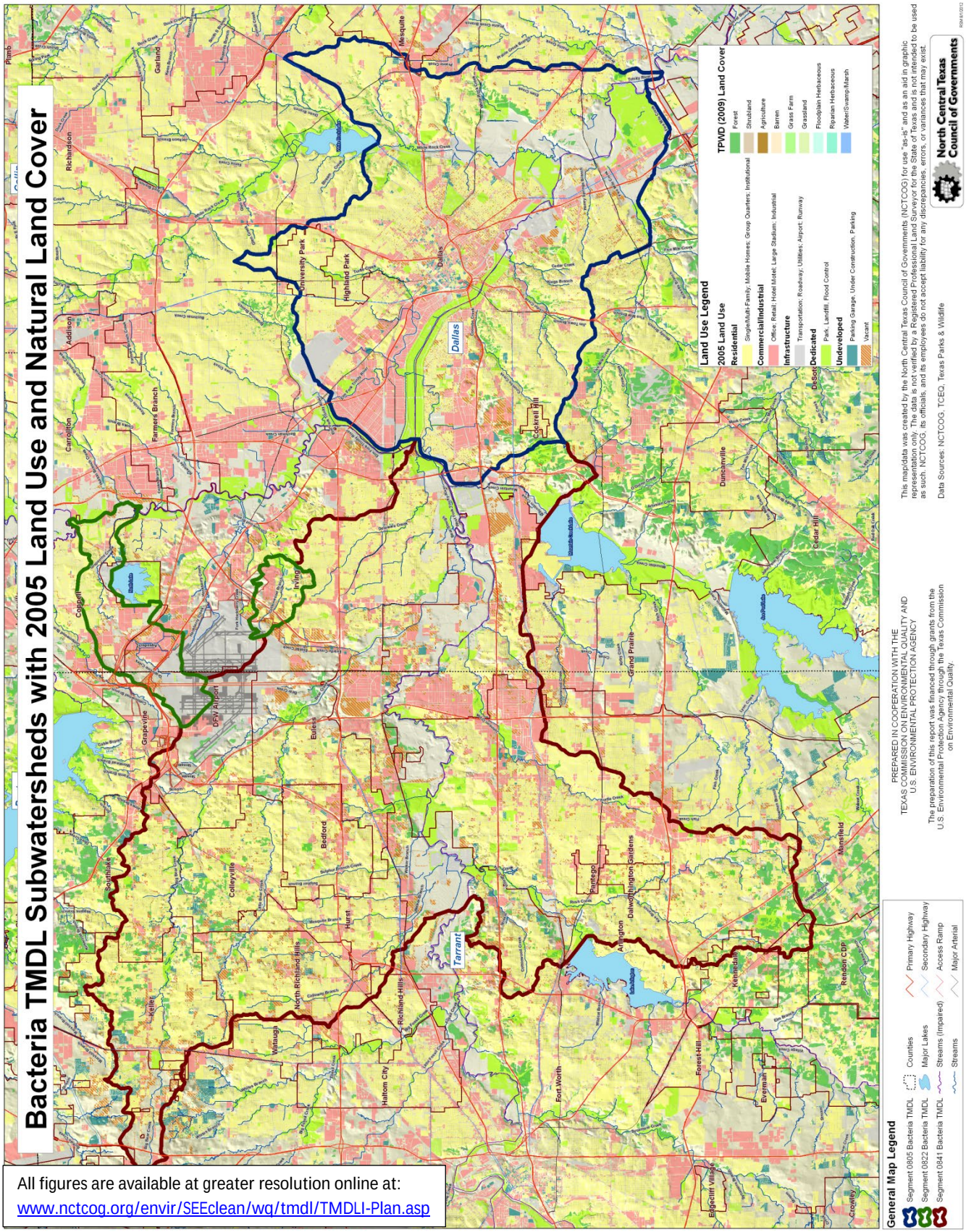
Concerns about population growth, the associated stormwater from development, and the impact on stormwater quality must be addressed as part of reducing bacteria levels. Green infrastructure (GI) uses vegetation, soils, and natural processes to manage water and create healthier urban environments. At the scale of a city or county, GI refers to the patchwork of natural areas that provides habitat, flood protection, lowered bacteria loading, and cleaner water. Brought to the scale of a neighborhood or site, GI refers to stormwater management systems that mimic nature by soaking up and storing water (USEPA, 2012a).

Similar, although not identical to GI, is low impact development (LID). LID is an approach to land development (or redevelopment) that works with nature to manage stormwater as close to its source as possible. LID employs principles, such as preserving and recreating natural landscape features, and minimizing effective imperviousness to create functional and appealing site drainage that treats stormwater as a resource rather than a waste product. There are many practices that have been used to adhere to these principles such as bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions. LID has been characterized as a sustainable stormwater practice by the Water Environment Research Foundation and others (USEPA, 2012b).

Another tool for reducing stormwater impact is the *integrated* Stormwater Management (iSWM) Program for Construction and Development, a cooperative initiative through NCTCOG that assists cities and counties to achieve their goals of water quality protection, stream bank protection, and flood mitigation, while also helping communities meet their construction and post-construction obligations under state stormwater permits.

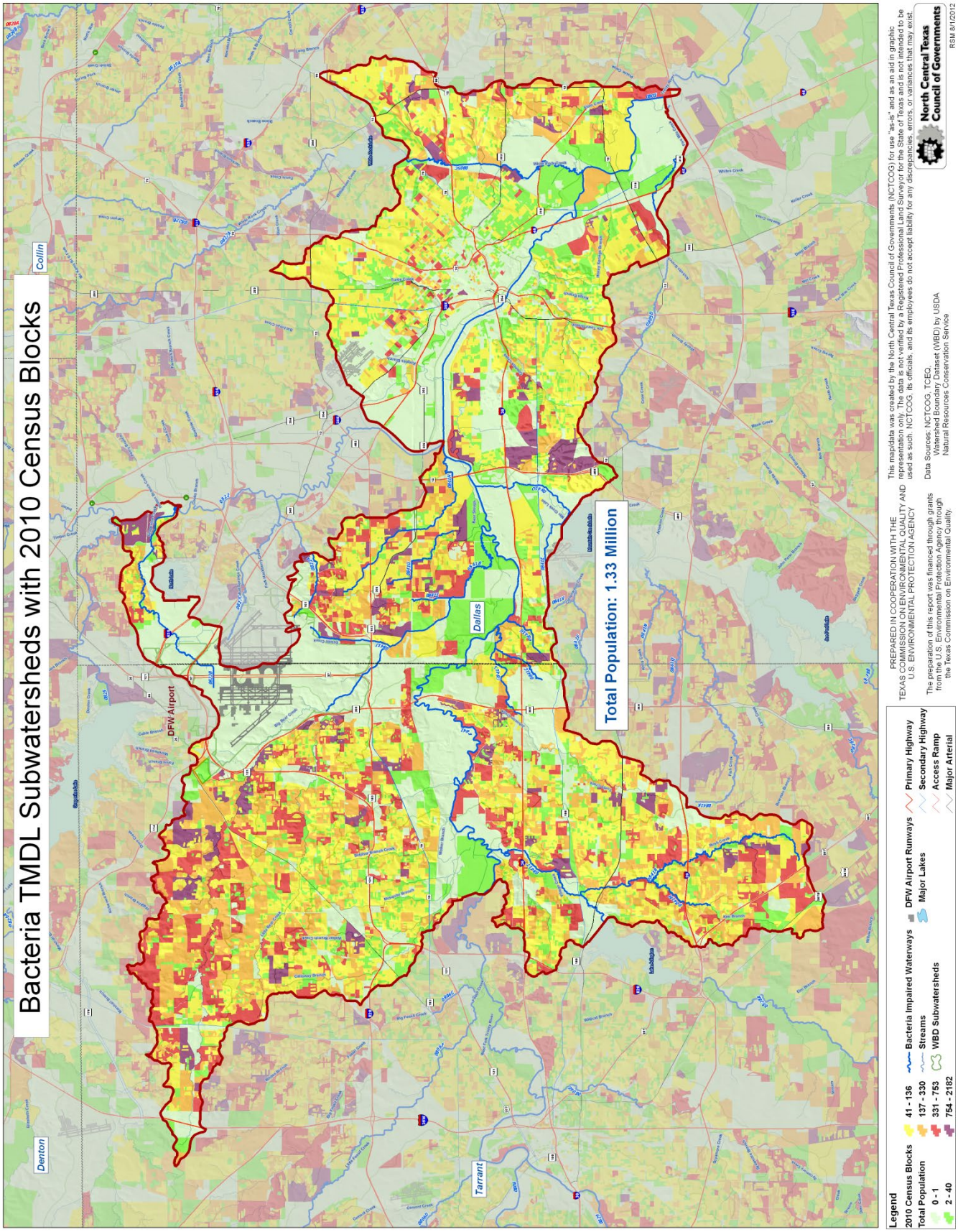
iSWM considers that development and redevelopment by their nature increase the amount of imperviousness in the surrounding environment. This increased imperviousness translates into loss of natural areas, more sources for pollution, such as bacteria, in runoff, and heightened flooding risks. To help mitigate these impacts, more than 60 local governments in the NCTCOG region are cooperating to proactively create sound stormwater management guidance for the region through the iSWM Program (NCTCOG, 2012b).

Figure 8. Land Use in Project Area



All figures are available at greater resolution online at:
www.nctcog.org/envir/SEEclean/wq/tmdl/TMDLI-Plan.asp

Figure 9 - Population Density from 2010 US Census Data



Implementation Strategy 3.0: Adoption of green infrastructure and low impact development standards by municipalities

Stakeholders are committed to expanding the use of GI, LID, and iSWM throughout the Project area. Although none of these practices focuses specifically on bacteria, measures slowing stormwater flow and increasing filtration will reduce bacteria carried by sheet flow into storm drains, creeks, and lakes thereby helping to reduce bacteria loading in the watersheds of the Project area. The Coordination Committee encourages 25 percent of municipalities within bacteria-impaired watersheds to adopt GI and/or LID standards for all sizes of development in their comprehensive plans by 2023 and 50 percent of cities do so by 2038. Implementation strategies for GI and LID are summarized in Table 22.

3.0.1: Reevaluation of development standards based on monitoring data

The lack of applicable data makes it difficult to assess the impact of implementation of practices like LID and GI and programs like iSWM. The current lack of information makes it even more important for stakeholders to do their own internal study of the effectiveness of development standards using stream monitoring data. Municipal stakeholders are encouraged to reevaluate development standards based on monitoring data no less than every five years in conjunction with the MS4 permit cycle.

3.0.2: Municipal ordinance evaluation for water quality impediments

By 2017, 25 percent of municipal stakeholders will evaluate their ordinances for impediments that discourage homeowners and businesses from actions or practices that may improve water quality. Fifty percent of municipalities will do so by 2023. Examples of impediments may include prohibitions on cisterns, rain barrels, or permeable pavement.

3.0.3: Internal policy and procedure integration and improved communication for municipalities

Municipal stakeholders are encouraged to evaluate city departmental structure and internal operations to better integrate policies and practices and improve communication between related departments. Additionally, municipalities are encouraged to evaluate internal practices and procedures for impediments to cooperation among stormwater-related divisions and departments with related goals, such as parks and recreation, public works, planning and development, and environmental management.

Table 22. Implementation Strategy 3.0 Summary — Adoption of GI and LID standards by municipalities

Targeted Source(s)	Construction, development, and redevelopment
Estimated Potential Load Reduction	IS 3.0 – 3.0.3 may result in a 40% reduction in bacteria loading if GI and LID are implemented to the fullest extent possible over the next 25 years
Technical and Financial Assistance Needed	Technical: engineering and/or technical assistance may be necessary to implement changes including the adoption of LID/GI standards, reevaluating development standards based on monitoring data, inclusion of construction BMPs, post construction review, and demonstration projects Financial: loans, grants, local SEPs, and existing funding as appropriate