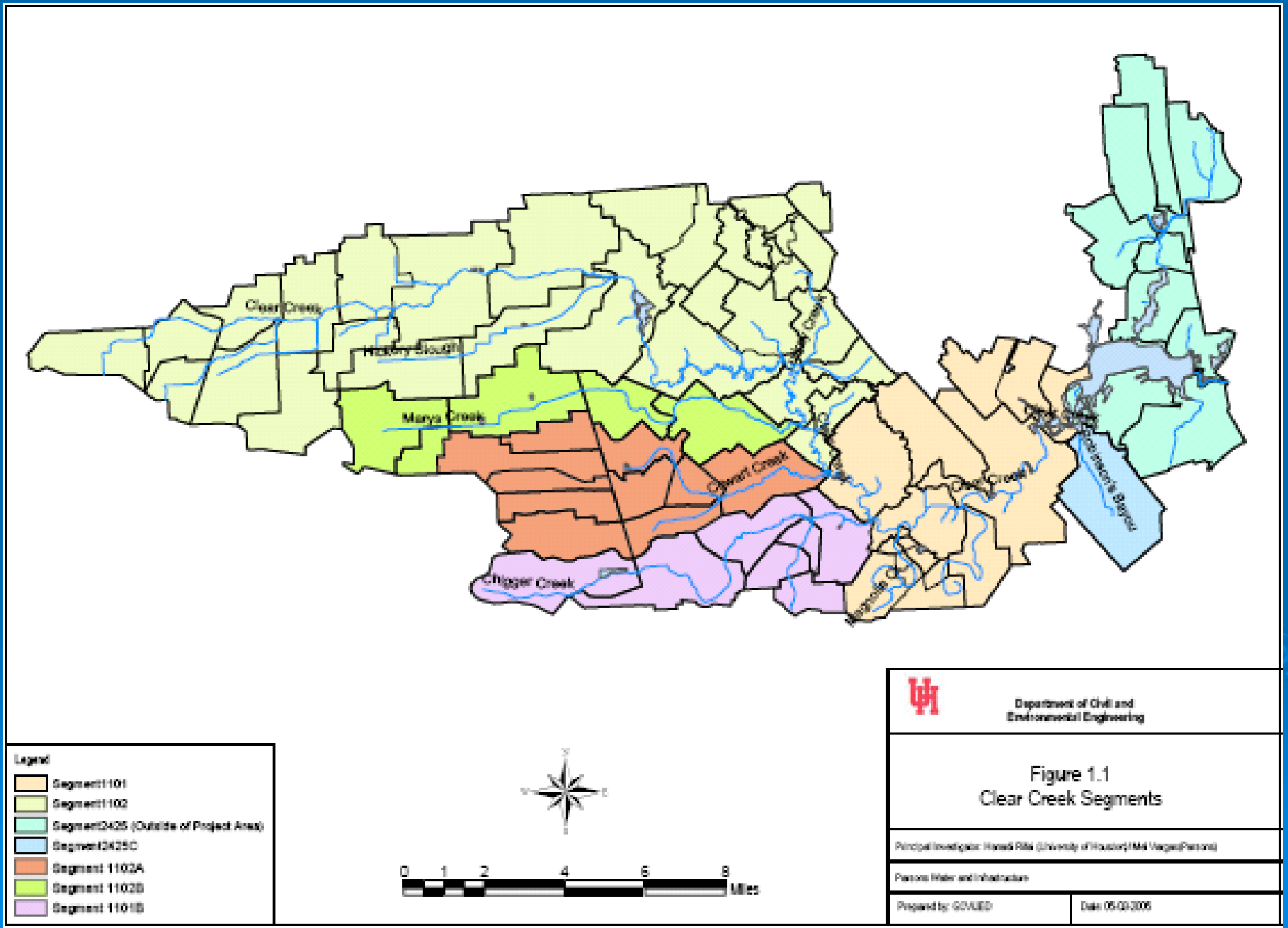
Clear Creek Watershed Bacteria TMDL

Data Review

Ron Stein
Texas Commission on Environmental Quality

April 5, 2006

Segments


Clear Creek
Mary's Creek
Chigger Creek
Legend
Segment1101
Segment1102
Segment2425 (Outside of Project Area)
Segment2425C
Segment 1102A
Segment 1102B
Segment 1101B
0 1 2 4 6 8
Miles
Department of Civil and Environmental Engineering
Figure 1.1
Clear Creek Segments
Principal Investigator: Howard Rifai (University of Houston) / Mike Vargas (Parsons)
Parsons Water and Infrastructure
Prepared by: GD/UED
Date: 05/03/2006

Watershed Characteristics

- Rainfall ~57 inches per year average
- Generally flat topography
- ~ 200 square miles
- Landuse
  - Developed 23.5% Cultivated Land/Grassland 39.0% Woody Land 18.2% Open Water 4.4% Wetland 8.5% Bare/Transitional Regions 6.4%

Watershed Characteristics

- City Population 182,261 in 2000 expected to increase 36% by 2020
- ~50,000 cats & ~44,000 dogs
- Livestock include beef cattle, horses, goats, chickens, and hogs
- ~92% households sanitary sewers, ~8% septic systems

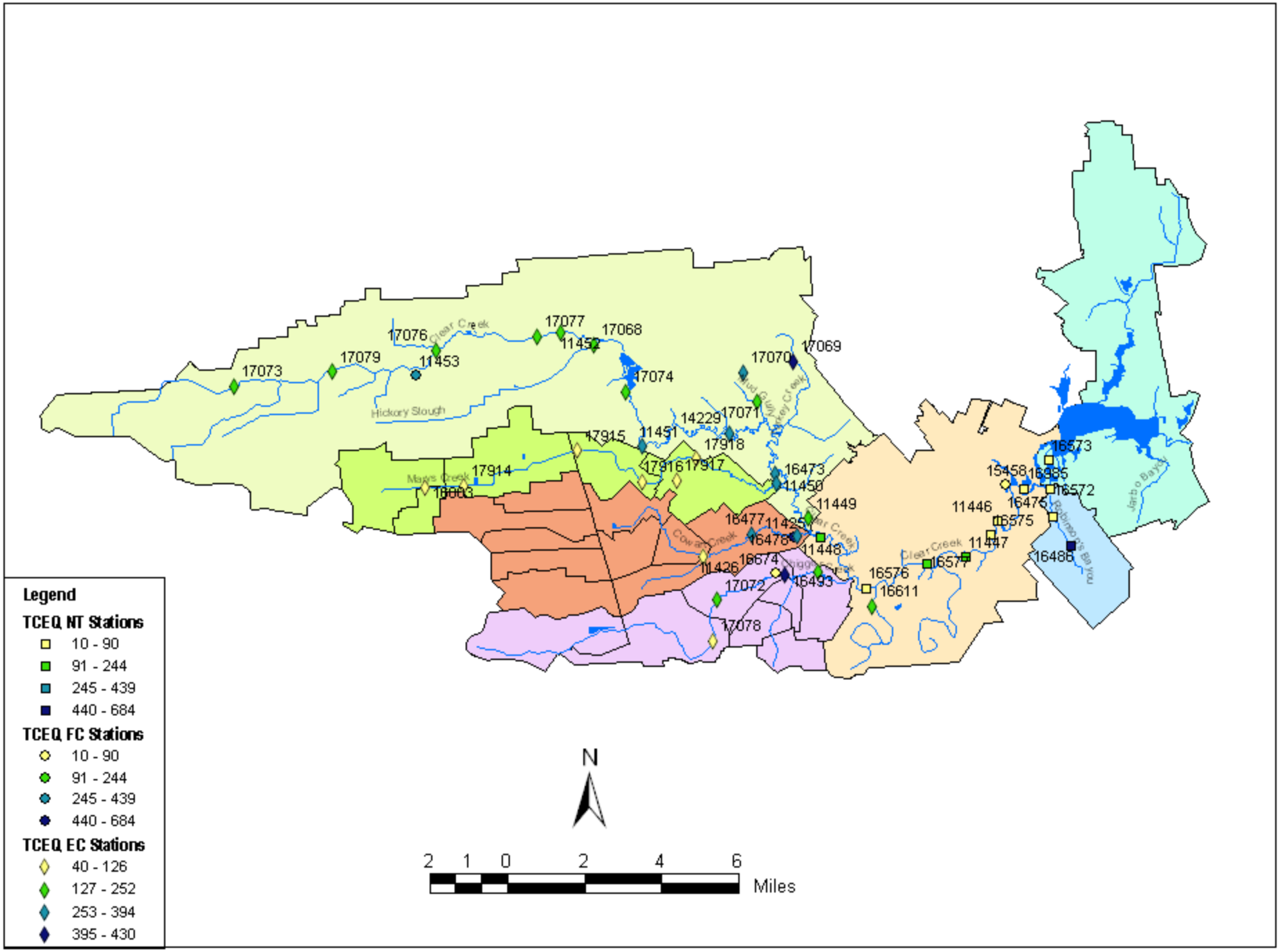
Historical Bacteria Data

Water Quality Standards for Contact Recreation

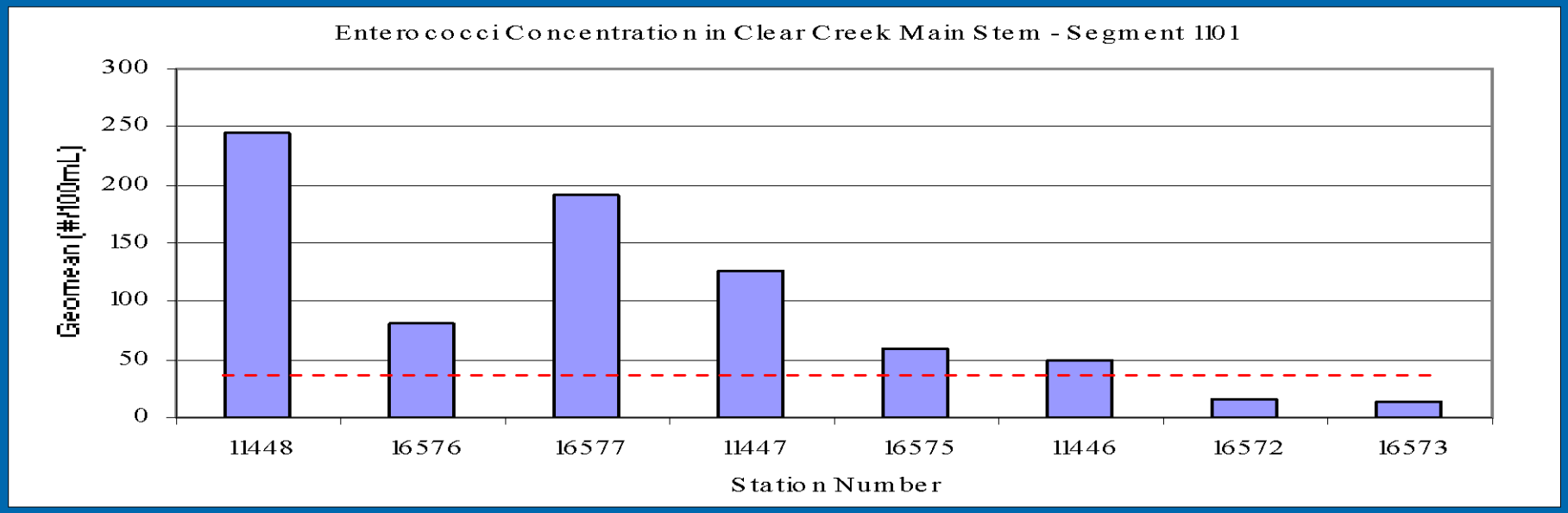
Fecal Pathogen Indicator	Geomean Standard	Single Sample Limit
Fecal Coliform (cfu/100 mL)	200	400
Escherichia coli (MPN/100 mL)	126	394
Enterococci (MPN/100 mL)	35	89

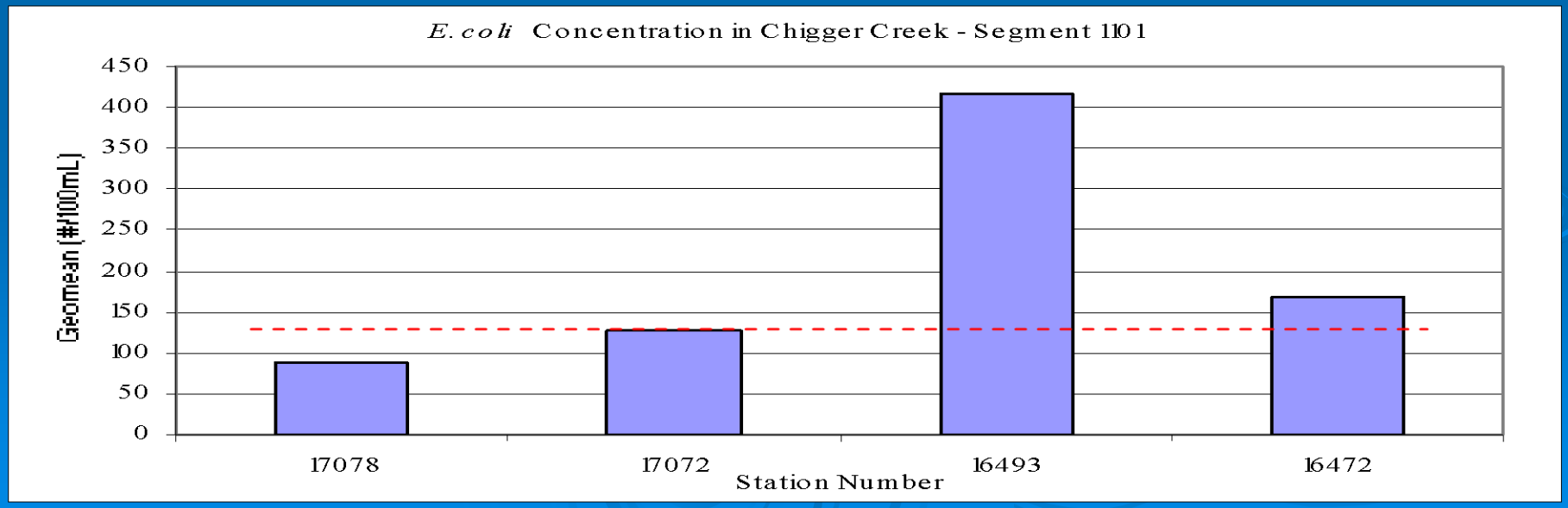
Historical Bacteria Data

- **43 water quality monitoring monitoring locations (stations)**
  - 72% exceed the geometric standard
  - 74% exceed the single sample standard 25% of the time

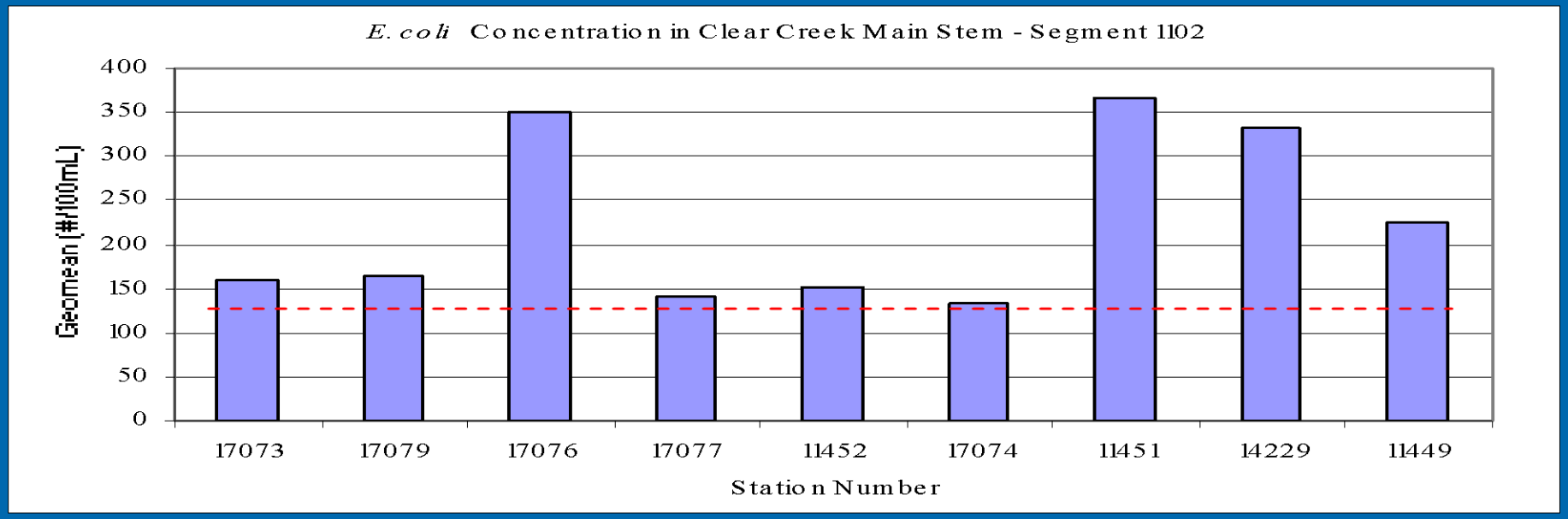

Legend
TCEQ NT Stations
10 - 90
91 - 244
245 - 439
440 - 684
TCEQ FC Stations
10 - 90
91 - 244
245 - 439
440 - 684
TCEQ EC Stations
40 - 126
127 - 252
253 - 394
395 - 430
N
2 1 0 2 4 6
Miles
Clear Creek
Hickory Slough
Mary Creek
Cowan Creek
Mud Gully
Hickory Creek
Jarbo Bayou
Robinson Bayou
17073
17079
17076
11453
17077
11452
17068
17074
17069
17070
17071
14229
11451
17918
17915
17914
17916
17917
16473
11450
11449
16477
11425
16478
11448
11426
16674
16493
17072
17078
16576
16611
16577
11446
11447
16475
16575
16573
15458
16572
16486

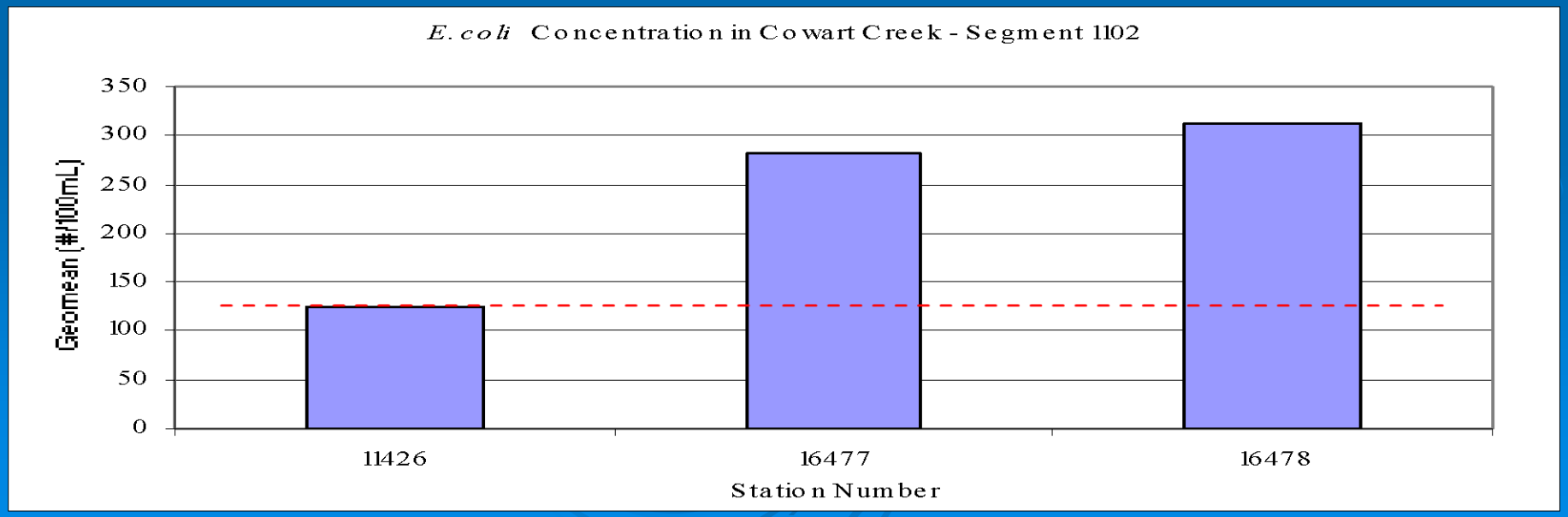
Historical Bacteria Data



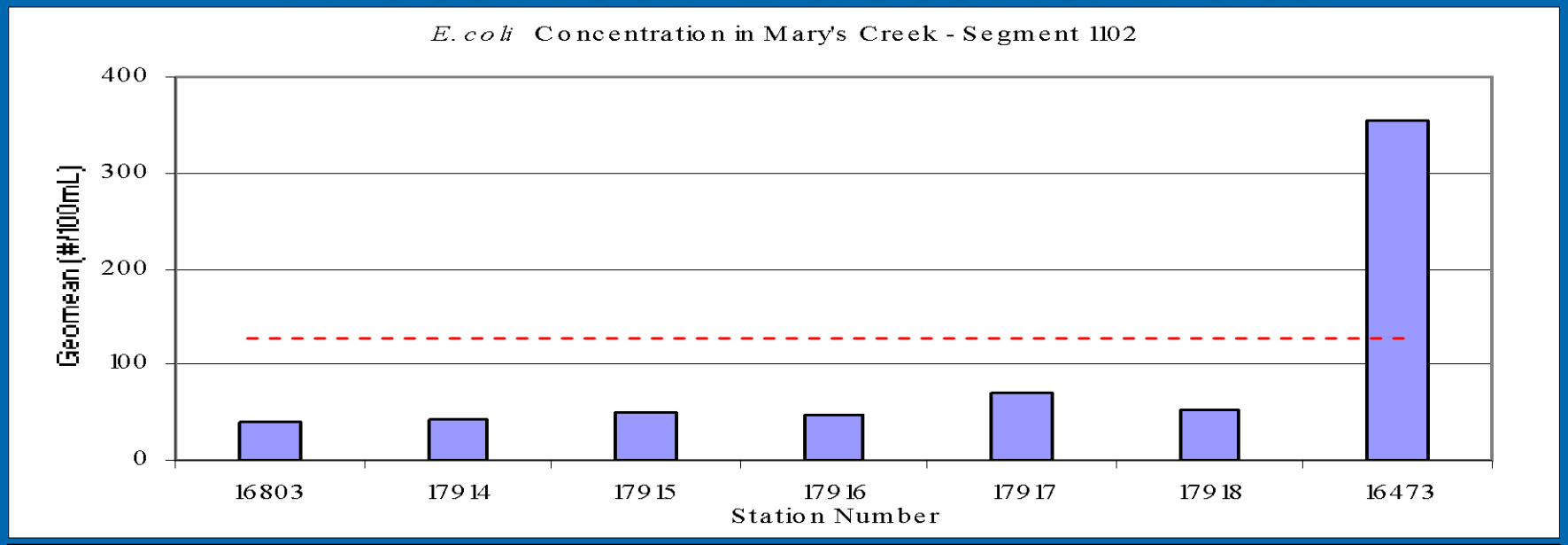


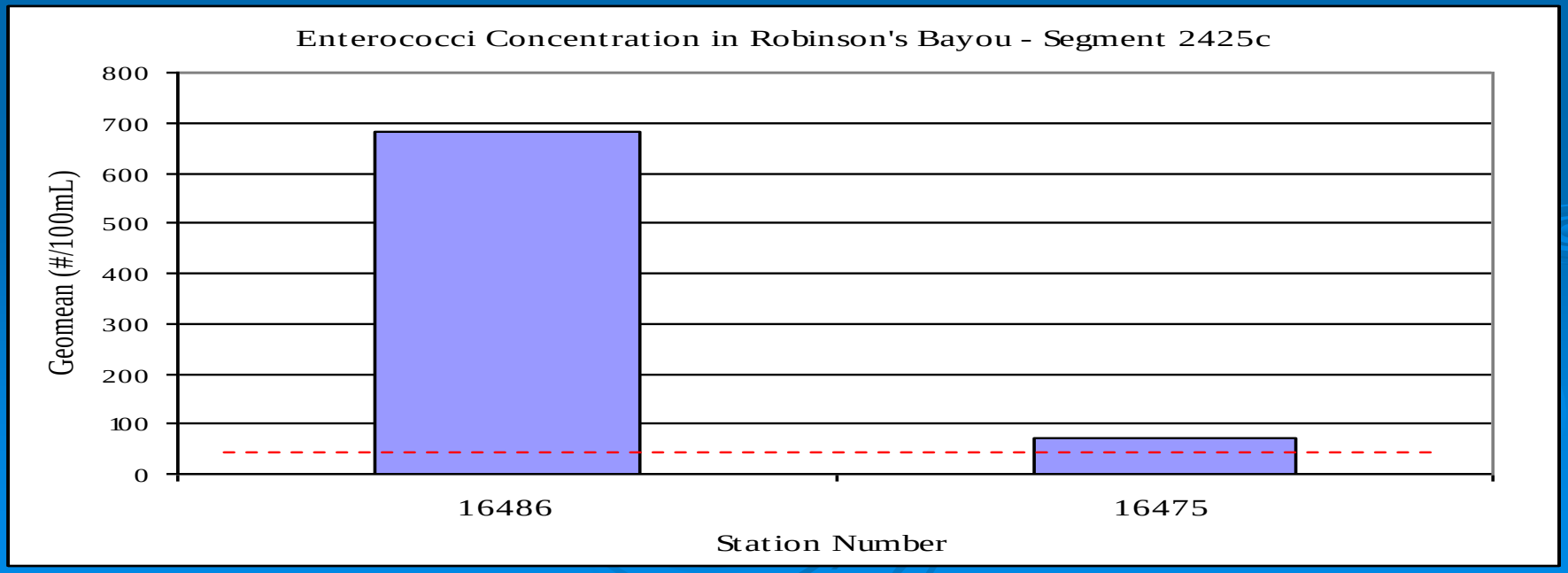
Historical Bacteria Data





Historical Bacteria Data





Potential Bacteria Sources

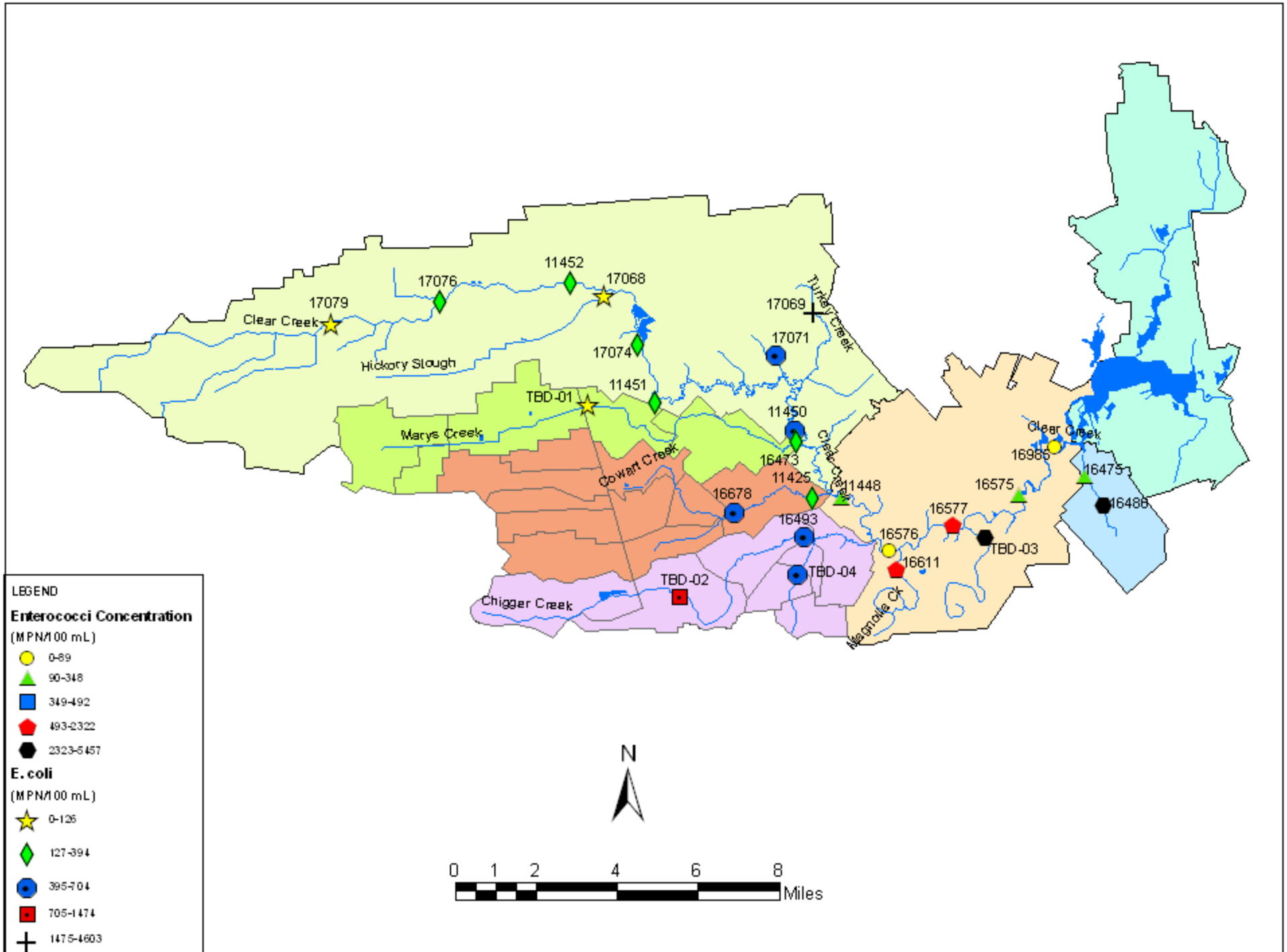
- 23 permitted municipal wastewater discharges
  - 16 in segment 1102
- 13 permitted industrial wastewater discharges
- Sanitary Sewer Overflows
  - 631 reported January 2002 through July 2005
- It is estimated that there are approximately 5,600 septic systems in the watershed
  - Nationwide 15% to 40% are failing

Potential Bacteria Sources

- Storm Water from Urban areas
  - Known to have high loads of bacteria
  - No sampling within the watershed
- Dry weather storm sewer discharges
  - Discharge from storm sewer outlet after period of no rain
  - These types of discharges may carry bacteria
  - 385 of 1,140 outfalls had dry weather discharges in 2001 study
  - 21 had high bacteria concentrations 1000 MPN/dL

Potential Bacteria Sources

- Storm Water from Urban areas
  - Known to have high loads of bacteria
  - No sampling within the watershed
- Dry weather storm sewer discharges
  - Discharge from storm sewer outlet after period of no rain
  - These types of discharges may carry bacteria
  - 385 of 1,140 outfalls had dry weather discharges in 2001 study
  - 21 had high bacteria concentrations 1000 MPN/dL


17076
11452
17068
17079
Clear Creek
Hickory Slough
17069
Turkey Creek
17071
17074
11451
TBD-01
11450
Marys Creek
Clear Creek
Cowart Creek
16473
11425
11448
16678
16493
TBD-04
TBD-02
Chigger Creek
16576
16611
16577
TBD-03
16575
Magnolia Ck
Clear Creek
16965
16475
16486
LEGEND
Enterococci Concentration
(MPN/100 mL)
0-89
90-348
349-492
493-2322
2323-5457
E. coli
(MPN/100 mL)
0-126
127-394
395-704
705-1474
1475-4603
N
0 1 2 4 6 8
Miles

Summer 2005 Sampling

- E. coli ranged from 38 MPN/dL to 4,790 MPN/dL
- Enterococci ranged from 39 MPN/dL to 5,460/dL
- Sediment bacteria concentrations
  - It has been found that the upper layer of sediment in streams in the Houston area have high bacteria concentrations
  - Sediment samples ranges from 1,973 MPN/100g to 498,769 MPN/100g
  - Generally 10 to 1000 times greater than the water

2006 Sampling

- Intensive Survey
  - 20 locations (stations)
  - 3 events with different flow conditions
  - 5-6 samples per station
  - EC, EN, Flow, Turbidity, TSS, temperature, DO, pH, conductivity
- Storm Water Sampling
  - 9 stations
  - When runoff is occurring – 1 inch of rain or more
  - 3 – 5 samples over three days
  - EC, EN, Flow, Turbidity, TSS, temperature, DO, pH, conductivity

2006 Sampling

- WWTP Sampling
  - 6 plants
  - Discharge during dry weather
  - Discharge during 2 rainfall events
  - Prior, during and after rain
  - EC, TSS, chlorine residual, orthophosphate, ammonia, flow, temperature, DO, pH, conductivity
- In Stream Sampling
  - 6 stations
  - Locations recent data is not available
  - EC, EN, Flow, Turbidity, TSS, temperature, DO, pH, conductivity

2006 Sampling

- Storm Water Outfall Survey
  - Complete the survey of storm water outfalls that was begun in 2005

Clear Creek Watershed Bacteria TMDL

QUESTIONS?

Ron Stein
Texas Commission on Environmental Quality

April 5, 2006