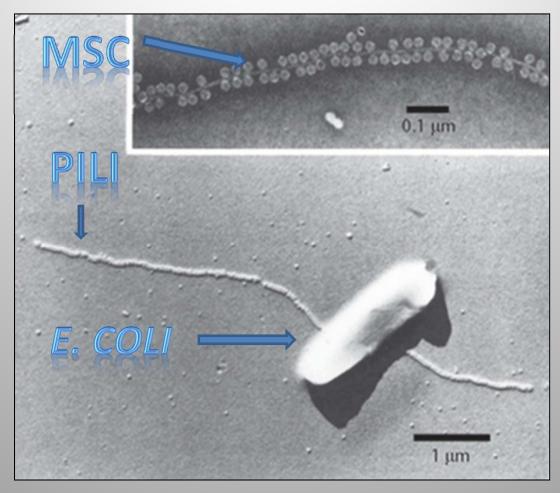
MSC in the NSSP



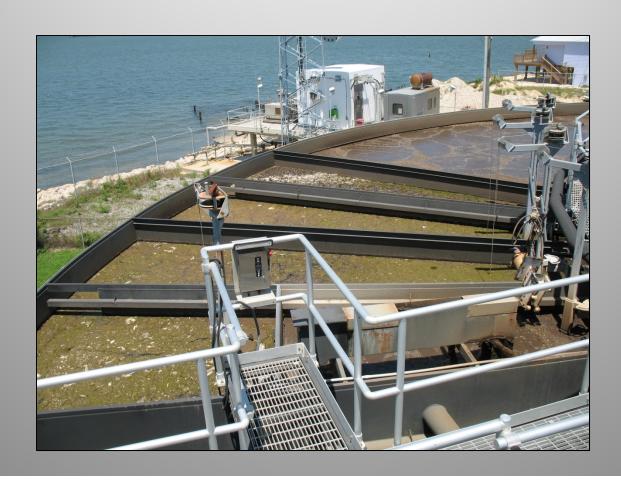


CDR Kevin R. Calci Gulf Coast Seafood Laboratory US Food & Drug Administration



Expanded Use of MSC:

- -Wastewater Treatment Plant Efficiency
- -Shoreline Survey



Expanded Use of MSC:

- -Wastewater Treatment Plant Efficiency
- -Shoreline Survey



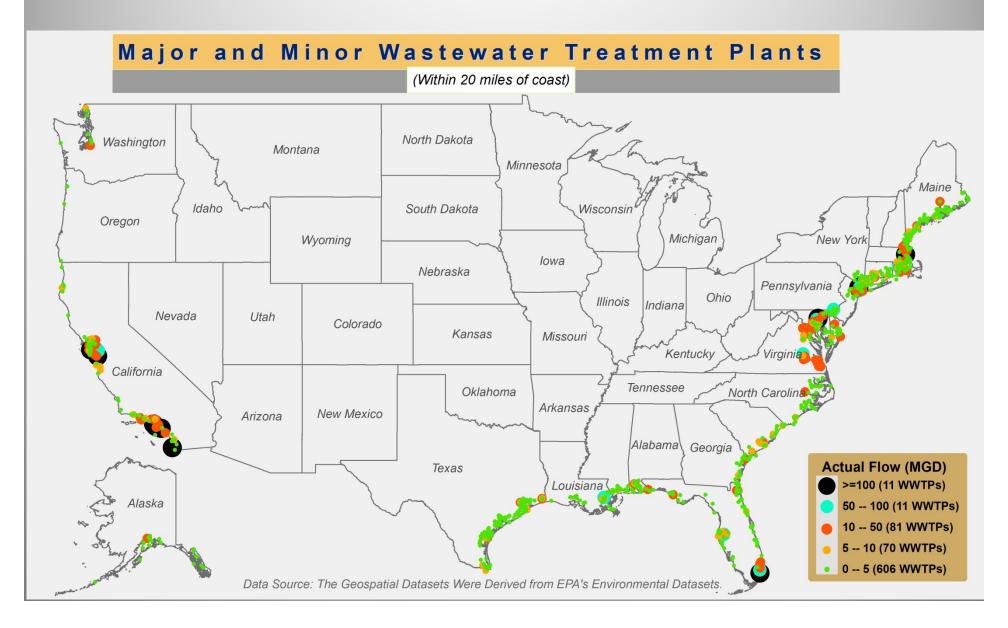
Male-Specific Coliphage Ecology

- > Raw Sewage
 - 10⁴⁻⁵ PFU/100ml
- > Treated Sewage
 - 10²⁻³ PFU/100ml
- > Animal Sources
 - Horses, hogs, chickens
 - 1700 horses to equal a 1 MGD WWTP



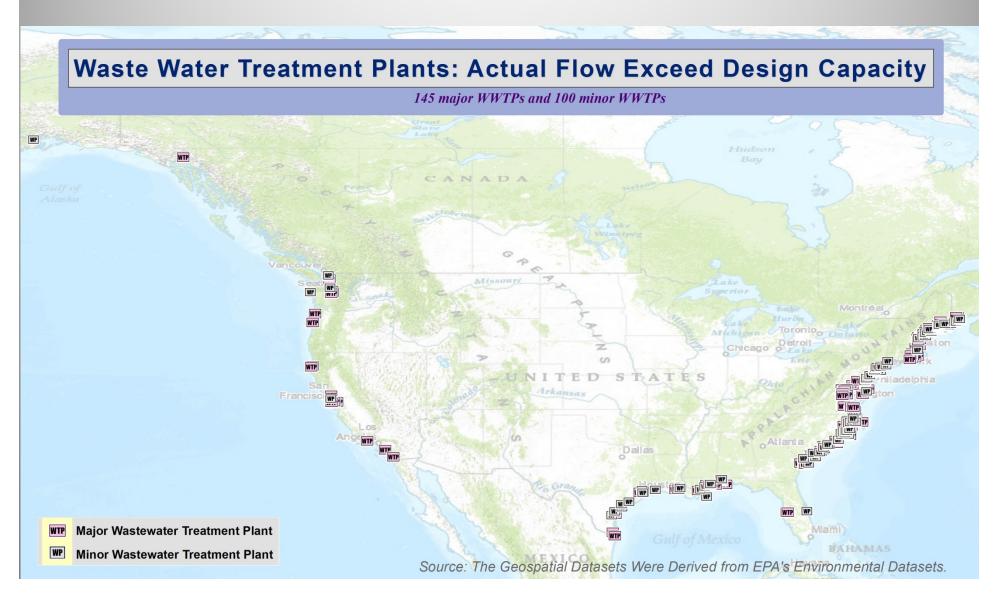


Sizing up the Problem



The Good News:

only 31% of the 779 wwtp exceed design capacity



WWTP Efficiency: How well are they doing?



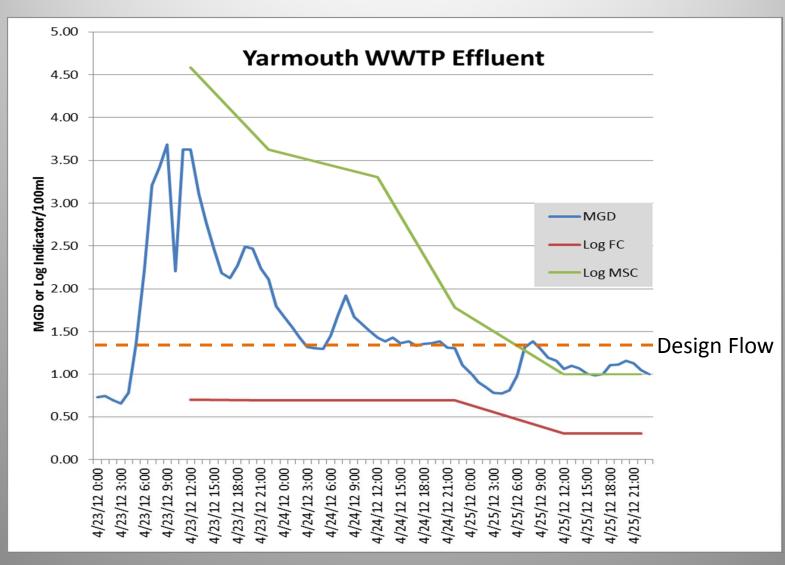
FDA/State WWTP Studies

- 39 mechanical wwtp's
- Ranged from Primary to Tertiary treatment
- No disinfection, chlorination or UV
- ME, NH, MA, RI, CT, VA, AL, MS, CA, OR, WA
- 7 wwtp-dye dispersion-shellfish sentinel studies



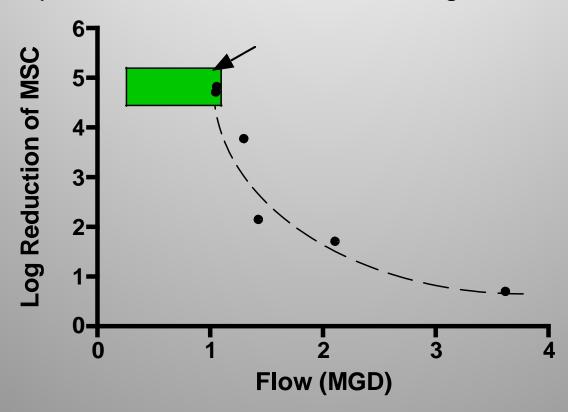


Capturing an Upset Condition



MSC Reduction in Response to Flow

MSC Reduction verses Flow at Yarmouth, Maine WWTP (data collected after 3" rain event during flood closure)



A Glimpse at More DATA to Come



Disclaimer

This information is provided solely for the purpose of this MSC Informational Meeting; it has not been formally disseminated by FDA, Health Canada, Canadian Food Inspection Agency or Environment Canada. It does not and should not be construed to represent any agency determination or policy.

Norovirus in Bivalve Molluscan Shellfish Food Safety Risk Assessment

 This risk assessment was commissioned as a collaborative effort between the United States Food and Drug Administration, Health Canada, the Canadian Food Inspection Agency and Environment Canada

 Assessment objectives include: <u>quantitatively</u> evaluating impact of selected factors on the risk of becoming ill with norovirus from consumption of (oysters), assessing impact of preventive practices and controls, and informing food safety objectives if possible

Risk Assessment Key Input: Data on Wastewater Treatment (DRAFT)

- A <u>meta-analysis</u> was completed in order to build the quantitative risk model. Data for NoV & MSC concentration in raw and treated wastewater was collected.
 - <u>Data sources:</u> refereed scientific literature (43 papers), as well as original data from the US FDA and Canadian agencies
 - Data selection: using systematic selection criteria
 - Data focus: NoV I or NoV II in influent and effluent, and MSC if NoV I or NoV II data are available for that WWTP
 - Method used: Bayesian inference model considering; censored data, random effects for influent level and log reduction among WWTPs, seasonal effect and correlations between log-reduction of NoV and MSC

Meta-analysis Draft Results: Influent concentrations

- Influent concentration estimates representing the population of WWTPs
 - Average over WWTPs and months

| | Estimate | CI 95% | | |
|---|----------|--------|-----|--|
| NoV I, influent (log ₁₀ gc/l) | 1.5 | 0.4 | 2.4 | |
| NoV II, influent (log ₁₀ gc/l) | 3.9 | 3.5 | 4.3 | |
| MSC, influent (log ₁₀ PFU/I) | 6.2 | 6.1 | 6.4 | |

Correlation coefficients: WWTP to WWTP DRAFT Results

| | Influent NoV I (log ₁₀ gc/l) | Influent NoV II (log ₁₀ gc/l) | Influent MSC (log ₁₀ PFU/I) | Log reduction NoV I (log ₁₀ gc/l) | Log reduction NoV II (log ₁₀ gc/l) |
|--|--|---|---|--|---|
| Influent NoV II (log ₁₀ gc/l) | 0.7 (0.3; 0.9) | | | | |
| Influent MSC (log ₁₀ PFU/I) | 0.3 (-0.2; 0.6) | 0.4 (0.1; 0.7) | | | |
| Log reduction NoV I (log ₁₀ gc/l) | -0.1 (-0.7; 0.7) | -0.2 (-0.8; 0.6) | -0.1 (-0.5; 0.5) | | |
| Log reduction NoV II (log ₁₀ gc/l) | -0.3 (-0.6; 0.1) | -0.5 (-0.8; -0.2) | -0.3 (-0.6; 0.1) | 0.5 (-0.2; 0.8) | |
| Log reduction MSC (log ₁₀ PFU/I) | -0.3 (-0.6; 0.2) | -0.5 (-0.8; -0.1) | -0.2 (-0.5; 0.1) | 0.5 (-0.2; 0.8) | 0.8 (0.6; 0.9) |

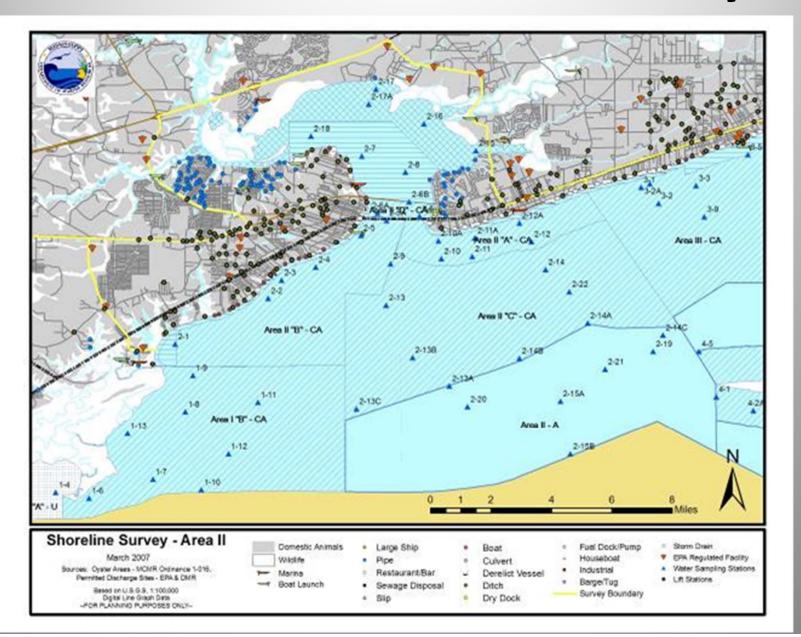
How to interpret this table:

A WWTP that provides (on average) a high log reduction for MSC, provides (on average) a high log reduction for NoV II

Estimate of average Log reduction as a function of WWTP DRAFT Results

| | Disinfection | WWTP type | Estimate | CI : | 95% |
|------------|--------------|--|----------|------|------|
| Mechanical | None | NoV I (log ₁₀ gc/l) | -2.2 | -3.7 | -0.8 |
| | | NoV II (log ₁₀ gc/l) | -2.5 | -3.4 | -1.6 |
| | | MSC (log ₁₀ PFU/l) | -2.4 | -2.9 | -1.9 |
| | Chlorine | NoV I (log ₁₀ gc/l) | -2.4 | -3.9 | -1.1 |
| | | NoV II (log ₁₀ gc/l) | -2.7 | -3.6 | -1.9 |
| | | MSC (log ₁₀ PFU/l) | -2.9 | -3.4 | -2.4 |
| | UV | NoV I (log ₁₀ gc/l) | -3.0 | -4.6 | -1.5 |
| | | NoV II (log ₁₀ gc/l) | -3.3 | -4.4 | -2.3 |
| | | MSC (log ₁₀ PFU/I) | -4.3 | -4.9 | -3.7 |

MSC Use in Shoreline Surveys



What's the Game Plan



Shoreline Survey Teams



Water Sample for the Laboratory



Shoreline Survey Water Samples

| Sample # | Site Name | Date | Time | FC/100ml | EC/100ml | MSC/100ml | Sample # Site Name | | | FC/100ml | EC/100 |
|----------|-----------|-----------|-------|----------|----------|-----------|-------------------------------|------------|-------|----------|--------|
| 1 | WS-1 | 1/10/2012 | 10:45 | 140 | 140 | 9.9 | 63 HP-51 | | 11:43 | 120 | |
| 2 | WS-2 | 1/10/2012 | 11:14 | 1665 | 1660 | 300 | 64 HP-52 | 1/13/2012 | 12:41 | 0.9 | |
| 3 | WS-3 | 1/10/2012 | 11:26 | 155 | 145 | 10 | 65 WS-1.5 | 1/13/2012 | 14:10 | 50 | |
| 4 | WS-5 | 1/10/2012 | 11:45 | 625 | 620 | 9.9 | 66 WS-1.4 | 1/13/2012 | 14:55 | 29 | |
| 5 | WS-6 | 1/10/2012 | 11:58 | 380 | 365 | 9.9 | 67 WS-1.6 | | 14:25 | 0.9 | |
| 6 | ES-2 | 1/11/2012 | 8:50 | 60 | 50 | 9.9 | 68 WS-1.3 | 1/13/2012 | 13:40 | 43 | |
| 7 | ES-5 | 1/11/2012 | 9:00 | 28 | 18 | 9.9 | 69 WS-1.2 | 1/13/2012 | 12:53 | 114 | |
| 8 | ES-8 | 1/11/2012 | 9:28 | 320 | 310 | 9.9 | 70 WS-2.1A | | 12:05 | 46 | |
| 9 | ESS-9 | 1/11/2012 | 9:55 | 300 | 290 | 9.9 | 71 WS-1B | 1/13/2012 | 11:35 | 13 | |
| 10 | WS-1A | 1/11/2012 | 8:45 | 175 | 170 | 9.9 | 72 WS-2C | 1/13/2012 | 11:40 | 265 | |
| 11 | WS-2A | 1/11/2012 | 9:10 | 3950 | 3700 | 280 | 73 WS-1.1A | 1/13/2012 | 12:20 | 157 | |
| 12 | WS-3A | 1/11/2012 | 9:28 | 1070 | 1035 | 10 | 74 BSW-16 | 1/13/2012 | 13:45 | 0.9 | |
| 13 | WS-4A | 1/11/2012 | 9:58 | 485 | 455 | 340 | 75 BSW-1 | 1/13/2012 | 12:46 | 220 | |
| 14 | WS-4.1 | 1/11/2012 | 10:29 | 290 | 275 | 9.9 | 76 BSW-2 | 1/13/2012 | 12:59 | 82 | |
| 15 | WS-4.2 | 1/11/2012 | 10:55 | 0.9 | 0.9 | 9.9 | 77 BSW-3 | 1/13/2012 | ND | 180 | |
| 16 | WS-5A | 1/11/2012 | 11:48 | 535 | 485 | 20 | WS golf course | 4/45/0040 | 40.00 | 0.0 | |
| 17 | WS-6A | 1/11/2012 | ND | 1035 | 1010 | 9.9 | 78 pond | 1/15/2012 | 19:00 | 0.9 | |
| 18 | WS-7 | 1/11/2012 | 12:57 | 116 | 115 | 9.9 | Pond overflow | 4/45/0040 | 40.45 | 705 | |
| 19 | WS-8 | 1/11/2012 | 13:08 | 28 | 28 | 9.9 | 79 stream | 1/15/2012 | | 785 | |
| 20 | WS-10 | 1/11/2012 | 13:20 | 18 | 18 | 9.9 | 80 WS PVC pipe | 1/16/2012 | 9:26 | 79 | |
| 21 | WS-11 | 1/11/2012 | 13:30 | 15 | 13 | 9.9 | WS parking lot 81 pond | 1/16/2012 | 9:37 | 65 | |
| 22 | WS-12 | 1/11/2012 | 13:40 | 4 | 4 | 9.9 | | | 9:43 | 23 | |
| 23 | WS-13 | 1/11/2012 | 13:50 | 2900 | 2900 | 9.9 | | 1/16/2012 | 9:43 | 23 | |
| 24 | WS-14 | 1/11/2012 | 14:51 | 4 | 4 | 9.9 | WS downstream 83 from weir | 1/16/2012 | 9:55 | 355 | |
| 25 | WS-16 | 1/11/2012 | 15:23 | 0.9 | 0.9 | 9.9 | WS baseball | 1/10/2012 | 9.55 | 300 | |
| 26 | WS-17 | 1/11/2012 | 15:43 | 5 | 5 | 9.9 | 84 upgrade of lift | 1/16/2012 | 10:19 | 65 | |
| 27 | WS-18 | 1/11/2012 | 15:53 | 106 | 104 | 9.9 | 85 Baseline River | 1/16/2012 | 12:30 | 20 | |
| 28 | E-11 | 1/11/2012 | ND | 7 | 7 | 9.9 | WS west fork Joes | 1/10/2012 | 12.30 | 20 | |
| 29 | E-12 | 1/11/2012 | ND | 9 | 8 | 9.9 | 86 Bayou | 1/16/2012 | 10:51 | 310 | |
| 30 | ES-14 | 1/11/2012 | ND | 275 | 260 | 9.9 | WS East Fork Joes | 1/10/2012 | 10.51 | 010 | |
| 31 | ES-15 | 1/11/2012 | ND | 235 | 232 | 9.9 | 87 Bayou | 1/16/2012 | 11:05 | 95 | |
| 32 | ES-16 | 1/11/2012 | ND | 134 | 122 | 9.9 | 88 WS-2D | 1/16/2012 | 9:00 | 625 | |
| 33 | ES-44 | 1/11/2012 | ND | 8 | 8 | 9.9 | WS golf course | 17 10/2012 | 0.00 | 020 | |
| 34 | ES-46 | 1/11/2012 | ND | 445 | 430 | 9.9 | 89 pond A | 1/16/2012 | 9:21 | 18 | |
| 35 | ES-47 | 1/11/2012 | ND | 0.9 | 0.9 | 9.9 | Diamondhead | | | | |
| 36 | WS-11 | 1/11/2012 | 11:30 | 55 | 55 | 30 | 90 WWTP outfall | 1/16/2012 | 13:00 | 70 | |
| 37 | SWS-9 | 1/11/2012 | 10:15 | 430 | 430 | 100 | Culvert @ Joe's | | | | |
| 38 | SWS-12 | 1/11/2012 | 12:02 | 170 | 165 | 30 | Bayou & Blue | | | | |
| 39 | SWS-15 | 1/11/2012 | 12:43 | 24 | 24 | 9.9 | 91 Meadow Rd | 1/18/2012 | 9:13 | 900 | |
| 40 | SWS-16 | 1/11/2012 | 13:10 | 285 | 285 | 9.9 | West fork of Joe's | | | | |
| 41 | WS-1.1 | 1/12/2012 | 11:05 | 17500 | 17000 | 510 | 92 Bayou | 1/18/2012 | 14:25 | 405 | |
| 42 | WS-2.1 | 1/12/2012 | 11:15 | 26 | 25 | 9.9 | Culvert near school | | | | |
| 43 | WS-2B | 1/12/2012 | 10:30 | 11850 | 11850 | 670 | 93 crossing | 1/18/2012 | 8:55 | 105 | |
| 44 | WS-6.1 | 1/12/2012 | 9:21 | 78 | 76 | 9.9 | East fork of the | | | | |
| 45 | WS-6.2 | 1/12/2012 | 9:43 | 230 | 155 | 9.9 | West fork Joe's | | | | |
| 46 | WS-6.3 | 1/12/2012 | 10:02 | 15 | 11 | 9.9 | 94 Bayou | 1/18/2012 | 9:44 | 7300 | 7 |
| 47 | WS-6B | 1/12/2012 | 11:29 | 550 | 520 | 9.9 | = | | | | |
| 48 | ES-61 | 1/12/2012 | ND | 7 | 6 | 9.9 | E fork of W fork of | 4/40/0040 | 0.00 | 4700 | |
| 49 | ES-67 | 1/12/2012 | ND | 0.9 | 0.9 | 9.9 | 95 W fork (sandy delta) | 1/18/2012 | 8:20 | 4700 | 4 |
| 50 | ES-71 | 1/12/2012 | ND | 27800 | 27800 | 9.9 | WS Joe's Bayou | | | | |
| 51 | SS-5 | 1/12/2012 | 10:21 | 38 | 32 | 9.9 | (between casino 96 and RV) | 1/18/2012 | | 27 | |
| 52 | WS-15A | 1/12/2012 | 12:35 | 50 | 50 | 9.9 | Pass Christian | 1/10/2012 | | 21 | |
| 53 | WS-16A | 1/12/2012 | 12:15 | 3 | 3 | 9.9 | 97 Effluent | 1/19/2012 | 14:05 | 0.49 | |
| 54 | SS-6 | 1/12/2012 | 11:10 | 24 | 20 | 9.9 | 98 Waveland Influent | 1/19/2012 | 11:48 | 6500000 | 6500 |
| 55 | SS-1 | 1/12/2012 | 9:07 | 17 | 17 | 9.9 | Pass Christian | 1/19/2012 | 11.40 | 6500000 | 6500 |
| 56 | SS-7 | 1/12/2012 | 11:33 | 92 | 86 | 9.9 | 99 Influent | 1/19/2012 | 14.20 | 3000000 | 3000 |
| 57 | IPJ | 1/12/2012 | ND | ND | ND | ND | Pass Christian | 1/19/2012 | 14.20 | 3000000 | 3000 |
| 58 | SS-8 | 1/12/2012 | 15:17 | 720 | 680 | 9.9 | Effluent | | | | |
| 59 | SS-10 | 1/12/2012 | 15:32 | 160 | 150 | 9.9 | 100 Prechlorinated | 1/19/2012 | 14:13 | 11250 | 11 |
| 60 | SS-11 | 1/12/2012 | 15:52 | 6 | 6 | 9.9 | Waveland Effluent | 10/2012 | | 200 | |
| 61 | SS-12 | 1/12/2012 | 16:04 | 39 | 38 | 9.9 | 101 post UV | 1/19/2012 | 11:25 | 140 | |
| 62 | SS-13 | 1/12/2012 | 16:20 | 1045 | 1000 | 9.9 | Waveland Effluent | | 0 | | |
| | | | | | | | 102 pre UV | 1/19/2012 | 11:32 | 14100 | 14 |
| | | | | | | | | | | | |

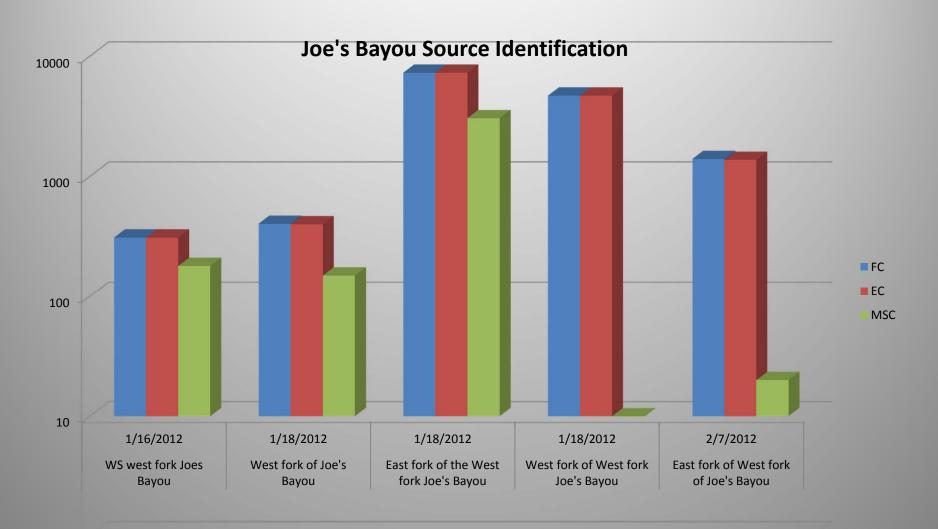
142000

Shoreline Survey Water Samples

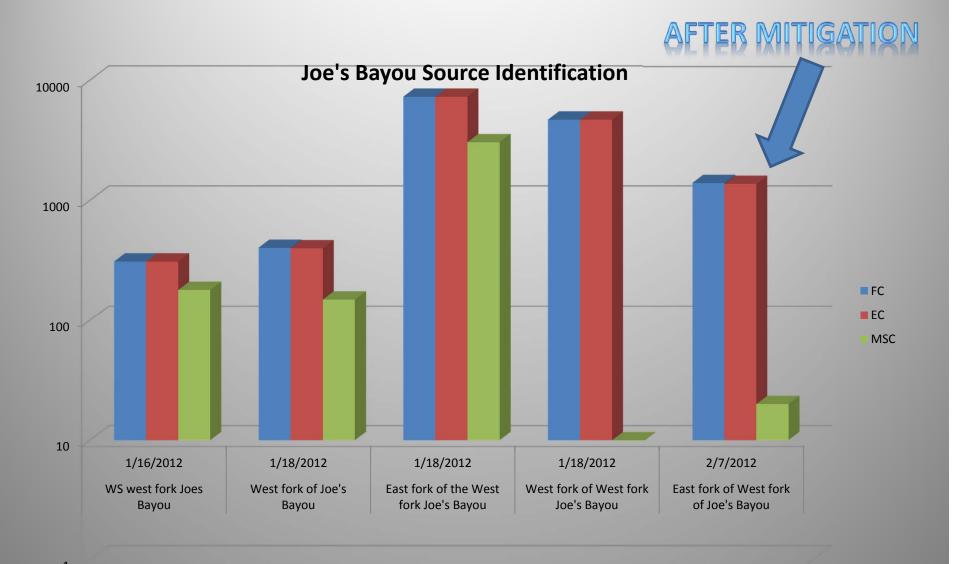
| Sample # | Site Name | Date | Time | FC/100ml | EC/100ml | MSC/100ml | |
|----------|----------------|------------------------|----------------|----------|----------|------------|--|
| 1 | WS-1 | 1/10/2012 | 10:45 | 140 | 140 | 9.9 | |
| 2 | WS-2 | 1/10/2012 | 11:14 | 1665 | 1660 | 300 | |
| 3 | WS-3 | 1/10/2012 | 11:26 | 155 | 145 | 10 | |
| 4 | WS-5 | 1/10/2012 | 11:45 | 625 | 620 | 9.9 | |
| 5 | WS-6 | 1/10/2012 | 11:58 | 380 | 365 | 9.9 | |
| 6 | ES-2 | 1/11/2012 | 8:50 | 60 | 50 | 9.9 | |
| 7 | ES-5 | 1/11/2012 | 9:00 | 28 | 18 | 9.9 | |
| 8 | ES-8 | 1/11/2012 | 9:28 | 320 | 310 | 9.9 | |
| 9 | ESS-9 | 1/11/2012 | 9:55 | 300 | 290 | 9.9 | |
| 10 | WS-1A | 1/11/2012 | 8:45 | 175 | 170 | 9.9 | |
| 11 | WS-2A | 1/11/2012 | 9:10 | 3950 | 3700 | 280 | |
| 12 | WS-3A | 1/11/2012 | 9:28 | 1070 | 1035 | 10 | |
| 13 | WS-4A | 1/11/2012 | 9:58 | 485 | 455 | 340 | |
| 14 | WS-4.1 | 1/11/2012 | 10:29 | 290 | 275 | 9.9 | |
| 15 | WS-4.2 | 1/11/2012 | 10:55 | 0.9 | 0.9 | 9.9 | |
| 16 | WS-5A | 1/11/2012 | 11:48 | 535 | 485 | 20 | |
| 17 | WS-6A | 1/11/2012 | ND | 1035 | 1010 | 9.9 | |
| 18 | WS-7 | 1/11/2012 | 12:57 | 116 | 115 | 9.9 | |
| 19 | WS-8 | 1/11/2012 | 13:08 | 28 | 28 | 9.9 | |
| 20 | WS-10 | 1/11/2012 | 13:20 | 18 | 18 | 9.9 | |
| 21 22 | WS-11 | 1/11/2012 | 13:30 | 15 | 13 | 9.9 | |
| | WS-12 | 1/11/2012 | 13:40 | 4 | | 9.9 | |
| 23 | WS-13 | 1/11/2012 | 13:50 14:51 | 2900 | 2900 | 9.9 | |
| 24 25 | WS-14 | 1/11/2012 | | 4 | 4 | 9.9 | |
| 25 26 | WS-16 WS-17 | 1/11/2012 | 15:23 15:43 | 0.9 | 0.9 | 9.9 9.9 | |
| 26 | WS-17 WS-18 | 1/11/2012 | | 5 | 5 | 9.9 | |
| 28 | WS-18 E-11 | 1/11/2012 1/11/2012 | 15:53 ND | 106 7 | 104 | 9.9 | |
| 29 | E-12 | 1/11/2012 | ND | 9 | 8 | 9.9 | |
| 30 | ES-14 | 1/11/2012 | ND | 275 | 260 | 9.9 | |
| 31 | ES-15 | 1/11/2012 | ND | 275 | 232 | 9.9 | |
| 32 | ES-16 | 1/11/2012 | ND | 134 | 122 | 9.9 | |
| 33 | ES-44 | 1/11/2012 | ND | 8 | 8 | 9.9 | |
| 34 | ES-46 | 1/11/2012 | ND | 445 | 430 | 9.9 | |
| 35 | ES-47 | 1/11/2012 | ND | 0.9 | 0.9 | 9.9 | |
| 36 | WS-11 | 1/11/2012 | 11:30 | 55 | 55 | 30 | |
| 37 | SWS-9 | 1/11/2012 | 10:15 | 430 | 430 | 100 | |
| 38 | SWS-12 | 1/11/2012 | 12:02 | 170 | 165 | 30 | |
| 39 | SWS-15 | 1/11/2012 | 12:43 | 24 | 24 | 9.9 | |
| 40 | SWS-16 | 1/11/2012 | 13:10 | 285 | 285 | 9.9 | |
| 41 | WS-1.1 | 1/12/2012 | 11:05 | 17500 | 17000 | 510 | |
| 42 | WS-2.1 | 1/12/2012 | 11:15 | 26 | 25 | 9.9 | |
| 43 | WS-2B | 1/12/2012 | 10:30 | 11850 | 11850 | 670 | |
| 44 | WS-6.1 | 1/12/2012 | 9:21 | 78 | 76 | 9.9 | |
| 45 | WS-6.2 | 1/12/2012 | 9:43 | 230 | 155 | 9.9 | |
| 46 | WS-6.3 | 1/12/2012 | 10:02 | 15 | 11 | 9.9 | |
| 47 | WS-6B | 1/12/2012 | 11:29 | 550 | 520 | 9.9 | |
| 48 | ES-61 | 1/12/2012 | ND | 7 | 6 | 9.9 | |
| 49 | ES-67 | 1/12/2012 | ND | 0.9 | 0.9 | 9.9 | |
| 50 | ES-71 | 1/12/2012 | ND | 27800 | 27800 | 9.9 | |
| 51 | SS-5 | 1/12/2012 | 10:21 | 38 | 32 | 9.9 | |
| 52 | WS-15A | 1/12/2012 | 12:35 | 50 | 50 | 9.9 | |
| 53 | WS-16A | 1/12/2012 | 12:15 | 3 | 3 | 9.9 | |
| 54 | SS-6 | 1/12/2012 | 11:10 | 24 | 20 | 9.9 | |
| 55 | SS-1 | 1/12/2012 | 9:07 | 17 | 17 | 9.9 | |
| 56 | SS-7 | 1/12/2012 | 11:33 | 92 | 86 | 9.9 | |
| 57 | IPJ | 1/12/2012 | ND | ND | ND | ND | |
| 58 | SS-8 | 1/12/2012 | 15:17 | 720 | 680 | 9.9 | |
| 59 | SS-10 | 1/12/2012 | 15:32 | 160 | 150 | 9.9 | |
| 60 | SS-11 | 1/12/2012 | 15:52 | 6 | 6 | 9.9 | |
| 61 | SS-12 | 1/12/2012 | 16:04 | 39 | 38 | 9.9 | |
| 62 | SS-13 | 1/12/2012 | 16:20 | 1045 | 1000 | 9.9 | |
| | | | | | | | |

| Sample # | Sita Nama | Date | Timo | FC/100ml | FC/100ml | MSC/100ml |
|----------|-----------------------------------|------------------------|----------------|-----------|------------|------------|
| | Site Name HP-51 | | | | | |
| 63 64 | HP-51 HP-52 | 1/13/2012 1/13/2012 | 11:43 12:41 | 120 | 120 0.9 | 9.9 9.9 |
| 65 | WS-1.5 | 1/13/2012 | 14:10 | 0.9 50 | 49 | 9.9 |
| 66 | WS-1.5 WS-1.4 | 1/13/2012 | 14:10 | 29 | 29 | 9.9 |
| 67 | WS-1.6 | 1/13/2012 | 14:25 | 0.9 | 0.9 | 9.9 |
| 68 | WS-1.3 | 1/13/2012 | 13:40 | 43 | 41 | 10 |
| 69 | WS-1.2 | 1/13/2012 | 12:53 | 114 | 106 | 9.9 |
| 70 | WS-1.2 WS-2.1A | 1/13/2012 | 12:05 | 46 | 45 | 9.9 |
| 71 | WS-1B | 1/13/2012 | 11:35 | 13 | 12 | 9.9 |
| 72 | WS-2C | 1/13/2012 | 11:40 | 265 | 265 | 540 |
| 73 | WS-1.1A | 1/13/2012 | 12:20 | 157 | 155 | 170 |
| 74 | BSW-16 | 1/13/2012 | 13:45 | 0.9 | 0.9 | 9.9 |
| 75 | BSW-1 | 1/13/2012 | 12:46 | 220 | 150 | 19.9 |
| 76 | BSW-2 | 1/13/2012 | 12:59 | 82 | 68 | 9.9 |
| 77 | BSW-3 | 1/13/2012 | ND | 180 | 180 | 9.9 |
| | WS golf course | | | | | |
| 78 | pond | 1/15/2012 | 19:00 | 0.9 | 0.9 | 9.9 |
| | Pond overflow | | | | | |
| 79 | stream | 1/15/2012 | 19:15 | 785 | 690 | 9.9 |
| 80 | WS PVC pipe | 1/16/2012 | 9:26 | 79 | 79 | 9.9 |
| | WS parking lot | | | | | |
| 81 | pond | 1/16/2012 | 9:37 | 65 | 65 | 9.9 |
| 82 | WS parking lot 2 | 1/16/2012 | 9:43 | 23 | 23 | 9.9 |
| | WS downstream | | | | | |
| 83 | from weir | 1/16/2012 | 9:55 | 355 | 345 | 9.9 |
| | WS baseball | | | | | |
| 84 | upgrade of lift | 1/16/2012 | 10:19 | 65 | 65 | 9.9 |
| 85 | Baseline River | 1/16/2012 | 12:30 | 20 | 20 | 9.9 |
| | WS west fork Joes | | | | | |
| 86 | Bayou | 1/16/2012 | 10:51 | 310 | 310 | 180 |
| 07 | WS East Fork Joes | 4/40/0040 | 44.05 | 0.5 | 0.5 | 0.0 |
| 87 | Bayou | 1/16/2012 | 11:05 | 95 | 95 | 9.9 |
| 88 | WS-2D | 1/16/2012 | 9:00 | 625 | 615 | 10 |
| 89 | WS golf course pond A | 1/16/2012 | 9:21 | 18 | 18 | 9.9 |
| 09 | Diamondhead | 1/10/2012 | 9.21 | 10 | 10 | 9.9 |
| 90 | WWTP outfall | 1/16/2012 | 13:00 | 70 | 65 | 9.9 |
| 90 | Culvert @ Joe's | 1/10/2012 | 13.00 | 70 | 03 | 3.3 |
| | Bayou & Blue | | | | | |
| 91 | Meadow Rd | 1/18/2012 | 9:13 | 900 | 900 | 30 |
| | West fork of Joe's | | | | | |
| 92 | Bayou | 1/18/2012 | 14:25 | 405 | 400 | 150 |
| | Culvert near school | | | | | |
| 93 | crossing | 1/18/2012 | 8:55 | 105 | 105 | 9.9 |
| | East fork of the | | | | | |
| | West fork Joe's | | | | | |
| 94 | Bayou | 1/18/2012 | 9:44 | 7300 | 7300 | 3060 |
| | E fork of W fork of | | | | | |
| 0.5 | W fork (sandy | 4/40/0040 | 0.00 | 4700 | 4700 | 0.0 |
| 95 | delta) | 1/18/2012 | 8:20 | 4700 | 4700 | 9.9 |
| | WS Joe's Bayou (between casino | | | | | |
| 96 | and RV) | 1/18/2012 | | 27 | 24 | 60 |
| 90 | Pass Christian | 1/10/2012 | | 21 | 24 | 00 |
| 97 | Effluent | 1/19/2012 | 14:05 | 0.49 | 0.49 | 9.9 |
| 98 | Waveland Influent | 1/19/2012 | 11:48 | 6500000 | 6500000 | 142000 |
| - 30 | Pass Christian | ., 10/2012 | 11.40 | 0000000 | 0000000 | 142000 |
| 99 | Influent | 1/19/2012 | 14:20 | 3000000 | 3000000 | 134800 |
| | Pass Christian | | | 2222000 | | |
| | Effluent | | | | | |
| 100 | Prechlorinated | 1/19/2012 | 14:13 | 11250 | 11200 | 400 |
| | Waveland Effluent | | | | | |
| 101 | post UV | 1/19/2012 | 11:25 | 140 | 140 | 9.9 |
| | Waveland Effluent | | | | | |
| 102 | pre UV | 1/19/2012 | 11:32 | 14100 | 14100 | 1730 |
| | | | | | | |

Indicator Profiles



Indicator Profiles



FDA/State Shoreline Surveys

- East Greenwich, RI- cross connections
- Empire, LA- failing septic tanks
- Bristol, RI- overflowing manhole in woods
- Pawcatuck River, RI- cross-connections
- Coos Bay, OR- 62 shoreline sources; <10 MSC
- Morro Bay, CA- very little shoreline contribution
- Tomales Bay, CA- Possible seeps from evaporation pond and failing septic tanks
- Bay St. Louis, MS- failing lift station and malfunctioning air-trap

Summary of WWTP Efficiency Use

 When a conditional management plan around a WWTP is developed, MSC would more accurately define viral pathogens reduction efficiency of the plant than the bacterial fecal indicators.

Summary of Shoreline Survey Use

 Shoreline surveys are very large investment in time and money. Get more bang for your buck, by adding a column of data on the spreadsheet. Indicator profiles will suggest where mitigation should occur to prevent municipal sewage from entering into the watershed.

Questions??

