Cane Run Watershed Council Meeting

Monday, November 28, 2011
Northside Public Library, Lexington, KY

Ben Krebs
Lindell Ormsbee
Ben Albritton
Sarah Wightman
Beth Finzer
Amanda Gumbert
Russ Turpin
Charlie Denham
Susan Byars
Stephanie Jenkins
Ernest Collins
Sarah Gracey
Angie Wingfield
Tom Blues
Jennifer Myatt
Cindy King

Update of UK Project (Amanda Gumbert)

- The watershed-based plan has been conditionally accepted and will be returned to DOW with changes in a few days, which means implementation can begin next year.
- BMP implementation is planned at the Kentucky Horse Park for the next year.
    - UK BAE senior design students are studying areas with erosion and nutrient-transfer problems for possible implementation.
- Education and outreach efforts will continue next year.
    - Watershed festivals?
        - Other watersheds are doing small ice cream social-type events
            - Amanda is in favor of these events, but it is unknown right now how the council will proceed with those.
- November 5th tree-planting at Lexmark as part of a CSX program

Legacy Trail Adopt-A-Plot (Susan/group discussion)

- The group did not come to total agreement, and we have exchanged information with Keith.
- Amanda did not want to commit herself and the whole group without agreement.
- Right now, the council has expressed interest, but has never confirmed participation.
- Discussion
    - Maintenance expectations
        - A couple times of year in terms of maintenance

        - Weed and mulch beds, report vandalism, remove debris, etc. – Russ
        - Keith made it sound low input
        - How do we get mulch in? – Susan
        - How much work is it really?
        - Doodle poll to figure out when the best times for people to gather to care for the plot – Sarah G.
    - Plot size/location
        - How big are the plots?
        - Near Spindletop, get the neighborhood involved - Susan
    - Benefits to the group/watershed
        - Good way to get publicity for the council
        - Lexmark had also expressed interest in adopting a plot near their property
        - Is pulling weeds an appropriate thing for the council? – Charlie
        - Maybe our function is best served elsewhere, but our name could get out there on the Legacy Trail
        - Tie adopting a plot to a watershed festival - Stephanie
            - Tie service piece to a festival
        - Work with Master Gardeners in the watershed – Stephanie
        - Maybe not adopt a bed, but get together and remove bush honeysuckle - Russ
    - Going forward
        - Susan will ask others in the Spindletop neighborhood and see if there's interest
        - The council could try it for a year, and not renew if it didn't work out - Amanda
        - Keith has our name, but we have not been assigned a plot yet - Ben

Pathogen TMDL Update (Lindell Ormsbee)

- See attached PowerPoint for information

Pathogen TMDL Development Cane Run Watershed

Lindell Ormsbee,
P.E., P.H., Ph.D., D.WRE, F.ASCE
Ben Albritton

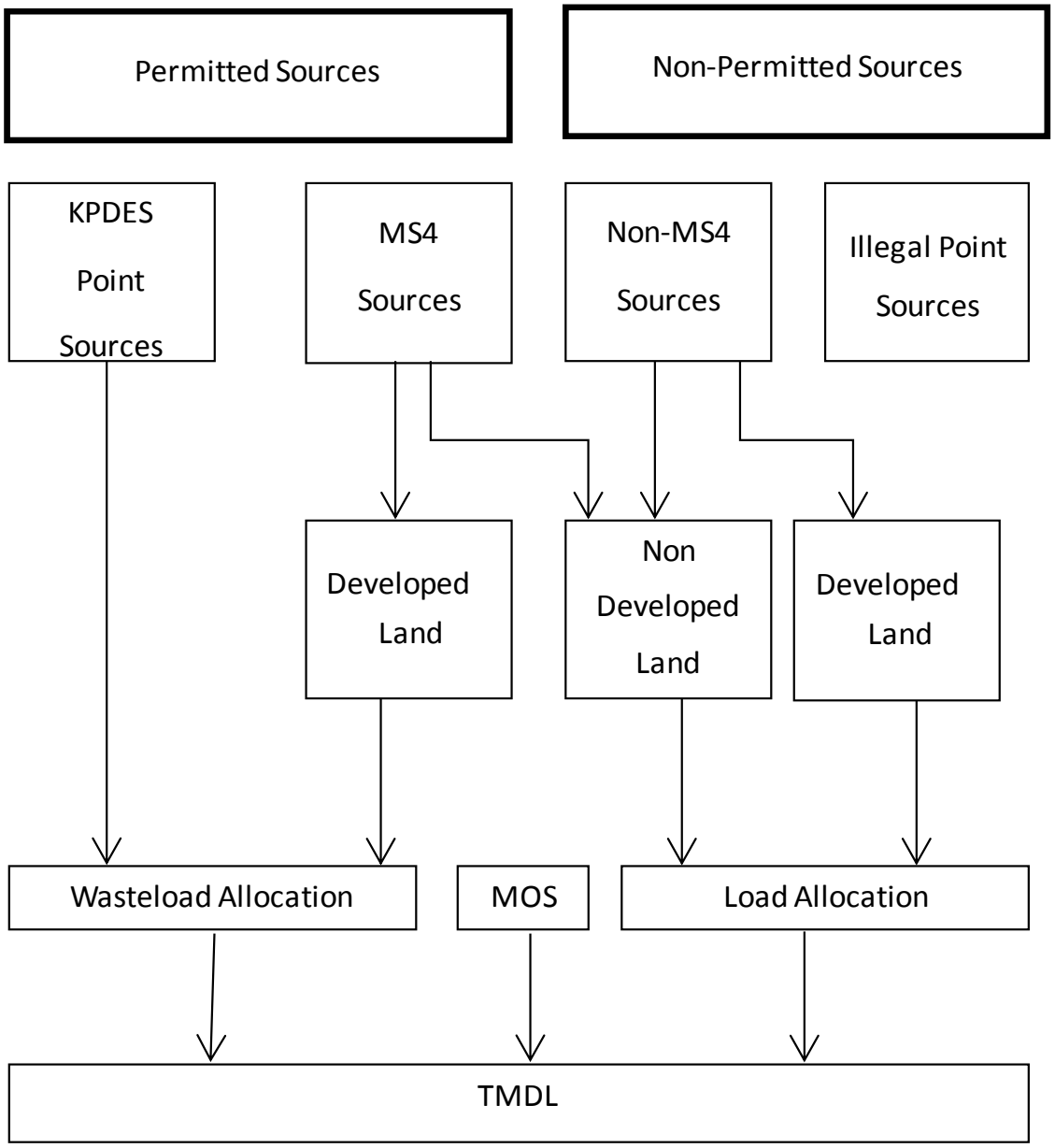
UK

Kentucky Water Research Institute

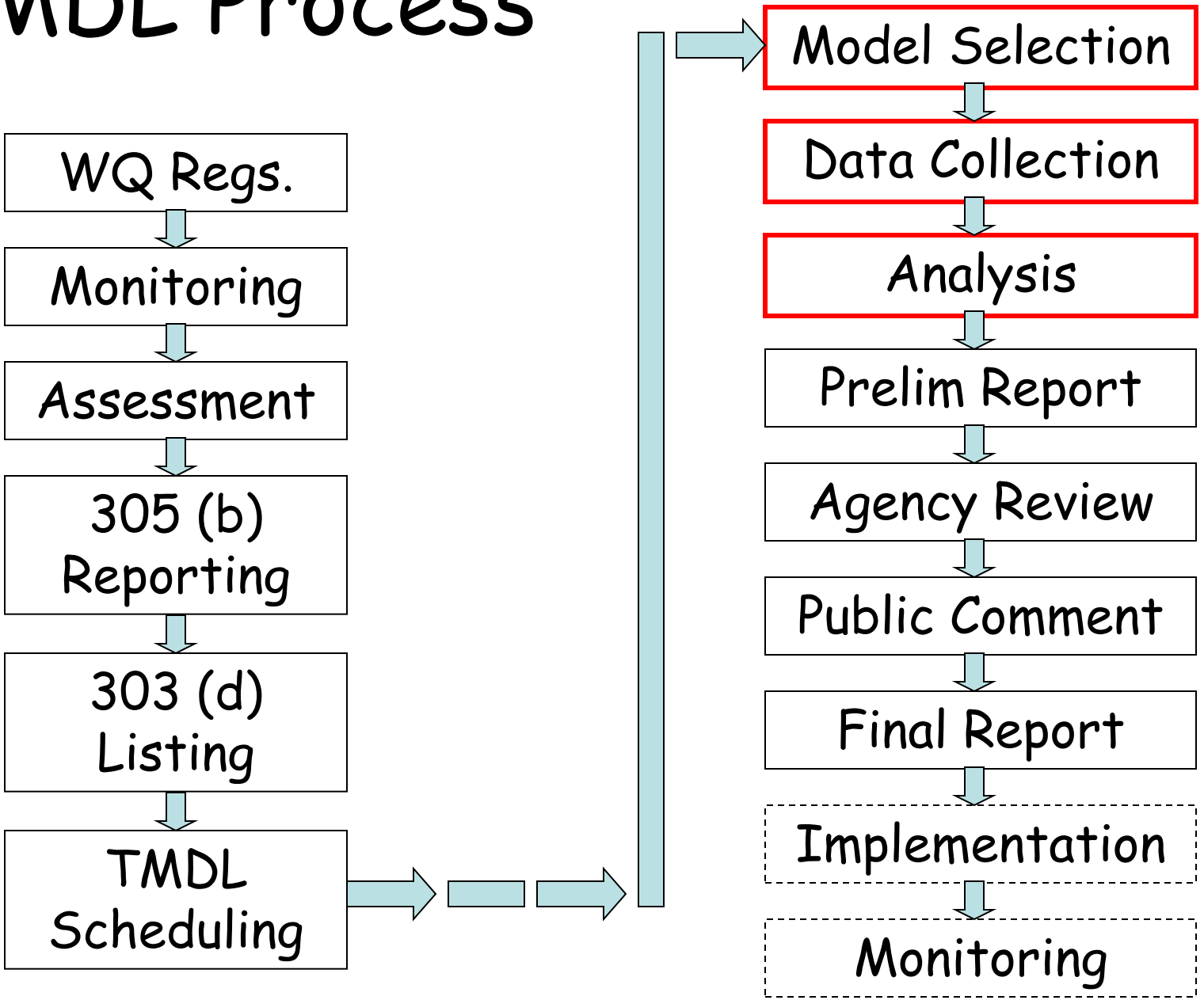
What is a TMDL?

- **Number**
  - T. - Total
  - M. - Maximum
  - D. - Daily
  - L. - Load
- **Analysis** to determine the TMDL.
- **Document** that contains a description of the problem, data, and calculations used to determine the TMDL, existing loads, load allocations, load reductions, and Imp. Plans.
- **Process** for restoring polluted waters by determining loads reductions for various point and non-point sources that if implemented should restore the stream to its designated use.

TMDL Components



TMDL Process



Designated Uses

- Every stream in Kentucky is assigned multiple designated uses:
  - **Warm Water Aquatic Life**
  - **Primary Contact Recreation**
  - **Secondary Contact Recreation**
  - *Drinking Water Supply*
  - *Cold Water Aquatic Life*
  - *Fish Consumption*

Primary Contact Standards

- (a) Fecal coliform content or Escherichia coli content shall not exceed 200 colonies per 100 ml or 130 colonies per 100 ml respectively as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 400 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for fecal coliform or 240 colonies per 100 ml for Escherichia coli. These limits shall be applicable during the recreation season of May 1 through October 31. Fecal coliform criteria listed in subsection (2)(a) of this section shall apply during the remainder of the year.

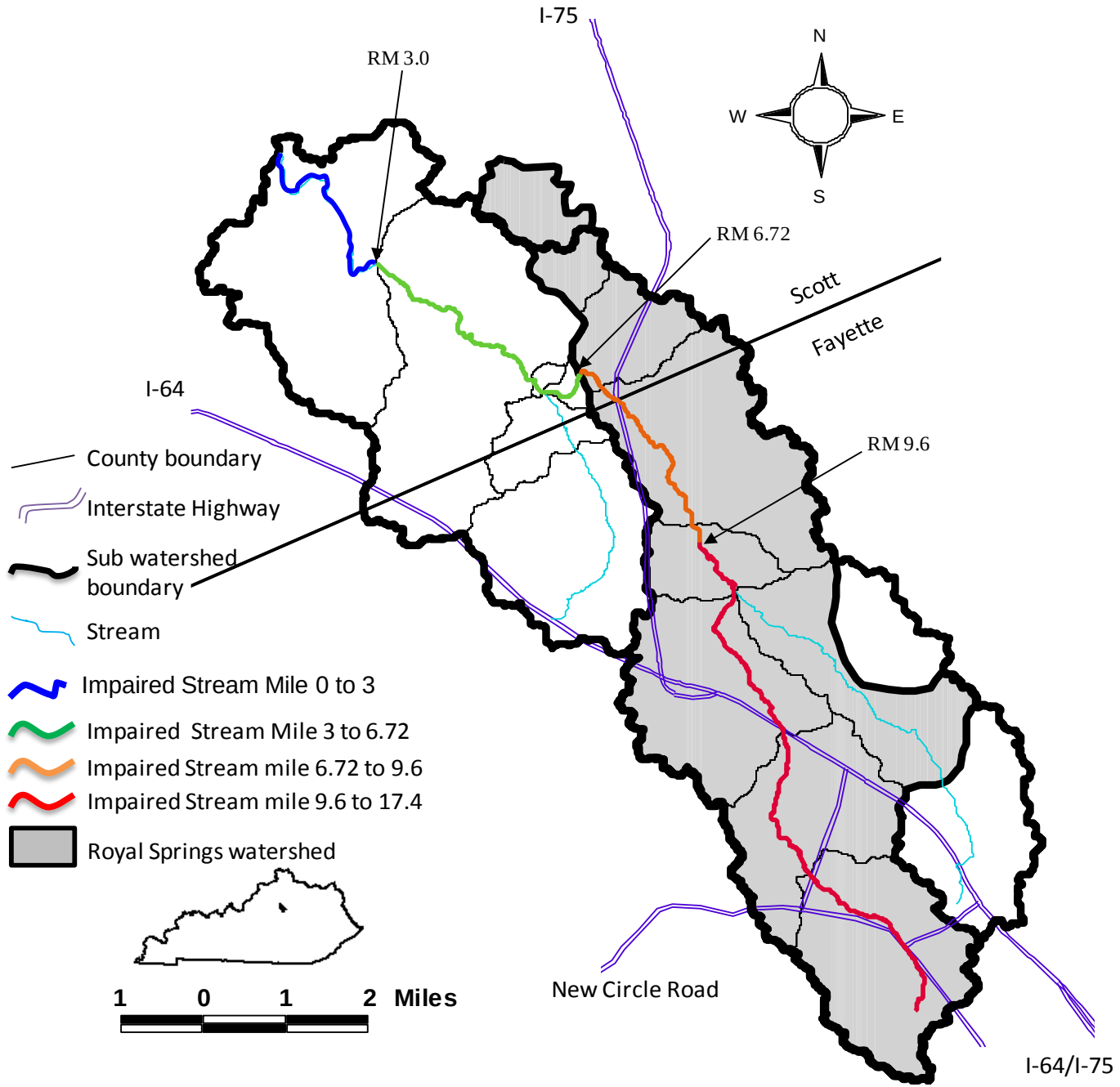
Secondary Contact Standards

- (a) Fecal coliform content shall not exceed 1,000 colonies per 100 ml as a thirty (30) day geometric mean based on not less than five (5) samples; nor exceed 2,000 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period.
- Geometric Mean:

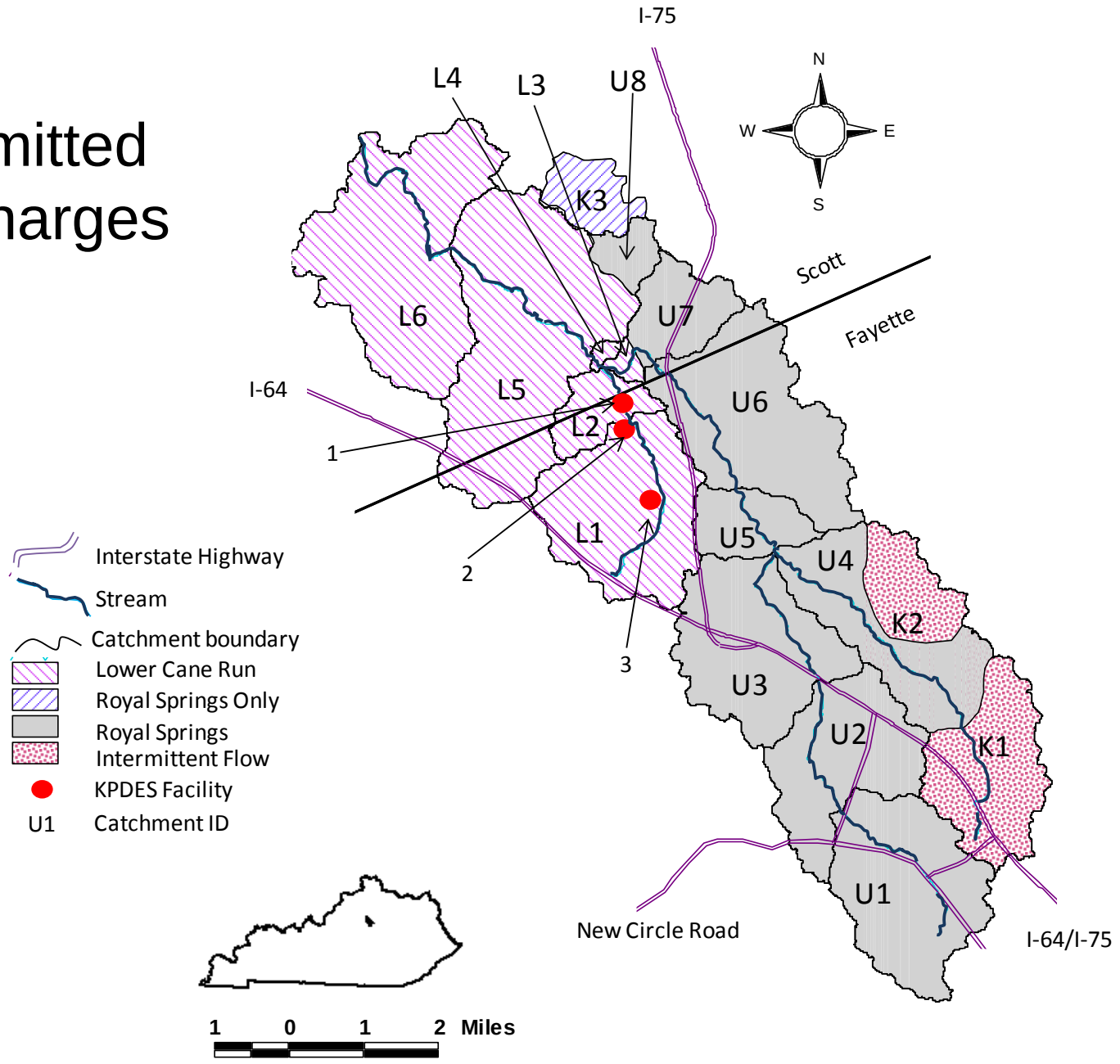
$$GM = \sqrt[n]{X_1 * X_2 * \ldots * X_n}$$

2010 303(d) List of Cane Run Creek Impaired Segments

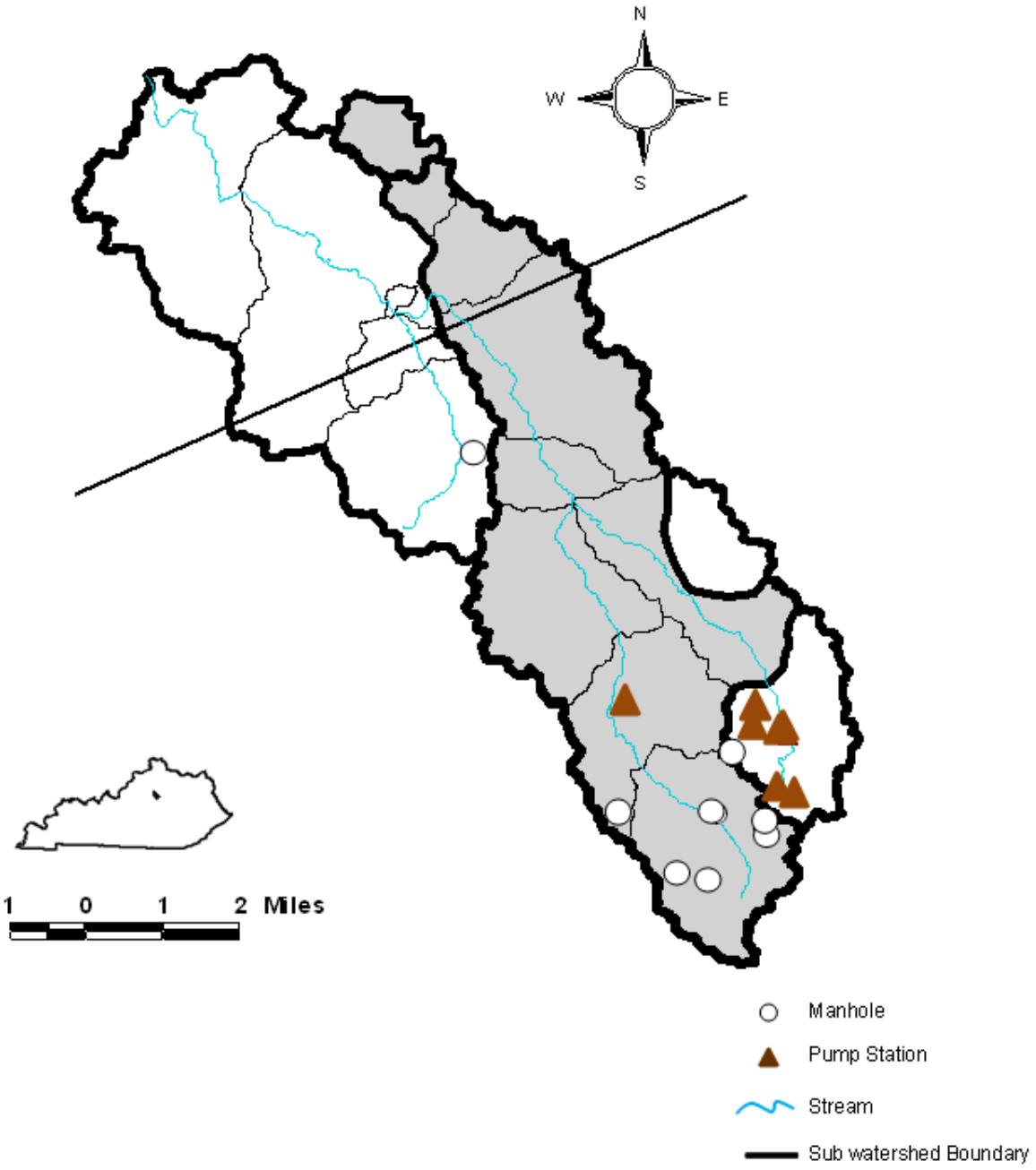
Stream	Impaired Segment	County	Impairment	Pollutant	Potential Sources
Cane Run of North Elkhorn Creek	0.0 - 3.0	Scott	Aquatic Life (NS), Primary Contact Recreation (NS)	Fecal Coliform	Nonpoint Source Pollution
Cane Run of North Elkhorn Creek	3.0 - 9.6	Scott	Aquatic Life (NS), Primary Contact Recreation (NS)	Fecal Coliform	Point Source Pollution, Nonpoint Source Pollution
Cane Run of North Elkhorn Creek	9.6 - 17.4	Fayette	Aquatic Life (NS), Primary Contact Recreation (NS) & Secondary Contact Recreation (NS)	Fecal Coliform	SSOs, Urban Stormwater


I-75
RM 3.0
N
W
E
S
RM 6.72
Scott
Fayette
I-64
RM 9.6
County boundary
Interstate Highway
Sub watershed boundary
Stream
Impaired Stream Mile 0 to 3
Impaired Stream Mile 3 to 6.72
Impaired Stream mile 6.72 to 9.6
Impaired Stream mile 9.6 to 17.4
Royal Springs watershed
1 0 1 2 Miles
New Circle Road
I-64/I-75

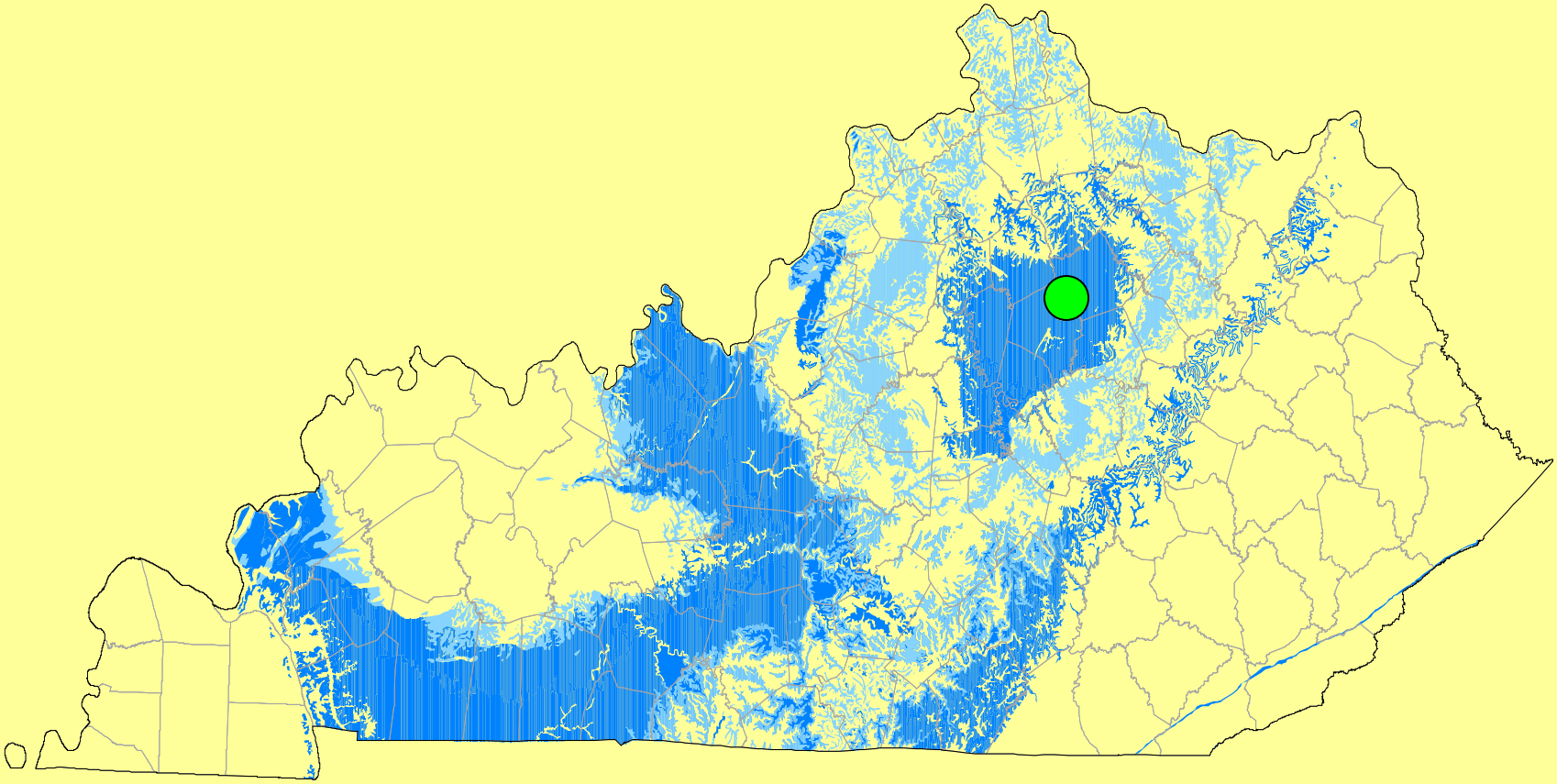
Permitted Discharges



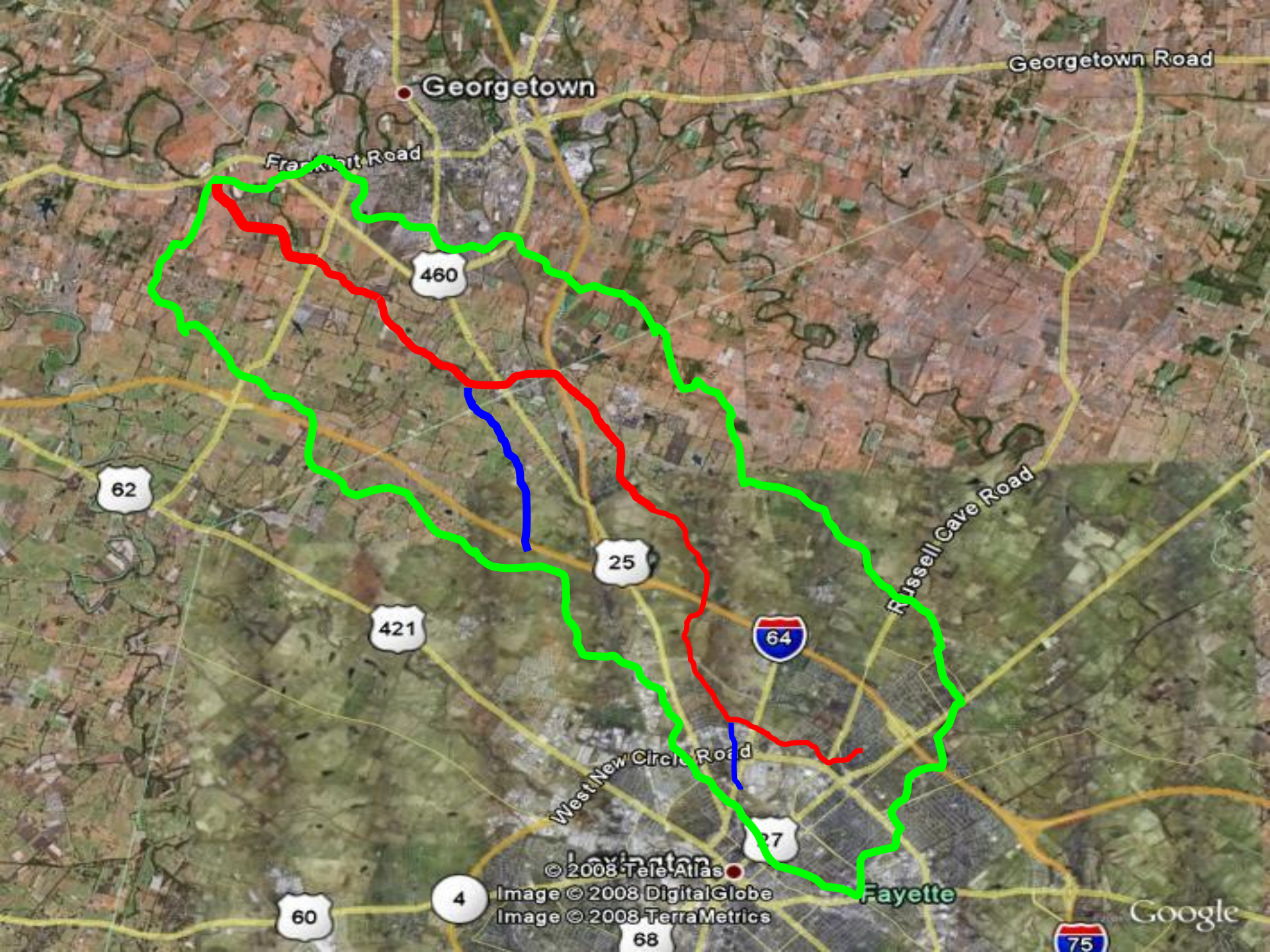
Illicit Discharges in 2007



Karst in Kentucky:
55 percent of the state has potential for karst




Georgetown Kentucky
Georgetown Road
Frankfort Road
460
Cane Run Watershed
45 Square Miles
62
25
421
64
Russell Cave Road
West New Circle Road
Lexington Kentucky
Image © 2008 DigitalGlobe
Image © 2008 TerraMetrics
Fayette
60
4
68
75
Google


Georgetown
Georgetown Road
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Russell Cave Road
West New Circle Road
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Lexington
Fayette
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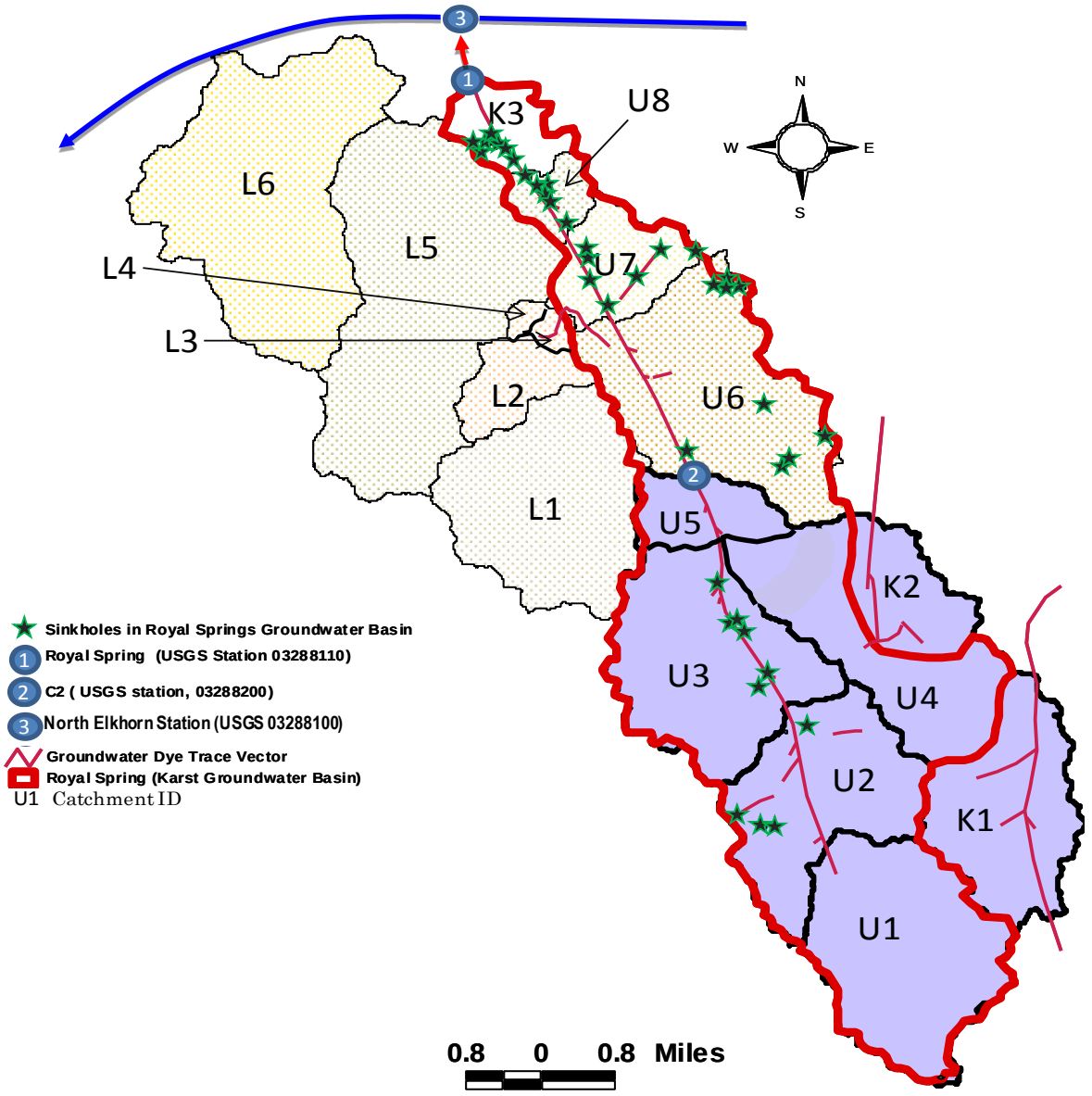
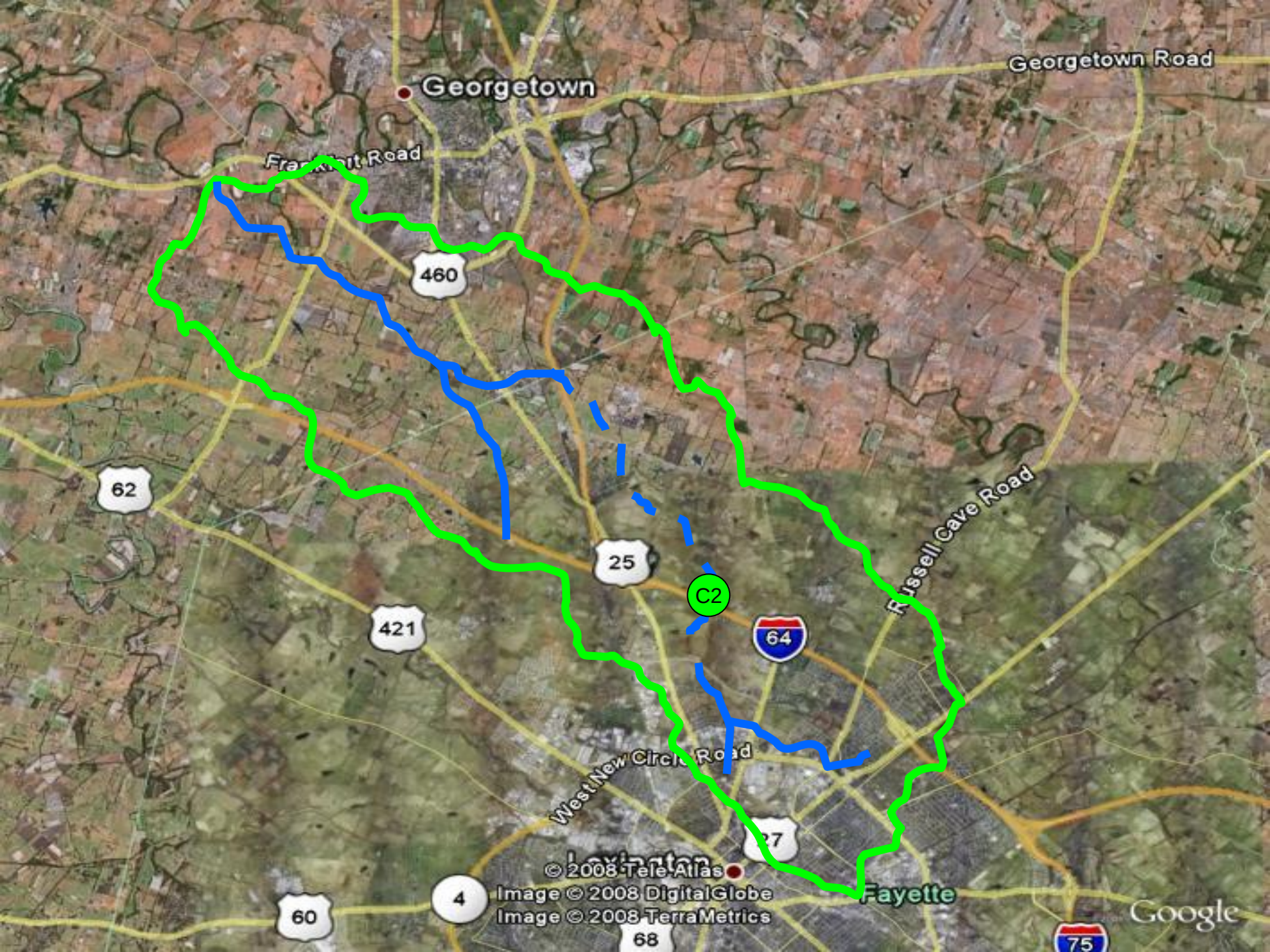
Google

Karst Features




Georgetown
Georgetown Road
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62
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C2
421
64
Russell Cave Road
West New Circle Road
Lexington
Fayette
4
60
68
75
© 2008 Tele Atlas
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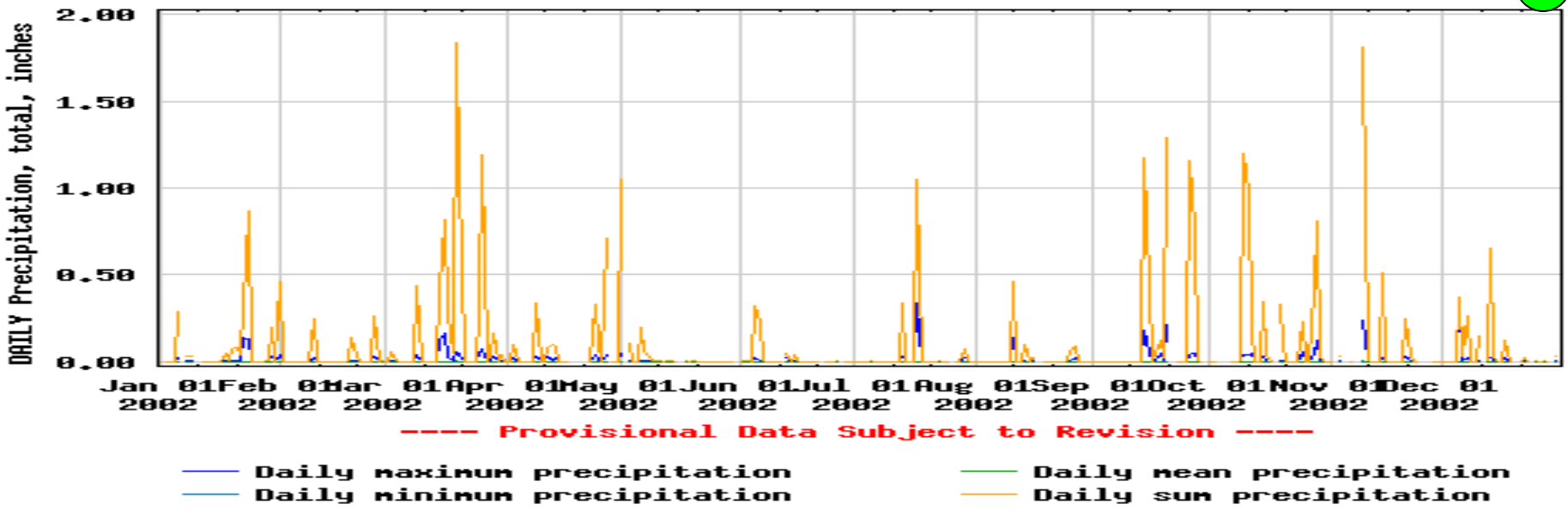
Google

USGS

USGS 03288200 CANE RUN AT BEREA ROAD NEAR DONERAIL, KY

C2



USGS

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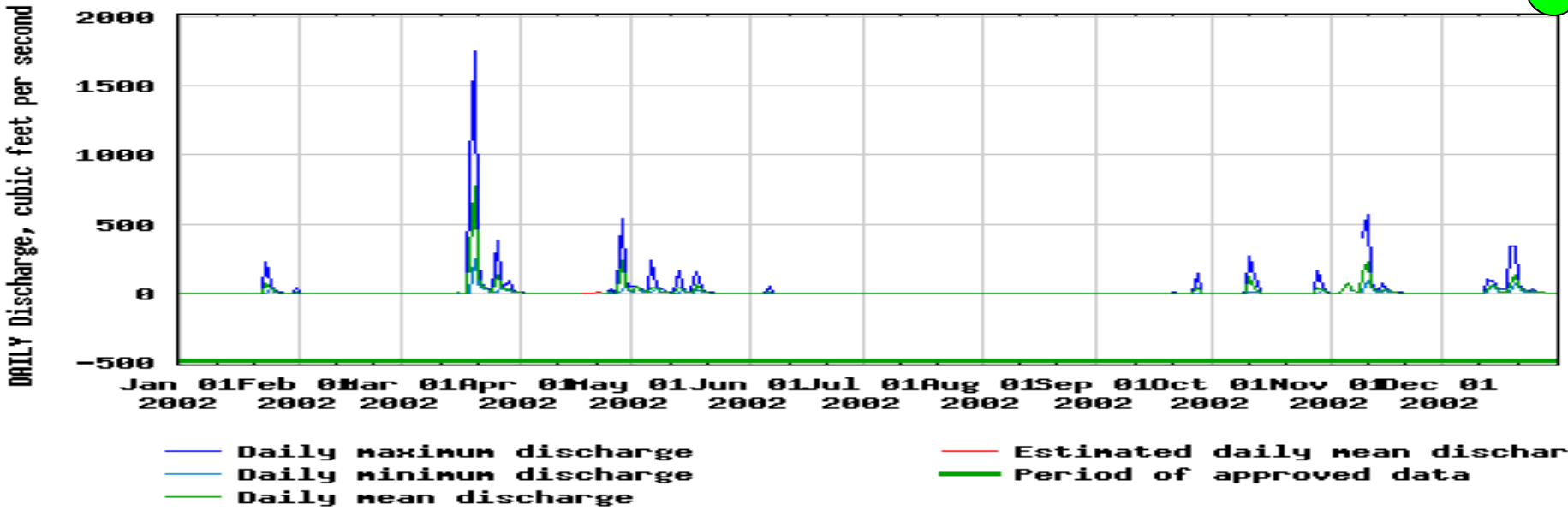

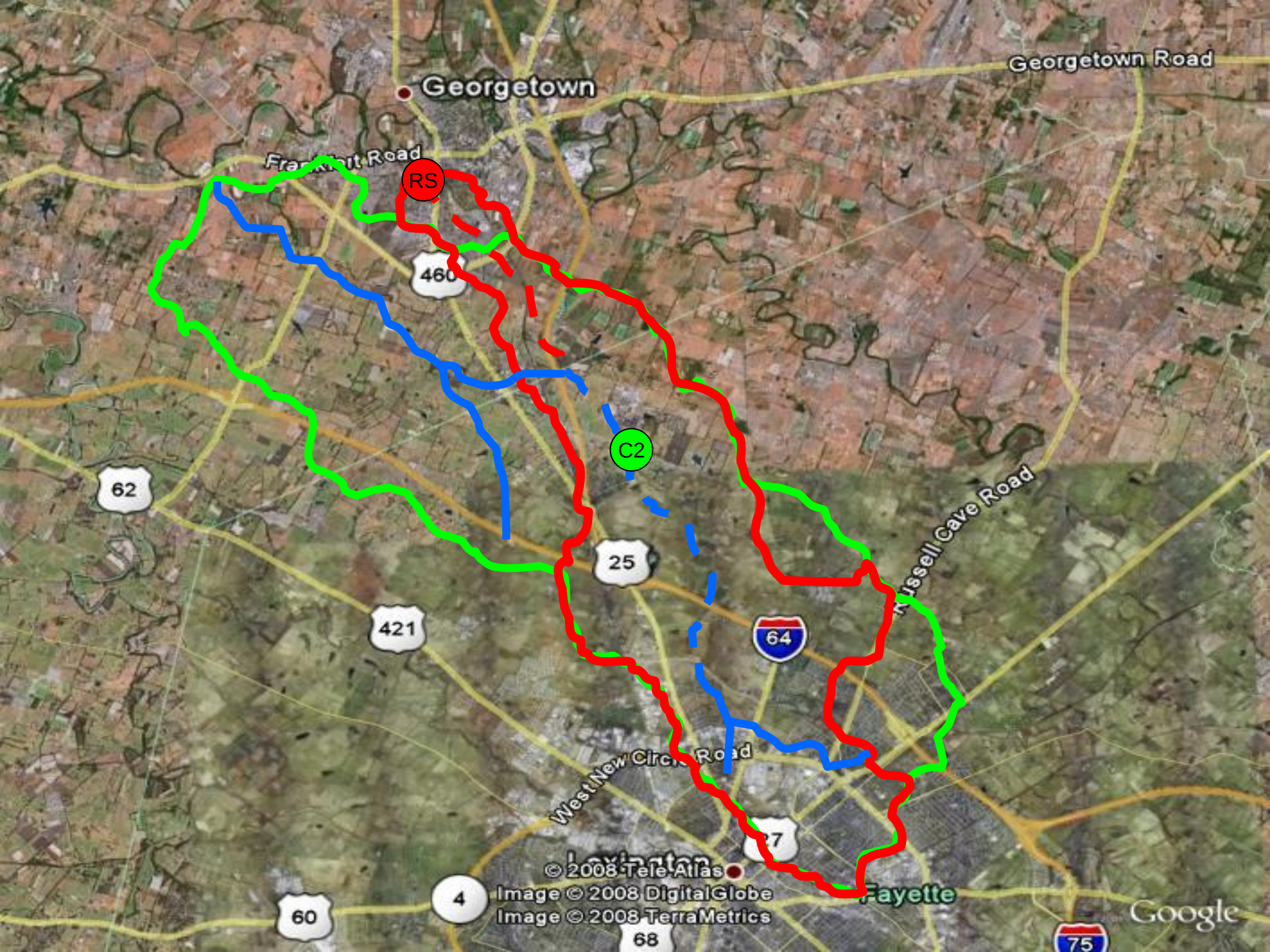
Georgetown
Georgetown Road
RS
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C2
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421
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Russell Cave Road
West New Circle Road
Lexington
Fayette
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4
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75
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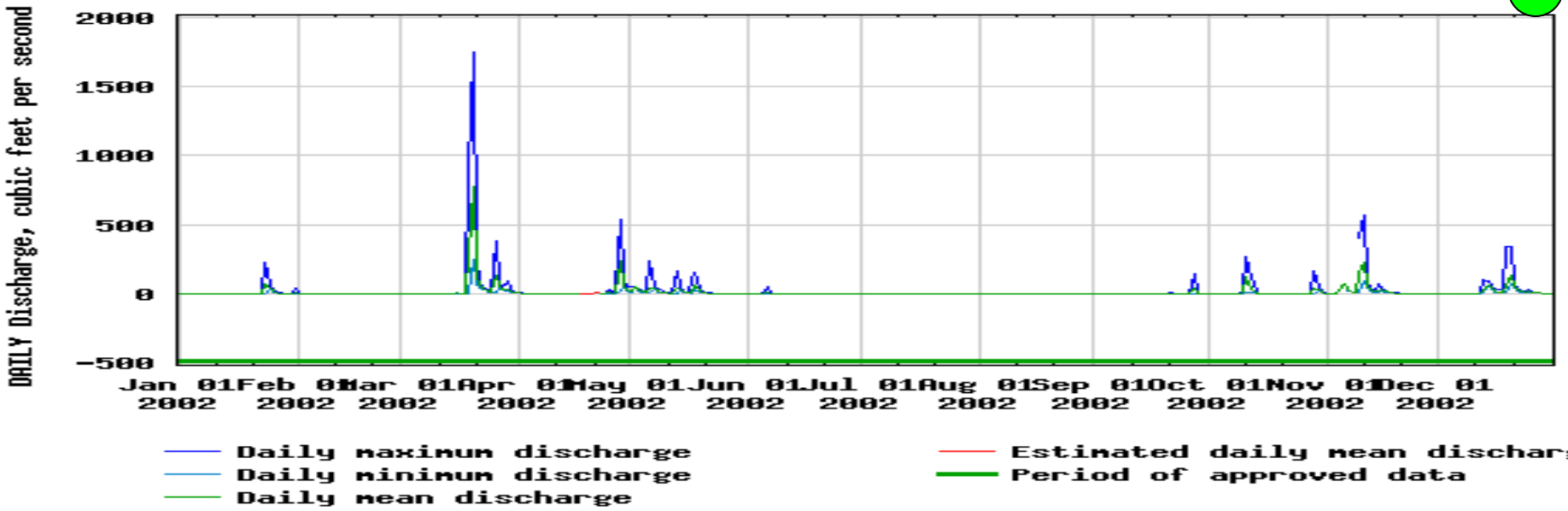
USGS

USGS 03288200 CANE RUN AT BEREA ROAD NEAR DONERAIL, KY

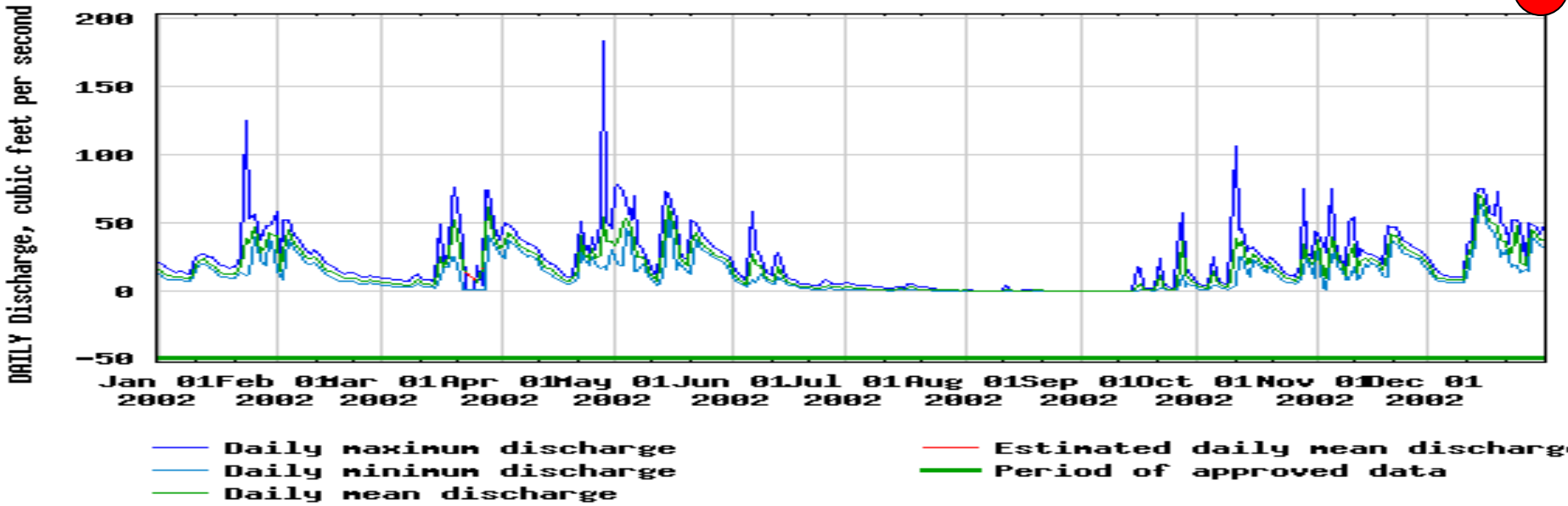
C2

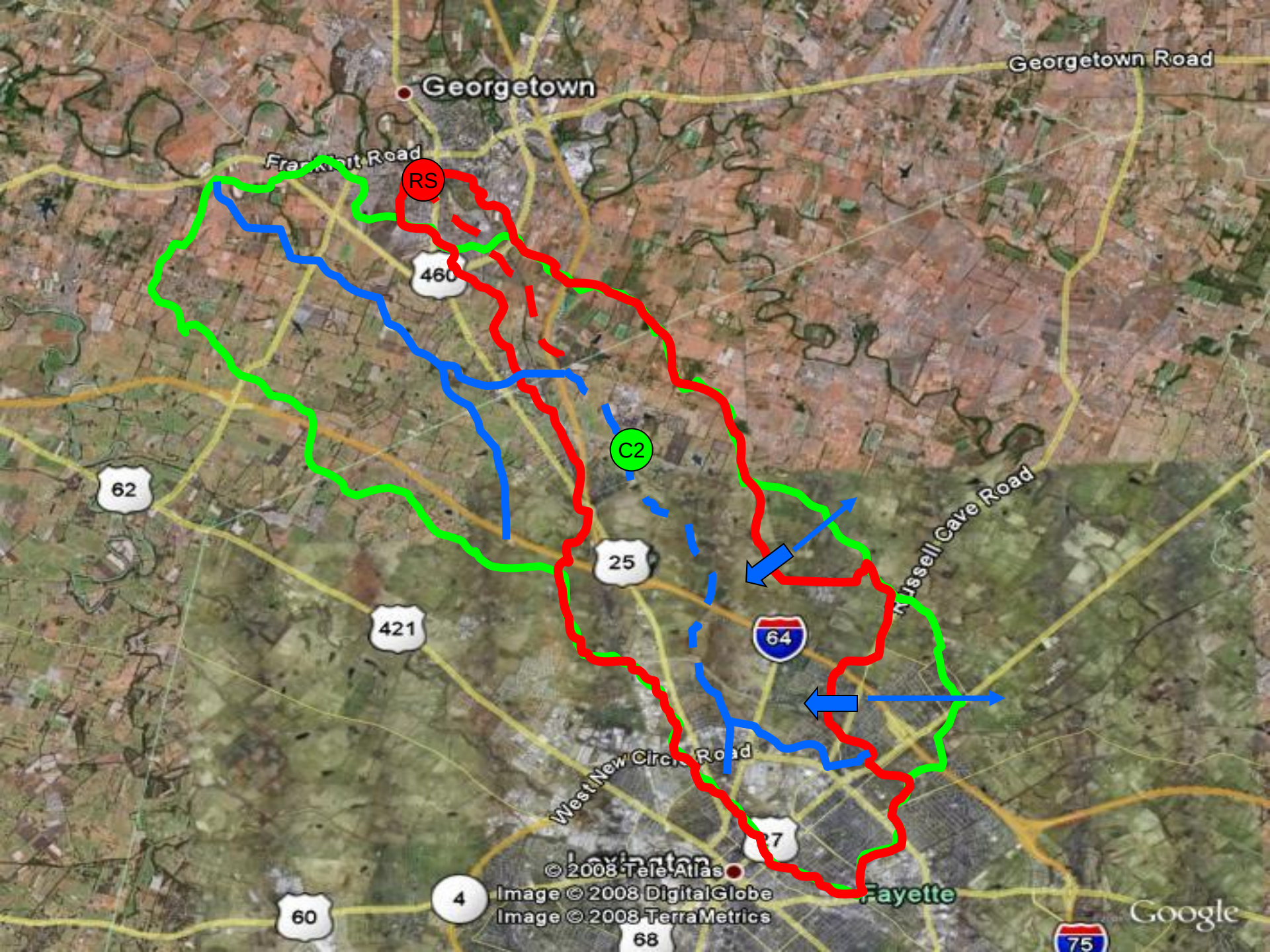


USGS

USGS 03288110 ROYAL SPRINGS AT GEORGETOWN, KY

RS




Georgetown
Georgetown Road
RS
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Russell Cave Road
West New Circle Road
Lexington
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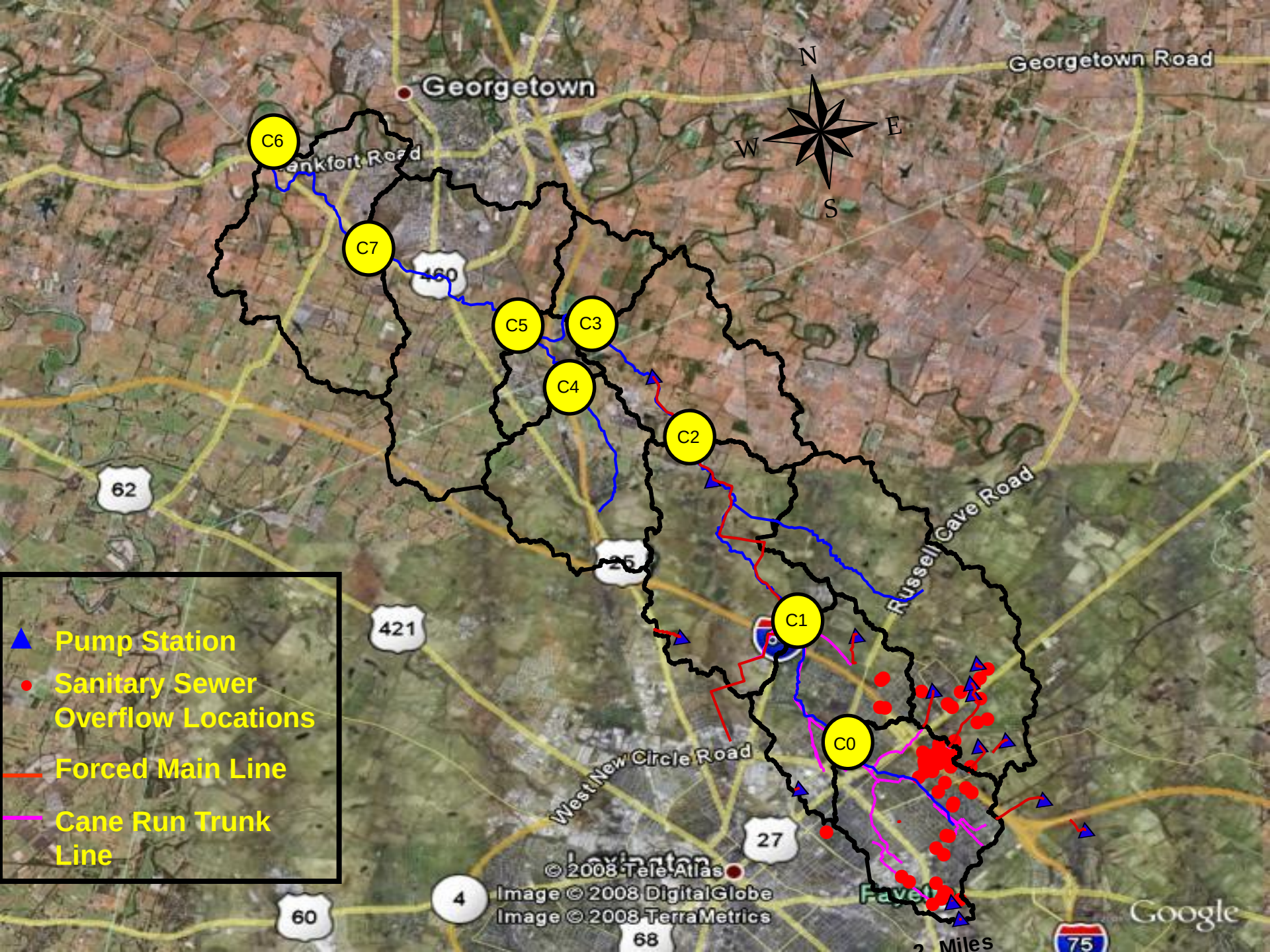
Google


Georgetown
Georgetown Road
N
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C3
C4
C2
C1
C0
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460
25
421
27
60
4
68
75
Russell Cave Road
West New Circle Road
Pump Station
Sanitary Sewer Overflow Locations
Forced Main Line
Cane Run Trunk Line
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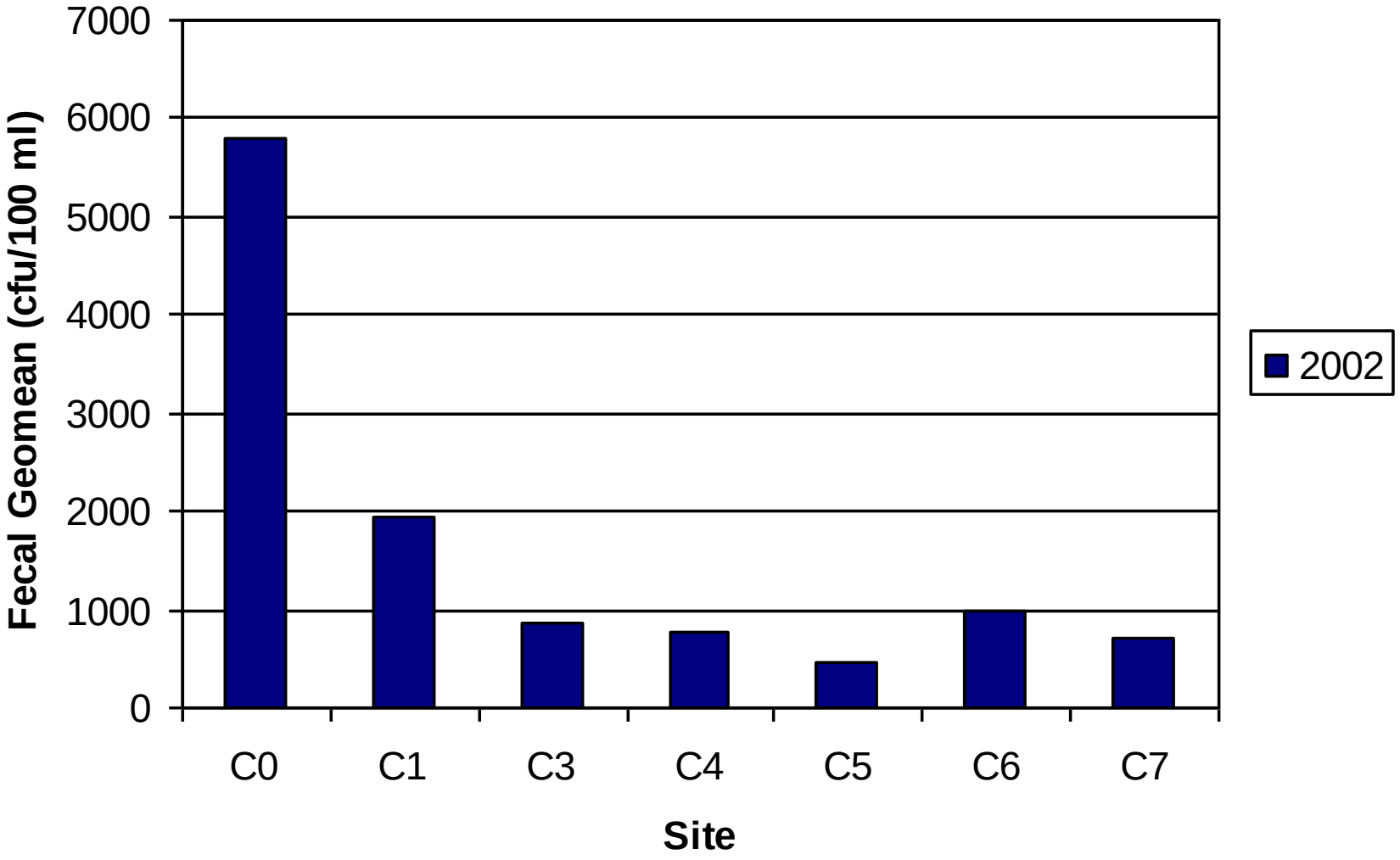
Image © 2008 TerraMetrics
Google
2 Miles

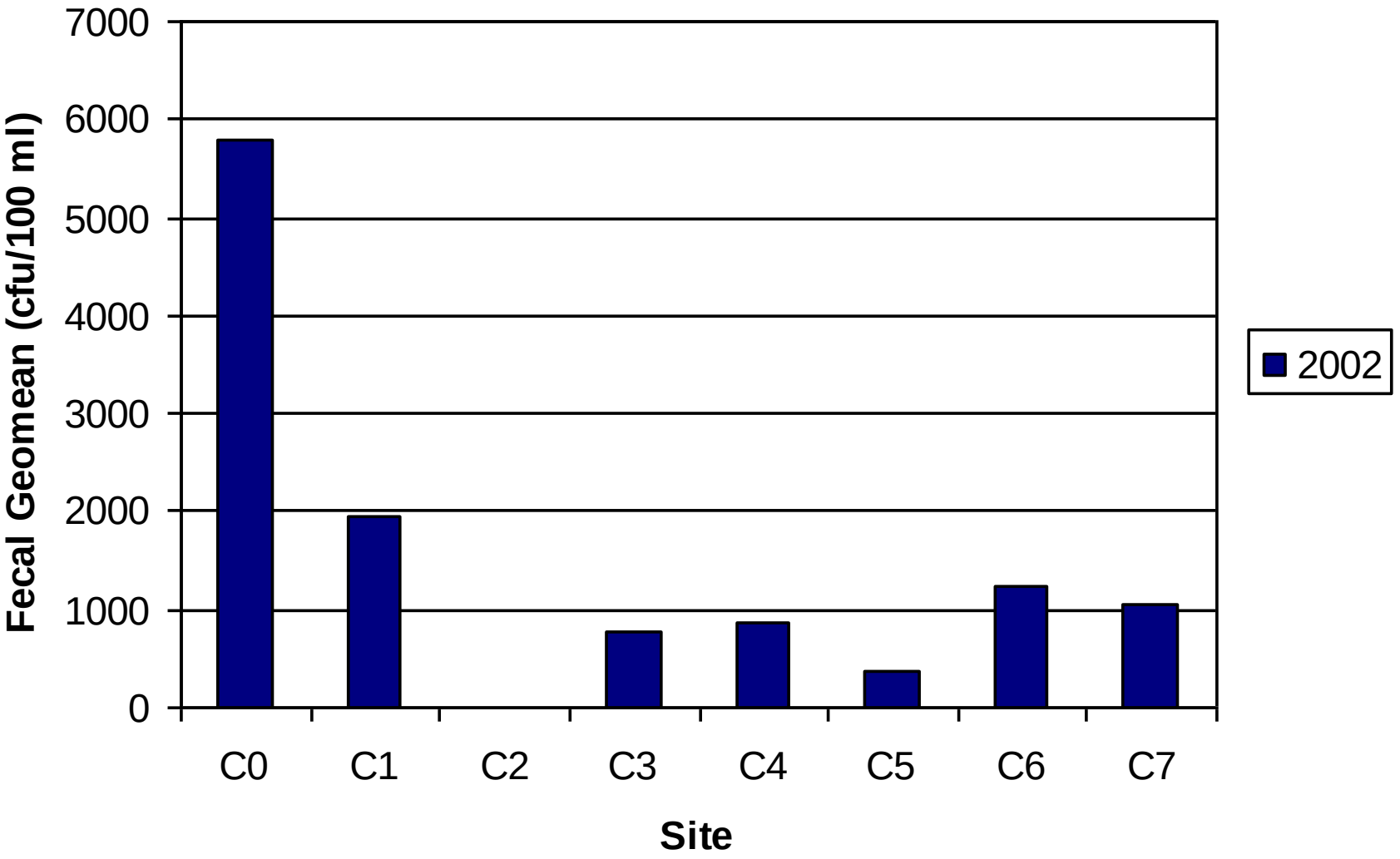
2002 Sample Results
Fecal Coliforms (col/100 ml)

SERIAL NO	Date of observation	C0 (Reach 10)	C1 (Reach 9)	C2 (Reach 8)	C3 (Reach 7)	C4 (Reach 5)	C5 (Reach 4)	C6 (Reach 1)	C7 (Reach 3)
1	6/11/2002	9,215	2,289	DRY	334	832	387	1,497	4,697
2	6/14/2002	6,482	4,469	DRY	250	723	373	1,294	698
3	7/2/2002	7,058	DRY	DRY	391	3,972	840	4,176	1,930
4	7/9/2002	DRY	DRY	DRY	204	7,470	612	290	495
5	7/15/2002	DRY	DRY	DRY	1,055	34,605	704	5,385	552
6	7/22/2002	DRY	DRY	DRY	1,030	18,624	672	1,144	519
7	7/29/2002	DRY	DRY	DRY	5,239	441	425	572	2,116
8	9/9/2002	DRY	DRY	DRY	6,088	362	1,270	137	199
9	9/23/2002	7,361	DRY	DRY	986	414	221	789	201
10	9/30/2002	2,121	721	DRY	1,179	909	282	997	519

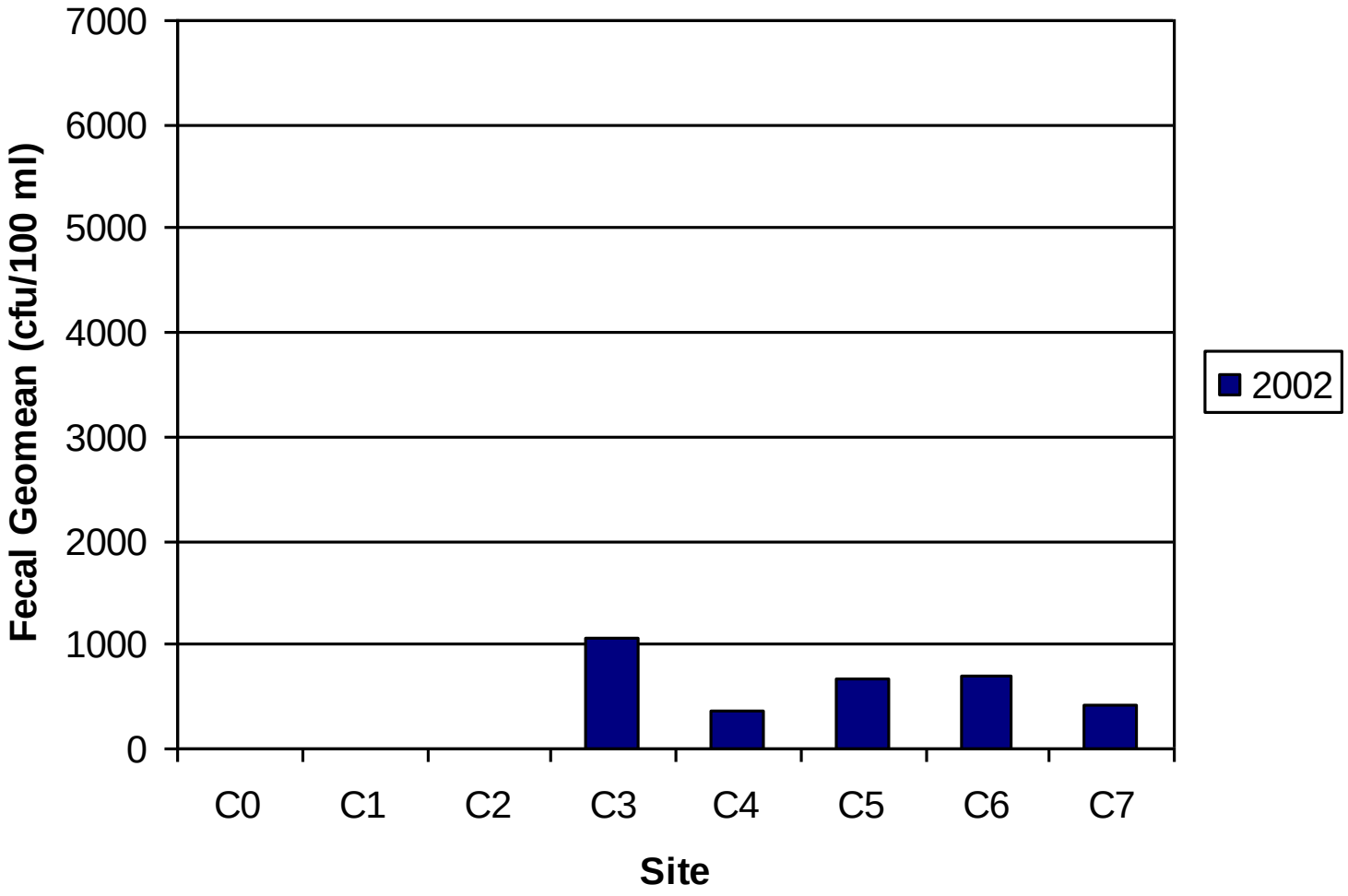
FC Geomeans


7000
6000
5000
4000
3000
2000
1000
0
Fecal Geomean (cfu/100 ml)
C0
C1
C3
C4
C5
C6
C7
Site
2002

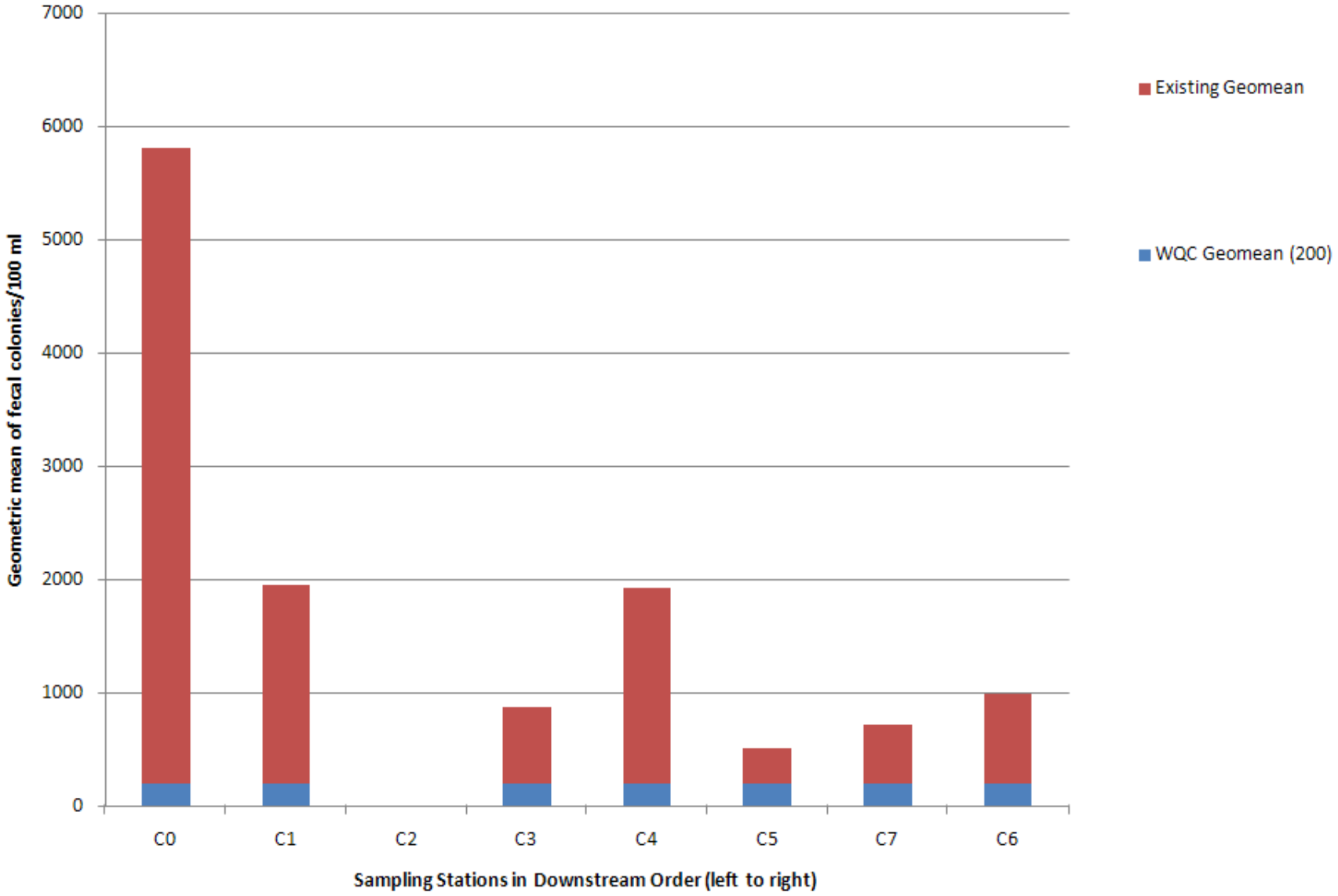
FC Geomeans (Wet Days)



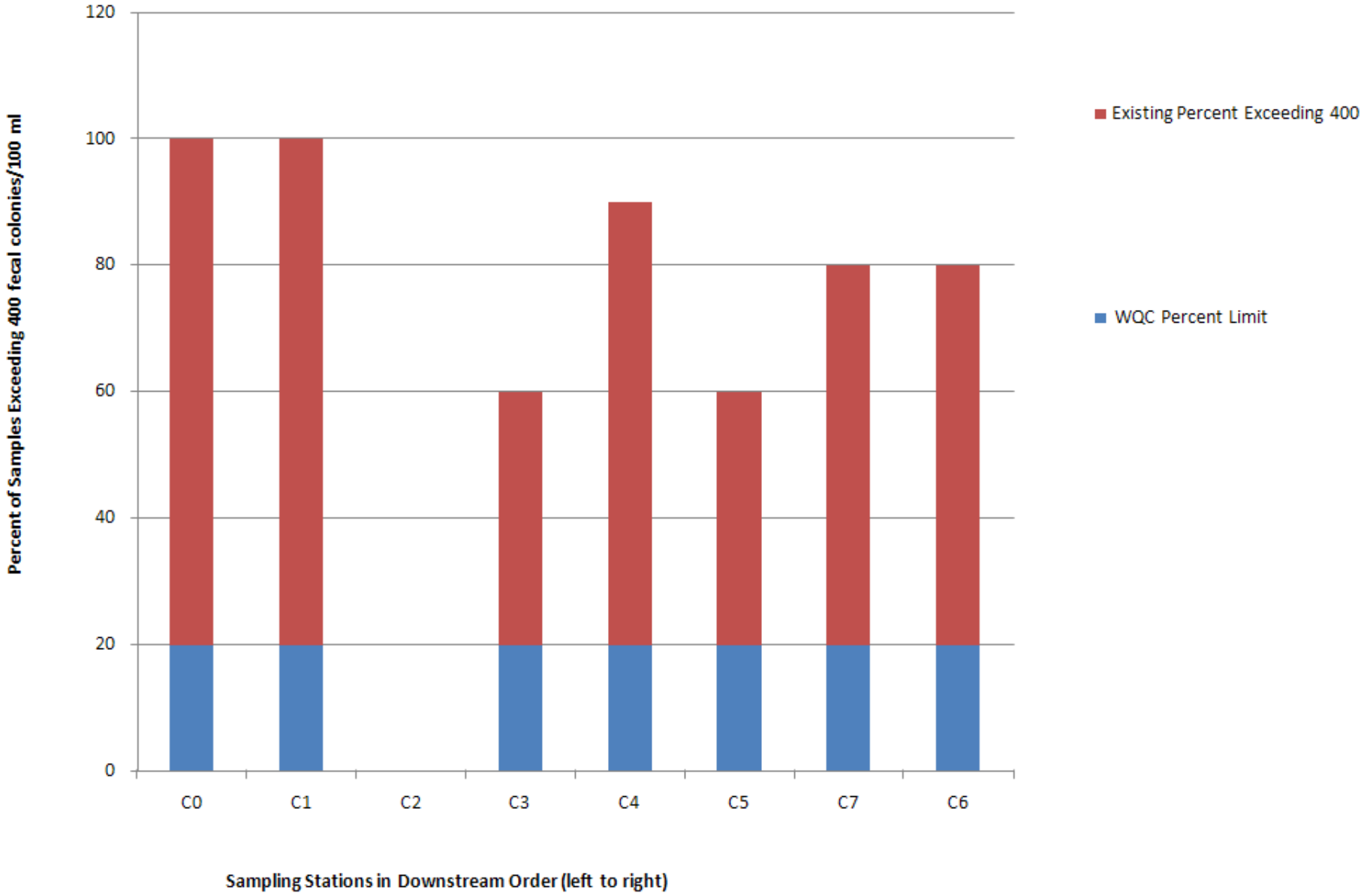
FC Geomeans (Dry Days)

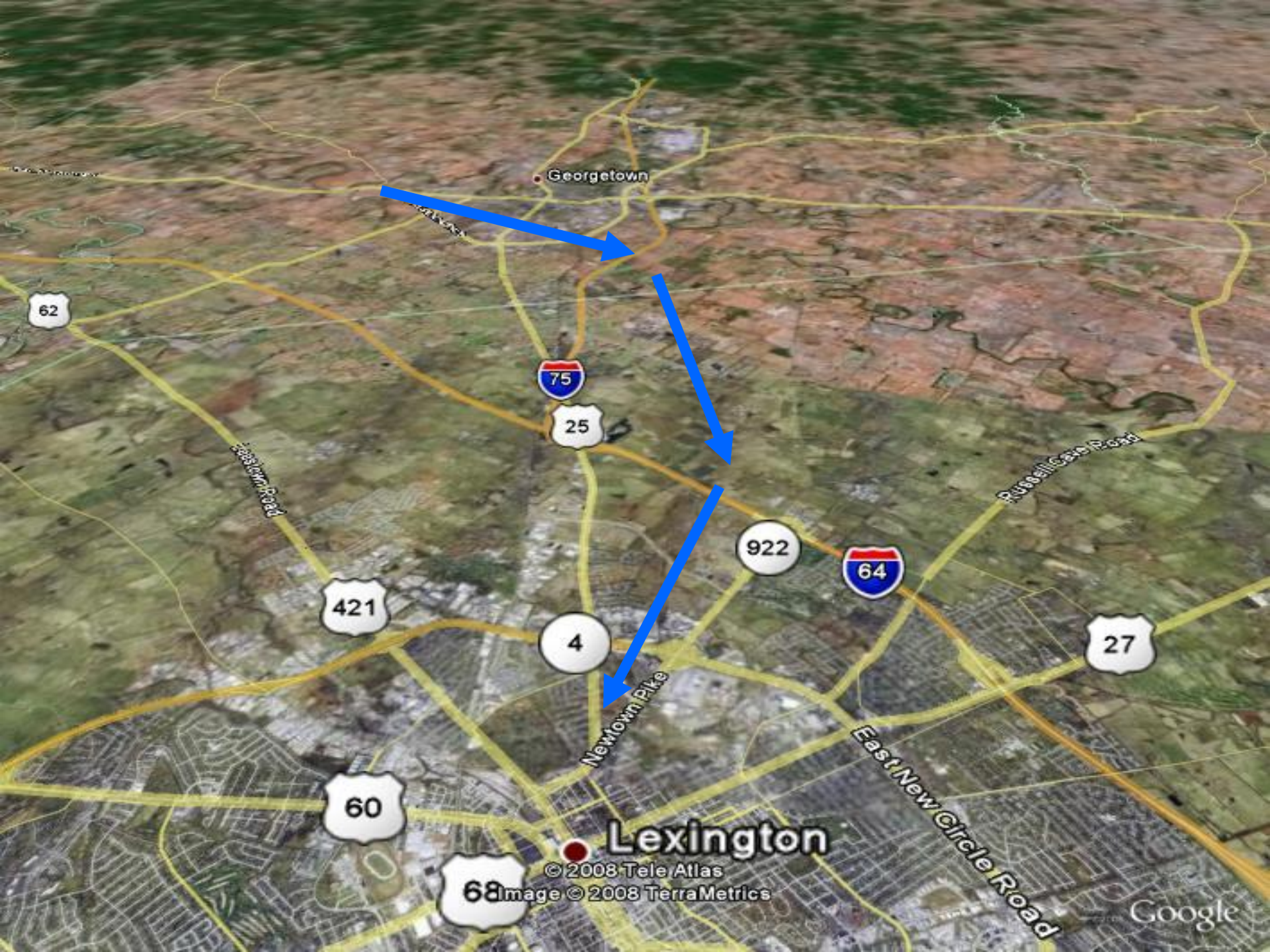


Chronic Criteria



Acute Criteria




Georgetown
62
75
25
922
64
421
4
27
60
68
Lexington
Newtown Pike
East New Circle Road
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North Elkorn Creek
724
C7
763
RS
Georgetown
988
C6
Urbanized Area
509
C5
25
Trailer Park
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Google


C2
DRY
C1
1,946 (3)
C0
5,803 (5)
IBM/LEXMARK
64
922
25
4
353
Georgetown Road
Price Road
Georgetown Street
Newtown Pike
West New Circle Road
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Google

LFUCG Water Quality Monitoring Stations

Station ID	Station Description	Sampling Dates	Fecal Geometric Mean Cfu/100 ml
CR-L1	Nandino Blvd	Dec-01 to Apr 02	8,900
CR-L2	Silver Lane	Nov-01 to Dec-01	2,711
CR-S1	Lexmark	May-96 to Jun-02	5,755
CR-S2	Cold Stream Farm	May-96 to Oct-96	36,037
CR-S3	US-25	May-98 to Nov-03	1,350


C2
DRY
C1
64
922
36,037
S2
25
8,900
L1
S1
C0
S3
1,350
5,755
353
Price Road
Georgetown Rd
Newtown Pike
Russell Cave Road
2,711
L2
IBM/LEXMARK
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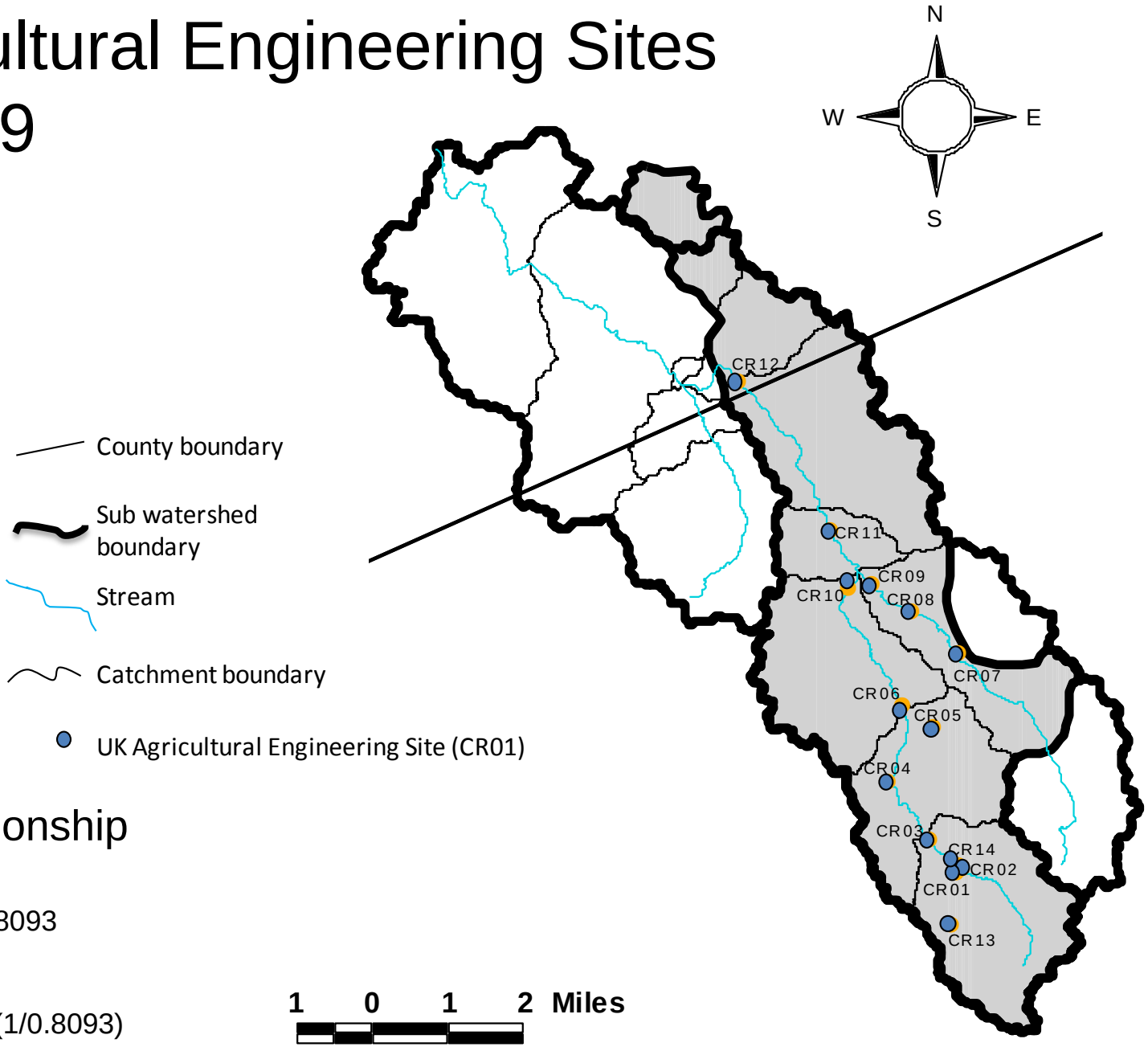
Image © 2008 TerraMetrics
Google

UK Agricultural Engineering Sites 2008-2009



EC to FC Relationship

$EC = 1.44*FC^{0.8093}$

$FC = (EC/1.44)^{(1/0.8093)}$

Station ID	Station Description	E. Coli Geometric Mean cfu/100 ml)	Approximate Fecal Coliform Equivalence (cfu/100 ml)
CR01	Lexmark Park West	2970	12456
CR02	Lexmark Park East	5223	25022
CR03	Newtown Pike	3076	13008
CR04	Highlands	7003	35949
CR05	Coldstream Park	887	2798
CR06	UK Farm South I-75	3708	16386
CR07	UK Farm below Fasig-Tipton	1769	6566
CR08	UK Farm	1075	3548
CR09	UK Farm below Lake	716	2148
CR10	UK Farm above Confluence	630	1834
CR11	Berea Road	431	1147
CR12	Lisle Road	410	1078
CR13	Loudon Avenue	10760	61119
CR14	Lexmark below Subdivision	1199	4061


CR12
C5
410
C3
C4
KY Horse Park
431
CR11
C2
Spindletop Estates
75
716
630
CR09
CR10
CR08
1,075
25
Greendale
UK Research Farm
CR07
1,769
3,708
CR06
C1
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Google
922


C2
3708
CR06
C1
887
CR05
7,003
CR04
64
922
25
4
3,076
CR03
C0
353
Georgetown Road
Price Road
Georgetown Street
Newtown Pike
West New Circle Road
IBM/LEXMARK
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Google


C2
C1
CR04
7,003
S2
64
922
25
4
353
CR03
3,076
L1
S1
C0
S3
1,199
CR14
CR02
5,223
CR01
2,970
L2
IBM/LEXMARK
Price Road
Georgetown Street
Newtown Pike
Georgetown Road
West New Circle Road
Russell Cave Road
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CR13
10,760
Google

Calculating the TMDL

- In order to determine the TMDL for a given stream, we typically use a computer model of a watershed.
- A watershed computer model is very similar to a check book register. Instead keeping track dollars and cents it keeps track of the balance of flows and pollutant loads for each day.

Computer Watershed Model

				Balance
Date	Transaction Item	Deposit/Credit	Payment/Debit	$1,000.00
July 1	Check 101 for phone bill		$100.00	$900.00
	Travel reimbursement	$50.00		$950.00
July 2	Check 102 for groceries		$75.00	$875.00
July 3	Auto insurance bank draft		$100.00	$775.00
	Birthday check	$25.00		$800.00

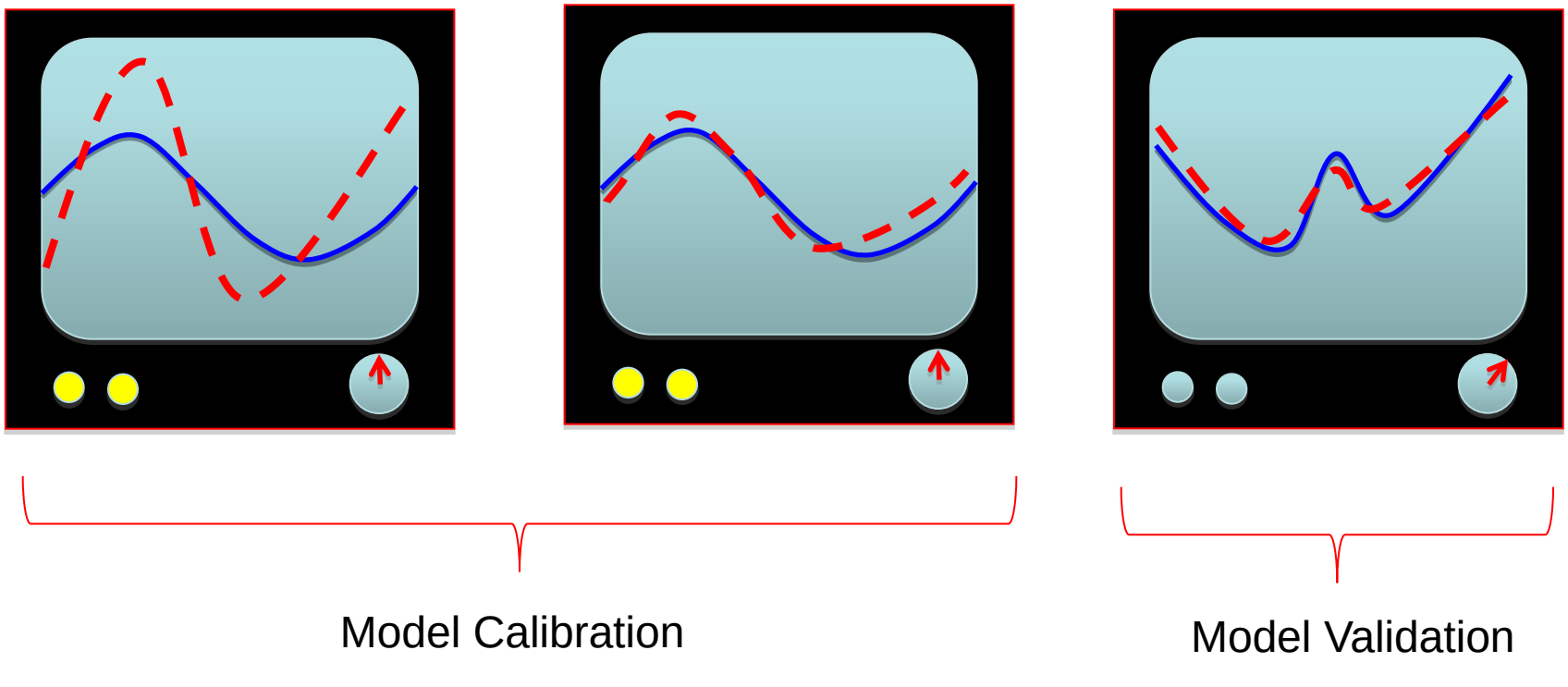
				Water storage (acre*ft)
Date	Event	Rainfall (ac.ft/day)	Stream Flow (ac.ft/day)	1000.00
July 1	Flow exits watershed		100.00	900.00
	Rainfall on watershed	50.00		950.00
July 2	Flow exits watershed		75.00	875.00
July 3	Flow exits watershed		100.00	775.00
	Rainfall on watershed	25.00		800.00

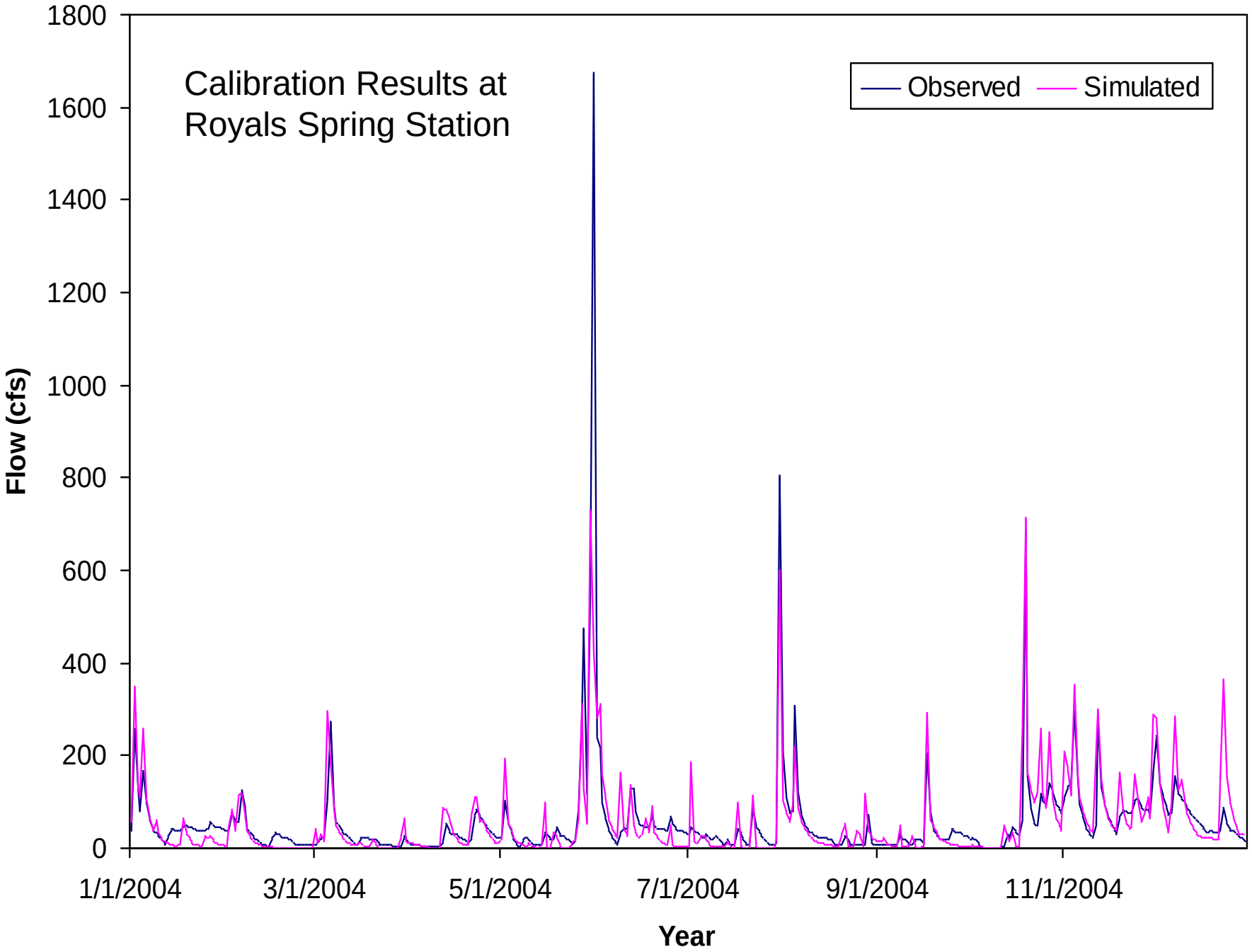
Computer Watershed Model

				Pollutant storage on land (g)
Date	Event	Mass IN (grams)	Mass OUT (grams)	2000.00
July 1	Mass leaving land by washoff		300.00	1700.00
	Mass entering land by deposition	50.00		1750.00
July 2	Mass entering land by deposition	50.00		1800.00
July 3	Mass leaving land by washoff		200.00	1600.00
	Mass entering land by deposition	50.00		1650.00

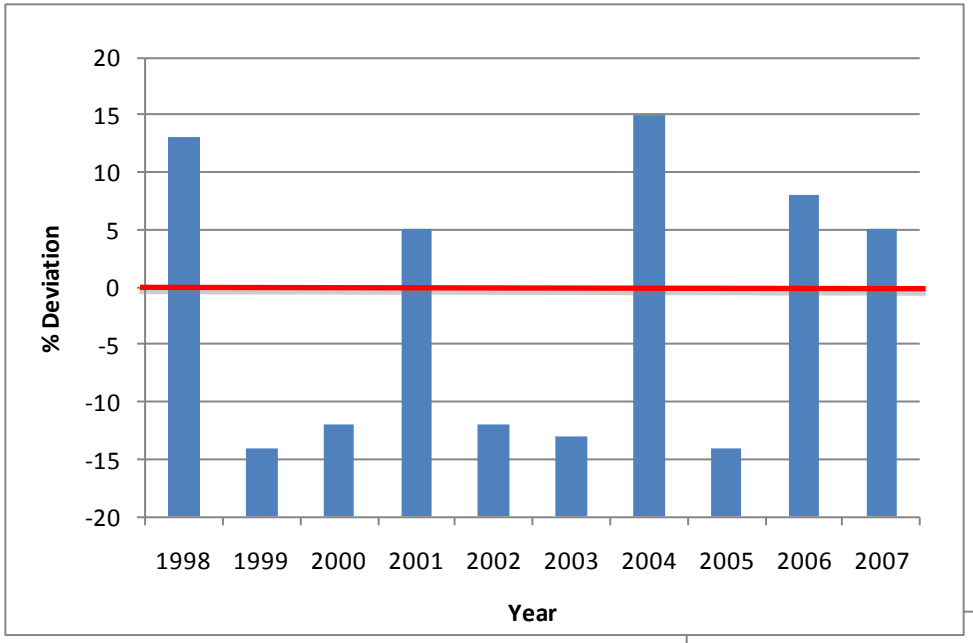
				Pollutant storage in reach (g)
Date	Event	Mass IN (grams)	Mass OUT (grams)	500.00
July 1	Mass leaving reach by flow		250.00	250.00
	Mass entering reach by washoff	300.00		550.00
July 2	Mass leaving reach by flow		350.00	200.00
July 3	Mass leaving reach by flow		50.00	150.00
	Mass entering reach by washoff	200.00		350.00

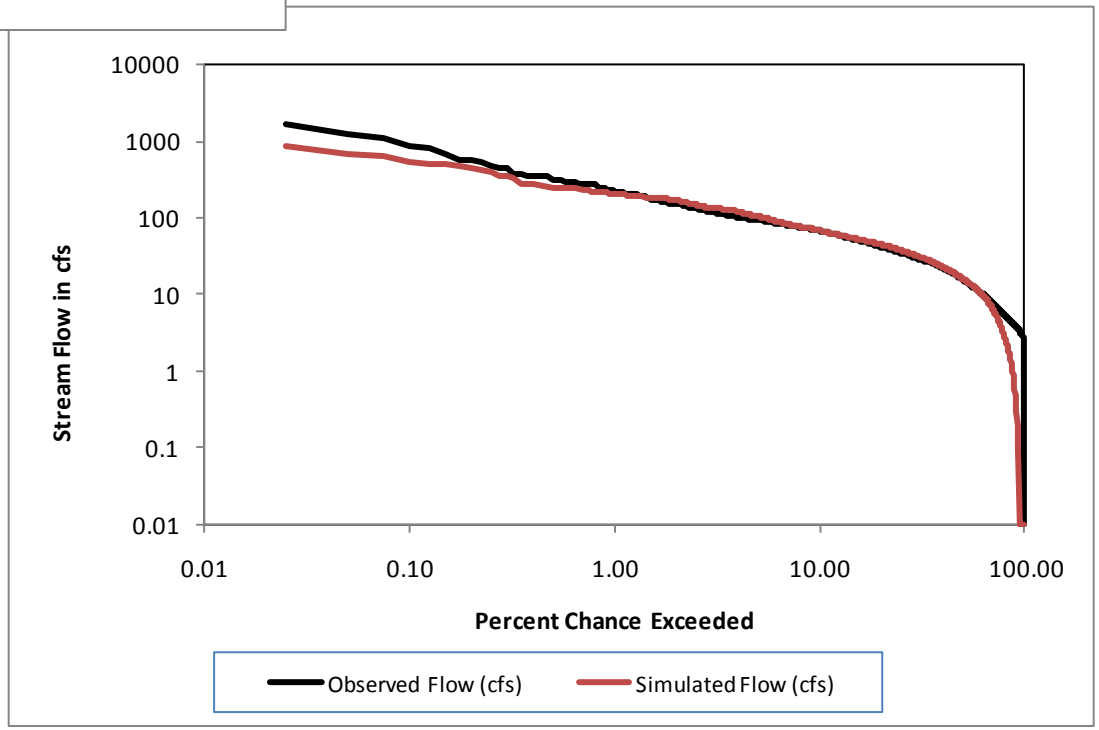
Watershed Model Calibration/Validation



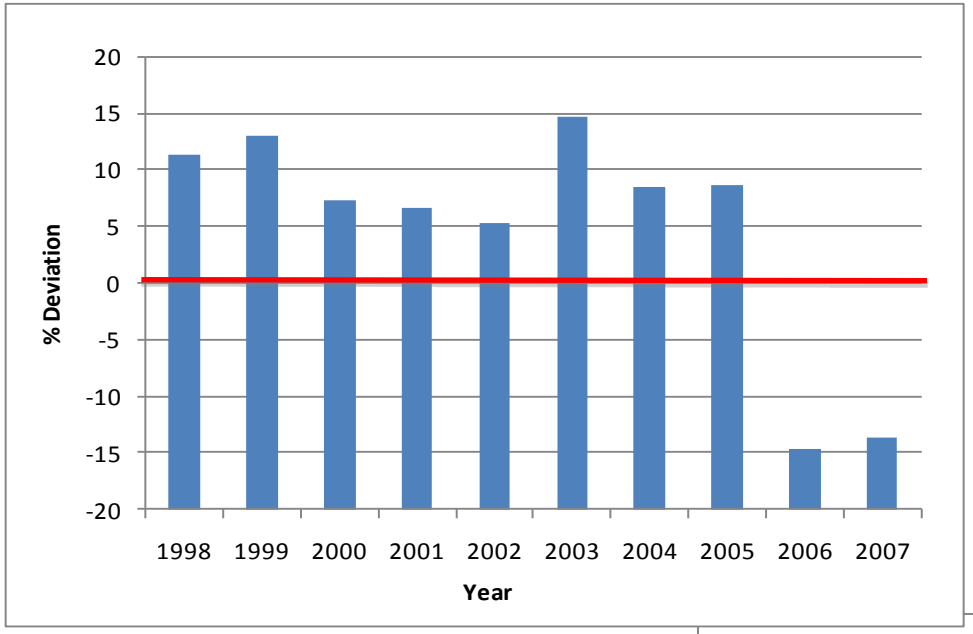

Calibration Results at
Royals Spring Station
Observed
Simulated
Flow (cfs)
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/2004
3/1/2004
5/1/2004
7/1/2004
9/1/2004
11/1/2004
Year

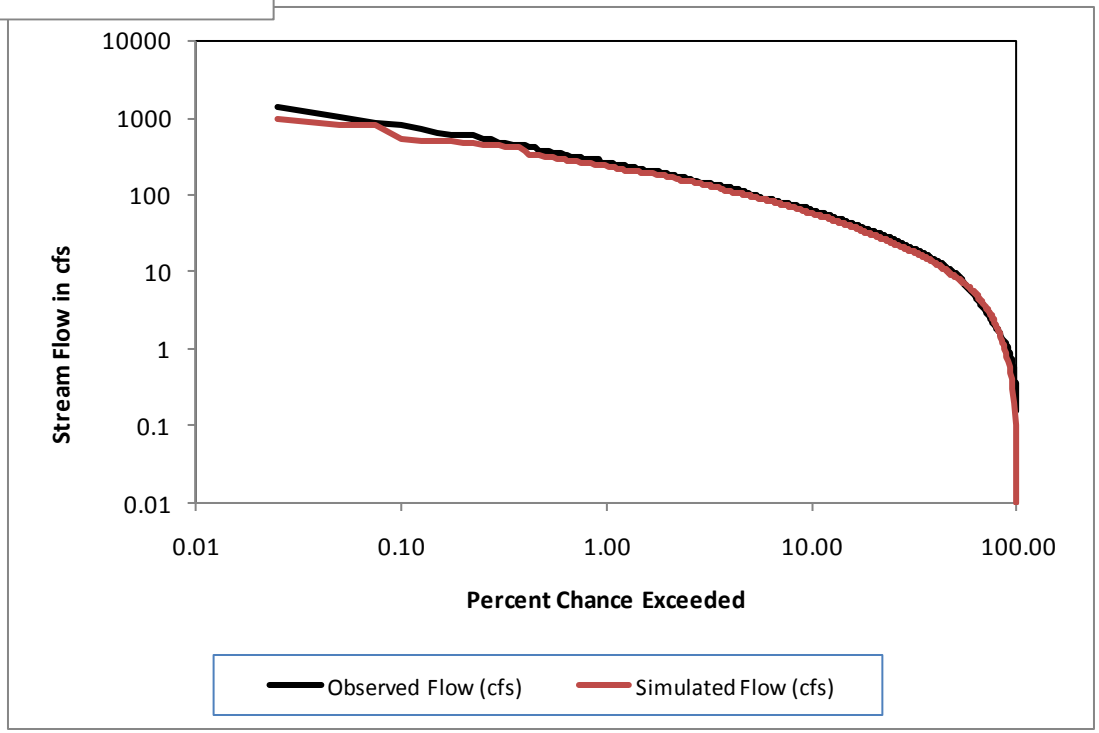
Flow Calibration Results at Royals Spring Station



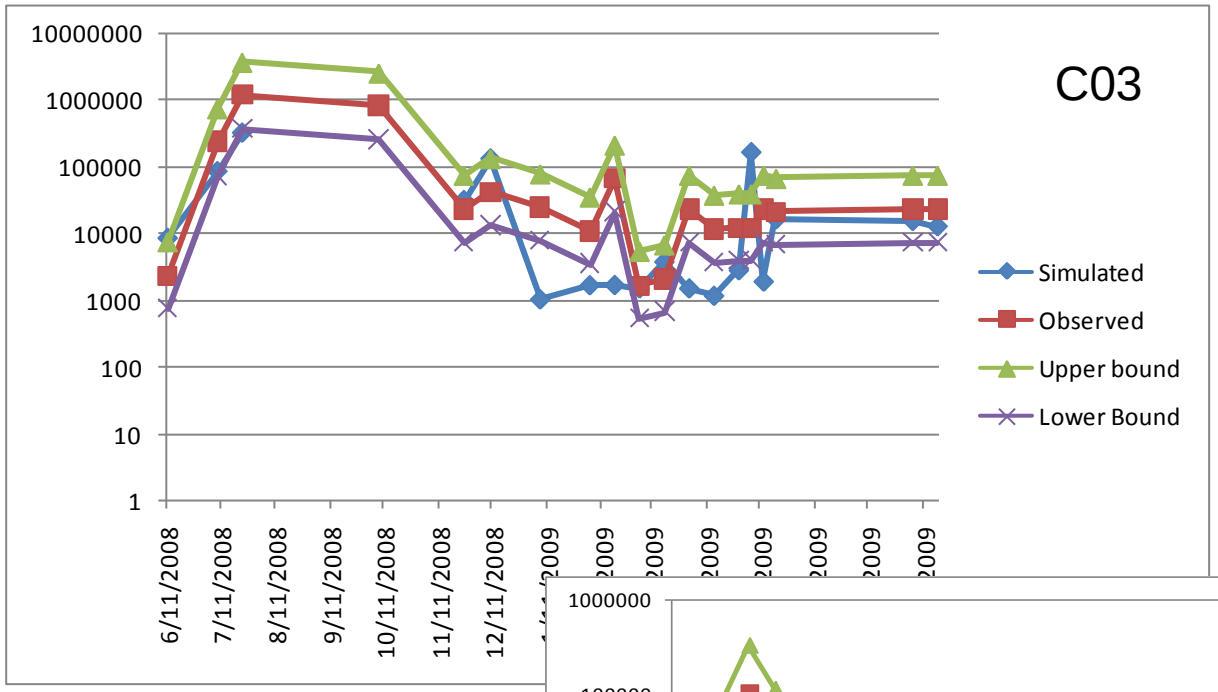


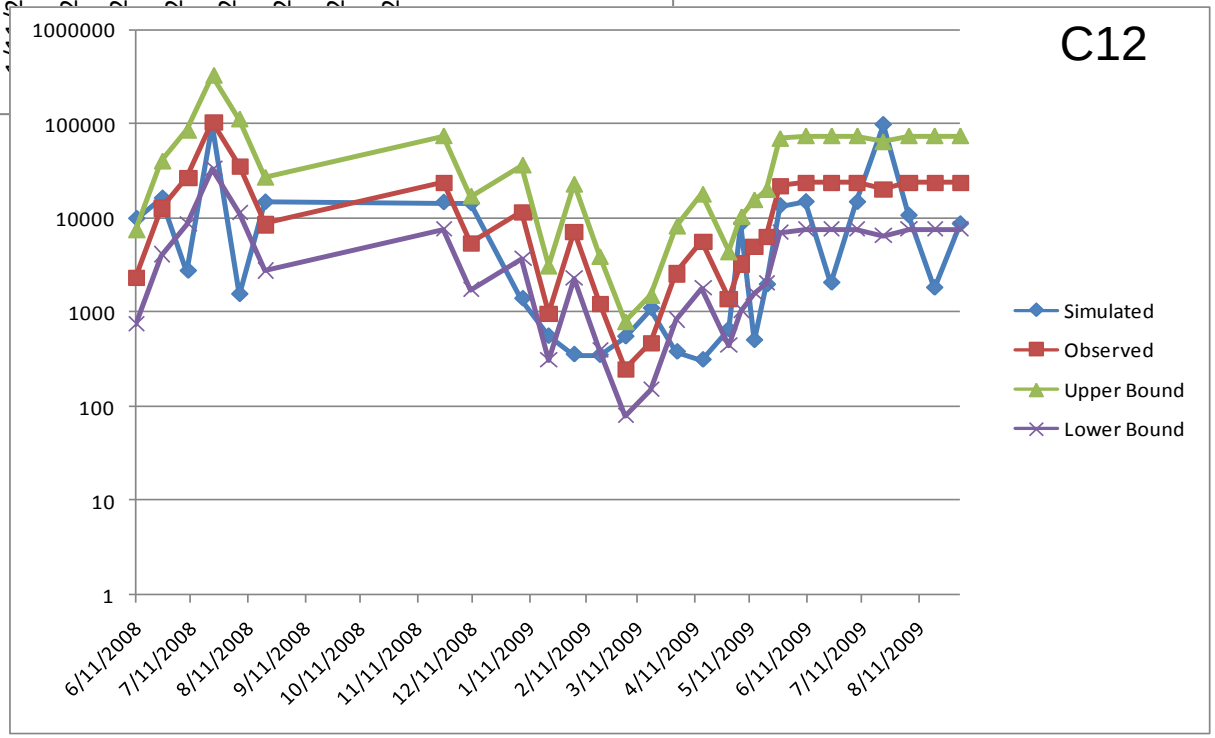
Flow Calibration Results at Outlet of Cane Run



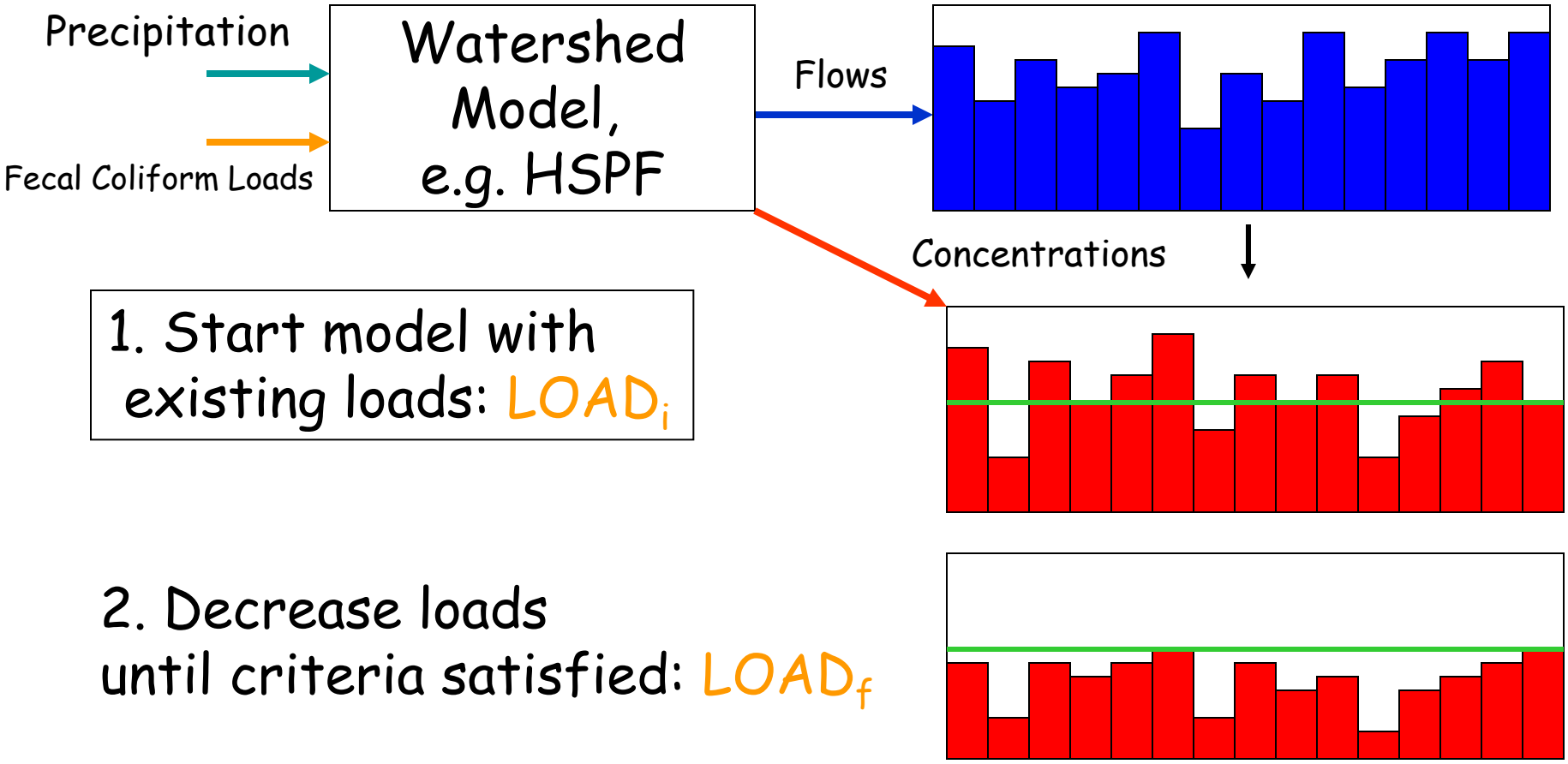


Fecal Coliform Validation Results UK Ag Stations





Watershed Model



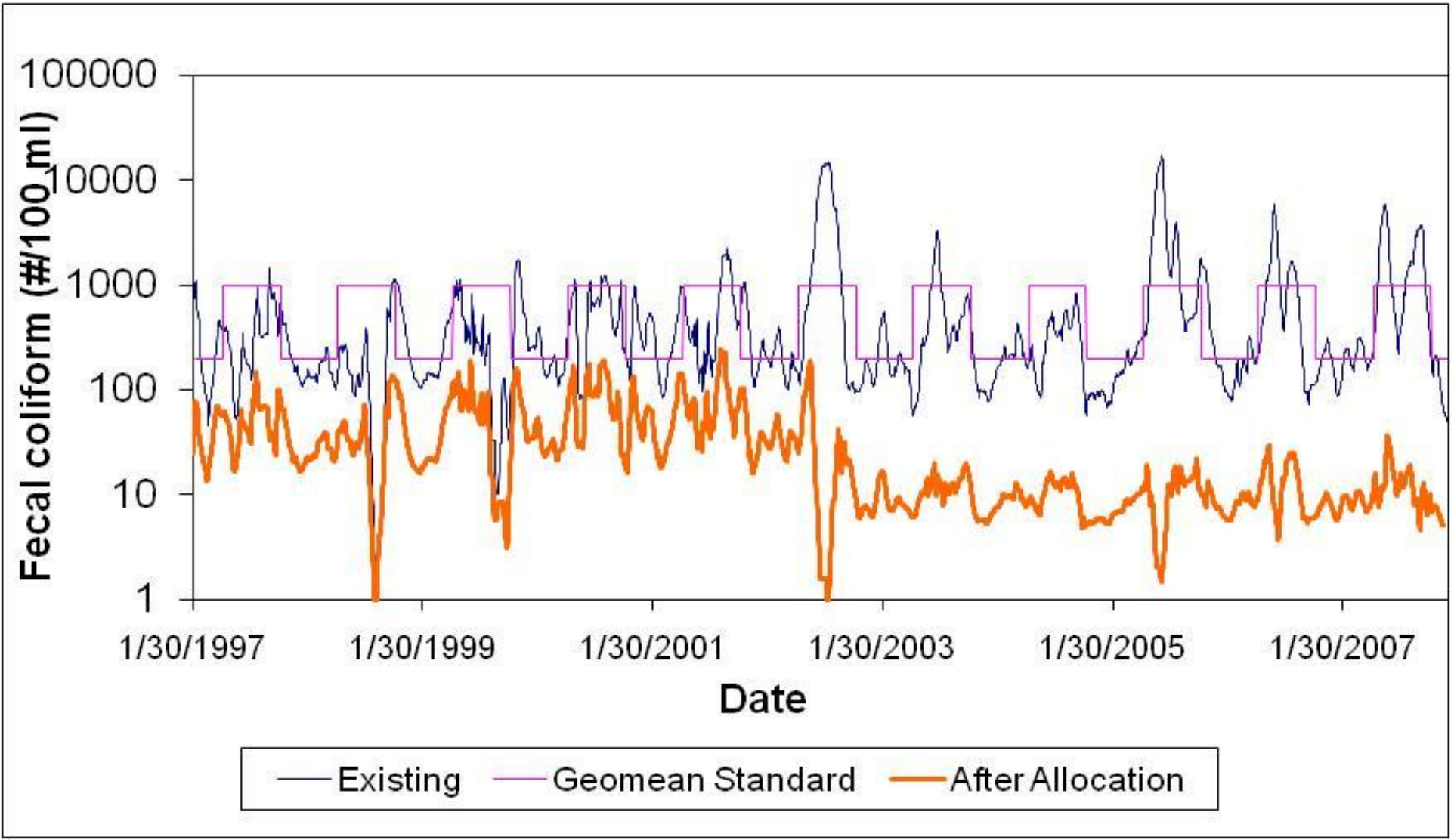
1. Start model with existing loads: $LOAD_i$

2. Decrease loads until criteria satisfied: $LOAD_f$

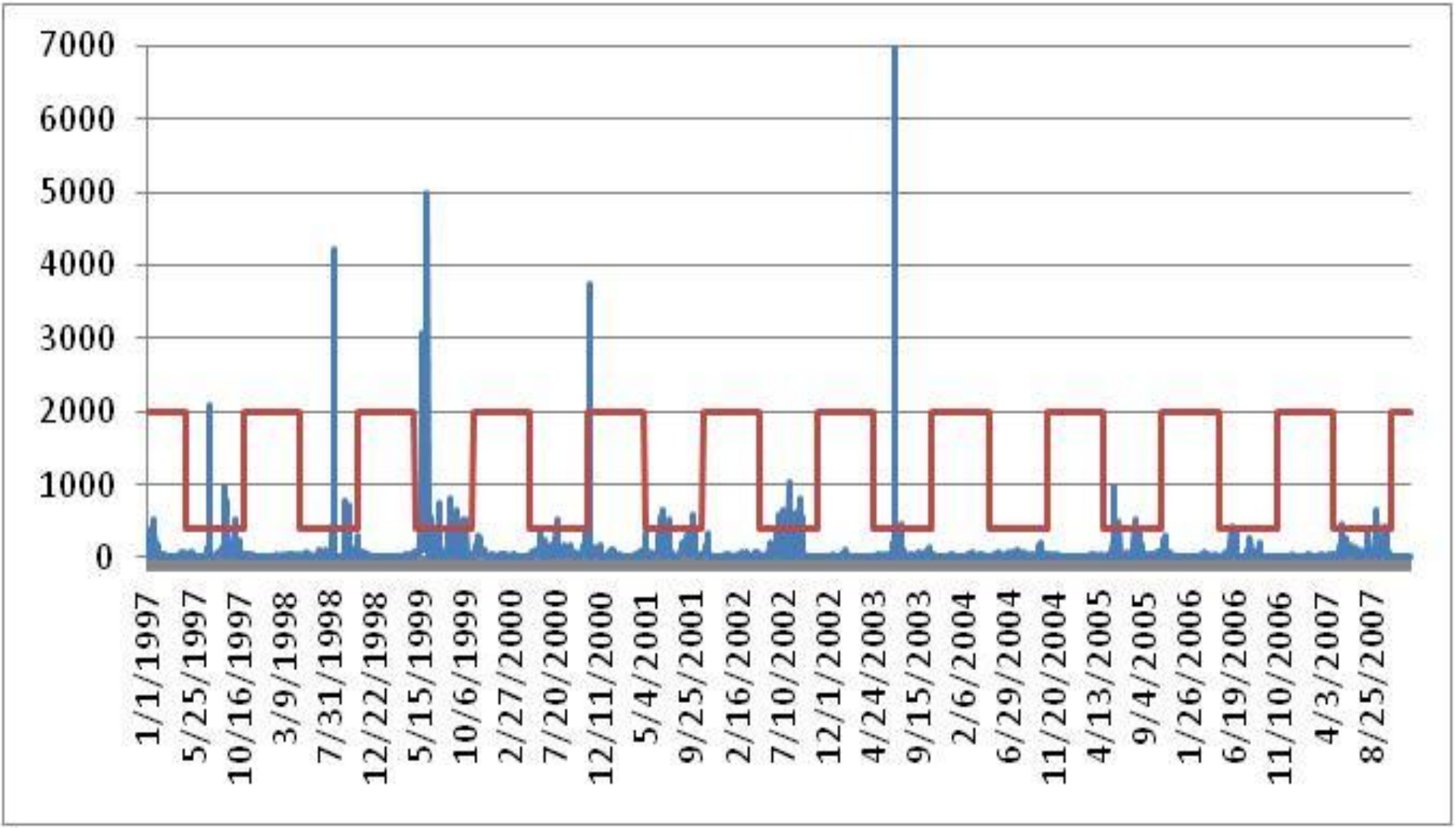
3. TMDL = $LOAD_f$

4. LR = $LOAD_i$ - TMDL

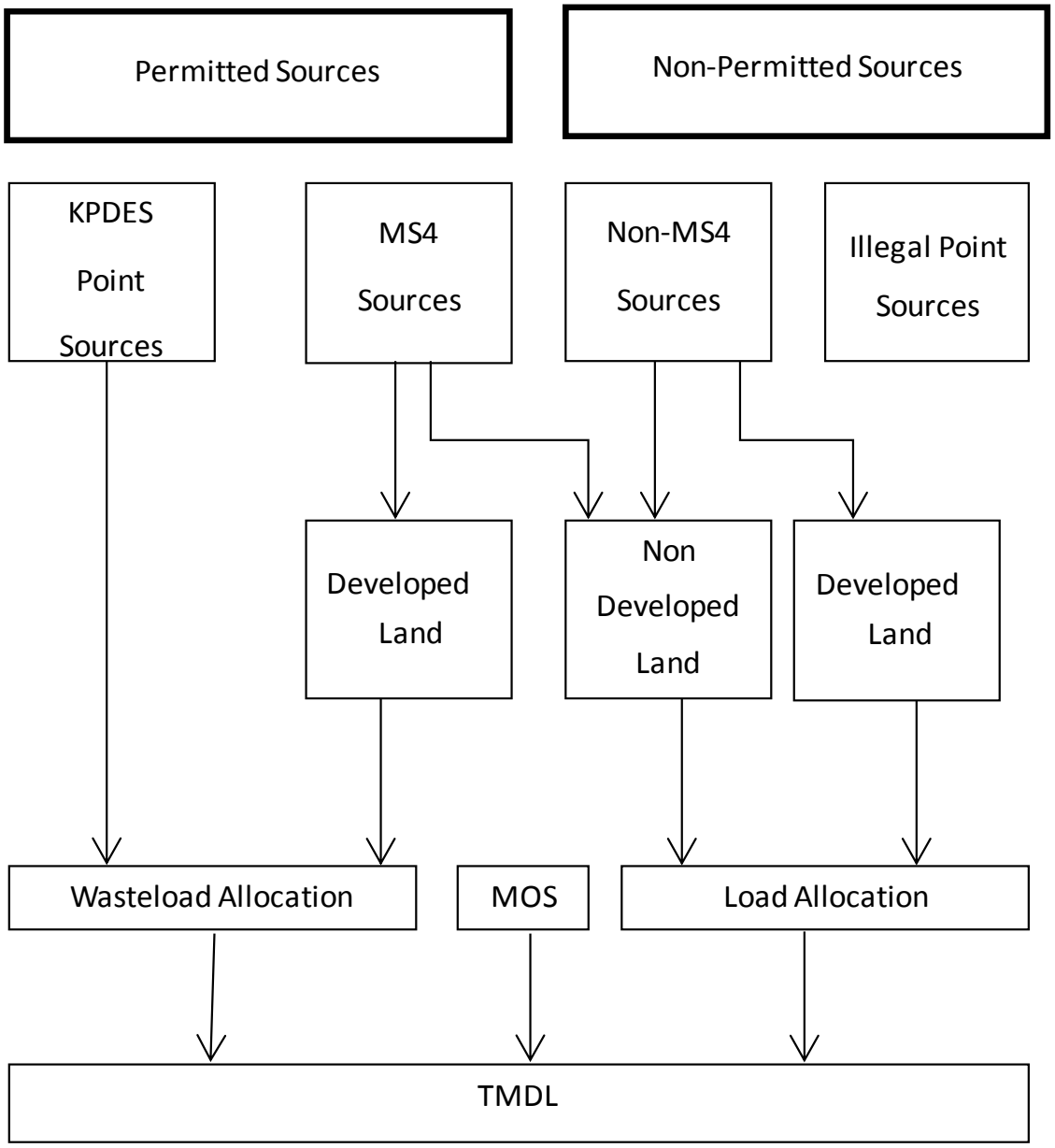
Acute Criteria (Geomean) (200 cfu/100 or 1000 cfu/100)



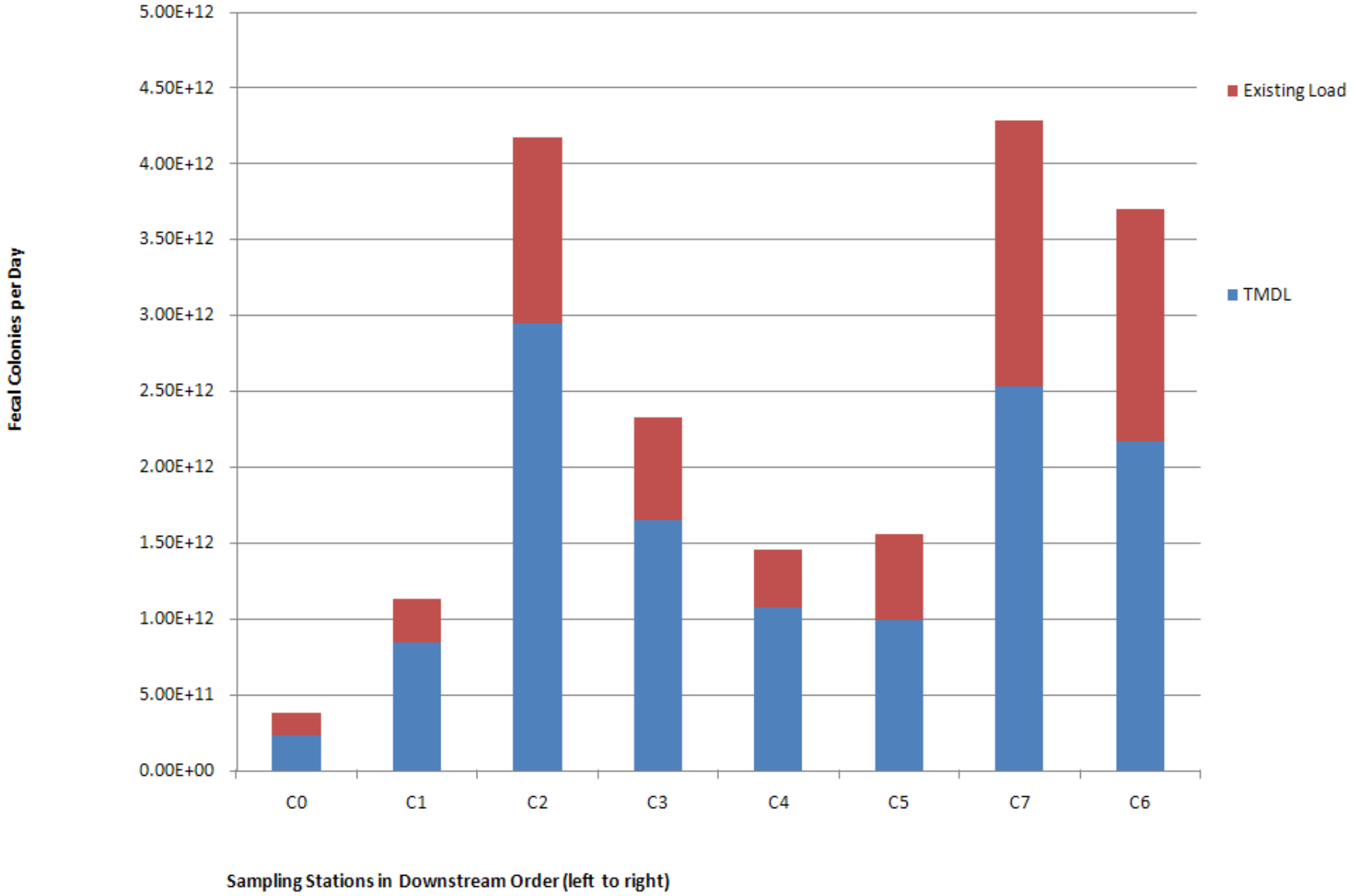
Chronic Criteria (< 20%) (400 cfu/100 or 2000 cfu/100)



TMDL Allocations



Existing and TMDL Loads



TMDL Load Components