



Finding & Fixing **Illicit** Connections in White Center

Pre-2009 to post-2012

(Photo of illicit stormwater connection from Michigan DOT website)

Presented by Jeanne Dorn, Stormwater Services, Nov 1 2012



The driving issue:

Hicklin Lake water quality

Community news headline:

“Will Hicks Lake finally get county help? Meeting set”



“Neighbors led by **Dick Thurnau** have worked a long time to try to get the county to do something about Hicks Lake water quality...”

From White Center Now blog, March 11, 2011



**Hicklin Lake, May 2011 (during
alum treatment)**

Note: County had been working *years* before 2009 to figure out high fekes in Hicklin Lake....

...but using fekes alone it's hard to find out if they're due to:

Overland runoff
carrying:

Dog poop?



Geese grease?



Seagull turds?



OR

Direct stormwater connection
carrying:

Human waste?





Finding suspected illicit connections:
a **COLLABORATION** between...



SCIENCE & TECHNICAL
SUPPORT FOLK



Sally



Chris



Lori



Mark

STORMWATER SERVICES
FOLK



Sabine



Candi



Cynthia

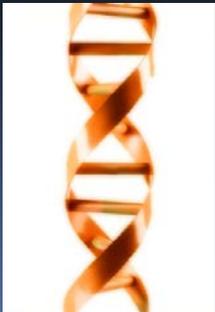


Virgil



Jeanne

KING COUNTY ENVIRONMENTAL LAB
FOLK

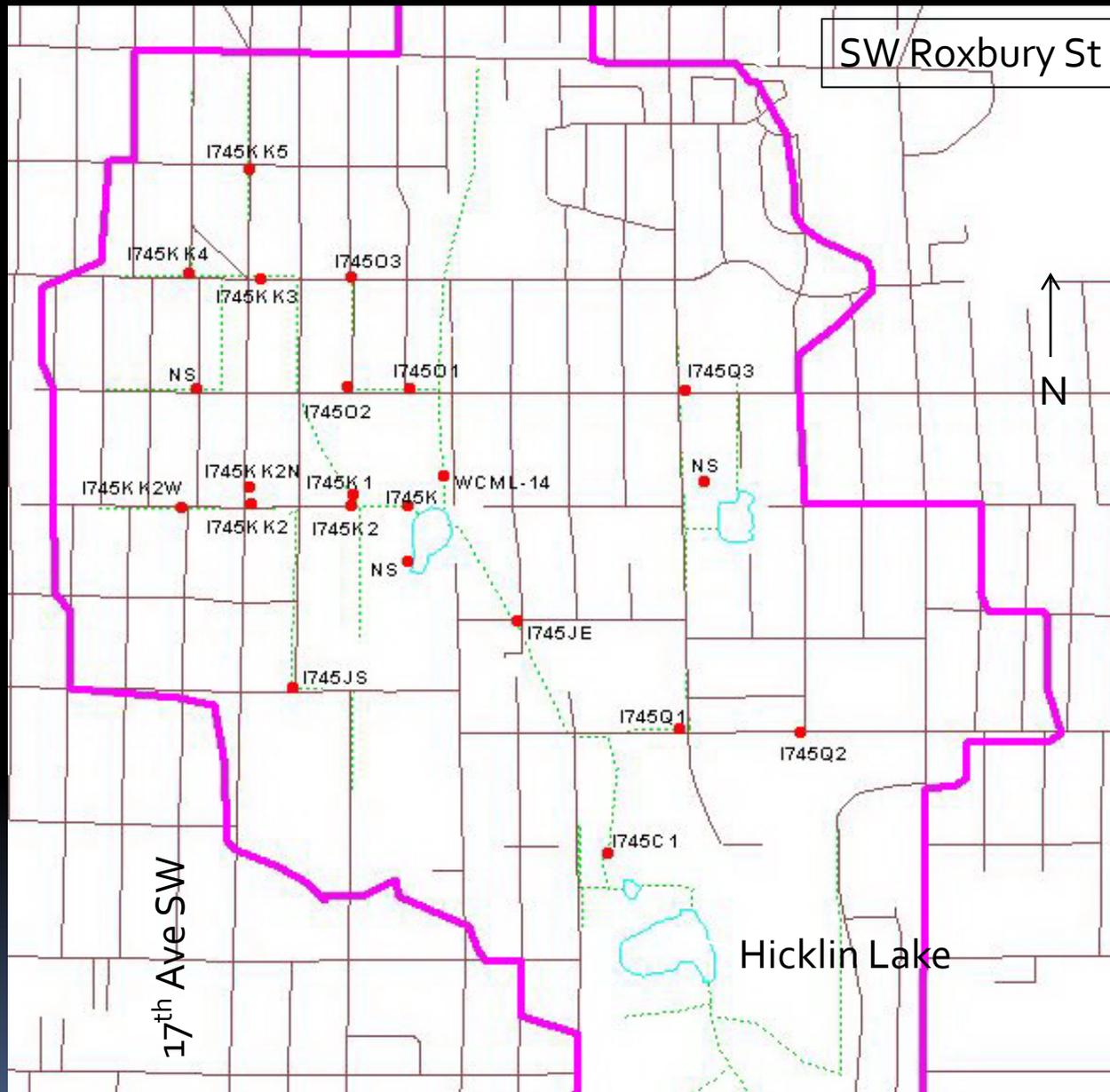




**What we're often dealing with:
Stormwater manhole 17th Ave
SW (previously sanitary & storm)**

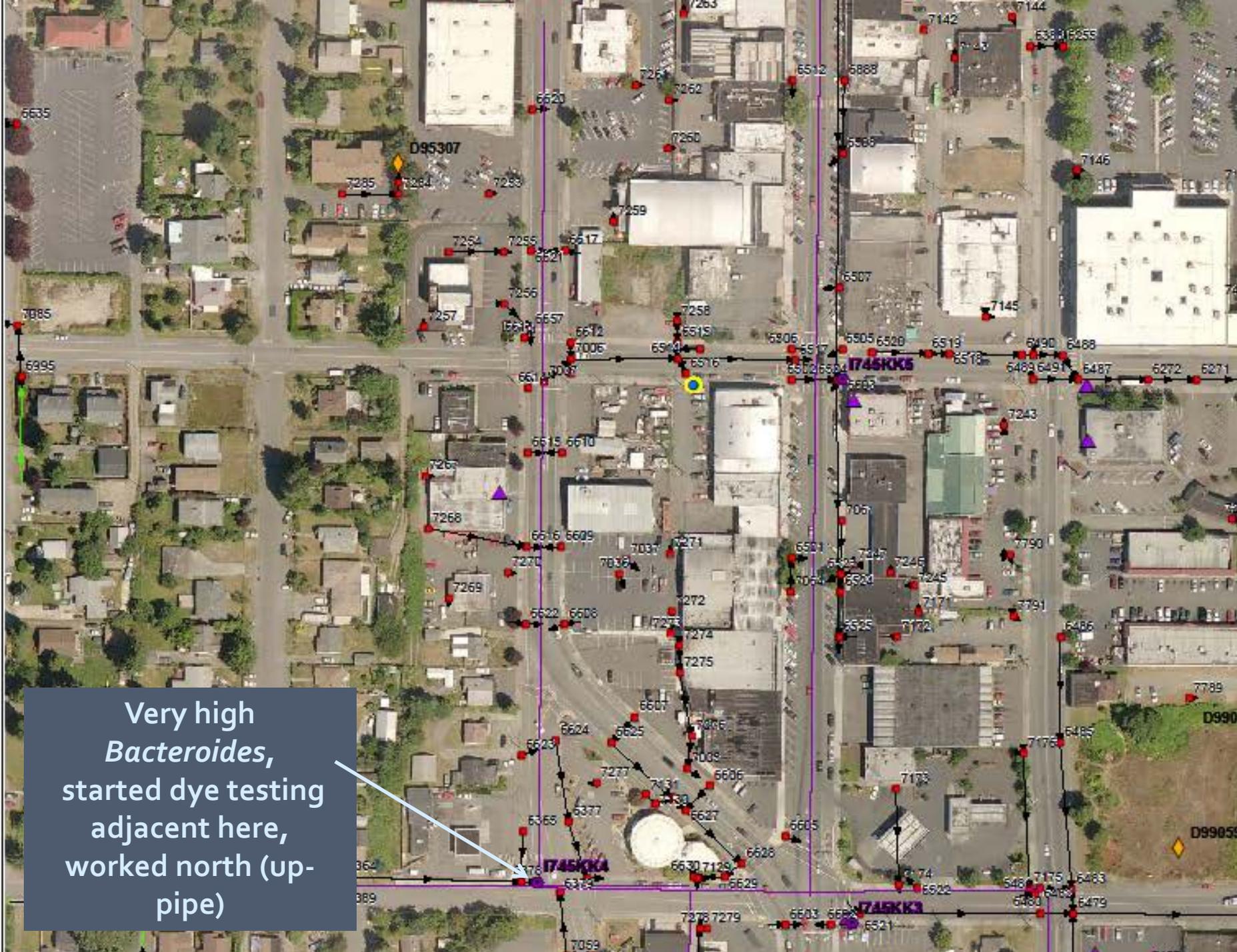


Stormwater manhole 17th Ave
SW & SW 100th St (previously
san. & storm). VERY high
Bacteroides found by Abella et al



Red dots show Sally's sampling locations for *Bacteroides* & other bacteria. Conceptual stormwater map by Sally.





Very high
Bacteroides,
started dye testing
adjacent here,
worked north (up-
pipe)

D95307

1745KK5

1745KK4

1745KK3

D990

D9905

Fixing identified illicit connections:
a **COLLABORATION** between...

STORMWATER SERVICES

humbly notified....



Who came to the rescue.

LOCAL SEWER DISTRICT: SOUTHWEST SUBURBAN



“Dedicated to Preserving the Purity of Your Environment”

Southwest Suburban
Sewer District fixed the
illicit sewage-to-
stormwater connections.
No charge to King County
or to the property owners.



FOUR SAMPLE EVENTS (pending Bacteroides results Oct 2012)

LOCATOR	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	Location Description
A745B	1800	149	2300	ns	ns	ns	ns	ns	ns	600		750	Hicklin Lake (Lake Hicks)
I745C1	170	154	81	3500	1358	1200	ns	ns	30	6300		4600	Outfall from north drainage into Hicks parking lot
I745JE	ns	ns	ns	ns	ns	ns	1800	12	1100	27000		19000	11th Ave SW and SW 106th St
I745JS	ns	ns	ns	ns	ns	ns	ns	1544	110	330		600	15th Ave SW and SW 107th St
I745K	ns	ns	ns	ns	ns	ns	1		<MDL	ns	ns	ns	Inlet outfall just NW of Mallard lake at end of 10th St
I745K1	2300	372000	2100	3800	66038	3100	170	9212	100	2100		3600	Tightline in western ballfield of Steve Cox park
I745K2	ns	ns	ns	ns	ns	ns	ns	ns	<MDL	ns	ns	ns	
I745KK2	2700	5559	1700	2700	5936	1700	8	ns	16	720		5800	16th Ave SW and SW 104th St
I745KK2N	ns	ns	ns	ns	ns		ns	ns	9	ns	ns	ns	
I745KK2W	ns	ns	ns	ns	ns		ns	ns	2	ns	ns	ns	
I745KK3	2900	70	4200	7000	2834	2800	ns	ns	1	15000		17000	SW 100th St just east of 16th Ave SW in sidewalk
I745KK4	6900	342000	8400	2500	10544	3500	ns	ns	ns	ns	ns	ns	17th Ave SW and SW 100th St on NW corner
I745KK5	35	2390	32	4300	2512	4000	ns	ns	ns	3100		5600	S of SW 98th St on 16th Ave SW
I745L	320	350	120	130	357	170	ns	ns	ns	ns	ns	ns	Mallard Lake outlet
I745N	250	125	160	ns	ns	ns	ns	ns	ns	ns	ns	ns	SW 100th St between 12th and 13th Aves SW?
I745O1	160	1460	100	4400	800	4000	ns	ns	ns	9000		8800	13th Ave SW and SW 102nd St
I745O2	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL	2000		3400	14th Ave SW and SW 102nd St
I745Q1	5	577	1	21000	1040	11000	ns	ns	9	4400		12000	8th Ave SW and SW 108th St
I745Q2	ns	ns	ns	ns	ns	ns	ns	ns	4	ns	ns	ns	
I745Q3	3	ns	ns	3	ns	ns	3	ns	2	ns	ns	ns	
I745S	61	13	33	1800	53	2600	ns	ns	ns	ns	ns	ns	In Lakewood Park at SE shoreline of lake, directly
WCML-14	ns	ns	ns	ns	ns		<MDL	ns	<MDL	ns	ns	ns	
	Sampled 4/27/2011			Sampled 6/1/2011			Sampled 5/15/2012			Sampled 10/15/2012			

TABLE NOTES

Shading: indicates sampled 10/15/2012 for all 3 analytes (ekes, fekes and bacs)

Units: E. coli & fekes in colony forming units/100 mL;

Bacteroides in cells/100 mL.

Oct 15 2012 not enough flow in I745KK4 or I745S to obtain sample for analyses.

LOW BACTEROIDES, HIGH FEKES

Interpretation, mainly animal waste; human waste significance not obvious

LOCATOR	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	Location Description
A745B	1800	149	2300	ns	ns	ns	ns	ns	ns	600		750	Hicklin Lake (Lake Hicks)
I745C1	170	154	81	3500	1358	1200	ns	ns	30	6300		4600	Outfall from north drainage into Hicks park
I745JE	ns	ns	ns	ns	ns	ns	1800	12	1100	27000		19000	11th Ave SW and SW 106th St
I745JS	ns	ns	ns	ns	ns	ns	ns	1544	110	330		600	15th Ave SW and SW 107th St
I745K	ns	ns	ns	ns	ns	ns	1		<MDL	ns	ns	ns	Inlet outfall just NW of Mallard lake at end of 16th Ave SW
I745K1	2300	372000	2100	3800	66038	3100	170	9212	100	2100		3600	Tightline in western ballfield of Steve Cox Park
I745K2	ns	ns	ns	ns	ns	ns	ns	ns	<MDL	ns	ns	ns	
I745KK2	2700	5559	1700	2700	5936	1700	8	ns	16	720		5800	16th Ave SW and SW 104th St
I745KK2N	ns	ns	ns	ns	ns		ns	ns	9	ns	ns	ns	
I745KK2W	ns	ns	ns	ns	ns		ns	ns	2	ns	ns	ns	
I745KK3	2900	70	4200	7000	2834	2800	ns	ns	1	15000		17000	SW 100th St just east of 16th Ave SW in side of 16th Ave SW
I745KK4	6900	342000	8400	2500	10544	3500	ns	ns	ns	ns	ns	ns	17th Ave SW and SW 100th St on NW corner of 17th Ave SW
I745KK5	35	2390	32	4300	2512	4000	ns	ns	ns	3100		5600	S of SW 98th St on 16th Ave SW
I745L	320	350	120	130	357	170	ns	ns	ns	ns	ns	ns	Mallard Lake outlet
I745N	250	125	160	ns	ns	ns	ns	ns	ns	ns	ns	ns	SW 100th St between 12th and 13th Aves SW
I745O1	160	1460	100	4400	800	4000	ns	ns	ns	9000		8800	13th Ave SW and SW 102nd St
I745O2	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL	2000		3400	14th Ave SW and SW 102nd St
I745Q1	5	577	1	21000	1040	11000	ns	ns	9	4400		12000	8th Ave SW and SW 108th St
I745Q2	ns	ns	ns	ns	ns	ns	ns	ns	4	ns	ns	ns	
I745Q3	3	ns	ns	3	ns	ns	3	ns	2	ns	ns	ns	
I745S	61	13	33	1800	53	2600	ns	ns	ns	ns	ns	ns	In Lakewood Park at SE shoreline of lake
WCML-14	ns	ns	ns	ns	ns		<MDL	ns	<MDL				
	Sampled 4/27/2011			Sampled 6/1/2011			Sampled 5/15/2012			Sampled 10/15/2012			

TABLE NOTES

Shading: indicates sampled 10/15/2012 for all 3 analytes (ekes, fekes and bacs)

Units: E. coli & fekes in colony forming units/100 mL;
Bacteroides in cells/100 mL.

MS4 White Center data from:
2011 Abella-Science MST study
2012 Science/Stormwater collab



HIGH BACTEROIDES, HIGH FEKES: thought possible human waste in stormwater system

Two interpretations, both human waste: weak signal nearby or strong signal far away

LOCATOR	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	Location Description
A745B	1800	149	2300	ns	ns	ns	ns	ns	ns	600		750	Hicklin Lake (Lake Hicks)
I745C1	170	154	81	3500	1358	1200	ns	ns	30	6300		4600	Outfall from north drainage into Hicks park
I745JE	ns	ns	ns	ns	ns	ns	1800	12	1100	27000		19000	11th Ave SW and SW 106th St
I745JS	ns	ns	ns	ns	ns	ns	ns	1544	110	330		600	15th Ave SW and SW 107th St
I745K	ns	ns	ns	ns	ns	ns	1		<MDL	ns	ns	ns	Inlet outfall just NW of Mallard lake at end of
I745K1	2300	372000	2100	3800	66038	3100	170	9212	100	2100		3600	Tightline in western ballfield of Steve Cox
I745K2	ns	ns	ns	ns	ns	ns	ns	ns	<MDL	ns	ns	ns	
I745KK2	2700	5559	1700	2700	5936	1700	8	ns	16	720		5800	16th Ave SW and SW 104th St
I745KK2N	ns	ns	ns	ns	ns	ns	ns	ns	9	ns	ns	ns	
I745KK2W	ns	ns	ns	ns	ns	ns	ns	ns	2	ns	ns	ns	
I745KK3	2900	70	4200	7000	2834	2800	ns	ns	1	15000		17000	SW 100th St just east of 16th Ave SW in sid
I745KK4	6900	342000	8400	2500	10544	3500	ns	ns	ns	ns	ns	ns	17th Ave SW and SW 100th St on NW corne
I745KK5	35	2390	32	4300	2512	4000	ns	ns	ns	3100		5600	S of SW 98th St on 16th Ave SW
I745L	320	350	120	130	357	170	ns	ns	ns	ns	ns	ns	Mallard Lake outlet
I745N	250	125	160	ns	ns	ns	ns	ns	ns	ns	ns	ns	SW 100th St between 12th and 13th Aves S
I745O1	160	1460	100	4400	800	4000	ns	ns	ns	9000		8800	13th Ave SW and SW 102nd St
I745O2	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL	2000		3400	14th Ave SW and SW 102nd St
I745Q1	5	577	1	21000	1040	11000	ns	ns	9	4400		12000	8th Ave SW and SW 108th St
I745Q2	ns	ns	ns	ns	ns	ns	ns	ns	4	ns	ns	ns	
I745Q3	3	ns	ns	3	ns	ns	3	ns	2	ns	ns	ns	
I745S	61	13	33	1800	53	2600	ns	ns	ns	ns	ns	ns	In Lakewood Park at SE shoreline of lake, d
WCML-14	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL				

Sampled 4/27/2011 Sampled 6/1/2011 Sampled 5/15/2012 Sampled 10/15/2012

TABLE NOTES

Shading: indicates sampled 10/15/2012 for all 3 analytes (ekes, fekes and bacs)

Units: E. coli & fekes in colony forming units/100 mL;
Bacteroides in cells/100 mL.

(from previous table:)

Lo Bacs, hi fekes
A745B
I745J

VERY HIGH BACTEROIDES, HIGH FEKES

Interpretation, definite human waste: Strong signal, nearby

LOCATOR	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	Location	Description
A745B	1800	149	2300	ns	ns	ns	ns	ns	ns	600	ns	750	Hicklin Lake	Pipe pump outlet
I745C1	170	154	81	3500	1358	1200	ns	ns	30	6300	ns	4600	Outfall from r	Corrugated ir In west parking lot feeding into
I745JE	ns	ns	ns	ns	ns	ns	1800	12	1100	27000	ns	19000	11th Ave SW	SE corner
I745JS	ns	ns	ns	ns	ns	ns	ns	1544	110	330	ns	600	15th Ave SW	NW corner
I745K	ns	ns	ns	ns	ns	ns	1		<MDL	ns	ns	ns	Inlet outfall j	Open ditch just east of the parking area for th
I745K1	2300	372000	2100	3800	66038	3100	170	9212	100	2100	ns	3600	Tightline in w	Manhole cov Standpipe configuration; enter
I745K2	ns	ns	ns	ns	ns	ns	ns	ns	<MDL	ns	ns	ns		
I745KK2	2700	5559	1700	2700	5936	1700	8	ns	16	720	ns	5800	16th Ave SW	NE corner cat In street right by fast food place
I745KK2N	ns	ns	ns	ns	ns	ns	ns	ns	9	ns	ns	ns		
I745KK2W	ns	ns	ns	ns	ns	ns	ns	ns	2	ns	ns	ns		
I745KK3	2900	70	4200	7000	2834	2800	ns	ns	1	15000	ns	17000	SW 100th St j	Catchbasin - Off Autozone parking lot
I745KK4	6900	342000	8400	2500	10544	3500	ns	ns	ns	ns	ns	ns	17th Ave SW	Catchbasin - In road triangle. Need cones! V
I745KK5	35	2390	32	4300	2512	4000	ns	ns	ns	3100	ns	5600	S of SW 98th	Catchbasin - on SE corner in sidewalk
I745L	320	350	120	130	357	170	ns	ns	ns	ns	ns	ns	Mallard Lake	Behind fence Have to either hop the fence or
I745N	250	125	160	ns	ns	ns	ns	ns	ns	ns	ns	ns	SW 100th St t	Outlet from c Sample in we -
I745O1	160	1460	100	4400	800	4000	ns	ns	ns	9000	ns	8800	13th Ave SW	Ditch running Outfall just east of 13th
I745O2	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL	2000	ns	3400	14th Ave SW	Manhole - NV In street across from church pa
I745Q1	5	577	1	21000	1040	11000	ns	ns	9	4400	ns	12000	8th Ave SW a	Manhole - SW In street, need cones! Can be v
I745Q2	ns	ns	ns	ns	ns	ns	ns	ns	4	ns	ns	ns		
I745Q3	3	ns	ns	3	ns	ns	3	ns	2	ns	ns	ns		
I745S	61	13	33	1800	53	2600	ns	ns	ns	ns	ns	ns	In Lakewood	Ballfield pipe Very flashy.
WCML-14	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL					
	Sampled 4/27/2011			Sampled 6/1/2011			Sampled 5/15/2012			Sampled 10/15/2012				

TABLE NOTES

Shading: indicates sampled 10/15/2012 for all 3 analytes (ekes, fekes and bacs)

Units: E. coli & fekes in colony forming units/100 mL;

Bacteroides in cells/100 mL.

(from previous tables:)

Non-human animal waste runoff, prob.

A745B

I745JE

I745KK3

I745S

Poss human cont.

I745C1

I745KK2

I745KK3

I745KK5

I745Q1

Our smoking guns
I745K1
I745KK4

Chose I745KK4 to begin up-pipe dye testing, as it bracketed NW corner of Abella study area



HIGH LEVELS & QUESTIONS REMAIN

LOCATOR	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	E.coli	Bac	FC	Location Description	Description
A745B	1800	149	2300	ns	ns	ns	ns	ns	ns	600	ns	750	Hicklin Lake (Lake Hicks)	Pipe pump outlet
I745C1	170	154	81	3500	1358	1200	ns	ns	30	6300	ns	4600	Outfall from north drainage into Hicklin Lake	Corrugated iron pipe in west parking lot
I745JE	ns	ns	ns	ns	ns	ns	1800	12	1100	27000	ns	19000	11th Ave SW and SW 106th St	SE corner
I745JS	ns	ns	ns	ns	ns	ns	ns	1544	110	330	ns	600	15th Ave SW and SW 107th St	NW corner
I745K	ns	ns	ns	ns	ns	ns	1	ns	<MDL	ns	ns	ns	Inlet outfall just NW of Mallard Lake	Open ditch just east of the parking lot
I745K1	2300	372000	2100	3800	66038	3100	170	9212	100	2100	ns	3600	Tightline in western ballfield of Stevedore Park	Manhole cover, Standpipe configuration
I745K2	ns	ns	ns	ns	ns	ns	ns	ns	<MDL	ns	ns	ns		
I745KK2	2700	5559	1700	2700	5936	1700	8	ns	16	720	ns	5800	16th Ave SW and SW 104th St	NE corner catchbasin, In street right by fast lane
I745KK2N	ns	ns	ns	ns	ns	ns	ns	ns	9	ns	ns	ns		
I745KK2W	ns	ns	ns	ns	ns	ns	ns	ns	2	ns	ns	ns		
I745KK3	2900	70	4200	7000	2834	2800	ns	ns	1	15000	ns	17000	SW 100th St just east of 16th Ave SW	Catchbasin - Off Autozone parking lot
I745KK4	6900	342000	8400	2500	10544	3500	ns	ns	ns	ns	ns	ns	17th Ave SW and SW 100th St on NW side	Catchbasin - In road triangle. Needs to be cleaned
I745KK5	35	2390	32	4300	2512	4000	ns	ns	ns	3100	ns	5600	S of SW 98th St on 16th Ave SW	Catchbasin - on SE corner in sidewalk
I745L	320	350	120	130	357	170	ns	ns	ns	ns	ns	ns	Mallard Lake outlet	Behind fence, Have to either hop to get to outlet or go around
I745N	250	125	160	ns	ns	ns	ns	ns	ns	ns	ns	ns	SW 100th St between 12th and 13th St	Outlet from catchbasin, Sample in well
I745O1	160	1460	100	4400	800	4000	ns	ns	ns	9000	ns	8800	13th Ave SW and SW 102nd St	Ditch running, Outfall just east of 13th Ave SW
I745O2	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL	2000	ns	3400	14th Ave SW and SW 102nd St	Manhole - NW, In street across from 14th Ave SW
I745Q1	5	577	1	21000	1040	11000	ns	ns	9	4400	ns	12000	8th Ave SW and SW 108th St	Manhole - SW, In street, need cone
I745Q2	ns	ns	ns	ns	ns	ns	ns	ns	4	ns	ns	ns		
I745Q3	3	ns	ns	3	ns	ns	3	ns	2	ns	ns	ns		
I745S	61	13	33	1800	53	2600	ns	ns	ns	ns	ns	ns	In Lakewood Park at SE shoreline of Stevedore Park	Ballfield pipe, Very flashy.
WCML-14	ns	ns	ns	ns	ns	ns	<MDL	ns	<MDL	ns	ns	ns		
	Sampled 4/27/2011			Sampled 6/1/2011			Sampled 5/15/2012			Sampled 10/15/2012				

TABLE NOTES

Shading: indicates sampled 10/15/2012 for all 3 analytes (ekes, fekes and bacs)

Units: E. coli & fekes in colony forming units/100 mL;
Bacteroides in cells/100 mL.

High fekes, lo bacs
A745B
I745JE
I745KK3
I745S
Non-human animal waste runoff, prob.

High fekes, hi bacs
I745C1
I745KK2
I745KK3
I745KK5
I745O1
I745Q1

High fekes, very hi bacs
I745K1
I745KK4
Definite human waste contamination

Enigmas/unresolved sites:
I745C1...not yet fully investigated
I745JS...why fairly high Bacs and low fekes? Dead Bacs?
I745K1...why fairly high Bacs and low fekes/lowish E coli? Dead Bacs?
I745Q1...not yet fully investigated



Finding & Fixing **Illicit** Connections in White Center

...AN ONGOING CONCERN, HERE AND ELSEWHERE....

King County Drainage & Water Quality
Complaint **Hotline**: 206 296 1900

Thanks for listening today!