

Lower St. Johns River Basin

Thermal Imaging Summary Report

August 31, 2009

Prepared For:



**Contract No. WM913 Task Assignment No. 16
Florida Department of Environmental Protection
2600 Blair Stone Road, MS 3565
Tallahassee, FL 32399
(850) 245-8506**

Prepared By:



**7406 Fullerton Street, Suite 350
Jacksonville, FL 32256
(904) 363-6100**

Fecal Coliform Source Identification Thermal Imaging Summary Report

In an effort to supplement existing information regarding possible sources of fecal contamination to area waters, International Imaging Technologies (IIT), Inc. performed a qualitative aerial infrared thermographic survey designed to identify potential illicit discharges in each of four selected tributaries in Jacksonville, Florida. These tributaries included: Big Fishweir Creek (WBID 2280), McCoy Creek (WBID 2257), Craig Creek (WBID 2297) and Miramar Creek (WBID 2304). Similar endeavors in the past have demonstrated that a great deal of resources is needed to field-verify all of the thermal anomalies identified in the survey. As a result, PBS&J and the City of Jacksonville Environmental Quality Division (COJ EQD) performed pre- and post-flight sampling for fecal coliforms at 33 pre-designated locations intended to bracket IIT results and help target those areas that require additional investigation. All water samples were delivered to the COJ EQD for processing. Post-processed results of the flight were provided by IIT to PBS&J and used in conjunction with existing infrastructure maps, sampling results, and ground-truthing exercises to identify potential pollutant sources. Field-verification efforts (conducted by PBS&J) were limited to Big Fishweir Creek, Miramar Creek and Craig Creek and were completed by August 21, 2009.

Thermal image aerial photography is most effective in winter months due to atmospheric conditions and the difference in temperature between the ambient water and the potential pollutant sources. As such, IIT conducted the flight on February 6, 2009 and all pre- and post-samples were therefore collected on February 5, 2009 and February 7, 2009, respectively (see Appendix A for results). The number of thermal anomalies identified in each of the four basins varied considerably (Table 1). Although this may have strictly been the result of differing numbers of anomalies present within the basins, as well as the relative area of each watershed, the low number of anomalies identified in Miramar Creek, especially along the northern branch, may also be due to the more extensive tree canopy in this area despite winter defoliation. In order to ensure that this area was investigated for potential illicit discharges, PBS&J conducted an intensive field review of the northern branch as part of the field verification process. A field description, approximate location, account of requested follow-up efforts, and conclusions regarding sources associated with the identified thermal anomalies and those potential illicit discharges observed along the northern branch of Miramar Creek are summarized in Appendix B. It should be noted that follow-up actions and conclusions were only identified for those anomalies that appeared to be associated with likely potential sources of fecal contamination. An aerial thermal image, provided by IIT, together with a field photograph of each of the identified anomalies is provided in Appendix C.

Table 1. Overview of identified thermal imaging anomalies in each of the four designated tributaries.

WBID	Stream Miles	Number of Identified Anomalies	Number of Pre-/Post-Flight Sampling Stations
Big Fishweir Creek	5.80	52	8
McCoy Creek	7.85	27	9
Craig Creek	2.13	15	11
Miramar Creek	1.95	9	6

Appendix A

Thermal Imaging Summary Results

Thermal Imaging Sampling Results

Pre-flight					Post-flight					
Sampling Station	Sample Date	Sample Time	Fecal Coliforms (CFU/100mL)	Remarks	Sample Date	Sample Time	Fecal Coliforms (CFU/100mL)	Remarks	Location	Sampling Entity
BIG FISHWEIR CREEK										
BF3	2/6/2009	11:00	2200		2/7/2009	11:05	2245	B	Park St. (East)	PBS&J
TBF5	2/6/2009	8:45	1705	B	2/7/2009	9:05	2300		Amherst St.	COJ EQD
TBF3	2/6/2009	8:55	1100		2/7/2009	9:15	440		Hamilton St. (North)	COJ EQD
Fair	2/6/2009	8:30	660		2/7/2009	8:55	620		Fair St. and Merrimac Ave. upstream of grinder pump	COJ EQD
BF2	2/6/2009	10:45	1967	B	2/7/2009	10:52	279	B	Herschel St.	PBS&J
BF1	2/6/2009	10:15	2164	B	2/7/2009	10:42	1600	B	Greenwood Ave.	PBS&J
TBF1	2/6/2009	10:30	520		2/7/2009	10:46	344	B	Greenwood Ave (Stormwater Outfall)	PBS&J
Herschel	2/6/2009	8:15	3500		2/7/2009	8:45	3900		Little Fishweir at Herschel St.	COJ EQD
MCCOY CREEK										
TMC3	2/6/2009	10:00	16	B	2/7/2009	10:25	16	B	Live Oak Ave	COJ EQD
TMC2	2/6/2009	9:50	1020		2/7/2009	10:15	440		McDuff Ave.	COJ EQD
Saranac	2/6/2009	9:35	33	B	2/7/2009	10:05	49	B	Superior St. Just SE of Amy St. was closed; sampled 1 block upstream at Saranac St.	COJ EQD
MC3	2/6/2009	12:00	279	B	2/7/2009	10:00	213	B	Broadway Ave.	PBS&J
Shearer	2/6/2009	9:10	460		2/7/2009	9:40	580		Between Plum St. and Green St.	COJ EQD
TMC1	2/6/2009	9:25	213	B	2/7/2009	9:50	230	B	Edison Ave. and Cherokee St.	COJ EQD
Leland S	2/6/2009	12:15	230	B	2/7/2009	10:20	82	B	Leland St. South Fork	PBS&J
Leland N	2/6/2009	12:30	1060		2/7/2009	10:14	360	B	Leland St. North Fork	PBS&J
MC1	2/6/2009	10:15	49	B	2/7/2009	10:40	<16		Myrtle Ave.	COJ EQD
MIRAMAR CREEK										
TMR3	2/6/2009	10:45	<16		2/7/2009	11:10	16	B	Emerson Rd. (West)	COJ EQD
TMR2	2/6/2009	11:05	820		2/7/2009	11:20	2100		Brooker Rd.	COJ EQD
MR5	2/6/2009	9:45	4000		2/7/2009	11:28	3400		Orlando Cir. West	PBS&J
Greenridge	2/6/2009	9:30	4000		2/7/2009	11:37	4500		Greenridge Rd. (North)	PBS&J
MR1	2/6/2009	9:15	1229	B	2/7/2009	11:44	2600		San Jose Blvd.	PBS&J
Seep downstream of Greenridge	2/6/2009	10:00	2300						Seep downstream of Greenridge Rd.	PBS&J
CRAIG CREEK										
St. Augustine SW Outfall	2/6/2009	11:30	920		2/7/2009	12:40	3000		St. Augustine Rd. stormwater pond southwest corner outfall	
CC3	2/6/2009	11:50	840		2/7/2009	12:30	2500		Lorimier Rd	COJ EQD
CC1	2/6/2009	12:20	3500		2/7/2009	11:45	2000		River Oaks Park	COJ EQD
TCC1	2/6/2009	12:30	880		2/7/2009	11:35	1491	B	Brookwood Rd	COJ EQD
TCC1 Pipe	2/6/2009	12:35	<16		2/7/2009	11:40	<16		4-inch PVC pipe discharge across from 1023 Brookwood Rd.	COJ EQD
Hendricks	2/6/2009	12:50	1426	B	2/7/2009	12:15	18727	B	Main creek at Hendrick's Ave upstream of River Oaks Park	COJ EQD
Hendricks SW Outfall	2/6/2009	13:15	279	B	2/7/2009	12:05	560		Just south of Hendricks Ave.	COJ EQD
TCC2	2/6/2009	13:30	2400		2/7/2009	12:55	<16		"2nd Trib Start" at end of Thornwood Ln.	PBS&J/COJ EQD
Seep at Hendricks	2/6/2009	13:00	108000	B	2/7/2009	12:20	10727	B	Southeast corner of Hendrick's Ave. and creek	COJ EQD
CC2	2/6/2009	13:00	26000						"2nd Trib Finish" at outfall to creek	PBS&J

Appendix B

Thermal Imaging Anomaly Summary

Thermal Imaging Anomaly Summary

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
BIG FISHWEIR CREEK							
Western Fork							
09_28-60_A	Where Creek emerges from underground conveyance at Lake Shore Blvd. and Royce Ave.	BF3	2200	2245	Just north of Lake Shore Blvd. and Royce Ave. intersection		
10_28-72_A	MS4 culvert with flowing water (no odor)	BF3	2200	2245	550 feet downstream of the Lake Shore Blvd. and creek intersection		
11_29-38_A	MS4 culvert with flowing water (no odor)	BF3	2200	2245	250 feet upstream of the Quan Dr. and Creek intersection		
12_29-54_A	Multiple ground water seeps flowing into the artificial channel	BF3	2200	2245	Clarendon Rd.		
12_29-54_B	MS4 culvert from unnamed tributary/ditch	BF3	2200	2245	Approximately 50 feet upstream of the Clarendon Rd. and creek intersection		
13_29-76_A	Blue 2-inch pipe dripping water (no odor) that originates at private residence	BF3	2200	2245	Approximately midway between Yerkes St. and Clarendon Rd.	COJ EQD investigation verified pipe as heat pump system drain (06/24/09)	COJ EQD
13_29-76_B	Road side swale with culvert that extends under a driveway	BF3	2200	2245	Just south of Yerkes St.		
19_30-176_A	Outfall from an open ditch that flows in close proximity to a dog pen with 2 dogs present	BF3	2200	2245	Just north of Park St.		
Eastern Fork							
20_32-81_A	MS4 outfall draining neighborhood (mixed sewer and OSTDS use) from northeast; high organic matter indicated by foam	TBF3	1100	440	Just southeast of JEA lift station N427 on Plymouth St.	Designated as supplemental sampling station (TBF3B)	FDEP

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Main Channel							
14_29-140_A	NA: pre- and post-flight fecal coliform samples ≤660 CFU/100mL	Fair	660	620	Blanding Blvd. and Glenwood Ave. intersection		
18_30-105_A	NA: on private property; unable to access site	Fair	660	620	1511 Hamilton Street	Investigated by the DCHD, COJ, and SJRWMD; ponding of surface waters in low-lying area (03/31/09)	DCHD, COJ, and SJRWMD
17_30-98_A	NA: pre- and post-flight fecal coliform samples ≤660 CFU/100mL	Fair	660	620	Roosevelt Blvd. and Park St. intersection	Adjacent to stormwater outfall on infrastructure map	
08_27-171_A	NA: pre- and post-flight fecal coliform samples ≤660 CFU/100mL	Fair	660	620	East side of Roosevelt Blvd. and north of Merrimac Ave.		
07_27-158_A	Flow from under rip rap at JEA lift station N116	BF2	1967	279	Merrimac Ave.; JEA lift station N116	COJ EQD sample collection (FC = 500 CFU/100mL; 03/31/09)	COJ EQD
07_27-158_B	Low-lying area; no pipes or odors observed	BF2	1967	279	Merrimac Ave.		
07_27-158_C	Multiple ground water inputs in low-lying area; no odors	BF2	1967	279	Merrimac Ave.		
07_27-158_D	NA: on private property; unable to access site	BF2	1967	279	Merrimac Ave.		
07_27-158_E	NA: on private property; unable to access site	BF2	1967	279	Merrimac Ave.		
07_27-158_F	NA: on private property; unable to access site	BF2	1967	279	Merrimac Ave.		
07_27-158_G	NA: on private property; unable to access site	BF2	1967	279	Merrimac Ave.		
06_30-71_A-C	NA: on private property; unable to access site	BF2	1967	279	Euclid St.		
05_27-146_A-B	NA: on private property; unable to access site	BF2	1967	279	East of Euclid St.		
04_30-45_A	Potential artesian well in main channel	BF2	1967	279	West of Herschel St. behind Harpoon Louie's	Requested follow-up 04/08/09	COJ EQD

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
04_30-45_C-D	Groundwater seep from bank, white discoloration and sulfur odor; no pipes	BF2	1967	279	West of Herschel St. on north bank		
04_30-45_B	Groundwater seep from bank at turbidity barrier, white discoloration and sulfur odor; no pipes observed	NA	NA	NA	East of Herschel St. on south bank		
16_30-37_A-B	NA: on private property; unable to access site	NA	NA	NA	East of Herschel St. on south bank		
03_27-90_A-B	NA: on private property; unable to access site	NA	NA	NA	East of Herschel St. on south bank		
03_27-90_C-D	NA: on private property; unable to access site	NA	NA	NA	Confluence with Little Fishweir Creek		
15_30-09_A	NA: on private property; unable to access site	NA	NA	NA	Confluence with Little Fishweir Creek		
LITTLE FISHWEIR CREEK							
29_35-127_A	Slight flow from parking lot drain (matches picture not GPS coordinates)	Herschel	3500	3900	FCCJ parking lot at MacArthur St.		
28_35-69_B or 28_35-68_B	Standing water appears to have originated from irrigation system in bank of clay tennis courts in Boone Park	Herschel	3500	3900	Boone Park tennis courts		
28_35-69_A	Concrete culvert with 4-inch submerged metal pipe crossing conveyance system	Herschel	3500	3900	Upstream of Walsh St.	Requested that JEA provide identification of submerged metal pipe (06/29/09); pipe identified by JEA (08/21/09) as gravity sewer service connection to 3805 Walsh St.	JEA
27_35-57_A-B	Standing water in low area; no odor (not exact match for GPS coordinates)	Herschel	3500	3900	Between Valencia Rd. and Boone Park Ave.		
26_35-46_A	Stormwater culvert at end of Boone Park Ave. (not exact match for GPS coordinates)	Herschel	3500	3900	Intersection of Boone Park Ave. and creek		
25_35-41_A	Stormwater outfall with sulfur odor	Herschel	3500	3900	Intersection of Herschel St. and creek		

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
24_35-17_A	Blue drainage pipe	BF1	2164	1600	Intersection of Riverside Ave. and creek		
23_33-38_A	Stormwater inlet completely clogged, grey water and bubbles indicating denitrification in channel connecting drop inlet to creek; possible sewage odor; nearby JEA sewer manhole	BF1	2164	1600	Pine Grove Ave. just east of Riverside Ave.	COJ EQD sample collection (FC =1,279 CFU/100mL; 03/30/09); COJ EQD reported possible turbidity violation to Erosion Control Group; Designated as supplemental sampling station (TBF2B)	
22_36-175_C	Concrete stormwater outfall	BF1	2164	1600	South of intersection of St. Johns Ave. and Montgomery Pl.		
22_36-175_B	~1.5 inch PVC pipe; no flow	BF1	2164	1600	1808 Montgomery Pl.		
22_36-175_A	Stormwater outfall; ~20 feet upstream is submerged iron pipe with no apparent connection	BF1	2164	1600	Intersection of Greenwood Ave. and creek		
21_33-22_A	Stormwater outfall sampled as site TBF1	TBF1	520	344	Stormwater outfall on Greenwood Ave.		
21_33-22_B	NA: on private property; unable to access site; infrastructure map indicates likely coincides with stormwater outfall	NA	NA	NA	Downstream of Greenwood Ave.		
02-27-77_A	NA: on private property; unable to access site;	NA	NA	NA	Mouth of Big Fishweir Creek		
01-27-48_A	2 pipes extending out from seawall (drainage)	NA	NA	NA	Mouth of Big Fishweir Creek		
01-27-48_B	Flowing stormwater outfall	NA	NA	NA	Mouth of Big Fishweir Creek		
MIRAMAR CREEK							
Main Channel							
09_14-85_A	NA: outside of the revised WBID boundaries	NA	NA	NA	East of St. Augustine Rd., south of Thomas Ct.		
08_12-24_A	NA: outside of the revised WBID boundaries	NA	NA	NA	East of St. Augustine Rd., south of Emerson St.		

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
07_12-01_A	NA: outside of the revised WBID boundaries	NA	NA	NA	East of St. Augustine Rd., southwest of Brido Rd.		
06_09-03_A	Metal fence along back of property adjacent to wooded area; beer, liquor bottles and storage drums scattered; no surface waters or point sources identified	TMR2	820	2100	Behind 782 Emerson Rd.		
Northern Branch							
04_07-12_A	Stormwater outfall to Colonial Manor Pond	Greenridge	4000	4500	Northwest corner of Colonial Manor Pond		
NA	Northern Branch Pipe 10: white PVC pipe over concrete stormwater outfall	Greenridge	4000	4500	East bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
NA	Northern Branch Pipe 9: black corrugated pipe possibly extending from property with white house	Greenridge	4000	4500	West bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09); Confirmed gutter drain as of 07/01/09	COJ EQD
NA	Northern Branch Pipe 8: black corrugated pipe with evidence of recent flow extending from property with brick house	Greenridge	4000	4500	West bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09); Confirmed gutter drain as of 07/01/09	COJ EQD
NA	Northern Branch Pipe 7: concrete pipe with no evidence of flow	Greenridge	4000	4500	East bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
NA	Northern Branch Pipe 6: blue pipe with screen at end with no evidence of flow	Greenridge	4000	4500	East bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
NA	Northern Branch Pipe 5: black plastic pipe extending from concrete on property with tan house and wood fence (same property as Pipe 3)	Greenridge	4000	4500	West bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
NA	Northern Branch Pipe 4: metal pipe extending from property with brick house	Greenridge	4000	4500	East bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
NA	Northern Branch Pipe 3: black plastic pipe with evidence of recent flow extending from property with tan house and wood fence	Greenridge	4000	4500	West bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
NA	Northern Branch Pipe 2: metal pipe; grey film in water downstream	Greenridge	4000	4500	West bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
NA	Northern Branch Pipe 1: metal pipe with no evidence of flow	Greenridge	4000	4500	West bank of north branch between Colonial Manor Pond outfall and JEA lift station S505	Requested follow-up (04/24/09)	COJ EQD
Main Channel							
02_01-63_A	Channel is dammed up by debris; almost stagnant upstream of dam with flow downstream; 2 groundwater seeps with white coloration enter creek from north bank downstream of signal	MR1	1229	2600	In wooded area behind ~ 1204 Morvenwood Rd.	Requested follow-up 04/24/09	COJ EQD
03_05-23_A	Rivulets of standing water in tidal area (thermal imaging picture labeled as 03_25-23_A)	NA	NA	NA	Mouth of Miramar Creek		
01_02-01_A	Rivulets of standing water in tidal area	NA	NA	NA	Mouth of Miramar Creek		
05_07-52_A	NA: outside of WBID boundary	NA	NA	NA	East bank of St. Johns River, north of Miramar Creek		
CRAIG CREEK							
North Fork							
10_23-08_A	NA: on private property; unable to access site	CC3	840	2500	The end of Westmont St., adjacent to I-95		

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
Main Channel							
09_17-56_A	Landscape pond in wooded area adjacent to residence	Hendricks	1426	18727	South side of main channel between Fieldston Ln. and Thornwood Ln.		
08_17-53_A	Water leak from JEA water pump station S506	Hendricks	1426	18727	JEA Water Pump station S506 at 2782 Southwood Ln.		
07_17-45_A	Stormwater outfall to vegetated ditch; evidence of recent, unreported SSO at adjacent manhole	CC1	3500	2000	South side of #2750 Hendricks Ave. In River Oaks Park	Evidence of SSO reported to JEA 07/15/09; confirmed operating properly upon inspection-pending additional inspection as of 08/20/09	JEA
07_17-45_B	Low-lying area in woods; no pipes or odors observed	CC1	3500	2000	In woods at the end of Green Bay Ln.		
07_17-45_C	Stormwater outfall; there is a soft dip in grass adjacent to creek that possibly holds water during rain events a few feet downstream of outfall	CC1	3500	2000	Immediately downstream of stormwater outfall entering River Oaks Park from Hendricks Ave.		
06_26-70_A	Stormwater outfall clogged with grass clippings	CC1	3500	2000	Stormwater outfall from Brookwood Rd. into River Oaks Park		
05_17-32_A	NA: marshy area on private property; unable to access site	NA	NA	NA	Just downstream of River Oaks Park on south side of Craig Creek; upstream of confluence with southern branch		
05_17-32_B	NA: marshy area on private property; unable to access site	NA	NA	NA	Just downstream of River Oaks Park on south side of Craig Creek; upstream of confluence with southern branch		

Thermal Imaging Anomaly	Field Description	Nearest Downstream Pre-/Post-Flight Station	Pre-flight Fecal Coliform Concentration (CFU/100mL)	Post-flight Fecal Coliform Concentration (CFU/100mL)	Approximate Location	Requested Follow-up and Conclusion	Responsible Agency
04_17-24_A	NA: marshy area on private property; unable to access site	NA	NA	NA	Just downstream of River Oaks Park on south side of Craig Creek; upstream of confluence with southern branch		
03_17-13_A or 03_17-03_A	NA: marshy area on private property; unable to access site	NA	NA	NA	Just downstream of River Oaks Park on south side of Craig Creek; downstream of confluence with southern branch		
03_17-13_B or 03_17-03_B	NA: marshy area on private property; unable to access site	NA	NA	NA	Just downstream of River Oaks Park on north side of Craig Creek; downstream of confluence with southern branch		
02_26-106_A	NA: marshy area on private property; unable to access site	NA	NA	NA	Just upstream of confluence with the St. Johns River on south side of Craig Creek		
01_16-80_A	NA: outside of WBID boundary	NA	NA	NA	East bank of St. Johns River, north of Craig Creek		

Appendix C

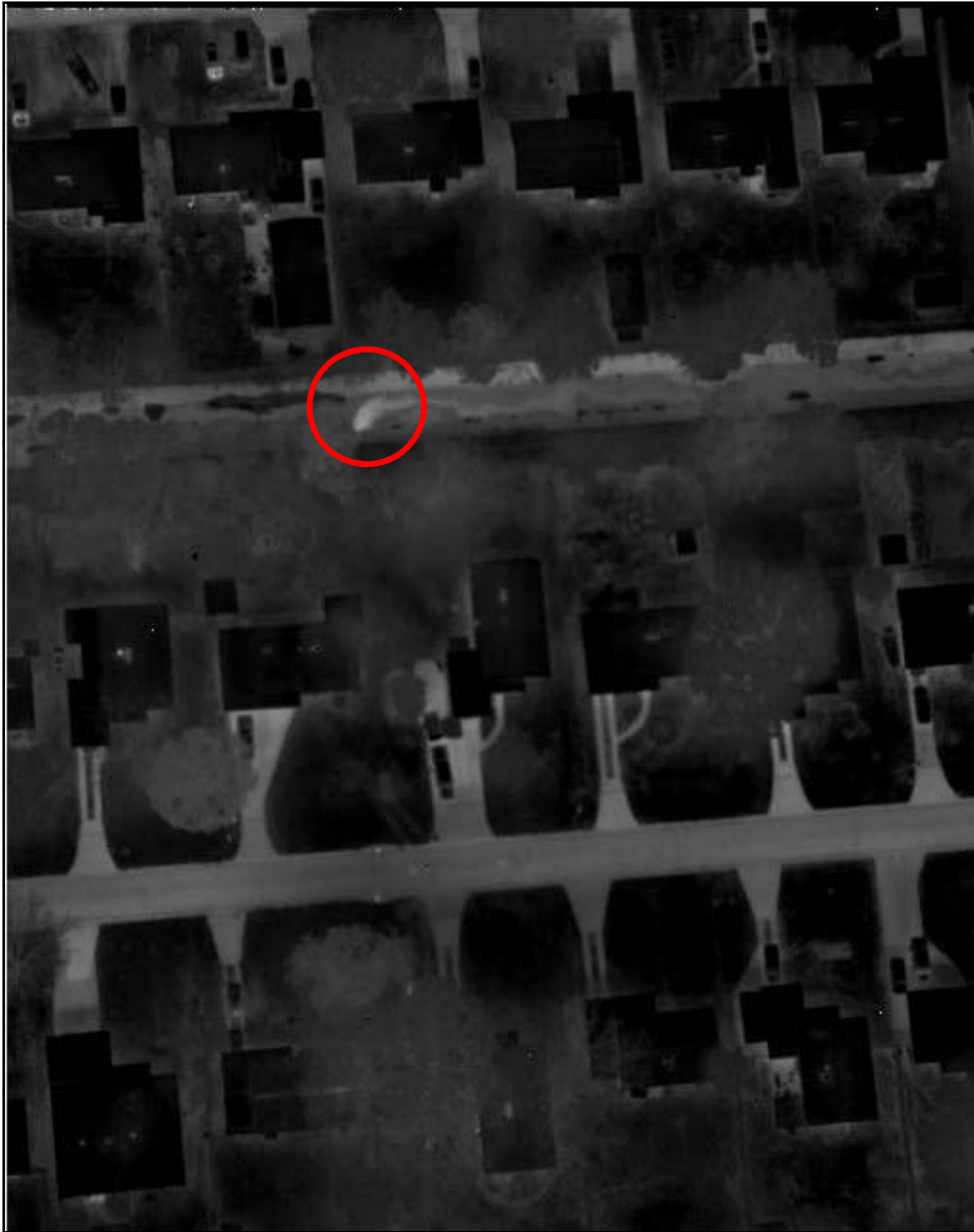
Aerial and Field Photographs of Thermal Anomalies

Big Fishweir Creek



Thermal Anomaly 09_28-60_A

Big Fishweir Creek



Thermal Anomaly 10_28-72_A

Big Fishweir Creek



Thermal Anomaly 11_29-38_A

Big Fishweir Creek



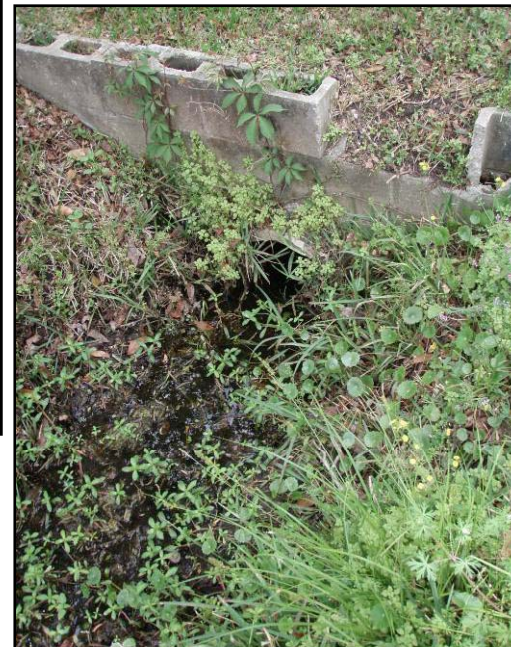
Thermal Anomaly 12_29-54_B



Thermal Anomaly 12_29-54_A

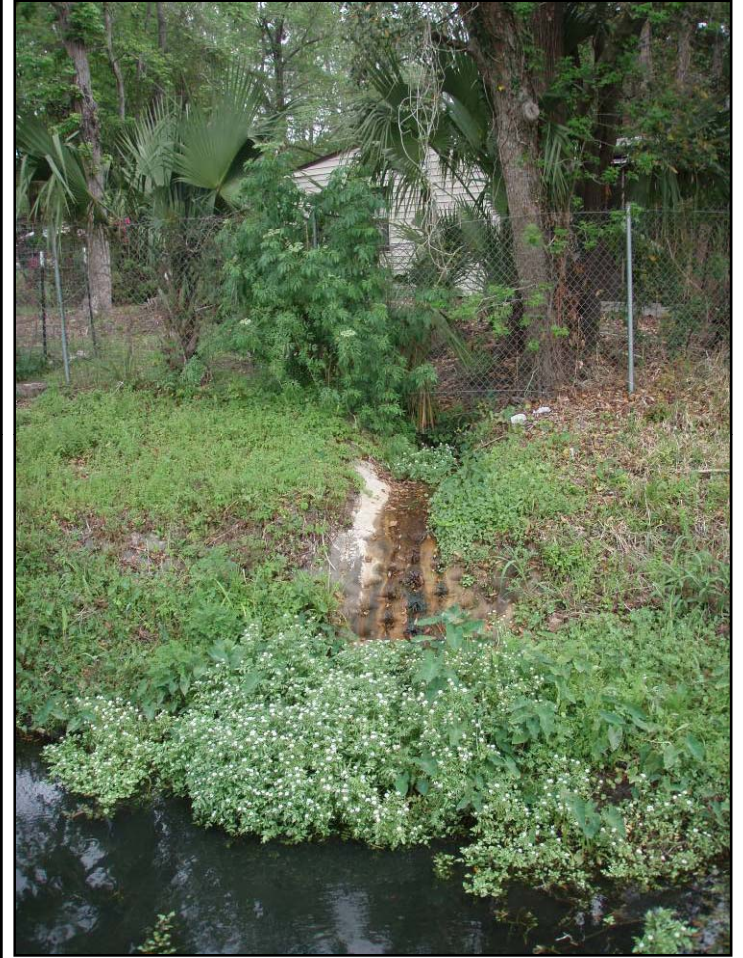
Big Fishweir Creek

Thermal Anomaly 13_29-76_A



Thermal Anomaly 13_29-76_B

Big Fishweir Creek



Thermal Anomaly 19_30-176_A

Big Fishweir Creek



Thermal Anomaly 20_32-81_A

Big Fishweir Creek



Thermal Anomaly 14_29-140_A

Big Fishweir Creek



Thermal Anomaly 18_30-105_A

Big Fishweir Creek

Thermal Anomaly 17_30-98_A



Big Fishweir Creek

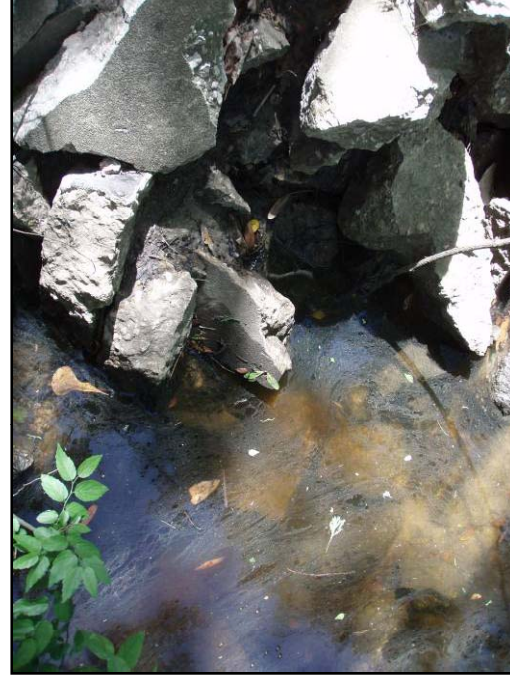


Thermal Anomaly 08_27-171_A

Big Fishweir Creek



Thermal Anomaly 07_27-158_A



Thermal Anomaly
07_27-158_B

Thermal Anomaly
07_27-158_C



Big Fishweir Creek



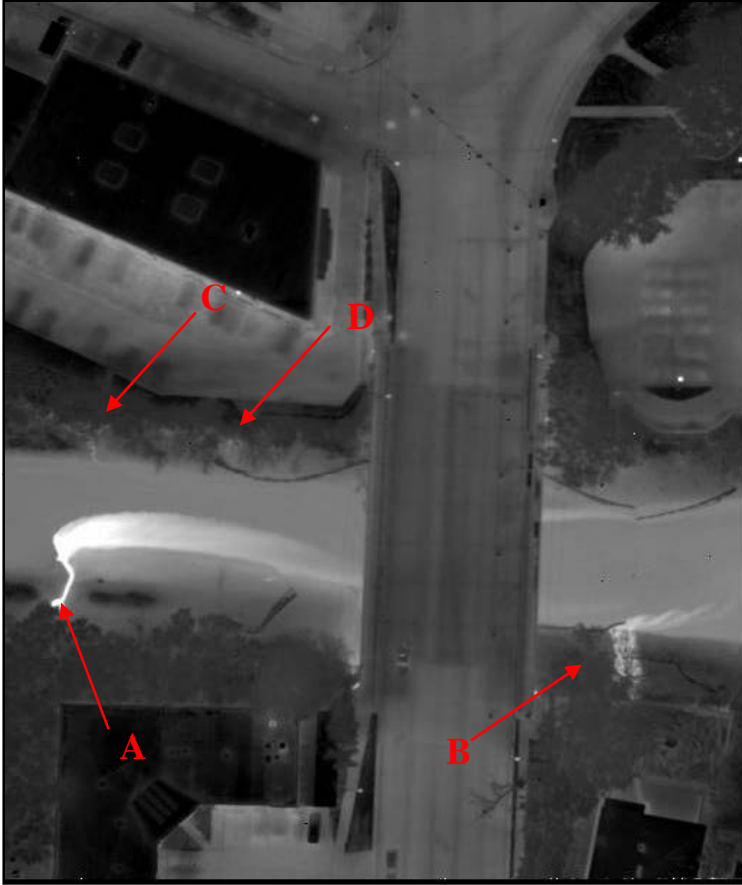
Thermal Anomaly 06_30-71_A-C

Big Fishweir Creek



Thermal Anomaly 05_27-146_A-B

Big Fishweir Creek



**Thermal Anomaly
04_30-45_A**

**Thermal Anomaly
04_30-45_B**



**Thermal Anomaly
04_30-45_C**

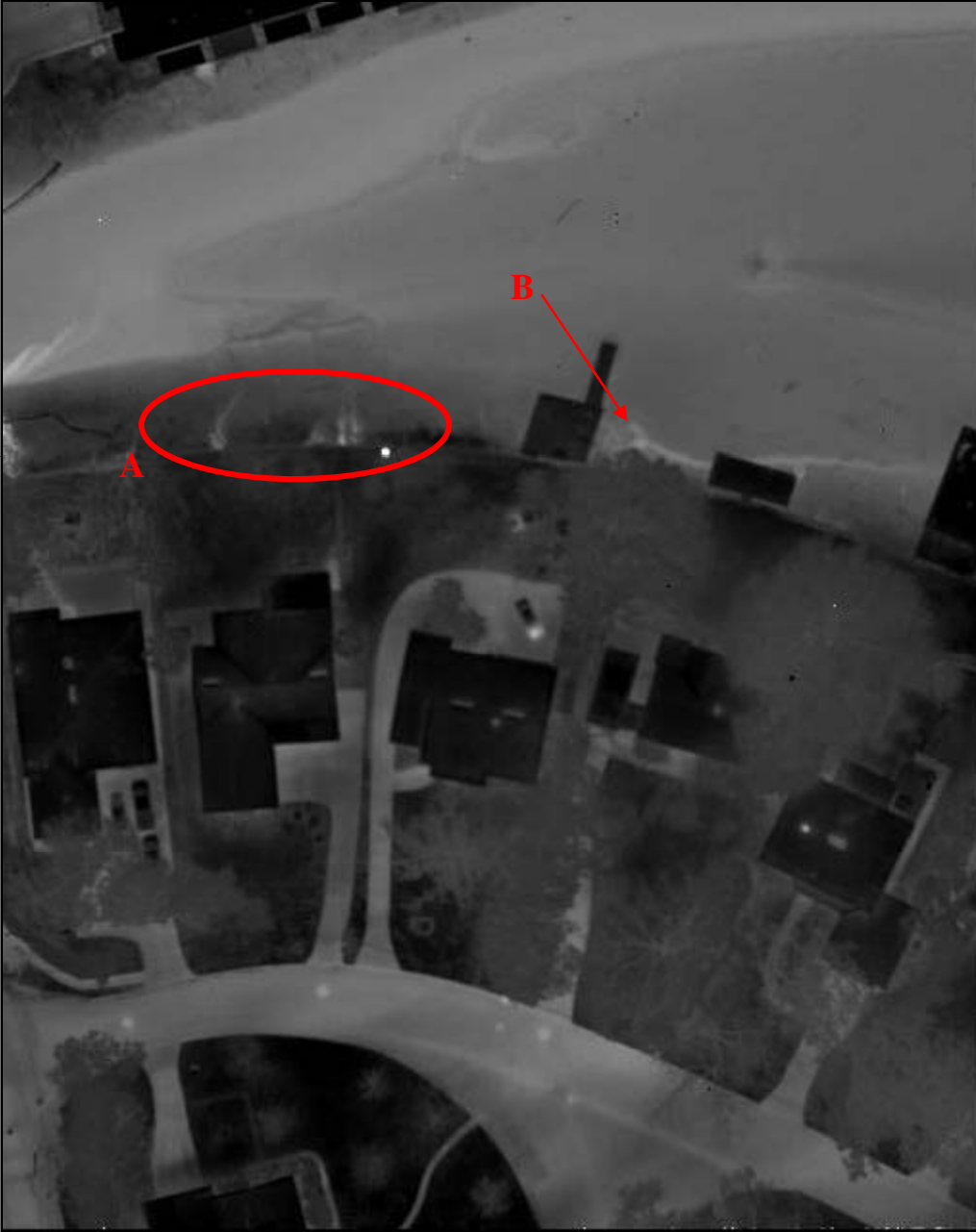


**Thermal Anomaly
04_30-45_D**



Big Fishweir Creek

Thermal Anomaly 16_30-37_A-B



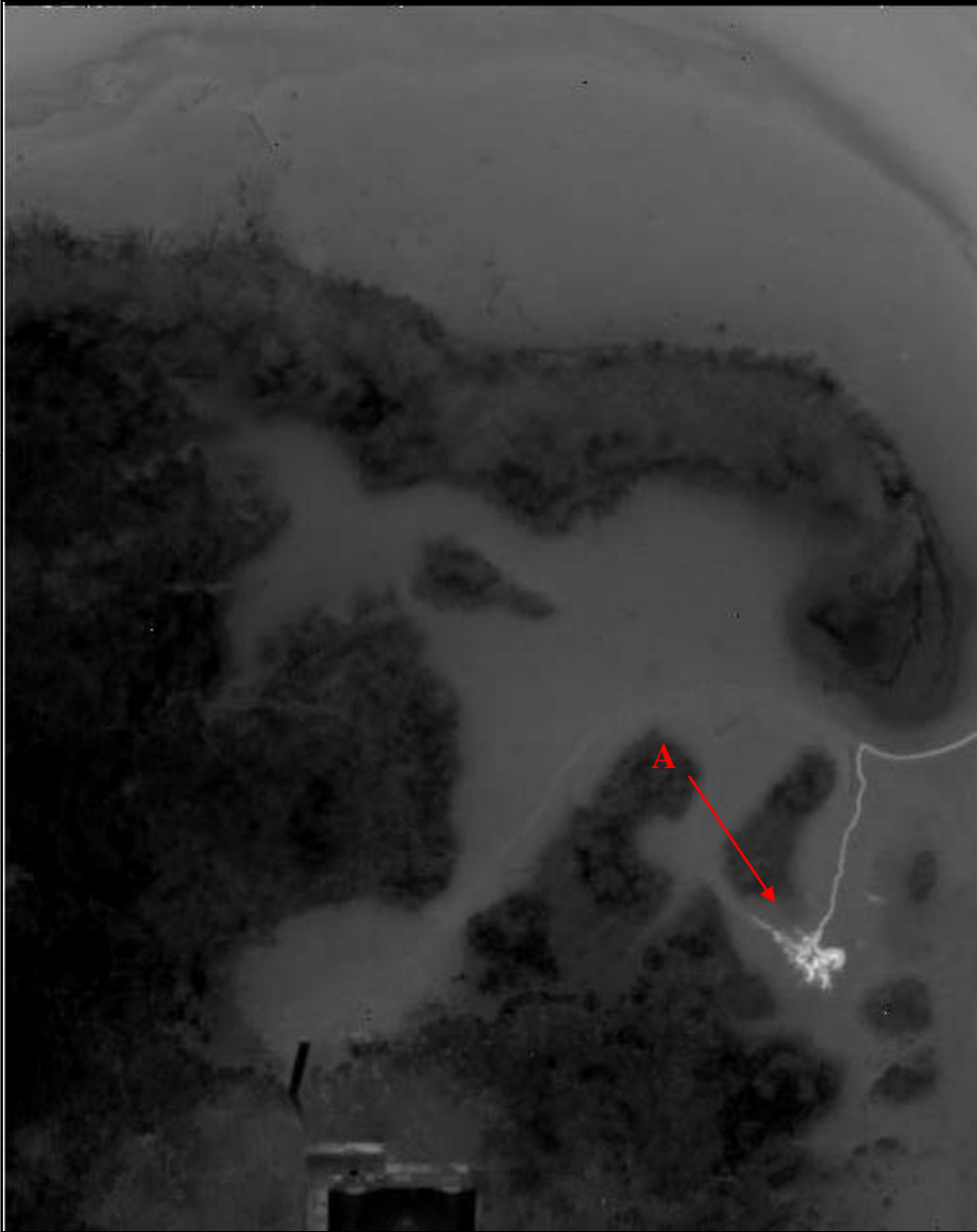
Big Fishweir Creek



Thermal Anomaly 03_27-90_A-D

Big Fishweir Creek

Thermal Anomaly 15_30-09_A



Big Fishweir Creek



Thermal Anomaly
29_35-127_A



Big Fishweir Creek

Thermal Anomaly

28_35-69_A



Thermal Anomaly
28_35-69_B or
28_35-68_B



Big Fishweir Creek



**Thermal Anomaly
27_35-57_A-B**



Big Fishweir Creek



Thermal Anomaly
26_35-46_A



Big Fishweir Creek



Thermal Anomaly
25_35-41_A



Big Fishweir Creek



Thermal Anomaly
24_35-17_A



Big Fishweir Creek



Thermal Anomaly
23_33-38_A



Big Fishweir Creek



**Thermal Anomaly
22_36-175_C**



**Thermal Anomaly
22_36-175_B**



**Thermal Anomaly
22_36-175_A**

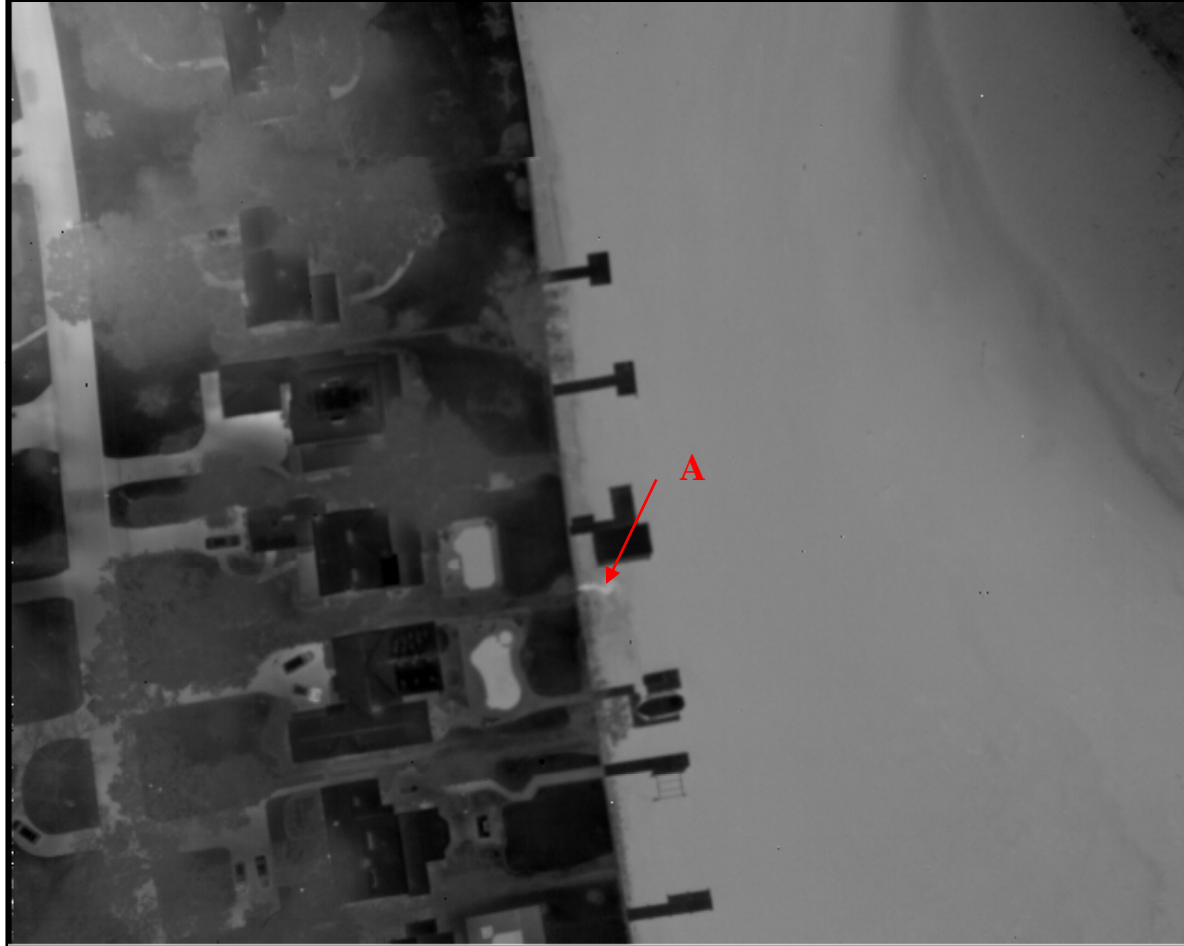
Big Fishweir Creek



Thermal Anomaly
21_33-22_A

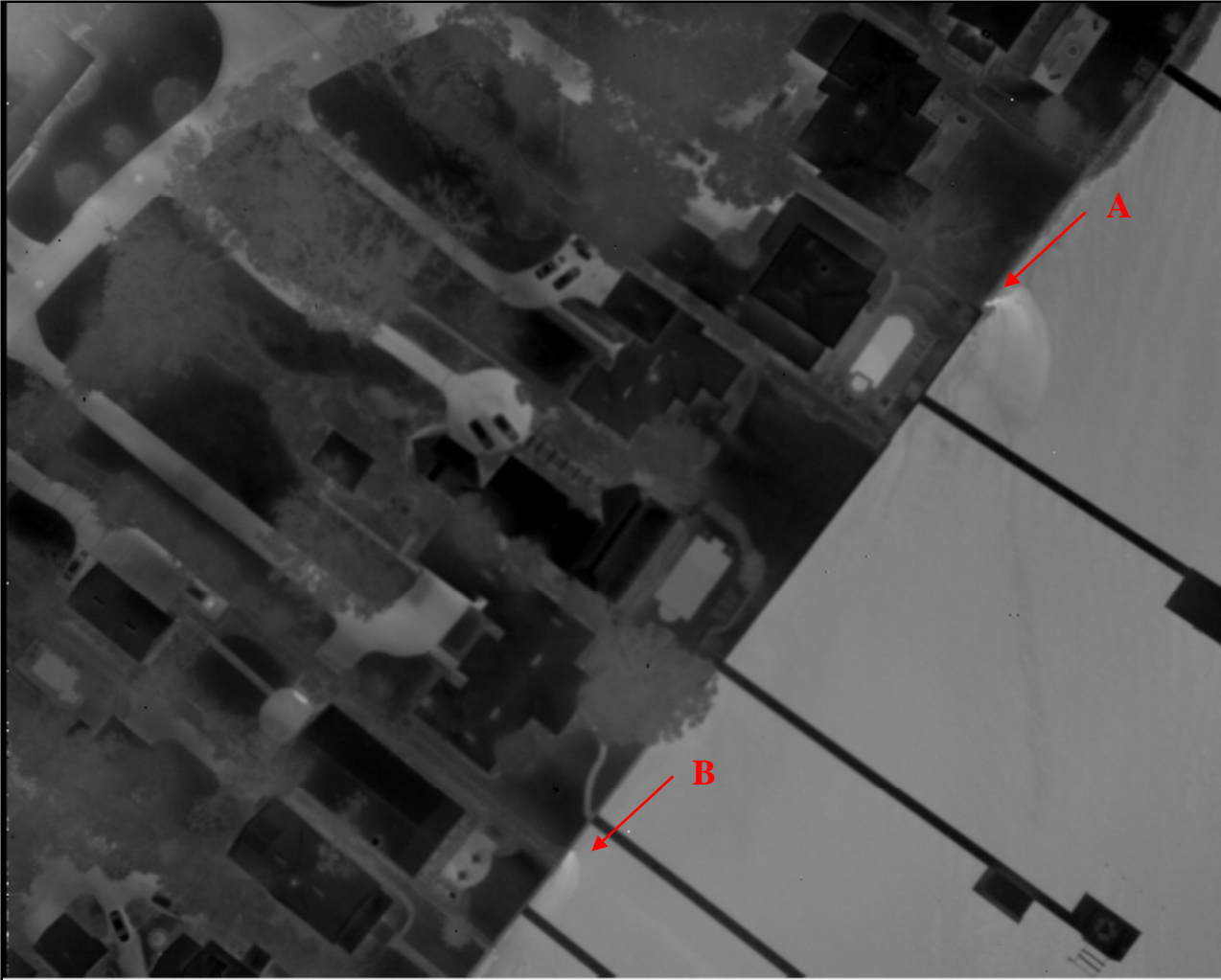


Big Fishweir Creek



Thermal Anomaly
02_27-77_A

Big Fishweir Creek



Thermal Anomaly
01_27-48_A-B

Miramar Creek



Thermal Anomaly
09_14-85_A

Miramar Creek



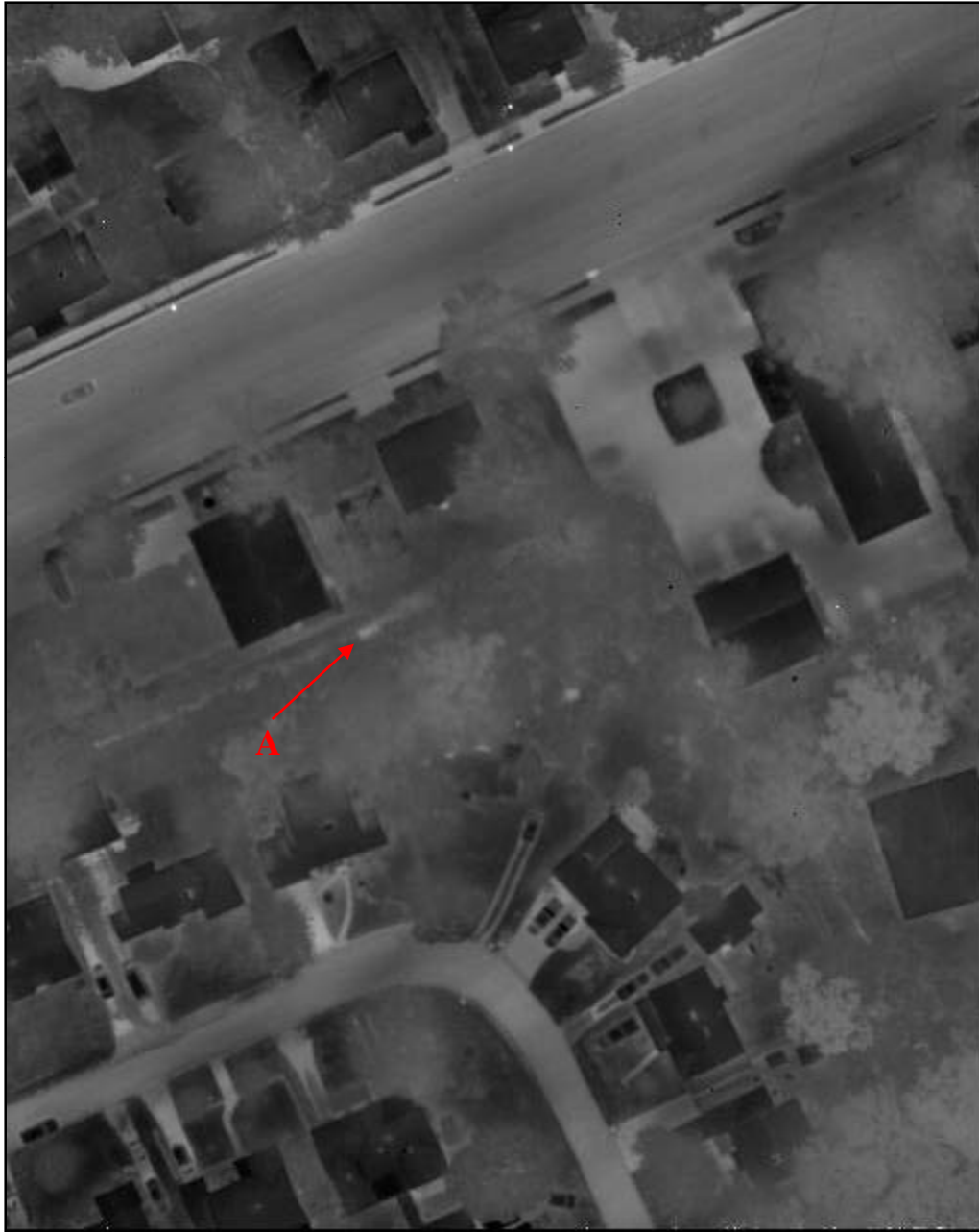
Thermal Anomaly
08_12-24_A

Miramar Creek



Thermal Anomaly
07_12-01_A

Miramar Creek



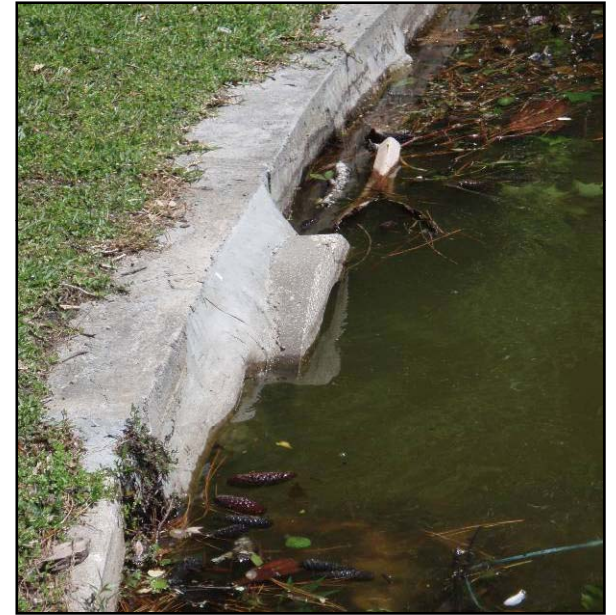
Thermal Anomaly
06_09-03_A



Miramar Creek



**Thermal Anomaly
04_07-12_A**



Miramar Creek



**Thermal Anomaly
02_01-63_A**

Miramar Creek



Thermal Anomaly
03_05-23_A or
03_25-23_A



Miramar Creek



Thermal Anomaly
01_02-01_A



Miramar Creek



Thermal Anomaly
05_07-52_A

Miramar Creek



**Northern Branch
Pipe 10**

**Northern Branch
Pipe 9**



Miramar Creek



Northern Branch
Pipe 8

Northern Branch
Pipes 6 and 7



Miramar Creek



**Northern Branch
Pipe 5**



**Northern Branch
Pipe 4**

Miramar Creek



**Northern Branch
Pipe 3**

Miramar Creek

Northern Branch
Pipe 1



Northern Branch
Pipe 2



Craig Creek



Thermal Anomaly
10_23-08_A

Craig Creek



Thermal Anomaly
09_17-56_A



Craig Creek



Thermal Anomaly
08_17-53_A



Craig Creek



Thermal Anomaly
07_17-45_A



Thermal Anomaly
07_17-45_B



Thermal Anomaly
07_17-45_C



Craig Creek



Thermal Anomaly
06_26-70_A



Craig Creek



Thermal Anomaly
05_17-32_A-B

Craig Creek



Thermal Anomaly
04_17-24_A

Craig Creek



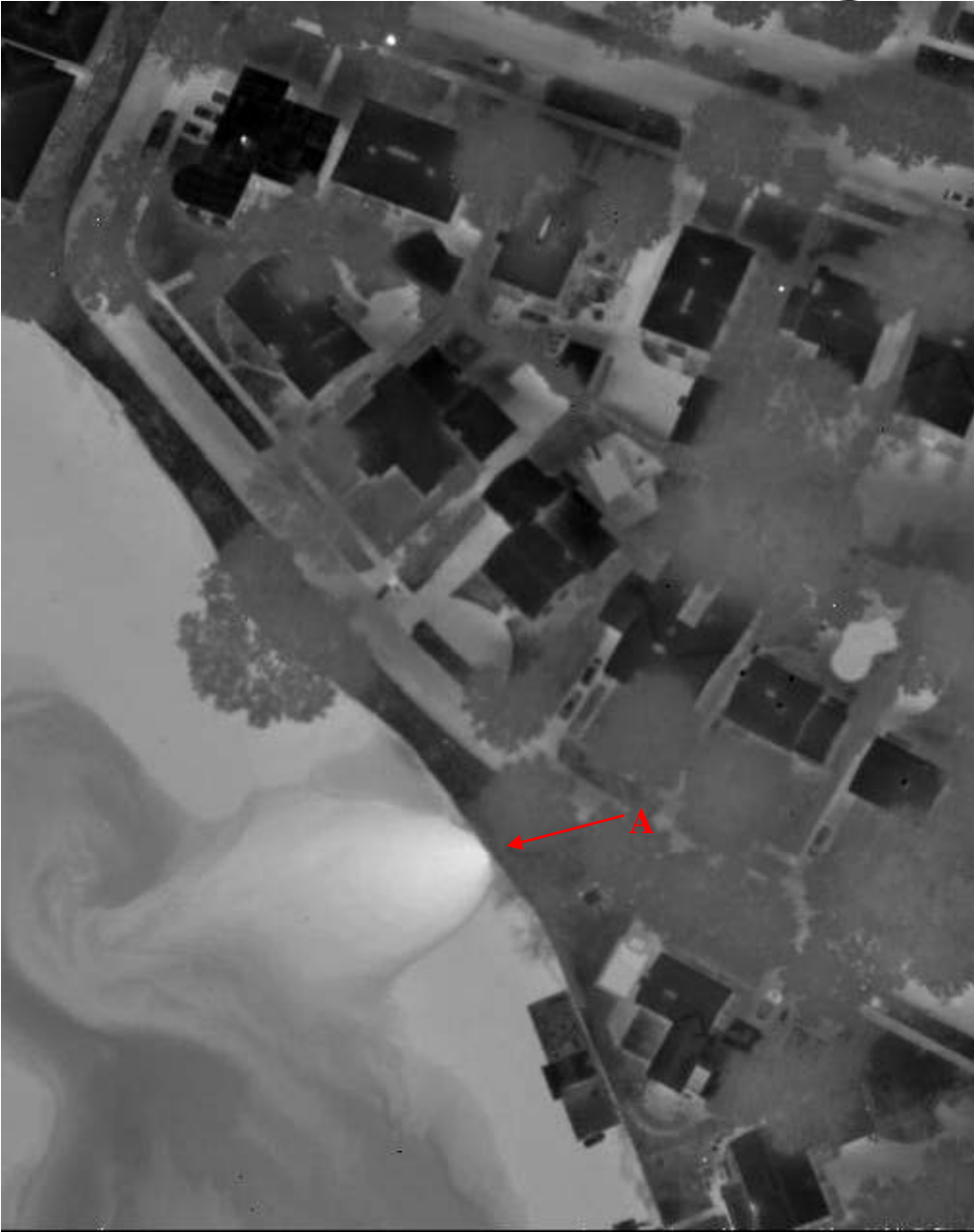
Thermal Anomaly
03_17-13_A-C or
03_17-03_A-C

Craig Creek



Thermal Anomaly
02_26-106_A

Craig Creek



Thermal Anomaly
01_16-80_A