

MEMORANDUM

DATE: May 21, 2013

TO: Brian Dissette, City of South Haven
Roger Huff, City of South Haven
Amanda Morgan, City of South Haven

FROM: Christopher J. Cook, PE

CC: Cindy Clendenon, MDEQ
Marcus Tironi, MDEQ
Timothy R. Drews, P.E., PTOE, Abonmarche
Tony McGhee, Abonmarche
Daniel A. Dombos, PE, Abonmarche

RE: City of South Haven – Sewer Study Progress Report

The following will summarize our progress to-date on the City of South Haven Sewer Study:

UTILITY MAPPING

We have completed this work. This task entailed compiling City record drawings, maps and field data into a comprehensive sanitary sewer system map. We converted city GIS information into AutoCAD for presentation, modeling, field investigation and study purposes.

FIELD INVESTIGATION AND DATA REVIEW

We have completed field work on the sewer lines to determine the size and slope of key runs and mapping that information for the modeling effort. We completed further investigation of the sewers in the Peterson Ravine Interceptor upstream of Clinton Street to the city limits. A significant portion of the I/I appears to be coming from the Peterson Ravine Interceptor and this is the basis for additional metering along the interceptor and its tributaries. An amendment to the S2 Grant will be sought to fund this additional work.

COMPUTER MODELING AND FLOW MONITORING

Recent efforts have focused on the computer modeling phase. Computer modeling, using calibration methods to adjust and fine tune the model will ensure that the results closely match actual flows observed during metering. The results will be used to predict the system response during certain large scale wet weather events (25 year, 24 hour storm). Unfortunately, the dry weather in 2012 made accurate modeling quite difficult, especially in the areas tributary to the interceptor. After additional metering is completed the model will be recalibrated and re-run. That will be in the fall of 2013.

SMOKE TESTING

We completed smoke testing of several key areas in the south-central portion of the City in June 2012 and presented the results to the BPU at that time. With the recent reaction of the Kalamazoo St., Main and other Lift Stations to the recent rains we are proposing to complete additional smoke testing in the LS tributary areas to further identify connection points for Inflow. This will also be part of the S2 amendment request.

SEWER TELEVISION

This work has been completed. We have reviewed the results and prepared a summary of the findings for inclusion in the SRF Project Plan. Excerpts of this are attached for your review.

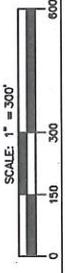
SRF PROJECT PLAN

We are roughly 70% complete with this task with the remaining work expected to be completed following the additional metering/modeling. It is expected that the final plan will be submitted to DEQ in the spring of 2014.





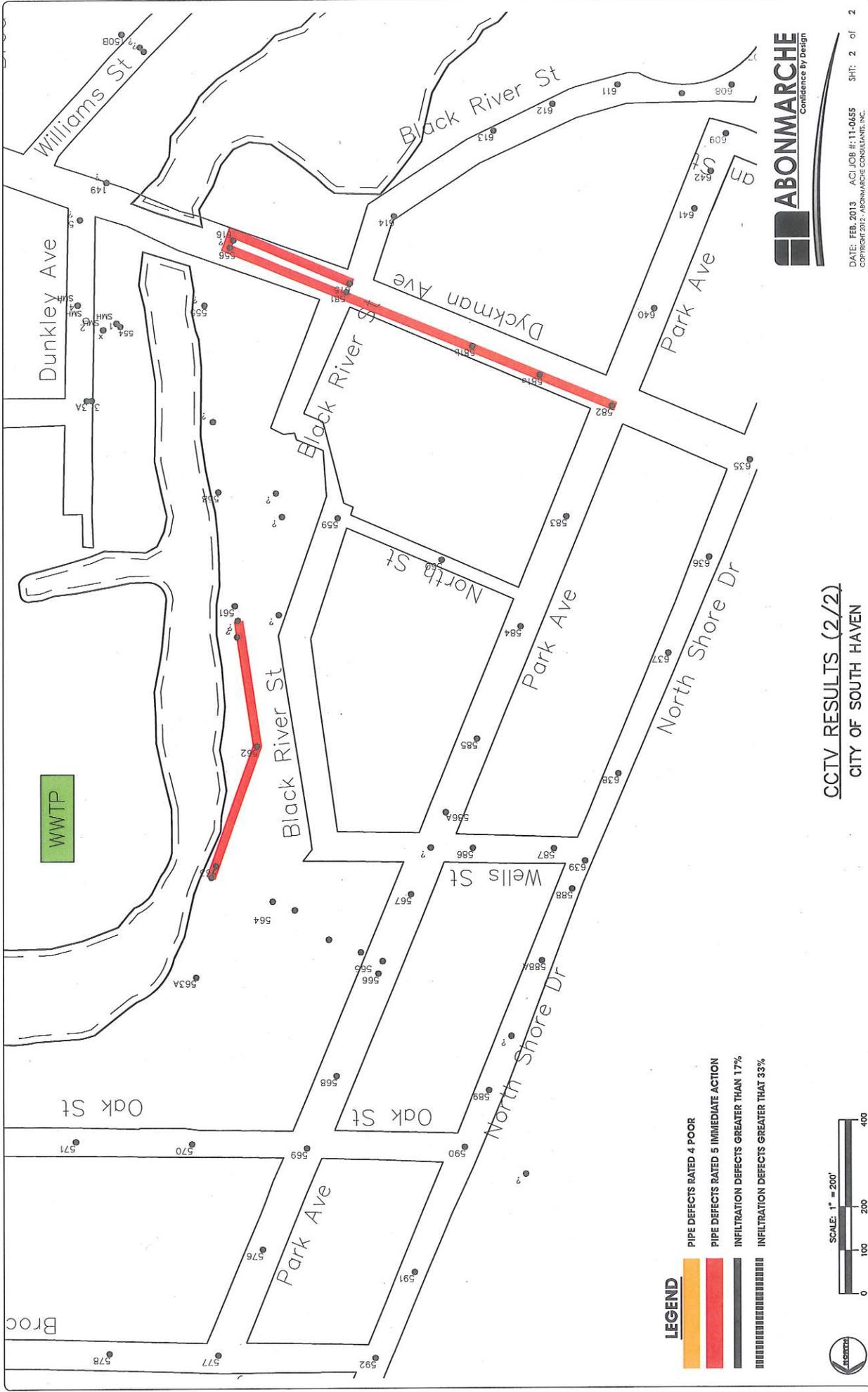
- LEGEND**
- PIPE DEFECTS RATED 4 POOR
 - PIPE DEFECTS RATED 5 IMMEDIATE ACTION
 - INFILTRATION DEFECTS GREATER THAN 17%
 - INFILTRATION DEFECTS GREATER THAN 33%



CCTV RESULTS (1/2)
CITY OF SOUTH HAVEN



E:\CIVIL_3D\ENGIN\11-0455 SOUTH HAVEN MAPING.dwg, FIG CCTV RES 1, 5/21/2013 6:06:29 PM, ddbomb, 1:1



DATE: FEB. 2013 ACI JOB #: 11-0455
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CCTV RESULTS (2/2)
 CITY OF SOUTH HAVEN

- LEGEND**
- PIPE DEFECTS RATED 4 POOR
 - PIPE DEFECTS RATED 5 IMMEDIATE ACTION
 - INFILTRATION DEFECTS GREATER THAN 17%
 - INFILTRATION DEFECTS GREATER THAN 33%



CCTV Grade Count report

Printed on
02/26/2013

Client City of South Haven
Project Sanitary Sewer
Location

Work Order
Project Start 12/18/2012
UOM Ft
Start Tape 1
Setups 98

Database H\111-0655 SOUTH HAVEN SEWER SYSTEM EVALUATION\SH Printed on 02/18/2013

Setup	To Manhole		Svy length	Pipe		Grade count							Structural conditions							O and M Conditions							Misc		
	From Manhole	Material		Diameter	Material	5	4	3	2	1	0	Break in pipe	Collapse	Cracks	Fracture	Deformation	Defective Joints	Defective Lining	Defective Taps	Roots	Grease	Encrustation & Scale	Settled Deposits	Infiltration	Obstruction	Line Deviations	Water Level +20%	Survey Abandoned	Camera Underwater
33	MH 363	MH 361	264.4	10	Vitrified Clay Pipe	0	1	2	10	2	14	7							2		50	51							
34	MH 361	MH 358	316.4	10	Vitrified Clay Pipe	0	0	2	11	7	19	7	1						1	5	5	4					2		
35	MH 358	MH 357	326.1	10	Vitrified Clay Pipe	0	0	1	25	1	32	4							3		27	28					2		
36	MH 357	MH 354	308.1	10	Vitrified Clay Pipe	0	0	1	17	3	21	7	1								19	17					2		
37	MH 354	MH 351	307.9	10	Vitrified Clay Pipe	0	1	1	16	0	31	2	1						1		23	29					3		
38	MH 351	MH 346S	101.9	10	Vitrified Clay Pipe	1	0	0	10	0	10								1		10	10	1				2	1	
39	MH 358	MH 360	94.7	8	Vitrified Clay Pipe	0	0	0	7	0	11	1							1		12	13							1
40	MH 358	MH 359	377.0	8	Vitrified Clay Pipe	0	0	1	15	11	27	8								15	12	12							
41	MH 356	MH 354	134.4	8	Vitrified Clay Pipe	1	0	0	7	2	14	2							1	3	2	4							1
42	MH 349	MH 348	203.4	8	Vitrified Clay Pipe	0	0	3	1	12	12	1							19										
43	MH 348	MH 347A	220.5	8	Vitrified Clay Pipe	0	0	4	4	14	10	7							1	20						1	1		
44	MH 347A	MH 346S	302.0	8	Vitrified Clay Pipe	3	6	3	23	8	9	21	6	9					2	6						2	7		
45	MH 346S	MH 350	377.3	8	Vitrified Clay Pipe	0	3	9	18	25	24	27	2	2					2	21						3	2	1	1
46	MH 351B	MH 351A	46.5	8	Vitrified Clay Pipe	1	0	0	0	5	5	1								5									1
47	MH 351A	MH 351	214.1	8	Vitrified Clay Pipe	0	0	2	11	4	10	4							2	2	39	40				2	1		
48	MH 347	MH 339A	194.2	8	Vitrified Clay Pipe	0	0	9	7	12	12								3	28	10						3	1	
49	MH 339A	MH 338A	31.4	8	Vitrified Clay Pipe	0	0	2	0	3	3									5									
50	MH 414	MH 413	48.3	8	Vitrified Clay Pipe	0	2	2	3	0	4								1		10	13				1	1		
51	MH 413	MH 414	148.4	8	Vitrified Clay Pipe	0	0	5	7	0	8								2		29	33				4	1		
52	MH 413	MH 412	68.1	8	Vitrified Clay Pipe	0	0	2	4	0	5	1							2		13	14						1	
53	MH 412	MH 413	195.5	8	Vitrified Clay Pipe	0	0	2	5	0	12	3									40	40							1
54	MH 412	MH 410	260.9	8	Vitrified Clay Pipe	0	0	2	9	0	16	1									47	45				45	1		
55	MH 400	MH 399	197.9	8	Vitrified Clay Pipe	0	0	6	9	1	21	8									5	15				4			
56	MH 399	MH 398	208.9	8	Vitrified Clay Pipe	0	0	7	19	0	14	11									30	34				4			
57	MH 398	MH 397	54.9	8	Vitrified Clay Pipe	0	1	0	6	1	5	1									11	10				1	1		
58	MH 397	MH 398	11.4	8	Vitrified Clay Pipe	0	0	0	1	0	1										1	1							1
59	MH 397	MH 396	134.4	8	Vitrified Clay Pipe	0	0	1	13	0	14	1									17	18				4			
60	MH 396	MH 395	18.1	8	Vitrified Clay Pipe	0	0	1	1	4	3								2	4									1
61	MH 395	MH 396	99.1	8	Vitrified Clay Pipe	0	0	1	2	0	3								1										1
62	MH 395	MH 395A	331.1	8	Vitrified Clay Pipe	2	0	5	19	22	30	9							2	22	19	18							1
63	MH 393	MH 395A	41.7	8	Polyvinyl Chloride	0	0	0	0	0	1																		
64	MH 411A	MH 411	195.4	8	Vitrified Clay Pipe	0	0	1	10	0	17	2							1		8	8							3

CCTV Grade Count report

Printed on
02/26/2013

Client: City of South Haven
Project: Sanitary Sewer
Location

Work Order
Project Start 12/18/2012
UOM Ft Setups 98
Start Tape 1

Database H:\111-0655 SOUTH HAVEN SEWER SYSTEM EVALUATION\ISH Printed on 02/18/2013

Setup	To Manhole		Svy length	Diameter	Material	Grade count					Structural conditions								O and M Conditions					Misc				
	From Manhole					5	4	3	2	1	0	Break in pipe	Collapse	Cracks	Fracture	Deformation	Defective Joints	Defective Lining	Defective Taps	Roots	Grease	Encrustation & Scale	Settled Deposits	Infiltration	Obstruction	Line Deviations	Water Level +20%	Survey Abandoned
65	MH 411A	MH 410	185.8	8	Vitrified Clay Pipe	0	0	0	17	0	19									12		12				5		
66	MH 409	MH 410A	46.3	8	Vitrified Clay Pipe	0	1	2	1	1	4	1											1			1		
67	MH 405	MH 404	146.6	8	Vitrified Clay Pipe	0	0	6	16	3	16									8		9						
68	MH 403A	MH 404	50.0	8	Vitrified Clay Pipe	0	0	2	5	1	5									10		10						1
69	MH 402	MH 401A	190.3	8	Vitrified Clay Pipe	0	1	1	9	1	13									9		3				3		
70	MH 401A	MH 401B	154.9	8	Vitrified Clay Pipe	0	1	0	11	3	16									7		7				1		
71	MH 405	MH 406	189.9	8	Vitrified Clay Pipe	0	0	1	10	2	19									23		26				2		3
72	MH 406	MH 407	148.7	8	Vitrified Clay Pipe	0	0	1	5	3	12	1								1		5				3		
73	MH 362	MH 361	380.9	8	Vitrified Clay Pipe	1	0	2	19	2	27									9		9				1		2
74	MH 369	MH 370	263.2	8	Vitrified Clay Pipe	0	1	3	11	1	15									47		47				6		1
75	MH 363	MH 364	189.0	8	Vitrified Clay Pipe	0	0	2	8	1	7	1								36		34				2		1
76	MH 354	MH 356	17.2	8	Vitrified Clay Pipe	1	0	0	1	0	3									1		1						1
77	MH 394	MH 393A NEW CONSTRUCTION	296.8	8	Vitrified Clay Pipe	0	0	0	4	19	14									3		20						
78	MH 360	MH 358	176.9	8	Vitrified Clay Pipe	0	0	0	11	1	18									22		24				1		1
79	MH 409	MH 410A	350.3	8	Vitrified Clay Pipe	1	2	5	11	6	17	2								1		2			1			
80	MH 353	MH 352	170.7	8	Vitrified Clay Pipe	0	0	0	8	0	11									25		24				1		
81	MH 352	MH 351	174.4	8	Vitrified Clay Pipe	0	0	1	16	0	16									32		33				2		
82	MH 337A	MH 338A	70.9	8	Vitrified Clay Pipe	0	0	1	4	1	8									2		2				1		
83	MH 338A	MH 336A	73.7	8	Vitrified Clay Pipe	0	1	0	6	5	3									4		5				1		
84	MH 336A	MH 345A	13.6	8	Vitrified Clay Pipe	0	0	0	0	4	7									4		4						1
85	MH 404	MH 403A	244.0	8	Vitrified Clay Pipe	0	0	2	25	10	28									17		25				2		
86	MH 403A	MH 401C	37.5	8	Vitrified Clay Pipe	0	0	0	10	0	10									8		8						1
87	MH 401	MH 401C	35.3	8	Polyvinyl Chloride	0	1	0	0	0	1																	
88	MH 375	MH 383	178.8	8	Vitrified Clay Pipe	0	2	1	12	2	67									1		1				6		1
89	MH 385	MH 386	134.3	8	Vitrified Clay Pipe	0	0	1	4	7	8									3		26				2		1
90	MH 385	MH 384	203.6	8	Vitrified Clay Pipe	1	2	3	14	10	8	1								14		12				4		3
91	MH 367	MH 365	333.0	8	Vitrified Clay Pipe	0	2	4	13	0	13									58		1				2		1
92	MH 410	MH 410A	314.6	10	Vitrified Clay Pipe	0	3	20	25	6	34									21		24				1		
93	MH 410A	MH 401	276.9	10	Vitrified Clay Pipe	1	1	9	28	6	36									26		28				1		
94	MH 346S	MH 351	161.6	10	Vitrified Clay Pipe	0	1	2	3	0	10									4		3				1		1
95	MH 346S	MH 345A	255.5	12	Vitrified Clay Pipe	1	2	2	8	0	15									2		11				5		6

CCTV Grade Count report

Printed on
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Client City of South Haven
Project Sanitary Sewer
Location

Work Order
Project Start 12/18/2012
UOM Ft
Start Tape 1
Setups 98

Printed on 02/18/2013

Database H:\11-0655 SOUTH HAVEN SEWER SYSTEM EVALUATION\SH

Setup	To Manhole		Svy length	Diameter	Material	Grade count					Structural conditions										O and M Conditions		Misc						
	From Manhole					5	4	3	2	1	0	1308	Break in pipe	Collapse	Cracks	Fracture	Deformation	Defective Joints	Defective Lining	Defective Taps	Roots	Grease	Encrustation & Scale	Settled Deposits	Infiltration	Obstruction	Line Deviations	Water Level +20%	Survey Abandoned
96	MH 345A	MH 345C NEW	0.0	12	Vitrified Clay Pipe	0	0	0	0	1	15	0	438	51	17	18	0	80	237	15	1664	0	1655	4	32	196	35	0	
97	MH 391	MH 390	339.2	8	Polyvinyl Chloride	0	0	0	4	0	268	0	438	51	17	18	0	80	237	15	1664	0	1655	4	32	196	35	0	
98	MH 390	MH 389	44.7	8	Polyvinyl Chloride	0	0	0	2	0	1	0	438	51	17	18	0	80	237	15	1664	0	1655	4	32	196	35	0	
Total surveyed length						17,702.0	Grade count totals																						

1.1.1.1 Internal Inspection

Based on flow measurements and Smoke Testing Results, we identified areas of the sewer system (Areas G and F as shown in Figure 3) which warranted televising and evaluation to identify I/I sources as well as the assess structural issues. Generally, the sewers in these areas are aging vitrified clay pipes constructed between 1907 and the mid 1950's. Field notes taken during the smoke testing phase showed many manhole structures built with concrete block as well as brick cones and chimney sections susceptible to infiltration of groundwater. Sewer pipes of this age and relative condition could warrant replacement or rehabilitation based on the removal of infiltration or structural condition. Inspections were performed using the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) and Manhole Assessment Certification Program (MACP).

Inspection was conducted on 98 surveys were conducted on 86 sections of sewer main. The resulting inspections identified structural defects in 43 of those pipes that scored 4 (Poor) or 5 (Immediate Action) in accordance with NASSCO PACP guidelines. In addition, the survey identified several pipes with numerous and continuous points of infiltration. Pipes with excessive sources of infiltration were evaluated based on the relative percentage of infiltration sources to the number of pipe joints. The survey identified 46 pipes with evidence of infiltration at 17% (1 out of 6) or more of the pipe joints. Of these, 27 showed evidence of infiltration at 33% (1 out of 3) or more of the pipe. The structural and infiltration issues identified during CCTV inspection are summarized below and shown in Figure XXX.

- Kalamazoo Street: Sanitary Manhole 487 to Sanitary Manhole 486 – Video inspection of this section revealed pipe fractures rated Poor (Grade 4) in four (4) locations as well as numerous water level sags between 25% and 50% of the pipe diameter. The presence of structural failures, including issues with the pipe profile, as well as the relatively high number of infiltrating defects (29) make this pipe a good candidate for replacement.
- Kalamazoo Street: Sanitary Manhole 486 to Sanitary Manhole 484A – This section included eight defects rated Poor (Grade 4). These defects included four (4) water level sags between 55% and 80% of the pipe diameter and four (4) fractures. The number and severity of the pipe fractures in addition to the serious issues with the pipe profile make this pipe a candidate for replacement.
- Aylworth Avenue: Sanitary Manhole 386 to Sanitary Manhole 385 – This section includes a single attached encrustation defect rated at Poor (Grade 4). The other structural defects were rated less severe. The pipe section also includes 28 infiltration defects. The pipe might be a good candidate for rehabilitation with a pipe liner except for the presence of offset joints and a discontinuity in the pipe alignment at the location of an existing PVC pipe repair. These alignment issues will preclude rehabilitation and require full replacement of the pipe.

- Aylworth Avenue: Sanitary Manhole 384 to Sanitary Manhole 385 – Inspection of this pipe segment revealed 1 structural defect rated Immediate Action (Grade 5) and 2 structural defects rated Poor (Grade 4). These defects are all related to broken or fractured pipe sections with significant deformation of the pipe barrel. Minor water level sags, alignment defects and other minor pipe cracks are also present within this pipe segment. Additionally, 12 infiltration defects are present as well as significant attached mineral encrustation which create partial blockage of the pipe barrel. Rehabilitation may be possible with significant work to remove attached encrustation. Otherwise, replacement is a viable option as well.
- Kalamazoo Street: Sanitary Manhole 383 to Sanitary Manhole 384 – This section of pipe includes a deformed and collapsing section of pipe rated Immediate Action (Grade 5). Otherwise, defects are relatively minor and may be addressed with a point repair at the collapsed section followed by cured-in-place-pipe (CIPP) rehabilitation with a pipe lining system to address less advanced structural defects as well as preventing infiltration.
- Kalamazoo Street: Sanitary Manhole 383 to Sanitary Manhole 375 – Video inspection observed three defects related Poor (Grade 4). The defects included an attached encrustation obstructing approximately 25% of the pipe area as well as two severe fractures. This section of pipe also includes 21 points of infiltration. These defects could be addressed by rehabilitation of the pipe section with CIPP rehabilitation.
- Center Street: Sanitary Manhole 382 to Sanitary Manhole 381 – This section of pipe includes severe root infiltration and 2 structural defects rated Poor (Grade 4). Structural defects included severe water level sags between 55% and 60% of the interior pipe area. Pipe replacement is necessary to address these pipe profile defects.
- Center Street: Sanitary Manhole 379 to Sanitary Manhole 381 – Eight defects were identified in this section of pipe earning a rating of Poor (Grade 4). These defects include 3 water level sags between 55% and 80% of the pipe diameter and 5 visible sources of running infiltration. In addition, the survey also identified 54 other points of infiltration within this section of pipe. Pipe replacement is necessary to address the pipe profile defects.
- Center Street: Sanitary Manhole 379 to Sanitary Manhole 380 – This section of pipe did not exhibit structural defects that would qualify for replacement as part of an SRF project. However, the inspection noted 33 points of infiltration, representing more than one third of the joints on this pipe run.
- Cartwright Street: Sanitary Manhole 379 to Sanitary Manhole 378 – Video inspection of this section revealed only 1 structural defect that would qualify for SRF funding. However, this pipe also had 33 other cracks or fractures throughout its whole length. Many of those cracks were listed as Fair (Grade 3). In addition to the structural issues in

this section of pipe, the inspection identified 19 infiltration defects. These defects could be addressed by rehabilitation of the pipe section with CIPP rehabilitation.

- Cartwright Street: Sanitary Manhole 378 to Sanitary Manhole 375 – Similar to the previous pipe, this section revealed only 2 structural defects that would qualify for SRF funding. These defects involved multiple fractures rated Poor (Grade 4). However, this pipe also had 14 other cracks or fractures throughout its whole length. Many of those cracks were listed as Fair (Grade 3). These defects could be addressed by spot repairs or with CIPP rehabilitation of the entire pipe section.
- Spencer Street: Sanitary Manhole 383A to Sanitary Manhole 383 – This section of pipe did not exhibit structural defects that would qualify for SRF Funding. However, the inspection noted 67 points of infiltration, representing more than one third of the joints on this pipe run.
- Kalamazoo Street: Sanitary Manhole 377 to Sanitary Manhole 376 – This section of pipe exhibits 1 severe fracture rated Poor (Grade 4). Otherwise, there were a small number of less severe cracks in this pipe and there did not appear to be a significant number of defects that would permit other points of infiltration. Point repair or CIPP rehabilitation would be appropriate for this section of pipe.
- Cartwright Street Sanitary Manhole 375 to Sanitary Manhole 374 - This section of pipe did not exhibit structural defects that would qualify for participation as part of an SRF project. However, the inspection noted 27 points of infiltration, representing more than one out of every six joints on this pipe segment.
- Cartwright Street Sanitary Manhole 375 to Sanitary Manhole 374 – No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 41 points of infiltration, representing more than one out of every four joints on this pipe segment.
- Kalamazoo Street: Sanitary Manhole 376 to Sanitary Manhole 375 – Inspection of this pipe section revealed 1 infiltration/maintenance defect rated Immediate action (Grade 5) and 1 rated Poor (Grade 4). In addition to the Grade 5 defect, several of the lesser defects were present within this section of pipe that related to infiltration and roots. The Grade 4 defect is related to an exterior drop connection in the manhole. Generally, the pipe is in need of maintenance to clean and remove roots. At this time, there are no defects that would qualify this section for SRF funding replacement or rehabilitation.
- Spencer Avenue: Sanitary Manhole 388 to Sanitary Manhole 387 – No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 62 points of infiltration, representing more than one third of the joints on this pipe segment.

- Indiana Avenue: Sanitary Manhole 387 to Sanitary Manhole 373 – No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 49 points of infiltration, representing more than one third of the joints on this pipe segment.
- Indiana Avenue: Sanitary Manhole 373 to Sanitary Manhole 371 – Inspection of this pipe segment revealed 1 infiltration defect rated Poor (Grade 4). The inspection also identified 55 other infiltration defects within this pipe segment, representing more than one third of the joints within the pipe segment.
- Indiana Avenue: Sanitary Manhole 371 to Sanitary Manhole 369 – This section of pipe exhibited 1 structural defect rated Immediate Action (5). The inspection also identified 55 other infiltration defects within this pipe segment, representing more than one third of the joints within the pipe segment.
- Abell Avenue: Sanitary Manhole 372 to Sanitary Manhole 371 – Inspection of this section revealed 4 structural or constructional defects and 1 infiltration defect rated Poor (Grade 4). These defects related to water level sags between 55% and 75% of the pipe diameter and pipe alignment. The inspection also identified 69 other infiltration defects within this pipe segment, representing more than one third of the joints within the pipe segment. Replacement of the pipe section is necessary due to profile and pipe alignment issues within this pipe segment.
- Indiana Avenue: Sanitary Manhole 369 to Sanitary Manhole 368 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 42 points of infiltration, representing more than one third of the joints on this pipe segment.
- Cable Avenue: Sanitary Manhole 370 to Sanitary Manhole 369 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 60 points of infiltration, representing more than one third of the joints in this pipe segment.
- Elkenburg Street: Sanitary Manhole 366 to Sanitary Manhole 366A – This pipe section exhibited 1 infiltration related defect rated Poor (Grade 4). The inspection also noted 32 points of infiltration, representing one out of every six joints within the pipe segment.
- Indiana Avenue: Sanitary Manhole 389 to Sanitary Manhole 387 – Inspection of this pipe segment revealed 1 structural defect, a multiple fracture, rated Poor (Grade 4). The pipe also included 26 cracks rated Fair (Grade 3). The inspection also noted 22 points of infiltration, representing more than one out of every 5 joints within the pipe segment.
- Humphrey Street: Sanitary Manhole 364 to Sanitary Manhole 363 - No structural defects were observed that would qualify for participation as part of an SRF project. However,

the inspection noted 66 points of infiltration, representing more than one third of the joints in this pipe segment.

- Indiana Avenue: Sanitary Manhole 365 to Sanitary Manhole 363 - No structural defects were observed that would qualify for participation as part of an SRF project. The inspection noted 11 cracks in this segment. The inspection also noted 32 points of infiltration, representing approximately one out every four joints within this pipe segment.
- Indiana Avenue: Sanitary Manhole 363 to Sanitary Manhole 361 - Inspection of this pipe segment revealed 1 infiltration defect rated Poor (Grade 4). There were no structural defects that meet the criteria for SRF participation. The inspection also noted 51 points of infiltration, representing more than one third of the joints within the pipe segment.
- Indiana Avenue: Sanitary Manhole 358 to Sanitary Manhole 357 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 28 points of infiltration, representing more than one out of every six joints within this pipe segment.
- Indiana Avenue: Sanitary Manhole 354 to Sanitary Manhole 351 - Inspection of this pipe segment revealed 1 structural defect rated Poor (Grade 4). The inspection also noted 29 points of infiltration, representing more than one third of the joints within the pipe segment.
- Indiana Avenue: Sanitary Manhole 351 to Sanitary Manhole 346S - Inspection of this pipe segment revealed 1 infiltration defect rated Poor (Grade 4). There were no structural defects that meet the criteria for SRF participation.
- Edgell Street Avenue: Sanitary Manhole 358 to Sanitary Manhole 360 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 37 points of infiltration, representing more than one out of every six joints within this pipe segment.
- Indiana Avenue: Sanitary Manhole 347A to Sanitary Manhole 346S - This section of pipe contains 8 structural defects rated Immediate Action (Grade 5) and 5 structural defects rated Poor (Grade 4). In addition, there exists a defective service connection rated Poor (Grade 4). The extensive structural defects within this section include deformed barrel, and hinged longitudinal cracks at the crown of the pipe. The deformed condition of the pipe section precludes the rehabilitation methods. Replacement is necessary to address the condition of this pipe.
- Clinton Street: Sanitary Manhole 346S to Sanitary Manhole 350 - Inspection of this pipe section revealed 3 structural defects rated Poor (Grade 4). This pipe section warrants reconstruction to address multiple pipe fractures as well as the defects associated with the service laterals within this pipe section.

- Monroe Street: Sanitary Manhole 351B to Sanitary Manhole 351A – This section of pipe contained 1 structural defect rated Immediate Action (Grade 5). Approximately 2-3 feet of the pipe is missing. The survey had to be abandoned due to the debris in the pipe. Significant repair is necessary to replace the missing pipe and rebuild the lateral connection near the defect. Once excavation is undertaken to remove and repair the missing section, the cost of rehabilitation would be prohibitive. Recommend replacement of this section of pipe.
- Monroe Street: Sanitary Manhole 351A to Sanitary Manhole 351 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 40 points of infiltration, representing more than one third of the joints within this pipe segment.
- Kalamazoo Street: Sanitary Manhole 414 to Sanitary Manhole 413 – Inspection of this pipe revealed 2 active infiltration-related defects rated Poor (4). In addition, the survey also identified 44 other infiltration defects within this pipe section.
- Kalamazoo Street: Sanitary Manhole 413 to Sanitary Manhole 412 – No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 54 points of infiltration, representing more than one third of the joints within this pipe segment.
- Kalamazoo Street: Sanitary Manhole 412 to Sanitary Manhole 410 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 45 points of infiltration, representing more than one third of the joints within this pipe segment.
- Lyon Street: Sanitary Manhole 399 to Sanitary Manhole 398 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 34 points of infiltration, representing over one quarter of the joints within this pipe segment.
- Lyon Street: Sanitary Manhole 398 to Sanitary Manhole 397 – This short pipe segment (66.3 feet overall) includes 1 infiltration-related defect rated Poor (Grade 4). The inspection also noted 10 points of infiltration, representing approximately one third of the joints within this pipe segment.
- Center Street: Sanitary Manhole 397 to Sanitary Manhole 396 – No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 18 points of infiltration, representing over one quarter of the joints within this pipe segment.

- South Haven Street: Sanitary Manhole 395 to Sanitary Manhole 395A - This section of pipe contained 2 structural defects rated Immediate Action (Grade 5). Approximately 2-3 feet of the pipe is missing near Sanitary Manhole 395 with a large void visible around the pipe. The other major defect was related to an intruding tapped service connection. The survey had to be abandoned due to the intruding service connection in the pipe. Significant repair is necessary to replace the missing pipe and rebuild the lateral connection near the defect. Once excavation is undertaken to remove and repair the missing section, the cost of rehabilitation would be prohibitive. Recommend replacement of this section of pipe.
- Edgell Street: Sanitary Manhole 409 to Sanitary Manhole 410 – Inspection revealed 1 defect rated Immediate Action (Grade 5) and 2 defects rated Poor (Grade 4). Defects include broken pipe near Sanitary Manhole 410A, fractured pipe and structurally compromised pipe near a break-in tap. There are also a number of structural cracks within this pipe segment which do not currently qualify for SRF funding on their own. Recommend CIPP pipe lining rehabilitation or complete replacement.
- Lyon Street: Sanitary Manhole 403A to Sanitary Manhole 404 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 35 points of infiltration, representing nearly one quarter of the joints within this pipe segment. Sewer survey was abandoned at 50 feet out of the 245 feet run and a reverse setup was performed.
- Lyon Street: Sanitary Manhole 402 to Sanitary Manhole 401A – This section of pipe contained 1 structural defect rated Poor (Grade 4). There are also 3 water level sags , an offset joint, and an intruding service tap within this section of pipe. These factors will limit the options available in terms of rehabilitation. Infiltration was not a significant issue in this pipe segment. There were only 3 infiltration points that were generally characterized by infiltration stains rather than visible infiltration. These defects would not qualify for SRF funding on their own. Recommend point repair of the fracture and reconstruction of service tap by replacement means due to proximity of these two defects.
- Lyon Street: Sanitary Manhole 401A to Sanitary Manhole 401B – Inspection indicates 1 structural defect rated Poor (Grade 4). The defect in question is actually a drop connection to the downstream manhole. There is no defect at this location. Otherwise, the pipe is in fair condition with a small water level sag and two minor cracks that would not qualify for SRF funding. There are a small number of infiltration points along this section of sewer. These points were generally characterized by infiltration stains or root intrusion rather than visible infiltration. No action is needed to address this pipe other than maintenance for the root intrusion and monitoring of the minor structural issues.
- Center Street at Alley between Lyon Street and Edgell Street: Sanitary Manhole 405 to Sanitary Manhole 406 - No structural defects were observed that would qualify for

participation as part of an SRF project. However, the inspection noted 24 points of infiltration, representing over one quarter of the joints within this pipe segment.

- Fruit Street: Sanitary Manhole 362 to Sanitary Manhole 361 – Inspection observed 1 operations and maintenance defect related to root intrusion. This defect was rated Poor (Grade 4). Otherwise, the inspection identified 11 structural defects which were rated below a level that would qualify for SRF participation.
- Cable Avenue: Sanitary Manhole 369 to Sanitary Manhole 370 – This pipe segment exhibited a number of structural cracks and fractures, including a defect rated Poor (Grade 4) related to a cracked and intruding lateral connection. In addition, the inspection noted 47 points of infiltration, representing more than one third of the joints within this pipe segment.
- Monroe Street: Sanitary Manhole 353 to Sanitary Manhole 352 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 24 points of infiltration, representing over one quarter of the joints within this pipe segment.
- Monroe Street: Sanitary Manhole 352 to Sanitary Manhole 351 - No structural defects were observed that would qualify for participation as part of an SRF project. However, the inspection noted 33 points of infiltration, representing over one third of the joints within this pipe segment.
- Kalamazoo Street: Sanitary Manhole 338A to Sanitary Manhole 336A – Video inspection of this pipe segment revealed 1 alignment related structural defect as well as a small number of less severe structural or operations & maintenance defects. Due to the nature of the alignment defect, replacement is necessary to address the problem.
- Lyon Street: Sanitary Manhole 403A to Sanitary Manhole 401C – No Structural defects were observed that would qualify for participation as part of an SRF project. Inspection noted 8 infiltration defects in the first 37.5 feet of pipe. The inspection was abandoned due to debris in the pipe. The downstream manhole is buried, so a reverse setup is not possible.
- Lyon Street: Sanitary Manhole 401 to Sanitary Manhole 401C – This section of pipe contained 1 structural defect rated Poor (Grade 4). The defect observed in this pipe segment is an alignment deflection in a newly installed pipe. This defect appears to have been necessary as part of the pipe installation and was likely the result of an underground conflict. Recommend no action for this pipe segment.
- Kalamazoo Street: Sanitary Manhole 375 to Sanitary Manhole 383 – Inspection indicates 2 structural defects rated Poor (Grade 4). These defects consist of multiple pipe fractures and are accompanied by a number of pipe alignment defects as well as other

minor structural cracks. In addition to these structural defects, the inspection noted 21 infiltration defects, representing nearly one quarter of the joints within this pipe segment.

- Elkenburg Street: Sanitary Manhole 367 to Sanitary Manhole 365 – Inspection noted 2 structural defect rated Poor (Grade 4). The defects are related to an alignment deflections, and one of those defects is actually an interior drop connection at the downstream manhole. There is no defect at the location of this drop connection. There are an additional 10 minor structural defects present in this pipe segment. Addressing the alignment issue will require reconstruction of the pipe segment.
- Kalamazoo Street: Sanitary Manhole 410 to Sanitary Manhole 410A – Video inspection of this pipe segment revealed 2 structural defects rated Poor (Grade 4) and 1 infiltration defect rated Poor (Grade 4). In addition to the qualifying defects, the inspection noted 44 cracks or fractures and 24 points of infiltration. Recommend full length rehabilitation or reconstruction of this pipe segment.
- Kalamazoo Street: Sanitary Manhole 410A to Sanitary Manhole 401 – This pipe segment exhibits 2 infiltration related defects. Both defects are closely spaced approximately 138 feet downstream of sanitary manhole 410A. In addition, several of the service laterals in this general area showed steady flow of clear water. Suspect significant underground issues in this area which may necessitate open excavation to determine extents and address issues. In addition, this pipe segment shows 24 cracks or fractures, 28 points of infiltration and some horizontal alignment deflections not identified in the PACP grading. Many of the defects would benefit from CIPP rehabilitation, however, the source of visible infiltration appears localized to the area noted above. Recommend partial or complete replacement to determine source of groundwater (suspect water distribution system).
- Clinton Street: Sanitary Manhole 346S to Sanitary Manhole 345A – Inspection noted 1 structural defect rated Immediate Action (Grade 5) and 2 defects rated Poor (Grade 4). The Grade 5 defect and one Grade 4 defect were structural related to a lateral service connection and a water level sag up to 65% of the pipe diameter. The other defect was infiltration related. Recommend replacement to address alignment issue.