

CITY OF VALPARAISO STORMWATER MASTER PLAN



2010 TO 2020 IMPLEMENTATION

Prepared by the City of Valparaiso Engineering Department

November, 2009

PLAN SUMMARY

In September of 2008, the City of Valparaiso experienced a major storm event that qualified as a disaster according to the Federal Emergency Management Agency (FEMA). This storm identified or highlighted needed stormwater infrastructure improvements. The City responded by conducting a city-wide drainage survey in November 2008. More than 1,800 responses were received, 880 of which identified problems including: standing water in streets and yards, basement sewer backups, basement seepage, and stormwater entering windows and doors of lower levels. A summary of the problems identified by those survey results, prepared by the Community Research and Service Center of Valparaiso University is included at the end of this report.

The City's Engineering Department analyzed the survey responses, combined them with reports from the Sewer Department's Collections crews and previously noted problem areas, and developed a list of 65 potential projects. Those projects were ranked by Engineering Department Staff based on Location, Obligation, Risk, Impact, Environment, Term, and Efficacy. These criteria were accepted by the original Stormwater Management Board in 1997 and most recently amended in 2003 as the method of prioritizing projects. Further explanation of these criteria is included in this Plan document.

The ranked projects were presented to the Valparaiso City Utilities Board of Directors and the Valparaiso City Council for review and input. Seventeen (17) projects were identified as having the greatest need. Descriptions of these projects, a location map, and associated project cost estimates are included within this Plan document.

The Final 17 Drainage Projects were presented as the "Stormwater Master Plan" to the Valparaiso City Utilities Board of Directors and adopted on November 9, 2009. The Master Plan was then also presented to the Valparaiso City Council on November 23, 2009.

It should be noted that while this plan sets the framework for stormwater capital projects over the next ten years, it should be reevaluated and updated on a regular basis to incorporate needs as they arise.

PROJECT DESCRIPTIONS

PROJECTS

1. CHAUTAUQUA PARK/CITY VIEW DRAINAGE STUDY
2. EVANS AVENUE WEST INTERCEPTOR SEWER
3. FRANKLIN STREET DETENTION BASIN
4. WALL STREET DETENTION BASIN REHABILITATION
5. MCKINLEY STREET STORM SEWER
6. CALUMET AVENUE NORTH
7. CALUMET AVENUE CENTRAL
8. STANLEY STREET STORM SEWER
9. HOTTER LAGOON SPILL PROTECTION AND POND
10. RANDLE STREET STORM SEWER
11. HARRISON BLVD. STORM SEWER
12. THORGREN BASIN REHABILITATION
13. NORTHVIEW DRIVE STORM SEWER
14. HOSPITAL STORM SEWER BRANCHES
15. FRANKLIN STREET SOUTH STORM SEWER
16. HORSEPRAIRIE/SAGERS RUN CULVERT REPLACEMENT
17. DEL VISTA STORM SEWER REPLACEMENT

1. CHAUTAUQUA PARK/CITYVIEW DRAINAGE STUDY

This potential project is generally located east of Yellowstone, north of Lincolnway, west of Campbell and south of the Canadian National Railroad. There are no storm sewers within this area. Any drainage is accomplished by overland flows and connections into the combined sewers.

There are several pronounced low areas within the project limits. During moderate to heavy rain events these areas flood, overload the sewers and result in back-ups into basements or flooding.

It had been proposed, a number of years ago, to construct a storm water detention basin on the vacant portion the former Valparaiso Tech property and extend storm sewers into the troubled areas. However, it was determined at that time to allow the use of the property to be developed rather than acquire it for the basin.

It is proposed that additional studies be performed to search for means to eliminate or reduce the surcharging of the sewers and/or the basement flooding problems.

Notes:

2. EVANS AVENUE (WEST) STORM INTERCEPTOR

This project proposes the construction of a 48" storm sewer from Evans and Valparaiso Streets west to Washington Street. At that location it would intercept the previously constructed north Washington Street Storm Sewer which collects the runoff from the area between Evans and Glendale on Washington Street. The sewer to be intercepted currently discharges into a combined sewer. The Valparaiso Street storm sewer needed to be in place before this project could be pursued. The cost of this project was estimated at \$475,000 (THIS IS AN OLD NUMBER).

The completion of this project would remove a very significant quantity of storm water from the combined sewer system. This would greatly benefit the homes south of the Canadian National Railroad in the Franklin, Washington, Lafayette, Napoleon Streets areas. It would also reduce the numbers of Combined Sewer Overflows into Salt Creek and reduce treatment costs at the Elden Kuehl Pollution Control Facility.

The design and construction of this project could begin immediately if funds are available.

Notes:

3. FRANKLIN STREET DETENTION BASIN and ENERGY DISSIPATOR

This project proposes the design and construction of a detention basin on Crosby Run east of Franklin Street. Much of the required land is already under the ownership of the City. There will be some additional land required. The project also includes the replacement of the 48" culvert under Franklin Street with a 36" culvert to control flows downstream, and an energy dissipater structure at the discharge point of the hospital sewer into Crosby Run.

The completion of the project is required before any additional storm water is added to the drainage system through new Hospital Sewer Branches (see Hospital Sewer Branches).

The completion of this project will also allow the reconstruction of the South Franklin Street Storm sewer. This sewer is in very bad condition and is undersized. It needs to be replaced in the very near future.

Notes:

4. WALL STREET DETENTION BASIN

Refer to Central Calumet Project(s) herein

It is proposed to rehabilitate the Wall Street detention basin to maximize its storage capacity and increase protection against flooding for properties downstream. The increase in the available storage capacity would be accomplished by removing the access berm around the perimeter of the basin and increasing the side slopes. It may also be possible to raise the elevation of the berm. It may also involve the construction of a new discharge structure.

Notes:

5. MCKINLEY STREET STORM SEWER

The project involves the construction of a storm sewer both east and west of Valparaiso Street. To the west the sewer should be extended (if possible) to the alley between Franklin and Washington Streets. The sewer would pick up runoff that currently finds its way into the combined sewers. The new sewer would help to alleviate basement and street flooding on McKinley Street.

Notes:

6. NORTH CALUMET

Location is the Calumet Avenue corridor between Vale Park Road on the south and the north lines of the Cumberland Crossing development and the Ace Hardware site. Heaviest emphasis is on the east side of the corridor.

During the major rain that occurred on September 12-14, 2008, a number of businesses along the east side of Calumet experienced flooding or near flooding. It appears that the flooding occurred because there were/are no overflows out of the low points in the subject area.

A substantial amount of data still needs to be acquired in order to address and propose possible solutions to the flooding problems along this corridor. The completion of the Cumberland Crossing development may ease the flooding somewhat; the extent is still to be determined.

The City proposes a round-a-bout at the intersection of Calumet and Vale Park. The tentative date for construction is 2011. That project will add both additional impervious areas and some extensions of storm sewers. It appears that the roundabout project may be the appropriate opportunity to also address at least some of the flooding problems.

It is proposed that staff continue to work towards the development of project specifics.

Notes:

7. CENTRAL CALUMET

This area consists of the Calumet corridor south of Vale Park to McDonald Drive.

Primary flooding issues are at Schultz Florist and the Caldwell Banker building. Limited information available at this time indicates that runoff came across Calumet from the west side to the east and flooded the subject properties.

The primary causes of the flooding appear to be:

1. lack of runoff management facilities (primarily detention) on both sides of the corridor,
2. lack of emergency overflows on the east side of the corridor.

Possible solutions are:

1. Increase the amount of detention along the corridor.
 - a. The Wall Street detention basin's storage capacity can be increased by roughly 10% by re-grading the facility. This will make mowing a little more difficult but that may be acceptable in light of the added storm protection gained. In addition, storm water quality BMPs could be added to the project. SEE SPECIFIC WALL STREET DETENTION BASIN PROJECT PROPOSED HEREIN.
 - b. On the west side of the corridor, there appears to be a large grassed area to the west and south of the CSI building that might be used to detain some runoff. There are also smaller grassed areas west of the McColley, Chuck's Bakery and Premier Grill buildings that might be used for detention.
 - c.
 - i On the east side of the corridor there is a larger grassed area east of the Pilot gas station and Schultz's Floral buildings that might be used for detention. This area might also incorporate a defined overflow away from the Schultz depression. The overflow would need to flow to the east through either the Hattie Smith or the car wash properties.
 - ii There are detention basins that exist on the credit union site and the medical center site that are south of the building east of Coldwell Banker. These basins could be expanded to probably double their storage capacity. This area could also be expanded west in the grassed area between Coldwell Banker and the commercial building to the south. This improvement could also provide a better overflow for the Coldwell Banker site.
 - iii There is an additional open area that could be used for runoff management. It is on the former Home Mountain property and land that extends south to

McDonald Drive. The southerly parcel probably has wetlands located on it so its capacity for detention might be diminished.

2. Create overflow routes out of existing depressed areas, particularly at the two subject sites.
 - a. An overflow out of the Schultz site appears to be possible through either the Hattie Smith property or the car wash property. Some pavement reconstruction will be required to provide the proper elevations.
 - b. An overflow out of the Coldwell Banker site appears to be possible to the south through the existing detention basins and then connecting to a new basin on the parcel south of the former Home Mountain building.

Note: It is important to create additional detention storage along the corridor along with the creation of the overflow routes so that the flooding problem is not simply relocated to a different area.

It is proposed that staff continue to acquire data and determine the specifics of the project(s).

Notes:

8. STANLEY STREET STORM SEWER

The area along Stanly Street regularly experiences street and basement flooding. This project involves the construction of a storm sewer west from Valparaiso Street toward Franklin Street to pick up the runoff that currently finds its way into the combined sewers in the area.

Notes:

9. HOTTER LAGOON SPILL PROTECTION AND POND

This project will consist of the design and construction of BMPs that will help ease impacts from spills on the existing wetlands.

Note: There was a large oil spill in February 2003 that made its way into Hotter's Lagoon wetlands. The oil was quickly contained and remediated costing \$42,011.56. This cost could easily be much higher if other spills occur and no BMPs are in place to alleviate the contaminants from entering the lagoon.

This project would also include the design and construction of modifications to the existing Hotter Lagoon Detention Facility to incorporate more environmentally favorable techniques. These may include excavating a portion of the basin to provide a "wet detention" area that will help with water quality issues. This project, if implemented, is intended to be a showcase and set the standard for future detention facility design in Valparaiso.

A study is the first step required in order to determine what water quality benefits would be realized by implementing the project.

Notes:

10. RANDLE STREET STORM SEWER

The project consists of the construction of storm sewers both east and west of Valparaiso Street to pick up the runoff that currently finds its way into the combined sewers. The project might not be justified until the street itself is reconstructed with curb and gutter to collect the runoff.

Notes:

11. HARRISON BOULEVARD STORM SEWER

The project involves the construction of a storm sewer both east and west of Valparaiso Street. To the west the sewer might be extended as far as Franklin Street. The sewer would pick up the runoff that currently finds its way into the combined sewers in that area. The project might not be justified until the street itself is reconstructed with curb and gutter to collect the runoff.

Notes:

12. THORGREN BASIN REHABILITATION

This project will involve the rehabilitation of the existing Thorgren Detention Basin, on Roosevelt Road just north of the Canadian National Railroad, to maximize its storage capacity and usefulness in detaining and cleaning storm water runoff in Knode Creek. The idea for this basin parallels that for Hotter Lagoon.

NOTE: MATT IS WORKING WITH THE SAVE THE DUNES FOUNDATION TO ASSIST WITH FUNDING A STUDY TO DETERMINE THE BASIN'S FEASIBILITY FOR ENVIRONMENTAL ENHANCEMENTS.

Notes:

13. NORTHVIEW DRIVE STORM SEWER

The project consists of the construction of a storm sewer west from Valparaiso Street to Franklin Street to pick up runoff that currently finds its way into the combined sewers. The project might not be justified until the street itself is reconstructed with curb and gutter to collect runoff.

Notes:

14. HOSPITAL SEWER BRANCHES

This project proposes the construction of storm sewer branch lines from the previously constructed Hospital Storm Sewer to Lincolnway on Locust, College and Garfield and a branch on Brown Street to College. These projects will improve surface drainage in the subject locations and remove a significant amount of storm water from the combined sewer system.

Notes:

15. FRANKLIN STREET (SOUTH) STORM SEWER

This project involves constructing a new storm sewer from the Norfolk Southern Railroad south to Crosby Run. The new sewer would replace the existing deteriorated storm sewers. The project could include the construction of new pavement and curb and gutter so as to contain the runoff in the street until it reaches inlet points.

This project should probably not be pursued until the Franklin Street Detention Basin is completed (see FRANKLIN STREET DETENTION BASIN above).

Notes:

16. HORSEPRAIRIE / SAGER RUN CULVERT

This project consists of the reconstruction of the culvert. It is located between Burger King and Zao Island on Horseprairie. It should be extended to allow pedestrian traffic to pass over it without being in the traffic lane.

NOTE: THE MAJOR STORM IN SEPTEMBER 2008 CAUSED A SIGNIFICANT SINK HOLE AT THIS LOCATION. THE CULVERT IS IN A VERY DETERIORATED CONDITION AND NEEDS TO BE REPLACED IN THE NEAR FUTURE.

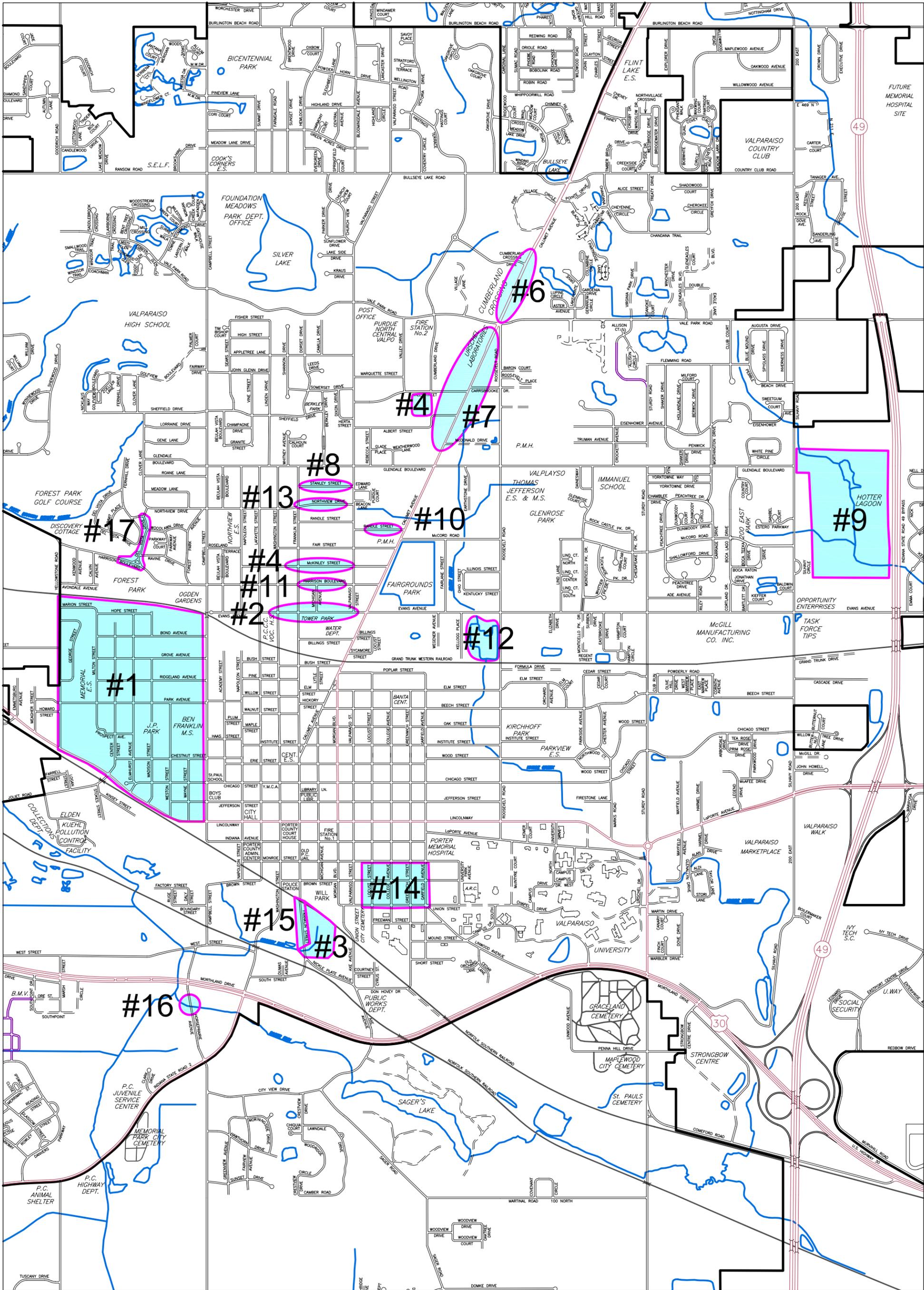
Notes:

17. DEL VISTA STORM SEWER REPLACEMENT

This project consists of the reconstruction of storm sewer along Del Vista Drive from the triangle south of Summit Place to Harrison Boulevard and to the west. The storm sewers along this street are in extremely poor condition and have caused premature deterioration of the street. Our Sewer Dept. has tried to video the lines, but is unable in several locations due to debris in the lines. This project was added to the list based on information from our Sewer Dept., Public Works Dept., and Engineering Dept.

Notes:

PROJECT LOCATION MAP



FINAL 17 DRAINAGE PROJECTS FOR CONSIDERATION


 NOT TO SCALE
 SEPT. 2009

PROJECT COST ESTIMATES

FINAL 17 DRAINAGE PROJECTS FOR CONSIDERATION

November, 2009

RANK	SCORE	PROJECT	BUDGET
1	194	CHAUTAUQUA PARK/CITY VIEW DRAINAGE	\$6,000,000
2	177	EVANS AVENUE WEST INTERCEPTOR SEWER	\$730,000
3	171	FRANKLIN STREET DETENTION BASIN	\$635,000
4	166	WALL STREET DETENTION BASIN	\$300,000
4	166	MCKINLEY STREET STORM SEWER (WEST)	\$363,000
6	163	CALUMET AVENUE NORTH	\$1,000,000
7	162	CALUMET AVENUE CENTRAL	\$1,000,000
8	161	STANLEY STREET STORM SEWER	\$323,000
9	158	HOTTER LAGOON SPILL PROTECTION AND POND	\$300,000
10	114	RANDLE STREET STORM SEWER (EAST)	\$296,000
11	113	HARRISON STREET STORM SEWER (WEST)	\$454,000
12	110	THORGREN BASIN REHABILITATION	\$660,000
13	109	NORTHVIEW DRIVE STORM SEWER	\$273,000
14	105	HOSPITAL STORM SEWER BRANCHES	\$1,720,000
15	MERIT	FRANKLIN STREET STORM SEWER	\$555,000
16	MERIT	HORSEPRAIRIE/SAGERS RUN CULVERT REPLACEMENT	\$190,000
17	MERIT	DEL VISTA STORM SEWER REPLACEMENT	\$360,000
		TOTAL	\$15,159,000

CRITERIA FOR RANKING STORMWATER PROJECTS

CRITERIA FOR RANKING STORM WATER DRAINAGE PROJECTS

The following are the criteria used to rank the various drainage projects that are on the SWM Board Project List.

LOCATION	Is this project related to a water course over which the City has jurisdiction (as opposed to a owned/maintained facility)?
EXTENT OF OBLIGATION	Is the problem related to or independent of normal operation of the facility? Ex: An erosion problem along a ditch may be the responsibility of the City. A basement that experiences seepage when the water level in the ditch rises would not be the responsibility of the City.
RISK	What is the potential for property damage or personal injury?
IMPACT	How many people and/or properties are affected?
COST	How much will the project cost? How much will the cost increase if the project is not addressed quickly? Can the project be built in house?
ENVIRONMENT	Does the project improve water quality or other environmental issues?
TERM	How long has the project been “on the table”?
EFFICACY	How well does the project fit into the current timetable, budget, and overall plan?

Accepted by Board 5/14/97
Amended 6/19/97
Reaffirmed 12/15/99
Amended 7/7/03

City of Valparaiso Storm Water Management Board

SUMMARY OF DRAINAGE SURVEY RESULTS

Flooding, Drainage, and Sewer Problems in the City of Valparaiso

February 2009

Prepared by the

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Educating a New Generation of Civic
Leaders and Making a Difference in
Northwest Indiana

Flooding, Drainage, and Sewer Backups in Valparaiso

Introduction

Mathew Kras, the City of Valparaiso's Stormwater Engineer, asked the Community Research and Service Center to help the City of Valparaiso conduct and analyze a survey on problems related to the flooding that occurred in early September, 2008 in the City. Working with the City and CRSC staff, as well as students in a Political Science research methods class, we developed a questionnaire, a complete copy of which is included in Appendix, designed to answer several questions.

1. At your current residence, have you had any problems with drainage or sewer backups?
2. What kind of problems have you had related to drainage or sewer backups?
3. How serious would you say the problems have been?
4. How often would you say the type of problems indicated above occur?
5. What have you done to try and solve the flooding problem.
6. If you have made changes, have they solved your problem?
7. Have you had any other problems or are there any other comments you would like to make about drainage and sewer problems?
8. In order to understand where the problems are, give us your name and address and phone number and how long you have lived in your current residence.

The surveys were distributed to approximately 12,000 households along with their city water bills. (Some of these households are located outside of the city limits.) Respondents were allowed to complete a mail copy or were given the option of completing the survey online. A link to the online survey also was placed on the City of Valparaiso webpage. A total of 1835 households responded with about 324 of those completing the survey online and the rest mailing back the completed questionnaire. While we received a large number of responses, the response rate falls around 20% and that is something that should be considered in interpreting the results. The data likely will provide a fairly accurate picture of problems because it is likely that those persons with problems responded and those without problems did not. However, some problems may have been overlooked because renters who pay the water bill may be less aware of actual water problems that would be handled by the landlord. Overall, given the large number of responses from all areas of the City, the data should provide a useful picture of the types and extent of problems related to the flooding.

All responses were coded and keyed into a dataset for analysis. The addresses for each response were also put into a different file to be used for creating maps of areas with and without problems. These maps are all available online for closer inspection at:
<http://www.valpo.edu/organization/copc/flooding>.

Results

Respondents were asked, “At your current address, have you had any problems with drainage or sewer backups?” Responses are reported in **Table 1**. Of those surveyed, slightly under half (48.0%) of respondents claimed that they had had a problem with drainage or sewer backup. Over half of respondents (50.9%) claimed they had no problems with drainage or sewer flooding. A map of these responses is presented in Map 1 on the following page.

Table 1
Problems with Drainage or Sewer Backups
Valparaiso Residents

Response	n	Percentage
Yes	880	48.0%
No	934	50.9%
Missing	21	1.1%
Total	1835	100.0%

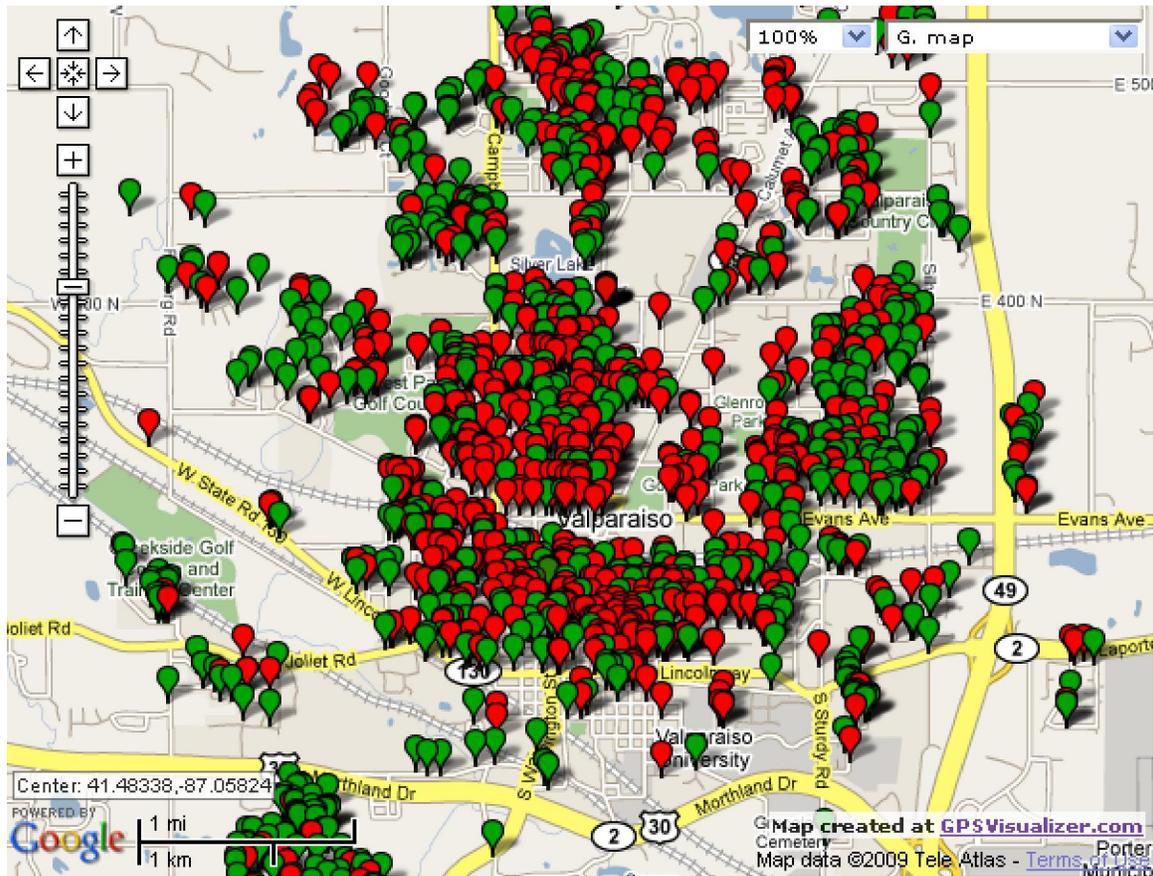
Respondents were also asked about what kinds of flooding problems they had experienced. Table 2 lists the number of respondents who reported sanitary sewer backup compared to the number of respondents who reported only other kinds of problems. These results are also shown in Map 2. A total of 277, or just over 30% of respondents who reported some sort of problem, reported a problem with sanitary sewer backups.

Table 2
Sanitary Sewer Backup Versus
Other Problems

	n	%
Sanitary Sewer Backup	277	31.5%
Other Problems Only	603	68.5%
Total	880	

Map 1: Problems with Drainage and Sewage. Map 1 identifies the location of the residents who reported they had any kind of flooding problem. Red markers indicate reported problems, and green indicates that they did not have any problems. All maps included in this report are also available online at: <http://www.valpo.edu/organization/copc/flooding>. The online versions allow for zooming in and magnification of any area.

Map 1 Problems with Drainage and Sewage



KEY: Red tab = Problem reported
 Green tab = No problem reported

Map 2: Sanitary Sewer Backup versus Other Problems. Map 2 plots locations where sanitary sewer backups were reported in red, and locations where only other kinds of problems were reported in blue.

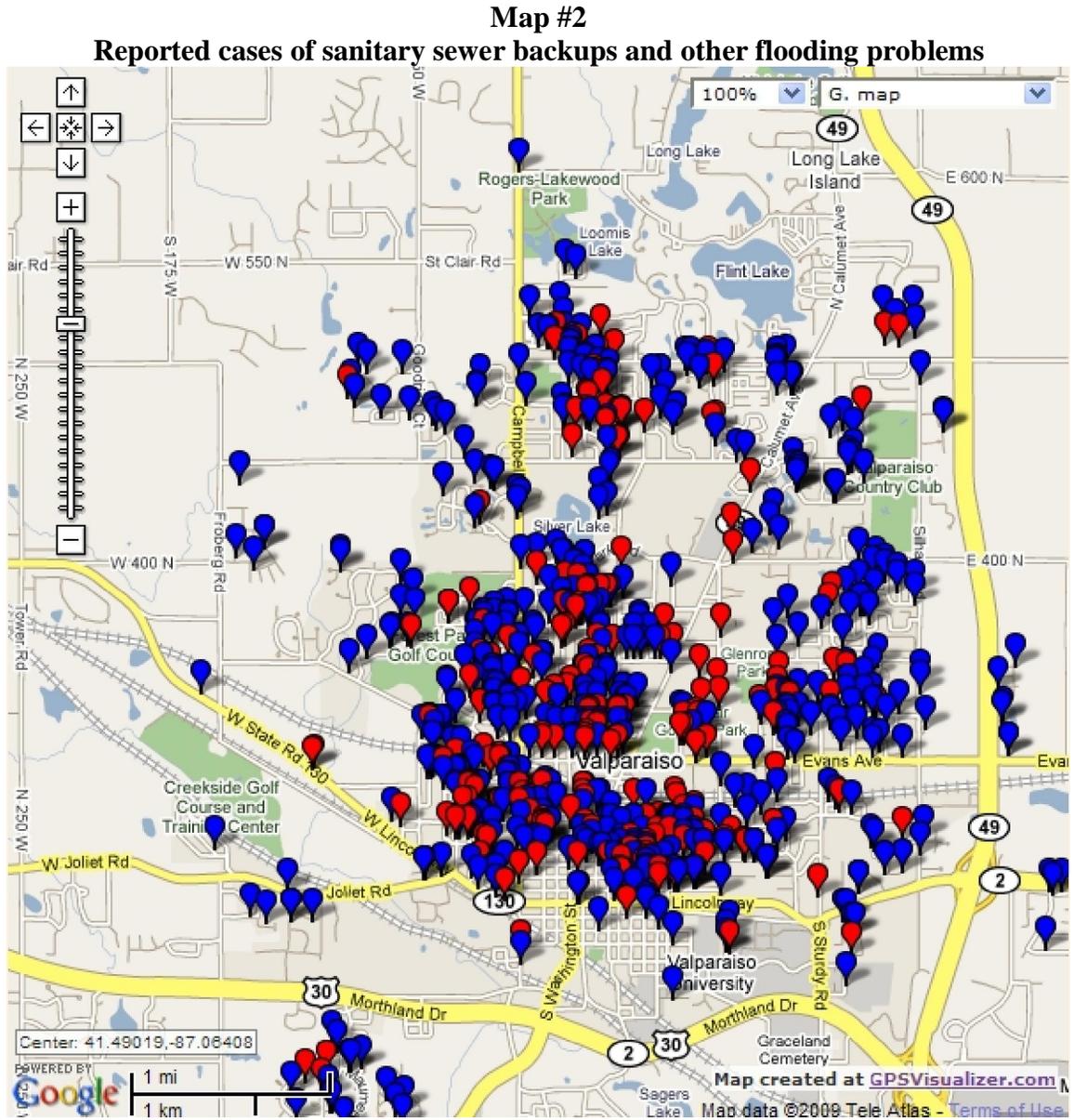


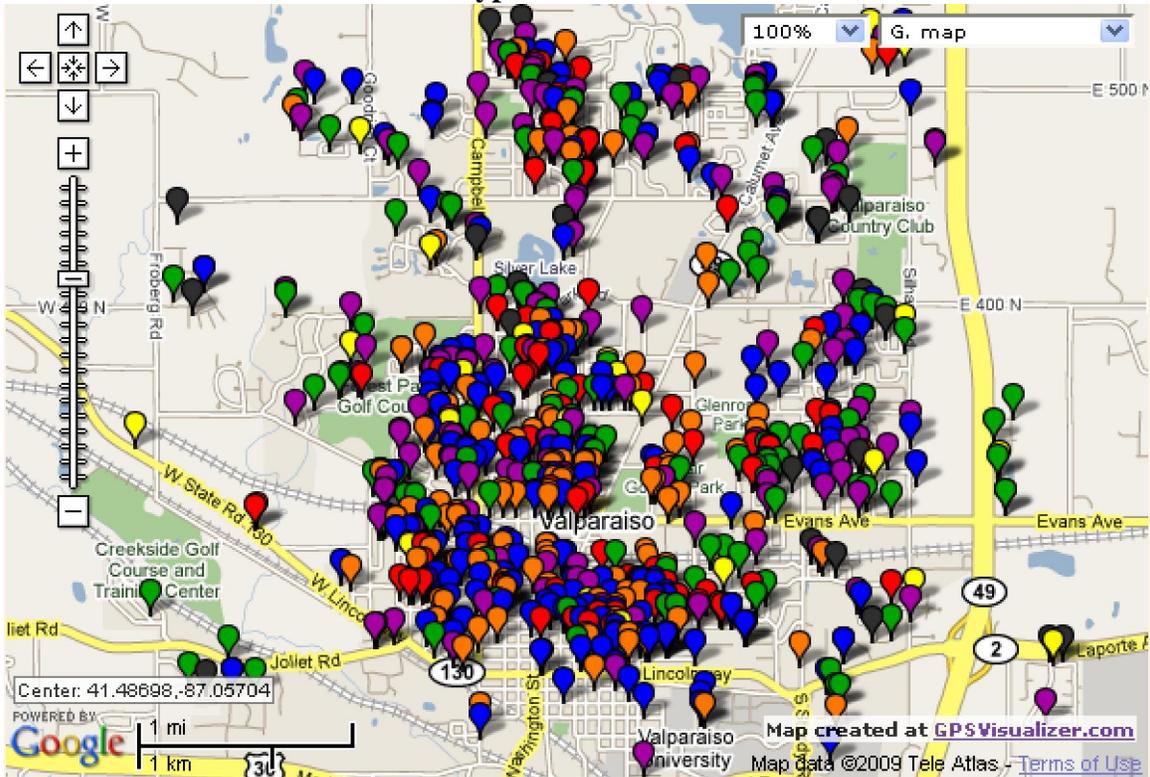
Table 3 presents the data indicating what types of problems respondents reported having. Considering only those persons who indicated they had problems, 31.6% had sewer backup problems, 15.7% had problems with water entering through doors or windows, 56.5% had basement seepage problems, 18.9% had problems with their sump pump, and 25.2% had some other type of problem. A map of these problems is presented in Map 3.

Table 3
Types of Drainage or Sewage Problems
Respondents with Flooding Problems

Type of Problem	Yes	%
Sewer Backup	277	31.6%
Water entering through Windows or Doors	138	15.7%
Seepage into Basement	495	56.5%
Sump Pump Failure	166	18.9%
Other	221	25.2%

Map 3: Types of Problems. Map 3 presents the location of various types of problems reported by Valparaiso residents. Red indicates only a sanitary sewer backup problem, orange indicates a combination of a sanitary sewer problem and some other problem(s), yellow indicates water entered the house through windows or doors only, blue indicates a problem of seepage through basement walls or floors only, black indicates a problem with sump pump failure only, green indicates some other type of flooding problem, and purple indicates multiple problems with flooding not including problems with sanitary sewer backup.

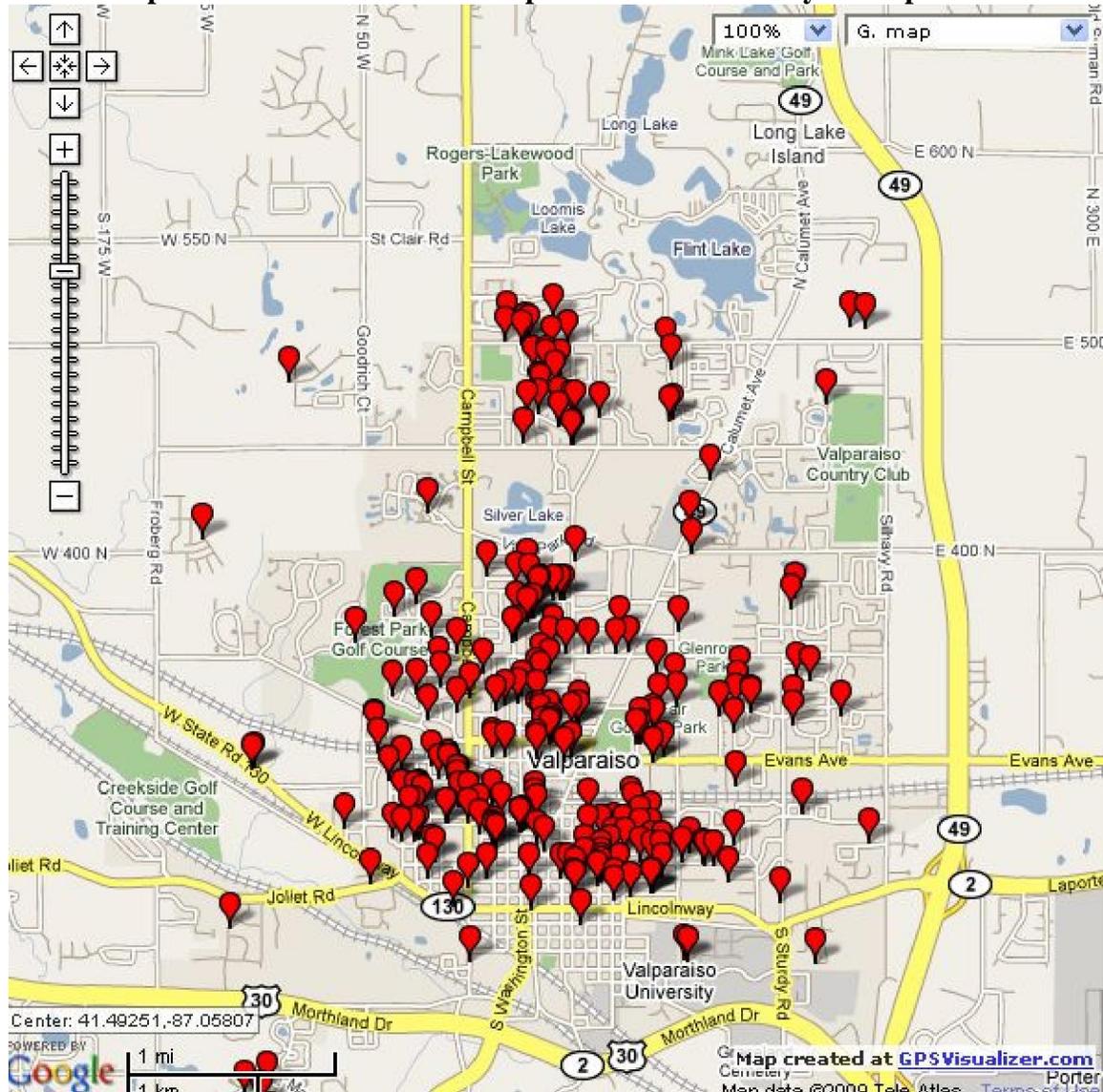
Map 3
Types of Problems



- KEY:**
- Red** = **Sanitary sewer backup only**
 - Orange** = **Sanitary sewer and other problem(s)**
 - Yellow** = **Water entering house through windows or doors only**
 - Blue** = **Seepage through basement walls or floors only**
 - Black** = **Sump pump failure only**
 - Green** = **Other problem only**
 - Purple** = **Multiple problems (not including Sanitary Sewer backup)**

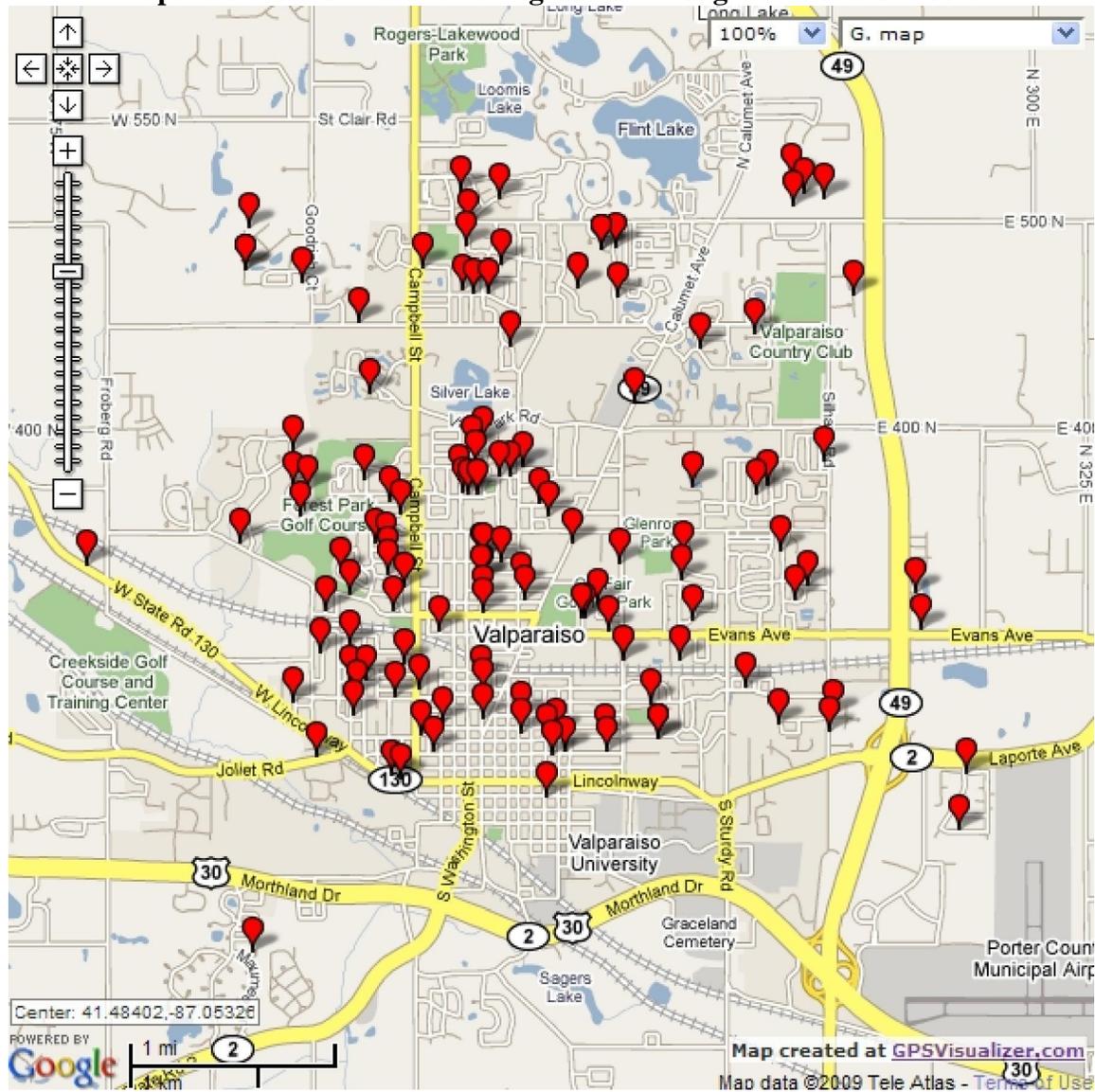
Map 4–8 breaks down the data in Table 3 and Map 3 by the types of problems that residents reported. Each map presents reports of a particular type of flooding problem. Map 4 demonstrates only reports of sanitary sewer backup into home.

Map 4
Reported Cases of Sewer Backup Problems in the City of Valparaiso



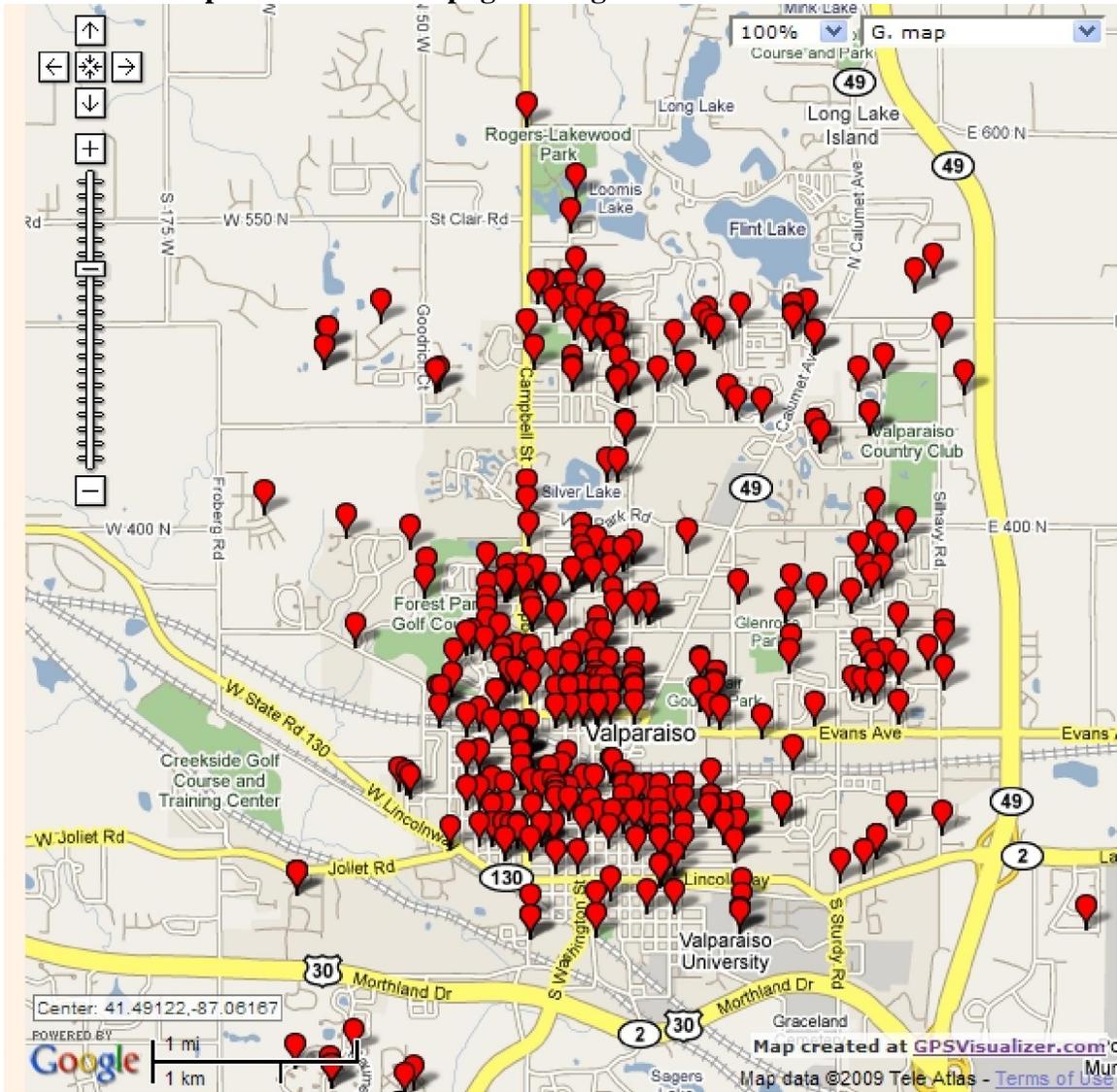
Map 5 plots reported cases of water entering homes through doors and windows.

Map #5 Reported cases of water entering homes through windows or doors



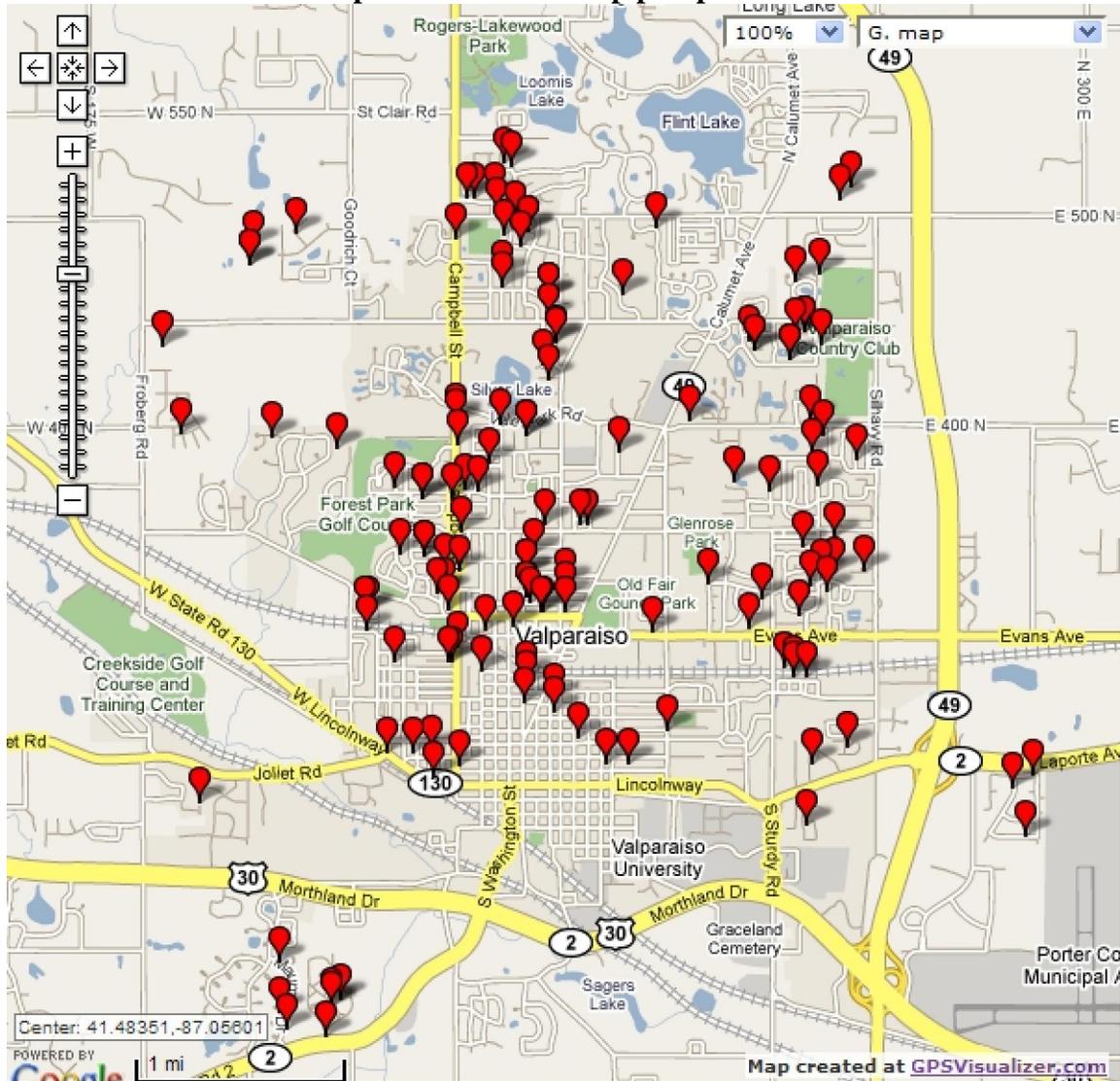
Map 6 plots reported cases of water seepage through basement walls and floors.

Map #6 Reported cases of seepage through basement walls or floors



Map 7 plots reported cases of sump pump failure in the city.

Map #7 Reported cases of sump pump failure



Map 8 plots all other reported flooding problems reported by residents.

Map #8 Other reported cases of flooding problems in the City of Valparaiso

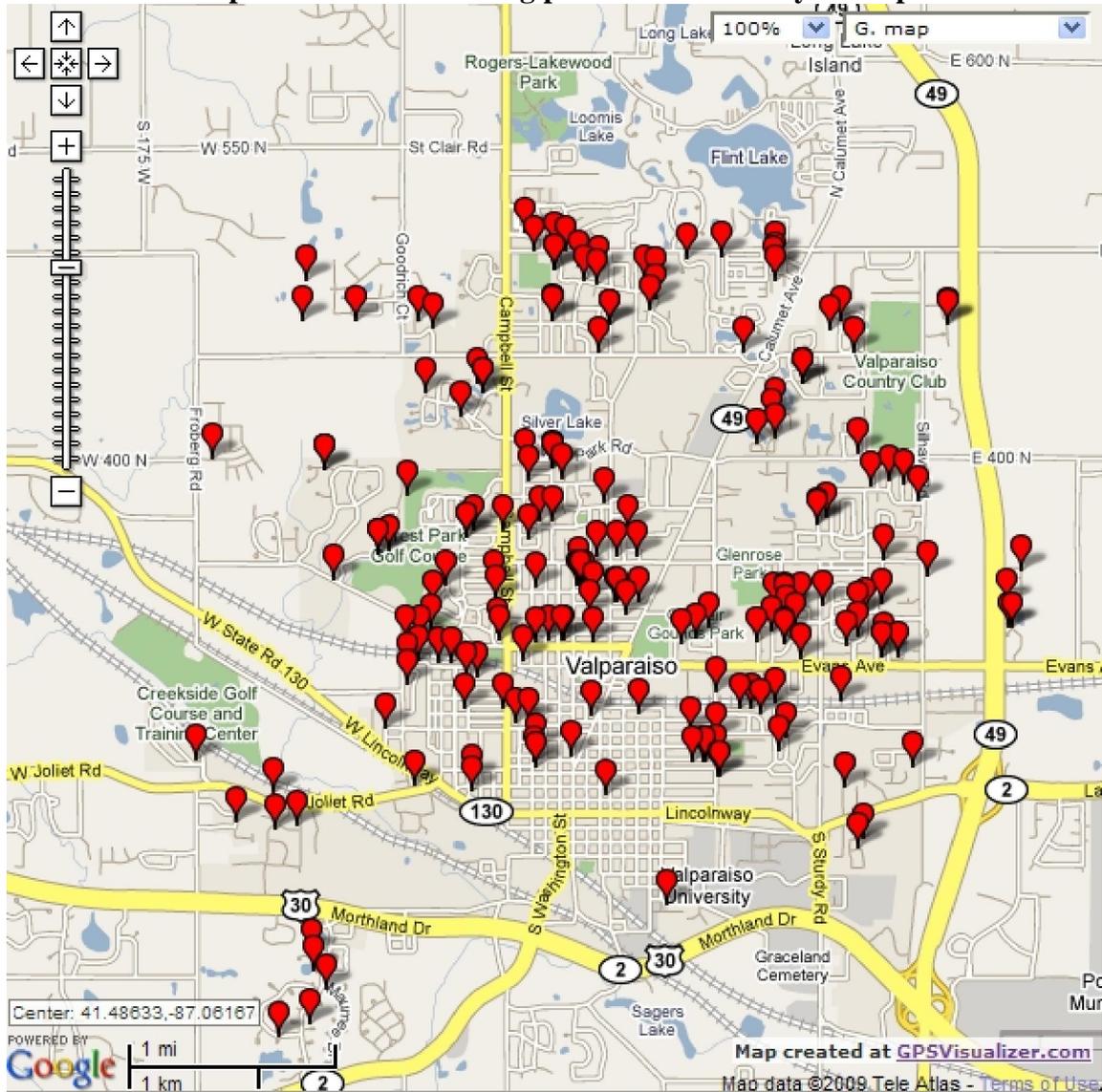


Table 9 demonstrates how serious residents considered their flooding problems to be. Considering only those persons who indicated they had problems, 22.5% reported very serious problems, 25.3% reported serious problems, 29.9% reported somewhat serious problems, and 22.3% reported only minor problems. These responses are demonstrated in Map 9.

Table 9
Seriousness of Valparaiso Residents'
Flooding Problems

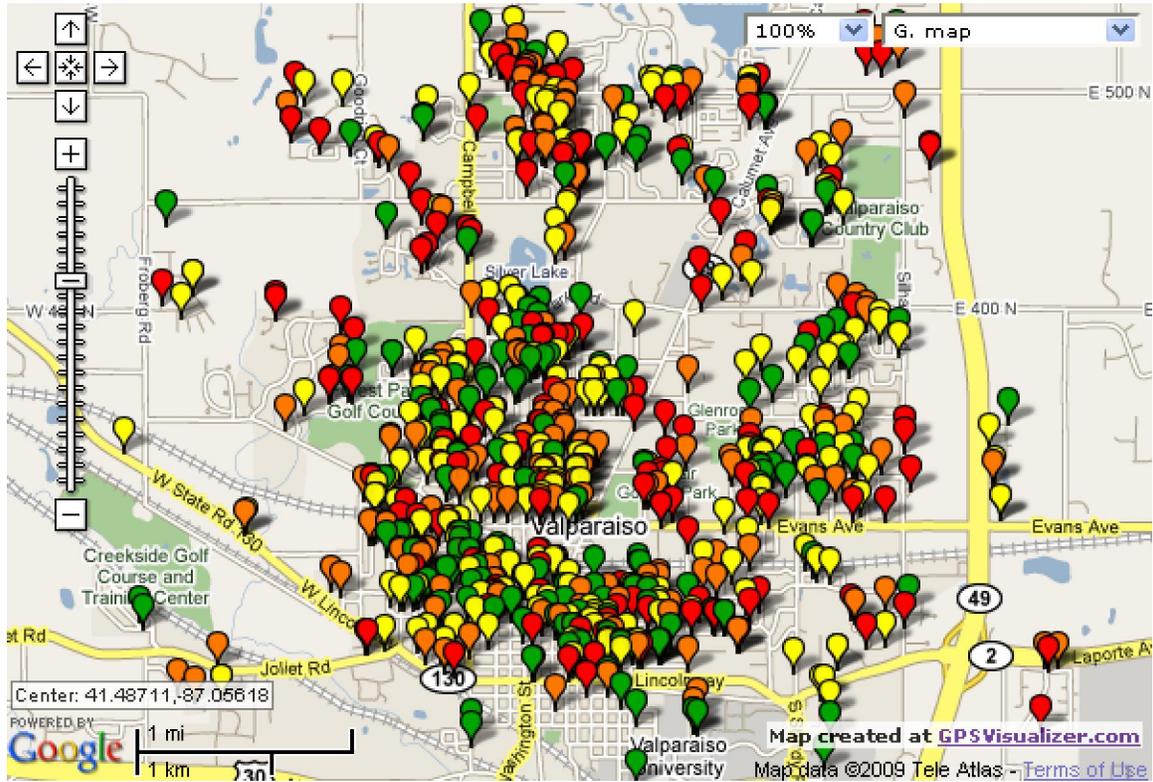
Response	n	Percentage
Very	193	22.5%
Serious	217	25.3%
Somewhat	256	29.9%
Minor	191	22.3%
Total	857	100.0%

Table 10 presents the reported frequency of flooding problems experienced by Valparaiso residents. Considering only those persons who indicated they had problems, 37.3% experienced problems several times per year, 24.6% experienced problems on a yearly basis, 18.8% experienced problems every couple of years, and 19.4% experienced problems only every 5-10 years. The seriousness of the problems is presented in Map 10.

Table 10		
Frequency of the Problems		
Valparaiso Residents		
Response	n	Percentage
Several per year	312	37.3%
Yearly	206	24.6%
Couple years	157	18.8%
5-10 years	162	19.4%
Total	837	100.0%

Map 9: The Seriousness of Flooding. Map 9 presents the data on the location of the most serious problems. Red indicates very serious problems, orange indicates serious problems, yellow indicates somewhat serious problems, and green indicates only minor problems.

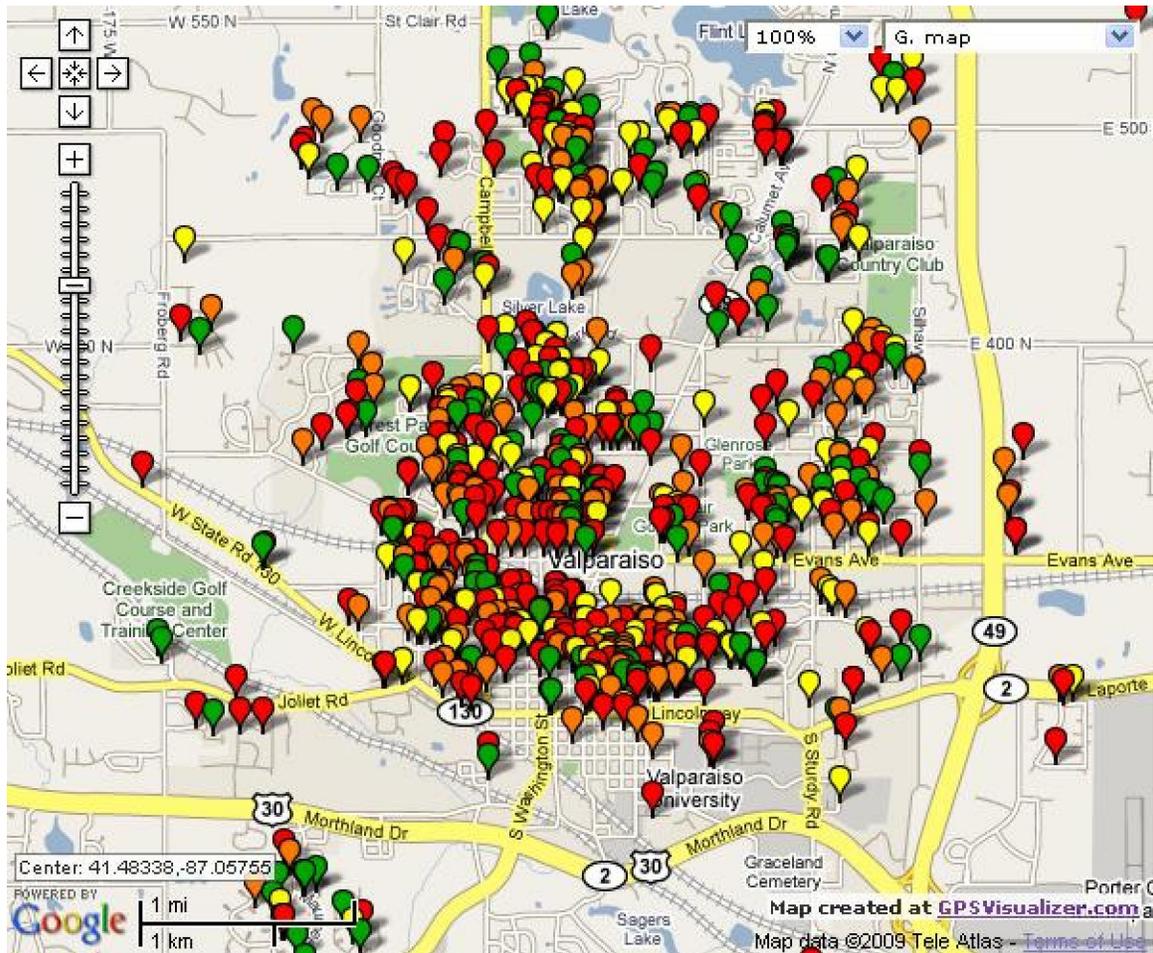
Map 9
Reported Seriousness of Flooding



KEY: Red = Very Serious
 Orange = Serious
 Yellow = Somewhat serious
 Green = Minor

Map 10: The Frequency of Flooding. Map 10 presents information on the frequency of reported flooding problems. Red indicates several times per year, orange indicates at least once per year, yellow once every couple of years, and green once every 5-10 years at most.

Map 10
Frequency of Flooding



KEY: Red = Several times a year
 Orange = At least once a year
 Yellow = Once every couple of years
 Green = Once every 5 to 10 years at most

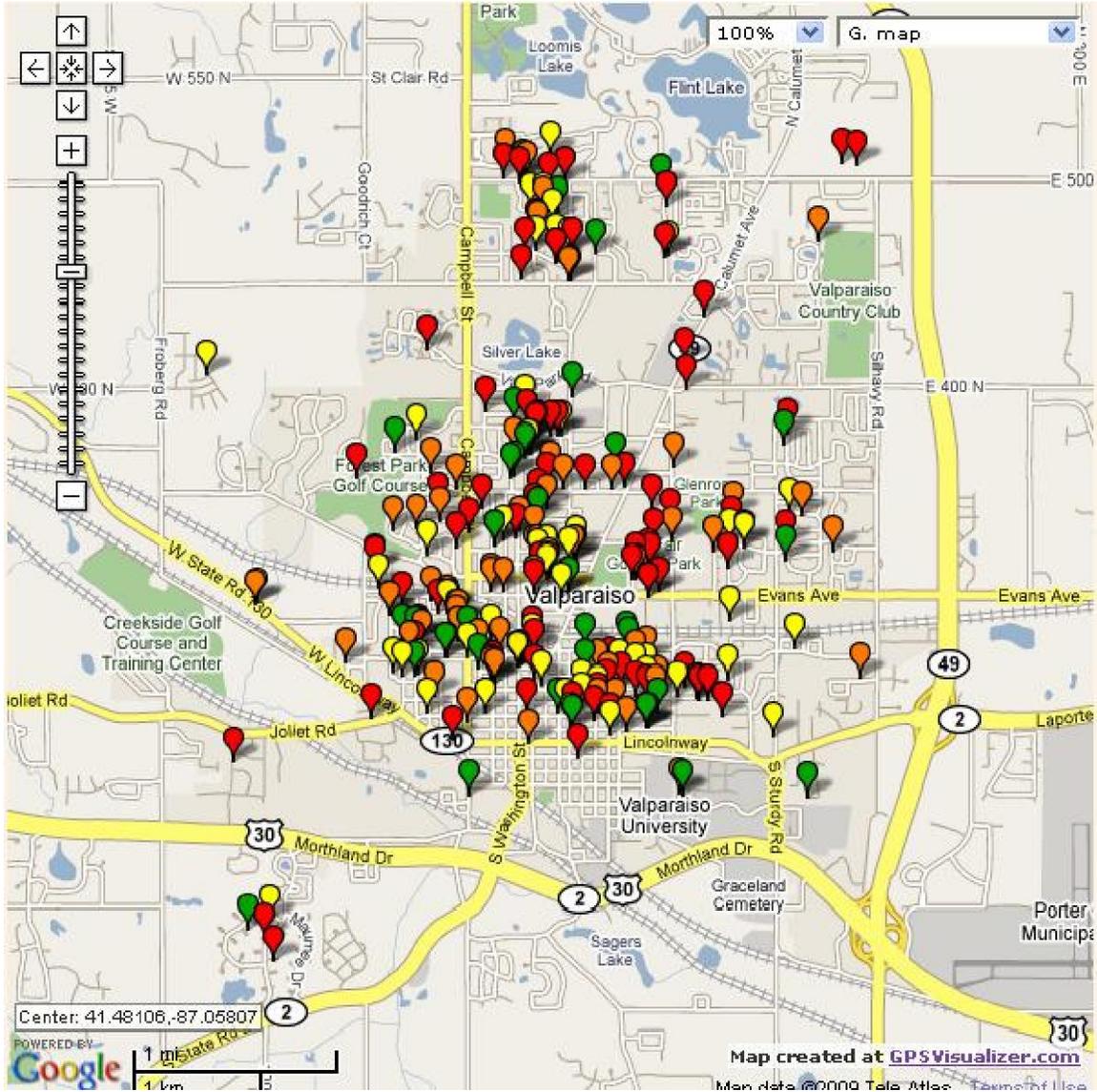
Table 11 focuses on data only for residents who reported that they had experienced sanitary sewer backups into their homes. Most respondents (35.9%) claimed that they had very serious problems, 26.0% said they had a serious problem, 23.8% said their problem was somewhat serious, 13.9% said their problem was minor. A map of the seriousness of the sewer backup problems is presented in Map 11.

Table 11
Seriousness of Sewer Backup
Valparaiso Residents

Response	N	%
Very Serious	98	35.9
Serious	71	26
Somewhat Serious	65	23.8
Minor	38	13.9
No Response	1	0.40%

Map 11: Seriousness of Sewer Backups. Map 11 presents data on the locations of sewer backup problems by how serious they were reported to be. Red indicates very serious sewer backup problems, orange serious problems, yellow somewhat serious problems, and green indicates only minor sewer backup problems.

Map 11
Seriousness of Sewer Backups



KEY: Red = Very serious
 Orange = Serious
 Yellow = Somewhat serious
 Green = Minor

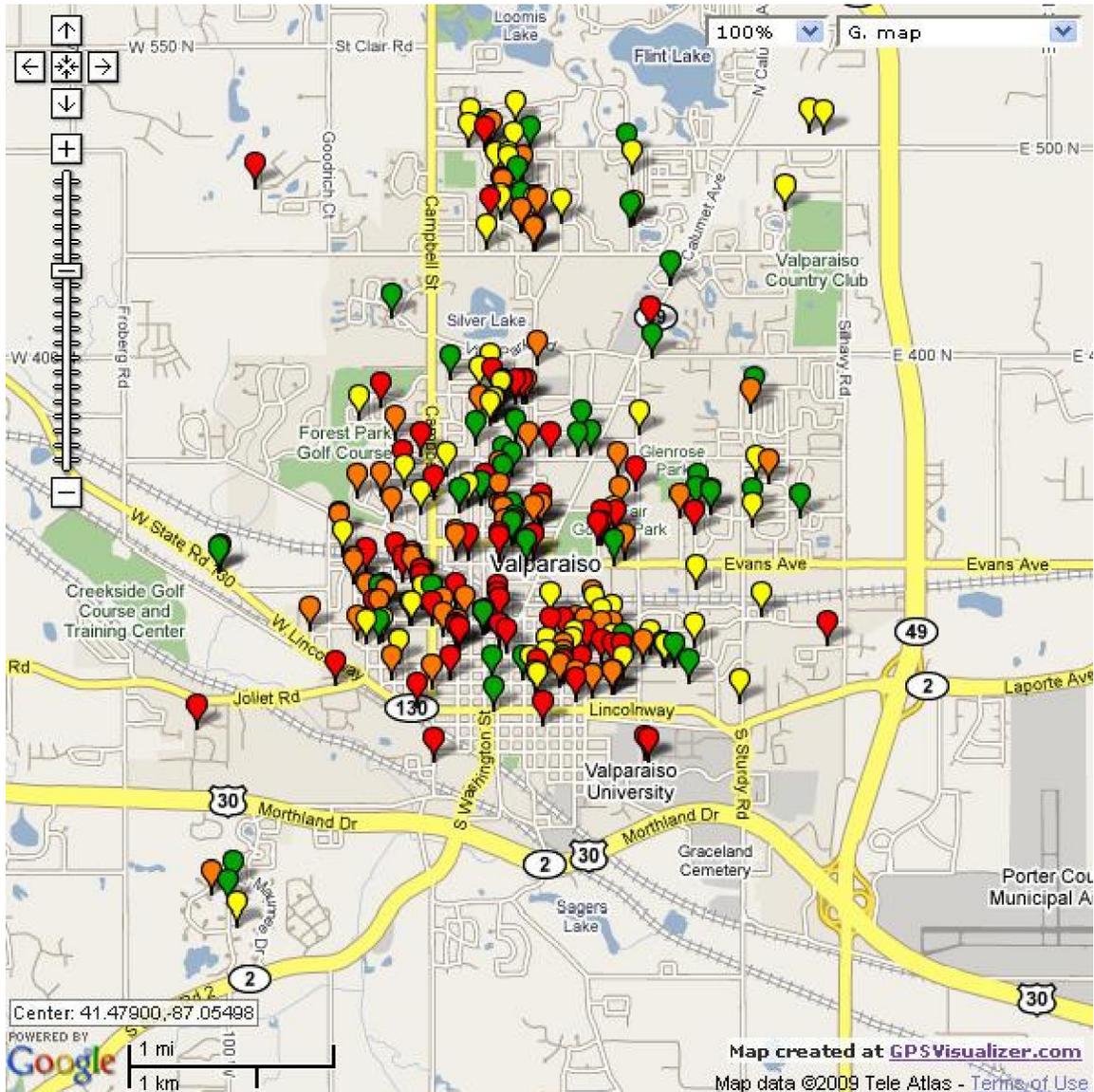
Table 12 shows the frequency of sewer backup problems. Respondents were asked about the frequency of their sewer problems as indicated in **Table 12**: 28.5% said they had several backup problems per year, 24.5% said once a year, 22.7% said that backups happened every couple of years, and 20.2% said they experienced sewer backup problems only every 5–10 years. The frequency of sewer backup problems is presented in Map 11.

Table 12
Frequency of the Sewer Backup
Valparaiso Residents

Response	n	Percentage
Several per year	79	28.5%
Yearly	68	24.5%
Couple years	63	22.7%
5-10 years	56	20.2%
Missing	11	4.0%
Total	277	100.0%

Map 13: Frequency of Sanitary Sewer Backup Problems. Map 13 presents information on the frequency of reported sewer backup problems. Red indicates several times per year, orange indicates at least once per year, yellow once every couple of years, and green once every 5-10 years at most.

Map 13
Frequency of Sanitary Sewer Backup Problems



KEY: Red = Several times a year
 Orange = At least once a year
 Yellow = Once every couple of years
 Green = Once every 5 to 10 years at most

Table 14 presents the data for the methods that residents have tried to solve their various water and flooding problems. Of those surveyed, 4.9% had installed a back flow preventer or check valve, 2.0% had installed a stand pipe, 5.5% had installed a drain plug, 20.1% had installed a sump pump, 31.2% had reconfigured their downspouts, 9.0% had reconfigured their sump pump's discharge, 17.2% had regraded their yard, 26.1% had done something different, and 10.0% had done nothing.

Table 14
Methods tried to solve flooding problems
Valparaiso Residents

Method Used	Yes	Percentage responding "Yes"	n
Installed a back flow preventer or check valve	60	4.9%	1230
Installed stand pipe over floor drain	24	2.0%	1230
Installed drain plug	67	5.5%	1228
Installed a sump pump	248	20.1%	1231
Reconfigured downspouts	383	31.2%	1229
Reconfigured sump pump discharge	110	9.0%	1229
Regraded yard	211	17.2%	1230
Other	321	26.1%	1229
Nothing	123	10.0%	1230