Analysis of Data Gathered by Heritage University Students for the

Lower Yakima Valley Ground Water Committee

In September, 2013, Students from Dr. Jessica Black's Environmental Science class at Heritage University completed a survey of rural residents in the Lower Yakima Valley to determine community understanding of issues related to nitrate contamination of groundwater. Yakima County provided a list of 300 Parcel Numbers and students contacted 284 of these households. A total of 136 surveys were completed, 88 were not possible to complete due to locked gates, dogs, no trespassing signs, etc. and 60 were declined. Survey questions covered types of wells, sources of drinking water, awareness of risks, well water testing, home ownership, illness from drinking water, at risk people in the home, and awareness of the Ground Water Management Area.

Highlights

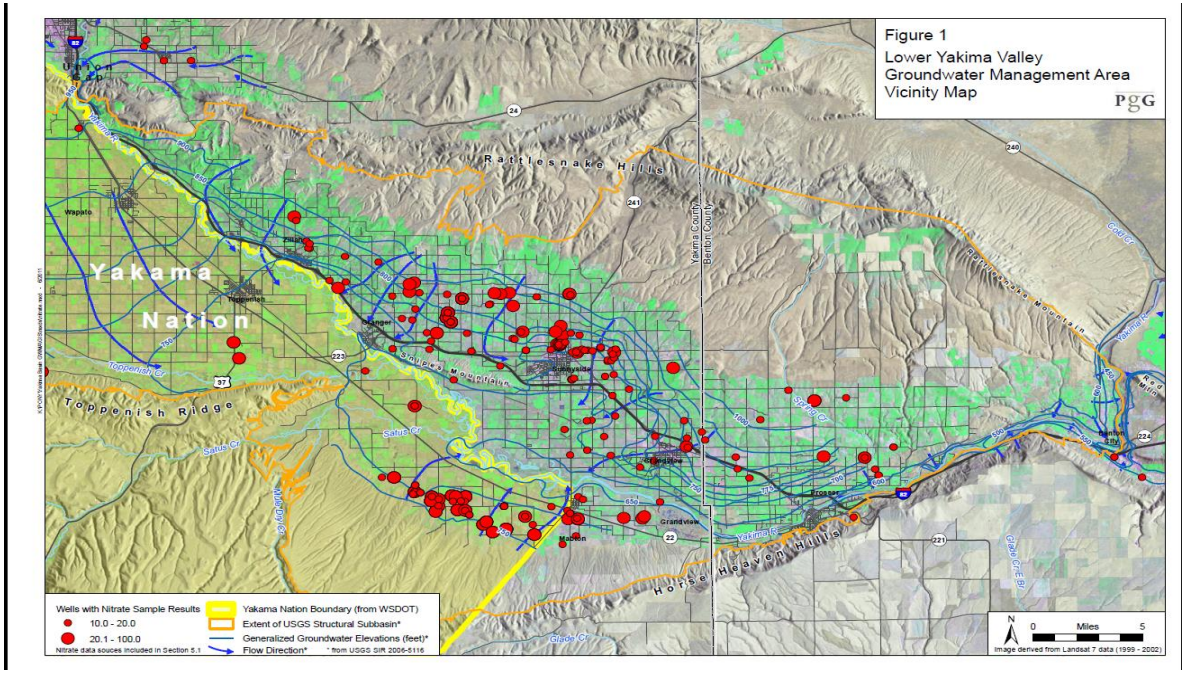
This analysis revealed:

- 26% of those who completed the survey were unaware of nitrate issues
- In two of the major zip codes, 98944 - Sunnyside & 99350 - Prosser, less than half of those surveyed test well water for nitrates.
- There is a statistical difference between home owners and renters regarding awareness of nitrate issues with drinking water. Renters are not as well informed as home owners.
- There is a statistical difference between home owners and renters regarding awareness of the Lower Yakima Valley Ground Water Management Area. Renters are not as well informed as home owners.
- 71% of renters were comfortable asking landlords to test well water and 29% were not.
- There is a high correlation between being aware of nitrate issues and having well water tested for nitrates.
- People in the Zillah area are most likely to know about nitrates, most likely to have their water tested and most likely to drink tap water. On average people from this group have lived in their homes five years, much lower than the average of eleven years for the study area.
- People in the Konnowac Pass area were least likely to complete a survey (16%) and most likely to decline (67%).

- People with Spanish Surnames were slightly more likely to complete surveys than those without: 55% compared to 49%.
- 43% of those with Spanish surnames purchase bottled water compared to 15% of those with non-Spanish surnames. There was no statistical difference in risks for those with Spanish surnames and those without.

Survey Area

The survey covers the land within the Lower Yakima Valley Groundwater Management Area as revised in July 2012. This includes all of Zip Codes 98932, 98938, and 98953; Most of Zip code 98930, 98944 and 98935; and parts of Zip Codes 98936, 98948, 98951 and 99350.The map below shows the original boundaries of the GWMA. The revised boundaries terminate at the Yakima Benton County line.



Populations

Only those residents who live outside city limits on property served by private wells were surveyed. The numbers of rural residents for the included zip codes are estimated in the table below. Between 2.1% and 5.2% of the rural households for the major zip codes were sampled.

Table 1: Survey Populations by Zip Code

ZipCode	City	ZipCode Pop	City Pop	Rural Pop	Households	Est Rural HH	Households Surveyed	% Rural HH Surveyed
98930	Grandview	15,252	9,053	6,199 (41%)	4,292	1,760	50	2.8%
98932	Granger	5,032	2,948	2,084 (41%)	1,286	527	14	2.7%
98935	Mabton	4,190	2,148	2,042 (49%)	1,070	524	11	2.1%
98936	Moxee	5,872	1,362	4,510 (77%)	1,903	1,465	12	0.8% (*)
98938	Outlook	2,177		2,177 (100%)	589	589	4	0.7% (*)
98944	Sunnyside	22,014	15,298	6,716 (31%)	6,124	1,898	99	5.2%
98948	Toppenish	13,225	9,360	3,724 (28%)	3,495	979	2	0.2% (*)
98951	Wapato	13,739	4,716	9,032 (66%)	3,617	2,387	10	0.4% (*)
98953	Zillah	6,681	2,699	3,982 (60%)	2,210	1,326	40	3%
99350	Prosser	12,979	5,799	7,180 (55%)	4,240	2,332	36	1.5% (*)

Zip Code population and household data from www.zipcodes.com

City population estimates from Yakima County Profile at http://www.yakimacounty.us/oem/hmp/YakimaCountyProfile.pdf

Population for Prosser from https://www.google.com/#q=Prosser+Wa+population

Starred Items:

Much of Zip Code 98936 is beyond Konowac Pass and outside the GWMA Boundaries

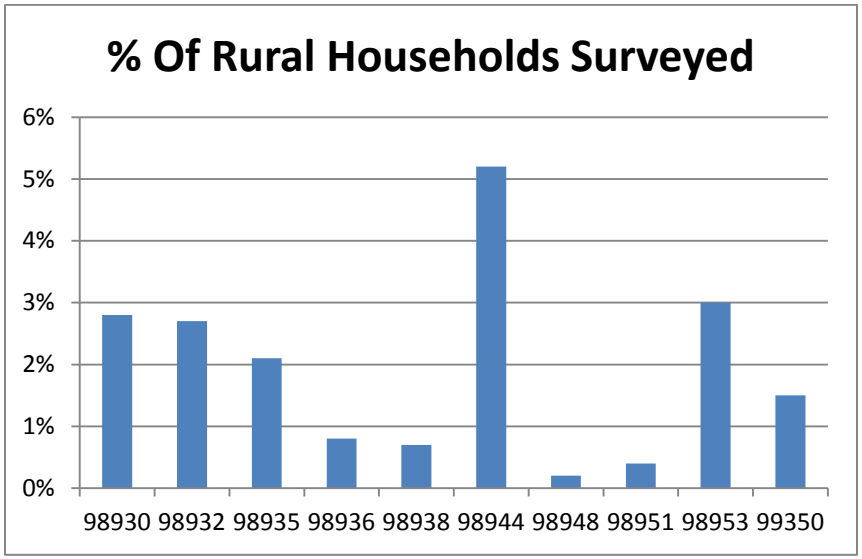
Much of Zip Code 98938 is part of a special agreement with the Environmental Protection Agency (EPA) which precludes inclusion in GWMA activities

Much of Zip Code 98948 is on the Yakama reservation which precludes inclusion in GWMA activities

Much of Zip Code 98951 is on the Yakama reservation which precludes inclusion in GWMA activities

Much of Zip Code 99350 is in Benton County and outside the GWMA Boundaries

Graph 1: % of Households Surveyed



Analysis

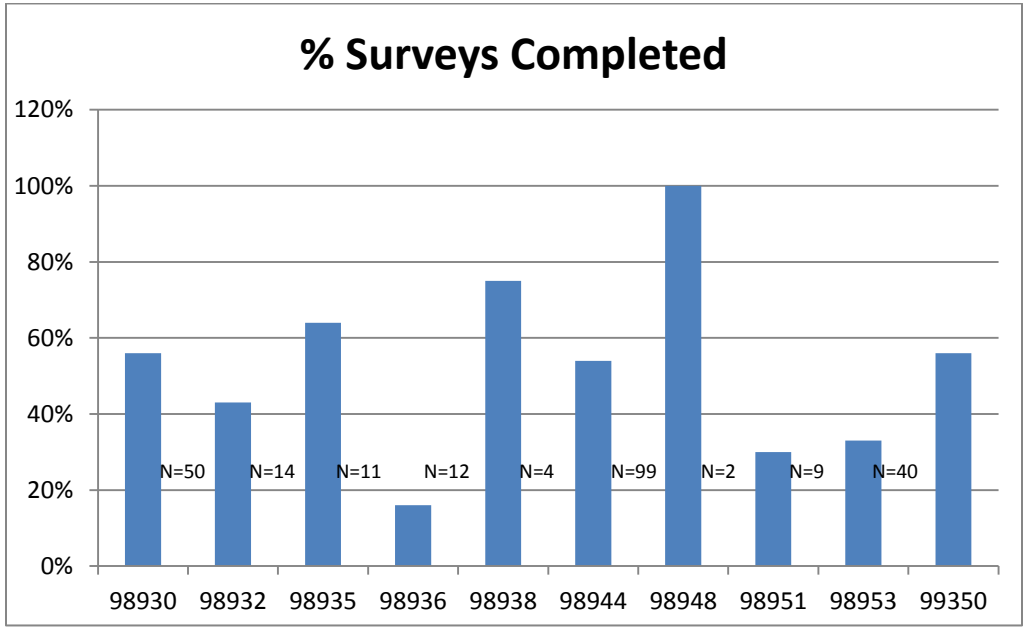
This analysis is presented in three parts. The first and largest compares results based on zip codes. The second looks at several clusters of properties that were intensively surveyed. This includes 5 parcels along Independence, Fordyce & Reeves Roads; 7 parcels on Krough Road; 5 parcels on the Old Prosser Highway' 7 parcels on Ray Road, 16 parcels on Van Belle & Cemetery Roads; 7 parcels on Welles Gap Road; and 6 parcels on Zickler Road. Finally there is a small section that compares properties owned by people with Spanish surnames to those without Spanish surnames.

Zip Code Analysis

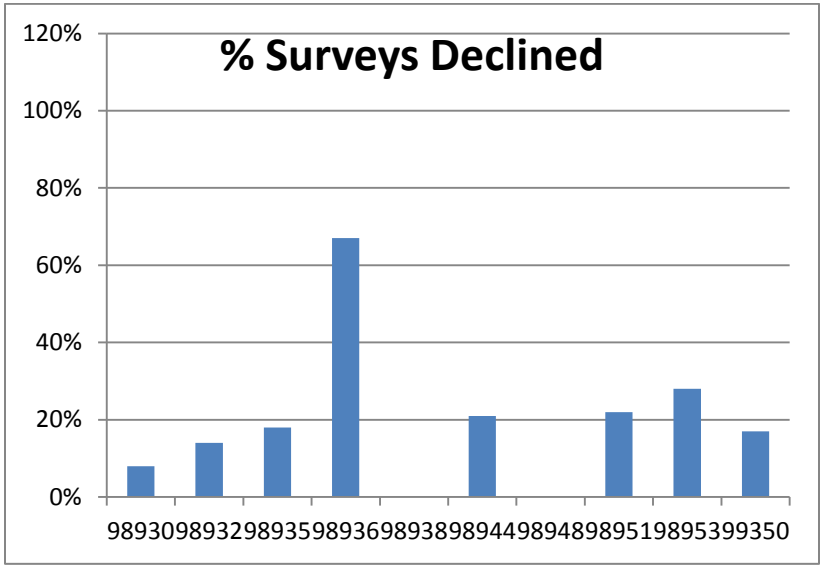
Willingness to Participate

Rates of survey completion for the ten Zip Codes ranged from 16% of those contacted in Zip Code 98936 – Konnowac Pass (N = 12) to 100 % in Zip Code 98948 – Toppenish (N = 2). Rates for declining to participate ranged from 0% in Zip Code 98948 to 67% in Zip Code 98936.

Graph 2: Percent of Surveys Completed



Graph 3: Percent of Surveys Declined



Graph 4: Percent Surveys Not Possible to Complete

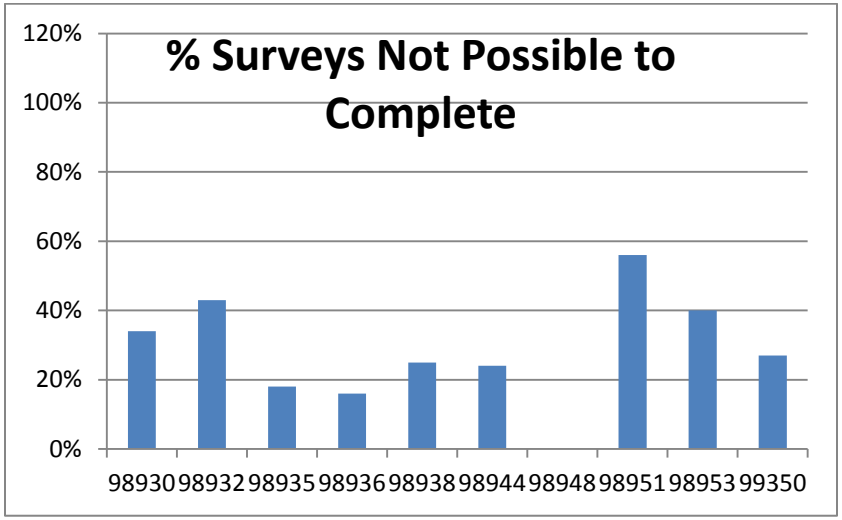


Table 2: Survey Completion Rates

ZipCode	City	HH Surveyed	Complete	% Complete	Declined	% Declined	Not Possible	% Not possible
98930	Grandview	50	28	56%	4	8%	18	34%
98932	Granger	14	6	43%	2	14%	6	43%
98935	Mabton	11	7	64%	2	18%	2	18%
98936	Moxee	12	2	16%	8	67%	2	16%
98938	Outlook	4	3	75%	0	0%	1	25%
98944	Sunnyside	99	53	54%	21	21%	25	24%
98948	Toppenish	2	2	100%	0	0%	0	0%
98951	Wapato	9	2	22%	2	22%	5	56%
98953	Zillah	40	13	33%	11	28%	16	40%
99350	Prosser	36	20	56%	6	17%	10	27%
Total		277	136	49%	56	20%	85	31%

Most of this the remaining analysis compares data from four zip codes with the highest numbers of completed surveys. The sample numbers for many zip codes were too small to offer statistically valid results. For example, there were only two completed surveys in zip code 98948. Using this data would allow two people to speak for a population of 3,724.

1. 98930 – Grandview with 28 completed surveys

2. 98944 – Sunnyside with 53 completed surveys

3. 98953 – Zillah with 13 completed surveys

4. 99350 – Prosser with 20 completed surveys

Survey Results

Wells: 88% of the properties surveyed relied on private wells for water. In the Grandview (98930) area 2 out of 28 or 7% of the wells were community or shared. In the Sunnyside (98944) area 4 out of 53 or 8% were community or shared.

Table 3: Well Type

	Private	%	Shared	%	Unknown	%	No Answ.	%
98930	25	89%	2	7%	1	4%	0	0%
98932	5	83%	1	17%	0	0%	0	0%
98935	6	86%	1	14%	0	0%	0	0%
98936	2	100%	0	0%	0	0%	0	0%
98938	3	100%	0	0%	0	0%	0	0%
98944	44	83%	4	8%	5	9%	0	0%
98948	2	100%	0	0%	0	0%	0	0%
98951	2	100%	0	0%	0	0%	0	0%
98953	13	100%	0	0%	0	0%	0	0%
99350	18	90%	0	0%	1	5%	1	5%
Total	120	88%	8	6%	7	5%	1	1%

Graph 5: Sources of Drinking Water for the Major Zip Codes

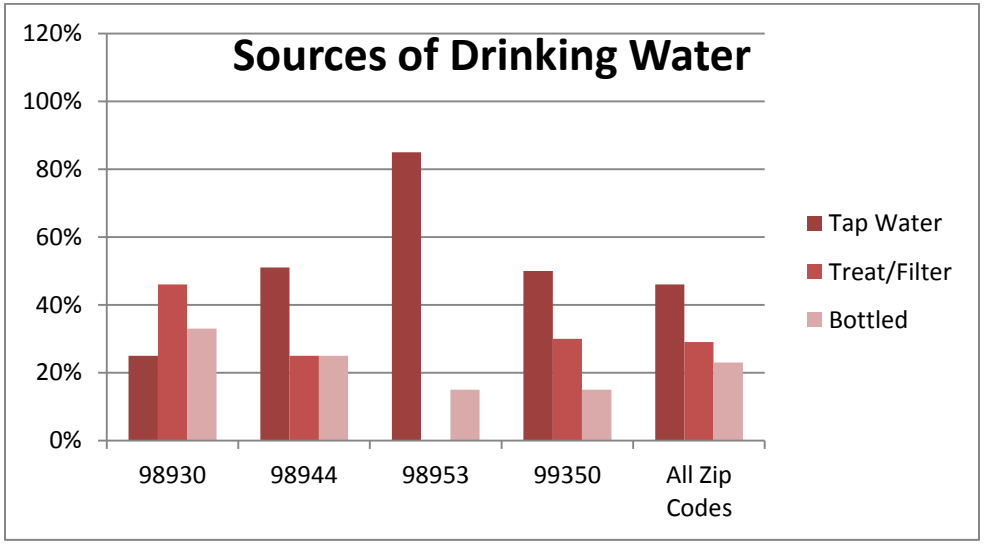


Table 4: Sources of Drinking Water for the Major Zip Code Areas

Zip Code Area	Tap Water	Treat/Filter	Bottled	No Answer
98930	25%	46%	33%	7%
98944	51%	25%	25%	0%
98953	85%	0%	15%	0%
99350	50%	30%	15%	5%
All Zip Codes	46%	29%	23%	2%

Awareness of Nitrate Problems: Between 60% and 85% of those surveyed are aware of nitrate issues. Overall 26% of those who completed the survey are not aware of the problem. In zip codes 98944 and 99350 30% of those surveyed did not know about nitrates in drinking water.

Graph 6: Awareness of Nitrate Issues in the Major Zip Codes

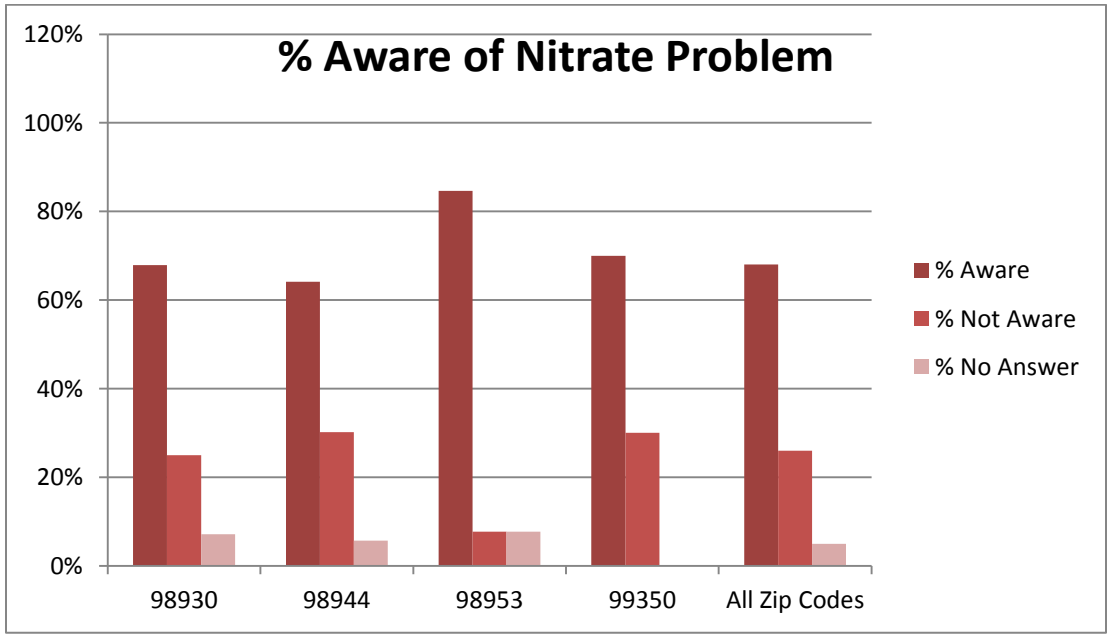


Table 5: Percentage Aware of Nitrate Problems for the Major Zip Code Areas

Zip Code Area	% Aware	% Not Aware	% No Answer
98930	68%	25%	7%
98944	64%	30%	6%
98953	85%	8%	8%
99350	70%	30%	0%
All Zip Codes	68%	26%	5%

Testing: In two of the major zip codes, 98944 & 99350, less than half of those surveyed test well water for nitrates. For the total GWMA area only 53% of the sample population tests for nitrates. Future surveys might explore the reasons why people do not test.

Graph 7: Testing for Nitrates in the Major Zip Codes

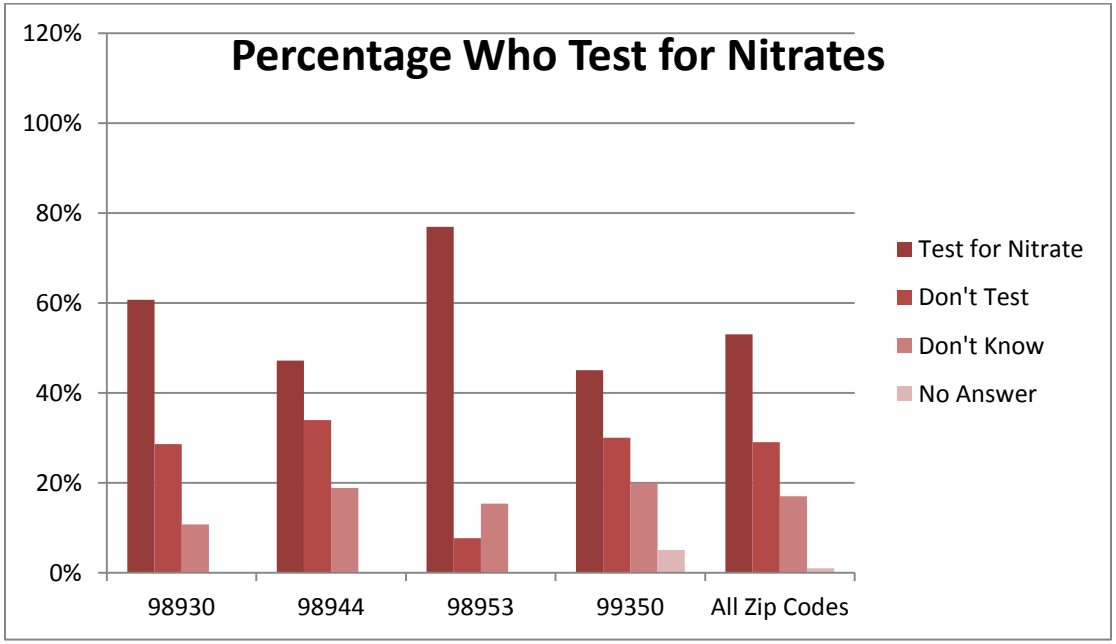


Table 6: Testing for Nitrates in the Major Zip Codes

Zip Code Area	Test for Nitrate	Don't Test	Don't Know	No Answer
98930	61%	29%	11%	0%
98944	47%	34%	19%	0%
98953	77%	8%	15%	0%
99350	45%	20%	20%	5%
All Zip Codes	53%	29%	17%	1%

Testing for Bacteria: Fewer people test for bacteria in their water compared to those who test for nitrates. We know from the VIRES study that rates of bacteria in groundwater may be higher in the middle valley compared to the lower valley. Zip Code 98953 is the closest to the middle valley and 62% of those sampled for this zip code test for bacteria. We also know that having both bacteria and nitrates in drinking water significantly increases the risk of methemoglobinemia. It would be interesting to know whether people understand this dynamic.

Graph 8: Testing for Bacteria in the Major Zip Codes

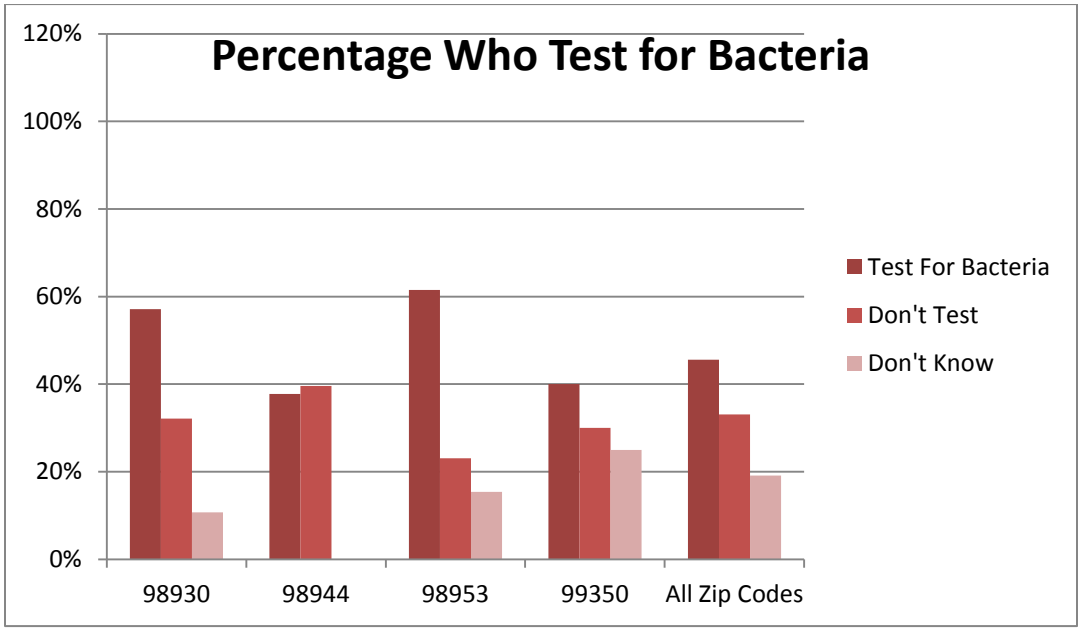


Table 6: Testing for Bacteria in the Major Zip Codes

Zip Code Area	Test for Bacteria	Don't Test	Don't Know	No Answer
98930	57%	32%	11%	0%
98944	38%	40%	0%	0%
98953	62%	23%	15%	0%
99350	40%	30%	25%	5%
All Zip Codes	46%	33%	19%	1%

Home Ownership: The majority of properties in the target area are occupied by home owners. The highest rental rates are in zip code 98930 and 9844 with 18% and 19%. Only 17 of the 136 people surveyed were renters and 4 did not specify.

Graph 9: Home Ownership

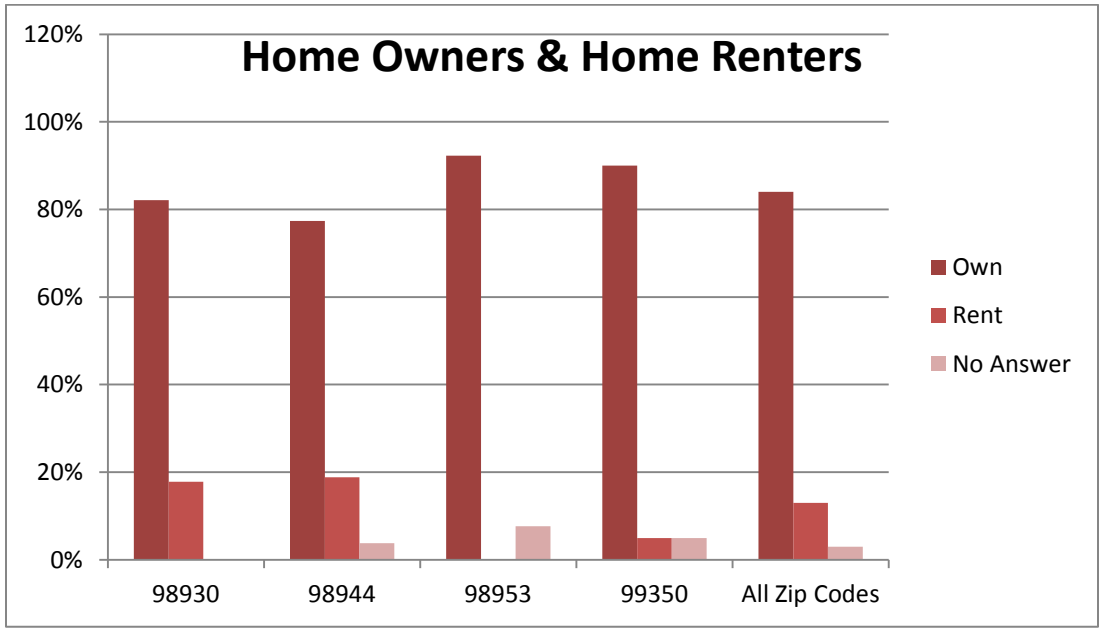


Table 7: Home Ownership

Zip Code Area	% Owners	% Renters	% No Answer
98930	82%	18%	0%
98944	77%	19%	4%
98953	92%	0%	8%
99350	90%	5%	5%
All Zip Codes	84%	13%	3%

Chi square testing found a statistical difference in the awareness of nitrate problems between renters and owner.

Table 7: Owners & Renters Awareness of Nitrate Issues

Status	% Aware	% Not Aware	% No Answer
Own	73.7% (84)	21.9% (25)	5 (4.4%)
Rent	35.3% (6)	58.8% (10)	5.9% (1)
No Answer to ownership	75% (3)	0% (0)	25% (1)

Chi square testing found no significant difference in rates of testing for nitrates or bacteria between renters and owners. However, 35% of renters did not answer these two questions.

Table 8: Owners & Renters – Testing for Nitrates

Status	Test for Nitrate	Don't Test	Don't Know/No Answer
Own	57% (65)	33% (32)	15% (17)
Rent	35% (6)	29% (5)	35% (6)
No Answer regarding ownership	25% (1)	50% (2)	25% (1)

Table 9: Owners & Renters – Testing for Bacteria

Status	Test for Bacteria	Don't Test	Don't Know/ No Answer
Own	49% (56)	33% (37)	18% (21)
Rent	29% (5)	35% (6)	35% (6)
No Answer regarding ownership	25% (1)	50% (2)	25% (1)

71% of renters (12) said they were comfortable asking their landlords to test well water for nitrates. 29% of renters (5) said they were not comfortable asking. Interestingly 21 people who said they were home owners answered this question as well as 2 people who did not specify home ownership. These cases were not included in the analysis.

Of the six people who became sick after drinking well water 2 were renters and 4 were home owners. This did not rise to a level of statistical significance. In other words, the numbers are too small to draw conclusions.

Table 10: Owners & Renters – Sick from Drinking water

Status	Sick from Water	Not Sick from water	No Answer
Own	4% (4)	92% (105)	4% (5)
Rent	12% (2)	88% (15)	0% (0)
No Answer to Ownership	0% (0)	100% (4)	0% (0)

Chi square analysis found no statistical difference between home owners and renters regarding knowledge of ways to make drinking water safe although the percentage for home owners is higher. This is the result of a small number of renters in the sample.

Table 11: Know Ways to Make Water Safer

Status	Know Ways to Make Water Safe	Don't Know Ways to Make Water Safe	No Answer
Own	64% (73)	26% (30)	10% (11)
Rent	41% (7)	41% (7)	18% (3)
No Answer to ownership	50% (2)	50% (2)	0% (0)

There was one pregnant woman in the survey and she was a home owner. There was one child under the age of six months and this child lived in the home of a renter. There were four chronically ill people living in owner homes and one in a renter home. The percentages are almost equal.

Differences in awareness of the Lower Yakima Valley Ground Water Management Area between home owners and renter are significant. Only 18% of the 17 renters in the study knew about the GWMA.

Table 12: Aware of the Ground Water Management Area

Status	Aware of GWMA	Not Aware of GWMA	No Answer
Own	46% (52)	50% (57)	4% (5)
Rent	18% (3)	82% (14)	0% (0)
No Answer to ownership	25% (1)	50% (2)	25% (1)

Demographic Data for All Properties Selected for the Survey:

	98930	98932	98935	98936	98938	98944	98948	98951	98953	99350
Smallest Property Siz	27,190 sq.	0.54 acre	0.79 acre	1.26 acre	2 acres	40,519 sq	2.03	0.97 acre	0.36 acre	0.36
Largest Property Size	14.63 acre	5.76 acre	10.83 acr	10.99 acr	2.41 acre	57.66 acr	2.81	15.58 acr	9.02 acre	18.14
Average Property Siz	2.77 Acres	2.37 acre	4.97 acre	7.65 acre	2.19 acre	2.437753	2.42	5.3 acres	2.64 acre	3.18
Lowest Home Value	$5,700	$22,400	$15,000	$64,800	$51,900	$0	$190,400	$79,800	$36,000	$35,400
Highest Home Value	$273,800	$240,900	$274,700	$729,500	$135,500	$470,900	$222,500	$463,200	$269,100	$317,100
Average Home Value	$106,260	$136,657	$100,945	$188,383	$86,675	$95,823	$206,900	$191,367	$125,459	$121,574
Lowest Property Valu	$30,100	$68,100	$45,450	$99,200	$92,800	$21,500	$231,500	$122,000	$75,500	$71,500
Highest Property Val	$311,600	$300,600	$322,000	$801,800	$177,700	$654,100	$271,300	$514,900	$324,100	$362,300

Average Property Value	$144,453	$184,286	$144,522	$231,800	$131,175	$134,102	$251,900	$244,133	$172,169	$165,703
Oldest Home	1903	1940	1920	1978	1950	1906	1978	1912	1920	1905
Newest Home	2010	2009	2010	2005	1999	2009	2008	2007	2008	2009
Spanish Surname	17 of 50 34%	3 of 14 21%	8 of 11 73%	1 of 12 8%	2 of 4 50%	35 of 95 37%	0 of 2 0%	0 of 2 0%	2 of 39 5%	4 of 38 11%

Please see attachments for graphical description of demographic data.

Statistical Analysis of the Total Survey

Most of the zip codes provided similar answers to the survey questions. The differences that rose to statistical significance are reported below. Chi square analysis was performed for correlations between awareness of nitrate issues, testing for nitrates or bacteria, home ownership, sickness from drinking water, ways to make water safe and awareness of the GWMA. The number of households with a child under six months, a pregnant woman or a chronically ill person was too small for inclusion. Open ended questions elicited a wide variety of answers that did not lend themselves to coding.

There is a high correlation between being aware of nitrate issues and having well water tested for nitrates. ($p = .004$)

Table 13

	Aware of Nitrates	Not Aware	No Answer	Total
Test for Nitrate	60 (65%)	8 (23%)	4 (57%)	72
Don't Test	21 (23%)	16 (46%)	2 (28%)	39
Don't Know	1 (1%)	0 (0%)	0 (0%)	1
No Answer	11 (12%)	11 (31%)	1 (14%)	23
Total	93	35	7	135

There is also a high correlation between being aware of nitrate issues and having well water tested for bacteria. (p = .002)

Table 14

	Aware of Nitrates	Not Aware	No Answer	Total
Test for Bacteria	52 (56%)	6 (17%)	4 (57%)	62
Don't Test	27 (29%)	16 (46%)	2 (29%)	45
Don't Know	0(0%)	0 (0%)	0 (0%)	0
No Answer	14 (15%)	13 (37%)	1 (14%)	28
Total	93	35	7	135

A statistically higher percentage of people who are not aware of nitrates have become ill from drinking well water than those who are aware. (p = .02)

Table 15

	Aware of Nitrates	Not Aware	No Answer	Total
Sick from Water	1 (1%)	4 (11%)	1 (14%)	6
Not Sick	90 (97%)	28 (80%)	6 (86%)	124
No Answer	2 (2%)	3 (9%)	0 (0%)	5
Total	93	35	7	135

People who are aware of nitrate issues are statistically more likely to have heard of the GWMA. (p = .011)

Table 16

	Aware of Nitrates	Not Aware	No Answer	Total
Aware of GWMA	45 (48%)	6 (17%)	5 (71%)	56
Not Aware of GWMA	44 (47%)	27 (77%)	2 (29%)	73
No Answer	4 (4%)	2 (6%)	0 (0%)	6
Total	93	35	7	135

Cluster Analysis

The survey gathered data from groups of people who live in close proximity at several locations around the county. This provided an opportunity to compare groups. The clusters are 5 parcels along Independence, Fordyce & Reeves Roads; 7 parcels on Krough Road; 5 parcels on the Old Prosser Highway' 7 parcels on Ray Road, 16 parcels on Van Belle & Cemetery Roads; 7 parcels on Welles Gap Road; and 6 parcels on Zickler Road.

Demographics for Clusters of Properties

	Welles Gap	Old Prosser Highway	Independence, Fordyce & Reeves	Ray Road	Zickler Road	Krough Road	Van Belle & Cemetery
Smallest Property Size	1.27 acre	27,190 sq.	0.43 acres	40,519 sq.	0.36 acre	0.45 acre	0.57 acres
Largest Property Size	2.64 acre	4 acres	57.66 acres	4.98 acres	6.42 acre	18.14 acr	7.9 acres
Average Property Size	1.76 acre	2.4 acres	5.28 acres	1.36 acres	2 acres	3.85 acre	2.3 acres
Lowest Home Valu	$103,400	$86,500	$41,800	$3,400	$36,500	$6,400	$31,500
Highest Home Value	$317,100	$273,800	$470,900	$128,900	$269,000	$185,700	$343,100
Average Home Value	$169,614	$138,282	$119,688	$79,627	$150,220	$90,960	$104,533
Lowest Property Value	$149,300	$127,900	$82,300	$30,900	$75,500	$502,00	$71,800
Highest Property Value	$362,300	$305,700	$654,100	$172,600	$324,100	$241,900	$390,600
Average Property Value	$212,457	$181,355	$168,150	$114,597	$195,040	$134,986	$145,211
Oldest Home	1980	1962	1915	1920	1935	1905	1906
Newest Home	2008	1989	1995	1993	2008	2008	2008
Spanish Surname	14%	0%	35%	73%	0	20%	26%
Zoned Agriculture	100%	100%	100%	0%	100%	100%	100%

Completed	57%	45%	29%	47%	50%	35%	84%
Declined	14%	9%	41%	27%	20%	30%	5%
Not possible	29%	45%	29%	27%	30%	35%	11%

There was a statistical difference among the clusters regarding testing or not testing for nitrate. The results ranged from 20% on the Old Prosser Highway to 100% along Independence, Fordyce and Reeves Road, (p = .025)

Graph 10: Percentage who test for nitrates in the clusters

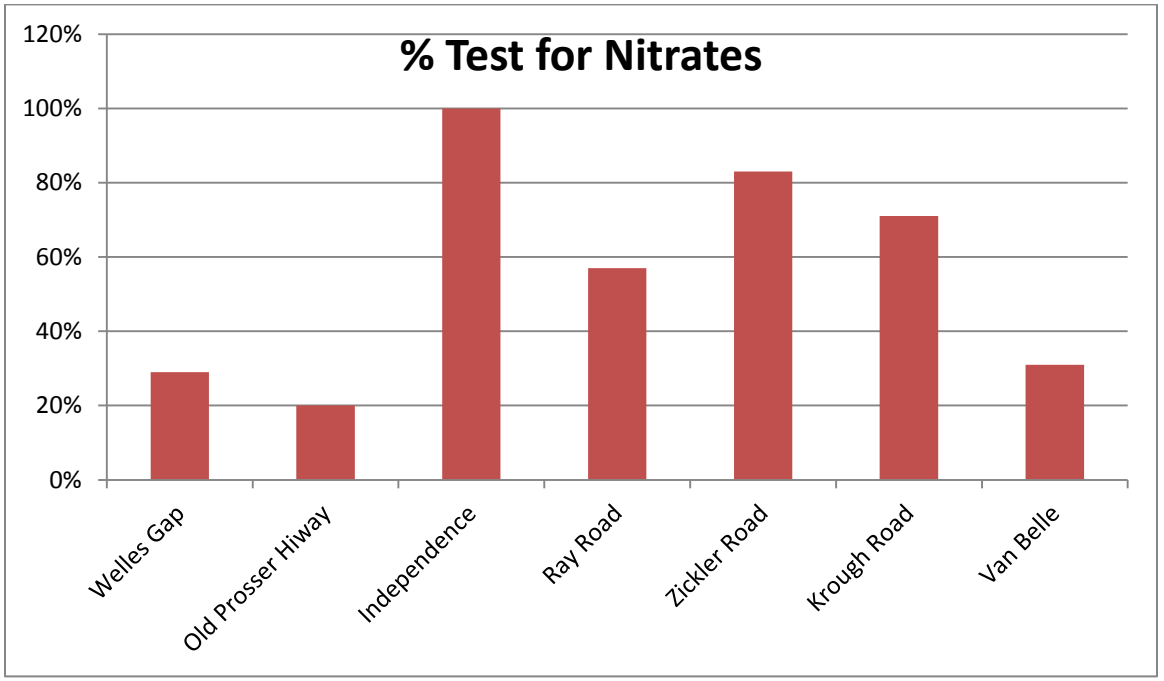


Table 17: Testing for Nitrates in the Cluster

Cluster	Yes – Test for N	No – Don't Test for N	Total
Welles Gap Road	2 (29%)	5 (71%)	7
Old Prosser Highway	1 (20%)	4 (80%)	5
Independence, Fordyce & Reeves Roads	5 (100%)	0 (0%)	5
Ray Road	4 (57%)	3 (43%)	7
Zickler Road	5 (83%)	1 (17%)	6
Krough Road	5 (71%)	2 (29%)	7
Van Belle & Cemetery	5 (31%)	11 (69%)	16

There was a statistical difference between the Welles Gap Road group and the Independence, Fordyce & Reeves Road group for N testing (Everyone on the Independence Road group tests for N) ($p = .027$)

Table 18

Cluster	Yes	No	Total
Welles Gap	2	5	7
Independence, Fordyce	5	0	5

There was a statistical difference between Welles Gap Road and Zickler Road regarding testing for bacteria. 1 out of 7 people on Welles Gap Road test for Bacteria while 5 out of 6 on Zickler Road test for bacteria. ($p = .025$)

Table 19

Cluster	Yes	No	Total
Welles Gap Road	1	6	7
Zickler Road	5	1	6

There was a statistical difference in testing for N between the Old Prosser Highway group and the Independence Road group (Everyone on Independence Road tests). (p = .024)

Table 20

Cluster	Yes	No	Total
Old Prosser Highway	1	4	5
Independence, Fordyce	5	0	5

There was a significant difference between the Independence Road group and the Van Belle & Cemetery Road Group regarding N testing. Everyone in the Independence Road group test while only 5 out of 16 on Van Belle test. (p = .012)

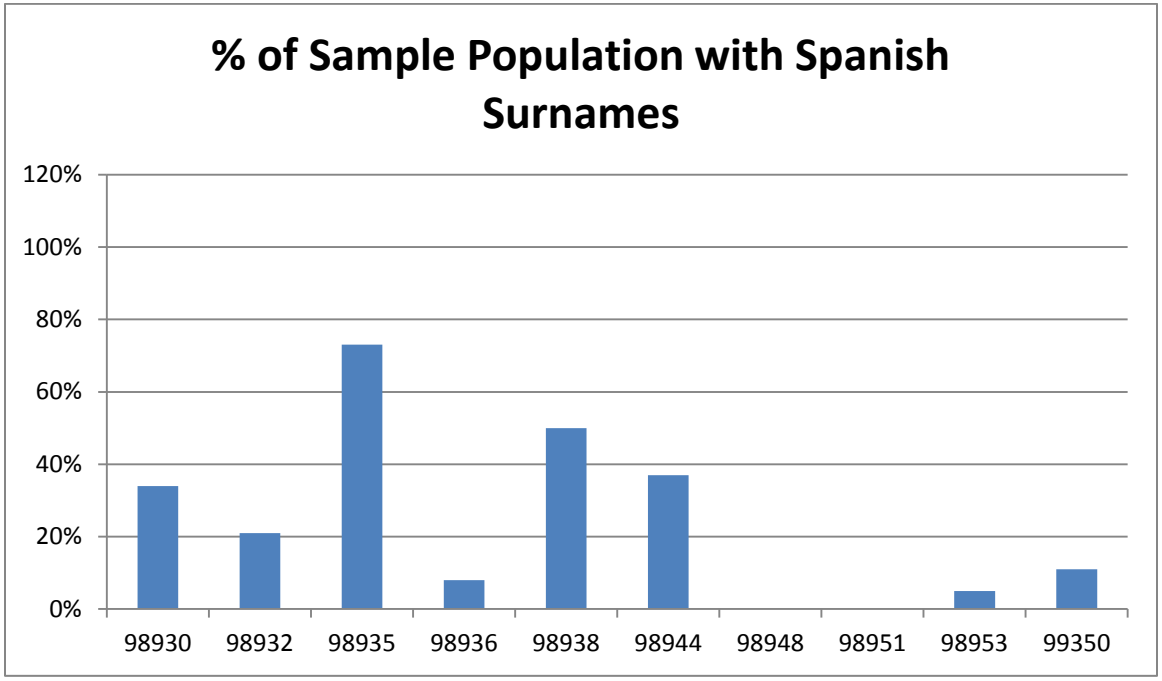
Table 21

Cluster	Yes	No	Total
Independence, Fordyce	5	0	5
Van Belle & Cemetery	5	11	16

People with Spanish Surnames

Carrying a Spanish surname is no guarantee of Hispanic ethnicity. However, this is the closest approximation to data for the Hispanic population in the survey data. The percentage of people with Spanish surnames in the various zip codes varied considerably. It is noteworthy that 30% of people surveyed here have Spanish surnames which is significantly below the percentage who stated Hispanic ethnicity on the 2010 census. Please remember that there are very small numbers for some of the zip codes.

Graph 11: People with Spanish Surnames



Those with Spanish surnames were slightly more likely to complete surveys than those without Spanish Surnames: 55% compared to 49%.

Table 22

ZipCode	HH Surveyed	Complete	% Complete	Declined	% Declined	Not Possible	% Not possible
Total	**277**	**136**	**49%**	**56**	**20%**	**85**	**31%**
Spanish Surname	**72**	**40**	**55%**	**15**	**21%**	**17**	**24%**

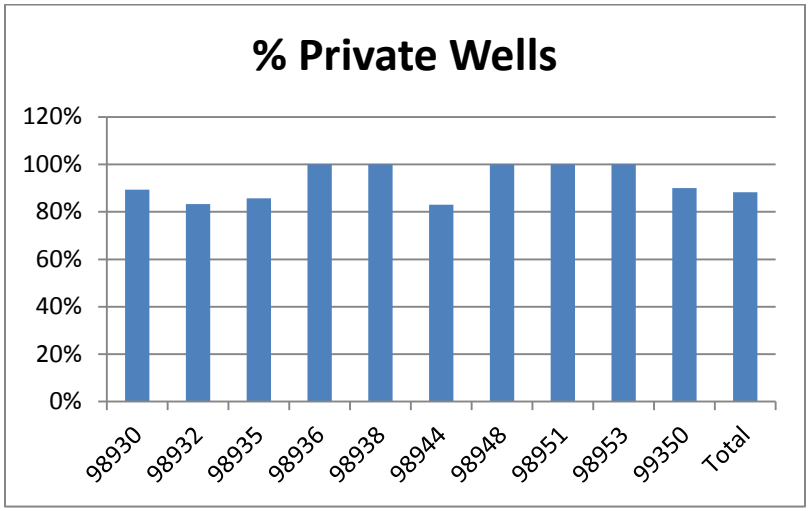
There is a statistical difference in the type of drinking water used by people with Spanish surnames and those without. 43% of those with Spanish surnames purchase bottled water compared to 15% of those with non-Spanish surnames. (p = 005)

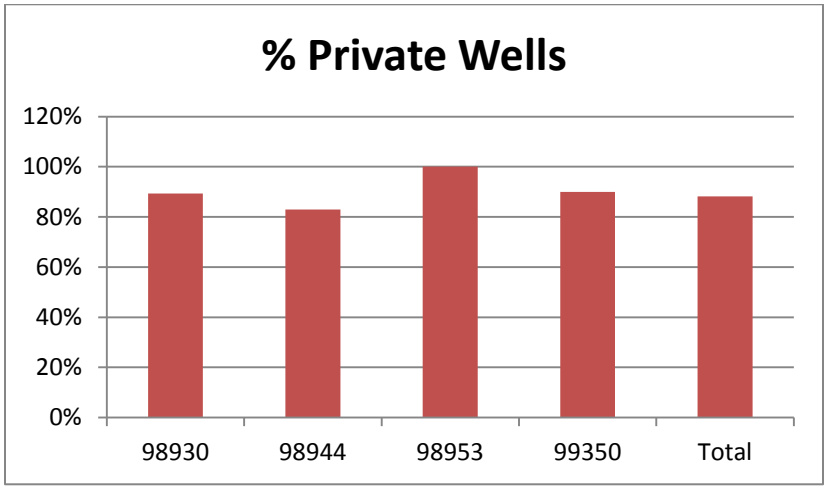
Table 23

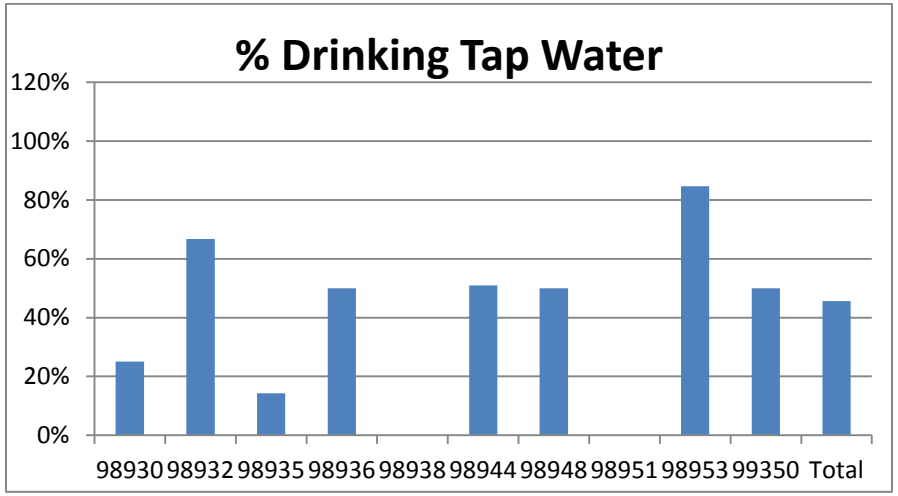
Drinking Water	Spanish Surname	Non – Spanish Surname	Total
Tap	13 (33%)	48 (51%)	61
Treated/Filter	10 (24%)	31 (34%)	41
Bottled	17 (43%)	14 (15%)	31
No Answer	0 (0%)	2 (2%)	2

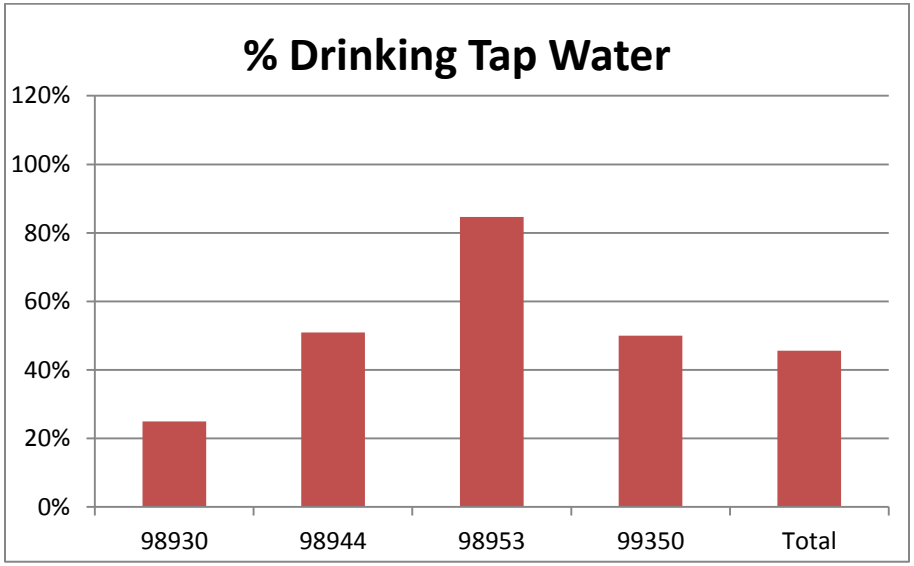
Survey questions regarding awareness of nitrate issues, testing for nitrates or bacteria, home ownership, sickness from drinking water, ways to make water safe and awareness of the GWMA showed no statistical differences between those with Spanish surnames and those with Non-Spanish surnames.

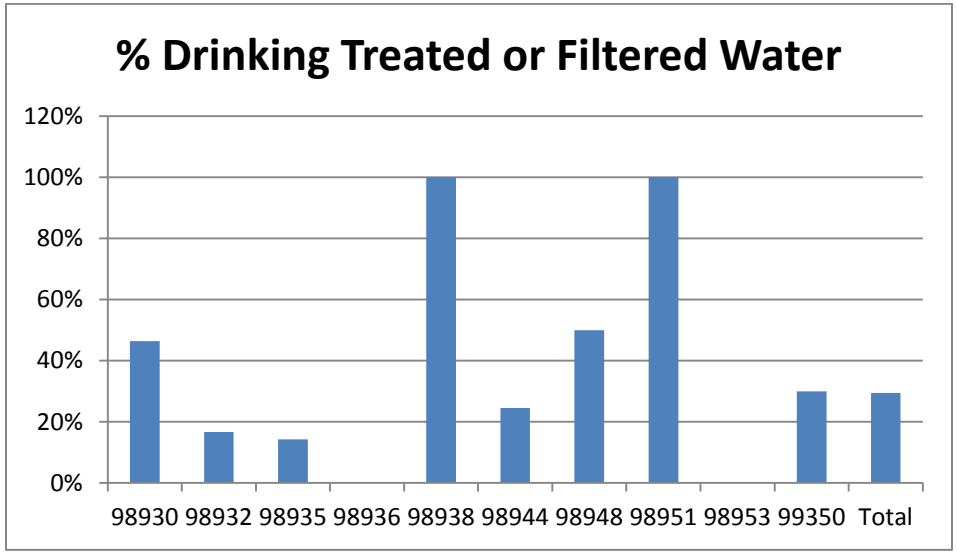
Graphs for Zip Codes & Total Survey Area

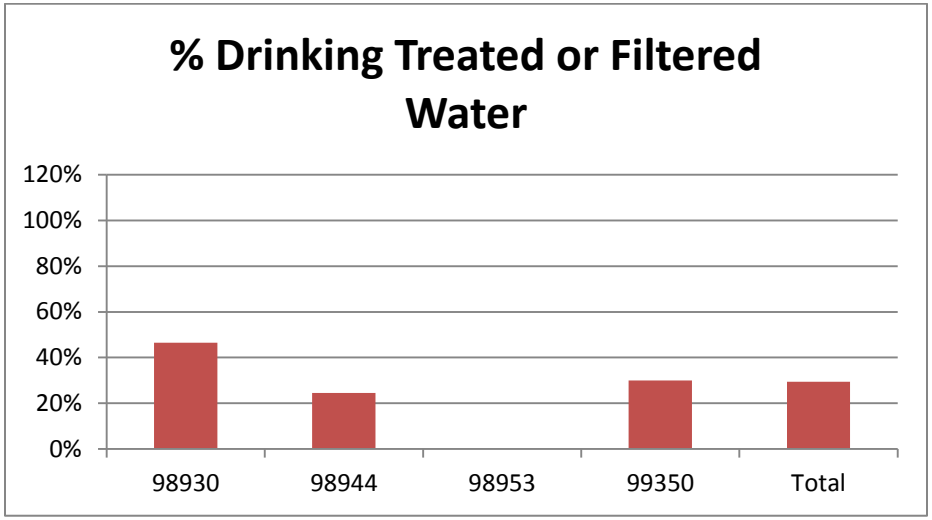


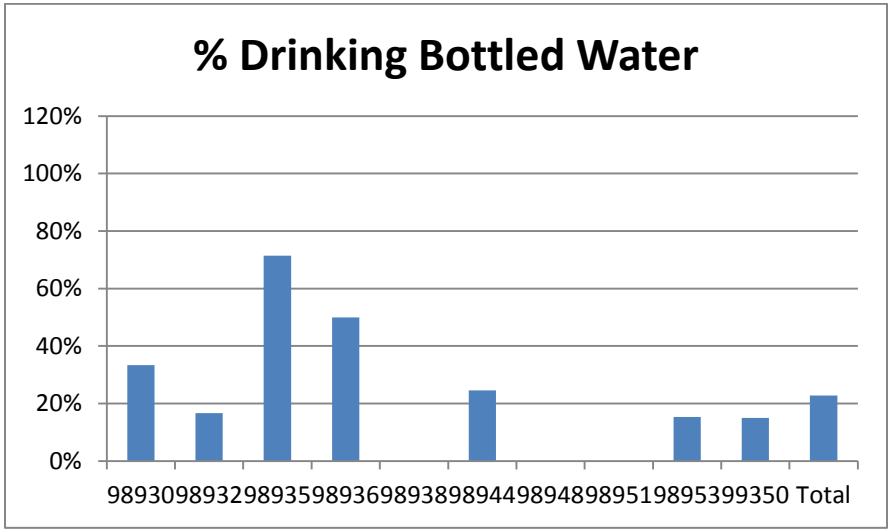



% Drinking Tap Water
120%
100%
80%
60%
40%
20%
0%
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total


% Drinking Tap Water
120%
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350
Total


% Drinking Treated or Filtered Water
120%
100%
80%
60%
40%
20%
0%
98930 98932 98935 98936 98938 98944 98948 98951 98953 99350 Total


% Drinking Treated or Filtered Water
120%
100%
80%
60%
40%
20%
0%
98930 98944 98953 99350 Total


% Drinking Bottled Water
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20%
0%
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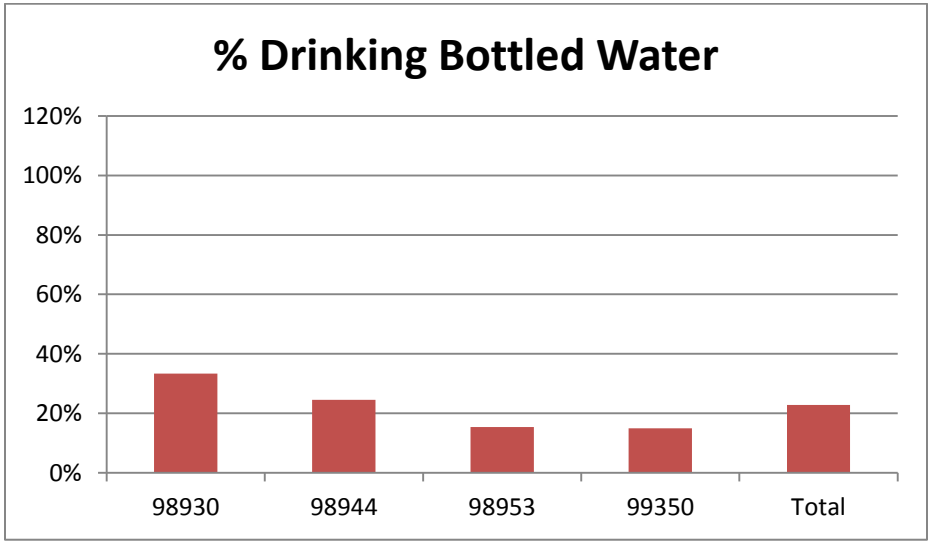
% Drinking Bottled Water
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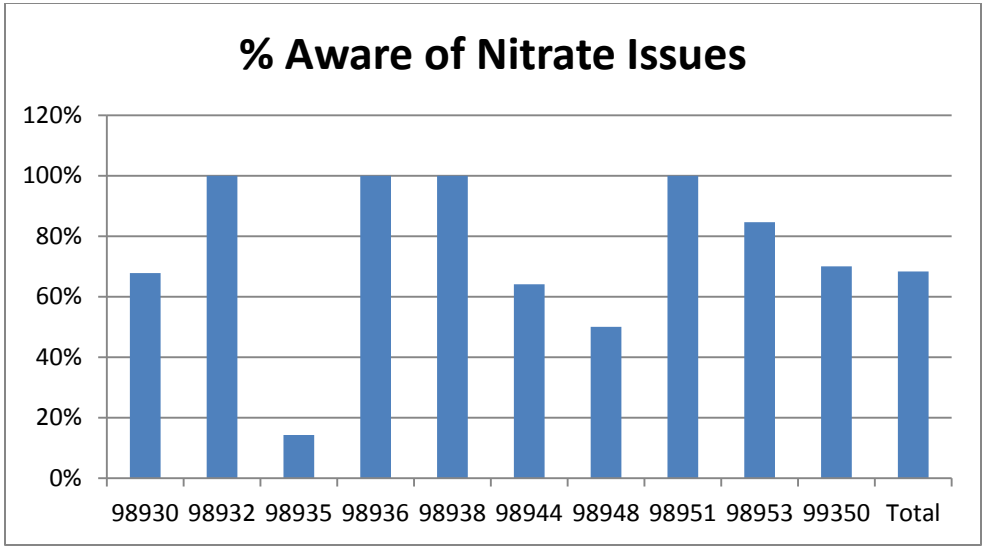
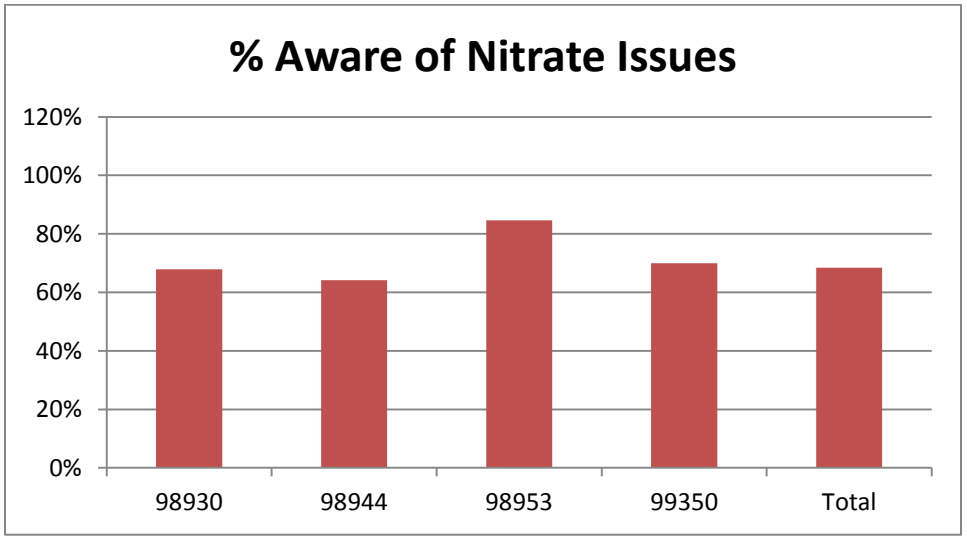
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350
Total


% Aware of Nitrate Issues
120%
100%
80%
60%
40%
20%
0%
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total


% Aware of Nitrate Issues
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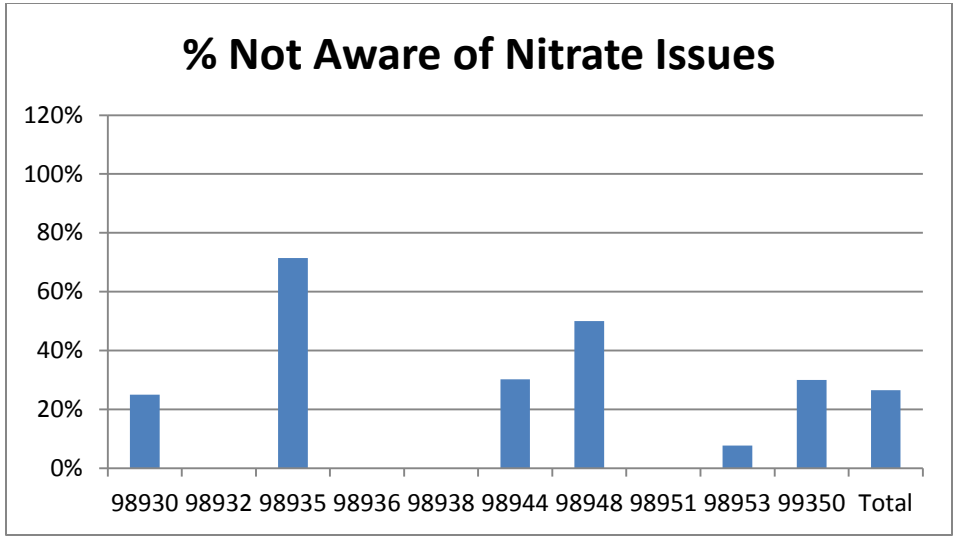
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350
Total


% Not Aware of Nitrate Issues
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100%
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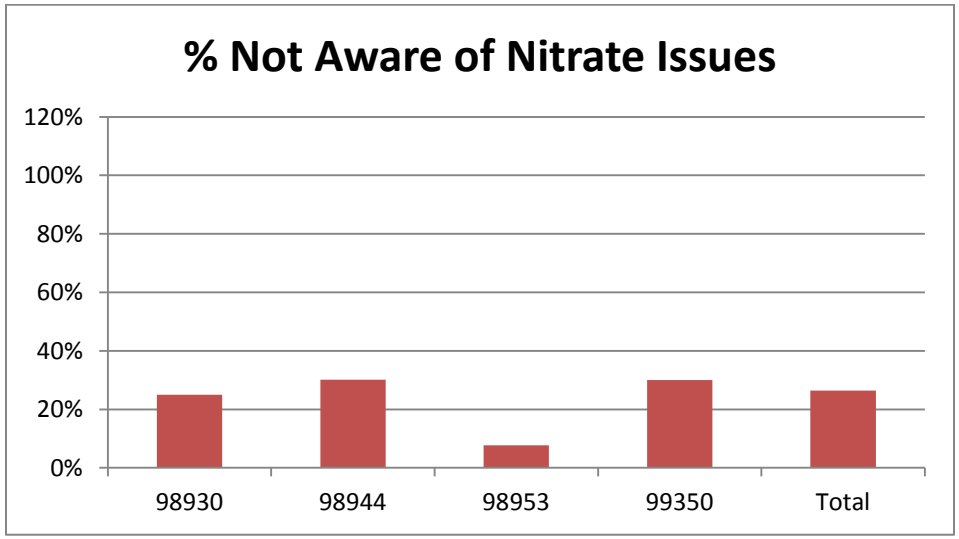
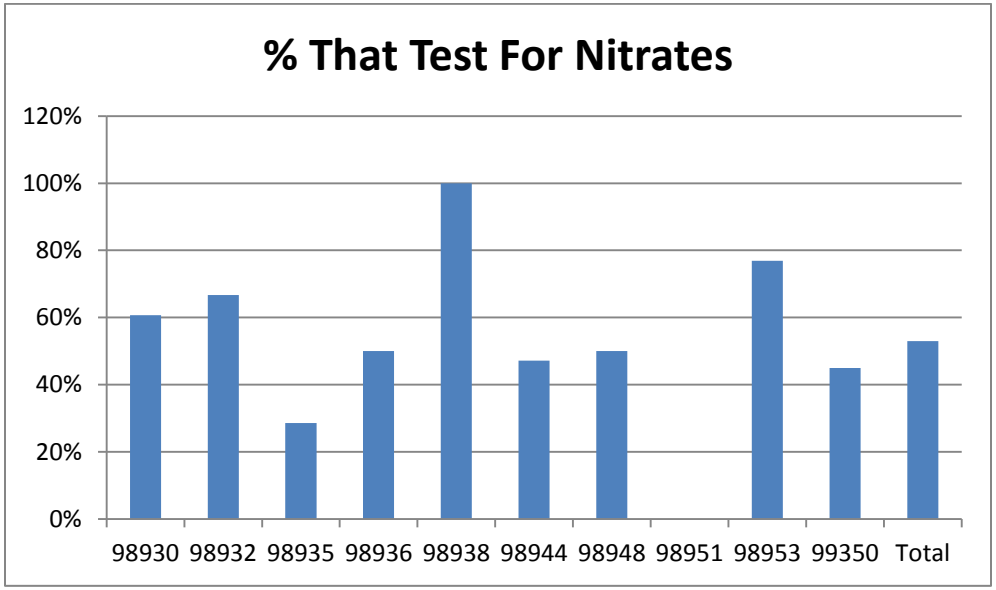
60%
40%
20%
0%
98930 98932 98935 98936 98938 98944 98948 98951 98953 99350 Total


% Not Aware of Nitrate Issues
120%
100%
80%
60%
40%
20%
0%
98930 98944 98953 99350 Total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100%
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40%
20%
0%
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98935
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98938
98944
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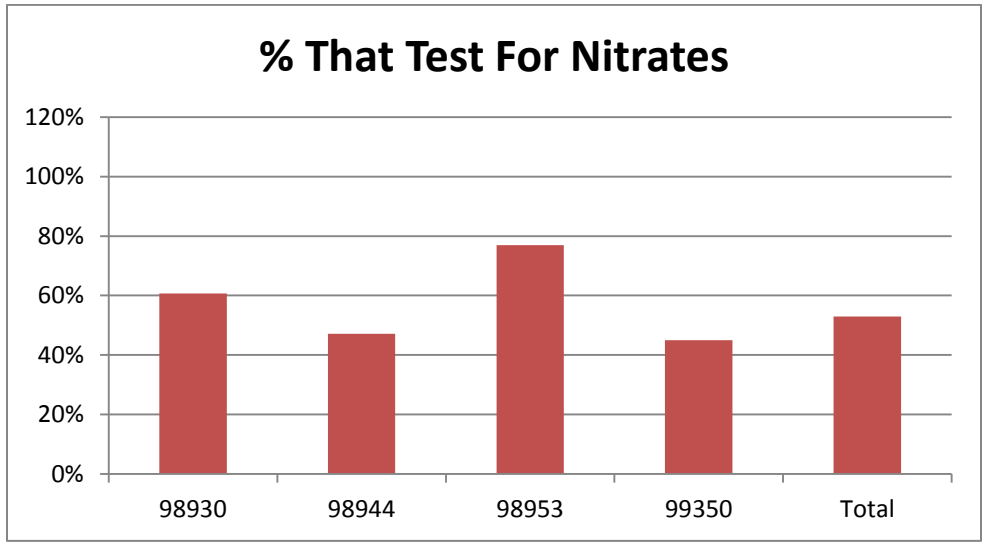
99350
Total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20%
0%
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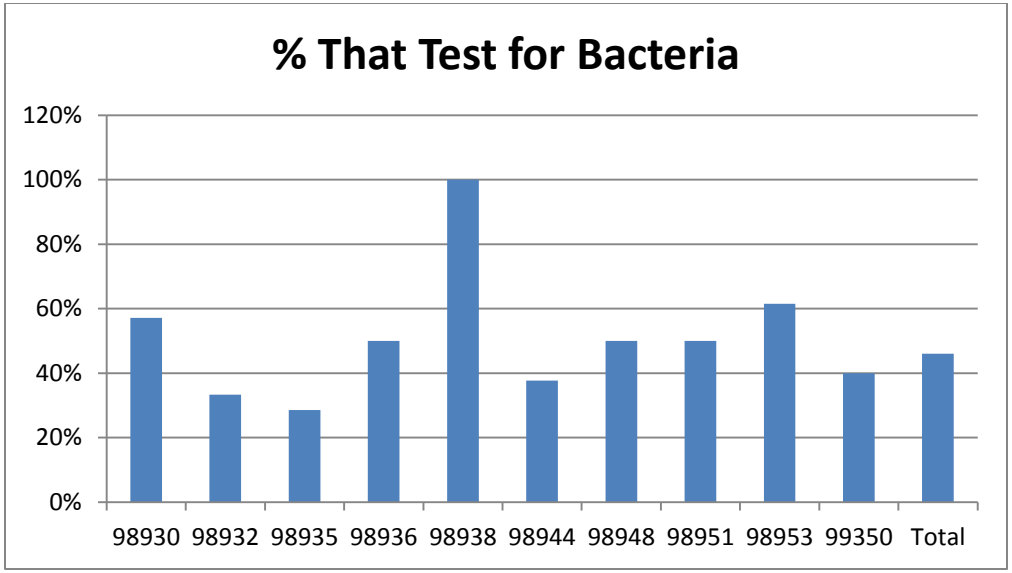
Total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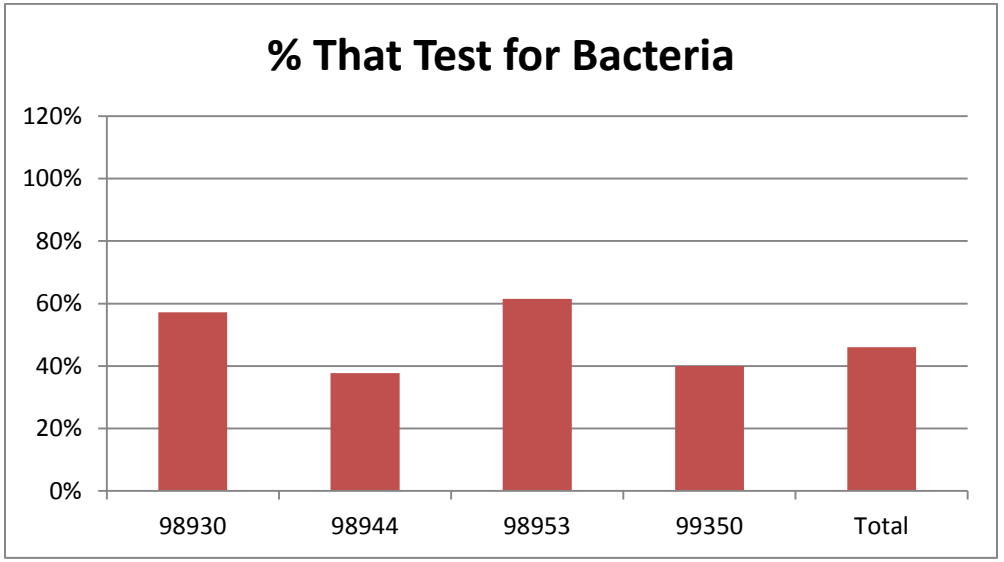
Total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80%
60%
40%
20%
0%
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98944
98953
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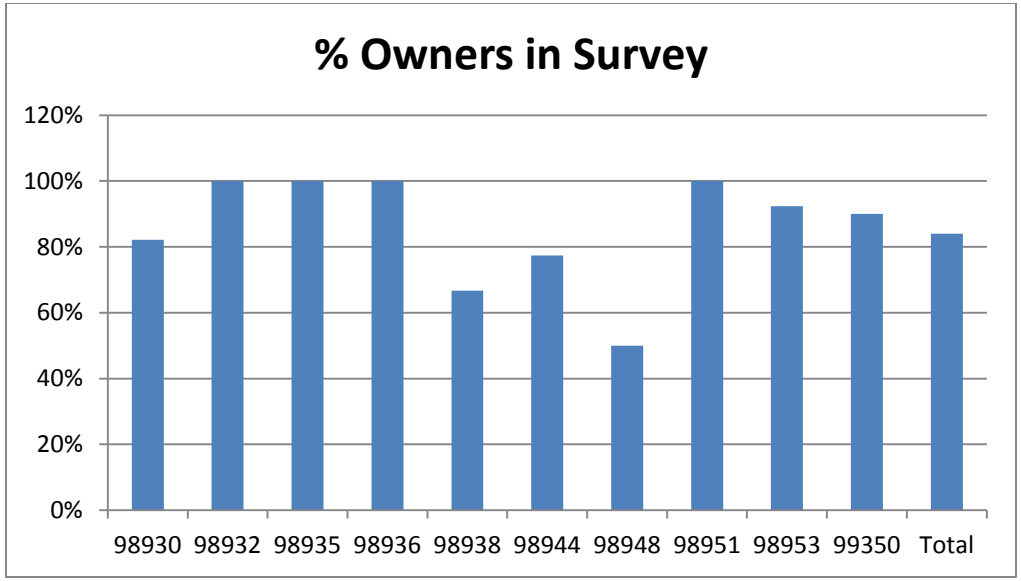
Total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100%
80%
60%
40%
20%
0%
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98935
98936
98938
98944
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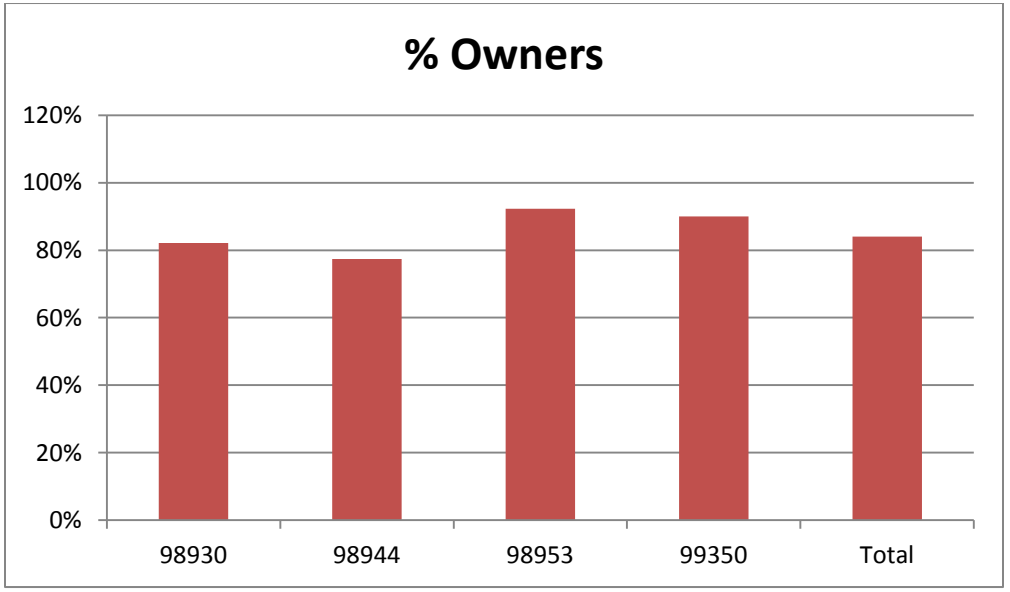
Total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100%
80%
60%
40%
20%
0%
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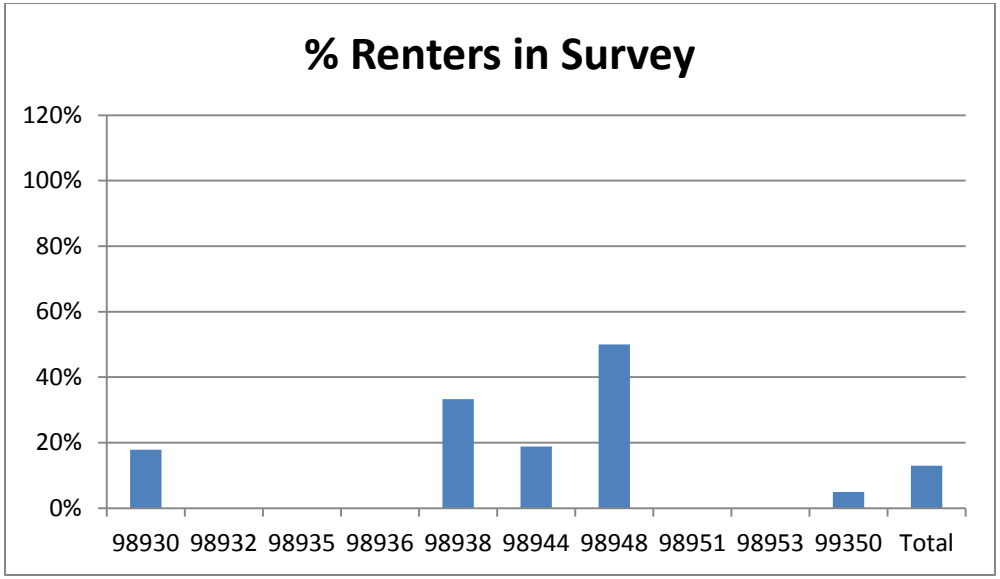
Total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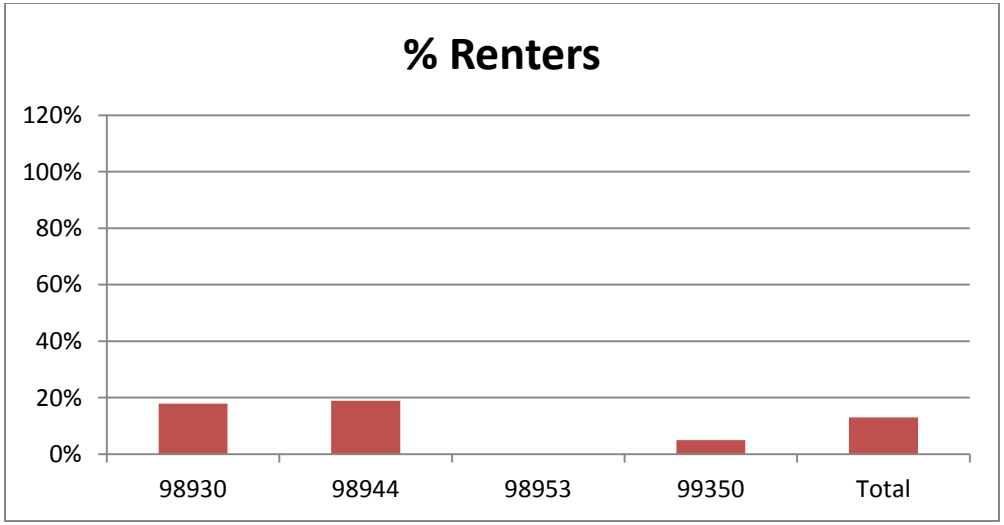
Total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100%
80%
60%
40%
20%
0%
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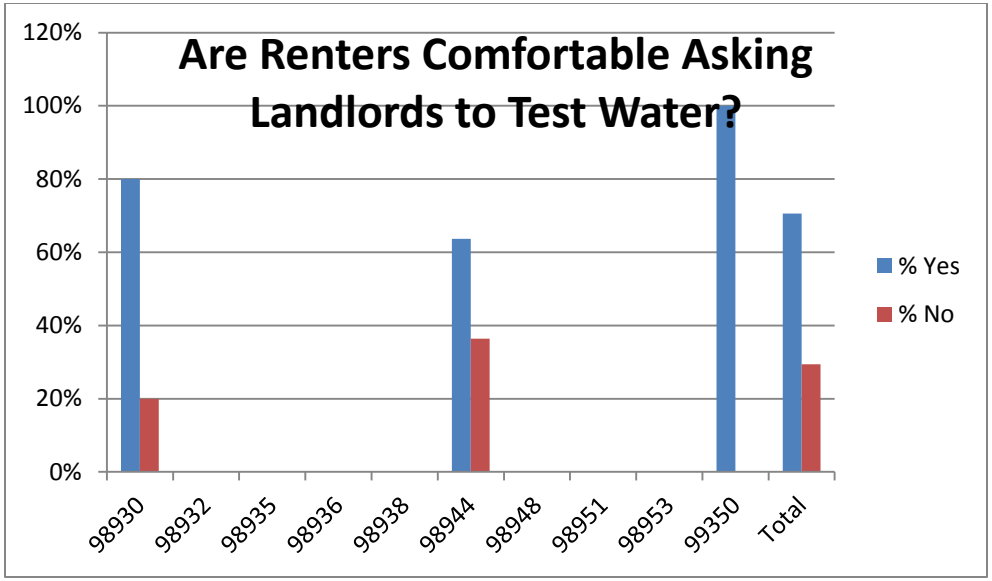
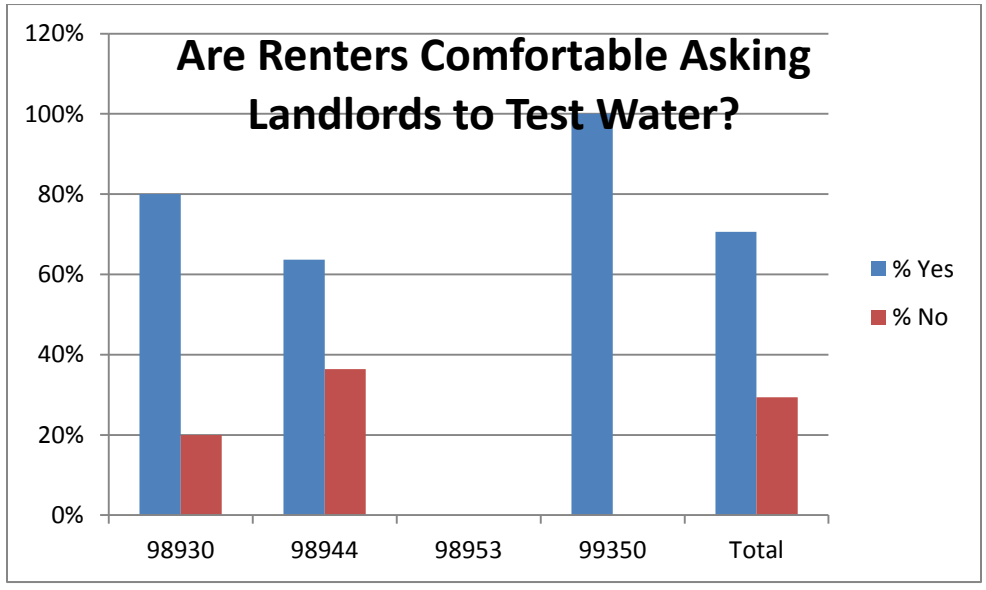
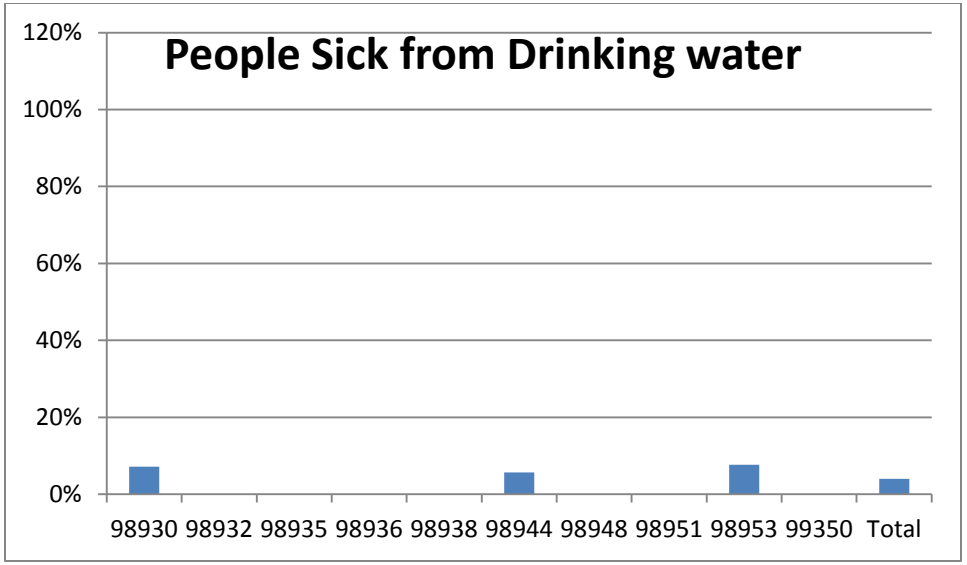
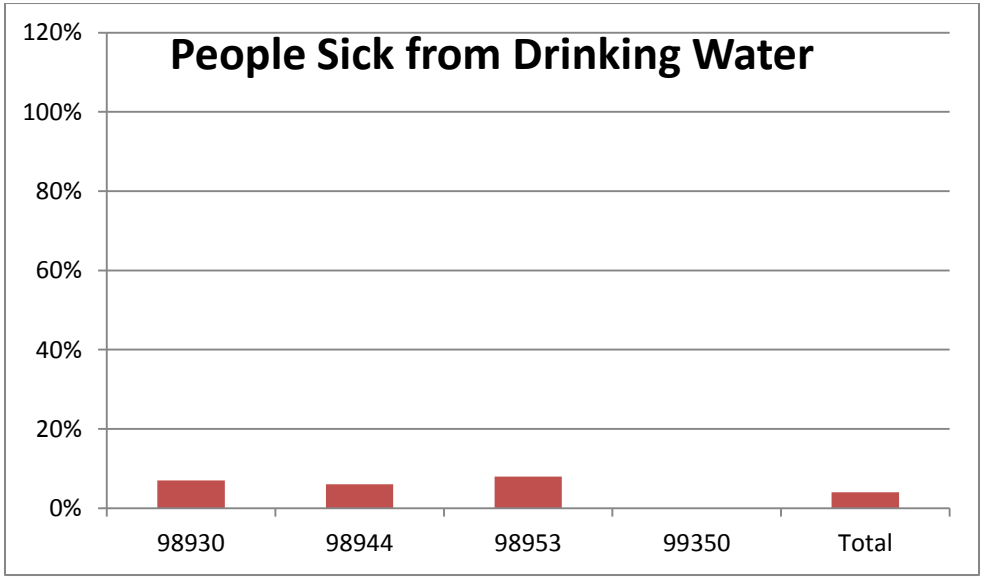
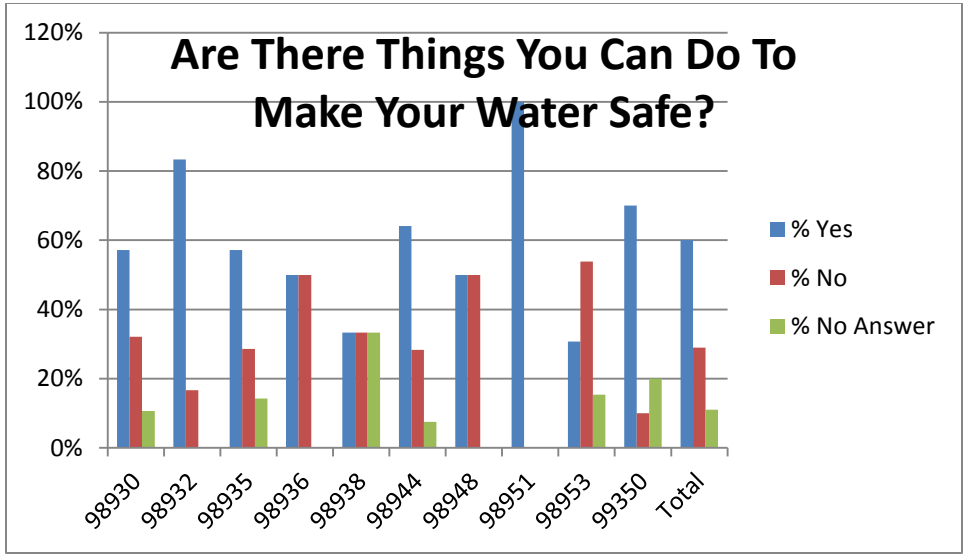
98944
98953
99350
Total

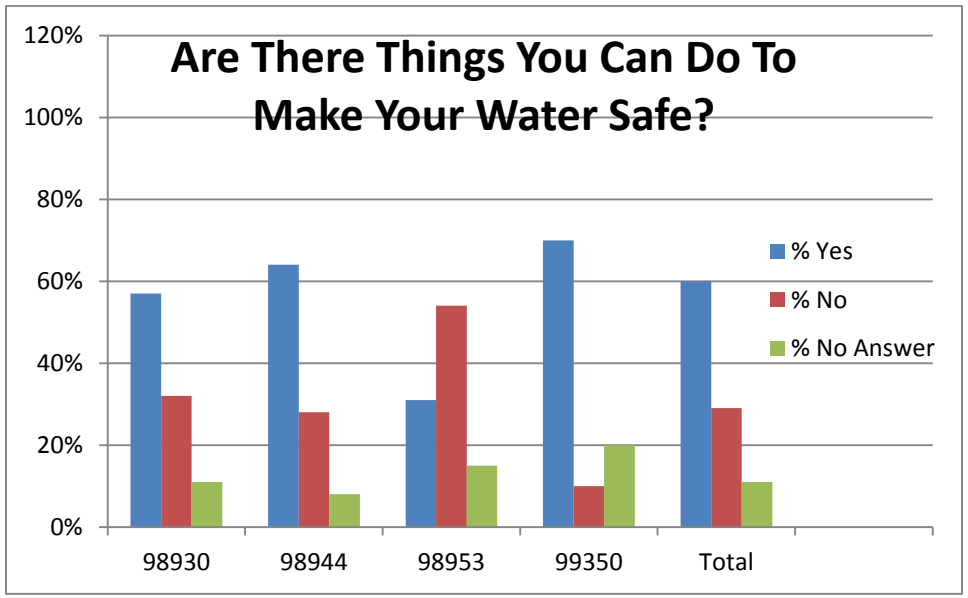

Are Renters Comfortable Asking Landlords to Test Water?
120%
100%
80%
60%
40%
20%
0%
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total
% Yes
% No


Are Renters Comfortable Asking Landlords to Test Water?
120%
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350
Total
% Yes
% No


People Sick from Drinking water
120%
100%
80%
60%
40%
20%
0%
98930 98932 98935 98936 98938 98944 98948 98951 98953 99350 Total


People Sick from Drinking Water
120%
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350
Total


Are There Things You Can Do To Make Your Water Safe?
120%
100%
80%
60%
40%
20%
0%
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total
% Yes
% No
% No Answer


Are There Things You Can Do To Make Your Water Safe?
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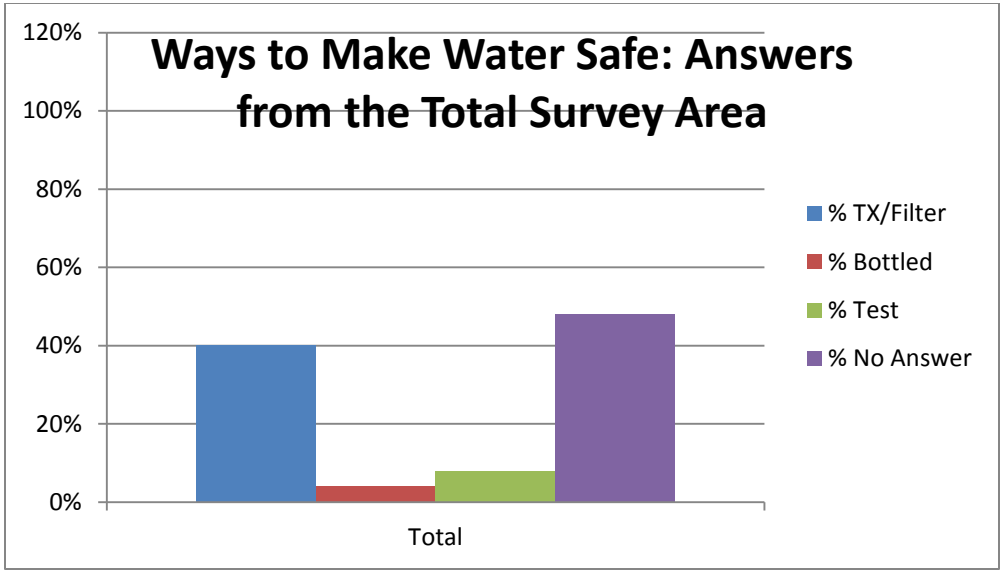
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350
Total
% Yes
% No
% No Answer


Ways to Make Water Safe: Answers from the Total Survey Area
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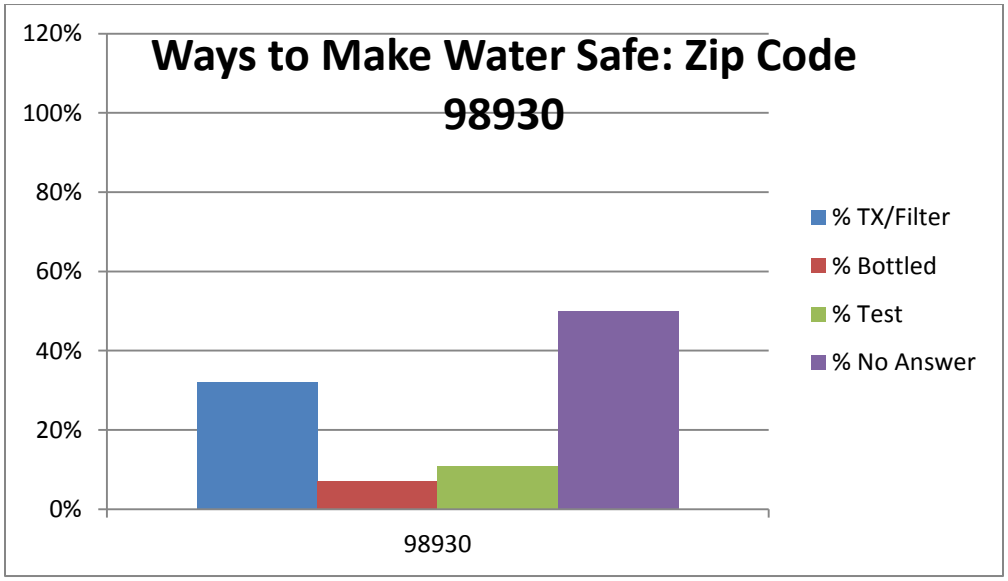
100%
80%
60%
40%
20%
0%
Total
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 98930
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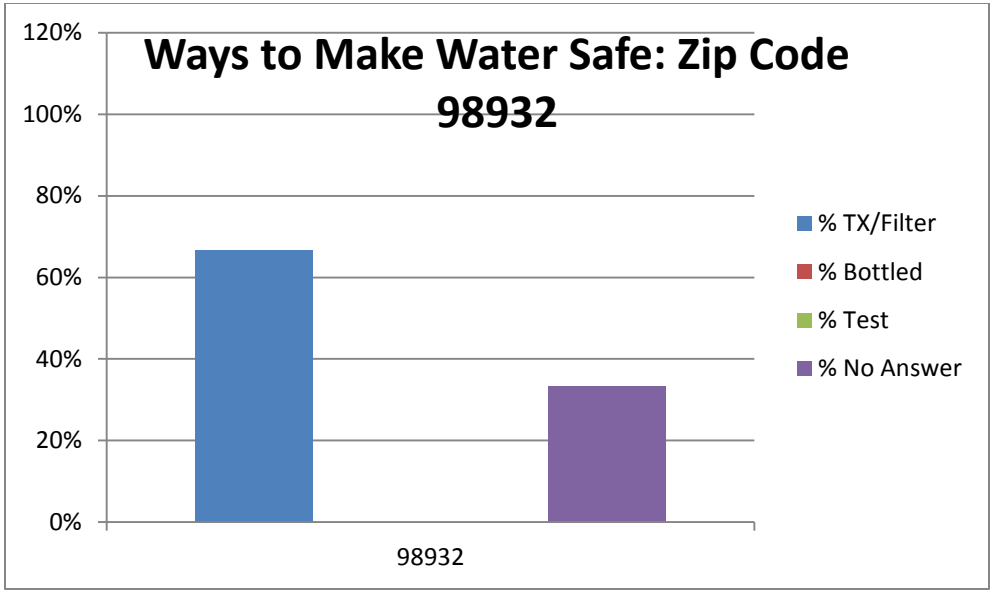
100%
80%
60%
40%
20%
0%
98930
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 98932
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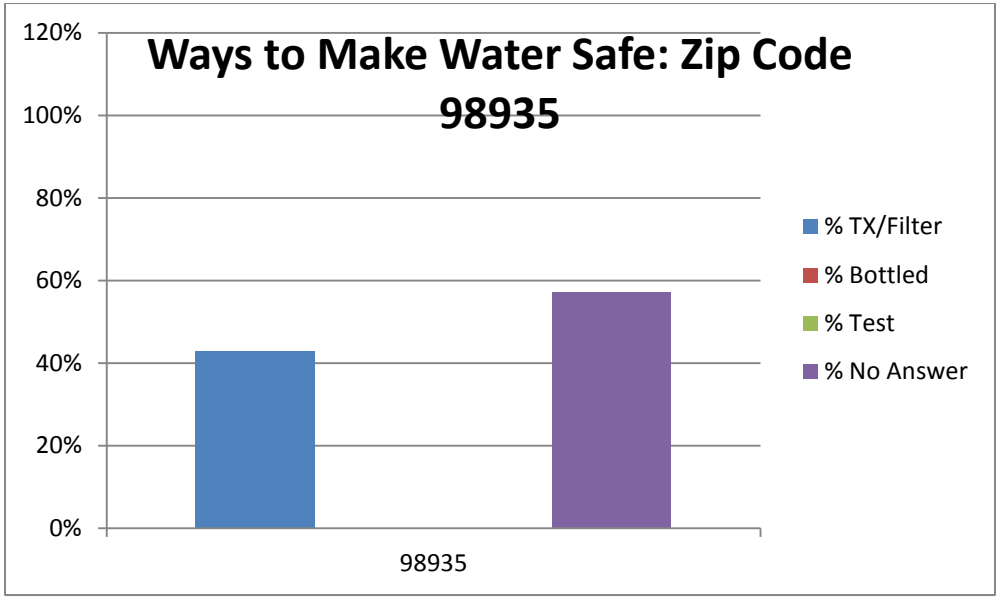
100%
80%
60%
40%
20%
0%
98932
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 98935
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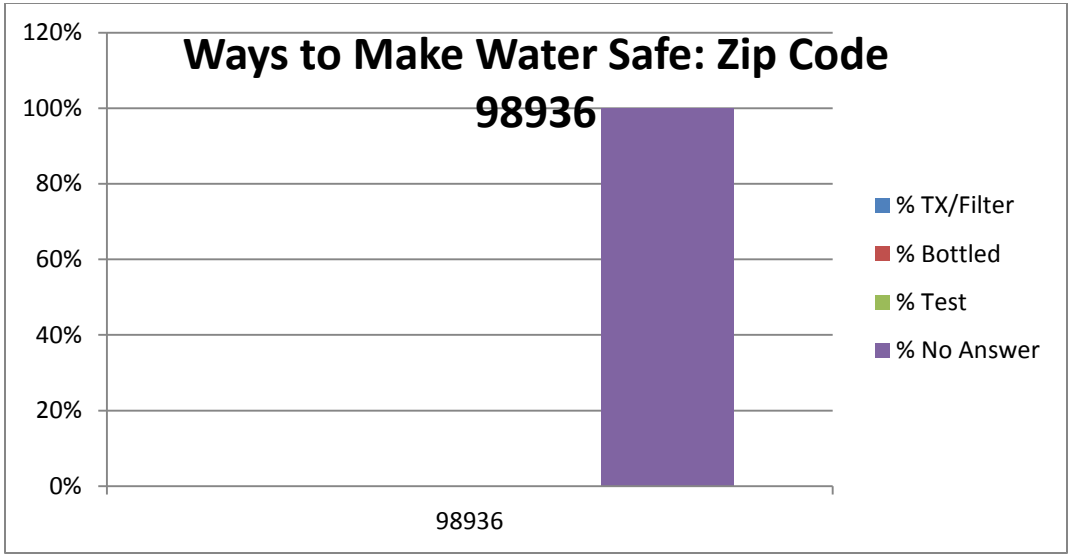
100%
80%
60%
40%
20%
0%
98935
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 98936
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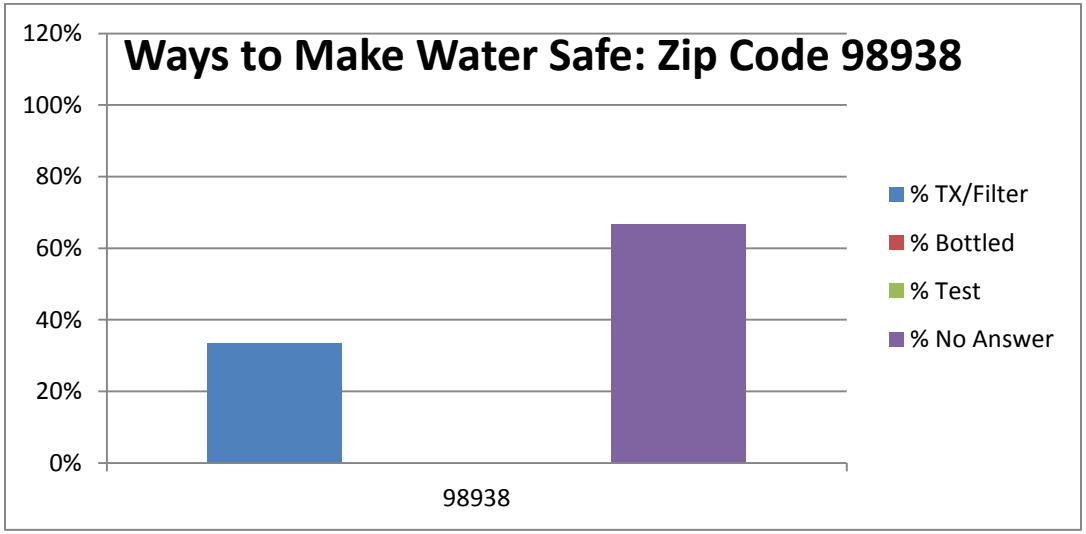
100%
80%
60%
40%
20%
0%
98936
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 98938
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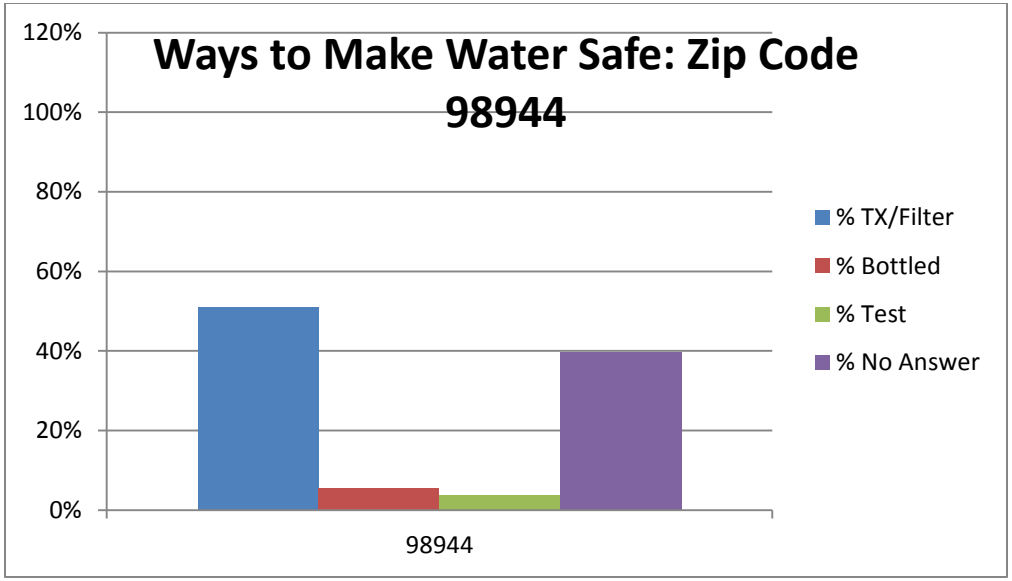
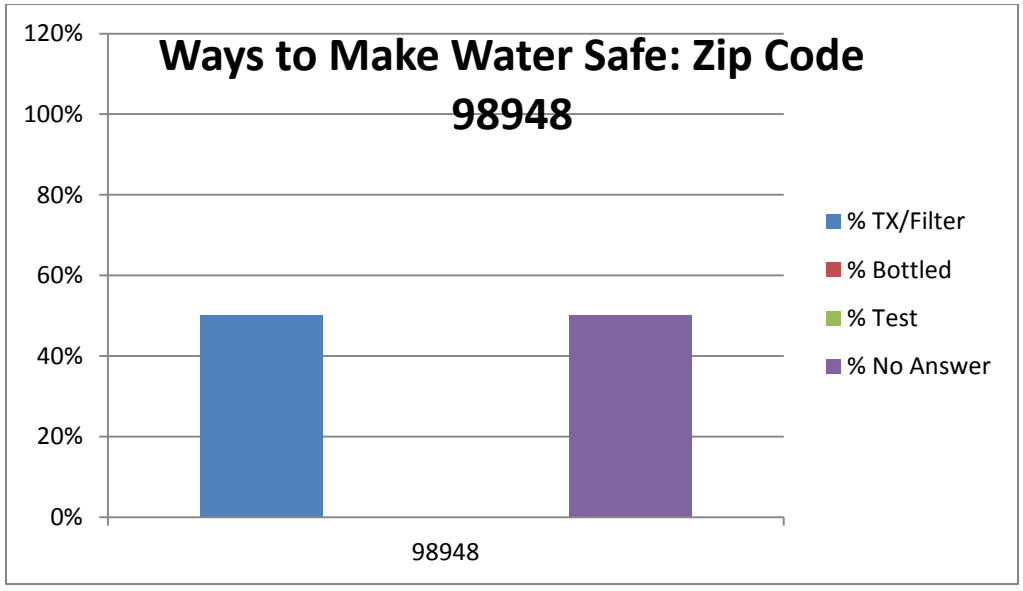
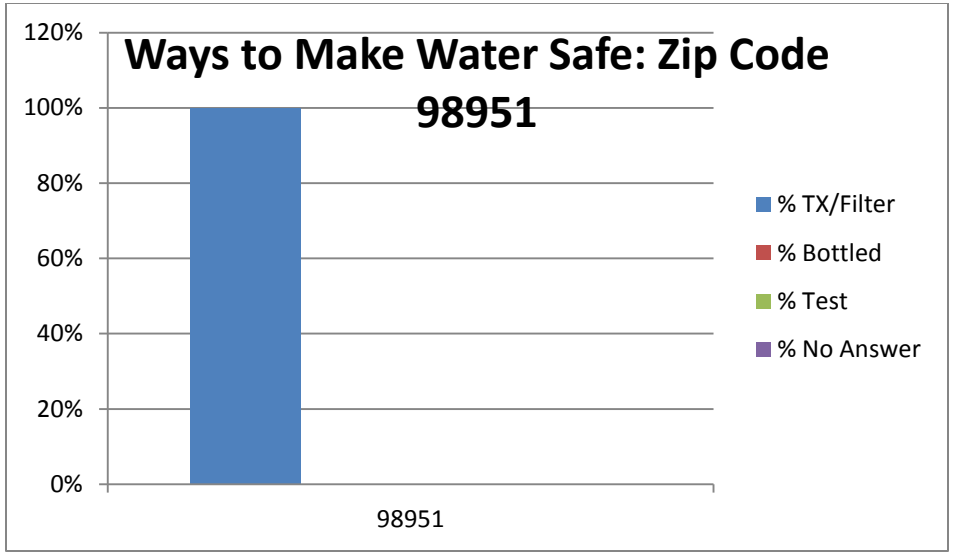
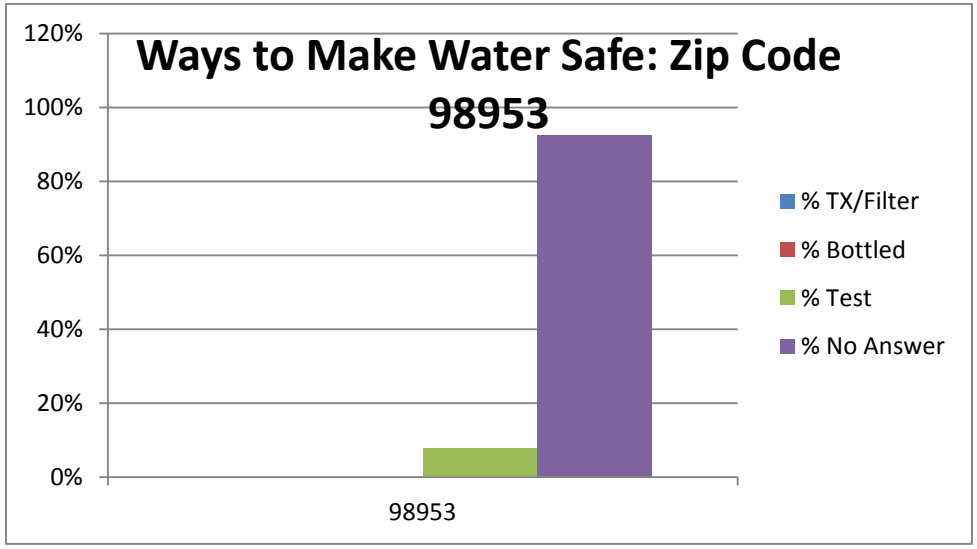
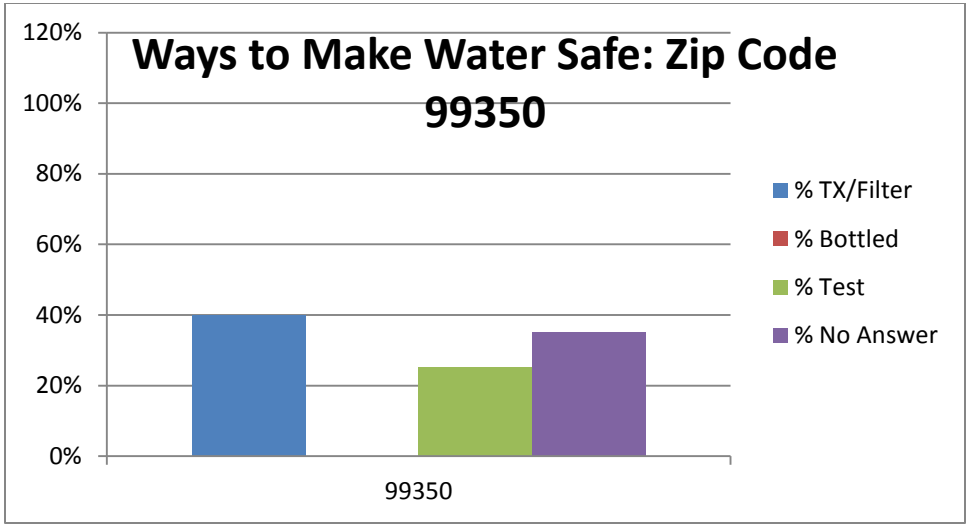
100%
80%
60%
40%
20%
0%
98938
% TX/Filter
% Bottled
% Test
% No Answer

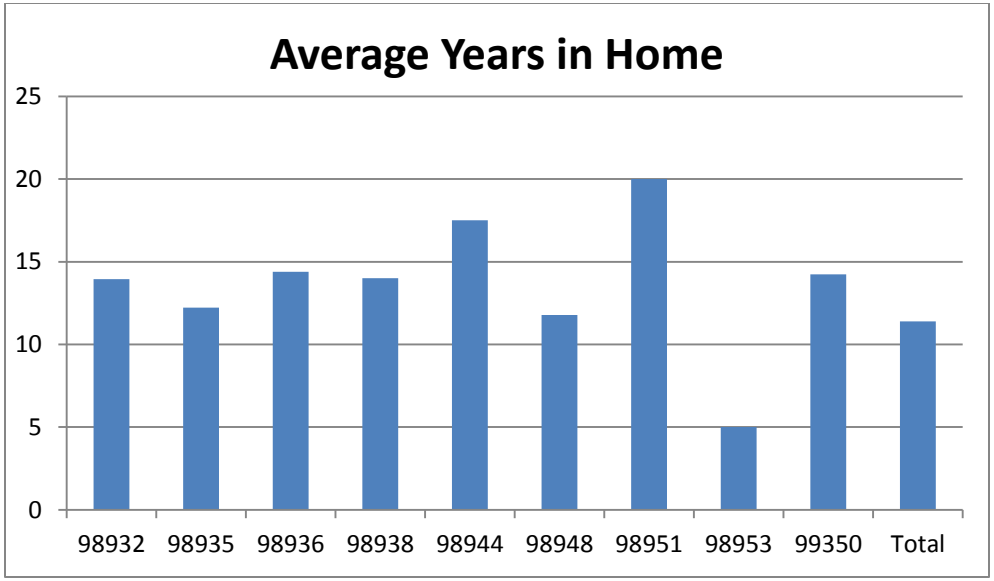

Ways to Make Water Safe: Zip Code 98944
120%
100%
80%
60%
40%
20%
0%
98944
% TX/Filter
% Bottled
% Test
% No Answer

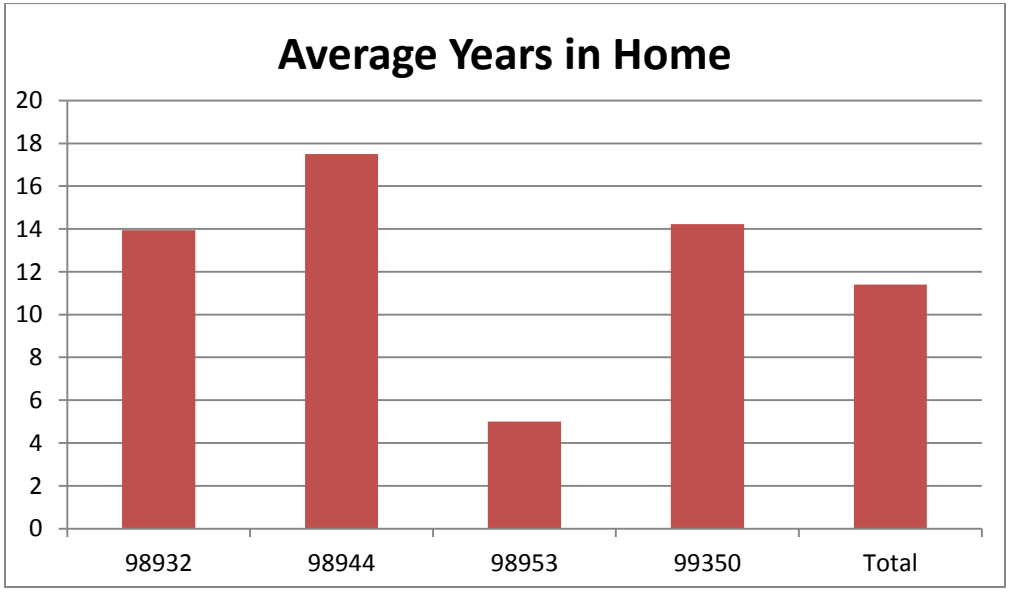

Ways to Make Water Safe: Zip Code 98948
120%
100%
80%
60%
40%
20%
0%
98948
% TX/Filter
% Bottled
% Test
% No Answer

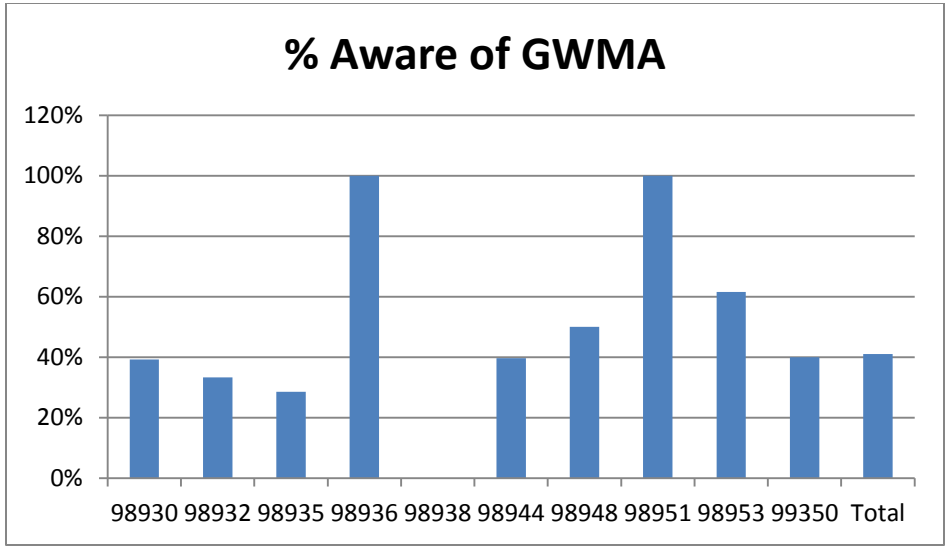

Ways to Make Water Safe: Zip Code 98951
120%
100%
80%
60%
40%
20%
0%
98951
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 98953
120%
100%
80%
60%
40%
20%
0%
98953
% TX/Filter
% Bottled
% Test
% No Answer


Ways to Make Water Safe: Zip Code 99350
120%
100%
80%
60%
40%
20%
0%
99350
% TX/Filter
% Bottled
% Test
% No Answer


Average Years in Home
25
20
15
10
5
0
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total


Average Years in Home
20
18
16
14
12
10
8
6
4
2
0
98932
98944
98953
99350
Total


% Aware of GWMA
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60%
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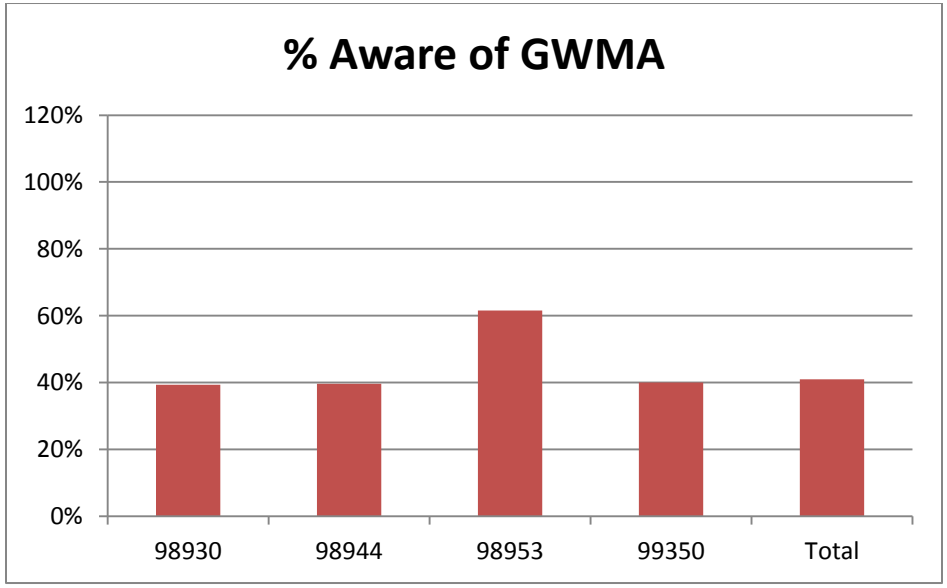
98930 98932 98935 98936 98938 98944 98948 98951 98953 99350 Total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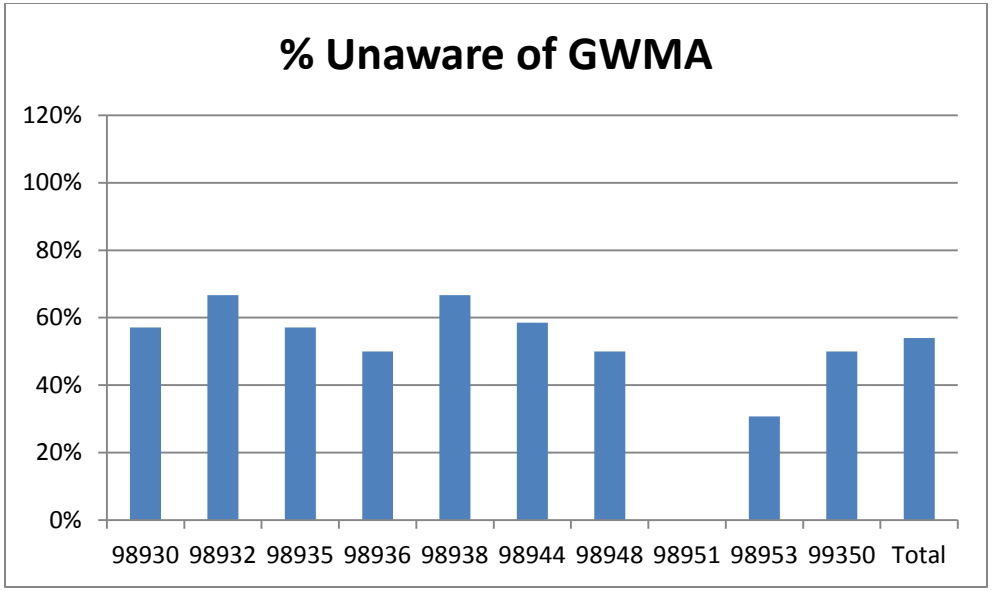
Total


% Unaware of GWMA
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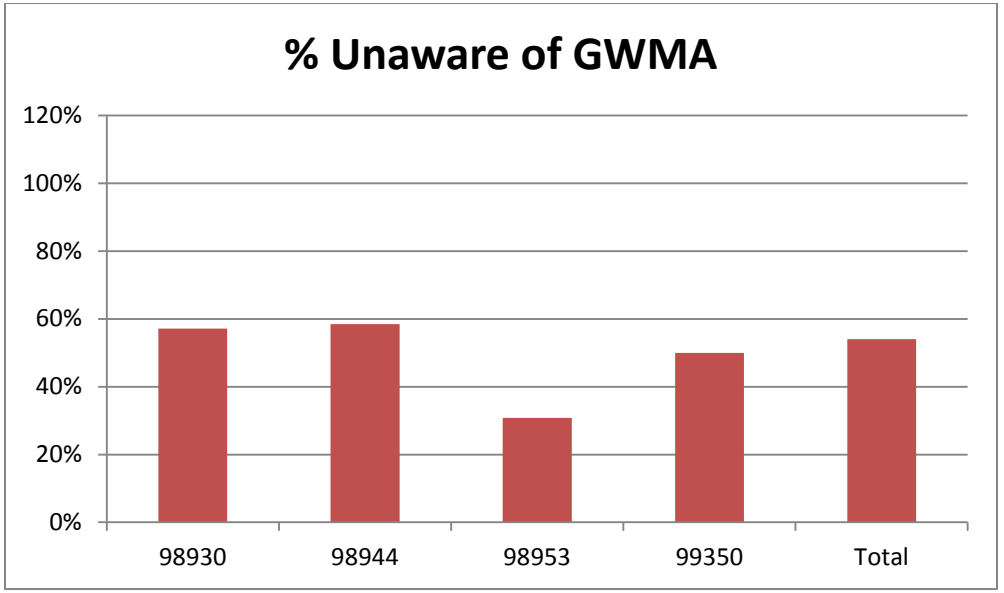
Total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100%
80%
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98944
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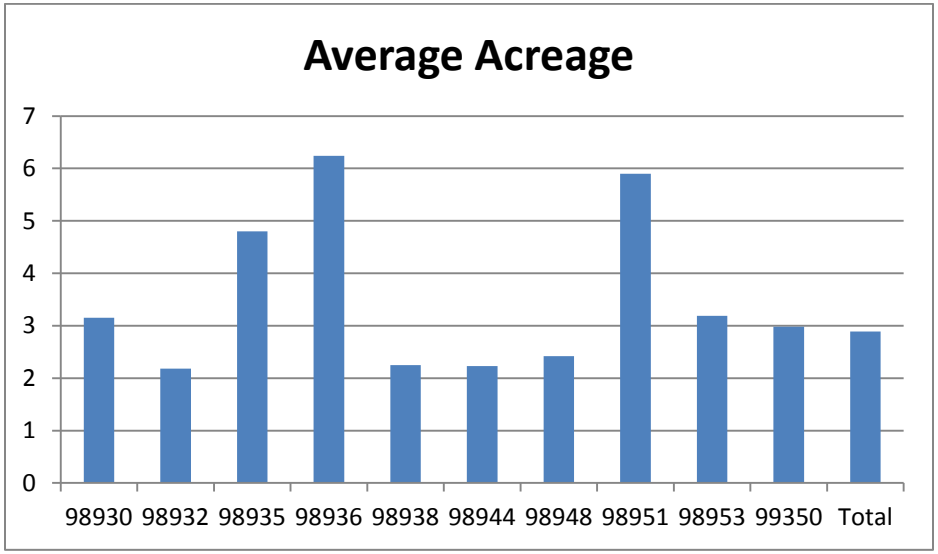
Total


Average Acreage
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6
5
4
3
2
1
0
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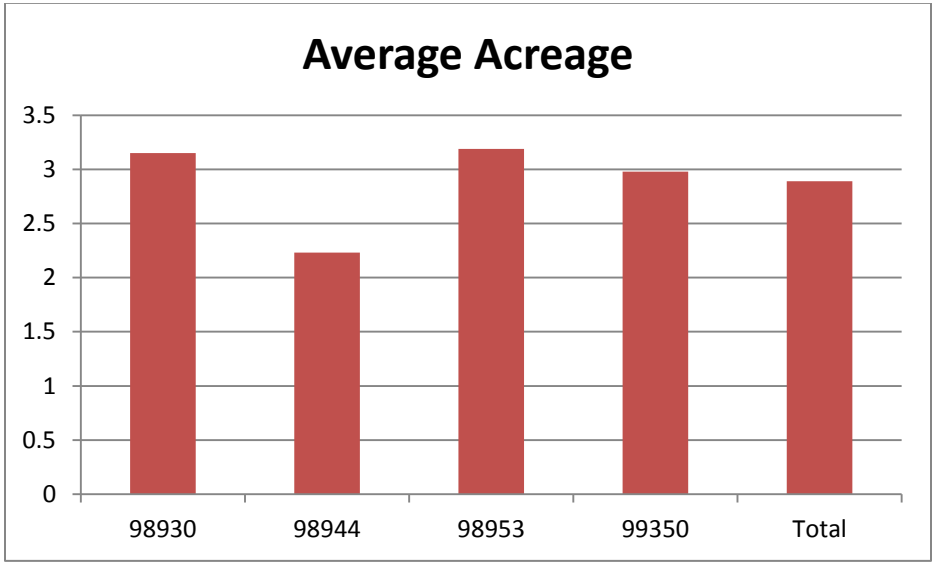
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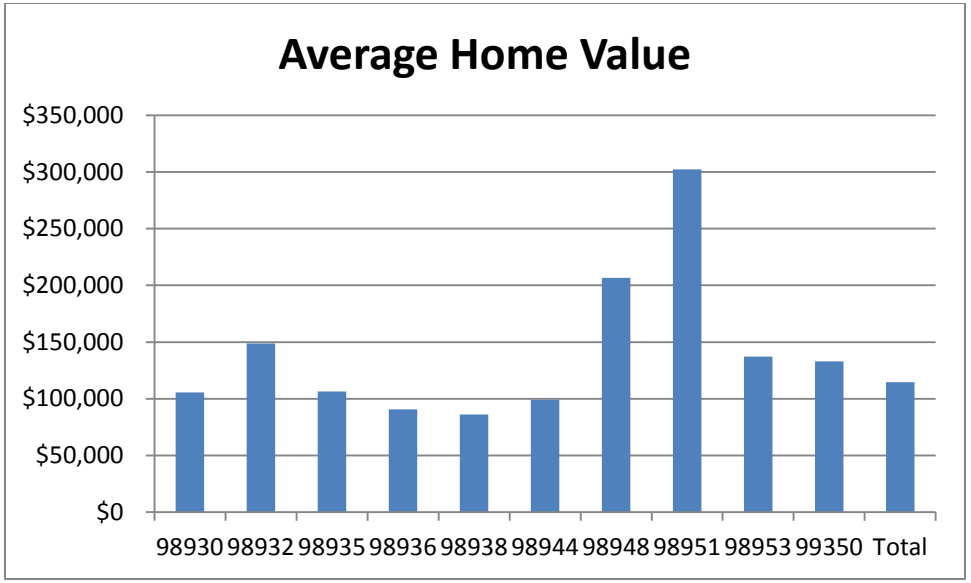
3
2.5
2
1.5
1
0.5
0
98930 98944 98953 99350 Total


Average Home Value
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
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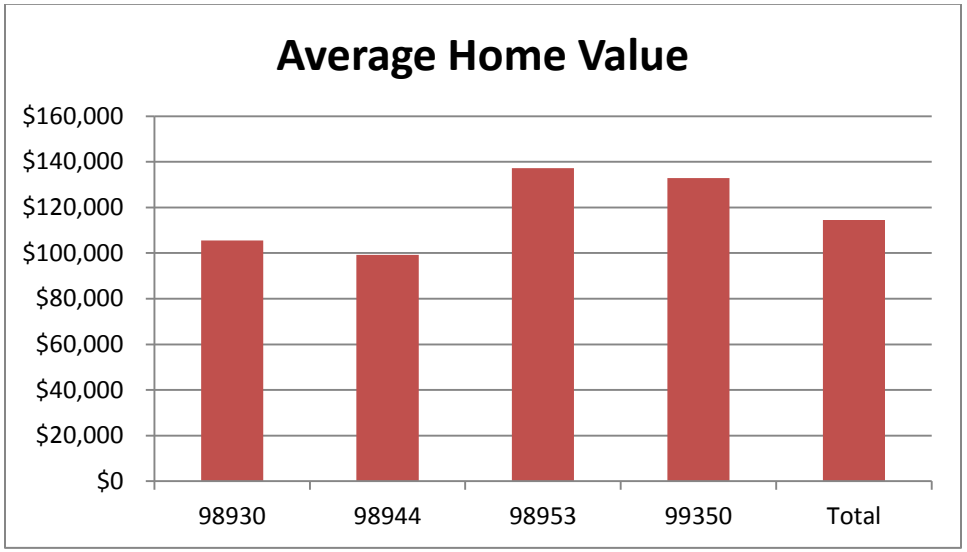
Average Home Value
$160,000
$140,000
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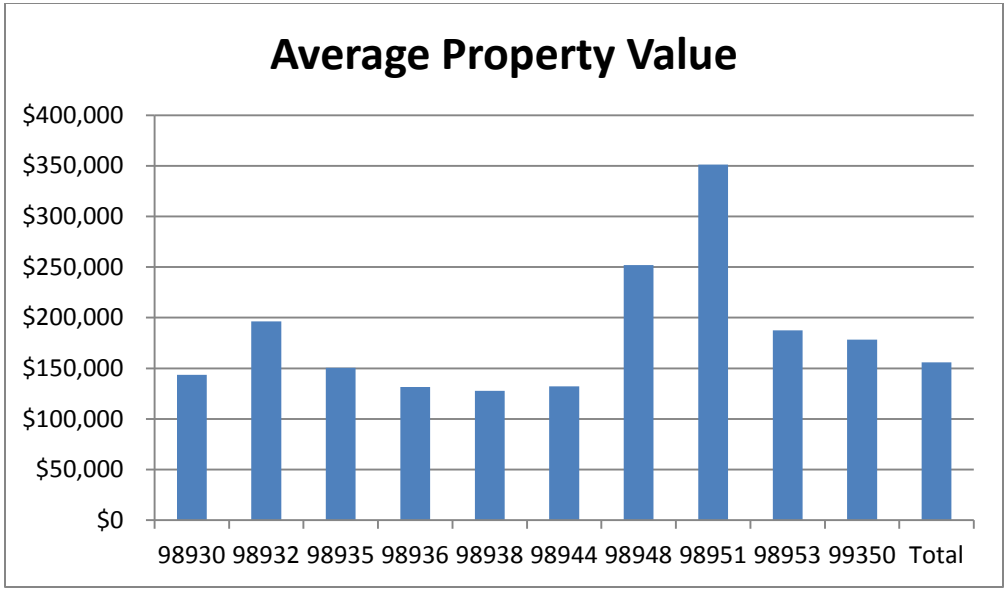
$100,000
$80,000
$60,000
$40,000
$20,000
$0
98930 98944 98953 99350 Total


Average Property Value
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$350,000
$300,000
$250,000
$200,000
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$0
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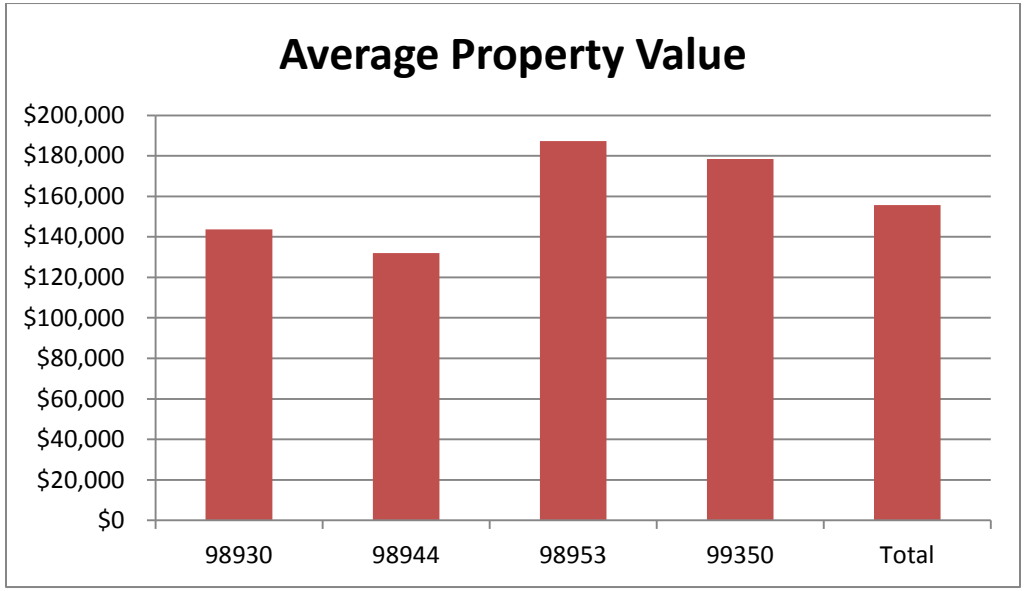
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$200,000
$180,000
$160,000
$140,000
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$20,000
$0
98930
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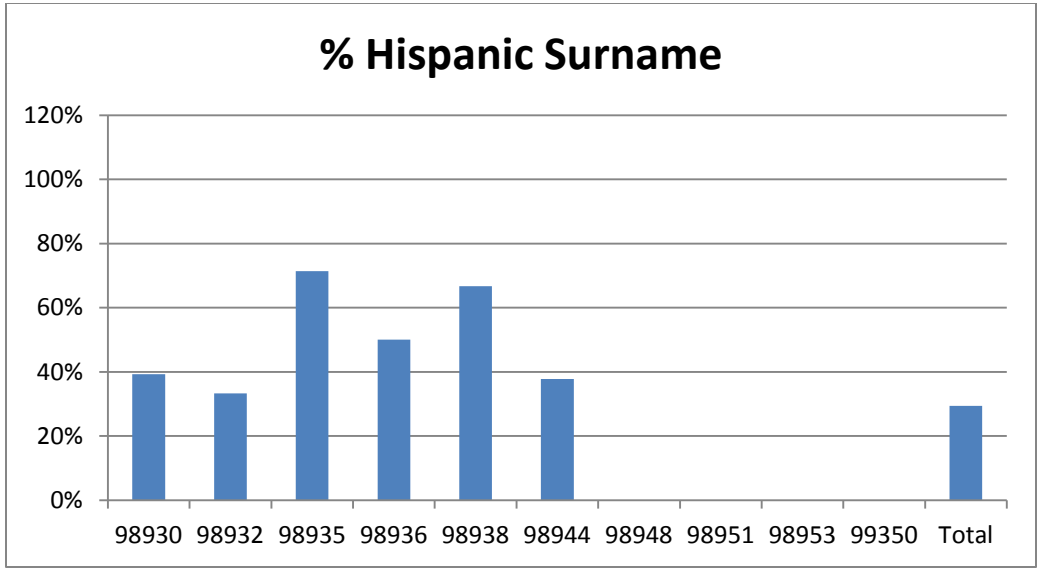
98953
99350
Total


% Hispanic Surname
120%
100%
80%
60%
40%
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98930
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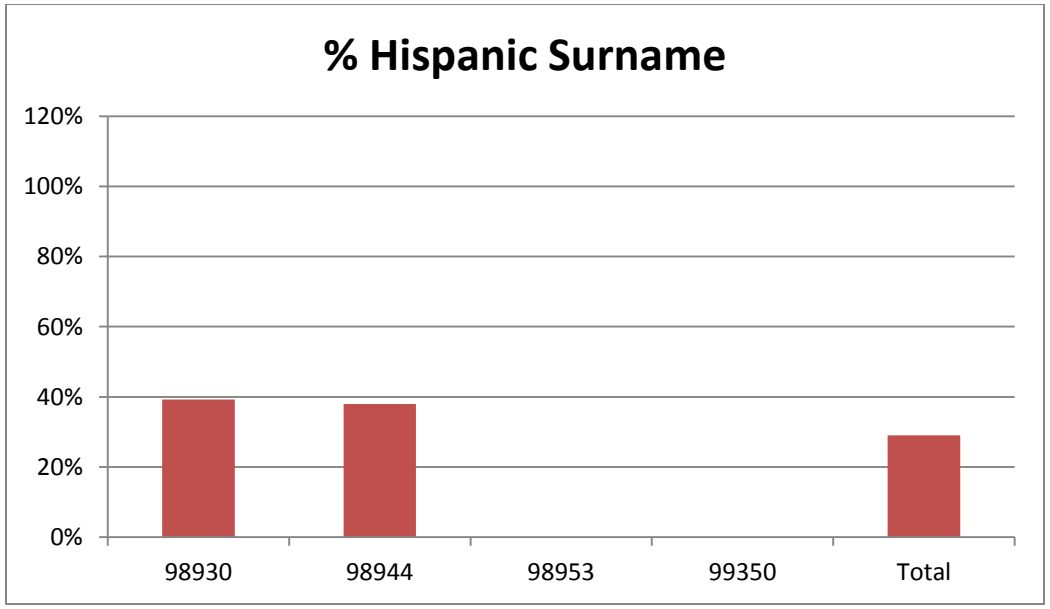
Total


% Hispanic Surname
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100%
80%
60%
40%
20%
0%
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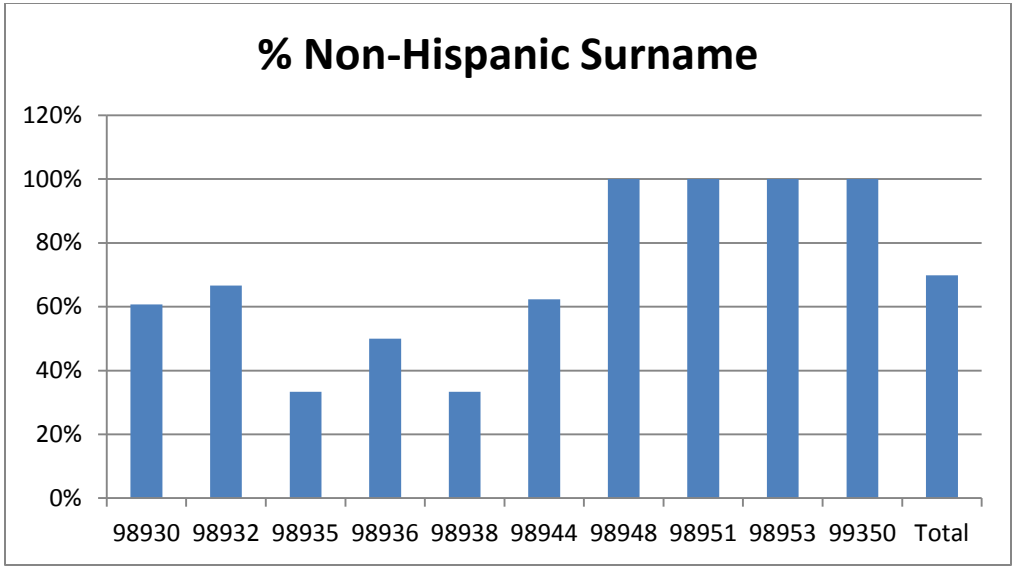
98953
99350
Total


% Non-Hispanic Surname
120%
100%
80%
60%
40%
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0%
98930
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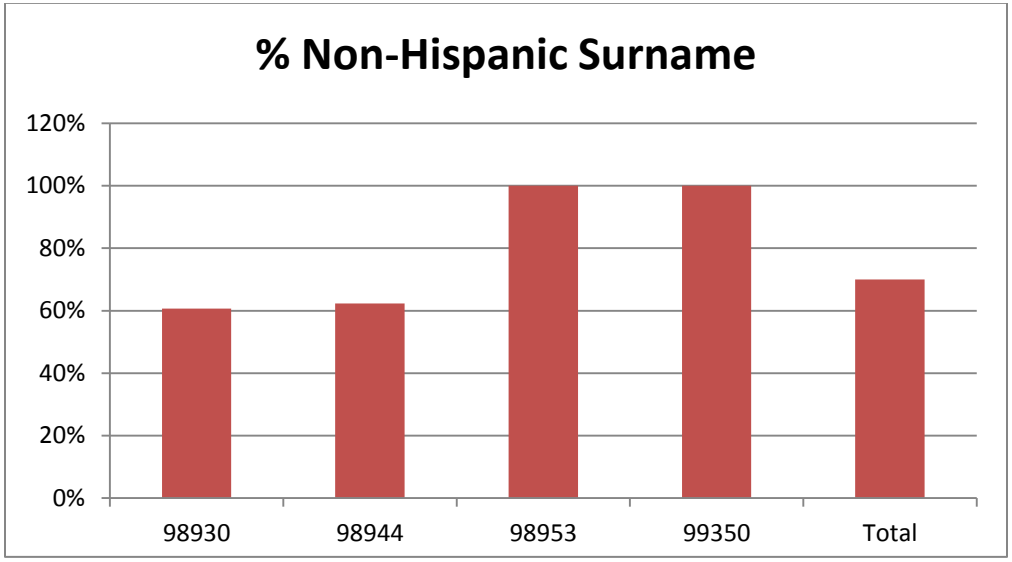
99350
Total


% Non-Hispanic Surname
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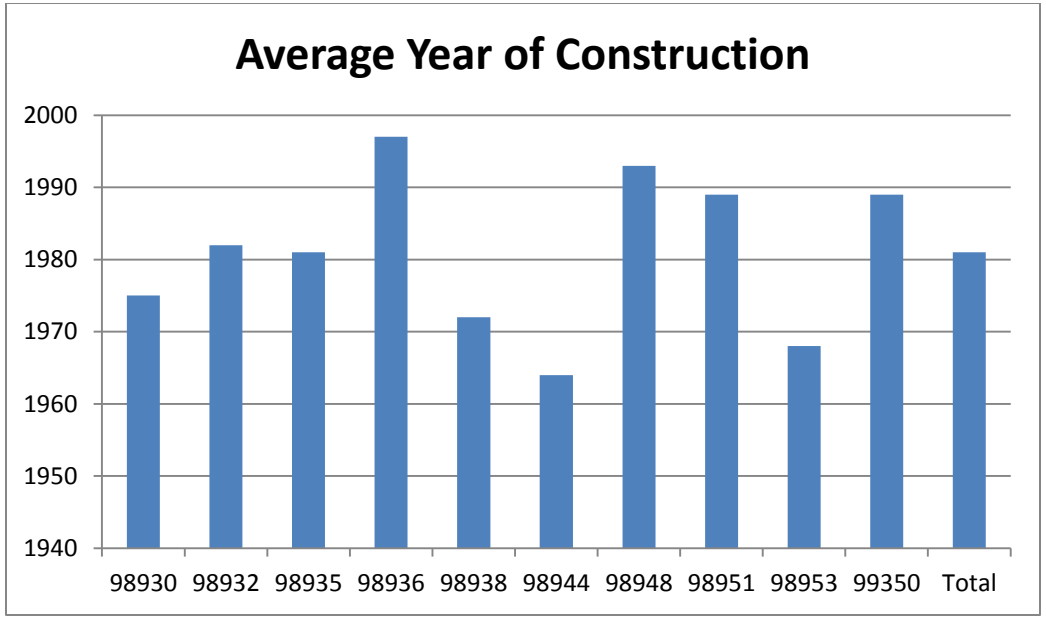
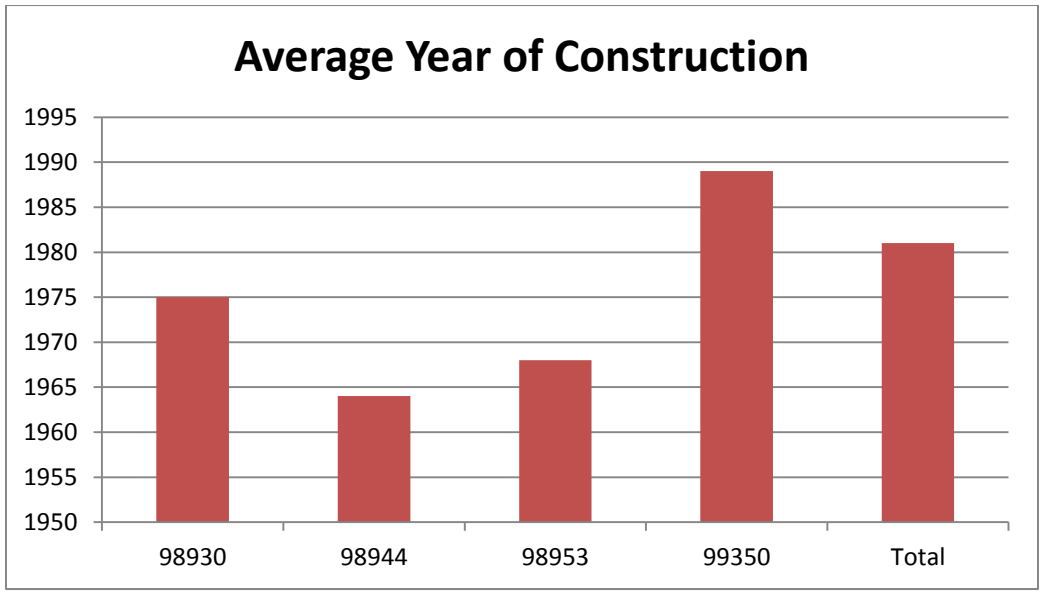
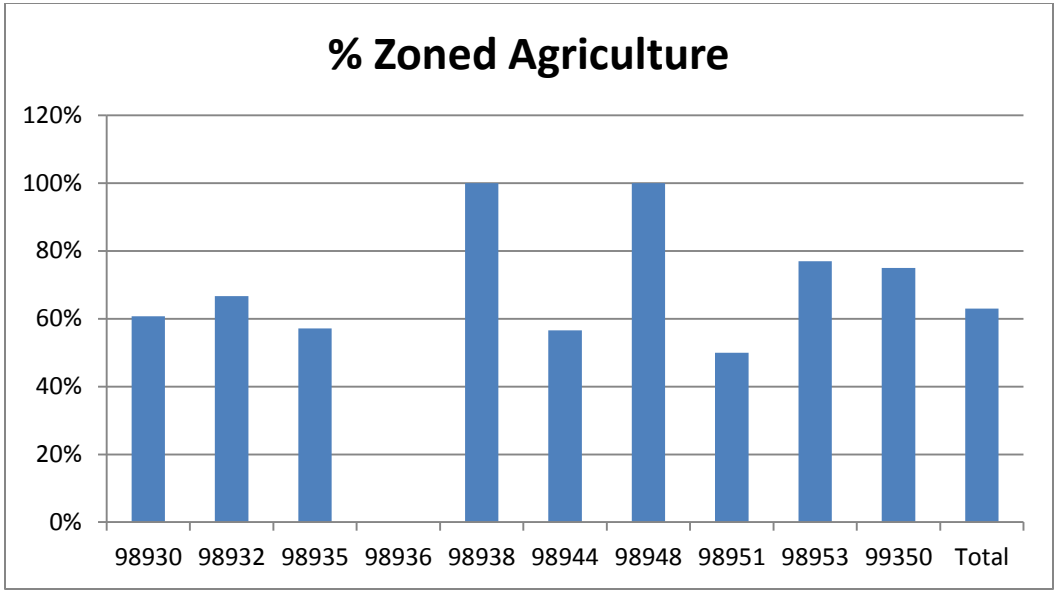
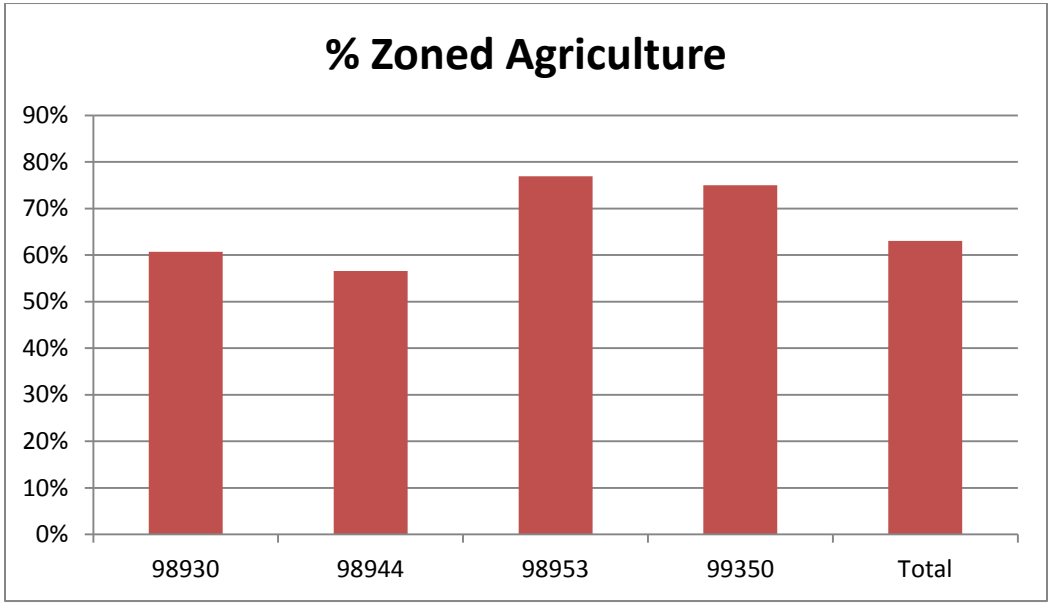
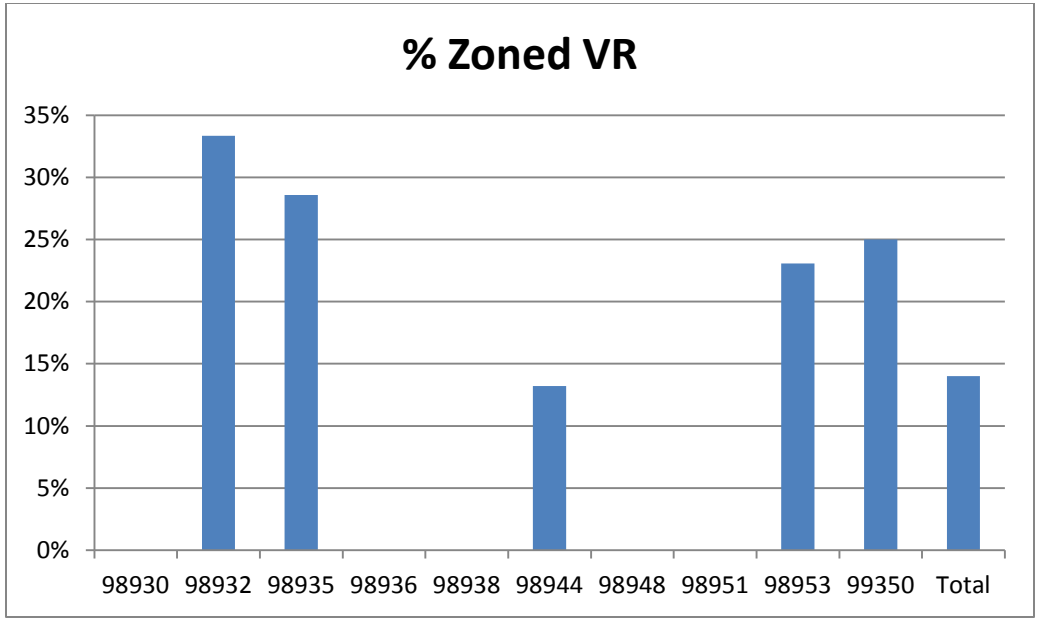
40%
20%
0%
98930
98944
98953
99350
Total


Average Year of Construction
2000
1990
1980
1970
1960
1950
1940
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total


Average Year of Construction
1995
1990
1985
1980
1975
1970
1965
1960
1955
1950
98930
98944
98953
99350
Total


% Zoned Agriculture
120%
100%
80%
60%
40%
20%
0%
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350
Total


% Zoned Agriculture
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
98930
98944
98953
99350
Total


% Zoned VR
35%
30%
25%
20%
15%
10%
5%
0%
98930
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98944
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98951
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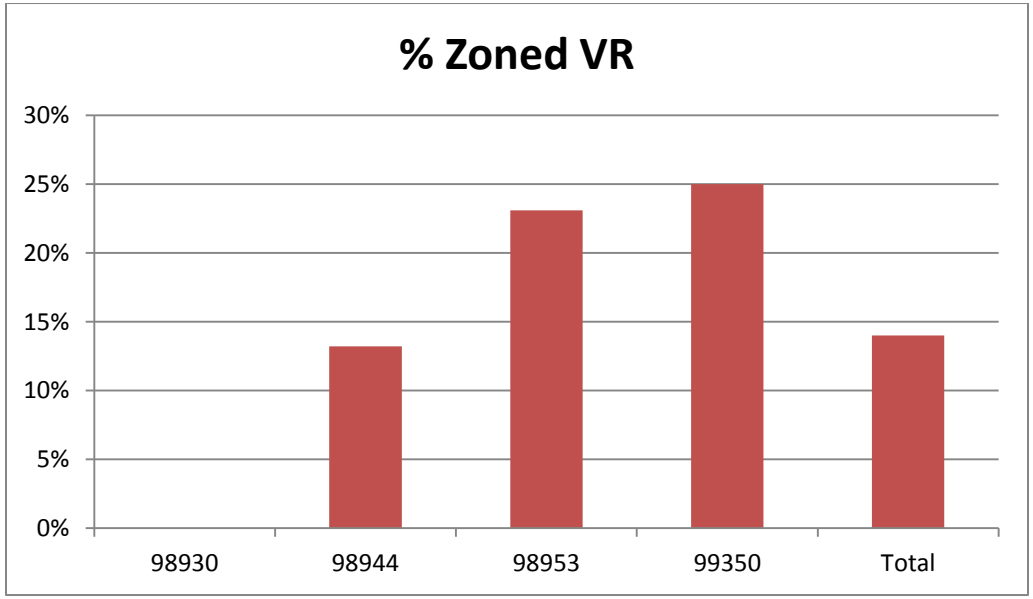
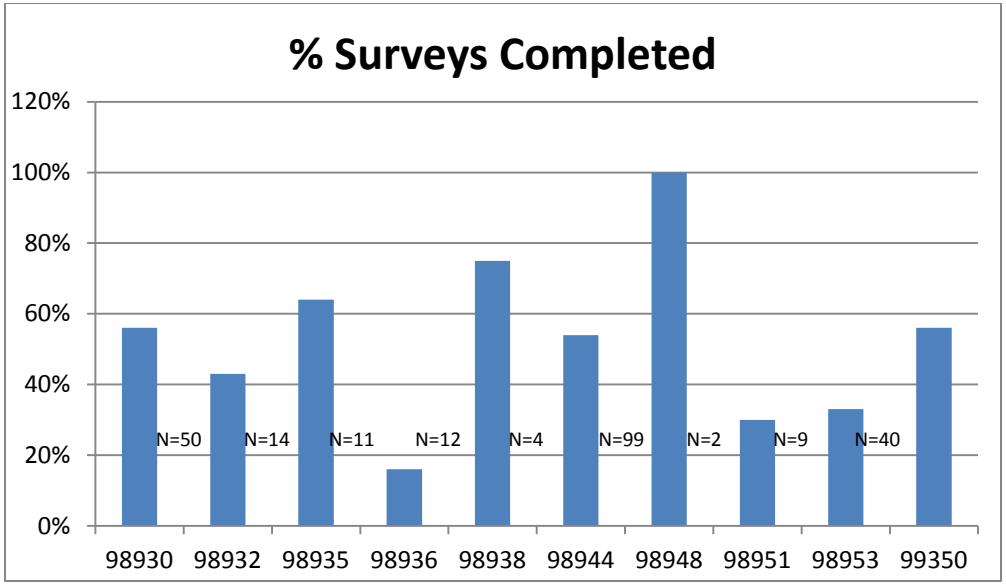
99350
Total


% Zoned VR
30%
25%
20%
15%
10%
5%
0%
98930
98944
98953
99350
Total


% Surveys Completed
120%
100%
80%
60%
40%
20%
0%
N=50
N=14
N=11
N=12
N=4
N=99
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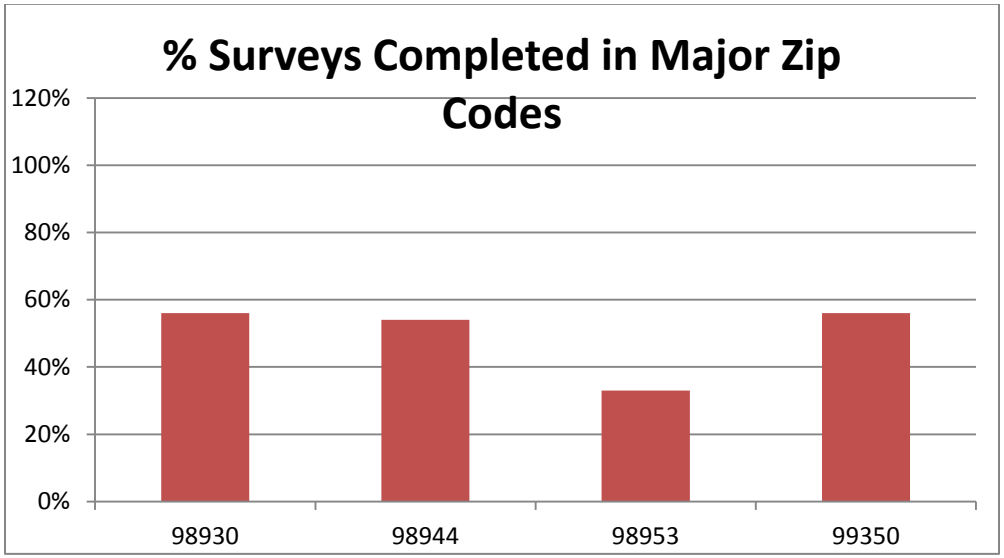
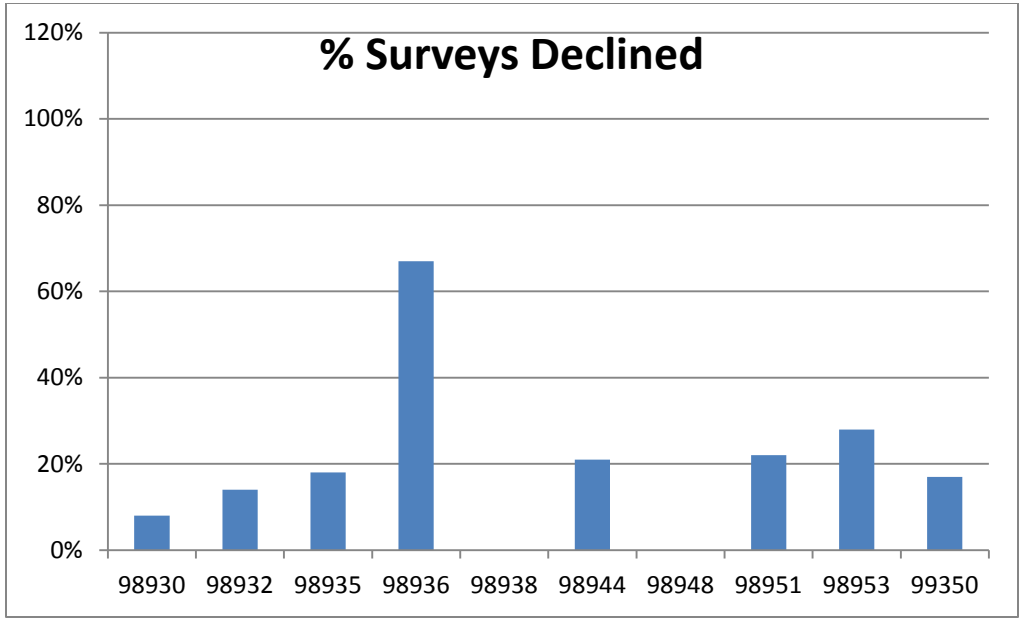
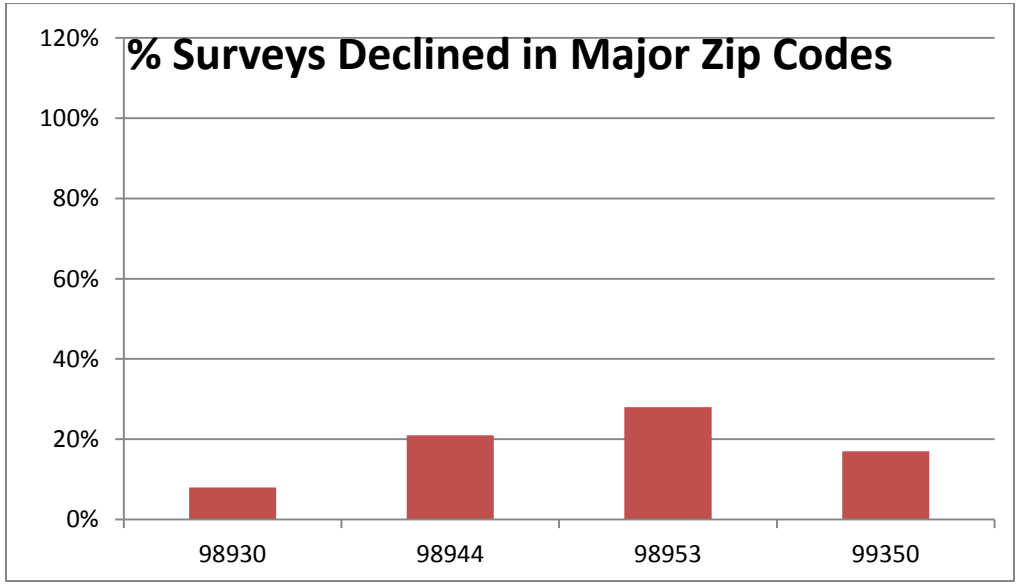
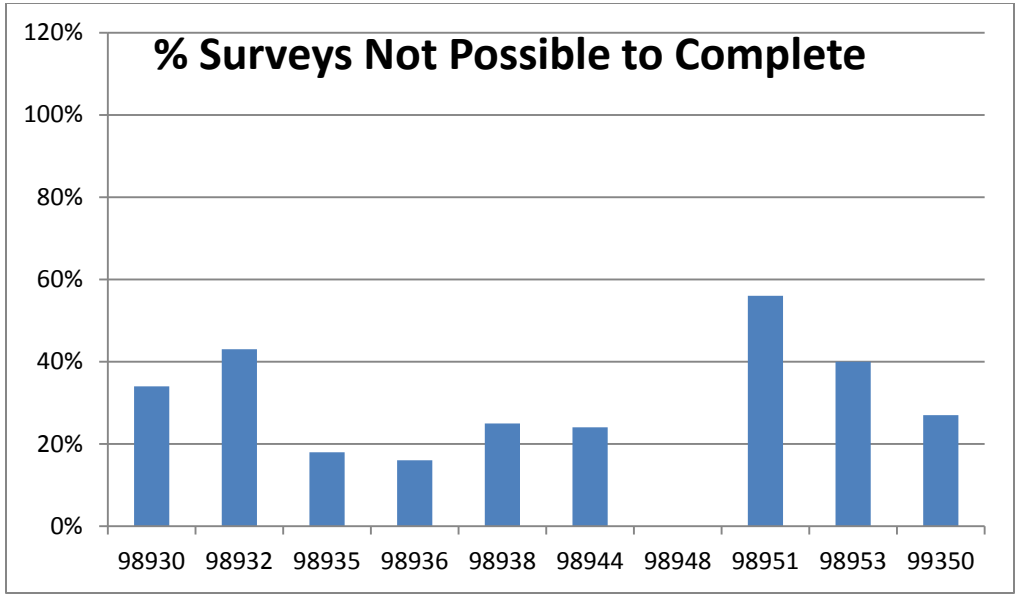
98938
98944
98948
98951
98953
99350


% Surveys Completed in Major Zip Codes
120%
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350


% Surveys Declined
120%
100%
80%
60%
40%
20%
0%
98930
98932
98935
98936
98938
98944
98948
98951
98953
99350


% Surveys Declined in Major Zip Codes
120%
100%
80%
60%
40%
20%
0%
98930
98944
98953
99350


% Surveys Not Possible to Complete
120%
100%
80%
60%
40%
20%
0%
98930
98932
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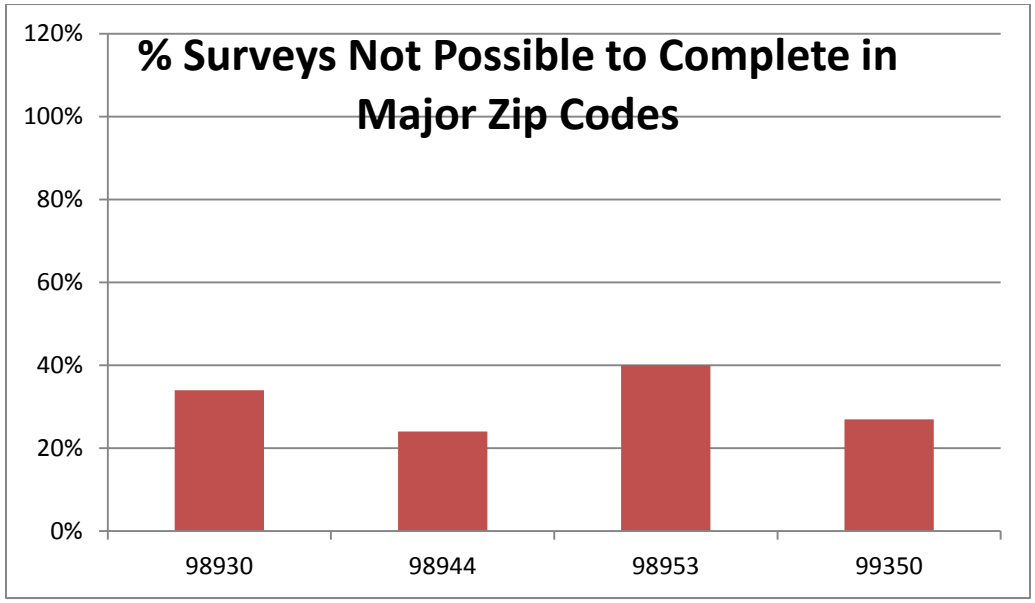
99350


% Surveys Not Possible to Complete in Major Zip Codes
120%
100%
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60%
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0%
98930
98944
98953
99350

Attachment 2

Survey Errata

1. There were seven Parcel Numbers with only ten digits. A valid Parcel Number has eleven digits. The ID numbers for the invalid parcel numbers are: 79, 126, 164, 214, 261, 263, & 274. See Attachment I –*GWMA EPO Survey Errata I Invalid Parcel Numbers.*

2. ID # 164: Address 1454 Konnowac Pass Road: The correct Parcel Number is 19122414402

3. ID #'s 9 and 68: Two teams surveyed the same address and Parcel Number with very similar results

4. ID # 12: The Parcel Number provided does not show any properties in the county data base. Parcel Number 20110923401 connects to an address 77 Zickler Road. Could this be the property that was surveyed? Is it possible that the county data base left a seven off this address? Adjacent properties are in the 700's.

5. ID #s 66 and 131 have the same address – 784 Zickler Road. In the county data base this address corresponds to the Parcel # for ID 66. The Parcel Number for ID # 131 yields the same address when you do the search. However, when you click on the adjoining property (22407) on the map you find the Parcel Number for ID 131 corresponds to 780 Zickler Road. There appears to be an error in the county data base

6. ID #s 66, 109, 131 & 165 have three addresses listed between them: 721 Zickler Road, 784 Zickler Road and 788 Zickler Road.

There are three Parcel Numbers listed between them: 20110922406, 20110922407, & 20110922411

Here is the correspondence that I find. It is different from the listings in the survey:

20110922406 – 784 Zickler Road

20110922407 – 780 Zickler Road

20110922411 – 792 Zickler Road

20110922412 – 788 Zickler Road

I did not find a Parcel Number that corresponds to 721 Zickler Road

7. ID # 214: The listed Parcel Number is invalid and I did not find a Parcel Number for the address, 1280 Blaine Road.

8. ID # 261 has an invalid Parcel Number. Parcel Number 21100534005 corresponds to 293 Durham Road.

9. ID # 126 has an invalid Parcel Number. Parcel Number 21100943404 corresponds to the address 85 N. Granger Road.

10. ID # 274 has an invalid Parcel Number. Parcel Number 22100333400 corresponds to the address 3313 Independence Road.

11. ID #s 273 and 153 give the same Parcel Number for two different addresses. This Parcel Number, 22100334002 yields the address 3471 Independence Road, the address given by ID # 153. The address 3253 Independence Road corresponds to Parcel Number 22100333402. See ID # 284.

12. ID#s 277 and 283 list the same address with different Parcel Numbers. The Parcel Number listed in 283 (22101022004) corresponds to 2841 Fordyce Road. The Parcel Number listed in 277 (22101022044) yields no results when entered into the search. It appears that there were three unsuccessful attempts to survey this address on two separate days.

13. ID # 79 has an invalid parcel number, but the survey was completed at this address

14. ID#s 49 and 50 list two separate addresses but give the Same Parcel #. The listed Parcel # corresponds to the address for ID # 49.

15. ID#s 72 and 141 list a PO Box and a street address but the same Parcel Number. The survey was declined and then completed.

16. ID#s 73 and 227 list the same address and same Parcel Number.

17. ID# 78: The address that comes up for this Parcel Number in the county data base is different. I cannot determine whether this is an alternate address or an address with a different Parcel #.

18. ID # 152: The address that comes up for this Parcel Number in the county data base is different. I cannot determine whether this is an alternate address or an address with a different Parcel #.

19. ID#s 99 and 100 list one parcel number and two addresses. The surveys were completed on the same day with similar but not identical results.

20. ID#s 155 and 161 list the same address and two Parcel Numbers. Surveys were conducted on two days and declined both times. Parcel Number 23103123407 lists no buildings.

21. ID # 182: The Parcel Number given corresponds to 1941 Konnowac Pass Road, a property with no improvements. I did not find a property number that corresponds to the address listed.

22. ID # 119 has an incorrect Parcel Number. 23091344004 is assigned to farmland further down Olmstead Road. The Parcel Number for the address 3231 Olmstead Road is 23091344004.

23. There was one sample, ID # 170 that said complete but there was no data entered. It was in zip code 99350.

Corrections

1. ID #'s 9 and 68: Two teams surveyed the same address and Parcel Number. The number of listings for Zip Code 98936 was reduced to 12 and the number of completions reduced to 2.

There were 102 listings for surveys at Zip Code 98944: Completed 53, Declined 23, not possible 24 with no one home at 1 and a vacant lot at 1.

2. ID#s 277 and 283 listed the same address so the number of surveys was reduced to 101 for Zip Code 98944 and the number who declined to 22

3. ID#s 72 and 141 list a PO Box and a street address but the same Parcel Number. The survey was declined and then completed. This reduces the number of surveys for Zip Code 98944 to 100 and the number of declined to 21.

4. ID#s 73 and 227 list the same address and parcel number. This reduces the number of surveys for Zip Code 98944 to 99 and the number of not possible to 23.

5. ID#s 99 and 100 list one parcel number and two addresses. The surveys were completed on the same day with similar but not identical results. No corrections were made.

6. ID#s 155 and 161 list the same address and two Parcel Numbers. Surveys were conducted on two days and declined both times. The Parcel Number (23103123407) lists no buildings. The number of surveys for Zip Code 99350 was reduced to 36 and the number that declined to 6.