SYSTEM-WIDE ODOR PREVENTION & MONITORING PROGRAM

Pima County Regional Wastewater Reclamation Department

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I. Summary

This report is the second quarterly report documenting the odor control activities of the RWRD. RWRD began a concerted effort toward managing odors in 2006 with many improvements implemented at the Roger Road and Ina Road Wastewater Reclamation Facilities and in the sanitary sewerage conveyance system. Approximately $4.5 million dollars were spent to mitigate nuisance odors that have existed around the Roger Road WTF. Approximately $2.0 million were spent on new odor control and monitoring systems in the sanitary sewerage system.

To a large degree, these efforts have had a considerable impact on odors as demonstrated through decreases in both odor concentrations and in the number of odor complaints during 2007. Since implementing system–wide odor control measures in 2007, the numbers of odor complaints are down by 15% and the concentrations of hydrogen sulfide, or H_2S, have decreased significantly. Odor abatement continues to be a high priority in the RWRD and at the Roger Road WRF. The frequency of odor monitoring has been increased from quarterly to monthly to measure performance and establish optimal maintenance intervals for odor mitigating equipment.

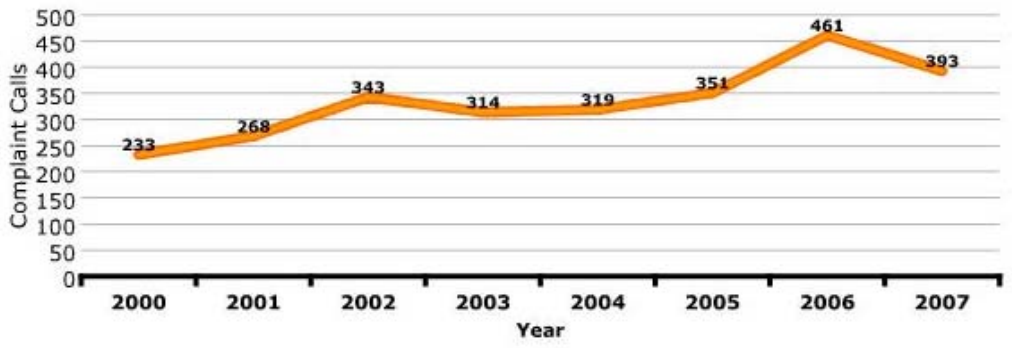
One of the key odor mitigating projects at the Roger Road Wastewater Reclamation Facility was delayed because of the cultural significance of the proposed odor scrubber site. However, we are happy to report that a contingency plan was developed and the biotower odor abatement project began in December of 2007 and is scheduled for completion by mid 2008.

New items currently under development in the 4th quarter of 2007 included a system-wide odor management plan is currently under development and an information brochure for controlling odors has been developed for community distribution. This new brochure describes the sources of odors, odor control strategies, tips for reducing household sewer odors and how to report sewer odors. A sample of this brochure is included in this report.

II. Odor Complaint Summary

Figure 1. demonstrates the decline in odor complaints that have resulted from the 2007 improvements. 2007 demonstrated the first decline in the number of odor complaints over the past four years. This decrease in complaints occurred despite annual increased service area and the increased publicity, newspaper articles, and awareness of the complaint hotline.

Figure 1. Odor Complaint History

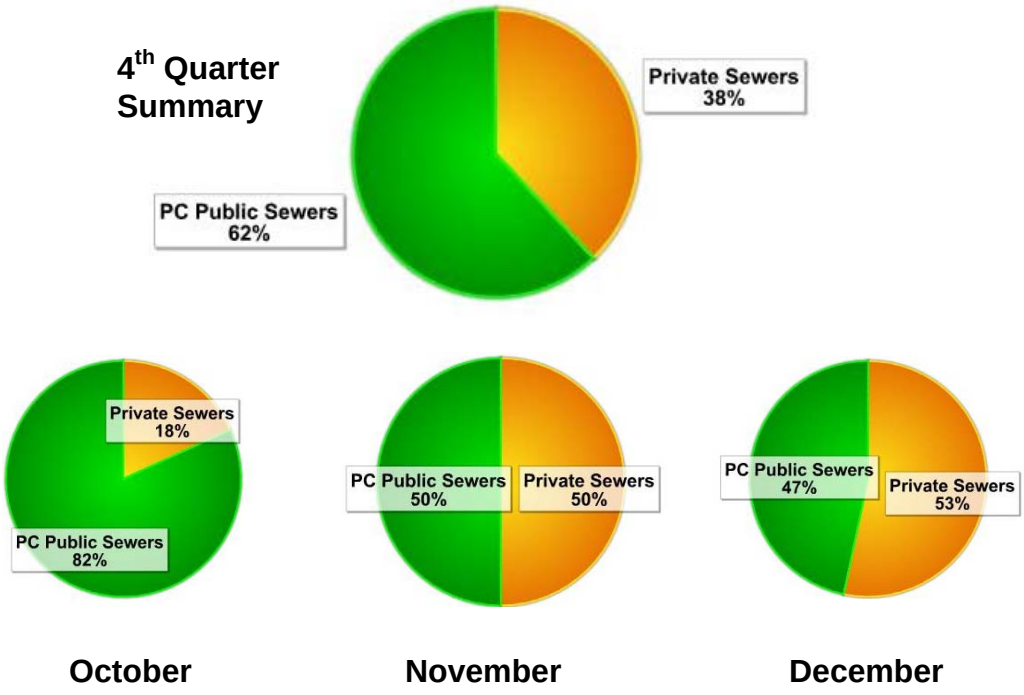


II. Odor Complaint Summary (Continued)

The RWRD is responding to all odor complaints when the caller has provided a name, phone number and address. Odor complaints calls are logged and a crew is dispatched immediately to investigate and to determine whether the odor indicates a sewer blockage or surcharged line.

Quite often, reported odors are fugitive emissions from private sources not under the management authority of the RWRD. For example, odors often attributed to the Roger Road treatment facility have been traced to nearby propane distribution retailers. In most instances, investigative teams meet with both property landlords and tenants to assist in the mitigation of odors and to prevent future reoccurrences. The ratio of public system odors to private source odors vary each month. Figure 2. provides a distribution total for the fourth quarter of 2007.

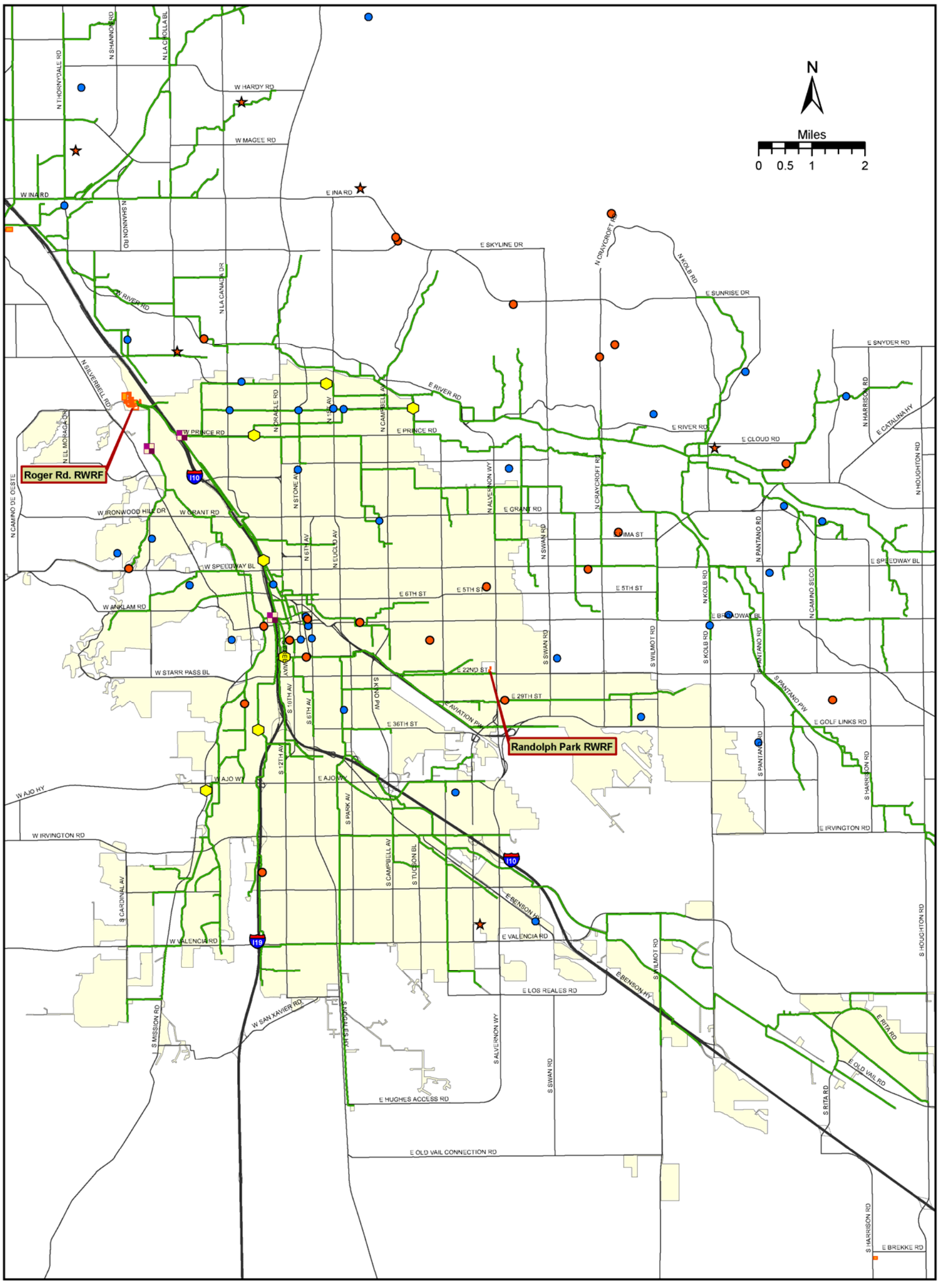
Figure 2. 2007 Odor Complaint History



Figures 3 through 5 contrast the spatial distribution of odor complaints for the fourth quarter of years 2006 and 2007. In these figures, odors are identified as originating from private and public systems. These maps demonstrate that odor complaints are not necessarily linked to proximity of a wastewater treatment facility. Of particular note is the absence of odor complaints downstream of the chemical dosing units in 2007. All CDUs appear to be functioning as designed.

II. Odor Complaint Summary (Continued)

Figure 3. October 2007 Spatial Distribution of Odor Complaints



October Odor Complaints 2006-2007 Including Private Manholes

Legend

- Ocober 2007 Private Manhole Service
- October 2007
- October 2006
- Vapor Phase Treatment Site
- CDU Location
- Sewer Interceptor Line
- Treatment Facilities
- Street Network
- Sewer Tributaries Flowing to Roger Rd. RWRF

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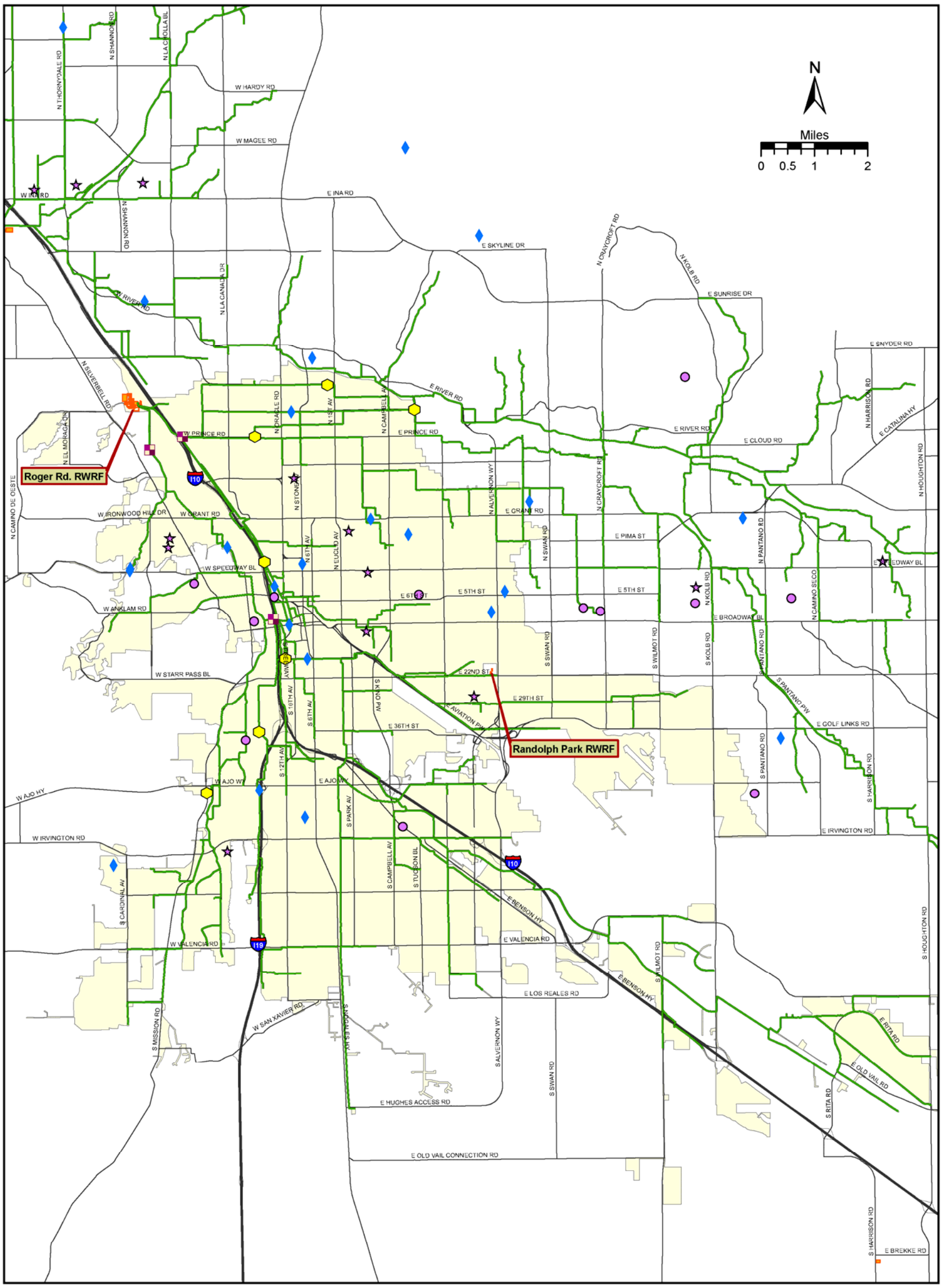
II. Odor Complaint Summary (Continued)

Figure 4. November 2007 Spatial Distribution of Odor Complaints



November Odor Complaints 2006-2007 Including Private Manholes

Legend

- November 2007 Private Manhole Service
- November 2007
- November 2006
- Vapor Phase Treatment Site
- CDU Location
- Sewer Interceptor Line
- Treatment Facilities
- Street Network
- Sewer Tributaries Flowing to Roger Rd. RWRF

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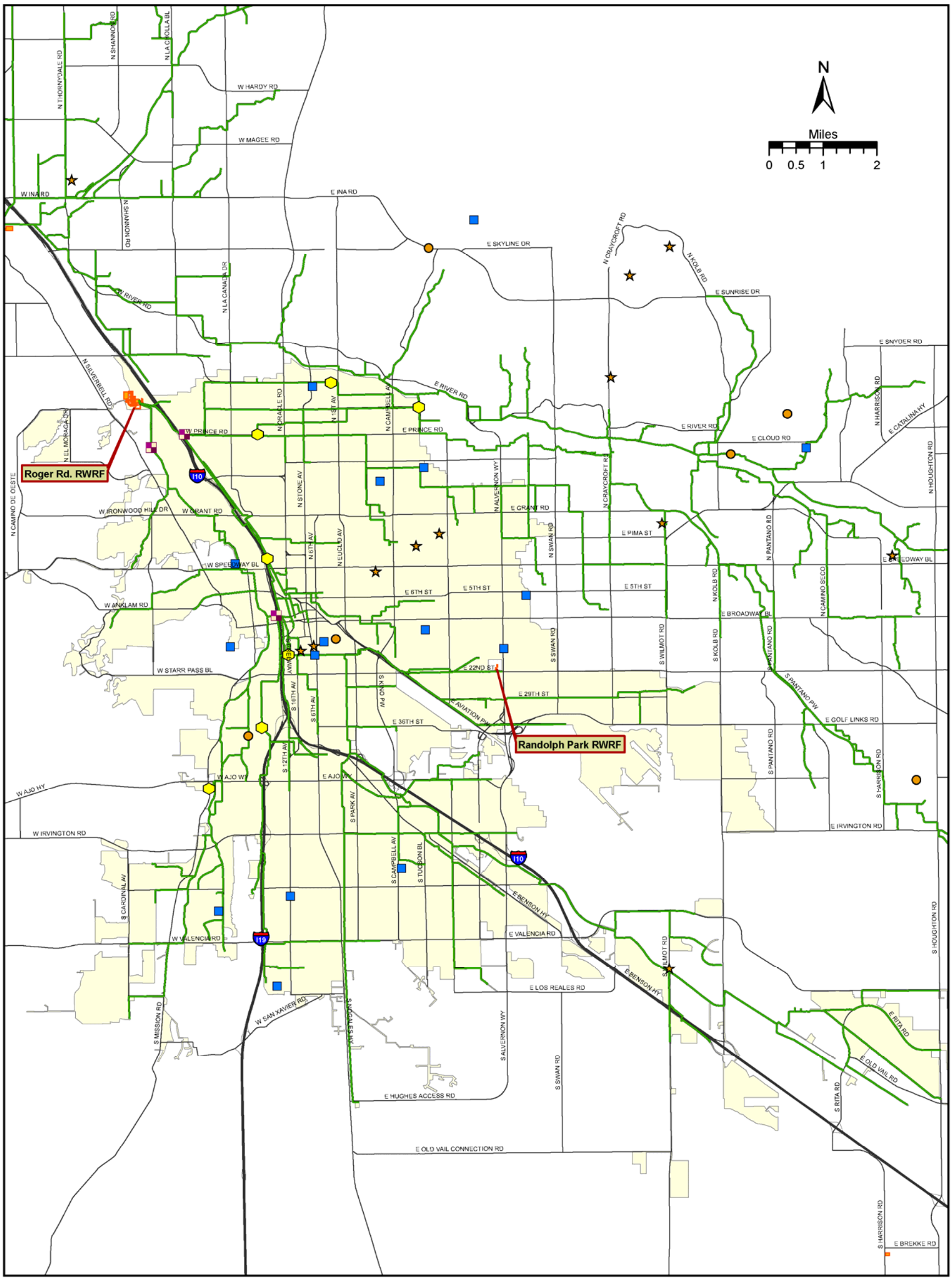
Conveyance Division

II. Odor Complaint Summary (Continued)

Figure 5. December 2007 Spatial Distribution of Odor Complaints



December Odor Complaints 2006-2007 Including Private Manholes

Legend

- December 2007 Private Manhole Service
- December 2007
- December 2006
- Vapor Phase Treatment Site
- CDU Location
- Sewer Interceptor Line
- Treatment Facilities
- Street Network
- Sewer Tributaries Flowing to Roger Rd. RWRF

Pima County
Regional Wastewater Reclamation
Department

Conveyance Division

III. Odor Abatement Activities

Odor Abatement Activities in this quarter included maintenance activities at the Roger Road and Ina Road facilities and within the sanitary sewerage conveyance system. At the Roger Road WRF, the chemical scrubber for the thickeners was acid washed and the activated carbon in the dry scrubbers serving the primary clarifiers was replaced. At the Ina Road WRF, the chemical scrubbers for the 12.5 MGD BNRAS expansion were acid washed and the activated carbon for the dry scrubbers at the Centrifuge Building odor control was replaced. Within the Conveyance Division, Field Operations serviced 187 reaches of the sewer system in response to odor complaints. Of these serviced reaches, 57 were serviced in response to odor complaints that were determined to be of emissions from private sources not under the operational control of the RWRD.

Odor abatement activities taking place this quarter were primarily confined to the Roger Road WRF and consisted of maintenance associated with the replacement of granular activated carbon (GAC) in the various odor scrubbers. The granulated activated carbon was replaced in the odor scrubbers attached to three primary clarifiers and the two larger odor scrubbers located at the headworks. Both of these activities were completed in November of 2007.

In December, a job order contract was initiated to implement odor abatement on the first of two biotowers. During normal biotower operation, air updrafts through the biotowers allowing odors to exit into the atmosphere. The biotower odor abatement projects consist of the installation of granulated activated carbon scrubber units on each of the biotowers. When complete, the normal air flow pattern within the biotower will be reversed and thus prevent exhaust air from escaping into the atmosphere. The airflow will be drawn down through the biotower and directed through carbon scrubber units prior to exhausting it into the atmosphere thereby substantially reducing. The south biotower is scheduled for completion in April of 2008 and the north biotower is scheduled for completion by July of 2008.

III. Odor Abatement Activities (Continued)

Figure 6. Odor Control Informational Brochure (Outer Pages)

How to report sewer odor complaints

Immediate reporting of sewer and treatment plant odors is very important step in odor control. Odors can be indicators of blockages in the sewer system, and rapid response is essential for preventing sewer overflows. Here are a few tips:

- Report the odor as soon as possible.
- Give the location of the odor and time it occurred.
- Provide a description and intensity of the odor.
- Provide your name and phone number should our response crews have difficulty locating the address.
- For odors occurring in homes and businesses, ensure that the "p" trap is not dry as this will allow sewer odors to enter your home.

How to contact us

Odor Complaint Hotline:

520.326.4333

Find us on the Web

You can learn more about wastewater treatment by visiting our Web site:

http://www.pima.gov/wwm

Odor Control

Working to enhance our community by protecting both public health and the environment

Pima County Regional Wastewater Reclamation Department

Pima County Regional Wastewater Reclamation Department

RWRD utilizes cost effective, cutting edge odor technologies at many of our newer facilities. Improvements are planned for both metropolitan treatment plants and in the sanitary sewerage system

Being a good neighbor

Controlling nuisance odors is a major goal of all responsible wastewater treatment organizations. The Regional Wastewater Reclamation Department continuously protects both the public health and the environment by treating over 70 million gallons of wastewater every day. We currently monitor our sewerage system and treatment plants for odor releases on a routine basis and reduce odors in the following ways:

- Chemical control of hydrogen sulfide in wastewater flows at strategic locations within the sanitary sewerage system.
- Installation of odor scrubbers in high odor areas.
- Immediate response to citizen complaints.
- Comprehensive system-wide odor monitoring program.

III. Odor Abatement Activities (Continued)

Figure 7. Odor Control Informational Brochure (Inside Pages)

Routine maintenance and debris removal are essential for maintaining the flow of wastewater in the sanitary sewer system.

The Pima County Sanitary Sewerage System

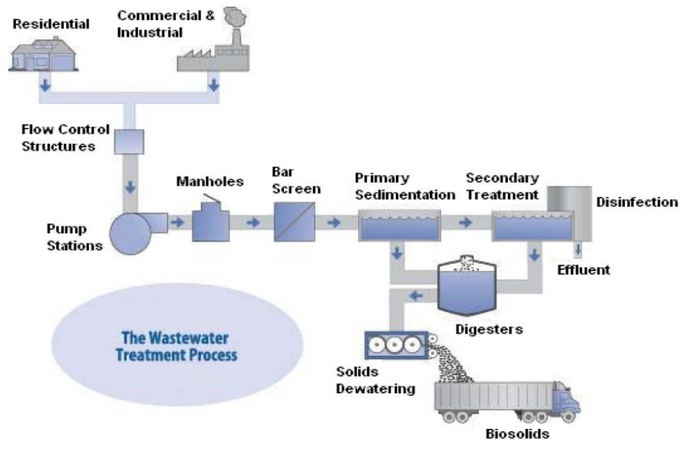
The Pima County Regional Wastewater Reclamation Department (RWRD) protects both public health and our environment by safely collecting and conveying wastewater through more than 3,400 linear miles of sewer pipes. The final destination of the wastewater is one of our eleven wastewater treatment facilities.

Odorous compounds form within sewers as the result of microbial activity breaking down organic material in the sanitary sewerage system. The long distances in which the wastewater travels before arriving at one of these facilities can lead to odor generation.

The potential for odors compounds to form within the sewer is further exacerbated by the warm temperature of the wastewater.

Wastewater temperatures have often been observed at over 90°F in summer months. This warm water temperature creates an ideal climate for bacterial growth which results in the partial breakdown of sewage and the potential release of odors from the sanitary sewer before sewage reaches the treatment plants.

Because the sewer collection system is primarily designed around gravity flow, our geography requires maintaining slopes for constructing sewers and effectively transporting wastewater. Inadequate slopes can increases the time the wastewater resides in the sewer system and thereby increase the potential for odors. Grease and sediment are also important contributors to the generation of odorous compounds within the conveyance system.



Odor Control Methodologies used in Pima County

Wet Chemical Scrubber—Foul air is forced through a spray of a chemical solution that prevent odor release into the environment.

Dry Chemical Scrubbers— Foul air is forced through a bed of activated carbon granules or alternate dry media. The granules adsorb the odor and prevent its release into the environment.

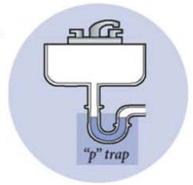
Biological Scrubber— Foul air is passed through biologically active media which digest contaminants and neutralize the odors.

Chemical Dosing—Chemicals are added directly to the flow of wastewater, usually through a manhole or locations where odors are troublesome. The chemicals reduce bacterial growth and neutralize odors.

RWRD is committed to odor control. We have numerous programs in place to minimize odors, including an extensive pretreatment program for industrial discharges, an efficient preventative maintenance program , a comprehensive odor measurement program and an extensive chemical odor control program.

Tips for reducing household sewer odors

The "p" trap under every sink, tub and floor drain is a water barrier that keeps sewer odors from coming into your home. Normal use will keep the "p" traps full of water and minimize odors.



Always install a "p" trap when making plumbing connections in your home.

Periodically run water through plumbing fixtures that are not used often, such as floor drains, garage drains, utility sinks and infrequently used "guest" bathrooms.

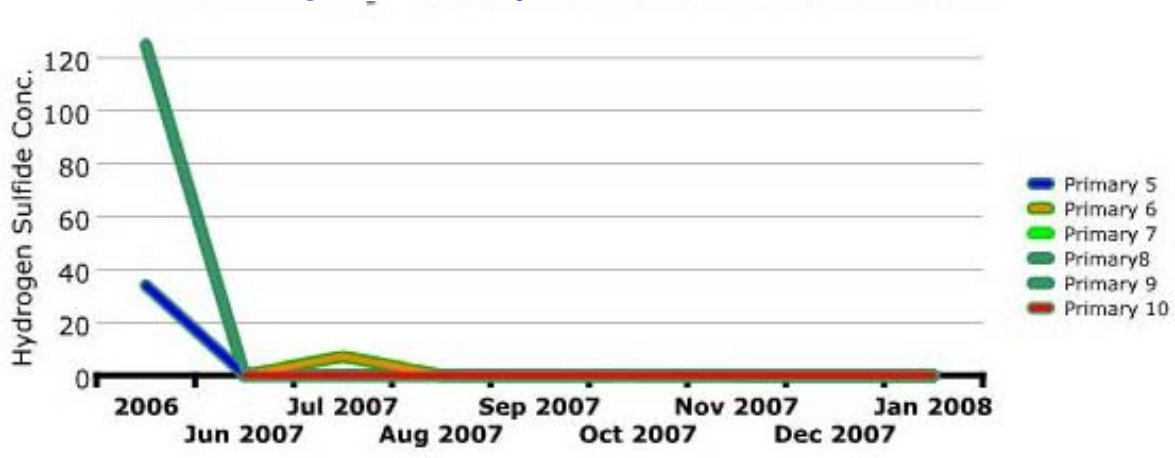
Make sure all plumbing vents go outside the house. Compliance with standard plumbing code should ensure proper venting.

Clean water…..is a sound investment

IV. Monitoring Program

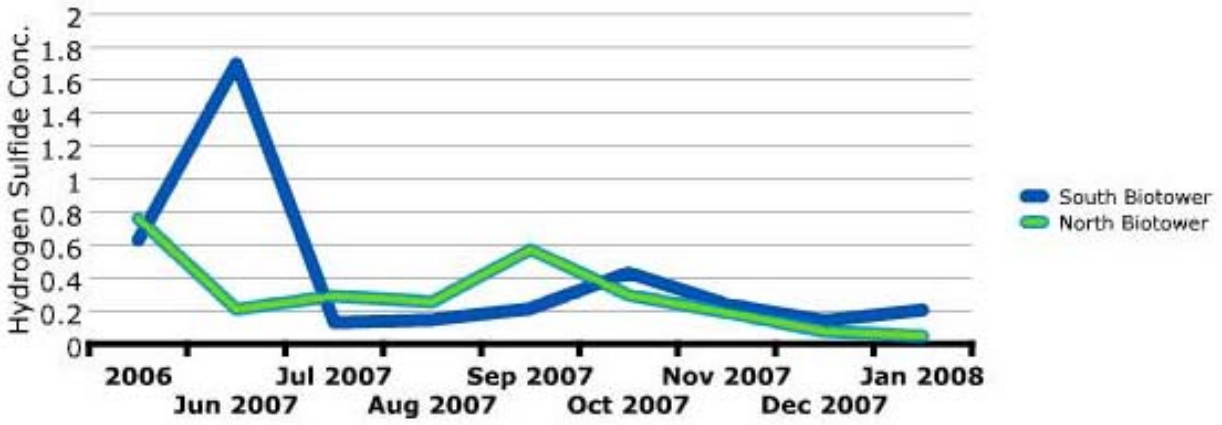
RWRD continues to monitor odors throughout the sanitary sewerage system and at various treatment facilities. Individual treatment processes are monitored monthly and hydrogen sulfide measurements are taken along the fenceline at select facilities. Figures 6 and 7 depict the levels of hydrogen sulfide reduction for different treatment processes at the Roger Road Wastewater Reclamation Facility.

Figure 8. Primary Clarifier Odor Reduction



Primary clarifier odors were reduced by effective chemical addition and odor scrubbing upstream of the clarifiers and by capturing and scrubbing odors coming off the clarifier overflow weirs.

Figure 9. Biotower Odor Reduction



Even though the biotower odor abatement projects have not been implemented to date, a marked decrease in H_2S emissions has been realized as a result of the upstream odor mitigation efforts. Even though the hydrogen sulfide odor levels are low, the mass of air that is exhausted through the biotowers is quite large and therefore the cumulative loading of hydrogen sulfide in the atmosphere can be significant at times.

IV. Monitoring Program (Continued)

Figures 10 through 12 depict fenceline monitoring conducted at the Roger Road Wastewater Reclamation Facility and represent typical odor levels that could be experienced within the nearby surrounding community. The average concentration is 9.6 parts per billion (PPB) of hydrogen sulfide, significantly below human detectable levels of 2000 PPB

Figure 10. October 2007 H_2S Concentrations Observed at Fenceline

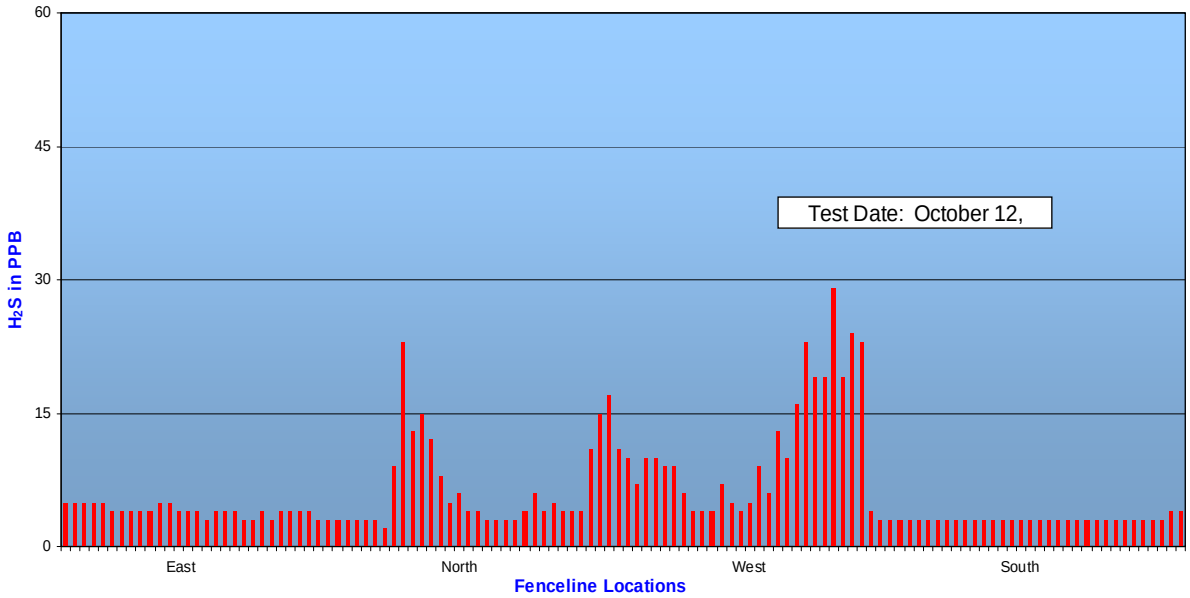
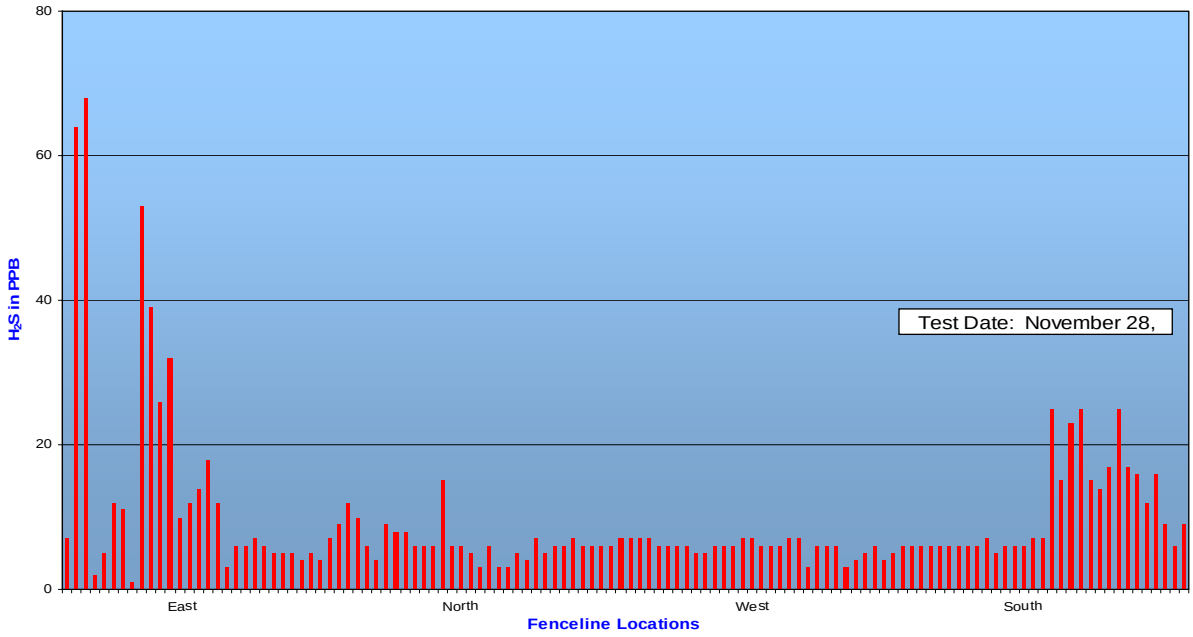
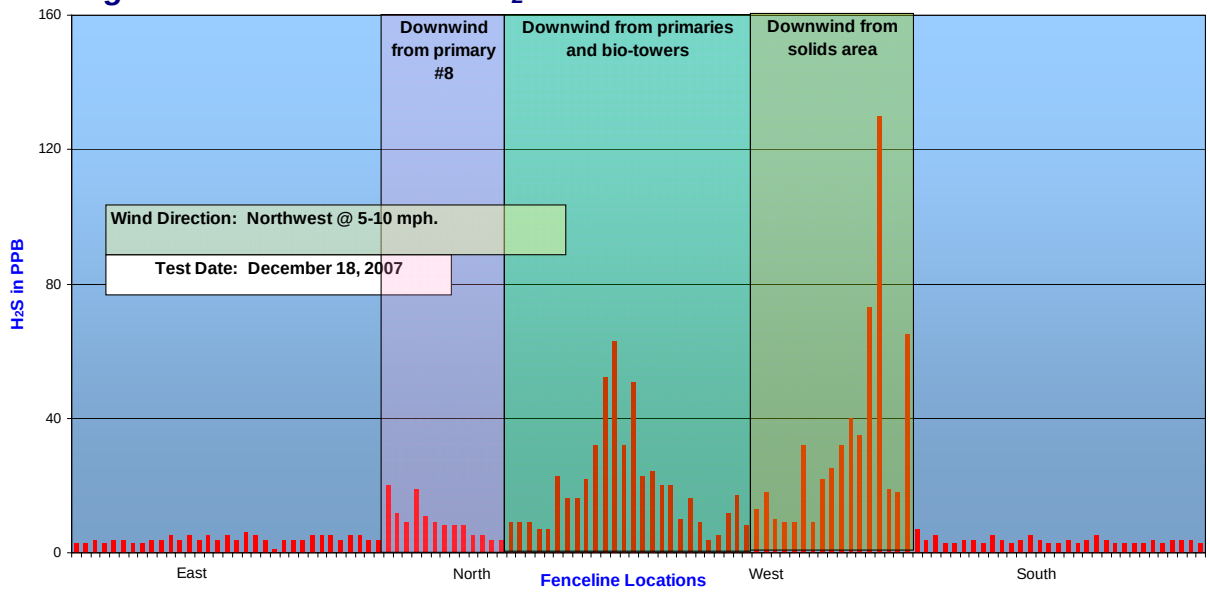


Figure 11. November 2007 H_2S Concentrations Observed at Fenceline



IV. Monitoring Program (Continued)

Figure 12. December 2007 H_2S Concentrations Observed at Fenceline



V. Conclusion

RWRD is committed to the goal of controlling and minimizing odors. This report documents those efforts utilizing measurable indicators such as odor complaints and analytical odor results. While odor complaints have decreased in 2007, the fourth quarter complaint maps demonstrate a marked improvement through the elimination of odor complaints downstream of strategically located chemical dosing units. In addition, quantitative analysis of specific process components at the Roger Road WRF have demonstrated a marked decrease in the concentration of hydrogen sulfide levels as a result of the mitigation efforts.

Increased community outreach has proved to be beneficial for prompt response to odor complaints. Outreach is further being expanded through the use of brochures and increased community dialog. The net effect has been a reduction in the persistent odors in the vicinity of the Roger Road WRF that were previously pervasive 24 hours per day, 365 days a year. Odors in this geographic area are now both infrequent and significantly reduced in concentration.