Office of the City Auditor

City of San Diego

Performance Audit of the Public Utilities Department's Valve Maintenance Program

Several Opportunities Exist to Improve Program Efficiency and Productivity

Presentation to the Audit Committee
February 4, 2013

OCA

Independent • Objective • Accurate

Introduction

- We conducted an audit of the Public Utilities Department's (PUD) valve maintenance program as part of a Service Level Agreement with the Office of the City Auditor for audit work in 2012

- We identified six findings and twelve recommendations to improve program efficiency and productivity

Background

Appurtenance Type	Isolation Valves	Fire Hydrants	Blow-off Valves	Air Valves	TOTALS
Number in City Inventory	45,217	25,100	4,696	2,573	**77,586**

- PUD maintains 78,000 valves and fire hydrants with a budget of $1.54 million
- Valves are used in the water distribution system to regulate water flow and pressure and to shut off water during a main pipe break
- Preventive maintenance extends valve and hydrant life and provides valuable asset information



Fire Hydrant



Gate Valve

Objectives

- The objectives of the audit were to examine:
  - The extent to which the valve maintenance program operates in accordance with industry standards and practices, as well as internal policies and goals; and
  - The extent to which the valve maintenance program management monitors valve maintenance reports and applicable data to ensure that maintenance scheduling appropriately reflects the areas of the City that experience the highest number of water main breaks, and/or present the highest risk.

Scope & Methodology

- To answer these objectives, we:

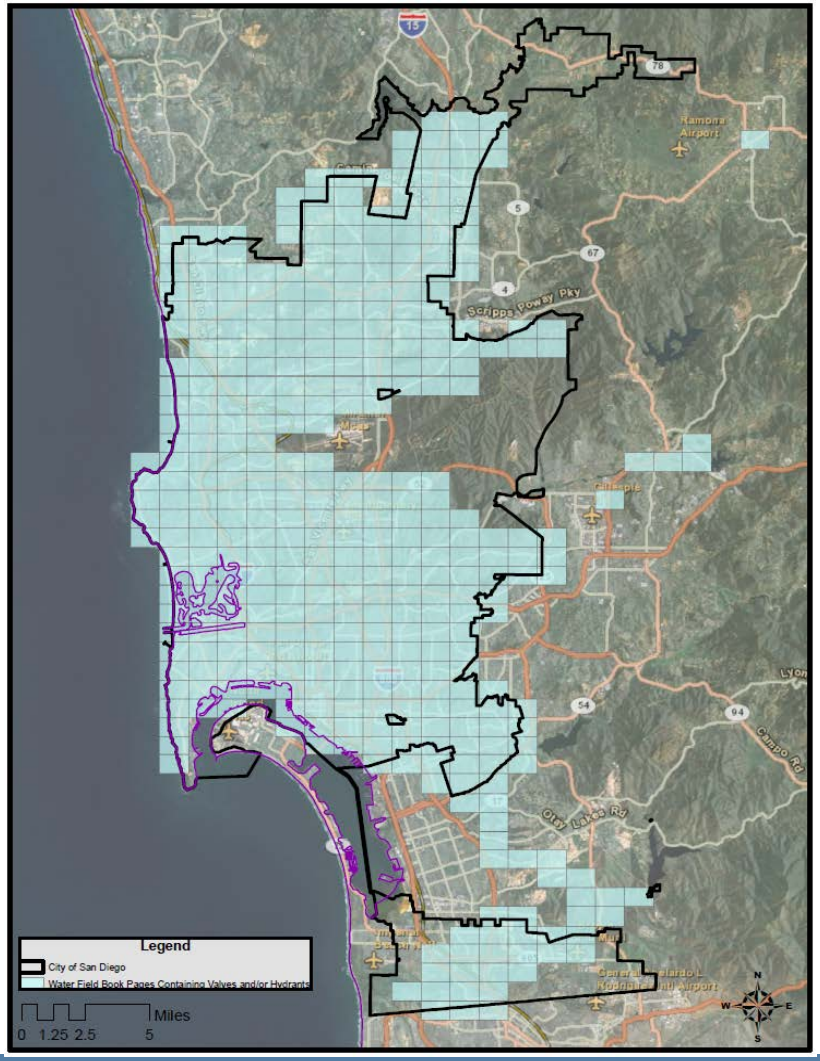
1. Reviewed policies and procedures, industry guidelines and best practices for valve and hydrant maintenance;

2. Interviewed relevant management and staff and conducted ride-alongs with valve maintenance crews;

3. Analyzed valve and hydrant maintenance data and other asset data as well as GIS data for fiscal years 2007-2012.

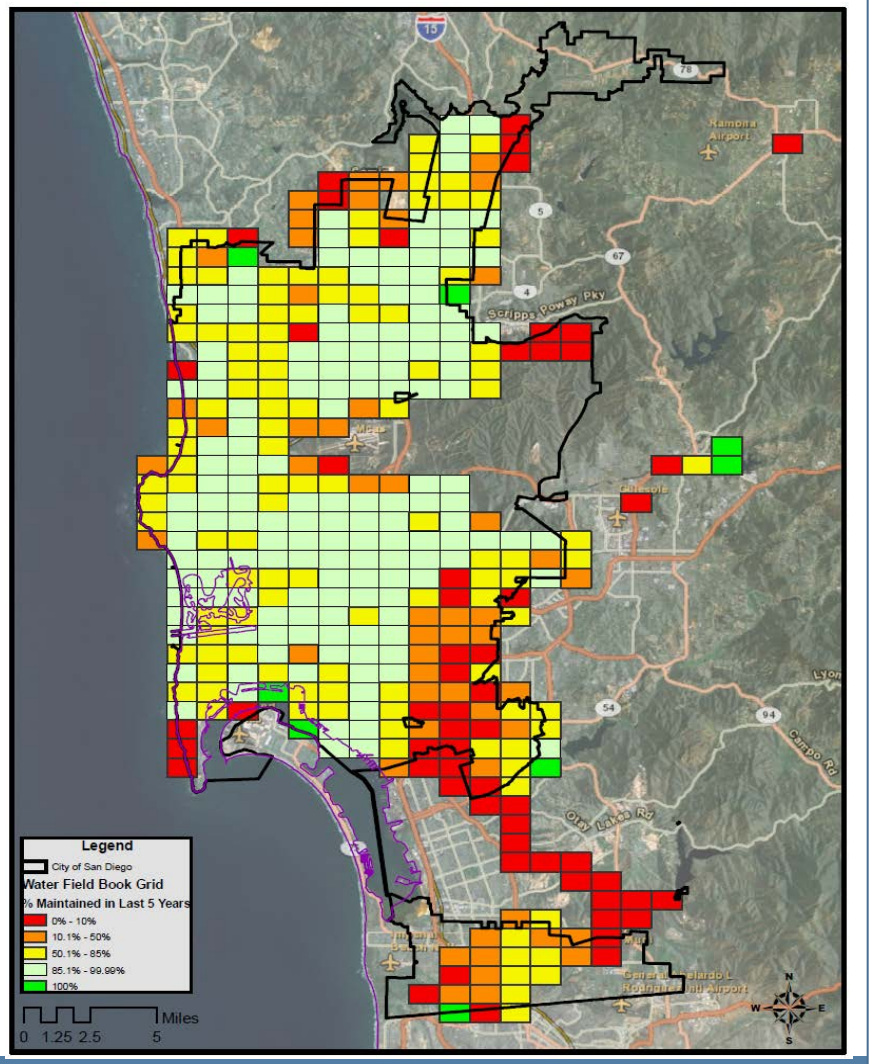
Chapter 1 – Several Opportunities Exist to Improve Valve Maintenance Efficiency and Reduce Risk

- 384 areas contain City-owned water valves and fire hydrants
- Crews should complete maintenance on all valves and hydrants in each area before moving on to the next
- Department has established a five-year maintenance cycle for all valves and hydrants
- Adhering to this cycle would ensure that all valves and hydrants are maintained on schedule



Chapter 1 - Several Opportunities Exist to Improve Valve Maintenance Efficiency and Reduce Risk

- Approximately 21,000 (27 percent) of valves and hydrants went unmaintained in the last five years
- More than 13,000 valves and hydrants were maintained multiple times unnecessarily
- Crews were sent to some areas repeatedly, while valves and hydrants in other areas did not receive maintenance
- Preventive maintenance deficiencies were caused by a lack of oversight and training, as well as inadequate policies and procedures



Chapter 2 - Improved Performance Metrics Would More Accurately Measure Program Performance

- PUD uses the 'Preventive Maintenance Completed' report to track annual progress toward program goals
- The report does not accurately reflect progress made towards the program goal of maintaining all valves and hydrants across the City every five years
- The FY 2011 report states that 15,493 valves and hydrants were maintained; however, only 6,448 of these were actually due for maintenance
- The report does not break down maintenance activity by geographic area

Chapter 3 - PUD Should Develop a Maintenance Prioritization Plan

- PUD currently has the goal of maintaining all valves in the valve maintenance program with the same frequency

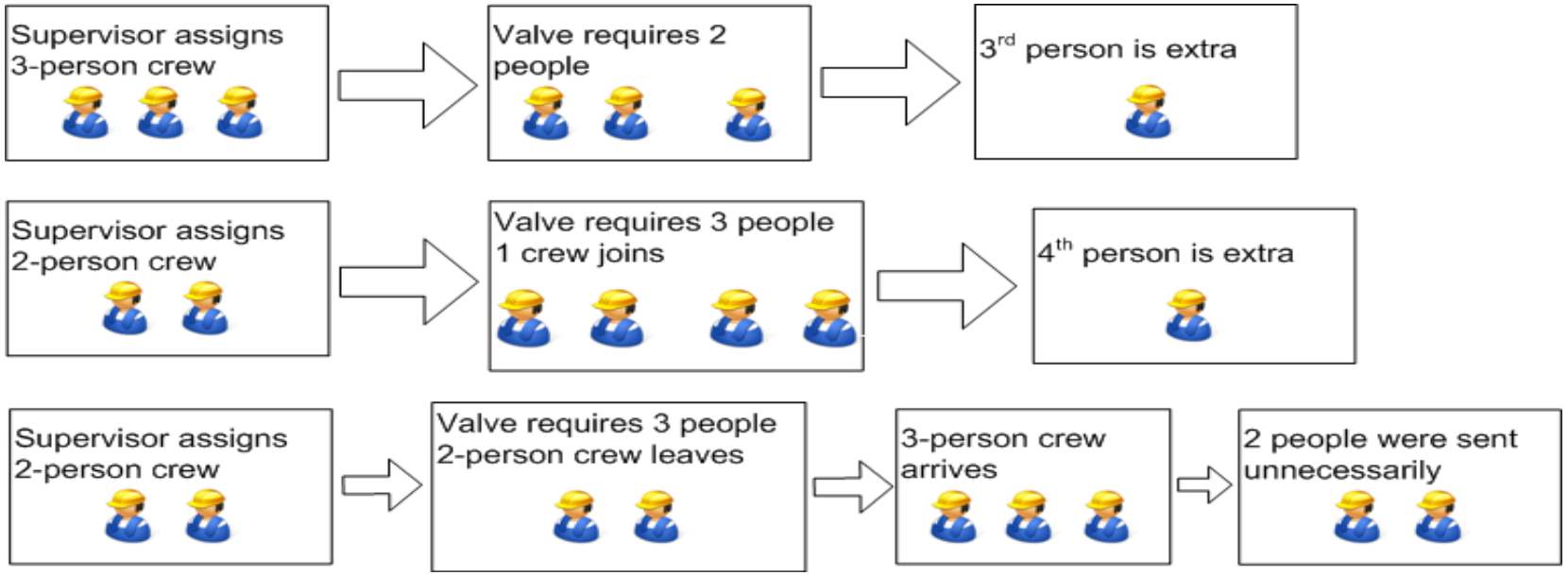
- Industry best practice is moving towards prioritizing some valves and hydrants for more frequent maintenance based on risk

	Priority		
Type	**Low**	**Medium**	**High**
VALVE	Small-diameter valves in a high valve redundancy area	Valves that are oldest, but may not be in a high risk location	Valves where flooding or large water shut-off area would occur if valve fails, or high probability of main failure
HYDRANT	Hydrants that are newer and in a high hydrant redundancy area	Mid-age hydrants with no prior maintenance problems	Hydrants near medical facilities

Chapter 4 - PUD Crews Can Be Deployed for Maintenance More Efficiently

- PUD supervisors do not have the policies and information they need to plan work efficiently

- The current valve maintenance crew structure of three two-person crews and three three-person crews may not be the most efficient use of crew resources



Chapters 5 & 6- The City can do more to prevent valves from being covered by asphalt & it can improve cost recovery for hydrant knock overs through better data collection

Chapter 5

- Valve maintenance crews occasionally encounter valves that are covered by asphalt, which can delay preventive maintenance
- Without an up-to-date copy of the water field book, inspectors and contractors do not have all the information they need to protect gate valve caps

Chapter 6

- PUD does not track specific water loss amounts for each hydrant knock over incident
- Risk Management lacks information to charge for water losses on a case by case basis and instead relies on a flat rate for water loss

Recommendations

We made 12 recommendations to improve program efficiency and productivity. The Department agreed to implement all 12 recommendations.

Contact Information

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Recommendations

1. **Public Utilities Department management should prioritize oversight and training of the valve preventive maintenance scheduler program to ensure that the program is executed effectively. Policies and procedures should be revised to designate responsibility for management-level review of completed work orders on a regular basis to ensure compliance with policy.**

In addition, the Public Utilities Department should revise existing policies and procedures to ensure that:

a) **Appurtenances are not scheduled for unnecessary preventive maintenance;**
b) **All appurtenances requiring preventive maintenance in each grid/area receive it before crews move to another area of the City; and**
c) **Preventive maintenance activities are cycled through all areas of the City.**

Recommendations

2. **The Public Utilities Department should develop performance measurement reports to facilitate effective oversight of and accountability for the valve maintenance program and ensure compliance with the five year maintenance cycle policy. Performance measures to be included in these reports should include:**
   a) **The number of unique valves and hydrants that have received preventive maintenance during the current maintenance cycle.**
   b) **The number and percentage of unique valves and hydrants that have been maintained in each geographic area (for example, each Field Book Page) during the reporting period.**

3. **The Public Utilities Department should develop a procedure to record in the Sewer/Water Infrastructure Management (SWIM) system when crews in the field discover that preventive maintenance could not be performed on an appurtenance. This procedure should ensure that work orders are not recorded as 'complete' in the SWIM system when maintenance work is not actually performed.**

Recommendations

4. The Public Utilities Department should implement a risk-based approach to valve and hydrant maintenance.

5. Upon implementation of a risk-based approach to valve and hydrant maintenance, the Public Utilities Department should work with the City's Information Technology provider to produce reports for each maintenance priority cycle.

6. The Public Utilities Department should conduct a formal study to determine the most efficient organizational structure and deployment of valve and hydrant maintenance crews.

7. The Public Utilities Department should work with the Labor Relations Office to present a formal proposal for the restructuring of valve and hydrant maintenance activities to the affected labor unions should reductions in FTE occur as a result.

Recommendations

8. The Public Utilities Department should develop a procedure for crews to note when they encounter a covered valve, and to use the SWIM database to maintain information on valves found covered so that appropriate action can be taken.

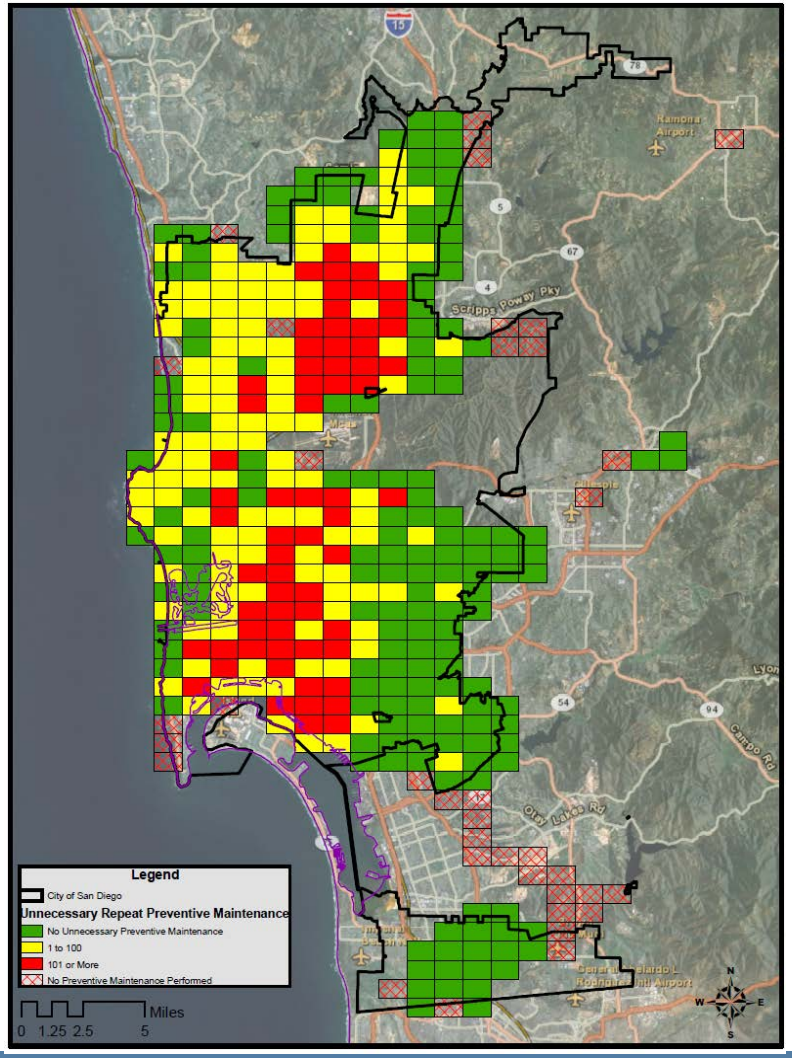
9. To prevent future valves from being covered, the Public Utilities Department should provide an up-to-date copy of the Water Field Book to inspectors and to contractors.

10. The Field Engineering Division of Engineering and Capital Projects should formalize the current guidelines for the inspection of capital improvement projects for asphalt overlay.

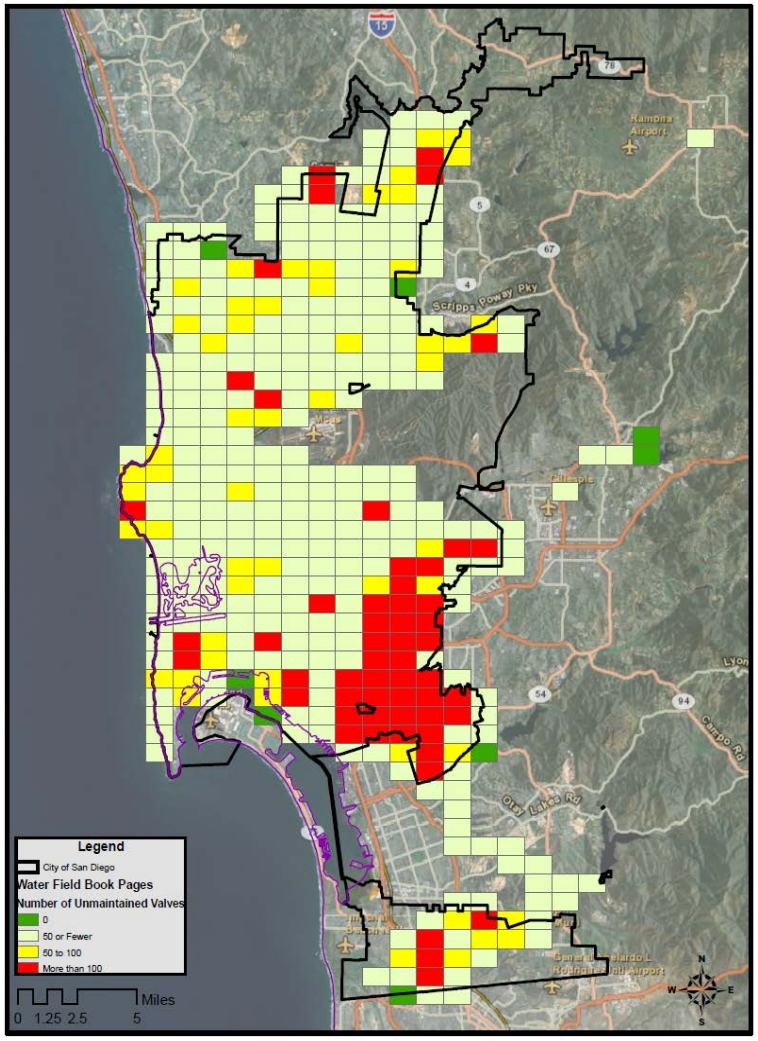
11. The Public Utilities Department should develop a procedure to track water loss time and calculate the amount of water loss from hydrant knock overs on a case by case basis.

12. The Public Utilities Department should work with the Risk Management Department to develop policies and procedures that ensure water loss cost recovery is based on the current cost of water and the actual amount of water lost.

APPENDIX
Unnecessary Preventive Maintenance Work Orders by Area



Unmaintained Valves and Hydrants by Area



Metal Detector Being Used to Locate a Valve (left) & Gate Valve Caps (right)





Hydrant Knock Over Resulting in Water Loss

