Agenda Item #:_____

Staff Report
City of Manhattan Beach

TO: Honorable Mayor Tell and Members of the City Council

THROUGH: Geoff Dolan, City Manager

FROM: Neil C. Miller, Director of Public Works
Dennis Groat, Fire Chief
Dana Greenwood, City Engineer

DATE: November 8, 2006

SUBJECT: Water System Control Conversion Program and Elevated Water Tank Status

---

RECOMMENDATION:
For reasons of water system supply reliability, it is recommended that the elevated water tank be retained as part of the City's water system's control strategy.

FISCAL IMPLICATION:
There will be undetermined fiscal implications depending on direction provided to staff by the City Council.

DISCUSSION:

Background

In April of 1994, the City completed a water and wastewater master plan study. While the master plan was being developed for the water system, it was noted that the pumps at all the City's main stations were old and replacement parts were becoming more and more difficult to obtain. It was also noted that the City had heavy reliance upon natural gas-powered electrical generators for backup power at all their facilities. In the event of a major earthquake, it was felt that the City's system was at risk should the natural gas lines go out of service at the same time as an electrical outage. A decision was therefore made to ultimately go to diesel-powered backup generator sets to provide emergency power.

Recommendations made resulting from the water system master plan included various upgrades to the water distribution system, supply system, and control system. In particular, the report recommended that the pumps at Peck Reservoir be replaced, backup electrical power be provided at all facilities, that the City consider developing new sources (up to three new wells), and finally, to evaluate alternatives for the system's control.

The subsequent Water System Control Feasibility Study was subsequently completed in April 1995. This study confirmed that the above-mentioned items needed to be implemented before conversion to a "closed system" (without the elevated tank) was feasible.

During the system upgrade program, the City's control hardware (Remote Terminal Units otherwise known as RTU's) became outdated and no longer produced or supported by the manufacturer. Replacements for the RTU's were becoming more and more difficult to find. The water and sewer systems' control software also became outdated. The company that had developed the software had been bought out by a larger company and was subsequently abandoned. It had gotten to the point where the only programmer available that was familiar with this proprietary program lived in Flagstaff, Arizona. The City found itself in the position of having to rely on this one individual when programming problems arose. It became obvious that the City also needed to migrate to a non-proprietary control system, not only for hardware but for software.

Water System Capital Improvements

As noted in Attachment A, there have been numerous Capital Improvement projects completed in an effort to bring the water system control strategy to a point where Council would have the opportunity to make a decision whether to keep the elevated tank as part of the control system or have the elevated tank removed. These projects included:

1. Well 11A – Development of a new wellhead and the construction of well facilities at the intersection of Manhattan Beach Boulevard and Green Lane in the City of Redondo Beach. This project also included installation of emergency backup power in an underground vault.

2. Control Conversion Phase 1 – Installed new pumps and variable frequency drives at Peck Reservoir, Larsson Pump Station and Block 35, along with backup emergency power at those three facilities and the City's well site at the intersection of Manhattan Beach Boulevard in the City of Redondo Beach.

3. Control software upgrade – This project provided expanded programming with greater capacity that enabled the new software to communicate with the old control hardware.

4. Block 35 Pumphouse Reconstruction – The old structure was replaced with a new concrete block building. (The existing structure was leaning precariously).

5. Control Conversion Phase II – This project involved removal of the old control hardware (RTU units), and replacing them with Programmable Logic Controllers (PLC's) at Peck Reservoir, Larsson, Block 35, and the system's connection point with MWD. Additional valves necessary to isolate the elevated tank and to improve the operation of the system were added at Peck Reservoir, Block 35, and the MWD turnout.

6. Block 35 Reservoir and Elevated Tank Structural Modifications – this project modified the spillway of the concrete reservoir, strengthened the footings for the elevated tank, and brought both facilities into compliance with current applicable codes.

7. Peck Reservoir Roof Replacement – Structural modifications were made to Peck

Reservoir, including installation of a new roof to improve the reliability of this reservoir.

8. Water System Control Conversion Phase III – This project is currently 80% complete. With the PLC's installed and tested at the primary sites (Block 35, Peck Reservoir and Larsson Pump Station, the conversion to PLC will be completed at the well sites, 2nd Street pump station, Grandview pressure monitoring station, as well as all the sewer lift stations.

System Communication

An important aspect of developing a control system is the communication network that ties all the facilities together. As part of the current contract, the City has switched over from analog telephone lines to digital telephone lines for communication to the outlying facilities. However, the City has experienced problems with Verizon's communication system, even with the upgrade to digital lines. Ultimately, it may be possible to migrate further to fiber optic communication lines once Verizon's system is up and running and fully tested. However, the City will still remain dependent on an outside entity for communication within the system. Radio communication schemes and cell phone technology were evaluated but dismissed as being unreliable given the City's varying topography.

Water System Capital Improvement Status

The City has migrated successfully to non-proprietary control hardware (PLC's). Also, the system has migrated to non-proprietary control software which is viewed as one of the industry's standards and programmers are readily available locally should the City need to modify the control software in the future. Actual testing of the system with the elevated tank isolated will be the next step once all the final programming at the water sites is completed. Staff feels, however, that a discussion of the elevated tank's future can be held at this time.

Elevated Tank

On January 17, 1994, Southern California experienced the Northridge Earthquake. Residents that lived in the vicinity of the elevated tank were concerned with the seismic safety of the elevated tank. In response to the resident's concerns, staff arranged for Pittsburg Tower and Tank, the company that originally constructed the tank in 1949, to inspect the tank. Their inspection indicated that the vessel itself was in good condition, but they did recommend minor modifications to the crisscrossing vertical braces. The minor modifications to the cross braces were done immediately.

Staff also contacted Boyle Engineering Corporation requesting a proposal to evaluate the seismic stability of the elevated tank. A contract with Boyle Engineering was post-authorized by the Council on April 5, 1994. As part of the project team, Boyle Engineering brought on board Geometrix Consultants to do the seismic geotechnical evaluation of the site. Staff also hired a second consultant, Behrens and Associates, to conduct an independent review of Boyle's draft report. The results of the Boyle report were reviewed with Council on August 16, 1994. Ultimately, the report recommended the installation of additional anchor bolts (tie downs) at the base of the elevated tank. With that improvement, the study showed that the elevated tank met or exceeded all pertinent codes.

Since the last study was completed almost 12 years ago, staff contacted Boyle Engineering Corporation this past summer to see if the analysis needed to be updated to be brought in line with any recent developments in either the field of seismic geotechnical engineering or changes in any of the applicable codes. Geometrix Consultants was again brought on board to review their work from 1994, and they indicated that their recommendations in the original report were still current. A different registered structural engineer with Boyle Engineering reviewed the analysis part of the report. He also indicated that the original structural analysis was still valid and that the tank as it stands today meets or exceeds all current applicable codes (see Attachment B).

Recent Experiences

In August 2004, the City's water control system was knocked offline by an electrical surge in Edison's system. Edison had experienced problems at one of their nearby substations. The electrical surge overwhelmed the City's surge protector, knocking out the computer programming at the City Yard. Control of the system was lost. Communication with the system had also been disrupted. Fortunately, one of the plant operators on duty was able to manually turn on the pumps at Peck Reservoir to restore system pressure. As a precautionary note, the City had issued a "boil water" alert, and followed the proper procedures in working with the Health Department to address the emergency.

Having 300,000 gallons stored at elevation (elevated tank) in the system provided sufficient time for the operator to turn on the pumps at Peck Reservoir. Staff feels that if the elevated tank had been removed prior to this incident, the system would most likely have lost pressure to the point where a boil water alert would have been necessary for a longer period of time as the system was flushed and brought back online.

Subsequent steps have been taken to address the problems in the control system that were identified by this incident, i.e. larger surge protectors were installed and a redundant host (computer) was installed at Block 35. This incident did drive home the point, however, that having water stored at elevation provided an additional degree of redundancy in the control system. This feature has served the system well for almost 50 years.

More recently, the County Sanitation District, which relies on very similar hardware and software in the control of their sewer lift station at the base of 27th Street and The Strand, experienced problems with their system. While they have redundancies built into their control system, they still experienced a failure. This incident further illustrated that no matter how many levels of redundancy are designed into the system, since it relies on man-made hardware and software, no system can be considered completely infallible.

Fire Department Concerns

It is imperative that our water distribution system has the capability to provide an adequate supply of water to our City's fire hydrants at all times. Our fire hydrants are part of the same water system that distributes and provides water to the homes and businesses in our City. As the City Engineer has noted, earthquakes, power surges, loss of communication systems, and electronic control malfunctions can shut down our water pumping systems. In these situations, the elevated water tank provides both an emergency reservoir of water and a means of maintaining some level of water pressure, even without the water system pumps.

If the elevated water tank is removed from our City water system, this 300,000 gallon emergency water supply and its almost foolproof ability to provide water pressure will be lost. If we are completely dependent on electric pumps and electronic controls for our water supply and water pressure in our fire hydrants, we could find ourselves in a position where water for firefighting is needed immediately, but not available in the necessary quantity or supply pressure. The Fire Department asks that the Mayor and City Council give careful consideration to the effects that the elimination of this water tower may have on our firefighting water supply.

CONCLUSION:

While the City's water control system has the capability of functioning as a closed system (without the elevated tank) staff feels that the prudent approach would be to keep the additional level of redundancy in the system and retain the elevated tank. It is estimated that the elevated tank still has a useful life of at least 35 to 40 years. The tank would require some routine maintenance, however, painting, possibly recoating the interior of the tank, as well as repairs of the catwalk and the ladder system.

Attachments:
- A. Water System Control Conversion Timeline
- B. Elevated Tank Seismic Assessment
- C. GIS Map of Water Distribution System

Water System Control Conversion Program
and Elevated Water Tank Status

Project Name	Completion	Description
Water and Wastewater Master Plan Study	April 1994	Evaluation of Water and Wastewater Master Plans. Recommended upgrades to water distribution system, water supply system, supply sources, emergency preparedness of water system. Recommended evaluation of system control alternatives.
Elevated Tank Seismic Study	August 1994	Evaluated elevated tank and concrete reservoir at Block 35 for compliance with current seismic codes.
Water System Control Feasibility Study	April 1995	Evaluated closed system vs. open system. Economically either control system was a push. Recommended proceeding with improvements for a closed system.
Well 11A Development	May 1995	Drilling and development of new well at Marine Lane and Manhattan Beach Boulevard.
Well 11A Wellhead Facilities	May 1999	Installation of pumps, control hardware (still utilizing RTU's), emergency generator and pump house.
Block 35 Elevated Tank/ Concrete Reservoir Modifications	June 1996	Installed additional anchor bolts for elevated tank and spillway modifications for adjacent concrete reservoir.
Peck Reservoir Roof Replacement	November 2000	Structural modifications to existing reservoir. Replaced concrete roof with lightweight steel roof.
SCADA Software Upgrade	February 2001	First step in migration of software to non-proprietary system. Contractor installed "black box" programming that allowed non-proprietary Citech software to communicate with old Phoenix Controls software. RTU's were still in use.
Block 35 Pumphouse	April 2001	Construct new pumphouse.
Water System Control Conversion Phase 1	October 2002	Installed variable frequency drives and new pumps and emergency backup generators at Block 35, Peck Reservoir, and Larsson Street pump plant (existing RTU's still being used).
Water System Control Conversion Phase 2	December 2004	Installation of Programmable Logic Controllers (PLC's) at Block 35, Peck Reservoir, Larsson Street pump plant, and MWD turnout. Install additional valves to improve system operation.
Water System Control Conversion Phase 3	In progress	Complete conversion to PLC's at remaining water sites, sewer lift stations, and storm drain pump stations.

Attachment A

BOYLE

1501 Quail Street
Newport Beach, CA 92660-2726
TEL: (949)476-3300
FAX: (949)721-7141
www.boyleengineering.com

Dana Greenwood
CITY OF MANHATTAN BEACH
1400 Highland Avenue
Manhattan Beach, CA 90206

August 14, 2006
14226.10

Seismic Assessment – Elevated Steel Tank

In accordance with our contract dated June 1, 2006, we have conducted a seismic assessment of the City's elevated steel tank located between 6th and 8th Streets east of Power Avenue. Boyle previously assessed the tank and submitted a report to the City dated July 8, 1994. The initial phase of this project involved updating the geotechnical information relative to the seismic ground motions and response spectrum for the tank site. Our geotechnical consultant, Geomatrix, has reviewed the current seismic data relative to the project site and recommends (see attached) that the same ground motions and response spectrum be used for the reassessment that were used for the 1994 assessment. The current edition and previous editions of the Uniform Building Code explicitly permit structural analysis of the tank using a site-specific response spectrum in lieu of static force procedures. That being the case, the findings and recommendations contained in the 1994 assessment are still valid and no further assessment work is required.

Please call me at (949) 476-3562, if you have any questions or wish to discuss this project.

Boyle Engineering Corporation

Albert H. Grathwol, SE
Project Manager

Enclosure

gjd/X:\B99\197\Projects\Manhattan Beach\14226.10\Letter to Dana Greenwood.doc

REGISTERED PROFESSIONAL ENGINEER
A. H. GRATHWOL
No. S002784
Exp. 9/30/07
STRUCTURAL
STATE OF CALIFORNIA
8-14-06

Geomatrix

August 7, 2006
Project 2661.001.0

Mr. Al Grathwol
Boyle Engineering Corporation
1501 Quail Street
Newport Beach, CA 92658

Subject: Report Update: Seismic Geotechnical Evaluation
Manhattan Beach Reservoirs
Manhattan Beach, California

Dear Mr. Grathwol:

This letter report presents an update for a previous seismic geotechnical evaluation of the Manhattan Beach Reservoirs in Manhattan Beach, California. This update was performed by Geomatrix Consultants, Inc., (Geomatrix), in accordance with a Boyle Engineering Corporation Task Order for Project Number 14226.10, dated June 13, 2006. The previous report was titled "Seismic Geotechnical Evaluation of Manhattan Beach Reservoirs" and dated June 28, 1994. The current update pertains to the elevated steel tank.

Geomatrix has reviewed the data, evaluations, and conclusions presented in the previous report and supplemented the previous evaluations with additional analyses. In particular, the seismic ground motions have been evaluated for application to the elevated steel tank. Based on our review and analyses, we recommend that the ground motions and response spectra presented in the previous report be used for the current evaluations. Additionally, other parameters provided in the report that are applicable to the elevated steel tank (e.g., parameters associated with evaluation of uplift resistance) also may be used in the current evaluations.

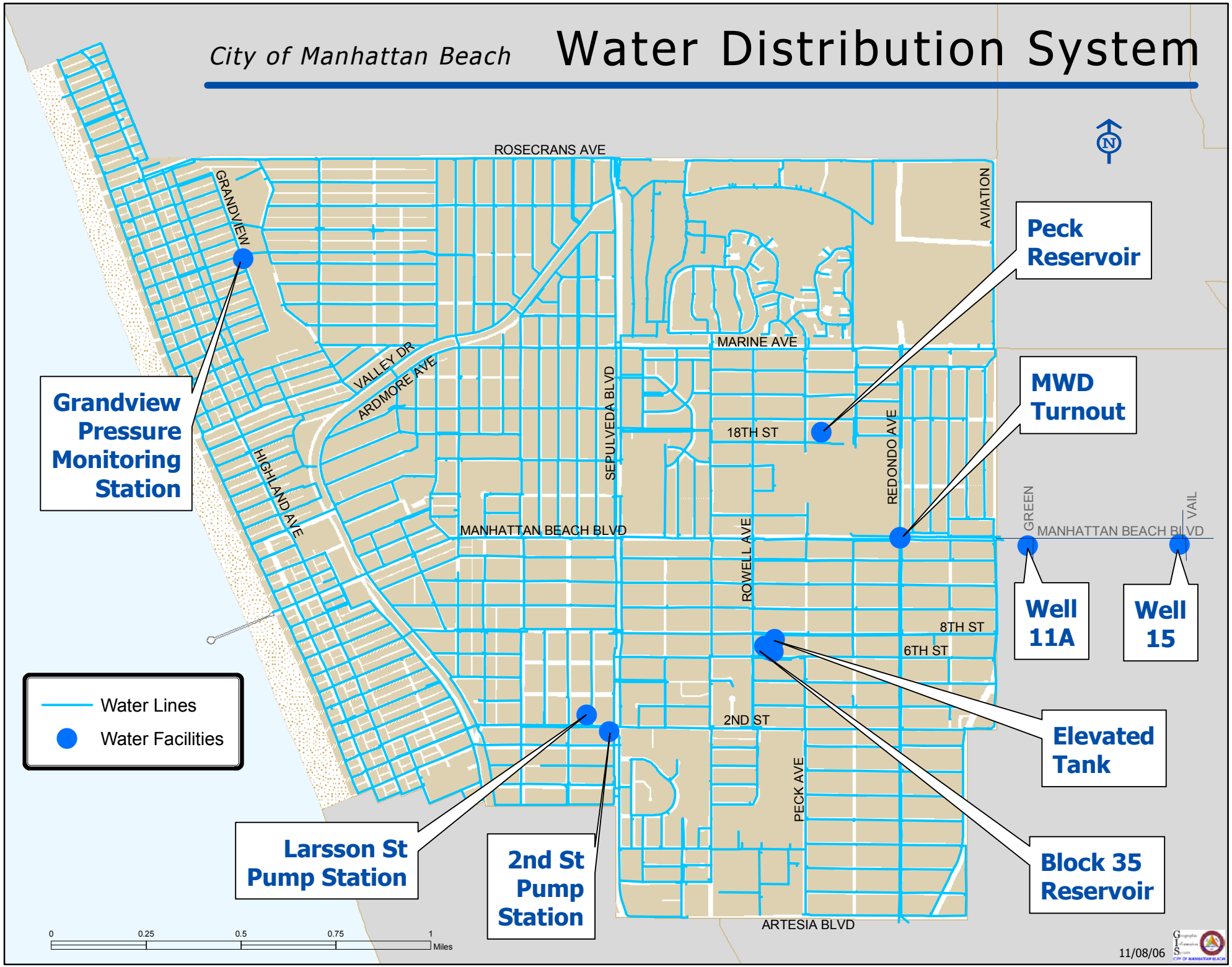
If you have any questions regarding these findings or if we can be of further assistance, please call us at (949)642-0245.

Sincerely yours,
GEOMATRIX CONSULTANTS, INC.

James J. Weaver, GE #884
Vice President and
Principal Geotechnical Engineer

P:\2661.001.0\Docs\UpdateLetter.doc

510 Superior Avenue, Suite 200
Newport Beach, California 92663-3627
Tel 949.642.0245
Fax 949.642.4474
www.geomatrix.com


City of Manhattan Beach
Water Distribution System
ROSECRANS AVE
GRANDVIEW
AVIATION
Peck Reservoir
MARINE AVE
MWD Turnout
Grandview Pressure Monitoring Station
VALLEY DR
ARDMORE AVE
SEPULVEDA BLVD
18TH ST
REDONDO AVE
HIGHLAND AVE
GREEN
VAIL
MANHATTAN BEACH BLVD
MANHATTAN BEACH BLVD
ROWELL AVE
Well 11A
Well 15
8TH ST
6TH ST
Water Lines
Water Facilities
2ND ST
Elevated Tank
PECK AVE
Larsson St Pump Station
2nd St Pump Station
Block 35 Reservoir
ARTESIA BLVD
0
0.25
0.5
0.75
1
Miles
11/08/06