Agenda Item #:_____

Staff Report
City of Manhattan Beach

TO: Honorable Mayor Montgomery and Members of the City Council

THROUGH: Geoff Dolan, City Manager

FROM: Jim Arndt, Director of Public Works
Dana Greenwood, City Engineer
Michael A. Guerrero, Principal Civil Engineer

DATE: August 5, 2008

SUBJECT: Award of Professional Services Contract to AKM Consulting Engineers in the net amount of $1,277,340.00 for the Utility Master Plan Study

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RECOMMENDATION:
Staff recommends that the City Council pass a motion to approve the award of a professional services contract to AKM Consulting Engineers in the net amount of $1,277,340.00 for the Utility (Sewer/Water) Master Plan Study.

FISCAL IMPLICATION:

FUNDING	
Sewer Fund	**$1,000,000.00**
Water Fund	**$ 500,000.00**
TOTAL FUNDING	**$1,500,000.00**
CONTRACT	
Sewer – Pipe/Manhole Video	**$ 423,400.00**
Sewer – Master Plan	**$ 530,290.00**
Water – Master Plan	**$ 323,650.00**
TOTAL CONTRACT	**$1,277,340.00**

DISCUSSION:
Wastewater Master Plan
The wastewater collection system in the City of Manhattan Beach consists of 92 miles of City and County pipelines. The City's portion of the collection system is comprised of approximately 86 miles of wastewater pipeline ranging in size from 6 to 21 inches in diameter, with most lines

being 8 inches in diameter. Pipeline materials are predominantly vitrified clay pipe (VCP) with the exception of some ceramic-lined concrete pipe in the older part of the system located in the Sand Section (beach area) of the City.

The City's wastewater collection system was constructed between the years 1925 and 2006, with almost 80% of the system being constructed prior to the year 1954. The collection system has appeared to serve the City adequately; however, due to the lack of a complete video inspection program and age of the system, the long term reliability may be questionable.

The City also owns, operates, and maintains seven pump stations: six larger pump stations located at various locations throughout the system and one smaller pump station which is required to pump the flows generated at City Hall. Although the City's pump station structures are old, the structures appear to be in satisfactory condition. The pumps and motors at the six primary facilities were replaced in the late 1990's, but the wet well capacities were not evaluated.

The City's last wastewater system master plan was completed in 1994. The focus of the 1994 master planning effort was to evaluate the capability of the City's existing wastewater collection and pumping system to provide service through a planning period that extended to the year 2010. The primary by-product of the current master planning effort will be the projection and identification of the City's wastewater facility requirements and development of a prioritized Capital Improvement Program. The current planning effort will extend the planning period to the year 2030.

The City's current master planning effort is being conducted to comply with the mandates established by the State Water Regional Control Board (SWRCB) Order No. 2006.003. Furthermore, the City realizes that there is a need to plan and develop a prioritized Capital Improvement Program to ensure reliable and uninterrupted wastewater service. The major elements of the general scope of work (see Attachment A) for this study includes:

General Scope:

- System-wide Data Collection and Review
- Sewer Main Cleaning and Inspection (50 pipeline miles of Closed Circuit Television (CCTV) Inspection)
- Engineering Evaluation of Collector System – Structural and Hydraulic
- Develop measurable performance indicators (pumping and collection system) to manage assets at lowest life cycle costs
- Update Geographic Information System (GIS) Database
- Pumping System Analysis (including wet well capacity and appropriate levels of redundancy/emergency overflow capacity)
- Cost Estimates – Collection and Pumping System Improvements
- Develop Rating System and Capital Improvement Program
- Prepare Wastewater Master Plan Document

Water Master Plan

The water distribution system in the City of Manhattan Beach consists of four pump stations, two storage reservoirs, one elevated storage tank, two water supply groundwater wells, and

approximately 112 miles of distribution pipeline.

The City currently has three available water supply sources:

- Metropolitan Water District (MWD) treated service water provided to the City by the West Basin Municipal Water District (WBMWD)
- Groundwater provided by a City-owned and operated well located within the City of Redondo Beach at the intersection of Manhattan Beach Boulevard at Green Lane (Well No. 11A)
- Groundwater is also provided by a second City-owned and operated well located in the City of Redondo Beach at the intersection of Manhattan Beach Boulevard and Vail Avenue (Well No. 15)

The City can obtain up to 8.1 million gallons per day (MGD) of water from MWD through the 45-inch diameter West Basin feeder pipeline along Manhattan Beach Boulevard. MWD guarantees delivery of water at 15 cubic feet per second and at a minimum pressure of 83.5 pounds per square inch at the outlet of their meter.

The City obtains its groundwater from the West Coast Basin, a major groundwater basin which underlies the area. The City has an adjudicated right to extract up to 1,131 acre feet per year of groundwater from the basin. The current pumping capacity of Well No. 15 is about 800-900 gallons per minute (GPM). The current pumping capacity of Well No. 11A is about 2,300 GPM.

The water quality of both MWD water and the groundwater is generally good and requires blending and chlorination prior to distribution. The City has recently installed a new transmission pipeline connecting its Peck Reservoir with the well sites to increase chlorination contact time and mitigate water taste complaints from some of the City's water customers.

The City has typically obtained approximately 85% of its water supply from MWD and the remaining water supply from its two groundwater wells. These three water supply sources have been and continue to be adequate to meet the total water demands of the City.

As an additional note, reclaimed water from WBMWD is also used in the City as an additional supply source for irrigation of many parks, schools, and other landscaped areas.

Water from MWD is conveyed from the MWD inter-tie to both Block 35 and Peck Reservoir, where it is chlorinated, stored, and then distributed to the system. The City's water system is generally controlled by the water surface elevation at the 300,000 gallon elevated water tank at Block 35, which overflows to an adjacent 2 million gallon reservoir. Water pressure can also be controlled utilizing the pumps with variable speed drives at both Block 35 and Peck Reservoir. Groundwater from the City's two well sites is also conveyed to both Block 35 and Peck Reservoir, where it is blended with MWD water, chlorinated, and then distributed to the system. Pumps at the Block 35 pumping plant have a combined maximum capacity of 6,700 GPM. The Peck Avenue pumping plant and adjacent 7.5 million gallon reservoir are fed either directly from the groundwater wells or from the distribution system, and generally provide water to the system during the day to meet peak demands. The four pumps at the Peck Avenue pumping plant have a combined maximum pumping capacity of 5,000 GPM.

The Larsson Street pump station and the Second Street pump station serve the higher elevation hill area pressure zone by boosting the water from the main distribution system. The Larsson Street pump plant and the Second Street pump plant have pumping capacities of 920 GPM and 2,000 GPM, respectively.

The City's water supply facilities are efficiently monitored by the City's Supervisory Control and Data Acquisition (SCADA) system, which allows for remote monitoring and operation of all water supply facilities.

The City's last water system master plan was completed in 1994. The City's current master planning effort is being conducted to plan and develop a prioritized Capital Improvement Program to ensure a reliable and uninterrupted water supply system. The major elements of the general scope of work (see Attachment A) for this study includes:

General Scope:

- System-wide Data Collection and Review
- Fire Hydrant Flow Testing
- Water System Modeling and Evaluation
- Engineering Evaluation of Water System (including adequacy of storage capacity)
- Operational Evaluation of Water System
- Update GIS Database
- Cost Estimates – Supply and Pumping System Improvements
- Develop Rating System and Capital Improvement Program
- Prepare Water Master Plan Document

Consultant Selection

A Request for Proposal (RFP) was provided to consultants that had extensive experience with the preparation of utility master plans. Five (5) consultants submitted proposals to the City. A selection committee comprised of sewer operations, water operations, GIS, and engineering staff within the Public Works Department reviewed the proposals. Subsequent to the proposal review the selection committee held interviews with the top four (4) consultant candidates. The proposals and interviews were evaluated based on the strength of the proposed project team with respect to the firm's experience with projects of this nature, a check of references provided, the understanding of key issues involved, the anticipated level of effort for the different tasks, and the overall project schedule. Staff is recommending awarding the contract to AKM Consulting Engineers for the following reasons:

1) Excellent experience on similar projects
2) Identification and understanding of key project issues
3) Appropriate level of staffing for the size and complexity of the project
4) Scope of work was thoroughly outlined with a good understanding of the level of effort required to complete the project in a timely manner
5) Overall schedule of 10 months for the project was appropriate (see Attachment B)

As outlined in the Fiscal Implication section of this report, staff is recommending awarding the contract to AKM Consulting Engineers in the net amount of $1,277,340.00. Each consultant included a fee proposal submitted under a separate sealed envelope which included an hourly

breakdown for each task of the subject project. The fee proposal was not used, however, in the selection process since State Law (Section 4526 of the Government Code) requires that professional services be selected on the basis of the quality of the proposal.

Attachments: Attachment A – Scope of Work
Attachment B – Project Schedule

xc: Henry Mitzner, Controller

EXHIBIT A
SCOPE OF WORK

WASTEWATER MASTER PLAN

1. PROJECT UNDERSTANDING

1.1 BACKGROUND

The City of Manhattan Beach (City) is located approximately 22 miles southwest of downtown Los Angeles at the base of the San Gabriel Mountains. Bordering cities include El Segundo to the north, Hawthorne to the east, and Redondo Beach to the east and south. On the west, the City is bordered by about 2 miles of beach frontage. The City provides wastewater service to a current population of approximately 33,800.

The service area encompasses 3.9 square miles within the City's corporate boundaries. The collection system consists of approximately 86 miles of gravity sewer pipelines ranging in diameter from 6-inches to 21-inches. The majority of the gravity sewers are vitrified clay pipe constructed prior to 1954. There are approximately 12,000 sewer service connections. The City also owns and operates 7 sewage pump stations and their associated force mains. The service area is crossed by 6 miles of Los Angeles County Sanitation District (LACSD) trunk sewers. The City's effluent is eventually treated at LACSD's Joint Water Pollution Control Plant in the City of Carson.

1.2 PREVIOUS STUDIES

The City's existing Wastewater Master Plan was prepared in 1994. It analyzed the wastewater collection and pumping system to provide service through a planning period that extended to the year 2010. The City's year 1990 population was over approximately 32,023.

In 2007, the City conducted closed circuit video inspection of 10.22 miles of its sewers. These inspections will be utilized in this Master Plan Study as a part of the condition assessment.

1.3 PURPOSE

The City of Manhattan Beach desires to prepare a wastewater master plan, which will:

- Develop proper service criteria and maintenance procedures
- Develop an up to date inventory of the assets
- Evaluate the hydraulic capacity of its system and the ability of the system to handle the ultimate peak wet weather flows from the service area
- Evaluate the condition of its pump stations, as well as representative portions of the collection system
- Produce a master plan document that will guide the operation and maintenance of the existing system

- Ascertain compliance with existing standards and regulations such as State Water Resources Control Board's Order No. 2006.003 and GASB 34, and prepare for upcoming ones, such as Capacity Management Operation and Maintenance (CMOM).
- Develop a prioritized Capital Improvement Program to ensure reliable and uninterrupted wastewater service
- Provide proper service at a reasonable cost

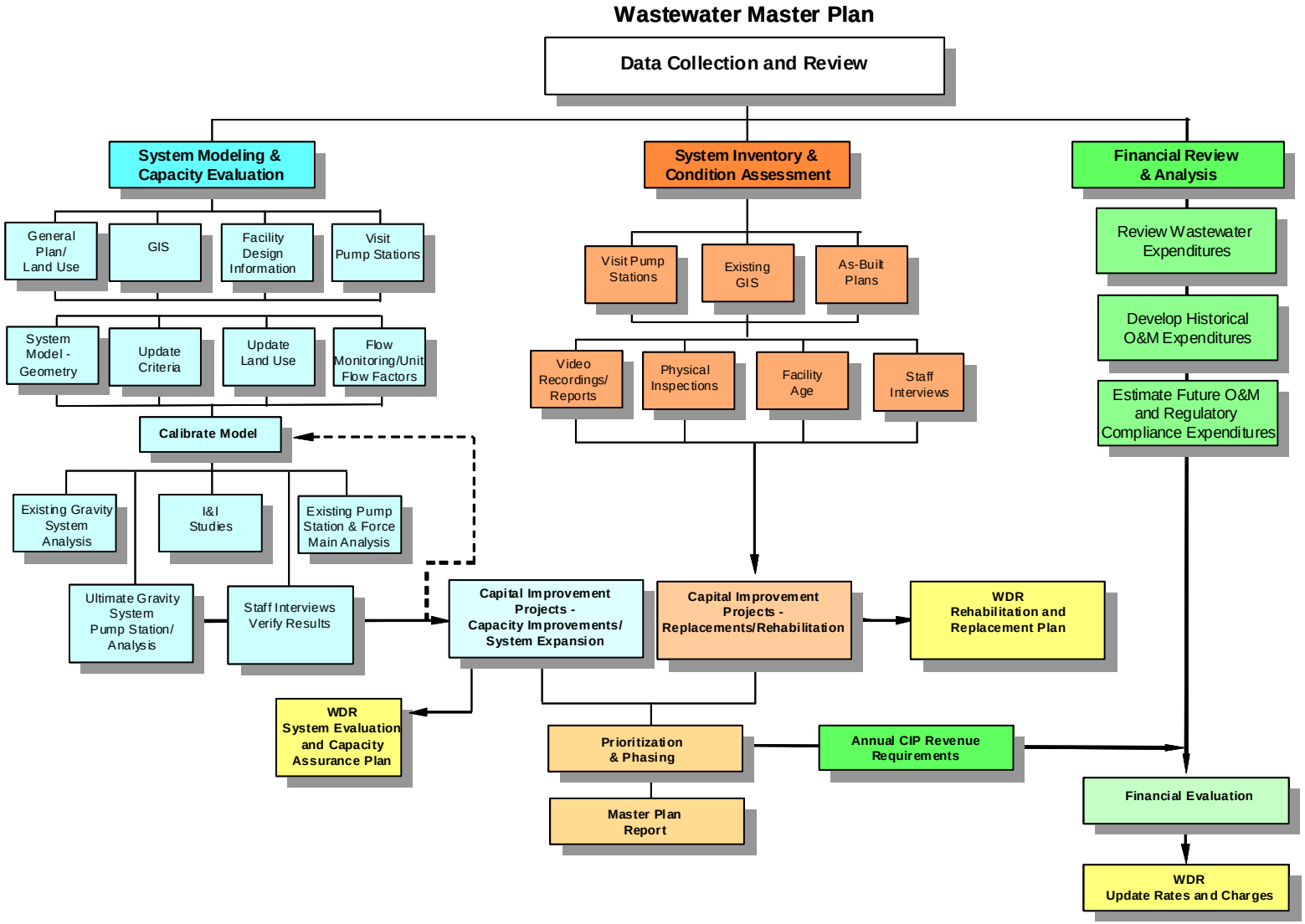
2. PROJECT APPROACH AND DETAILED SCOPE OF WORK

The scope of work for a comprehensive wastewater master plan varies greatly depending on the purpose of the study and specific conditions of the study area. The flow chart illustrated on Page 3-3 summarizes the key elements of a sewer master plan study.

2.1 DATA COLLECTION AND REVIEW

AKM Consulting Engineers will research and review all of the documents listed in the City's RFP as well as a few additional items, if available. These include the:

- General Plan, zoning element and map, land use element and map, specific plans, redevelopment plans, and regional planning documents
- Previous Wastewater Master Plan (1994)
- Existing sewer atlas maps
- Existing sewer as-built drawings (scanned copies – approximately 95% of system)
- Topographic and hydrology maps
- Regional facility drawings
- Correspondence and records
- Sanitary system code requirements
- Digital copies of aerial photography (4" ground pixel size – 1^{H} = 100' resolution)
- 2' ground contour elevation data
- GIS data (sewers, parcels, land use, zoning, streets, storm drains)
- Existing hydraulic data for sewer system
- Drainage Master Plan and local / regional drainage reports
- Previous Water Master Plan (1994)
- Regional facility plans, as needed
- Maintenance records of the sewer facilities
- Completed Closed Circuit Television (CCTV) written reports and videos, as needed
- Pump station data, including SCADA data, as-built construction plans, maintenance records, and pump specifications


Wastewater Master Plan
Data Collection and Review
System Modeling & Capacity Evaluation
System Inventory & Condition Assessment
Financial Review & Analysis
General Plan/ Land Use
GIS
Facility Design Information
Visit Pump Stations
Visit Pump Stations
Existing GIS
As-Built Plans
Review Wastewater Expenditures
System Model - Geometry
Update Criteria
Update Land Use
Flow Monitoring/Unit Flow Factors
Video Recordings/ Reports
Physical Inspections
Facility Age
Staff Interviews
Develop Historical O&M Expenditures
Estimate Future O&M and Regulatory Compliance Expenditures
Calibrate Model
Existing Gravity System Analysis
I&I Studies
Existing Pump Station & Force Main Analysis
Ultimate Gravity System Pump Station/ Analysis
Staff Interviews Verify Results
Capital Improvement Projects - Capacity Improvements/ System Expansion
Capital Improvement Projects - Replacements/Rehabilitation
WDR Rehabilitation and Replacement Plan
WDR System Evaluation and Capacity Assurance Plan
Prioritization & Phasing
Annual CIP Revenue Requirements
Financial Evaluation
Master Plan Report
WDR Update Rates and Charges

- Water meter records for representative land uses, as well as the City's service area to assess reasonableness of the unit wastewater flow factors
- Information on high water users to aid in selecting flow monitoring locations
- Residential, commercial, industrial, and office land use vacancy rates
- Geotechnical reports, boring logs, water well static and pumping levels, and monitoring well records available at the City and the County to determine the relative location of the wastewater system with respect to perched or other groundwater
- Past flow monitoring records within the service area, as well as in the contributing communities

We will review, reduce and catalogue this information for subsequent use in the study.

2.2 DEVELOPMENT PATTERNS

Existing system loads will be based upon the current general plan land uses and flow monitoring conducted during this study (see Section 2.5 for further discussion on flow monitoring and the development of unit flow factors). Future system loads through 2030 will be based upon existing zoning information and the assumption of full build-out and infill intensification.

2.3 SEWER USE ORDINANCES

We have reviewed the City's existing sewer use ordinance, contained in **Title 5 Sanitation and Health Chapter 5.36 Sewers, Sewage Disposal-City Sewage System** of the Municipal Code.

Legal Authority is Element (iii) of the Sewer System Management Plan. It states:

Each Enrollee must demonstrate, through sewer system use ordinances, service agreements, or other legally binding procedures, that it possesses the necessary legal authority to:

(a) Prevent illicit discharges into its sanitary sewer system (examples may include I/I, stormwater, chemical dumping, unauthorized debris and cut roots, etc.);

(b) Require that sewers and connections be properly designed and constructed;

(c) Ensure access for maintenance, inspection, or repairs for portions of the lateral owned or maintained by the Public Agency;

(d) Limit the discharge of fats, oils, and grease and other debris that may cause blockages, and

(e) Enforce any violation of its sewer ordinances.

The existing Municipal Code covers most of these requirements adequately. We suggest additions to the Municipal Code for complete compliance with the WDR. Additionally, we will suggest procedures for establishment of violation noticing, fines, and their enforcement. We will also suggest that Standard Plan ST-05 be updated, and the Municipal Code references all current standards. We will prepare draft ordinances, review them with the staff and the City Attorney, and assist in their approval as required, and their incorporation into the Municipal Code.

Under this task, we will also assist in the preparation of the FOG program. The primary sources of FOG into the collection systems that cause plugging are food service establishments (FSEs) and large multi-family residential developments. The FOG program will include prohibitions for discharging FOG into the collection system; requirements for grease interceptors at the new FSEs; interceptor maintenance requirements; and a map of the system with FSEs and large multi-family residential unit locations, if this information can be provided by the City. The map will also include the data from CCTV inspections to characterize the portions of the system with existing grease problems, and any past overflow locations due to grease, and grease related hot spots.

Another important element of a FOG program is a public education and outreach program. We will review the City's existing efforts in this area and suggest any others. These may include posters for FSEs and apartment complexes showing proper disposal of FOG; school programs to educate the youth in the importance of keeping FOG out of sewers, bill stuffers, and other media activities.

City's FOG Program will be presented in a separate report.

2.4 SEWER MAIN CLEANING AND INSPECTION

2.4.1 Gravity Sewers

The purpose of the inspections is to provide a permanent record of the existing condition of the City's gravity sewer system, and to develop the City's Sewer System Rehabilitation and Replacement Plan, which is a part of the Operation and Maintenance Program.

As a sub-consultant to AKM, Empire Pipe Cleaning and Equipment, Inc. will furnish all equipment, materials, traffic control, and labor required to thoroughly clean and inspect 50 miles of gravity sewers (6-inch to 21-inch diameter sewers) through closed circuit television (CCTV). Cleaning and CCTV inspection work shall be performed in accordance with Exhibit A and Exhibit B of the RFP. We will select the locations to be inspected so that, including the 10.22 miles inspected during the past year, it will provide a representative sampling of the entire system. This will allow us to extrapolate the results to the remainder of the system and prepare the Rehabilitation and Replacement Plan by the due date of May 2, 2009.

If acceptable to the City, we propose to conduct all inspections in accordance with the National Association of Sewer System Companies (NASSCO) Pipeline Assessment and Condition Program (PACP) standards. In recent years, the PACP standards have become nationally recognized as the industry standard for evaluating the condition of sewer systems. Upon City approval, all defects will be reported per the NASSCO PACP standards and as specified in the Request for Proposal. Conditions and defects will be located by footage and clock reference and will be described using the PACP defect classification.

At the conclusion of the CCTV inspection, all original written logs and all original recording media, one duplicate set copy, and one hard drive containing the entire inspection will become the property of the City of Manhattan Beach. The written reports and recording media will meet all reporting requirements as specified in the Request for Proposal.

All inspections will include the upstream and downstream manhole identification numbers and pipe numbers per the City's updated sewer GIS. This will ensure compatibility with the City's Sewer GIS as well as the Wastewater Master Plan report.

2.4.2 Sewer Manholes

The City would like to have the sewer manholes inspected in conjunction with the gravity sewer pipes. Manholes along the same 50 miles of gravity sewers inspected as a part of Task 2.4.1 will be inspected

A detailed manhole inspection will be conducted by an independent crew. Pole cameras and software will capture high quality images of each of the manholes. Features such as frame, lid, chimney, and wall will be documented and measured. Manhole inspection data will be recorded separately for each manhole.

2.5 ENGINEERING EVALUATION

2.5.1 System-wide Hydraulic Modeling and Analysis

We will utilize the updated wastewater system database and GIS as the basis of the hydraulic model. The computer model shall include all City sewer pipes (excluding laterals and private lines), manholes, pump stations, force mains, large point source flows and tributary area boundaries. Because the Operation and Maintenance Program requires an "*up-to-date map of the sanitary sewer system, showing **all gravity line segments** and manholes, pumping facilities, pressure pipes and valves, and applicable stormwater conveyance facilities:"*, the model will include all the pipes. We will delineate the tributary area to each manhole from the service lateral information in the sewer GIS. The tributary area, along with unit flow factors or point sources for high sewage generators will be used to calculate the average flow tributary to each manhole.

We will select the flow monitoring locations following determination of sub-tributary areas and initial staff interviews. We propose to perform sufficient flow monitoring to develop unit flow factors for Low Density and Medium Density land uses. We will delineate the tributary areas for key manholes, by land use category and monitor the flows at these locations. The wastewater generation rates for other land uses (high density residential, commercial, industrial, schools) will be primarily developed from water use records, as well as the flow monitoring results at the calibration locations. We currently expect to monitor 10 locations for a period of two weeks (dry weather conditions). Calibration locations will cover larger tributary sewersheds with multiple land uses. An exact determination of monitoring locations cannot be made without a field review of each individual site. A site selected in the office may not be ideal for monitoring due to unfavorable hydraulic conditions, traffic hazards, manhole access restraints, and unexpected low flows in the pipe, and low flow depth.

We will analyze existing and anticipated land uses within the City, in accordance with the General Plan and develop unit flow factors accordingly for existing and ultimate development conditions. Ultimate unit flow factors will include allowances for existing vacancies. The unit flow factors developed will be utilized along with corresponding areas to estimate the average dry weather flows. Peaking relationships will be developed from flow monitoring and based upon our experience. They will be proposed as part of the criteria that will be

utilized for determining the peak dry and wet weather flows. The flow monitoring results will be utilized in calibrating the model.

The model will be used to analyze and evaluate the capacity of the existing system and with system improvements under existing and projected flow conditions. A total of three final model conditions will be run as follows:

1. Existing system with current flow conditions showing deficiencies and proving areas of adequacy
2. Existing system with projected ultimate flow conditions (buildout) showing deficiencies and proving areas of adequacy
3. Fully improved system with ultimate flow conditions (buidout)

Full data conditions, results, and maps of each of the three main model runs will be included in the final report.

Following a thorough quality control, we will review the analysis results with the City's operations and maintenance personnel for comparison with field observations. If inconsistencies are found, the reasons will be determined and addressed. These may be due to the tributary area not having been developed to the General Plan allowed densities, larger than usual vacancies, etc. If necessary, we will request additional flow monitoring to verify the existing capacity deficiencies. The analyses will be refined, and hydraulic capacity deficiencies will be determined. We will then formulate mitigation projects for each deficiency, and develop cost estimates for their implementation.

In addition to development of unit flow factors and peaking formulas, criteria with respect to velocity, depth to diameter ratios, pipeline sizing, allowances for inflow and infiltration, general useful life spans, and maintenance and operations guidelines will be developed in cooperation with the City. This task, along with Pumping System Analysis, will complete the City's System Evaluation and Capacity Assurance Plan.

2.5.2 Structural Rehabilitation Analysis

We will prepare a database summarizing the findings of CCTV reports and recordings. At a minimum, the database will include the following:

- DVD Number
- Inspection Number
- Inspection Location
- Inspection Date
- Manhole Identification Numbers
- Pipe Identification Numbers
- Direction of Camera during Inspection

- Size of Pipe
- Material of Pipe
- Length of Pipe
- Number of Occurrences of Each Structural and Operation and Maintenance Deficiency

The CCTV recordings will be prioritized per the database summary. Although each reach is given a condition grade per the PACP standards, we will also base our prioritization on the type and number of defects identified in each recording. The pipes that are believed to be at higher risk of collapse and blockages, and therefore have a greater potential for causing a sanitary sewer overflow will be given the highest priority. For example, a pipe with a severe structural defect such as broken pipe, a hole in the pipe, or a large joint offset might be given a higher priority than a pipe with many other less severe defects such as cracks or fractures.

Operation and maintenance (O&M) defects such as grease, roots, and deposits will be considered separately. Often times, these defects will require additional cleaning or root cutting, but will not necessarily need replacement. Additional hotspots will be identified for the City's review.

Based on the prioritized database, we will select representative reaches of the system to review the CCTV recordings in detail to ensure compliance with CCTV standards and procedures and further prioritize the sewers for replacement and/or repair. We do not anticipate that all the CCTV recordings (estimated to be 1200 reaches) will have to be reviewed in detail. Based on our experience, we expect to review up to 50 percent of the pipe reaches inspected (600 reaches). This amount may increase or decrease following review of the CCTV reports. We will verify the completeness of the inspection reports, and update the inspection database. The work effort and its corresponding cost will be adjusted to reflect the actual number of reaches reviewed in detail.

We will develop a rating system to identify and prioritize the condition deficiencies, therefore identifying the critical sewer mains in need of replacement, rehabilitation and/or repair. The focus will be on sewer pipes that are at risk of collapse or prone to more frequent blockages.

For each of the identified condition deficiencies, we will formulate constructible mitigation projects, and develop an engineer's cost estimate. We will consider the impact of these projects on the community, and phase them to be concurrent with other planned infrastructure improvements in order minimize the impact. The cost estimates will be based primarily upon the actual bid results from recent similar projects completed by AKM for its clients, as well as those obtained from other agencies. The estimates will include the construction cost, as well as design, inspection, administration costs and contingencies. This task, along with Pumping System Analysis will complete the Rehabilitation and Replacement Plan.

2.5.3 Infiltration and Inflow (I&I) Analysis

Inflow and infiltration studies are needed to assess the sources and quantities of extraneous flows into the wastewater collection system. This information is then used in establishing capacity criteria in accordance with the Waste Discharge Requirements (WDR).

Currently, there is no set standard for wet weather flows. Some agencies use inflow and infiltration resulting from a 10-year 24-hour storm as their standard. However, unless precisely such an event occurs and is monitored in the system, its impact on the system cannot be properly estimated. The more appropriate storm duration may be the time of concentration within the system. This may be a one to three hour storm for inflow purposes in a relatively small system such as the City of Manhattan Beach's.

If accurate SCADA information is available from the City's pump stations, along with corresponding rainfall information, we can review past flows during significant storm events to estimate inflow and infiltration, and to establish wet weather flow criteria. Otherwise, we will initially recommend a wet weather flow criterion to the City based upon our experience. If desired by the City, we will conduct flow monitoring during the next rainy season in an attempt to capture adequate wet weather flow data and define the wet weather peaking relationship. This effort would involve conducting wet weather flow monitoring at five (5) locations for a period of 12 weeks. The Los Angeles County Department of Public Works, Water Resources web site shows a precipitation gage maintained by a volunteer in Manhattan Beach (1070 Manhattan Beach). However, this is not a tipping bucket type gage and only the daily totals are available. Therefore, we would install one rain gage along with the wet weather flow monitors to obtain accurate precipitation information, and relate it to inflow and infiltration.

It is our understanding that the City does not have a significant inflow and infiltration problem. However, if wet weather flow monitoring indicates substantially more inflow and infiltration than currently expected, we will update the hydraulic analyses based upon those results, and provide recommendations for correcting the problem.

2.6 REPAIR AND REHABILITATION ALTERNATIVES EVALUATION

We will evaluate traditional and trenchless technology methods for upgrade, repair and rehabilitation of deficient sewers and manholes identified. This evaluation will take into consideration the impacts on the community, adjacent utilities, and constructability. Technology methods that will be evaluated include but are not limited to the following:

- Open Cut
- Directional Drilling
- Microtunneling
- Pipe Bursting
- Sliplining

2.7 PERFORMANCE INDICATORS

In addition to establishing system criteria, we will develop measurable performance indicators for both the pumping system and collector system to determine the optimal time to repair or replace elements. Examples of performance indicators are depth to diameter trigger levels and pump efficiencies.

2.8 GIS UPDATE

GIS Basemap Data

The City will supply the basemap data consisting of parcels, street centerlines, orthophotos and two foot contours. The parcels will include APN's and addresses. The street centerlines will include the street names.

The existing Sewer GIS shapefiles will be supplied by the City to AKM. Additional data that will be provided by the City will include a point shapefile that represents the water meter billing information for each parcel so AKM can use water consumption for preparing the modeling information for the sewer system analysis. The City will also supply the geodatabase template for the new Sewer GIS.

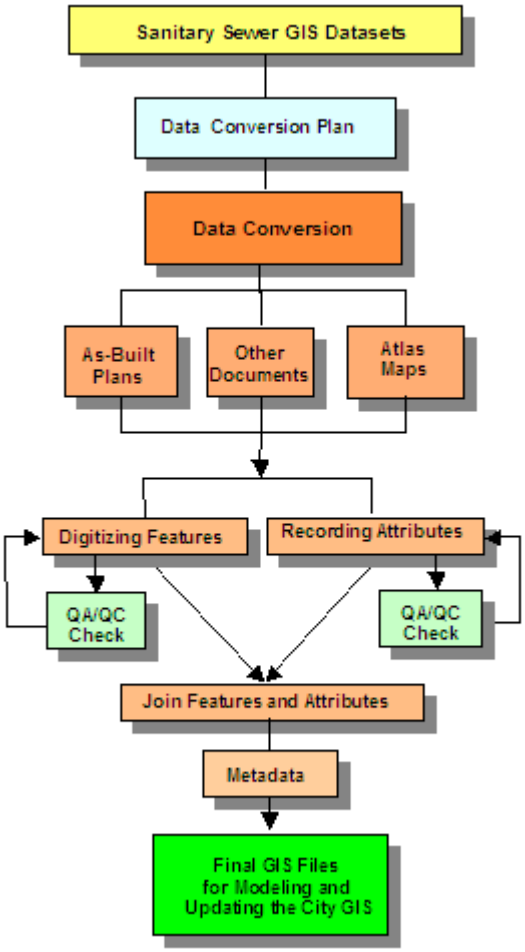
Sewer GIS Source Maps

The City will be supplying scanned drawings for the sewer system. There are approximately 752 scanned sheets. There may be some recent plans that have not yet been scanned. AKM will georeference these drawing to fit the parcel basemap. Depending upon the needs of the City, multiple references may be used for any single sheet where plan views are split on a single sheet.

Data Collection Plan

The new Sewer GIS will be created from the georeferenced scanned drawings. The process will be to draw the structures and then the connecting pipes. This work will be done in the City's geodatabase, which we will assist in developing throughout the project. The existing Sewer GIS created in 1995 will be displayed as well to allow for initial checking of the completeness of the georeferenced drawings.

The feature classes will include treatment works, pipes 6" and greater, structures, flow direction arrows, pipe materials, pump stations, lift stations and connections to outside agencies.



The data capture process will include obtaining data from the scanned drawings as well as from record drawings, if necessary. The information as available on the plans that will be collected will include:

- Pipe diameter, slope and material
- Manhole numbers, rim (if available), invert elevations and measured depth to flow line
- Junction structures, transition structures, plugs, lift stations.
- Offset reference, direction and distance.
- Meters or monitors
- Plan numbers for associated plan and profile drawings and hyperlink to drawing numbers
- Date of construction for use as the age of the materials and for use with the three City datums for correcting elevations to consistent NAVD 1988.
- Street name, agency, status
- Flow direction arrows
- Hyperlink to CCTV video files

AKM will create all data in California State Plane Coordinates, Zone 5, NAD 83, NAVD 88, US survey feet.

Network connectivity rules as defined in the geodatabase template will be maintained so that the City can do network tracing and area isolation.

Other data to be captured and included will be determined in conjunction with the requirements of the City staff and the current sewer geodatabase.

Joined and Linked Data

AKM will add an attribute field that links the prior video work to each sewer pipe or will provide a point shapefile that contains the rating of critical points in the pipes from an evaluation of the video recordings.

The most recent 12 months of water billing, as previously mentioned, will be linked for the purpose of modeling sewer flows.

AKM will also link the valve card database, hydrant database, and water quality sampling database to the corresponding features data set. These databases will need to be supplied by the City in Excel format.

Quality Assurance / Quality Control (QA/QC) Processes

The QA/QC processes will be completed at several times during the project. These processes have been developed over a twenty year period. Some processes are manual and others are automated. In addition, the City may want to perform its own QA check during the data creation phases of the project.

AKM will be drawing the GIS feature data sets and entering the attributes separately and performing a data loading operation to add the attributes to the features. Therefore QC processes will be set up for both the features and attributes.

The scanned as-built maps will be printed for the QA/QC processes. These printed copies will be marked up as the features are drawn. The highlighted features will also act as a guide as to project completion. The scanned as-built maps will be compared against the 1995 GIS data to help locate and define any differences.

Attributes will be entered into a spreadsheet and checked for accuracy and data domains. This is a faster method of entering attributes and provides the ability to do data loading once the features have all be created or during the project as well.

The data collection plan will comprise several key components that will include but not be limited to the following:

- Finalization of methods, tools, and standards
- Interpretation rules that will be used for resolving inconsistencies.
- Identification of any significant data gaps that may exist.
- Definition of quality assurance and quality control (QA/QC) methods and measures.
- Refined plan of products and schedules for incremental data deliveries.
- In conjunction with the City, AKM will define a pilot area that will be used to test and refine data collection and GIS creation prior to full City-wide implementation.

QA/QC procedures are applied throughout all stages of the data conversion and update effort and are necessary to ensure that each incremental step is carried out in a thorough and accurate manner to maintain the overall quality and completeness of the information from one stage of data conversion to the next.

Sewer Atlas Map Book Creation

We propose to use the Map Series software available from ESRI. It will be given to the City as a part of this project. AKM maintains this software and supports it with its clients.

The Map Book software is a very comprehensive package which can quickly and easily produce printed or PDF map books or individual pages. It automatically produces atlas sheets at pre-determined scales using a grid. As the City does not have a grid system, AKM will assist the City in creating a grid system for use with the atlas sheets.

As a minimum, the atlas sheet will display pipes, manholes, lift stations, flow direction arrows and labeling of pipes and manholes. We will make use of the automatic text placement capabilities of ArcGIS 9.2. Labeling will include pipe diameters, material other than VCP, pipe length, and manhole ID.

Deliverables

The Sewer GIS deliverables will include:

1. A technical report containing the entire feature and attribute data. This will include the data dictionary, summary tables, assumptions, and comments. The printed and formatted document will be in a 3-ring binder.

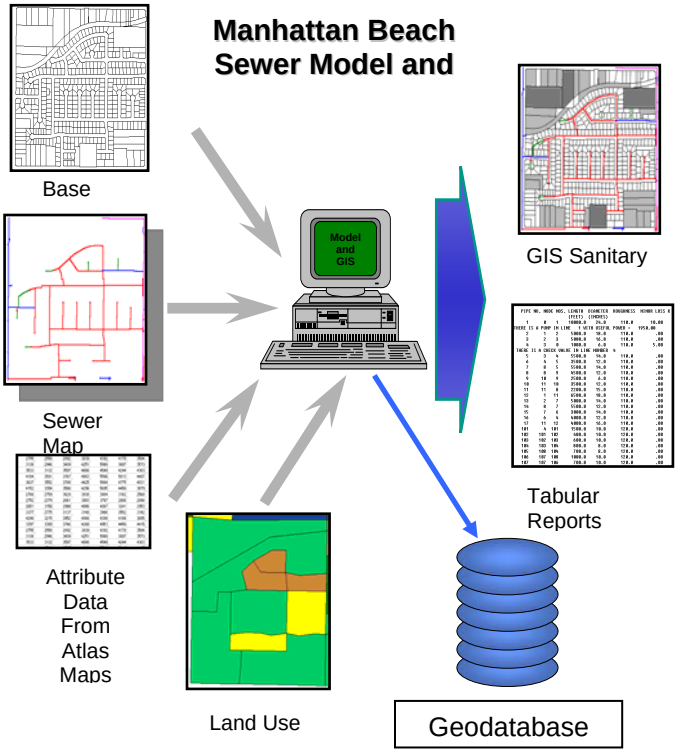
2. The GIS will be delivered in the City's current geodatabase. The metadata file will be completed for all feature types if the City has not already completed it.

3. An overall system map on an "E" size sheet will be provided. All features will be shown.

4. One color copy of completed atlas map books at 24x36 ("D" size") and one printed copy at 11x17 inch (Tabloid size). These will be bound with an index sheet. One 11x17 inch (Tabloid size) copy will be delivered with three-hole punched pages. The atlas map will also be delivered in PDF format.

5. The map book software will be supplied and installed on the City's GIS system.

6. One year of support for the GIS will be provided. This support is limited to answering questions about the features and attributes created for this project. Any changes necessary due to errors found during this one year period will also be corrected by AKM.



2.9 PUMPING SYSTEM ANALYSIS

Pump station criteria will be established for wet well capacity, pump capacity, number of pumps, storage, emergency power, and other redundancies to minimize the possibility of overflows. We will evaluate the six larger sewer pump stations. This work will include review of construction plans, design calculations, shop drawings, and maintenance records, as well as a thorough field review that will include an evaluation of the physical structural condition of the pump stations. If the pump stations have flow meters, we will utilize the information from the flow meters for capacity analysis, as well as the adequacy of the wet wells to preclude frequent cycling of the equipment. We propose to conduct field flow measurements to verify the accuracy of the flow meters unless they have been recently calibrated. We will also analyze each pump station for average, peak dry weather, and peak wet weather capacity. We will then determine if the appropriate level of redundancy as well as emergency wet well capacity is available to avoid overflows. We will determine if each of the pump stations meet the criteria established and current industry standards. We will then make recommendations for bringing them up to current standards.

2.10 RATING SYSTEM AND CAPITAL IMPROVEMENT PROGRAM

The hydraulic analysis, the structural rehabilitation analysis, and the pumping system analysis will form the basis of the City's Wastewater Capital Improvement Program. A rating system will be developed to prioritize improvements to the wastewater system. We will work with City staff to develop a short-term and long-term Capital Improvement Plan. The highest priorities will be given to verified capacity deficiencies and structural defects that may fail and cause overflows.

2.11 COST ESTIMATES

We will prepare current cost estimates for all recommended improvement projects and wastewater system programs (i.e. Activities related to complying with the Statewide General Waste Discharge Requirements). An estimate of the replacement value of the entire wastewater system will also be provided.

2.12 WASTEWATER MASTER PLAN DOCUMENT

The work effort and the results will be presented in a Master Plan report. At a minimum, the report will include: Executive Summary, Introduction, Study Area, Criteria, Existing System, Ultimate System, System Analyses, and Capital Improvement Program.

The report will also include clear exhibits of appropriate scale to illustrate the data used, analyses performed, and the recommendations. Appendices will include the backup information utilized in formulating the recommended improvements.

Ten (10) draft copies of the report will be submitted for City review. Following the incorporation of City staff comments, the final report will be provided in both hard copy (20) and electronic formats to the City. The electronic copy will be on compact discs and will include all reports, digital database products or other documentation that is made throughout the project.

Our proposal also includes time for one meeting with the City Manager and two presentations to be made to the City Council of the study findings.

The Master Plan Report will also be the City's System Evaluation and Capacity Assurance Plan.

2.13 SOFTWARE AND TRAINING

We will utilize H2O Map Sewer/Pro (non-proprietary) for the hydraulic model and capacity analysis of the system. It is a stand-alone GIS-based computer program that is designed to seamlessly view, manipulate, and exchange GIS data sets with ease. The program creates and stores all geographic data in a native shapefile format, making the information compatible with any other GIS applications.

One stand-alone license for the sewer system model will be provided to the City. The City's entire sewer system consists of 86 miles of sewers. If the City desires one model representing the entire collection system, we will purchase a computer model that can accommodate all of the City's existing pipes as well as some future pipelines. Per the City's existing Sewer GIS, there are 2,216 pipe segments. It is therefore estimated that an H2OMap Sewer/Pro program with a capacity for 3,000 pipes would be sufficient. The cost of this program will be $7,000. We will finalize the total number of existing pipes following the completion of the update to the Sewer GIS.

It is also possible to purchase a computer program with a lower pipe limit, divide the City up into major drainage regions and model them separately. This will reduce the pipe limit required and thus the price of the software.

We will provide training for City staff on the use of the hydraulic model. The training will include a general 2-day training course provided by MWHSoft at their Headquarters in Pasadena, CA for two staff members and 8-hours of training by AKM specific to the City's sewer model.

2.14 MAP SPOT PROBLEMS USING SINGLE PHOTOS FROM CCTV INSPECTIONS

The locations of the still photos and points of information along the CCTV inspected reaches that represent specific issues related to the failure or root intrusion will be placed into a point feature data set. The attributes will simply be either the link to the still photo or the description of the problem.

WATER SYSTEM MASTER PLAN

1. PROJECT UNDERSTANDING

1.1 PREVIOUS STUDIES

The City's existing Water System Master Plan was prepared in 1994. It analyzed the water supply sources, pumping system, and distribution system through a planning period that extended to the year 2010. Since the study was completed, the City constructed a new well and made extensive modifications to its pump stations, as well as recommended improvements to parts of the distribution system. The City has also prepared and implemented a water system conversion plan to operate pumps and storage as an open or closed water system.

1.2 EXISTING SYSTEM

The City of Manhattan Beach provides water service to 3.9 square miles of residential, commercial, industrial, and institutional customers through approximately 13,500 services. The estimated service population is about 33,800. The service area is located within the City boundaries.

The existing water system includes the following facilities:

- 112 miles of distribution water mains, sizes ranging from 1-inch to 27-inches
- 4 booster pump stations with a total capacity of 14,620 gpm
- 2 storage reservoirs with a total capacity of 9.5 million gallons
- One elevated storage tank (300,000 gallons)
- 2 water supply wells with a total pumping capacity of about 3,200 gpm
- 13,500 service connections
- More than 1,800 valves
- One imported (MWD) water service connection
- SCADA system which allows for remote operation and monitoring of all water supply facilities

The City's water system is a closed system that is generally controlled by the water surface elevation at the 300,000 gallon elevated tank located at Block 35. The elevated tank overflows into an adjacent 2 million gallon reservoir. Water pressure can also be controlled with the use of variable speed drive pumps at both Block 35 Reservoir and Peck Reservoir.

1.3 WATER DEMANDS

The City's water demand has averaged approximately 7,018 acre-feet per year (6.27 mgd or 4350 gpm) for the past 10 years (*Ref: West Basin Municipal Water District Water Use Report FY 2005-2006*). This corresponds to a per capita use of 185 gallons per day.

The future water demand projections over the study horizon will be based upon a detailed review of the General Plan land uses, and the currently anticipated future development.

1.4 SOURCE OF SUPPLY

Groundwater

Approximately 15 percent of the City's water supply comes from the City owned and operated wells. Both wells obtain groundwater from the West Coast Basin, a major ground water basin underlying the area. The City has an adjudicated right to extract up to 1,131 acre-feet of groundwater from this basin each year. .

Well 15, located at Manhattan Beach Boulevard and Vail Avenue, has a capacity of about 900 gpm. Well 11A, located at Manhattan Beach Boulevard and Green Lane, has a capacity of about 2,300 gpm.

These two wells combined have pumped an average of 1,057 acre-feet per year (0.94 mgd or 655 gpm) for the past ten years.

Imported Water

Approximately 85 percent of the City's water supply is imported water. Imported water is obtained from the Metropolitan Water District (MWD) through the West Basin Municipal Water District (WBMWD) at a connection (WB-4) located along the 45-inch West Basin feeder pipeline in Manhattan Beach Boulevard. The City can obtain up to 8.1 mgd of water from MWD through this connection. MWD guarantees delivery of 15 cfs at a minimum pressure of 83.5 psi at the outlet of their meter.

WBMWD also provides the City with reclaimed water as an additional supply source for irrigation of many of its parks, schools, and other landscaped areas. The City's recycled water use has averaged 246 acre-feet per year (0.22 mgd, 152 gpm) for the past 10 years. This is approximately 3 percent of the City's total water use.

Water Quality

The water quality of both the imported water and the groundwater is generally good. All water is blended and chlorinated prior to entering the distribution system.

1.5 PURPOSE

The City's main objective is to obtain a Water System Master Plan that can guide its future water system operations. The focus of this Master Plan will be to analyze the improvements that are currently required, as well as the improvements required to meet the following performance objectives through the year 2030.

- Have a supply that meets demand and all health regulations
- Provide adequate flows and pressure for fire protection and peak demand
- Have redundancy for service reliability
- Operate at highest efficiency and lowest cost

The primary tasks of the project will include evaluation of existing and future water supply and demand conditions, evaluation of fire flow requirements and standards, development of system criteria, updating the existing Water GIS, development of a calibrated hydraulic model followed by analyzing the water system under various conditions, and development of a prioritized Capital Improvement Program.

2. PROJECT APPROACH AND DETAILED SCOPE OF WORK

Comprehensive water resources master planning is an essential tool for utility systems in providing efficient service to their existing customers, and plan for future expansions in a responsible manner. As such, they have to be based upon the best information available, yet be flexible so that they can be updated as changes occur in the base information and the regulations guiding their formulation. Therefore, AKM's approach to water resources master planning assignments involve several basic procedures which ensure that the finished product is used for accomplishing the agency's goals.

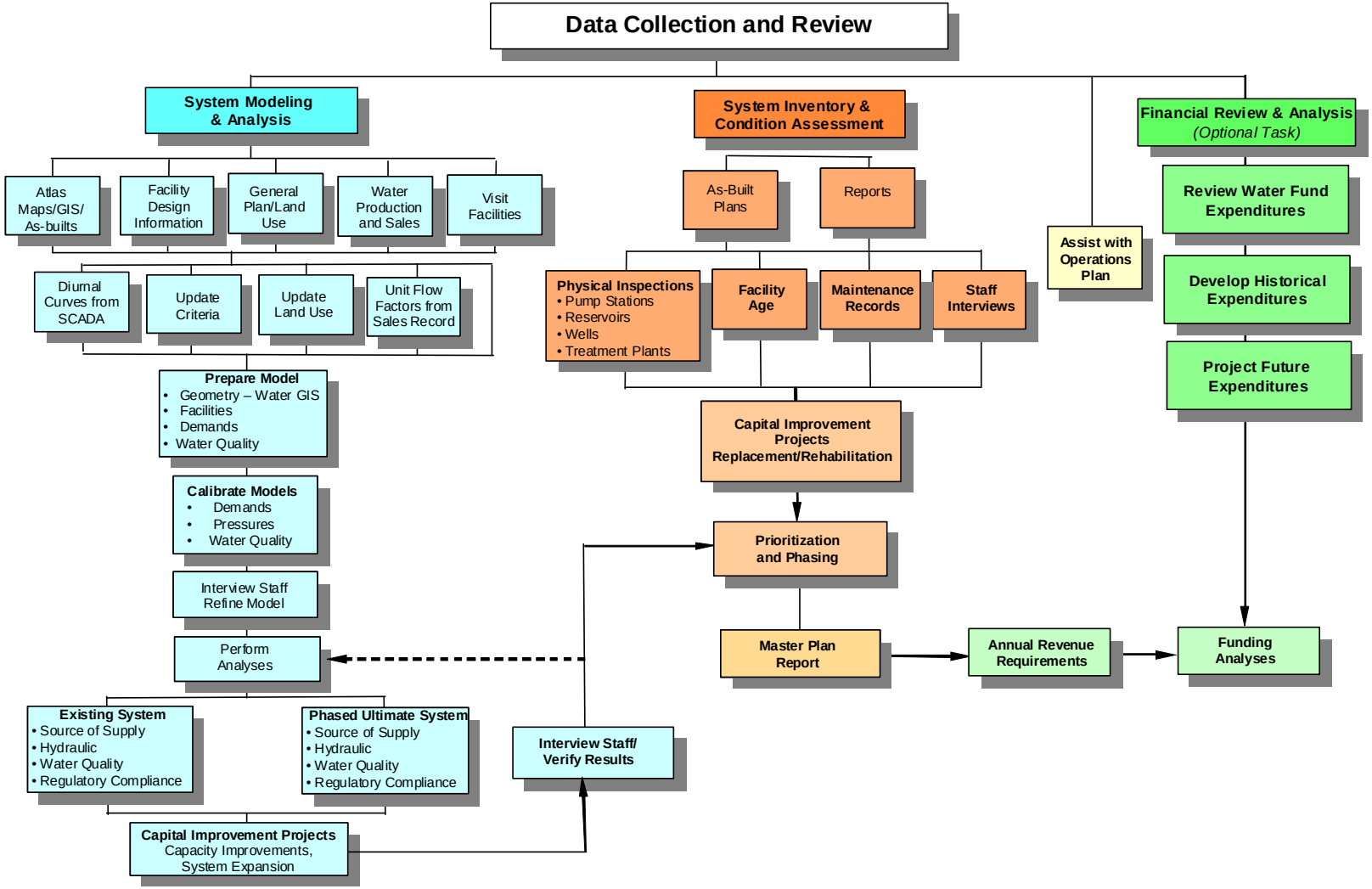
Our general approach to a Water Master Planning assignment is illustrated in the flow chart on page 3-19. The tasks listed under Financial Review and Analysis is not proposed as part of our study, but is shown only to illustrate its importance in the overall utility planning process.

2.1 DATA COLLECTION AND REVIEW

AKM Consulting Engineers will research and review all of the documents listed in the City's RFP as well as a few additional items, if available. These include the:

- General Plan, zoning element and map, land use element and map, specific plans, redevelopment plans, and regional planning documents
- Historic water production and purchase records for the last 10 years
- Digital copies of aerial photography (4" ground pixel size – 1^H = 100' resolution)
- 2' ground contour elevation data
- GIS data (water facilities, parcels, land use, zoning, streets, storm drains)

Water Master Plan



- Existing water atlas sheets
- Existing water as-built drawings (scanned copies – approximately 95% of system)
- Topographic and hydrology maps
- Previous Water Master Plan (1994)
- Pump station data, including SCADA data, as-built construction plans, maintenance records, and pump specifications
- Water meter records of entire system by billing period for at least one year
- Residential, commercial, industrial, and office land use vacancy rates
- Maintenance records of the water facilities
- Operational settings
- Pump curves and efficiency tests
- Water quality information – chlorine residual, nitrates, VOC's etc.
- Disinfection procedures
- SCADA data
- Well drilling logs
- Diver/inspection reports for the reservoirs
- Electric billing information, including the rate schedule for each pumping facility
- Information from other water agencies and the local fire department, as necessary.

We will review, reduce and catalogue this information for subsequent use in the study.

2.2 DEVELOPMENT PATTERNS

Existing system loads will be based upon the current general plan land uses and current water use data. Future system loads through 2030 will be based upon existing zoning information and the assumption of full build-out and infill intensification.

2.3 FIRE HYDRANT FLOW TESTING

With assistance from City staff, we will conduct flow testing of hydrants within the water system. The flow testing shall assist in the calibration of the hydraulic model (see Section 2.4 for further discussion on calibration). Locations for fire hydrant flow testing will be selected after performing the initial calibration. Selected locations may include isolated areas, which may aid model calibration particularly to determine pipe friction factors and to locate closed, partially closed and/or open zone isolation valves. Our proposal includes fire flow testing at 25 locations.

A fire flow map will also be developed from the fire hydrant flow testing, identifying areas with low residual pressures. The City's fire flow requirements and standards for residential and commercial zones will be evaluated and recommendations will be made for improvements.

2.4 SYSTEM MODELING AND EVALUATION

2.4.1 Model Geometry

We will utilize the updated water system database and GIS as the basis of the hydraulic model. The computer model shall include all City water pipes (excluding meter connections and private lines), pump stations, wells, reservoirs, and pressure reducing valves. Modeling information associated with each pipe will include identification numbers, diameter, length, roughness, pressure zone, year of construction, material, and plan number. Model nodes will be located to represent points of intersection, ends of pipes, fire hydrant locations, changes in diameter or material, high points, low points, and/or locations where supply or demands are applied to the system. Modeling information associated with each node will include identification numbers, pressure zone, land use category, fire flow demand requirement, development area, service type, and elevation.

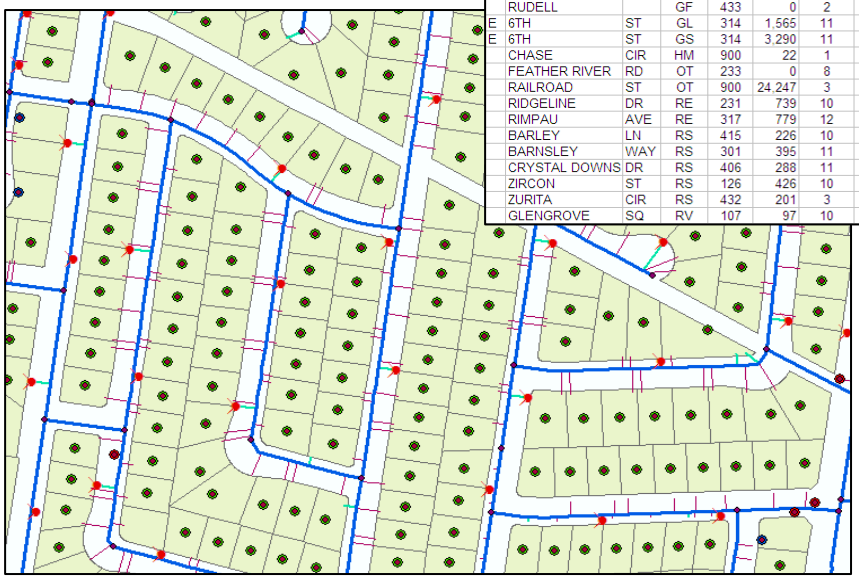
We will obtain all well, pump station, reservoir, and pressure regulating station information, as well as operational settings from the City. We will model each facility based upon as-built construction drawings and the existing operating conditions. We will enter pump curves into the model based on the latest field performance tests. At least three points will be input for each pump curve. Historic water well data will be reviewed to set the ground water levels in the model.

2.4.2 Diurnal Curves

We will retrieve SCADA data for a low demand period, an average demand period, and a high demand period for developing diurnal demand curves from reservoir levels; well flows and start/stop times; and pump flows and start/stop times. These use patterns will be assigned to appropriate nodes for extended period simulations. We will develop individual diurnal use patterns for large water users with specific use patterns.

2.4.3 Demands

We propose to use one or more years of actual water use data collected from meter readings or billing information to compute and distribute the water system demands in the hydraulic model. The figure below illustrates the technique whereby the billing information on an annual basis is used for computing water demands.



Annual Consumption

		Accnt Type	Book	Units	Reads	Account:	Meter #	Mtr Manufacturer	Size	Average Usage (gpd)	Average Usage (gpm)
	JOY	ST	CS	312	422	12	05205174	9185460	PREC	1 1/2"	865	0.6
	EL SOBRANTE	RD	GF	314	0	11	07204657	9042759	OTHR	4"	0	0.0
	RUDELL		GF	433	0	2	10000352	18038622	BDTB	5/8"	0	0.0
E	6TH	ST	GL	314	1,565	11	07201297	39240403	OTHR	2"	3,207	2.2
E	6TH	ST	GS	314	3,290	11	07303500	9042703	PREC	2"	6,743	4.7
	CHASE	CIR	HM	900	22	1	10001428	03048468	OTHR	6"	45	0.0
	FEATHER RIVER	RD	OT	233	0	8	06390778	59202070	SENS	1 1/2"	0	0.0
	RAILROAD	ST	OT	900	24,247	3	10001382	03053546	OTHR	6"	49,693	34.5
	RIDGELINE	DR	RE	231	739	10	02905032	59209640	SENS	2"	1,515	1.1
	RIMPAU	AVE	RE	317	779	12	05401309	40332892	ROCK	1"	1,597	1.1
	BARLEY	LN	RS	415	226	10	06603723	95426335	PREC	3/4"	463	0.3
	BARNSLEY	WAY	RS	301	395	11	09706630	92584072	PREC	3/4"	810	0.6
	CRYSTAL DOWNS	DR	RS	406	288	11	09000926	98517252	PREC	3/4"	590	0.4
	ZIRCON	ST	RS	126	426	10	07800096	9045481	OTHR	3/4"	873	0.6
	ZURITA	CIR	RS	432	201	3	10000631	61733596	SENS	1"	412	0.3
	GLENGROVE	SQ	RV	107	97	10	01901080	39722108	OTHR	5/8"	199	0.1

Based on information provide by City staff, the City meter consumption data can be tied to the GIS parcels. This will allow us to use the meter data to obtain a spatial distribution of demands. We will analyze the existing water system's purchase and production (supply) data for the last 5 years to establish the existing system average day supply. Meter consumption data will be adjusted upward to match this established existing average day supply. The demands will then be aggregated and assigned to the appropriate modeling node, usually the closest node. This method will inherently account for all high water users, it will most closely represent the current water use, and will be the most appropriate data to use for model calibration after incorporating unaccounted for water.

The ultimate water system demands can be computed using land use coupled with unit flow factors or by increasing the existing system demands universally by some factor that will account for vacancies and future densification.

Specific demands for special circumstances will also be input manually at a selected model node. For instance, the demand for a known future development that will have a high density and therefore a high water use can be input manually at a model node close to that development's future point of connection.

2.4.4 Operational Controls

Operational controls will be set based upon information provided by City staff and SCADA data.

2.4.5 Model Calibration

We propose to calibrate the model by collecting field pressure measurements and SCADA data (pump flows and pressures, reservoir levels, well flows, pressure regulating station flows and pressures, and import connection flows) for the same time period. The pressure measurements will be collected by attaching data loggers to selected fire hydrants throughout the system. We currently anticipate the need for about 15 data loggers to cover the entire system adequately. It may be possible to borrow data loggers from other municipalities. We will direct and oversee the field calibration process. The City will provide the required equipment and personnel to assist with the field calibration, including any additional data loggers.

We propose to duplicate the actual water use pattern from the calibration period in the model for 24-hour period. It is our current understanding that the SCADA data can be provided electronically in a database format for the following items:

1. Reservoirs – levels
2. Booster Pump Stations –flow and event logs
3. Wells –flow and event logs
4. Pressure Reducing Stations – flows
5. Import Connections – flows (This data can be obtained from the MWD web site at 15 minute intervals)
6. Interconnections - flows

Diurnal curves will be developed from the collected SCADA data. Individual curves will be developed for the large users, as needed. We will input the pump operational settings, as well as the initial conditions (reservoir levels, pump on-off status) in the model. We will then adjust the demands and the diurnal curves to the appropriate time of the year. We will run the model and compare the results to the SCADA data and field measured pressures. We will also compare the model's demands and reservoir levels to the SCADA data collected. If the model results are close to the field measurements (no more than 5 to 10 percent deviations in the energy grade line and flow rate), the model will be deemed calibrated. Otherwise, we will determine the causes of the differences, make adjustments to the model, and re-run it until it closely matches the field conditions. The pipe roughness coefficients (C values) will be the last variable adjusted in the model to reach calibration. Through and iterative process, the system calibration will be refined. As discussed in Section 2.3, fire hydrant flow tests will also be utilized to further calibrate the hydraulic model.

2.4.6 Interview City Staff

We feel that appropriate insight into the operation and condition of the system cannot be developed by review of records alone. Interviews with the City staff are particularly important in ascertaining the areas of immediate concern, and identifying the operational problems in the system. We will interview the staff again following the initial completion of hydraulic analyses to compare the results to field observations and staff's knowledge of the system.

2.4.7 Conduct Facility Site Investigations

We will schedule field reviews of all the system facilities. This is an important part of understanding the operations of the system as well as determining the condition of each facility so that appropriate recommendations can be made in the final report.

2.5 ENGINEERING EVALUATION

2.5.1 Criteria

We will recommend performance criteria to the City. This will include the source of supply, unit flow factors, peaking factors, fire flow requirements, velocities, storage, pumping capacity, and maximum and minimum pressures. The criteria will form the basis of subsequent analyses in verifying the adequacy of the system, and formulating deficiency mitigation projects.

2.5.2 System Hydraulic Analyses

We will conduct analyses of the existing system for the average day, maximum day, and maximum day plus fire flow scenarios. We will review the results with the City to ascertain that they are reasonable. If needed, adjustments will be made and analyses will be conducted again. We will also run the analysis for a maximum week demand. This will be important in evaluating the adequacy of the storage facilities.

We will then formulate mitigation projects for eliminating the deficiencies identified through the hydraulic analyses, and analyze the existing system until all agreed on criteria are met. We will meet with City for review and comments at appropriate points.

2.5.3 Additional Analyses

In addition to the analyses conducted with the use of the model, we will evaluate

- Source of supply capacity for the overall system and evaluation of existing wells, including the consideration of the addition of a third well at 6th Street and Aviation Boulevard.
- Storage capacity, with the goal of maintaining a seven-day supply in the event of an emergency outage of the MWD connection
- Booster pumping capacity
- Facilities needed for emergency supply
- Facility replacement based first upon known condition, then upon age
- Sufficiency of the valve system to comply with the recently adopted California Water Standards.
- Impact of conjunctive use on groundwater storage, to be determined through interviews of Water Replenishment District staff

2.6 OPERATIONAL EVALUATION

We will evaluate the City's policy for operating its wells and also evaluate the pressure control methodology established as part of the SCADA system. AKM will review and update the City's Water System Conversion Project to include when the wells should be operated to maximize the use of the City's water rights in the West Basin; and review blending scenarios at Peck Avenue Reservoir. AKM will also review areas of pressure deficiencies defined by the water model or indicated by staff, and recommend pump pressure settings to mitigate the problems.

2.7 GIS UPDATE

GIS Basemap Data

The Water System GIS will use the same basemap data as described in the sewer GIS section of this proposal.

Water GIS Source Maps

The City will be supplying scanned drawings for the water system. There are approximately 1,561 scanned as-built drawing sheets and 1,100 water intersection drawings. There may be some recent plans that have not yet been scanned.

AKM will georeferenced these drawing to fit the parcel basemap. Depending upon the needs of the City, multiple references may be used for any single sheet where plan views are split on a single sheet.

Data Collection Plan

The new Water GIS will be created from these georeferenced scanned drawings. The process will be to draw the structures and then the connecting pipes. This work will be done in the City's geodatabase, which we will assist in developing throughout the project. The existing water GIS created in 1995 will be displayed as well to allow for initial checking of the completeness of the georeferenced drawings.

The feature classes will include treatment works, distribution pipes 4" and greater, fittings, valves, fire hydrants, wells, reservoirs, and pump stations.

The data capture process will include obtaining data from the scanned drawings as well as from record drawings if necessary. The information as available on the plans that will be collected will include:

- Pipe diameter, length and material
- Valves, valve number, hydrants, fire department connection points and meters larger than 1-1/2 inches.
- Fittings including crosses, tees, and reducers.
- Reservoirs and water tower

- Wells
- Pump stations
- Offset reference, direction and distance.
- Plan numbers for associated plan and profile drawings and hyperlink to drawing name
- Date of construction
- Street name, cross street, agency, status

AKM will create all data in California State Plane Coordinates, Zone 5, NAD 83, NAVD 88, US survey feet.

Network connectivity rules as defined in the geodatabase template will be maintained so that the City can do network tracing and area isolation.

Other data to be captured and included will be determined in conjunction with the requirements of the City staff and the current water geodatabase.

Quality Assurance / Quality Control (QA/QC) Processes

The QA/QC processes will be identical to those described for the Sewer GIS on pages 3-11 and 3-12 of this proposal.

Water Atlas Map Book Creation

The water atlas map books will be identical to those described for the Sewer GIS on page 3-12 of this proposal.

Deliverables

The Water GIS deliverables will include:

1. A technical report containing the entire feature and attribute data for the newly added features. This will include the data dictionary, summary tables, assumptions, and comments. The printed and formatted document will be in a 3-ring binder.

2. The GIS will be delivered in the City's current geodatabase. The metadata file will be completed for all feature types if the City has not already completed it.

3. An overall system map on an "E" size sheet will be provided. All features will be shown.

4. One (1) printed color copy of completed atlas map books at 24x36 ("D" size") and one (1) printed copy at 11x17 inch (Tabloid size). These will be bound with an index sheet. One 11x17 inch (Tabloid size) copy will be delivered with three-hole punched pages. The atlas map will also be provided in PDF

5. The map book software which has been specified in this proposal will be supplied and installed on the City's GIS system.

6. One year of support for the GIS will be provided. This support is limited to answering questions about the features and attributes created for this project. Any changes necessary due to errors found during this one year period will also be corrected by AKM.

2.8 CAPITAL IMPROVEMENT PROGRAM

A capital improvement program (CIP) will be developed based on the results of the hydraulic analyses and condition assessment of the facilities. It will include all identified improvements required to support future growth in the City, as well as improvements required to correct existing system deficiencies. Project priorities will be established for meeting the adopted criteria. The CIP will include recommendations for improvements to the water distribution system, supply sources, pump stations, storage facilities, and instrumentation. A rating system will be developed for the distribution portion of the water system. Pipelines will be ranked so that the CIP for replacement and upgrading of lines can be established.

The planning period for the CIP will extend to the year 2030. Cost estimates will be developed for each recommended CIP project and will include engineering, construction, and other contingencies. We will also develop a replacement value for the entire system for use in justifying a separate rate study in the future.

2.9 WATER MASTER PLAN DOCUMENT

The work effort and the results will be presented in a Master Plan report. At a minimum, the report will include: Executive Summary, Introduction, Study Area, Criteria, Existing System, Ultimate System, System Analyses, and Capital Improvement Program.

The report will also include clear exhibits of appropriate scale to illustrate the data used, analyses performed, and the recommendations. Appendices will include the backup information utilized in formulating the recommended improvements.

Ten (10) draft copies of the report will be submitted for City review. Following the incorporation of City staff comments, the final report will be provided in both hard copy (20), and electronic formats to the City. The electronic copy will be on compact discs and will include all reports, digital database products or other documentation that is made throughout the project.

Our proposal also includes time for two presentations to be made to the City Council of the study findings.

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We will utilize H2O Map Water Suite (non-proprietary) for the hydraulic model and capacity analysis of the system. It is a stand-alone GIS-based computer program that is designed to seamlessly view, manipulate, and exchange GIS data sets with ease. The program creates and stores all geographic data in a native shapefile format, making the information compatible with any other GIS applications.

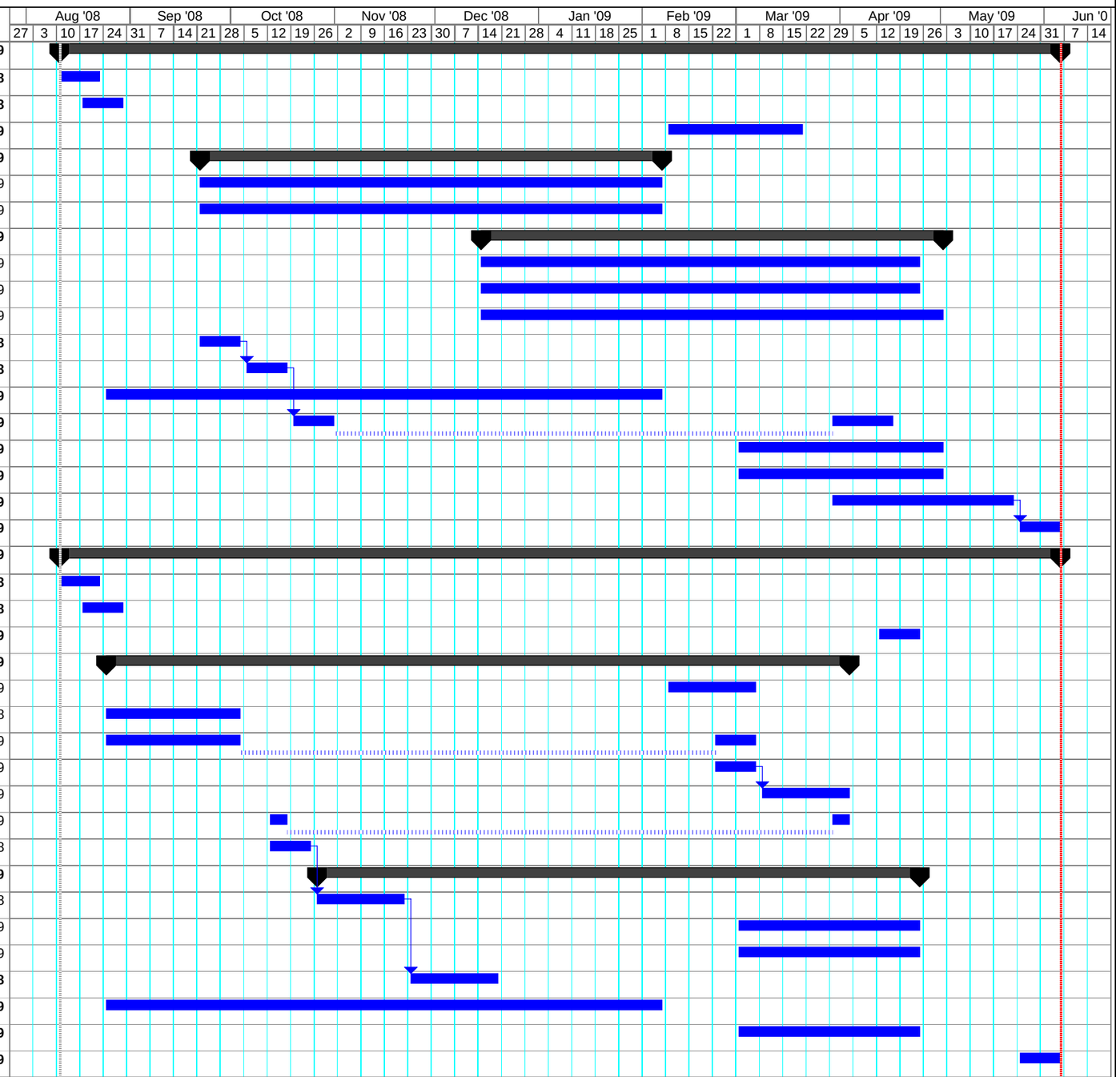
One stand-alone license for the water system model will be provided to the City. The City's entire water system consists of 112 miles of distribution mains. This may be as many as 4,000 pipes altogether. The cost of a 4,000 pipe model will be $8,000. We will determine the total number of model pipes following the completion of the update to the Water GIS.

We will provide training for City staff on the use of the hydraulic model. The training will include a general 2-day training course provided by MWHSoft at their Headquarters in Pasadena, CA for two staff members and 8-hours of training by AKM specific to the City's water model.

EXHIBIT B

PROJECT SCHEDULE
City of Manhattan Beach
WASTEWATER AND WATER SYSTEM MASTER PLAN PROJECTS
July 15, 2008

ID	Task Name	Duration	Start	Finish
1	**1. WASTEWATER MASTER PLAN**	**215 days**	**Mon 8/11/08**	**Fri 6/5/09**
2	**1.1 Data Collection and Review**	**10 days**	**Mon 8/11/08**	**Fri 8/22/08**
3	**1.2 Development Patterns**	**10 days**	**Mon 8/18/08**	**Fri 8/29/08**
4	**1.3 Sewer Use Ordinances - FOG Program**	**30 days**	**Mon 2/9/09**	**Fri 3/20/09**
5	**1.4 Sewermain Cleaning and Inspection**	**100 days**	**Mon 9/22/08**	**Fri 2/6/09**
6	1.4.1 Gravity Sewers	100 days	Mon 9/22/08	Fri 2/6/09
7	1.4.2 Sewer Manholes	100 days	Mon 9/22/08	Fri 2/6/09
8	**1.5 Engineering Evaluation**	**100 days**	**Mon 12/15/08**	**Fri 5/1/09**
9	1.5.1 System-Wide Hydraulic Modeling and Analysis	95 days	Mon 12/15/08	Fri 4/24/09
10	1.5.2 Structural Rehabilitation Analysis	95 days	Mon 12/15/08	Fri 4/24/09
11	1.5.3 Infiltration and Inflow Analysis	100 days	Mon 12/15/08	Fri 5/1/09
12	**1.6 Repair and Rehabilitation Alternatives Evaluation**	**10 days**	**Mon 9/22/08**	**Fri 10/3/08**
13	**1.7 Performance Indicators**	**10 days**	**Mon 10/6/08**	**Fri 10/17/08**
14	**1.8 GIS Update**	**120 days**	**Mon 8/25/08**	**Fri 2/6/09**
15	**1.9 Pumping System Analysis**	**24 days**	**Mon 10/20/08**	**Thu 4/16/09**
16	**1.10 Rating System, CIP**	**45 days**	**Mon 3/2/09**	**Fri 5/1/09**
17	**1.11 Cost Estimate**	**45 days**	**Mon 3/2/09**	**Fri 5/1/09**
18	**1.12 Wastewater Master Plan Document**	**40 days**	**Mon 3/30/09**	**Fri 5/22/09**
19	**1.13 Software and Training**	**10 days**	**Mon 5/25/09**	**Fri 6/5/09**
20	**2. WATER MASTER PLAN**	**215 days**	**Mon 8/11/08**	**Fri 6/5/09**
21	**2.1 Data Collection and Review**	**10 days**	**Mon 8/11/08**	**Fri 8/22/08**
22	**2.2 Development Patterns**	**10 days**	**Mon 8/18/08**	**Fri 8/29/08**
23	**2.3 Fire Hydrant Flow Testing**	**10 days**	**Mon 4/13/09**	**Fri 4/24/09**
24	**2.4 System Modeling and Evaluation**	**160 days**	**Mon 8/25/08**	**Fri 4/3/09**
25	2.4.1 Model Geometry	20 days	Mon 2/9/09	Fri 3/6/09
26	2.4.2 Diurnal Curves	30 days	Mon 8/25/08	Fri 10/3/08
27	2.4.3 Demands	40 days	Mon 8/25/08	Fri 3/6/09
28	2.4.4 Operational Controls	10 days	Mon 2/23/09	Fri 3/6/09
29	2.4.5 Model Calibration	20 days	Mon 3/9/09	Fri 4/3/09
30	2.4.6 Interview City Staff	10 days	Mon 10/13/08	Fri 4/3/09
31	2.4.7 Conduct Facility Site Investigations	10 days	Mon 10/13/08	Fri 10/24/08
32	**2.5 Engineering Evaluation**	**130 days**	**Mon 10/27/08**	**Fri 4/24/09**
33	2.5.1 Criteria	20 days	Mon 10/27/08	Fri 11/21/08
34	2.5.2 System Hydraulic Analyses	40 days	Mon 3/2/09	Fri 4/24/09
35	2.5.3 Additional Analyses	40 days	Mon 3/2/09	Fri 4/24/09
36	**2.6 Operational Evaluation**	**20 days**	**Mon 11/24/08**	**Fri 12/19/08**
37	**2.7 GIS Update**	**120 days**	**Mon 8/25/08**	**Fri 2/6/09**
38	**2.8 Capital Improvement Program**	**40 days**	**Mon 3/2/09**	**Fri 4/24/09**
39	**2.10 Software and Training**	**10 days**	**Mon 5/25/09**	**Fri 6/5/09**



AKM Proposal No. 08-2960

Task | Split | Progress | Milestone | Summary