ATTACHMENT #1
UTILITY minutes of 10/9/2006

Black & Veatch

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September 27, 2006

Sharon J. Duca
Assistant City Engineer
City of Dover Department of Public Utilities
860 Buttner Place
Dover, Delaware 19904

Subject: Attachment A
Water Quality Improvement Proposals

Dear Ms. Duca:
In your July 5th email, you requested Black & Veatch to submit pricing on the following water quality improvement projects:

(1) Historic Water Quality Data - Insufficient reaction time is provided for the disinfection process at the majority of the well stations in the system. Chlorine residual measurements should occur after an appropriate period of contact time with the sodium hypochlorite. This may require installation of large diameter piping at the well sites to achieve the necessary reaction time. This should include design for 15 well stations on 13 sites.

(2) Preparation for New/Pending Regulations - It is recommended that the City develop a timely plan to address the requirements of the Stage II DBPR, specifically the IDSE. An IDSE monitoring plan must be submitted to DHSS/ODW for approval by October 1, 2007.

(3) Modeling Support - Investigate uses of the existing hydraulic model and uses of an upgraded water quality model.

(4) Corrosion Coupon Testing - Once the procedures necessary to achieve a stable and uniform water quality are put into place, it is recommended that the City undertake a corrosion coupon testing program. Insertion of corrosion coupons at each of the POE to the distribution system and at strategic points within the system will yield important data about corrosion rates within the system.

Additionally, we identified the following projects on our August 16th conference call:

(5) Data Analysis - Analysis of additional sample data to be collected over one year period as recommended in Water Quality Evaluation.

(6) On Call Services - On Call Services provides a budgeted amount to cover miscellaneous needs such as meeting attendance, assistance in evaluating specific water quality issues, and City Council presentations.

At the request of Dover at our August 31st meeting the below projects were added to the scope:

(1A) Well Station Surveying – Provide surveying of 11 well station locations to develop necessary design information for the well piping improvements project.

We appreciate the opportunity to present costs associated with the above tasks. As requested, we provide below the individual prices for each proposal.

Water Quality Improvement Proposals

(1) Historic Water Quality Data

Providing the appropriate amount of contact time will require the installation of a large diameter pipe loop at each of 15 well stations on 13 sites plus continuous chlorine residual analyzers at each well station. A specific contact time volume must be designed for each well based on a chlorine reaction time plus a 5 minute contact period and the well production or flow rate. The contact time will also be designed for 4 log inactivation of viruses as required in the upcoming USEPA Ground Water Rule (GWR). It is estimated that this project would require a 15 sheet drawing set to show the required piping modifications and 10 sheet drawing set for Erosion & Sediment Control. Project assumptions:

Dover to provide tax property maps in AutoCAD or GIS format
Dover to provide pipe bedding specifications
Dover to provide soil borings, if needed
Dover to provide the following water quality data:
- one sample per well of Ammonia,
- one sample per well of Total Organic Carbon
- one sample per well of Total Iron

Black & Veatch to utilize 1,887 linear feet of available 16" cement lined DIP where design permits. Factors prohibiting the use of the cement lined DIP are as follows:
- Pump flow rate and site area available for pipe loop installation
- DIP pipe will not be used at well stations adjacent to electrical substations

Dover to provide City & County Permitting
Black & Veatch to provide State Permitting
Dover to negotiate with property owners adjacent to well stations for pipe loop installation access, property purchases, and easements
Dover to provide pipe installation crews
Black & Veatch to provide completed design drawings at the 100% level
Design documents will be suitable for installation of the improvements by City crews. Front-end contract documents, engineer's opinions of probable cost, bidding assistance, and construction administration services are not included in the scope, but may be added as a supplemental service at the City's option.
Black & Veatch assumes the well station SCADA system is capable of capturing and recording residual chlorine data. SCADA upgrade services are not included in the scope, but may be added as a supplemental service at the City's option.
Black & Veatch assumes that this project is not creating additional impervious area and therefore stormwater management design is not required.

Chlorine Demand Testing– Black & Veatch proposes to perform on-site testing to determine the actual chlorine demand exerted by the raw water from each available well supply. The chlorine demand data will be an important component in the well piping improvement project under Project 1 and will assist in the assuring the delivery of a consistently high quality water supply from each well station.

Black & Veatch will prepare a Technical Memorandum outlining the results of the chlorine demand evaluation as well as recommended chlorine dosages to be fed at each well station.

Level of Effort Estimate

This estimate is based on the project divided into three phases which are Well 13R, Well 8, and Remaining Wells submittals. The following are costs for the anticipated tasks outlined above:

Chlorine Demand Testing (all wells)	$3,600
State Permitting Cost:	$ 2,400
Design Drawing Costs:	
Well 5 & 13 R	$25,000
Well 8	$12,000
Remaining 12 Wells	$42,000
Erosion & Sediment Control Drawing Costs:	
Well 5 & 13 R	$14,000
Well 8	$ 8,000
Remaining 12 Wells	$ 24,000
Well Piping Improvements Project Cost:	**$131,000**

Project Schedule

The design schedule for each phase of the project will begin upon the receipt of well station survey data in AutoCAD format. Design and State approval will be about a 2-month process for the Well 13 R and Well 8 submittals. The remaining 12 wells would require about a 4-month design and regulatory review period. The anticipated schedule is shown in the following table.

Well Piping Improvements
Design and Regulatory Approval Schedule

Design Package	Well No.	Estimated Design Period (1)	Estimated State Review/Approval Period
1	5 and 13R	4 weeks	5 weeks
2	8	3 weeks	5 weeks
3	All others	12 weeks	5 weeks

(1) From receipt of survey data.

(1A) Well Station Surveying Project

Provide surveying of 11 well station locations to develop required design information for the Well Piping Improvements project.

Project assumptions:

The survey provided to Dover will be based on property deed and survey monuments. Should a discrepancy occur between the property deed and survey monuments, a site boundary survey will be required. If necessary, the site boundary survey will be completed as a supplemental task upon authorization by Dover.
Davis, Bowen & Friedel, Inc. (DBF) to provide survey of Well #8 and will not be included in this survey project.
Black & Veatch to provide survey crews to establish the required well station design information in AutoCAD format

- Site property lines
- Adjacent property lines within 500 feet of site
- Utilities within site and within 500 feet of site
- Site topography

Dover to provide any required CAD formatting standards required for project acceptance.

Level of Effort Estimate

This estimate is based on the project divided into two phases which are Well 13R and Remaining Wells submittals. The following are costs for the anticipated tasks outlined above:

Well Station Surveying Project Cost: $36,800

Project Schedule

The survey schedule for each phase of the project will begin upon notice to proceed from the City. This project has a fast schedule which is required to expedite the design of the well improvements project. Survey submittal deadlines are outlined below:

Well Piping Improvements
Survey Completion Schedule

Survey Package	Well No.	Estimated Survey Period(1)	Responsibility
1	5 and 13R	2 Weeks	Black & Veatch
2	8	To Be Determined	City of Dover (Davis, Bowen & Friedel)
3	Remaining 10 locations	8 weeks	Black & Veatch

(1) Surveying schedule will be based upon Dover issuing written notice to proceed.

(2) Preparation for New/Pending Regulations

Initial Distribution System Evaluation

The Stage II Disinfection By-Products Rule (DBPR) requires that all water systems perform an Initial Distribution System Evaluation (IDSE) to select the most suitable sampling sites for compliance monitoring for the DBPR. The IDSE can be implemented in two principal ways including development of a Standard Monitoring Plan (SMP) or with a System Specific Study (SSS) that utilizes hydraulic modeling to select the sampling sites. The SMP involves the collection of DBP samples over the period of one year. The frequency and number of samples required is determined by the type of source water and system size. With the SSS approach, systems can conduct the IDSE by making use of a calibrated hydraulic model that assists in selecting sampling sites that meet the site collection criteria of the IDSE. With the SSS, DBP monitoring is required. As with the SMP, the number of monitoring locations is based upon the type of source water and system size.

The DBPR contains a provision for water systems with historically low disinfection byproduct (DBP) levels to apply for an exemption from the SMP and SSS requirements. This exemption, referred to as the 40/30 certification, is available to systems that can demonstrate that the analytical results from each individual Stage I DBPR monitoring site had Total Trihalomethane (TTHM) and Haloacetic Acid (HAA_5) concentrations equal to or less than 0.040 mg/L and 0.030 mg/L, respectively, during eight consecutive quarters of monitoring.

Because the City of Dover serves less than 50,000 consumers, the eight consecutive quarters of monitoring results must be for the period beginning no earlier than January 2005. Therefore, if all TTHM and HAA_5 results for the period from January 2005 through December 2006 are below the 0.040 mg/L and 0.030 mg/L levels, respectively, the City of Dover would qualify for the 40/30 certification.

Black & Veatch can provide services to the City of Dover to facilitate qualification for the 40/30 certification of the DBPR. Specifically, Black & Veatch proposes to perform the following tasks:

1. Data Evaluation – Black & Veatch would obtain all of the monitoring data for the period January 2005 through December 2006 from the City of Dover. The data would then be compared against the specific criteria of the Stage II DBPR for qualification for the 40/30 certification.

2. Technical Memorandum – Based upon the aforementioned data evaluation, Black & Veatch will prepare a Technical Memorandum outlining the outcome of the data evaluation as well as recommendations for compliance with the IDSE requirements of the Stage II DBPR.

3. Site Visit – Black & Veatch will meet with the City of Dover to discuss findings of the technical memorandum.

A cursory analysis of data to date indicates that the City of Dover will qualify for the 40/30 certification. Should the City decide to proceed with this course of action for compliance with the Stage II DBPR, Black & Veatch can assist the City of Dover with electronic submission of the data for the 40/30 certification to the U.S. Environmental Protection Agency (EPA) as per the requirements of the Stage II DBPR. Specifically, Black & Veatch would perform the following tasks:

1. Utilization of IDSE Wizard – By utilizing this web-based wizard, the software program determines the IDSE option that best suits a given water system. This then makes available to the user, the necessary forms for submitting the IDSE plan to EPA.

2. **Utilization of IDSE Plan/Report Entry** - The IDSE Plan/Report Entry creates custom forms for the selected IDSE compliance option and guides the user, step-by-step, through the forms that must be submitted to EPA.

3. Submission of IDSE Plan Forms – The forms required to qualify for the 40/30 certification would be submitted electronically to EPA.

The 40/30 certification offers the City of Dover a low cost and simple option for compliance with the IDSE requirements of the Stage II DBPR.

Should the 40/30 certification not be achievable, the City of Dover will be required to submit a Standard Monitoring Plan (SMP) or a System Specific Study (SSS) by October of 2007. This would require starting a SMP by July of 2007 or starting an IDSE compliant water quality hydraulic model by May of 2007 to meet the regulatory deadline. The SMP path would expand the scope of this project and the SSS route

would require accelerating the schedule of the Hydraulic Modeling Support project for a completion date of September 2007.

Level of Effort Estimate
The following table summarizes the anticipated level of effort for each of the tasks outlined above.

Qualification for IDSE 40/30 Certification:

Tasks	Hours
Task 1 – Data Evaluation	8
Task 2 - Technical Memorandum	8
Task 3 – Site Visit	8
TOTAL	**24**

Submission of IDSE Plan to U.S. EPA:

Tasks	Hours
Task 1 – Utilization of IDSE Wizard	8
Task 2 - **Utilization of IDSE Plan/Report Entry**	16
Task 3 - Submission of IDSE Plan Forms	4
TOTAL	**28**

Preparation for New/Pending Regulations Project Cost: $10,400

(3) Hydraulic Modeling Support

The City of Dover currently has a water system hydraulic model; however, it has not been upgraded for use in water quality modeling analyses. Use of a hydraulic model for performing water quality analyses on the Dover distribution system is likely outside of current regulatory needs but would be very useful in addressing future regulations that we anticipate impacting the distribution system. As stated in the above project, we feel that Dover can meet the 40/30 certification exemption using Stage I DBPR compliance monitoring samples collected through the fourth quarter of 2006. This would eliminate the need for a System Specific Study (SSS) using a water quality hydraulic model. However, in the event that obtaining a 40/30 certification proves infeasible, the hydraulic model may be used to assist with the selection of sampling sites in conjunction with a SMP.

Black & Veatch recommends a two-phased approach for the Modeling Support project. Phase 1 provides a review of the data that is currently available to prepare a hydraulic model for water quality analyses and will describe a field testing program that the City should implement to obtain additional data that is needed for calibration. B&V will prepare a technical memorandum for Phase 1 summarizing the anticipated benefits of performing water quality modeling and explaining the upgrades and calibration procedures necessary to produce a water quality model. Modeling Support Phase 2 is intended to produce a hydraulic modeling tool that is capable of performing water quality analysis. Model calibration and verification are included in Phase 2 and will be structured to meet the water quality evaluation needs identified in Phase 1. Phase 2 also includes the preparation of model documentation and a model training

workshop. The workshop will be geared toward providing sufficient knowledge to facilitate the City's use of the model for conducting modeling analyses. Tasks associated with two alternatives for completing Phase 2 activities – preparing a new H2OMap model or updating the current model – are described below

Phase 1 – Review Existing Hydraulic Model Data

The City of Dover's existing hydraulic model appears to be an adequate tool for conducting master planning-level improvement analyses based on hydraulic considerations. However, the model was not constructed to support water quality modeling applications.

Since the events of September 11, 2001, distribution system water quality has been a hot topic within the water industry, and current interest extends well beyond security concerns to include water quality regulations and aesthetic parameters. Water distribution systems are increasingly being considered "horizontal plants", and the focus of the level of service to customers has shifted from the point of entry to the point of use. There are a number of complex factors that may contribute to water quality changes as water moves from the point of entry (POE) through the distribution system.

Accordingly, there are many potential benefits of developing a hydraulic modeling tool capable of performing water quality analyses of the Dover distribution system. One benefit is an improved hydraulic model that is capable of performing reliable extended period simulations (EPS) analysis. EPS analyses can be used to:

Conduct operational studies to evaluate alternative control strategies
Evaluate alternative rate schedules or operating rules to minimize energy costs
Evaluate level of service under emergency conditions, i.e., main breaks, fires, etc.
Confirming CIP recommendations based on static model runs

Although EPS capability enhances planning based on distribution system hydraulic characteristics, performing basic water quality analyses such as water age and source trace can provide an additional level of comfort that new or modified facilities will not contribute to water quality deterioration.

While water quality modeling can be used to support capital investment planning, many of its benefits relate to operational planning applications not necessarily involving new facilities. These include evaluating sources of water quality issues, assisting well operation strategies and addressing future regulations impacting distribution systems. The benefits for all of these applications rest in the ability of a water quality model to predict conditions in the distribution system that have been correlated to adverse or undesirable water quality conditions. Once this has been done, any of the following system operations and/or maintenance practices can be modeled to check whether conditions have improved and the desired result achieved:

Set points to improve storage turnover
Alternative well pump operation to reduce water age
Valving changes to minimize residence times or achieve adequate velocities and flow patterns during flushing operations
Distribution main renewal (relining/replacement), locations and priorities
WQ modeling sample location selection
Tracing actual/potential contamination events

The following tasks will allow Black & Veatch to evaluate the existing hydraulic model and recommend the best approach for developing a water quality model consistent with the City's needs:

1. Site Visit – Black & Veatch will meet with the City of Dover to obtain supporting information for model evaluation.

2. Data Review/Model Evaluation – The City of Dover's existing hydraulic model will be evaluated relative to currently available GIS, billing, production, and other data describing relevant physical characteristics of the distribution system. B&V will also evaluate the availability of suitable operational data, i.e., SCADA or equivalent, needed to update and calibrate the hydraulic model so that it may be used to perform water quality analyses.

3. Evaluation Technical Memorandum – A memorandum will be prepared to discuss the adequacy of existing data and indicate the requirements for upgrading the hydraulic model for use in water quality modeling applications. B&V will also recommend a program for collecting operational data that is needed to complete a 24-hour EPS calibration in the event that suitable SCADA data (or equivalent) are not available. B&V has prepared a proposed scope and fee estimate for Phase 2 that includes preparation of a hydraulic model and completion of basic water age and source trace analyses. Following the City's selection of an approach for model development based on updating the current model or constructing a new model, and upon delivering the needed supplemental field data, if any, B&V would proceed with the preparation of a hydraulic model and completion of the basic water age and source trace analyses in Phase 2.

Level of Effort Estimate
The cost shown below is for evaluating the current Dover distribution system hydraulic model and recommendations to upgrade for water quality modeling purposes.

Modeling Evaluation and Technical Memorandum:

Tasks		**Update Model Hours**	**New Model Hours**
Task 1 – Site Visit		16	16
Task 2 – **Model Data Evaluation**		32	24
Task 3 – Evaluation Technical Memorandum		8	8
	TOTAL	**56**	**48**

Update Model and Recommendations Project Cost: $11,200

New Model and Recommendations Project Cost: $9,600

Phase 2 – Upgrade Existing or Develop New Model

Upon completion of the model data evaluation Black & Veatch, will update the existing model to include new pipes and facilities since it was last updated, will update the demand allocation in the model to reflect the most recent sales data by customer class and will conduct a 24-hour extended period simulation (EPS) calibration based on available historic SCADA (or equivalent) data, or SCADA data to be collected in conjunction with a forthcoming data collection effort by the City.

Preliminary information available from the City indicates that the existing hydraulic model may contain some discrepancies compared to its GIS that can be attributed to the original distribution system map that was used to prepare the model. In addition, better data may be available for performing a demand allocation. For these reasons, tasks associated with the preparation of a new hydraulic model are described as potential alternatives to those associated with updating the existing model.

Tasks associated with updating an existing or preparing a new model, allocating demand, and performing an EPS calibration are described in detail below:

1. Update Model - Engineer will update existing H2OMap model to include piping and pump station improvements not indicated on the current model. Engineer will provide Owner with updated model and model data to review prior to model calibration. New transmission mains in the model will generally include the main transmission grid piping 8-inches in diameter and larger. Distribution mains less than 8-inches in diameter will be included only when required to produce a coherent representation of the physical piping network as is present in the existing model.

    1A. Develop New Model – The preparation of a new hydraulic model based on the City's GIS would provide a means for better integrating the model with the piping network. If a new model were to be constructed, the first step would be to convert the existing GIS pipes into model pipes. While software can be employed to semi-automate this process, a significant QA/QC process will also be employed to ensure proper connectivity for the converted pipes.

Preparation of a new model will also entail incorporation of distribution system facilities. Appropriate data will be input into the model to simulate pumping (including wells and the treatment plant) and storage facilities. Pumping facilities will be simulated using manufacturers pump curve data or pump curve test data that was developed in previous studies or adapted from the existing model, as appropriate. Storage facilities will be simulated using overflow elevation, sidewater depth, and capacity data. As-built drawings, existing model representations or schematics of pumping and storage facilities will be collected and used to include the appropriate piping detail at pumping and storage facilities. Elevations for calibration points will be extracted from the existing model or attributed based on as-built drawings.

The final step in the basic model development process is the assignment of elevations to all other model nodes. B&V's approach assumes that the City will provide digital elevation data in same coordinate system as its pipeline GIS data and that sufficient vertical accuracy for modeling purposes (roughly +/- 10 feet or less). These data will be used to extract elevations using the modeling software.

2. Update Demand Allocation – While the City has indicated that model demands were recently allocated in conjunction with the preparation of a model for use in completing a Water Master Plan, the data used posed difficulties for the consultant. This raises questions regarding the adequacy of the allocation – especially when these data are planned for use with an EPS calibration. In addition, since improved demand data is apparently available from the City, completion of a new demand allocation, consistent with the approach for new model development is recommended for updating the existing model.

    2.A Perform New Demand Allocation – Allocation of base year average annual day demands will be based on historical metered sales for a recent 12-month period. Metered sales will be factored to match the annual average day retail sales for the base year condition. The factored metered sales will be assigned to the nearest network node (junction) in the model based on information to be provided by the City in digital format that relates the metered sales to

distribution system locations such as customer addresses or meter routes. Demands for wholesale customers will be point-loaded based on the location of the customer meter, which will be provided by the Owner. Non-revenue water will be determined as the difference between metered sales and production for the 12-month period and be allocated to the model based on the percent of total demand at each network node. Assignment of metered sales to model nodes by customer class will be performed to the extent that the appropriate data are available. Preparation of a second demand data set for the water age and source trace analyses will also be performed.

3. EPS Calibration - An overall diurnal demand curve will be developed for the system for the maximum day demand condition. The diurnal curve shall be input to the model to allow the model to factor the average day allocated demands to maximum day diurnal conditions. Separate diurnal demand factors will be estimated and applied for each customer class if demand is allocated by customer class.

   Engineer will conduct calibration analyses for a selected 24-hour period for the hydraulic model using SCADA data obtained from a recent day of maximum day demand. Dover shall provide:

   SCADA data sufficient to calculate hourly flows and pressures for each treatment plant and well facility that delivers water to the distribution system. If the pumping stations do not have meters, run time hours and pump curves will be used to estimate volume pumped.
   SCADA data sufficient to determine hourly water levels in each storage reservoir that supplies water directly to the distribution system, or alternatively, actual chart records for each storage reservoir that supplies water directly to the distribution system
   SCADA data for any other recorded flow or pressure locations throughout the distribution system.
   Verification of system operational controls and conditions for the days that the EPS calibration data is provided.

   An EPS calibration is essential for the development of a hydraulic model used for water quality modeling applications. In lieu of available SCADA data (or equivalent – charts, well pump on/off time, etc.), B&V can work with the City of Dover to develop a field testing program that will include the installation of appropriate instruments (or other means for recording data) to measure pressures and flows at critical locations for a specific period of time (about 7-10 days).

   Development of the field data measurement program, assistance with purchase and installation of instrumentation, and subsequent data collection will be completed by B&V as a supplemental service, as necessary and authorized by the City. The indicated level of effort for this task assumes that adequate SCADA data (or equivalent) exist.

   An EPS analysis will be performed comparing the model-predicted flows, pressures, and tank levels with the recorded values obtained from the 24-hour period of SCADA data. The C-factors in the existing model will be assessed and revised if necessary based on pipe age, material, diameter, and previous experience from Black & Veatch projects. It is anticipated that the primary activity to achieve calibration will be adjustment of C factors and diurnal demand factors for customer classes. If necessary, adjustments will be made to pump settings and valve controls until results of the EPS analysis are in satisfactory agreement with recorded system performance.

Following completion and acceptance of the calibrated EPS-model, Black & Veatch will prepare a 28-day EPS analysis representing a current year maximum month condition and will conduct water age and source trace analyses under the selected conditions.

1. Develop Model Operational Controls - Engineer will develop model operational controls to be used for EPS analyses. Engineer will begin the process of developing model operational controls by conducting a meeting with City's staff to confirm current system operation information and discuss operational protocols. The purpose of the meeting will be to confirm and supplement known information including tank and pump station operational parameters, and operational situations such as how the system reacts to pump station outages. Engineer will review existing needs and operating criteria and practices for the selected operating and demand conditions. Current energy use rates and pumping station alternative power supply utilization guidelines will also be reviewed. Following the meeting and data review, Engineer will document the facility control information in a memorandum to be submitted to the City for review and comment.

2. Conduct EPS Analyses - Following receipt of written comments by City on the Model Operational Controls memorandum, Engineer will conduct extended period simulation analyses of the distribution system under one operational scenario. For this scenario, Engineer will evaluate the source of water being served throughout the system and the water age between well stations or treatment plant and the point of delivery. The EPS scenario will be run for 28 days. Plots of water age and source interfaces (mixing zones) will be created by Engineer.

3. Prepare EPS Analysis Memorandum - Engineer will prepare a draft technical memorandum summarizing model updates and presenting the results of the model calibration and EPS scenario for water age and source trace. Five (5) copies of the technical memorandum will be submitted to the City for review and comment. Upon receipt of the City's comments, Engineer will prepare five (5) copies of a final technical memorandum.

Upon completion of the water age and source trace analyses, documentation will be prepared and an electronic copy of the updated model with final analyses will be delivered to the City at a workshop as described below:

1. Model Documentation Binder - Upon completion of the water age and source trace analyses, documentation will be prepared and an electronic copy of the updated model with final analyses will be delivered. The documentation will include the following:
   Electronic copies of final computer analysis results on CD
   Input files containing the model data of the water distribution system will be provided on CD
   Diurnal demand curve(s) for the selected EPS condition
   Hard-copy printouts and annotated computer plots of the model results for each modeling scenario
   Model update OR development procedures

   Two copies of the computer model documentation will be delivered.

2. Model Delivery Workshop - A two-day workshop will be conducted to deliver the updated or new model, and to review the EPS hydraulic analysis and discuss the results. Plots and charts will be prepared to assist the staff with review. Procedures for developing and applying alternatives to the basic water age and source trace analyses to consider operational changes will also be

discussed with the City. The goal of this workshop will be to train Dover to use the water quality hydraulic model.

Level of Effort Estimate

The cost shown below is for upgrading the current Dover distribution system hydraulic model for water quality modeling purposes.

Model Update and EPS Calibration:

Tasks	Hours
Task 1 – Update Model Facilities	52
Task 1A – Develop New Model	290
Task 2 – Update Demand Allocation	120
Task 2A – Prepare New Demand Allocation	120
Task 3 – EPS Calibration	156
TOTAL – Update Model - Tasks 1, 2, & 3	**328**
TOTAL – New Model - Tasks 1A, 2A, & 3	**566**

Update Model and EPS Calibration Proposed Fee: $44,900

New Model and EPS Calibration Proposed Fee: $67,700

Water Age and Source Trace Analyses:

Tasks	Hours
Task 1 – Develop Model Operational Controls	40
Task 2 – Conduct Water Age and Source Trace Analyses	96
Task 3 – EPS Analysis Memorandum	64
TOTAL	**200**

Water Age and Source Trace Analyses Proposed Fee: $25,900

Model Documentation and Workshop:

Tasks	Update Model Hours	New Model Hours
Task 1 – Prepare Model Documentation	72	96
Task 2 – Conduct 2-day Workshop	36	36
TOTAL	**108**	**132**

Update Model Documentation and Workshop Proposed Fee: $16,500

New Model Documentation and Workshop Proposed Fee: $20,200

Modeling Support Project Cost Summary:	**Model Update**	**New Model**

Modeling Support Phase 1:		
Update Model and Recommendations	$11,200	
New Model and Recommendations		$9,600
Modeling Support Phase 2:		
Model Update and EPS Calibration	$44,900	
New Model and EPS Calibration		$67,700
Water Age and Source Trace Analysis	$25,900	$25,900
Update Model Documentation and Workshop	$16,500	
New Model Documentation and Workshop		$20,200
Phase 2 Total	$87,300	$113,800
Total Modeling Support Project Cost:	**$98,500**	**$123,400**

(4) Corrosion Coupon Testing

At the outset of the recently-completed water quality evaluation performed for the City of Dover, it was envisioned that a series of corrosion coupons would be inserted within storage facilities and at strategic points within the distribution system, to develop an understanding of the rates of corrosion occurring throughout the system. However, a review of the POE water quality parameters revealed that there are significant fluctuations in finished water quality. In order to receive meaningful and valid data from the corrosion coupons, it is essential that they be exposed to stable water quality conditions.

Once the water system has put into place the procedures necessary to achieve a stable and uniform water quality, the corrosion coupon testing program can begin. Black & Veatch has considerable experience in this area and would offer this experience to the City in designing and implementing the program. Specifically, Black & Veatch proposes to perform the following tasks:

1. Site Selection – Black & Veatch, working in cooperation with the City of Dover and a representative of Nalco Company, will select sites for insertion of corrosion coupons. These sites, typically storage facilities and strategic points within the distribution system, will be selected to offer a comprehensive snapshot of corrosion conditions within the distribution system. A visit to each of these sites is important to confirm their viability for coupon insertion.

2. Data Evaluation – Ninety days after insertion, the coupons will be harvested by the City and submitted to Nalco for analysis. Results of the analysis will be forwarded to Black & Veatch and to the City of Dover. Black & Veatch will conduct an evaluation of the coupon data both in terms of corrosion rate, expressed in mils per year for each type of coupon, and overall appearance of the coupons.

3. Technical Memorandum – Based upon the aforementioned data evaluation, Black & Veatch will prepare a Technical Memorandum outlining the outcome of the data evaluation as well as recommendations for modifications, if needed, to the City of Dover's corrosion control program.

Level of Effort Estimate

The following table summarizes the anticipated level of effort for each of the tasks outlined above.

Tasks		Hours
Task 1 – Site Selection/Site Visit		16
Task 2 - Data Evaluation		8
Task 3 - Technical Memorandum		8
	TOTAL	**32**

Black and Veatch Cost: $6,400
Corrosion Coupon Testing Cost: $3,000

Corrosion Coupon Testing Project Cost: $9,400

(5) Data Organization and Analysis

As monitoring and operational data becomes available from the City, organization and analysis of the data will be conducted by Black & Veatch. Specifically, Black & Veatch proposes to perform the following tasks:

1. Data Organization – Black & Veatch will organize the data (received from City in Excel spreadsheets) specific to the nature of the data. This activity will be performed for the initial data set provided to Black & Veatch; subsequent data sets will be organized by the City in a similar format.
2. Data Analysis – It is assumed that the City will collect samples in accordance with the sampling program shown in the following tables. In addition, the City will provide bi-monthly Routine Distribution Sample Data which includes temperature, Total Dissolved Solids, pH, fluoride, chlorine residual, alkalinity and hardness. Black & Veatch will perform an analysis of the monitoring and operational data from this program on a monthly basis for a period of one (1) year.. Results of the analysis will be conveyed monthly to the City in the form of Technical Memoranda and Figures generated from the Excel spreadsheets.

City of Dover, DE Sampling Program

Piney Point/Cheswold Aquifer (Deep) Wells

Frequency	Sampling Point	Analyte	Duration
Monthly	Raw water	TOC	6 months

Distribution System Monitoring

Frequency	Analytes	Duration
Monthly	Total iron Dissolved iron	Until water quality is characterized

Total Manganese
Dissolved Manganese
Turbidity
Color

Long Point Road Water Treatment Plant (Columbia Aquifer)

Frequency	Sampling Points	Analyte	Duration
Daily	Raw water, GAC effluent, plant effluent	Turbidity	Permanent basis

Each Well Station

Frequency	Sampling Point	Analyte	Duration
Monthly	Finished water	Turbidity	Permanent basis

Point-of Entry Monitoring

Frequency	Analytes	Duration
Annually	Sulfate Total Manganese	Each year

Project assumptions:

Dover to provide sampling data in the format request by Black & Veatch
Dover to provide the following raw water quality data:

- one sample per well of Total Manganese
- one sample per well of Turbidity
- one sample per well of Chlorides
- one sample per well of Sulfates
- Shallow wells will require 2 raw water data sets
  - During a dry period – after 1 week without rain
    one sample per well of Ammonia,
    one sample per well of Total Organic Carbon
    one sample per well of Total Iron
  - After a rain event – within 1 or 2 days of a significant rain event
    one sample per well of Ammonia,
    one sample per well of Total Organic Carbon
    one sample per well of Total Iron

The sampling requested in the Well Piping Improvements project and the Data Analysis and Organization project include all of the sampling required at this time. The Well Piping Improvements project will stabilize the distribution system chemistry. Should water quality complaints persist after completion of the Well Piping Improvements project, Dover may be required to provide Black & Veatch with additional sampling results to further define the water quality problem.

Level of Effort Estimate
The following table summarizes the anticipated level of effort for each of the tasks outlined above.

Tasks	Hours
Task 1 – Data Organization	12
Task 2 – Data Analysis	48
TOTAL	**60**

Data Organization and Analysis Project Cost: $10,400

(6) On Call Services

On Call Services provides a budgeted amount to cover miscellaneous needs such as meeting attendance, assistance in evaluating specific water quality issues, and Town Council presentations.

Specifically, Black & Veatch proposes to perform the following tasks:

6. Miscellaneous Engineering Services – Black & Veatch will provide engineering support for miscellaneous tasks requested and approved by the City of Dover.
7. General Contingency – Black & Veatch will provide additional surveying or engineering services.

Level of Effort Estimate
The following table summarizes the anticipated level of effort for the task outlined above.

Tasks	Hours
Task 1 – Miscellaneous Engineering Services	60
Task 2 – General Contingency	100
TOTAL	**160**

On Call Services Project Cost: $32,000

Schedule
Estimated duration is provided for each project and schedule will be based upon written notice to proceed.

Project Staffing & Organization

Black & Veatch will provide professional staff and necessary support staff to complete the assigned tasks. Local support will be provided through the Philadelphia and Gaithersburg offices. Additional technical support will be coordinated with other B&V offices as needed.

Key project staff for the proposed work are listed below:

Project Manager Doug Brinkman

Senior Process/Distribution Engineers	John Dyksen, Kevin Dixon, Alan Hess, George Budd
Senior Engineer	Bob Rinne
Director of Infrastructure Planning Department	Jerry Edwards
Senior Engineer, Planning/Modeling	Scott Phillips
Project Engineer	Chris Evans
Staff Engineers	Sierra Dean, Joe Goodwill, Joumana Sayegh

Biographical information will be made available upon request. Additional personnel may be utilized depending on the project needs.

Cost Proposal

Black & Veatch estimates the cost for the described work to total approximately $328,500 for an updated model and $353,400 for a new model including a $32,000 allocation for on-call services. Black and Veatch proposes to perform the work on a "cost plus" basis. The estimated total for each project identified will not be exceeded unless the scope of work increases and additional funding is authorized by the City. Work will only be performed on those projects for which Black & Veatch receives a written notice-to-proceed from the City. The City is under no obligation to authorize all projects identified within this proposal. The City will only be charged for those sub-tasks which are performed. The estimated cost of each project is summarized in the table below.

Project	Description	Level of Effort	Update Model Estimated Cost	New Model Estimated Cost
1	Well Piping Improvements	15 Design Drawings	$131,000	$131,000
1A	Well Station Surveying	12 Well Station Locations	$36,800	$36,800
2	Preparation for New/Pending Regulations	52 hours	$10,400	$10,400
3	Hydraulic Modeling Support Phase 1 – Update Model	56 hours	$11,200	
3	Hydraulic Modeling Support Phase 1 – New Model	48 hours		$9,600
3	Hydraulic Modeling Support Phase 2 – Update Model	636 hours	$87,300	
3	Hydraulic Modeling Support Phase 2 – New Model	898 hours		$113,800
4	Corrosion Coupon Testing	32 hours	$9,400	$9,400
5	Data Organization and Analysis	52 hours	$10,400	$10,400
6	On Call Services	160 hours	$32,000	$32,000
	Total Cost of Projects		**$328,500**	**$353,400**

Costs are estimated based on the scope of work and stated assumptions. Labor rates used in the estimate are based on average rates. Actual hourly billing rates will be based on billing rate schedule provided as Attachment B to the agreement. The City will be implementing these services as part of a multi-year contract. These budget prices however are based on the assumption of completing all work by June 2007. Billing rates for this project will be escalated annually starting in July 1, 2007.

We appreciate your consideration of Black & Veatch for these important water quality improvement projects and look forward to finalizing the agreement, schedule, scope and budget. If you have any further questions or require additional information, please contact me at (301) 921-2887 or e-mail at BrinkmanDG@bv.com.

Very truly yours,

BLACK & VEATCH CORPORATION

Douglas G. Brinkman, P.E.
Project Manager

cc: Kevin Dixon
Jerry Edwards
Chris Evans
Alan Hess

ACTION FORM

PROCEEDING: Utility Committee	**AGENDA ITEM**: 10-9-06 – 2
DEPARTMENT OF ORIGIN: Public Utilities	**DATE SUBMITTED**: 09-29-06
PREPARED BY: Sharon Duca, P.E., Assistant City Engineer	
SUBJECT: Evaluation of Bids – U.S. 13 Route East Sanitary Sewer Interceptor - Construction at Dover Downs.	
REFERENCE: N/A	
RELATED PROJECT: U.S. Route 13 East Sanitary Sewer Interceptor CIP	
APPROVALS: City Manager	
EXHIBITS: N/A	
EXPENDITURE REQUIRED: $ 300,000.00	**AMOUNT BUDGETED**: $850,000.00 FY 2007
FUNDING SOURCE (Dept./Page in CIP & Budget): Page 89 of Water/Wastewater Capital Investments Plan	
TIME TABLE: Issuance of Notice to Proceed to Dover Downs, to proceed with the time & materials contract with George & Lynch, to be completed within seven days of Council approval. Construction work to be coordinated with Fall 2006 Dover Downs expansion project. Substantial completion to be achieved by the end of calendar year 2006.	
RECOMMENDED ACTION: Waive the City of Dover purchasing policy and authorize Dover Downs to administer the time & materials contract with George & Lynch for the installation of 1,015 linear feet of a 27-inch sanitary sewer interceptor across the Dover Downs property to avoid undue disturbance or scheduling delays for the Dover Downs expansion project estimated $300,000.	

BACKGROUND AND ANALYSIS

The installation of the U.S. Route 13 East Sanitary Sewer Interceptor is a project which has been proposed for the past few years. This project would allow for the installation of large diameter gravity sewer from just south of the entrance road to Dover Downs to the Schwartz pumping station at U.S. Route 13 and West Rustic Lane. The overall project would allow for the abandonment of the Schwartz pumping station as well as the more effective re-routing of flows within the City's sanitary sewer transmission system.

The primary difficulty in implementing this project has been the obtainment of easements necessary to install the sanitary sewer interceptor. Due to the expansion project proposed at Dover Downs, the easement across this property will be finalized as part of the plan review process. Failure to take advantage of this opportunity will seriously impact the future cost of the project by requiring the City to re-route the interceptor or install it after completion of the Dover Downs expansion and cause additional costs related to penetrating a new roadway and restoring it.

In order to minimize the impact to the Dover Downs property and to coordinate the sewer installation in a timely manner with the site work proposed for the property, Dover Downs is willing to incorporate the work into the construction work proposed for their property. This would allow Dover Downs to oversee the project and coordinate work activities on their property while avoiding

potential delays due to City contractor's involvement or future disturbance on their property. The City would then reimburse Dover Downs for the cost of the sanitary sewer interceptor installation. Although Dover Downs will oversee the contract and necessary coordination on their site, the work will be inspected by Public Utilities Department inspectors as per the approved time & materials policy. The section of sanitary sewer interceptor across Dover Downs property to be installed represents approximately 20% of the overall U.S. Route 13 East Sanitary Sewer Interceptor project.

The construction of the sanitary sewer on the Dover Downs property will be implemented through a time & materials contract between Dover Downs and George & Lynch. The time & materials contract awarded to George & Lynch by Kent County is effective through June 30, 2007. George & Lynch has prepared a cost estimate of $275,000 - $300,000 which includes 1,015 l.f. of 27-inch diameter sanitary sewer pipe, three 6-foot manholes, tie-ins to the existing main, line testing, restoration of lawns and pavement, well-pointing and select backfill. The cost of the project may slightly increase due to unforeseen problems or possibly decrease if well-pointing or the projected volume of select backfill is not required (to be determined from planned soil borings). The overall proposed cost of the project was found to be reasonable by staff based upon rates and material costs that are being experienced in relation to other projects.

Because of the need to integrate this project with the Dover Downs project, awarding the project as prescribed does not meet the standard bidding requirements of the purchasing policy or any of the listed exemptions. Therefore, a waiver of the policy is necessary.

The Public Utilities Department recommends the following:

> Waive the City of Dover purchasing policy and authorize Dover Downs to administer the time & materials contract with George & Lynch for the installation of 1,015 linear feet of a 27-inch sanitary sewer interceptor across the Dover Downs property to avoid undue disturbance or scheduling delays for the Dover Downs expansion project estimated $300,000.