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## HTETCO Replacing Existing 150 Year Old Utilities with New 3.5 Miles of Long Street Car Construction

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## SECTION I: INTRODUCTION

This Technical Paper is intended to educate the reader(civil estimator) about procedures , knowledges, tools and steps required and suggested for creating a conceptual cost estimate for replacement over 100 years old existing brick sewer, evaluate available options with conjunction to new City of Seattle building a modern streetcar system. The City of Seattle is building a modern streetcar system that will provide new mobility options, support economic growth, and strengthen connection in the urban core. Larger part of this project is replace 150 years old brick sewer and steam pipe that will provide a multiple challenge to put together comprehensive Budget Estimate with 3 basic estimate options. This overall project will fully replace or partially replace and reline over 100 years old existing brick sewer and manhole with new RCP concrete pipe and pre-cast manhole. The work may be conducted as a single project or multiple projects dependent on factors including cost, schedule sequencing, failures or external priorities. This project will maintain existing combined sewer capacity (throughout the C3 alignment, reducing the risk of mainline and service failures, while reducing the increased O&M costs that result from the streetcar.

Existing over 100 years old Sewer Rehab project-The combined sewer between Madison Street and Jackson Street consists of a bricked lined sewer of variable size. The current condition of this section of sewer is not expected to last the desired 50 year life of the street car project. This line must be repaired or replaced. The 970 foot section between Madison Street and Cherry Street is an egg shaped section measuring 22" wide by 33" high. Another 270 foot section of brick sewer between Cherry Street and Yesler Street is an egg shaped section measuring 28" wide and 42" high. The 600 foot sewer section between Yesler Street and South Main Street is an egg shaped brick sewer measuring 32" wide by 48" high. And 340 foot sewer section between South Main Street and Jackson Street is a 48" diameter round brick sewer. In addition to the above indicated item, project will consist of existing MH's replacement that located North of Madison Street and along the main proposed project location Madison to Jackson Street. FOM identified necessary repairs, rehabilitations and replacements along the C3 alignment through CCTV analysis. With the Base Case and all other options, the project team has determined that all requested work alongside C3 construction must be performed. Final decision been made to replace existing sewer with new.

### MAIN CSI MASTERFORMAT™

#### DIVISION: 33 00 00 Utilities

##### Sub-Divisions

- 01 00 00 General Requirements**
- 02 21 05 Surveys**
- 02 41 30 Site Demolition**
- 31 23 16.13 Excavation + Fill Trenching**
- 31 05 10 Aggregates for Earthwork**
- 31 41 05 Trench Shoring**
- 33 44 20 Storm Water Utility Area Drains**

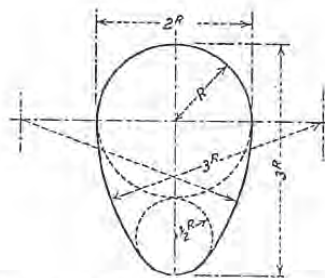


FIG. 2.—Standard Egg-shaped Section for Brick Sewer.

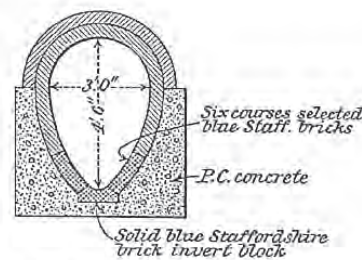


FIG. 4.—Main Sewer, Southampton.

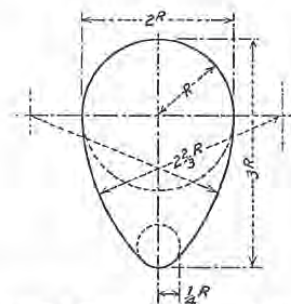


FIG. 3.—New Type of Section for Brick Sewers suited for both Small and Large Flows.

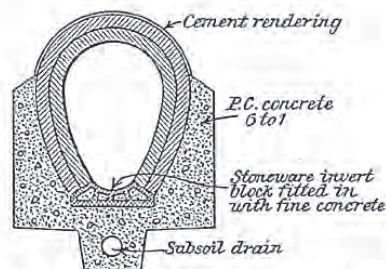


FIG. 5.—Section of Egg-shaped Sewer, showing use of Invert Block and Subsoil Drain.

Existing Brick Sewer Cross section. Sewer project been completed in December 1893.

## **SECTION 2: TYPES AND METHODS OF MEASUREMENTS**

Quantity development will be based on a CCTV Inspection and existing as-build drawings (Dated Dec 1893), takeoff made from preliminary developed plans, profiles and sewer crossing details crossing details. Main Sewer pipe line utilities are measured by length, (L.F.=linear foot), fitting associated with any pipe line are measured by the piece (E.A=each). Precast Concrete Maintenance Hole (also known as catch basin) is measured by each structure (E.A=each), and Cast in Place Maintenance Hole is measured by vertical linear feet of pouring concrete (V.LF=vertical linear feet). Support and Safety System in trench excavation are measured in square area (S.F=square feet). Bedding for Sewer pipe is measured by length, (L.F.=linear foot). In addition we are having supporting activities to the main sewer line such as Safety and Health Program is measured by Month of construction (MO=month), Maintenance and Protection of Traffic Control is measured by Day (DAY=day), and Traffic Control Peace officers are measured by hour (H.R=hour). Most of the demolition items are measured the same way as the new installed items. Consumables can be calculated from manufacturer's chart or, based upon historical job cost data. Labor is MHRs/Ft of pipe or in Manhole Structure. Fittings and specialties such as cleanout are measured in MHRs/pc. Equipment, Consumables and Labor are included in the unit prices line item base on existing database with composite crew, materials, equipment and sub-contractor cost. Quantities for miscellaneous items, such as the trenching, sand bed and backfilling estimated and measured according to past historical completed projects and existing estimating database for the unit prices.

## **SECTION 3: PROJECT SPECIFIC FACTORS TO CONSIDER**

### **Engineering Quality**

Quality of the engineering drawings is extremely important in preparation of quantity development for this particular scope of work. O&M staff have performed closed circuit television inspection of the mainline existing brick sewers and lateral connections along the alignment, and have completed work orders recommending replacements along the C3 alignment. This project was estimated using two different methods, a construction estimation approach and an

Engineering approach. The construction estimation approach evaluated equipment, materials, labor, and level of effort (work duration) to develop this cost estimate based on recent SDOT project work. The engineering approach involved direct estimating using project 60 percent design quantities and recent

SPU unit price Bid tabs.

### **Effect of Geographical location**

When putting budgetary estimate together, it is crucial to consider geographical location of the project. Due to the location of this project in very busy downtown Seattle area we need to consider the

following important factors that will definitely affect the cost:

- Higher costs for repairs if will be selected
- Higher costs for operations and maintenance and higher cost to perform repairs or replacement, as well as limited access near streetcar tracks
- Potential loss of public confidence due to infrastructure failure

In addition to the above quality labor force often depends on location and current Market condition. First, it is important to find out if skilled labor is available for the hire through the union hall. Second, it is important for estimator to familiarize themselves with the delivery workers to the job-site and how to schedule the working hrs. that will not disturb the public. The specific attention need to be taken when locating the staging and materials storage areas. Excavation and fill conditions vary widely, so their cost impact must be closely considered.

### **Construction Quantity Allowances**

Usually for this type of project quantity allowance of 10% has been applied to this estimate to protect against anticipated increases during design and through construction. The increased % can be for variations in routing and filed run changes along with delivery damages, load damages etc. The project team did evaluate feasibility of performing meaningful Value Engineering on this project considering when our first design deliverable will be available and how this fits in the overall project schedule.

### **Seasonal Effect on Work**

When working outdoors, it is crucial that you as estimator consider the working environment. You should be familiar with project schedule constraints, and labor cost factor along with at least past 10 years weather temperature in region.

## **SECTION 4: OVERVIEW OF COSTS**

**Labor:** Labor costs are calculated on a composite crew day basis and typically in this case determined by the project schedule restrains. This particular type of work most efficiently accomplished by a crew of six or more by the local Heavy and Highways/Civil Laborers Union. Labor rates do not cover contractor field indirect costs such as Mobilization and temporary facilities. All these items are included with the construction indirect cost. Estimate prepared and assumed that G.C will self-perform the work and labor burden been added into union labor rates (Fig 1).

Groups	Basic Wage	Fringes	Credit Union/Dues	Small Tools/ Consumb.- (2.5%-5%Basic)	Total/HR
Foreman	\$48.38	\$10.72	\$2.35	\$2.42	\$63.87
Operator Engineer II	\$45.88	\$10.72	\$2.35	\$1.15	\$60.10
Operator Equipment-I	\$43.39	\$10.72	\$2.35	\$1.08	\$57.54
Operator Equipment-II	\$43.39	\$10.72	\$2.35	\$1.08	\$57.54
Lead Pipe layer	\$34.76	\$10.56	\$2.35	\$1.74	\$49.41
Laborer- Apprentice-3rd	\$33.39	\$10.56	\$2.35	\$1.67	\$47.97
Laborer-Apprentice-1st	\$30.05	\$10.56	\$2.35	\$1.50	\$44.46

Notes: Fringes are as follow: H&M; Pension; Training, WALECET; WCISAP  
Credit Union/Dues are as follow: Credit Union; Working Dues; WFC

**Fig 1**

The pipe journeyman will be instrumental in the pipe installation process, as they are usually very well versed in underground utility task. In addition as always all labor forces will need appropriate small tools & supply to perform assigned work activities.

**Equipment:** Equipment necessary to provide a complete task will be mid-size in comparison to other types of combine underground sewer project and will be based on general contractor responsibilities for site excavation, installation of shoring system, pipe installation, structures installation, back-fill and compaction. Proper selection of Equipment and tools for this project very important factor for safety, efficiency and eventually for total construction overhead and profit. The main piece of equipment required to complete pipe installation will be the following: Mid-Excavator for removal existing brick sewer, digging trench, and new pipe installation; Loader for carry disposal of offsite soil, dumping back granular fill and hauling excavated spoils ;Roller for compaction and dump tracks with drivers will required as well. A generator and pump should also be included in the estimate, because there are extensive amount of dewatering in different project locations. Equipment will also include mid-size crane with operator for shoring system installation and crew mid-size track. Total List of Construction Equipment with rental rates provided below (Fig 2).

Descriptions	Make/Models	Rates/Day
Crawler Loader/7501	Bobcat T250	\$225.00
Backhoe/65-74HP	CASE 590SL	\$285.00
Crane/Carry Deck-8T	Broderson IC80-3G	\$375.00
Generator/2.9KW/Gas	MIKASA GA2.5H	\$35.00
Pump/Submersible/4" HYD	Pioneer 4HS-O	\$85.00
Track/Box Dump/3-4YD	FORD F550	\$240.00
Track/Pickup/F150CL	FORD F150	\$125.00

**Fig 2**

**Materials:** Sources of materials pricing and methods of adjusting them are essential to the estimator in creating professionally reliable cost estimate. Materials prices has been obtained from the local SPU unit Cost database, that is updated twice per Calendar year base on supplier prices catalog. Material for this task will consist of a few different commodities. The items that impact cost are as follow (See Fig 3) .After evaluating current market condition and taking into consideration the fact that that project will starts in 2018, it is not unreasonable to put a 10-20% contingency on market unit cost if the work is more than 1 year out from the current estimate. Sales Tax are included as 9.5% base on the current Settle Market for 2016 unit cost report in the summary sheet, but shipping and handling are included in the item unit cost. A quantity allowance of 10% for materials waste has been applied to this estimate to protect against any unanticipated increases during design development.



Activity	Materials/Type	Unit	Cost
PIPE REPAIR	High-strength grout	CY	\$142.50
MAINTENANCE HOLE, TYPE 211B	Pre-Cast MH type 211B	EA	\$16,500.00
Bedding, CL B, 12 IN Pipe	1/2" Clean Rock	TN	\$30.50
Pipe PSD, Conc Reinf C76 CL IV, 12IN	PSD CONC REINF Pipe C76 CL IV-12" DIA	LF	\$35.63
Bedding, CL B, 18 IN Pipe	3/4" Clean Rock	TN	\$44.53
Pipe PSD, Conc Reinf C76 CL IV, 18IN	PSD CONC REINF Pipe C76 CL IV-18" DIA	LF	\$45.25
Bedding, CL B, 24 IN Pipe	1" Clean Rock	TN	\$48.00
Pipe PSD, Conc Reinf C76 CL IV, 24IN	PSD CONC REINF Pipe C76 CL IV-24" DIA	LF	\$54.37
TEE, 12 IN, Cut-In-Existing Conc Pipe	12" PSD Concr Reinf Tee	EA	\$403.33
TEE, 18 IN, Cut-In-Existing Conc Pipe	18" PSD Concr Reinf Tee	EA	\$802.08
TEE, 24 IN, Cut-In-Existing Conc Pipe	24" PSD Concr Reinf Tee	EA	\$947.92
Pipe PSD, Conc Reinf C76 CL IV, 30IN	PSD CONC REINF Pipe C76 CL IV-30" DIA	LF	\$155.00
TEE, 30 IN, Cut-In-Existing Conc Pipe	30" PSD Concr Reinf Tee	EA	\$1,020.83
TEMPORARY SEWER BYPASS	PIPE, PS or PSS, PVC, D3034 SDR 35,15 IN	LF	\$43.33
TEMPORARY SEWER BYPASS	TEE, VCP, 10 IN	EA	\$212.50

**Fig 3**

After tabulation and explanation of the direct cost for this project you as an Estimator will have to begin the consideration of indirect cost, that consist of many variables such as supporting activities and overhead and profit.

**Indirect Cost:** Indirect cost is usually considered to be costs that are necessary to complete any construction project and is consist of 2 (two) additional supporting cost to the direct or hard project cost in our business. This cost include the supporting activities that area needed to main scope of work, but are not directly attributable to productive labor. This cost in our Estimate include the following supporting activities: Mobilization; Survey; Safety and Health Program; Traffic Control Peace Officers; Construction Storm Water & Erosion Control Plan and Tree Vegetation & Soil Protection Plan and Soft Cost which include Engineering Design, Permitting, Coordination with Residents, Property acquisition cost, Legal Fee, Economical Analyst of Life Cycle. All overhead and profit cost are allocated in the each line item unit cost base on existing historical Database For this Estimate we are included 10% of overhead and 5% of profit.

**Approach:** Approach is basically the plan of action. Each Budget Estimate for Underground Utility work need to maintain special approach. You as an estimator will need to be confident that you do understand the scope of work as well as schedule constrains .After fully agree with the Designers and understand the project scope, you might begin QTY take off process base on proposed profile layout and 100 years old as-build drawings. The take-off is basically a quantity survey where you literally count all items that impact the cost of the project.

**Project Reserve:** This include the combination of Contingency Reserve and Management Reserve. Contingency is an amount added to the Direct Estimating Cost to cover identified risk events that occur on the project, excluding changes in project scope; Management Reserve is an amount added to the Base Cost to cover unidentified risk events that occur on the project, including minor changes in project scope. Examples of Contingency Reserve and Management Reserve for this Estimating task are provided below:

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- Contingency Reserve is estimated at 15% of the Direct Cost Total.
- Management Reserve is estimated 10% per the Direct Cost Total.
- Total reserves are estimated at 25% of the direct cost or about 50% of the construction line items.

### SECTION 5: SPECIAL RISK CONSIDERATION

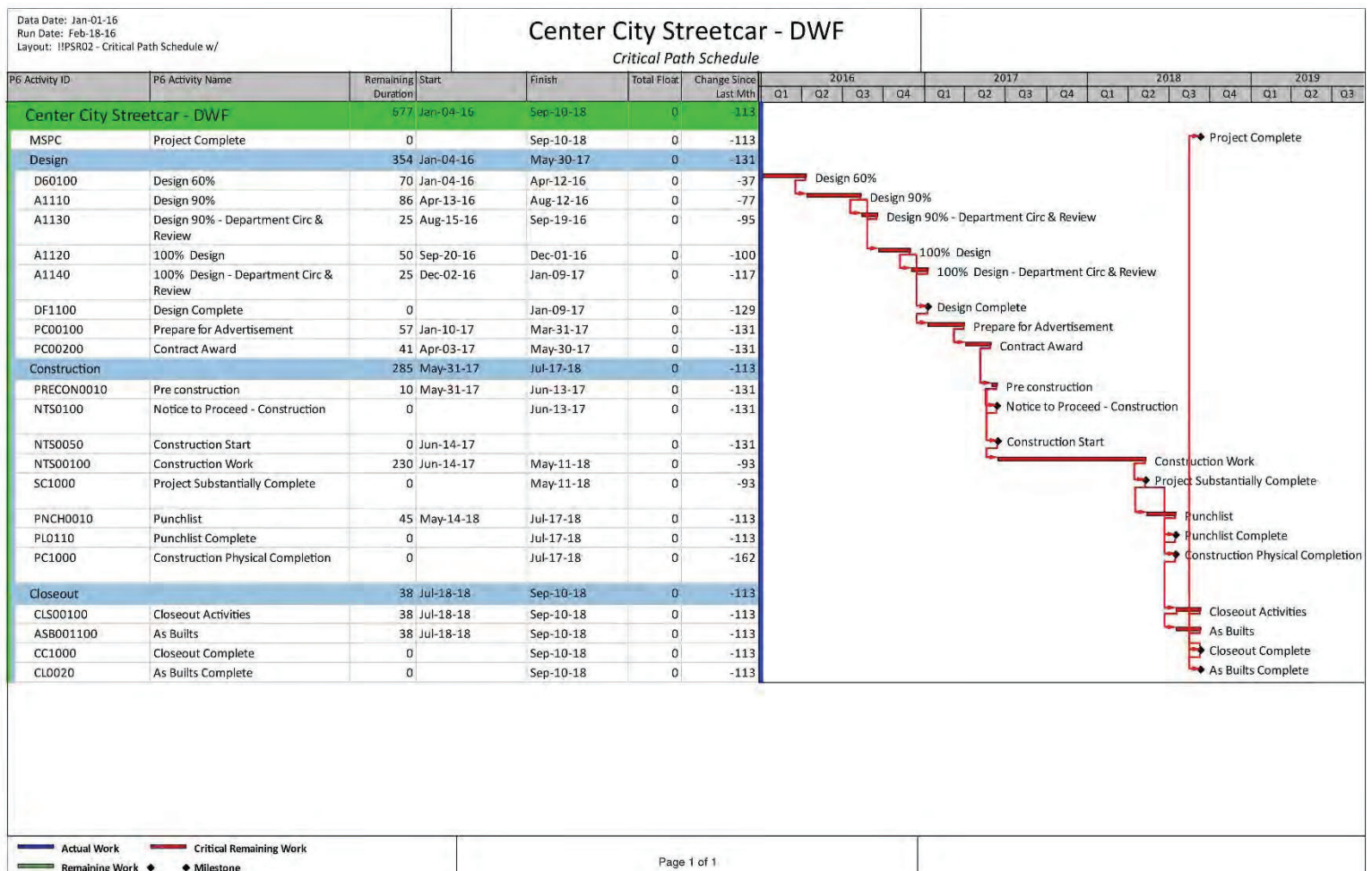
#### Construction Schedule

It is very important to start scheduling construction activities in the early stage of design. The planning of all critical path construction activities should be prepared well in advance in Design phase with proper coordination of main player for the project the Department of Transportation whose starting activities for the related segment will be fully depends on completing activities for Underground Sewer work. Total project schedule for this project consisting for 29 activities and commenced to complete by August 21, 2019. Schedule Calendar been build base on 40 Hour Week/8hr/day work load. Project Schedule is showing below.

#### Construction Facilities

Sewer replacement which is considers the underground utilities in general always present a contractor with great deal of risk consideration. Estimator is better to judge all type of risk factors and include all assumptions in the unit cost along with the indirect cost into the Estimate.

- Estimating project cost without Construction Drawings and only using 60% Design Development along with completed base map and 100 years old as-build technical Drawings.
- Work in downtown very busy street along with having into consideration the noise barrier , extended working hours, multiple coordination with residents and business owners created the higher than usual risk.
- Risk potential of unforeseen existing utilities such as gas, Steam pipe, and electrical duct bank along with communication cable.
- Rock excavation and dewatering along with the Environmental procedures will be creating another risk factors. Groundwater in the selected construction field can be very tricky and surprise when preparing the estimate and need special and careful evaluation.



## SECTION 6: RATIOS AND ANALYSIS

After the take-off has been completed, information regarding Labor, Materials and Equipment pricing been verified in historical Database and included along with the identifying special risk consideration and indirect cost the cost estimate is fully completed. The final estimate should and will be reviewed by prepared estimator for any errors, omissions and forwarded to the appropriate management parties for the final review. Ratio and analysis are calculated from historical data, and should be in the estimator library of resources in our particular example we are using 2(two) existing database-APWA and CSI. Although brick sewer replacement project is very unique and cost can vary depends on location, size of pipe and schedule restraints, estimator should develop and maintain database base on historical process from past similar projects. For example, in our estimate we will price Installation of PSD Concrete Reinforcement 12" Diameter pipe for \$98 per LF. This price comes from a combination of historical data as well as analysis of past and existing projects.

Historical Database presented partially as an example of unit prices for this Estimate.

APWA Historical Pricing DATABASE														
Bid item	Item/Description	Take-Off T	Unit	Labor Amount	% of Total	Materials Amount	% of Total	Equipment Amount	% of Total	Sub Amount	% of Total	Sub Total Unit	OH Profit %	Total Cost Unit
107005	Safety and Health Program		MO	\$180	12.0%	\$1,278	85.0%	\$45	3.0%	-	-	\$1,504	12.0%	\$2,000
109007	Mobilization Small to Mids Project value\$2.5M-\$5.0M - 6% Sub Total Const Cost		LS	\$0	71.0%	\$0	2.0%	\$0	15.0%	\$0	12.0%	\$0	10.0%	\$0
110020	TRAFFIC CONTROL PEACE OFFICERS		HR	-	-	-	-	\$9	11.0%	\$77	89.0%	\$86.36	10.0%	\$95.00
110005	MAINTENANCE & PROTECTION OF TRAFFIC CONTROL INCLUDING FLAGGING-CSI(REF)		DA	\$611.38	75.0%	\$41	5.0%	\$163.03	20.0%	-	-	\$815.17	12.0%	\$913
201303	CLEANING E ISTING PIPE		LF	\$5	35.0%	-	-	\$9	60.0%	\$0.83	5.0%	\$15	10.0%	\$17
202190	REMO E PIPE In TRENCH-Depth 10-15 FEET		LF	\$11.13	55.0%	-	-	\$9.10	45.0%	-	-	\$20.23	30.00%	\$26.30
202190A	REMO E PIPE FITTING Depth 10-15 FEET		EA	\$8.88	55.0%	-	-	\$7.27	45.0%	-	-	\$16.15	30.00%	\$21.00
202270	REMO E BRICK MH STRUCTURES		EA	\$962.50	55.0%	\$350.00	20.0%	\$437.50	25.0%	-	-	\$1,750	20.00%	\$2,100.0
207010	SAFET S STEM IN TRENCH E CA TION 7-10 Feet Deep		SF	\$0.56	45.0%	\$0.31	25.0%	\$0.38	30.0%	-	-	\$1.25	20.00%	\$1.50

## SECTION 7: MISCELLANEOUS

At this time we will use only 30% design Development Drawing which will be considered as schematic. This is totally on Estimator to develop and survey the comprehensive QTY .Having the issue with the varying of Design Development phases and incomplete Drawing, the estimator must be well knowledgeable and verses in the CSI division he is working. Many construction projects today have constrained budgets, thereby making the value engineering process an important part of most projects. In the parametric Estimate task every civil Estimator need to evaluate and exercise a few options and alternatives to effectively construct the estimate proposal. The following sample of Estimate file made up of a series rows and columns. These rows and columns contain data including quantity, activity descriptions, break-down components of activity unit cost, cost escalation factor and total Activity cost.

Summary of proposed Estimate included the following: Allowance for Indeterminates, Allowance for Market Conditions and Sales tax.

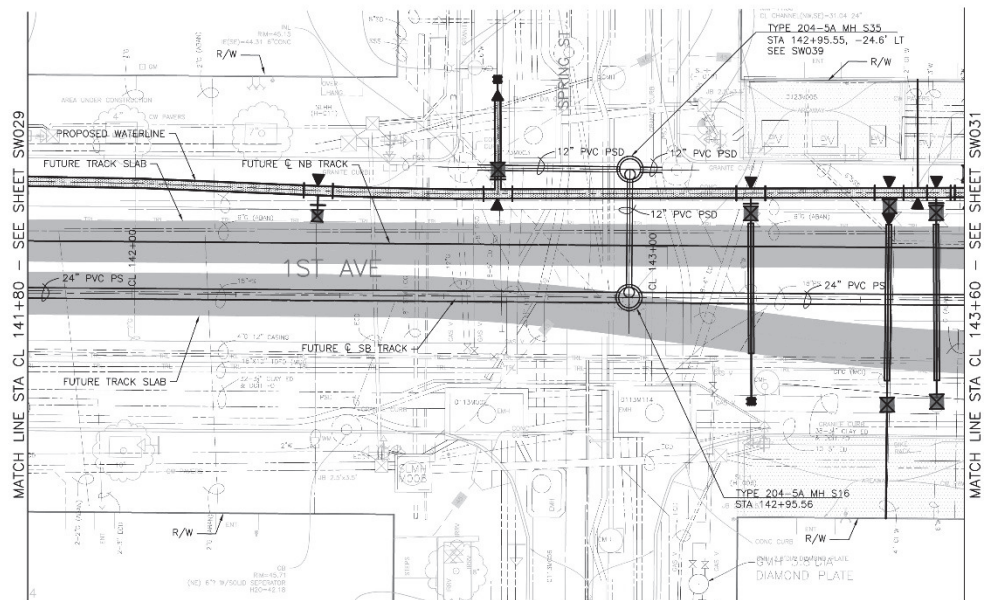
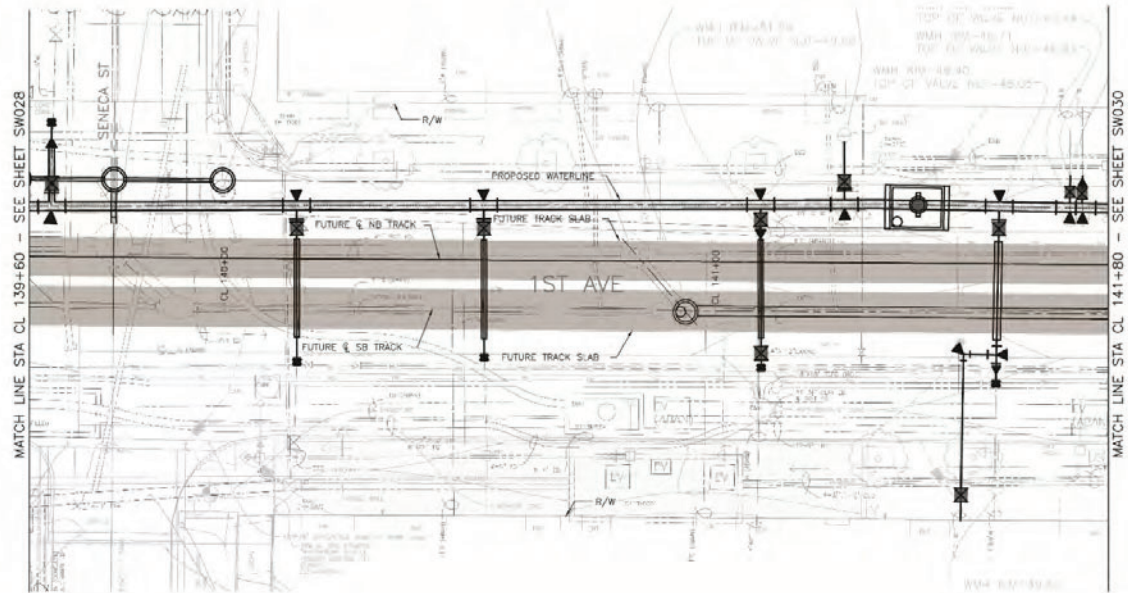
## SECTION 8: SAMPLE PLAN AND TAKEOFF

Major Take-off QTY presented below:

Item	Si e	Materials	Unit	QTY	otes/Assumptions
MOBILI ATION	Project		LS	1	Assumed % of Subtotal of all Activities (without Mob).
SURVEY	Project	Wood Stake/Rebar-Rod	DAY	80	Survey Crew(2 Man s) along with Survey Track & Instruments
SUPPORT AND SAFETY SYSTEM	7 x10	Timber Wood/Steel Frame	SF	18,900	ty take from Option Summary, Unit price new Database-Section between Cherry St & Madison St.
SUPPORT AND SAFETY SYSTEM	8 x10	Timber Wood/Steel Frame	SF	6,790	Section between Cherry St & ackson St.
MAINTENANCE HOLE-211B	Dia-11 xH-20	Pre-Cast Concrete	EA	9	ty take from Option Summary, Unit price new Database-Section between Cherry St & Madison St.
MAINTENANCE HOLE-211B	Dia11 xH-12	Pre-Cast Concrete	EA	5	ty take from Option Summary, Unit price new Database-Section between Cherry St & ackson St.
CATCH BASIN, TYPE 240A	Dia-4 xH-8	Pre-Cast Concrete	EA	2	Section between Cherry St & Madison St.
Bedding, CL B, 12 IN Pipe	1/2" Clean	Washed Gravel	LF	92	ty take from Option Summary-Section-North of Madison.
Bedding, CL B, 18 IN Pipe	1/2" Clean	Washed Gravel	LF	192	Section between Cherry and ackson Street.
Bedding, CL B, 24 IN Pipe	3/4" Clean	Washed Gravel	LF	30	Section between Madison St & ackson St.
Bedding, CL B, 30 IN Pipe	1" Clean	Washed Gravel	LF	2,180	Section between Cherry St. and Madison St. ty take from Option Summary-Section North of Madison St.
Pipe TEE, 12 IN	12" Dia	Pre-Cast Concrete	EA	5	
Pipe TEE, 18 IN	18" Dia	Pre-Cast Concrete	EA	10	Section between Cherry and ackson Street.
Pipe TEE, 24 IN	24" Dia	Pre-Cast Concrete	EA	30	Section between Madison St & ackson St.
Pipe TEE, 30 IN	30" Dia	Pre-Cast Concrete	EA	30	Section between Cherry St. and Madison St.
Pipe PSD, C76, Class IV	12" Dia	RCP ASTM C76	LF	99	ty take from Option Summary-Section North of Madison St.(with 7.5% waste)
Pipe PSD, C76, Class IV	18" Dia	RCP ASTM C76	LF	207	Section between Cherry and ackson Street.(with 7.5% waste)
Pipe PSD, C76, Class IV	24" Dia	RCP ASTM C76	LF	896	Section between Madison St & ackson St.-7.5% waste
Pipe PSD, C76, Class IV	30" Dia	RCP ASTM C76	LF	1043	Section between Cherry St. and Madison St.-7.5% waste



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## HTETCO Replacing Existing 150 Year Old Utilities with New 3.5 Miles... continued

### SECTION 9: SAMPLE TAKE-OFF

Item	APWA Bid Item	Bid Item Description	Unit	E R Escalation	Labor	Material	Equipment	2 1 Unit Price	Quantity	Unit Price E tension
1	109005	MOBILI ATION	%	0%				6%	1	\$188,817
2	105000	SURVEY	DAY	1.04	\$581.3	\$77.5	\$116.3	\$802	80.0	\$64,170
3	107005	SAFETY AND HEALTH PROGRAM	MO	1.04	\$1,300.0	\$500.0	\$200.0	\$2,070	13.0	\$26,910
4	110005	MAINTENANCE AND PROTECTION OF TRAFFIC CONTROL INCLUDING FLAGGING	DAY	1.04	\$696.0	\$43.5	\$130.5	\$900	100.0	\$90,045
5	110020	TRAFFIC CONTROL PEACE OFFICERS	HR	1.04	\$72.3	\$10.2	\$2.6	\$88	220.0	\$19,355
6	201113	CLEANING E ISTING PIPE	LF	1.04	\$12.7	\$0.8	\$2.4	\$16	2,383.0	\$39,053
7	202190	REMOVE PIPE	LF	1.04	\$10.0		\$15.0	\$26	1,117.0	\$28,902
8	202190	REMOVE PIPE FITTING	EA	1.04	\$11.0		\$9.0	\$21	50.0	\$1,035
9	202190	REMOVE PIPE	LF	1.04	\$10.0		\$15.0	\$26	970.0	\$25,099
10	202190	REMOVE PIPE FITTING	EA	1.04	\$11.0		\$9.0	\$21	80.0	\$1,656
11	202915	PIPE REPAIR(Existing)	LS	1.04				\$153,772	1.0	\$153,772
12	202270	Remove Brick MH Structures	EA	1.04	\$1,500.0	\$100.0	\$400.0	\$2,070	14.0	\$28,980
13	207020	SUPPORT AND SAFETY SYSTEM TY 500SF 6-10Feet deep	SF	1.04	\$5.4	\$4.4	\$2.2	\$12	32,340.0	\$401,663
14	208010	DEWATERING- PUMPING WATER(6" Pump) to Baker Tank Large Water Flow Capacity	DAY	1.04	\$525	\$150.0	\$825.0	\$1,553	210.0	\$326,025
15	210005	BAKFILL-SELECT MATERIALS TY 100 CY	CY	1.04	\$12	\$3.5	\$19.3	\$36	5,673.0	\$205,504
16	705072	MAINTENANCE HOLE, TYPE 211B TY 5 EA	EA	1.04	\$5,000	\$13,000	\$2,000	\$20,700	14.0	\$289,800
17	705352	CATCH BASIN, TYPE 240A	EA	1.04	\$571.3	\$1,485.3	\$228.5	\$2,365	2.0	\$4,730
18	710000	WATERMAIN PROTECTION PLAN	LF	1.04	\$170	\$20	\$10	\$207	300.0	\$62,100
19	717012	Bedding, CL B, 12 IN Pipe TY 50LF	LF	1.04	\$7.7	\$11.0	\$3.3	\$23	99.0	\$2,254
20	717413	Pipe PSD, Conc Reinf C76 CL IV, 12IN TY 50 FT	LF	1.04	\$38.0	\$38.0	\$19.0	\$98	99.0	\$9,734
21	717018	Bedding, CL B, 18 IN Pipe TY 50LF	LF	1.04	\$8.8	\$12.5	\$3.8	\$26	192.0	\$4,968
22	717418	Pipe PSD, Conc Reinf C76 CL IV, 18IN TY 50 FT	LF	1.04	\$35.0	\$45.0	\$25.0	\$109	207.0	\$22,496
23	717124	Bedding, CL B, 24 IN Pipe TY 50LF	LF	1.04	\$9.5	\$13.5	\$4.1	\$28	833.0	\$23,278
24	717424	Pipe PSD, Conc Reinf C76 CL IV, 24IN TY 50 FT	LF	1.04	\$45.5	\$52.0	\$33.5	\$136	896.0	\$121,481
25	717892	TEE, 12 IN, Cut-In-Existing Conc Pipe TY 3EA	EA	1.04	\$260.0	\$910.0	\$130.0	\$1,346	5.0	\$6,728
26	717898	TEE, 18 IN, Cut-In-Existing Conc Pipe TY 3EA	EA	1.04	\$375.0	\$1,875.0	\$250.0	\$2,588	10.0	\$25,875

27	717898	TEE, 24 IN, Cut-In-Existing Conc Pipe TY 3EA	EA	1.04	\$600.0	\$2,100.0	\$300.0	\$3,105	30.0	\$93,150
28	717130	Bedding, CL B, 30 IN Pipe TY 50LF	LF	1.04	\$10.5	\$15.0	\$4.5	\$31	2,180.0	\$67,689
29	717430	Pipe PSD, Conc Reinf C76 CL IV, 30IN TY 50 FT	LF	1.04	\$56.0	\$56.0	\$28.0	\$145	2,180.0	\$315,882
30	717900	TEE, 30 IN, Cut-In-Existing Conc Pipe TY 3EA	EA	1.04	\$875.0	\$2,275.0	\$350.0	\$3,623	30.0	\$108,675
31	717985	TEMPORARY SEWER BYPASS Length-2500-4500 FT	LS	1.04	\$28,000	\$20,000	\$32,000.0	\$82,800	1.0	\$82,800
32	717990	TELEVISION INSPECTION-CCTV-FOM REPAIR	LF	1.04	\$3.2	\$0.4	\$0.6	\$4	970.0	\$4,267
33	722034	RELINING E ISTING SEWER PIPE EGG SHAPED & ROUND SECTION (28"x42",32" x48" and 48" DIA)	LF	1.04	\$76.5	\$59.5	\$34.0	\$176	1,210.0	\$212,900
34	801001	Construction Storm Water & Erosion Control Plan-CSECP Project Value \$1-\$3M	LS	1.04	\$17,800	\$3,337.5	\$1,112.5	\$23,029	1.0	\$23,029
35	801002A	Tree Vegetation & Soil Protection Plan-TCSPP Plan-CSECP Project Value \$3-\$5M	LS	1.04	\$8,400.0	\$1,575.0	\$525.0	\$10,868	1.0	\$10,868

<b>Construction Line Item Pricing</b>	<b>3, 3,</b>
Allowance for Indeterminates	\$3,867,110
Adjustment for Market Conditions	\$4,060,465
<b>Construction Bid Amount</b>	<b>, , 5</b>
Sales Tax %	\$4,446,209
<b>Construction Contract Amount</b>	<b>, , 2</b>