Stantec

Woodward 3rd Party Review – Capital Construction Cost Review

September 25, 2023

Prepared for:

City of Hamilton

Prepared by:

Stantec Consulting Ltd.
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165640394

Revision	Description	Author		Quality Check		Approved By	
0	Draft	HH PK		MK		MK	
1	Final	HH				MK	

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Prepared by _____

(signature)

Hailey Holmes, M.E.Sc., E.I.T., Stantec

Prepared by _____

(signature)

Paul Kusiar, C.E.T., Kusiar Project Services

Approved by _____

(signature)

Mike Kocher, P.Eng., Stantec

Executive Summary

Stantec Consulting Ltd. was retained by the City of Hamilton (City) to conduct a 3rd party review of the proposed Phase 2 upgrades at the Woodward WTP. Recently, the City has undertaken a number of studies related to the Phase 2 upgrades project.

This report presents a review of the conceptual cost estimate developed by Stantec and Kusiar Project Services (KPS) for the Woodward WTP Phase 2 Upgrades.

Using the City's previous council report as a guideline for reporting, the following table summarizes the overall cost estimate for the Phase 2 Upgrades at Woodward WTP:

Table E-1-1: Cost Estimate for Woodward WTP Phase 2 Upgrades (excluding engineering, inflation and contingencies)

Process	Opinion of Cost
Low Lift	$18,100,000
Temporary Pre-Treatment	$17,100,000
Pre-Treatment	$62,486,000
Filter to Waste	$16,100,000
Backwash System	$15,100,000
Filter Underdrains	$7,100,000
Filter Media	$15,100,000
UV Disinfection	$110,223,000
Chlorine Building	$21,100,000
Miscellaneous	$5,100,000
Total (2023 Dollars, not including inflation, engineering, and contingency)	***$287,509,000***

The total opinion of cost comes to $287.5M and does not include contingency, engineering or inflation, assuming one construction contract at current 2023 rates. Based on the current stage of the project, it is expected that this estimate will be refined and change over time as the scope of the project is better defined. There is no current indication that construction cost increases will slow, but if stabilized they will continue to be subject to inflation which is difficult to accurately forecast. This initial capital cost estimate was then input into the City of Hamilton's CCE Vertical Project Cost Estimate Worksheet V1.2, which provided a final total project cost of $514.6M.

Stantec provided a recommendation to split the construction contract into two phases, a phase 2A and a phase 2B. Phase 2A prioritizes upgrades that improve protection of public health, including filter upgrades and the UV building. Two construction contracts would result in the following capital cost breakdown:

Table E-1-2: Phase 2A Capital Cost Estimate

Process	Opinion of Cost
Filter to Waste	$16,100,000
Backwash System	$15,100,000
Filter Underdrains	$7,100,000
Filter Media	$15,100,000
UV Disinfection	$110,223,000
Chlorine Building	$21,100,000
Miscellaneous	$2,550,000
Sub-total Phase 2A (2023 Dollars, not including inflation, engineering, and contingency)	***$187,273,000***
Total Phase 2A (2027 Dollars, including inflation, engineering, and contingency)	**$335,200,000**

Table E-1-3: Phase 2B Capital Cost Estimate

Process	Opinion of Cost
Low Lift	$18,100,000
Temporary Pre-Treatment	$17,100,000
Pre-Treatment	$62,486,000
Miscellaneous	$2,550,000
Sub-total Phase 2B (2023 Dollars, not including inflation, engineering, and contingency)	**$100,236,000**
Total Phase 2B (2032 Dollars, including inflation, engineering, and contingency)	**$208,800,000**

Including the City of Hamilton's CCE Vertical Project Cost Estimate Worksheet V1.2 factors for inflation, engineering, and contingency, the total Phase 2A cost estimate is $335.2M assuming construction start date of 2027, and total Phase 2B cost estimate is $208.8M assuming construction start date of 2032.

Table of Contents

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 BACKGROUND

The Woodward Water Treatment Plant (WTP) provides potable water for the City of Hamilton and some communities in Halton and Haldimand. The plant was originally constructed in 1931 and expanded in the late 1950s. The treatment process includes intake chlorination for seasonal zebra mussel control and year-round pathogen inactivation, screening, pre-chlorination for pathogen inactivation ahead of pre-treatment, coagulation with polyaluminum chloride (PACl), flocculation, conventional gravity sedimentation, granular activated carbon (GAC) filtration, post-filter chlorination for primary and residual disinfection, ammoniation to form chloramines for residual maintenance, and fluoridation. The current rated capacity of the WTP is 909 MLD.

The AECOM 2022 Conceptual Design Report for Phase 2 of the upgrades includes the following:

- Low lift pumps: replace three of the four existing pumps in low lift pump spots #1 – 4 with three (two variable speed, one constant speed) pumps, replace the starters for the two existing large constant speed pumps with VFDs, relocate existing pump 1 to pump 5 or 6.
- Rapid mixing and flocculation tanks: raise the roof slab of the rapid mixing tanks and flocculation tanks No. 1 and 2, construct an additional third-stage flocculation tank within the sedimentation tank, relocate starters and mixers; install VFDs for all flocculation mixers.
- Sedimentation tanks: install plate settlers within sedimentation tanks no. 1 and 2, demolish roof slab of sedimentation tanks no. 1 and 2 and construct a superstructure above the plate settler zone, install automated sludge removal systems, construct and demolish a temporary sedimentation tank No. 5 with temporary relocation of existing access road.
- Filtration: replace the underdrains in 23 filters, replace the GAC and sand media in 24 filters, refurbish 23 filters, construct two backwash tanks and install backwash pumps within the UV building, install duty blowers within the UV building and air scour headers to the filter building, install a de-chlorination system within the UV building.
- UV Building: construct a UV building to house a UV vault with up to six 1200 mm diameter UV trains, sized for future UV oxidation reactors, but installed with disinfection reactors, construct two new chlorine contact tanks with serpentine baffles, and incorporate the backwash and air scour systems within the new building.

1.2 PROBLEM STATEMENT

The construction cost estimate for the Phase 2 Upgrades project had previously increased from $165M (CH2M HILL, 2016, pre-conceptual design) to the recent estimate of $385M (AECOM, 2022). Stantec will provide an independent review and update to the overall capital cost estimate, incorporating additional project scope, market factors (inflation), and considering timing of construction.

1.3 OBJECTIVES

The 3rd party review of the conceptual design capital cost estimate is intended to assist the City with the capital cost budgeting and planning. The purpose of this review is to assess if there are major gaps or assumptions that can be identified within the conceptual design estimate that could significantly impact final construction costs.

1.4 APPROACH

The conceptual design cost estimate is presented in Section 2.0.

Stantec and Kusiar Project Services' review of the existing cost estimate is presented in Section 3.0.

Construction inflation is discussed in Section 4.0.

CCE workshop review is discussed in Section 5.0.

Conclusions are presented in Section 6.0.

2.0 REVIEW OF PREVIOUS COST ESTIMATES

The AECOM conceptual design report (2022) included a construction cost estimate of $242M before engineering, contingency, and level-of-accuracy impacts (30%). With the addition of contingencies and level-of-accuracy impacts, the estimate rose to $368M, excluding engineering and inflation. There were several other major exclusions regarding the 2022 cost estimate. These include but are not limited to:

- Additional LLPS works (i.e. replacement of the remaining 3 large pumps, upgrades to the facility). Additional study and pump testing was recommended.
- New chlorine building works (conceptual design completed by Stantec, 2022).
- Filter-to-Waste works (conceptual design completed by Jacobs, 2022).
- Any works related to effluent pump station improvements (known hydraulic bottleneck).
- Major concrete rehabilitation / repairs to sedimentation tanks.

The Council Report (PW22078) cost estimate, dated September 2022, included line items for the chlorine building, miscellaneous upgrades, and engineering, but excluded contingencies and inflation. The cost estimate was a total of $348M.

3.0 STANTEC/KPS REVIEW OF COST ESTIMATE

3.1 BACKGROUND

KPS assembled the Opinion of Cost based on information provided within the previous conceptual designs completed by Jacobs and AECOM. Where information was deemed insufficient to sufficiently prepare costing estimates, assumptions were made based on a variety of previous projects in similar size and scope.

Further, the “construction community” typically working on these types of projects was consulted to gain a better understanding of current pricing on large scale multi-year projects, gather current information on materials specific to inflation, and gather current vendor pricing for as many items as possible. It is not currently known whether the City will elect to issue this project as one large contract or if it will be split in two smaller projects, however, for the purposes of this exercise an estimate was developed based on one construction contract from start to finish using today’s market value pricing.

High prices were observed in all areas of the estimate, with some signs of stabilizing but no signs of any significant reductions in the near future. Significant price increases worth noting include concrete, which has risen in price significantly more quickly recently than has been historically observed. Stainless steel pricing has stabilized somewhat due to the Euro conversion rate; stainless steel pricing has an influence specifically on the plate settlers. Stainless steel pricing could become more volatile again when this project reaches the tender stage – it is recommended to update the estimate frequently. The City could gather updated costing information or engage a consultant to provide quarterly updates as construction draws closer and the design evolves. As the detailed design progresses, an estimation team could update all quantities and track the market for current pricing. Additionally, the contractor community should be engaged for current market pricing regularly as part of this undertaking.

3.2 UV BUILDING

KPS has previously recommended the City move away from large diameter CPP and construct a CIP conduit system for water conveyance. The UV Building cost estimate was developed assuming the City has accepted this recommendation. While the UV building design will not result in a complicated build, the scope is complex considering the amount of buried services in the surrounding area that will need to be relocated or managed prior to or during construction. The civil works portion of the estimate was quantified by calculating excavation quantities, concrete volumes, backfilling and disposal quantities and the complexity of concrete forming types. The wall areas of the super-structure were used to determine an accurate quantity of concrete and values were factored in. Overall pricing was straight forward to estimate, however, assumptions were required for the electrical portion of the cost as limited detail was provided in the conceptual design. Assumptions included minor adjustments to the main incoming high voltage service in terms of fuse sizing at the 27.6 kV level, a new sub-station/switchgear, and 600V distribution throughout. The primary process equipment was quoted by Trojan UV’s local representative

Jeff Dobbin of H2Flow Equipment Inc. The pricing is current as of April 2023 and the high level quotation for the UV equipment is included in Appendix B.

The cost estimate for the UV building, excluding engineering, inflation and contingencies, is $110.2M.

3.3 SEDIMENTATION

The sedimentation tank upgrade is a large undertaking with many associated unknowns. The cost estimate was developed under the assumption that plate settlers would be installed in the existing sedimentation basins, per the AECOM conceptual design report and drawings. The number of removals was quantified, and demolition values from other projects were used to develop a demolition cost estimate. For the modifications to occur as planned, both sedimentation tanks must be removed from service - this assumption was carried through the cost estimate development. If the City proceeds with the tank modification as detailed in the conceptual design, it is recommended to engage a professional demolition contractor to prepare a formal quotation and scope of work for inclusion in the tender documents. There will be strategic removals that must be made while maintaining the integrity of the remaining structure; it is highly recommended to engage an independent firm local to the Greater Toronto Area (GTA) and capable of managing a demotion of this size and complexity.

In addition to current pricing from local contractors, a quotation from a local vendor for the plate settler system was included in the quotation. Scott Lenhardt, P. Eng. of Pro-Aqua Inc. provided a budgetary quotation for the plate settler system, included in Appendix B.

The budgetary estimate for the sedimentation tank works was prepared based on major sub tasks including demolition & removals, excavation, concrete, process, mechanical and electrical. The total estimate for the sedimentation tanks (including temporary pre-treatment system and a new super structure) is $79.6M, excluding contingency, engineering and inflation.

3.4 FILTRATION

The filter building estimate includes a full replacement of all underdrains, media, and a significant amount of surficial concrete restoration. Recent restoration pricing from other active projects was used as a basis for the cost estimate. A contractor and vendor were consulted to confirm the construction approach in terms of pricing and schedule. Bennet Mechanical (Bennett) and Continental Carbon (Continental) provided budgetary quotations for the materials. Bennett confirmed the approach referenced previous work in the filter building at Woodward WTP while Continental quoted the media and underdrain replacement including labour and material. Jacobs was retained to complete a preliminary design for installation of filter-to-waste within the filter building; their conceptual cost estimate was updated and included in the overall estimate.

The budgetary estimate for filter underdrain replacement and concrete restoration is $7.1M, for filter media replacement is $15.1M, and for filter-to-waste is $16.1M.

3.5 CHLORINE BUILDING

The new chlorine building conceptual design and cost estimate were previously prepared by Stantec. The cost estimate included in the overall Phase 2 upgrades is $21.1M.

3.6 OVERALL ESTIMATE

Using the City's previous council report as a guideline for reporting, the following table summarizes the overall cost estimate for the Phase 2 Upgrades at Woodward WTP:

Table 3-1: Cost Estimate for Woodward WTP Phase 2 Upgrades, excluding engineering, inflation and contingencies

Process	Opinion of Cost
Low Lift	$18,100,000
Temporary Pre-Treatment	$17,100,000
Pre-Treatment	$62,486,000
Filter to Waste	$16,100,000
Backwash System	$15,100,000
Filter Underdrains	$7,100,000
Filter Media	$15,100,000
UV Disinfection	$110,223,000
Chlorine Building	$21,100,000
Miscellaneous	$5,100,000
Total (2023 Dollars, not including inflation, engineering, and contingency)	***$287,509,000***

The total opinion of cost comes to $287.5M and does not include contingencies, engineering and inflation, assuming one construction contract at current 2023 rates. It is expected that this estimate will change over time. There is no current indication that construction cost increases will slow, but even if stabilized they will continue to be subject to inflation which is difficult to accurately forecast. This initial estimate was used in the City of Hamilton's CCE Vertical Project Cost Estimate Worksheet V1.2, which provided a final total project cost of $514.6M.

The CCE spreadsheet factors in project contingencies, inflation, engineering costs, and land costs where applicable. An inflation factor of 3% was assumed; refer to Section 4 for further information.

3.7 TWO CONSTRUCTION CONTRACTS

Stantec provided a recommendation to split the construction contract into two phases, a phase 2A and a phase 2B. Phase 2A prioritizes upgrades that improve protection of public health, including filter upgrades and the UV building. Two construction contracts would result in the following capital cost breakdown:

Table 3-2: Phase 2A Capital Cost Estimate

Process	Opinion of Cost
Filter to Waste	$16,100,000
Backwash System	$15,100,000
Filter Underdrains	$7,100,000
Filter Media	$15,100,000
UV Disinfection	$110,223,000
Chlorine Building	$21,100,000
Miscellaneous	$2,550,000
Sub-total (2023 Dollars, not including inflation, engineering, and contingency)	***$187,273,000***
Total Phase 2A (2027 Dollars, including inflation, engineering, and contingency)	**$335,200,000**

Table 3-3: Phase 2B Capital Cost Estimate

Process	Opinion of Cost
Low Lift	$18,100,000
Temporary Pre-Treatment	$17,100,000
Pre-Treatment	$62,486,000
Miscellaneous	$2,550,000
Sub-total (2023 Dollars, not including inflation, engineering, and contingency)	**$100,236,000**
Total (2023 Dollars, including inflation, engineering, and contingency)	**$208,800,000**

Including the City of Hamilton's CCE Vertical Project Cost Estimate Worksheet V1.2 factors for inflation, engineering, and contingency, the total Phase 2A cost estimate is $335.2M assuming a construction start date of 2027, and total Phase 2B cost estimate is $208.8M assuming a construction start date of 2032. Stantec strongly recommends prioritizing upgrades that improve protection of public health, including filtration upgrades and the new UV building. Discussion surrounding the possibility of delaying the UV building occurred during the final workshop with the City of Hamilton. Careful consideration should be given to delaying the UV building upgrades from both constructability and process risk perspectives; the process risks associated with the UV building are well documented in previous technical memos. Should the UV building be delayed to Phase 2B, a new location for the backwash pumps and air scour equipment required for the filter upgrades would be needed as the current conceptual design places the equipment in the UV building. Consideration needs to be given to buildings and equipment with overlapping functionality.

4.0 CONSTRUCTION INFLATION

Non-residential construction inflation is significant. The 11-census metropolitan area (CMA) composite for non-residential construction cost increased 12.5% in 2022 compared to 2021, representing the highest annual increase since the beginning of the Non-Residential Building Construction Price Index in 1981[1].

Higher costs for steel and concrete have primarily led the non-residual construction price growth. Structural steel framing alone increased by 2.5% in Q4 2022, compared to Q3 2022, followed by concrete and metal fabrications which were both up by 2.3%. The cost to build bus depots with maintenance and repair facilities and factors rose the most in the 11-CMA composite (up by 1.9%).

Supply chain disruptions that started during the COVID-19 pandemic continued to impact the construction industry in 2022. The generalized increase in fuel prices has also impacted the industry. Wood, plastics, and composites recorded one of the largest year-over-year increases. These factors, along with the growth in prices of structural steel framing, concrete, and metal fabrications, led the rise in construction material costs.

[1] Statistics Canada. *Building construction price indexes, fourth quarter 2022*. February, 2023. The Daily — Building construction price indexes, fourth quarter 2022 (statcan.gc.ca)

5.0 CCE WORKSHOP REVIEW & DISCUSSION

The City of Hamilton Construction Cost Estimating (CCE) worksheet was reviewed and its impact on the construction cost estimate assessed.

Using a starting point of a construction inflation rate of 3% and engineering inflation rate of 3% per the City's current inflation factors, in addition to the allowances and contingencies referenced in the worksheet, the overall total cost estimate increased to $514.6M.

The largest contributors to the increased costs produced with the CCE worksheet relative to AECOM estimate included project contingency (construction) at $72M, construction inflation (3 years at 3%) at $51M, and the overall consultant costs (including permits/approvals, contingencies, etc.) at $61.6M.

The CCE worksheet includes a Construction Contingency allowance of 25%. Although this may seem high for a project of this size and magnitude, based on the current conceptual level design, this is an appropriate amount to carry until the scope of the project is further refined and detailed design progress. Typically, a conceptual or schematic level design cost estimate (Class D) is considered to have a +/- 20 – 25% level of accuracy.

5.1 PREVIOUS COST ESTIMATES

Previous estimates have been provided to the City by CH2MHill (2015) and AECOM (2022). Works included in each of the estimates is summarized in Table 5-1. The scope of the work was expanded between the CH2M Hill analysis in 2016 and AECOM's conceptual design in 2022, as well as further detail provided resulting in expected increases in estimated capital cost.

Table 5-1: Woodward WTP Phase 2 Upgrades Consultant Comparison

Works	CH2M Hill	AECOM	Stantec
LLPS		X	X
Rapid Mixers and Flocculation Mixers		X	X
Flocculation Tank Tertiary Stage		X	X
Sedimentation Tank 1 and 2 Plate Settlers	X	X	X
Sedimentation Tank 1 and 2 Superstructure	X	X	X
Temporary 5th Sedimentation Tank		X	X
Backwash Pumps and Aeration for 24 Filters	X	X	X
Refurbishment of 23 Filters	X	X	X
Filter Underdrain Replacement of 23 Filters	X	X	X
Filter Media Replacement of 23 Filters	X	X	X
Filter Effluent Headers and Treated Water Headers		X	X
UV Building	X	X	X

Works	CH2M Hill	AECOM	Stantec
New Backwash Pumps and Tanks		X	x
New Chlorine Contact Tanks	X	X	X
Yard Piping		X	X
Miscellaneous	X	X	X

A comparison of the previous estimates, with Stantec's estimate, is provided in **Table 5-2**. Additional contingency and inflation factors are included in the Stantec estimate per the City's CCE worksheet.

Table 5-2: Consultant Cost Estimate Comparison

Conditions	CH2M Hill ($M)[2]	AECOM ($M)[3]	Stantec ($M)
	Not provided	242 (2022 $)	287.5 (2022 $)
Estimate with contingency and/or inflation	93.8 (2015 $) 112.8 (2022 $)	368 (2022 $)	514.6 (2022 $)
Contingency and/or inflation included	• 15% contractor fees • 20% design contingency • 10% construction contingency	• 2% provisional cash allowance • 15% tender contingency • 30% level of accuracy contingency	• 3% construction inflation annually through 2027 • 3% engineering inflation annually through 2027 • 25% construction continency • 15% design and contract administration

[2] Final Summary Report, Woodward WTP Capital Works Implementation Plan. CH2M Hill. April 2016.
[3] Woodward WTP Upgrades Conceptual Design Report. AECOM. September 2022.

6.0 CONCLUSIONS

In conclusion, the Stantec team has evaluated the construction cost estimate associated with the Phase 2 upgrades project at the Woodward WTP.

It is anticipated that the construction cost will rise to $514.6M, including engineering, contingencies and inflation. If the construction contracts are split into Phase 2A and Phase 2B as recommended by Stantec, the anticipated constructions costs are $335.2M and $208.8M, respectively.

APPENDIX A
CAPITAL COST REVIEW WORKSHOP MEETING MINUTES

Stantec

Meeting Notes

Woodward WTP 3rd Party Review – Capital Cost Review Worksop

Project/File: 165640394
Date/Time: April 21, 2023 / 11:00 am – 1:00 pm

Location: MS Teams

Next Meeting: TBD

Attendees:

City of Hamilton
Stuart Leitch (SL)
Bill Docherty (BD)
Deborah Goudreau (DG)
Trevor Marks (TM)
Jason Fox (JF)
Richard Fee (RF)

Stantec
Michael Kocher (MK)
Hailey Holmes (HH)

KPS
Paul Kusiar (PK)

Absentees: None

Distribution: Attendees

	Item	Action
1	• The AECOM conceptual design report cost estimate was reviewed. • SL confirmed that the cost estimate presented at the council meeting in September 2022 did not include contingencies and inflation, only the total estimate for engineering and construction.	Info
2	• The cost estimate developed by Stantec and KPS was reviewed.	Info

	Item	Action
	• MK noted that this estimate is assuming plate settlers move forward as the sedimentation technology. • PK noted that soils costs could be reduced by developing a soil management plan in advance of construction as soil disposal costs are currently very high. • PK noted that estimate was prepared separately from AECOM's estimate. • PK noted concrete costs have doubled in recent years and accounts approximately $47M for the full project. • KPS consulted with Bennett, Continental Carbon, etc for updated costing for updates in the filter building including underdrains and media. • SL inquired whether the underdrain style quoted was AWI SS style. PK confirmed. PK clarified the media costing was $2.5M per quad (set of 4 filters) to purchase and install new media. SL requested to view the quotation from Continental Carbon. • The total cost estimation was determined to be $287.6M. With contingency, and construction and consultant inflation, the total project cost is estimated at $554.7M. • SL noted the high contingency is standard for City of Hamilton project management. Through pre-design and detailed design, the City carries lower contingency values as estimate precision increases. • SL noted FTW and LLPS changes included in cost and inquired whether other exclusions included in costs such as rehabilitation work in sed tanks and clearwells. MK clarified those costs have not yet been included. SL requested costs to be included to provide a full complete estimate. • MK noted the biggest cost difference between Stantec and AECOM estimate is pre-treatment and UV disinfection building costs. • SL inquired whether Stantec could provide a high level understanding of lifecycle comparison of DAF and plate settlers with a decision matrix using contingency.	KPS Stantec
3	• MK presented a discussion on construction inflation. • Non-residential construction cost increases have been > 10% year over year since 2020, with biggest increases in structural steel framing, followed by concrete and metal fabrications. • SL noted the contingency and inflation will be included when presenting project to council this coming summer.	Info

	Item	Action
4	• SL inquired about the low inflation cost carried for consultant. MK noted this is fairly standard for the industry and not expecting to see large increases in coming years. • SL noted that based on recent construction contracts, it does appear the industry may be slowly calming down. MK noted these are 1-2 year contracts which may skew the trend. PK noted that with they have seem some stabilization recently. • MK recommends engagement with large GCs, informing and updates, until tender goes out. • MK inquired whether there are ways to include material fluctuation clauses into a traditional design, bid, build contract. PK noted there are. SL noted this would need to be done carefully – not issuing a blank cheque. • TM requested clarification for exclusions: high lift pumps, concrete restoration on sedimentation tanks and clearwells. PK clarified 2000 m^2 of surficial repairs was included in the filter estimate. • SL requested the breakdown of cost estimate. PK confirmed this can be provided.	Info Stantec/KPS

The meeting adjourned at 11:55AM.

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Best regards,

STANTEC CONSULTING LTD.

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Environmental Designer
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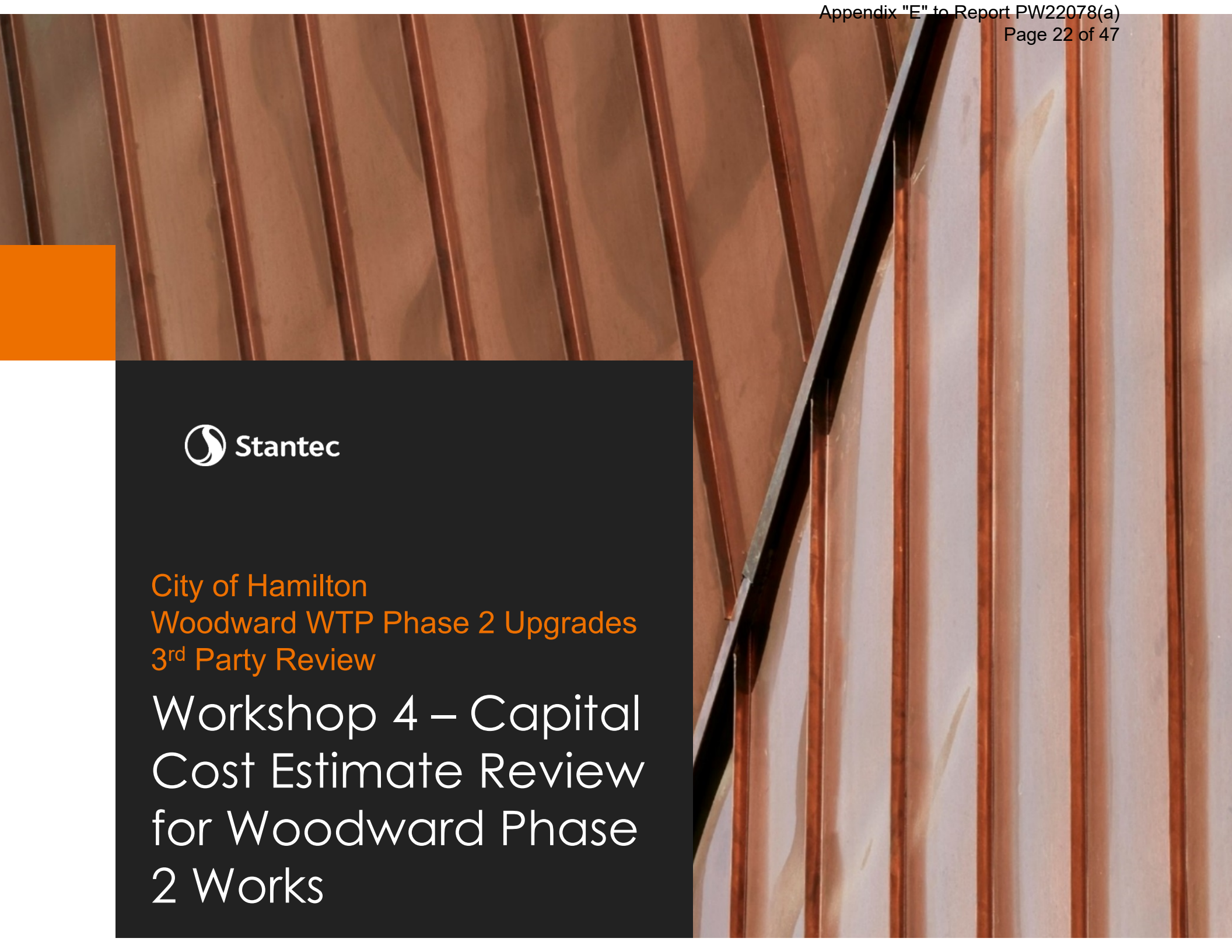
Attachment: Workshop presentation, cost estimate breakdown



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City of Hamilton
Woodward WTP Phase 2 Upgrades
3rd Party Review

Workshop 4 – Capital Cost Estimate Review for Woodward Phase 2 Works

Agenda

1. Introductions
2. Review Previous Estimates (AECOM, PW22078)
3. Stantec / KPS review of Cost Estimate
4. Construction Inflation Discussion
5. CCE Workshop Review & Discussion
6. Next Steps

Introductions

Stantec Team

- Mike Kocher: Project Manager
- Paul Kusiar: Constructability Lead
- Hailey Holmes: Process Engineering Support

Recent Estimates

Recent Estimates

AECOM Concept Design Report

- $242M before Engineering, Contingences, and Level-of-Accuracy Impact (30%)
- Inflation not included
- $368M including Contingencies and Level-of-Accuracy Impact. Did not include Engineering or Inflation.
- Major exclusions from AECOM estimate:
  - Additional LLPS works (i.e. replacement of remaining Large 3 pumps, upgrades to facility). Additional study and pump testing were recommended.
  - New Chlorine Building works (Stantec concept design)
  - Filter-to-Waste works (Jacobs concept design).
  - Any works related to Effluent Pump Station improvements (known bottleneck)
  - Major concrete rehabilitation / repairs to sedimentation tanks

Recent Estimates

PW22078 – Sept 19, 2022

- Built further off the AECOM concept design estimate
- Included line items for Chlorine Building, Misc. Upgrades, and Engineering (?)
- Excluded Contingencies and Inflation
- $348M total estimate
- Notes within PWC report:

HW is undertaking a third-party review of key areas that are deemed critical to the success of this project as part of a due diligence approach. The main project scope of this review includes:

- *Capital Construction Cost Review of the WTP Phase 2 Process Upgrades capital budget evolution from the CH2M Hill 2016 Study to the current AECOM 2022 conceptual design. The review will focus on additional scope identified during the AECOM 2022 conceptual design. Other factors will also be assessed including labour shortages, complex project sequencing, supply chain challenges, excess soil regulations, material costs and escalating inflation.*

Stantec / KPS Cost Estimate Review

Stantec / KPS Cost Estimate Review

Cost Estimate Development Review

- Paul Kusiar from KPS to walk through cost estimate development
- Focus of bottom-up cost estimate development was primarily on Sedimentation Tank Upgrades (Plate Settlers), Filter Building Upgrades, and UV Building Upgrades.
- Used combination of take-offs for Concrete, Steel, and Civil Works, discussions with large Contractors on current material cost rates, as well as updated vendor quotations for key components (i.e. Plate Settlers, Filter Media)
- Electrical / I&C represent approx. 15% of cost estimate.
- Additional items also added for recently completed cost estimates from other supporting studies (i.e. Chlorine Building, Filter-to-Waste).

Stantec / KPS Cost Estimate Review

Summary of Results

- Current estimate sits at $287.5M, before contingencies, allowances, inflation, and engineering.
- Approx. 19% higher base capital cost estimate compared with AECOM concept design ($287.5M vs $242M).
- The following items are still in progress / not yet included in the estimate:
  - Seeking updated vendor quotation for UV process equipment. Currently have allowance within Detailed Cost Estimate.
  - Does not yet include any Sed Tank concrete rehabilitation work (that may be required following Jacobs concrete testing).
  - Does not include any works associated with Effluent PS (known bottleneck).
  - Engineering, contingencies, allowances etc. have been assessed using City of Hamilton CCE Worksheet (next section).

Construction Inflation Discussion

Construction Inflation

Construction Inflation

Year-over-Year Non-Residential Construction Inflation Increase (%)				
	4th Quarter 2022	4th Quarter 2021	4th Quarter 2020	4th Quarter 2019
Toronto Metro Area	**14.5**	**11.2**	**2.6**	**2.9**

Non-residential construction costs register record increase (2022 4th Quarter - Statistics Canada)

https://www150.statcan.gc.ca/n1/daily-quotidien/230208/dq230208d-eng.htm

> The 11-CMA composite for non-residential construction cost increased 12.5% in 2022 compared with 2021. This was the highest annual increase since the beginning of the Non-Residential Building Construction Price Index in 1981.

> Higher costs for steel and concrete led non-residential construction price growth

> Non-residential building construction cost growth was led by cost increases in structural steel framing (+2.5%), followed by concrete and metal fabrications (both up by 2.3%). Of all non-residential buildings surveyed, the cost to build bus depots with maintenance and repair facilities and factories (both up by 1.9%) rose the most in the 11-CMA composite.

CCE Worksheet Review

CCE Worksheet Review

City of Hamilton CCE Worksheet Review

- CCE Worksheet to be shared and discussed.
- Using a starting point of a Construction Inflation Rate of 7% and Engineering Inflation Rate of 3%, plus allowances and contingencies from the Worksheet, overall total increases substantially to $554M
- Largest contributors to increases using CCE worksheet:
  - Project Contingency (Construction): $72M
  - Construction Inflation (3 years @ 7%): $90M
  - Overall Consultant Costs (inc. Permits/Approvals, Contingencies, etc.): $61M

Next Steps

Next Steps

- Updates to TM1 and TM2 based on City comments.
- Submission of draft TM3 – Resourcing for WTP Phase 2 Works
- Submission of draft TM4 – 3rd Party Review of Conceptual Design Cost Estimate
- Submission of draft TM5 – Woodward WTP Phase 2 Funding Opportunities

APPENDIX B
CAPITAL COST QUOTATIONS

Filter Media Replacement Quote

To: Paul Kusiar- KPS
Re: Budget Pricing for Filter Media Replacement
At: Woodward Water Treatment Plant

SCOPE: REMOVAL AND DISPOSAL OF FILTER MEDIA

-CCG will remove and dispose of all existing GAC and sand in each of the 24 filters. All filter media will be removed via industrial vacuum and disposed offsite.

SCOPE: SUPPLY & DELIVERY OF FILTER MEDIA

-CCG will supply and install 305mm of 0.45-0.55 UC 1.50 Sand in each of the 24 filters. All sand is NSF 61 Certified. Supply includes extra volume for skimming of fines and void fill of stainless-steel underdrains. All sand will be installed through slurry induction system and will be in accordance with AWWA B100. Owner to supply water for installation.
-Upon completion of sand installation, CCG will disinfect each of the 12 filters in accordance with AWWA C653-13.
-CCG will supply and install 914mm of FILTRASORB 300 8X30 GAC in each of the 24 filters. CCG will install all GAC in accordance with AWW B604.
-CCG will work with Owner to properly backwash and commission each of the filters.
-Prior to shipment of all filter media, both sand and GAC will be sampled and sent to independent laboratory for testing. 1 sample for ever 25m3 of each filter media type.
-Once the filter media is delivered CCG will once again sample both the sand and GAC and send of to independent labs for testing. 1 sample for ever 50m3.
-CCG will also come in and sample 3 months and 12 months after commissioning of filters. All samples will be tested at independent labs.
-All the above scope was based on having access to one quadrant (6 filters) at a time.

PER QUADRANT BUDGETARY PRICING

REMOVAL & DISPOSAL OF EXISTING FILTER MEDIA	$308,480.00
SUPPLY AND INSTALLATION OF FILTER MEDIA	$2,190,820.00

CLARIFICATIONS:

-HST is extra. All amounts are in CAD dollars.

-Quotation is budgetary and based on current market conditions.

Should you have any questions concerning this quote please contact me at 905-645-4916 or 905-643-7615 ext 221.

CONTINENTAL CARBON GROUP INC

Michael Massis Date: April 18, 2023

Vice President Marketing and Sales

UV Cost Estimate

From: Paul Kusiar
To: Holmes, Hailey
Subject: Fwd: WTP - UV Estimate
Date: Thursday, July 6, 2023 3:15:14 PM
Attachments: image001.jpg

FYI

Get Outlook for iOS

From: Jeff Dobbin <Jeff@h2flow.com>
Sent: Friday, April 21, 2023 11:24:58 AM
To: Paul Kusiar <paul.kusiar@kps.ca>
Subject: RE: WTP - UV Estimate

Hi Paul,

Thanks for the email!

I remember working with you on the Mid-Halton upgrade.

Good luck at your meeting, and please let us know if you need anything else.

Best regards

Jeff

Jeff Dobbin
Municipal Sales Manager & Municipal Area Manager – Ontario Central
H2Flow Equipment Inc.
580 Oster Lane, Vaughan, Ontario, Canada L4K 2C1
Tel: (905) 660-9775 x31 Fax: (905) 660-9744 Cell: (416) 500-5388
jeff@h2flow.com www.h2flow.com

From: Paul Kusiar <paul.kusiar@kps.ca>
Sent: April 21, 2023 10:12 AM
To: Jeff Dobbin <Jeff@h2flow.com>
Subject: WTP - UV Estimate

Hi Jeff,

Thanks again for taking my call earlier this morning. As I get more details that I can share with you I will, but for now as discussed, six (6) reactors at 1.2 m diameter each complete with all controls/panels et al is what is being considered for Woodward WTP.

Construction start is currently expected as early as 2026, and I am carrying $6M for supply of your full system. If you have any questions or further comments, please do not hesitate to let me know.

Respectfully,

Paul Kusiar, C.E.T
Kusiar Project Services Inc.
163 Long Dr., Stratford, ON, N5A 7Y8
paul.kusiar@kps.ca
p. 519-273-7631
f. 519-273-6263
c. 519-949-3791

Plate Settler Cost Estimate

From: Paul Kusiar
To: Holmes, Hailey; Kocher, Michael
Subject: Fwd: Hamilton WTP - quote
Date: Tuesday, July 11, 2023 10:51:57 AM
Attachments: image001.png

FYI Gang,

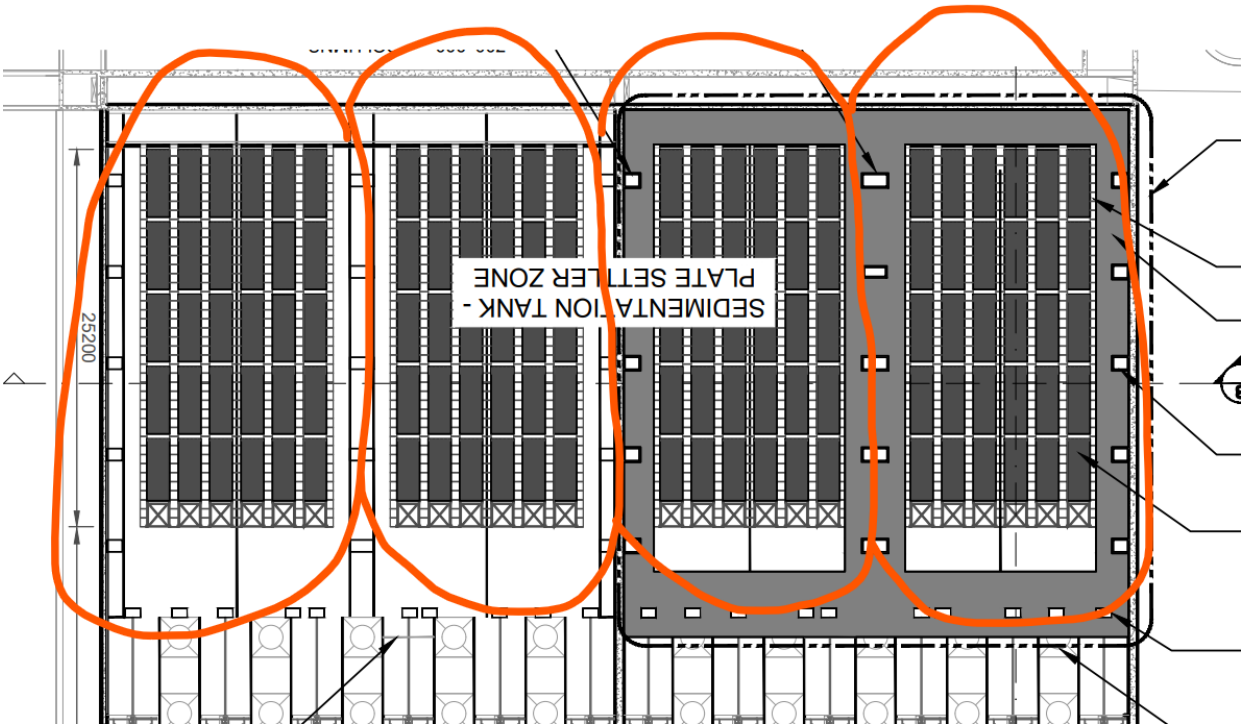
I'll tidy up estimate when I get to office.

Regards,
Paul
Get Outlook for iOS

From: Scott Lenhardt <Scott@proaquasales.com>
Sent: Tuesday, July 11, 2023 10:50:33 AM
To: Paul Kusiar <paul.kusiar@kps.ca>
Subject: RE: Hamilton WTP - quote

Paul,

Confirming the price of 20-25MM in CAD for :



Scott Lenhardt, P.Eng.

Pro Aqua, Inc.
264 Bronte Street South
Unit #7
Milton, ON
L9T 5A3

905-864-9311 x228 Office (rare)
905-864-8469 Fax
905-330-9244 Cell (best)

scott@proaquasales.com
www.proaquasales.com

From: Scott Lenhardt
Sent: Thursday, April 20, 2023 9:10 AM
To: Paul Kusiar <paul.kusiar@kps.ca>
Subject: RE: Hamilton WTP - quote

For more detail:

Budget Price for Two (2) Sedimentation Tanks: Safer number if a couple years out, to allow for some material and currency fluctuation - $20,000,000-$25,000,000 CAD Plate Settler Units and Supports

Assumptions: Two (2) Sedimentation Tanks, twelve (12) rows of plate settlers per tank, 5 plate modules per row, 60 modules per basin, 120 plate modules total. Plate totals, 98 plates per module, 11,760 plates total. Type 304 SS.

Supports: To be designed and made of stainless steel. Type 304 SS.

Scott Lenhardt, P.Eng.

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scott@proaquasales.com
www.proaquasales.com

From: Scott Lenhardt
Sent: April 20, 2023 9:06 AM
To: Paul Kusiar <paul.kusiar@kps.ca>
Subject: RE: Hamilton WTP - quote
Importance: High

Paul,

Based on today's exchange rate and SS pricing, we would be C$16-18MM for the plates and C$2-4MM for the supports (these vary wildly form job to job depending on how crazy the structural requirements become) in 304SS for two tanks.

I'll send you a bit more detail shortly, but I know you wanted an order of magnitude price sooner than this morning!

Scott Lenhardt, P.Eng.

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scott@proaquasales.com
www.proaquasales.com

From: Paul Kusiar <paul.kusiar@kps.ca>
Sent: April 17, 2023 2:39 PM
To: Scott Lenhardt <Scott@proaquasales.com>
Subject: Hamilton WTP - quote

Hi Scott,

As discussed, looking for high level budgetary number for potential works project. Hoping to have by Thursday night, but I would accept a rough number from the back of your bar napkin tonight. Its all budgetary right now Scott so I don't want to waste your time.

Objective is to retrofit the existing sed tanks and add in plate settlers capable of 230MLD each cell. Drawings are attached for your reference, but please do not share.

Regards,

Paul Kusiar, C.E.T

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