

**COMMITMENT & INTEGRITY
DRIVE RESULTS**

35 New England Business Center
Suite 180
Andover, Massachusetts 01810
www.woodardcurran.com

T 866.702.6371
T 978.557.8150
F 978.557.7948

August 29, 2007



Mr. Steve Scialabba
Rhode Island Department of Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

Dear Mr. Scialabba:

This letter is intended to update the Rhode Island Department of Public Utilities (DPU) on the peer review work completed since our correspondence of July 16. This letter will discuss the ongoing work completed by Woodard & Curran (W&C) reviewing the plans for the proposed upgrades to the Philip J. Holton Water Purification Plant (water treatment plant). Additionally, this letter will expand upon the positions expressed in our earlier correspondence and address concerns and comments made by the Maguire Group (MGI) in a letter dated August 16, 2007.

Work Completed to Date

On August 23, 2007, representatives of the Providence Water Supply Board (PWSB) made 50% design documentation available to W&C (Mr. Ron Hidu, P.E. and Mr. Toby Fedder, P.E.) for review at the PWSB offices in Cranston. During our visit to review the design drawings, W&C was supplied with a copy of the "Basis of Design Technical Memorandum," completed by MGI in July 2007. Both of the documents were reviewed for the purposes of further understanding the project's design, construction sequencing, and potential costs.

The list below includes all materials which have been reviewed by W&C to date:

1. Design Concept Report: Filtration System Rehabilitation and Improvements, Philip J. Holton Water Purification Plant, Presented by: Maguire Group, October, 2006;
2. Filter Pilot Study Final Report, by Black & Veatch, October 2004;
3. Filter Evaluation Summary Memo, by CDM, August 2003;
4. Comprehensive Plant Evaluation, by CDM, April 1997;
5. Pilot Scale Evaluation of Alternative Treatment Methodologies, by FST, September 1995;
6. Alternate Underdrain and Auxiliary Wash System Summary Memo, by FST, March 1994;
7. Raw and Finished Water Quality Data Sheets;
8. Table of Reservoir Elevations;
9. 2005 and 2004 Annual Statistical Reports;
10. 50% Design drawings for the Treatment Plant Improvements; and
11. Basis of Design Technical Memorandum; Filtration System Rehabilitation and Improvements Project, Prepared by Maguire Group, July 2007.



Additionally, W&C has requested, from the PWSB, a detailed breakdown of the estimated construction costs included in the 2006 Design Concept Report.

Findings of the Work

As with our earlier correspondence, W&C will present our findings in the same sequence as the itemized costs found on Table 8-1 of 2006 Design Concept Report (Table 8-1). Comments included in this section are largely limited to areas where our review of the 50% design documents has led to a modification in the opinions included in our earlier correspondence.

Item 1. Central Filter Gallery – Filters

The 50% Design drawings indicate a phased construction sequence starting at filters 1 through 4 and proceeding down the filter gallery, four filters at a time, until all filters have been reconstructed. This order of construction allows for the simultaneous construction of both filter improvements and the filter gallery (roof) improvements. The concurrent construction should allow for less filter downtime than alternate construction sequences.

A detailed basis of design for the filter rehabilitation construction has been completed by O'Brien & Gere and is appended to the Basis of Design Technical Memorandum completed by MGI in July 2007. W&C continues to agree with the plan for this portion of the project and takes no exception to the estimated construction cost for the filter rehabilitation portion of this work included on Table 8-1.

Item 2. Filter Effluent Piping Gallery

Based upon our review of the 50% design plans and further discussion with Rich Razza (PWSB) on the extent and nature of piping challenges associated with many of the old valves and lead-oakum joints in the piping gallery, W&C now feels that the work in this area should not be considered optional (as indicated in our earlier correspondence) and is needed to complete the upgrade to the overall plant.

In the design documents reviewed as part of the ongoing work, the project sequencing suggests that this portion of the project is planned for completion first to prepare the piping gallery for construction of the filter upgrades. W&C feels that it may be appropriate to coordinate construction in this area with the rehabilitation of the filters themselves to reduce the construction impact on plant capacity, however this would require an alternate piping layout. Further, based upon our review of the 50% design, W&C no longer has concerns about the manner of structural support for the new 48" backwash header's proposed location above the clearwell.

Finally, W&C continues to believe that an alternate backwash piping setup could offer significant advantages (from the perspective of construction cost and complexity as well as future plant operations flexibility) to the proposed backwash header layout. This topic is discussed further in the section below responding to comments included in MGI's letter dated August 16, 2007.

Item 3. Central Filter Gallery – Roofs and Architectural

Based upon our review of the 50% design documents, it appears that the current plan to raise the roof over the filters includes the removal of the entire existing filter gallery superstructure (in a section by section basis) and building a new structure from the top of the filters up. While the improvements to the roof are needed, W&C feels that it is likely that the amount budgeted as shown on Table 8-1 will be insufficient to cover the probable construction costs associated with these improvements.



The projected finished cost for the new structure is shown as approximately \$110/square foot, which includes phased demolition, phased construction, a significant amount of structural glass work, tile work, significant architectural window treatments, new HVAC facilities, and the provision of temporary construction to protect the plant's active filters. W&C has not completed an independent construction cost estimate, however, recent experience on other projects suggests that a more probable unit cost for this type of construction to be in the range of \$200 to \$250/square foot.

Additionally, the current plan requires four or more filters to be off-line at a time, which may or may not be possible while still meeting water demand from the system. Any effort to lessen the construction impact on the treatment plant (i.e. fewer filters off-line at a time) is likely to further increase construction costs.

Item 4. Electrical, Instrumentation, and Controls

Following the review of the 50% design documentation, W&C's position remains unchanged on the need for E,I,&C upgrades as a necessary part of the other upgrades being completed at the plant.

Response to MGI Comments

MGI responded to some of the comments in our earlier correspondence with a letter dated August 16, 2007. In the letter, MGI expresses disagreement with several of the points we brought up in our initial correspondence, the primary concerns of which are listed below:

1. W&C's expressed opinion that the filter gallery improvements should be considered optional and were severable from the other work;
2. W&C's expressed concern on the structural effect of the new header upon the clearwell;
3. W&C's expressed opinion that a smaller diameter pumped backwash header should be considered in lieu of the replacement of the 48" diameter gravity fed header; and
4. W&C's expressed reservations concerning projected construction costs for the filter gallery roof and pipe gallery improvements.

Following the review of the 50% design documents and discussion with PWSB staff, the concerns noted as Nos. 1 and 2 above have been alleviated. W&C better understands the reasoning for the filter gallery improvements as integral to the treatment plant upgrades and agrees the piping gallery improvements should occur as part of the larger plant upgrades. Additionally, access to design drawings of the proposed 48" backwash header support structure over the clearwell has removed our concern of potential structural impacts associated with the header's placement in this location.

The review of the 50% design drawings has not altered W&C's opinions with respect to Nos. 3 and 4. In fact, the in-depth review of the construction sequencing and building design has made W&C more cautious with respect to the adequacy of funding for these improvements. The absence of more detailed cost projections for each of the project phases precludes a more thorough analysis of the method by which the costs on Table 8-1 were developed.

With respect to the difference of opinion between W&C and MGI over the likely capital savings and operational benefits of using a directly pumped backwash, W&C respectfully submits the following reasoning behind our opinion. The "Maguire Response" column is taken directly from the "Summary of Reasoning" table included in MGI's August 16 correspondence.



<u>Maguire Response</u>	<u>W&C Opinion</u>
<ul style="list-style-type: none"> • With gravity system, cannot reduce pipe size • Installation of new direct pumping systems is more expensive and complex than gravity feed system • Higher backwash rate will be required for future use of GAC • High capacity pumping system more expensive long-term than gravity pipe replacement • Introduces direct mechanical pumping, impacts other existing pumps • Direct mechanical pumping has higher operational risk of failure 	<ul style="list-style-type: none"> • We concur and propose a pumped backwash header • We disagree; replacement of the existing backwash booster with a VFD controlled pump attached to Venturi allows for precise and reliable control of backwash process • This potential change argues in favor of the installation of a pumped backwash system • Marginally higher operational costs more than offset by lower capital costs • Replace existing backwash booster pumps with stronger VFD-controlled pumps; no other pumps in the backwash system • The existing system already relies on mechanical pumping so there is no added risk

Additionally, there are a number of good reasons for considering a switch to a direct pump backwash cycle both from the up-front construction cost perspective as well as from the operational flexibility perspective. These reasons are outlined in the tables below.

Pumped Backwash	Existing Gravity Backwash
Construction Cost Implications	
<ul style="list-style-type: none"> • Can install smaller diameter line along roof of existing gallery (hung or base supported) • Header can be constructed in ~10' pre-assembled sections for easier installation with all fittings already attached • Use of O/C valves (much cheaper) • No coring required • Shorter connection pipes to existing filter connections • Simplified construction sequencing because it will not disrupt wall-mounted E,I,&C equipment • No external construction • Pumped backwash header installation allows for piping upgrades concurrent with filter upgrades allowing for a single down period for each filter • Smaller diameter tie-in to existing lines is within the building pump room/gallery 	<ul style="list-style-type: none"> • Must keep large diameter header to maintain flow rate under gravity flow • Modular construction more complicated due to need to fit adjacent wall cores • Widespread use of modulating valves • 37 – 26" wall cores required • 36 – 20' sections of 24" pipe need to span pipe gallery • Removal and replacement of all E,I,&C equipment must be coordinated into header construction • Requires reconstruction of shed over clearwell plus installation of subgrade portion of 48" line • Order of construction for gravity fed header is opposite the filter improvements, requiring a minimum of two down periods for each filter • Tie-in to existing 48" CI line must be made underground.



Pumped Backwash	Existing Gravity Backwash
Operational Implications	
<ul style="list-style-type: none"> • Can abandon wash water tank • More precise and flexible control of wash water flow rates by venturi/VFD pumps • Must pump to overcome modest additional flow losses in smaller pipe • Zero modulating valves; flow rate controlled at pump (easier to alter backwash rates in case of future modifications to filter media) • Single control point for backwash flow control 	<ul style="list-style-type: none"> • Wash water tank remains • Flow control via modulating valves from gravity driven, falling level tank • Lower pump TDH but still must boost uphill to wash water tank • Multiple modulating valves must be calibrated/reset individually if flow rate is changed • Dual control points for backwash flow control

Closing

Following the review of the 50% design documents, W&C has revised its position that the piping gallery work should be considered optional and no longer has concerns of the structural impacts of a new backwash header upon the clearwell roof. Other opinions expressed in earlier correspondence remain unchanged, including our reservations on some of the construction cost estimates and the apparent reluctance to consider a pumped backwash header (standard industry practice) in spite of likely lower construction costs and increased operational flexibility of a pumped backwash set-up.

If you have questions which have not been adequately addressed in the text of this letter, please contact me at 800-446-5518 or via email at hgordon@woodardcurran.com

Sincerely,

WOODARD & CURRAN

Helen Gordon, P.E.
Senior Vice President

cc: File
Ron Hidu, W&C
Toby Fedder, W&C