TOWN OF RIVERHEAD
RIVERHEAD SEWER DISTRICT
SUFFOLK COUNTY, NEW YORK

MAP & PLAN/
ENGINEERING DESIGN REPORT

WASTEWATER REUSE FOR GOLF COURSE IRRIGATION

PHASE II – FULL-SCALE IMPLEMENTATION

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Report prepared by H2M and SCIENTIFIC METHODS, INC.

TOWN OF RIVERHEAD / RIVERHEAD SEWER DISTRICT MAP & PLAN / ENGINEERING DESIGN REPORT - WASTEWATER REUSE FOR GOLF COURSE IRRIGATION PHASE II - FULL SCALE IMPLEMENTATION

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1 INTRODUCTION

In January 2005, Holzmacher, McLendon & Murrell, P.C. (H2M) and Scientific Methods, Inc. (SMI) completed the *Technical Report* for the *Phase 1 – On-Site Implementation (Pilot Study)* for the reuse of highly treated wastewater effluent produced by the Riverhead Sewer District's Advanced Wastewater Treatment Facility for irrigation of the Indian Island Golf Course. There are two (2) categories of water reuse that apply to golf course irrigation. They are: "Restricted Urban Reuse" (controlled access for the general public and workers) and "Unrestricted Urban Reuse" (open access for the general public and workers). These categories have their own treatment process requirements, water quality standards, monitoring requirements and safety standards. The most comprehensive regulations and guidelines have been developed by California, Florida and Arizona. For unrestricted reuse, Arizona and Florida share the minimum requirement of secondary (biological) treatment, filtration and disinfection while California requires tertiary treatment followed by coagulants or polymers addition (if needed to meet quality standards), filtration and disinfection. As per the California Title 22, Article 4 (f) requirements: *"(f) No spray irrigation of any recycled water, other than disinfected tertiary recycled water, shall take place within 100 feet of a residence or a place where public exposure could be similar to that of a park, playground, or school yard*". The standards of the State of California are the most stringent and will be followed for this project.

The unrestricted urban reuse category, as defined by the State of California, will be adopted for the Riverhead project. The current process of the Riverhead Advanced Wastewater Treatment Facility already produces a tertiary effluent. Therefore, with the addition of a properly configured coagulation, filtration and disinfection system the final effluent (irrigant) achieves the criteria for an "*Unrestricted Urban Reuse*".

The treatment process recommendations presented in the *Technical Report for the Phase 1 – On-Site Implementation (Pilot Study)* report were to side-stream 350,000 gallons per day (gpd) of treatment plant effluent for advanced filtration and disinfection using cloth media filtration (AquaDisk Package Model 54, Aqua Aerobics, Rockford, IL), followed by membrane microfiltration (Model AP4 Microfilters, Pall Corporation, East Hills, NY) and UV disinfection (Model 3600K-PTP, Trojan Technologies, London, Ontario).

The H2M/SMI January 2006 literature research document prepared for the benefit of the Suffolk County Department of Health Services (SCDHS) indicated that a number of

municipalities in the United States are currently irrigating using treated effluent produced from treatment process systems that do not include microfiltration. Based upon a combination of the results of the *Pilot Study* information and the extensive information obtained through research, the technical team, in concert with the SCDHS, reconsidered the recommendations as to the overall wastewater reuse treatment process and concluded that micro/ultra filtration using the Pall membrane system was not required for reasons detailed hereinafter.

Although the 2004 pilot study *Technical Report* did not evaluate wastewater treatment in the absence of membrane microfiltration, the research team concluded that based upon the raw data obtained from the pilot study, as well as state requirements from some of the most stringent reuse programs in the country, it would be technologically reasonable to produce treated effluent that would meet USEPA water reuse guidelines without the use of the microfiltration component. The modified treatment scheme includes cloth media filtration followed by hi-dose UV disinfection based upon the justification that effective solids removal would occur through the cloth filtration process and that the remaining infectious biosolids could be inactivated through UV disinfection. The pilot study showed that cloth media filtration alone was capable of producing approximately 40-50% removals for both viruses and bacteria, and UV alone was capable of inactivating at least 99.97% of both microorganisms. These data supports the contention that cloth media and UV disinfection can be effectively combined for use at the Riverhead facility to produce an effluent that will meet the reuse water quality expectations for unrestricted irrigation at the Indian Island Golf Course.

As observed from the systems used by others throughout the United States, UV disinfection designs that use conservative values for UV transmittance and higher UV light dosing will offset the removal of the microfilters. Specifically, the Riverhead project system design presented herein uses:

- A conservative UV transmittance value of 55%, when in reality the SBR effluent now produced by the facility has routinely experienced UV transmittance in the high 60% to low 70% range.

- The design dose of UV radiation will be increased from approximately 80$\mu J/cm^2$ to >100$\mu J/cm^2$, to compensate for possible elevated turbidity levels that could adversely impact the UV transmittance value and impede the performance of the UV disinfection system.

- Auxiliary equipment will be installed for polymer coagulation prior to the cloth media filtration to give the operator an additional tool in the remote case that the UV

transmittance falls below design values. This process provides for improved solids removal if necessary to keep the turbidity (UV transmittance) in range prior to UV treatment so as to allow continued effluent use as an irrigant.

One must keep in mind that wastewater reuse treatment quality is not required by permit. Consequently, in the worst case scenario should the process not produce reuse quality effluent, then the treated wastewater will be discharged to the Peconic River as is currently taking place. Total maximum daily load (TMDL) regulations have not yet been formalized nor made public and this document has been prepared without the benefit of knowing the expected TMDL requirements. *If effluent requirements for the Riverhead AWTF are put into place that would require wastewater reuse during the irrigation season, then duplication of facilities and mechanical reliability standards would be necessary thus substantially increasing the project cost. The current design does not include duplication of facilities.*

At the writing of this document, the only changes required to the existing SPDES permit are those associated with the discharge of wastewater to the Indian Island Golf Course and for use about the treatment plant site for landscape irrigation and miscellaneous plant uses, like equipment washdown. Therefore, a second and third outfall location will be required as follows:

- Outfall 001: Peconic River (Existing)
- Outfall 002: Landscape Irrigation & Miscellaneous Plant Use at the Treatment Plant
- Outfall 003: Indian Island Golf Course

Outfall 001 effluent requirements remain unchanged since the discharge to the Peconic River will remain. A SPDES permit modification will be submitted for approval to NYSDEC adding Outfall 002 and Outfall 003.

The Sewer District is now considering another possible outfall (Outfall 004) for land application of the "golf course quality" effluent to the wooded, uninhabited property of the Sewer District. This property is currently owned by the district and is adjacent to the existing sewage treatment plant land. Since the water produced by the wastewater treatment system is classified as "unrestricted use", as described hereinafter, this then would allow the use of the treated product to be applied to the woods.

2 PURPOSE OF PROJECT

This is the first water reclamation project in Suffolk County. It is initiated by the conditions of the Peconic Estuary Program, rather than by a lack of water. However, the benefits from this program extend well beyond nitrogen loading within the Peconic Estuary. It is the Town of Riverhead's belief that now is the time for the community to take the lead in water conservation to plan and be prepared before it becomes critical. This project will be a model for other areas when the time for action comes.

Severe water shortages may change the water supply conditions that we now take for granted. At the present time, the Suffolk County's Indian Island Golf Course is irrigated from on-site wells. The golf course property is located on the east end of a small peninsula in the Peconic River. Salt water intrusion into the drinking water aquifer is always a concern when using deep wells. In low lying coastal areas like Florida, southern California, and Long Island the high use of groundwater as the potable water supply has resulted in the normal fresh water / salt water interface to move both inland and nearer the ground surface.

With continued groundwater pumping the intrusion of salt water will be a problem because of the resulting drop in the potentiometric level of the groundwater. It is reasoned that less groundwater pumping will ultimately result in less salt water intrusion since the potentiometric level would remain high enough to prevent salt water intrusion.

The use of potable water for irrigation is expensive. It also puts a stress on the existing water distribution system during times of the year when warm weather demands high water usage. Projected population increases throughout Suffolk County will also make potable water supplies an issue.

The success of this project may affect development within Suffolk County. The Suffolk County Department of Public Works (SCDPW) is responsible for operating some twenty-one municipal sewer districts. They also act as the regulatory review arm of the Suffolk County Sewer Agency. SCDPW is looking at this project for possible alternative solutions for treated wastewater disposal. The treated effluent recharge land area requirements, with the associated setback (buffer) distance requirements, are a significant impediment to next generational (affordable housing) development. As the amount of developable land within the County shrinks, land costs increase making it less attractive for developers to build homes that are affordable for our next generation. A wastewater treatment system that produces reusable water would result in less land area for wastewater disposal that could otherwise be used to develop affordable housing. A new method of disposal (reuse) will provide options yet

unavailable for both development projects and for operational conditions at municipal treatment districts.

3 BACKGROUND

In January 2005, Holzmacher, McLendon & Murrell, P.C. (H2M) and Scientific Methods, Inc. (SMI) completed the *Technical Report* for the *Phase 1 – On-Site Implementation (Pilot Study)* for the reuse of highly treated wastewater effluent produced by the Riverhead Sewer District's Advanced Wastewater Treatment Facility for irrigation of the Indian Island Golf Course. In response to discussions with the Suffolk County Department of Health Services (SCDHS) at the October 13, 2005 meeting, the Town of Riverhead retained H2M and SMI to conduct a review of water reuse guidelines and standards implemented by municipalities and golf courses with long-standing, aggressive, and/or progressive programs for golf course irrigation using wastewater treatment plant effluent. The literature review was completed by H2M and SMI in January, 2006. After review comments were received from the SCDHS, a meeting was held to discuss the alternatives for providing a publicly safe effluent for reuse.

Informal literature reviews were conducted by H2M/SMI and SCDHS. At a meeting held on July 14, 2006, the Town agreed to re-evaluate the recommendations of the *Pilot Study*, taking into consideration SCDHS's opinion that previous information presented in the *Literature Review,* together with the alternate treatment methods as used by others and outlined in USEPA's 2004 *Guidelines for Water Reuse* were sufficient to revisit the use of microfiltration.

A supplemental report was prepared to provide information requested by SCDHS and addressed the relevant issues discussed at the July 2006 meeting. The USEPA *Guidelines for Water Reuse*, the supplemental report, and the Technical Report developed via the pilot plant project were submitted for examination to the SCDHS for conceptual approval of the process that will be used for wastewater reuse at the Indian Island Golf Course. We received conceptual approval via an email from the SCDHS on November 22, 2006. This *Map & Plan - Wastewater Reuse for Golf Course Irrigation* (Engineering Design Report/Facility Plan) provides the design details required for final review and comment by the SCDHS and the NYSDEC.

The use of a wastewater reuse treatment system is deemed safe to humans and the environment. Although the original concept addressed a quantity of 350,000 gallons per day (gpd), the current plan is to **increase** the reuse quantity to greater than **385,000 gpd** to allow for the on-site irrigation of treatment plant landscaping, the use of reclaimed water for process

equipment washing, and to satisfy peak demand requirements of the Indian Island Golf Course.

4 REUSE HISTORY

Wastewater reclamation projects have been undertaken in many states. California, Florida, Texas, Arizona and South Carolina have the most projects. California is leading the way with wastewater reclamation. They have been involved in water conservation for the past 50 years. In 1969, the Porter-Cologne Act passed by the California Legislature declared its intent to "undertake all possible steps to encourage development of water recycling facilities". The California Department of Health Services established water quality standards and treatment reliability criteria for water recycling under Title 22, Chapter 4, of the California Code of Regulations. With the adoption of a support resolution from the United States Environmental Protection Agency (EPA), Region 9; the California Water Resources Control Board; the California Department of Water Resources; the California Department of Health Services; the California Conference of Directors of Environmental Health; the United States Bureau of Reclamation; and the Water Reuse Association of California in 1994, these agencies affirmed their support for the pursuit and development of federal, state and local water reclamation policies and regulations that will reduce constraints and promote water reclamation projects in California. Water reuse in California is projected to achieve a level of production of 1,300,000 acre-feet by the year 2010.[1]

There are at least four (4) other golf courses in New York State that take advantage of reclaimed water for irrigation. Reportedly these facilities treat to effluent limits that are equal to the quality that the existing Riverhead AWTF currently produce. The Sewer District feels that it is appropriate to treat to levels as reported hereinafter. For the project to be implemented on a full scale basis, it was determined that a demonstration pilot study was prudent considering the pioneering nature of such a project on Long Island and the environmental benefits that could be achieved.

5 PLANNING, STUDIES & CONCEPTS

Upon recommendations from the SCDHS, H2M conducted an extensive search for a qualified environmental microbiologist to work on the Pilot Study. Based upon the results of this endeavor, the Town contracted with Scientific Methods, Inc., which provided environmental

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1 WateReuse Association – Statement of Support for Water Reclamation

microbiology consulting services. Their tasks were as follows: perform testing services to characterize the quality of the existing wastewater; develop the pilot-scale testing protocol; assess the performance of the pilot-scale treatment system; assess the quality of the effluent produced by the advanced treatment system; consider the potential for bioaerosol dispersions; and, provide support in determining the effects of irrigation using the treated effluent upon the soils and plantings.

In January 2005, H2M and Scientific Methods completed the *Technical Report* for the **Phase 1 – On-Site Implementation (Pilot Study)** for the reuse of highly treated wastewater effluent from the Riverhead Sewer District's treatment plant for irrigation of the Indian Island Golf Course. The results of the study contributed to the development of the following list of recommendations:

1. *"The New York State Department of Environmental Conservation and the Suffolk County Department of Health Services should use this report to establish testing requirements, effluent quality standards and golf course/general public exposure control procedures such as signs, water fountain covers, time restrictions, etc. as part of developing regulations for wastewater reuse in Suffolk County."*

2. *"During the development of reuse regulations, meetings must be conducted to allow for both public input and comment. The Town will proceed with a public education program as soon as the SCDHS grants conceptual approval of this document."*

3. *"Based upon the extensive testing program of this study, the SCDHS should accept this pilot study report (with or without exceptions) that wastewater reuse is safe, viable and practical and can be used in Suffolk County as one way to preserve our water supply. The Town seeks the permission of the SCDHS to proceed with the full-scale implementation phase of the project. The Town of Riverhead wishes to proceed with the preparation of the Facility Plan for the design of the 350,000 gpd facility."*

4. *"The Town of Riverhead, based upon the establishment of reuse regulations, can then proceed with the development of an agreement with Suffolk County for using reclaimed wastewater for irrigation of the Indian Island Golf Course and the design for implementing the full-scale project."*

5. *"Preliminary information from the equipment manufactures indicates that a full-scale design, capable of matching the water quality produced by the pilot systems, is available. The following listed equipment will be used as the basis of the design requirements of the full-scale system:*

- *AquaDisk Package Model 54, 6 Disk or 10 Disk Units;*
- *PALL Model AP4 Microfilter Packages, one (1) or two (2) units;*
- *Trojan UV 3600K-PTP Ultraviolet Disinfection Units, three (3) units will provide redundancy."*

After review, the technical team in concert with the SCDHS determined that the pilot study recommendations were too stringent and not in keeping with the accepted practices used by other municipalities. They did not want to establish an unrealistic standard for the County. In response to discussions with the Suffolk County Department of Health Services at the October 13, 2005 meeting, the Town of Riverhead retained H2M and Scientific Methods, Inc. (SMI) to conduct a literature search and review of standards that have been put into place by municipalities and golf courses with long-standing, aggressive, and/or progressive programs for golf course irrigation using treated wastewater plant effluent. The literature research was completed by H2M and Scientific Methods in January, 2006. Additional informal literature reviews were conducted by H2M and Scientific Methods. At a meeting held on July 14, 2006, Town representatives agreed to re-evaluate the recommendations of the *Pilot Study*, taking into consideration the information presented in the *Literature Research,* together with the alternate treatment methods as used by others and outlined in the USEPA's *Guidelines for Water Reuse*.

The discussions relating to the research lead to the belief that the microfilter unit can be removed from the treatment system without compromise to the biological quality of the effluent. This filter equipment is the most expensive treatment element of the advanced treatment process and removal of this process step could result in significant capital cost savings to the municipality.

Removing the microfilter equipment from the advanced treatment process requires that the design parameters consider a more conservative UV transmittance value than the biological treatment system actually achieves and the dosage of UV radiation will need to be increased from approximately $80\mu J/cm^2$ to $>100\mu J/cm^2$ to compensate for any increase in turbidity that could impede the performance of the UV disinfection system. Also, equipment will be installed for polymer coagulation prior to the cloth media filter to give the operator an additional tool, if deemed necessary for use.

5.1 BRIEF DESCRIPTION OF PROPOSED PROCESS

A simple schematic of the proposed process is included as **Figure No. 1** located in **Appendix A**.

- The flow from the Riverhead Sewer District and the effluent from the existing Scavenger Waste Plant enters the Advanced Wastewater Treatment Facility and undergoes preliminary treatment consisting of solids and grit removal. Solids are removed using a mechanical bar screen. Grit is removed using an aerated grit chamber.

- The wastewater flows by gravity to a flow equalization basin where peak flows are dampened. The basins are aerated to mix the contents of the basin.

- The equalized flow is pumped to the Sequencing Batch Reactor (SBR) process where nitrification and denitrification of the sewage takes place.

- The SBR process decants treated effluent to the post flow equalization basins where the flow is again equalized for pumping to the constant head boxes located ahead of the existing UV system.

- The flow from the constant head boxes is gravity conveyed around the existing UV disinfection system. Under this plan the existing UV system remains as a backup to the new UV system. This allows for the plant effluent discharge to the Peconic River (Outfall No. 001) in case of a problem with the new system or whenever irrigation can not take place.

- The flow enters an existing wet well that used to feed the old trickling filter process. New pumps and controls are added under this project.

- The total plant flow plus the scavenger waste treatment plant flow up to the SPDES Permit flow limit of 1.3 mgd is treated by the new cloth filters and new UV disinfection system. This is explained in greater detail hereinafter. The flow is then split for discharge to Outfall 001, Outfall 002 (in-plant use for washdown of equipment and site irrigation), and Outfall 003 (Indian Island).

5.2 WATER REUSE PRACTICE FOR UNRESTRICTED URBAN REUSE

Water reuse practices differ appreciably among the utilities that produce treated effluent for irrigation purposes. However, communities relying upon reuse for irrigation share the common goal of providing safe, reliable reclaimed water. Because environmental conditions vary from region to region and because effluent quality expectations and treatment requirements depend largely upon the specific reuse application, *a universal quality standard for reclaimed water does not exist.* It follows that no single treatment process or process train is applicable for all reuse applications. Instead, design teams must consider site-specific criteria prior to recommending treatment for irrigation purposes, with the general assumption that a *minimum* of secondary treatment, filtration and high level disinfection will be employed for unrestricted urban reuse. *For this project, tertiary treatment will be utilized together with filtration and hi-dose UV disinfection.*

Numerous golf courses relying upon reclaimed water currently employ process schemes whereby biological treatment is followed by filtration and UV disinfection. One example includes the Cave Creek Reclaimed Water Reclamation Plant serving northeast Phoenix, which produces tertiary effluent for golf course, cemetery and medians irrigation using a combination of biological treatment, filtration and UV to meet Arizona DEQ Class A standards.

To address one issue raised at the July 2006 meeting with SCDHS, the research team located and investigated the four (4) active reuse systems in the United States that incorporate AquaDisk cloth media filtration equipment in conjunction with UV disinfection after biological treatment for the purpose of golf course irrigation. *This is the exact process train proposed for the Riverhead project.* One system is located in California (Russian River) and three are located in Arizona (El Mirage, Palm Valley and Sundance). The California facility is operated under the strict "Title 22" permit regulations; the Arizona permitting system is equally rigorous and is governed through the State's "Class A" reuse water quality regulations.

As requested by SCDHS, the research team contacted operators from each of these four facilities to ascertain the exact conditions and permit requirements under which performance is controlled. Also, information was obtained regarding the golf courses that use this reclaimed water and calls were also placed to the superintendents of the facilities. Interviews with these parties resulted in additional contacts at the University of California (Extension Farm Advisor service) for information on reuse of treated wastewater effluent for irrigation. The team contacted a regional expert consultant at UC-Extension, Dr. Ali Harivandi, to

review his experience in California reuse projects where treated effluents were directed towards golf course irrigation.

The results of these investigations were published in the August 21, 2006 *Supplemental Report* prepared by H2M and SMI which was furnished to and accepted by SCDHS. These investigations confirmed the effective use of these treatment processes in producing a quality effluent that meets both the California and Arizona standards for unrestricted reuse.

6 1992 AND 2004 USEPA GUIDELINES FOR WATER REUSE - FLORIDA, ARIZONA AND CALIFORNIA

Currently there are no federal regulations directly governing water reuse practice in the United States. However, regulations and/or guidelines have been developed by a number of individual states. As of the release date of the EPA's revised *Water Reuse Guidelines* (2004), half of the U.S. states had developed some level of water reuse regulation, albeit with little harmonization across state boundaries.

As per the California Title 22, Article 4 (f) requirements: *"(f) No spray irrigation of any recycled water, other than disinfected tertiary recycled water, shall take place within 100 feet of a residence or a place where public exposure could be similar to that of a park, playground, or school yard".*

This project is classified as an unrestricted reuse application per Title 22. Consequently, there are no restrictions regarding its use as a spray irrigant.

The most comprehensive regulations and guidelines have been developed by California, Florida and Arizona. The treatment requirements and effluent criteria that govern unrestricted golf course irrigation among these three states are presented in the table below along with the EPA recommendations from the *Water Reuse Guidelines*. All three states share the minimum requirement of biological treatment followed by coagulants or polymers addition (if needed to meet quality standards), filtration and disinfection. Filtration is defined as the passage of wastewater through natural undisturbed soils or filter media such as sand and/or anthracite, filter cloth or membranes (USEPA, 2004). Specific permissible pathogen levels are not specified currently in any U.S. states for unrestricted urban reuse, although one state (Florida) does require monitoring for protozoan pathogens.

The following is taken from California's Title 22 Regulations:

"ARTICLE 3. USES OF RECYCLED WATER.

60303. Exceptions

The requirements set forth in this chapter shall not apply to the use of recycled water onsite at a water recycling plant, or wastewater treatment plant, provided access by the public to the area of onsite recycled water use is restricted.

60304. Use of recycled water for irrigation

(a) Recycled water used for the surface irrigation of the following shall be a disinfected tertiary recycled water, except that for filtration pursuant to Section 60301.320(a) coagulation need not be used as part of the treatment process provided that the filter effluent turbidity does not exceed 2 NTU, the turbidity of the influent to the filters is continuously measured, the influent turbidity does not exceed 5 NTU for more than 15 minutes and never exceeds 10 NTU, and that there is the capability to automatically activate chemical addition or divert the wastewater should the filter influent turbidity exceed 5 NTU for more than 15 minutes:

(1) Food crops, including all edible root crops, where the recycled water comes into contact with the edible portion of the crop,

(2) Parks and playgrounds,

(3) School yards,

(4) Residential landscaping,

(5) Unrestricted access golf courses, and

(6) Any other irrigation use not specified in this section and not prohibited by other sections of the California Code of Regulations."

The following comparison summary shows the requirements of three states that rely on water reuse. The USEPA suggested guidelines are also provided.

Table 1 - Summary of State Requirements

Parameter	California	Florida	Arizona	2004 EPA Guidelines
Treatment	Tertiary Oxidized Coagulants (If Required) Filtration Disinfection	Secondary Coagulants (If Required) Filtration Disinfection	Secondary Coagulants (If Required) Filtration Disinfection	Secondary Filtration Disinfection
BOD_5	Unspecified	20 mg/L $CBOD_5$ (Annual Avg.)	Unspecified	≤ 10 mg/l
TSS	Unspecified	5 mg/L	Unspecified	≤5 mg/L (Avg.) in lieu of turbidly
Turbidity	2 NTU (24 hr. Avg) 5 NTU (Max 5% of 24 hr. time) 10 NTU (Max)	Unspecified	2 NTU (24 hr. Avg.) 5 NTU (Max.)	≤ 2 NTU (24 hr Avg.) 5 NTU (Max.)
Coliform	**Total**	**Fecal**	**Fecal**	**Fecal**
	2.2/100 mL (7 day median)	75% samples below detection	ND (4 of last 7 days)	ND/100ml
	23/100 mL (30 day max sample) 240/100 ml (max sample)	25/100 mL (max)	23/100 mL (max)	14/100 mL (max)

Note: Bold cells indicate proposed limits (See Section 11)

LIST OF STATES THAT REQUIRE GROUNDWATER MONITORING

As per the USEPA Guidelines documents, the following states require some form of a groundwater monitoring program for water reuse programs:

Table 2 - Groundwater Monitoring

RECLAIMED WATER IRRIGATION
Alabama
Arkansas
Delaware
Florida
Hawaii
Illinois
Iowa
Massachusetts
Missouri
New York
Ohio
Pennsylvania
South Carolina
South Dakota
Tennessee
West Virginia
Wisconsin

The monitoring requirements of the various states listed above range from site specific to as many as one (1) well per every two (2) fairways. Of the three prominent states involved in reuse programs, only Florida requires a monitoring program.

7 PROCESS PERFORMANCE BASED UPON PILOT INFORMATION

The wastewater treatment processes that were piloted during the 2004 study at the Riverhead AWTF included cloth media filtration, membrane filtration, and UV disinfection. Both ultrafiltration and microfiltration configurations were tested for the membrane component. The results of the pilot study indicated that when these processes were integrated, microbial reductions of more than 6 logs (>99.9999%) could be achieved for both viruses and bacteria, and served as the design basis for the recommended system that included membrane microfiltration.

The research team did evaluate the efficiencies of the individual components in their ability to remove model microorganisms that were seeded into the AWTF effluent used throughout the study. As mentioned above, cloth media filtration alone was capable of producing approximately 40-50% removals for both viruses and bacteria, and UV alone was capable of inactivating at least 99.97% of both microorganisms. These data support the contention that cloth media and UV disinfection can be integrated effectively at this site to produce an effluent that will meet the reuse water quality expectations for irrigation at the golf course.

8 RISK ASSESSMENT/HEALTH EFFECTS

At present, reclaimed water standards and guidelines for U.S. states are not based upon risk assessment using infectivity models. A single state (Florida) is currently considering the use of infectivity modeling in the development of water reuse standards, and is targeting virus levels of 0.04 – 14 MPN per 100 liters, Cryptosporidium levels of 22 oocysts per 100 liters, and Giardia levels of 5 cysts per 100 liters. It should be noted that Cryptosporidium and Giardia analyses were performed on the effluent produced during the pilot study and the treated effluent was found to be absent of measurable levels of these pathogens. It should also be noted that despite its well-documented resistance to most forms of chemical disinfection, Cryptosporidium is one of the most UV-sensitive microorganisms studied to-date. The design dose recommended for the UV disinfection component of the operational scale system would be expected to achieve well in excess of 5 log10 reductions of this human pathogen.

9 GROUNDWATER MONITORING RECOMMENDATIONS

Based upon the above information, it is recommended that Suffolk County not require the monitoring of groundwater conditions in areas where water reuse irrigation is used on a golf course as the quality of the effluent to be used is extremely high, and there are no restrictions for the maintenance addition of chemicals or fertilizers. It should be noted that during the pilot study conducted in 2004, the effluent used for irrigation was analyzed for culturable viruses and found to be free of measurable levels of these microorganisms. The justification for these analyses was two-fold: (1) human enteric viruses are the smallest of the pathogens that may be found in raw sewage and in treated effluent, they exhibit extended survival times in the aquatic environment, and they may retain their infectious state as they percolate through the subsurface to aquifers tapped by irrigation wells, and (2) viruses are among the most environmentally resilient of the pathogens that can be found in sewage and hence their absence in treated effluent may serve as an effective measure of water quality prior to reuse.

10 RECLAIMED WATER MONITORING RECOMMENDATIONS

In addition to the existing SPDES Permit required monitoring, daily fecal coliform tests and automatic continuous turbidity monitoring will be performed on the processed water diverted to the stored water tanks for irrigation usage.

Because the recommended treatment process train is designed to produce a high quality effluent that is essentially free of detectable levels of human enteric viruses, pathogenic bacteria and parasitic protozoa, routine monitoring of aerosols produced during irrigation practice is not recommended. The removal of the membrane component of the system evaluated during the pilot study could have an indirect impact on the perception of the efficacy of pathogen removal of the operational scale system. However, rather than relying upon costly and perhaps unnecessary tests for human enteric viruses, the research team recommends the more economical alternative of coliphage monitoring.

Because coliphages are small, bacterial viruses that are morphologically similar to disease-causing viruses such as hepatitis A virus, and because they can be found in high densities in raw sewage as well as inadequately treated effluent, coliphage monitoring would provide an ongoing measure of the effectiveness of the treatment scheme during the irrigation season. Weekly monitoring of coliphage levels in both the raw sewage and in the treated effluent is recommended for the initial season, followed by monthly monitoring thereafter. Although the research team does not anticipate that measurable levels of viruses or viral indicators will be present in the sprinkler spray, initial coliphage screening of the bioaerosols from the sprinklers is recommended when the system is brought on-line.

11 RECLAIMED WATER QUALITY STANDARDS FOR INDIAN ISLAND GOLF COURSE IRRIGATION

Based upon the information gathered in the various research projects; the data obtained from the pilot study; the regulations of the States of California, Arizona and Florida; the USEPA Guidelines; and, the actual in-service treatment systems studied, the following reuse water quality standards are recommended for this irrigation project:

- Total Suspended Solids: 5 mg/L
- Turbidity: 2 NTU daily average / 10 NTU max. limit
- Fecal Coliform: non-detectable in 4 of 7 days and 23/100 mL max.

12 SETBACK DISTANCES

There are no houses bordering the golf course that are on private wells and there are no public water supply wells in the vicinity of the golf course. Based upon the above and the reuse classification being "unrestricted", no setback distances will be necessary.

13 SAFETY WARNINGS

As per the California Title 22, Article 4 (g) requirements: *"All use areas where recycled water is used that are accessible to the public shall be posted with signs that are visible to the public, in a size no less than 4 inches high by 8 inches wide, that include the following wording: "**RECYCLED WATER - DO NOT DRINK**" (Each sign shall display an international symbol)".*

Based upon the above, warning signs will be posted, outdoor water fountains will be covered and for the safety of the general public eating at the restaurant, no irrigation will take place during the restaurant's operational hours.

A sign approved by SCDHS and the Town will be posted at the entrance to the Golf Course indicating the source of water used for irrigation and the hours of irrigation operation.

14 PROCESS OPERATIONS SAFETY PROCEDURES

In order to guarantee the quality of the irrigant product, an automatic UV dose monitoring system will be installed on the UV system and an automatic valve system will be installed at the irrigation supply pumps piping. These systems will be controlled by several continuously operating turbidity meters to ensure that, based upon actual turbidity, the proper UV dose is applied and that no under-processed water is supplied for irrigation.

Controls will be placed at the golf course pump station to automatically transfer operation of the irrigation system to the Suffolk County water supply wells in the event that reuse water is not available or desirable. The safety scheme will be reviewed with the Parks Department and a system will be developed that is approved by Suffolk County.

15 EXISTING CONDITIONS

15.1 EXISTING PERMIT

The existing treatment plant has been issued State Pollutant Discharge Elimination System (SPDES) permit number NY 0020061 (NYSDEC No. 1-4730-0039/00001). The permit became effective on 10/01/01, was modified for the Phase 1 Wastewater Reuse on 05/17/04 and was again renewed in February 2006 with a revised expiration date of 9/30/11. The Town will apply for a permit modification to permanently add Outfall No. 002. Special conditions are attached to the permit that require a monthly average effluent total nitrogen load for the sewage treatment plant (STP) and the scavenger waste treatment plant (SCTP) not to exceed 170 pounds per day. The existing sewage treatment plant is permitted to discharge 1.3 million gallons per day (mgd) to the Peconic River (Outfall No. 001). This includes the scavenger waste plant that is designed to process 0.10 mgd.

15.2 EXISTING PROCESS

The existing treatment processes at the Riverhead Advanced Wastewater Treatment Facility are designed to handle the SPDES Permitted 1.3 mgd, average daily flow. The sewage processing consists of the following: Bar Screens, Aerated Grit Chamber, Flow Equalization Basins, Sequencing Batch Reactor (SBR) Tanks, Post Equalization Tanks, Ultraviolet Disinfection Channels (UV), Flow Metering and Effluent discharge to the Peconic River. The scavenger waste processing consists of the following: Aerated Grit Chamber, Equalization Basins, Clarifiers, Rotating Biological Contactors (RBC), Clarifier, Denitrification, Flow Metering, UV Disinfection Channels (mixing with the processed sewage), Flow Metering and Effluent discharge to the Peconic River.

15.3 EXISTING IRRIGATION SYSTEM

The existing irrigation water supply is provided via an extensive piping system covering over 60 acres of the 18 hole Indian Island Golf Course. All eighteen (18) tees, fairways and greens of the Course are included in this system. The water supply piping system's distribution mains consist of piping sized in the range of 2.5 inches to 8 inches in diameter. Water is obtained from both on-site wells located along the north side of the 15th fairway and a Riverhead Water District's 8 inch diameter potable water supply system along Riverside Drive. Both systems are connected at the Central Well Building adjacent to the on-site wells.

16 RECLAIMED WATER - PROCESS DESIGN

16.1 PIPING MODIFICATIONS

Appendix A contains the following figures that should now be referred to by the reader:

- **Figure No. 1 – Process Schematic**
- **Drawing P-1 – Hydraulic Profile**
- **Drawing S-1 – Partial Site Plan**
- **Drawing B-1 – Filter Building Layout**

At this time, the SBR effluent is pumped from the Effluent Equalization Tanks directly to the existing Trojan UV disinfection system and flows by gravity to the Outfall Chamber for disposal to the Peconic River. Piping already exists to by-pass the existing UV equipment with valves and piping in place to divert the effluent directly into the existing off-line Trickling Filter Wet Well (TFWW). The existing valves and piping leading into the TFWW will be evaluated for possible replacement during final design. If replacement is required, the system will be sized at 10 inch diameter, cement lined ductile iron (CLDI), class 52 pipe. The existing TFWW pumps will be replaced by 20 hp, Flygt pumps, Model No. NP 3171, with 224 mm impellers, designed to handle 1.3 mgd at a TDH of 48 feet. A piping system will be constructed from the TF head box to a new Filter Building to be constructed across from the AWTF's main office building. This system will be sized at 12 inch diameter. The new piping will be cement lined ductile iron (CLDI), class 52. The new Filter Building structure will house a Fluid Dynamics, Inc. chemical polymer coagulation system, the new AquaDisk filter and the new Trojan 3000Plus UV disinfection equipment.

New UV effluent gravity piping, sized at 12 inch diameter and constructed of Class 52, CLDI pipe, will be installed between the new Filter Building and the existing off-line Trickling Filter Tanks. A flow splitter box will be installed in the new piping system that will be used to discharge all effluent that will not be diverted to the irrigant water storage tanks (excess water or under-processed irrigation quality water) to the existing Outfall Chamber. All overflow water from the polymer system and the cloth filters will be piped back to the Trickling Filter Wet Well from the new Filter Building. Filter backwash water will be piped directly to the existing influent equalization tanks.

The new yard piping is shown on the Preliminary Site Plan, located in **Appendix A**, and identified as Drawing S-1.

16.2 REUSE OF EXISTING TANKS

The 1999 upgrade of the Riverhead STP to an AWTF allowed for the decommissioning of two (2) trickling filter tanks. These tanks are 50 feet in diameter and 6.5 feet deep. Each tank can store 95,465 gallons of treated irrigant. The golf course will use approximately 350,000 gallons of water each day and on-site usage for irrigation and wash-downs is estimated at 35,000 gpd. During the daily irrigation period, the treatment system will have to make-up approximately 185,000 gallons of irrigant to satisfy the demand. The usual process will allow for all effluent to pass through the Storage Tanks; therefore, there is no need to add covers to the tanks to protect from algae growth. The concrete walls and floor of these tanks are in fairly good structural condition. Patching of certain areas will be required and the tanks will be painted with a durable epoxy coating prior to reactivation. A new pump system will be installed in a pit within the new Filter Building to transfer the irrigation water to the golf course system.

16.3 AWTF EFFLUENT CHARACTERISTICS

The effluent from the AWTF is already of high quality. The applicable existing permit limits are:

Total N:	170 #/day
Total Suspended Solids:	30 mg/l (monthly average) 45 mg/l (7 day arithmetic mean)
Fecal Coliform:	200 /100 ml (30 day geometric mean) 400 /100 ml (7 day geometric mean)
Total Coliform:	700/100 ml. (monthly median)

A review of the DMR data for June and July of 2006 indicates that the facility is working well within the permitted requirements. The following table summarizes the average results of the recent permit testing.

Table 3 – Averaged Summary of Recent Effluent Results

Parameter	No. of Samples Taken	Minimum Concentration (mg/l)	Maximum Concentration (mg/l)	Average Concentration (mg/l)
TOTAL SS (monthly average)	8	5.4	13.5	9.5
TOTAL SS (7 day arithmetic mean)	2	11	39	25
Total Nitrogen	20	2	8	6
Total Coliform (monthly median)	8	30	135	82.5
Fecal Coliform (7 day geometric mean)	8	50	158	104
Fecal Coliform (7 day geometric mean)	8	1.12	10.9	6.0

16.4 REUSE WATER PERMIT LIMITS FOR OUTFALL 002

The following permit limits are recommended for the irrigation water (new outfall number 002), for this project. These limits are the basis for the design of the equipment and systems necessary to achieve quality performance. They are:

- Total Suspended Solids: 5 mg/L
- Turbidity: 2 NTU daily average / 10 NTU max. limit
- Fecal Coliform: non-detectable in 4 of 7 days and 23/100 mL max.

16.5 POLYMER COAGULATION SYSTEM

A chemical polymer coagulation system will be installed ahead of the AquaDisk Cloth Media Filter, as a supplemental system if in the unlikely event it becomes necessary to improve the solids removal capability of the filter. The system to be designed will be a liquid polymer feed system such as model L4-P/L6-P, as manufactured by Fluid Dynamics, Inc. This system was selected based upon testing of the actual Riverhead SBR effluent by Fluid Dynamics, Inc. of Boulder Colorado. Polymer blended effluent will flow from the injection system to the cloth media filter.

16.6 CLOTH MEDIA FILTER

The next stage of the treatment system will be an Aqua-Disk Cloth Media Filter manufactured by Aqua-Aerobic Systems, Inc of Rockford, Illinois. The disk filter removes particles above 10 microns (1/1,000 mm) in size and functions to enhance the performance of the downstream UV treatment units, which enhances the overall reliability of the treatment process to produce a consistent product. The disk filter also removes nutrients that are associated with the SBR biological solids. The filter has the capacity to process the average daily flow of 1.3 mgd (903 gpm). The flow will be fully equalized to match the hydraulic limitations of the filter and downstream UV units. The effluent quality is expected to be <5.0 mg/l TSS and <2 NTU turbidity. **Appendix B** includes technical information for this unit process.

16.6.1 Description

The AquaDisk filter is a complete filtration gravity flow device utilizing cloth media that incorporates a nominal 10-micron pore size fabric to remove suspended solids and turbidity from the existing RAWTF SBR effluent. The disk filter was selected to reduce further the effluent solids from the Sequencing Batch Reactor (SBR) activated sludge system operating at the RAWTF. The disk filter precedes the final disinfection step provided by the ultraviolet equipment described later.

As the filter removes solids from the waste stream, a mat of solids builds up on the outside of the cloth disks. The unit is constructed of stainless steel and has a footprint size of approximately 223 inches long x 110 inches wide. The tank is approximately 138 inches high. The system includes internal piping, six (6) cloth disks, 2 HP waste pump, 2-inch electric backwash valves, 2-inch electric sludge valve, backwash pump, level sensing equipment, other miscellaneous valves and a control panel. The unit is Model No. 54 with six (6) disks installed and room for ten (10) disks if desired in the future. This unit is designed to handle a loading of 1.3 mgd with the six (6) disks operating and over 2.3 mgd with all ten (10) disks installed. As flow increases additional discs will have to be installed.

16.6.2 Operation

The six (6) filter unit has 322.8 $ft.^2$ of surface area. At the design flow rate of 903 gpm (1.3 mgd equalized flow), the filter surface loading rate is 2.8 gpm/ $ft.^2$. This is below the loading rate condition as required by the State of California in their acceptance of this equipment

As the mat builds up, water elevation increases in the filter tank until the unit reaches a high water level, as sensed by a pressure transducer inside the tank. This mat is removed by utilizing the suction side of a backwash pump to "vacuum" the solids off the cloth. The backwash water represents approximately 3% of the forward flow of the unit. The backwash water will be returned to the existing influent flow equalization tanks located downstream of the plant's headworks equipment.

The disk filter comes with an integral control panel with programmable logic controller (PLC). The unit operates in an automatic mode unless operator attention is required. Little operator intervention is required during the "AUTO" mode of operation. Backwash is initiated automatically while filtration continues.

16.7 MERCURY VAPOR ULTRAVIOLET DISINFECTION

The last stage of processing is a high dose ultraviolet disinfection process. A low-pressure, high output amalgam mercury ultraviolet disinfection system, as manufactured by Trajan Technologies of Ontario, Canada will be specified. The Model will be the UV3000 Plus. It will be capable of providing a dosage of > 140,000 $\mu J/cm^2$ for the entire plant flow. The existing UV system will be retained as an off-line standby unit to allow for outfall No. 001 discharge in the event of problems with the new disinfection system.

16.7.1 Description

The Trojan System UV3000 Plus ultraviolet disinfection process will be a single channel unit with two (2) banks of low pressure amalgam bulbs. Each bank will have eleven (11) modules with eight (8) lamps per module, for a total of 176 lamps. The system will be assembled within a stainless steel or epoxy coated lined concrete trough. The approximate dimensions of the channel will be 30 feet long, 44 inches wide and 62 inches deep. There will be two (2) power distribution centers with each requiring 480 volt, 3 phase, 4 wire (plus ground), 22.5 kVA. The hydraulic system requires 120 volt, 1 phase, 3 wire (plus ground), 2 kVA. The control system requires 120 volt, 1 phase, 2 wire (plus ground), 10 amps.

The system includes an automatic chemical/mechanical lamp cleaning system and a module lifting device. An on-line UVT monitor will be specified. The equipment includes a 12 month guarantee against faulty workmanship, 12,000 hour operational guarantee for the bulbs and 5 years for the ballasts. Trojan Technologies includes a conditional lifetime performance guarantee for their system.

16.7.2 Operation

The treatment facility's proposed equalized design effluent flow is 972 gpm. At this flow rate; and with a minimum transmittance value of 55%, a maximum total suspended solids concentration of 5 mg/l and a maximum average particle size of 30 microns, the disinfection system will consistently operate below the limit of 2.2 total coliform per 100 ml. This performance standard will ensure that the system meets the recommended SPDES Permit Fecal Coliform performance limits as noted above. This system will provide a UV dose (third party bioassay validated per NWRI Guidelines) of greater than 140,000 μJ/cm2. Typical UV doses required for reuse applications are in the range of 100,000 μJ/cm2 to 120,000 μJ/cm^2. As flow increases the dosage will be adjusted automatically to compensate for the decreased detention time in the channel.

UV Dose is calculated as follows: *UV Dose = Intensity x Retention Time*

The intensity in this equation represents the intensity provided by the system at the end of lamp life and also is corrected for quartz sleeve transmittance. Factors that affect the intensity are as follows: sleeve cleanliness, lamp age, power supply, UV absorbance of the water, and the treatment process upstream of the system. The Town of Riverhead currently has an installed Trojan UV3000™ and they are familiar with the operation and maintenance of the Trojan equipment. Fouling depends on the interaction of hardness, pH, and temperature. With this new system, sleeve cleanliness is controlled by the automatic cleaning system. Lamp age is controlled by proper maintenance schedules; power supply is controlled by an automatic system that monitors the intensity of the dose; and, absorbance will be controlled by two (2) continuously operating, redundant turbidity meters.

Factors that affect the retention time are flow rate and the channel configuration where the system is installed. An adjustable weir is included in the system to adjust the detention time within the channel.

System adjustments will be necessary in order to provide the dose that will actually be required to achieve the desired level of disinfection. In order to obtain a useful dose – response curve, a number of different doses will be applied to the effluent to determine the necessary dose that will actually provide the desired level of disinfection.

As stated above, because coliphages are small, bacterial viruses that are morphologically similar to disease-causing viruses such as hepatitis A virus, and because they can be found in high densities in raw sewage as well as inadequately treated effluent, coliphage monitoring would provide an ongoing measure of the effectiveness of the treatment scheme during the

irrigation season. During system setup and on a weekly monitoring basis, coliphage levels in both the raw sewage and in the treated effluent is recommended for the initial season, followed by monthly monitoring thereafter. This monitoring will be utilized to develop a response curve and adjust the system's operational parameters.

16.8 IRRIGANT SUPPLY SYSTEM

A reinforced concrete pump well will be constructed within the new Filter Building. This structure will house two (2) new Aurora 410 Series, Split Case, Model No. 4 x 5 x 11C, 125 hp pumps with 10.63 inch impellers for the irrigation system. These pumps will each be capable of providing 1,200 gpm of irrigant, at a pressure of 120 psi, to the Central Well Building located on the golf course property. These pumps will be connected to the irrigation system with a 1,400 foot long, 10 inch diameter, DR-18, PVC force main pipe. Controls and valves will be provided at both the new pump well and Suffolk County's existing Central Well Building.

The proposed location of the supply piping is shown on the attached aerial photograph labeled as **Exhibit 2.**

16.9 CONTROL SYSTEM

All SBR effluent will be pumped to the new filter building for advanced treatment. This treatment will be performed as described above. Water exiting the AquaDisk Filter will be analyzed by two (2) concurrently operating turbidity meters. Water that does not meet the reuse water quality turbidity standards, as established for proper UV disinfection, will bypass the Storage Tanks (abandoned trickling filter tanks). If this occurs, valves controlled by the turbidity meters will divert all of the effluent that does not meet the SPDES Permit for unrestricted irrigation reuse to the Outfall Chamber. The turbidity standards for unrestricted reuse are: 2 NTU daily average / 10 NTU max. Controls on the UV system will be able to measure the UV transmittance and automatically adjust the detention time and the intensity of the dose. If the transmittance values indicate that the system cannot disinfect to the required standards for unrestricted reuse, a signal will close the valves to the Storage Tanks. The turbidity meters will be Solitax, Model No. 6940100, as manufactured by Hach Co., Loveland, CO.

Controls will be placed at the golf course Central Well Building that will lock-out the reuse water system if the maintenance staff decides that they don't care to use this water or if sufficient water is not available in the storage tanks. Under these conditions, they will use either their well system or the potable water from the Riverhead Water District.

16.10 FILTER BUILDING

The polymer system, cloth filter, ultraviolet disinfection, power, pumping and control equipment will be installed within a new steel pre-engineered "Filter Building"; similar to those as manufactured by Olympia, Empire, Premier, Steel Master and Freedom Steel. This facility is to be located on the east side of the plant entrance road across from the Administration Building. The building is sized at 40 feet wide by 60 feet long. The layout for the building and the site piping is indicated on the **Filter Building Layout Drawing** included in **Appendix A**, and identified as **Drawing B-1**. The building will be insulated and heated for protection of equipment during winter operations. The building interior and exterior will be field painted using an epoxy coating system. Sky lights will be installed to provide natural lighting during the day.

17 TESTING

In addition to the performance monitoring outlined in Section 10 above for the new Outfall No. 002, the existing SPDES Permit required monitoring for the existing Outfall No. 001, daily fecal coliform tests, and continuous turbidity monitoring will be performed on the processed water diverted to the storage tanks for irrigation usage. Normal SPDES Permit testing will be performed to allow for proper effluent disposal to the Peconic River as required.

18 PROJECT COST OPINION

The construction cost is predicated on two construction contracts being let for the project, namely Mechanical Construction and Electrical Construction. As shown on the spreadsheet in **Appendix F** (page 3 of 4), the Mechanical Construction Contract cost opinion is $1,810,000. The Electrical Construction Contract cost opinion is $650,000.

Consequently, the total construction cost is estimated to be $2,460,000. The contract period is estimated to be 12 months or 276 working days.

The following table summarizes the project budget opinion:

Table 4 - Project Cost Opinion

TASK REF.	COST COMPONENT	BUDGET AMOUNT
1	Construction Cost	$ 2, 460,000
2	Additional SCDHS Research, Reports and Meetings Necessary to Gain Design Conceptual Approval *	$25,000
3	Topographical Survey **	$10,000
4	NYSDEC Grant Work Plan (PO # 064763) **	$10,000
5	Engineering Design Report ($25,000 or 50% of Town P.O. # 064763) and Design / Contract Documents	$180,000
6	NYSDEC Required Grant Contract, Status Reports and Applications for Grant Reimbursement **	$20,000
7	Construction Administration	$60,000
8	Technical Observation (Part Time for 1 Year) / Wicks Law Coordination	$170,000
9	Microbiological Consultant	$15,000
10	Soil Borings and Printing	$22,000
Total Project Cost		$2,972,000
Say . . .		*$2,975,000*

** Special Service Not Included in ASCE Curve (50% of Town P.O. # 064763)*
*** Special Service Not Included in ASCE Curve (Estimated Amount to be confirmed as Project Progresses*

As shown, the total project cost opinion as described herein this report is $2,975,000. A detailed breakdown is included in **Appendix D**. The budget estimate prepared by H2M in March 27, 2006 was $3,300,000. This estimate included the microfiltration unit. Therefore, the savings associated with eliminating the microfiltration unit is approximately $325,000. The project cost reflects the difficulty and expenses associated with upgrading and enlarging an active sewage treatment facility and working on an operating golf course. The contractor must employ special construction means and methods to maintain sewage flow and allow for

uninterrupted operation of the golf course throughout the construction period. The estimated cost of the sheeting operations adds to the project cost. Labor expenses associated with working during low flow conditions have also been factored into the cost.

19 FINANCING

The project is an environmental benefit to the community for improvement of the quality of the Peconic Estuary. As such, it has qualified for New York State Clean Air/Clean Water Environmental Bond Act funding in the amount of $2,095,250.

The following provides a summary of the present and future funds necessary to implement the full scale project:

Total Project Cost:	$2,975,000.
Less Bond Act Grant:	($2,095,250.)
Total Funded by Town:	$879,750.
Less Current Connection Fee Account (as of January 22, 2007):	($576,208.)
Less Suffolk County Contribution:	($165,000.)
Projected Bond Amount:	$138,542

As indicated, the Town would bond approximately $138,542. Assuming an interest rate of 4.5% for 20 years, yields an annual cost to retire the debt as follows:

- Bond Amount: $138,542
- Capital Recovery Factor: 0.07688 (4.5% @ 20 years)
- Annual Amortized Cost: $11,532

Consequently, the first year debt service on the bond is $11,532.

The tax impact on the district (not including the belt filter press project which is currently being jointly undertaken by the Sewer District and Scavenger Waste District) is as follows:

- Riverhead Sewer District:

  Assessed Value - $296,322,109

  Current Full Sewer Tax Rate – 0.444 / $1,000

  Current Annual Tax - $131,567 (Approx.)

  New Tax Amount - $143,099 (Approx.)

New Tax Rate – 0.483 / $1,000 (Approx.)

As an example, for a home assessed at $50,000 the annual increase for the district is as follows:

- Riverhead Sewer District: = 0.483 – 0.444 = $0.039 / $1,000 AV x 50-$1000
  = $1.95 per year increase (8.8% increase)

20 SEQR

Based upon a Full Environmental Assessment Form (EAF) prepared by Joseph Hall, in July 2006, the Town Board undertook a coordinated review process that resulted in no substantial comments or any interest by others to be the Lead Agency. The EAF is included in Appendix D. To continue the SEQR process, the Board realized that they should declare themselves as Lead Agency. The Town of Riverhead has prepared the Part I, Public Information Staff Report as based on the Pilot Study information. The Town Board plans to declare themselves as the Lead Agency. After addressing any review comments, they expect to rule on the SEQR determination. A copy of Part I, Public Information, is included in **Appendix G.**

21 PRELIMINARY PROJECT SCHEDULE

The following table presents the preliminary project schedule for the project:

REF.	MILESTONE	ON OR BEFORE DATE
1	Gain SCDHS and NYSDEC of Engineering Report (this document)	May 1, 2007
2	Complete Design & Gain SCDHS & NYSDEC Approval To Bid	January 1, 2008
3	Bid & Construction Period & Irrigate Indian Island	September 1, 2008

As indicated, the project should be completed in 2008.

A: EPB | FMR | DB (SM1) | | PM: FMR | LSB: FMR |
LSD: 2/27/2007 12:32 PM | LPD: 2/27/2007 1:21 PM | 27 FEBRUARY 2007| R#: 3 | P: 32 |
X:\RDSD (RIVERHEAD SEWER DISTRICT) - 10805\RDSD0606 WASTEWATER REUSE FULL SCALE PLANT MAP & PLAN\01-MAP AND PLAN\FMR FINAL DOCUMENT\FMR FINAL REPORT AS PUBLISHED TO SCDHS_NYSDEC\2007 FEB 27 WW REUSE FINAL REPORT FOR AGENCY REVIEW BY FMR_00.DOC |
MAP & PLAN - WASTEWATER REUSE GOLF COURSE IRRIGATION | PHASE 2 - OFF-SITE IMPLEMENTATION | RDSD 06-06

Appendix A

Figure No. 1	Process Schematic
Drawing P-1	Hydraulic Profile
Drawing S-1	Partial Site Plan
Drawing B-1	Filter Building Layout

Appendix B

Aqua-Aerobics, Inc.
Cloth Media Filter Technical Information

Appendix C

Trojan Technologies, Inc.
UV3000 Plus Ultraviolet Disinfection System
Technical Information

Appendix D

Full Environmental Assessment Form

Appendix E

Pump and Piping Information

Appendix F

Cost Opinion Spreadsheets

Appendix G

Staff Report (SEQR) - Part I, Project Information

Exhibit 1

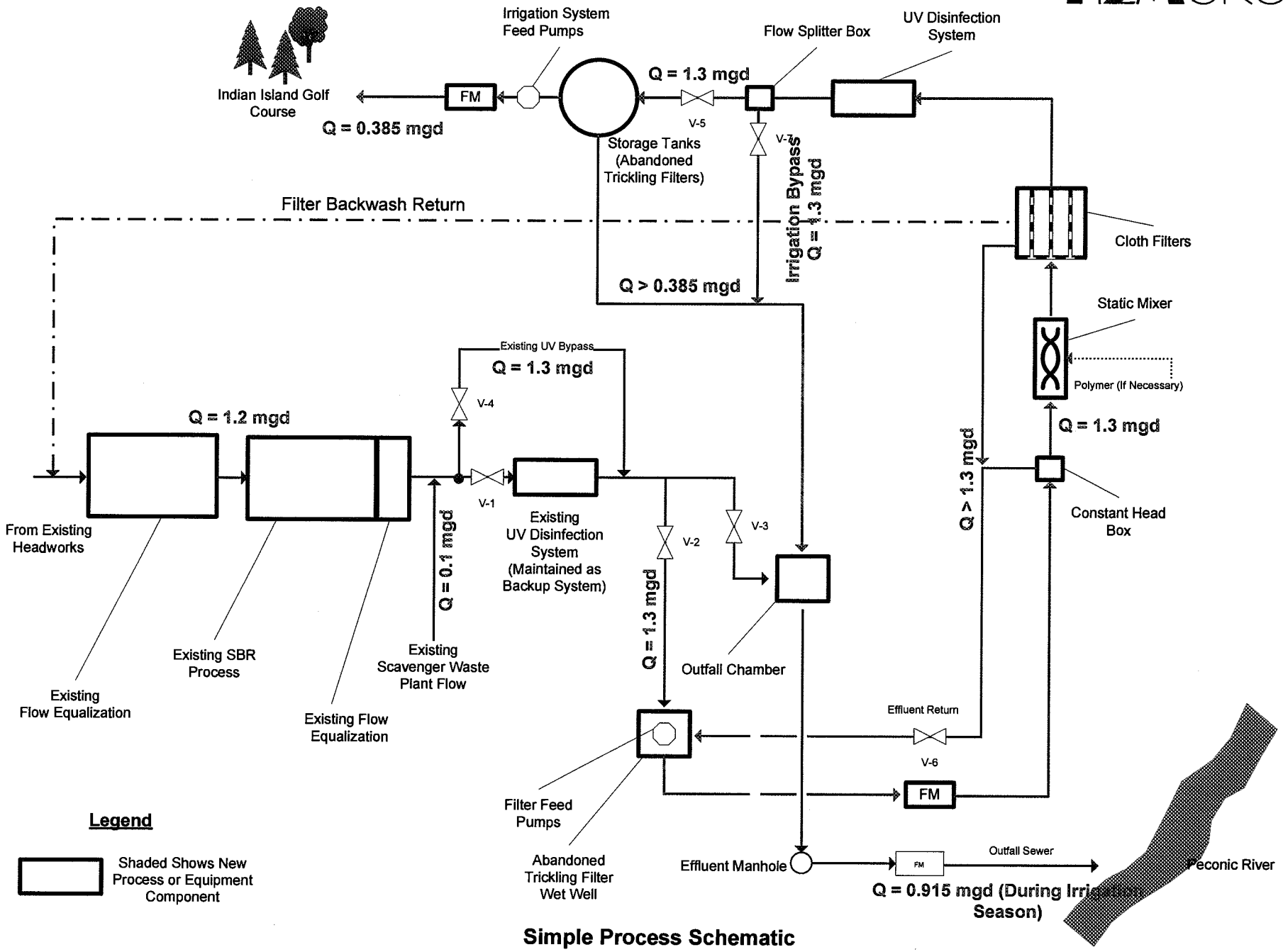
Site Photographs

Exhibit2

Aerial Photographs

Appendix A

Figure No. 1	Process Schematic
Drawing P-1	Hydraulic Profile
Drawing S-1	Partial Site Plan
Drawing B-1	Filter Building Layout



Simple Process Schematic
Wastewater Reuse for Golf Course Irrigation

Appendix B

Aqua-Aerobics, Inc.
Cloth Media Filter Technical Information

PROCESS DESIGN REPORT

Riverhead Reuse, NY - Membranes

Design#: 28775

Option: Preliminary Design - 10/6 disk filter, 304 SS

Designed by Tamera Knapp on Wednesday, July 19, 2006

The enclosed information is based on preliminary data which we have received from you. There may be factors unknown to us which would alter the enclosed recommendation. These recommendations are based on models and assumptions widely used in the industry. While we attempt to keep these current, Aqua-Aerobic Systems, Inc. assumes no responsibility for their validity or any risks associated with their use. Also, because of the various factors stated above, Aqua-Aerobic Systems, Inc. assumes no responsibility for any liability resulting from any use made by you of the enclosed recommendations.

Design Notes

Filtration

- The filter recommendation following the SBR is predicated on an equalization basin preceding the filter.

- The anticipated effluent quality is based upon filterable influent solids.

- Aqua-Aerobic Systems recommends covering filters in areas where bright sunlight is expected to cause excessive algae growth.

- For this application, pile filter cloth is recommended, which has a nominal pore size of 10 microns.

Pricing

- Pricing includes freight, installation supervision and start-up services.

- Pricing is based upon Aqua Aerobic Systems standard materials of construction and electrical components.

AquaDISK Tertiary Filtration - Design Summary

DESIGN INFLUENT CONDITIONS

Pre-Filter Treatment: SBR

Avg. Design Flow	= 1.4 MG/day	= 972.2 gpm	= (5292 m^3/day)
Max. Design Flow	= 1.4 MG/day	= 972.2 gpm	= (5292 m^3/day)

			Effluent			
DESIGN PARAMETERS	**Influent**	**mg/l**	**Required**	**<= mg/l**	**Anticipated**	**<= mg/l**
Avg. Total Suspended Solids:	TSSa	10	TSSa	5	TSSa	5
Max. Total Suspended Solids:	TSSm	15	--	--	--	--
Bio/Chem Oxygen Demand:	BOD5	10	BOD5	5	BOD5	5

AquaDISK FILTER SIZING CRITERIA

Filter Type:

Vertically Mounted Cloth Media Disks featuring automatically operated vacuum backwash . Tank shall include a hopper-bottom and solids removal manifold system.

Average Flow Conditions:

Average Hydraulic Loading = 3.25 gpm per square foot of filter area at Avg. Flow.
= (2.21 L/s per square meter of filter area at Avg. Flow.)

Filter Area Required = Avg. Design Flow (gpm) / Avg. Hydraulic Loading (gpm/ft^2) = 299.1 ft^2 = (27.79 m^2)

Maximum Flow Conditions:

Maximum Hydraulic Loading = 6.5 gpm per square foot of filter area at Max. Flow.
= (4.42 L/s per square meter of filter area at Max. Flow.)

Filter Area Required = Max. Design Flow (gpm) / Max. Hydraulic Loading (gpm/ft^2) = 149.6 ft^2 = (13.9 m^2)

Solids Loading:

Solids Loading Rate = 3.25 lbs TSS per square foot of filter area per day.
= (15.87 kg TSS per square meter of filter area per day.)

Filter Area Required = (lbs TSS/day) / Solids Loading Rate (lbs TSS/ft^2/day) = 53.9 ft^2 = (5.01 m^2)

AquaDISK FILTER RECOMMENDATION

Qty Of Filter Units Recommended = 1

Number Of Disks Per Unit = 6

Total Number Of Disks Recommended = 6

Total Filter Area Provided = 322.8 ft^2 = (29.99 m^2)

Filter Model Recommended = AquaDisk Package Model 54: 10 Disk Unit w/6 Disks

Equipment Summary

Cloth Media Filters

AquaDisk Tanks/Basins

1 Aquadisk model # ADFP-54x10E-PC package filter 304 stainless steel tank(s) consisting of:

- 10/6 Disk 304 SS tank(s).
- Effluent seal plate weldment.
- 3" ball valve(s).

AquaDisk Centertube Assemblies

1 Centertube Assembly(ies) consisting of:

- Centertube.
- Lower carrier assembly.
- Centertube position maintainer.
- Centertube end support bearing kit(s).
- Effluent centertube lip seal.
- Centertube drive sprocket(s).
- 5/8" diameter 316 stainless steel media support rods.
- Neoprene media sealing gaskets.
- Effluent port cover plates.
- Pile cloth media and non-corrosive support frame assemblies.

AquaDisk Drive Assemblies

1 Drive System Assembly(ies) consisting of:

- Gearbox with motor.
- Stationary drive bracket weldment.
- Drive chain(s) with pins.
- Warning label(s).
- Chain guard weldment(s).
- Drive spocket(s).

AquaDisk Backwash/Sludge Assemblies

1 Backwash Support Assembly(ies) consisting of:

- Backwash support weldment(s).
- 304 stainless steel temporary end angles.

1 Backwash Pump installation(s) consisting of:

- Backwash and sludge pump(s).
- Backwash pump throttling gate valve(s).
- 3" ball valve(s).

1 Backwash System Assembly(ies) consisting of:

- Backwash collection nozzle.
- PVC sludge collection manifold(s).
- Combination nipple(s) for hose to pipe connection(s).
- Stainless steel backwash nozzle springs.
- 1 1/2" PVC flexible hose.
- 2" wire reinforced flexible hose.
- Stainless steel hose clamps.
- 304 stainless steel blind flange(s).
- 304 stainless steel backwash collection manifold(s).

1 External Piping Assembly(ies) consisting of:

- 316 stainless steel combination nipple(s).
- Polypropylene quick coupler dust covers.

- Polypropylene quick couplers.
- 2" wire reinforced flexible hose.
- 0 to 30 inches mercury vacuum gauge(s).
- 304 stainless steel blind flange(s).
- Pipe plug
- Pressure gauge(s).

AquaDisk Instumentation

1 Pressure Transducer Assembly(ies) consisting of:

- Level sensing pressure transducer(s).
- Schedule 80 PVC stilling tube(s).
- Float Switch(es).

AquaDisk Valves

1 Influent Valve(s) consisting of:

- 18" manual butterfly valve(s).

1 Set(s) of Backwash Valve(s) consisting of:

- 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be manufactured by TCI / Nibco or equal.

1 Sludge Valve(s) consisting of:

- 2" full port, three piece, stainless steel body ball valve(s), grooved end connections with single phase electric actuator(s). Valve / actuator combination shall be manufactured by TCI / Nibco or equal.

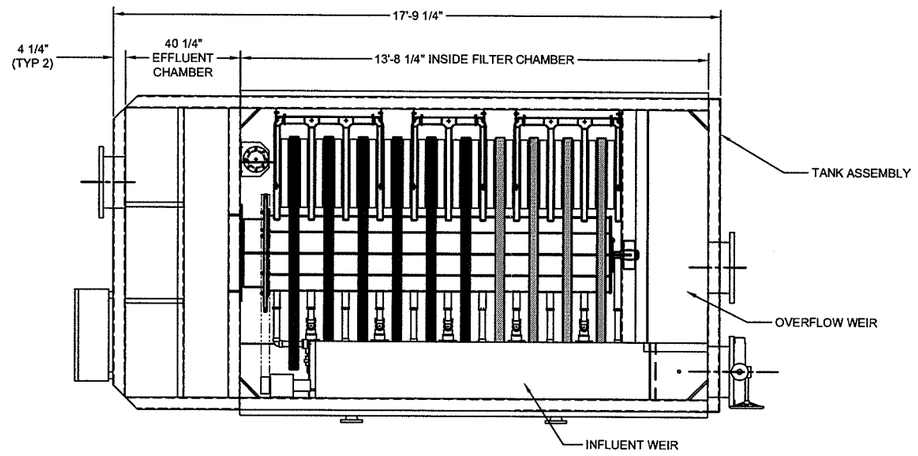
AquaDisk Controls w/Starters

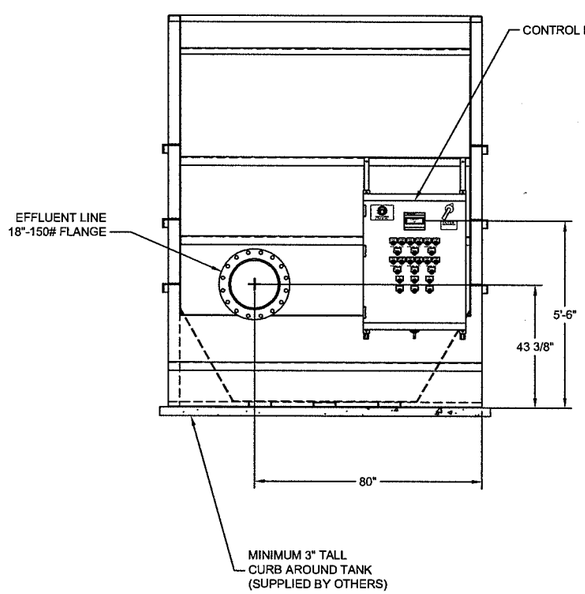
1 Controls Package(s) will be provided as follows:

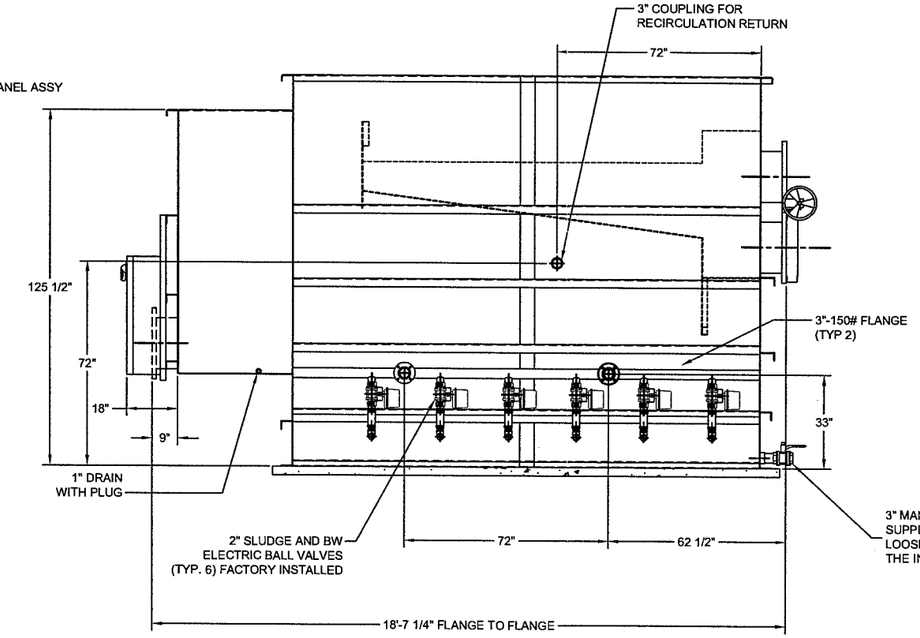
- Nema 4X 304 stainless steel enclosure(s).
- Starter 18 AMP 3-Pole.
- Allen Bradley Panelview 550 touch screen display(s).
- Panelview 550 operational cable.
- Allen Bradley SLC 5/04 integral programmable controller.
- Analog input card(s).

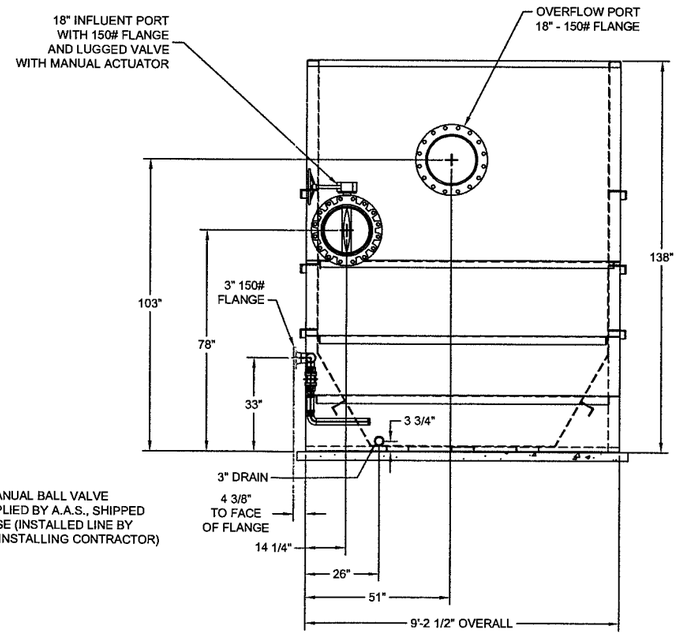
FREEZE NOTE

IF FREEZING IS A CONCERN, AQUA-AEROBIC SYSTEM RECOMMENDS THE FILTERS BE PLACED IN A HEATED BUILDING.



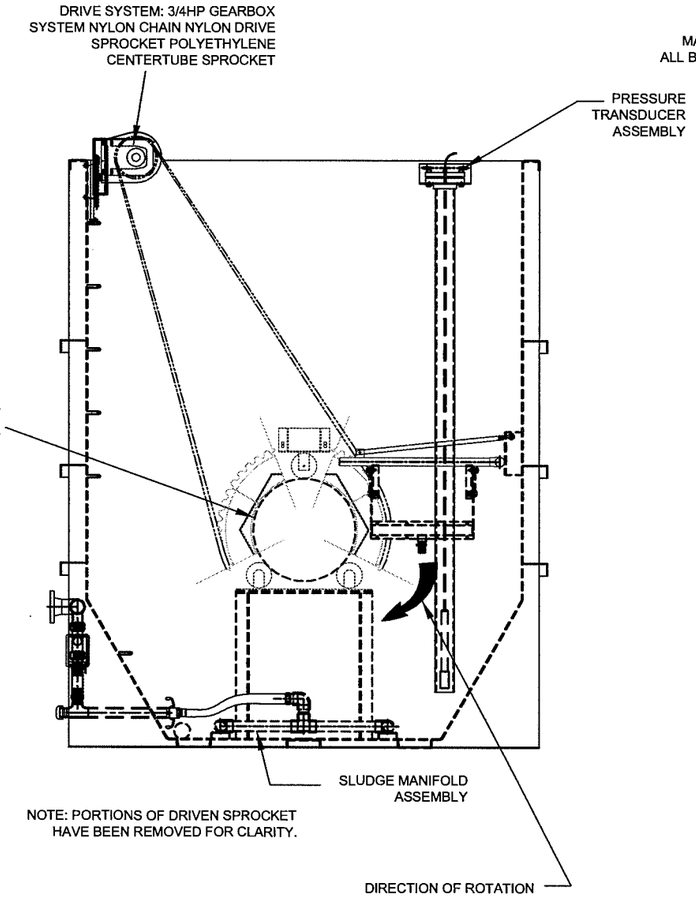






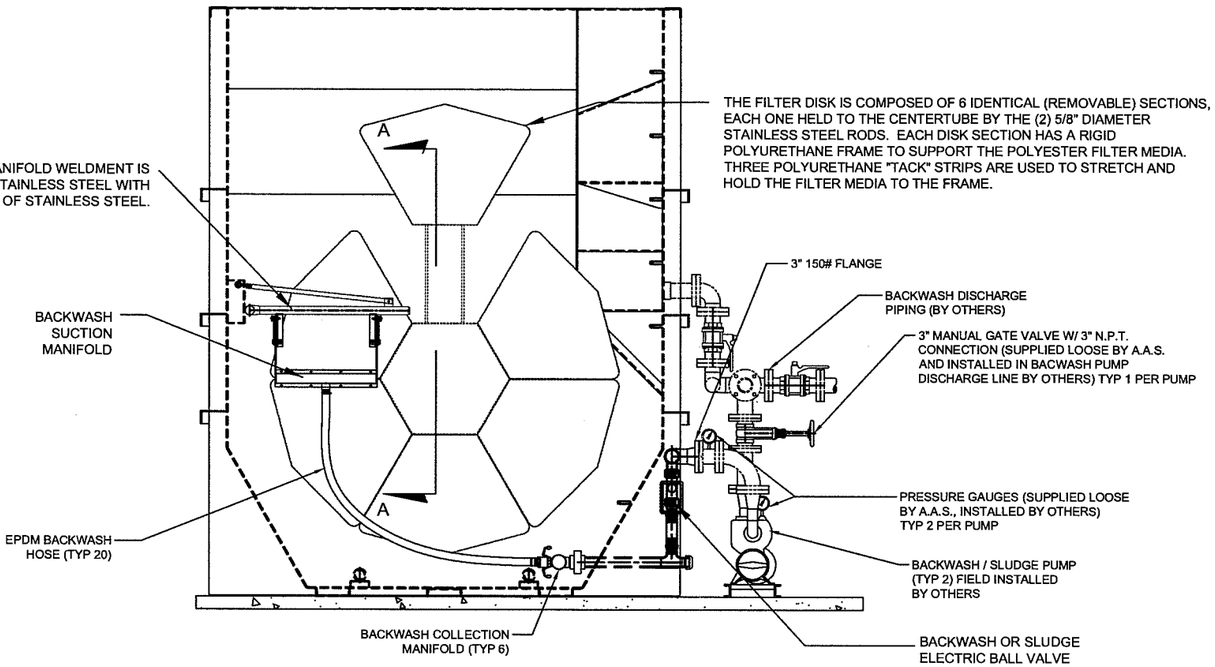
DRY WT (LBS)	OPER. WT. (LBS)
20,900	120,400

JOB NAME:				DO NOT SCALE DRAWING	AQUA-AEROBIC SYSTEMS, INC.
JOB LOCATION:				DRN BY: JRA	DATE: 4/25/01
ENGINEERS:				CKD BY:	ACT WT:
				SCALE:	NAME: AQUADISK FILTER
				SIMILAR:	MODEL ADFP-54x10E-PC
				REF:	PILE CLOTH
				HP/SIZE:	SHEET 1 OF 5
REF	ECO	DATE	BY	REVISION	TYPE: DWG. NO.: 2801553



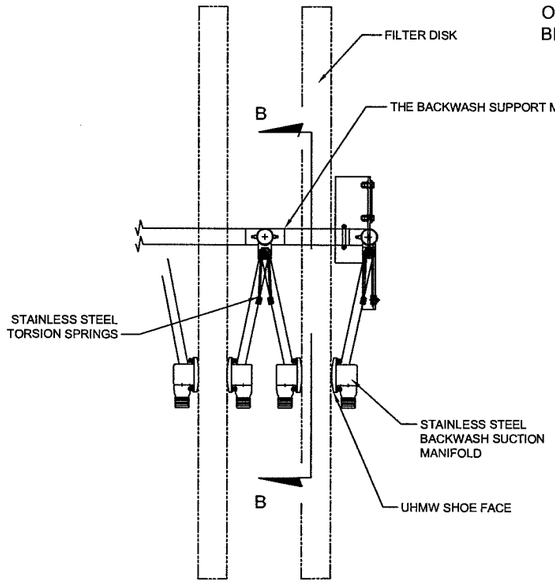
NOTE: PORTIONS OF DRIVEN SPROCKET HAVE BEEN REMOVED FOR CLARITY.

FRONT MOUNTING AND DRIVE CROSS SECTION

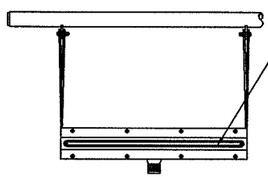


BACKWASH MANIFOLD CROSS SECTION

ALL EXTERNAL PIPING DRAWN FOR REFERENCE ONLY AND PROVIDED BY OTHERS, ACTUAL PIPING LAYOUT TO BE DETERMINED BY OTHERS.

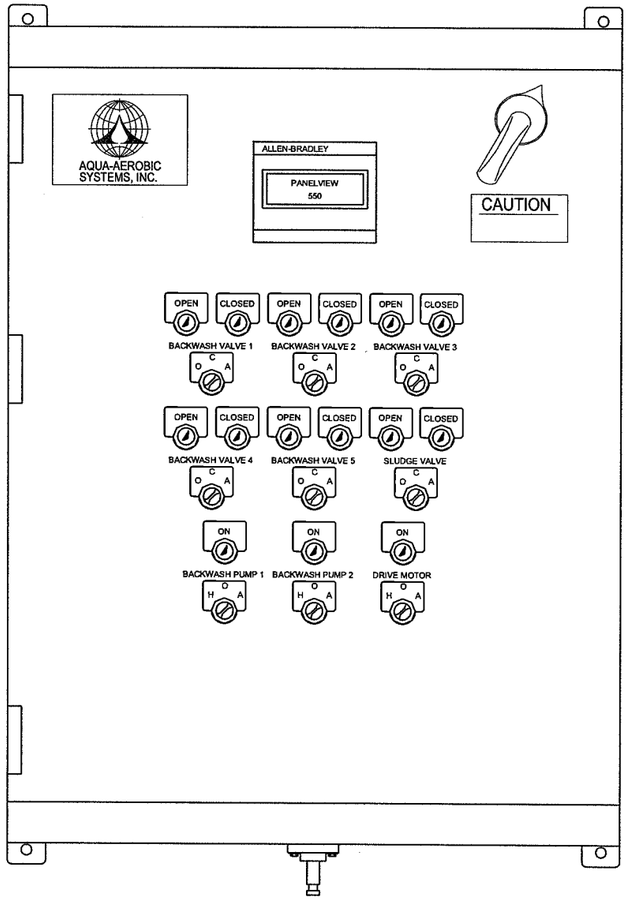


VIEW A-A

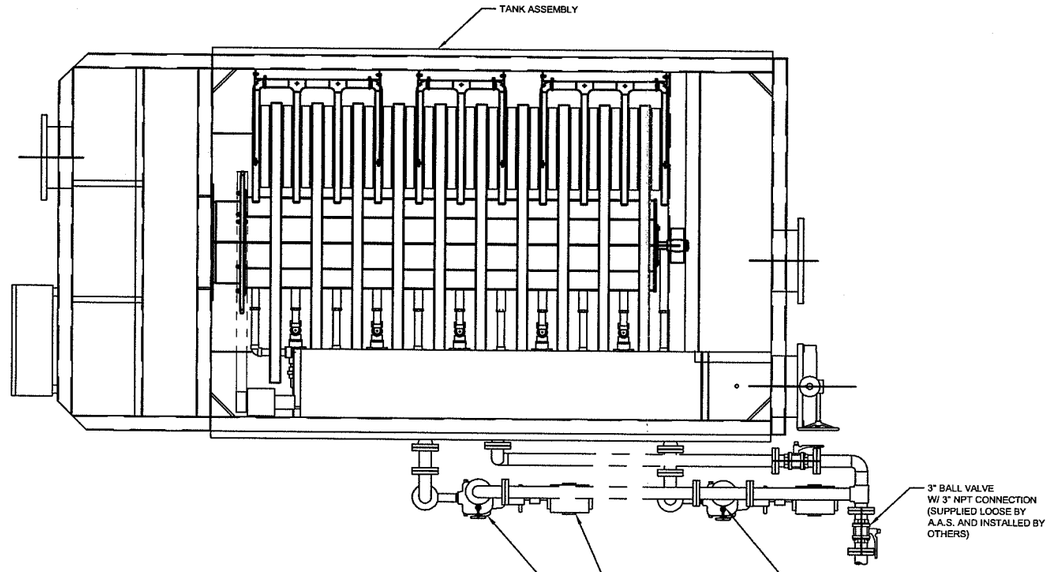


VIEW B-B

JOB NAME:					DO NOT SCALE DRAWING		AQUA-AEROBIC SYSTEMS, INC. MANUFACTURERS OF WASTEWATER TREATMENT EQUIPMENT
JOB LOCATION:					DRN BY: JRA	DATE: 4/25/02	
ENGINEERS:					CKD BY:	ACT WT:	
					SCALE:		NAME: AQUADISK FILTER
					SIMILAR:		MODEL ADFP-54x10E-PC
					REF: 2801553		
					HP/SIZE:		SHEET 2 OF 5
REF	ECO	DATE	BY	REVISION	TYPE:		DWG. NO.: 2801553



PANEL LAYOUT



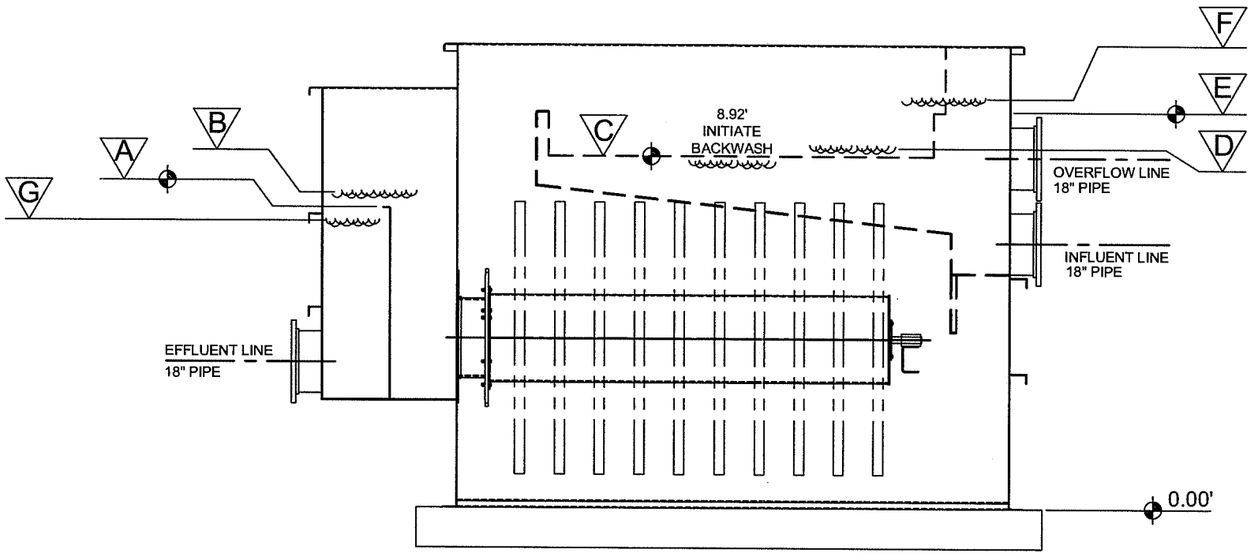
PIPING LAYOUT

ALL EXTERNAL PIPING DRAWN FOR REFERENCE ONLY AND PROVIDED BY OTHERS, ACTUAL PIPING LAYOUT TO BE DETERMINED BY OTHERS.

NOTE:
THE STANDARD WASTE PUMPS PROVIDE 23.2 FEET OF TOTAL HEAD AT A FLOW OF 130 GPM. THE SUCTION-SIDE PIPING REQUIRES APPROXIMATELY 11 FEET OF THIS HEAD. THIS LEAVES APPROXIMATELY 12 FEET (5 PSIG) FOR THE DISCHARGE SIDE. THE DISCHARGE DIAMETER, EQUIVALENT LENGTH, AND VERTICAL LIFT MUST RESULT IN A HEAD LOSS LESS THAN 12 FEET. INSTALLATIONS WITH MORE THAN ONE WASTE PUMP MUST ACCOMMODATE ALL WASTE PUMPS RUNNING SIMULTANEOUSLY WITHOUT EXCEEDING 12 FEET OF DISCHARGE HEAD.

FOR INSTALLATIONS THAT REQUIRE MORE DISCHARGE HEAD, ALTERNATIVE PUMPS ARE AVAILABLE. PLEASE CONSULT AASI ENGINEERING TO VERIFY THE SUITABILITY OF THE DISCHARGE PIPING OR FOR SPECIAL PUMP REQUIREMENTS.

JOB NAME:					DO NOT SCALE DRAWING		AQUA-AEROBIC SYSTEMS, INC. MANUFACTURERS OF WASTEWATER TREATMENT EQUIPMENT
JOB LOCATION:					DRN BY: JRA	DATE: 4/25/01	
ENGINEERS:					CKD BY:	ACT WT:	
					SCALE:		NAME: AQUADISK FILTER
					SIMILAR:		MODEL ADFP-54x10E-PC
					REF:		PILE CLOTH
					HP/SIZE:		SHEET 3 OF 5
REF	ECO	DATE	BY	REVISION	TYPE:		DWG. NO.: 2801553



HYDRAULIC PROFILE
BASED UPON AVERAGE FLOW RATE OF 3.25 GPM PER SQUARE FOOT (2.5 MGD)
BASED UPON MAXIMUM FLOW RATE OF 6.5 GPM PER SQUARE FOOT (5.0 MGD)

	ELEVATION	
A	7.53'	EFFLUENT WEIR ELEVATION.
B	7.80'	NAPPE OVER EFFLUENT WEIR. AVERAGE FLOW.
	7.96'	NAPPE OVER EFFLUENT WEIR. PEAK FLOW.
C	8.96'	INFLUENT WEIR ELEVATION.
D	9.22'	NAPPE OVER INFLUENT WEIR. AVERAGE FLOW.
	9.37'	NAPPE OVER INFLUENT WEIR. PEAK FLOW.
E	9.92'	OVERFLOW WEIR ELEVATION.
F	10.23'	NAPPE OVER OVERFLOW WEIR. AVERAGE FLOW.
	10.41'	NAPPE OVER OVERFLOW WEIR. PEAK FLOW.
G	7.00'	MAXIMUM AVAILABLE LIQUID LEVEL FOR EFFLUENT CONVEYENCE.

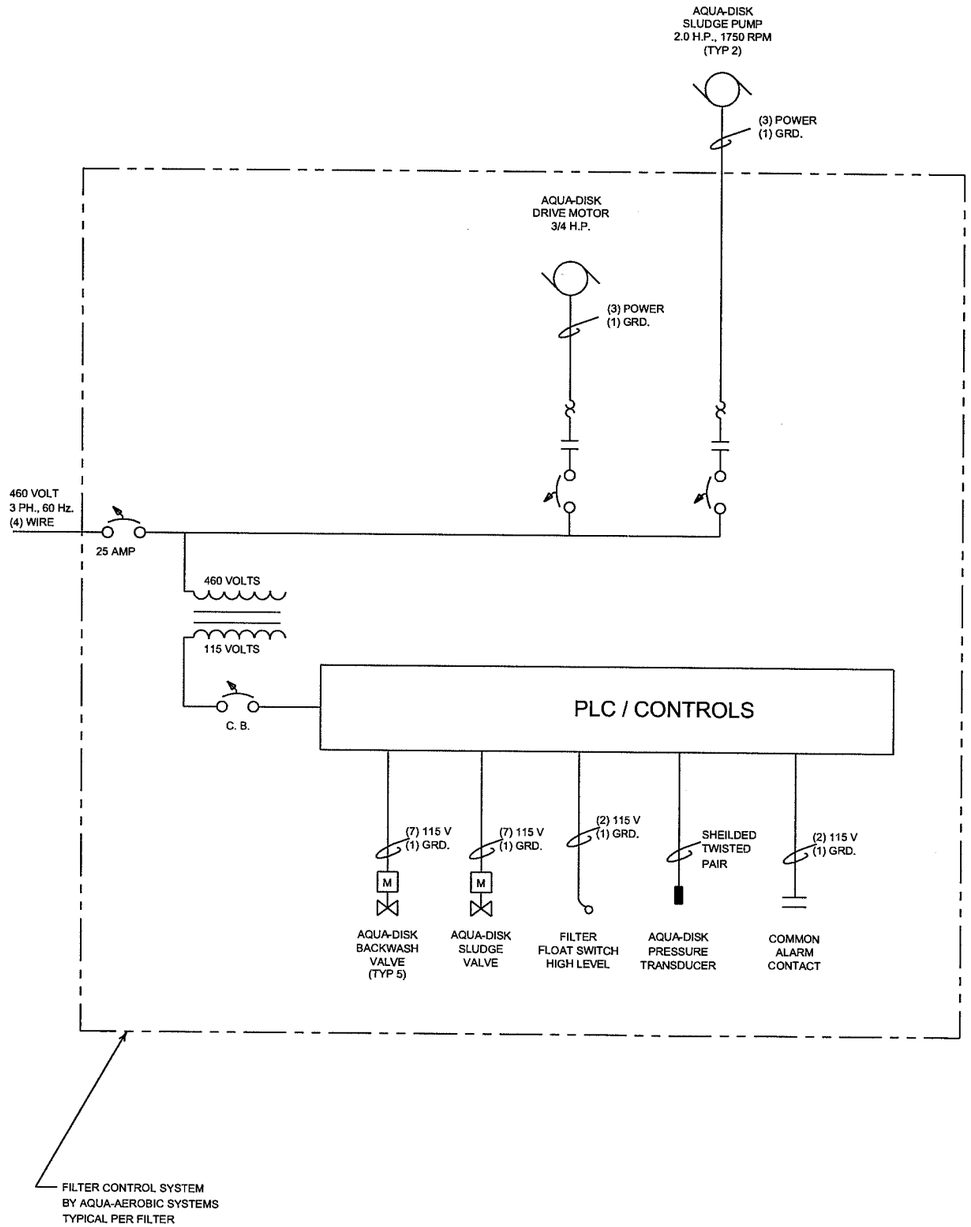
WEIR LENGTHS
INFLUENT - 9.00'
EFFLUENT - 8.50'
OVERFLOW - 6.83'

JOB NAME:					DO NOT SCALE DRAWING		AQUA-AEROBIC SYSTEMS, INC.
JOB LOCATION:					DRN BY: JRA	DATE: 4/25/01	
ENGINEERS:					CKD BY:	ACT WT:	
					SCALE:		NAME: AQUADISK FILTER
					SIMILAR:		MODEL ADFP-54x10E-PC
					REF:		PILE CLOTH
					HP/SIZE:		SHEET 4 OF 5
REF	ECO	DATE	BY	REVISION	TYPE:		DWG. NO.: 2801553

SYMBOL KEY

	MOTOR		CIRCUIT BREAKER		ELECTRICAL DISCONNECT	VFD	VARIABLE FREQUENCY DRIVE		PRESSURE TRANSDUCER	M	MOTOR OPERATED WEIR		STARTER CONTACTOR
M	MOTOR OPERATED VALVE		D.O. SENSOR PROBE		MOTOR OVERLOAD	P	PNEUMATIC OPERATED VALVE		FUSE		TRANSFORMER	P	PNEUMATIC OPERATED WEIR

NOTE: SOME SYMBOLS MAY NOT BE APPLICABLE



JOB NAME:						DO NOT SCALE DRAWING		AQUA-AEROBIC SYSTEMS, INC. MANUFACTURERS OF WASTEWATER TREATMENT EQUIPMENT	
JOB LOCATION:						DRN BY: JRA	DATE: 5/28/02		
ENGINEERS:						CKD BY:	ACT WT:		
						SCALE:		NAME: AQUADISK FILTER	
						SIMILAR:		MODEL ADFP-54x10E-PC	
						REF:		ONELINE DIAGRAM	
-						HP/SIZE:		SHEET 5 OF 5	
REF	ECO	DATE	BY	REVISION		TYPE: 10 DISK PILE CLOTH		DWG. NO.: 2801553	

RIVERHEAD SEWER DISTRICT

TOWN OF RIVERHEAD
200 HOWELL AVENUE
RIVERHEAD, N.Y. 11901

FAX TRANSMITTAL SHEET

DATE: _____

TIME: _____

NUMBER OF PAGES (INCL. COVER SHEET) 6

TO: Ed Bysse

COMPANY H2M

FAX NUMBER 694-4122

FROM: Mike Reichel

RE: _____

COMMENTS: Ed, attached is the info you were looking for from Cayuga Chemical. If you have any questions please call me. Thanks Mike

CONTACT SENDER IF YOU DO NOT RECEIVE ALL PAGES OR COPY IS NOT LEGIBLE.

Fax# (631) 369-3091 Telephone# (631) 727-3069

Coyne Chemical environmental services

3015 State Road, Croydon, PA 19021-6997
215 785-3000 215 785-1585 FAX 800 523-1230 ORDER ENTRY

October 5, 2006

Tim Allen
Superintendent
Town of Riverhead Sewer District
200 Howell Avenue
Riverhead, NY 11901

RE: Effluent Jar Test Results

Dear Tim:

Thank you for the opportunity to evaluate Ciba Specialty Polymers for potential effluent treatment.

Your effluent is very clean and solids are not visible to the naked eye. We could not see any floc formation when we added various amounts of two different polymers. To determine if there was any activity we measured the effluent turbidity before and after polymer addition. A very small floc or just a hazing can be measured via turbidity and will likely lead to improved filtration. The results are as follows:

Starting Effluent Turbidity: 4 NTU

Product	Dosage	Final Turbidity
Zetag 7875 FS40	0.5 mg/L	4 NTU
Zetag 7875 FS40	1.0 mg/L	7 NTU
Magnafloc LT 7985	0.5 mg/L	5 NTU
Magnafloc LT 7985	1.0 mg/L	7 NTU

Since you already use Zetag 7875 FS40 I recommend a pilot study with this product. Magnafloc LT 7985 is a product traditionally used as a filter aid and tends to be more forgiving where blinding filters is a concern. Since I am not familiar with the filter equipment you are considering I cannot offer an opinion as to the effect polymer may have on it. If blinding is not an issue at these low dosages then using the polymer you already have on site makes sense.

Thank you for your interest in Coyne Chemical. Please don't hesitate to call me or Julie Jones, your Customer Service Representative, for further assistance.

Sincerely,
GEORGE S. COYNE CHEMICAL CO., INC.

Jamie Newgarde
Chemical Applications Specialist
Environmental Services Division

Ciba Specialty Chemicals
USA
Additives

Ciba
Value beyond chemistry

Pollution Control

CIBA® ZETAG™ 7875 FS40 Flocculant

Cationic Liquid Dispersion Grade Polymer

Description

ZETAG 7875 FS40 is a low molecular weight, polyacrylamide based flocculant which exhibits a high degree of cationic charge. **ZETAG 7875 FS40**, once inverted and hydrated in water, reacts readily to provide superior floc formation and performance in a variety of solids/liquid separation processes. **ZETAG 7875 FS40** is supplied in a unique liquid dispersion form which offers superior stability.

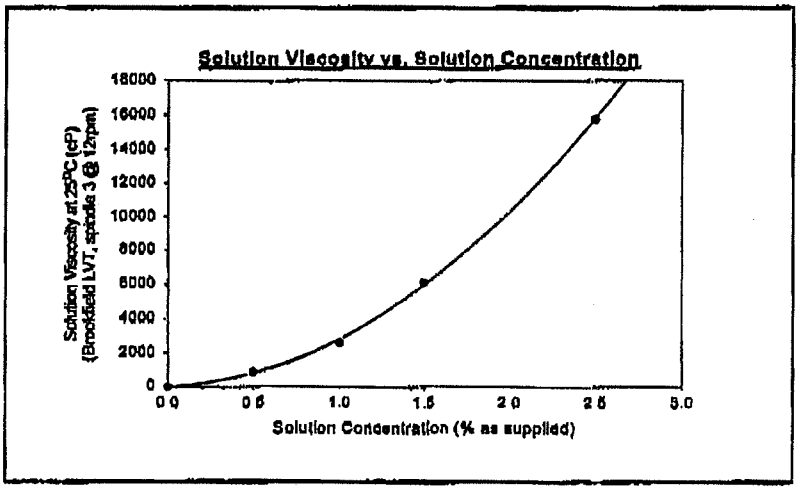
Principal Uses

ZETAG 7875 FS40 has been designed as a flocculant for a variety of municipal and industrial waste substrates. It has been proven especially effective for conditioning these substrates for solids sedimentation, thickening, and dewatering processes.

ZETAG 7875 FS40 offers greatly improved solids/liquid separation efficiencies over a wide range of pH and is available in a variety of packaging for ease of handling and safety.

Typical Properties

Appearance	milky, off-white liquid
Solids Content	50%
Particle Size	10% > 1.1μm, 50% > 0.9μm, and 90% > 0.7μm
Specific Gravity	1.06
Solution pH	3.5-5.5
Flash Point	>200F (93C) - product not combustible
Viscosity of Supplied Product	933cP (LVT, spindle #2 @ 12rpm)
Solution Viscosity	See graph below



Application & Storage	Recommended solution concentrations: Stock solution 0.5%-1.6% as supplied Feed solution 0.1%-0.5% as supplied Recommended storage periods: Product as Supplied 1 year Stock solution 2-5 days Feed solution 1-3 days Storage of the product and solutions for longer than the recommended periods may be acceptable under the correct conditions but could result in some loss of product efficiency. Storage should be in a cool, dry place, and conditions of extreme temperatures should be avoided. Packages should be kept sealed when not in use. Depending upon storage conditions and product age, product separation may occur. If separation is observed, the product should be re-dispersed well by mixing or re-circulation before use to ensure maximum efficiency. Full details of solution preparation are contained within the **ZETAG** and **MAGNAFLOC** leaflet. Further advice on solution preparation using Ciba Specialty Chemicals automated make-up systems is available, and details may be obtained on request.
Corrosive Properties	Corrosion towards most standard materials of construction is very low. Stainless steel, fiberglass, polyethylene, polypropylene and rubberized surfaces are recommended. In some cases, aluminum and galvanized surfaces can be adversely affected.
Packaging	**ZETAG 7875 FS40** is supplied in 44lb. (20kg.) drums, 441lb. (200kg.) drums, 2205lb. (1002kg.) semi-bulk containers, or in bulk by tanker delivery (45,000lb/20,450kg maximum).
Spills	Spills of **ZETAG 7875 FS40** should be contained and disposed of in accordance with local regulations. Discharges of product or solutions of product to waterways should be avoided since some polymeric products may have an adverse effect on the mucous membranes on fish gills. Solutions of **ZETAG 7875 FS40** are very slippery.
Technical Service	Complete technical service is provided in the sale of **ZETAG 7875 FS40**. This includes advice and full assistance in all aspects of product selection, laboratory testing, troubleshooting, and plant trials.
Health and Safety	**ZETAG 7875 FS40** exhibits a very low order of toxicity and does not present any abnormal problems in its handling or general use. Standard industrial safety procedures should be observed. Detailed information on handling and any precautions to be observed in the use of the product(s) described in this leaflet can be found in our relevant Material Safety Data Sheets.
Warranty	The information contained in this leaflet is given in good faith but no liability is assumed nor is freedom from any patent owned by Ciba Specialty Chemicals or others implied. This information should not be taken to represent a specification for the product.

Ciba Specialty Chemicals Water Treatments, Inc.
PO Box 820 Suffolk, Virginia 23439-0820
Tel: 757 538 3700 Fax: 757 538 0258

Ciba Specialty Chemicals
USA
Additives

Ciba
Value beyond chemistry

Pollution Control

CIBA® MAGNAFLOC LT® 7985 Coagulant

NSF Certified Cationic Solution Grade Polymer

Description

MAGNAFLOC LT 7985 is a very low molecular weight, coagulant product with a very high degree of cationic charge. It is a very pure product which has been specifically designed to meet the American Standard ANSI/NSF 60 and has been certified by NSF International for use in the treatment of potable water at a maximum recommended concentration of 50mg/L. **MAGNAFLOC LT 7985** reacts readily in its diluted form to provide superior coagulation and performance in a variety of solids/liquid separation processes. **MAGNAFLOC LT 7985** is supplied as a solution of polymer in water.

Principal Uses

MAGNAFLOC LT 7985 has been designed as a coagulant for a variety of municipal and industrial waste substrates and applications where NSF certification is needed. It has been proven especially effective for processes where enhanced sedimentation or filtration is necessary or where a reduction of turbidity, color, BOD/COD, or similar pollutants is necessary. The appropriate **MAGNAFLOC LT** flocculant used in conjunction with **MAGNAFLOC LT 7985** will generally further enhance solid/liquid separation rates in cases where this is needed.

MAGNAFLOC LT 7985 offers greatly improved solids/liquid separation efficiencies over a wide range of pH and is available in a variety of packaging for ease of handling and safety.

Typical Properties

Appearance	clear, straw colored liquid
Solids Content	20%
Specific Gravity	1.04
pH of Supplied Product	7
Viscosity of Supplied Product	120cP
Viscosity of 1% Solution	<50cP (LVT, spindle #1 @ 12rpm)

Application & Storage

Recommended solution concentrations: **MAGNAFLOC LT 7985** can be metered directly into the wastewater stream and mixed in-line by static mixing. If solutions are to be prepared, typical dilution concentrations of 0.25%-5% product as supplied are recommended.

Recommended storage periods: The product as supplied should be stable under normal conditions of 40-85F for at least two years. If preparing and storing solutions, solutions greater than 1% can be stored for 2-5 days, whereas, solutions less than 1% should be prepared fresh after 1-2 days.

Storage of the product and solutions for longer than the recommended periods may be acceptable under the correct conditions but could result in some loss of product efficiency. Product should be stored in a cool place, and conditions of extreme temperatures should be avoided. Packages should be kept sealed when not in use. Further advice on solution preparation using Ciba Specialty Chemicals automated make-up systems is available, and details may be obtained on request.

Corrosive Properties	Corrosion towards most standard materials of construction is very low. Stainless steel, fiberglass, polyethylene, polypropylene and rubberized surfaces are recommended. In some cases, aluminum and galvanized surfaces can be adversely affected.
Packaging	**MAGNAFLOC LT 7985** is supplied in 40lb. (18kg.) plastic drums, 450lb. (205kg.) plastic drums, 2,250lb. (1,023kg.) semi-bulk containers, or in bulk by tanker delivery (45,000lb./20,450kg. maximum).
Spills	Spills of **MAGNAFLOC LT 7985** should be contained and disposed of in accordance with local regulations. Discharges of product or solutions of product to waterways should be avoided since some polymeric products may have an adverse effect on the mucous membranes on fish gills.
Technical Service	Complete technical service is provided in the sale of **MAGNAFLOC LT 7985**. This includes advice and full assistance in all aspects of product selection, laboratory testing, troubleshooting, and plant trials.
Health and Safety	**MAGNAFLOC LT 7985** exhibits a very low order of toxicity and does not present any abnormal problems in its handling or general use. Standard industrial safety procedures should be observed. Detailed information on handling and any precautions to be observed in the use of the product(s) described in this leaflet can be found in our relevant Material Safety Data Sheets.
Warranty	The information contained in this leaflet is given in good faith but no liability is assumed nor is freedom from any patent owned by Ciba Specialty Chemicals or others implied. This information should not be taken to represent a specification for the product.

Ciba Specialty Chemicals Water Treatments, Inc.
PO Box 820 Suffolk, Virginia 23439-0820
Tel: 757 538 3700 Fax: 757 538 0258

Jamie Newbarge

DYNABLEND

LIQUID POLYMER APPLICATIONS WORK SHEET

BASED ON "ACTIVE" POLYMER

Sludge Dewatering / Thickening Application

Step 1. _____ GPM sludge X 8.34 lbs/gal = _____lbs / min liquid sludge

Step 2. _____ lbs / min sludge X _____% dry solids (expressed as a decimal, i.e. 4% = 0.04) = _____lbs / min dry solids

Step 3. _____ lbs / min dry solids x 60 min / hr = _____lbs / hr dry solids

Step 4.a $\frac{\text{\_\_\_\_\_ lbs / hr dry solids}}{\text{2000 lbs. / dry ton}}$ = _____ tons / hour dry solids

-or- (if sludge volume is given in tons per day, skid steps 1 thru 4.a)

Step 4.b $\frac{\text{\_\_\_\_\_tons / day}}{\text{24 hrs / day}}$ = _____ tons / hour dry solids

Step 5. _____ tons / hr dry solids X _____ lbs of polymer / dry ton of sludge =_____ lbs active polymer / hr
(typically 10 – 20 lbs / dry ton)

Step 6. $\frac{\text{\_\_\_\_\_ lbs active polymer}}{\text{8.5 lbs / gal}}$ = _____ gallons active polymer / hr

Step 7. $\frac{\text{\_\_\_\_\_ gal active polymer / hr}}{\text{\_\_\_\_\_ \% active content}}$ = _____ gallons / hr "neat" concentrated polymer (pump rate required)
(expressed as a decimal, i.e. 45% = 0.45)

Step 8. $\frac{\text{\_\_\_\_\_ gal neat polymer / hr}}{\text{\_\_\_\_\_ \% solution desired}}$ = _____ gallons / hr dilution water
(expressed as a decimal, i.e. 0.25% = 0.0025)

Liquid Polymer Characteristics			
Type	**% Active**	**% Dilution**	
		Dewater.	**Clar.**
Emulsion	25-35	0.25 - 0.5	0.15 – 0.3
Dispersion	40-75	0.2 - 0.4	0.1 - 0.2
Mannich	3-8	2 - 5	1 - 3

Clarifying / Filtration Application

Step 1. 1.4 MGD plant flow X 5 PPM polymer dosage = 7 GPD active polymer
(typically 0.5 to 5 ppm)

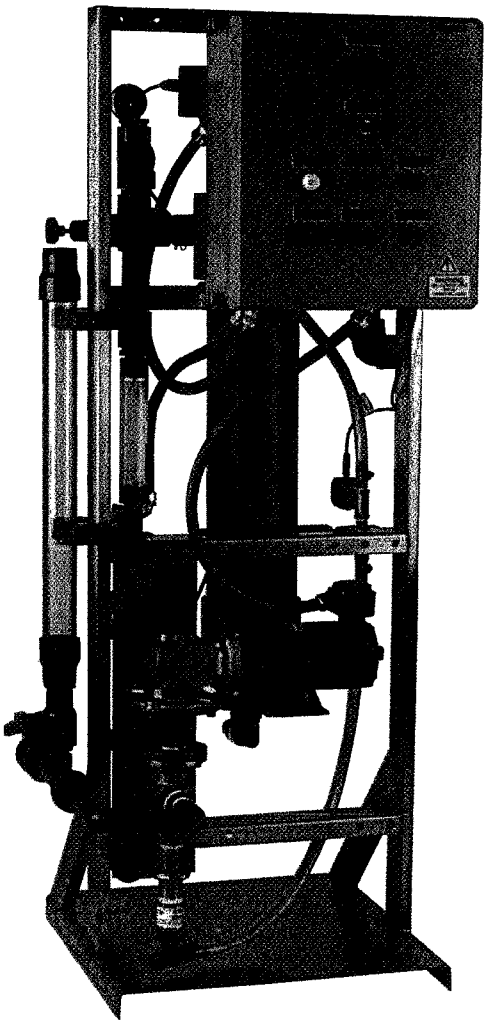
Step 2. $\frac{7 \text{ GPD active polymer}}{\text{24 hrs / day}}$ = .29 GPH active polymer

Step 3. $\frac{.29 \text{ gal active polymer / hr}}{.35 \text{ \% active content}}$ = .833 gallons / hr "neat" concentrated polymer (pump rate required)
(expressed as a decimal, i.e. 30% = 0.3)

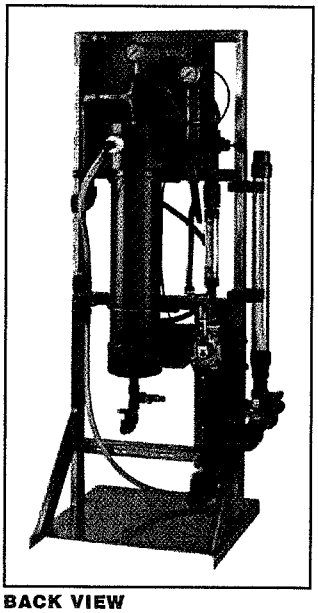
Step 4. $\frac{.833 \text{ gal neat polymer / hr}}{.005 \text{ \% solution desired}}$ = 167 gallons / hr dilution water
(expressed as a decimal, i.e. 0.1% = 0.001)

Fluid Dynamics, Inc. 6595 Odell Pl., Boulder, CO 80301 888.530-7300 (FX) 303.530.7754
www.dynablend.com

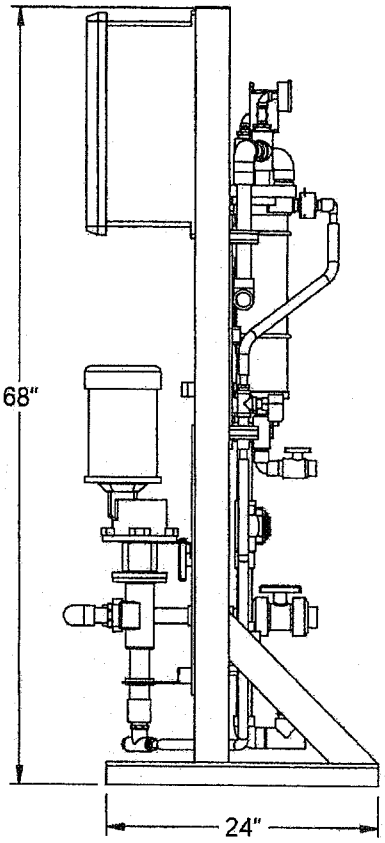
series **L4-P / L6-P** specifications



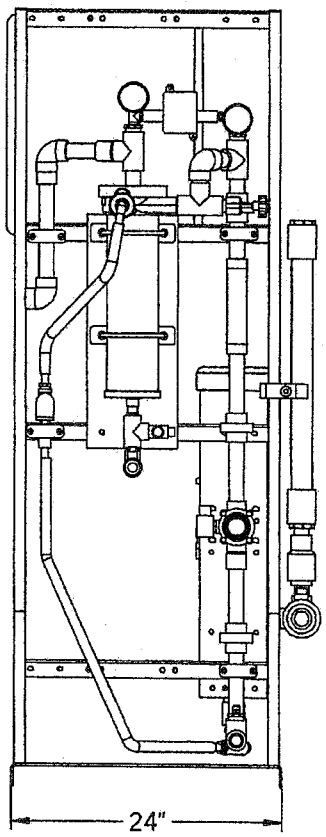
The L4-P / L6-P Series dynaBLEND™ offers the same flow rates and features of the L4-D / L6-D Series with an upgrade to a progressing cavity pump. The progressing cavity pump provides increased life cycle.



BACK VIEW



SIDE VIEW



BACK VIEW

SERIES	DILUTION WATER
L4-300-	30- 300 GPH (113-1136 LPH)
L4-600-	60- 600 GPH (227-2271 LPH)
L4-1200-	120-1200 GPH (454-4543 LPH)
L6-1800-	180-1800 GPH (681-6814 LPH)
L6-2400-	240-2400 GPH (909-9085 LPH)
L6-3000-	300-3000 GPH (1136-11356 LPH)

PUMP	POLYMER RANGE
1.2P	0.12-1.2 GPH (0.45-4.5 LPH)
3.0P	0.3-3.0 GPH (1.13-11.3 LPH)
6.0P	0.6-6.0 GPH (2.27-22.7 LPH)
15P	1.5-15.0 GPH (5.68-56.8 LPH)
20P	2.0-20.0 GPH (7.57-75.7 LPH)

Dual pump configurations available.

dynaBLEND™ MODEL EXAMPLE:
L6-1800-6.0P fits applications with 180-1800 GPH dilution water and 0.6-6.0 GPH polymer

WATER SUPPLY PRESSURE
Water supply must be able to provide the maximum flow rate at 35-50 psi (240-345 kPa) greater than the pressure at point of use.

OPERATING PRESSURE
100 psi maximum (689 kPa)

DIMENSIONS
24" D x 24" W x 68" H
(61cm x 61cm x 173cm)

WEIGHT
Series L4-P: 250 lbs. (114 kg)
Series L6-P: 275 lbs. (125 kg)

POWER REQUIREMENTS
Single phase 115 VAC standard

Appendix C

Trojan Technologies, Inc.
UV3000 Plus Ultraviolet Disinfection System
Technical Information

TROJANUV
WATER CONFIDENCE™

UV3000Plus™ PROPOSAL

August 2, 2006

GA Fleet Associates
55 Calvert Street
Harrison, NY
USA

Attention: Peter Pastore
Reference: Riverhead (reuse), NY
Quote No: LTB2046B

In response to your request, we are pleased to provide the following **Trojan UV3000Plus™** proposal for the **Riverhead (reuse)** project.

Since introduction in 1999, the **Trojan UV3000Plus™** has become the reference standard in UV disinfection. This highly flexible system has demonstrated performance around the world in over 400 installations. It is well suited to wastewater disinfection applications with a wide range of flow rates, including challenging effluents such as combined sewer overflows, primary effluent disinfection and tertiary wastewater reclamation and reuse.

Engineered and built for dependable performance, the **Trojan UV3000Plus™** requires minimal maintenance and delivers long lamp life. It also incorporates innovative features to reduce O&M costs, including variable output electronic ballasts and Trojan's revolutionary **ActiClean™** system – the industry's only chemical and mechanical quartz sleeve cleaning system.

Please review the design criteria for peak flow rate, total suspended solids, disinfection limit, and UV transmittance to ensure that the criteria match actual project parameters. Trojan is pleased to provide analytical services to help characterize the effluent quality and confirm the design sizing criteria. Please contact us if this service is required.

Trojan's price for the attached design is **$355,900** (in US$). This price excludes any taxes that may be applicable. This pricing is to be used for budget estimates only and is valid for 90 days from this date. Trojan's equipment proposal is supported by the warrantees and guarantees described in page three of this letter. Finally, all of Trojan's installations are supported by a network of certified service Representatives stationed around the globe – providing local service and support.

Please do not hesitate to call us if you have any questions regarding this proposal. Thank you for the opportunity to quote the **Trojan UV3000Plus™** and we look forward to working with you on this project.

With best regards,
Trojan Technologies Inc.

Cathy Robson
Municipal Designer

DESIGN CRITERIA

Current Peak Design Flow:	**1.4 MGD**
UV Transmission:	**55%** (minimum)
Total Suspended Solids:	**5 mg/l** (maximum; grab samples)
Max Average Particle Size	**30 microns**
Disinfection Limit:	**2.2 total coliform** per 100 ml, based on a one (1) day maximum
Design Dose:	**>140,000 µWs/cm^2**, Bioassay Validated per NWRI Guidelines

DESIGN SUMMARY

Based on the above design criteria, the Trojan System **UV3000Plus™** proposed consists of:

Number of Channels:	**1**
Total Number of Banks:	**2**
Number of Modules per Bank:	**11**
Number of Lamps per Module:	**8**
Total Number of UV Lamps:	**176**
Number of Power Distribution Centers:	**2**
Number of System Control Centers:	**1**
Number of Level Controllers:	**1**
Type of Level Controller:	**ALC**
Automatic Chemical/Mechanical Cleaning:	**Included**
UV Module Lifting Device:	**Included**
On-line UVT Monitor:	**Not Included ($14,000 adder)**

EFFLUENT CHANNEL DIMENSIONS

L =	Approximate channel length required:	**30 ft**
W =	Channel width based on number of UV modules:	**44 in**
D =	Maximum depth recommended for UV module access:	**62 in**

ELECTRICAL REQUIREMENTS

1. Each Power Distribution Center requires an electrical service of one (1) 480 Volts, 3 phase, 4 wire (plus ground), 22.5 kVA.

2. The Hydraulic System Center requires an electrical service of one (1) 120 Volts, 1 phase, 3 wire (plus ground), 2 kVA.

3. The UV System Control Center requires an electrical service of one (1) 120 Volts, 1 phase, 2 wire (plus ground), 10 Amps.

NOTES

1. If there are site-specific hydraulic constraints that must be applied, please consult the manufacturer's representative to ensure compatibility with the proposed design.
2. Standard spare parts and safety equipment are included with this proposal.
3. The weighted gate (automatic level controller) is not designed for zero flow conditions.
4. Electrical disconnects required per local code are not included in this proposal.

OPERATING COST ESTIMATE FOR TROJAN SYSTEM UV3000Plus™

Operating Conditions

Average Flow:	1.4 MGD
Yearly Usage:	8,750 hours
UV Transmission:	55 %
System Control:	Automatic dose pacing

Power Requirements

Maximum Power Draw:	44 kW
Average Power Draw:	23.42 kW (both banks operating at minimum power)
Annual Operating Hours:	8,750 hours
Cost per kW Hour:	$0.05
Annual Power Cost:	**$10,246**

Replacement Lamp Costs

Number of lamps replaced per year:	64
Price per lamp:	$204
Annual Lamp Replacement Cost:	**$13,056**

The annual O&M cost estimate is $23,302. This cost estimate is based on the average flow and design UV transmittance listed above. Actual operating costs may be lower due to the UV3000Plus™ automatic dose pacing control system. As UV demand decreases, by either a decrease in flow or an improvement in water quality, the power level of the lamps decreases accordingly. The dose pacing system ensures that equipment power levels are minimized while the target UV dose is maintained.

EQUIPMENT WARRANTEES

1. Trojan Technologies Inc. warrants all components of the system (excluding UV lamps) against faulty workmanship and materials for a period of 12 months from date of start-up or 18 months after shipment, which ever occurs first.
2. UV lamps purchased are warranted for 12,000 hours of operation. The warranty is pro-rated after 9,000 hours of operation. This means that if a lamp fails within the first 9,000 hours of use a new lamp is provided at no charge.
3. Electronic ballasts are warranted for 5 years, pro-rated after 1 year.

DISINFECTION PERFORMANCE GUARANTEE

Trojan believes and stands behind every system that we design and build. The Trojan Lifetime Performance Guarantee is a clear demonstration of that confidence, and a significant differentiating feature of Trojan wastewater systems.

The spirit of the Trojan Lifetime Performance Guarantee is simple: the Trojan equipment, as sized for the project, will meet the disinfection requirements for the life of the system. At Trojan, we sell a treatment process, not just equipment. Our thoroughness in the design process and extensive validation testing results in UV systems that are guaranteed to disinfect the specified design conditions for years to come.

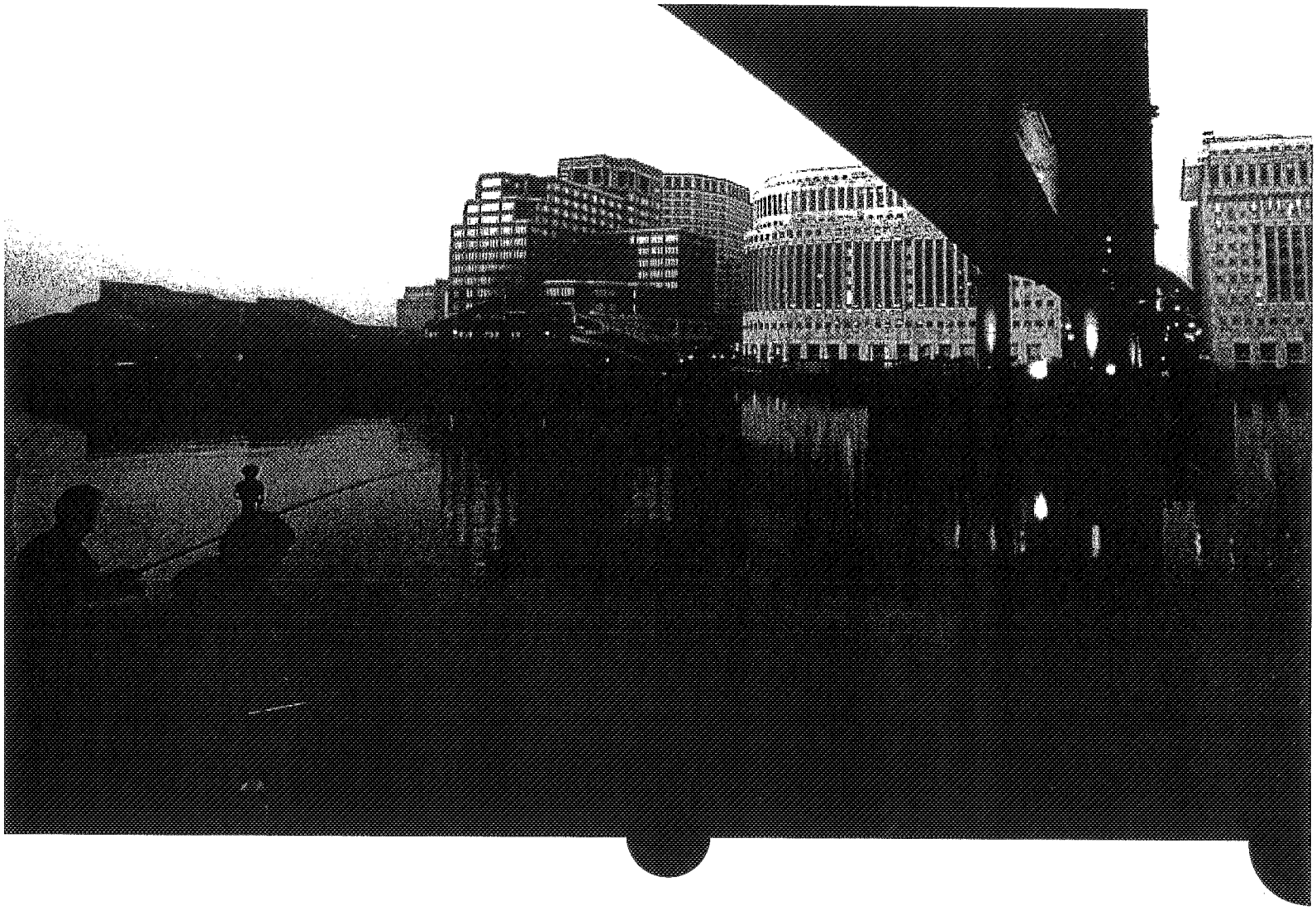
To be eligible for the industry-leading Trojan Lifetime Performance Guarantee, the UV system must be sized using the criteria that Trojan, Regulators and most Consulting Engineers have been advocating for many years – accurate validated data on:

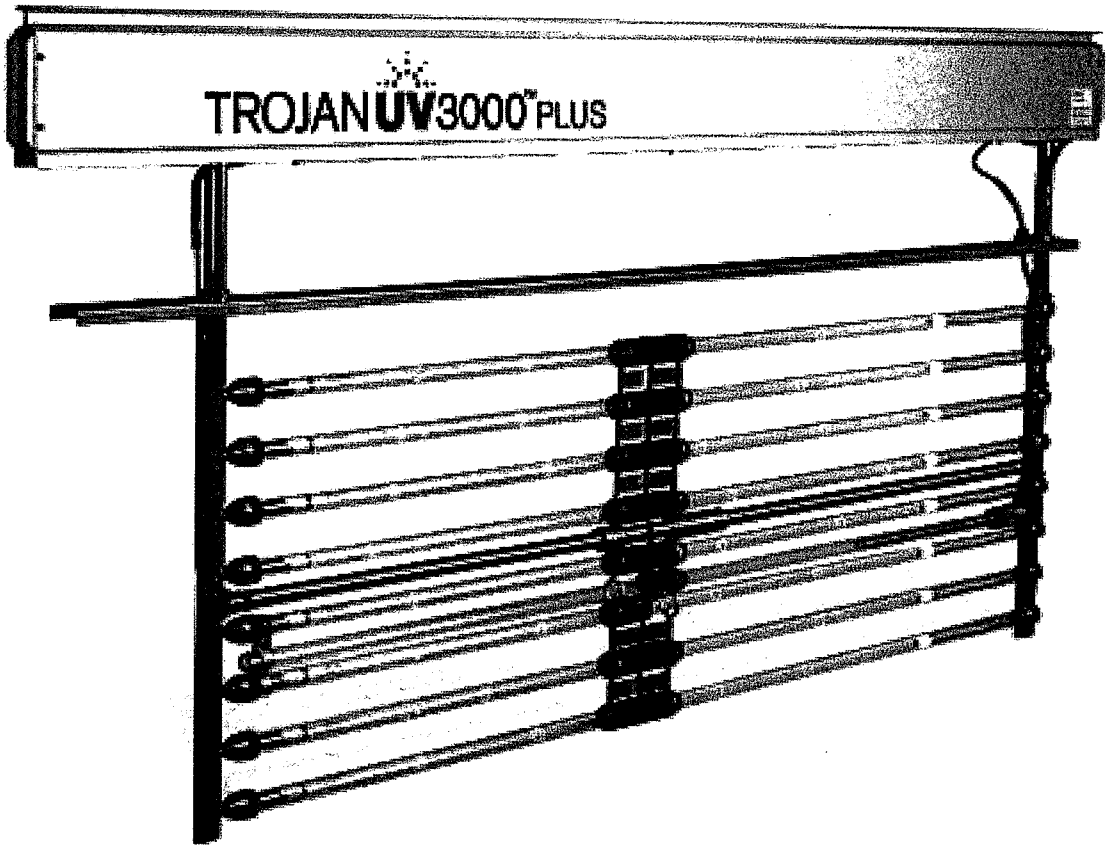
1. Field validation of reactor dose delivery (bioassay)
2. Lamp aging factors (lamp efficiency)
3. Quartz sleeve fouling factors (cleaning system efficiency)

Contact us to ensure that your disinfection application receives this performance guarantee.

TROJAN UV3000™ PLUS

WASTEWATER DISINFECTION





The reference standard in UV

Proven, chemical-free disinfection from the industry leader

Trojan Technologies Inc. is an ISO 9001 registered company that has set the standard for proven UV technology and ongoing innovation for more than 25 years. With unmatched scientific and technical expertise, and a global network of water treatment specialists, representatives and technicians, Trojan is trusted more than any other firm as the best choice for municipal UV solutions. Trojan has the largest UV installation base – over 4,000 municipal installations worldwide – and almost one in five North American wastewater treatment plants rely on our proven, chemical-free disinfection solutions.

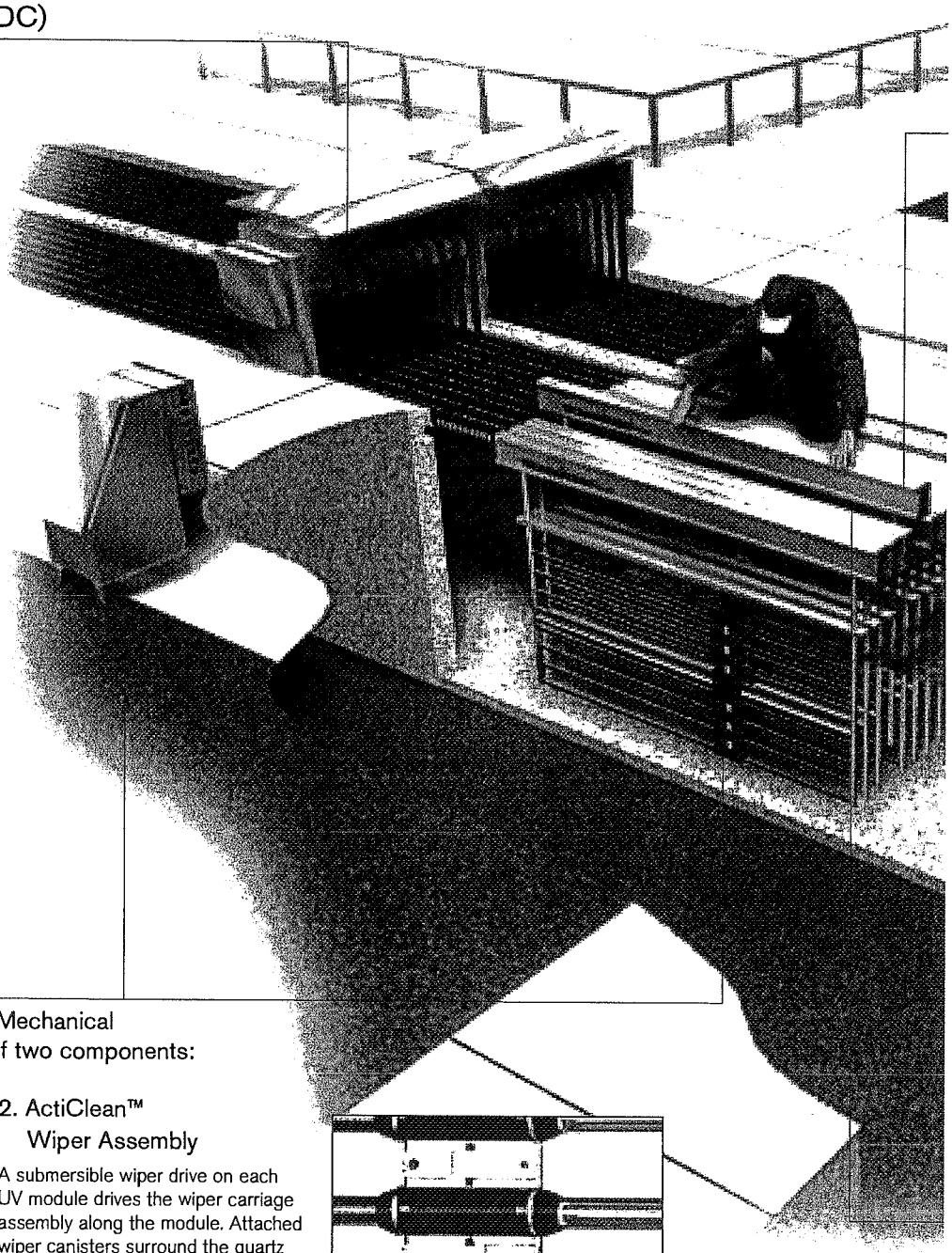
The TrojanUV3000™Plus is one of the reasons why. This highly flexible system has demonstrated its effective, reliable performance around the world in over 400 installations. It is well suited to wastewater disinfection applications with a wide range of flow rates, including challenging effluent such as combined sewer overflows, primary and tertiary wastewater reclamation and reuse. Engineered and built for dependable performance, the TrojanUV3000™Plus requires minimal maintenance, and delivers long lamp life. It also incorporates innovative features to reduce O&M costs, including variable output electronic ballasts and Trojan's revolutionary ActiClean™ system – the industry's only chemical/mechanical sleeve cleaning system.

TROJAN UV3000™ PLUS

Designed for efficient, reliable performance

Power Distribution Center (PDC)

Powers each bank of modules. Heavy-gauge stainless steel enclosure mounted across the channel. Consists of a service entrance and a bus bar power distribution system for incoming power. Power is relayed from the bus bar to individual UV modules through stainless steel receptacles. All UV modules are individually ground-fault and overload protected for safety. Like all Trojan UV3000™Plus components, the PDC can be installed outdoors and requires no shelter or air conditioning.



ActiClean™ Cleaning System

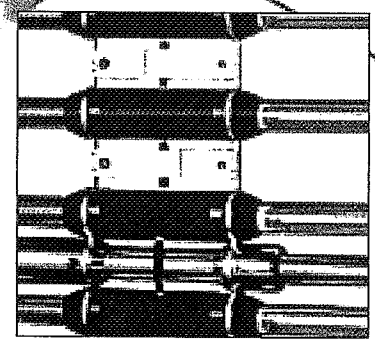
The optional ActiClean™ Chemical/Mechanical Sleeve Cleaning System consists of two components:

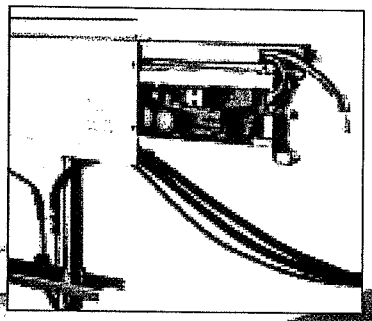
1. Hydraulic System Center (HSC)

The Hydraulic System Center (HSC) actuates the cleaning system. Located close to the channel in a stainless steel enclosure (or mounted directly on the PDC) it contains the pump, valves and ancillaries for the cleaning system. Hydraulic fluid is pumped to manifolds located on the underside of the Power Distribution Center (PDC). Extend and retract hoses run from the manifolds to the wiper drive on each module and complete the hydraulic loop.

2. ActiClean™ Wiper Assembly

A submersible wiper drive on each UV module drives the wiper carriage assembly along the module. Attached wiper canisters surround the quartz sleeves, and are filled with Trojan's ActiClean™ Gel. The gel uses food grade ingredients and contacts the lamp sleeves between the two wiper seals. Cleaning takes place while the lamps are submerged and while they are operating.





Electronic Ballasts

The [illegible]

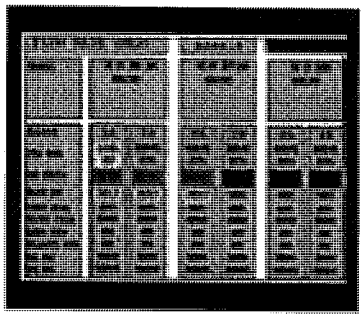
[illegible] electrical connection[illegible] by convection.

System Control Center

The SCC monitors and controls all UV functions and dose pacing. Consists of a PLC or microprocessor-based controller, operator interface, input/output connections and communications hardware mounted in a stainless steel enclosure. The dose pacing program conserves power and extends lamp life by varying lamp intensity and controlling bank on/off status according to flow variations. Remote monitoring capabilities allow technicians and operators to monitor lamp operating status, power levels, hours of operation, and other parameters remotely.

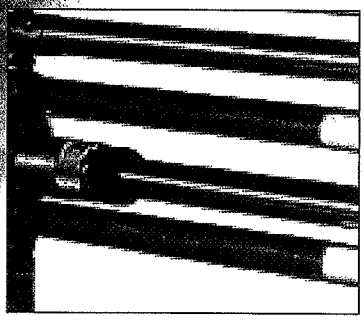
Alarms

Extensive alarm reporting system ensures fast, accurate diagnosing of system process and maintenance alarms. Programmable control software can generate unique alarms for individual applications.



Water Level Controller

A fixed weir, motorized weir gate, or Automatic Level Control (ALC) gate is required in the channel to maintain the appropriate water level over the lamps. Trojan engineers will work with you to select the appropriate level control device for your application.



UV Intensity Sensor

The UV intensity sensor continually monitors UV lamp output to ensure specified UV dose levels are maintained. The optional ActiClean™ cleaning system automatically cleans the sensor sleeve every time lamp sleeves are cleaned.

UV Modules

UV lamps are mounted on modules installed in open channels. The lamps are enclosed in quartz sleeves, and positioned horizontally and parallel to water flow. A bank is made up of multiple modules placed in parallel positions. All ballast and lamp wiring runs inside the module frame.

Key Benefits
TrojanUV3000™Plus

Increased operator, community and environmental safety.
The TrojanUV3000™Plus uses environmentally-friendly ultraviolet light –the safest alternative for wastewater disinfection. No disinfection by-products are created, and no chemicals must be transported, stored or handled.

Well suited to changing regulations. Trojan UV systems do not have any negative impact on receiving waters and do not produce disinfection by-products, making them a strategic, long-term choice as regulations become increasingly stringent.

Most efficient UV system available versus competitive low-pressure, high-output (LPHO) or amalgam lamp-based systems.

Reduces operating costs by as much as 30% per year. Long-lasting amalgam lamps and variable-output ballasts optimize UV output to meet wastewater conditions and maximize system efficiency versus competitive UV systems.

Proven disinfection based on actual dose delivery testing (bioassay validation), and over 400 TrojanUV3000™Plus installations worldwide. Real-world, field performance data eliminates sizing assumptions resulting from theoretical dose calculations.

Dual-action sleeve cleaning system improves performance and reduces labor costs. Optional automatic ActiClean™ chemical/mechanical cleaning system maintains sleeve transmittance of at least 95%, and works online – eliminating the need to remove modules from the channel.

Reduced installation costs. The compact TrojanUV3000™Plus can be retrofitted into existing chlorine contact tanks, and comes pre-tested, pre-assembled and pre-wired to minimize installation costs.

Outdoor installation flexibility. The entire TrojanUV3000™Plus system can be installed outdoors, eliminating the need and costs of a building, shelter, and air conditioning for ballast cooling.

Guaranteed performance and comprehensive warranty. Trojan systems include a Lifetime Performance Guarantee, the best lamp warranty in the industry, and use lamps from multiple approved suppliers. Ask for details.

ActiClean™ Dual-Action Automatic Cleaning System

Optional chemical/mechanical cleaning system eliminates sleeve fouling

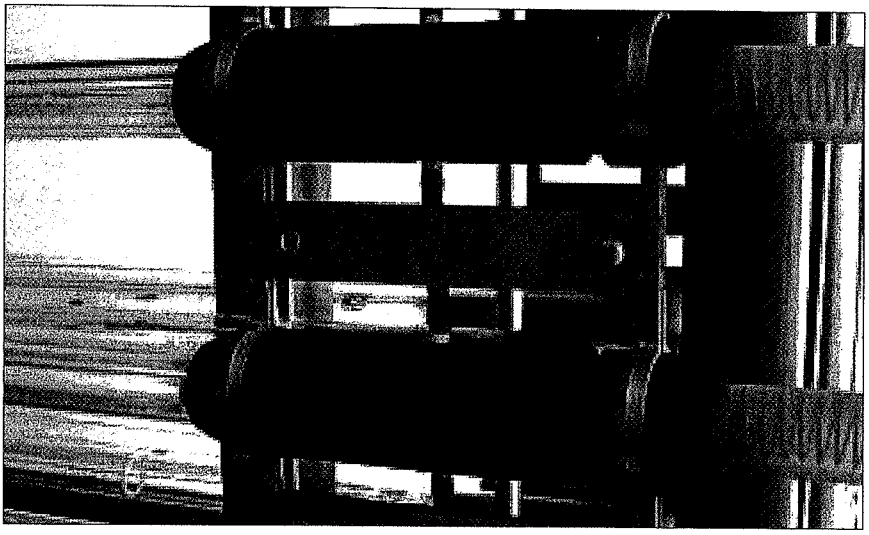
Benefits:

- **Cleans 50% more effectively than mechanical wiping alone**
- **Improves lamp performance for more reliable dose delivery**
- **Elimination of fouling factor reduces equipment sizing requirements and power consumption**
- **Automatic, online cleaning reduces O&M costs associated with manual cleaning**

- Combination of chemical and mechanical cleaning action removes deposits on quartz lamp and sensor sleeves much more effectively than mechanical wiping alone
- Innovative wiper design incorporates a small quantity of ActiClean™ Gel for superior, dual-action cleaning
- Cleans automatically while the lamps are disinfecting. There's no need to shut down the system, remove or bypass lamp modules for routine cleaning
- Trojan's ActiClean™ cleaning system has been proven effective in hundreds of systems around the world, including use in plants where heavy fouling had previously prohibited the use of UV disinfection technology
- ActiClean™ can be added to an installed TrojanUV3000™Plus not originally equipped with a cleaning system

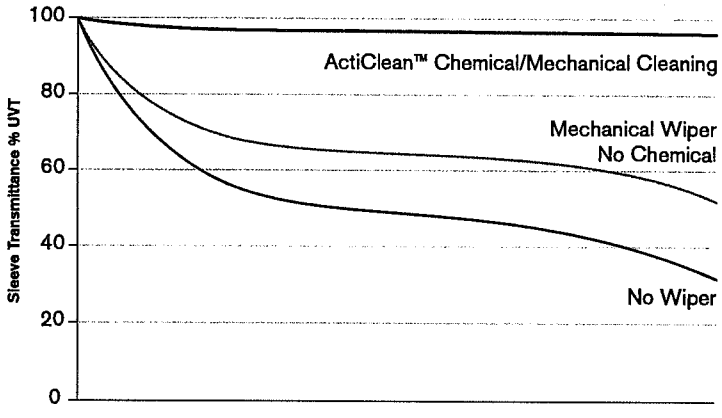
ActiClean™ Gel is Safe to Handle

- ActiClean™ Gel is comprised of food-grade ingredients
- Quick connect on cleaning system allows for easy refill of gel solution
- Lubricating action of ActiClean™ Gel maximizes life of wiper seals



The dual-action, chemical/mechanical cleaning with the ActiClean™ system provides superior sleeve cleaning and reduces maintenance costs. Fouling and residue build-up on quartz sleeves reduces system efficiency. ActiClean™ maintains at least 95% transmittance, ensuring sleeves are clean and the system is consistently delivering accurate dosing while reducing power consumption.

Efficacy of Cleaning Technologies to Control Sleeve Fouling



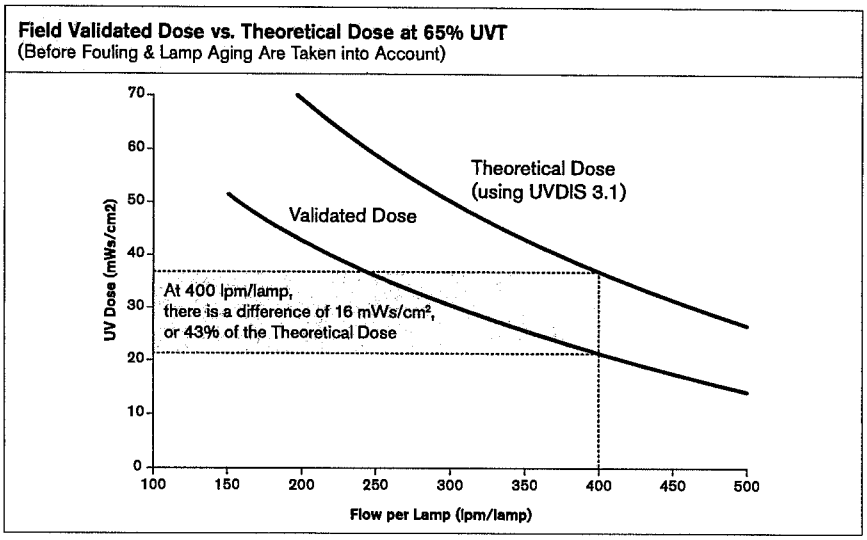
EPA-Endorsed Bioassay Validated Performance

Real-world testing ensures accurate dose delivery

Benefits:

- **Performance data is generated from actual field testing over a range of flow rates, effluent quality, and UVTs**
- **Provides physical verification that system will perform as expected; ensures public and environmental safety**
- **Provides accurate assessment of equipment sizing needs**

- The Trojan UV3000™Plus has been thoroughly validated through real-world bioassay testing under a wide range of operating conditions
- In-field bioassay testing offers the peace of mind and improved public and environmental safety of verified dose delivery – not theoretical calculations
- The USEPA has endorsed bioassays as the standard for assessment and comparison of UV technologies
- The disinfection performance ratings for the Trojan UV3000™Plus are proof that what you see is what you actually get



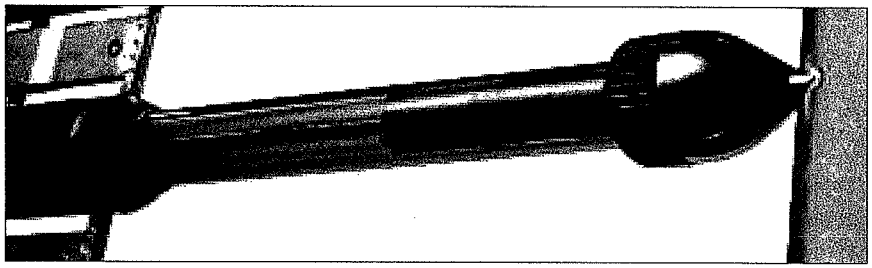
This shows the validated dose of an actual working system and the theoretical dose calculated using UVDIS. Note that the UVDIS 3.1 dose calculation overestimates the system performance.

Amalgam Lamps Require Less Energy

Require fewer lamps and reduce O&M costs

Benefits:

- **Draw less energy than competitive high-output systems – only 250 Watts per lamp**
- **Stable UV output over a wide range of water temperatures**
- **Fewer lamps are required to deliver the required dose, which reduces O&M costs**
- **Can treat lower quality wastewater such as primary effluents, combined sewer overflows, and storm water**
- **Fewer lamps allow systems to be located in compact spaces, reducing installation costs**



Trojan's amalgam lamps generate stable UV output in a wide range of water temperatures, and use energy very efficiently.

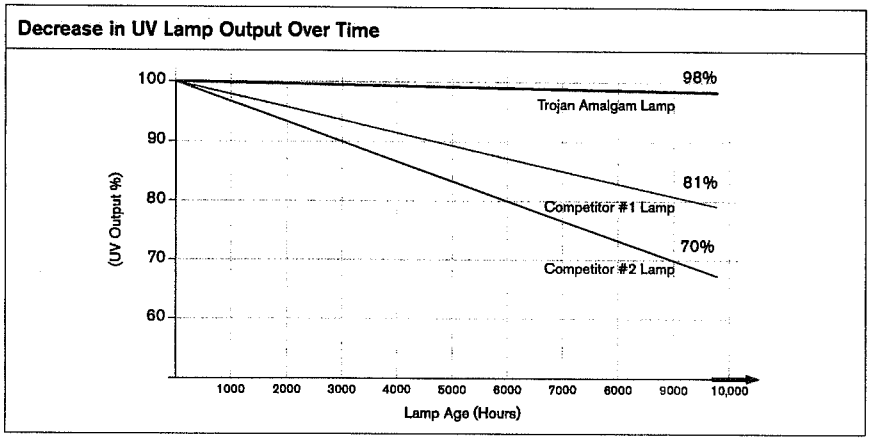
- Trojan's amalgam lamps produce significantly higher UV output than conventional low-output lamps
- Fast and simple lamp changeouts; replacing a 50-lamp system takes less than two hours and requires no tools
- The lamps are sealed inside heavy-duty quartz sleeves by Trojan's multi-seal system, maintaining a watertight barrier around the internal wiring while individually isolating each lamp and the module frame
- Lamps are pre-heated for reliable startup

Amalgam Lamps Maintain Maximum UV Output

Trojan lamps deliver 98% of full UV output after one year of use

Benefits:

- **Trojan's high efficiency, amalgam lamps deliver the most consistent UV output over their lamp life**
- **Trojan lamps have 20% less decline in UV output after 9,000 hours of use compared to competitive UV lamps**
- **Validated performance data assures you of reliable dose delivery and prolonged lamp life**



TrojanUV3000™Plus lamp has been independently validated to maintain 98% of original output after 9,000 hours of operation.

Open-Channel Architecture Designed for Outdoor Installation

Cost-effective to install and expand

Benefits:

- **Compact, open-channel design allows cost-effective installation in existing effluent channels and chlorine tank basins**
- **System can be installed outdoors to reduce capital costs – no building, shelter or air conditioning is required**
- **Gravity-fed design eliminates costs of pressurized vessels, piping and pumps**
- **Scalable architecture allows precise sizing – reduces capital and O&M costs associated with oversizing**
- **Modular design is readily expandable to meet new regulatory or capacity requirements**

The TrojanUV3000™Plus system delivers flexibility and cost savings through its simple installation in existing channels and chlorine contact tanks. The system is totally stand-alone and can be situated outdoors with no additional building, shelter or cooling requirements.

- Trojan's thorough design approach ensures that effluent quality, upstream treatment processes, and O&M needs, are addressed in system configuration
- Horizontal lamp mounting delivers optimal hydraulic performance. Induces turbulence and dispersion, maximizing wastewater exposure to UV output

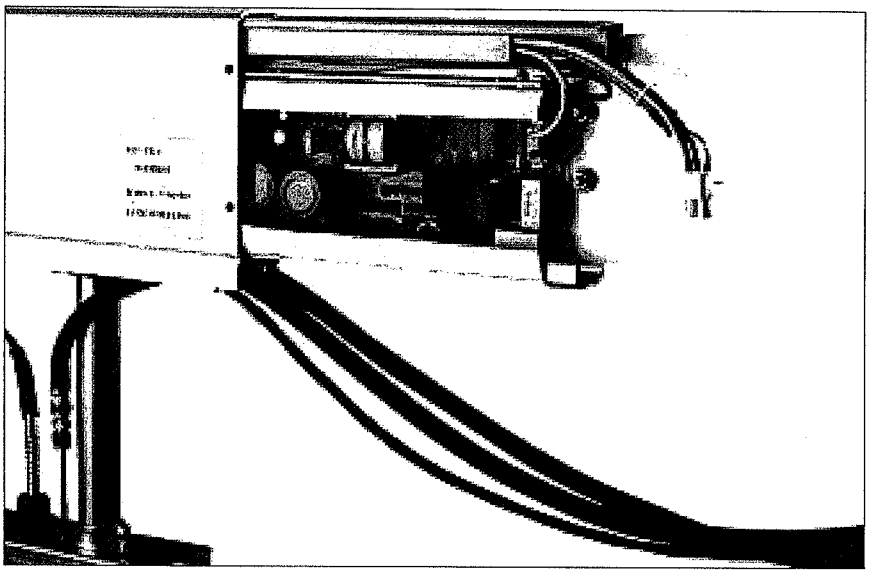
Advanced, Self-Contained UV Module

Dramatically reduces footprint size and eliminates costs of air conditioning

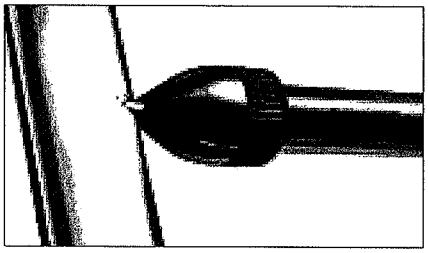
Benefits:

- **Lamps are protected in a fully submersible, 316 stainless steel frame**
- **Waterproof module frame protects cables from effluent, debris fouling and UV light**
- **Space-saving electronic ballasts are housed right in the module, so separate external cabinets are not required**
- **Ballast enclosures are rated 6P (air/water tight)**

- Module leg and lamp connector have a hydrodynamic profile to reduce head-loss
- Ballasts are housed on the module, reducing footprint size, and minimizing installation time and costs
- The variable-output, electronic ballast is mounted in an enclosure integrated within the module frame
- Cooling ballasts by convection eliminates costs associated with air conditioning and forced-air cooling
- Wiring is pre-installed and factory-tested



Module-mounted ballasts allow for compact installation, convection cooling, and protect wires and cables from exposure to effluent and UV light.

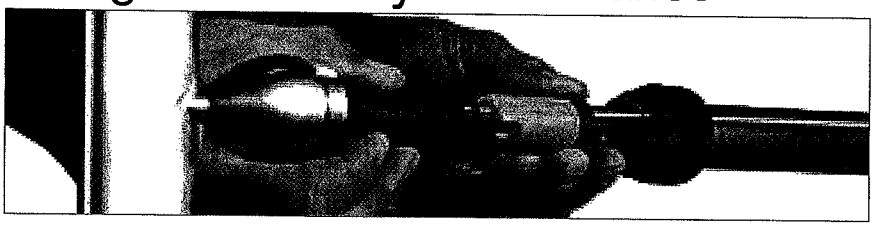


Module leg and lamp connector have a hydrodynamic profile to reduce head-loss and potential for debris fouling.

Trojan's Innovative Ballasts and Enclosures Provide Significant Advantages

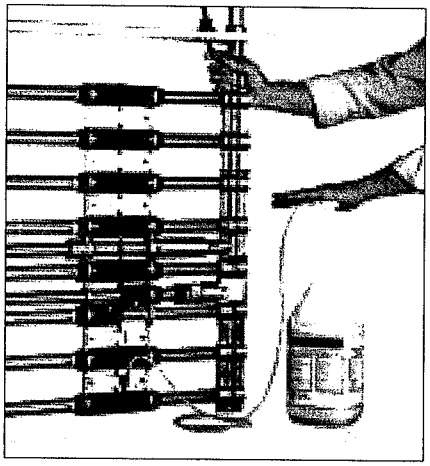
Module-Mounted Ballasts	• Take up less space and reduce footprint, minimizing installation time and costs
Convection Cooling	• Housing the ballasts in the module allows for natural convection cooling to dissipate the heat of the ballasts into the air • The ballasts are kept cooler and reliable • No air conditioning or forced air cooling required
Clean, Water-Tight Protection	• Some suppliers use external cabinets with fresh air venting that increases dust and moisture present inside the enclosure, corroding electronic components greatly reducing their reliability • Trojan's sealed module keeps all components dry and clean
Internal Cabling	• All lamp and ballast wiring is contained within the module frame, this significantly protects wires and cables from exposure to effluent, debris fouling and UV light • Trojan's design allows all electrical connections within the module to be factory tested

Designed for Easy Maintenance



Trojan UV lamps are easily replaced in minutes without the need for tools.

- **Lamps are available from more than one source**
- **TrojanUV3000™ Plus lamps are warranted for 12,000 hours**
- **Modular design allows for maintenance on one module without disrupting disinfection performance**
- Individual panels for power distribution and system control provide an electrically independent and operator-friendly operation
- Maintenance limited to replacing lamps and cleaning solution
- Optional automated ActiClean™ cleaning system reduces manual labor associated with cleaning



Quick connect allows for easy refill of ActiClean™ Gel solution approximately every 12 months.

System Specifications	
System Characteristics	
Typical Applications	Wide range of wastewater treatment plants
Lamp Type	High-efficiency amalgam
Ballast Type	Electronic, variable output (60 -100% power)
Input Power per Lamp	260 Watts
Lamp Configuration	Horizontal, parallel flow
Level Control Device Options	ALC gate, fixed weir or motorized weir gate
Enclosure Ratings	
All Enclosures	TYPE 4X (IP65), TYPE 6P (IP67) for ballast enclosure
Ballast Cooling Method	Convection, no air conditioning or forced-air required
Installation Location	Indoor or outdoor
Cleaning System Details	
ActiClean™ Cleaning System	Optional Automatic Chemical/Mechanical Cleaning System
Recommended Fouling Factor	1.0
System Control Center	
Controller	Microprocessor- or PLC-based
Inputs Required	4 - 20 mA flow signal
Typical Outputs Provided	Bank status, common alarms and SCADA communication
Location	Indoor or outdoor
Maximum Distance from UV Channel	500 feet (152m)
Electrical Requirements	
Power Distribution Center(s)	50/60 Hz, 380 - 480V, 3 phase, 4 wire
System Control Center	50/60 Hz, 110 - 240V, single phase, 2 wire
Stand-alone Hydraulic System Center (for ActiClean™) OR Combined Hydraulic System Center and Power Distribution Center	50/60 Hz, 380 - 480V, 3 phase, 4 wire
Water Level Sensor	50/60 Hz, 110 - 240V, single phase, 2 wire

Find out how your wastewater treatment plant can benefit from TrojanUV3000™Plus – call us today.

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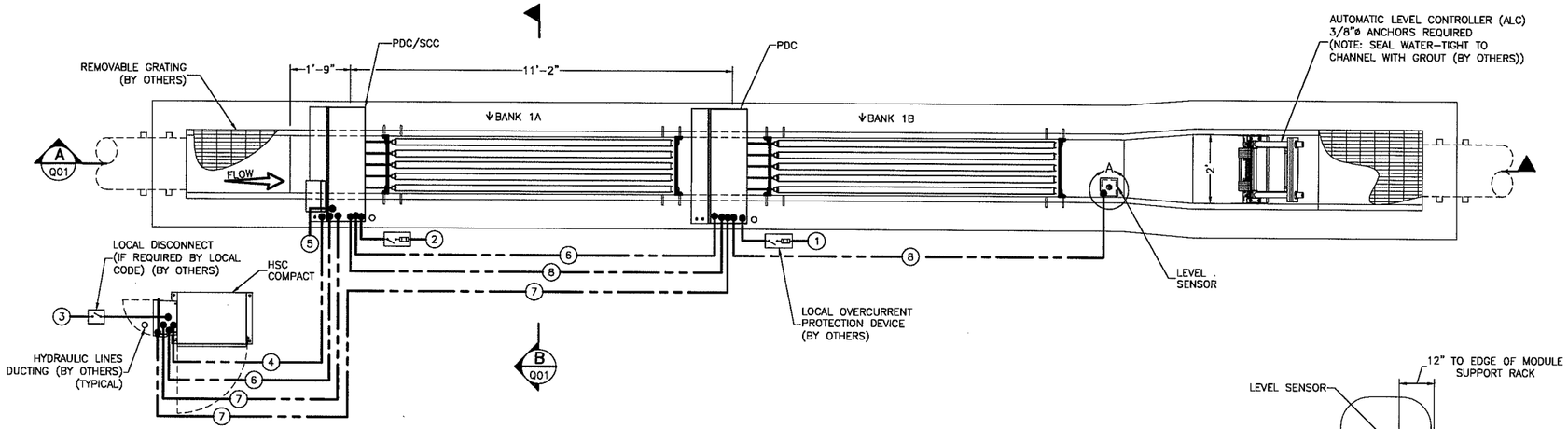
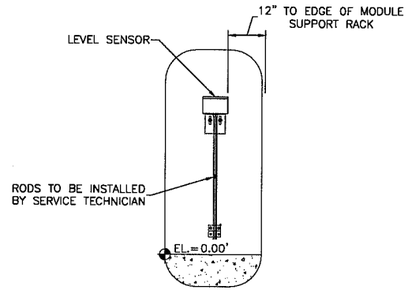
Toll Free: 1-888-220-6118
Fax: (519) 457-3030

TROJAN UV
WATER CONFIDENCE™

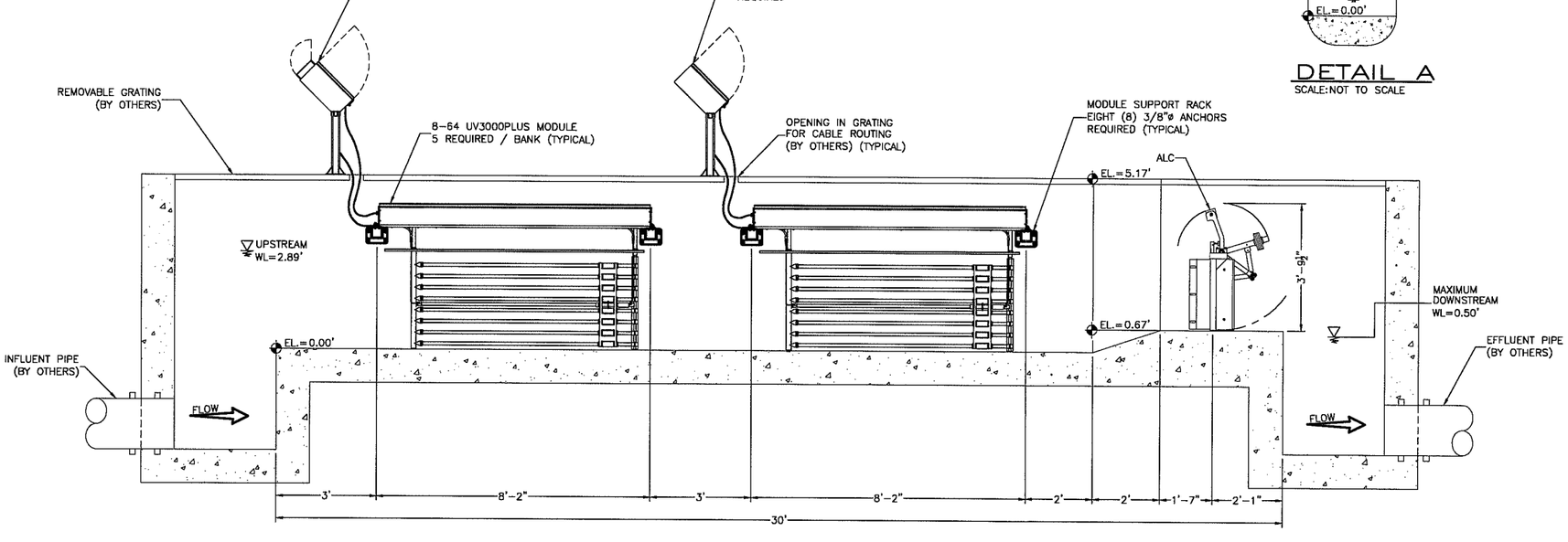
MWW-002 (1105)



PLAN VIEW
SCALE:AS SHOWN



DETAIL A
SCALE:NOT TO SCALE

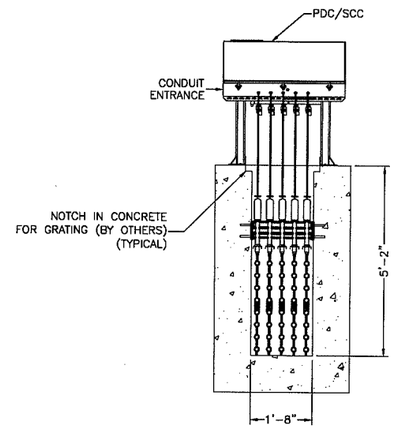


A Q01 SECTION
SCALE:AS SHOWN

TROJAN UV3000PLUS™
EQUIPMENT INTERCONNECTIONS

No.	DESCRIPTION	FROM	TO
1	POWER DISTRIBUTION CENTER (PDC) POWER SUPPLY 208V, 3 PHASE, 3 WIRE + GROUND XX KVA/PDC POWER DRAW XX AMPS MAXIMUM CURRENT/PHASE	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC
2	POWER DISTRIBUTION CENTER/SYSTEM CONTROL CENTER (PDC/SCC) POWER SUPPLY 208V, 3 PHASE, 3 WIRE + GROUND 10.2 kVA/PDC POWER DRAW 34.0 AMPS MAXIMUM CURRENT/PHASE	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	PDC/SCC
3	HYDRAULIC SYSTEMS CENTER COMPACT (HSC COMPACT) POWER SUPPLY 208V, 3 PHASE, 3 WIRE + GROUND, 5 AMPS	DP (BY OTHERS) (NOT SHOWN)	HSC COMPACT
4	HSC COMPACT REMOTE INPUT/OUTPUT 24 VDC	PDC/SCC	HSC COMPACT
5	FLOW METER 4-20 mA, DC ANALOG INPUT (BY OTHERS)	FLOW METER PANEL (NOT SHOWN) (BY OTHERS)	PDC/SCC
6	GROUND LINK 14 AWG TYPE TWH STRANDED	PDC/SCC	HSC COMPACT AND POC
7	MODBUS 1 SHIELDED TWISTED PAIR	PDC/SCC	PDC THRU HSC COMPACT
8	LOW LEVEL SENSOR 24VDC	LOW LEVEL SENSOR	PDC/SCC THRU PDC

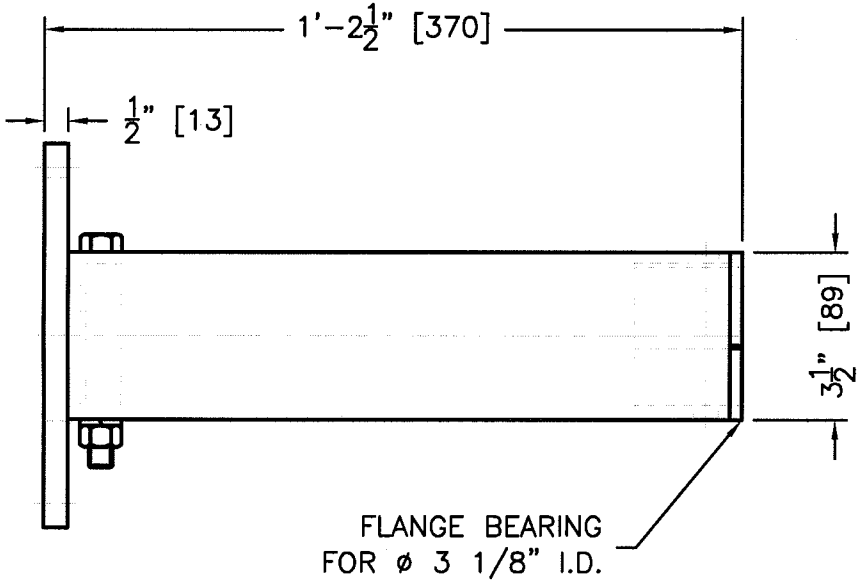
NOTES:
: DO NOT SLOPE CHANNEL FLOOR.
: CHANNEL WIDTH & DEPTH MUST BE KEPT WITHIN A TOLERANCE OF + OR - ¼".
: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES INC.
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY. ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
: REMOVABLE GRATING SECTIONS SHALL BE EASILY REMOVED BY ONE PERSON. MAXIMUM WEIGHT OF THE SECTIONS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF THE APPLICABLE JURISDICTION.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INC. INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.
: TOLERANCE AT ALC IS CHANNEL WIDTH +1".



B Q01 SECTION
SCALE:AS SHOWN
NOTE: HSC COMPACT AND GRATING (BY OTHERS) NOT SHOWN FOR CLARITY

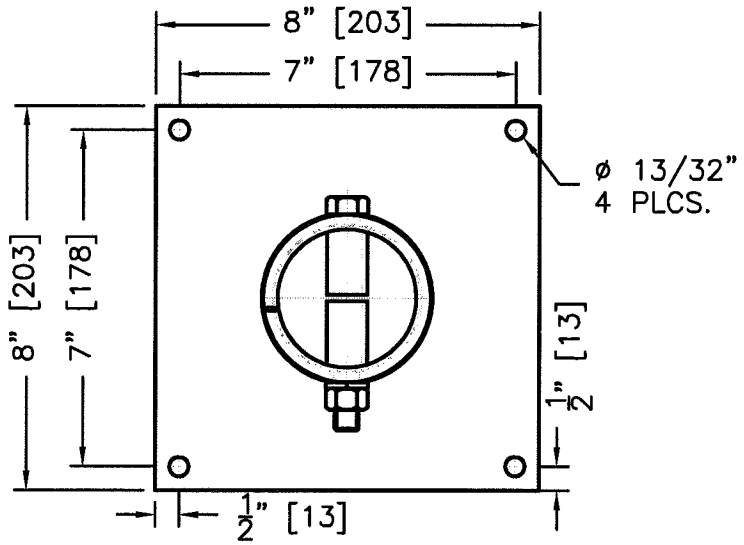
DESIGN CRITERIA		
	PEAK FLOW	10.00 MGD
	U.V TRANSMITTANCE AT 253.7 nm	65 %
	SUSPENDED SOLIDS	20 mg / l
	DISINFECTION STANDARD	1000 FC / 100ml

DESCRIPTION: LAYOUT, UV3000PLUS KENNYVILLE PA		LJU2509
DRAWN BY : ABC	DATE : 06JL05	N/A
CHECKED BY : SLO	DATE : 06JL26	
APPROVED BY : JLM	DATE : 06JL26	DWG NO. Q01 / REV. A
SCALE (11x17) : 1/4"=1'-0"	LOG NUMBER : N/A	



SIDE VIEW

SCALE:AS SHOWN

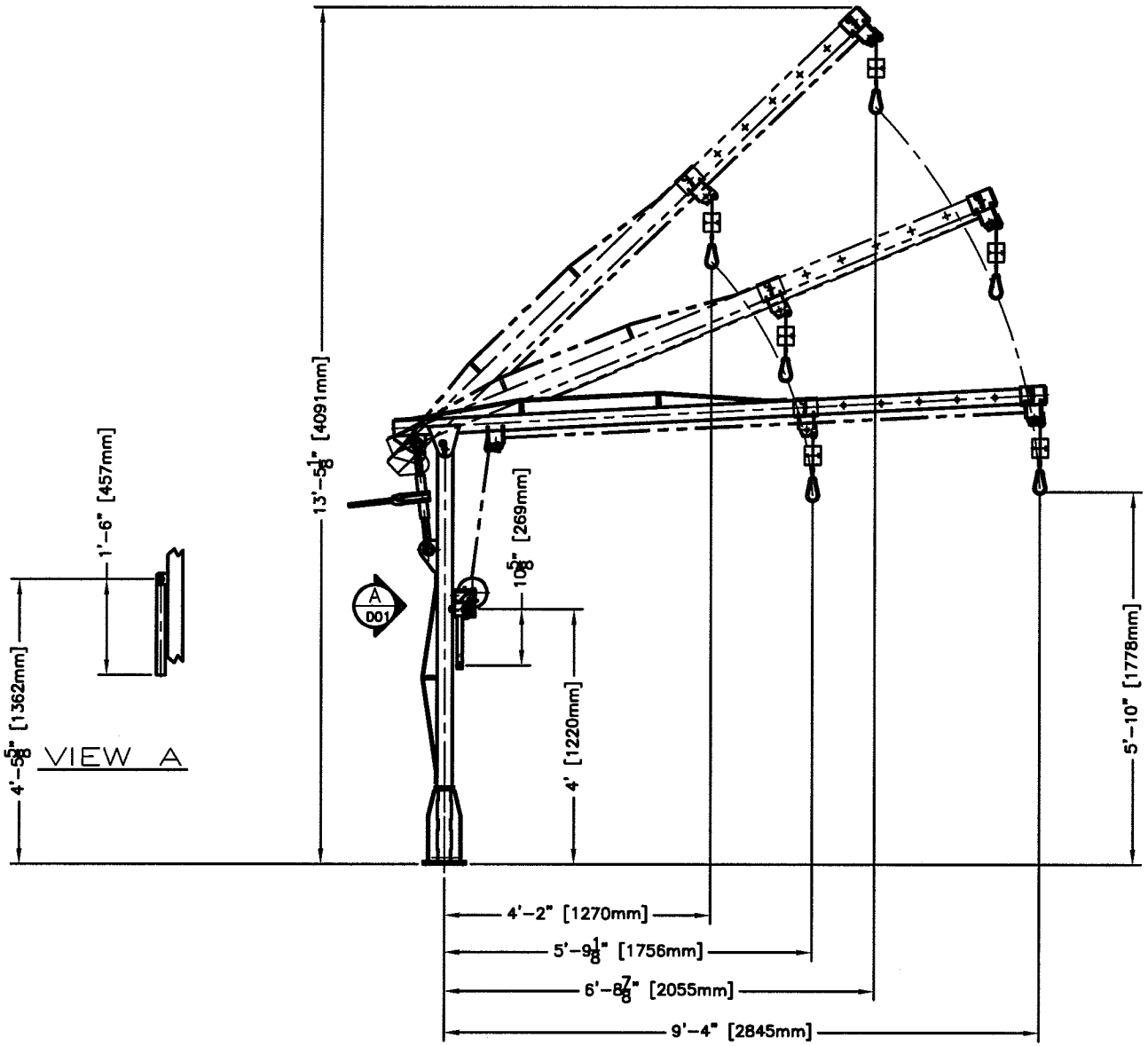


TOP VIEW

SCALE:AS SHOWN

Trojan Technologies Inc.

DESCRIPTION: STD, DAVIT CRANE BASE		STANDARD DRAWING NO.	3M0494
DRAWN BY : GDS	DATE : 02MY09	PROJECT NO.	N/A
CHECKED BY : MMB	DATE : 02MY09		
APPROVED BY : JAW	DATE : 02MY09	DWG NO.	D01
SCALE (8½x11) : 3"=1'0"	LOG NUMBER : N/A	REV.	A

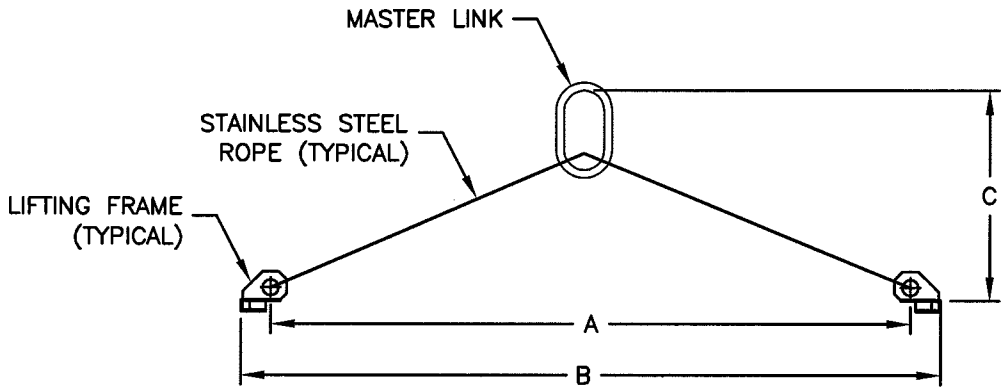


Trojan Technologies Inc.

DESCRIPTION: STD, DAVIT CRANE DRAWING

DRAWN BY : GDS	DATE : 02MR14		
CHECKED BY : MMB	DATE : 02MR14		
APPROVED BY : JAW	DATE : 02MR14		
SCALE (8½x11) : NOT TO SCALE	LOG NUMBER : N/A		

STANDARD DRAWING NO.	
3M0488	
PROJECT NO.	
N/A	
DWG NO.	REV.
D01	A



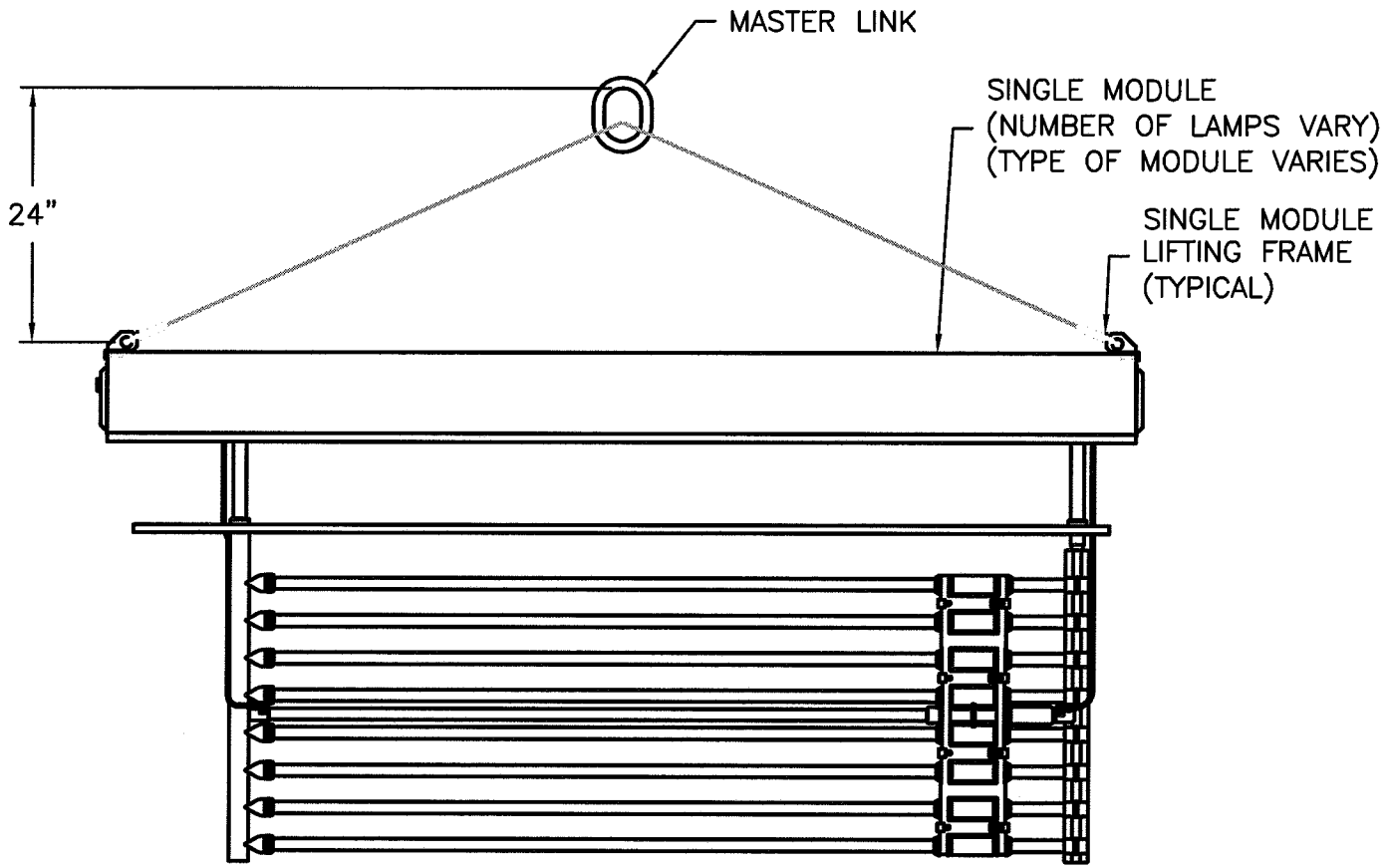
SLING SPECIFICATIONS	
NO. OF LEGS:	2
WORKING LOAD:	200LBS
MATERIAL:	316SST
DIMENSION A:	93.50"
DIMENSION B:	97"
DIMENSION C:	24"
SAFETY FACTOR:	5x
CERTIFICATE:	YES

MANUFACTURERS QUOTATION	
WORKING LOAD LIMIT:	200LBS
LIFTING FRAME TYPE:	TROJAN PN 309422
MASTER LINK TYPE:	OMS 63
ROPE SIZE:	1/4"–7x19SSAC TYPE316

Trojan Technologies Inc.

DESCRIPTION: STD, UV3+ LIFTING SLING GEN

DRAWN BY : CMS	DATE : 03JL11	STANDARD DRAWING NO.	3M0432
CHECKED BY : LZ	DATE : 03JL16	REFERENCE NO.	309422
APPROVED BY : JAW	DATE : 03JL16	DWG NO.	D01
SCALE (11x17) : NTS	LOG NUMBER : N/A	REV.	B

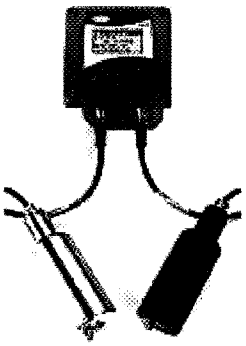


Trojan Technologies Inc.

DESCRIPTION: STD, UV3+ MODULE w/ LIFTING FRAME & SLING

DRAWN BY : CMS	DATE : 03JL17	STANDARD DRAWING NO.	3M0444
CHECKED BY : LZ	DATE : 03JL17	REFRENCE NO.	N/A
APPROVED BY : JAW	DATE : 03JL17	DWG NO.	D01
SCALE (8½x11) : 1-1/2"=1'-0"	LOG NUMBER : N/A	REV.	C

SOLITAX sc Suspended Solids and Turbidity Analyzer for Immersion in Open Tanks



Product #: 6940100
US Price: $4,400.00
Qty in Order: 0
Quantity: 1

Add to Order

SOLITAX sc Suspended Solids and Turbidity Analyzer includes Solids and Turbidity Sensor for Immersion in Open Tanks Applications

- Includes a sc100 controller and stainless steel ts-line sc Solids and Turbidity Sensor (0.001 to 50 g/L, 0.001 to 4000 NTU) with wiper
- Measures turbidity or turbidity and suspended solids in drinking water, wastewater, and industrial process applications
- Accurate, color-independent measurements
- Self-cleaning device presents erroneous values
- Easy one-point calibration
- Any two SOLITAX sc sensors can be installed using one Hach sc100 Controller

NOTE: Power cords must be ordered separately. Fixed point installation kit or handrail mount kit must be ordered separately for all analyzers for immersion in open tanks (includes PN 6940000, 6940100, 6940200)

View Available Service Plans

Parameter/Range/Reagent Information

Related Product Information:

Pages
- Overview
- Detailed Description
- Features/Benefits
- Specifications
- SOLITAX sc Turbidity and Suspended Sensor Accessories

Downloads
- SOLITAX sc Turbidity/Suspended Solids Analyzer Manuals
- Brochure/Data Sheet
- SOLITAX sc Turbidity/Suspended Solids Analyzer Application Solutions
- Application Case History
- Hach Application Notes, General

RECOMMENDED ACCESSORIES

Turbidity Standard, StablCal®, 800.0 NTU, Bottle/500 mL
US Price: $54.60

Sunshield for sc100 controller
US Price: $105.00

View All

ALTERNATIVES

SOLITAX sc High Range Suspended Solids and Turbidity Analyzer for Immersion in Open Tanks
US Price: $4,730.00

SOLITAX sc Turbidity Analyzer for Immersion in Open Tanks
US Price: $3,790.00

View All

ALSO CONSIDER

SOLITAX sc High Range Suspended Solids and Turbidity Analyzer for Insertion in Pipes
US Price: $7,520.00

SOLITAX sc Suspended Solids and Turbidity Analyzer for Insertion in Pipes
US Price: $6,730.00

Printer friendly versio

Appendix D

Full Environmental Assessment Form

617.20
Appendix A
State Environmental Quality Review
FULL ENVIRONMENTAL ASSESSMENT FORM

Purpose: The full EAF is designed to help applicants and agencies determine, in an orderly manner, whether a project or action may be significant. The question of whether an action may be significant is not always easy to answer. Frequently, there are aspects of a project that are subjective or unmeasurable. It is also understood that those who determine significance may have little or no formal knowledge of the environment or may not be technically expert in environmental analysis. In addition, many who have knowledge in one particular area may not be aware of the broader concerns affecting the question of significance.

The full EAF is intended to provide a method whereby applicants and agencies can be assured that the determination process has been orderly, comprehensive in nature, yet flexible enough to allow introduction of information to fit a project or action.

Full EAF Components: The full EAF is comprised of three parts:

Part 1: Provides objective data and information about a given project and its site. By identifying basic project data, it assists a reviewer in the analysis that takes place in Parts 2 and 3.

Part 2: Focuses on identifying the range of possible impacts that may occur from a project or action. It provides guidance as to whether an impact is likely to be considered small to moderate or whether it is a potentially-large impact. The form also identifies whether an impact can be mitigated or reduced.

Part 3: If any impact in Part 2 is identified as potentially-large, then Part 3 is used to evaluate whether or not the impact is actually important.

THIS AREA FOR LEAD AGENCY USE ONLY

DETERMINATION OF SIGNIFICANCE -- Type 1 and Unlisted Actions

Identify the Portions of EAF completed for this project: ☑ Part 1 ☑ Part 2 ☑ Part 3

Upon review of the information recorded on this EAF (Parts 1 and 2 and 3 if appropriate), and any other supporting information, and considering both the magnitude and importance of each impact, it is reasonably determined by the lead agency that:

☐ A. The project will not result in any large and important impact(s) and, therefore, is one which **will not** have a significant impact on the environment, therefore **a negative declaration will be prepared.**

☐ B. Although the project could have a significant effect on the environment, there will not be a significant effect for this Unlisted Action because the mitigation measures described in PART 3 have been required, therefore **a CONDITIONED negative declaration will be prepared.***

☐ C. The project may result in one or more large and important impacts that may have a significant impact on the environment, therefore **a positive declaration will be prepared.**

*A Conditioned Negative Declaration is only valid for Unlisted Actions

Town of Riverhead Wastewater Reuse Plan (Phase II)
Name of Action

Riverhead Town Board
Name of Lead Agency

Joseph Hall
Print or Type Name of Responsible Officer in Lead Agency

Environmental Planner
Title of Responsible Officer

Signature of Responsible Officer in Lead Agency

Signature of Preparer (if different from responsible officer)

website

Date

PART 1--PROJECT INFORMATION
Prepared by Project Sponsor

NOTICE: This document is designed to assist in determining whether the action proposed may have a significant effect on the environment. Please complete the entire form, Parts A through E. Answers to these questions will be considered as part of the application for approval and may be subject to further verification and public review. Provide any additional information you believe will be needed to complete Parts 2 and 3.

It is expected that completion of the full EAF will be dependent on information currently available and will not involve new studies, research or investigation. If information requiring such additional work is unavailable, so indicate and specify each instance.

Name of Action Town of Riverhead Wastewater Reuse Plan (phase II)

Location of Action (include Street Address, Municipality and County)

Riverhead Sanitary Treatment Plant and Indian Island County Golf Course

Name of Applicant/Sponsor Town of Riverhead

Address 200 Howell Avenue

City / PO Riverhead State New York Zip Code 11901

Business Telephone (631) 727-3200

Name of Owner (if different) Suffolk County Dept. of Parks Recreation and Conservation

Address P.O. Box 144, Montauk Highway

City / PO West Sayville State New York Zip Code 11796

Business Telephone (631) 854-0900

Description of Action:

See EAF attachment for detailed project description and detail on site and project and on planning and zoning information.

Please Complete Each Question--Indicate N.A. if not applicable

A. SITE DESCRIPTION

Physical setting of overall project, both developed and undeveloped areas.

1. Present Land Use: ☐ Urban ☐ Industrial ☐ Commercial ☐ Residential (suburban) ☐ Rural (non-farm)
   ☐ Forest ☐ Agriculture ☑ Other institutional and recreational

2. Total acreage of project area: _____ acres.

APPROXIMATE ACREAGE	PRESENTLY	AFTER COMPLETION
Meadow or Brushland (Non-agricultural)	_____ acres	_____ acres
Forested	_____ acres	_____ acres
Agricultural (Includes orchards, cropland, pasture, etc.)	_____ acres	_____ acres
Wetland (Freshwater or tidal as per Articles 24,25 of ECL)	_____ acres	_____ acres
Water Surface Area	_____ acres	_____ acres
Unvegetated (Rock, earth or fill)	_____ acres	_____ acres
Roads, buildings and other paved surfaces	_____ acres	_____ acres
Other (Indicate type) _____	_____ acres	_____ acres

3. What is predominant soil type(s) on project site?
   a. Soil drainage: ☐ Well drained _____% of site ☐ Moderately well drained _____% of site.
   ☐ Poorly drained _____% of site
   b. If any agricultural land is involved, how many acres of soil are classified within soil group 1 through 4 of the NYS Land Classification System? _____ acres (see 1 NYCRR 370).

4. Are there bedrock outcroppings on project site? ☐ Yes ☑ No
   a. What is depth to bedrock >=500ft. (in feet)

5. Approximate percentage of proposed project site with slopes:
   ☐ 0-10% _____% ☐ 10- 15% _____% ☐ 15% or greater _____%

6. Is project substantially contiguous to, or contain a building, site, or district, listed on the State or National Registers of Historic Places? ☐ Yes ☑ No

7. Is project substantially contiguous to a site listed on the Register of National Natural Landmarks? ☐ Yes ☑ No

8. What is the depth of the water table? >=10ft. (in feet)

9. Is site located over a primary, principal, or sole source aquifer? ☑ Yes ☐ No

10. Do hunting, fishing or shell fishing opportunities presently exist in the project area? ☐ Yes ☑ No

11. Does project site contain any species of plant or animal life that is identified as threatened or endangered? ☐ Yes ☒ No

According to:

Identify each species:

12. Are there any unique or unusual land forms on the project site? (i.e., cliffs, dunes, other geological formations?

☐ Yes ☒ No

Describe:

13. Is the project site presently used by the community or neighborhood as an open space or recreation area?

☒ Yes ☐ No

If yes, explain:

Public (County operated) golf course.

14. Does the present site include scenic views known to be important to the community? ☒ Yes ☐ No

From the Peconic Estuary. Contemplated improvements will not be visible from that viewshed.

15. Streams within or contiguous to project area:

Sawmill Creek and Peconic River.

a. Name of Stream and name of River to which it is tributary

16. Lakes, ponds, wetland areas within or contiguous to project area:

Tidal and freshwater wetlands of above adjacent surface waters and upland freshwater wetlands on and adjacent to overall site.

b. Size (in acres):

17. Is the site served by existing public utilities? ☐ Yes ☐ No

a. If **YES,** does sufficient capacity exist to allow connection? ☐ Yes ☐ No

b. If **YES**, will improvements be necessary to allow connection? ☐ Yes ☐ No

18. Is the site located in an agricultural district certified pursuant to Agriculture and Markets Law, Article 25-AA, Section 303 and 304? ☐ Yes ☒ No

19. Is the site located in or substantially contiguous to a Critical Environmental Area designated pursuant to Article 8 of the ECL, and 6 NYCRR 617? ☒ Yes ☐ No

20. Has the site ever been used for the disposal of solid or hazardous wastes? ☐ Yes ☒ No

B. Project Description

1. Physical dimensions and scale of project (fill in dimensions as appropriate).

a. Total contiguous acreage owned or controlled by project sponsor: _____ acres.

b. Project acreage to be developed: _____ acres initially; _____ acres ultimately.

c. Project acreage to remain undeveloped: _____ acres.

d. Length of project, in miles: _____ (if appropriate)

e. If the project is an expansion, indicate percent of expansion proposed. _____ %

f. Number of off-street parking spaces existing _____; proposed _____

g. Maximum vehicular trips generated per hour: _____ (upon completion of project)?

h. If residential: Number and type of housing units:

	One Family	Two Family	Multiple Family	Condominium
Initially				
Ultimately				

i. Dimensions (in feet) of largest proposed structure: _____ height; _____ width; _____ length.

j. Linear feet of frontage along a public thoroughfare project will occupy is? _____ ft.

2. How much natural material (i.e. rock, earth, etc.) will be removed from the site? none tons/cubic yards.

3. Will disturbed areas be reclaimed ☐ Yes ☐ No ☒ N/A

a. If yes, for what intended purpose is the site being reclaimed?

b. Will topsoil be stockpiled for reclamation? ☐ Yes ☐ No

c. Will upper subsoil be stockpiled for reclamation? ☐ Yes ☐ No

4. How many acres of vegetation (trees, shrubs, ground covers) will be removed from site? none acres.

5. Will any mature forest (over 100 years old) or other locally-important vegetation be removed by this project?

☐ Yes ☒ No

6. If single phase project: Anticipated period of construction: six months, (including demolition)

7. If multi-phased:

   a. Total number of phases anticipated _____ (number)

   b. Anticipated date of commencement phase 1: _____ month _____ year, (including demolition)

   c. Approximate completion date of final phase: _____ month _____ year.

   d. Is phase 1 functionally dependent on subsequent phases? ☐ Yes ☐ No

8. Will blasting occur during construction? ☐ Yes ☒ No

9. Number of jobs generated: during construction none ; after project is complete

10. Number of jobs eliminated by this project none .

11. Will project require relocation of any projects or facilities? ☐ Yes ☒ No

    If yes, explain:

12. Is surface liquid waste disposal involved? ☒ Yes ☐ No

    a. If yes, indicate type of waste (sewage, industrial, etc) and amount _____

    b. Name of water body into which effluent will be discharged _____

13. Is subsurface liquid waste disposal involved? ☒ Yes ☐ No Type _____

14. Will surface area of an existing water body increase or decrease by proposal? ☐ Yes ☒ No

    If yes, explain:

15. Is project or any portion of project located in a 100 year flood plain? ☒ Yes ☐ No

16. Will the project generate solid waste? ☒ Yes ☐ No

    a. If yes, what is the amount per month? _____ tons

    b. If yes, will an existing solid waste facility be used? ☐ Yes ☐ No

    c. If yes, give name _____ ; location _____

    d. Will any wastes not go into a sewage disposal system or into a sanitary landfill? ☐ Yes ☐ No

e. If yes, explain:

17. Will the project involve the disposal of solid waste? ☐ Yes ■ No

a. If yes, what is the anticipated rate of disposal? _____ tons/month.

b. If yes, what is the anticipated site life? _____ years.

18. Will project use herbicides or pesticides? ☐ Yes ■ No

19. Will project routinely produce odors (more than one hour per day)? ☐ Yes ■ No

20. Will project produce operating noise exceeding the local ambient noise levels? ☐ Yes ■ No

21. Will project result in an increase in energy use? ■ Yes ☐ No

If yes, indicate type(s)

Electricity

22. If water supply is from wells, indicate pumping capacity N/A gallons/minute.

23. Total anticipated water usage per day N/A gallons/day.

24. Does project involve Local, State or Federal funding? ■ Yes ☐ No

If yes, explain:

1996 Environmental Bond Act

25. Approvals Required:

			Type	Submittal Date
City, Town, Village Board	☒ Yes	☐ No	direct agency undertaking	
City, Town, Village Planning Board	☐ Yes	☒ No		
City, Town Zoning Board	☐ Yes	☒ No		
City, County Health Department	☒ Yes	☐ No	facility plan	
Other Local Agencies	☐ Yes	☒ No		
Other Regional Agencies	☒ Yes	☐ No	County Parks (const. and specs.)	
State Agencies	☒ Yes	☐ No	NYSDEC (facility plan and SPDES)	
Federal Agencies	☐ Yes	☒ No		

C. Zoning and Planning Information

1. Does proposed action involve a planning or zoning decision? ☒ Yes ☐ No

If Yes, indicate decision required:

☐ Zoning amendment ☐ Zoning variance ☐ New/revision of master plan ☐ Subdivision

☐ Site plan ☐ Special use permit ☐ Resource management plan ☒ Other

2. What is the zoning classification(s) of the site?

N/A

3. What is the maximum potential development of the site if developed as permitted by the present zoning?

N/A

4. What is the proposed zoning of the site?

N/A

5. What is the maximum potential development of the site if developed as permitted by the proposed zoning?

N/A

6. Is the proposed action consistent with the recommended uses in adopted local land use plans? ☒ Yes ☐ No

7. What are the predominant land use(s) and zoning classifications within a ¼ mile radius of proposed action?

Area uses are residential, recreational and istitutional. Zones are Residence A-40 and Tourism/Resort Campus.

8. Is the proposed action compatible with adjoining/surrounding land uses with a ¼ mile? ☒ Yes ☐ No

9. If the proposed action is the subdivision of land, how many lots are proposed? N/A

   a. What is the minimum lot size proposed? _____

10. Will proposed action require any authorization(s) for the formation of sewer or water districts? ☐ Yes ■ No

11. Will the proposed action create a demand for any community provided services (recreation, education, police, fire protection?

☐ Yes ■ No

a. If yes, is existing capacity sufficient to handle projected demand? ☐ Yes ☐ No

12. Will the proposed action result in the generation of traffic significantly above present levels? ☐ Yes ■ No

a. If yes, is the existing road network adequate to handle the additional traffic. ☐ Yes ☐ No

D. Informational Details

Attach any additional information as may be needed to clarify your project. If there are or may be any adverse impacts associated with your proposal, please discuss such impacts and the measures which you propose to mitigate or avoid them.

E. Verification

I certify that the information provided above is true to the best of my knowledge.

Applicant/Sponsor Name Town of Riverhead Date July 18, 2006

Signature

Title Environmental Planner

If the action is in the Coastal Area, and you are a state agency, complete the Coastal Assessment Form before proceeding with this assessment.

EAF Attachment

Town of Riverhead Sanitary Wastewater Reuse Plan (phase II)

Description of Action: The applicant Town of Riverhead proposes to undertake phase II of its wastewater reclamation project whereby 350,000gpd of treated effluent will be reused for irrigation of the adjacent Indian Island County Golf Course. The volume represents approximately 46% of current surface water discharge and 25% of nitrogen mass loading to Peconic Bay during the irrigation season and is a first step to the hoped for permanent and total elimination of this nitrogen input to the Peconic Estuary. It is the first such wastewater reclamation project undertaken in Suffolk County.

Phase I of the project was a pilot study to establish the viability of the intent undertaken on the grounds of the Riverhead Advanced Wastewater Treatment Facility. A fraction of the facility's effluent was diverted for supplemental treatment by cloth and membrane filtration and ultraviolet disinfection to remove parasites and achieve 99.9999% viral reduction. The pilot plant's output was tested to insure a total nitrogen concentration of 10mg/l or less to meet drinking water standards and was applied to a model golf hole (tee, fairway and green areas) in the same irrigation regime as the actual course for an eighteen week period between May and September 2004. Soil tests and visual observations were undertaken to monitor nitrogen concentration compliance and evaluate the health of the managed turf areas and the result was a recommendation of the methodology for the entire County golf course.

Full scale implementation will not only meet the goal of the Peconic Estuary Comprehensive Conservation and Management Plan for no net increase in nitrogen input to the ecosystem, but will reduce and may eventually eliminate the RAWTF contribution. The potential for algal blooms and resultant biological oxygen demand is reduced as a result. Further, the nutrient content of the applied reclaimed water may reduce the County's need to fertilize the golf course and reducing or eliminating their need to pump irrigation water from the aquifer will reduce the potential for saltwater intrusion.

Physical construction is limited to the placement of the supplemental filtering and disinfection improvements on the RAWTF site and connection to the existing in ground golf course irrigation system. A pipeline of approximately 700ft. will be placed between the RAWTF holding tanks and the course's well head. The line will be direct bored to limit the physical disturbance.

A. Site Description:

2. The Riverhead STP and Scavenger Waste plant are on 14.9ac of land which is a little less than half forested (including a small deciduous wetland area) with structural improvements and grassed area on the rest. These coverages will not be significantly altered by the project. The County golf course occupies 156.4ac. of which about 80% is devoted to play area (turf grasses, hazards, cart paths, etc.) with most of the balance being out of bounds and other wooded areas. There's a small area of hard surfacing consisting of the course clubhouse/restaurant and parking area, various outbuildings and the gas depot. These coverages will remain unchanged.

3. Sheet 44 of the County Soil Survey indicates the soils on the portion of the Town land occupied by the RAWTF to be Plymouth loamy sand (PlA and PlB) and gently sloping Cut and Fill land (CuB). The golf course is a mosaic of Plymouth, Carver and Plymouth sands and Cut and Fill lands. The only severe developmental restriction of these soil types is to lawns, landscaping and golf fairways which wouldn't effect any contemplated

physical alterations. The County land has already been successfully altered to these type of improved areas for many years.
5. The Town land features no slope above 10%. The County site has a wide range and steeper slopes which wouldn't be altered by the project.
8. Depth to groundwater is highly variable over both Town and County land but would be expected to be about 10ft. in the area of the RAWTF.
16. Adjacent surface waters of Sawmill Creek and the Peconic River include tidal and freshwater wetlands and three small upland freshwater wetlands are on the RAWTF site and adjacent to the west. These resources are regulated by both state and local statute but are beyond jurisdictional distance of any contemplated alterations.
17. The RAWTF site is served by public water and sewer; the golf course by water only. No new connections or use is a part of the project.
19. The lands lie within the Peconic Bay CEA. Under the 1995 revision of SEQR regulations, Unlisted actions within CEA's are no longer automatically elevated to Type I status.

B. Project Description:

1. 14.9ac. are held by the Town, 156.4ac. by the County. The existing levels of development will not change. The project represents a change in existing operation and management procedures of the Town and County facilities; not an expansion. No additional parking is proposed nor is any increased traffic likely.
12.&13. 350,000gpd of the RAWTF output of up to 1.4MGD is to be diverted from the Peconic River outfall and discharged as irrigation for essentially a subsurface waste disposal.
15. The Town and County land is bordered by the AE flood zone of Sawmill Creek and the Peconic River but all contemplated improvements are well distant from that area.
16. Some residual (filter) waste is expected which will be landfilled or processed at the Bergen Point treatment facility.

C. Zoning and Planning Information:

1. The zoning decision involves operations and maintenance of public facilities.
2. Public buildings and facilities of this nature are independent of zoning.

PART 2 - PROJECT IMPACTS AND THEIR MAGNITUDE

Responsibility of Lead Agency

General Information (Read Carefully)

! In completing the form the reviewer should be guided by the question: Have my responses and determinations been **reasonable?** The reviewer is not expected to be an expert environmental analyst.

! The **Examples** provided are to assist the reviewer by showing types of impacts and wherever possible the threshold of magnitude that would trigger a response in column 2. The examples are generally applicable throughout the State and for most situations. But, for any specific project or site other examples and/or lower thresholds may be appropriate for a Potential Large Impact response, thus requiring evaluation in Part 3.

! The impacts of each project, on each site, in each locality, will vary. Therefore, the examples are illustrative and have been offered as guidance. They do not constitute an exhaustive list of impacts and thresholds to answer each question.

! The number of examples per question does not indicate the importance of each question.

! In identifying impacts, consider long term, short term and cumulative effects.

Instructions (Read carefully)

a. Answer each of the 20 questions in PART 2. Answer **Yes** if there will be **any** impact.

b. **Maybe** answers should be considered as **Yes** answers.

c. If answering **Yes** to a question then check the appropriate box(column 1 or 2)to indicate the potential size of the impact. If impact threshold equals or exceeds any example provided, check column 2. If impact will occur but threshold is lower than example, check column 1.

d. Identifying that an Impact will be potentially large (column 2) does not mean that it is also necessarily **significant**. Any large impact must be evaluated in PART 3 to determine significance. Identifying an impact in column 2 simply asks that it be looked at further.

e. If reviewer has doubt about size of the impact then consider the impact as potentially large and proceed to PART 3.

f. If a potentially large impact checked in column 2 can be mitigated by change(s) in the project to a small to moderate impact, also check the **Yes** box in column 3. A **No** response indicates that such a reduction is not possible. This must be explained in Part 3.

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change
Impact on Land			
1. Will the Proposed Action result in a physical change to the project site? NO ☐ YES ☑			
Examples that would apply to column 2			
Any construction on slopes of 15% or greater, (15 foot rise per 100 foot of length), or where the general slopes in the project area exceed 10%. all 0-10%	☑	☐	☐ Yes ☐ No
Construction on land where the depth to the water table is less than 3 feet. >10'	☑	☐	☐ Yes ☐ No
Construction of paved parking area for 1,000 or more vehicles. no	☐	☐	☐ Yes ☐ No
Construction on land where bedrock is exposed or generally within 3 feet of existing ground surface. >500'	☑	☐	☐ Yes ☐ No
Construction that will continue for more than 1 year or involve more than one phase or stage. 6 months	☑	☐	☐ Yes ☐ No
Excavation for mining purposes that would remove more than 1,000 tons of natural material (i.e., rock or soil) per year. no	☐	☐	☐ Yes ☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change
Construction or expansion of a santary landfill. NO	☐	☐	☐ Yes ☐ No
Construction in a designated floodway. NO	☐	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

2. Will there be an effect to any unique or unusual land forms found on the site? (i.e., cliffs, dunes, geological formations, etc.)
☑ NO ☐ YES

Specific land forms:	☐	☐	☐ Yes ☐ No

Impact on Water

3. Will Proposed Action affect any water body designated as protected? (Under Articles 15, 24, 25 of the Environmental Conservation Law, ECL)
☐ NO ☑ YES

Examples that would apply to column 2

Developable area of site contains a protected water body.	☑	☐	☐ Yes ☐ No
Dredging more than 100 cubic yards of material from channel of a protected stream. NO	☐	☐	☐ Yes ☐ No
Extension of utility distribution facilities through a protected water body. NO	☐	☐	☐ Yes ☐ No
Construction in a designated freshwater or tidal wetland. adjacent (well distant)	☑	☐	☐ Yes ☐ No
Other impacts:	☑	☐	☐ Yes ☐ No

Potential overland runoff of applied irrigation wastewater into adjacent surface waters + wetlands.

4. Will Proposed Action affect any non-protected existing or new body of water?
☑ NO ☐ YES

Examples that would apply to column 2

A 10% increase or decrease in the surface area of any body of water or more than a 10 acre increase or decrease.	☐	☐	☐ Yes ☐ No
Construction of a body of water that exceeds 10 acres of surface area.	☐	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change

5. Will Proposed Action affect surface or groundwater quality or quantity?
   ☐ NO ☑ YES

Examples that would apply to column 2

Proposed Action will require a discharge permit. modified existing SPDES + new SDVR water	☑	☐	☐ Yes	☐ No
Proposed Action requires use of a source of water that does not have approval to serve proposed (project) action. no	☐	☐	☐ Yes	☐ No
Proposed Action requires water supply from wells with greater than 45 gallons per minute pumping capacity. no	☐	☐	☐ Yes	☐ No
Construction or operation causing any contamination of a water supply system. 3 SPE source aquifer – wastewater discharge to groundwater – structural runoff	☐	☑	☑ Yes	☐ No
Proposed Action will adversely affect groundwater.	☐	☑	☑ Yes	☐ No
Liquid effluent will be conveyed off the site to facilities which presently do not exist or have inadequate capacity. no	☐	☐	☐ Yes	☐ No
Proposed Action would use water in excess of 20,000 gallons per day. no	☐	☐	☐ Yes	☐ No
Proposed Action will likely cause siltation or other discharge into an existing body of water to the extent that there will be an obvious visual contrast to natural conditions.	☑	☐	☐ Yes	☐ No
Proposed Action will require the storage of petroleum or chemical products greater than 1,100 gallons. unlikely	☑	☐	☐ Yes	☐ No
Proposed Action will allow residential uses in areas without water and/or sewer services. no	☐	☐	☐ Yes	☐ No
Proposed Action locates commercial and/or industrial uses which may require new or expansion of existing waste treatment and/or storage facilities. no	☐	☐	☐ Yes	☐ No
Other impacts:	☐	☐	☐ Yes	☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change

6. Will Proposed Action alter drainage flow or patterns, or surface water runoff?
☐ NO ☑ YES

Examples that would apply to column 2

Proposed Action would change flood water flows *no*	☐	☐	☐ Yes	☐ No
Proposed Action may cause substantial erosion.	☑	☐	☐ Yes	☐ No
Proposed Action is incompatible with existing drainage patterns.	☑	☐	☐ Yes	☐ No
Proposed Action will allow development in a designated *no* floodway.	☐	☐	☐ Yes	☐ No
Other impacts:	☐	☐	☐ Yes	☐ No

IMPACT ON AIR

7. Will Proposed Action affect air quality?
☐ NO ☑ YES

Examples that would apply to column 2

Proposed Action will induce 1,000 or more vehicle trips in any given hour.	☑	☐	☐ Yes	☐ No
Proposed Action will result in the incineration of more than 1 ton *no* of refuse per hour.	☐	☐	☐ Yes	☐ No
Emission rate of total contaminants will exceed 5 lbs. per hour or a heat source producing more than 10 million BTU's per hour.	☑	☐	☐ Yes	☐ No
Proposed Action will allow an increase in the amount of land *no* committed to industrial use.	☐	☐	☐ Yes	☐ No
Proposed Action will allow an increase in the density of industrial development within existing industrial areas. *no*	☐	☐	☐ Yes	☐ No
Other impacts:	☑	☐	☐ Yes	☐ No

Short term construction emissions

IMPACT ON PLANTS AND ANIMALS

8. Will Proposed Action affect any threatened or endangered species?
☑ NO ☐ YES

Examples that would apply to column 2

Reduction of one or more species listed on the New York or Federal list, using the site, over or near the site, or found on the site.	☐	☐	☐ Yes	☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change
Removal of any portion of a critical or significant wildlife habitat.	☐	☐	☐ Yes ☐ No
Application of pesticide or herbicide more than twice a year, other than for agricultural purposes.	☐	☐	☐ Yes ☐ No
Other impacts:	☑	☐	☐ Yes ☐ No

9. Will Proposed Action substantially affect non-threatened or non-endangered species?
☑ NO ☐ YES

Examples that would apply to column 2

Proposed Action would substantially interfere with any resident or migratory fish, shellfish or wildlife species.	☐	☐	☐ Yes ☐ No
Proposed Action requires the removal of more than 10 acres of mature forest (over 100 years of age) or other locally important vegetation.	☐	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

IMPACT ON AGRICULTURAL LAND RESOURCES

10. Will Proposed Action affect agricultural land resources?
☑ NO ☐ YES

Examples that would apply to column 2

The Proposed Action would sever, cross or limit access to agricultural land (includes cropland, hayfields, pasture, vineyard, orchard, etc.)	☐	☐	☐ Yes ☐ No
Construction activity would excavate or compact the soil profile of agricultural land.	☐	☐	☐ Yes ☐ No
The Proposed Action would irreversibly convert more than 10 acres of agricultural land or, if located in an Agricultural District, more than 2.5 acres of agricultural land.	☐	☐	☐ Yes ☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change
The Proposed Action would disrupt or prevent installation of agricultural land management systems (e.g., subsurface drain lines, outlet ditches, strip cropping); or create a need for such measures (e.g. cause a farm field to drain poorly due to increased runoff).	☐	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

IMPACT ON AESTHETIC RESOURCES

11. Will Proposed Action affect aesthetic resources? (If necessary, use the Visual EAF Addendum in Section 617.20, Appendix B.)
☐ NO ☑ YES

Examples that would apply to column 2 Proposed land uses, or project components obviously different from or in sharp contrast to current surrounding land use patterns, whether man-made or natural.	☑	☐	☐ Yes ☐ No
Proposed land uses, or project components visible to users of aesthetic resources which will eliminate or significantly reduce their enjoyment of the aesthetic qualities of that resource.	☑	☐	☐ Yes ☐ No
Project components that will result in the elimination or significant screening of scenic views known to be important to the area.	☐	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

IMPACT ON HISTORIC AND ARCHAEOLOGICAL RESOURCES

12. Will Proposed Action impact any site or structure of historic, prehistoric or paleontological importance?
☑ NO ☐ YES

Examples that would apply to column 2 Proposed Action occurring wholly or partially within or substantially contiguous to any facility or site listed on the State or National Register of historic places.	☐	☐	☐ Yes ☐ No
Any impact to an archaeological site or fossil bed located within the project site.	☐	☐	☐ Yes ☐ No
Proposed Action will occur in an area designated as sensitive for archaeological sites on the NYS Site Inventory.	☐	☐	☐ Yes ☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change
Other impacts:	☐	☐	☐ Yes ☐ No

IMPACT ON OPEN SPACE AND RECREATION

13. Will proposed Action affect the quantity or quality of existing or future open spaces or recreational opportunities?
☐ NO ☑ YES

Examples that would apply to column 2			
The permanent foreclosure of a future recreational opportunity.	☐	☐	☐ Yes ☐ No
A major reduction of an open space important to the community.	☐	☐	☐ Yes ☐ No
Other impacts:	☑	☐	☐ Yes ☐ No

Change in management practices of existing recreational resource.

IMPACT ON CRITICAL ENVIRONMENTAL AREAS

14. Will Proposed Action impact the exceptional or unique characteristics of a critical environmental area (CEA) established pursuant to subdivision 6NYCRR 617.14(g)?
☐ NO ☑ YES

List the environmental characteristics that caused the designation of the CEA.

Fragile natural and cultural resources comprising part of Suffolk County's unique environment and scenic beauty and requiring stringent protection including groundwater resources

Examples that would apply to column 2			
Proposed Action to locate within the CEA?	☑	☐	☐ Yes ☐ No
Proposed Action will result in a reduction in the quantity of the resource? (no)	☐	☐	☐ Yes ☐ No
Proposed Action will result in a reduction in the quality of the resource?	☑	☐	☐ Yes ☐ No
Proposed Action will impact the use, function or enjoyment of the resource?	☑	☐	☐ Yes ☐ No
Other impacts:	☑	☐	☐ Yes ☐ No

Application of wastewater as irrigation to CEA bound land with possible runoff into CEA waters. Accompanied by commensurate reduction of direct waste water discharge to these waters.

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change

IMPACT ON TRANSPORTATION

15. Will there be an effect to existing transportation systems?
☐ NO ☑ YES

Examples that would apply to column 2 Alteration of present patterns of movement of people and/or goods.	☑	☐	☐ Yes ☐ No
Proposed Action will result in major traffic problems.	☑	☐	☐ Yes ☐ No
Other impacts:	☑	☐	☐ Yes ☐ No

Short term construction traffic

IMPACT ON ENERGY

16. Will Proposed Action affect the community's sources of fuel or energy supply?

☐ NO ☑ YES

Examples that would apply to column 2 Proposed Action will cause a greater than 5% increase in the use of any form of energy in the municipality.	☑	☐	☐ Yes ☐ No
Proposed Action will require the creation or extension of an energy transmission or supply system to serve more than 50 single or two family residences or to serve a major commercial or industrial use. no	☐	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

NOISE AND ODOR IMPACT

17. Will there be objectionable odors, noise, or vibration as a result of the Proposed Action?

☐ NO ☑ YES

Examples that would apply to column 2 Blasting within 1,500 feet of a hospital, school or other sensitive facility. no	☐	☐	☐ Yes ☐ No
Odors will occur routinely (more than one hour per day).	☑	☐	☐ Yes ☐ No
Proposed Action will produce operating noise exceeding the local ambient noise levels for noise outside of structures.	☑	☐	☐ Yes ☐ No
Proposed Action will remove natural barriers that would act as a noise screen.	☑	☐	☐ Yes ☐ No
Other impacts:	☑	☐	☐ Yes ☐ No

Short term construction noise

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change

IMPACT ON PUBLIC HEALTH

18. Will Proposed Action affect public health and safety?
☐ NO ☑ YES

Proposed Action may cause a risk of explosion or release of hazardous substances (i.e. oil, pesticides, chemicals, radiation, etc.) in the event of accident or upset conditions, or there may be a chronic low level discharge or emission.	☐	☑	☑ Yes	☐ No
Proposed Action may result in the burial of "hazardous wastes" in any form (i.e. toxic, poisonous, highly reactive, radioactive, irritating, infectious, etc.) Filter waste	☑	☐	☐ Yes	☐ No
Storage facilities for one million or more gallons of liquefied natural gas or other flammable liquids. unlikely	☑	☐	☐ Yes	☐ No
Proposed Action may result in the excavation or other disturbance within 2,000 feet of a site used for the disposal of solid or hazardous waste. no	☐	☐	☐ Yes	☐ No
Other impacts:	☐	☑	☑ Yes	☐ No

Potential exposure of the public to pathogens expected to found in wastewater and impacts to the public water supply (groundwater)

IMPACT ON GROWTH AND CHARACTER OF COMMUNITY OR NEIGHBORHOOD

19. Will Proposed Action affect the character of the existing community?
☐ NO ☑ YES

Examples that would apply to column 2

The permanent population of the city, town or village in which the project is located is likely to grow by more than 5%. no	☐	☐	☐ Yes	☐ No
The municipal budget for capital expenditures or operating services will increase by more than 5% per year as a result of this project.	☑	☐	☐ Yes	☐ No
Proposed Action will conflict with officially adopted plans or goals. no	☐	☐	☐ Yes	☐ No
Proposed Action will cause a change in the density of land use.	☑	☐	☐ Yes	☐ No
Proposed Action will replace or eliminate existing facilities, structures or areas of historic importance to the community. no	☐	☐	☐ Yes	☐ No
Development will create a demand for additional community services (e.g. schools, police and fire, etc.)	☑	☐	☐ Yes	☐ No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated by Project Change
Proposed Action will set an important precedent for future projects.	☐	☑	☑ Yes ☐ No
Proposed Action will create or eliminate employment.	☑	☐	☐ Yes ☐ No
Other impacts:	☐	☐	☐ Yes ☐ No

20. Is there, or is there likely to be, public controversy related to potential adverse environment impacts?
☐ NO ☑ YES

If Any Action in Part 2 Is Identified as a Potential Large Impact or If you Cannot Determine the Magnitude of Impact, Proceed to Part 3

Part 3 - EVALUATION OF THE IMPORTANCE OF IMPACTS

Responsibility of Lead Agency

Part 3 must be prepared if one or more impact(s) is considered to be potentially large, even if the impact(s) may be mitigated.

Instructions (If you need more space, attach additional sheets)

Discuss the following for each impact identified in Column 2 of Part 2:

1. Briefly describe the impact.

2. Describe (if applicable) how the impact could be mitigated or reduced to a small to moderate impact by project change(s).

3. Based on the information available, decide if it is reasonable to conclude that this impact is **important**.

   To answer the question of importance, consider:

   - The probability of the impact occurring
   - The duration of the impact
   - Its irreversibility, including permanently lost resources of value
   - Whether the impact can or will be controlled
   - The regional consequence of the impact
   - Its potential divergence from local needs and goals
   - Whether known objections to the project relate to this impact.

Reset

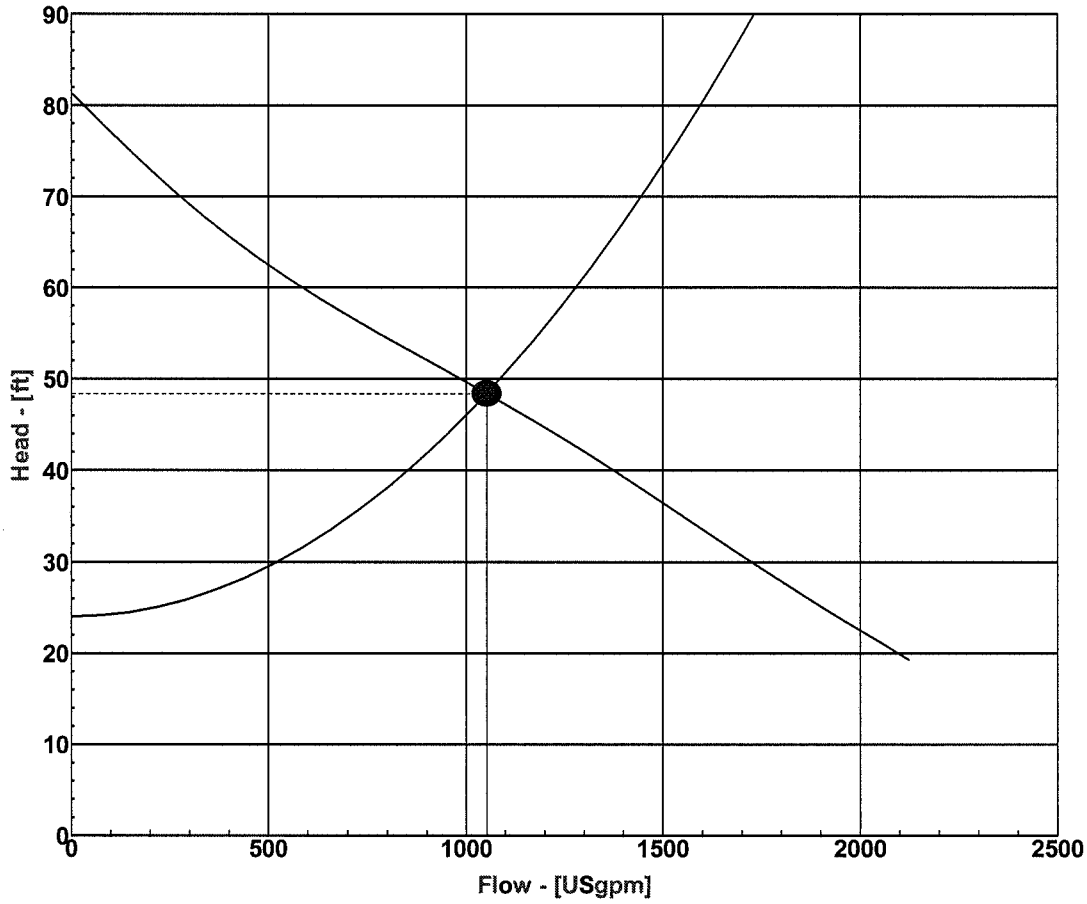
Appendix E

Pump and Piping Information

Duty Analysis - Duty conditions

Project: WASTEWATER REUSE FILTER INFLUENT PU

Created by:: EDWARD BYRNE



Pump curve

1 NP 3171 63-437-00-3030

PRODUCT DATA

Rtd. pwr.: 20 hp

Imp. diam.: 224 mm

Vanes: 2

DUTY CONDITIONS

No of pumps: 1

Flow: 1052.2 USgpm

Head: 48.4 ft

Shaft power: 17.0 hp

Pump efficiency: 75.7 %

Specifc energy: 226.8 kWh/mg

FLYGT

FLYPS

Rating

Frequency	**60** Hz	Product	**3171 . 180**	Issue	**3**
Phases	**3**	Motor #	**25-12-4AA**	# of Starts/Hr	**15**
Poles	**4**	Rated power	**20.0** hp	Issue date	
Approval		Installations	**PSTZ**	Valid from	**3/13/2003**
-	**N**	Type of duty	**S1**	Status	**APPR**

Rtd. amb. temp. **40** ° C / **104** ° F

	Alternative 1	*Alternative 2*		
Voltage	**460** V	**230** V	Stator variant	**07**
Connection	**YSER**	**Y//**	Speed	**1755** r/min
Rtd. Curr.	**25.0** A	**50.0** A	Module	**134**
Starting current	**153.0** A	**305.0** A	Motor issue	**11**
Power factor	**0.85**	**0.85**		
NEMA code letter	**G**	**G**		

Warm liquid data Note! Reduced rated power

Rtd. amb. temp.	**70** ° C / **158** ° F	° C /	° F
Rtd. Curr. (1)	**21.0** A	A	
Rtd. Curr. (2)	A	A	
Max input power	**13.4** kW	kW	

Flygt

ITT Industries

PERFORMANCE CURVE

PRODUCT	NP3171.180	TYPE	MT
DATE	2006-10-06	PROJECT	
CURVE NO	63-437-00-3030	ISSUE	3

	1/1-LOAD	3/4-LOAD	1/2-LOAD
POWER FACTOR	0.85	0.80	0.70
EFFICIENCY	87.5 %	89.0 %	89.0 %
MOTOR DATA	---	---	---

RATED POWER	20	hp
STARTING CURRENT ...	153	A
RATED CURRENT ...	25	A
RATED SPEED	1755	rpm
TOT.MOM.OF INERTIA ...	0.12	kgm2
NO. OF BLADES	2	

IMPELLER DIAMETER: 224 mm

MOTOR #	STATOR	REV
25-12-4AA	07YSER	11

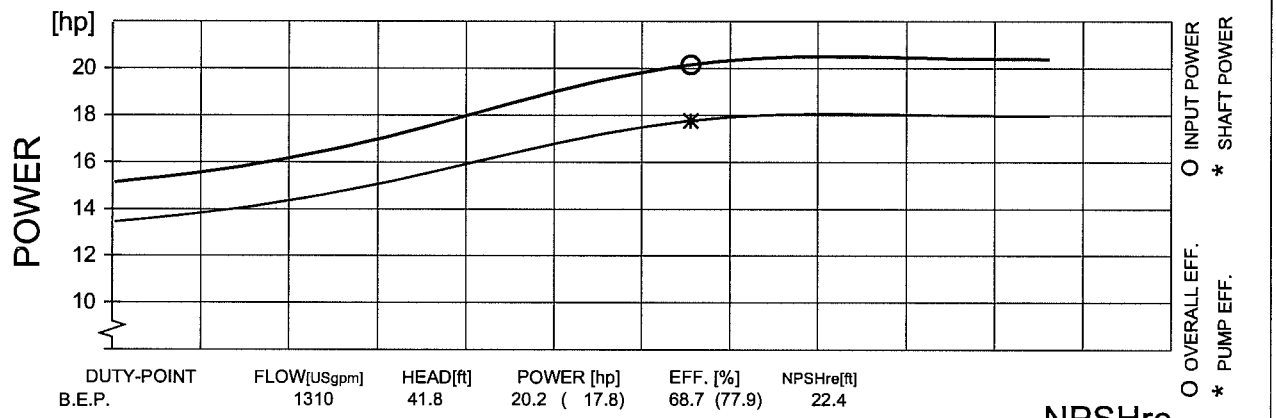
FREQ.	PHASES	VOLTAGE	POLES
60 Hz	3	460 V	4

GEARTYPE	RATIO
---	---

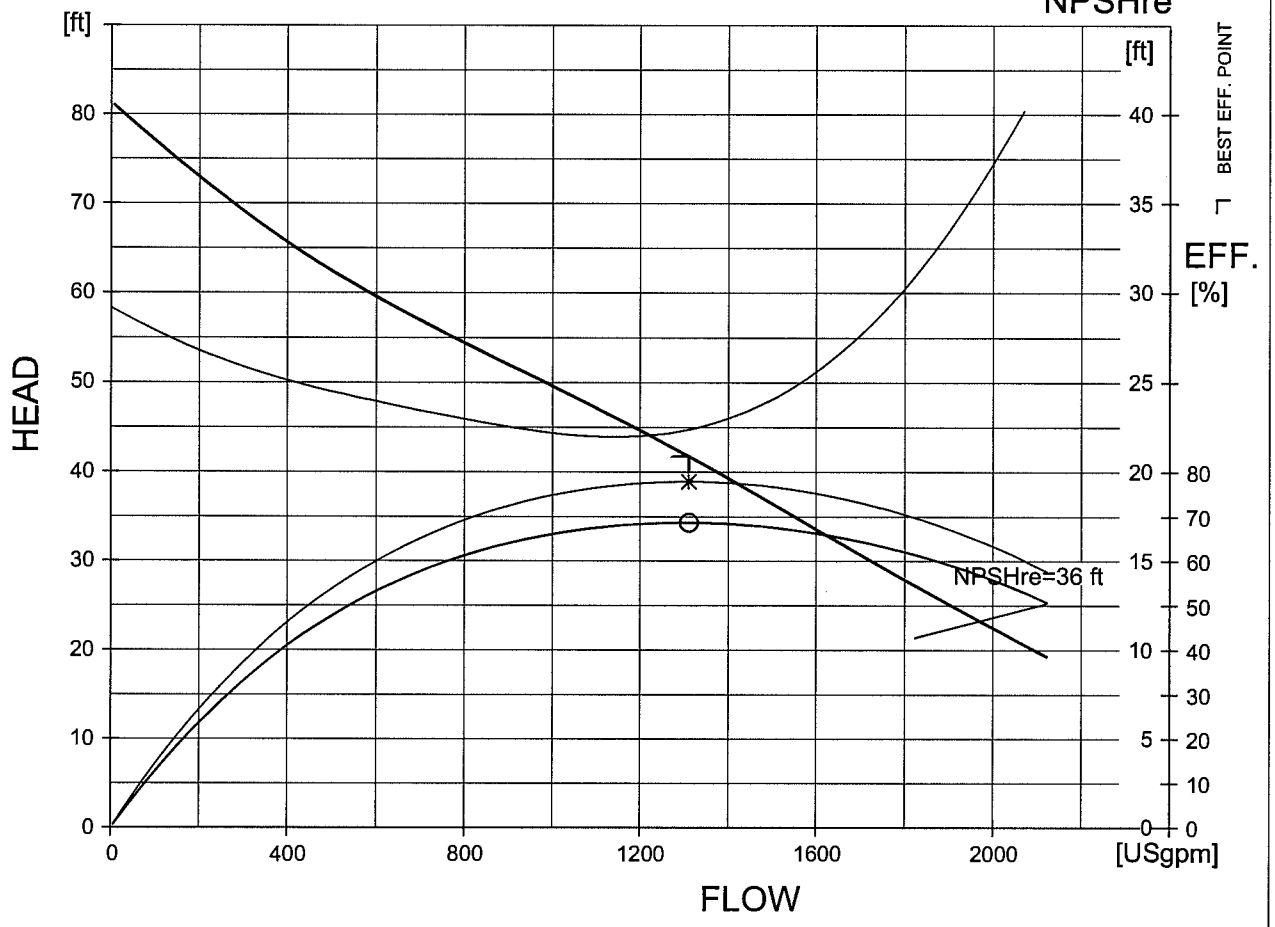
COMMENTS

INLET/OUTLET: -/ 6 inch

IMP. THROUGHLET: ---



DUTY-POINT	FLOW[USgpm]	HEAD[ft]	POWER [hp]	EFF. [%]	NPSHre[ft]
B.E.P.	1310	41.8	20.2 (17.8)	68.7 (77.9)	22.4



NPSHre = NPSH3% + min. operational margin

Performance with clear water and ambient temp 40 °C

HI B Curve

FLYPS3.1.2.0 (20050224)

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Prepared By: EPB

Definitions:	
TDH =	Total Dynamic Head
Hd =	Total Discharge Head
Hs =	Total Suction Head
TDH = Hd - Hs	The total discharge head less the total suction head.

Hd = hsd + hfd	
Where:	
hsd =	Static Discharge Head (ft.). The vertical distance in feet above the pump centerline to the free level of discharge .
hfd =	Friction head in discharge line (pipe loss + fitting & valve losses).

Hs = hs - hfs	
Where:	
hs =	Static Suction Head (ft.).
	The vertical distance in feet above the centerline of the pump inlet to the free level of the fluid source.
	In this case, "hs" is positive (+).
	If the free level of the fluid source is below the inlet, hs will be negative (-). This is known as static suction lift.
hfs =	Friction head in suction line (pipe loss + fitting & valve losses).

Substituting:	
TDH = (hsd - hs) + hfs + hfd	*(Pay attention to the sign of the value "hs")*

General Explanation of Worksheets:	
Data Input Worksheet	Input your data here
Worksheet No. 1	Calculates the velocity and velocity head for any pipe sizes. Default values are 8" - 24"
Worksheet No. 2	Calculates the pipe loss due to friction in the discharge line of the pump.
Worksheet No. 3	Calculates the " k " factor for minor losses in the pump discharge line.
Worksheet No. 4	Calculates minor losses in pump discharge line. This worksheet uses the "Total KT " calculated in Worksheet 3.
Worksheet No. 5	Calculates the pipe loss due to friction in the suction line of the pump.
Worksheet No. 6	Calculates the " k " factor for minor losses in the pump suction line.
Worksheet No. 7	Calculates minor losses in pump suction line. This worksheet uses the "Total KT " calculated in Worksheet 6.
TDH Calc. (Old Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
TDH Calc. (New Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
System Curves	Plots System Head Curve at C values
Station Loss (Pipe)	Calculates the pipe loss due to friction for station loss section of pipe
Station Loss (Minor)	Calculates the " k " factor for minor losses for the station loss section
Station Loss - Minor Head Loss	Calculates minor losses for the station loss section. This worksheet uses the "Total KT " calculated in Worksheet 6.
Modified - TDH Curve	Plots the worst case system head curve, pump performance curve, and modified pump curve.

Note: Values to be inserted have a yellow cell background. Type the value in the highlighted cell only.
Values in Red are cell references. Do not edit red values. Values in Blue are calculated values. Only edit the formula.

Step #			
1	*Select System Flow Rates Used To Generate System Head Curves:*		
	Point No. 1	800	gpm
	Point No. 2	900	gpm
	Point No. 3	1000	gpm
	Ponit No. 4	1100	gpm
	Point No. 5	1200	gpm
2	*Select "C" values*		
	New Pipe:	140	
	Older Pipe:	120	

Assumption: Class 53, Ductile Iron, Cement Lined.
Use C = 140 and C = 120 for PVC pipe

		WORKSHEET DIRECTIONS
3	**Worksheet No. 1**	Insert pipe information. Pipe area is calculated based on ID.
4	**Worksheet No. 2**	Calculates pipe loss for input "C" values in the discharge pipe.
5	**Worksheet No. 3**	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
6	**Worksheet No. 4**	No input is required. Total minor head loss in discharge line is automatically calculated.
7	**Worksheet No. 5**	Same as Worksheet 2 except for suction line of the pump.
8	**Worksheet No. 6**	Same as Worksheet 3 except for suction line of the pump.
9	**Worksheet No. 7**	No input is required. Total minor head loss in suction line is automatically calculated.
10	**Worksheet "TDH Calc.". (OLD PIPE)**	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
11	**Worksheet "TDH Calc.". (NEW PIPE)**	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
12	**Worksheet " System Curve"**	Worksheet " System Curve" - Plots system head curves for Min. & Max. static heads and at selected "C" values.
13	**Station Loss (Pipe)**	Calculates pipe loss for input "C" values.
14	**Station Loss (Minor)**	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
15	**Station Loss - Minor Head Loss**	No input is required. Total minor head loss in discharge line is automatically calculated.
16	**Modified - TDH Curve**	Insert the required information for the pump you have selected.

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Prepared By: EPB

Pipe Hydraulic Parameters

System Head Points				Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
			gpm	800		900		1,000		1,100		1,200	
			cfs	1.7824		2.0052		2.228		2.4508		2.6736	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)		Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. He (ft.)
4	4.23	0.10		18.26	5.18	20.55	6.56	22.83	8.09	25.11	9.79	27.40	11.6
6	6.09	0.20		8.81	1.21	9.91	1.53	11.01	1.88	12.12	2.28	13.22	2.71
8	7.98	0.35		5.13	0.41	5.77	0.52	6.41	0.64	7.06	0.77	7.70	0.92
10	9.79	0.52		3.41	0.18	3.84	0.23	4.26	0.28	4.69	0.34	5.11	0.41
12	11.65	0.74		2.41	0.09	2.71	0.11	3.01	0.14	3.31	0.17	3.61	0.20
14	13.2	0.95		1.88	0.05	2.11	0.07	2.34	0.09	2.58	0.10	2.81	0.12
16	1	0.01		326.80	1658.33	367.65	2098.82	408.50	2591.13	449.35	3135.27	490.20	3731.
18	1	0.01		326.80	1658.33	367.65	2098.82	408.50	2591.13	449.35	3135.27	490.20	3731.

Edit the values in the yellow cells for the pipe sizes of your application

Pipe Loss On Discharge Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	800		900		1,000		1,100		1,200	
				cfs	1.78		2.01		2.23		2.45		2.6736	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	120	140	120	140	120	140	120	140	120	140
4	4.23	0.10	*10*		3.13	2.35	3.89	2.93	4.73	3.56	5.64	4.24	6.63	**4.98**
6	6.09	0.20			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
8	7.98	0.35			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
10	9.79	0.52	*280*		1.48	1.11	1.84	1.38	2.23	1.68	2.66	2.00	3.13	**2.35**
12	11.65	0.74			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
14	13.2	0.95			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
16	1	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
18	1	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
			Total Pipe Loss		**4.61**	**3.46**	**5.73**	**4.31**	**6.96**	**5.23**	**8.30**	**6.24**	**9.75**	**7.33**

Type the length for each size pipe in your system in the yellow cells.

" k " Factors For Discharge Line

	PIPE DIAMETER (IN.)																					
	4			6			8			10			12			14			16			18		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.	2	0.42	0.84		0.42	0		0.39	0	6	0.39	2.34		0.39	0	3	0.36	1.08		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.1	0	1	0.1	0.1		0.1	0	1	0.1	0.1		0.1	0		0.1	0
Tee (thru)	1	0.28	0.28		0.28	0		0.26	0		0.26	0		0.26	0	1	0.24	0.24		0.24	0		0.24	0
Tee (branch)	1	0.84	0.84		0.84	0		0.78	0		0.78	0		0.78	0	1	0.72	0.72		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0
Check	1		0			0			0		0.8	0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0	1	0.78	0.78		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0	1	1	1		1	0		1	0
Total Kt			1.96			0			0			2.44			0			3.92			0			0

You can enter minor loss components in the yellow cells.

Minor Discharge Head Loss Calculation (Discharge Side)

(HL = Vh * Kt)

		800		900		1000		1100		1200	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)
4	1.96	5.18	10.15	6.56	12.85	8.09	15.86	9.79	19.19	11.65	22.84
6	0.00	1.21	0.00	1.53	0.00	1.88	0.00	2.28	0.00	2.71	0.00
8	0.00	0.41	0.00	0.52	0.00	0.64	0.00	0.77	0.00	0.92	0.00
10	0.00	0.18	0.00	0.23	0.00	0.28	0.00	0.34	0.00	0.41	0.00
12	0.00	0.09	0.00	0.11	0.00	0.14	0.00	0.17	0.00	0.20	0.00
14	0.00	0.05	0.00	0.07	0.00	0.09	0.00	0.10	0.00	0.12	0.00
16	0.00	1658.33	0.00	2098.82	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00
18	0.00	1658.33	0.00	2098.82	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00
Total Minor Head Loss			**10.15**		**12.85**		**15.86**		**19.19**		**22.84**

This table is automatically generated based on the previous worksheet inputs.

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Pipe Loss On Suction Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	800		900		1,000		1,100		1,200	
				cfs	1.78		2.01		2.23		2.45		2.67	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	120	140	120	140	120	140	120	140	120	14
4	4.23	0.10	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	6.09	0.20	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	7.98	0.35	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	9.79	0.52	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
12	11.65	0.74	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	13.2	0.95	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	1	0.01	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	1	0.01	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
			Total Pipe Loss		**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.0**

Input the total length of each size pipe on the suction side of the pump.

" k " Factors For Suction Line

	PIPE DIAMETER (IN.)																					
	4			6			8			10			12			14			16			18	
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k
Loss Type																							
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	
Tee (thru)		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	
			0			0			0			0			0			0			0			
			0			0			0			0			0			0			0			
			0			0			0			0			0			0			0			
			0			0			0			0			0			0			0			
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	
Total Kt			0			0			0			0			0			0			0			

Minor Suction Head Loss Calculation (Suction Side)

(HL = Vh * Kt)

		800		900		1000		1100		1200	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft
4	0.00	5.18	0.00	6.56	0.00	8.09	0.00	9.79	0.00	11.65	0.00
6	0.00	1.21	0.00	1.53	0.00	1.88	0.00	2.28	0.00	2.71	0.00
8	0.00	0.41	0.00	0.52	0.00	0.64	0.00	0.77	0.00	0.92	0.00
10	0.00	0.18	0.00	0.23	0.00	0.28	0.00	0.34	0.00	0.41	0.00
12	0.00	0.09	0.00	0.11	0.00	0.14	0.00	0.17	0.00	0.20	0.00
14	0.00	0.05	0.00	0.07	0.00	0.09	0.00	0.10	0.00	0.12	0.00
16	0.00	1658.33	0.00	2098.82	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00
18	0.00	1658.33	0.00	2098.82	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00
Minor Head Loss			**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Prepared By: EPB

System Summary

Maximum & Minimum Static Heads For Old Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No
		800	900	1,000	1,100	1,200
	SYSTEM CURVE FOR C =	120	120	120	120	120
Misc. Loss Here:			0	0	0	
Misc. Loss Here:						
Misc. Loss Here:		*0*	0	0	0	
	Discharge Pipe Loss	4.61	5.73	6.96	8.30	9
	+ Discharge Minor Loss	10.15	12.85	15.86	19.19	22
	hfd =	14.76	18.58	22.82	27.50	32
	Suction Pipe Loss	0.00	0.00	0.00	0.00	0
	+ Suction Minor Loss	0.00	0.00	0.00	0.00	0
	hfs =	0.00	0.00	0.00	0.00	0

System Head Curve @ Maximum Static Head Condition

	hsd (Static Discharge Head)	*24.00*	24.00	24.00	24.00	24
	- hs (Static Suction or Lift)	*1.00*	1.00	1.00	1.00	1
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	37.76	41.58	45.82	50.50	55

System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	*24.00*	24.00	24.00	24.00	24
	- hs (Static Suction or Lift)	*4.00*	4.00	4.00	4.00	4
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	34.76	38.58	42.82	47.50	52

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-)

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Prepared By: EPB

System Summary

Maximum & Minimum Static Heads For New Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No
		800	900	1,000	1,100	1,200
	SYSTEM CURVE FOR C =	140	140	140	140	140
Misc. Loss Here:			0	0	0	
Misc. Loss Here:		0	0	0	0	
Misc. Loss Here:		0	0	0	0	
	Discharge Pipe Loss	3.46	4.31	5.23	6.24	7
	+ Discharge Minor Loss	10.15	12.85	15.86	19.19	22
	hfd =	13.62	17.16	21.10	25.44	30
	Suction Pipe Loss	0.00	0.00	0.00	0.00	0
	+ Suction Minor Loss	0.00	0.00	0.00	0.00	0
	hfs =	0.00	0.00	0.00	0.00	0

System Head Curve @ Maximum Static Head Condition

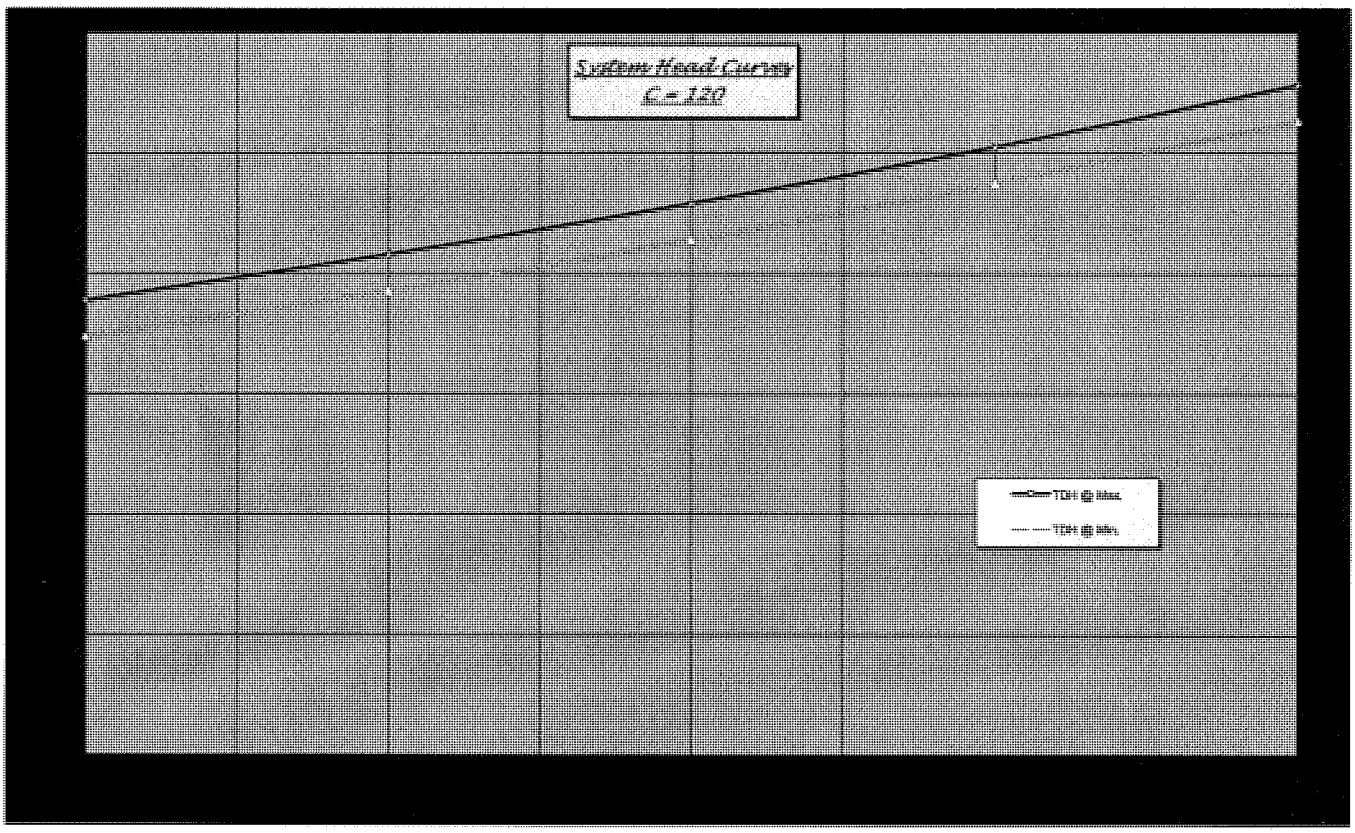
	hsd (Static Discharge Head)	24.00	24.00	24.00	24.00	24
	- hs (Static Suction or Lift)	1.00	1.00	1.00	1.00	1
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	36.62	40.16	44.10	48.44	53

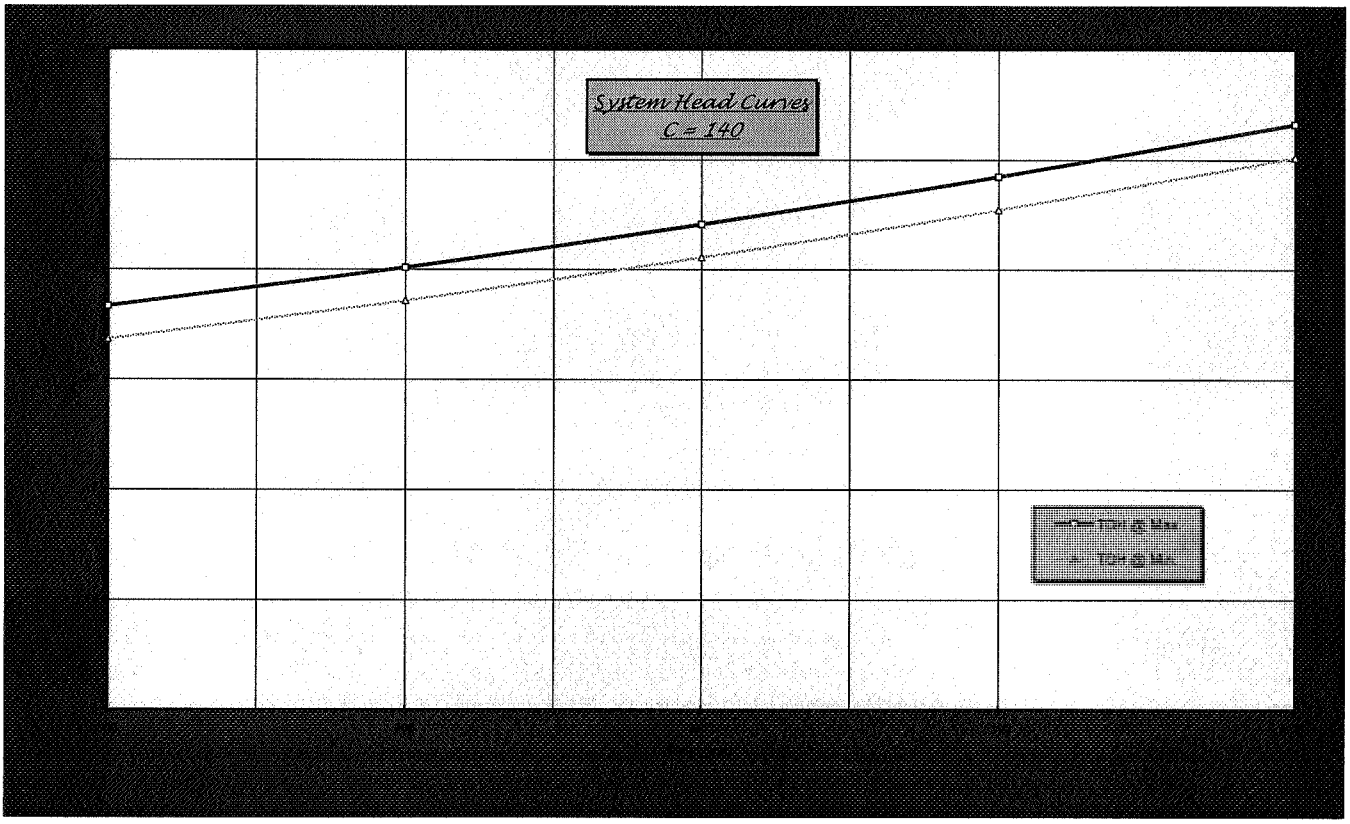
System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	24.00	24.00	24.00	24.00	24
	- hs (Static Suction or Lift)	4.00	4.00	4.00	4.00	4
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	33.62	37.16	41.10	45.44	50

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-)


System Head Curves
C = 120


System Head Curves
C = 140

Station Pipe Loss On Discharge Side Of Pump (Header Loss)

System Head Points					Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No
Select Flow Rates For Modified Pump Curve Here:					*800*	*900*	*1,000*	*1,100*	*1,200*
				cfs	1.78	2.01	2.23	2.45	2.6736
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	*Select "C" Value Here:*	*120*	120	120	120	120
4	4.23	0.10			0.00	0.00	0.00	0.00	0.00
6	6.09	0.20			0.00	0.00	0.00	0.00	0.00
8	7.98	0.35			0.00	0.00	0.00	0.00	0.00
10	9.79	0.52			0.00	0.00	0.00	0.00	0.00
12	11.65	0.74			0.00	0.00	0.00	0.00	0.00
14	13.2	0.95			0.00	0.00	0.00	0.00	0.00
16	1	0.01			0.00	0.00	0.00	0.00	0.00
18	1	0.01			0.00	0.00	0.00	0.00	0.00
				Total Pipe Loss	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

" k " Factors For Station Loss Discharge Line

	PIPE DIAMETER (IN.)																							
	4			6			8			10			12			14			16			18		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	
Loss Type																								
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36	
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19	
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	
Tee (thru)		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24	
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72	
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	
Check			0		*8.4*	0			0			0			0			0			0			
			0			0			0			0			0			0			0			
			0			0			0			0			0			0			0			
			0			0			0			0			0			0			0			
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	
Total Kt			**0**			**0**			**0**			**0**			**0**			**0**			**0**			

Minor Station Loss Head Loss Calculation
(HL = Vh * Kt)

		800		900		1,000		1,100		1,200	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft
4	0.00	5.18	0.00	6.56	0.00	8.09	0.00	9.79	0.00	11.65	0.00
6	0.00	1.21	0.00	1.53	0.00	1.88	0.00	2.28	0.00	2.71	0.00
8	0.00	0.41	0.00	0.52	0.00	0.64	0.00	0.77	0.00	0.92	0.00
10	0.00	0.18	0.00	0.23	0.00	0.28	0.00	0.34	0.00	0.41	0.00
12	0.00	0.09	0.00	0.11	0.00	0.14	0.00	0.17	0.00	0.20	0.00
14	0.00	0.05	0.00	0.07	0.00	0.09	0.00	0.10	0.00	0.12	0.00
16	0.00	1658.33	0.00	2098.82	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00
18	0.00	1658.33	0.00	2098.82	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00
Total Minor Loss			**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

TDH SPREADSHEET

RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Total Station Loss

	Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
	800	**900**	**1,000**	**1,100**	**1,200**
C =	120	120	120	120	120
Station Loss (Pipe)	0.00	0.00	0.00	0.00	0.00
+ Station Loss (Minor)	0.00	0.00	0.00	0.00	0.00
Total Station Loss	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

This table is automatically generated based on the previous worksheet inputs.

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE FILTER INFLUENT

Prepared By: EPB

These curves were already plotted on Worksheet "System Curves".

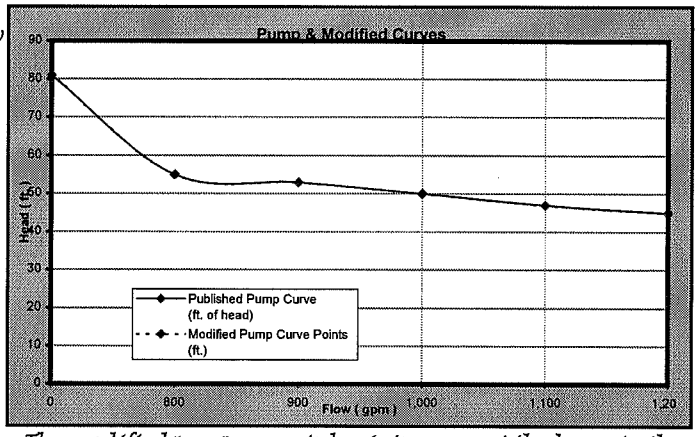
System Head Curves From Worksheet

	C = 120			C = 140	
FLOW (gpm)	TDH @ Max.	TDH @ Min.	FLOW (gpm)	TDH @ Max.	TDH @ Min.
800	37.76	34.76	800	36.62	33.62
900	41.58	38.58	900	40.16	37.16
1000	45.82	42.82	1000	44.10	41.10
1100	50.50	47.50	1100	48.44	45.44
1200	55.60	52.60	1200	53.18	50.18

From the manufacturer's published pump curve select the head at the flow

Pump & Modified Pump Curves			
FLOW (gpm)	Published Pump Curve (ft. of head)	Modified Pump Curve Points (ft.)	Total Station Loss (ft.)
0	*81*	81.00	*0.00*
800	*55*	55.00	0.00
900	*53*	53.00	0.00
1,000	*50*	50.00	0.00
1,100	*47*	47.00	0.00
1,200	*45*	45.00	0.00

These columns are plotted at the right. (The last column is subtracted from the pump curve points).

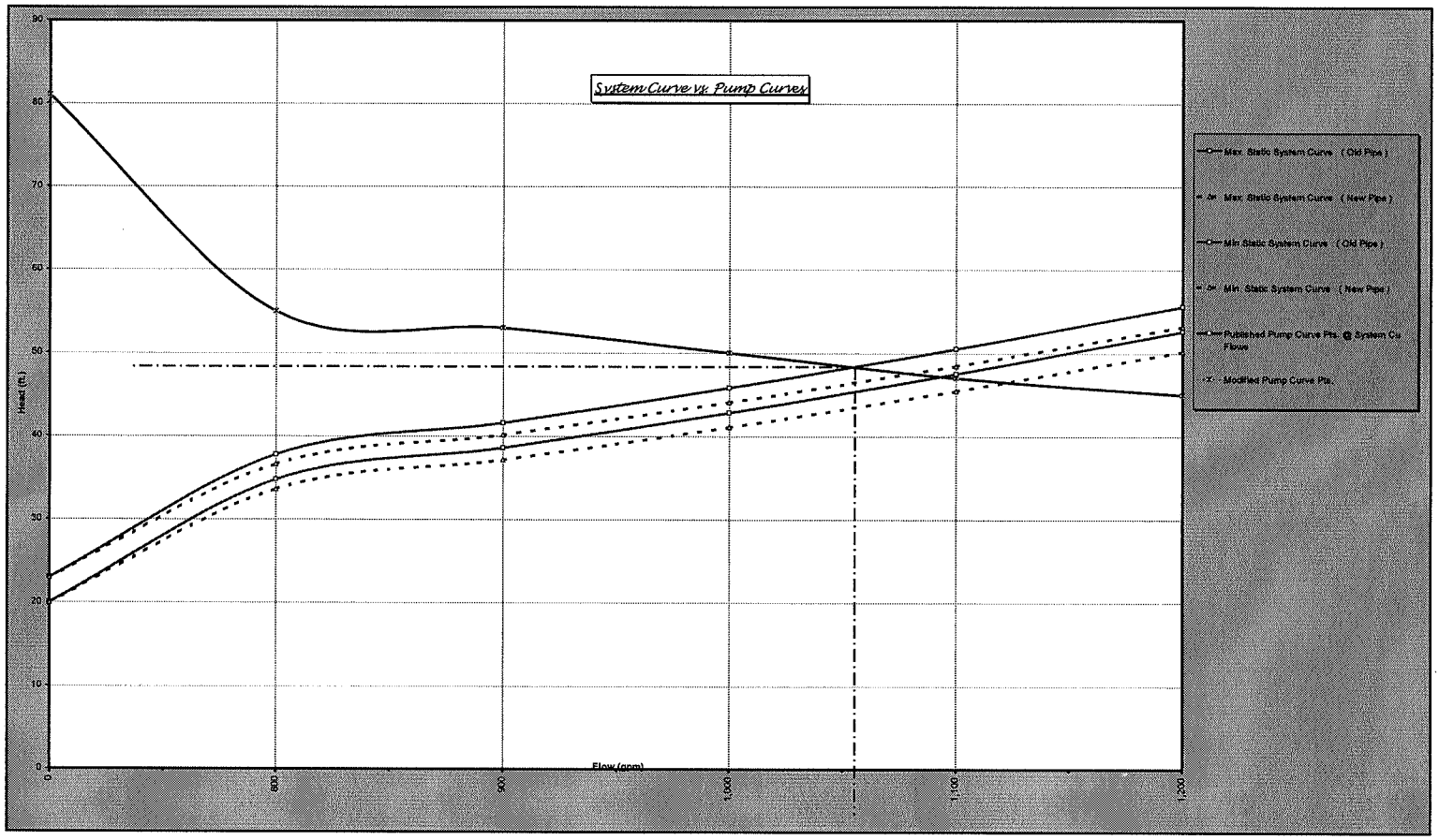


The modified pump curve takes into account the losses in the "station". They must be added back into the system in order t specify the duty point.

This portion of the table summarizes all of the system curves.

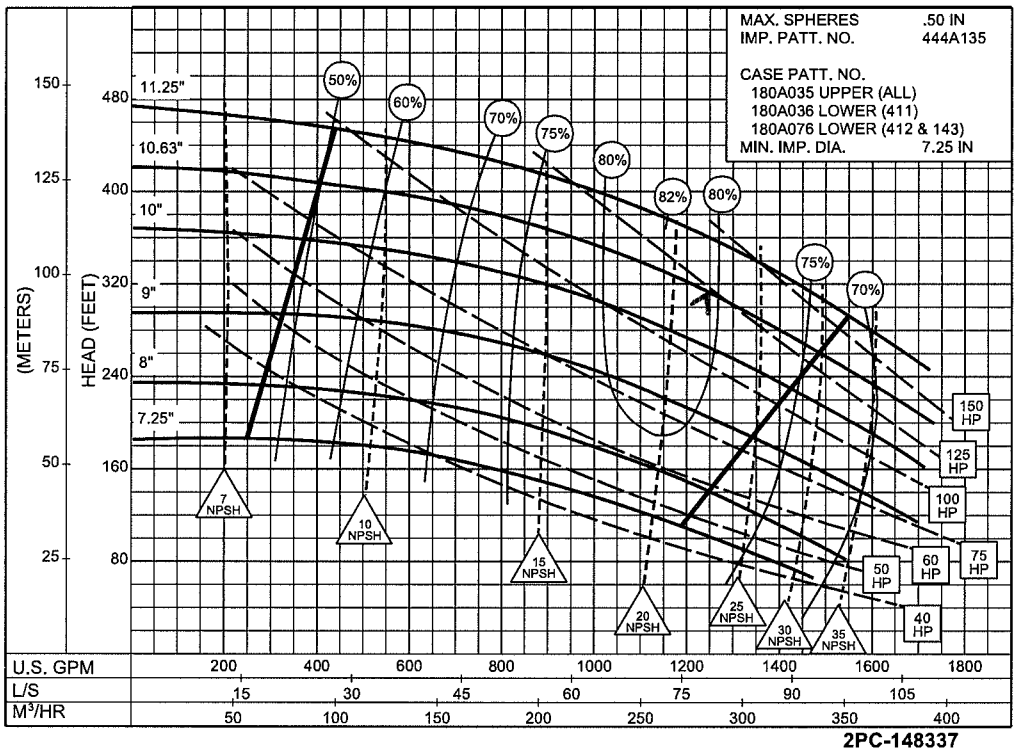
Curve Plot						
Flow	Max. Static System Curve (Old Pipe)	Max. Static System Curve (New Pipe)	Min.Static System Curve (Old Pipe)	Min. Static System Curve (New Pipe)	Published Pump Curve Pts. @ System Curve Flows	Modified Pump Curve P
0	23.00	23.00	20.00	20.00	*81*	*81*
800	37.76	36.62	34.76	33.62	*55*	*55*
900	41.58	40.16	38.58	37.16	*53*	*53*
1,000	45.82	44.10	42.82	41.10	*50*	*50*
1,100	50.50	48.44	47.50	45.44	*47*	*47*
1,200	55.60	53.18	52.60	50.18	*45*	*45*
	Curve #1	*Curve #2*	*Curve #3*	*Curve #4*	*Curve #5*	*Curve #6*

The station losses have to be manually input. From the plot above interpolate, if necessary, and input the modified pump curve point in this column.


System Curve vs. Pump Curves
Head (ft.)
Flow (gpm)
0
10
20
30
40
50
60
70
80
90
600
900
1,000
1,100
1,200
Max. Static System Curve (Old Pipe)
Max. Static System Curve (New Pipe)
Min Static System Curve (Old Pipe)
Min. Static System Curve (New Pipe)
Published Pump Curve Pts. @ System Cu
Flows
Modified Pump Curve Pts.

4 x 5 x 11C
SERIES 410
ENCLOSED IMPELLER

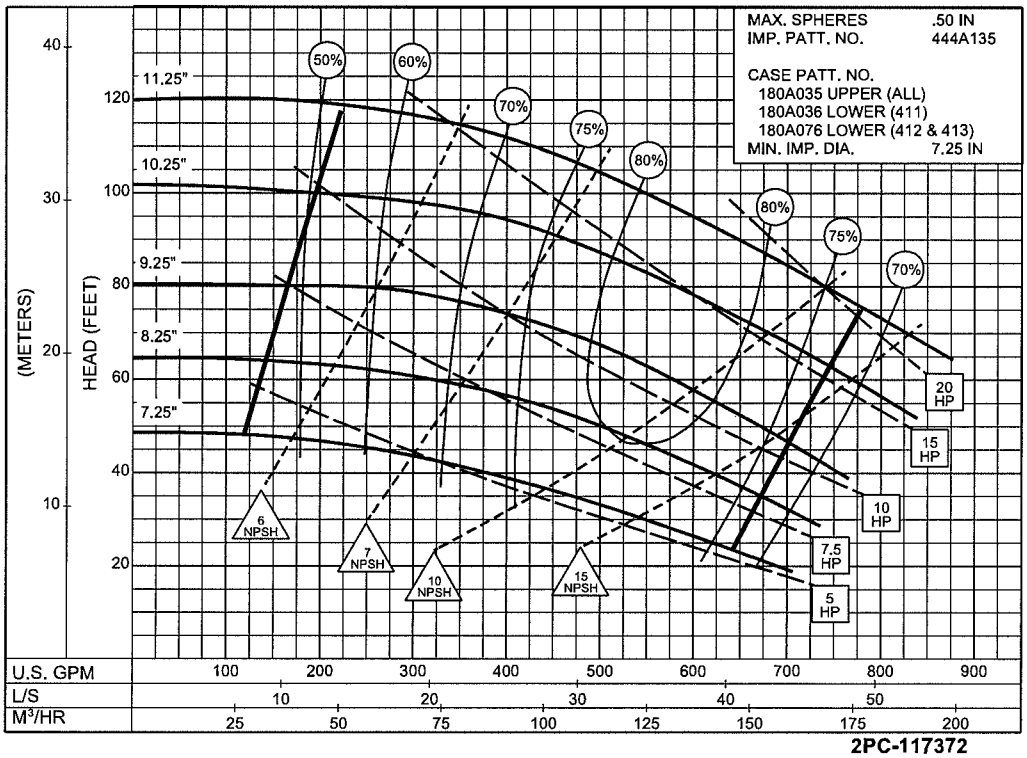
SIZE : 4x5x11C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 3500**



2PC-148337

3500 RPM

SIZE : 4x5x11C **TYPE : 410** **IMPELLER : Enclosed** **R. P. M. : 1750**



2PC-117372

1750 RPM

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE IRRIGANT FORCE MAIN

Prepared By: EPB

Definitions:	
TDH =	Total Dynamic Head
Hd =	Total Discharge Head
Hs =	Total Suction Head
TDH = Hd - Hs	The total discharge head less the total suction head.

Hd = hsd + hfd	
Where:	
hsd =	Static Discharge Head (ft.). The vertical distance in feet above the pump centerline to the free level of discharge .
hfd =	Friction head in discharge line (pipe loss + fitting & valve losses).

Hs = hs - hfs	
Where:	
hs =	Static Suction Head (ft.).
	The vertical distance in feet above the centerline of the pump inlet to the free level of the fluid source.
	In this case, "hs" is positive (+).
	If the free level of the fluid source is below the inlet, hs will be negative (-). This is known as static suction lift.
hfs =	Friction head in suction line (pipe loss + fitting & valve losses).

Substituting:	
TDH = (hsd - hs) + hfs + hfd	*(Pay attention to the sign of the value "hs")*

General Explanation of Worksheets:	
Data Input Worksheet	Input your data here
Worksheet No. 1	Calculates the velocity and velocity head for any pipe sizes. Default values are 8" - 24"
Worksheet No. 2	Calculates the pipe loss due to friction in the discharge line of the pump.
Worksheet No. 3	Calculates the " k " factor for minor losses in the pump discharge line.
Worksheet No. 4	Calculates minor losses in pump discharge line. This worksheet uses the "Total KT " calculated in Worksheet 3.
Worksheet No. 5	Calculates the pipe loss due to friction in the suction line of the pump.
Worksheet No. 6	Calculates the " k " factor for minor losses in the pump suction line.
Worksheet No. 7	Calculates minor losses in pump suction line. This worksheet uses the "Total KT " calculated in Worksheet 6.
TDH Calc. (Old Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
TDH Calc. (New Pipe)	Calculates TDH for a "C" value and max. & min. static heads.
System Curves	Plots System Head Curve at C values
Station Loss (Pipe)	Calculates the pipe loss due to friction for station loss section of pipe
Station Loss (Minor)	Calculates the " k " factor for minor losses for the station loss section
Station Loss - Minor Head Loss	Calculates minor losses for the station loss section. This worksheet uses the "Total KT " calculated in Worksheet 6.
Modified - TDH Curve	Plots the worst case system head curve, pump performance curve, and modified pump curve.

Note: Values to be inserted have a yellow cell background. Type the value in the highlighted cell only.
Values in Red are cell references. Do not edit red values. Values in Blue are calculated values. Only edit the formula.

Step #			
1	*Select System Flow Rates Used To Generate System Head Curves:*		
	Point No. 1	1000	gpm
	Point No. 2	1100	gpm
	Point No. 3	1200	gpm
	Ponit No. 4	1300	gpm
	Point No. 5	1400	gpm
2	*Select "C" values*		
	New Pipe:	140	
	Older Pipe:	120	

Assumption: Class 53, Ductile Iron, Cement Lined.
Use C = 140 and C = 120 for PVC pipe

	WORKSHEET DIRECTIONS	
3	**Worksheet No. 1**	Insert pipe information. Pipe area is calculated based on ID.
4	**Worksheet No. 2**	Calculates pipe loss for input "C" values in the discharge pipe.
5	**Worksheet No. 3**	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
6	**Worksheet No. 4**	No input is required. Total minor head loss in discharge line is automatically calculated.
7	**Worksheet No. 5**	Same as Worksheet 2 except for suction line of the pump.
8	**Worksheet No. 6**	Same as Worksheet 3 except for suction line of the pump.
9	**Worksheet No. 7**	No input is required. Total minor head loss in suction line is automatically calculated.
10	**Worksheet "TDH Calc.". (OLD PIPE)**	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
11	**Worksheet "TDH Calc.". (NEW PIPE)**	Input information with yellow cell background. For "hs" pay attention to it's sign (-) or (+). *(Misc. Losses shown are treated as additional static head.)* *Note: You should have input for Maximum Static Head and Minimum Static Head.*
12	**Worksheet " System Curve"**	Worksheet " System Curve" - Plots system head curves for Min. & Max. static heads and at selected "C" values.
13	**Station Loss (Pipe)**	Calculates pipe loss for input "C" values.
14	**Station Loss (Minor)**	Input the total no. of fittings, valves in the column marked "QTY." Worksheet calculates "Total Kt" for each pipe diameter.
15	**Station Loss - Minor Head Loss**	No input is required. Total minor head loss in discharge line is automatically calculated.
16	**Modified - TDH Curve**	Insert the required information for the pump you have selected.

Pipe Hydraulic Parameters

System Head Points				Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
			gpm	1,000		1,100		1,200		1,300		1,400	
			cfs	2.228		2.4508		2.6736		2.8964		3.1192	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)		Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. Head (ft.)	Velocity (fps)	Vel. He (ft.)
4	4.23	0.10		22.83	8.09	25.11	9.79	27.40	11.65	29.68	13.68	31.96	15.8
6	6.09	0.20		11.01	1.88	12.12	2.28	13.22	2.71	14.32	3.18	15.42	3.69
8	7.98	0.35		6.41	0.64	7.06	0.77	7.70	0.92	8.34	1.08	8.98	1.25
10	9.79	0.52		4.26	0.28	4.69	0.34	5.11	0.41	5.54	0.48	5.97	0.55
12	11.65	0.74		3.01	0.14	3.31	0.17	3.61	0.20	3.91	0.24	4.21	0.28
14	13.2	0.95		2.34	0.09	2.58	0.10	2.81	0.12	3.05	0.14	3.28	0.17
16	1	0.01		408.50	2591.13	449.35	3135.27	490.20	3731.23	531.04	4379.01	571.89	5078.
18	1	0.01		408.50	2591.13	449.35	3135.27	490.20	3731.23	531.04	4379.01	571.89	5078.

Edit the values in the yellow cells for the pipe sizes of your application

Pipe Loss On Discharge Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	1,000		1,100		1,200		1,300		1,400	
				cfs	2.23		2.45		2.67		2.90		3.1192	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	120	140	120	140	120	140	120	140	120	140
4	4.23	0.10			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
6	6.09	0.20			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
8	7.98	0.35			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
10	9.79	0.52	*1570*		12.52	9.41	14.93	11.22	17.54	13.19	20.34	15.29	23.32	**17.54**
12	11.65	0.74			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
14	13.2	0.95			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
16	1	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
18	1	0.01			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
			Total Pipe Loss		**12.52**	**9.41**	**14.93**	**11.22**	**17.54**	**13.19**	**20.34**	**15.29**	**23.32**	**17.54**

Type the length for each size pipe in your system in the yellow cells.

" k " Factors For Discharge Line

	PIPE DIAMETER (IN.)																					
	4			6			8			10			12			14			16			18		
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt
Loss Type																								
90 EL.		0.42	0		0.42	0		0.39	0	2	0.39	0.78		0.39	0		0.36	0		0.36	0		0.36	0
45 EL.		0.22	0		0.22	0		0.21	0	4	0.21	0.84		0.21	0		0.19	0		0.19	0		0.19	0
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08	0
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3	0
Gate		0.11	0		0.11	0		0.1	0	1	0.1	0.1		0.1	0		0.1	0		0.1	0		0.1	0
Tee (thru)		0.28	0		0.28	0		0.26	0	1	0.26	0.26		0.26	0		0.24	0		0.24	0		0.24	0
Tee (branch)		0.84	0		0.84	0		0.78	0	1	0.78	0.78		0.78	0		0.72	0		0.72	0		0.72	0
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4	0
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75	0
Reducer		0.15	0		0.15	0		0.15	0	1	0.15	0.15		0.15	0		0.15	0		0.15	0		0.15	0
Check			0			0			0	1	0.8	0.8			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
			0			0			0			0			0			0			0			0
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1	0
Total Kt			0			0			0			3.71			0			0			0			0

You can enter minor loss components in the yellow cells.

Minor Discharge Head Loss Calculation (Discharge Side)

(HL = Vh * Kt)

		1000		1100		1200		1300		1400	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)
4	0.00	8.09	0.00	9.79	0.00	11.65	0.00	13.68	0.00	15.86	0.00
6	0.00	1.88	0.00	2.28	0.00	2.71	0.00	3.18	0.00	3.69	0.00
8	0.00	0.64	0.00	0.77	0.00	0.92	0.00	1.08	0.00	1.25	0.00
10	3.71	0.28	1.05	0.34	1.27	0.41	1.51	0.48	1.77	0.55	2.05
12	0.00	0.14	0.00	0.17	0.00	0.20	0.00	0.24	0.00	0.28	0.00
14	0.00	0.09	0.00	0.10	0.00	0.12	0.00	0.14	0.00	0.17	0.00
16	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00	4379.01	0.00	5078.62	0.00
18	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00	4379.01	0.00	5078.62	0.00
Total Minor Head Loss			**1.05**		**1.27**		**1.51**		**1.77**		**2.05**

This table is automatically generated based on the previous worksheet inputs.

Pipe Loss On Suction Side Of Pump

System Head Points					Point No.1		Point No. 2		Point No. 3		Point No. 4		Point No. 5	
				gpm	1,000		1,100		1,200		1,300		1,400	
				cfs	2.23		2.45		2.67		2.90		3.12	
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	"C" Values	120	140	120	140	120	140	120	140	120	14
4	4.23	0.10	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
6	6.09	0.20	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
8	7.98	0.35	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
10	9.79	0.52	*170*		1.36	1.02	1.62	1.22	1.90	1.43	2.20	1.66	2.53	1.9
12	11.65	0.74	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14	13.2	0.95	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
16	1	0.01	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
18	1	0.01	*0*		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
			Total Pipe Loss		**1.36**	**1.02**	**1.62**	**1.22**	**1.90**	**1.43**	**2.20**	**1.66**	**2.53**	**1.9**

Input the total length of each size pipe on the suction side of the pump.

" k " Factors For Suction Line

	PIPE DIAMETER (IN.)																					
	4			6			8			10			12			14			16			18	
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k
Loss Type																							
90 EL.		0.42	0		0.42	0		0.39	0	1	0.39	0.39		0.39	0		0.36	0		0.36	0		0.36
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3
Gate		0.11	0		0.11	0		0.1	0	1	0.1	0.1		0.1	0		0.1	0		0.1	0		0.1
Tee (thru)		0.28	0		0.28	0		0.26	0	1	0.26	0.26		0.26	0		0.24	0		0.24	0		0.24
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15
			0			0			0			0			0			0			0		
			0			0			0			0			0			0			0		
			0			0			0			0			0			0			0		
			0			0			0			0			0			0			0		
Entrance		0.78	0		0.78	0		0.78	0	1	0.78	0.78		0.78	0		0.78	0		0.78	0		0.78
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1
Total Kt			**0**			**0**			**0**			**1.53**			**0**			**0**			**0**		

Minor Suction Head Loss Calculation (Suction Side)

(HL = Vh * Kt)

		1000		1100		1200		1300		1400	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft
4	0.00	8.09	0.00	9.79	0.00	11.65	0.00	13.68	0.00	15.86	0.00
6	0.00	1.88	0.00	2.28	0.00	2.71	0.00	3.18	0.00	3.69	0.00
8	0.00	0.64	0.00	0.77	0.00	0.92	0.00	1.08	0.00	1.25	0.00
10	1.53	0.28	0.43	0.34	0.52	0.41	0.62	0.48	0.73	0.55	0.85
12	0.00	0.14	0.00	0.17	0.00	0.20	0.00	0.24	0.00	0.28	0.00
14	0.00	0.09	0.00	0.10	0.00	0.12	0.00	0.14	0.00	0.17	0.00
16	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00	4379.01	0.00	5078.62	0.00
18	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00	4379.01	0.00	5078.62	0.00
Minor Head Loss			**0.43**		**0.52**		**0.62**		**0.73**		**0.85**

This table is automatically generated based on the previous worksheet inputs.

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE IRRIGANT FORCE MAIN

Prepared By: EPB

System Summary

Maximum & Minimum Static Heads For Old Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No
		1,000	1,100	1,200	1,300	1,400
	SYSTEM CURVE FOR C =	120	120	120	120	120
Misc. Loss Here:	pressure in irrigation system (120 PSI)	279	279	279	279	2
Misc. Loss Here:						
Misc. Loss Here:		0	0	0	0	
	Discharge Pipe Loss	12.52	14.93	17.54	20.34	23
	+ Discharge Minor Loss	1.05	1.27	1.51	1.77	2
	hfd =	13.56	16.20	19.04	22.10	25
	Suction Pipe Loss	1.36	1.62	1.90	2.20	2
	+ Suction Minor Loss	0.43	0.52	0.62	0.73	0
	hfs =	1.79	2.14	2.52	2.93	3

System Head Curve @ Maximum Static Head Condition

	hsd (Static Discharge Head)	10.00	10.00	10.00	10.00	10
	- hs (Static Suction or Lift)	1.00	1.00	1.00	1.00	1
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	303.35	306.33	309.56	313.03	316

System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	10.00	10.00	10.00	10.00	10
	- hs (Static Suction or Lift)	8.50	8.50	8.50	8.50	8
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	295.85	298.83	302.06	305.53	309

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-)

ATMOSPHERIC PRESSURE (psia) =	14.696
14.696 psi ÷ 0.433 psi/ft =	33.96
VAPOR PRESSURE OF WATER AT 68 DEGREES F =	0.78
NPSHA (ft) = atmospheric pressure - vapor pressure + hs - hfs =	**31.66**

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE IRRIGANT FORCE MAIN

Prepared By: EPB

System Summary

Maximum & Minimum Static Heads For New Pipe

(Note: All values in this table must be in feet of water.)

		Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No
		1,000	1,100	1,200	1,300	1,400
	SYSTEM CURVE FOR C =	140	140	140	140	140
Misc. Loss Here:	*pressure in irrigation system*	*279*	279	279	279	2
Misc. Loss Here:		*0*	0	0	0	
Misc. Loss Here:		*0*	0	0	0	
	Discharge Pipe Loss	9.41	11.22	13.19	15.29	17
	+ Discharge Minor Loss	1.05	1.27	1.51	1.77	2
	hfd =	10.46	12.49	14.69	17.06	19
	Suction Pipe Loss	1.02	1.22	1.43	1.66	1
	+ Suction Minor Loss	0.43	0.52	0.62	0.73	0
	hfs =	1.45	1.74	2.05	2.38	2

System Head Curve @ Maximum Static Head Condition

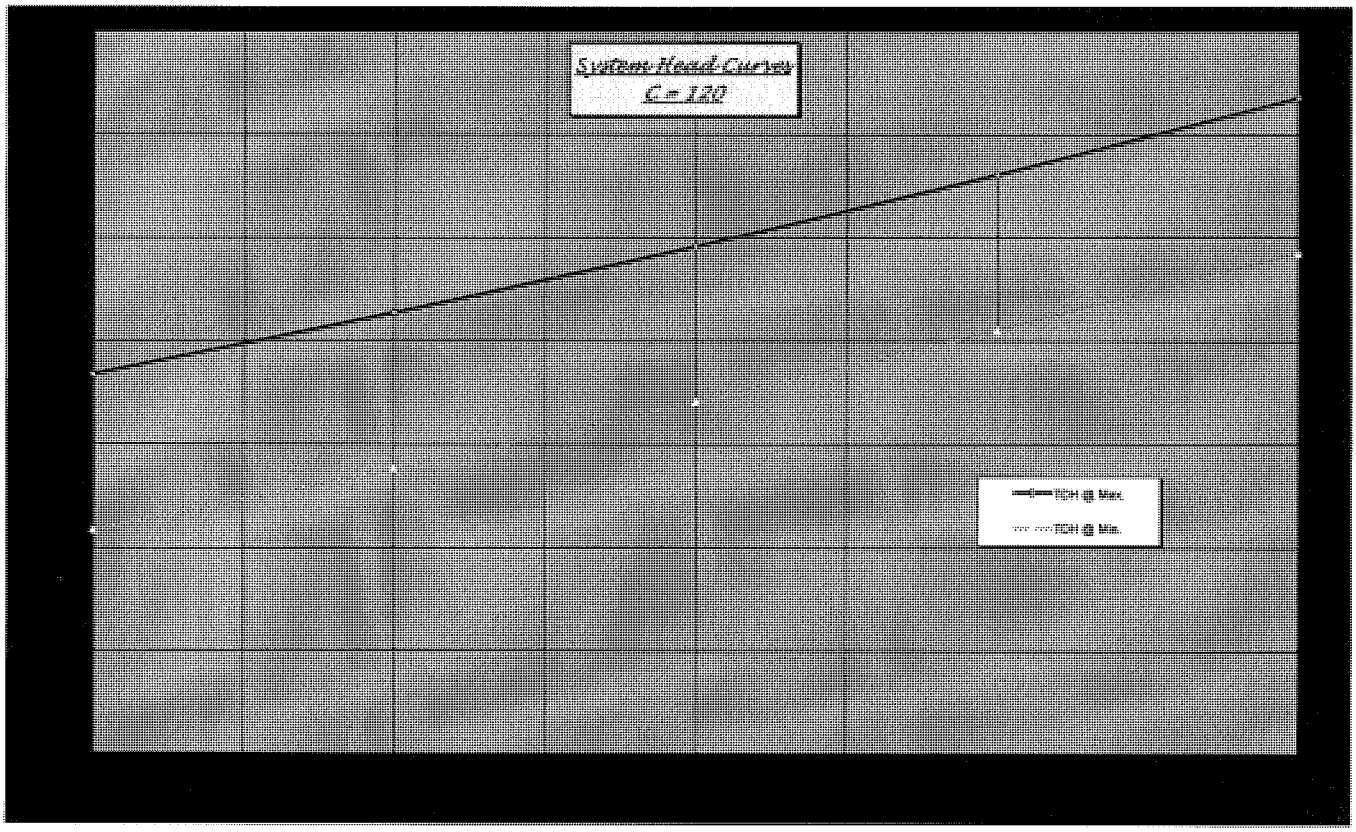
	hsd (Static Discharge Head)	*10.00*	10.00	10.00	10.00	10
	- hs (Static Suction or Lift)	*1.00*	1.00	1.00	1.00	1
Max. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	299.91	302.23	304.74	307.44	310

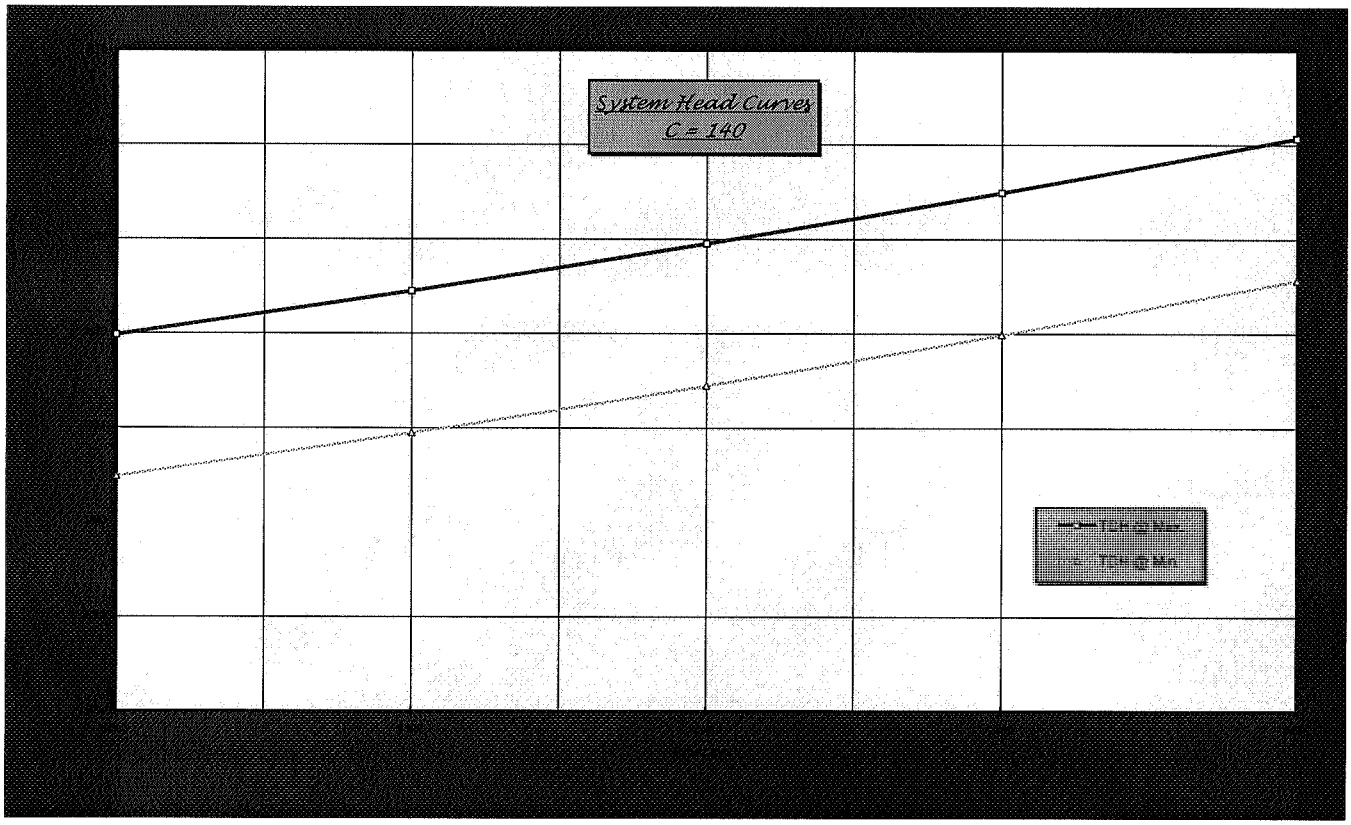
System Head Curve @ Minimum Static Head Condition

	hsd (Static Discharge Head)	*10.00*	10.00	10.00	10.00	10
	- hs (Static Suction or Lift)	*8.50*	8.50	8.50	8.50	8
Min. Static Head	TDH = (hsd - hs) + hfs + hfd + misc.	292.41	294.73	297.24	299.94	302

Input the static discharge head and static suction (or lift) in the yellow cells.

Remember: If the free level of the fluid source is below the inlet of the pump, "hs" will be negative (-)


System Head Curves
C = 130


System Head Curves
C = 140

Station Pipe Loss On Discharge Side Of Pump (Header Loss)

System Head Points					Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No
Select Flow Rates For Modified Pump Curve Here:					*1,000*	*1,100*	*1,200*	*1,300*	*1,400*
				cfs	2.23	2.45	2.67	2.90	3.1192
Pipe Dia. (in.)	ID (in.)	Area (sq. ft.)	Length (ft.)	*Select "C" Value Here:*	*120*	**120**	**120**	**120**	**120**
4	4.23	0.10			0.00	0.00	0.00	0.00	0.00
6	6.09	0.20			0.00	0.00	0.00	0.00	0.00
8	7.98	0.35			0.00	0.00	0.00	0.00	0.00
10	9.79	0.52			0.00	0.00	0.00	0.00	0.00
12	11.65	0.74			0.00	0.00	0.00	0.00	0.00
14	13.2	0.95			0.00	0.00	0.00	0.00	0.00
16	1	0.01			0.00	0.00	0.00	0.00	0.00
18	1	0.01			0.00	0.00	0.00	0.00	0.00
				Total Pipe Loss	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

" k " Factors For Station Loss Discharge Line

	PIPE DIAMETER (IN.)																					
	4			6			8			10			12			14			16			18	
	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k	Kt	Qty.	k
Loss Type																							
90 EL.		0.42	0		0.42	0		0.39	0		0.39	0		0.39	0		0.36	0		0.36	0		0.36
45 EL.		0.22	0		0.22	0		0.21	0		0.21	0		0.21	0		0.19	0		0.19	0		0.19
22.5 EL.		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.08	0		0.08	0		0.08
Butterfly		0.63	0		0.63	0		0.35	0		0.35	0		0.35	0		0.3	0		0.3	0		0.3
Gate		0.11	0		0.11	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1	0		0.1
Tee (thru)		0.28	0		0.28	0		0.26	0		0.26	0		0.26	0		0.24	0		0.24	0		0.24
Tee (branch)		0.84	0		0.84	0		0.78	0		0.78	0		0.78	0		0.72	0		0.72	0		0.72
Cross (thru)		0.48	0		0.48	0		0.45	0		0.45	0		0.45	0		0.4	0		0.4	0		0.4
Cross (branch)		0.88	0		0.88	0		0.8	0		0.8	0		0.8	0		0.75	0		0.75	0		0.75
Reducer		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15	0		0.15
Check			0		*8.4*	0			0			0			0			0			0		
			0			0			0			0			0			0			0		
			0			0			0			0			0			0			0		
			0			0			0			0			0			0			0		
Entrance		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78	0		0.78
Exit		1	0		1	0		1	0		1	0		1	0		1	0		1	0		1
Total Kt			0			0			0			0			0			0			0		

Minor Station Loss Head Loss Calculation
(HL = Vh * Kt)

		1,000		1,100		1,200		1,300		1,400	
Pipe Dia.	Kt	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft.)	Vh	HL (ft
4	0.00	8.09	0.00	9.79	0.00	11.65	0.00	13.68	0.00	15.86	0.00
6	0.00	1.88	0.00	2.28	0.00	2.71	0.00	3.18	0.00	3.69	0.00
8	0.00	0.64	0.00	0.77	0.00	0.92	0.00	1.08	0.00	1.25	0.00
10	0.00	0.28	0.00	0.34	0.00	0.41	0.00	0.48	0.00	0.55	0.00
12	0.00	0.14	0.00	0.17	0.00	0.20	0.00	0.24	0.00	0.28	0.00
14	0.00	0.09	0.00	0.10	0.00	0.12	0.00	0.14	0.00	0.17	0.00
16	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00	4379.01	0.00	5078.62	0.00
18	0.00	2591.13	0.00	3135.27	0.00	3731.23	0.00	4379.01	0.00	5078.62	0.00
Total Minor Loss			**0.00**		**0.00**		**0.00**		**0.00**		**0.00**

This table is automatically generated based on the previous worksheet inputs.

Total Station Loss

	Point No.1	Point No. 2	Point No. 3	Point No. 4	Point No. 5
	1,000	**1,100**	**1,200**	**1,300**	**1,400**
C =	120	120	120	120	120
Station Loss (Pipe)	0.00	0.00	0.00	0.00	0.00
+ Station Loss (Minor)	0.00	0.00	0.00	0.00	0.00
Total Station Loss	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

This table is automatically generated based on the previous worksheet inputs.

TDH SPREADSHEET
RIVERHEAD WASTEWATER REUSE IRRIGANT FORCE MAIN

These curves were already plotted on Worksheet "System Curves".

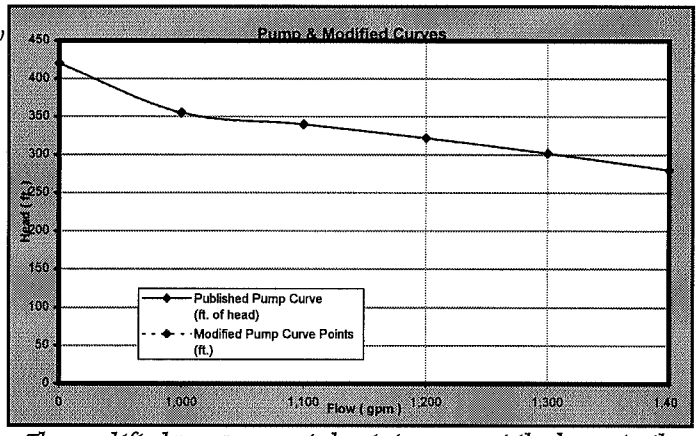
System Head Curves From Worksheet

	C = 120			C = 150	
FLOW (gpm)	TDH @ Max.	TDH @ Min.	FLOW (gpm)	TDH @ Max.	TDH @ Min.
1000	303.35	295.85	1000	299.91	292.41
1100	306.33	298.83	1100	302.23	294.73
1200	309.56	302.06	1200	304.74	297.24
1300	313.03	305.53	1300	307.44	299.94
1400	316.75	309.25	1400	310.33	302.83

From the manufacturer's published pump curve select the head at the flow

Pump & Modified Pump Curves			
FLOW (gpm)	Published Pump Curve (ft. of head)	Modified Pump Curve Points (ft.)	Total Station Loss (ft.)
0	*420*	420.00	*0.00*
1,000	*355*	355.00	0.00
1,100	*340*	340.00	0.00
1,200	*322*	322.00	0.00
1,300	*302*	302.00	0.00
1,400	*280*	280.00	0.00

These columns are plotted at the right. (The last column is subtracted from the pump curve points).

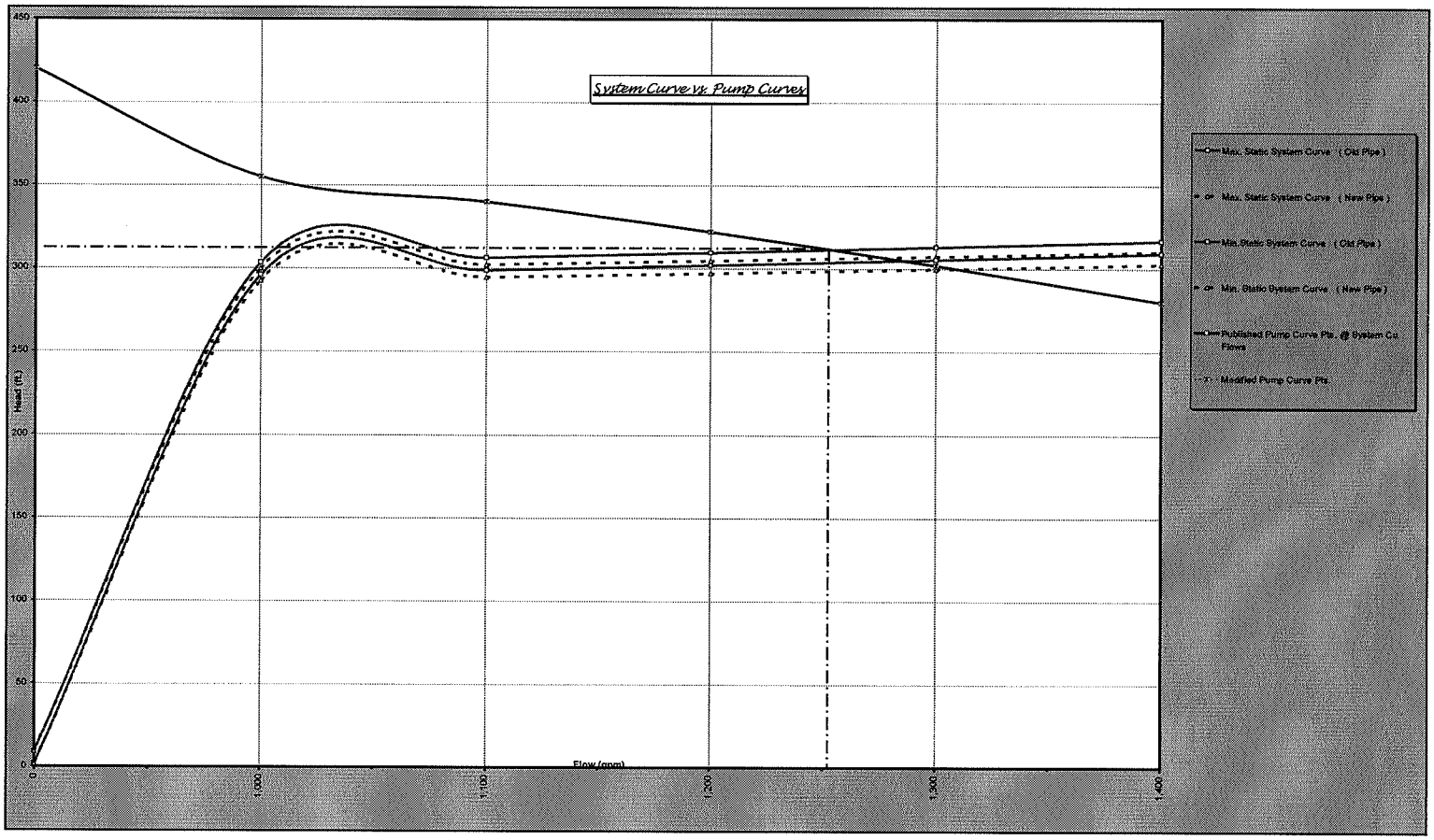


The modified pump curve takes into account the losses in the "station". They must be added back into the system in order t specify the duty point.

This portion of the table summarizes all of the system curves.

Curve Plot						
Flow	Max. Static System Curve (Old Pipe)	Max. Static System Curve (New Pipe)	Min.Static System Curve (Old Pipe)	Min. Static System Curve (New Pipe)	Published Pump Curve Pts. @ System Curve Flows	Modified Pump Curve P
0	9.00	9.00	1.50	1.50	*420*	*420*
1,000	303.35	299.91	295.85	292.41	*355*	*355*
1,100	306.33	302.23	298.83	294.73	*340*	*340*
1,200	309.56	304.74	302.06	297.24	*322*	*322*
1,300	313.03	307.44	305.53	299.94	*302*	*302*
1,400	316.75	310.33	309.25	302.83	*280*	*280*
	Curve #1	*Curve #2*	*Curve #3*	*Curve #4*	*Curve #5*	*Curve #6*

The station losses have to be manually input. From the plot above interpolate, if necessary, and input the modified pump curve point in this column.


System Curve vs. Pump Curves
Max. Static System Curve (Old Pipe)
Max. Static System Curve (New Pipe)
Min. Static System Curve (Old Pipe)
Min. Static System Curve (New Pipe)
Published Pump Curve Pts. @ System Co. Flows
Modified Pump Curve Pts.
Head (Ft.)
Flow (gpm)
450
400
350
300
250
200
150
100
50
0
1,000
1,100
1,200
1,300
1,400

Appendix F

Cost Opinion Spreadsheets

RIVERHEAD SEWER DISTRICT - WASTEWATER REUSE FOR GOLF COURSE IRRIGATION

INSPECTION BUDGET

4-Jan-07

PIPE FITTINGS	**6"**	**8"**	**10"**	**12"**	**15"**	**18"**		
QUANTITY	0	6	14	0	0	0		
UNIT PRICE (EA)	$152.00	$264.62	$340.60	$470.29	$943.20	$1,834.00		
EXTENDED FITTING COSTS	$0.00	$1,587.72	$4,768.40	$0.00	$0.00	$0.00		**$6,356.12**
10" DIA. PVC FORCEMAIN	**PIPE, EXC. & B"FILL**	**CLEANOUTS**	**4' MANHOLES**	**4' TOP SLAB**	**FRAME & COVER**	**CONN. TO MH**		
QUANTITY	1,400	2	2	4	4	2		
UNIT PRICE (LF)	$65.50	$7,860.00	$2,109.10	$609.15	$825.30	$1,965.00		
EXTENDED 10" DIA. FORCEMAIN COSTS	$91,700.00	$15,720.00	$4,218.20	$2,436.60	$3,301.20	$3,930.00		**$121,306.00**
ASPHALT PAVING	**3" BASE**	**1.5" TOP**	**TEMP**					
QUANTITY	300	300	0					
UNIT COSTS (SY)	$15.72	$11.79	$6.55					
EXTENDED ASPHALT COSTS	$4,716.00	$3,537.00	$0.00					**$8,253.00**
TOPSOIL & SEEDING								
QUANTITY	2,000							
UNIT COST (SY)	$10.81							
EXTENDED TOPSOIL & SEEDING COSTS	$21,615.00							**$21,615.00**

RIVERHEAD SEWER DISTRICT - WASTEWATER REUSE FOR GOLF COURSE IRRIGATION

INSPECTION BUDGET

WATER MAIN CROSSINGS			
QUANTITY	3		
UNIT COST (EA)	$6,550.00		
EXTENDED WATER MAIN CROSSING COSTS	$19,650.00		**$19,650.00**
TEST PITS			
QUANTITY	3		
UNIT COST (EA)	$786.00		
EXTENDED TEST PIT COSTS	$2,358.00		**$2,358.00**
MAINTENANCE AND PROTECTION OF TRAFFIC (LS)	$4,000.00		**$4,000.00**
AQUA-DISK FILTER	$395,000.00		**$395,000.00**
TROJAN 3000 PLUS UV	$407,000.00		**$407,000.00**
PUMPING SYSTEM	$55,000.00		**$55,000.00**
VALVES	$45,000.00		**$45,000.00**
METERS & CONTROLS	$23,500.00		**$23,500.00**
FILTER BUILDING	$60,000.00		**$60,000.00**
CONNECTIONS TO IRRIGATION SYSTEM	$25,000.00		**$25,000.00**
POLYMER COAGULATION SYSTEM	$65,000.00		**$65,000.00**

INSPECTION BUDGET

EQUIPMENT INSTALLATIONS	$428,000.00		$428,000.00
SUB-TOTAL (GENERAL)			$1,687,038
7% CONTINGENCIES (GENERAL)			$118,092.67
TOTAL (GENERAL)			$1,810,000
ELECTRICAL CONSTRUCTION	$600,000.00		$600,000.00
7% CONTINGENCIES (ELECTRICAL)			$42,000.00
TOTAL (ELECTRICAL)			$650,000
GRAND TOTAL		AUGUST 2007 COST OPINION	$2,460,000

RIVERHEAD SEWER DISTRICT - WASTEWATER REUSE FOR GOLF COURSE IRRIGATION

INSPECTION BUDGET

Project Name:	WASTEWATER REUSE STAGE 2		
H2M File No.:	RDSD 06-06		
Prepared By:	EPB		FMR
Date:	1/4/2007		1/4/2007

Contract Designation	Contract	Facilities	Amount
G	GENERAL CONSTRUCTION		$1,810,000
E	ELECTRICAL CONSTRUCTION		$650,000
Total Construction Cost			$2,460,000

Construction Period =	12	Months (Part-Time at 65%)
No. of Days =	276	Working Days
No. of Hours =	1,435	

INSPECTION FEE CALCULATION						
Classification	Hourly Rate for Year 2007	Mult.	% Utilized on Project	Billing Rate	No. of Hours	Fee Budget
Inspection Dept. Supervisor	$63.00	3.2195	0.00%	$202.83	0	$0
Resident Engineer	$52.00	3.2195	0.00%	$167.41	0	$0
Senior Inspector	$45.00	3.2195	20.00%	$144.88	287	$41,600
Junior Inspector	$27.00	3.2195	65.00%	$86.93	933	$81,100
Project Manager	$60.00	3.2195	15.00%	$193.17	215	$41,600
TOTAL INSPECTION BUDGET FOR PROJECT						$164,300
					Say :	$170,000

RIVERHEAD SEWER DISTRICT - WASTEWATER REUSE FOR GOLF COURSE IRRIGATION

INSPECTION BUDGET

Construction				Engineering for Design & Construction Administration					
Contract Designation	Contract		Amount	% From ASCE Curve	Total Basic Fee	ASCE Allowed Adjustment Factor	Adjusted Total Basic Fee	Design Fee [2]	Construction Administration Fee [3]
			$0	0.00%	$0	1.33	$0	$0	$0
G	General & Mechanical Construction	(1)	$1,810,000	7.00%	$126,658	1.33	$168,455	$126,341	$42,114
E	Electrical Construction	(1)	$650,000	8.15%	$52,991	1.33	$70,478	$52,858	$17,619
Total All Construction Contracts			$2,460,000				$240,000	$179,200	$59,733
Miscellaneous Costs									
Additional SCDHS Research, Reports and Meetings for Conceptual Approval							$25,000		
NYSDEC Grant Work Plan							$10,000		
NYSDEC Required Grant Contract, Status Reports & Applications							$20,000		
Construction Inspection / Wicks Law Coordination Budget:							$170,000		
Miscellaneous Topographical Survey Budget (Estimated):							$10,000		
Soil Borings & Piezometers Budget (Estimated):							$12,000		
Commercial Printing Budget (Estimated):							$10,000		
Microbiological Consultations, Report, & Testing Services							$15,000		
						Subtotal	$272,000		
						Total Engineering & Miscellaneous Costs	$512,000		
						Say:	$512,000		
Total Project Cost * =		*$2,460,000*		+			*$512,000*	=	*$2,972,000*
								Say:	*$2,975,000*

Notes:

(1)	Adjusted by 33% to Account for a Project Involving Existing Conditions Per ASCE Manual of Practice No. 45 - Pg. 44
(2)	75% of Total Adjusted Basic Fee
(3)	25% of Total Adjusted Basic Fee

Appendix G

Staff Report (SEQR) - Part I, Project Information

STAFF REPORT (SEQR)
PART I, Project Information

Date: August 31, 2006.

Name of Action: Town of Riverhead Wastewater Reuse Plan (phase II).

Involved Agency: Town Board for direct agency undertaking.

Project: Applicant Town of Riverhead proposes to undertake phase II of its wastewater reclamation project whereby 350,000gpd of treated effluent will be reused for irrigation of Suffolk County's Indian Island Golf Course which lies adjacent to the Town sanitary treatment plant.

Location: North side Riverside Dr. and west of Cross River Dr. (CR 105), Riverhead Hamlet. SCTM 0600-131-3-31.1&35.1 (Town land) and 132-1-2&3 (County land).

SEQR Classification/Lead Agency Status: Unlisted per Part 617. Optional coordinated review undertaken 7/18/06 eliciting no lead agency interest or substantive comment. Town Board should assume lead agency.

Special Area Concerns: (critical environmental area, wetlands, cultural-archeological resources) The lands are partially captured by the Peconic Bay CEA and are entirely within the Peconic Estuary Program study area. The areas of both Town and County land to be actually disturbed and effected by the new irrigation source have no overt cultural archeological sensitivity and are already developed as a sanitary treatment plant and a golf course. State and locally regulated tidal and freshwater wetlands of Sawmill Creek and the Peconic River are on and adjacent to these lands and several upland freshwater wetlands are on or adjacent to the Town held land but these resources are well beyond jurisdictional distance from any contemplated improvements. The site lies in Groundwater Management Zone IV.

Site Visit: None. Aerial photos consulted.

Plans Provided: Project plans will be developed under contract as part of the Facility Plan upon the decision to proceed with phase II. The experience with the phase I pilot program gives a general understanding of the nature of the contemplated improvements and their location.

Part I , EAF (notes on applicant provided data): Full EAF by Joseph Hall, dated 7/18/06. An attachment was included to clarify the action. The nature of the project and project site and the somewhat conjectural status of potential physical improvements were difficult to describe within the structure of the EAF which typically presents traditional development projects.
Project Description: As mentioned, phase II of the wastewater reclamation project will involve reusing 350,000gpd of treated effluent for irrigation of the adjacent Indian Island

County Golf Course. The volume represents approximately 46% of current surface water discharge and 25% of nitrogen mass loading to Peconic Bay during the irrigation season and is a first step to the hoped for permanent and total elimination of this nitrogen input to the Peconic Estuary. It is the first such wastewater reclamation project undertaken in Suffolk County.

Phase I of the project was a pilot study to establish the viability of the intent undertaken on the grounds of the Riverhead Advanced Wastewater Treatment Facility. A fraction of the facility's effluent was diverted for supplemental treatment by cloth and membrane filtration and ultraviolet disinfection to remove parasites and achieve 99.9999% viral reduction. The pilot plant's output was tested to insure a total nitrogen concentration of 10mg/l or less to meet drinking water standards and was applied to a model golf hole (tee, fairway and green areas) in the same irrigation regime as the actual course for an eighteen week period between May and September 2004. Soil tests and visual observations were undertaken to monitor nitrogen concentration compliance and evaluate the health of the managed turf areas and the result was a recommendation of the methodology for the entire County golf course.

Full scale implementation will not only meet the goal of the Peconic Estuary Comprehensive Conservation and Management Plan for no net increase in nitrogen input to the ecosystem, but will reduce and may eventually eliminate the RAWTF contribution. The potential for algal blooms and resultant biological oxygen demand is reduced as a result. Further, the nutrient content of the applied reclaimed water may reduce the County's need to fertilize the golf course and reducing or eliminating their need to pump irrigation water from the aquifer will reduce the potential for saltwater intrusion.

Physical construction is limited to the placement of the supplemental filtering and disinfection improvements on the RAWTF site and connection to the existing in ground golf course irrigation system. A pipeline of approximately 700ft. will be placed between the RAWTF holding tanks and the course's well head. The line will be direct bored to limit the physical disturbance.

A. Site Description:

2. The best information available indicates new structural improvements related to supplemental effluent treatment and storage would locate on cleared ground proximate to either the existing sanitary or scavenger waste plants. Their size would be expected to be subordinate to the existing construction. The subsurface connection line to the well head on the golf course is the only other physical disturbance.

3.&5. The site soils and slopes involved with formal construction (PlA, PlB and CuB) offer no severe developmental restrictions to that intent.

15.&16. Sawmill Creek and the Peconic River are tidal and fresh surface waters and wetlands subject to State and local jurisdiction. These streams and upland freshwater wetlands (DEC areas R-18 and R-19, Chapter 107 areas 2703, 2704 and 2705) are on and adjacent to the overall site but are likely beyond jurisdictional distance from where improvements are expected.

B. Project Description:

12.&13. The project diverts 350,000gpd of the RAWTF's 1.3MGD discharge to the Peconic Bay surface waters and applies that volume as irrigation water to essentially become a sub surface liquid waste disposal.

15. New improvements will all locate well distant from the identified AE flood zone.

16. The supplementary filtering may generate solid waste (volume unknown) which will be landfilled or processed at the Bergen Point treatment plant.
25. The NYSDEC is involved for modification of the RAWTF's SPDES discharge permit and for issuance of a phase I SPDES storm water permit.

C. Zoning and Planning Information:

1. Operations and maintenance of public facilities is the zoning decision in question.
2. Public buildings and facilities of this nature are free from zoning use requirements and performance standards.

D. Informational Detail:

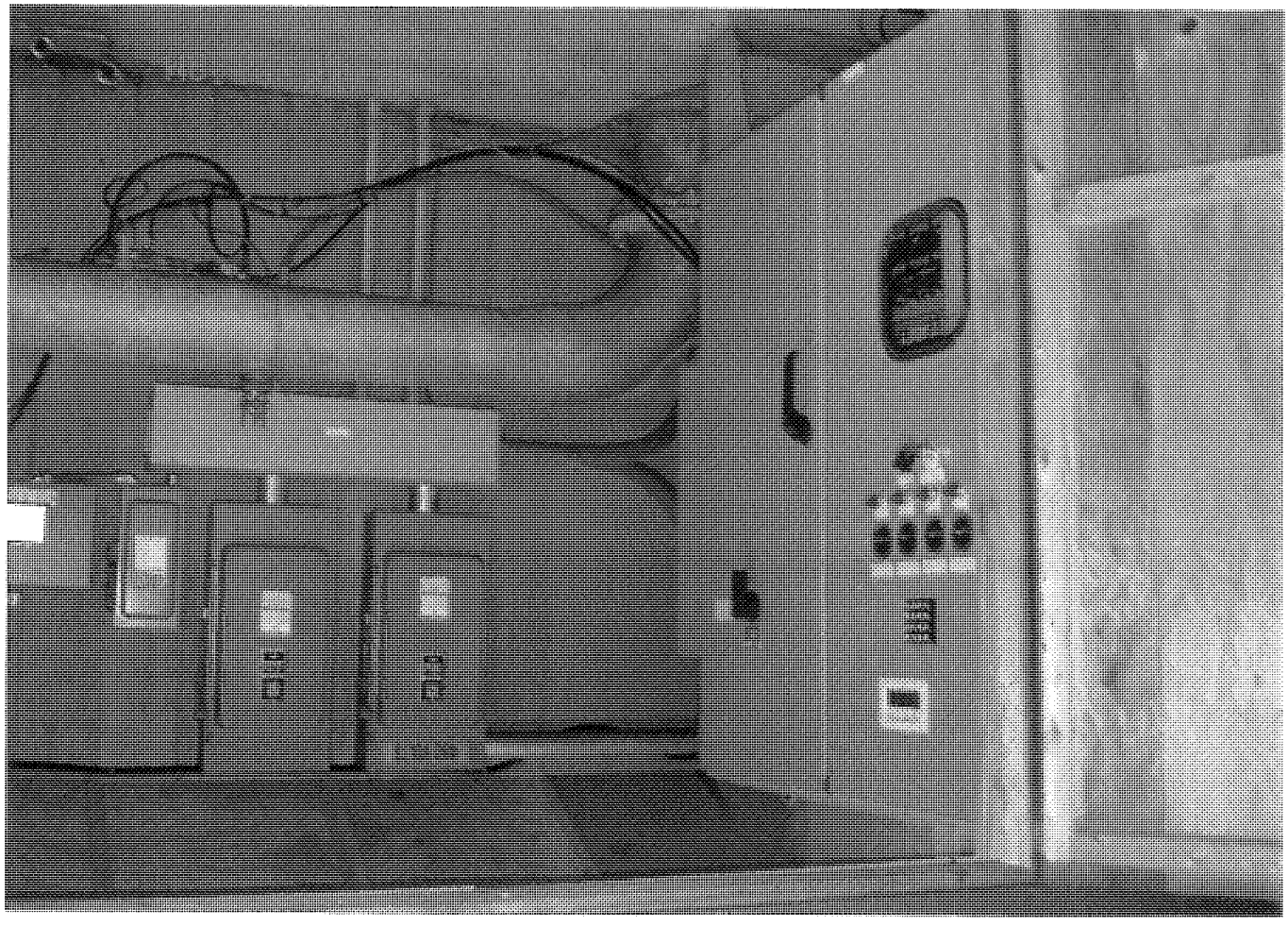
Of relevance to the project's potential impacts is the January 2005 Technical Report on phase I prepared by Holzmacher, McLendon & Murrell, PC. From the outset, the Town, County Health, NYSDEC and County Parks had all recognized the need to protect the health of the golf course's public patrons, its County staff and that of adjacent homeowners. The vigor of the course's plantings and of the general environment including the Peconic Estuary was also a concern. The project carried the potential for waterborne disease outbreaks from pathogens expected to be found in wastewater as well as for unintended consequences to the irrigation system from using wastewater such as sprinkler head clogging. A difficulty in public acceptance was also recognized.

Scientific Methods, Inc. had been contracted for microbiological services to test the quality of existing wastewater, develop pilot scale testing protocol, assess the pilot scale treatment system and its effluent quality, determine the potential for bioaerosol dispersions and to aid in determining the effects of effluent irrigation on soils and plantings. H2M's labs also performed testing. The report notes that the output of the phase I pilot plant greatly exceeded the EPA drinking water viral reduction standards even for water treatment systems utilizing surface water supplies and that the plant's total nitrogen concentration averaged 6 mg/l which is well below the 10 mg/l limit for groundwater discharge. The pilot plant was expected to demonstrate an ability to reduce coliform bacteria by 99.99%. As it was fed effluent treated to tertiary levels by the RAWTF, it was necessary to seed the wastewater with lab propagated E. coli to directly test the plant's efficacy. When tested, plant effluent met the requirement with the only spike in coliform numbers being attributed to bird waste from roosting on the holding tanks. Because enteroviruses and protozoan parasites were not detectable in the treated effluent, bioaerosol sampling was deemed unnecessary.

The model golf hole's soil was tested by Cornell Cooperative Extension for ph and soluble salt levels. The wastewater irrigation resulted in acceptable salt concentration and slightly alkaline ph suggesting less use of lime for maintenance of a similarly irrigated course. The Extension's observations on the condition of the model's vegetation as well as those of the County Parks personnel who cared for it were almost always "good" though it was noted the hole wasn't subjected to play traffic.

Exhibit 1

Site Photographs

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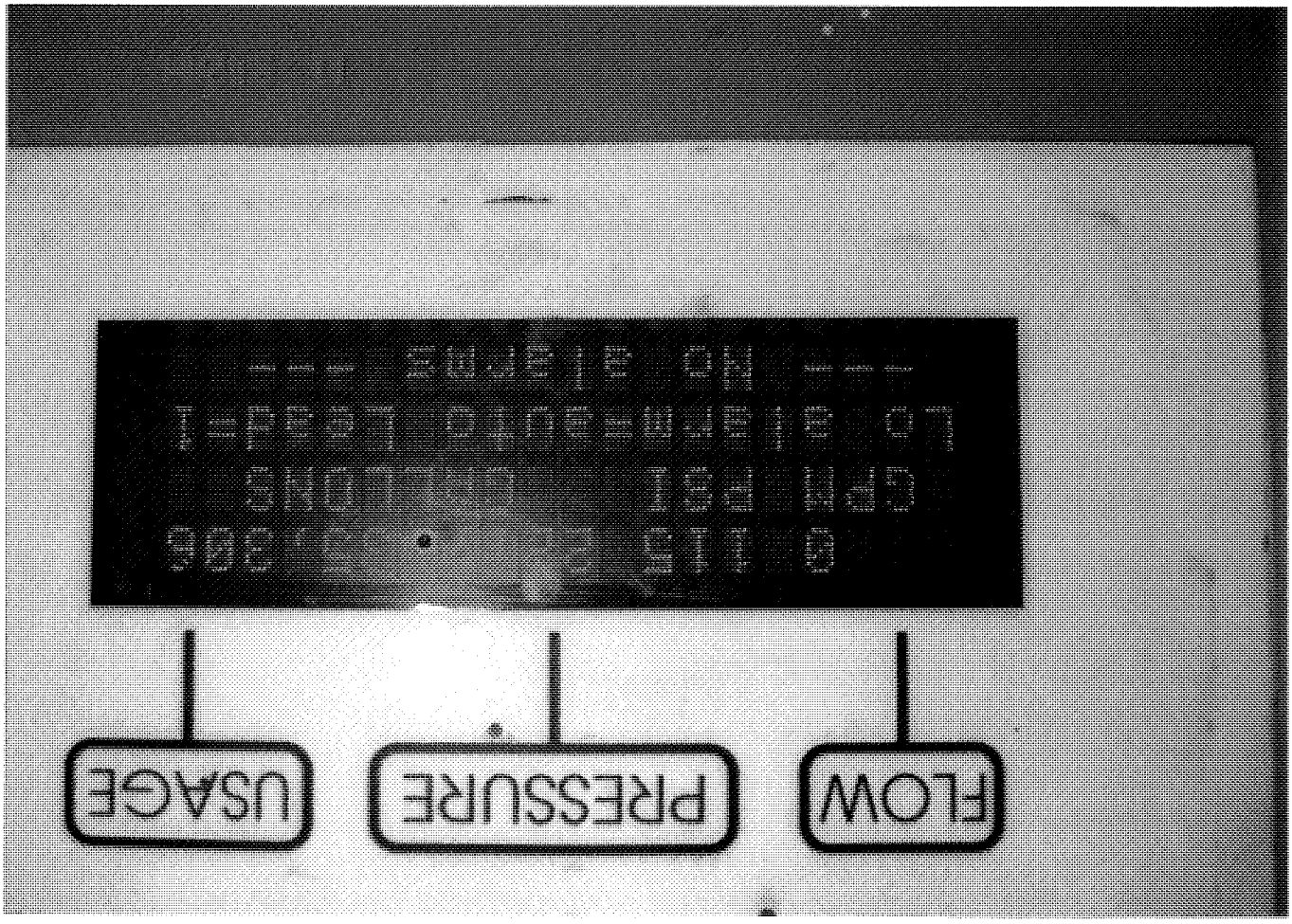
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FLOW

11

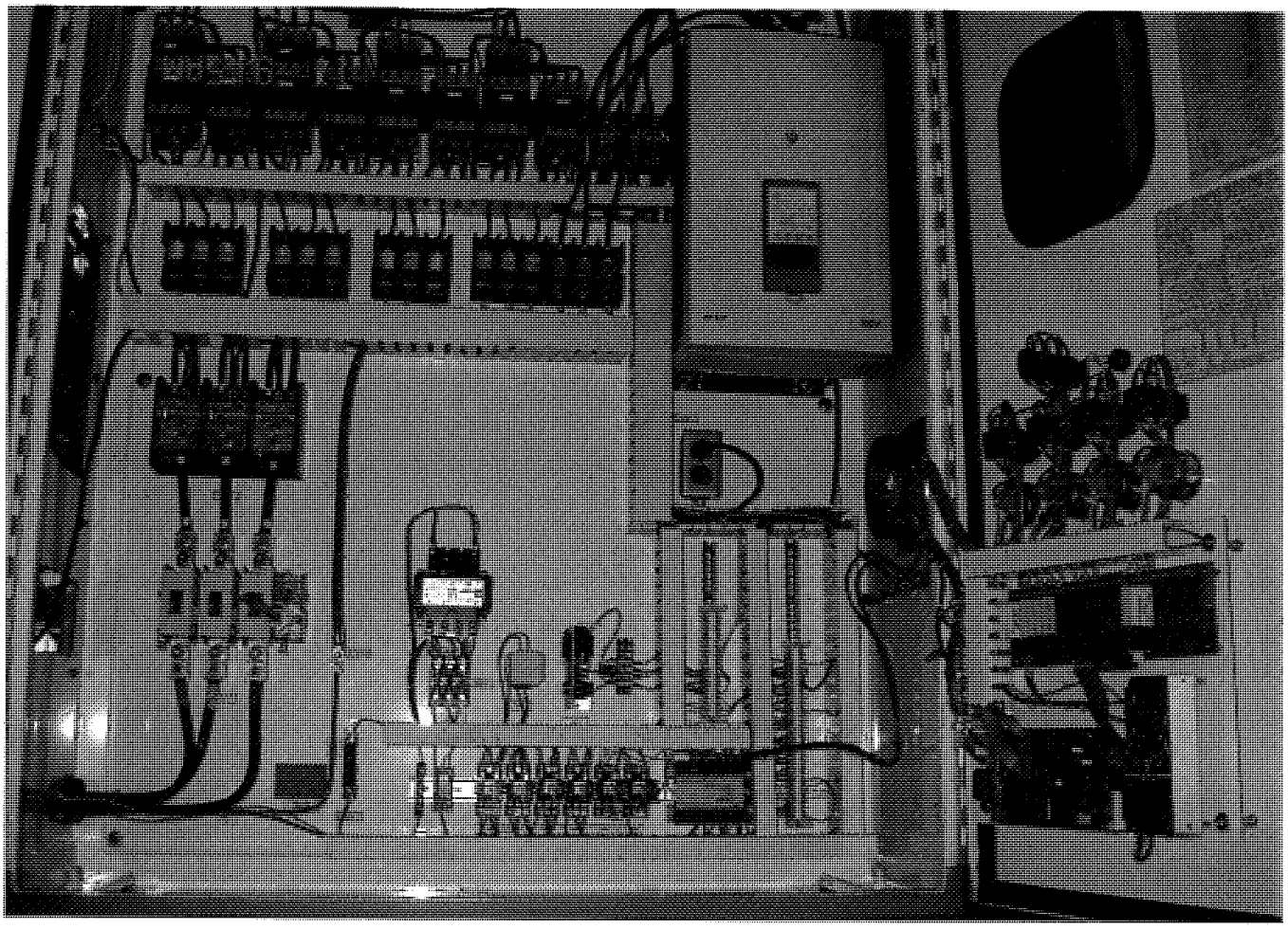
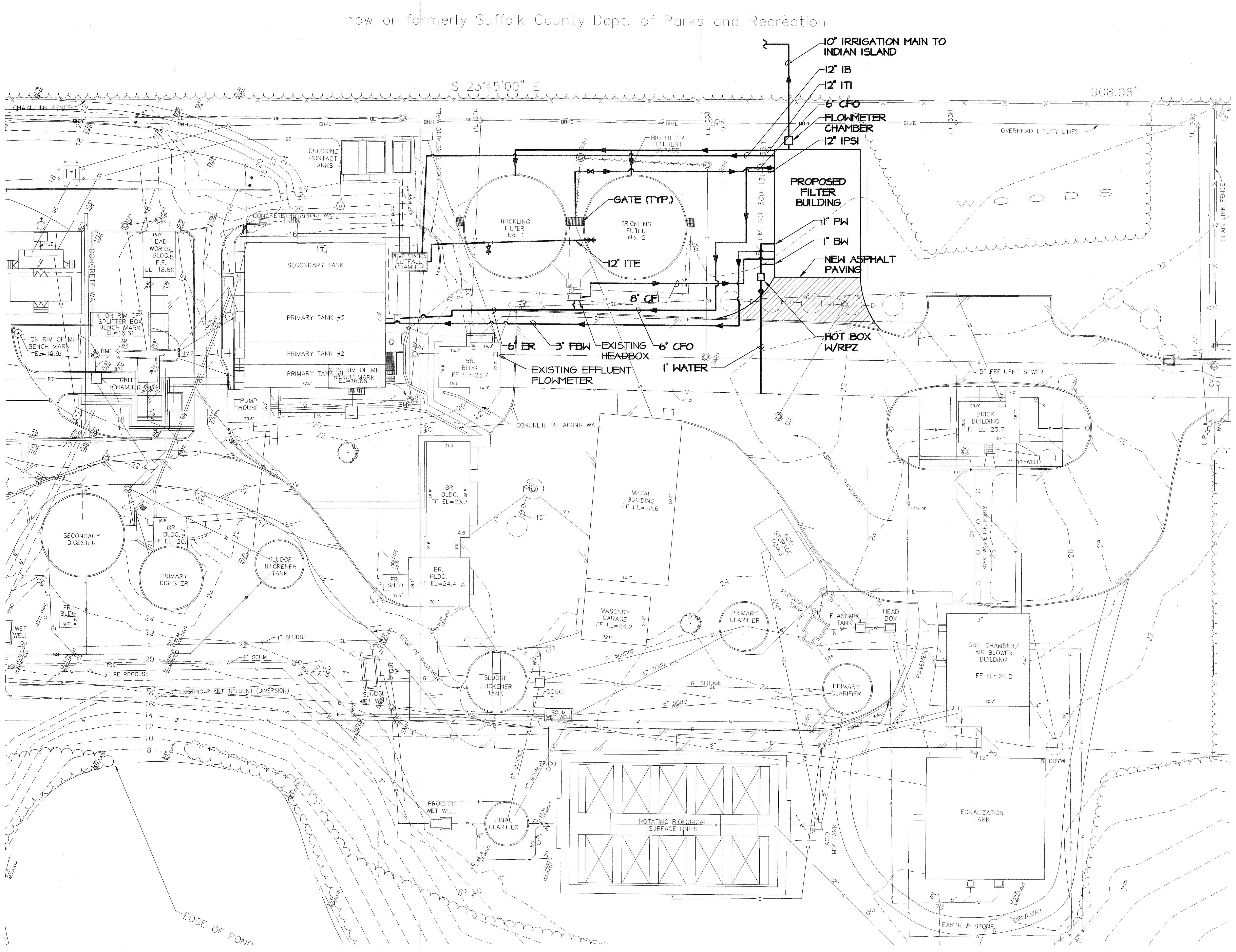


Exhibit2

Aerial Photograph

H2M GROUP
HOLZMACHER, MCLENDON AND MURRELL, P.C.
575 Broad Hollow Road
Melville, New York 11747
(631)-756-8000
www.h2m.com

EXHIBIT III
AERIAL PHOTOGRAPH



PRELIMINARY SITE PLAN

SCALE: 1" = 30'

LEGEND:

- IPSI - IRRIGATION PUMP STATION INFLUENT
- ITI - IRRIGATION TANK INFLUENT
- IB - IRRIGATION BYPASS
- CFO - CLOTH FILTER OVERFLOW
- PW - POLYMER WATER
- BW - BUILDING WATER
- FBW - FILTER BACKWASH
- CFI - CLOTH FILTER INFLUENT
- ITE - IRRIGATION TANK EFFLUENT
- ER - EFFLUENT RETURN

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DESIGNED BY:	EPB
DRAWN BY:	RM
CHECKED BY:	
REVIEWED BY:	

RIVERHEAD SEWER DISTRICT

WASTEWATER REUSE PHASE 2 FULL SCALE FACILITY

CONTRACT

MAP & PLAN

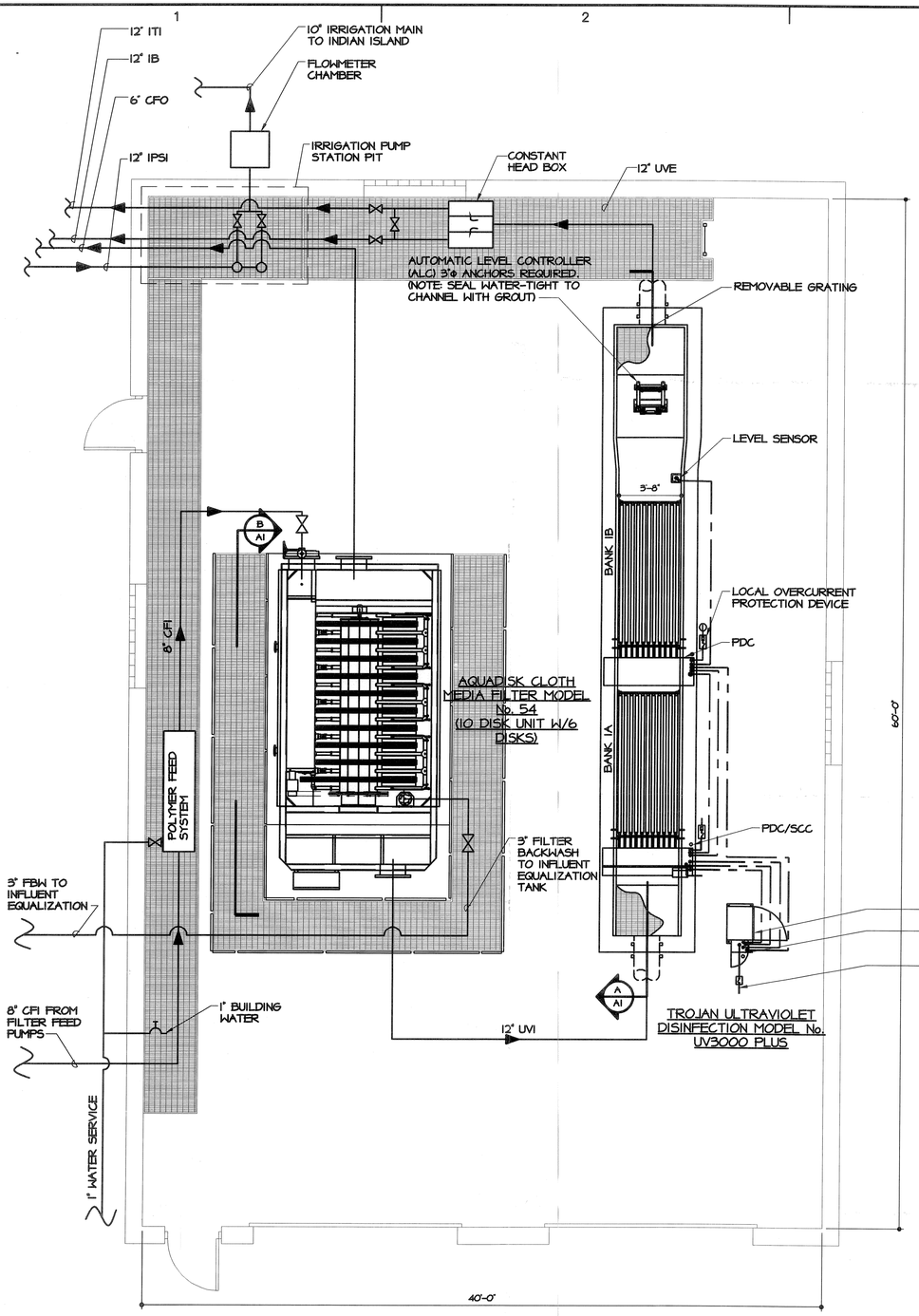
NOT FOR CONSTRUCTION

SHEET TITLE

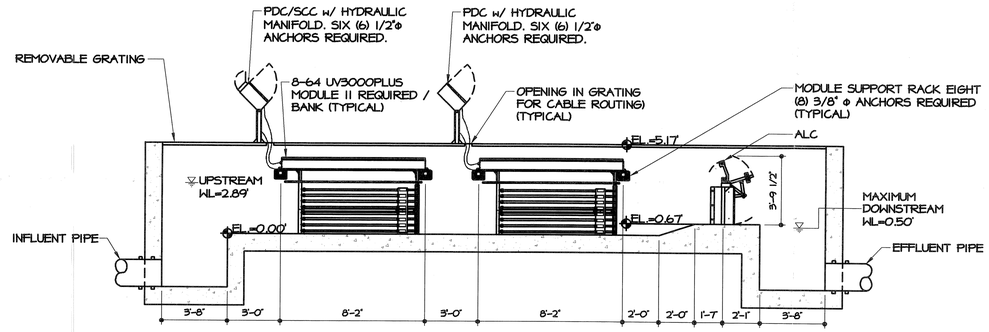
PRELIMINARY SITE PLAN

SHEET NUMBER

S-1



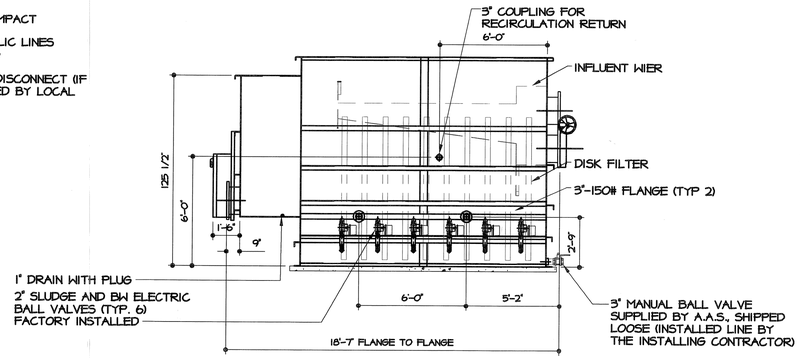
FLOOR PLAN
SCALE: 1/4" = 1'-0"



UV3000 PLUS SECTION
SCALE: 1/4" = 1'-0"

LEGEND:

IPSI - IRRIGATION PUMP STATION INFLUENT
ITI - IRRIGATION TANK INFLUENT
IB - IRRIGATION BYPASS
CFO - CLOTH FILTER OVERFLOW
PW - POLYMER WATER
BW - BUILDING WATER
FBW - FILTER BACKWASH
CFI - CLOTH FILTER INFLUENT
ITE - IRRIGATION TANK EFFLUENT
UVE - ULTRA VIOLET EFFLUENT
UVI - ULTRA VIOLET INFLUENT



AQUADISK FILTER ELEVATION
SCALE: 1/4" = 1'-0"

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MARK	DATE	DESCRIPTION

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DRAWN BY:	BAC/RM
CHECKED BY:	
REVIEWED BY:	

RIVERHEAD SEWER DISTRICT

WASTEWATER REUSE PHASE 2 FULL SCALE FACILITY

CONTRACT

MAP & PLAN

NOT FOR CONSTRUCTION

SHEET TITLE

FILTER BUILDING LAYOUT

SHEET NUMBER

B-1