WASTEWATER TECHNOLOGY

NSF/ANSI Standard 40 - *Residential Wastewater Treatment Systems*

Final Report:

Quanics
Bio-COIR Model ATS-SCAT-8-BC-C500 Wastewater Treatment System
04/04/2015/060

NSF International
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Evaluation Report:
Quanics
Bio-COIR Model ATS-SCAT-8-BC-C500
Wastewater Treatment System

Under the provisions of NSF/ANSI Standard 40
Residential Wastewater Treatment Systems

January 2006

EXECUTIVE SUMMARY

Testing of the Quanics Bio-COIR Model ATS-SCAT-8-BC-C500 treatment system was conducted under the provisions of NSF/ANSI Standard 40 for Residential Wastewater Treatment Systems (November 2004 revision). NSF/ANSI Standard 40 was developed by the NSF Joint Committee on Wastewater Technology.

The performance evaluation was conducted at the Massachusetts Alternative Septic System Test Center (MASSTC) located at Otis Air National Guard Base in Bourne, Massachusetts. Sanitary sewage from the base residential housing was used for the testing. The evaluation consisted of sixteen weeks of dosing at design flow, seven and one half weeks of stress testing and two and one half weeks of dosing at design flow. Sampling started in the spring and continued into the fall, covering a range of operating temperatures. Three mechanical problems with the system were encountered during the performance testing, which did not invalidate the test data but resulted in additional testing at reduced sampling. The results of the sampling for the original testing formed the basis for this Certification.

Over the course of the evaluation, the average effluent $CBOD_5$ was 9 mg/L, ranging between 2 and 30 mg/L, and the average effluent suspended solids was 12 mg/L, ranging between <2 mg/L and 61 mg/L.

The Quanics ATS-SCAT-8-BC-C500 produced an effluent that successfully met the performance requirements established by NSF/ANSI Standard 40 for Class I effluent:

> The maximum 7-day arithmetic mean was 19 mg/L for $CBOD_5$ and 34 mg/L for total suspended solids, both below the allowed maximums of 40 and 45 mg/L respectively. The maximum 30-day arithmetic mean was 14 mg/L for $CBOD_5$ and 20 mg/L for total suspended solids, both below the allowed maximums of 25 mg/L and 30 mg/L respectively.

The effluent pH during the entire evaluation ranged between, 6.3 and 7.8, within the required range of 6.0 to 9.0. The ATS-SCAT-8-BC-C500 met the requirements for noise levels (less than 60 dbA at a distance of 20 feet), color, threshold odor, oily film and foam.

Although not required by Standard 40, Quanics requested that influent and effluent samples be taken from the ATS-SCAT-8-BC-C500 system to be analyzed for ammonia, TKN, nitrate, nitrite and total nitrogen. During the evaluation all samples were 24–hour composite samples, collected by automatic samplers programmed to collect samples in coordination with the discharge of treated wastewater from the system. Samples were taken from April 28, 2004 through October 27, 2004. Influent total nitrogen averaged 38 mg/L as N and the effluent total nitrogen averaged 17 mg/L as N.

PREFACE

Performance evaluation of residential wastewater treatment systems is achieved within the provisions of NSF/ANSI Standard 40: Residential Wastewater Treatment Systems (revised November 2004), prepared by the NSF Joint Committee on Wastewater Technology and adopted by the NSF Board of Trustees.

Conformance with the Standard is recognized by issuance of the NSF Mark. This is not to be construed as an approval of the equipment, but a certification of the data provided by the test and an indication of compliance with the requirements expressed in the Standard.

Plants conforming to Standard 40 are classified as Class I or Class II plants according to the quality of effluent produced by the plant during the performance evaluation. Class I plants must also demonstrate performance consistent with the effluent color, odor, oily film and foam requirements of the Standard. Class I plants must meet the requirements of EPA Secondary Treatment Guidelines[1] for five day carbonaceous biochemical oxygen demand, suspended solids and pH.

Permission to use the NSF Mark is granted only after the equipment has been tested and found to perform satisfactorily, and all other requirements of the Standard have been satisfied. Continued use of the Mark is dependent upon evidence of compliance with the Standard and NSF General and Program Specific Policies, as determined by periodic reinspection of the equipment at the factory, distributors and reports from the field.

NSF Standard 40 requires the testing laboratory to provide the manufacturer of a residential wastewater treatment system, a report including significant data and appropriate commentary relative to the performance evaluation of the plant. NSF policy specifies provision of performance evaluation reports to appropriate state regulatory agencies at publication. Subsequent direct distribution of the report by NSF is made only at the specific request of or by permission of the manufacturer.

The following report contains results of the entire testing program, a description of the plant, its operation and key process control equipment, and a narrative summary of the test program, including test location, procedures and significant occurrences. The plant represented herein reflects the equipment authorized to bear the NSF Mark.

CERTIFICATION

NSF International has determined by performance evaluation under the provisions of NSF/ANSI Standard 40 (revised November 2004) that the Bio-COIR Model ATS-SCAT-8-BC-C500 manufactured by Quanics, has fulfilled the requirements of NSF/ANSI Standard 40. The ATS-SCAT-8-BC-C500 has therefore been authorized to bear the NSF Mark so long as Quanics continues to meet the requirements of Standard 40 and NSF General and Program Specific Policies.

General performance evaluation and stress tests were performed at the Wastewater Technology Site located at the Massachusetts Alternative Septic System Test Center located at Otis Air National Guard Base in Bourne, Massachusetts. The raw wastewater used in the test was sanitary sewage from the base residential housing. The characteristics of the wastewater during the test are included in the tabulated data of this report.

The observations and analyses included in this report are certified to be correct and true copies of the data secured during the performance tests conducted by NSF on the wastewater treatment system described herein. The manufacturer has agreed to present the data in this certification in its entirety whenever it is used in advertising, prospectuses, bids or similar uses.

Thomas J. Bruursema
General Manager
Wastewater Treatment Unit Certification

Thomas Stevens
Manager
Federal Programs

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1.0 PROCESS DESCRIPTION

The Bio-COIR Model ATS-SCAT-8-BC-C500 treatment system is an attached growth packed bed reactor, which uses the recycled husks of coconuts as a filtering media. In the packed bed reactor, microorganisms remove soluble contaminants from the wastewater, utilizing them as a source of energy for growth and production of new microorganisms. The organic matter is attacked by extracellular enzymes that solubilize the solids to make them available to the microorganisms as a food source. The organisms primarily responsible for the degradation of the organic and some inorganic matter are aerobic bacteria. As such, the transfer of oxygen into the wastewater is critical to the treatment process.

2.0 PERFORMANCE EVALUATION

2.1 Description of Plant Evaluated

The Bio-COIR Model ATS-SCAT-8-BC-C500 treatment system tested in this evaluation has a rated capacity of 500 gallons per day (gpd). Specifications and drawings are included in Appendix A.

The ATS-SCAT-8-BC-C500 system is made up of a primary treatment tank, a pump tank and a secondary treatment unit. Raw sewage enters a two-compartment, 1,500 gal concrete tank. The first compartment (1,000 gal) provides primary treatment, where settleable solids accumulate on the bottom and floatable solids accumulate on the surface. A Zabel A300-8x18-VC effluent filter is provided on the pipe between the first and second compartments of the tank to help retain solids in the first compartment. Effluent from the clear layer of the first compartment flows into the second compartment of the tank (500 gal). A pump located in a screened pump vault in the second compartment transfers effluent to the filter pod for secondary treatment.

Four spray nozzles inside the filter pod distribute the liquid over a coconut shell media (85 ft^3) inside the pod. The applied wastewater percolates down through the media and is collected at the bottom of the pod. The collected water flows out through a pipe to an automated splitter valve located in a gravity recirculation device. During periods of no flow to the system, all of the treated effluent is returned to the second compartment. Otherwise, approximately 20% of the treated effluent is discharged and 80% is returned to the second compartment. Aeration is provided by the sprinkling action of the water over the media and as the water moves down through the media.

2.2 Test Protocol

Section 8 of NSF/ANSI Standard 40 protocol, “Performance Testing and Evaluation”, is included in Appendix B. Start up of the system was accomplished by filling the pretreatment tank with 2/3 water and 1/3 raw sewage. The system was then dosed at the design loading rate of 500 gpd as follows:

6 a.m. to 9 a.m. - 35 percent of daily rated capacity (175 gallons)
11 a.m. to 2 p.m. - 25 percent of daily rated capacity (125 gallons)
5 p.m. to 8 p.m. - 40 percent of daily rated capacity (200 gallons)

Doses were spread uniformly over each dosing period.

After a start up period (up to three weeks at the manufacturer's discretion), the system was subjected to the following loading sequence:

Design loading	-	16 weeks
Stress loading	-	7.5 weeks
Design loading	-	2.5 weeks

During the design loading periods, flow proportioned 24-hour composite samples were collected of the influent and effluent five days per week. The influent samples were analyzed for five-day biochemical oxygen demand, and total suspended solids concentrations. The effluent samples were analyzed for five-day carbonaceous biochemical oxygen demand, and total suspended solids concentrations. On-site determinations of the effluent temperature and pH were made five days per week.

Stress testing is designed to evaluate how the plant performs under non-ideal conditions, including varied hydraulic loadings and electrical or system failure. The test sequence includes (1) Wash Day stress, (2) Working Parent stress, (3) Power/Equipment Failure stress, and (4) Vacation stress. Detailed descriptions of the stress sequences are shown in Appendix B.

During the stress test sequences, 24-hour composite samples are collected before and after each stress dosing pattern. The analyses and on-site determinations completed on the samples are the same as described for the design load testing. Each stress is followed by seven consecutive days of dosing at design rated capacity before beginning the next stress test. Sample collection is initiated twenty-four hours after completion of wash day, working parent, and vacation stresses, and beginning 48 hours after completion of the power failure stress.

In order for the plant to achieve Class I effluent it is required to produce an effluent, which meets the EPA guidelines for secondary effluent discharge[1]:

(1) $CBOD_5$: The 30-day average of effluent samples shall not exceed 25 mg/L and each 7-day average of effluent samples shall not exceed 40 mg/L.

(2) Total Suspended Solids: Each 30-day average of effluent samples shall not exceed 30 mg/L and each 7-day average of effluent samples shall not exceed 45 mg/L.

(3) pH: Individual effluent values remain between 6.0 and 9.0.

Requirements are also specified for effluent color, odor, oily film and foam, as well as maximum noise levels allowed from the plant.

2.3 Test Chronology

The system was installed under the direction of the manufacturer on April 20, 2004. The infiltration/exfiltration test during which the entire system was tested for leaks was completed on April 21, 2004. The system was filled with 2/3 fresh water and 1/3 raw sewage and dosing was initiated at the rate of 500 gpd, beginning April 22, 2004. While sampling was initiated on April 22, 2004, the test was officially started on May 2, 2004. The stress test sequence was started on August 23, 2004 and ended on October 13, 2004. Testing at the Massachusetts Septic System Test Center was completed on October 29, 2004. As

described in Section 3.1, mechanical problems encountered during the testing resulted in a repeated Standard 40 test (with reduced sampling frequency) at the Waco, Texas test facility. Testing began on February 28, 2005 and was completed on July 15, 2005.

3.0 ANALYTICAL RESULTS

3.1 Summary

Chemical analyses of samples collected during the evaluation were completed using the procedures in *Standard Methods for the Examination of Water and Wastewater*[2] and USEPA methods. Copies of the data generated during the evaluation are included in Appendix C. The results of the analyses performed during the first week of dosing are also included in Appendix C for informational purposes only. Results of the chemical analyses and on-site observations and measurements made during the evaluation are summarized in Table I.

TABLE I. SUMMARY OF ANALYTICAL RESULTS

	Average	Std. Dev.	Minimum	Maximum	Median	Interquartile Range
Oxygen Demand (mg/L)						
Influent (BOD_5)	160	50	69	400	160	130 – 190
Effluent ($CBOD_5$)	9	5	2	30	9	6 – 12
Total Suspended Solids (mg/L)						
Influent	190	59	73	370	180	140 –220
Effluent	12	10	<2	61	10	3 – 15
Volatile Suspended Solids (mg/L)						
Influent	170	53	70	330	170	130 – 200
Effluent	11	10	<2	63	9	3 – 14
pH						
Influent	-	-	6.7	7.7	7.4	7.3 – 7.4
Effluent	-	-	6.3	7.8	6.9	6.8 – 6.9
Temperature (°C)						
Influent	18	3	12	23	18	16 – 21
Effluent	20	3	13	26	21	16 – 22
Dissolved Oxygen (mg/L)						
Effluent	3.6	1.4	1.2	6.6	3.5	2.3 – 4.8

Notes: The median is the point where half of the values are greater and half are less.
The interquartile range is the range of values about the median between the upper and lower 25 percent of all values.

Criteria for evaluating the analytical results from the testing are described in Section 8.5 of NSF/ANSI Standard 40. In completing the pass/fail determination for the data, an allowance is made for effluent total suspended solids and $CBOD_5$ during the first month of testing. The 30 and 7-day averages during this time may equal or exceed 1.4 times the effluent limits required for the rest of the test. This provision recognizes that an immature culture of microorganisms within the system may require additional time to achieve adequate treatment efficiency. Effluent $CBOD_5$ and total suspended solids concentrations from the ATS-SCAT-8-BC-C500 during the first calendar month of testing were within the normal limits and did not need to use this provision.

Section 8.1.6 of the Standard addresses electrical or mechanical defects, which require that all repairs made during the performance testing and evaluation be documented in the final report. There were three separate events that took place during the MASSTC test:

(1) The first event occurred on Monday, August 2, 2004, involving the recirculation device. Biological material had accumulated in the center of the device in sufficient amount to cause the water level in the system to rise and activate the alarm. After removing the material from the device, the water level returned to normal.

(2) The second event occurred on Thursday, August 12, 2004, signaled by a high water alarm condition in the tank. The screen in the pump vault was partially clogged causing the vault to rise as the water accumulated in the tank to higher than normal levels. The site operator was inspecting the problem and inadvertently touched the vault, causing it to sink back to the normal operating condition, which resolved the high water condition.

(3) The third event occurred on Friday September 10, 2004. The nozzle heads in the filter pod plugged. Only one of the four nozzles was actually spraying wastewater over the media. As a result, the site operator changed out the clogged nozzles and replaced them with new ones. Analysis completed on the material found in the clogged nozzles indicated all of the material was biological in nature, and represented bacteria typically found in domestic wastewater.

A thorough review of all the information gathered from the three separate events indicated that the problems were related to design issues. The recirculation device used during the MASSTC test had interior edges that may have caused the material to accumulate. Due to the type of problems encountered and the prohibition in the Standard for any routine service and maintenance of the system during the course of the test, it was agreed that the problems must be addressed before the results of the MASSTC testing would be considered acceptable. Quanics made product changes that addressed the plugging issues and the six-month test was repeated, focusing on the issue of plugging. The test was conducted at the NSF Wastewater Testing Facility in Waco, Texas from February 28, 2005 through July 15, 2005. Observations were made throughout the test to verify that the problems were not being repeated and samples were periodically collected to gauge the system performance. A total of 11 days of sampling occurred from March 1 through July 14, 2005. The test was stopped six weeks earlier than initially anticipated, at the same point in the initial test when the third even occurred. Over the course of the six-month test, effluent $CBOD_5$ ranged from <2 to 22 mg/L and effluent total suspended solids ranged from <2 to 15 mg/L. Photos taken of the interior of the tank showed no signs of accumulation of biological material. Data collected during this testing is included in Appendix D.

Section 8.5.1.1 of the Standard provides guidance addressing the impact of unusual testing conditions, including sampling, dosing, or influent characteristics, on operation of a system under test. The Section

allows for exclusion of specific data points from 7- and 30-day average calculations where determined to have an adverse impact on performance of the system, with rationale for the exclusion to be documented in the final report. There were no such conditions during the MASSTC test.

Sections 3.6 and 8.2.1 of the Standard define influent wastewater characteristics as they apply to testing under the Standard. Typical domestic wastewater is defined as having a 30-day average BOD_5 concentration between 100 and 300 mg/L and a 30-day average total suspended solids concentration between 100 and 350 mg/L. The 30-day average influent strength remained inside this specified range for the duration of the MASSTC test.

3.2 Biochemical Oxygen Demand

The five-day biochemical oxygen demand (BOD_5) and carbonaceous five-day biochemical oxygen demand ($CBOD_5$) analyses were completed using the EPA Method 405.1. The results of the analyses completed on the samples collected during the testing are shown in Figure 1.

Influent BOD_5:

The influent BOD_5 ranged from 69 to 400 mg/L during the evaluation, with an average concentration of 160 mg/L and a median concentration of 160 mg/L.

Effluent $CBOD_5$:

The effluent $CBOD_5$ concentrations ranged from 2 to 30 mg/L over the course of the evaluation, with an average concentration of 9 mg/L. The median effluent $CBOD_5$ concentration was 9 mg/L.

The Standard requires that the effluent $CBOD_5$ not exceed 40 mg/L on a 7-day average or 25 mg/L on a 30-day average. Table II shows the 7 and 30-day average effluent $CBOD_5$ concentrations and the 30-day average influent BOD_5 concentrations.

The 7-day average effluent $CBOD_5$ ranged from 3 to 19 mg/L. The 30-day average ranged from 6 to 14 mg/L throughout the test. As shown in Table II, the ATS-SCAT-8-BC-C500 met the requirements of Standard 40 for effluent $CBOD_5$.

BOD_5 Loading:

Over the course of the evaluation the influent BOD_5 loading averaged 0.67 lbs/day. The Bio-COIR Model ATS-SCAT-8-BC-C500 achieved an average reduction of 0.63 lbs/day.

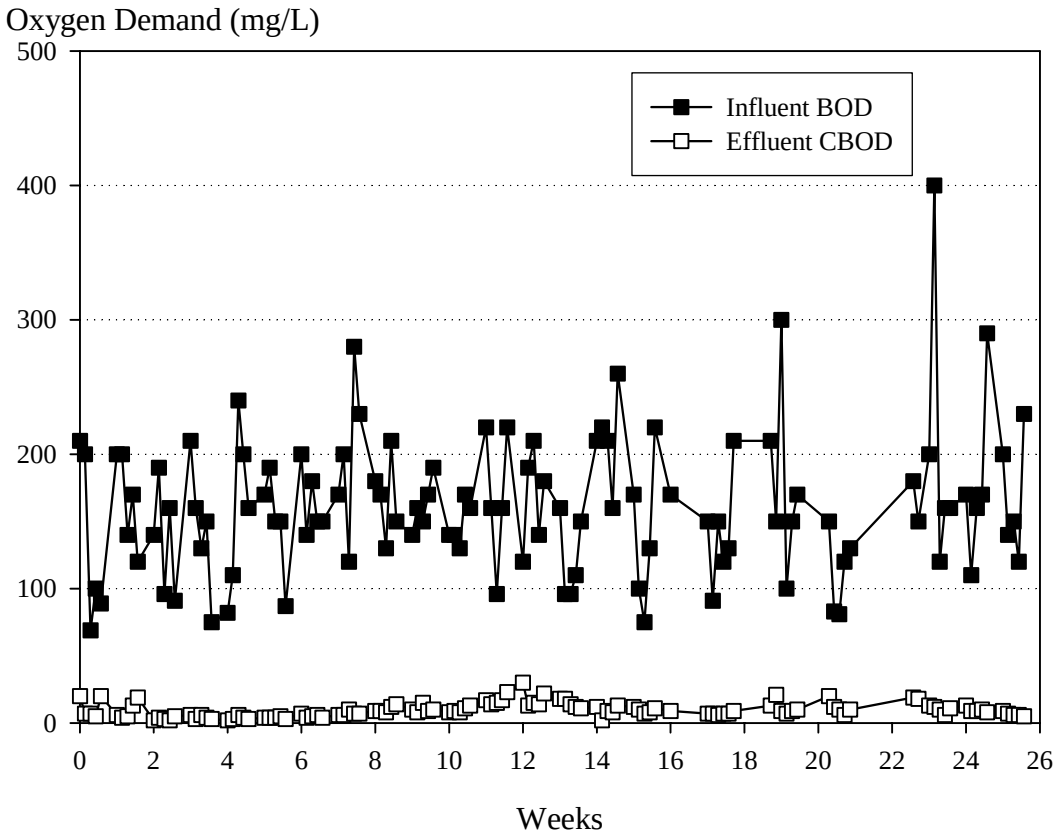

Figure 1. Biochemical Oxygen Demand

3.3 Total Suspended Solids

Total suspended solids and volatile suspended solids analyses were completed using Methods 209C and 209D of *Standard Methods*. The results of the total suspended solids analyses over the entire evaluation are shown in Figure 2. Data from the total suspended solids analyses are summarized in Table I.

Influent Total Suspended Solids:

The influent total suspended solids ranged from 73 to 370 mg/L during the evaluation, with an average concentration of 190 mg/L. The median influent suspended solids concentration during the evaluation was 180 mg/L.

Effluent Total Suspended Solids:

The effluent total suspended solids concentration ranged from <2 to 61 mg/L during the evaluation, with an average concentration of 12 mg/L and a median concentration of 10 mg/L.

Over the course of the evaluation, NSF/ANSI Standard 40 requires that the effluent total suspended solids not exceed 45 mg/L on a 7-day average or 30 mg/L on a 30-day average. Table III shows the 7- and 30-day total suspended solids averages.

The 7-day average effluent total suspended solids ranged from 2 to 34 mg/L and the 30-day average ranged from 2 to 20 mg/L throughout the test. As shown in Table III, the ATS-SCAT-8-BC-C500 met the requirements of NSF/ANSI Standard 40 for effluent total suspended solids.

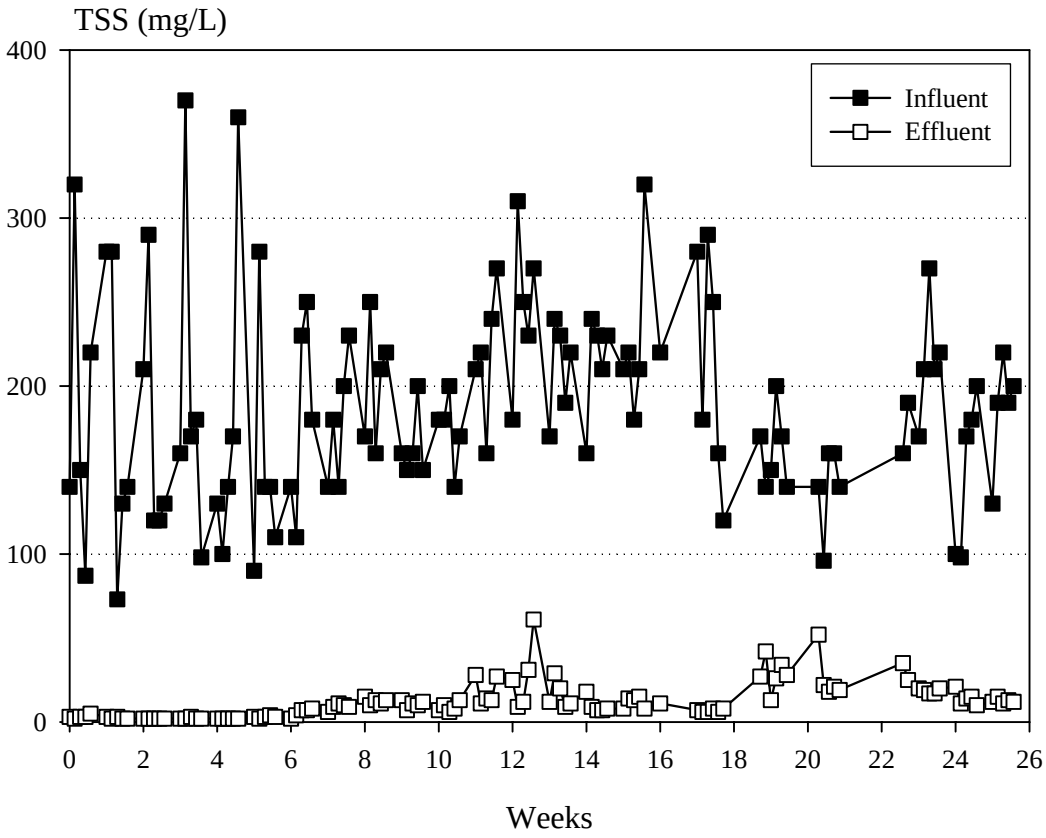

Figure 2. Total Suspended Solids

Table II. 7- and 30-day Average Effluent $CBOD_5$ and 30-day Average Influent BOD_5

Month	Week	7-day Average Effluent $CBOD_5$ (mg/L)	30-day Average Effluent $CBOD_5$ (mg/L)	30-day Average Influent BOD_5 (mg/L)
1	1	12	7	140
	2	9		
	3	3		
	4	4		
2	5	4	6	180
	6	4		
	7	5		
	8	7		
3	9	10	14	160
	10	10		
	11	10		
	12	17		
	13	19		
4	14	15	11	160
	15	9		
	16	10		
	17	9		
5	18	7	10	150
	19	10		
	20	8		
	21	14		
	22	9		
6	23	17	10	180
	24	10		
	25	10		
	26	7		

Table III. 7- and 30-day Total Suspended Solids

Month	Week	7-day Average Effluent TSS (mg/L)	30-day Average Effluent TSS (mg/L)	30-day Average Influent TSS (mg/L)
1	1	3	2	180
	2	2		
	3	2		
	4	2		
2	5	2	6	180
	6	3		
	7	6		
	8	9		
3	9	12	16	200
	10	11		
	11	9		
	12	19		
	13	28		
4	14	16	12	220
	15	10		
	16	12		
	17	11		
5	18	7	20	170
	19	14		
	20	24		
	21	34		
	22	19		
6	23	27	17	180
	24	18		
	25	14		
	26	13		

3.4 pH

Over the entire evaluation period, the influent pH ranged from 6.7 to 7.7 (median of 7.4). The effluent pH ranged from 6.3 to 7.8 during the evaluation (median of 6.9), within the 6 to 9 range required by NSF/ANSI Standard 40. The pH data for the evaluation are shown in Appendix C.

3.5 Temperature

Influent temperatures over the evaluation period ranged from 12 to 23°C (median of 18°C). The temperature data are shown in Appendix C.

3.6 Dissolved oxygen

Dissolved oxygen (DO) was measured in the effluent during the evaluation. The effluent DO ranged between 1.2 and 6.6 mg/L (averaging 3.6 mg/L, with a median of 3.5 mg/L). All dissolved oxygen data are shown in Appendix C.

3.7 Color, Threshold Odor, Oily Film, Foam

Three samples of the effluent were analyzed for color, odor, oily film and foam as prescribed in NSF/ANSI Standard 40. The effluent was acceptable according to the requirements in NSF/ANSI Standard 40, with color less than 15 units, non-offensive threshold odor, no visible evidence of oily film and no foam.

3.8 Noise

A reading of the noise level at a distance of 20 feet from the plant was taken while the plant was in operation, using a hand-held decibel meter. The reading was below the 60 dbA required by NSF/ANSI Standard 40.

3.9 Nitrogen Analysis

Although not required by Standard 40, Quanics requested that influent and effluent samples be taken from the ATS-SCAT-8-BC-C500 system to be analyzed for ammonia, TKN, nitrate, nitrite and total nitrogen. Chemical analyses of the samples collected during the evaluation were completed using the procedure from EPA Method 351.1. During the evaluation all samples were 24–hour composite samples, collected by automatic samplers programmed to collect samples in coordination with the discharge of treated wastewater from the system. Ammonia and TKN samples were stored at $2 \pm 2\ ^{o}C$ and preserved with sulfuric acid at the time of collection. Nitrate and nitrite samples were stored at $2 \pm 2\ ^{o}C$ and were not preserved. Samples were taken from April 28, 2004 through October 27, 2004. Copies of the data generated during the evaluation are included in Appendix E. Influent total nitrogen averaged 38 mg/L as N and the effluent total nitrogen averaged 17 mg/L as N.

4.0 REFERENCES

1. "Environmental Protection Agency Guidelines for Secondary Treatment", Federal Register, Volume 28, No. 159, 1973.

2. APHA, AWWA, WPCF, Standard Methods for the Examination of Water and Wastewater, 20th Edition, American Public Health Association, Washington, D.C.

3. U.S. EPA, Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, Washington, D.C.

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APPENDIX A

PLANT SPECIFICATIONS

PLANT SPECIFICATIONS

Quanics
Bio-COIR Model ATS-SCAT-8-BC-C500

Plant Capacity

Design Flow	500 gpd
Septic Tank Hydraulic Capacity at Design Flow	1,500 gallons
First compartment (pre-treatment)	1,000 gallons
Second compartment	500 gallons
Septic Tank Hydraulic Retention Time (at Design Flow)	
First compartment	48 hours
Second compartment	24 hours

Effluent Filter

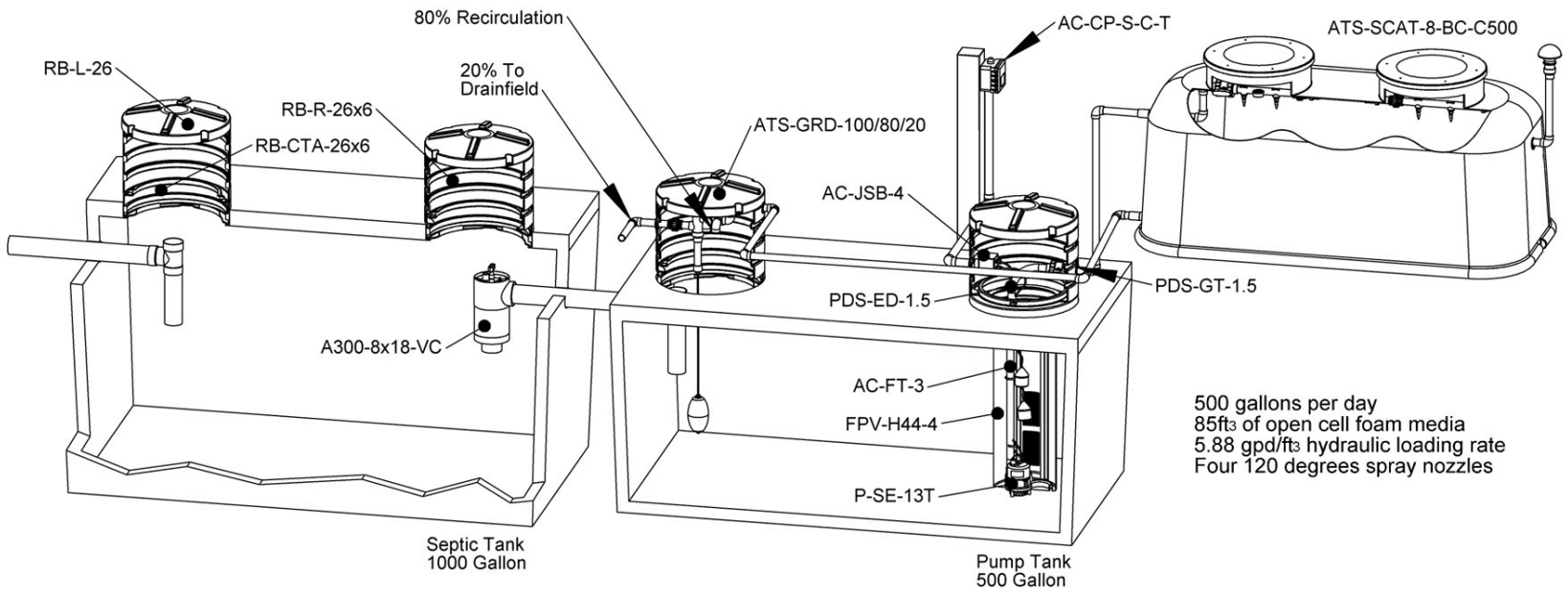
Filter	Zabel A300-8x18-VC

COIR Media

Fiber Diameter	16 microns
Fiber lengths	3-5”
Density:	1.40 g/cc
Lignin content	44.84%
Cellulose content	43.44%

Note: Coarse fibers extracted from the protective husks of coconut, fruit of *Coco nucifera*. 100% COIR fiber, a lignocellulosic material, packaged in 12 inch by 12 inch by 36 inch bales. The fibers are mechanically or manually chopped and fed into the SCAT tank.

		REVISIONS		
ZONE	REV.	DESCRIPTION	DATE	APPROVED



500 gallons per day
85ft3 of open cell foam media
5.88 gpd/ft3 hydraulic loading rate
Four 120 degrees spray nozzles

Parts Included:

ATS-SCAT-8-BC-C500
A300-8x18-VC
FPV-H44-4
P-SE-13T
PDS-ED-1.5
PDS-GT-1.5 (2x)
AC-FT-3
AC-JSB-4
AC-CP-S-C-T
ATS-GRD-100/80/20
RB-CTA-26x6 (4x)
RB-R-26x18 (3x)
RB-L-26 (3x)

Product(s) covered by one or more U.S. and/or International patents. Other U.S. and International patents may be pending.

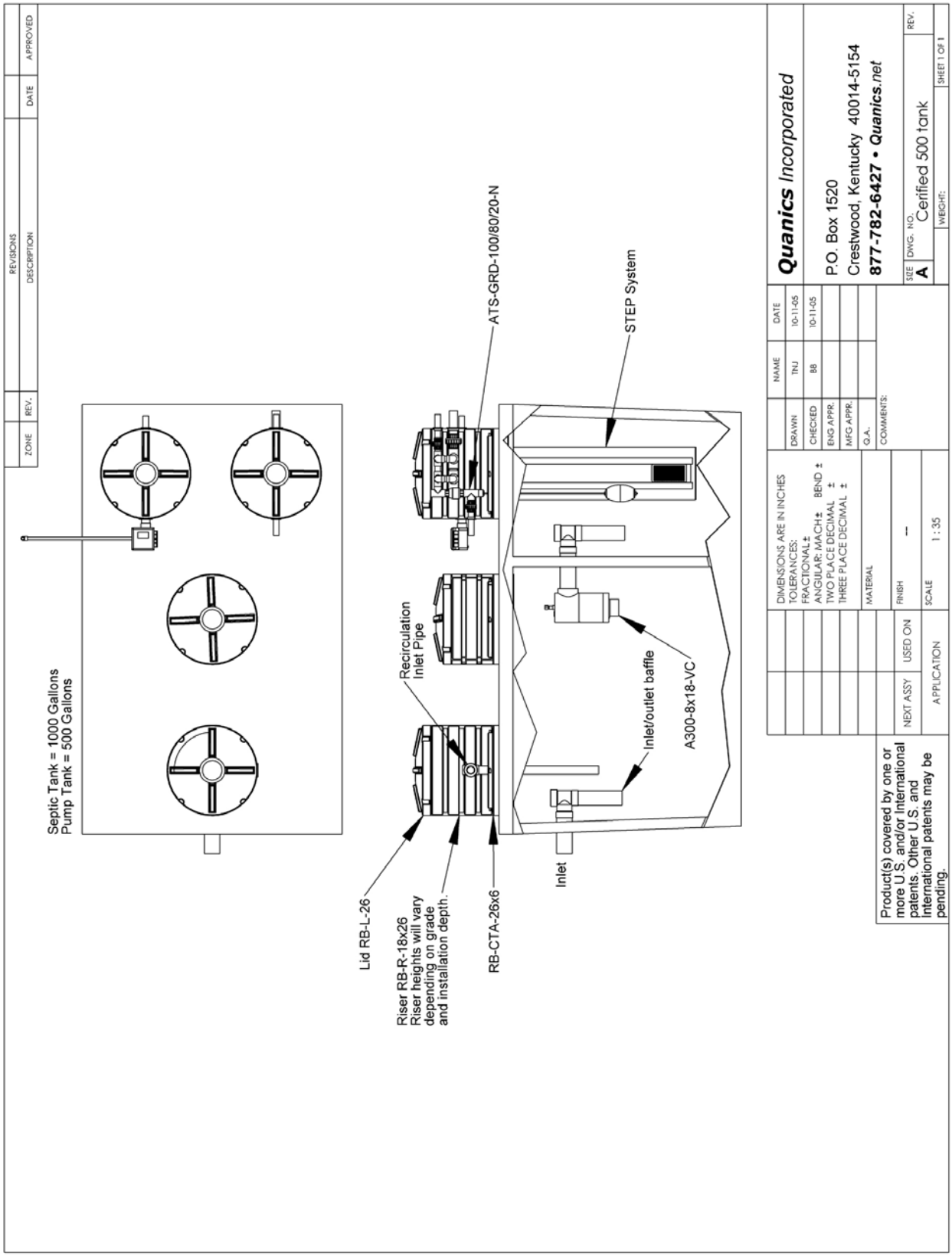
NEXT ASSY	USED ON	
APPLICATION		

DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ±
ANGULAR: MACH ± BEND ±
TWO PLACE DECIMAL ±
THREE PLACE DECIMAL ±
MATERIAL
FINISH --
SCALE 1 : 40

	NAME	DATE
DRAWN	TNJ	08-08-05
CHECKED	BB	08-08-05
ENG APPR.		
MFG APPR.		
Q.A.		
COMMENTS:		

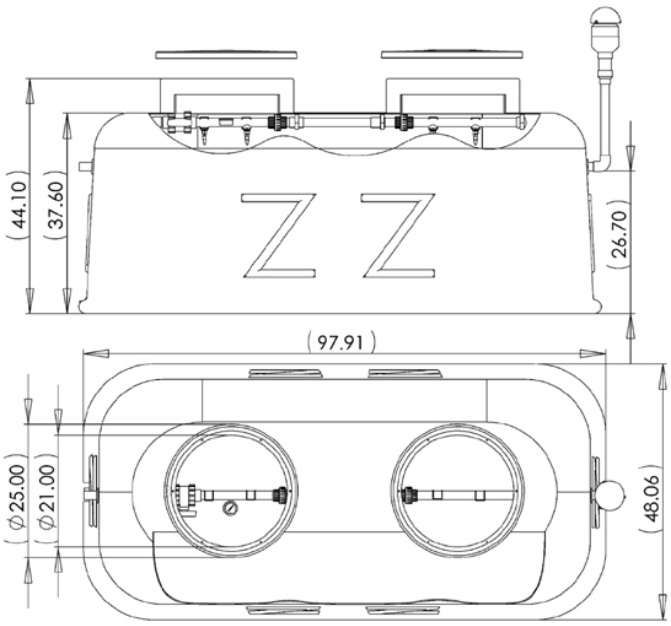
QUANICS *Incorporated*

SIZE	DWG. NO.	REV.
A	ATS-SCAT-8-BC-C500	
	WEIGHT:	SHEET 1 OF 1



ADVANCED TREATMENT
SCAT® AeroCell®

ATS-SCAT-8 Treatment tank



AeroCell Specifications

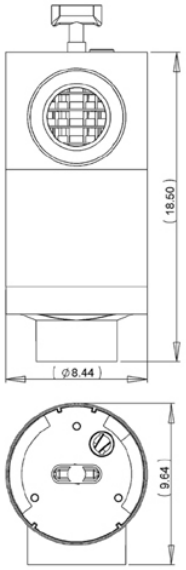
Model #	GPD Rating	Nozzles	Modules	Media (ft^3)	Loading (gpd/ft^3)	Septic Tank (gal)	Pump Tank (gal)	Individual Dose Volume (gal)	Discharge Volume per Individual Dose (gal)	Doses per 24 hrs.
ATS-SCAT-8-AC-C500	***500****	4	1	85	5.88	1000	500	25.6	5.12	98

Features
- Effluent discharge and carbon filter vent assemblies included
- Fiberglass lid with neoprene gasket and security screws included
- Indented flat spots on bottom for easy grommet and outlet pipe installation.
- .015 - .016 lbs/ft^3/day organic loading rate

Warranty for Defects in Material and Workmanship
- Fiberglass SCAT Module - 2 years
- Effluent Discharge and Vent Assembly - 2 years

EFFLUENT FILTER
Filter Series (8")

A300-8x18-VC



A300-8x18-VC
GPD: 1200 / ***FS***: 1/32"

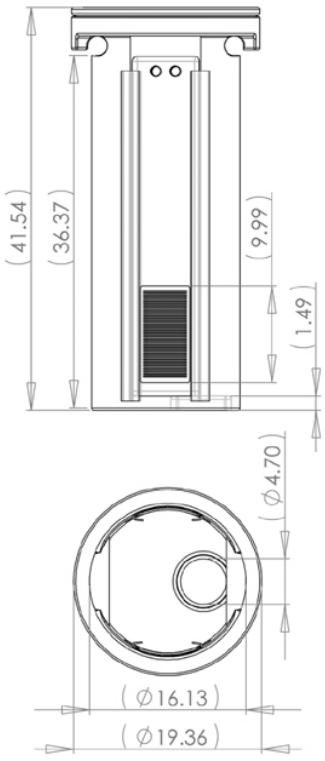
Features
- Patented effluent filter for light commercial, grease traps and in conjunction with advanced treatment systems
- Average of 50% to 90% reduction in TSS within 6 months of installation
- Average of 20% to 45% reduction in BOD_5 within 6 months of installation, reduction is dependent on the make-up of the wastewater
- Average of 60% to 90% reduction in FOG within 6 months of installation
- Filter cartridges are green for easy identification
- Outlet hub accepts 4" or 6" SCH 40 outlet pipe
- All Zabel® Filters accept SmartFilter® alarm switch

GPD = *Maximum Gallons Per Day*
FS = *Filtration Size*

Warranty for Defects in Material and Workmanship
Effluent Filters *- Limited Lifetime*

FILTERED PUMP VAULT
Hanging

FPV-H44-4



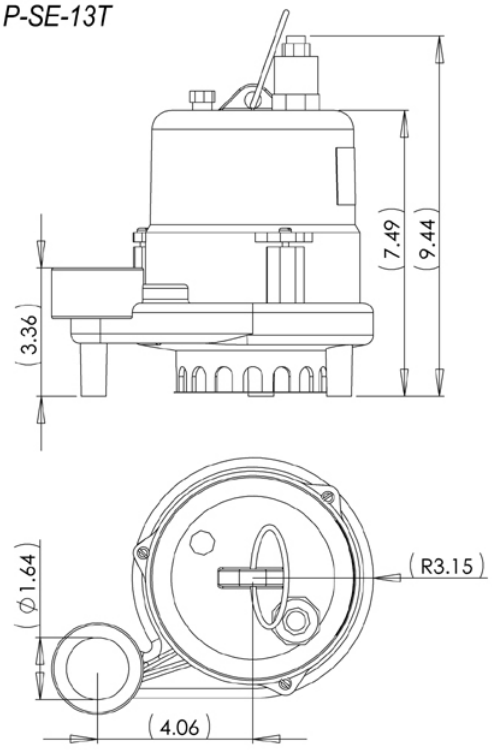
FPV-H44-4, FPV-H56-4
High density non-corrosive polyethylene plastic with stainless steel screws

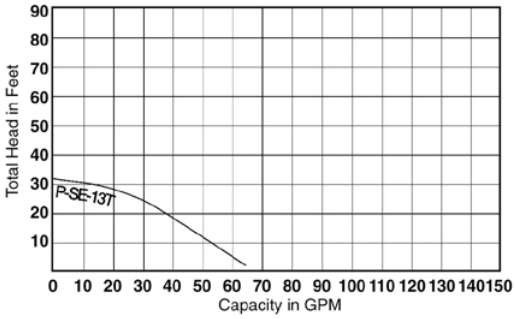
Features
- Hanging filtered pump vault installs into primary or pump tanks
- Protects pump and disposal field from solids larger than 1/16"
- Available with either 2 or 4 filter plates
- Includes maintenance plate for servicing ease

Warranty for Defects in Material and Workmanship
FPVs *- 2 Year*
All FPVs when used with a Zabel pump *- 10 year*

PRESSURE DISTRIBUTION
Pumps

P-SE-13T





Specifications

Capacities: From 15 - 80 GPM

Heads: To 260 FT

Motor: 1/2 HP; hermetically sealed with automatic thermal overload

Electrical: 115V, 12.0 FLA, 1PH, 60Hz

Operation: Manual model (controls required)
Minimum Diameter: 4" (102mm)

Impeller: Delrin®, closed vane type

Solids handling: 1/8" (3.2mm)

Power Cord: 10' (3M), 300 V SJOW jacketed, 2-wire with ground

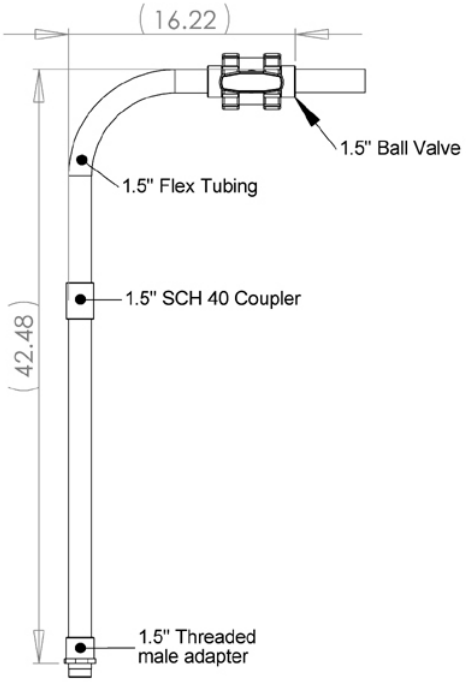
Materials of Construction: 300 grade stainless and cast-iron

Discharge: 1-1/2"

Warranty for Defects in Material and Workmanship
- All components - 3 Years

STEP SYSTEMS
Effluent Discharges

PDS-ED-1.5



Materials

Pipe
- 1.5" SCH 40 PVC
- 1.5" PVC flex tubing

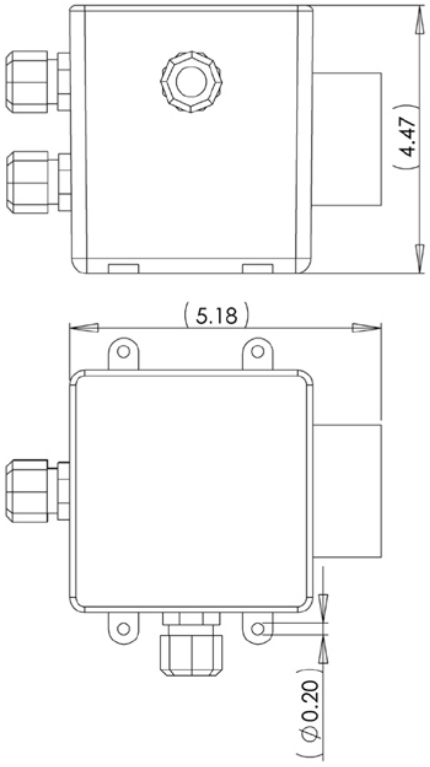
True Union Ball Valve
- PVC Plastic
- Double block, full port design
- 1.5" slip/slip hubs

Fittings
- SCH 40 PVC threaded slip adapter
- SCH 40 PVC slip/slip adapter

Warranty for Defects in Material and Workmanship
- All components - 2 Years

STEP SYSTEMS
Junction Box

AC-JSB-4



Materials
Lid & Box
- High impact, corrosion resistant thermoplastic
- Weatherproof
- 1/2" UL approved, CSA Certified round cable liquid-tight strain relief connectors
- 1-1/2" terminal adapter hub

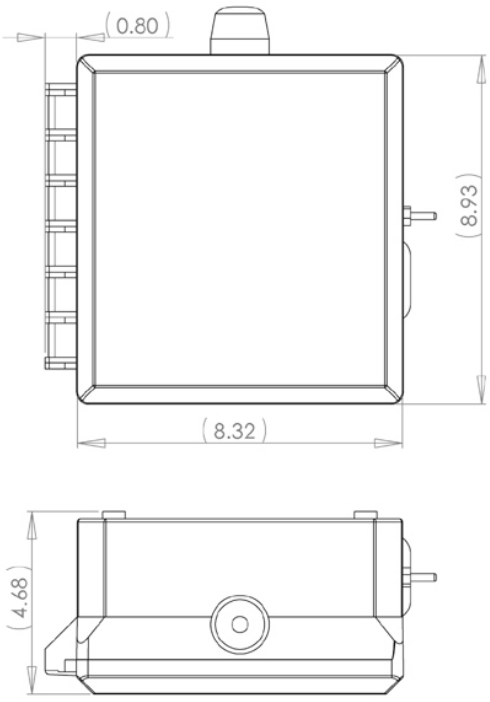
Gasket
- Flexible PVC

Screws
- Brass

Warranty for Defects in Material and Workmanship
- Junction Boxes - 3 Years

STEP SYSTEMS
Control Panel

AC-CP-S-C-T



Specifications
Enclosure
- Measures 10x8x4 inches (25.40x20.32x10.16 cm). NEMA 4X (ultraviolet stabilized thermoplastic with removable flanges for outdoor or indoor use).
- Magnetic Motor Contactor controls pump by switching hot electrical lines
- HOA Switch for manual pump control (mounted on circuit board)
- Float Switch Terminal Block
- Alarm and Control Fuses
- Programmable Timer with separate variable controls allows for setting the on and off times from .05 seconds to 30 hours.
- Circuit Breaker provides pump disconnect and branch circuit protection

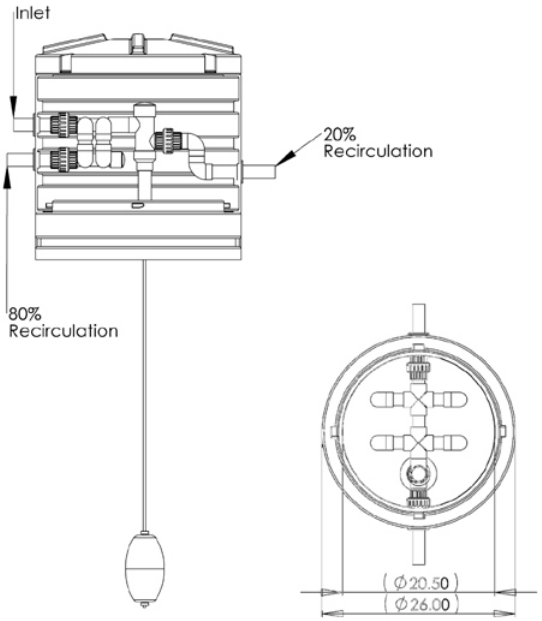
Power Supply
- Pump-120/208/240V, 7-15FLA
- Alarm-120V

Standard Alarm Package
- Red Alarm Beacon provides 360 visual check of alarm condition
- Exterior Horn Test/Normal/Silence Switch allows alarm horn to be silenced and testing of horn and light to ensure proper operation of alarm system
- Horn Silence Relay automatically resets alarm after alarm condition has been resolved (mounted on circuit board)

Warranty for Defects in Material and Workmanship
- Control Panel - 3 Years

ADVANCED TREATMENT
Recirculation Devices

ATS-GRD-100/80/20-N



Materials

Riser and Lid

- High density non-corrosive polyethylene plastic
- Tested to withstand up to a 2500 lb wheel load
- Neoprene gasket
- Stainless steel tamper resistant hardware
- 26″ diameter lid

Effluent Discharge Assembly

- 1.25″ Sch 40 PVC Pipe
- Rubber Grommets

Float Valve Assembly

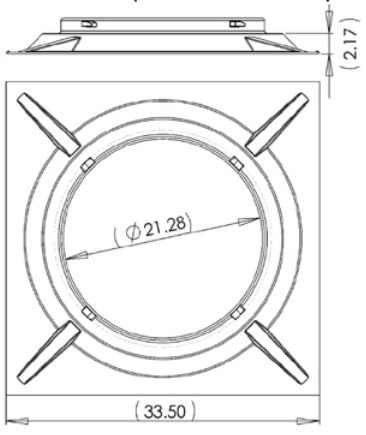
- 60″ Stainless steel rod
- Polypropylene float

Warranty for Defects in Material and Workmanship

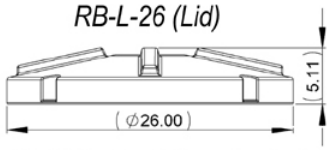
- Riser and Lid - 2 Years
- Effluent Discharge Assembly - 2 Years
- Float Valve Assembly - 2 Years

STEP SYSTEMS
Risers, Lids, Tank Adapters

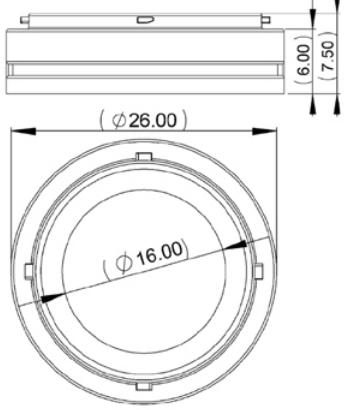
RB-RTA-26x2 (Retrofit Tank Adapter)



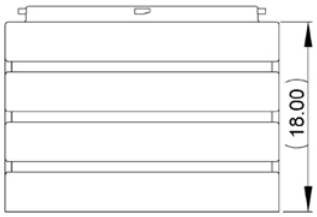
RB-L-26 (Lid)



RB-CTA-26x6 (Cast-in Tank Adapter)



RB-R-26x18 (Riser)



Materials:

Risers and Lids

- High density non-corrosive polyethylene plastic
- Stainless steel screws
- Neoprene gasket

IMPORTANT:

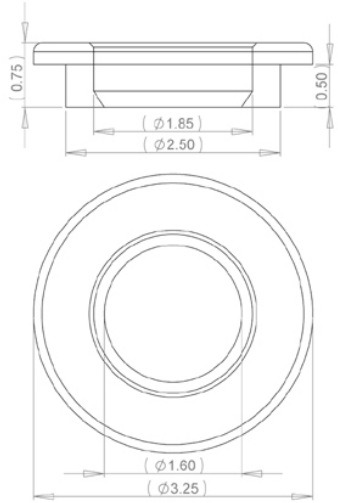
- When adding risers together for deeper installations Zabel does not recommend exceeding a maximum depth of 48″.
- Neoprene gaskets must be installed as per instructions
- To prevent unauthorized entry install all tamper resistant fasteners as per instructions

Warranty for Defects in Material and Workmanship

- Riser, Lids & Tank Adapters - 2 Years

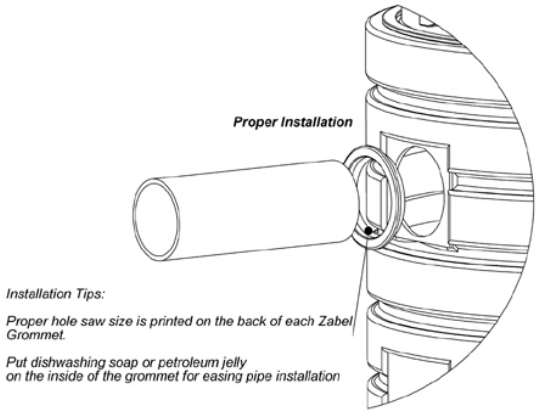
Pressure Distribution
Grommets

PDS-GT-1.5



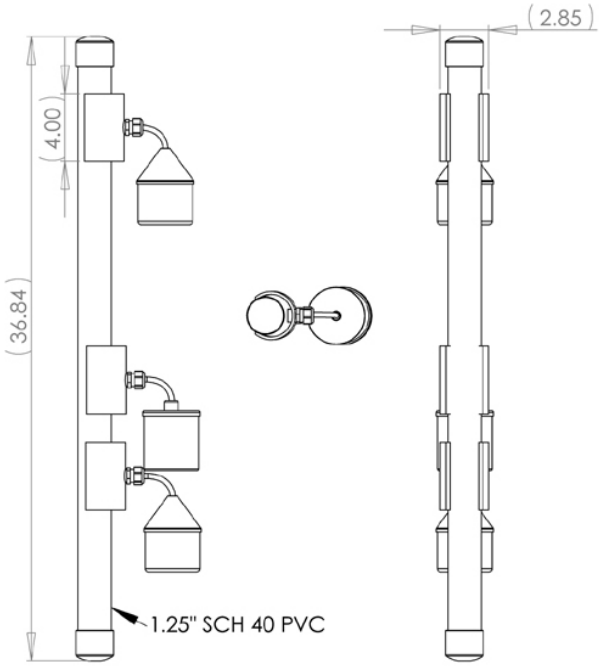
Materials
- 65 Durometer PVC

Warranty for Defects in Material and Workmanship
- All components - 2 Years



STEP SYSTEMS
Float Tree

AC-FT-3



Materials
Pipe
- 1.5" SCH 40 PVC

Warranty for Defects in Material and Workmanship
- All components - 2 Years

APPENDIX B

NSF STANDARD 40 PERFORMANCE EVALUATION METHOD AND REQUIREMENTS

8 Performance testing and evaluation

This section describes the methods used to evaluate the performance of residential wastewater treatment systems. Systems shall be designated as Class I or Class II. The performance classification shall be based upon the evaluation of effluent samples collected from the system over a six-month period.

8.1 Preparations for testing and evaluation

8.1.1 The system shall be assembled, installed, and filled in accordance with the manufacturer's instructions.

8.1.2 The manufacturer shall inspect the system for proper installation. If no defects are detected and the system is judged to be structurally sound, it shall be placed into operation in accordance with the manufacturer's start-up procedures. If the manufacturer does not provide a filling procedure, ⅔ of the system's capacity shall be filled with water and the remaining ⅓ shall be filled with residential wastewater.

8.1.3 The system shall undergo design loading (see 8.2.2.1) until testing and evaluations are initiated. Sample collection and analysis shall be initiated within 3 weeks of filling the system and, except as specified in 8.5.1.2, shall continue without interruption until the end of the evaluation period.

8.1.4 If conditions at the testing site preclude installation of the system at its normally prescribed depth, the manufacturer shall be permitted to cover the system with soil to achieve normal installation depth.

8.1.5 Performance testing and evaluation of systems shall not be restricted to specific seasons.

8.1.6 When possible, electrical or mechanical defects shall be repaired to prevent evaluation delays. All repairs made during the performance testing and evaluation shall be documented in the final report.

8.1.7 The system shall be operated in accordance with the manufacturer’s instructions. However, routine service and maintenance of the system shall not be permitted during the performance testing and evaluation period.

NOTE – The manufacturer may recommend or offer more frequent service and maintenance of the system but for the purpose of performance testing and evaluation, service and maintenance shall not be performed beyond what is specified in this Standard.

8.2 Testing and evaluation conditions, hydraulic loading, and schedules

8.2.1 Influent wastewater characteristics

The 30-d average BOD_5 concentration of the wastewater delivered to the system shall be between 100 mg/L and 300 mg/L.

The 30-d average TSS concentration of the wastewater delivered to the system shall be between 100 mg/L and 350 mg/L.

8.2.2 Hydraulic loading and schedules

The performance of the system shall be evaluated for 26 consecutive weeks. During the testing and evaluation period, the system shall be subjected to 16 weeks of design loading, followed by 7.5 weeks (52 days) of stress loading, and then an additional 2.5 weeks (18 days) of design loading.

8.2.2.1 Design loading

The system shall be dosed 7 days a week with a wastewater volume equivalent to the daily hydraulic capacity of the system. The following schedule shall be adhered to for dosing:

Time frame	% rated daily hydraulic capacity
6:00 a.m. to 9:00 a.m.	approximately 35
11:00 a.m. to 2:00 p.m.	approximately 25
5:00 p.m. to 8:00 p.m.	approximately 40

8.2.2.2 Stress loading

Stress loading is designed to evaluate a system's performance under four non-ideal conditions. Systems shall be subjected to each stress condition once during the 6-month testing and evaluation period, and each of the four stress conditions shall be separated by 7 days of design loading (see 8.2.2.1).

8.2.2.2.1 Wash-day stress

The wash day stress shall consist of 3 wash days in a 5-day period. Each wash day shall be separated by a 24-h period. During a wash-day, the system shall be loaded at times and capacities similar to those delivered during design loading (see 8.2.2.1), however during the first two dosing periods per day, the design loading shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

8.2.2.2.2 Working-parent stress

For 5 consecutive days, the system shall be subjected to a working-parent stress. During this stress, the system shall be dosed with 40% of its daily hydraulic capacity between 6:00 a.m. and 9:00 a.m. Between 5:00 p.m. and 8:00 p.m., the system shall be dosed with the remaining 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

8.2.2.2.3 Power/equipment failure stress

The system shall be dosed with 40% of its daily hydraulic capacity between 5:00 p.m. and 8:00 p.m. on the day the power/equipment failure stress is initiated. Power to the system shall then be turned off at 9:00 p.m. and dosing shall be discontinued for 48 hours. After 48 hours, power shall be restored and the system shall be dosed over a 3- h period with 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

8.2.2.2.4 Vacation stress

On the day that the vacation stress is initiated, the system shall be dosed at 35% of its daily hydraulic capacity between 6:00 a.m. and 9:00 a.m. and at 25% between 11:00 a.m. and 2:00 p.m. Dosing shall then be discontinued for 8 consecutive days (power shall continue to be supplied to the system). Between 5:00 p.m. and 8:00 p.m. of the ninth day, the system shall be dosed with 60% of its daily hydraulic capacity, which shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

8.2.3 Dosing volumes

The 30-d average volume of the wastewater delivered to the system shall be within 100% ± 10% of the system's rated hydraulic capacity.

NOTE – All dosing days, except those with dosing requirements less than the daily hydraulic capacity, shall be included in the 30-d average calculation.

8.2.4 Color, odor, foam, and oily film assessments

During the 6-month testing and evaluation, a total of 3 effluent samples shall be assessed for color, odor, foam, and oily film. The assessments shall be conducted on effluent composite samples selected randomly during the first phase of design loading (weeks 1 – 16), the period of stress loading (weeks 17 – 23.5), and the second phase of design loading (weeks 23.5 – 26).

8.3 Sample collection

8.3.1 General

8.3.1.1 A minimum of 96 data days shall be required during system performance testing and evaluation. No routine service or maintenance shall be performed on the system whether the time period to achieve the 96 data days falls within or exceeds 6 months.

8.3.1.2 All sample collection methods shall be in accordance with APHA's *Standard Methods for the Examination of Water and Wastewater* unless otherwise specified.

8.3.1.3 Influent wastewater samples shall be flow-proportional, 24-h composites obtained during periods of system dosing. Effluent samples shall be flow-proportional, 24-h composites obtained during periods of system discharge.

8.3.2 Design loading

During periods of design loading, daily composite effluent samples shall be collected and analyzed 5 days a week.

8.3.3 Stress loading

During stress loading, influent and effluent 24-h composite samples shall be collected on the day each stress condition is initiated. Twenty-four hours after the completion of washday, working-parent, and vacation stresses, influent and effluent 24-h composite samples shall be collected for 6 consecutive days. Forty-eight hours after the completion of the power/equipment failure stress, influent and effluent 24-h composite samples shall be collected for 5 consecutive days.

8.4 Analytical descriptions

8.4.1 pH, TSS, BOD_5, and $CBOD_5$

The pH, TSS, and BOD_5 of the collected influent and the pH, TSS and $CBOD_5$ of the collected effluent 24-h composite samples shall be determined with the appropriate methods in APHA's *Standard Methods for the Examination of Water and Wastewater*.

8.4.2 Color, odor, oily film, and foam

8.4.2.1 General

The effluent composite samples shall be diluted 1:1000 with distilled water. Three composite effluent

samples shall be tested during the 6-month evaluation period.

8.4.2.2 Color

The apparent color of the diluted effluent samples shall be determined with the visual comparison method described in APHA's *Standard Methods for the Examination of Water and Wastewater*.

8.4.2.3 Odor

A panel consisting of at least 5 evaluators shall qualitatively rate 200 mL aliquots of the diluted effluent samples as offensive or non offensive when compared to odor-free water prepared in accordance with APHA's *Standard Methods for the Examination of Water and Wastewater*.

8.4.2.4 Oily film and foam

Diluted effluent sample aliquots shall be visually evaluated for the presence of an oily film or foaming.

8.5 Criteria

8.5.1 General

8.5.1.1 If conditions during the testing and evaluation period result in system upset, improper sampling, improper dosing, or influent characteristics outside of the ranges specified in 8.2.1, an assessment shall be conducted to determine the extent to which these conditions adversely affected the performance of the system. Based on this assessment, specific data points may be excluded from the 7-d and 30-d averages of effluent measurements. Rationale for all data exclusions shall be documented in the final report.

8.5.1.2 In the event that a catastrophic site problem not described in this Standard including, but not limited to, influent characteristics, malfunctions of test apparatus, and acts of God, jeopardizes the validity of the performance testing and evaluation, manufacturers shall be given the choice to:

1) Perform maintenance on the system, reinitiate system start-up procedures, and restart the performance testing and evaluation; or

2) With no routine maintenance performed, have the system brought back to pre-existing conditions and resume testing within 3 weeks after the site problem has been identified and corrected. Data collected during the system recovery period shall be excluded from 7-d and 30-d averages of effluent measurements.

NOTE – Pre-existing conditions shall be defined as the point when the results of 3 consecutive data days are within 15% of the previous 30-d average(s).

8.5.1.3 A 7-d average discharge value shall consist of a minimum of 3 data days. If a calendar week contains less than 3 data days, sufficient data days may be transferred from the preceding calendar week to constitute a 7-d average discharge value. If there are not sufficient data days available in the preceding calendar week, the transfer of data days may take place from the following calendar week to constitute a 7-d average discharge value. No data day shall be included in more than one 7-d average discharge value.

8.5.1.4 A 30-d average discharge value shall consist of a minimum of 50% of the regularly scheduled sampling days per month. If a calendar month contains less than the required number of data days, sufficient data days may be transferred from the preceding calendar month to constitute a 30-d average discharge value. If there are not sufficient data days available in the preceding calendar month, the transfer of data days may take place from the following calendar month to constitute a 30-d average discharge value. No

data day shall be included in more than one 30-d average discharge value.

8.5.1.5 During the stress loading sequence, consisting of wash-day, working-parent, power/equipment failure, and vacation stress loading periods, data shall be collected from a minimum of ⅔ of the total scheduled sampling days and from at least 2 of the scheduled sampling days during any single stress loading period.

8.5.2 Class I systems

The following criteria shall be met in order for a system to be classified as a Class I residential wastewater treatment system.

All requirements for each parameter shall be achieved except as provided for in 8.5.2.2.

8.5.2.1 EPA secondary treatment guideline parameters

8.5.2.1.1 $CBOD_5$

The 30-d average of $CBOD_5$ concentrations of effluent samples shall not exceed 25 mg/L.

The 7-d average of $CBOD_5$ concentrations of effluent samples shall not exceed 40 mg/L.

8.5.2.1.2 TSS

The 30-d average of TSS concentrations of effluent samples shall not exceed 30 mg/L.

The 7-d average of TSS concentrations of effluent samples shall not exceed 45 mg/L.

8.5.2.1.3 pH

The pH of individual effluent samples shall be between 6.0 and 9.0.

8.5.2.2 Effluent concentration excursions

System performance shall not be considered outside the limits established for Class I systems if, during the first calendar month of performance testing and evaluation, 7-d average and 30-d average effluent $CBOD_5$ and TSS concentrations do not equal or exceed 1.4 times the effluent limits specified in 8.5.2.1.

NOTE – The technology utilized in many residential wastewater treatment systems is biologically based. The allowance of excursions from the effluent limits established in this Standard during the first calendar month of performance testing and evaluation reflects the fact that an immature culture of microorganisms within the system may require additional time to achieve adequate treatment efficiency.

The value of 1.4 is based on the USEPA Technical Review Criteria for Group I Pollutants, including $CBOD_5$ and TSS.

8.5.2.3 Color, odor, oily film, and foam

8.5.2.3.1 Color

The color rating of each of the 3 diluted composite effluent samples shall not exceed 15 units.

8.5.2.3.2 Odor

The overall rating of each of the three diluted composite effluent samples shall be non offensive.

8.5.2.3.3 Oily film and foam

Oily films and foaming shall not be visually detected in any of the diluted composite effluent samples.

8.5.3 Class II systems

The following criteria shall be met in order for a system to be classified as a Class II residential wastewater treatment system.

8.5.3.1 $CBOD_5$

Not more than 10% of the effluent $CBOD_5$ values shall exceed 60 mg/L.

TSS
Not more than 10% of the effluent TSS values shall exceed 100 mg/L.

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APPENDIX C

ANALYTICAL RESULTS

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: May 2, 2004 Plant Code: Zabel

Weeks Into Test: 1

Weekend Dosing: Sunday 502 gallons Saturday 492 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		488	488	488	492	492
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	5.5	5.7	5.5	5.2	4.3
Temperature (C)	influent	13	12	12	12	13
	aeration chamber					
	effluent	16	15	14	14	14
pH	influent	7.3	7.2	7.4	7.4	7.5
	aeration chamber					
	effluent	7.3	7.1	6.9	6.8	7.2
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	210	200	69	100	89
	effluent ($CBOD_5$)	<20	<7	<7	5	<20
Total Suspended Solids (mg/L)	influent	140	320	150	87	220
	aeration chamber					
	effluent	3	2	3	3	5
Volatile Suspended Solids (mg/L)	influent	120	280	140	80	200
	aeration chamber					
	effluent	3	2	2	3	5
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: The dilutions used to measure effluent CBOD on 5/3, 5/4, 5/5, and 5/7 did not allow for a detection limit below the reported values.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: May 9, 2004 Plant Code: Zabel

Weeks Into Test: 2

Weekend Dosing: Sunday 492 gallons Saturday 494 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	494	494
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	4.9	4.8	4.6	4.6	3.7
Temperature (C)	influent	13	12	13	13	13
	aeration chamber					
	effluent	14	15	16	17	16
pH	influent	7.3	7.3	7.5	7.5	7.6
	aeration chamber					
	effluent	6.9	6.9	6.9	6.9	7.1
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	220	200	140	170	120
	effluent ($CBOD_5$)	6	4	5	13	19
Total Suspended Solids (mg/L)	influent	280	280	73	130	140
	aeration chamber					
	effluent	3	<2	3	<2	<2
Volatile Suspended Solids (mg/L)	influent	260	250	70	120	130
	aeration chamber					
	effluent	3	2	3	<2	<2
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: May 16, 2004 Plant Code: Zabel

Weeks Into Test: 3

Weekend Dosing: Sunday 494 gallons Saturday 498 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		510	510	510	498	498
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	4.4	4.6	3.8	4.2	4.2
Temperature (C)	influent	13	14	14	14	14
	aeration chamber					
	effluent	17	16	17	16	17
pH	influent	7.3	7.3	7.4	7.4	7.3
	aeration chamber					
	effluent	6.9	7.0	7.0	6.9	7.0
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	140	190	96	160	91
	effluent ($CBOD_5$)	2	4	3	2	5
Total Suspended Solids (mg/L)	influent	210	290	120	120	130
	aeration chamber					
	effluent	<2	2	<2	<2	<2
Volatile Suspended Solids (mg/L)	influent	190	270	110	110	120
	aeration chamber					
	effluent	<2	2	<2	<2	<2
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: May 23, 2004 Plant Code: Zabel

Weeks Into Test: 4

Weekend Dosing: Sunday 498 gallons Saturday 505 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		502	502	502	502	505
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	4.5	4.7	5.0	5.1	4.7
Temperature (C)	influent	14	14	14	14	14
	aeration chamber					
	effluent	17	16	16	16	16
pH	influent	7.4	7.3	7.4	7.4	7.5
	aeration chamber					
	effluent	7.0	6.9	6.9	6.9	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	210	160	130	150	75
	effluent ($CBOD_5$)	6	3	6	4	3
Total Suspended Solids (mg/L)	influent	160	370	170	180	98
	aeration chamber					
	effluent	2	2	3	2	<2
Volatile Suspended Solids (mg/L)	influent	140	330	160	94	94
	aeration chamber					
	effluent	2	2	3	3	2
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: May 30, 2004 Plant Code: Zabel

Weeks Into Test: 5

Weekend Dosing: Sunday 505 gallons Saturday 495 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		505	505	495	495	495
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	4.4	4.8	4.8	4.7	5.1
Temperature (C)	influent	14	14	14	14	15
	aeration chamber					
	effluent	17	16	16	17	17
pH	influent	7.4	7.3	7.3	7.3	7.2
	aeration chamber					
	effluent	6.9	6.9	6.9	6.9	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	82	110	240	200	160
	effluent ($CBOD_5$)	2	3	6	4	3
Total Suspended Solids (mg/L)	influent	130	100	140	170	360
	aeration chamber					
	effluent	2	2	2	2	<2
Volatile Suspended Solids (mg/L)	influent	120	94	140	160	320
	aeration chamber					
	effluent	2	2	2	2	2
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: June 6, 2004 Plant Code: Zabel

Weeks Into Test: 6

Weekend Dosing: Sunday 495 gallons Saturday 510 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		502	502	502	510	510
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	4.5	4.1	3.7	3.4	3.7
Temperature (C)	influent	15	16	15	16	15
	aeration chamber					
	effluent	16	18	19	20	19
pH	influent	7.2	7.2	7.4	7.2	6.9
	aeration chamber					
	effluent	6.8	6.8	6.8	6.9	7.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	170	190	150	150	87
	effluent ($CBOD_5$)	4	4	4	5	3
Total Suspended Solids (mg/L)	influent	90	280	140	140	110
	aeration chamber					
	effluent	3	2	3	4	3
Volatile Suspended Solids (mg/L)	influent	84	260	130	130	97
	aeration chamber					
	effluent	3	3	3	4	3
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: June 13, 2004 Plant Code: Zabel

Weeks Into Test: 7

Weekend Dosing: Sunday 510 gallons Saturday 495 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		507	507	507	495	495
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	3.5	4.3	3.1	3.1	3.2
Temperature (C)	influent	16	16	16	17	17
	aeration chamber					
	effluent	19	19	20	21	22
pH	influent	7.3	7.3	7.3	7.3	7.3
	aeration chamber					
	effluent	6.8	6.7	6.7	6.7	6.7
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	200	140	180	150	150
	effluent ($CBOD_5$)	7	4	5	6	4
Total Suspended Solids (mg/L)	influent	140	110	230	250	180
	aeration chamber					
	effluent	2	4	7	7	8
Volatile Suspended Solids (mg/L)	influent	130	100	210	230	170
	aeration chamber					
	effluent	3	4	7	6	7
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: June 20, 2004 Plant Code: Zabel

Weeks Into Test: 8

Weekend Dosing: Sunday 495 gallons Saturday 491 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		480	480	480	491	491
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	2.7	3.0	2.4	2.7	2.3
Temperature (C)	influent	17	18	18	18	17
	aeration chamber					
	effluent	20	21	21	20	21
pH	influent	7.4	7.2	7.4	7.1	7.3
	aeration chamber					
	effluent	6.8	6.6	6.8	6.7	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	170	200	120	280	230
	effluent ($CBOD_5$)	6	6	10	7	7
Total Suspended Solids (mg/L)	influent	140	180	140	200	230
	aeration chamber					
	effluent	6	9	11	10	9
Volatile Suspended Solids (mg/L)	influent	130	190	120	190	210
	aeration chamber					
	effluent	6	8	11	9	8
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: June 27, 2004 Plant Code: Zabel

Weeks Into Test: 9

Weekend Dosing: Sunday 491 gallons Saturday 495 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		490	490	490	495	495
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	3.2	2.6	3.1	2.6	2.0
Temperature (C)	influent	18	18	18	18	19
	aeration chamber					
	effluent	21	21	21	21	22
pH	influent	7.4	7.3	7.4	7.4	7.4
	aeration chamber					
	effluent	6.7	6.7	6.9	6.7	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	180	170	130	210	150
	effluent ($CBOD_5$)	9	9	8	12	14
Total Suspended Solids (mg/L)	influent	170	250	160	210	220
	aeration chamber					
	effluent	15	10	13	11	13
Volatile Suspended Solids (mg/L)	influent	150	220	140	180	200
	aeration chamber					
	effluent	14	9	12	10	13
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: July 4, 2004 Plant Code: Zabel

Weeks Into Test: 10

Weekend Dosing: Sunday 495 gallons Saturday 495 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		495	495	487	487	497
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	3.5	2.0	2.4	2.6	2.3
Temperature (C)	influent	18	18	19	18	18
	aeration chamber					
	effluent	22	22	22	22	22
pH	influent	7.5	7.3	7.5	7.3	7.4
	aeration chamber					
	effluent	6.8	6.9	6.8	6.8	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	140	160	150	170	190
	effluent ($CBOD_5$)	10	8	15	9	10
Total Suspended Solids (mg/L)	influent	160	150	160	200	150
	aeration chamber					
	effluent	13	7	11	10	12
Volatile Suspended Solids (mg/L)	influent	140	130	150	180	130
	aeration chamber					
	effluent	12	7	11	9	11
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: July 11, 2004 Plant Code: Zabel

Weeks Into Test: 11

Weekend Dosing: Sunday 495 gallons Saturday 498 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		495	495	495	498	498
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	1.5	2.0	1.9	2.4	2.2
Temperature (C)	influent	19	19	19	19	19
	aeration chamber					
	effluent	22	21	21	21	22
pH	influent	7.2	7.5	7.2	7.5	7.4
	aeration chamber					
	effluent	6.9	6.8	6.9	6.9	6.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	140	140	130	170	160
	effluent ($CBOD_5$)	8	9	8	11	13
Total Suspended Solids (mg/L)	influent	180	180	200	140	170
	aeration chamber					
	effluent	7	10	6	8	13
Volatile Suspended Solids (mg/L)	influent	170	160	180	130	150
	aeration chamber					
	effluent	7	9	6	8	12
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: July 18, 2004 Plant Code: Zabel

Weeks Into Test: 12

Weekend Dosing: Sunday 498 gallons Saturday 504 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		489	489	489	504	504
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	2.0	1.3	2.2	1.5	1.5
Temperature (C)	influent	20	20	20	21	20
	aeration chamber					
	effluent	23	23	23	24	24
pH	influent	7.4	7.4	7.4	7.3	7.3
	aeration chamber					
	effluent	6.9	6.8	6.9	6.8	7.1
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	220	160	96	160	220
	effluent ($CBOD_5$)	17	14	15	17	23
Total Suspended Solids (mg/L)	influent	210	220	160	240	270
	aeration chamber					
	effluent	28	11	14	13	27
Volatile Suspended Solids (mg/L)	influent	190	200	150	220	240
	aeration chamber					
	effluent	26	10	13	12	25
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: July 25, 2004 Plant Code: Zabel

Weeks Into Test: 13

Weekend Dosing: Sunday 504 gallons Saturday 477 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		510	510	510	477	477
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	2.0	2.3	1.7	1.9	3.2
Temperature (C)	influent	21	20	20	20	20
	aeration chamber					
	effluent	22	22	23	23	23
pH	influent	7.5	7.3	7.3	7.3	7.5
	aeration chamber					
	effluent	7.0	7.0	7.1	7.1	7.1
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	120	190	210	140	180
	effluent ($CBOD_5$)	30	13	15	14	22
Total Suspended Solids (mg/L)	influent	180	310	250	230	270
	aeration chamber					
	effluent	25	9	12	31	61
Volatile Suspended Solids (mg/L)	influent	170	280	230	210	250
	aeration chamber					
	effluent	25	9	11	32	57
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: August 1, 2004 Plant Code: Zabel

Weeks Into Test: 14

Weekend Dosing: Sunday 477 gallons Saturday 501 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		501	501	501	501	501
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	1.7	2.0	2.0	2.5	1.7
Temperature (C)	influent	21	22	21	21	21
	aeration chamber					
	effluent	26	26	24	23	22
pH	influent	7.3	7.4	7.3	7.5	7.4
	aeration chamber					
	effluent	7.0	7.1	7.0	6.9	7.0
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	160	96	96	110	150
	effluent ($CBOD_5$)	18	18	14	12	11
Total Suspended Solids (mg/L)	influent	170	240	230	190	220
	aeration chamber					
	effluent	12	29	20	9	11
Volatile Suspended Solids (mg/L)	influent	160	220	210	180	200
	aeration chamber					
	effluent	12	27	18	10	11
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: August 8, 2004 Plant Code: Zabel

Weeks Into Test: 15

Weekend Dosing: Sunday 501 gallons Saturday 504 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		504	504	504	504	504
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	3.4	2.6	2.5	2.8	2.1
Temperature (C)	influent	21	21	21	22	22
	aeration chamber					
	effluent	23	24	24	24	21
pH	influent	7.4	7.4	7.3	7.4	7.5
	aeration chamber					
	effluent	7.0	6.9	6.9	7.1	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	210	220	210	160	260
	effluent ($CBOD_5$)	12	2	9	8	13
Total Suspended Solids (mg/L)	influent	160	240	230	210	230
	aeration chamber					
	effluent	18	9	7	7	8
Volatile Suspended Solids (mg/L)	influent	150	220	210	190	210
	aeration chamber					
	effluent	17	8	6	6	8
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: August 15, 2004 Plant Code: Zabel

Weeks Into Test: 16

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	2.2	2.3	1.9	2.8	2.4
Temperature (C)	influent	22	21	21	21	22
	aeration chamber					
	effluent	24	23	22	24	24
pH	influent	7.4	7.4	7.7	7.3	7.4
	aeration chamber					
	effluent	6.9	6.9	6.9	6.8	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	170	100	75	130	220
	effluent ($CBOD_5$)	12	10	7	8	11
Total Suspended Solids (mg/L)	influent	210	220	180	210	320
	aeration chamber					
	effluent	8	14	13	15	8
Volatile Suspended Solids (mg/L)	influent	190	190	160	190	280
	aeration chamber					
	effluent	8	13	12	13	7
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: August 22, 2004 Plant Code: Zabel

Weeks Into Test: 17

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	489	489	496	496	496
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent		1.4					
Temperature (C)	influent		21					
	aeration chamber							
	effluent		24					
pH	influent		7.3					
	aeration chamber							
	effluent		6.8					
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)		170					
	effluent ($CBOD_5$)		9					
Total Suspended Solids (mg/L)	influent		220					
	aeration chamber							
	effluent		11					
Volatile Suspended Solids (mg/L)	influent		200					
	aeration chamber							
	effluent		10					
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Wash day stress 8/23 through 8/27.

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Plant Effluent

Week Beginning: August 29, 2004 Plant Code: Zabel

Weeks Into Test: 18

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		496	504	504	504	496	496	499.5
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent		2.0	2.5	2.5	2.5	2.3	2.4
Temperature (C)	influent		22	23	22	22	21	22
	aeration chamber							
	effluent		26	26	24	24	23	24
pH	influent		7.0	7.4	7.4	7.4	7.6	7.5
	aeration chamber							
	effluent		6.9	6.9	7.0	6.9	6.9	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)		150	91	150	120	130	210
	effluent ($CBOD_5$)		7	7	6	7	7	9
Total Suspended Solids (mg/L)	influent		280	180	290	250	160	120
	aeration chamber							
	effluent		7	6	6	8	6	8
Volatile Suspended Solids (mg/L)	influent		260	160	260	240	140	110
	aeration chamber							
	effluent		7	6	5	8	5	7
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Working Parent Stress started on 9/4.

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Plant Effluent

Week Beginning: September 5, 2004 Plant Code: Zabel

Weeks Into Test: 19

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		496	500	500	500	496	496	500
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent							2.2
Temperature (C)	influent							22
	aeration chamber							
	effluent							24
pH	influent							7.4
	aeration chamber							
	effluent							7.1
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)							210
	effluent ($CBOD_5$)							13
Total Suspended Solids (mg/L)	influent							170
	aeration chamber							
	effluent							27
Volatile Suspended Solids (mg/L)	influent							150
	aeration chamber							
	effluent							29
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Working Parent Stress completed on 9/8.

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Plant Effluent

Week Beginning: September 12, 2004 Plant Code: Zabel

Weeks Into Test: 20

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		499.5	500	500	500	500	0	302
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	5.1	2.8	3.7	4.8	3.4		
Temperature (C)	influent	22	22	21	22	22		
	aeration chamber							
	effluent	22	23	22	21	22		
pH	influent	7.5	6.7	7.4	7.4	7.4		
	aeration chamber							
	effluent	7.3	7.0	7.0	6.9	6.9		
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	150	300	100	150	170		
	effluent ($CBOD_5$)	21	9	7	9	10		
Total Suspended Solids (mg/L)	influent	140	150	200	170	140		
	aeration chamber							
	effluent	d	13	26	34	28		
Volatile Suspended Solids (mg/L)	influent	120	130	180	170	150		
	aeration chamber							
	effluent	d	d	d	21	30		
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Power/Equipment Failure Stress 9/16 through 9/18.
Effluent TSS/VSS on 9/12 was not analyzed properly due to laboratory error.
Effluent VSS was not measured on 9/13 and 9/14 due to laboratory error.

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Plant Effluent

Week Beginning: September 19, 2004 Plant Code: Zabel

Weeks Into Test: 21

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent				4.2	4.5	5.0	5.0
Temperature (C)	influent				21	22	21	21
	aeration chamber							
	effluent				22	22	19	20
pH	influent				7.5	7.4	7.5	7.5
	aeration chamber							
	effluent				6.9	6.9	6.8	6.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)				150	83	81	120
	effluent ($CBOD_5$)				20	12	10	6
Total Suspended Solids (mg/L)	influent				140	96	160	160
	aeration chamber							
	effluent				52	22	18	21
Volatile Suspended Solids (mg/L)	influent				110	93	150	140
	aeration chamber							
	effluent				46	21	16	20
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: September 26, 2004 Plant Code: Zabel

Weeks Into Test: 22

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		302	0	0	0	0	0	0
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	5.3						
Temperature (C)	influent	21						
	aeration chamber							
	effluent	21						
pH	influent	7.6						
	aeration chamber							
	effluent	6.8						
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	130						
	effluent ($CBOD_5$)	10						
Total Suspended Solids (mg/L)	influent	140						
	aeration chamber							
	effluent	19						
Volatile Suspended Solids (mg/L)	influent	130						
	aeration chamber							
	effluent	17						
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Vacation Stress started on 9/26.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 3, 2004 Plant Code: Zabel

Weeks Into Test: 23

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		0	0	302	502	502	500	500
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent						6.4	6.5
Temperature (C)	influent						19	20
	aeration chamber							
	effluent						16	18
pH	influent						7.6	7.5
	aeration chamber							
	effluent						6.8	6.6
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)						180	150
	effluent ($CBOD_5$)						19	18
Total Suspended Solids (mg/L)	influent						160	190
	aeration chamber							
	effluent						35	25
Volatile Suspended Solids (mg/L)	influent						150	170
	aeration chamber							
	effluent						32	24
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Vacation Stress completed on 10/5.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 10, 2004 Plant Code: Zabel

Weeks Into Test: 24

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	500	495
Dissolved Oxygen (mg/L)	aeration chamber							
	effluent	6.1	6.6	5.2	5.5	4.5	5.0	
Temperature (C)	influent	20	17	16	19	19	19	
	aeration chamber							
	effluent	18	19	19	16	16	18	
pH	influent	7.5	7.4	7.3	7.4	7.4	7.5	
	aeration chamber							
	effluent	6.6	6.6	6.6	6.7	6.7	6.7	
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	a	200	400	120	160	160	
	effluent ($CBOD_5$)	a	13	12	10	6	11	
Total Suspended Solids (mg/L)	influent	180	170	210	270	210	220	
	aeration chamber							
	effluent	27	20	19	17	17	20	
Volatile Suspended Solids (mg/L)	influent	160	150	180	240	190	200	
	aeration chamber							
	effluent	25	19	17	15	16	19	
45 Minute Settleable Solids (mL/L)	aeration chamber							

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: No BOD data on 10/10 due to laboratory error.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 17, 2004 Plant Code: Zabel

Weeks Into Test: 25

Weekend Dosing: Sunday 495 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	4.7	5.9	6.0	5.2	6.6
Temperature (C)	influent	18	18	18	18	18
	aeration chamber					
	effluent	16	15	16	15	15
pH	influent	7.4	7.3	7.3	7.4	7.5
	aeration chamber					
	effluent	6.5	6.6	6.6	6.6	6.5
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	170	110	160	170	290
	effluent ($CBOD_5$)	13	9	9	10	8
Total Suspended Solids (mg/L)	influent	110	110	190	200	220
	aeration chamber					
	effluent	23	11	15	17	11
Volatile Suspended Solids (mg/L)	influent	100	98	170	180	200
	aeration chamber					
	effluent	21	11	14	15	10
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 24, 2004 Plant Code: Zabel

Weeks Into Test: 26

Weekend Dosing: Sunday 500 gallons Saturday 498 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		502	502	502	498	498
Dissolved Oxygen (mg/L)	aeration chamber					
	effluent	5.1	6.6	5.1	5.8	5.1
Temperature (C)	influent	18	18	18	17	18
	aeration chamber					
	effluent	14	14	14	14	13
pH	influent	7.4	7.5	7.4	7.4	7.2
	aeration chamber					
	effluent	6.3	6.5	6.4	6.5	6.6
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	200	140	150	120	230
	effluent ($CBOD_5$)	9	7	6	6	5
Total Suspended Solids (mg/L)	influent	140	210	240	210	220
	aeration chamber					
	effluent	12	16	12	14	12
Volatile Suspended Solids (mg/L)	influent	130	190	220	190	200
	aeration chamber					
	effluent	12	15	11	13	12
45 Minute Settleable Solids (mL/L)	aeration chamber					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

APPENDIX D

ADDITIONAL TEST RESULTS

Date	Influent	Effluent	Influent	Effluent	Weeks into Test
	BOD	CBOD	TSS		
03/01/05	140	22	94	9	1
05/02/05	300	<2	400	15	10
05/30/05	180	<2	350	6	14
06/01/05	240	<2	200	4	14
06/03/05	240	<2	160	2	14
06/06/05	90	<2	170	<2	15
06/08/05	91	<2	100	<2	15
06/10/05	200	<2	260	<2	15
06/20/05	160	<2	160	<2	17
07/13/05	270	<2	330	<2	20
07/14/05	240	<2	320	<2	20

APPENDIX E

NITROGEN RESULTS

Date	Ammonia Nitrogen (mg/L)		Total Kjeldahl Nitrogen (mg/L)		Nitrate Nitrogen (mg/L)		Nitrite Nitrogen (mg/L)		Total Nitrogen	
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent
4/28/04	23	14	42	17	-	3	-	1	42	21
5/5/04	20	3.3	39	2.9	-	26	-	2	39	31
5/12/04	24	1	40	1.8	-	14	-	0.53	40	16
5/19/04	22	0.7	40	2.1	-	10	-	<0.05	40	12
5/26/04	17	0.7	27	2.4	-	10	-	<0.05	27	12
6/2/04	19	0.3	30	0.7	-	12	-	<0.05	30	13
6/9/04	20	0.8	34	2.1	-	14	-	<0.05	34	16
6/16/04	26	0.6	43	1.2	-	14	-	0.3	43	16
6/23/04	28	2.5	40	5.1	-	7.1	-	<0.05	40	12
6/30/04	26	4.5	48	7.8	-	4.8	-	<0.05	48	13
7/7/04	21	3.8	32	6.8	-	2.6	-	<0.05	32	9
7/14/04	23	8.2	35	5.3	-	<0.1	-	<0.05	35	5
7/21/04	35	12	43	15	-	2	-	<0.05	43	17
7/28/04	29	13	43	18	-	1.1	-	<0.05	43	19
8/4/04	25	9.8	44	15	-	<0.1	-	<0.05	44	15
8/11/04	25	5.4	41	7.9	-	3	-	<0.05	41	11
8/18/04	27	6	46	10	-	3.6	-	<0.05	46	14
8/30/04	17	4.2	33	6.8	-	3.8	-	<0.05	33	11
9/1/04	19	4.3	37	6.7	-	4.4	-	<0.05	37	11

Date	Ammonia Nitrogen (mg/L)		Total Kjeldahl Nitrogen (mg/L)		Nitrate Nitrogen (mg/L)		Nitrite Nitrogen (mg/L)		Total Nitrogen	
	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent	Influent	Effluent
9/15/04	22	1.4	33	4.5	-	7.6	-	<0.05	33	12
9/22/04	22	2	36	7.4	-	14	-	0.73	36	22
10/8/04	25	3	36	5.5	-	26	-	<0.05	36	32
10/13/04	31	0.3	40	2	-	23	-	<0.05	40	25
10/20/04	20	0.4	33	2.4	-	29	-	0.16	33	32
10/27/04	24	0.3	38	<0.5	-	26	-	<0.02	38	27

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APPENDIX F

OWNER'S MANUAL

Quanics

Engineering Water Solutions™

P.O. BOX 1520
6244 OLD LAGRANGE ROAD
CRESTWOOD, KY 40014
www.quanics.net

PHONE: (502) 992-8200
1-877-QUANICS
FAX: (502) 992-8201

CLASS I / NSF STD 40
WASTEWATER TREATMENT SYSTEM

Self Contained Advanced Treatment System AeroCell™

Bio-COIR™ Naturally Treated Wastewater

HOMEOWNERS MANUAL

FIXED FILM MEDIA
WASTEWATER TREATMENT SYSTEMS

Revised December 2005

INTRODUCTION

QUANICS™ is committed to becoming the best water solutions problem solver in the world. We promise to provide complete engineered water solutions using the latest technology and best products. We will provide the best technical assistance and customer service available and we will always deliver more than we promise.

In our quest to serve our market, we do not view a technology as the one and only option, but rather look to develop a wide variety of technologies that the engineer and/or end user can tailor to their individual application. Along this line, we are proud to introduce two NSF Certified treatment systems, SCAT® **AeroCell®** and SCAT **Bio-COIR**™.

Both systems operate as fixed-film media filters to treat wastewater. The patented SCAT delivery system is the same for each system only the media is different. Each media type has its own unique properties and both have been tested and listed under NSF International Standard 40 Class 1 requirements. Both systems have also been demonstrated to significantly reduce total nitrogen. The following manual will explain the differences and similarities of each system. Before reading this manual determine which system you are currently utilizing by examining the data plate attached to the system lid. Each system will be identified by name "**Bio-COIR**" or "**AeroCell**".

This manual covers the following model numbers.

AeroCell Model #'s	Bio-COIR Model #'s
ATS-SCAT-8-AC-C500	ATS-SCAT-8-BC-C500
ATS-SCAT-86-AC-C750	ATS-SCAT-86-BC-C750
ATS-SCAT-88-AC-C1000	ATS-SCAT-88-BC-C1000
ATS-SCAT-886-AC-C1250	ATS-SCAT-886-BC-C1250
ATS-SCAT-888-AC-C1500	ATS-SCAT-888-BC-C1500

The dealer who installs your wastewater treatment system is responsible for completing and submitting the warranty sheet found in this manual to activate your warranty.

We are eager to assist you with any questions or problems. Please contact **QUANICS** at 1-877-QUANICS to request assistance.

PROCESS DESCRIPTION

The **QUANICS AeroCell & Bio-COIR** are individual wastewater treatment systems utilizing fixed film media. The module(s) consist of a fiberglass tank(s) containing a pre-determined amount of media. Effluent is sprayed over the media utilizing specialized spay nozzles. This patented delivery system evenly distributes wastewater to achieve the desired treatment levels.

The **AeroCell** utilizes open cell foam media. The foam has a high porosity, large surface area and ease of microbial attachment that allows for loading rates up to ten times that of sand. Open cell foam has a fifteen year track

record of treating wastewater to the highest quality treatment levels. The application rates for the **AeroCell®** system have been carefully selected to provide optimal treatment and performance in a long lasting media.

The **Bio-COIR™** utilizes a patent pending **Bio-COIR** media for treatment. The **Bio-COIR** media is composed of fibers that constitutes the thick mesocarp, or husk, of the coconut fruit. The long fibers are used for ropes, door mats etc, leaving pith tissue and short to medium length fibers as a waste which has accumulated in heaps in many third world countries. The short to medium length fibers used in **Bio-COIR** are a lingocellulosic material. The high lignin content of these fibers results in a more durable material than other natural medias. The high lignin content of 45.84% also results in a slower degradation of the media and assures that excellent water/air ratio is maintained over a longer period of time.

In both **AeroCell & Bio-COIR** systems, pretreatment of the wastewater occurs through the use of a septic tank equipped with a Zabel® A300 series effluent filter on the outlet. The pretreated wastewater then moves into a dosing tank where an effluent pump doses the wastewater to the treatment module(s). The dosing of effluent occurs in short frequent doses over a 24-hour period utilizing a timed dosed control panel. Effluent is sprayed over the media through the use of specially designed helical spray nozzles that provide uniform distribution of the effluent over the entire surface area.

Once sprayed, the effluent moves via gravity down though the media where it is allowed to come into contact with beneficial microorganisms that serve to treat the effluent to NSF International Standard 40 Class 1 requirements. After passing through the full depth of media the effluent travels to the **QUANICS™** ATS-GRD-100/80/20 recirculation device. The recirculation device splits the flow and discharges 80% back into the treatment stream and 20% to the final disposal point. In periods of low flow, 100% of the treated effluent discharges back into the treatment stream.

OPERATING INSTRUCTIONS

The **AeroCell & Bio-COIR** systems have been designed and built to provide efficient, dependable and reliable service. However, as with any individual wastewater treatment system, routine periodic service is required. When proper preventive maintenance is performed, these systems will operate at designed performance levels giving years of satisfactory treatment of domestic wastewater.

The local dealer from whom you purchased your **AeroCell** or **Bio-COIR** system will perform all routine inspections for the first 2 years from the original date of installation. At the time of inspection, the system will be checked for proper operation. If a problem exists, service will be performed at no charge to the owner unless the required maintenance is not warranty related. At the end of the 2 year initial service period, your local dealer will make available a continuing service policy. Call **QUANICS** at 1-877-**QUANICS** for more information.

The treatment system electrical controls are located within the control panel. The control panel enclosure is equipped with an alarm beacon and an audible horn alarm. See "System Troubleshooting Guide" in this manual for

instructions on what to do if the alarm beacon or horn comes on. After a power failure, if an alarm remains on for more than 30 minutes you should call the local dealer immediately.

Your **AeroCell**® or **Bio-COIR**™ system will handle all domestic wastewater from your home. By the term wastewater we are referring to rapidly biodegradable material. To keep maintenance at a minimum level and to prevent the system from malfunctioning, the following guidelines need to be followed:

* Since aerobic bacteria are responsible for treating the wastewater, inorganic or non rapidly biodegradable materials should not be put into the system. Examples of improper items are: plastic products, rubber products, sanitary napkins or tampons, washcloths, cigarette butts, coffee grounds, eggshells, matches, or other non-biodegradable objects.
* Do not dispose of cooking grease or large amounts of oil into system; instead pour it into a container and dispose of it properly.
* To minimize pump-out frequency, limit use of garbage disposals.
* Lint from lint catchers, hair, etc., should be disposed in the trash and not washed down the drain.
* Water softener backwash should not be routed through the system. Another source of disposal should be used.
* Diapers can be rinsed out in the toilet; however, do not flush cloth or disposable diapers down the toilet.
* Large amounts of harsh chemicals, high-sudsing detergents, disinfectants or any substance that kills bacteria must not be discharged into the system.
* The system will not perform to its fullest capabilities if volumetric overload is allowed to occur. This occurs whenever excessive water, above the designed flow rate, is allowed into the system. Excessive water use or leaking plumbing fixtures may cause this condition.

Other than for the mechanical and structural workings of the system itself, **QUANICS**™ is not responsible for the in-field operation of a system. The proper operation of this or any other individual wastewater system depends upon proper organic and hydraulic loading of the system. We cannot control the loading and thereby cannot control the amount of harmful substances that may be discharged into the system. Only the users of a system can control what enters the unit.

MAINTENANCE SCHEDULE

Your **AeroCell** or **Bio-COIR** system includes an initial service policy stating that **QUANICS** or Certified SERVICE PROVIDER shall inspect the **AeroCell** or **Bio-COIR** system once every six (6) months for a period of two (2) years. An extended service policy with terms comparable to the initial policy, will be available for purchase by the owner from **QUANICS** or the Certified SERVICE PROVIDER.

If any problem is found during the time of initial service policy and can not be remedied during inspection, the homeowner will be notified in writing of the situation along with a date of estimated completion.

Normal maintenance on your **AeroCell** or **Bio-COIR** system will include:

1. Effluent quality inspection: visual assessment of color, turbidity, and scum overflows and an olfactory assessment of odor.
2. Maintaining effluent filter
3. Maintaining filtered pump vault
4. Proper pump operation
5. Inspecting and testing system alarms
6. Check spray nozzles for debris
7. Inspect septic/dosing tanks for pump out

Note 1: Replacement parts can be obtained from your local dealer or **QUANICS**.

Note 2: Pumping the septic/dosing tanks is usually necessary every 2 to 6 years; however, there is no set time because loadings vary from household to household. Access to the tank(s) is accomplished through the normal 26-inch access opening, which is at surface grade. The tank(s) should be washed and cleaned while it is being pumped. The waste from the system must be disposed of in compliance with all federal, state, and local laws.

Warning - Caution must be used when pumping water from any tank. Hydraulic displacement and tank flotation may occur whenever water and solids are removed from the tank when high groundwater conditions exist. Any source of water in the soil around the system installation could cause the tank to float. Water sources may include rainfall, springs, creeks, bayous, rivers, lakes, and coastal areas. Proper precautions are therefore required to prevent tank flotation due to hydraulic displacement.

These precautions include, but are not limited to, the following:

* System locations - choose a site that will minimize possible groundwater saturation. Consider seasonal water table and soil conditions in the area of installation. Do not locate the system in a low spot in the ground where water tends to pool or at the edge of any natural body of water. If such a location cannot be avoided, call **QUANICS**™ (1-877-**QUANICS**) for technical advice.
* It is recommended that you pump the tank during dry seasons only. However, if tank must be pumped during the wet season, watch for upward movement of the tank while pumping is being done. If upward movement is detected during pumping, immediately stop pumping water out of the tank and refill the tank to stop flotation. Each site must be evaluated on a case-by-case basis to determine the best time to remove water from the tank and prevent flotation.

COMPLIANCE WITH LAW

All permits and approvals from the local regulatory body should first be obtained before the treatment system is installed. All state and federal laws should be obeyed in areas that do not have local control over environmental activities.

It is important to remember that each state has independent regulations and guidelines for the installation of this treatment system and any auxiliary equipment that may accompany the system. You are responsible for installing this system and associated ancillary items in accordance with all regulations and guidelines as they are issued in your respective state. If such items as pretreatment tanks, storage or equalization tanks, chlorination facilities,

pump tanks, etc. are required by law, then it is the intent of this company to comply with the letter of the law.

QUANICS through its years of experience recognizes the advantages of every component of the wastewater treatment system. Because of this experience we can recommend to you those parts of a system that are beneficial to the overall system and those that are also compliant with the laws in your state. Please contact us for assistance or inquiries at 1-877-**QUANICS**.

START-UP PROCEDURE

Once all installation connections are completed, remove the four spray nozzles by un-clamping them from the discharge assembly. Turn on the pump to flush any debris from inside the discharge assembly. After flushing, turn off the pump and reinstall by locating the nozzle over the discharge hole and sliding the clamp over the top of the discharge assembly. Turn the pump back on to pressurize the system to check for leaks and set the pressure gauge mounted on the nozzle discharge assembly to 5-8 psi using the ball valve attached to the assembly. Place the control panel Pump On switch in the auto position.

If the system is to be used intermittently or extended periods of non use are anticipated, no special procedures are required. The system is equipped with a timer, floats, and recirculation device that will keep the system operational. If any mechanical or electrical problems are experienced when attempting startup, the owner should call the dealer for service and assistance.

SYSTEM TROUBLESHOOTING GUIDE

The **AeroCell® & Bio-COIR™** systems have proven to be very effective and reliable in the treatment of domestic wastewater. The problems outlined here occur only in a very small percent of total installations. They can all be corrected and most can be prevented.

When calling for service, describe the problem in detail and determine the system age and service history from your records. You will need to provide the service technician with the model numbers of the treatment system. These are found on data plates on the lid of the treatment module. Service will be provided by **QUANICS** or Certified SERVICE PROVIDER within 48 hours of request.

If routine servicing does not solve the problem, additional steps/maintenance, repair and/or replacement of defective parts may be required. Your service representative should perform these system inspections to assure adequate and proper operation of the wastewater treatment system.

1. Proper Installation Check

Inspect system to verify that the treatment system is installed properly and is not damaged. The system should be level and internal components should be in their proper place and working order. High water level in the system can adversely affect performance.

2. Proper Treatment Check

After determining that the system is installed properly and is not damaged,

inspect the operation and maintenance status to determine if the system if performing correctly.

To do this a technician takes a grab sample of the effluent. This is tested for Total Suspended Solids (TSS) and Biochemical Oxygen Demand (BOD). The results should be within the performance guidelines outlined by NSF Standard 40 for Class 1 effluent. Adjustment and repairs to the system will be made as required by following factory recommended guidelines. Corrections to the system by a qualified service technician can keep the system operating properly.

3. Alarm System Check

The alarm supplied with this system provides the owner with a secure, reliable, dependable, and economical means of notification for high water levels. This alarm needs to be inspected and tested during each system operation and maintenance site visit.

The outside face of the control panel enclosure is equipped with visible and audible alarms to alert you of high-level conditions. If the alarms are activated on the control panel, a service technician should be called to determine the cause and make corrections. To silence the horn alarm while waiting for the service technician to arrive, locate the switch on outside of face of the control panel enclosure labeled "normal/silence" and push it into the "silence" (right) position. The alarm beacon will remain illuminated until alarm condition is solved.

If you exceed the system's designed daily flow rate (due to having house guests, doing multiple loads of laundry, etc.) the storage capacity of the pump/holding tank can be exceeded, activating audible and visible alarms. This system is equipped with a timer override function that should allow the system to run longer and alleviate any alarm condition. If the alarms are activated, silence the horn alarm by locating the switch on outside face of the control panel enclosure labeled "normal/silence" and pushing it to the "silence" (right) position. The alarm beacon will remain illuminated until alarm condition is solved. If excess water use continues, this problem could occur repeatedly.

4. Check to Determine Other Tanks Need Pumping

High solids level in other tanks can cause improper functioning of the treatment system. Inspection and service, as needed, should be performed a minimum of every 6 months.

SAFETY

As raw wastewater may and usually does contain some level of unsafe microorganisms, proper respect and care must be given to safety. Whenever you come into contact with raw sewage, do not fear the contact, but do take proper precautions to avoid potential danger.

Follow these simple safety precautions whenever exposed to wastewater:

* Wear disposable rubber gloves when handling wastewater contaminated items.
* Always wash with soap and water after handling wastewater contaminated items. The use of good bactericide soap is strongly recommended.
* Always dispose of scum, rags, trash, debris, or soiled material in a proper

waste container.

* If a wastewater spill or leak occurs in a yard, flush area with plenty of clean water and disinfect. If a spill or leak occurs in the house, clean with a dilute solution of bleach.
* Protect any injury, wound, open cut, etc. from exposure to wastewater. Prevention is always better and easier than curing a disease.
* If an illness or disease is suspected to have come from exposure to sewage, get proper medical attention immediately. There are some serious diseases that could be transmitted by contact with raw sewage - take the proper precautions and be safe!

LIMITED WARRANTY

QUANICS™, herein identified as **QUANICS**, warrants each **AeroCell® & Bio-COIR**™ wastewater treatment system to be free from defects in material and workmanship for a period of two (2) years from the date of installation by an authorized Dealer for the end user when properly registered with **QUANICS**. The sole obligation under this warranty is as follows: **QUANICS** shall fulfill this warranty by replacing or exchanging any component part, FOB factory that in **QUANICS'** judgment shows evidence of defects, provided said component part has been paid for and is returned through an authorized Dealer, transportation prepaid. The Limited Warranty does not make any provision for an informal dispute settlement arrangement.

The warranty does not cover **QUANICS** wastewater treatment systems and related components that have flooded, by external means, or that have been disassembled by unauthorized person, improperly installed, subjected to external damage or damage due to altered or improper wiring or overload protection.

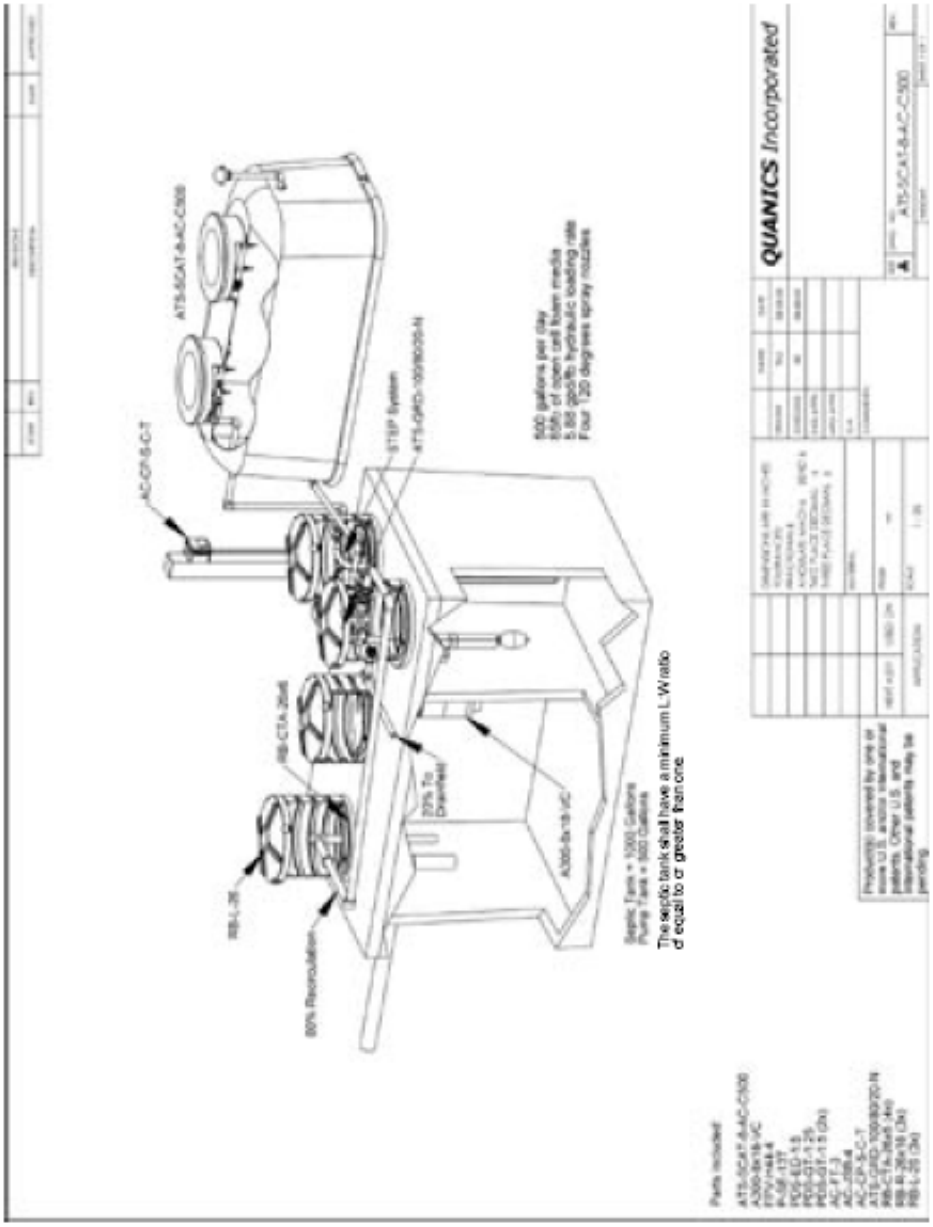
Recommendations for special applications will be based upon the best available expertise of **QUANICS** and published industry information. Such recommendations do not constitute a warranty of satisfactory performance.

No warranty is made as to the field performance of any systems. The Limited Warranty applies to the systems and does not include any portion of the plumbing, drainage, house wiring or installation of the treatment systems. Accessories supplied by **QUANICS**, but manufactured by others, are warranted for a period of two (2) years. In no event shall **QUANICS** be responsible for delay or damages of any kind or character resulting from, or caused directly or indirectly by, defective components or materials manufactured by others.

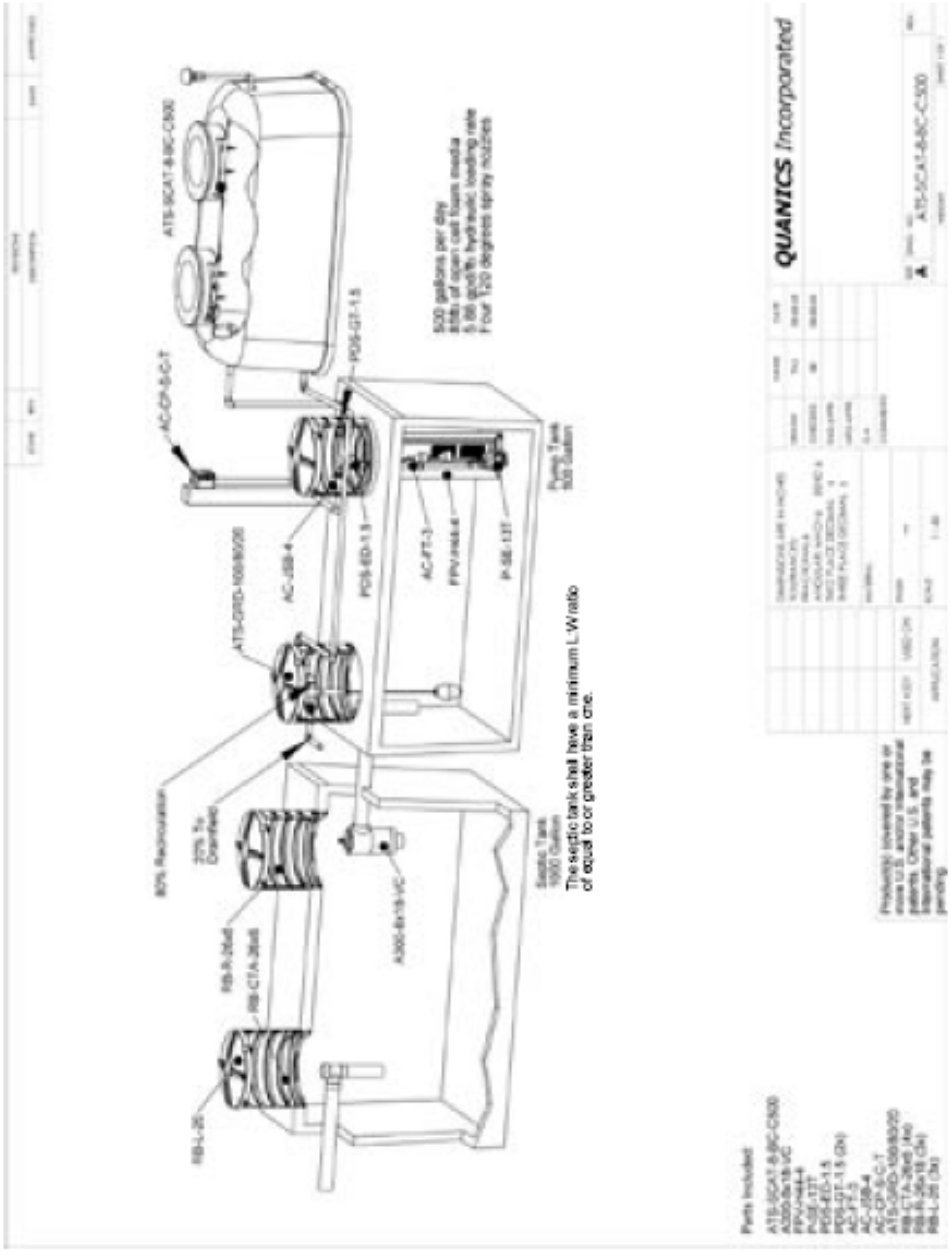
The Limited Warranty extends to the end user of this product. The end user is defined as the purchaser who first has the system installed, or in the case of the system designed for non-permanent installation, the purchaser who first uses the system. It is the end user's obligation to make known to any other consumer the terms and conditions of this Limited Warranty.

QUANICS reserves the right to revise, change, or modify the construction and design of the **QUANICS** aerobic wastewater treatment system, or any component part or parts thereof, without incurring any obligations to make such changes or modifications in previously sold equipment. **QUANICS** also reserves the right, in making replacements of component parts under this warranty, to furnish a component part, which, in its judgment, is equivalent to the part replaced. This warranty is a Limited Warranty. No claim of any nature shall be made against **QUANICS** unless and until the end user, or their legal representative, notifies **QUANICS**, in writing of the defect complained of and delivers the product and /or defective part(s), freight prepaid, to **QUANICS** or an authorized **QUANICS** dealer.

500 GPD AeroCell® System
www.quanics.net/autocad.htm



500 GPD Bio-COIR™ System
www.quanics.net/autocad.htm



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Quanics
Engineering Water Solutions
P.O. Box 1520,
Old LaGrange Road
Crestwood, KY 40014
(502) 992-8200 • (877) QUANICS
Fax (502) 992-8201
www.quanics.net

WARRANTY FORM

AeroCell
Bio-COIR

Owner/User	
Physical Address	
City/County/ State/ZIP	
Mailing Address (if different)	
Telephone	
Best time to be reached	
Dealer/Installer	
Address	
City/County/ State/ZIP	
Telephone	
Distributor (if applicable)	
Service Will Be Performed BY:	
Name	
Address	
City/County/ State/ZIP	
Telephone	

Type of Installation: Residential ☐ Commercial ☐

Number of residents or occupants _____ Garbage Disposal? Yes ☐ NO ☐ Date Installed _____

Model # _____ Serial # _____

Control Panel Model # _____ Serial # _____

Effluent Disposal Method & Equipment Used _____

Regulatory Agency: _____

Regulatory Representative's Name _____

Address _____

City/County/ State/ZIP _____

Telephone (_____) _____ Cell phone (_____) _____

I attest this information to be true and accurate.

Dealer's Signature _____

Witness _____ Date _____

Quanics

Engineering **Water** Solutions ™

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6244 OLD LAGRANGE ROAD
CRESTWOOD, KY 40014
www.**quanics**.net

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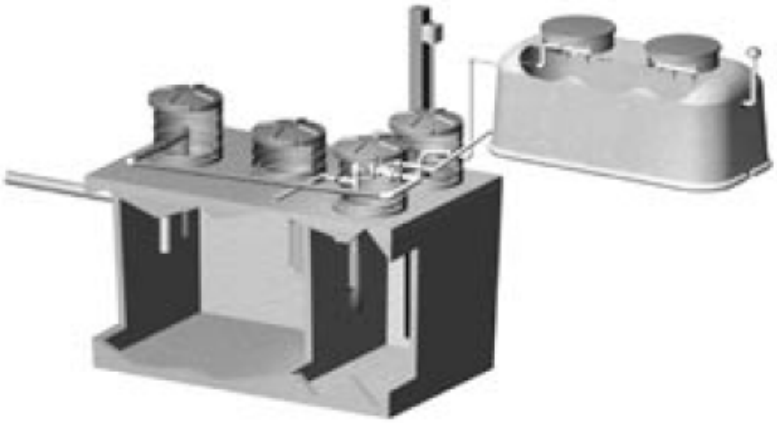

Treatment system service provider:

122905-296