UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX

IN THE MATTER OF Robert Johnson; Johnson Resort Properties, Inc. Kailua-Kona, Hawaii Proceedings under Section 1423(c) of the Safe Drinking Water Act, 42 U.S.C. § 300h-2(c)	DOCKET NO. UIC-09-2010-0002 CONSENT AGREEMENT AND [PROPOSED] FINAL ORDER

CONSENT AGREEMENT

I. STATUTORY AUTHORITY

This Consent Agreement and Final Order ("CA/FO") is issued under the authorities vested in the Administrator of the United States Environmental Protection Agency ("EPA") by Sections 1423(c) and 1445(a) of the Safe Drinking Water Act (the "SDWA" or the "Act"), 42 U.S.C. §§ 300h-2(c), 300j-4(a). The Administrator has delegated these authorities to the Regional Administrator of EPA Region IX. The Regional Administrator in turn has delegated these authorities to the Director of the Water Division, EPA Region IX. In accordance with these authorities, and with the "Consolidated Rules of Practice Governing the Administrative Assessment of Civil Penalties and the Revocation/Termination or Suspension of Permits," 40 C.F.R. Part 22 (hereinafter "Consolidated Rules of Practice"), the Director of the Water Division, EPA Region IX, hereby issues, and Robert Johnson and Johnson Resort Properties, Inc. ("Respondents") hereby agree to the issuance of, this CA/FO.

Respondents and EPA (the "Parties") agree that settlement of the matters at issue without litigation will save time and resources, is in the public interest, is consistent with the provisions and objectives of the Act and applicable regulations, and that entry of this CA/FO is the most appropriate means of resolving such matters.

II. STIPULATIONS AND FINDINGS

Respondents stipulate and EPA finds as follows:

1. Pursuant to Part C of the Act, 42 U.S.C. §§ 300h to 300h-8, EPA has promulgated

regulations establishing minimum requirements for Underground Injection Control ("UIC") programs, to prevent underground injection which endangers drinking water sources. These regulations are set forth at 40 C.F.R. Part 144.

2. "Underground injection" means the subsurface emplacement of fluids by well injection. 42 U.S.C. § 300h(d)(1); 40 C.F.R. § 144.3.

3. Pursuant to 40 C.F.R. § 144.88, existing large capacity cesspools are required to be closed no later than April 5, 2005. "Large capacity cesspools" include "multiple dwelling, community or regional cesspools, or other devices that receive sanitary wastes, containing human excreta, which have an open bottom and sometimes perforated sides." 40 C.F.R. § 144.81(2). Large capacity cesspools do not include single family residential cesspools or non-residential cesspools which receive solely sanitary waste and have the capacity to serve fewer than 20 persons per day. Id. A "cesspool," is a "drywell," which in turn is a "well," as those terms are defined in 40 C.F.R. § 144.3

4. Pursuant to Section 1422(c) of the Act, 42 U.S.C. § 300h-1(c), and 40 C.F.R. Part 147 Subpart M, § 147.601, EPA administers the UIC program in the State of Hawaii. This UIC program consists of the program requirements of 40 C.F.R. Parts 124, 144, 146, 147 (Subpart M), and 148.

5. Pursuant to Section 1423(c)(1) of the Act, 42 U.S.C. § 300h-2(c)(1), and 40 C.F.R. § 19.4, EPA may issue an order either assessing an administrative civil penalty of not more than $11,000 for each day of each violation occurring before January 12, 2009 and not more than $16,000 for each day of each violation occurring after January 12, 2009, up to a maximum penalty of $177,500, or requiring compliance, or both, against any person who violates the Act or any requirement of an applicable UIC program. In assessing a penalty for such violations, EPA must take into account: (1) the seriousness of the violations; (2) the economic benefit resulting from the violations; (3) the history of such violations; (4) any good faith efforts to comply with the applicable requirements; (5) the economic impact of the penalty on the violator; and (6) such other matters as justice may require. 42 U.S.C. § 300h-2(c)(4)(B).

6. Pursuant to Section 1445(a)(1)(A) of the Act, 42 U.S.C. § 300j-4(a), EPA may require any person who is subject to the requirements of the Act to submit information relating to such person's compliance with the requirements of the Act. 42 U.S.C. § 300j-4(a)(1)(A).

7. Robert Johnson is an individual, and Johnson Resort Properties, Inc. is a corporation. Thus, both Respondents qualify as a "person" within the meaning of Section 1401(12) of the SDWA, 42 U.S.C. § 300f(12), and 40 C.F.R. § 144.3.

8. Respondents own and operate three (3) large capacity cesspools at 78-6671 and 78-6665 Alii Drive, Kailua-Kona, Hawaii.

9. The large capacity cesspools referred to in paragraph 8 were not closed by April 5, 2005, as required by 40 C.F.R. § 144.88.

10. Respondents have initiated steps to close the large capacity cesspools and intend to complete closure of all large capacity cesspools referred to in paragraph 8 by September 15, 2010.

11. Based on all the foregoing, Respondents have violated the requirement that all large capacity cesspools be closed by April 5, 2005.

III. PROPOSED ORDER

Respondents and EPA agree to issuance of the following, which, upon issuance of the Final Order, shall become effective:

A. Supplemental Environmental Project ("SEP")

12. Prior to closure of the large capacity cesspools and installation of an individual wastewater treatment plant ("WWTP"), Respondents shall submit a completed application for conversion of the three large capacity cesspools referred to in paragraph 8 to the Hawai'i Department of Health's ("DOH") Safe Drinking Water Branch. The design plans submitted to DOH shall provide for the same or similar treatment design of the WWTP represented by the Preliminary Engineering Design Report from WSI International, LLC dated July 21, 2009, which Respondents previously submitted to EPA (see Attachment B). The proposed wastewater treatment plant will function to remove organic matter (BOD_5), total suspended solids (TSS), total nitrogen (TN), and ammonia, resulting in an effluent which meets R-2 reclaimed water, as defined by industry standards.

13. Respondents shall complete installation of the WWTP and properly close the three large capacity cesspools referred to in paragraph 8, in accordance with 40 C.F.R. § 144.89(a), no later than September 15, 2010. The three large capacity cesspools will be considered properly closed when the requirements of paragraph 14 are met.

14. The same or similar treatment design of the WWTP represented by the Preliminary Engineering Design Report from WSI International, LLC, dated July 21, 2009, which Respondents previously submitted to EPA, shall be installed and operational no later than September 15, 2010. The WWTP will provide for, at minimum, between 90-95% BOD_5 removal, and also provide for disinfection of

treated effluent prior to subsurface injection. The three large capacity cesspools shall either be backfilled or converted into State-approved seepage pits. In doing so, Respondents shall comply with DOH's large capacity cesspool conversion and abandonment procedures and techniques and any other requirements of DOH's UIC program. Respondents shall notify DOH when conversion of the three large capacity cesspools to State-approved seepage pits is complete. The large capacity cesspools will be considered properly closed once installation of the WWTP is complete and Respondents have notified DOH.

15. Within ten (10) days of receipt, Respondents shall submit to EPA copies of (1) DOH approval of WWTP Plans to replace existing LCCs, and (2) DOH approval to operate the WWTP. Documents shall be sent to the Region IX LCC Project Coordinator, at the address specified in paragraph 24.

16. If the SEP is not satisfactorily completed by the date specified in paragraph 13, Respondents shall pay a stipulated penalty of $100 for each and every day that the completion of the SEP is delinquent, up to a maximum amount of 61 days past the date specified in paragraph 13, November 15, 2010, unless Respondents have claimed and EPA has agreed that the delay was caused by a force majeure event as defined in paragraphs 20-24.

17. If the SEP is not satisfactorily completed by November 15, 2010, Respondents shall also pay a stipulated penalty of $68,855, which is equal to $92,453 less the penalty amounts Respondents will have paid pursuant to paragraphs 16 and 26. The stipulated penalties shall be paid no later than thirty (30) days following November 15, 2010, and according to the process expressed in Section III.B.

18. The determination of whether the SEP has been satisfactorily completed (i.e. pursuant to the terms of the agreement) and whether the Respondents have made a good faith, timely effort to implement the SEP shall be reserved to the sole discretion of EPA.

19. If any event occurs which causes or may cause delays reaching the deadline for closure of the large capacity cesspools, as set forth in paragraph 13 of this CA/FO, Respondents or their attorney shall, within forty-eight (48) hours of the delay or within 48 hours of Respondents' knowledge of the anticipated delay, whichever is earlier, notify by telephone the EPA Region IX LCC Project Coordinator or, in her/his absence, the Manager of the EPA Region IX Ground Water Office. Within fifteen (15) days thereafter, Respondents shall provide in writing the reasons for the delay, the anticipated duration of the delay, the measures taken or to be taken to prevent or minimize the delay, and a timetable by which those measures will be implemented. Respondents shall exercise their best efforts to avoid or minimize any delay and any effects of a delay. Failure to comply with

the notice requirement of this paragraph shall preclude Respondents from asserting any claim of force majeure.

20. If EPA agrees that the delay or anticipated delay in compliance with this CA/FO has been or will be caused by circumstances entirely beyond the control of Respondents, the time for performance may be extended for a period of no longer than the delay resulting from the circumstances causing the delay. In such event, EPA shall grant, in writing signed by the Manager of the EPA Region IX Ground Water Office, the extension of time. An extension of the time for performing an obligation granted by EPA pursuant to this paragraph shall not, of itself, extend the time for performing a subsequent obligation.

21. In the event that EPA does not agree that a delay in achieving compliance with the requirements of this CA/FO has been or will be caused by circumstances beyond the control of the Respondents, EPA will notify Respondents in writing of its decision and any delays will not be excused. Upon this occurrence, the stipulated penalties as specified in paragraph 16 and paragraph 17, if the delay extends beyond November 15, 2010, will become due and shall be paid according to the process expressed in Section III.B.

22. Respondents shall have the burden of demonstrating, by a preponderance of the evidence, that the actual or anticipated delay has been or will be caused by a force majeure event, that the duration of the delay was or will be warranted under the circumstances, that Respondents did exercise or are using their best efforts to avoid and mitigate the effects of the delay, and that Respondents complied with the requirements of this section.

23. "Force majeure," for purposes of this Consent Agreement, is defined as any event arising from causes beyond the control of Respondents, of any entity controlled by Respondents, or of Respondents' contractors that delays or prevents the performance of any obligation under this CA/FO despite Respondents' best efforts to fulfill the obligation. The requirement that Respondents exercise "best efforts to fulfill the obligation" includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any such event (a) as it is occurring and (b) after it has occurred to prevent or minimize any resulting delay to the greatest extent possible. Examples of events that are <u>not</u> force majeure events include, but are not limited to, increased costs or expenses of any work to be performed under this Consent Agreement, financial or business difficulties of Respondents, and normal inclement weather.

24. Written communications, including any requests for extension of time, shall be sent to the following address:

LCC Project Coordinator
Water Division
Ground Water Office, WTR-9
Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105
Fax: (415) 947-3545

25. The person signing Respondents' submissions shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

B. Penalty

26. To settle this matter, Respondents agree to pay to the United States an administrative civil penalty of seventeen thousand and four hundred ninety eight dollars ($17,498) no later than thirty (30) days following the effective date of the Final Order (hereafter referred to as the "due date").

27. The administrative civil penalty referred to in paragraph 26 shall be made payable to the Treasurer, United States of America, in accordance with any acceptable method of payment listed in Attachment A "EPA Region IX Collection Information," which is incorporated by reference as part of this CA/FO.

28. Concurrent with the payment of the penalty, Respondents shall provide written notice of payment, referencing the title and docket number of this case, via certified mail, to each of the following:

Steven Armsey
Regional Hearing Clerk (ORC-1)
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105

Erica Maharg
Office of Regional Counsel (ORC-2)
U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105

29. Payment must be received on or before the due date specified in paragraph 26.

30. If the full payment is not received on or before the due date, interest shall accrue on any overdue amount from the due date through the date of payment, at the annual rate established by the Secretary of the Treasury pursuant to 31 U.S.C. § 3717. In addition, a late payment handling charge of $15.00 will be assessed for each thirty (30) day period (or any portion thereof) following the due date in which the balance remains unpaid. A six percent (6%) per annum penalty will also be applied on any principal amount not paid within ninety (90) days of the due date. Respondents shall tender any interest, handling charges, or late penalty payments in the same manner as described above.

31. Pursuant to Section 1423(c)(7) of the Act, 42 U.S.C. § 300h-2(c)(7), if Respondents fail to pay by the due date the administrative civil penalty assessed in paragraph 26 of this CA/FO or, if applicable, fail to pay by the due date the stipulated penalties due in accordance with paragraph 16 or 17, EPA may bring a civil action in an appropriate district court to recover the amount assessed (plus costs, attorneys' fees, and interest). In such an action, the validity, amount, and appropriateness of such penalty shall not be subject to review. 42 U.S.C. § 300h-2(c)(7).

C. General Provisions

32. Respondents waive any right to a hearing under Section 1423(c)(3) of the Act, 42 U.S.C. § 300h-2(c)(3). Respondents waive any right to contest the allegations contained in the Consent Agreement, or to appeal the CA/FO.

33. For the purpose of this proceeding, Respondents admit the jurisdictional allegations of the Consent Agreement and agree not to contest, in any administrative or judicial forum, EPA's jurisdiction to enter into this CA/FO.

34. Respondents neither admit nor deny the allegations set forth in the Stipulations and Findings set forth in the Consent Agreement.

35. Respondents consent to the issuance of this CA/FO and the conditions specified herein, including payment of the administrative civil penalty and satisfactory completion of the SEP in accordance with the terms of this CA/FO. Full payment

of the penalty and satisfactory completion of the SEP set forth in this Consent Agreement and Final Order shall only resolve Respondents' liability for federal civil penalties for the SDWA violations specifically alleged in the Consent Agreement.

36. Respondents agree that if and when they publicize the SEP or the results of the SEP, they will state in a prominent manner that the project is being undertaken as part of the settlement of an enforcement action.

37. Each undersigned signatory to this Consent Agreement certifies that he or she is duly and fully authorized to enter into and ratify this Consent Agreement.

38. The provisions of this CA/FO shall apply to and be binding upon Respondents, its officers, directors, agents, servants, authorized representatives, employees, and successors or assigns. Action or inaction of any persons, firms, contractors, employees, agents, or corporations acting under, through, or for Respondents shall not excuse any failure of Respondents to fully perform its obligations under this CA/FO.

39. Respondents shall give notice, and provide a copy of this CA/FO, to any successor-in-interest prior to transfer of ownership or operation of the large capacity cesspools referred to in paragraph 8. Such transfer, however, shall have no effect on Respondents' obligation to comply with Sections III.A and III.B of this CA/FO. Respondents shall notify EPA in writing at least thirty (30) days prior to any such transfer of ownership or operation of the large capacity cesspools referred to in paragraph 8.

40. Respondents shall not deduct the administrative civil penalty, including any stipulated penalty, nor any interest, late penalty payments, or administrative handling fees provided for in this CA/FO from its federal, state, or local income taxes.

41. This CA/FO does not constitute a waiver, suspension, or modification of the requirements of any federal, state, or local statute, regulation or condition of any permit issued thereunder, including the requirements of the Act and accompanying regulations.

42. Issuance of this CA/FO does not in any case affect the right of EPA to pursue appropriate injunctive or other equitable relief or criminal sanctions for any violations of law, nor does it affect Respondents' rights to contest any such action by EPA.

43. This CA/FO is not a permit or modification of a permit. It shall not affect

Respondents' obligation to comply with all federal, state, local laws, ordinances, regulations, permits, and orders. Issuance of, or compliance with, this CA/FO does not waive, extinguish, satisfy, or otherwise affect Respondents' obligation to comply with all applicable requirements of the SDWA, regulations promulgated thereunder, and any order or permit issued thereunder.

44. EPA reserves any and all legal and equitable remedies available to enforce this CA/FO, as well as the right to seek recovery of any costs and attorneys' fees incurred by EPA in any actions against Respondents for noncompliance with this CA/FO. Violation of this CA/FO shall be deemed a violation of the Act.

45. Except as stated in paragraph 31, each party hereto shall bear its own costs and attorneys' fees incurred in this proceeding.

EFFECTIVE DATE

46. The effective date of the CA/FO shall be the date that the Final Order is filed.

FOR THE CONSENTING PARTIES:

For Robert Johnson and Johnson Resort Properties, Inc.:

Robert A Johnson
Robert Johnson

Date: April 1st 2010

For the United States Environmental Protection Agency:

Alexis Strauss
Alexis Strauss, Director
Water Division

Date: 27 April 2010

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX

IN THE MATTER OF Robert Johnson; Johnson Resort Properties, Inc. Kailua-Kona, Hawaii Proceedings under Section 1423(c) of the Safe Drinking Water Act, 42 U.S.C. § 300h-2(c)	DOCKET NO. UIC-09-2010-0002 [PROPOSED] FINAL ORDER

The United States Environmental Protection Agency Region IX ("EPA"), and Robert Johnson and Johnson Resort Properties, Inc. ("Respondents"), having entered into the foregoing Consent Agreement, and EPA having duly publicly noticed the Stipulations and Findings and proposed Final Order regarding the matters alleged therein,

IT IS HEREBY ORDERED THAT:

1. The foregoing Consent Agreement and this Final Order (Docket No. UIC-09-2010-0002) be entered; and

2. Respondents shall pay an administrative civil penalty of seventeen thousand and four hundred ninety eight dollars ($17,498) to the Treasurer of the United States of America in accordance with the terms set forth in the Consent Agreement.

This Final Order shall become effective on the date that it is filed. This Final Order constitutes full adjudication of the Complaint issued by EPA in this proceeding.

____________________________ Date: ____________________

Steven Jawgiel
Presiding Officer
U.S. Environmental Protection Agency
Region 9

ATTACHMENT A

In the Matter of Robert Johnson and Johnson Resort Properties, Inc.

DOCKET NO. UIC-09-2010-0002

EPA REGION IX COLLECTION INFORMATION:

ELECTRONIC FUNDS TRANSFERS

Federal Reserve Bank of New York
ABA = 021030004
Account = 68010727
SWIFT address = FRNYUS33
33 Liberty Street
New York, NY 10045
Field Tag 4200 of the Fedwire message should read:
"D 68010727 Environmental Protection Agency "

CHECK PAYMENTS

U.S. Environmental Protection Agency
Fines and Penalties
Cincinnati Finance Center
P.O. Box 979077
St. Louis, MO 63197-9000

OVERNIGHT MAIL

U.S. Bank
1005 Convention Plaza
Mail Station SL-MO-C2GL
St. Louis, MO 63101

Contact: Natalie Pearson
314-418-4087

ATTACHMENT B

KAHULUU BEACH

WASTEWATER TREATMENT PLANT

PRELIMINARY ENGINEERING DESIGN REPORT

TO:

FROM: **WSI International, LLC**

This document is issued for preliminary review only.

Date: **July 21, 2009**

TABLE OF CONTENTS

List of Tables

List of Figures

1 INTRODUCTION

1.1 Purpose

The purpose of this preliminary design report is to provide the process design for the Kahuluu Beach Wastewater Treatment Plant (Kahuluu Beach WWTP), in Hawaii. This proposal consists of three sections including introduction, packaged treatment facility design, and unit process design. The appendices include process design calculations, design drawings and equipment specifications.

1.2 Design Basis

The Kahuluu Beach WWTP will be designed and built to receive and dispose of the domestic sewage from the Kahuluu Beach in Hawaii. The average dry weather flow (ADWF) is 5,000 gpd. The design criteria are summarized in Table 1, based upon the information provided by the client.

Table 1 Design Flow Conditions and Effluent Quality

Parameter	Influent	Effluent
ADWF	5,000 gpd	
BOD_5 (mg/L)	400	20
TSS (mg/L)	400	20
NH_3-N (mg/L)	25	
TKN (mg/L)	40	
Total N (mg/L)		10
Total Coliform (MPN)		≤23 colonies/100 mL in any 30 days ≤100 colonies/100 mL in any sample

The proposed Kahuluu Beach WWTP will function to remove organic matter (BOD_5), total suspended solids (TSS), total nitrogen (TN) and ammonia. Effluent will meet the R-2 reclaimed water standards.

2 KAHULUU BEACH WWTP PROCESS DESIGN

2.1 Design Considerations

2.1.1 Wastewater Biological Treatment Process

The biological wastewater treatment process is the most proven technology for organic matter removal and nutrient removal. Based upon the growth type of the microorganisms, the biological wastewater treatment can be divided into two major groups; suspended growth process (e.g., activated sludge) and attached growth process (e.g., trickling filter).

In a suspended growth process (e.g., activated sludge), the microorganisms are suspended in mixed liquor and have more opportunities to capture food sources (organic matter and nutrients) and dissolved oxygen. The advantages of a suspended growth process include a higher quality effluent (90-95% BOD_5 removal), nitrogen or phosphorus removal, and the flexibility to adapt to minor pH, organic and temperature changes. The major disadvantages of a suspended growth process include sludge bulking, highly skilled labor requirements, and sensitivity to shock loads, metallic and other poisons, etc.

An attached growth process (e.g., trickling filter) consists of a bed of permeable medium of either rock or plastic used to host the microorganisms. The organic matter (BOD_5) and nutrients in the wastewater diffuse into a film, where it is then metabolized. In order to acquire a good quality effluent (80-90% BOD_5 removal), more stages of the attached growth system may be required. The advantages of an attached growth system include a higher concentration of microorganisms that are available on the surface of the media, no sludge bulking concerns, and the ability to withstand shock loads better than the suspended growth process. The disadvantages of an attached growth process include a poorer effluent quality in terms of BOD and TSS, odor production, clogging of distributors or beds, sloughing of the biofilm, snail, mosquito and other insect problems.

The Bio-Chip Reactor (BCR®) is an enhanced activated sludge process with the biomass attached onto a small bio-media that is suspended in the mixed liquor. The BCR® combines the advantages of a suspended growth process and an attached growth process. Compared to a conventional activated sludge system, the BCR® has the advantages of providing a greater biomass concentration, therefore increasing treatment capacity, no sludge bulking concerns, having more stability in process operations, reduced sludge production, enhanced sludge settleability, and lower costs for operations and maintenance. Compared to the attached growth processes, the BCR® has the advantages of providing a better quality effluent, easily designed for nitrogen and phosphorus removal, more opportunities for contact with organic matter nutrients, air and no odor or insect problems.

Since there are no sludge bulking concerns and no odor or insect concerns, there are less technical support and operating skills required for daily operations. This is critical for a small community wastewater treatment facility where it is economically not feasible to maintain a large management team for daily operations.

The BCR® performance can easily be controlled by the sludge retention time (SRT) and oxygen supply. The inline DO monitoring controls the blower operation which provides enough oxygen, and the amount of sludge wasting can control the biological system growth and formal functions. The daily operation of the BCR® process can be automatically controlled and executed by the Programmable Logical Controller (PLC).

In the BCR® design for the Kahuluu Beach WWTP, the dissolved air flotation (DAF) was introduced to separate the microorganisms from the treated effluent. This completely eliminates the concerns of solid water separation.

2.1.2 DAF Units

In the DAF system, micro sized air bubbles are introduced into the incoming flow from the bottom of the vessel. Buoyancy force lifts the air bubbles to the water's surface. Accumulated material is then removed from the water surface for disposal.

The DAF unit functions in the separation of microorganisms from the effluent. The major advantage of the DAF unit over the secondary clarifier is that very small or lighter particles which settle slowly by gravity will be removed more completely and in a shorter time period. This design completely eliminates the concerns of sludge bulking problems that may happen in the secondary clarifiers for both the suspended growth process and the attached growth system.

DAF systems are frequently used to provide wastewater pretreatment, product recovery, and thickening of biological solids in industries ranging from food processing to pulp and paper to petrochemical industries. There has been an expansion of the different applications using a DAF unit over the last several years in traditional and non-traditional areas of water and wastewater treatment.

Many of the DAF units used in municipal applications in the past have been light weight units. These units were made of epoxy coated mild steel materials resulting in high corrosion problems. After several months of operation the bio-mass on the internal rise plates would cause the epoxy plates to collapse due to the weight of the biomass on them. Also, the rake mechanism was light weight and was continuously creating problems with output consistency.

In recent years, the specially designed centrifugal air dissolving pumps have been used to pressurize water with entrained air (10-20% v/v) without causing cavitations or vapor lock. This feature eliminated the requirements for a compressor and air saturation tank previously being used in the more traditional DAF designs. The advantages of the DAF unit using air dissolving pumps include a higher air dissolving efficiency due to high pressure and the unique design. The DAF efficiently shears incoming air into smaller bubbles, allowing larger amounts of air to be entrained in the water, simple single-stage, single-impeller design, reliability and longer life, superior whitewater production with very fine bubbles, as well as a more compact footprint.

The air dissolving pump is used for air dissolving purposes in the design of this packaged WWTP. Air is introduced into the pump suction and the bubbles are sheared into smaller bubbles by the pump and then dissolved into the water by high pressure. When the air-water solution is released into the incoming waste stream at atmospheric pressure, the air comes out of the solution in the form of tiny bubbles (~10-50 micron). These micro bubbles attach to the oil, grease, and solid particles and float them to the surface of the DAF unit. The floated material is then removed from the surface by a skimming device.

2.2 PROPOSED SYSTEM DESCRIPTIONS

The packaged Kahuluu Beach WWTP consists of EQ tank, anoxic and aerobic BCR®, dissolved air flotation (DAF) units, UV system and aerobic sludge digester. Figure 1 shows the process flow diagram for the Kahuluu Beach WWTP.

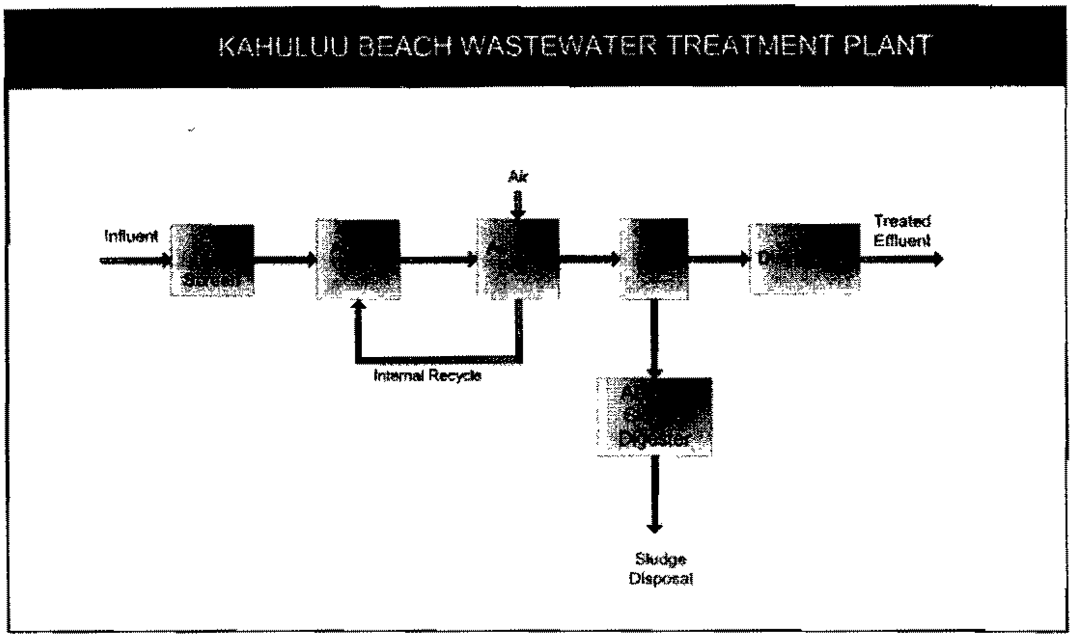


Figure 1 Process Flow Diagram for Kahuluu Beach WWTP

Raw sewage from the sewer flows to equalization tank (EQ) and will be pumped to the above ground screens by a grinder pump. Screened water enters into the anoxic/aerobic BCR® system for BOD and nutrient removal. Air is supplied to the aerobic zone. The aerobic BCR® system is divided into two zones operating in a series used for promoting different species growth which would result in higher efficiency BOD and nutrient removal. Internal recycled pump is used to provide the required recirculation flow for denitrification from the internal recycle tanks located at the end of the aerobic BCR® tanks to the anoxic BCR® tanks.

Flow from the aerobic BCR® tank enters into the DAF unit to separate the solids and biomass from the BCR® effluent. Treated effluent will be disinfected by the UV unit prior to discharge. Sludge discharged from the DAF unit is transferred to the aerobic sludge digester. The digested sludge will be periodically trucked to local disposal facilities for final disposal.

3 FACILITIES DESIGN

3.1 HEADWORKS

Raw sewage from the sewer flows to equalization tank (EQ) and will be pumped to the above ground screens by a grinder pump.

The inlet screen unit's function is to remove suspends and grits. The screen unit has the capability to handle 476 gpm. The screen opening is 6 mm. The design parameters for the inlet screen/EQ tanks are shown in Table 2.

Table 2 Design Parameters for EQ Tank/Inlet Screen

Parameter		Value
EQ Tank	No. of Tanks	1
	Diameter, ft	10
	Length, ft	1.5
	Water Depth, ft	8
	Total Working Volume	101 ft^3
		756 gal
	HRT, hr	3.0
	Hydraulic Retention Time, hr	2.5
Lift Pump	No. of Units	1
	Capacity, gpm	
	TDH, ft	
	Rated Power, hp	
Inlet Screen	No. of Units	1
	Capacity per Unit, gpm	476
	Opening, mm	6

Air will be provided at the rate of 30 cfm/1,000 ft^3 for mixing and preventing odor.

3.2 BCR® TREATMENT SYSTEM

3.2.1 BCR® SYSTEM Description

The BCR® is an enhanced activated sludge process with biomass attaching to the small bio-chip media that are suspended in the mixed liquor that moves around the reactors. The innovative design of the BCR® system creates a higher percentage of protected surface area for microorganisms to adhere to and propagate. This feature results in increased levels of overall biomass concentrations inside the reactor and the reduction of the reactor's volume required for the biodegradation of organic matter in the influent. The BCR® has no sludge bulking concerns and also no odor or insect concerns, thus, daily operation is less complicated and can be automatically controlled and executed by the PLC.

In the BCR® system, coarse bubble diffusers distribute air across the basin. The aeration system will provide the oxygen needed for the growth of the aerobic microorganisms attached on the bio-chip media. The aeration also supplies mixing energy which causes the bio-chips to be dispersed throughout the tank. The healthy and thin layer of biofilm can be maintained with the help of the collisions between the bio-chips and water, or between bio-chips and air bubbles. The large openings on the bio-chips allow the wastewater to freely pass through the chips; this also helps to refresh the biofilm which mature within this protected area. Figure 2 shows the schematic of the typical BCR® system.

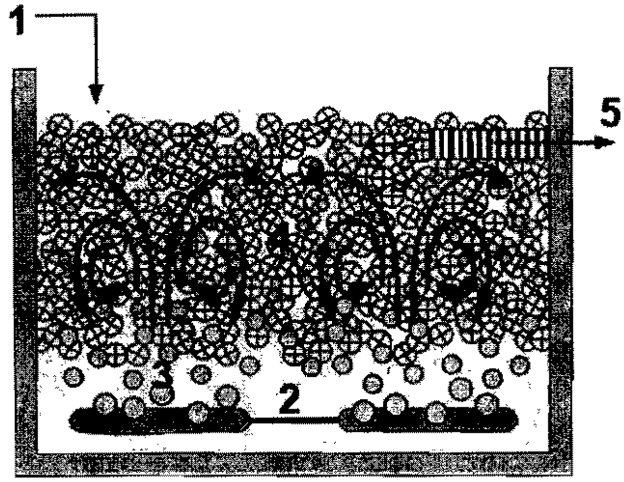


Figure 2 Schematic of Aerobic BCR® **System**

A BCR® system consists of tanks equipped with the outlet sieves for retaining the media, the bio-chip media, and aeration devices. Within the reactor, the media, wastewater and air are completely mixed resulting in very efficient contact between the biofilm and the substrates (organic matter and nutrients) within the liquid. The thickness of the biofilm is controlled by the movement of the media so that oxygen diffusion through the biofilm is enhanced. The detached biofilm is suspended within the reactor and leaves the reactor with the treated effluent. Aeration is provided by blowers and the coarse bubble air distribution system.

3.3 Bio-Chip Media

The bio-chip media used in the BCR® is provided by Jaeger Environmental. The bio-chip media used in the support of biofilm growth is made of a high-density polyethylene (HDPE) which is approximately 0.8-inch in diameter and 3/8-inch long as shown in Figure 3. The bio-chips are lightweight, durable, and rugged. The media has an effective specific surface area of152.4 ft^2/ft^3 for biofilm growth and has a void space of 92%.

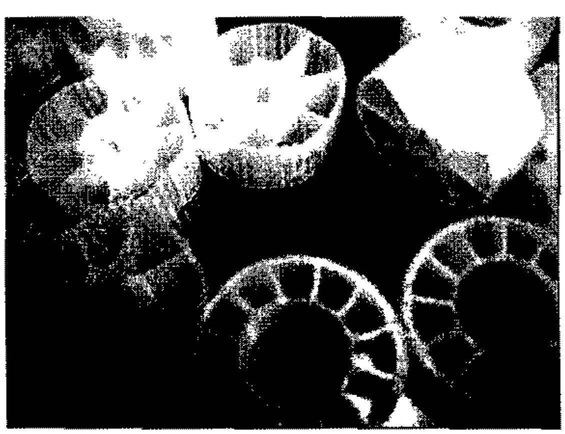


Figure 3 Configuration of Bio-chip Media

3.4 BCR® SYSTEM DESIGN PARAMETERS

This packaged BCR® system consists of an anoxic zone and an aerobic zone. Two zones function in removing organic matter (BOD_5), TSS, and nutrients (TN). The internal pumps will return the flow from the end of the aerobic zone to the front of the anoxic zone, for the purpose of nitrogen removal.

Nitrogen removal processes incorporate aerobic zones for nitrification, anoxic zones for denitrification, and mixed liquor recirculation (MLR) to transfer the nitrate-N generated in the aerobic zone back to the initial anoxic zone.

Nitrification is an aerobic process and will occur only in the aerobic zones. Nitrosomonas oxidizes ammonia to the intermediate product nitrite. Nitrite is converted to nitrate by Nitrobacter. The conversion from ammonia to Nitrite involves a complex series of reactions that control the overall conversion process as evidenced by the lack of nitrite build-up in the system. Dissolved oxygen concentrations above 1 mg/L are essential for nitrification to occur.

Denitrification is the conversion of nitrate-N to nitrogen gas by heterotrophic bacteria that utilize nitrate-N as their terminal electron acceptor as they oxidize organic matter in the absence of dissolved oxygen. The process of denitrification requires the presence of nitrates, absence of DO, and a source of Rapidly Biodegradable Organic Matter (RBOM). Alkalinity is produced during the conversion of nitrate to nitrogen gas resulting in an increase in pH. Bioreactor sizing and design parameters are determined based upon the following equations.

- Anoxic BCR® Parameters

Depending upon the influent Total Kjeldahl Nitrogen (TKN) content, the internal recycle ratio varies in the range of 2 to 3. The biological process units are designed based upon the following procedures:

<u>DETERMINATION OF ANOXIC ZONE VOLUME</u>

$$V_{nox} = \frac{QS_0}{X_b(F/M)}$$

Where V_{nox} = anoxic zone volume, gallons
F/M = food to microorganism ratio, g BOD_5/g MLVSS.d
Q = flowrate, gpd
S_0 = influent BOD_5 concentration, mg/L
X_b = anoxic zone biomass concentration, mg/L MLVSS

<u>DETERMINATION OF INTERNAL RECYCLE RATIO OF ANOXIC ZONE</u>

$$IR = \frac{NO_x}{N_e} - 1.0$$

Where IR = internal recycle ratio

NO_x = nitrate produced in aeration zone, mg NO_3-N/L
N_e = effluent NO_3-N concentration, mg NO_3-N/L

- Aerobic BCR® Parameters

DETERMINATION OF AEROBIC ZONE VOLUME

$$V = \frac{QS_0}{X_{MLVSS}(F/M)}$$

Where V = reactor volume, gallons
F/M = food to microorganism ratio, g BOD_5/g MLVSS.d
Q = flowrate, gpd
S_0 = influent BOD_5 concentration, mg/L
X_{MLVSS} = biomass concentration in reactor, mg/L MLVSS

BOD concentrations are important parameters to be monitored for the correct operation of the BCR® treatment system. The typical BOD_5 loadings of the BCR® system are in the range of 40 - 200 lb BOD_5/1000 ft^3 as calculated using the equation below.

VOLUMETRIC LOADING RATE

$$L = \frac{8.34QS_0}{10^3 V}$$

Where L = volumetric BOD loading, lb BOD/1,000 ft^3
V = aerobic zone volume, gallons
Q = flowrate, gpd
S_0 = influent BOD_5 concentration, mg/L

The dissolved oxygen concentration is a very important parameter in controlling the growth of the microorganisms and in determining the performance of the BCR® system.

OXYGEN REQUIREMENTS CALCULATIONS

$$R_o = Q(S_0 - S) - 1.42P_{X,VSS} + 4.33QNO_x$$

$$NO_x = TKN - N_e - 0.12P_{X,VSS}/Q$$

Where R_o = total oxygen required, lb/d
TKN = influent TKN concentration, mg/L
N_e = effluent NH_4-N concentration, mg/L

Excess biosolids in the tank are wasted as wasted activated sludge as calculated below:

BIOSOLIDS PRODUCTIONS

$$P_{X,VSS} = \frac{QY(S_0 - S)}{1 + k_d SRT} + \frac{f_d k_d QY(S_0 - S)SRT}{1 + k_d SRT} + \frac{QY_n(NO_x)}{1 + k_{dn} SRT} + QX_{0,i}$$

Where $P_{X,VSS}$ = total solids wasted daily, lb VSS/d
S = effluent BOD_5 concentration, mg/L
$X_{0,i}$ = non-biodegradable VSS in influent, mg/L
SRT = solids retention time, d
Y = biomass yield, g VSS/g BOD_5 (typical 0.30-0.50)
k_d = endogenous decay coefficient (typical 0.10)
f_d = fraction of biomass that remains as cell debris (typical 0.10-0.15)
Y_n = biomass yield in nitrification, g VSS/g BOD_5 (typical 0.12)
k_{dn} = endogenous decay coefficient for nitrifying organisms (typical 0.08)
NO_x = concentration of NH_4-N in influent that is nitrified, mg/L

The detailed mass balance analysis was performed to size the reactors based on the above equations as included in Appendix i. The design parameters for the aerobic BCR® system are summarized in Table 3.

Table 3 BCR® System Design Parameters

Parameters		Value
Bio-Chips	Biomedia Filling Capacity	50%
	Specific Surface Area of Media, ft^2/ft^3	152
Anoxic Tank	No. of Tanks	1
	Diameter, ft	10
	Length, ft	1.5
	Water Depth, ft	8
	Total Working Volume	101 ft^3
		756 gal
	HRT, hr	3.0
Aerobic Tank	No. of Tanks	1
	Diameter, ft	10
	Length, ft	3
	Water Depth, ft	8
	Total Working Volume	196 ft^3
		1,467 gal
	Organic Loading, lb BOD_5/1000 ft^3	85
	HRT, hr	7.0
Internal Recycle Pump	Calculated Internal Recycle Ratio	2.3
	No. of Pumps	1
	Pump Capacity, gpm	50
	Head, ft	20
	Horse Power, hp	1.0

In the anoxic zone, the calculated internal recycle ratios is 2.3. In the aerobic zone, the design organic loading of this BCR® system is 85 lb BOD_5/1000 ft^3, which is at the lower range of its typical BOD loading rate (40 - 200 lb BOD_5/1000 ft^3). Therefore, the system has the flexibility of handling the peak flow and organic loading conditions. The serial zone configured aerobic BCR® system will grow different species of microorganisms in each zone to accommodate the organic loading changes along the stream line. This feature is also helpful in producing a higher quality effluent and makes the system more resilient to shocking flow and organic loadings.

3.5 DAF Units

The DAF unit removes the suspended solids from the effluent of the BCR® process. DAF is the process whereby micro-air-bubbles attach themselves to suspended materials causing them to float to the surface of a flotation chamber to achieve liquid/solids separation.

Effluent from the BCR® system enters the mixing chamber with air saturated water provided by the air dissolving pump. A polymer solution may need to be introduced into the mixing chamber to increase the particle size. The air saturated water is a mixture of a portion of the DAF effluent, which has been saturated with atmospheric air via the Edur air dissolving technology. The water then enters the flotation chamber by passing over the influent chamber dividing wall. The velocity of the water in the flotation chamber is significantly reduced to maximize separation potential. Inside the flotation chamber, the micro-bubbles (saturated water mixture), which have attached themselves to the particle's surface, change the particle's density. This causes the previously suspended solids to float to the surface where paddle assemblies skim them from the surface into a sludge box.

Heavy grit and solid particles settle onto the bottom of the DAF where they are flushed out into the sludge system via a manual ball valve. The clarified liquid then enters the effluent chamber and passes over an effluent weir into an effluent box. From the effluent box, the clarified effluent flows into the chlorination chamber.

3.5.1 DAF System

The DAF unit consists of flotation tanks and air dissolving pumps. The wasted sludge is discharged to the aerobic sludge digester for further stabilization before final disposal. The DAF unit design parameters are listed in Table 4.

Table 4 Design Parameters for DAF Unit

Parameters		Value
DAF Tank	No. of Units	1
	Diameter, ft	10
	Length, ft	2
	Hydraulic Loading, gpm/ft^2	.58
	Solids Loading, lb/ft^2-hr	0.06
	Maximum Flow Capacity	30 gpm
		43,208 gpd

3.5.2 Polymer System

Polymer addition to the DAF unit is utilized to enhance the solids separation effectiveness. The polymer system is comprised of a neat polymer dispensing system, dilution, mixing, aging and solution injection systems.

The objective of a polymer preparation system is to fully hydrate or "uncoil" the polymer molecule in order to expose the maximum number of charge sites to the treatment process. The process of the polymer activation and blending system is to gently and thoroughly activate the polymer without damaging the fragile molecular chain.

Maintaining a uniform shear field of energy is vitally important to the polymer activation process. The polymer system is designed to apply the ultra-high mixing energy at the point of initial polymer and water contact to prevent the polymer from gelling or agglomeration. The non-mechanical high hydrodynamic shear energy which disperses the polymer into small particles is created by using the mixing educator.

The high velocity jet stream produces a strong suction in the mixing chamber of the mixing educator causing the neat polymer to be drawn through the suction port into the mixing chamber. The well mixed polymer is then diffused into the aging tank. A pump is provided to recirculate the polymer in the aging tank and will switch on to pump the well blended polymer to the polymer solution tank when the level drops in the solution tank. A feed pump is supplied to inject the polymer solution into the DAF unit. The polymer system is designed to inject the 0.1% polymer solution at a dosage of 5 ppm.

3.6 DISINFECTION

Inline ultraviolet disinfection (UV) unit is installed in the system for disinfection. The UV unit will deliver 40 mw-s/cm^2 at the daily flow capacity to provide the combined inactivation and removal of 99.999% of the plaque-forming units of F-specific bacteriophage MS2. The design parameters for UV systems are summarized in Table 5.

Table 5 Design Parameters for UV System

Parameters	Value
Model	Tri-12M
No. Of Units	1
No. Of Lumps Per Unit	1
Capacity per Unit, gpm	12
Power, kw	0.03

3.7 SLUDGE DISPOSAL

The digested sludge will be trucked to local sludge disposal facilities.

DETERMINATION OF AEROBIC SLUDGE DIGESTER VOLUME

The aerobic sludge digester is sized based upon (WEF 1998)

$$V = \frac{Q_i(X_i + YS_i)}{X(k_d P_v + 1/SRT)}$$

Where V = volume of aerobic digester, ft^3
Q_i = influent average flowrate to digester, ft^3/d
X_i = influent SS, mg/L
Y = fraction of the influent BOD$_5$ consisting of raw primary solids
S_i = influent BOD$_5$
k_d = reaction rate constant, 1/d
P_v = volatile fraction of digester SS
SRT = solids retention time, d

The design parameter for the aerobic sludge digester is exhibited in Table 6.

Table 6 Design Parameters for Aerobic Sludge Digester

Parameter		Value
Aerobic Digester	No. of Tanks	1
	Diameter, ft	10
	Length, ft	2
	Water Depth, ft	8
	Total Working Volume	117 ft^3
		878 gal
	Sludge Flow, gpd	34
	Solids Content, %	3.0
	HRT, d	26
	Solids Loading, lb VSS/1000 ft^3	65

4 CONTROL AND INSTRUMENTATIONS

The control system for the Kahuluu Beach WWTP consists of a PLC that monitors the processes and instrumentation of the plant. In the event of a total PLC failure, it is designed to be able to be run manually if needed. An optional UPS can be installed to maintain the system's status during extended power outages.

The PLC is a modular style unit with individual input, output and logic control modules that are of a "Plug and Play" design. If a single module fails it can be replaced and the logic module will control it automatically. In the event the logic module has a failure, a new module can be plugged in already pre-loaded with the program or it can be programmed via the internet. An option also available is our redundant PLC which always has two systems monitoring the entire process independent of each other and in the event of one failing; the back-up unit takes over and sends an alarm notifying of the failure.

The entire process is tied into a customer supplied static IP address and has a distinct URL on the internet. In the event of an alarm or malfunction, alarms will be sent to user specified email addresses, cell phones, pagers, PDA's or a full time alarm monitoring station, such as ADT or a police dispatch center. This process allows the operator to be notified, either directly or by others monitoring the plant. The operator will perform the standard functions of acknowledging the alarm; determine its cause, and resolving the problem.

Additionally, a remote telephone dialer could be used to send various levels of alarms via a customer supplied telephone (land line or cell phone). There are four outputs dedicated to alarms in the standard package. These can drive lights, horns or strobes if local annunciation is required. The remote dialer can also be a secondary back-up in the event of internet failure.

The PLC trends all of the critical processes and values, and stores them for documentation of run time of the equipment and monitored levels, i.e., pH, DO, turbidity, flow, etc.

5 ABBREVIATIONS

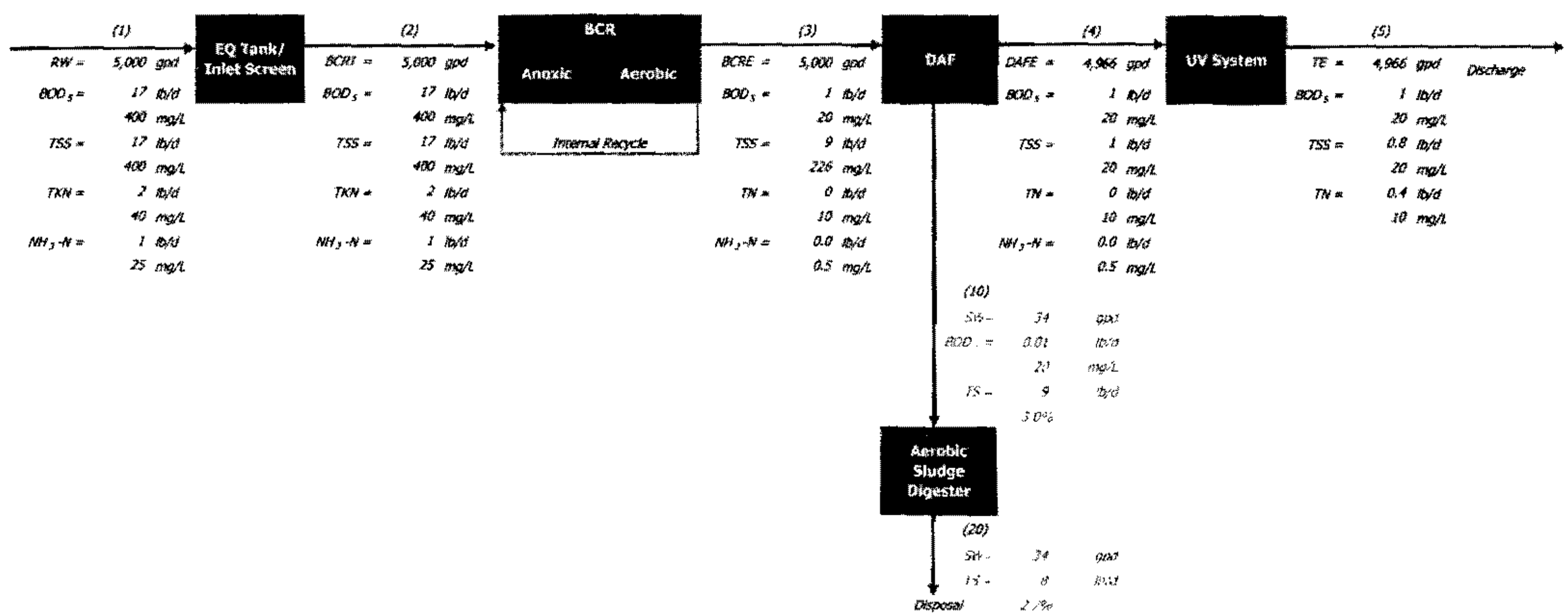
BCR®	Bio-chip reactor
BOD_5	5-day biological oxygen demands
cfm	Cubic feet per minute
DAF	Dissolved air flotation
EQ	Equalization
ft	Feet
gal	Gallons
gpd	Gallons per day
gpm	Gallons per minute
HDPE	High-density polyethylene
HRT	Hydraulic retention time
MBR	membrane biological reactor
mgd	Million gallons per day
mg/L	Milligram per liter
MLR	Mixed liquor recirculation
NTU	Nephelometric turbidity unit
PLC	Programmable logical controller
RBOM	Rapidly Biodegradable Organic Matter
RFP	Request for proposal
SRT	Solids retention time
TKN	Total Kjeldahl nitrogen
TN	Total nitrogen
TSS	Total suspended solids

APPENDICES

APPENDIX I PROCESS DESIGN CALCULATIONS

KAHULUU BEACH WASTEWATER TREATMENT PLANT

MASS BALANCE ANALYSIS - 5,000 GPD @ AVERAGE DRY WEATHER FLOW



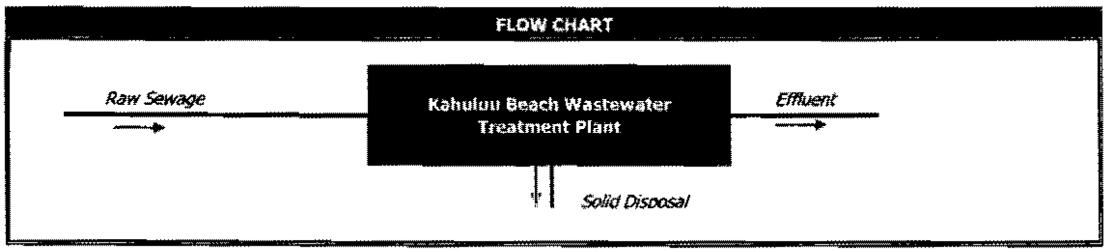
MASS BALANCE ANALYSIS

- Kahuluu Beach Wastewater Treatment Plant -

Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

I. Design Criteria



1.1 Influent:		@ ADWF	
Temperature		70.0	°F
		21.1	°C
Flow Rate		5,000	gpd
		3.5	gpm
		0.01	ft^3/s
Mass			
	BOD_5	16.7	lb/d
	TSS	16.7	lb/d
	TKN	1.7	lb/d
	NH_4-N	1.0	lb/d
	Alkalinity	8.3	lb/d as $CaCO_3$
Quality			
	BOD_5	400	mg/L
	TSS	400	mg/L
	TKN	40	mg/L
	NH_4-N	25	mg/L
	Alkalinity	200	mg/L as $CaCO_3$
1.2 Effluent:			
Discharge Rate		4,966	gpd
Mass			
	BOD_5	0.83	lb/d
	TSS	0.83	lb/d
	TN	0.39	lb/d
	NH_4-N	0.02	lb/d
Quality			
	BOD_5	20	mg/L
	TSS	20	mg/L
	TN	9.5	mg/L
	NH_4-N	0.5	mg/L

MASS BALANCE ANALYSIS

- Kahuluu Beach Wastewater Treatment Plant -

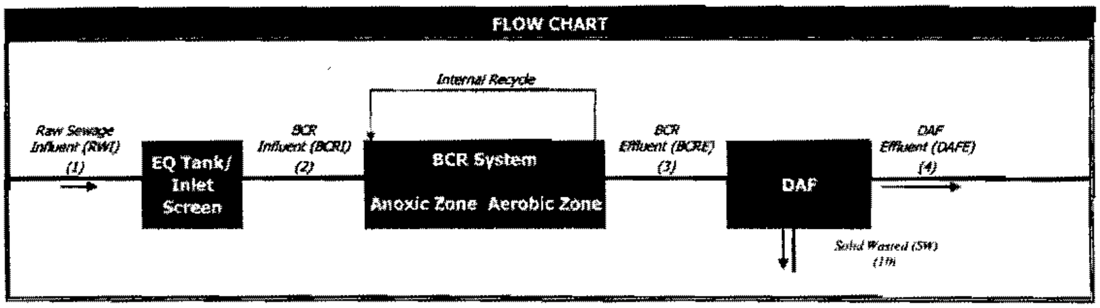
Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

II. Process Design Calculation

2.1 Secondary Treatment System

2.1.1 Flow Chart and Mass Balance Analysis



2.1.2 Parameter:

EQ Tank/Inlet Screen

No. of units	1
Total EQ tank volume	756 gallons
Equalization time	3.6 hr
No. of units	1
Size of opening	6 mm
Flowrate at maximum flow	476 gpm

Anoxic Zone:

Internal recycle ratio	2.3
Nitrate fed to anoxic zone	0.9 lb-NO_3-N/d
F/M	1.40 g-BOD_5/g-MLVSS
MLVSS	3,000 mg/L
MLSS	3,750 mg/L
MLVSS/MLSS	0.80
Total required operational reactor volume, V	64 ft^3
	476 gallons
No. of units	1
Water depth, H	8 ft
Operational volume of each train	756 gallons
Total operational volume, V	756 gallons
Hydraulic retention time, HRT	3.63 hr
Specific denitrification rate, SDNR	0.20 g-NO_3-N/g-MLVSS.d
Nitrate could be reduced, NO_r	3.8 lb-NO_3-N/d
Oxygen supplied by nitrate reduction	2.8 lb-O_2/d
Check Alkalinity	
Alkalinity consumed for nitrification	234 mg/L as $CaCO_3$
Alkalinity produced in denitrification	117 mg/L as $CaCO_3$
Alkalinity deficit	(83) mg/L as $CaCO_3$
Na_2CO_3 needed	No additional alkalinity required

Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

Anoxic Zone Mixing Energy		
Mixing Energy Required	10	kw/1000 m^3
Power	29	w
Aerobic Zone:		
F/M	0.45	g-BOD_5/g-MLVSS.d
MLVSS	3,000	mg/L
MLSS	3,750	mg/L
MLVSS/MLSS	0.80	
Total required operational reactor volume, V	198	ft^3
	1,481	gallons
No. of trains	1	
Water depth, H	8.0	ft
Operational volume of each train	1,467	gallons
Total operational volume, V	1,467	gallons
Hydraulic Retention Time, HRT	7.0	hr
Sludge Retention Time, SRT	21	days
BOD_5:N:P	100:5:1	
BOD_5 Removal		
BOD_5 Removal Rate, E	95	%
Effluent BOD_5	20	mg/L
BOD_5 Removed	16	lb/d
BOD_5 Removal Kinetic Coefficients		
Biomass Yield Coefficient, Y	0.34	g-VSS/g-BOD_5 (removed)
Endogenous Decay Coefficient, k_d	0.10	1/d
Biomass in cell debris, f_d	0.15	g-VSS/g-VSS
Nitrification Kinetic Coefficients		
Maximum Specific Growth Rate, m_{mn}	0.75	g-VSS/g-VSS.d
Half-velocity Constant, K_n	0.74	g-NH_4-N/m^3
Biomass Yield Coefficient, Y_n	0.12	g-VSS/g-NH_4-N.d
Endogenous Decay Coefficient, k_{dn}	0.08	g-VSS/g-VSS.d
Oxygen Inhibition Coefficient, K_o	0.50	g/m^3
Check SRT_n Required for Nitrification		
Specific Growth Rate for Nitrification, m_n	0.48	g-VSS/g-VSS.d
Required SRT for Nitrification, SRT_n	4.2	d
Biosolids Production		
Total Solids Wasted Daily, $P_{X,VSS}$	2.4	lb-VSS/d
Total Solids Wasted Daily, $P_{X,TSS}$	9	lb-TSS/d
Nitrogen Oxidized		
Nitrogen Oxidized to Nitrate	1.4	lb-N/d
	33	mg/L
Oxygen Requirements		
Oxygen Required	15.6	lb-O_2/d
Dissolved Air Flotation (DAF):		
No. of units	1	

Air Dissolving Pump

B7S1

MASS BALANCE ANALYSIS

- Kahuluu Beach Wastewater Treatment Plant -

Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

Air to solids, A/S	0.06	mL (air)/mg (solids)
Dissolved air required	0.05	gpm
Pump flow	4	gpm
Air flowrate	3.0	cfh
Recycle ratio	115%	
Pressure, *P*	126	ft
Rated power	0.25	hp
Air Floatation Tank		
Length	3.0	ft
Width	2.0	ft
Actual hydraulic loading	0.58	gpm/ft^2
Maximum flow capacity	30	gpm
Solids loading	0.06	lb/ft^2-hr
TSS Removal Rate	90%	
BOD_5 Removal Rate	50%	
Dimensions		
Diameter	10	ft
Length	2	ft
Polyaluminum Chloride System (PAC)		
Dosage	5	mg/L
Amount	0.2	lb/d
Al_2O_3 content	18%	
Specific gravity	1.36	
Flow	0.189	gpd
Feed rate	0.25	gph
Dilution ratio	32	

2.1.4 Given Flow Conditions:

Stream (1) - Raw Sewage

Flow	5,000	gpd
Mass		
BOD_5	17	lb/d
TSS	17	lb/d
TKN	2	lb/d
NH_4-N	1	lb/d
Quality		
BOD_5	400	mg/L
TSS	400	mg/L
TKN	40	mg/L
NH_4-N	25	mg/L

Stream (2) - BCR Influent

Flow	5,000	gpd
Mass		
BOD_5	17	lb/d
TSS	17	lb/d
TKN	2	lb/d
NH_4-N	1	lb/d
Quality		
BOD_5	400	mg/L

Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

TSS	400	mg/L
TKN	40	mg/L
NH_4-N	25	mg/L

2.1.5 Results:

Stream (3) - BCR Effluent

Flow		5,000	gpd
Mass			
	BOD_5	0.8	lb/d
	TSS	9.4	lb/d
	TN	0.4	lb/d
	NH_4-N	0.0	lb/d
Quality			
	BOD_5	20	mg/L
	TSS	226	mg/L
	TN	10	mg/L
	NH_4-N	0.5	mg/L

Stream (4) - DAF Effluent

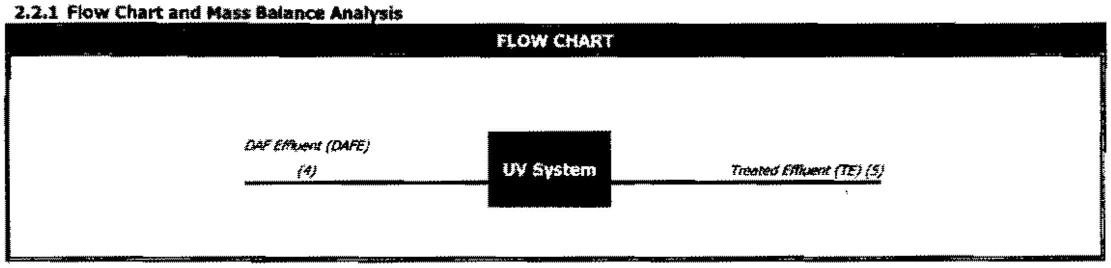
Flow		4,966	gpd
Mass			
	BOD_5	0.83	lb/d
	TSS	0.83	lb/d
	TN	0.39	lb/d
	NH_4-N	0.02	lb/d
Quality			
	BOD_5	20	mg/L
	TSS	20	mg/L
	TN	9.5	mg/L
	NH_4-N	0.5	mg/L

Stream (10) - Solid Wasted

Flow		34	gpd
Mass			
	BOD_5	0.01	lb/d
	TS	9	lb/d
	TN	0.00	lb/d
	NH_4-N	0.000	lb/d
Quality			
	BOD_5	20	mg/L
	TS	3.0	%
	TN	10	mg/L
	NH_4-N	0.5	mg/L

2.2 Disinfection System

2.2.1 Flow Chart and Mass Balance Analysis



MASS BALANCE ANALYSIS

- Kahuluu Beach Wastewater Treatment Plant -

Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

2.2.2 Parameter:

Inline UV

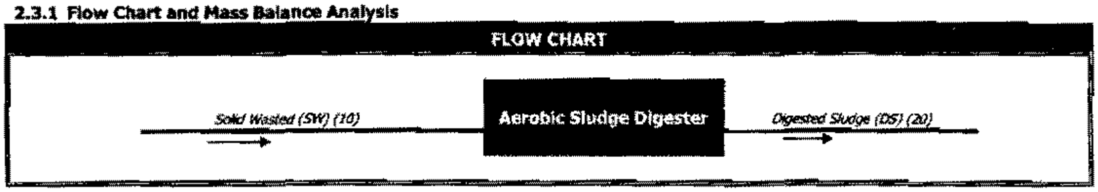
No. of units	2
Minimum dose for 99.999% inactivation	80 mJ/cm^2
No. of lamps per unit	1
Flow capacity of each unit	12 gpm

Clear Water Tank

No. of tank	1
Volume of tank	2,900 gallons

2.3 Sludge Handling System

2.3.1 Flow Chart and Mass Balance Analysis



2.3.2 Parameter:

Sludge feed concentration, TS	3%
Sludge feed flow, Qs	34 gpd
Sludge retention time, SRT	20 days
Required aerobic digester volume	686 gallons
No. of units	1
Water depth	7 ft
Operational volume of each tank	878 gallons
Aeration period	26 day
Total operational volume	878 gallons
Solid loading	65 lb VSS/1000 ft^3
VSS feed amount:	2 lb VSS/day
VSS reduction:	40%
VSS destroyed in digester:	1 lb VSS/day

Oxygen Requirements

Oxygen required	2.3 lb O_2/lb VSS

2.3.3 Results:

Stream (20) - Digested Sludge

Flow		34 gpd
Mass		
	TS	8 lb/d
Quality		
	TS	2.7%

MASS BALANCE ANALYSIS

- Kahuluu Beach Wastewater Treatment Plant -

Kahuluu Beach Wastewater Treatment Plant

5,000 gpd @ Average Dry Weather Flow

III. Summary of Flow and Mass Balance Data

3.1 Summary of Flow and Mass Balance Data

Code	Name						
1	Raw Sewage	Flow	gpd	5,000			
		BOD_5	lb/d	17	TKN	lb/d	2
			mg/L	400		mg/L	40
		TSS	lb/d	17	NH3-N	lb/d	1
			mg/L	400		mg/L	25
2	BCR Influent	Flow	gpd	5,000			
		BOD_5	lb/d	17	TKN	lb/d	2
			mg/L	400		mg/L	40
		TSS	lb/d	17	NH3-N	lb/d	1
			mg/L	400		mg/L	25
3	BCR Effluent	Flow	gpd	5,000			
		BOD_5	lb/d	1	TN	lb/d	0
			mg/L	20		mg/L	10
		TSS	lb/d	9	NH3-N	lb/d	0.0
			mg/L	226		mg/L	0.5
4	DAF Effluent	Flow	gpd	4,966			
		BOD_5	lb/d	1	TN	lb/d	0
			mg/L	20		mg/L	10
		TSS	lb/d	1	NH3-N	lb/d	0.0
			mg/L	20		mg/L	0.5
10	Solid Wasted	Flow	gpd	34			
		BOD_5	lb/d	0.01	TN	lb/d	0.00
			mg/L	20		mg/L	10
		TSS	lb/d	9	NH3-N	lb/d	0.000
			%	3.0%		mg/L	0.5
20	Digested Sludge	Flow	gpd	34			
		TS	lb/d	8			
			mg/L	2.7%			

KAHULUU BEACH

WASTEWATER TREATMENT PLANT

I. BASIS OF DESIGN

1.1 INFLUENT CHARACTERISTICS

Design flow:	5,000 gpd
	3.5 gpm
Design loading:	
Average:	
BOD_5	400 mg/L
lb. BOD_5	17 lb/day
SS	400 mg/L
lb. SS	17 lb/day
TKN	40 mg/L
lb. TKN	1.7 lb/day
NH_3-N	25 mg/L
lb. NH_3-N	1 lb/day
Alkalinity	200 mg/L as $CaCO_3$
lb. Alkalinity	8 lb $CaCO_3$/day

1.2 EFFLUENT CRITERIA

Flow:	4,966 GPD
BOD_5	20 mg/L
lb. BOD_5	0.83 lb/day
SS	20 mg/L
lb. SS	0.83 lb/day
TN	10 mg/L
lb. TN	0.39 lb/day

II. BCR SYSTEM

2.1 HEADWORKS

EQ TANK

No. of units	1
Water depth	8.0 ft
Tank dimensions:	
Diameter	10 ft
Length:	1.5 ft
Actual operational volume:	756 gallons
Air flow:	30 SCFM/1000 ft^3
Total air flow:	3 SCFM

INLET SCREENS

KAHULUU BEACH

WASTEWATER TREATMENT PLANT

No. of units	1
Size of opening	6 mm
Flowrate at maximum flow	571 gpm

2.2 <u>BCR SYSTEM</u>

ANOXIC ZONE

Internal recycle ratio	2.3
No. of units	1
Water depth	8.0 ft
Operational volume of each tank	756 gallons
Actual operational volume	756 gallons
Hydraulic retention time	3.6 hr
Tank dimensions:	
Diameter	10 ft
Length:	1.5 ft
Actual operational volume:	756 gallons

AEROBIC ZONE

Biomedia filling capacity:	50%
Media required (ft^3) for BOD:	149 ft^3
Specific surface area of media:	152.4 ft^2/ft^3
Surface area available on media:	22,640 ft^2
Thickness of biofilm:	0.4 mm
Dry density of biofilm:	90 mg/cm^3
Biomass available in tank:	9.0 g/L
No. of units	1
Water depth	8.0 ft
Total operational volume	1,467 gallons
Hydraulic retention time:	7.0 hr
Tank dimensions:	
Diameter	10 ft
Length:	3.0 ft
Actual operational volume:	1,467 gallons
Volumetric BOD loading:	85 lb $BOD_5/1000\ ft^3$

2.3 <u>AIR SUPPLY SYSTEM</u>

OXYGEN REQUIREMENTS

Oxygen required for BOD_5 removal:	15.6 lb O_2/day
Actual oxygen requirement (AOR) for BOD_5 removal:	0.65 lb O_2/hr
Correction factor:	0.34
Total standard oxygen requirement (SOR):	2 lb O_2/hr
Safety factor:	1
Oxygen flow required:	2 lb O_2/hr

BWS1

KAHULUU BEACH

WASTEWATER TREATMENT PLANT

AERATION SYSTEM

lb. O_2 per ft.^{3} of air:	0.0175
Efficiency per foot of immersion depth:	1.00%
Air flow required:	23 SCFM
	1.4 SCFM/lb BOD_5/day
Air flow for each coarse bubble diffuser (TFA-3):	6 SCFM
No. of diffusers:	3

2.4 DAF

No. of DAF units:	1
Maxim flow capacity:	30 gpm
Dimensions:	
Diameter	10 ft
Width:	2 ft
Actual surface area:	0.1 ft^2
Actual hydraulic loading:	0.6 gpd/ft^2
Actual solid loading:	5.00 lb/d/ft^2

2.6 INLINE UV

No. of units	1
Minimum dose for 99.999% inactivation	80 mW.s/cm^2
No. of lamps per unit	1
Flow capacity of each unit	12 gpm
Power	0.03 kw

III. AEROBIC SLUDGE DIGESTER

3.1 SLUDGE DIGESTER

No. of Tanks:	1
Water depth:	7.0 ft
Operational volume of each tank:	878 gallons
Tank dimensions:	
Diameter	10 ft
Length:	2.0 ft
Actual operational volume:	878 gallons

B. OXYGEN REQUIREMENTS:

lb. O_2 required for lb. VSS destroyed:	2.3 lb O_2/lb VSS
Actual oxygen requirement (AOR):	0.1 lb O_2/hr
Correction factor in wastewater:	0.65
Correction factor in sludge:	0.27
Safety factor:	1.1
Standard oxygen requirement (SOR):	0.4 lb O_2/hr

C. AIR SUPPLY SYSTEM

lb. O_2 per ft.^{3} of air:	0.0175
Efficiency per foot of immersion depth:	1.00%
Air flow required:	5.0 SCFM
Air volume per 1,000 ft^3 tank volume	42 SCFM
Air flow for each coarse bubble diffuser (TFA-3/4"):	6 SCFM
No. of diffusers:	0

IV. MECHANICAL EQUIPMENT

4.1 BCR BLOWER

Air flow required:	31 SCFM
No. of air blower:	2
Model:	AB402
RPM:	3,985
Discharge temperature:	147 °F
Power:	3.5 hp
Inlet volume:	113 SCFM
Inlet pressure:	14.7 psia
Inlet temperature:	100 °F
Discharge pressure:	118.0 In H_2O
Differential pressure:	6.0 psia
Estimated noise level:	71 dB(A)

4.2 PUMPS

Lift Pumps

No. of pump:	1
Flow:	20 gpm
Head:	36 ft
Power:	2 hp

Internal Recycle Pumps

No. of pump:	1
Flow:	15 gpm
Head:	20 ft
Power:	1 hp

4.3 DAF

No. of DAF:	1
Power:	0.75 hp
No. of air dissolving pump	1
Flow:	4 gpm

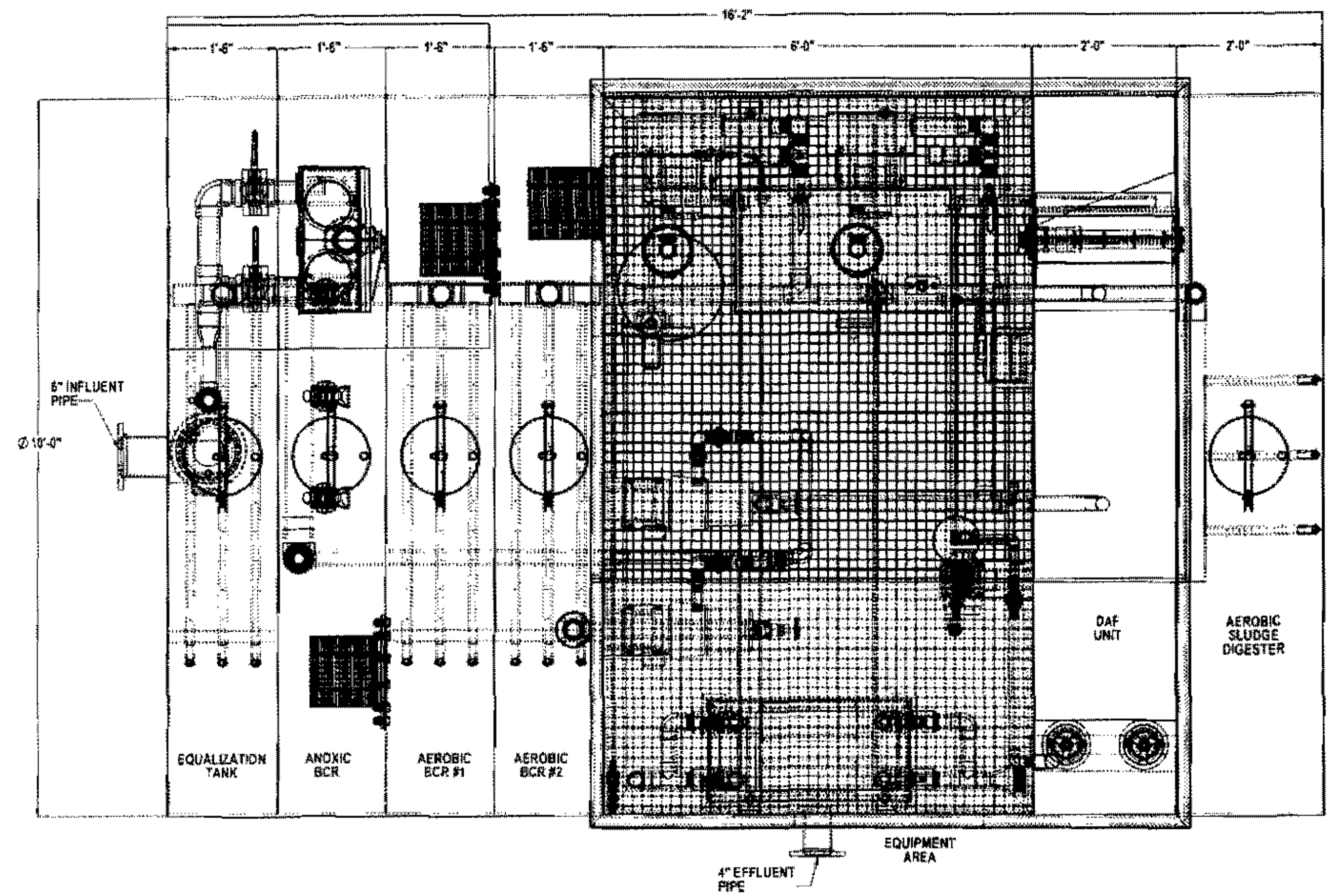
Head:	1.152 psi
Power:	126 hp

4.4 CHEMICAL FEED PUMP

No. of units:	1
Power:	0.11 kw

APPENDIX II DESIGN DRAWINGS

- **General Plan Layout**
- **General Plan Layout - 3D View**
- **General Site Plan Layout**
- **Process Flow Diagram**



NOT FOR CONSTRUCTION

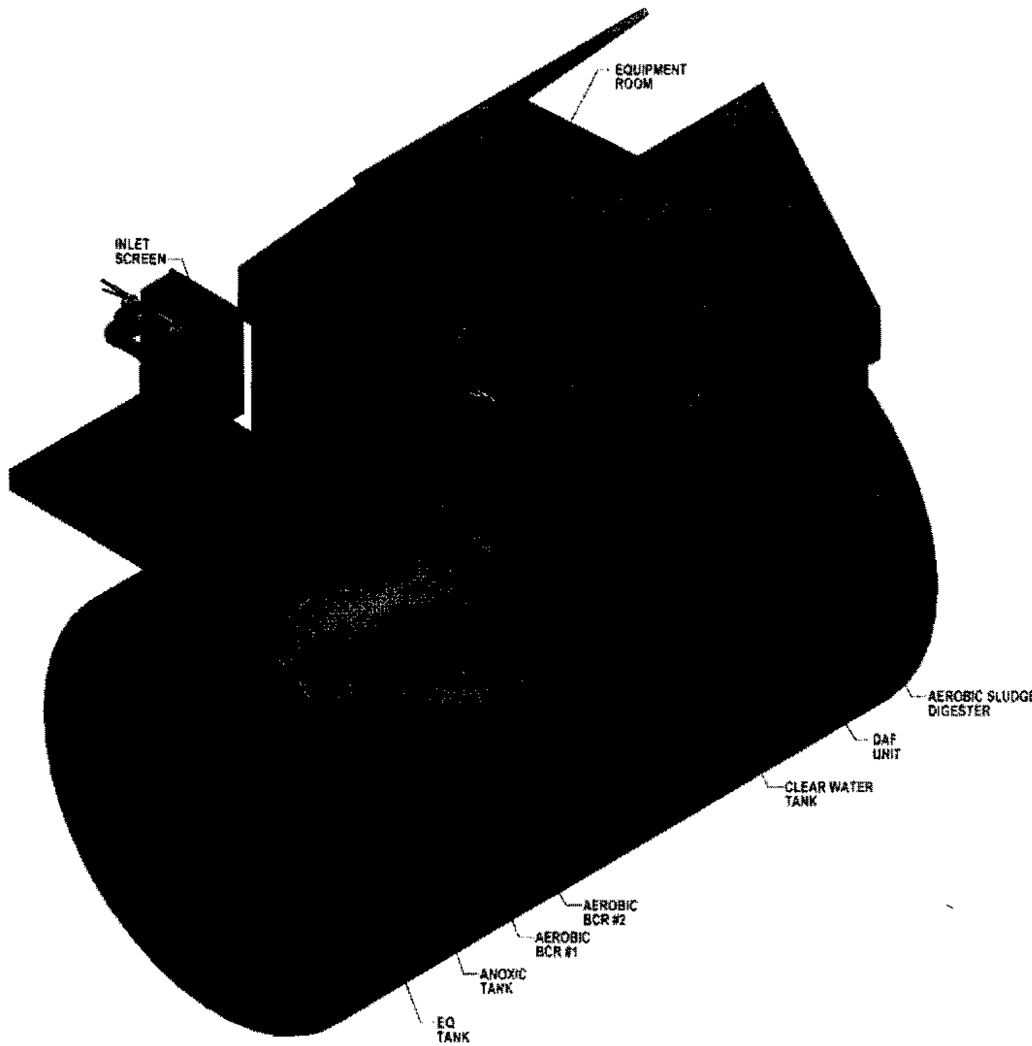
KAHULUU BEACH
5,000 GPD WWTP

8424 SOUTH QUEBEC ST
CENTENNIAL, COLORADO

GENERAL PLAN LAYOUT

PROJECT: KAHULUU BEACH 5,000 GPD WWTP

SCALE 1:20 | SHT 1 | OF 4



NOTES:

1 CLEAR WATER TANK LOCATED BELOW EQUIPMENT AREA

2 INLET SCREEN PLACED AT GROUND LEVEL

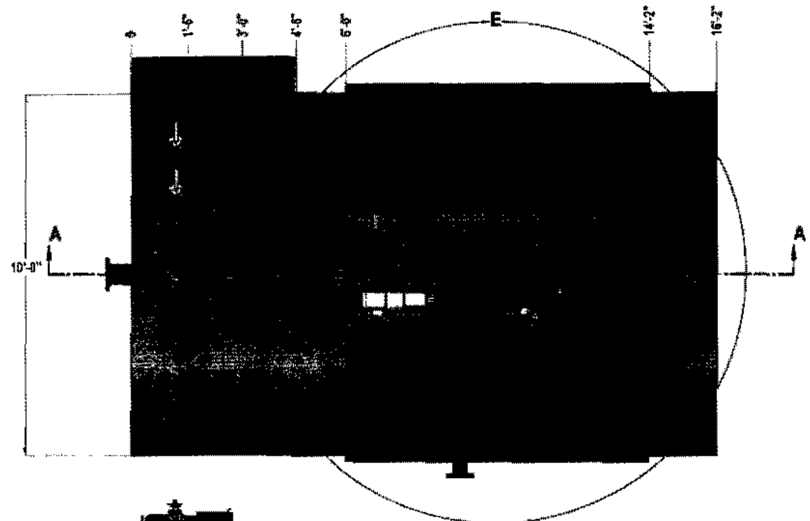
NOT FOR CONSTRUCTION	KAHULUU BEACH 5,000 GPD WWTP	

BCS1 INTERNATIONAL
6424 SOUTH QUEBEC ST
CENTENNIAL, COLORADO
80111
PHONE 303-665-3555

DESCRIPTION: GENERAL PLAN LAYOUT, 3D VIEW

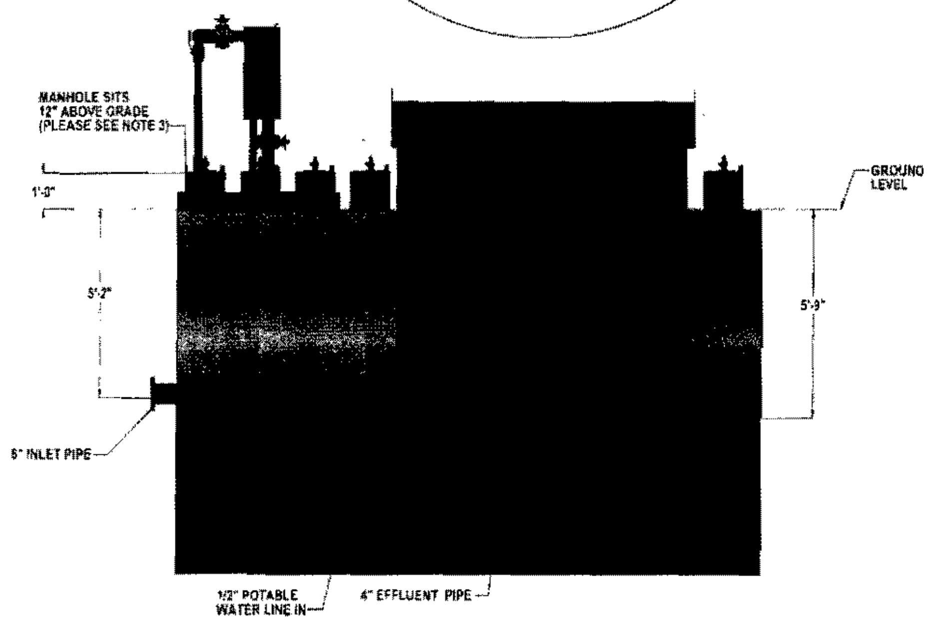
PROJECT: KAHULUU BEACH 5,000 GPD WWTP

SCALE 1:15

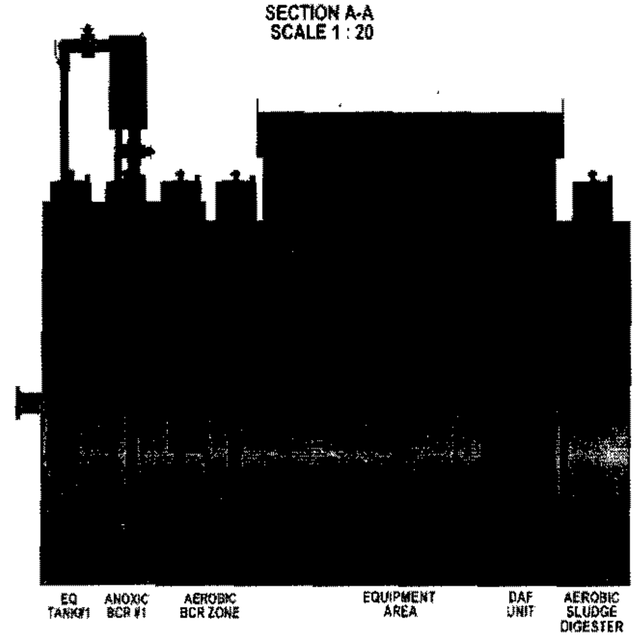


NOTES:

1. ELECTRICAL CONTROL BOX PLACED OUTSIDE OF TANK
2. ROOF HATCH TO EQUIPMENT AREA NOT SHOWN
3. MANHOLE CAN BE EXTENDED FOR DEEPER TANK BURIAL



SECTION A-A
SCALE 1 : 20

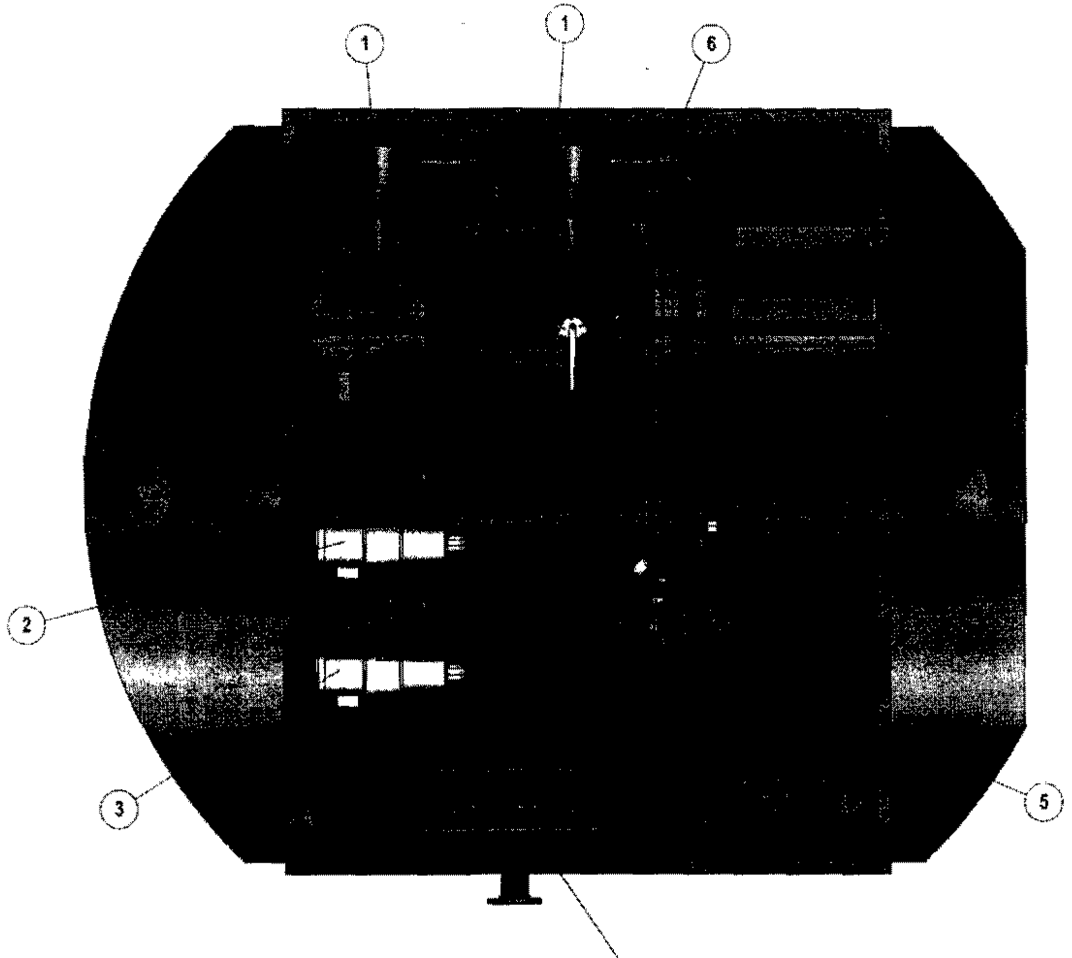


NOT FOR CONSTRUCTION	KAHULUU BEACH 5,000 GPD WWTP	5K GPD PLANT INSTALLATION VIEWS

BWSI — CENTENNIAL, COLORADO

PROPRIETARY AND CONFIDENTIAL

KAHULUU BEACH 5,000 GPD WWTP — SCALE 1:20 — SHEET 3 OF 4



DETAIL E
SCALE 1 : 10

ITEM NO.	DESCRIPTION	QTY
1	BLOWER	2
2	SLUDGE PUMP	1
3	INTERNAL RECYCLE PUMP	1
4	UV SYSTEM	2
5	AIR DISSOLVING PUMP	1
6	POLYMER SYSTEM	1

NOT FOR CONSTRUCTION

KAHULUU BEACH
5,000 GPD WWTP

PROPRIETARY AND CONFIDENTIAL

SOUTH QUEBEC ST
CENTENNIAL, COLORADO

PHONE

5K GPD PLANT INSTALLATION VIEWS

SIZE D

PROJECT KAHULUU BEACH 5,000 GPD WWTP

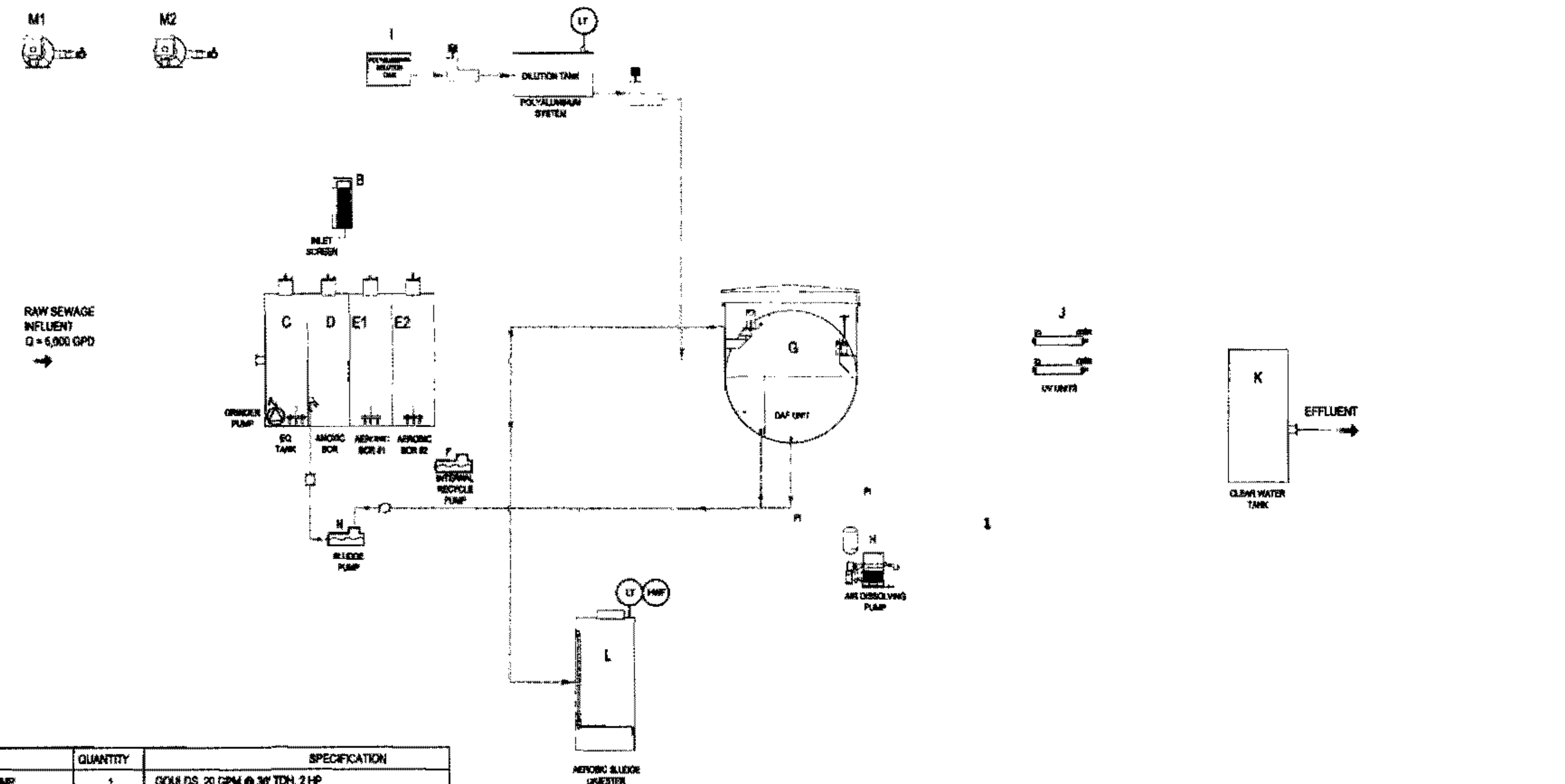
DRAWN PKC

APVD BY

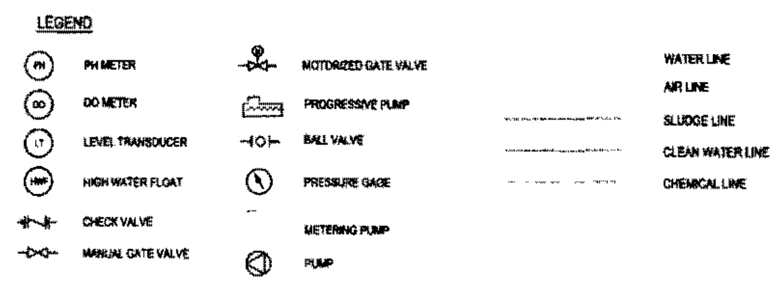
DWG. NO

SCALE 1:10

SHT 4 OF 4



ID	EQUIPMENT	QUANTITY	SPECIFICATION
A	SUBMERSIBLE GRINDER PUMP	1	GOULDS, 20 GPM @ 36' TDH, 2 HP
B	INLET SCREEN	1	MAX. 475 GPM, 6 MM
C	EQ TANK	1	756 GAL, L=1.5', Ø10'
D	ANOXIC BCR	1	756 GAL, L=1.5', Ø10'
E	AEROBIC BCR	1	1,467 GAL. TOTAL, L=3', Ø10'
F	INTERNAL RECYCLE PUMP	1	MOYNO, 20 GPM @ 20' TDH, 1 HP
G	DAF UNIT	1	MAX. 30 GPM, 0.75 HP
H	AIR DISSOLVING PUMP	1	4 GPM @ 1.152 PSI, AIR FLOW 3.0 CFH, 0.25 HP
I	POLYALUMINUM SYSTEM	1	5 PPM
J	UV SYSTEM	2	40 MJ/CM²
K	CLEAR WATER TANK	1	2,900 GAL
L	AEROBIC SLUDGE DIGESTER	1	678 GAL, L=2', Ø10'
M	BLOWER	2	113 SCFM, 118.0 PSI, 3.5 HP
N	SLUDGE PUMP	1	MOYNO, 3 HP



NOT FOR CONSTRUCTION

PREPARED FOR:

KAHULUU BEACH
HAWAII
WASTEWATER TREATMENT PLANT

PROPRIETARY AND CONFIDENTIAL

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DRAWN BY: PHC DATE: 07/20/09
APPROVED BY: DATE:

6424 SOUTH QUEBEC ST
CENTENNIAL, COLORADO
80111
PHONE 303 - 265 - 0686

TITLE: PROCESS FLOW DIAGRAM

SIZE: D PROJECT: KAHULUU BEACH WWTP-5,000 GPD REV

DWG. NO. SCALE SHT OF

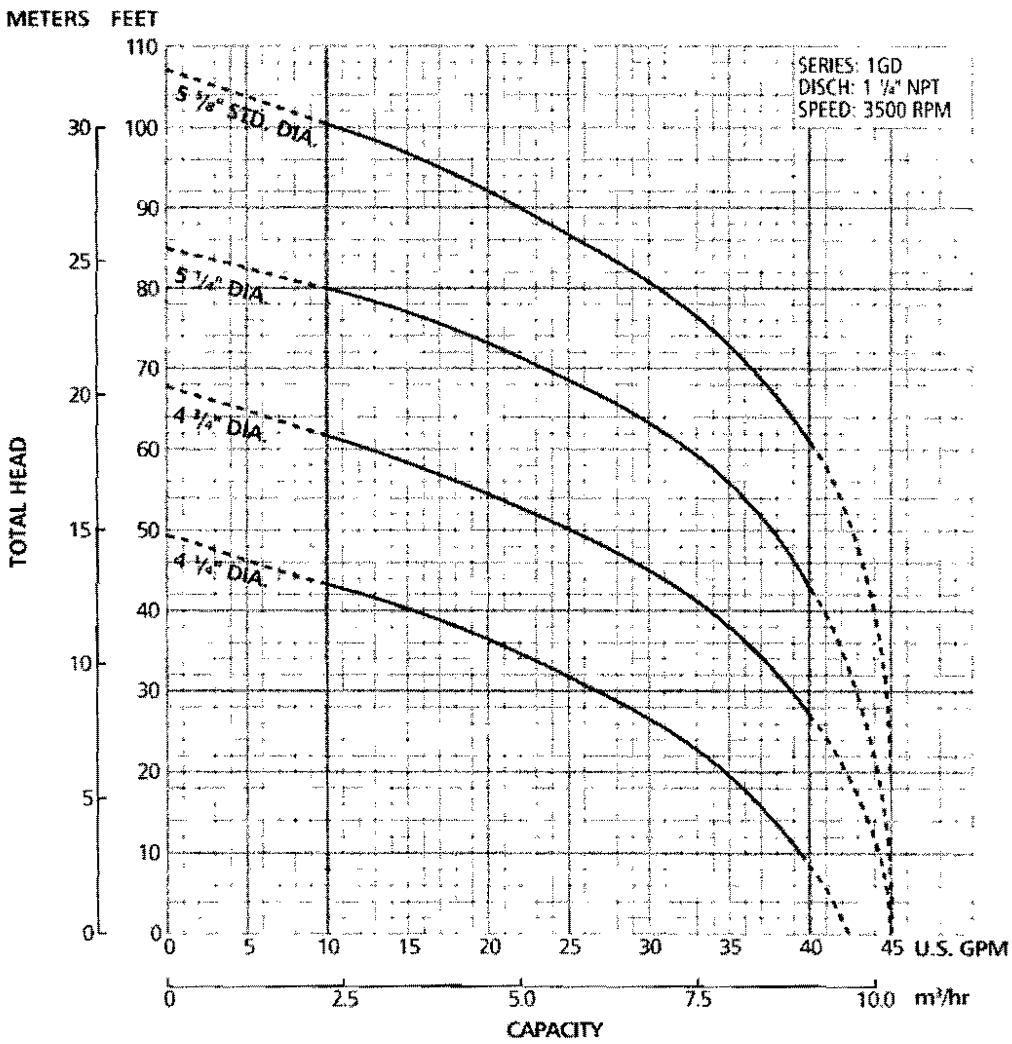
APPENDIX III MECHANICAL EQUIPMENT SPECIFICATIONS

ITT

Wastewater

Goulds Pumps

1GD Submersible Grinder Pump PERFORMANCE CURVE



= A 1 1/4" minimum discharge pipe requires a minimum flow of 10 gpm to maintain a 2 ft./sec. scouring velocity. Flows less than 10 gpm will allow solids to settle in the pipe

GOULDS PUMPS

www.goulds.com

Goulds Pumps is a brand of ITT Corporation.

Engineered for life

ITT

Wastewater

Goulds Pumps

1GD Submersible Grinder Pump

Dual Seal with Optional Seal Sensor Probe

GOULDS PUMPS

Goulds Pumps is a brand of ITT Residential and Commercial Water.

www.goulds.com

Engineered for life

FEATURES

- Single phase pumps now have built-in overload protection. See control panel note on page 3.
- **Impeller:** Silicon bronze, multi-vane semi-open, with pump-out vanes for mechanical seal protection. Balanced for smooth operation.
- **Grinder Cutter System:** The anti-roping design, hardened cutter is keyed to the motor shaft for positive drive. The cutter ring is specially designed to be reversed when the first side wears out thus doubling its life and reducing maintenance costs. The cutter system is designed and tested to pass items found in normal wastewater.
- **Casing:** Heavy duty cast iron, volute type for maximum efficiency. Use with A10-12 guide rail system for ease of installation and maintenance.
- **Dual Mechanical Seals:** Silicon carbide vs. silicon carbide outer seal and ceramic vs. carbon inner seal, stainless steel metal parts, BUNA-N elastomers. Upper and lower shaft seals are positioned independently and are separated by an oil-filled chamber. Optional Silicon/Tungsten Carbide outer seal available.
- **Optional Seal Sensor Probe:** Located in oil-filled chamber. If pumpage should begin to leak past lower seal it indicates to pump control panel a fault has occurred. **Requires optional Seal Fail Circuit in the control panel.**
- **Fasteners and Pipe Plugs:** 300 series stainless steel.

AGENCY LISTINGS

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association
File #LR38549

Goulds Pumps is ISO 9001 Registered.

ITT

GOULDS PUMPS
Wastewater

APPLICATIONS

Designed for high head sewage applications where a gravity system is not practical. Ideal for pressure sewage systems.

SPECIFICATIONS

Pump:
- Solids handling capabilities: 3" maximum.
- Discharge: 1¼" NPT removable flange.
- Capacities: up to 46 GPM.
- Total heads: up to 106 feet TDH.

Motor:
- 2 HP, 3450 RPM, 60 Hz
- Class "F" insulation
- Rated for continuous duty fully submerged
- Max. Fluid Temperature: 104° F continuous duty, 140° F intermittent duty

Single Phase:
- 208 or 230 volt
- Built-in, auto reset, on-winding motor overload

Three Phase:
- 200, 230, 460 or 575 volt
- Class 10 ambient compensated, overload protection required in control panel.

MOTORS

- Fully submerged in oil-filled chamber. High grade turbine oil surrounds motor for more efficient heat dissipation, permanent lubrication of bearings and mechanical seal for complete protection against outside environment.
- Class F insulation.
  - **Single phase:** 2 HP, 208 or 230 volt, 60 Hertz, 3450 RPM, 14/4 power cord. Motor has built-in overload with automatic reset. Start capacitor, run capacitor and starting relay are required and will be located in the control panel. See "Recommended Control Panels" in chart on this bulletin.
  - **Three phase:** 2 HP, 200, 230, 460 or 575 V, 60 Hz, 3450 RPM. 14/4 STOW. Overload protection must be provided in starter unit.
- **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits and can be operated continuously without damage when fully submerged.
- **Bearings:** Upper and lower heavy duty ball bearing construction for precision positioning of parts and to carry thrust loads.
- **Power (Sensor) Cables:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. 20 foot standard with optional lengths available.
- **O-ring:** Assures positive sealing against contaminants and oil leakage.
- **Shaft:** 300 series stainless steel, keyed design, short overhang for minimum shaft deflection.
- Pump is capable of running dry without damage to mechanical components.

NOMENCLATURE DESCRIPTION

1st, 2nd and 3rd Characters – Discharge Size and Type
1GD = 1¼" discharge, grinder, dual seal

4th Character – Mechanical Seals
5 = silicon carbide/silicon carbide/BUNA – lower seal and carbon/ceramic/BUNA – upper seal (standard)
3 = silicon carbide/tungsten carbide/BUNA – lower seal and carbon/ceramic/BUNA – upper seal (optional)

5th Character – Cycle/RPM
1 = 60 Hz/3500 RPM   5 = 50 Hz/2900 RPM

6th Character – Horsepower
G = 2 HP

7th Character – Phase/Voltage
1 = single phase, 230 V   5 = three phase, 575 V
2 = three phase, 200 V   6 = three phase, 380 V
3 = three phase, 230 V   8 = single phase, 208 V
4 = three phase, 460 V

8th Character – Impeller Diameter
A = 5⅝", Standard   C = 4¾"
B = 5¼"   D = 4¼"

9th Character – Cord Length (Power and Sensor)
A = 20' (standard)   F = 50'   J = 100'
D = 30'   G = 75'

10th Character – Options
S = Seal fail, moisture sensing circuit[1]
E = Epoxy paint

Last Character – Option
H = Pilot duty thermal sensors[1]

These options add a 2-wire or 4-wire sensor cord to the pump and require optional control panel circuits to operate. See panel options on control panel bulletin BCP5.

ITT

GOULDS PUMPS
Wastewater

MODEL AND MOTOR INFORMATION

ORDER NO.	HP	PHASE	VOLTS	RPM	MAXIMUM AMPS	LOCKED ROTOR AMPS	KVA CODE	FULL LOAD EFFICIENCY %	RESISTANCE START	RESISTANCE LINE-LINE	POWER CORD	WEIGHT LBS.
1GD51G1AA	2	1	230	3450	15.5	120.0	P	79.0	1.37	0.62	14/4 STOW 20' LONG	110
1GD51G8AA			208		17.5							
1GD51G2AA		3	200		14.0	44.8	J	81.0	NA	1.8		105
1GD51G3AA			230		12.0	37.4	D	81.4		2.8		
1GD51G4AA			460		6.0	18.7				11.1		
1GD51G5AA			575		4.8	14.0	J	83.2		18.0		

FEATURES *(continued)*

Effective with December 2005 (M05) Date Codes -

Single-Phase 1GD Pumps Contain a Built-in, Auto Reset Overload.

Important Control Panel Requirements and Notes:

Pump Order No.	Pump Seal Fail Circuit	Voltage / Phase	Recommended Control Panel Simplex	Recommended Control Panel Duplex
1GD51G1A_	NO	230 / 1	S1GD2	D1GD2
1GD51G8A_	NO	208 / 1	S1GD2	D1GD2
1GD51G1A_S	YES	230 / 1	S1GD2H	D1GD2J
1GD51G8A_S	YES	208 / 1	S1GD2H	D1GD2J

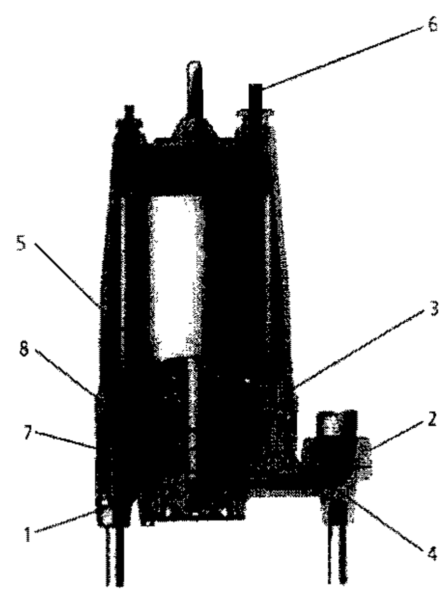
1) See panel bulletin BCPS for other available options.
2) These pumps require a magnetic contactor, start and run capacitors and a starting relay in the control panel.
3) CP-1GDB Capacitor packs with starting relays are available on product bulletin BCPCAP. They are for certified panel shops to "build" into a custom panel. Field installing capacitor packs into a S10020 or D10020 will negate the UL listing on that panel and is therefore not permissible.

MATERIALS OF CONSTRUCTION

Item No.	Part Name	Material
1	Impeller, multi-vane	1179
2	Castings	1003
3	Shaft-keyed	300 Series SS
4	Fasteners	300 Series SS
5	Ball bearings	Steel
6	Power cable	STOW, 20 feet
7	O-ring	BUNA-N

Item No.	Outer Mech. Seal	No.	Service	Rotary	Stationary	Elastomers	Metal Parts
8	OPT	10K22	Heavy duty	Silicon Carbide	Tungsten Carbide	BUNA-N	300 Series SS
	STD	10K28	Mild abrasives	Silicon carbide		BUNA-N	300 Series SS

Material Code	Engineering Standard
1003	Cast iron — ASTM A48 Class 30
1179	Silicon bronze - ASTM C87600



APPLICATION DATA

Maximum Solid Size	N/A
Minimum Casing Thickness	5/16"
Casing Corrosion Allowance	1/8"
Maximum Working Pressure	50 PSI
Maximum Submergence	50 feet
Minimum Submergence	Fully submerged for continuous operation
	6" below top of motor for intermittent operation
Maximum Environmental Temperature	40°C (104°F) continuous operation
	60°C (140°F) intermittent operation

CONSTRUCTION DETAILS

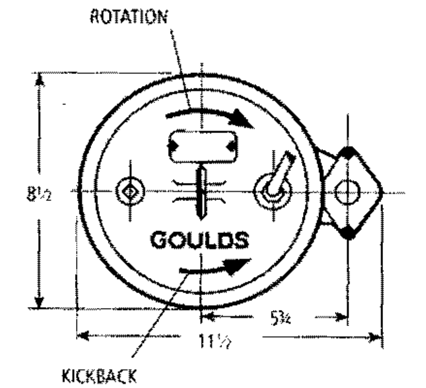
Power Cable – Type	14/3, type STOW: single phase
	14/4, type STOW: three phase
	14/4, type STOW: all three phase
Sensor Cable – Type	16/2, type SJTOW: heat sensor or seal fail only
	18/4, type SJTOW: seal/heat sensor
Motor Cover	Gray Cast Iron – ASTM A48 Class 30
Bearing Housing	Gray Cast Iron – ASTM A48 Class 30
Seal Housing	Gray Cast Iron – ASTM A48 Class 30
Casing	Gray Cast Iron – ASTM A48 Class 30
Impeller	Cast Bronze – ASTM B584 C87600
Motor Shaft	AISI 300 Series Stainless Steel
Motor Design	NEMA 56 Frame, oil filled with Class F Insulation
Optional: Motor Seal Fail (Moisture) Detection	Seal fail sensor in an oil-filled seal chamber. Connect to an optional relay in control panel.
Optional: Motor Thermal Protection 1Ø and 3Ø	Normally closed on-winding thermostats open at 275° F (135° C) and close at 112° F (78° C). Require terminal connections in the control panel.
Motor Overload Protection	**Single Phase:** Built-in, auto reset overload. **Three Phase:** Requires ambient compensated, Class 10 protection in the control panel.
External Hardware	300 Series stainless steel
Impeller Type	Semi-open with pump out vanes on back shroud
Cutter	Two blades; type 440C stainless steel
Oil Capacity – Seal Chamber	1.5 quarts
Oil Capacity – Motor Chamber	4.5 quarts

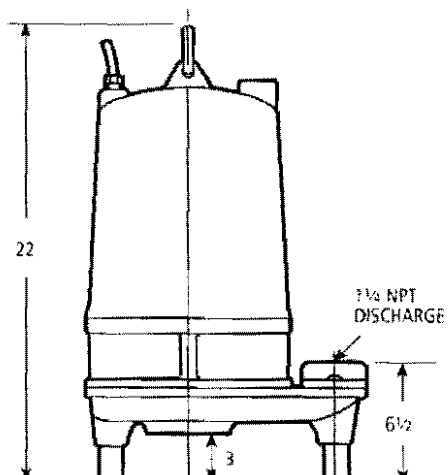
STANDARD PARTS

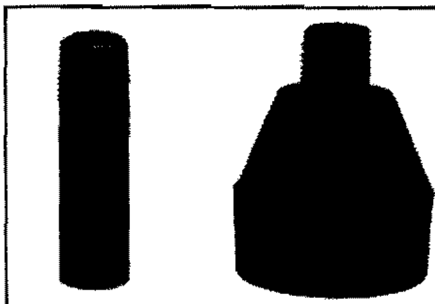
Ball Bearing – Upper	Single row ball – SKF™ 6203-2Z
Ball Bearing – Lower	Single row ball – SKF™ 6206-2Z
Mechanical Seals – Standard	Carbon/Ceramic – Upper Silicon Carbide/Silicon Carbide – Lower
Mechanical Seals – Optional	Silicon Carbide/Tungsten Carbide – Lower
O-Ring – Stuffing Box	BUNA-N, AS 568A-256
O-Ring – Motor Cover	BUNA-N, AS 568A-166

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)







Standard Foot

Optional Pump Legs
Order No. 4K639
(Set of 3)

GOULDS PUMPS

B1GD August, 2006

Engineered for life

Bio-Chip Reactor (BCR) Wastewater Treatment System

WSI INTERNATIONAL

SYSTEMS FOR ALL WASTEWATER APPLICATIONS

SERIES: BCR

Water Systems Integrators BCR series wastewater treatment systems are designed to treat 50,000 gpd to over 5 MGD of domestic or industrial wastewater. The BCR treatment system utilizes Bio-Chip Reactor (BCR) technology for primary BOD, nitrogen, and phosphorous removal. The BCR system can handle BOD concentrations from 150 to over 5,000 mg/L and total Kjeldahl nitrate concentration exceeding 65 mg-N/l. Due to the unique design of BCR systems, greater removal performance can be achieved in a smaller system footprint with no sludge recycle.

SYSTEM FEATURES

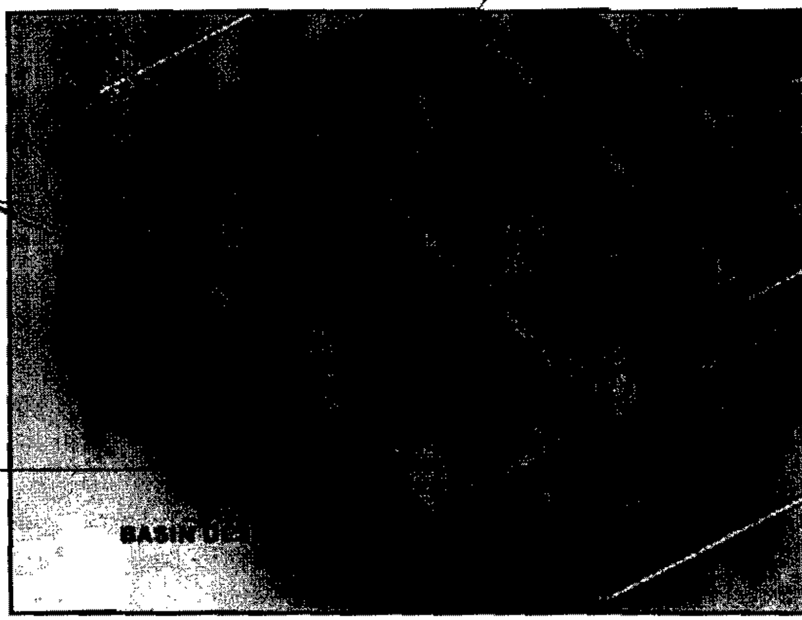
- Attached biofilm growth allows for high MLVSS concentrations (upwards of 10,000 mg/L) while minimizing TSS carryover
- Low TSS effluent does not require large clarification basins.
- Eliminates requirement for sludge return into main reaction basin – no RAS.
- Technology is attractive for both new and existing facilities requiring small footprint or an increase in capacity.
- Ability to achieve 300% to 500% increase in organic loading to existing facilities.
- If required the system can be configured as a strict biofilm system or combined with activated sludge.

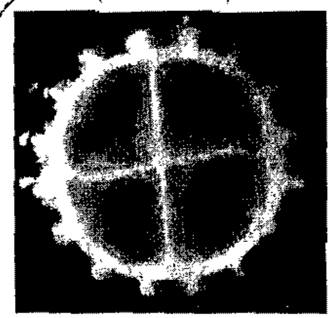
SPECIFICATIONS

Flow Capacity	50,000 gpd to over 5 MGD
Volume Requirements	5,500 ft^3/1 MGD @ 250 mg/L BOD
	15,00 ft^3/1 MGD @ 45 mg-N/L NH_3
	7,00 ft^3/1 MGD @ 35 mg-N/L NO_3
Water Depth	8 to 16 ft.
Aeration Blower	Rotary, pos. disp., 65 scfm, 3 HP
O_2 Transfer Eff.	0.85 – 1%/ft water depth
Biocarrier Characteristics	Total SA = 245 ft^2/ft^3
	Protected SA = 153 ft^2/ft^3
	S.G. = 0.94
	Max. Biofilm Thickness = 2 mm
	Water Displacement = 18%

WSI International, LLC 6424 South Quebec Street• Centennial, CO 80111 • Ph. 303.985.0885 • Fax. 303.985.3253 • www.wsi-llc.com

SYSTEM COMPONENTS

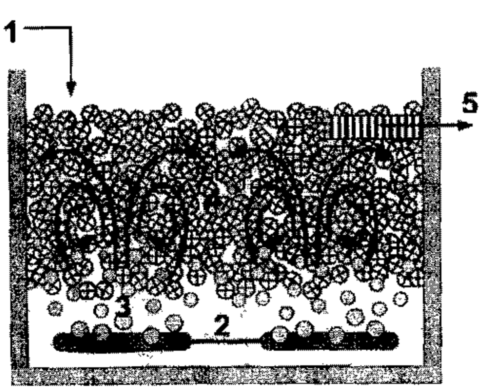




Biocarrier with attached bacterial biofilm.

Operation

1. Raw Wastewater enters the reaction basin .
2. Coarse bubble diffusers distribute air across basin (for aerobic operations; anaerobic operations require fluid diffusers).
3. Rising air bubbles lift and circulate biocarrier media in basin.
4. Biocarrier rises and falls with basin resulting in high mixing and elimination of "dead" zones.
5. Effluent discharged through carrier screen.



BCR Advantages

BCR systems have many advantages including the ability to operate under anoxic conditions for nitrogen removal or under conditions to promote removal of phosphorous. Since the majority of biomass within a BCR system is attached, effluent TSS from the reaction basins is typically lower than 200 mg/L. This allows for the use of highly efficient and compact solids separation techniques such as dissolved air flotation (DAF). In addition, the high MLSS concentration in the reaction basin translates into increased system stability and system capacity.

Disinfection

Depending on wastewater discharge requirements, the final disinfection of the treated wastewater can be achieved through conventional hypochlorite addition or by optional UV treatment.

Sludge Management

Sludge management includes the automatic removal of solids from the secondary solids separation system (typically a DAF unit) into either a digester basin or a gravity dewatering unit. If selected, the digester is operated in an aerobic mode to minimize the production of odors and potentially harmful gasses.

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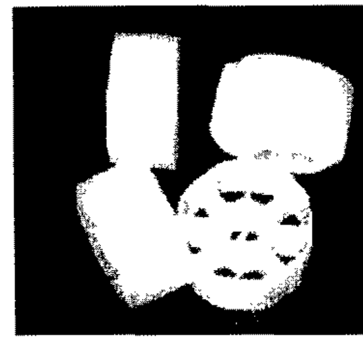
KONTAKT™ High Performance Carrier Elements for MBBR and IFAS Processes

A key component to the MBBR (Moving Bed Biological Reactor) and IFAS (Integrated Fixed-Film / Activated Sludge) processes is the efficiency of the reactor media or carrier element. Jaeger Environmental has developed KONTAKT™; a light-weight, durable, rugged and highly efficient media for MBBR and IFAS applications.



The KONTAKT design allows the media to freely move throughout the bioreactor while providing a significant protected surface area for biomass to adhere.

KONTAKT is added to aeration tanks and retained by a separation device. Diffused aeration systems and/or low energy mechanical mixers usually achieve sufficient agitation of the media.

KONTAKT offers key benefits to MBBR / IFAS applications:

- Manufactured of durable high density polyethylene
- Lightweight with a variable specific gravity from 0.93 to 1.05 for HDPE material
- Provides a large protected surface area
- Open internal design resists clogging
- Long lasting, economical, and easy to ship and install
- Easily upgrade overloaded aerated basins or A/S plants by adding Kontakt and minor system upgrades
- Eliminate sludge recycling
- Cost effective solution for retrofitting existing treatment systems
- Inexpensive alternative media for new plants

Kontakt has the following characteristics:

Jaeger Environmental can help you with your municipal or industrial wastewater

Type	Size	Weight, dry	Surface Area	Protected SA	Void Space
Kontakt 500	0.80" Diameter x 3/8" Long	7 lbs/ft^3	152 ft^2/ft^3	113 ft^2/ft^3	92%

application. Our other products include three different types of trickling filter media including our Sessil hanging strip media, Bio-Pac SF#30 random dump media, and Dura-Pac PVC modular media. We also manufacture media for submerged fixed bed systems, wastewater screening systems and random dump tower packings for air scrubber and stripping applications.

Please contact Jaeger Environmental to discuss your application today.

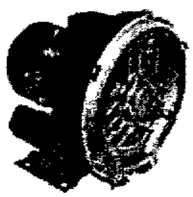
JAEGER ENVIRONMENTAL

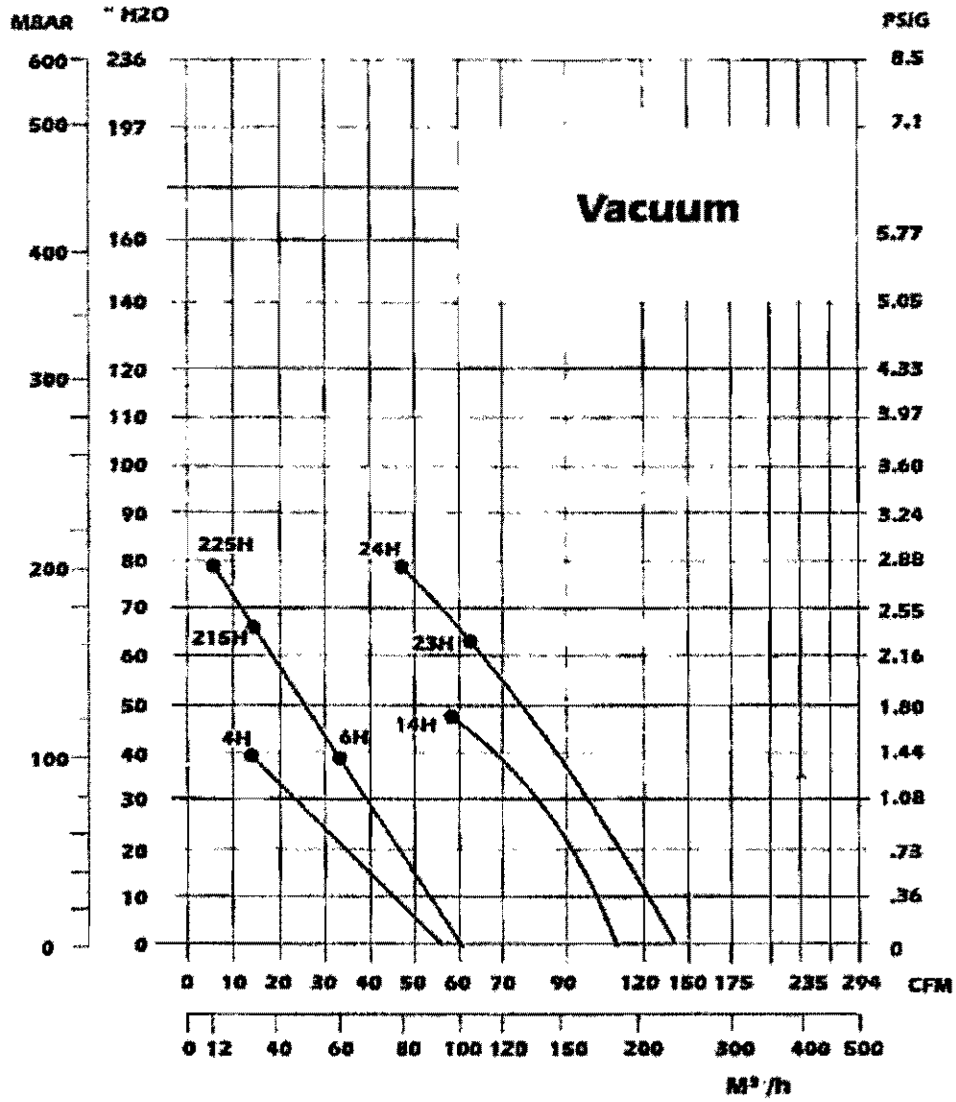
Jaeger Environmental · El Dorado, KS
540-862-8426 · Fax: 540-862-8427
www.JaegerEnvironmental.com · email: jpinfo@jaeger.com

ATLANTIC BLOWERS

Vacuum Performance Curve

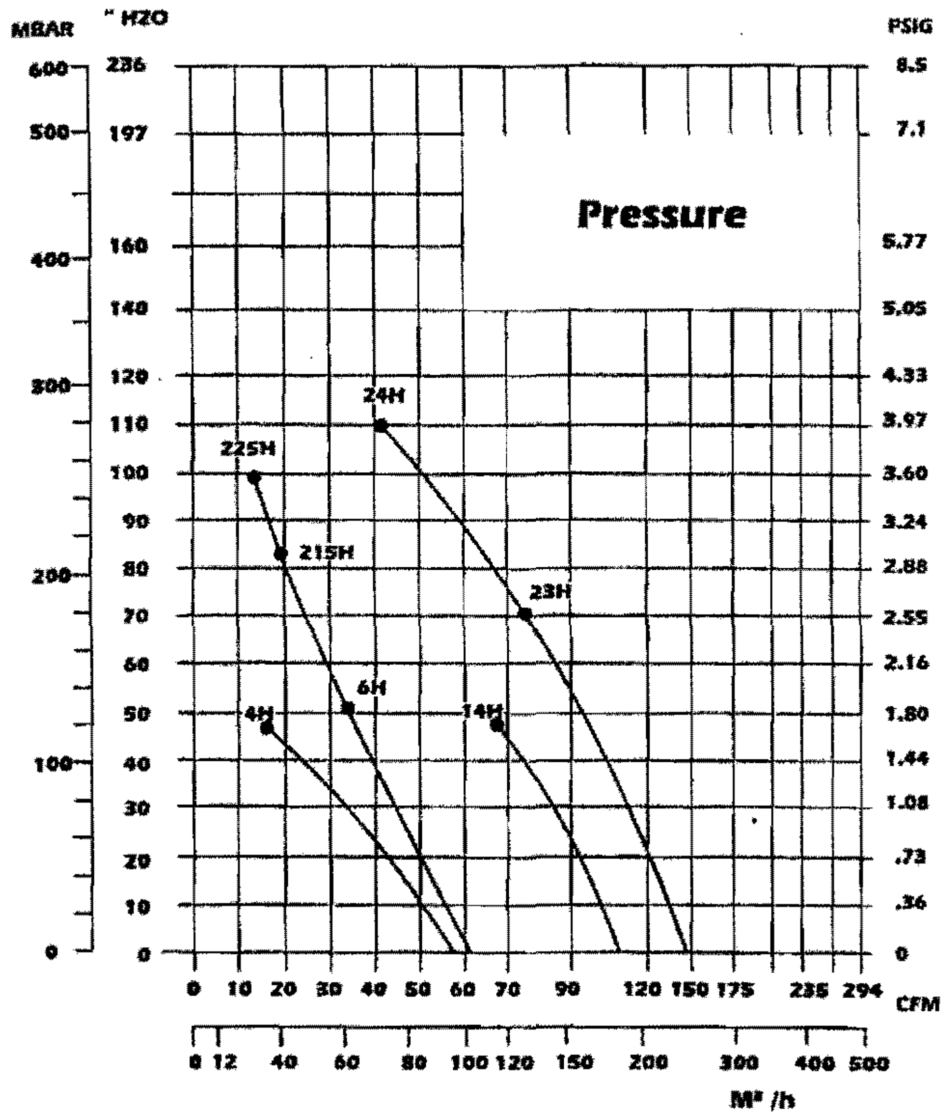
Single Phase





Pressure Performance Curve

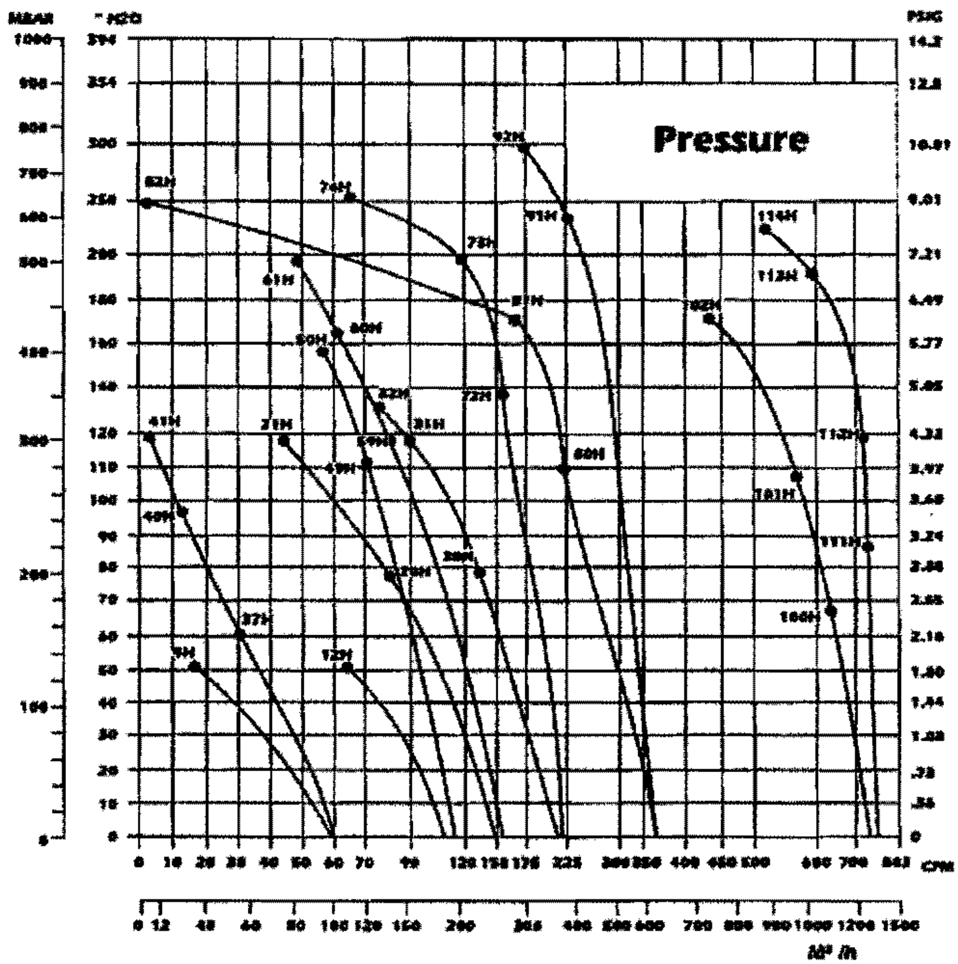
Single Phase



*Performance for all blowers is 60Hz. Ask for information on 50Hz.

Pressure Performance Curve

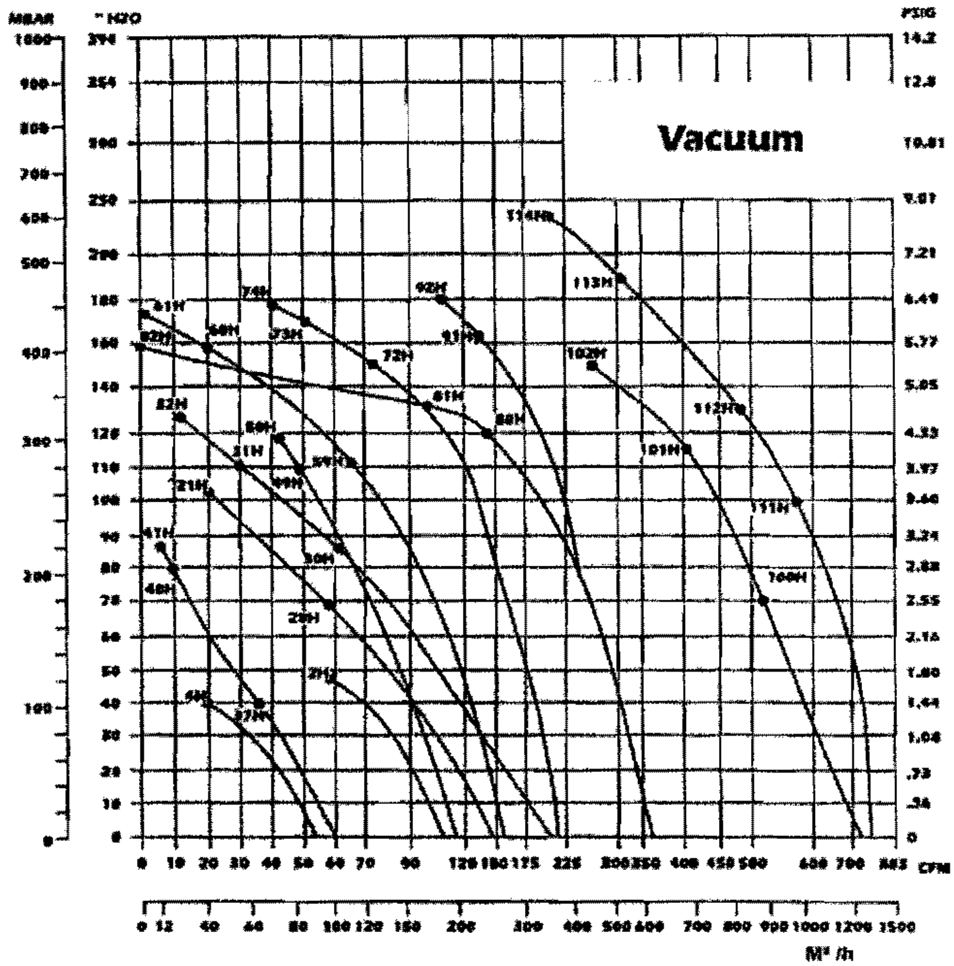
3 Phase



*Performance for all blowers is 60Hz. Ask for information on 50Hz.

Vacuum Performance Curve

3 Phase

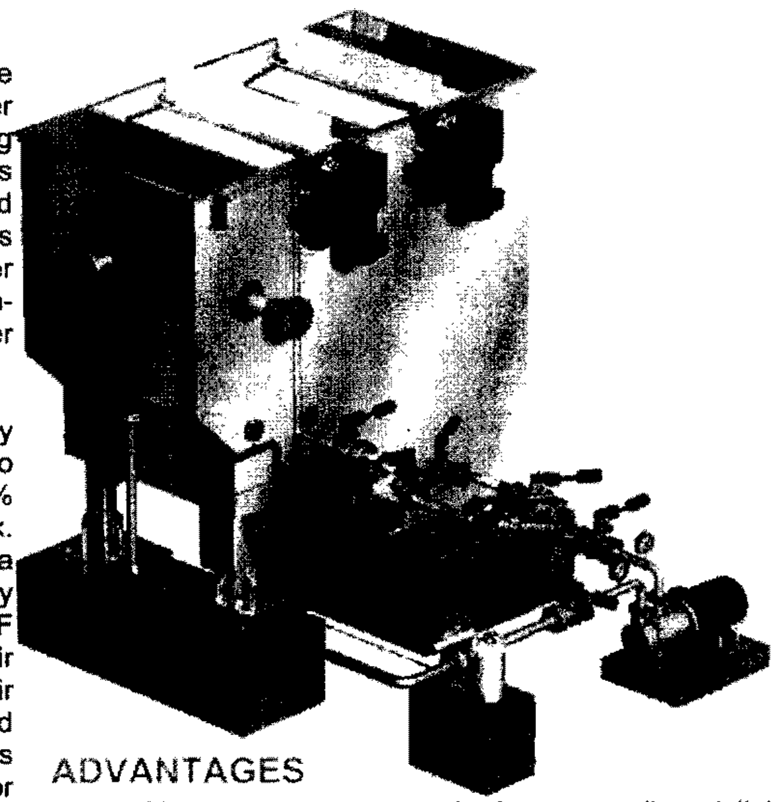


DISSOLVED AIR FLOTATION
Wastewater Treatment System

INTERNATIONAL

ETE TREATMENT SYSTEMS FOR SMALL TO LARGE WASTEWATER APPLICATIONS

SERIES: DAF UNITS



Dissolved Air Flotation (DAF) systems are frequently used in providing wastewater pretreatment, product recovery, and thickening of biological solids in numerous industries ranging from food processing to pulp and paper, as well as petrochemicals. There has been an expansion using DAF systems over the past several years in traditional and non-traditional areas of water and wastewater treatment.

The modern DAF units use the specially designed centrifugal air dissolving pumps to pressurize water with entrained air (10-20% v/v) without causing cavitations or vapor lock. This feature eliminates the requirements for a compressor and air saturation tank presently being used in the more traditional DAF designs. The advantages of the DAF using air dissolving pumps include a higher air dissolving efficiency due to high pressure and a unique design. The DAF efficiently shears incoming air into smaller bubbles, allowing for larger amounts of air to be entrained in the water, simple single-stage, single-impeller design, reliability and long life, superior whitewater production with very fine bubbles.

The WSI DAF unit series is designed based upon 30 years of industrial application experience with DAF units. The WSI DAF unit is constructed completely of stainless steel, either 304L or 316L, depending on the specific requirements of the customer. All bearings used in the DAF unit will have a B10 rating of no less than 250,000 hours.
The internal rise plates will be manufactured from heavy gauge stainless steel and are removable for cleaning.

ADVANTAGES

- More complete removal of very small and light particles which settle slowly by gravity in a shorter time period.
- Eliminate concerns of sludge bulking problems that may happen in the secondary clarifiers for both the suspended growth process and the attached growth system.
- Makes the daily operation of biological system easier and more stable;
- Higher hydraulic loading of DAF unit (2-5 gpm/ft^2) (compared to the conventional clarifier 0.4-0.5 gpm/ft^2);
- Much smaller footprint required;
- Higher wasted sludge solid content (about 2-3%, compared to 0.12-0.15% of conventional secondary clarifiers)

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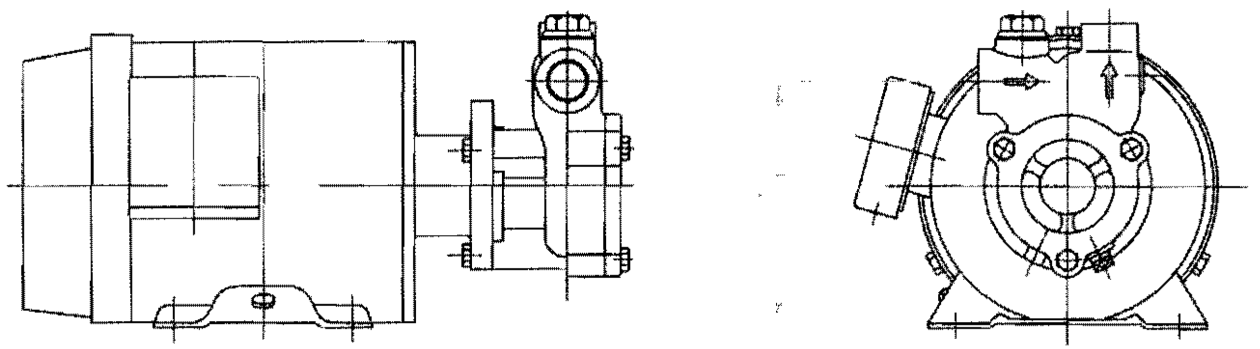


Model	M15NPD02Z
Flowrate	~4 gpm
Air Flowrate	~3 CFH
Seal	Mechanical
Weight	
Pump Only	22 lbs.
Fittings	
Inlet	1/2" FPT
Outlet	3/8" FPT
Air Inlet	3/8" NPT
Materials	
Shaft	316 SS
Impeller	316 SS
O-Ring	PTFE
Mech. Seal	SiCxSiC
Body	316 SS
Motor	
Speed	3500 rpm
HP	.25 HP

NIKUNI

NIKUNI USA

REF. DRAWINGS:

For Sales

M15NPD02Z

General Pump Layout

M15NPD02Z LAYOUT

NONE YU 08/19/03

NIKUNI

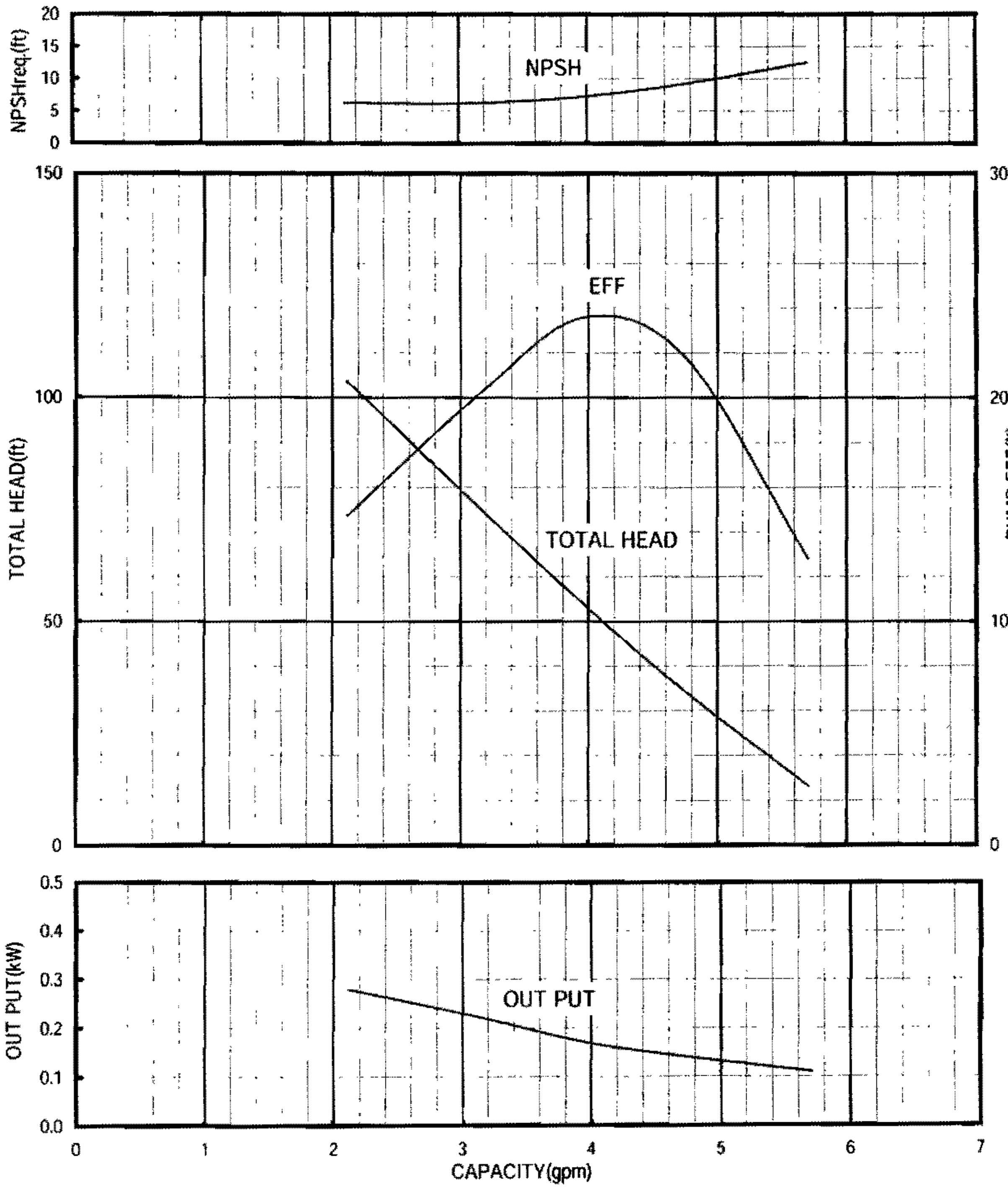
PUMP SUPPOSITION CURVE

60Hz

CLIENT

PUMP TYPE M15NPD02

SPEC.



NIKUNI CO.,LTD.

MOYNO

Always the Right Solution™

SPECIFICATION DATA

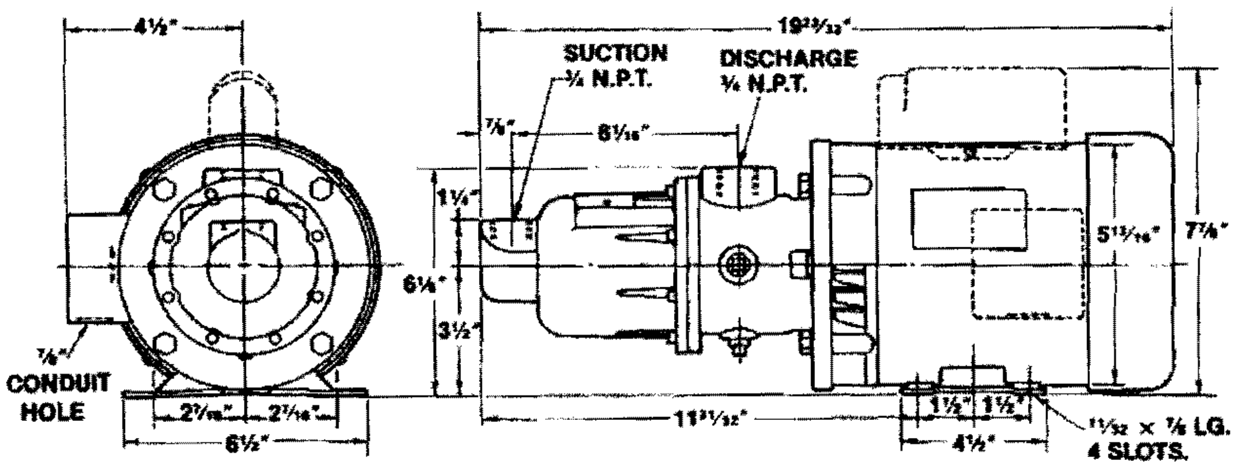
MOYNO® 500 PUMPS

300 SERIES MOTORIZED

331, 332, 333, 344, 356 AND 367 MODELS

331, 332, 333, 344 MODELS

DIMENSIONS

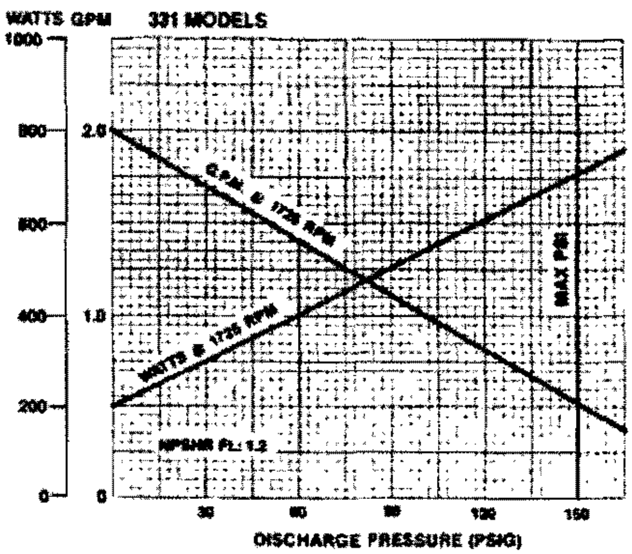


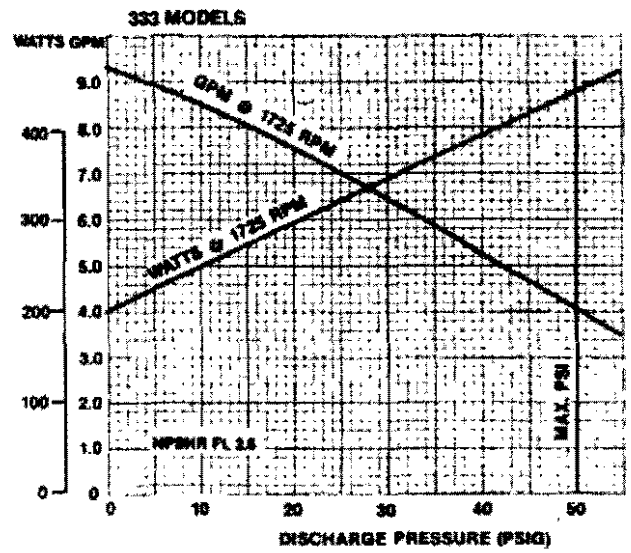
MATERIALS OF CONSTRUCTION

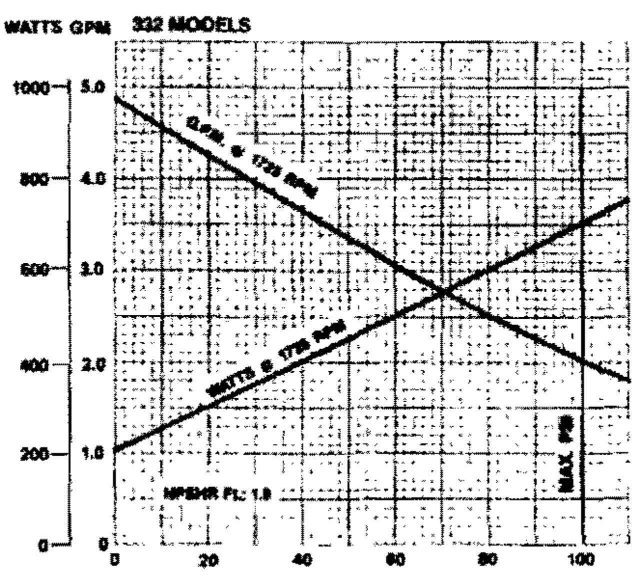
COMPONENT	MODELS			
	33159, 33259 33359, 34459	**33160, 33260 33360, 34460**	**33152, 33252 33352, 34452**	**33150, 33250 33350, 34450**
Housing Rotor Stator	Cast iron 416 SS/CP NBR (Nitrile)	Cast iron 416 SS/CP NBR (Nitrile)	316SS 316 SS/CP NBR (Nitrile)	316SS 316 SS/CP NBR (Nitrile)
Motor Data	1/2 HP,1 PH 115/230 VAC 60 HZ TEFC	1/2 HP, 3 PH 230/440 VAC 60 HZ TEFC	1/2 HP, 1 PH 115/230 VAC 60 HZ TEFC	1/2 HP, 3 PH 230/440 VAC 60 HZ TEFC
Weight (lbs)	41	41	41	41

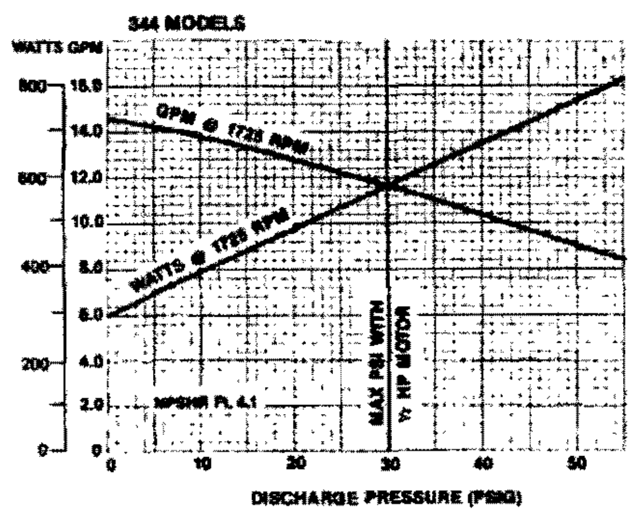
CP = Chrome plated

PERFORMANCE (Water at 70°F)







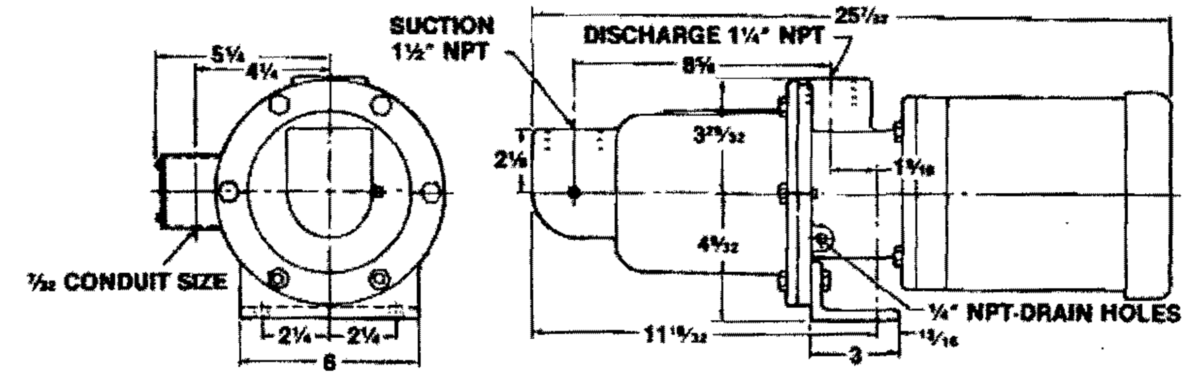


NOTE: With the standard 1/2 HP motor, maximum fluid viscosity is 100 CP (500 SSU).

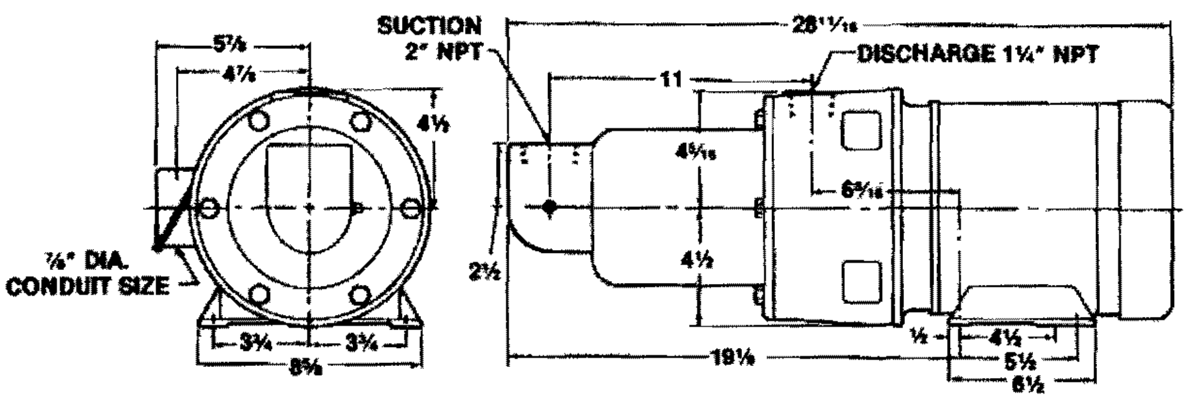
356 AND 367 MODELS

DIMENSIONS

Model 35651



Model 36751



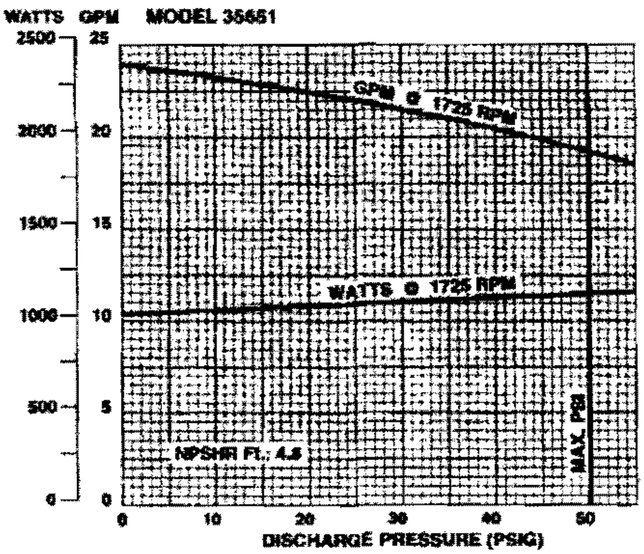
All dimensions are in inches.
Specifications subject to change without notice.

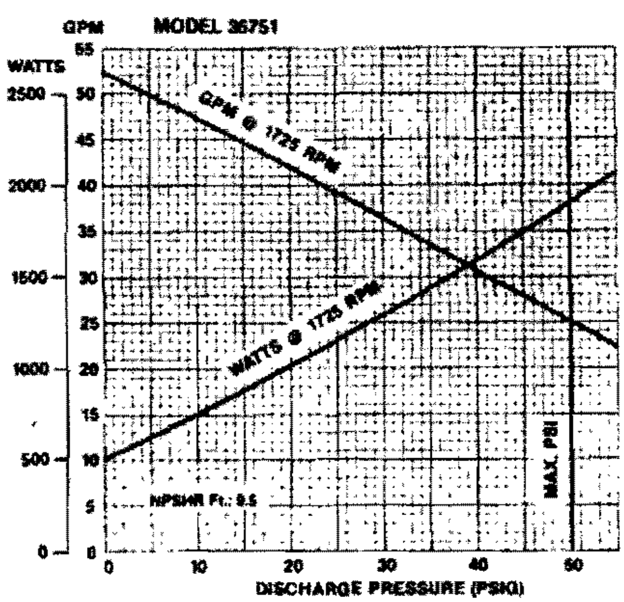
MATERIALS OF CONSTRUCTION

COMPONENT	MODELS					
	35651	36751	35650	35652	36750	36752
Housing Rotor Stator	Cast iron 416 SS/CP NBR (Nitrile)	Cast iron 416 SS/CP NBR (Nitrile)	316 SS 316 SS/CP NBR (Nitrile)	316 SS 316 SS/CP NBR (Nitrile)	316 SS 316 SS/CP NBR (Nitrile)	316 SS 316 SS/CP NBR (Nitrile)
Motor Data	1-1/2 HP, 3 PH 208/230/440 VAC 60 HZ TEFC	2 HP, 3 PH 230/440 VAC 60 HZ TEFC	1-1/2 HP, 3 PH 230/460 VAC 60 HZ TEFC	1-1/2 HP, 1 PH 115/230 VAC 60 HZ TEFC	2HP, 3 PH 230/460 VAC 60 HZ TEFC	2 HP, 1 PH 115/230 VAC 60 HZ TEFC
Weight (lbs)	68	115	68	68	115	115

CP = Chrome plated

PERFORMANCE (Water at 70°F)

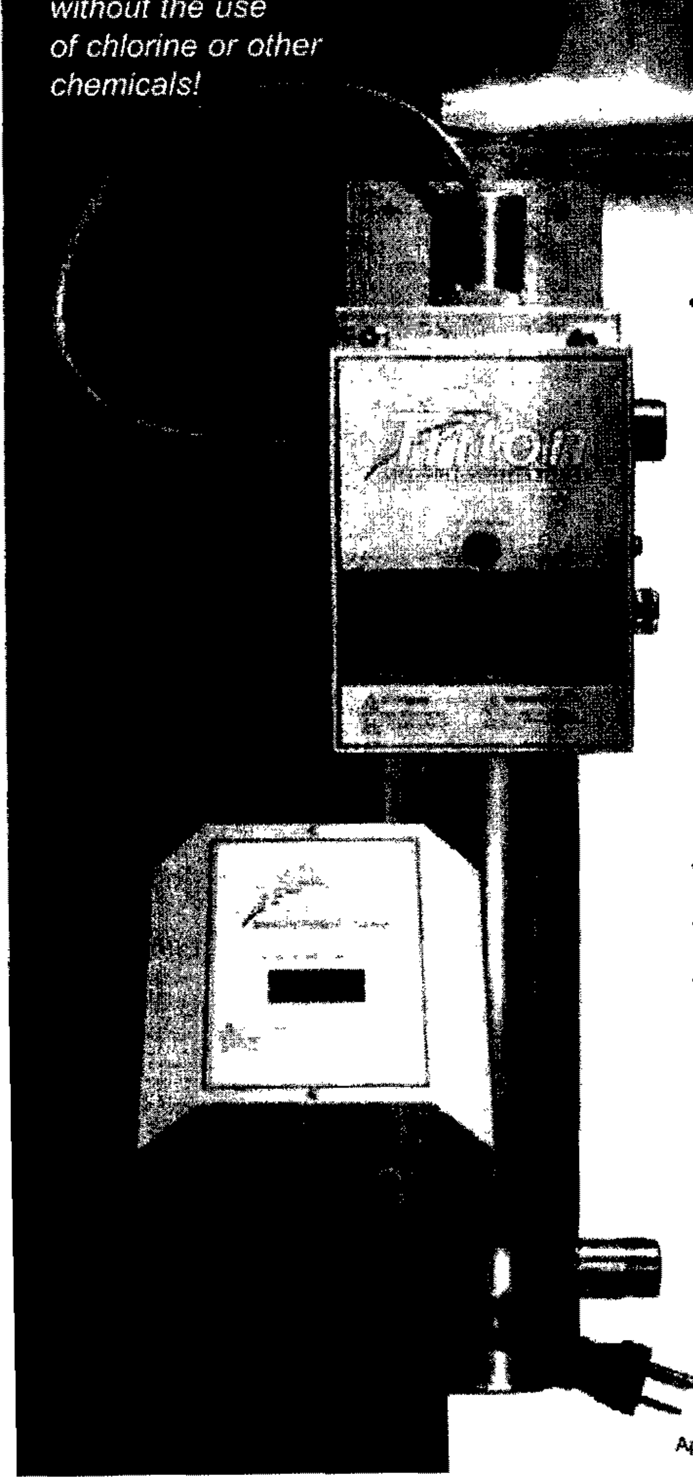




NOTE: With the standard 1 ½ HP (Model 35651) 2 HP (Model 36751) motor, maximum fluid viscosity is 100 CP (500 SSU).

Triton 12M & 20M Series

Protect your family's health from waterborne micro-organisms without the use of chlorine or other chemicals!



Triton

Ultraviolet Disinfection Systems

12M & 20M Series

- *Fail Safe Features*
  - *30 day Replacement Lamp Notification*
  - *9,000 Hours Replacement Lamp Notification*
  - *Resetable Lamp Counter Clock*
  - *Audible and Lamp-Out Alarms*
  - *Digital Ultraviolet Intensity Monitor*
  - *Surge Protection Standard*
  - *Optional Solenoid for Water Shut-Off (All units equipped with plug - No wiring required.)*
  - *Upper & Lower Mounting Brackets*
- *All Stainless Steel Construction*
- *Electropolished All Wetted Parts*
- *Rated Flow Control Standard*
- *Inlet Flow Diverter Design Optimizes UV Exposure*
- *Heavy Duty Quartz Sleeve*

Note: EPA Product Registration # 062333-P4-001

MEMBER Eastern Water Quality. ASSOCIATION

MADE IN U.S.A.

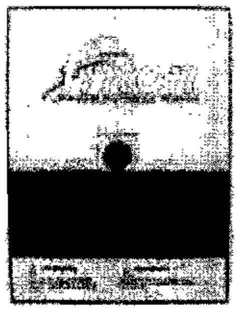
Triton

Ultraviolet Disinfection Systems

BENEFITS

- ***Completely Automatic***
- ***Compact and Easy to Install***
- ***No Chemicals Required***
- ***Low Operating Costs***
- ***Low Maintenance***
- ***No Taste or Odor***

FEATURES

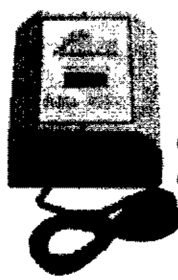


Simplified Electronics

Surge Protection

Optional Solenoid Shut-Off Valve

Monitor Port for UV sensors



U.V. Monitor - U.V. dosage metering device. This true U.V. Monitor reads only the 254-nm intensity output of the ultraviolet light within the U.V. treatment chamber.

TRITON SPECIFICATIONS

Model #	Max. Flow GPM	No. Lamps	KW @ 120V	AMP @ 120V	Pipe Size	Overall Dimensions L x W x D	Shipping Weight
TRI-12M	12	1	0.03	0.25	3/4" MIP	32" x 3.5" x 3.5"	18 Lbs.
TRI-20M	20	1	0.03	0.25	1" MIP	35" x 5" x 5"	21 Lbs.

Manufacturer	Dealer
Water Treatment & Accessories, L.L.C. 2045 Rockvale Rd. Lancaster, PA 17062	