

State of Washington Department of Ecology
**Verification of Operating Conditions
of Advanced Wastewater Treatment
Systems for Cruise Ship Discharges**

Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	GOLDEN PRINCESS	Date:	July 14, 2007
Vessel Operator:	Princess Cruises	Entry Time:	9:01 AM
IMO Number:	9192351	Exit Time:	11:24 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Dwight Hutchinson; July 10, 2007
Location:	Pier 30, Seattle		
On-board contact(s):	Yulian Varbanov, Environmental Officer		
Inspector(s):	Amy Jankowiak, Department of Ecology		
# passengers/crew:	~3000/~1060 capacity	Amount of Wastewater:	~320 tons/day

Description of advanced wastewater treatment system (name, type, major components, etc.):
Hamworthy is a biological reactor and ultrafiltration system. The system includes screening via a screen press, biological treatment via bio-reactors with inter-stage fillers and a membrane system, and ultraviolet light disinfection. Approval for continuous discharge from Ecology was granted on May 3, 2007, although the vessel chooses not to discharge at <4nm in Washington waters at this time.

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input checked="" type="checkbox"/>	Operations Center/Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input checked="" type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	Not Applicable

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input checked="" type="checkbox"/>	Schematics match black/gray wastewater system	System appears to be as depicted in schematics
<input checked="" type="checkbox"/>	Sludge disposal protocol per MOU	All screen press material is incinerated and all other sludge from the Hamworthy system are discharged at >12nm.
<input checked="" type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Notification procedures include notifying the office, who in turn notifies Ecology and also reporting it to the captain, who also notifies local authorities. The environmental officer was unable to locate a copy of the MOU on the vessel. Ecology provided the environmental officer with an electronic copy.
<input checked="" type="checkbox"/>	Operations as described in submitted documentation	Operations appeared to be as described in submitted documentation
<input checked="" type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Continuous turbidity monitoring. There are turbidity meters on each of the three MBR permeate tanks. A value of 25 NTU or greater triggers shut down (also alarmed at 20 NTU).
<input checked="" type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Appears to be functioning properly
	<u>Turbidity or equivalent</u> : Yes Last calibration: Not discussed Frequency of readings: continuous Trigger level for alarm: 20 NTU Trigger level for shutdown: 25 NTU Recorded turbidity/equivalent levels above triggers: None, typical results are 4 NTU or less	
<input checked="" type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Yes. There are turbidity meters on each of the three MBR permeate tanks. A value of 25 NTU or greater triggers shut down (also alarmed at 20 NTU).

<input checked="" type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	Yes
<input checked="" type="checkbox"/>	UV replacement bulbs available	Yes.
<input checked="" type="checkbox"/>	UV/bulbs cleaned regularly	Staff was unsure of any needs for hand wipe cleaning

Section E: General

<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	As of the date of the inspections, sampling has been conducted as required
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	Not required yet, in first season of approval
<input checked="" type="checkbox"/>	Training up to date for system operators	Not discussed in detail
<input checked="" type="checkbox"/>	Discharge records maintained	Maintained properly
<input checked="" type="checkbox"/>	Alarms functioning properly	Alarms appear to be functioning properly.
Alarms Shutdowns: Yes High turbidity/TSS warnings: Yes High wastewater levels: Yes UV disinfection (intensity, bulbs, bank out, power failure): Yes		

Section F: Sample Results

Parameter	Effluent Result
Biochemical Oxygen Demand 5-Day (BOD)	6.60 mg/l
Total Suspended Solids (TSS)	13 mg/l
Fecal Coliform, MF	1140 CFU/100 ml
Residual Chlorine	<0.1 mg/l
Ammonia, Nitrogen	21 mg/l
pH	6.61 standard units

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program (NWRO-WQ), conducted the inspection of the GOLDEN PRINCESS (photos #01 and #02) on July 14, 2007. The main contacts on board the GOLDEN PRINCESS included Yulian Varbanov, Environmental Officer, and the engineers for the MBR system. Prior notification of the visit was given on July 10, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State*, as amended. The GOLDEN PRINCESS received approval to discharge continuously on May 3, 2007.

The GOLDEN PRINCESS's current advanced wastewater treatment system (AWTS), Hamworthy Membrane Bioreactor system (MBR), was installed on the vessel in 2007 and began operation in March/April 2007. The GOLDEN PRINCESS has been in operation for six years, with 2007 being the first season to call to port in Seattle. There are typically about 3000 passengers and about 1060 crew.

Inspection

I arrived boarded the ship at 9:01 am and began with introductions and a plan for the day. I met with Mr Yulian Varbanov, the Environmental Officer, and discussed some general information about the vessel, as well as some particulars about various waste streams. Mr Varbanov has been on the GOLDEN PRINCESS for about one month, and has been with Princess Cruises for about one year. The Environmental Officers receive both the Environmental Awareness training and the Advanced Environmental Awareness Training, as well as Tier I, II, and III training. The engineers that work with specific equipment receive training on that equipment, and watch engineers are trained on all equipment. The Hamworthy system is operated by one engineer, a chief plumber and one or two other plumbers. All crew on board the vessel receive the Environmental Awareness Training which among other things, addresses keeping chemicals like bleach out of the toilets, and the proper disposal of medications. Mr. Varbanov was unable to locate a copy of the MOU on board the vessel at the time of the inspection. Ecology provided the environmental officer with an electronic copy. Notification procedures include notifying the office, who in turn notifies Ecology and also reporting it to the Captain, who also notifies local authorities.

Food waste from the vessel is collected in the galley, and goes through a pulper. The water extracted from the pulper is recycled through the pulper. The food material then goes to the food press and then into a holding tank. The food waste is then discharged at greater than 12 nautical miles from shore per discharge protocol. The protocol includes a notification from the bridge to the engine control room. An e-mail warning is first sent that an area of approved discharge is

approaching. A second e-mail is sent prior to exiting the approved discharge area. Wastewater from the Hamworthy MBR system is discharged per protocol at greater than four nautical miles, even though the vessel is approved for continuous discharge. Pool water is collected along with graywater (except for accommodation graywater which is combined with blackwater and treated with the Hamworthy MBR system), and discharged at greater than 12 nautical miles from shore. Drinking water is either brought onto the vessel during bunkering as potable water, or water is generated by an evaporator (desalinization) system taking salt water, and desalinating. The water is then filtered, chlorinated, adjusted for pH, and mineralized. The filtered residuals are sent to the bilge tank. Bilge water is discharged post oily water separator at less than 15 ppm. Laundry water does not go through the MBR system, and is discharged as graywater at greater than 12 nautical miles from shore. Sludge from the MBR system is collected and discharged at greater than 12 nautical miles from shore, and outside of the Olympic Coast National Marine Sanctuary. Screenings from the MBR screen press are collected and incinerated.

We then headed to the control room to discuss the operation of the Hamworthy system and to review records. Discharge records were reviewed and are well kept. The records include dates, times, discharge locations, port locations, effluent type, volumes, speed, signatures and remarks. Since the vessel began discharging in May of 2007, there have been only a few occasions of discharge in Washington waters. The locations of the discharges from the MBR system appear to be at greater than four nautical miles from shore while coming into Seattle and also while leaving Seattle. The vessel is approved to discharge continuously, however, the line chooses to discharge only at greater than four nautical miles. All discharges of sludge or graywater appeared to be outside of the MOU waters. The e-mail notifications to the engine control room were also reviewed for a couple of the MOU water discharges.

We then headed down for a tour of the Hamworthy system. The Hamworthy system consists of three separate MBR's which combine at the UV Permeate tank prior to disinfection and discharge. Two MBR's would be sufficient for the quantity of wastewater entering the system; however, the vessel operates all three unless conducting maintenance. Blackwater and accommodation graywater is collected by an Air-Vac System (vacuum) and sent to the blackwater collection tank (photo #03). From there, the wastewater is mixed and piped (photo #04) to the screen press (photo #05). The solids are screened into bags (photo #06). The screened solids are then sent to the incinerator (photo #17). The liquid moves to the 1st stage (photo #07) of the membrane bioreactor where aeration occurs. From the 1st stage, flow moves to the inter-stage filters (photo #08). The inter-stage filters are about 2 microns and the filtered solids are returned back to the 1st stage. The liquid moves onto the 2nd stage (photo #09) of the MBR for further aeration. From the 2nd stage MBR, flow is sent to the membrane modules (photos #10 and #11) for ultrafiltration. Solids from the filters are sent back to the 2nd stage MBR. Effluent from the membrane modules are sent to a permeate tank (photo #12) where turbidity is monitored. Flow then combines with the other two MBR's at the UV Permeate tank (photo #15). From the UV Permeate tank, effluent moves through the ultraviolet disinfection system (photo #14). Disinfected effluent either goes directly overboard or to a holding tank if not in an approved area for discharge. The MBR discharge port is padlocked unless approved to discharge and discharging.

Turbidity is measured continuously on each of the MBR permeate tanks. Staff has not seen readings of greater than 4 NTU since the system began operation. The meters are alarmed at 20 NTU with shut down at a 25 NTU maximum. The membranes are cleaned by backwashing about once a week and is triggered by the pressure values. Cleaning and maintenance of the new MBR system has been challenging and time consuming. Staff has been working with the vendors on any needed replacement parts and challenges. Staff was unsure of the cleaning requirements for the UV disinfection system. It is recommended that staff review the manufacturer recommendation on cleaning the UV system, as most systems require periodic hand wiping of the bulbs to prevent scaling and maintaining clarity of the bulbs.

The staff has been trained by Admiralty Environmental, LLC on process control and compliance sampling. The staff have a small laboratory on board where they sample for such parameters as coliform, pH, COD, and other tests (photo #15). The on-board sampling allows for immediate results and a chance for immediate corrections to the system.

Next we looked at some of the areas of potential waste streams including food waste and photo waste. Food waste from the vessel is collected in the galley, and goes through a pulper. The water extracted from the pulper is recycled back through the pulper. The food material then goes to the food press (photo #16) and then into a holding tank. The food waste is then discharged at greater than 12 nautical miles from shore per discharge protocol. Photo waste is collected in 2 separate pails, one of which has the silver waste. Both pails are sent to the waste disposal area and both pails are tested for silver. The waste material is incinerated at <5 ppm. A log is kept at both the photo room and the waste disposal area.

Samples were taken for Biochemical Oxygen Demand (BOD 5-Day), Total Suspended Solids (TSS), pH, chlorine residual, fecal coliform and ammonia from the effluent of the UV disinfection prior to going to the holding tank. The sample port (photo #18) was cleaned prior to pulling samples. The samples were put on ice immediately and were transported to AmTest laboratory in Redmond, Washington that morning. Chain of Custody and sampling procedures were followed. All results are in Section F. The results are typical of the results submitted to Ecology thus far for 2007 with the exception of fecal coliform. The highest fecal coliform reported for 2007 has been 200 cts/100ml, and all other results were 6 or less. There could be a number of reasons for the occasional higher fecal coliform levels including, but not limited to, ultraviolet light disinfection.

system bulb failures, scaling on the UV lights, membrane filter problems, or sample contamination.

Conclusions and Recommendations

The laboratory testing on-board is an excellent way to monitor and make needed adjustments to the system. Having a laboratory on-board for the testing is ideal

Mr. Varbanov and the staff operating and maintaining the Hamworthy system were very knowledgeable of the system as well as the other environmental impacts of the vessel

It is requested that staff look into possible reasons for the occasional higher fecal coliform counts and report to Ecology the findings. It is also requested that staff report to Ecology the on-board coliform results for samples taken between July 11 – July 18 and the turbidity results for each of the MBR's during the same time period. Please submit the above information by August 24, 2007.

It is recommended that the manufacturer recommendations for cleaning the UV disinfection system be reviewed and any needed changes be implemented.

Attachments:

- Photographs
- Sampling Results Report

Copies to:

- Andrew Lorenzana, Princess Cruises
- Yulian Varbanov, Environmental Officer
- Amy Jankowiak, Ecology
- Kevin Fitzpatrick, Ecology
- Central Files: Princess Cruises; GOLDEN PRINCESS; WQ 6 1

Section H: Signatures

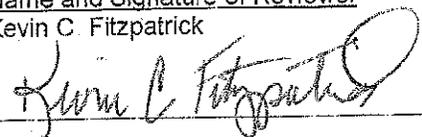
<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology/Northwest Regional Office/Water Quality Program/Municipal Compliance Specialist/(425) 649-7195	8/7/07
<u>Name and Signature of Reviewer</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Kevin C. Fitzpatrick 	Department of Ecology/Northwest Regional Office/Water Quality Section Manager/(425) 649-7033	8/7/07



PHOTO #01 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No :P7140003
DESCRIPTION: GOLDEN PRINCESS VESSEL



PHOTO #02 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No :P7140002
DESCRIPTION: GOLDEN PRINCESS VESSEL

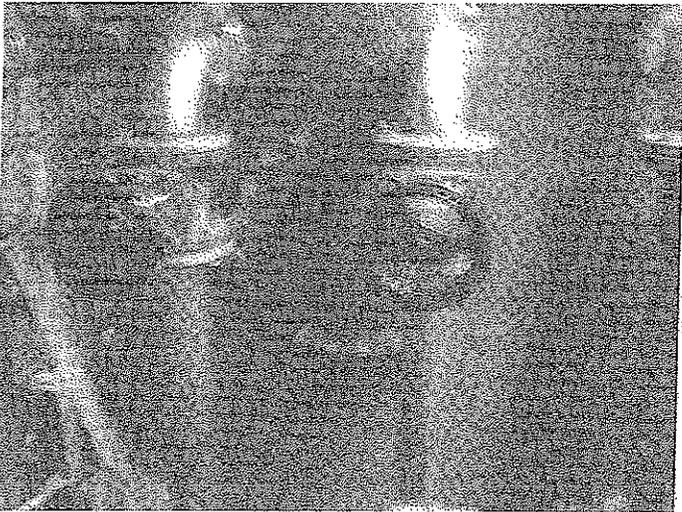


PHOTO #03 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No :P7140005
DESCRIPTION: BLACK WATER COLLECTION TANK



PHOTO #04 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No :P7140004
DESCRIPTION: PIPING FROM BLACK WATER COLLECTION TANK
TO SCREEN PRESS

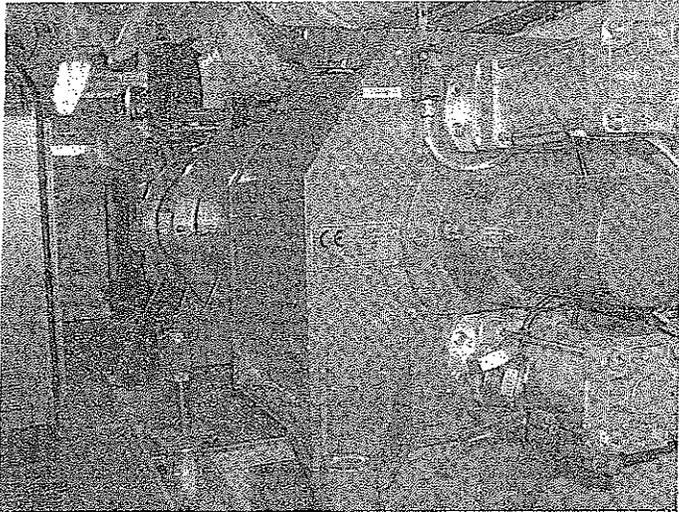


PHOTO #:05 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140008
DESCRIPTION: SCREEN PRESS

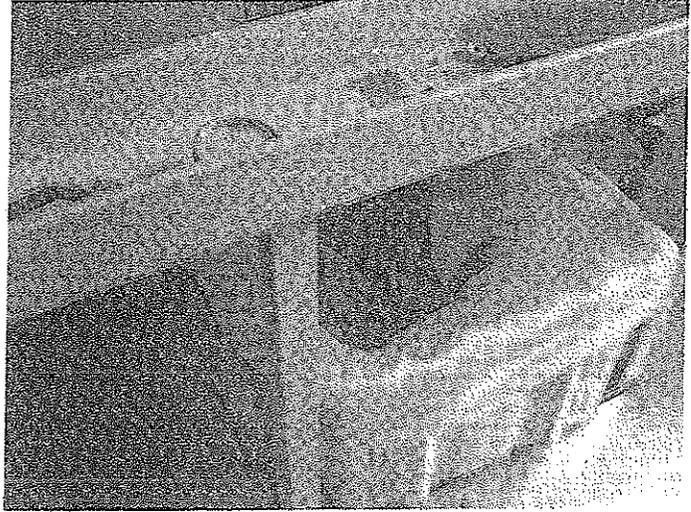


PHOTO #:06 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140006
DESCRIPTION: SCREEN PRESS SOLIDS COLLECTION

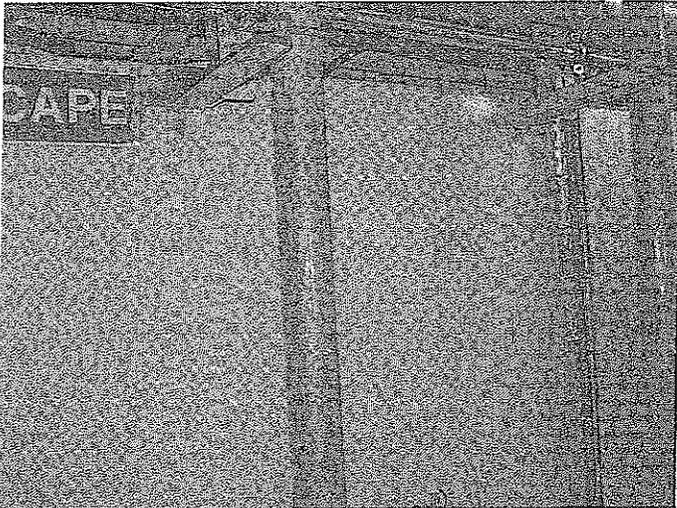


PHOTO #:07 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140009
DESCRIPTION: 1ST STAGE TANK

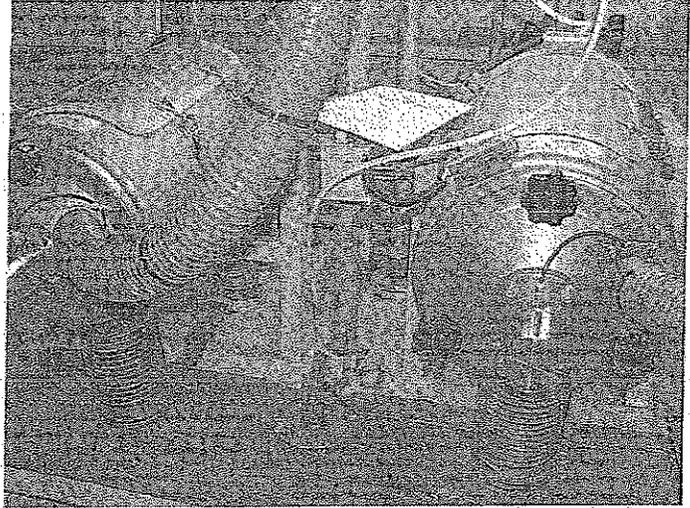


PHOTO #:08 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140010
DESCRIPTION: INTERSTAGE FILTERS

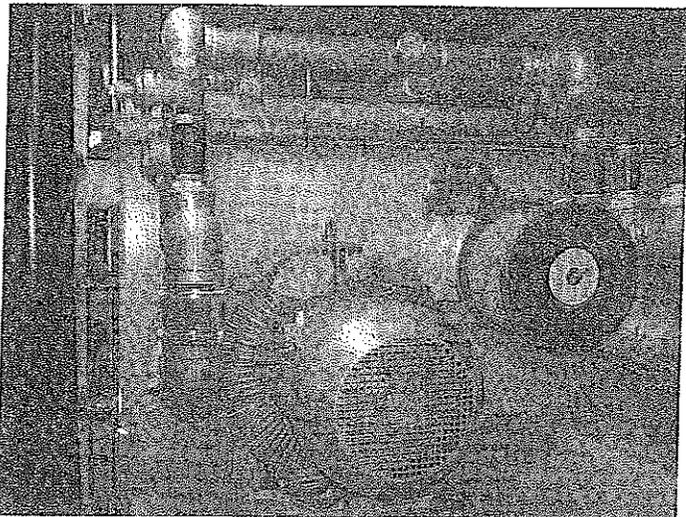


PHOTO #:09 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140011
DESCRIPTION: 2ND STAGE TANK



PHOTO #:10 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140012
DESCRIPTION: MEMBRANE FILTERS (TUBES), PRINCESS CRUISES
STAFF (ENVIRONMENTAL OFFICER, AND MBR ENGINEER)

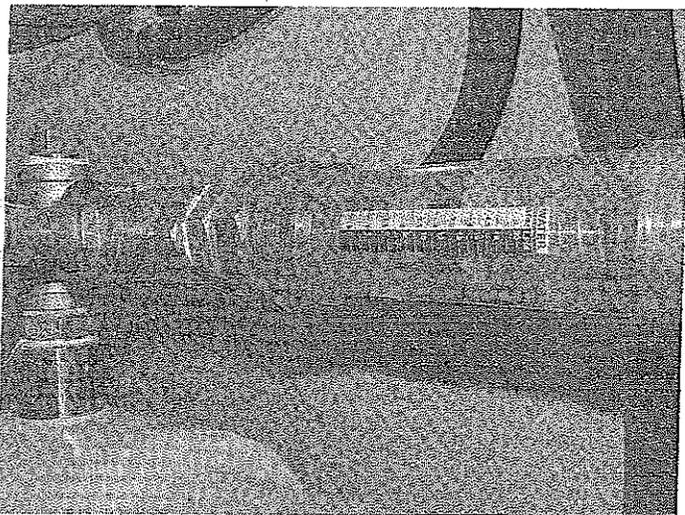


PHOTO #:11 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140013
DESCRIPTION: MEMBRANE FILTER VIEWER (1 ON EACH FILTER)

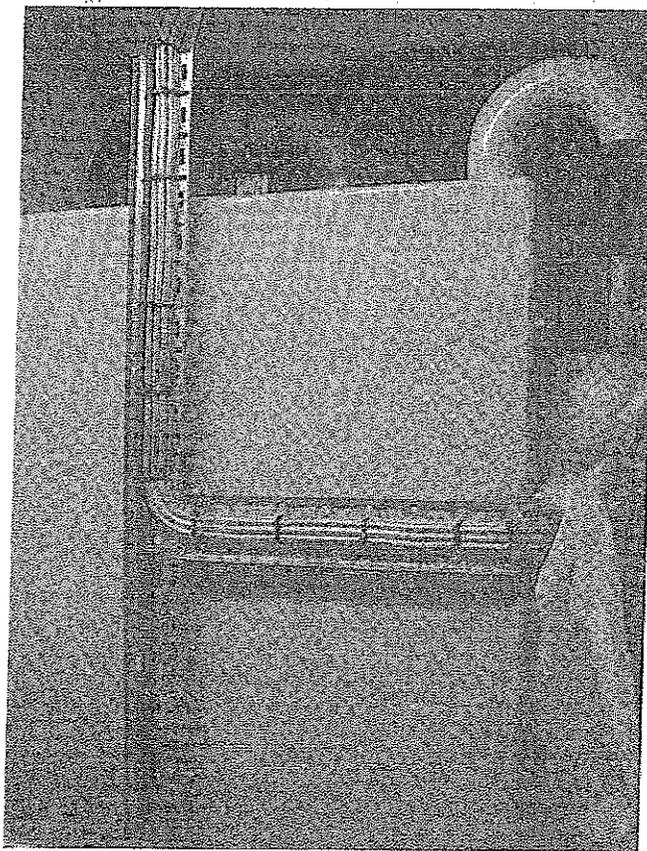


PHOTO #:12 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140014
DESCRIPTION: PERMEATE TANK



PHOTO #:13 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140015
DESCRIPTION: UV PERMEATE TANK

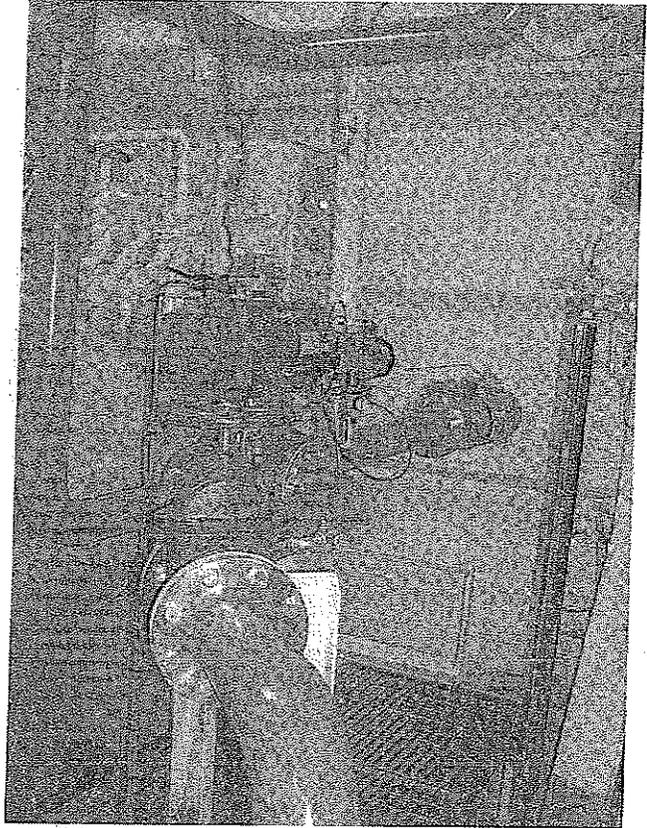


PHOTO #:14 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140016
DESCRIPTION: ULTRAVIOLET (UV) DISINFECTION SYSTEM

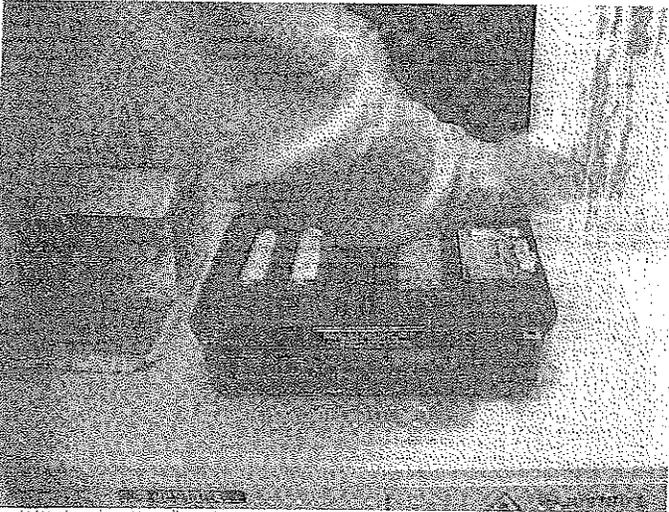


PHOTO #:15 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140017
DESCRIPTION: ON-BOARD LABORATORY TEST KIT

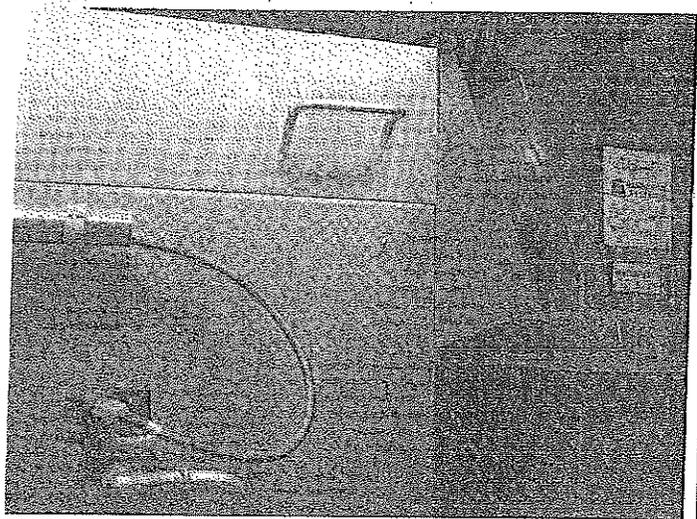


PHOTO #:16 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P7140018
DESCRIPTION: FOOD WASTE PRESS



PHOTO #:17 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No :P7140019
DESCRIPTION: INCINERATOR

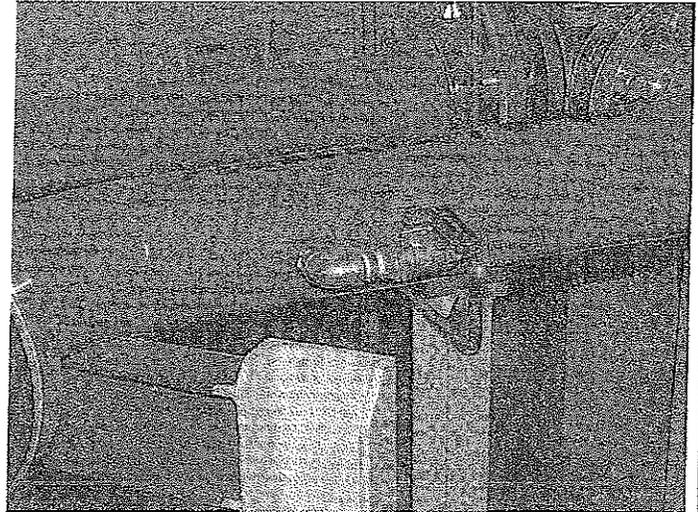


PHOTO #:18 DATE: 07/14/07 TAKEN BY: AMY JANKOWIAK
FILE No :P7140021
DESCRIPTION: FINAL EFFLUENT SAMPLING POINT (AT UV
DISINFECTION

[Faint, illegible text, possibly bleed-through from the reverse side of the page]



Am Test Inc.
14603 N E. 87th St.
Redmond, WA 98052
(425) 885-1664

Professional
Analytical
Services

RECEIVED

JUL 25 2007

DEPT OF ECOLOGY

Jul 23 2007
Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008
Attention: Amy Jonkawiak

Dear Amy Jonkawiak:

Enclosed please find the analytical data for your Golden Princess project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
Golden Eff	Water	07-A009018	Micro, CONV, DEM, NUT

Your sample was received on Monday, July 16, 2007. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

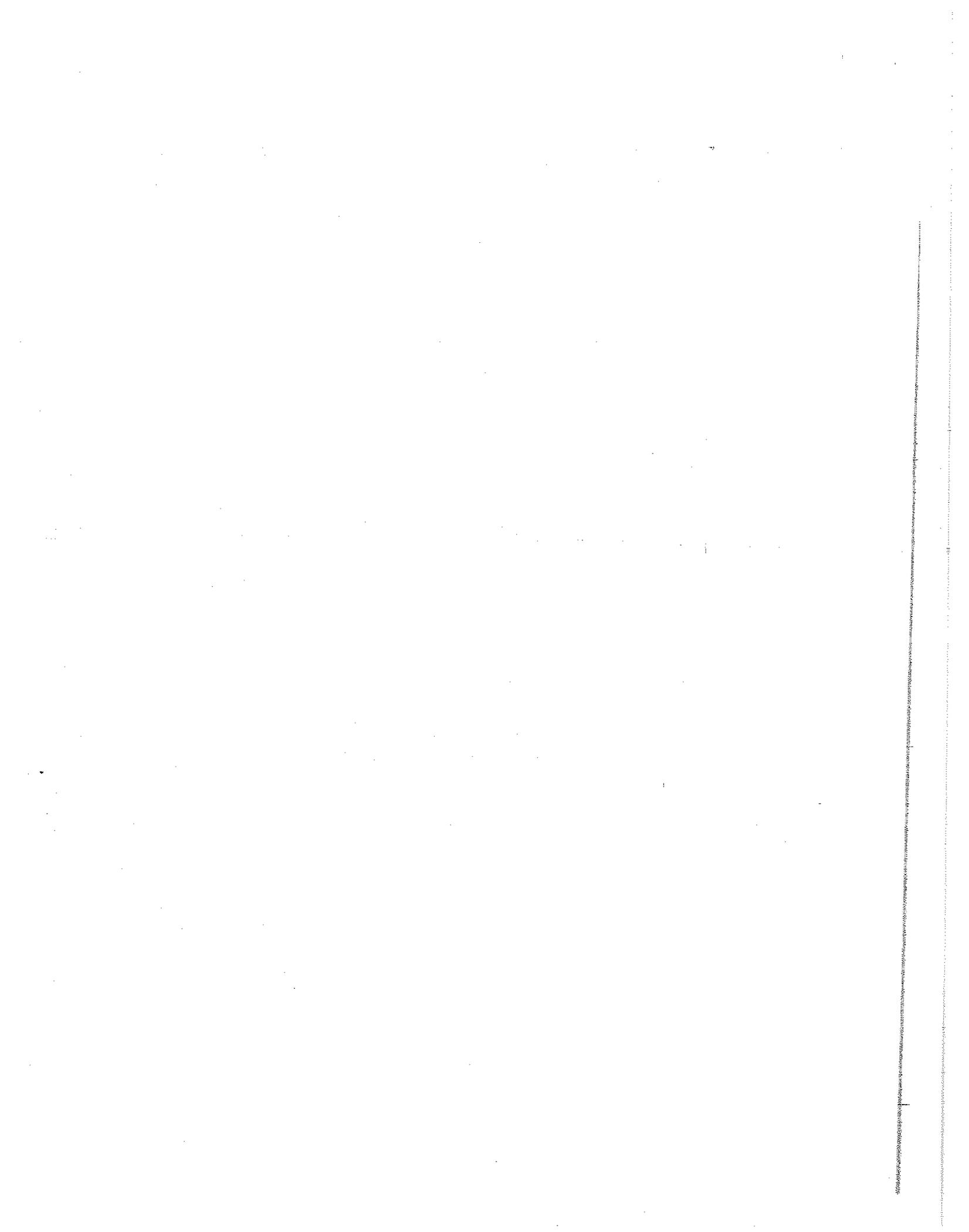
Kathy Fugiel
President

BACT = Bacteriological
CONV = Conventionals

MET = Metals
ORG = Organics

NUT=Nutrients
DEM=Demand

MIN=Minerals



Am Test Inc.
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 Redmond, WA 98052
 (425) 885-1664
 www.amtestlab.com



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 Analytical
 Services

ANALYSIS REPORT

Department of Ecology
 3190 160th Ave SE
 Bellevue, WA 98008
 Attention: Amy Jankowiak
 Project Name: Golden Princess

Date Received: 07/14/07
 Date Reported: 7/24/07

AMTEST Identification Number 07-A009018
 Client Identification Golden Eff
 Sampling Date 07/14/07, 11:15
 All results reported on an as received basis.

Microbiological

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fecal Coliforms	1140	CFU/100 ml		1.	SM 9222D	KF	07/14/07 12:30

Conventionals

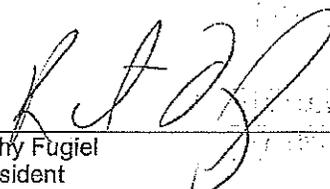
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	6.61	unit			EPA 150.1	L:KF Rspc	07/14/07
Chlorine Residual	< 0.1	mg/l		0.10	EPA 330.5	KF	07/14/07
Total Suspended Solids	13.	mg/l		10	EPA 160.2	JR	07/17/07

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
BOD-low	6.60	mg/l		2.00	SM 5210	MRW	07/14/07

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia Nitrogen	21.	mg/l		0.005	EPA 350.1	TS	07/18/07


 Kathy Fugiel
 President

AMTEST

L A B O R A T O R I E S

QC Summary for sample number: 07-A009018

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUPLICATE VALUE	RPD
07-A009018	Chlorine Residual	mg/l	< 0.1	< 0.1	
07-A008801	Ammonia Nitrogen	mg/l	< 0.005	< 0.005	
07-A008821	Ammonia Nitrogen	mg/l	0.020	0.023	14.
07-A008919	Ammonia Nitrogen	mg/l	0.009	< 0.005	
07-A008737	Total Suspended Solids	mg/l	45	44.	2.2
07-A008875	Total Suspended Solids	mg/l	12	8.0	40.

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
07-A008819	Ammonia Nitrogen	mg/l	0.040	0.26	0.25	88.00 %
07-A008917	Ammonia Nitrogen	mg/l	0.12	0.38	0.25	104.00 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
pH	unit	7.40	7.50	101. %
BOD	mg/l	200	180	90.0 %
Chlorine Residual	mg/l	0.25	0.28	112. %
Ammonia Nitrogen	mg/l	0.89	0.88	98.9 %
Ammonia Nitrogen	mg/l	4.0	4.1	102. %
Total Suspended Solids	mg/l	100	83.	83.0 %
Total Suspended Solids	mg/l	100	93.	93.0 %

BLANKS

ANALYTE	UNITS	RESULT
BOD	mg/l	< 10
Chlorine Residual	mg/l	< 0.1
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Total Suspended Solids	mg/l	< 1
Total Suspended Solids	mg/l	1.0



AmTest Chain of Custody Record

14603 NE 87th St. Redmond, WA 98052
Ph (425) 885-1664 Fx (425) 883-3495
www.amtestlab.com

Chain of Custody No. **1417**

Client Name & Address: Department of Ecology 3190 North Ave SE Bellevue WA 98008	Invoice To: Amy Jankowat Department of Ecology 3190 North Ave SE Bellevue WA 98008
Contact Person: <u>Amy Jankowat</u>	Invoice Contact: <u>Amy Jankowat</u>
Phone No: <u>425-649-7195</u>	PO Number:
Fax No: <u>425-649-7098</u>	Invoice Ph/Fax: <u>425-649-7195</u>
E-mail: <u>ajankowat@ecy.wa.gov</u>	Invoice E-mail: <u>ajankowat@ecy.wa.gov</u>
Report Delivery: (Choose all that apply) <input checked="" type="checkbox"/> Mail / <input type="checkbox"/> Fax / <input checked="" type="checkbox"/> Email / <input type="checkbox"/> Posted Online	Data posted to online account: YES / NO
	Web Login ID:

Special Instructions:

Requested TAT: (Rush must be pre-approved by lab)
 Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)

RUSH Request Approved By:

Project Name: <u>GOLDEN PRINCESS</u>		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number:	AmTest ID					Client ID (35 characters max)	<u>BOD(5-Day)</u>	<u>TSS</u>	<u>fecal coliform</u>	<u>pH</u>	<u>residual chlorine</u>	<u>ammonia</u>		
	<u>9016</u>	<u>7/14/07</u>	<u>15</u>		<u>3</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>				

Collected/Relinquished By: <u>Amy Jankowat</u>	Date: <u>7/14/07</u>	Time: <u>12:18</u>	Received By: <u>[Signature]</u>	Date: <u>7/14/07</u>	Time: <u>12:18</u>
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By: <u>[Signature]</u>	Date: <u>7/14/07</u>	Time: <u>12:18</u>

COMMENTS:

10

10

10



State of Washington Department of Ecology
**Verification of Operating Conditions
of Advanced Wastewater Treatment
Systems for Cruise Ship Discharges**

Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	NORWEGIAN STAR	Date:	August 4, 2007
Vessel Operator:	NCL (Bahamas) Ltd.	Entry Time:	9:02 AM
IMO Number:	9195157	Exit Time:	10:48 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Randy Fiebrandt, July 31, 2007
Location:	Pier 66, Seattle		
On-board contact(s):	Matilda Ivanova, Environmental Officer; Macario Ihalad, Environmental Engineer		
Inspector(s):	Amy Jankowiak, Ecology Northwest Regional Office, Water Quality Program		
# passengers/crew:	Actual: ~2600/~1100	Amount of Wastewater:	40-50 m ³ /hr
Description of advanced wastewater treatment system (name, type, major components, etc): Scanship is a biological reactor and ultrafiltration system. The system includes prefiltration, biological treatment via a biofilm process, chemical precipitation, clarification through flotation tanks, polishing filtration and UV disinfection. Approval for continuous discharge from Ecology was granted in 2004, 2005, 2006 and May 3, 2007.			

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input checked="" type="checkbox"/>	Operations Center/ Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input checked="" type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other (oil spill notification drill, debunking)

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	NA
<input type="checkbox"/>	Sludge disposal protocol per MOU	NA
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	NA

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input checked="" type="checkbox"/>	Schematics match black/gray wastewater system	System is as depicted in schematics.
<input checked="" type="checkbox"/>	Sludge disposal protocol per MOU	Discharges 12 nm out and outside of the Olympic Coast National Marine Sanctuary Area to Be Avoided per stated protocol.
<input checked="" type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Notification is done per NTVCR plan which includes Ecology's phone number posted on the bridge and control room
<input checked="" type="checkbox"/>	Operations as described in submitted documentation	Operations were as described
<input checked="" type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Has continuous TSS monitoring
<input checked="" type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Appears to be functioning properly. Details in narrative.
	<u>Turbidity or equivalent</u> Last calibration: not sure, not required per AMOS work order/maintenance program Frequency of readings: continuous Trigger level for alarm: 20 mg/l, then 28 mg/l to stop for 1 minute, then trigger level for shutdown: 30 mg/l, then reopen at 25 mg/l Recorded turbidity/equivalent levels above triggers:	
<input checked="" type="checkbox"/>	Auto shut down or operational	Automatic shutdown appears to be operating properly.

	controls to insure system shut down if a system upset occurs	
<input checked="" type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	3 UV banks run in series for effluent with 14 bulbs each
<input checked="" type="checkbox"/>	UV replacement bulbs available	There are two unit's worth of spares available.
<input checked="" type="checkbox"/>	UV/bulbs cleaned regularly	Yes, the units are cleaned by dosing Metal Bright automatically about every 3 5 days Hand wiping of the bulbs is not done, nor required by AMOS.

Section E: General		
<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	As of the date of the inspection, sampling has been conducted as required.
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	Acute WET testing was conducted in 2005 and Chronic WET testing in 2006
<input checked="" type="checkbox"/>	Training up to date for system operators	Scanship conducts training on the ship during start-up of the system and handover training occurs including notes and verbal for about 2 weeks.
<input checked="" type="checkbox"/>	Discharge records maintained	Maintained properly.
<input checked="" type="checkbox"/>	Alarms functioning properly	Alarms appear to be functioning properly.
	Alarms Shutdowns: Yes High turbidity/TSS warnings: Yes High wastewater levels: Yes UV disinfection (intensity, bulbs, bank out, power failure): Yes	

Section F: Sample Results		
	Parameter	Effluent Result
	Biochemical Oxygen Demand (BOD 5-Day)	18 mg/l
	Total Suspended Solids (TSS)	7 mg/l
	Fecal Coliform (MF)	6 CFU/100ml
	Residual Chlorine	0.10 mg/l (0.10=detection limit)
	Ammonia, Nitrogen	49 mg/l
	pH	7.32 standard unit

Section G: Summary of Findings/Comments
<p>Introduction Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, Municipal Compliance Specialist conducted the inspection of the NORWEGIAN STAR (photo #01) on August 4, 2007. The main contacts on board the NORWEGIAN STAR included Matilda Ivanova, Environmental Officer and Macario Ihaled, Environmental Engineer. Mr. Ihaled is filling in as operator of the Scanship system, while Mr. Delfin Josen is on vacation. Prior notification of the visit was given on July 31, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the <i>Memorandum of Understanding Cruise Operations in Washington State (MOU)</i>, as amended including the operating conditions of Advanced Wastewater Treatment System (AWTS). The NORWEGIAN STAR received approval to discharge continuously per the MOU in 2004, 2005, 2006 and on May 3, 2007.</p> <p>The NORWEGIAN STAR was built in 2001, is 965 feet long with 15 guest decks, with about a 28-foot draft. Passenger capacity is 4080 total passenger berths. There are typically about 2600 passengers and 1100 crew. It is my understanding that the ship's wastewater system, Scanship, was installed in 2004.</p> <p>Inspection We arrived boarded the ship at 9:02 am and began with introductions and a plan for the day. We then discussed the operation of the Scanship system and reviewed discharge records. We discussed some of the areas of potential waste streams. We then headed down for a tour of the Scanship system and bilge system. Samples were pulled from the AWTS prior to finalizing the inspection and disembarking the vessel at about 10:48 am.</p> <p>Discharge Types and Protocols:</p> <p>The latitude and longitudes are recorded in the <i>Sewage and Graywater Discharge Record Book</i> along with all other discharge records. Discharge records were well kept and include dates, times, discharge locations, port locations, effluent type, volumes, speed, signatures and remarks. Discharge protocols include a pre-schedule include detailed estimated times</p>

for the various types of discharges. Also, prior to any discharge, a notification from the bridge is made, as well as a notification prior to closing discharge ports. The Environmental Officer has the key for discharges and is in charge of all discharges. The Captain and the Chief Engineer also have spare keys.

Treated effluent from the AWTS is discharged continuously. Laundry water is sent to the Scanship system for treatment. Food waste pulper water is discharged at greater than 12 nautical miles. Food waste is discharged at greater than 4 nautical miles and outside of Washington waters and the Olympic Coast National Marine Sanctuary (OCNMS). Pulper water used to go through the AWTS, however, this caused pH problems, and now the waste water is discharged directly (at greater than 4 nautical miles and outside of Washington waters and the OCNMS). Sludge from the AWTS is collected and is discharged at greater than 12 nm and outside the OCNMS. Some of the sludge material can be dried and incinerated. The Scanship dryer has not been functioning properly and has only been used about once this year.

Oily bilge water is sent to a dirty bilge tank (photo #14) and then onto the Marinfloc for separating oil. Waste from the Marinfloc is off-loaded and liquid flow goes to the Clean bilge tank and onto the oily water separator. From the oily water separator, the oil content is again measured in the locked "white box" (photo #16). If the parts per million exceed 15, the discharge valve (photo #15) closes and sends the waste either to the clean bilge tank where it then again goes through the oily water separator or it can be sent all the way back to the dirty bilge tank.

Ballast water is exchanged outside of Washington waters, greater than 50 nautical miles out at sea. X-ray/photo waste is separated, collected, labeled and offloaded to shore as hazardous waste in Canada. Air Conditioning Condensate is sent to the laundry tank to be used for washing clothes.

Water (production and bunkering): Potable water that is bunkered is sampled prior to bringing on board and then again after chlorination (pH, chlorine, coliform...). After chlorination, water is sent to a potable only tank separated of void space and is chlorinated again before using. All bunkered potable water is used within 48 hours. Water is also produced by desalination using a reverse osmosis system. Three evaporators are used that are run by engine heat. Some of the produced water is non-chlorinated and used as technical water (boilers, engine coolants...). The reverse osmosis water for general use is chlorinated at least 2 ppm and is sent to a tank designated for consumption. At the farthest point, the chlorine residual is to be between 0.2 ppm and 5 ppm. The salt that is collected through the production process is sent back to the salt water.

Scanship Advanced Wastewater Treatment System:

Graywater and blackwater from the ship are collected in a tank - mixed. The wastewater is pumped to two drum screens for pre-screening (photo #02), followed by biological treatment (biofilm on rotating plastic pieces - 2 tanks in series) (photos #03 and #04), chemical precipitation (flocculants, polymer) (photos #05, #06, #07 and #08), clarification via flotation tanks (2 tanks) (photos #05 and #08), ultrafiltration via polishing filters (2 rotating mesh drums) (photo #10), and disinfection via ultraviolet light (UV) (photo #11).

The cruise line uses a system called AMOS for work orders and maintenance. Manufacturer recommendations for maintenance for each piece of equipment is included into the AMOS system which triggers staff when maintenance is required. Scanship also monitors maintenance on the system. Any needed calibrations, cleaning, and other needed maintenance would be included in AMOS. The last calibration of the TSS meter (photo #13) is not known, and is not required by AMOS. The trigger level for an alarm of the TSS meter is set at 20 mg/l, then 28 mg/l to stop for 1 minute, and the trigger level for shutdown is 30 mg/l. The discharge port can then reopen at 25 mg/l. There are three UV banks that run in series for effluent with 14 bulbs each. There are two unit's worth of spares available. The units are cleaned by dosing Metal Bright at automatically about every 3-5 days. Hand wiping of the bulbs is not done, nor required by AMOS.

Samples were taken for Biochemical Oxygen Demand (BOD 5-Day), Total Suspended Solids (TSS), pH, chlorine residual, fecal coliform and ammonia from the effluent of the UV disinfection at the discharge port (photos #12 and #13). The samples were put on ice immediately and were transported to AmTest laboratory in Redmond, Washington that morning. Chain of Custody and sampling procedures were followed. All results are in Section F.

Conclusions and Recommendations

The Scanship system appears to be functioning well. The staff was knowledgeable of the system.

Procedures for discharge appear to be thorough and inclusive of verification.

Attachments:

Photographs
Sampling Results Report

Copies to:

Randy Fiebrandt, NCL
Matilda Ivanova, STAR
Amy Jankowiak, Ecology
Kevin Fitzpatrick, Ecology
✓ Central Files: Norwegian Cruise Lines - NORWEGIAN STAR; WQ 6 1

Section H: Signatures

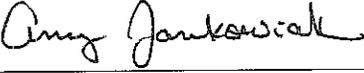
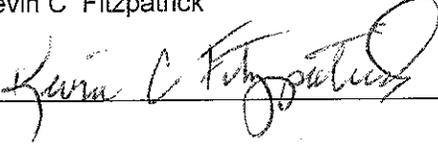
<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology/Northwest Regional Office/Water Quality Program/Compliance Specialist/(425) 649-7195	9/25/07
Kevin C Fitzpatrick 	Department of Ecology/Northwest Regional Office/Water Quality Section Manager/ (425) 649-7033	9/25/07



PHOTO #:01 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040037
DESCRIPTION: NORWEGIAN STAR VESSEL

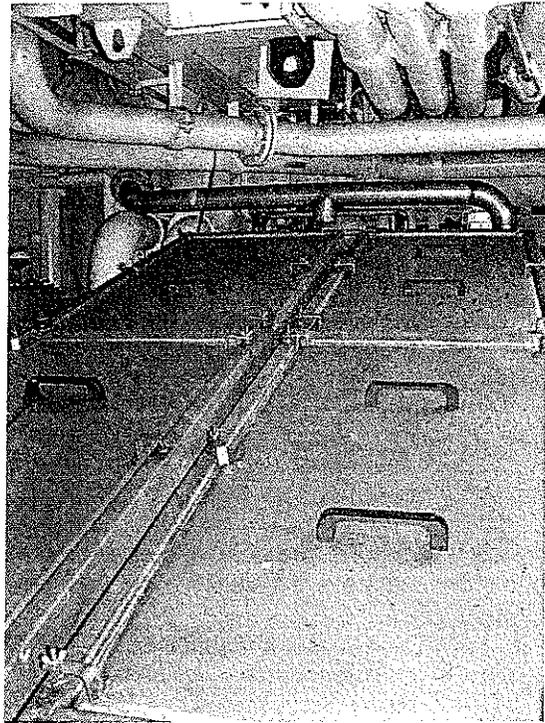


PHOTO #:02 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040020
DESCRIPTION: AWTS DRUM SCREENS

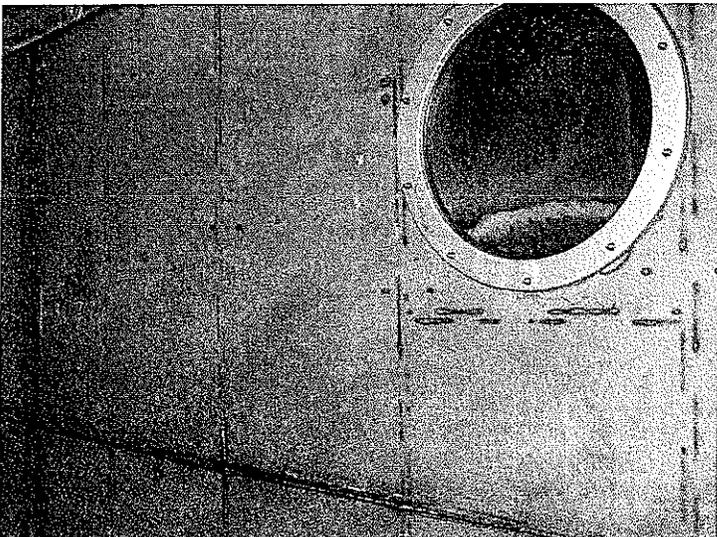


PHOTO #:03 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040021
DESCRIPTION: AWTS 1ST BIOFILM TANK

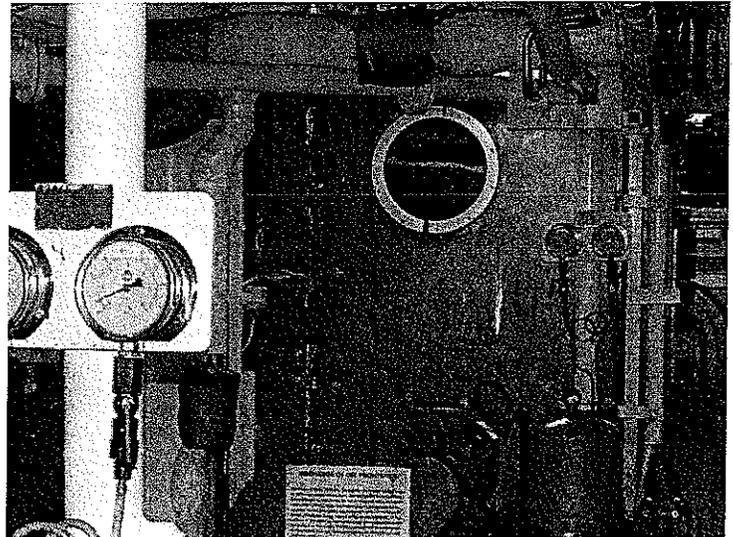


PHOTO #:04 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040022
DESCRIPTION: AWTS 2ND BIOFILM TANK

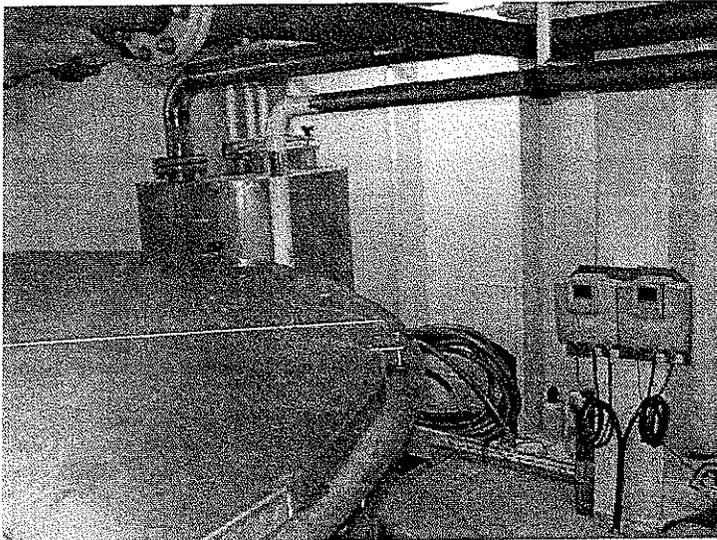


PHOTO #:05 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040023
DESCRIPTION: AWTS FLOC TANK A (BACK LEFT), FLOTATION
TANK A (FRONT), PH METERS (RIGHT)

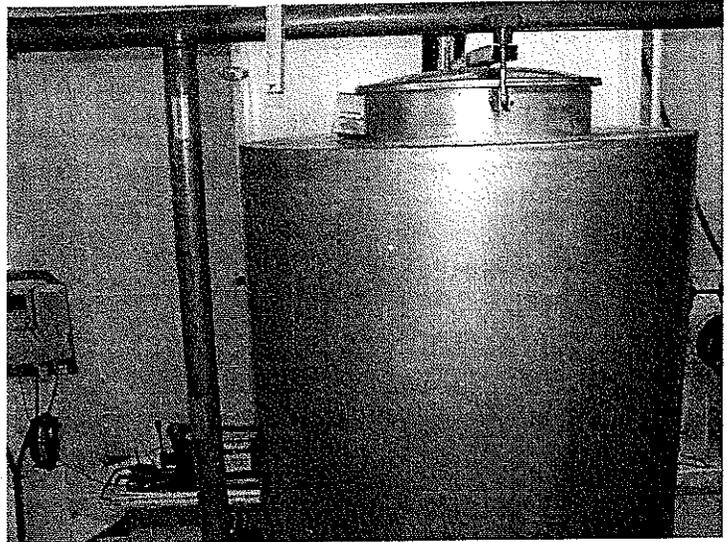


PHOTO #:06 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040024
DESCRIPTION: AWTS FLOC TANK B



PHOTO #:07 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040025
DESCRIPTION: AWTS FLOC TANK PH METERS (7 24 AND 6.94)

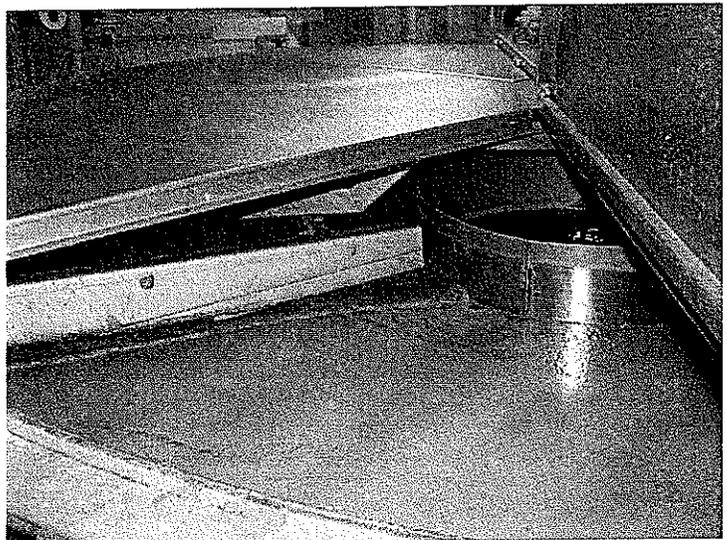


PHOTO #:08 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040027
DESCRIPTION: AWTS FLOTATION TANK B (VIEW OF INSIDE WITH
SKIMMER)



PHOTO #:09 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040029
DESCRIPTION: AWTS POLYMER (POLYACRYLAMIDE EMULSION)
AND POLYMER MIXING TANK

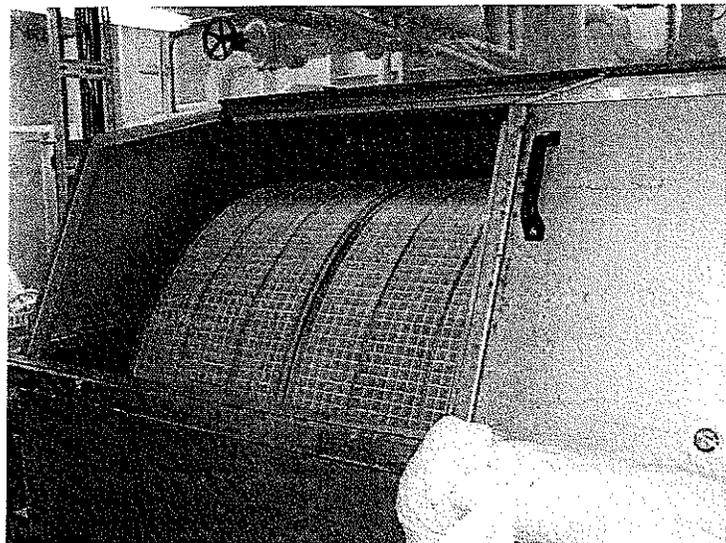


PHOTO #:10 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040030
DESCRIPTION: AWTS ULTRAFILTRATION UNIT (1 OF 2)

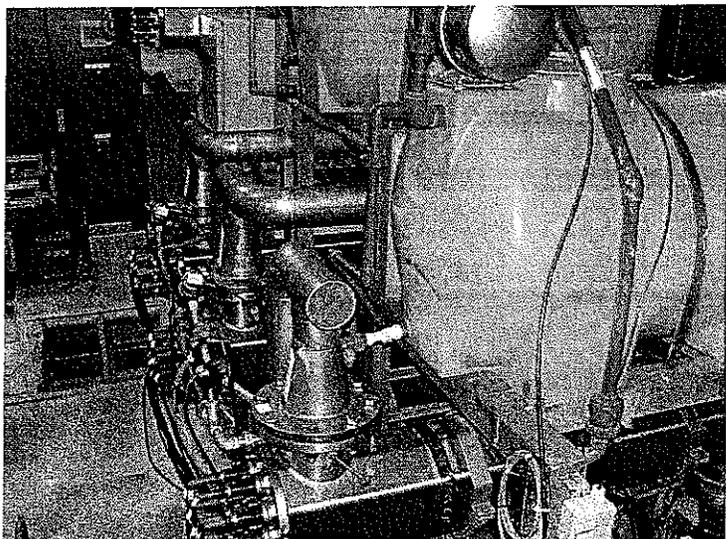


PHOTO #:11 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040031
DESCRIPTION: AWTS ULTRAVIOLET DISINFECTION SYSTEM (3
UNITS WITH BLUE METAL BRITE CLEANERS)

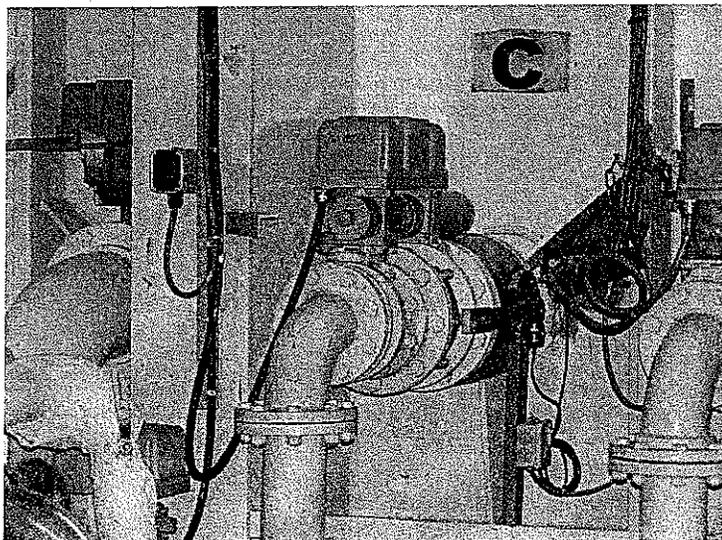


PHOTO #:12 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040032
DESCRIPTION: AWTS DISCHARGE PORT (C)

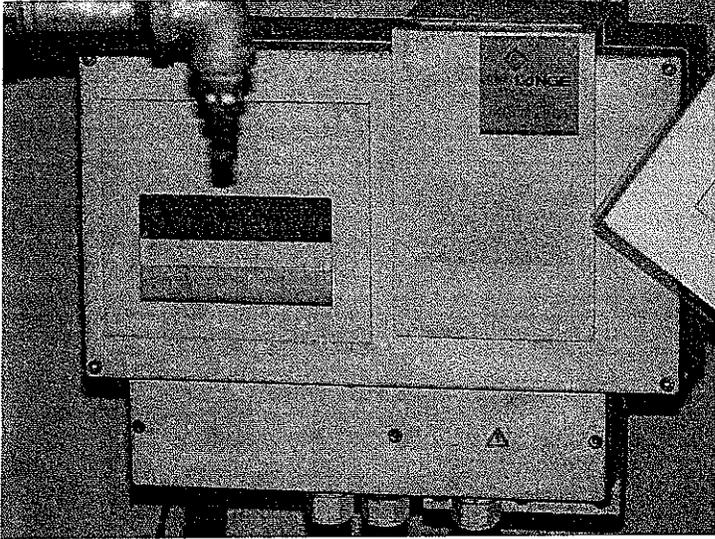


PHOTO #:13 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040033
DESCRIPTION: AWTS CONTINUOUS TSS MONITOR (2 MG/L) AND
SAMPLE PORT

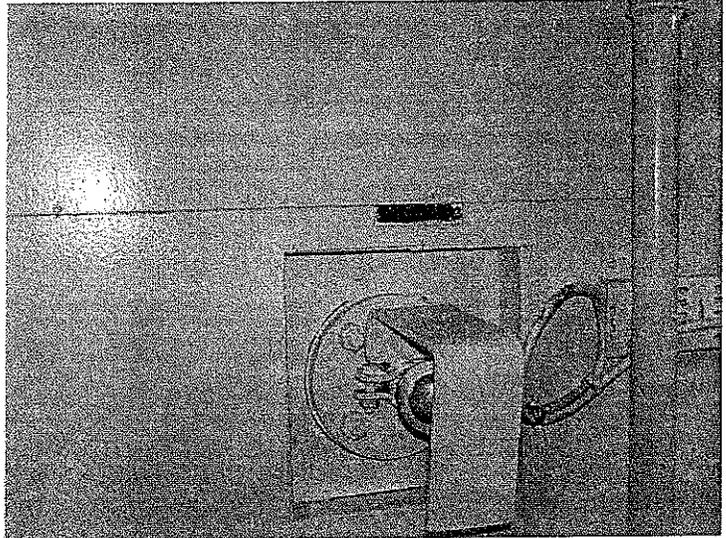


PHOTO #:14 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040034
DESCRIPTION: DIRTY BILGE TANK

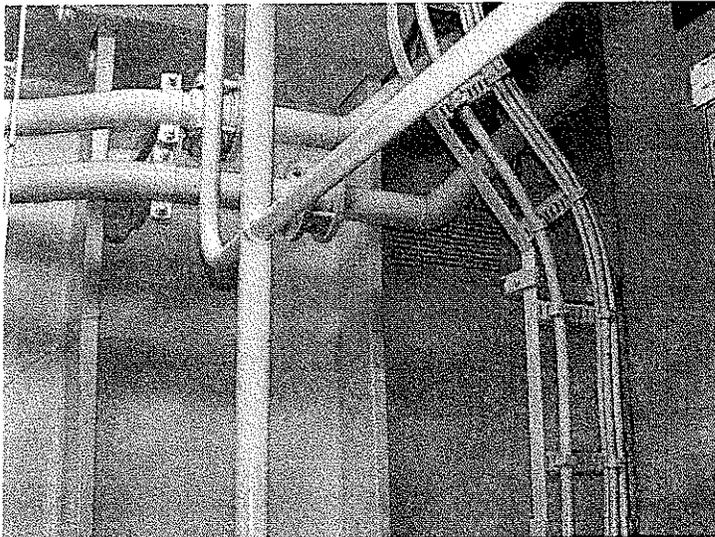


PHOTO #:15 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040035
DESCRIPTION: BILGE DISCHARGE PORT

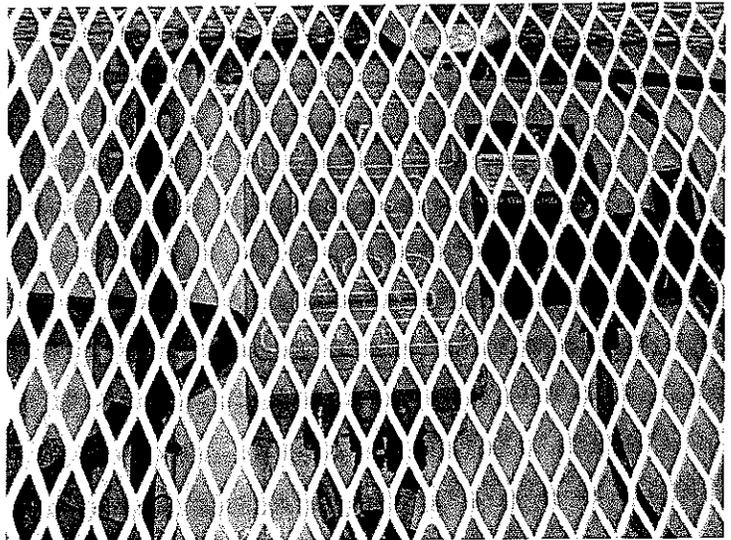


PHOTO #:16 DATE: 08/4/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8040036
DESCRIPTION: BILGE WHITE BOX



Am Test Inc.
14603 N.E. 87th St.
Redmond, WA 98052
(425) 885-1664

Professional
Analytical
Services

Aug 21 2007
Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008
Attention: Amy Jankowiak

Dear Amy Jankowiak:

Enclosed please find the analytical data for your Norwegian Star project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
STAR-EFF	Water	07-A009961	Micro, CONV, DEM, NUT

Your sample was received on Saturday, August 4, 2007. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me:

Sincerely,

Kathy Fugiel
President

BACT = Bacteriological
CONV = Conventional

MET = Metals
ORG = Organics

NUT=Nutrients
DEM=Demand

MIN=Minerals



Am Test Inc.
 14603 N.E. 87th St.
 Redmond, WA 98052
 (425) 885-1664
 www.amtestlab.com



Professional
 Analytical
 Services

ANALYSIS REPORT

Department of Ecology
 3190 160th Ave SE
 Bellevue, WA 98008
 Attention: Amy Jankowiak
 Project Name: Norwegian Star
 All results reported on an as received basis.

Date Received: 08/04/07
 Date Reported: 8/21/07

AMTEST Identification Number 07-A009961
 Client Identification STAR-EFF
 Sampling Date 07/04/07, 10:28

Microbiological

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fecal Coliforms	6.	CFU/100 ml		1.	SM 9222D	KF	08/04/07

Conventionals

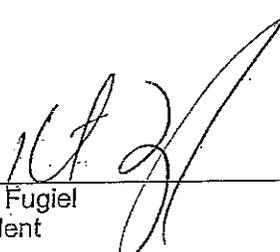
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	7.32	unit			EPA 150.1	KF	08/04/07
Chlorine Residual	0.10	mg/l		0.10	EPA 330.5	KF	08/04/07
Total Suspended Solids	7.0	mg/l		1.0	EPA 160.2	JR	08/14/07

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
BOD-low	18.0	mg/l		2.00	SM 5210	MRW	08/04/07

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia Nitrogen	49.	mg/l		0.005	EPA 350.1	AY	08/13/07


 Kathy Fugiel
 President

AMTEST

LABORATORIES

QC Summary for sample number: 07-A009961

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUPLICATE VALUE	RPD
07-A009856	Ammonia Nitrogen	mg/l	0.047	0.050	6.2
07-A010125	Ammonia Nitrogen	mg/l	< 0.005	0.030	
07-A010145	Ammonia Nitrogen	mg/l	0.008	0.010	22.
07-A010228	Ammonia Nitrogen	mg/l	0.024	0.026	8.0
07-A009961	Total Suspended Solids	mg/l	7.0	8.0	13.
07-A010033	Total Suspended Solids	mg/l	4.0	5.0	22.
07-A010234	Total Suspended Solids	mg/l	4.0	3.0	29.

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
07-A010057	Ammonia Nitrogen	mg/l	0.013	0.29	0.25	110.80 %
07-A010143	Ammonia Nitrogen	mg/l	0.78	1.1	0.25	128.00 %
07-A010206	Ammonia Nitrogen	mg/l	0.052	0.33	0.25	111.20 %
07-A010245	Ammonia Nitrogen	mg/l	0.029	0.26	0.25	92.40 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
BOD-low	mg/l	200.	215.	108. %
Chlorine Residual	mg/l	2.50	2.30	92.0 %
Ammonia Nitrogen	mg/l	4.0	4.2	105. %
Ammonia Nitrogen	mg/l	8.9	8.7	97.8 %
Ammonia Nitrogen	mg/l	4.0	4.2	105. %
Total Suspended Solids	mg/l	100	100	100. %
Total Suspended Solids	mg/l	100	100	100. %

BLANKS

ANALYTE	UNITS	RESULT
BOD-low	mg/l	< 2
Chlorine Residual	mg/l	< 0.1
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Total Suspended Solids	mg/l	< 1
Total Suspended Solids	mg/l	< 1

Client Name & Address: Department of Ecology 3190 160th Ave SE Bellevue, WA 98008	Invoice To: Amy Jankowiak Department of Ecology 3190 160th Ave SE Bellevue, WA 98008
Contact Person: Amy Jankowiak	Invoice Contact: Amy Jankowiak
Phone No: 425-649-7195	PO Number:
Fax No: 425-649-7098	Invoice Ph/Fax: 425-649-7195 / 425-649-7098
E-mail: aijan461@ecy.wa.gov	Invoice E-mail: aijan461@ecy.wa.gov
Report Delivery: (Choose all that apply) <input checked="" type="checkbox"/> Mail / <input type="checkbox"/> Fax / <input checked="" type="checkbox"/> Email / <input type="checkbox"/> Posted Online	Data posted to online account: YES / NO
Special Instructions:	

Requested TAT: (Rush must be pre-approved by lab)
 Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR) RUSH Request Approved By:

Project Name: NORWEGIAN STAR		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
Project Number:	AmTest ID					Client ID (35 characters max)	BOD (5-Day)	TSS	Fecal coliform	Residual chlorine	Ammonia			
	9961	STAR-EFF	8/4/07	10:28	2	-	-	-	-	-	-	-	-	-
		STAR-EFF	8/4/07	10:30	2	-	-	-	-	-	-	-	-	-
			9960	65										

Collected/Relinquished By:	Date	Time	Received By:	Date	Time
<i>Amy Jankowiak</i>	8/4/07	11:30			
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
			<i>Kurt Zyl</i>	8/4/07	

COMMENTS:
shelf 65
PH = 7.32





State of Washington Department of Ecology
**Verification of Operating Conditions
 of Advanced Wastewater Treatment
 Systems for Cruise Ship Discharges**

Northwest Regional Office
 3190 160th Ave SE
 Bellevue, WA 98008
 Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	AMSTERDAM	Date:	August 17, 2007
Vessel Operator:	Holland America Line	Entry Time:	9:55 AM
IMO Number:	9188037	Exit Time:	11:55 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Tina Stoltz, 8/14/07
Location:	Pier 30, Seattle		
On-board contact(s):	Kieron Connelly, On-coming Environmental Officer, Ted Arnold, Out-going Environmental Officer, Robert Diaz, HAL Office – Deputy Director, Environmental Compliance, William “Bill” Morani Jr., HAL Office – VP, Environmental Compliance		
Inspector(s):	Amy Jankowiak, Department of Ecology – Northwest Regional Office, Water Quality Program		
# passengers/crew:	~ 1400 / ~ 650	Amount of Wastewater:	----

Description of wastewater treatment system (name, type, major components, etc.):
 Blackwater is treated with a marine sanitation device (not an Advanced Wastewater Treatment system) including filtration, aeration, and chlorination. Graywater is collected, strained, and held prior to discharge. All wastewater discharges occur at greater than 12 nautical miles and outside of MOU waters

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input type="checkbox"/>	Operations Center/Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	Not Applicable

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Not Applicable
<input type="checkbox"/>	Operations as described in submitted documentation	Not Applicable
<input type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Not Applicable
<input type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Not Applicable
	Turbidity or equivalent : Not applicable Last calibration Frequency of readings: Trigger level for alarm: Trigger level for shutdown: Recorded turbidity/equivalent levels above triggers:	
<input type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Not Applicable
<input type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	Not Applicable
<input type="checkbox"/>	UV replacement bulbs available	Not Applicable
<input type="checkbox"/>	UV/bulbs cleaned regularly	Not Applicable

Section E: General

<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	Not Applicable
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	Not Applicable
<input checked="" type="checkbox"/>	Training up to date for system operators	Not Applicable
<input checked="" type="checkbox"/>	Discharge records maintained	Not Applicable
<input checked="" type="checkbox"/>	Alarms functioning properly	Not Applicable
	Alarms Shutdowns: not applicable High turbidity/TSS warnings: High wastewater levels: UV disinfection (intensity, bulbs, bank out, power failure):	

Section F: Sample Results

Parameter	Effluent Result
Biochemical Oxygen Demand 5-Day (BOD)	Not Applicable
Total Suspended Solids (TSS)	Not Applicable
Fecal Coliform, MF	Not Applicable
Residual Chlorine)	Not Applicable
Ammonia, Nitrogen	Not Applicable
pH	Not Applicable

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, conducted the inspection of the Holland America Line AMSTERDAM (photo #01) on August 17, 2007. The main contacts on board the AMSTERDAM included Kieron Connelly, the on-coming Environmental Officer, Ted Arnold, the out-going Environmental Officer, William Morani Jr, Vice President, Environmental Compliance HAL, and Robert Diaz, Deputy Director, Environmental Compliance HAL. Prior notification of the visit was given on August 14, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State* (MOU), as amended. The AMSTERDAM does not have an advanced wastewater treatment system on board, and therefore, does not discharge any black or graywater into MOU waters

The AMSTERDAM was delivered in 2000, is 780 feet long, with about a 26-foot draft. Passenger capacity is about 1400 with about 650 crew.

Inspection

I arrived and boarded the ship at 9:55 am and began with introductions and a plan for the day. We then discussed discharge protocols for various waste streams, non-compliance notification procedures, and the operation of food waste, oily bilge water, water bunkering and production, and ballast water management. Discharge records were reviewed for blackwater and graywater discharges, ballast water and oil. We then discussed the blackwater and graywater treatment and then viewed the systems themselves. The inspection was then finalized and I disembarked the vessel at about 10:55 am.

Non-compliance notification: The USCG and Ecology are notified appropriately for any non-compliance issues. Staff mentioned that the numbers are posted and available to staff.

Discharge Types and Protocols:

All discharges to water occur at greater than 12 nautical miles and outside of MOU waters with the possible exception of spa water. Spa water may be discharged close to the Strait of Juan de Fuca. Staff will check on the locations of these discharges. Bromine is not specifically listed as a toxic substance in the Washington Water Quality Standards, so the general rule applies: **“WAC 173-201A-240 Toxic substances.** (1) Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department.” It is unlikely that the bromine discharged from the vessel would violate the standards as long as the vessel is moving while discharging at the concentrations typical for the vessel (2-5ppm).

Only upon verification of location between the Bridge and the Engine Control Room (ECR), will a discharge occur at greater than 12 nautical miles and outside of MOU waters. The Bridge authorizes the discharge. The latitude and longitude coordinates are recorded in the *Sewage and Graywater Discharge Record Book* and in the deck log. There is an overboard valve monitoring system on the bridge and the ECR has lights monitoring discharges. The date, time and location of both the start and the stop of the discharges are recorded, along with port location, effluent type, volumes, and speed. Discharges are tentatively scheduled ahead of time by matrix, but are locations are always verified prior to discharges. All discharge records that were reviewed appeared to be in compliance with the MOU.

The discharge ports have either locks, green tags (photo #08), seals (photo #10), or a combination there of. The seals automatically record when the valve is open or closed. It is recorded when a tag or lock is broken or opened.

Blackwater treated by the marine sanitation device (photo #03), and graywater is always discharged at greater than 12 nautical miles and outside of MOU waters. Blackwater is collected by vacuum to a tank (photos #04 and #05), then goes through prefiltration. Liquid moves to the next tank for aeration, while the solids collected by prefiltration are collected and off-loaded in Victoria. The aerated liquid is fine-filtered. The solids are sent back for aeration and breakdown. The filtered effluent is then chlorinated and held until discharge (photos #9 and #10). There are four of the blackwater treatment systems (photo #02) on board the vessel. Graywater is collected and strained. The strained material is also collected and off-loaded in Victoria. The graywater does not receive any further treatment and is held until discharge.

Oily bilge water is treated with a Cascade System (photo #07). Oily bilge water is sent to the 50 ppm oily water separator, then to the intermediate tank and then to the 15 ppm oily water separator. If the effluent does not meet 15ppm, it is automatically sent back to the intermediate tank for more treatment. The effluent that meets 15 ppm (typically <9 ppm) is either discharged at greater than 12 nautical miles and outside of MOU waters or is sent to a clean tank and later discharged (photo #11). All effluent first goes through the white box for monitoring prior to discharge.

Food waste goes from the galley to the Somat Press. The hydro extractor water is sent through spiral pumps and is sent back to the Somat Press. The food waste from the press/extractor is discharged (typically Saturday night, Tuesday night and Thursday morning) at greater than 12 nautical miles and outside of MOU waters. Food waste that does not go through the press (bones, etc.) is collected and off-loaded on-shore in Victoria. The liquid from the press/extractor is changed out occasionally and discharged over the side at greater than 12 nautical miles and outside of MOU waters. Plastics and garbage are separated at the source, overseen by staff.

Ballast water discharges occur outside of MOU waters prior to coming into the Strait of Juan de Fuca.

X-ray's in the medical area are performed digitally. Silver is captured from the photo waste, collected and off-loaded as hazardous waste in Victoria. All wastes to shore are off-loaded in Victoria.

Potable water is bunkered typically in Seattle, Juneau, and Ketchikan. Chlorine is added prior to distribution. Water is also produced by desalination. Three evaporators (photo #06) are used that are run by engine heat (<100°C). The seawater is boiled off in vacuum. The water is then chlorinated and sent to a tank for a short time prior to distribution. Salt collected from the evaporators is sent back to the sea. Residual chlorine is monitored at the furthest point for a minimum of 0.2 ppm.

Conclusions and Recommendations

The protocols and procedures for discharge are clear and inclusive of verification. The discharge records showed no discharges of blackwater or graywater in MOU waters for the period looked at of 2005 through the date of the inspection.

The staff was very knowledgeable of the systems and procedures related to compliance with the MOU.

Attachments:
Photographs

Copies to:
William Morani, Jr., HAL
Robert Diaz, HAL
Kieron Connelly, HAL
Ted Arnold, HAL
John Turvey, HAL
Tina Stoltz, HAL
Amy Jankowiak, Ecology

Kevin Fitzpatrick, Ecology
Mark Toy, Dept. of Health
✓ Central Files: Holland America Line - AMSTERDAM; WQ 6.1

Section H: Signatures

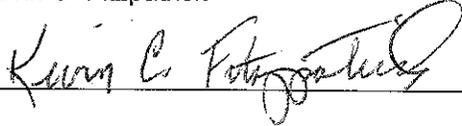
<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology/Northwest Regional Office/Water Quality Program/Compliance Specialist/(425) 649-7195	9/25/07
Kevin C. Fitzpatrick 	Department of Ecology/Northwest Regional Office/Water Quality Section Manager/(425) 649-7033	9/25/07



PHOTO #:01 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170038
DESCRIPTION: HOLLAND AMERICA LINE AMSTERDAM VESSEL

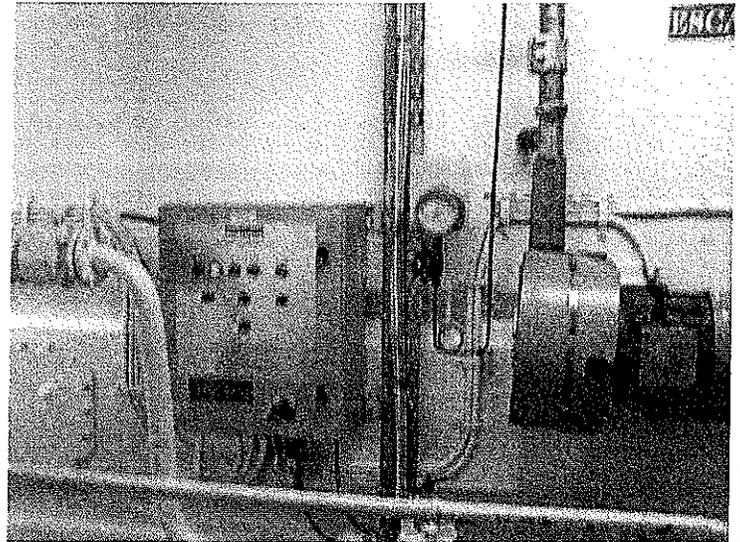


PHOTO #:02 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170039
DESCRIPTION: BLACKWATER TREATMENT SYSTEM

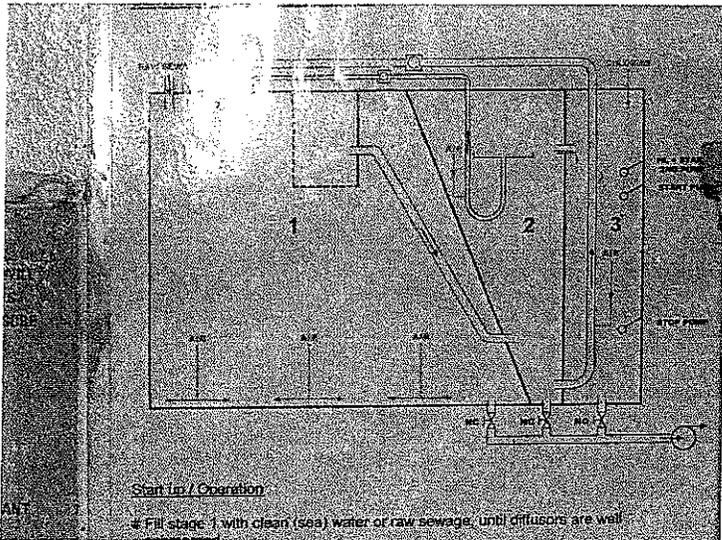


PHOTO #:03 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170040
DESCRIPTION: BLACKWATER TREATMENT SYSTEM SCHEMATIC

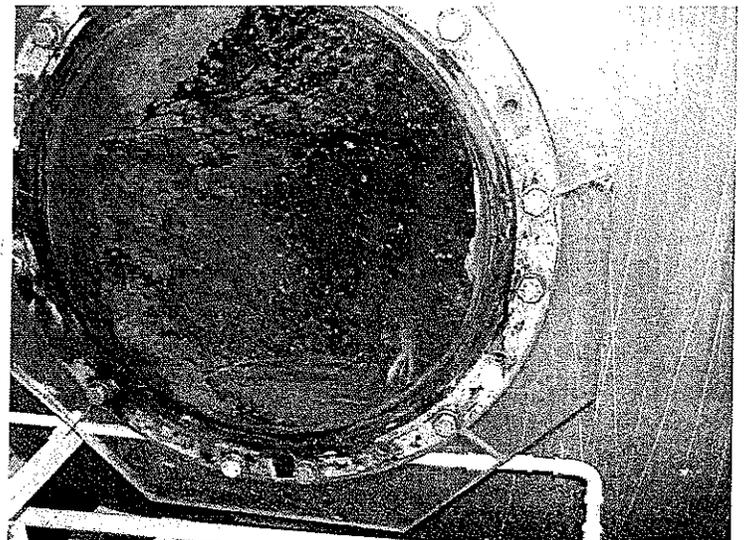


PHOTO #:04 DATE: 08174/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170042
DESCRIPTION: BLACKWATER VACUUM TANK



PHOTO #:05 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170043
DESCRIPTION: BLACKWATER VACUUM TANK

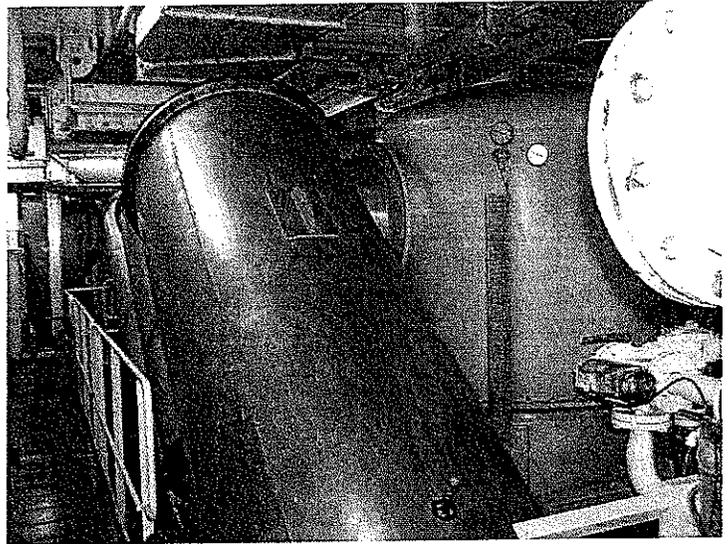


PHOTO #:06 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170044
DESCRIPTION: EVAPORATORS (3) FOR WATER PRODUCTION

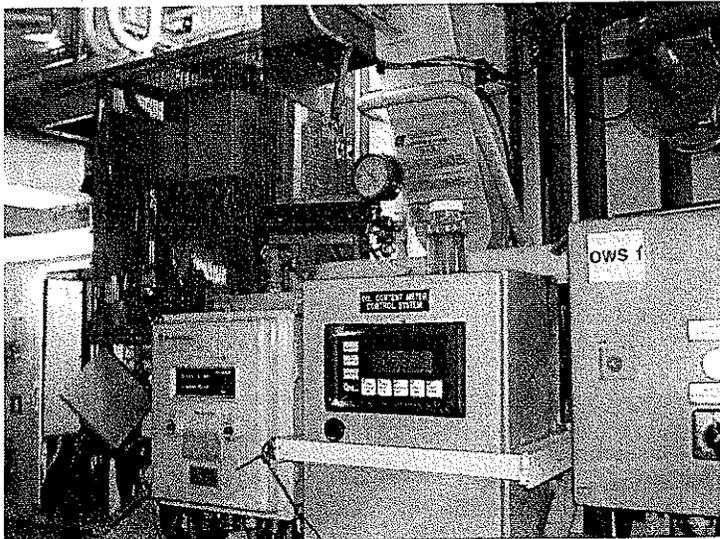


PHOTO #:07 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170045
DESCRIPTION: BILGE WATER SYSTEM (WHITE BOX UPPER LEFT)

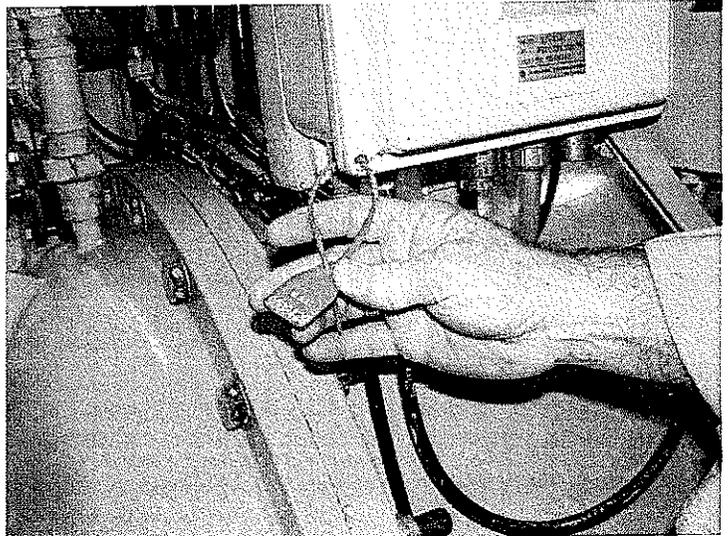


PHOTO #:08 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170047
DESCRIPTION: GREEN TAG USED FOR LOCKOUTS

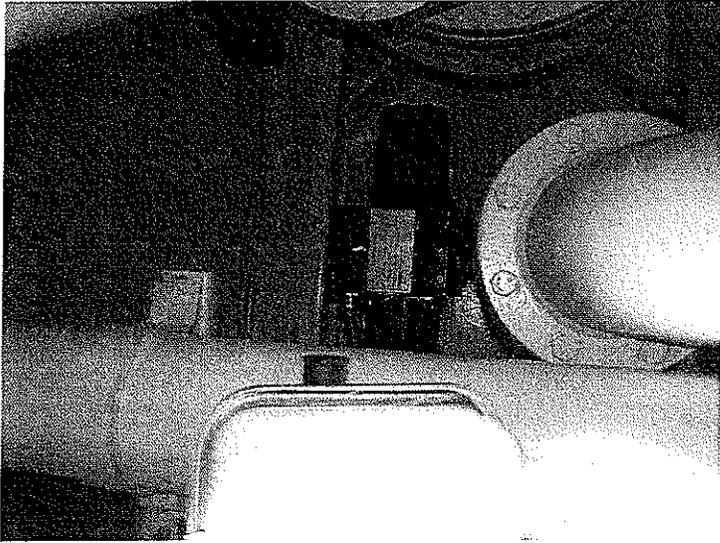


PHOTO #:09 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170048
DESCRIPTION: BLACKWATER AND GRAYWATER DISCHARGE
PORT

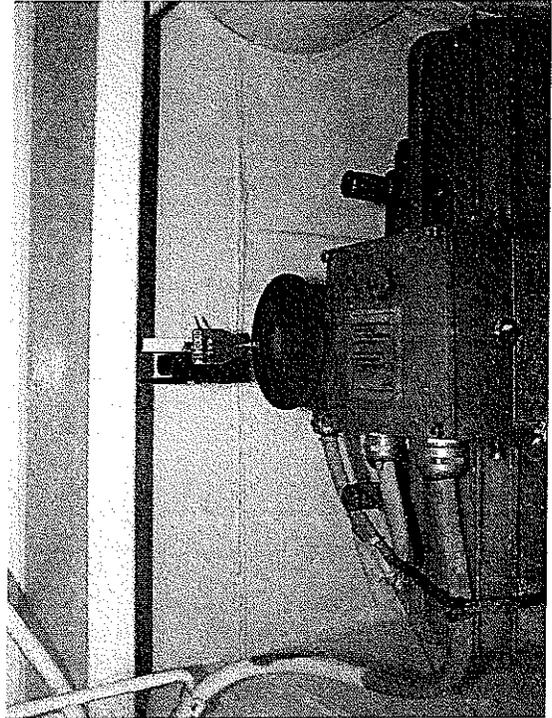


PHOTO #:10 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170049
DESCRIPTION: BLACKWATER AND GRAYWATER DISCHARGE
PORT (GREEN LOCKOUT TAG AND SEAL)

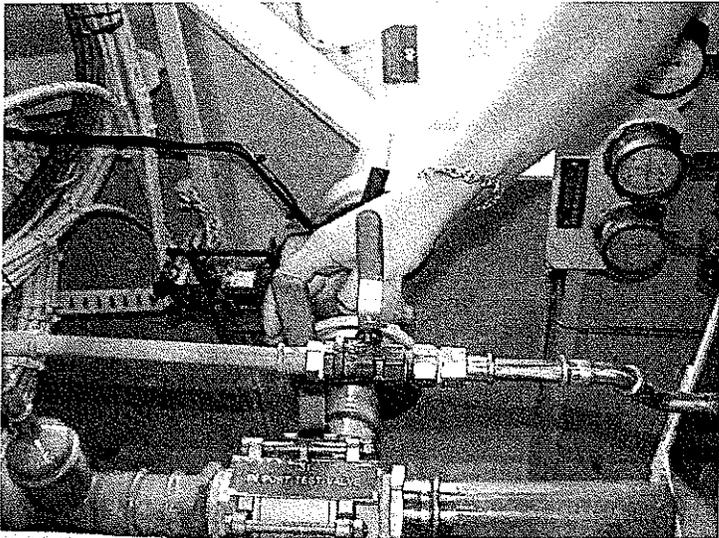


PHOTO #:11 DATE: 08/17/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8170050
DESCRIPTION: BILGE WATER DISCHARGE PORT (AND SAMPLE
PORT)

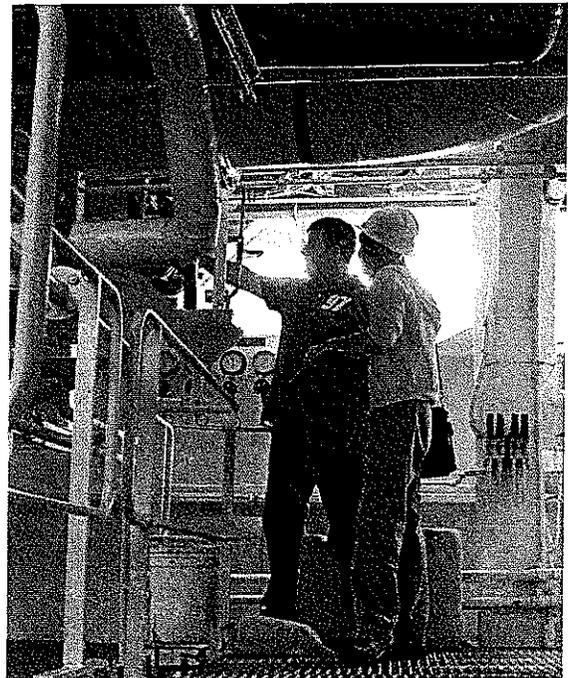


PHOTO #:12 DATE: 08/17/07 TAKEN BY: WILLIAM MORANI
FILE No.:8
DESCRIPTION: KIERON CONNELLY, HAL EO AND AMY
JANKOWIAK, DOE DURING INSPECTION





State of Washington Department of Ecology
**Verification of Operating Conditions
 of Advanced Wastewater Treatment
 Systems for Cruise Ship Discharges**

Northwest Regional Office
 3190 160th Ave SE
 Bellevue, WA 98008
 Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	OOSTERDAM	Date:	August 25, 2007
Vessel Operator:	Holland America Line	Entry Time:	9:40 AM
IMO Number:	9221281	Exit Time:	11:50 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Tina Stoltz; August 21, 2007
Location:	Pier 30, Seattle		
On-board contact(s):	Cornelis Kant, Environmental Officer, Marc Laughlan, AWWPS, Robert Diaz, HAL Office – Deputy Director, Environmental Compliance		
Inspector(s):	Amy Jankowiak, Department of Ecology; Michael Cahill, Department of Ecology		
# passengers/crew:	Actual ~1800/~650	Amount of Wastewater:	GW ~ 34m ³ /hr BW ~14m ³ /hr (2006 numbers)

Description of advanced wastewater treatment system (name, type, major components, etc.):
 Rochem Advanced Waste Water Purification System. The Rochem graywater system includes prefiltration, reverse osmosis and UV disinfection. The Rochem blackwater system includes prefiltration, biological treatment via bioreactors, ultrafiltration, and UV disinfection. Approval for discharge at greater than one nautical mile away from port and at greater than six knots from Ecology was granted in July 2004, June 2005 and June, 2006. Discharge approval has not been requested as of yet for the 2007 season. Discharges are being held until outside MOU waters.

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input checked="" type="checkbox"/>	Operations Center/Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	Not Applicable

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Not Applicable
<input type="checkbox"/>	Operations as described in submitted documentation	Not Applicable
<input type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Not Applicable
<input type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Not Applicable
	<u>Turbidity or equivalent</u> : Not applicable Last calibration Frequency of readings: Trigger level for alarm: Trigger level for shutdown: Recorded turbidity/equivalent levels above triggers:	
<input type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Not Applicable
<input type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	Not Applicable
<input type="checkbox"/>	UV replacement bulbs available	Not Applicable
<input type="checkbox"/>	UV/bulbs cleaned regularly	Not Applicable

Section E: General

<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	Sampling being conducted, but not approved for or discharging
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	WET testing was conducted in 2005 and 2006.
<input checked="" type="checkbox"/>	Training up to date for system operators	Trainings conducted by handovers and/or manufacturer specific training.
<input checked="" type="checkbox"/>	Discharge records maintained	Records maintained properly No discharges in MOU waters present for 2007 to date.
<input checked="" type="checkbox"/>	Alarms functioning properly	Alarms appear to be functioning properly.
<u>Alarms</u> Shutdowns: not applicable High turbidity/TSS warnings: High wastewater levels: UV disinfection (intensity, bulbs, bank out, power failure):		

Section F: Sample Results

Parameter	Effluent Result
Biochemical Oxygen Demand 5-Day (BOD)	Not Applicable
Total Suspended Solids (TSS)	Not Applicable
Fecal Coliform, MF	Not Applicable
Residual Chlorine)	Not Applicable
Ammonia, Nitrogen	Not Applicable
pH	Not Applicable

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, and Michael Cahill, Ecology Northwest Regional Office, Spill Prevention Unit, conducted the inspection of the Holland America Line OOSTERDAM on August 25, 2007. The main contacts on board the OOSTERDAM included Cornelis Kant, Environmental Officer, Marc Laughlan, AWWPS, and Robert Diaz, Deputy Director, Environmental Compliance HAL. Prior notification of the visit was given on August 21, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State (MOU)*, as amended. The OOSTERDAM is currently not approved for and is not discharging black or graywater into MOU waters. The vessel has requested and received approval for discharge at greater than one nautical mile from shore and at greater than six knots in 2004, 2005, and 2006. Discharge approval has not been requested as of yet for the 2007 season. Discharges are being held until outside MOU waters.

The HOLLAND OOSTERDAM was built in 2002, and is 936 feet long with a width of 106 feet and a maximum draft of 26 feet. There are typically about 1800 passengers and about 650 crew. The ship's wastewater systems', Rochem, were installed in 2002. The vessel is powered with on-shore power during port calls in Seattle

Inspection

We arrived and boarded the ship at about 9:40 am and began with introductions and a plan for the day. We then discussed various waste streams, and the operation of food waste, air conditioning condensate, pool/spa water, water bunkering and production, photo waste, laundry water, and medical wastes. We discussed protocols for discharges. Discharge records were reviewed for blackwater and graywater discharges, and oily water discharges. We then headed to the bridge to review discharge procedures and to verify locations of certain discharges. We then viewed and discussed the black and graywater treatment systems, as well as the oily bilge system. The inspection was then finalized and I disembarked the vessel at about 11:50 am. Mr. Cahill stayed on board to finalize a fuel bunkering inspection.

Discharge Types and Protocols:

All discharges to water occur at greater than 12 nautical miles and outside of MOU waters. No discharges occur in the Olympic Coast National Marine Sanctuary.

Food waste is collected from the galley and is sent to the press. The solid food waste is heated (by steam engine), dried and incinerated. The liquid food waste is sent to the graywater system for treatment. Grease is collected separately and off-loaded to shore, often in Seattle for biodiesel use

Plastics and garbage are separated from the food waste at the source/galley and is overseen by various staff several times a day. Cardboard is incinerated along with the food waste. Holland America Line is looking into using plastic foldable boxes for products to cut down on the amount of cardboard incinerated. There is not enough room on the vessel to store the cardboard for recycling.

Air conditioning condensate is collected and discharged while underway at greater than 12 nautical miles. Pool and spa water is always discharged at greater than 12 nautical miles.

Potable water is bunkered now and then, while the rest is produced by desalination. Steam from the boilers heat up the sea water with low pressure evaporation. The condensate is then chlorinated and adjusted for pH prior to distribution. Salt collected from the evaporators is sent back to the sea. Scaling is treated with acid and is then neutralized prior to discharge at sea. Residual chlorine is monitored at the furthest point for a minimum of 0.2 ppm.

Silver is captured from the photo waste, collected and off-loaded as hazardous waste in Victoria. All hazardous wastes to shore are off-loaded in Victoria.

Laundry water is sent to the graywater system for treatment. Eco-Lab products are used for the laundry and cleaning.

Medical waste is collected and sent to shore with hazardous waste, including sharps. Medicines that are not used or expired are sent back to the manufacturer.

Oily bilge water is sent to the 50 ppm oily water separator, then to the intermediate tank and then to the 15 ppm oily water separator (photos #10 and #11). If the effluent does not meet 15ppm, it is automatically sent back for further treatment. The effluent that meets 15 ppm is either discharged at greater than 12 nautical miles and outside of MOU waters or is sent to a clean tank and later discharged. All effluent first goes through the white box (photo #12) for monitoring prior to discharge.

Discharge Protocol:

Only upon verification of location between the Bridge and the Engine Control Room (ECR), will a discharge occur at greater than 12 nautical miles and outside of MOU waters. The maps on the bridge clearly showed that no discharges are to occur in the Olympic Coast National Marine Sanctuary. The Bridge also has discharge protocols displayed showing that approval must be granted first by Ecology for black and graywater discharges. The Bridge authorizes any discharge. The latitude and longitude coordinates are recorded in the *Sewage and Graywater Discharge Record Book* and in the deck log. There is an overboard valve monitoring system (photo #01) on the bridge. The system has four lights:

- >12 nm
- > 4, <12 nm
- <4 nm
- Special Areas

The "special areas light" means no discharges (lit during inspection). The computer system "Overboard Valve Monitoring" system details where certain discharges can and cannot take place and includes alarms (including a greater than 6 knots alarm). When any overboard valve is open, the location (lat and long) is automatically recorded (open and close). The date, time and location of both the start and the stop of the discharges are recorded, along with port location, effluent type, volumes, and speed. Discharges are tentatively scheduled ahead of time by matrix, but locations are always verified prior to discharges. All discharge records that were reviewed appeared to be in compliance with the MOU. Two locations were plotted at the Bridge for verification of location (graywater discharges). The discharges occurred in Canadian waters.

The discharge ports have either locks, green tags (photo #08), seals (photo #10), or a combination there of. The seals automatically record when the valve is open or closed. It is recorded when a tag or lock is broken or opened.

Graywater System:

Laundry water and passenger shower/sink wastewater goes into the graywater holding tank and is sent to the low pressure reverse osmosis (LP-RO) treatment system. The flow enters the prefiltration SWECO system (photo #13) and then goes to the LP-RO units (photo #14). Screenings from the prefiltration are collected and sent to incineration. The LP-RO system consists of four different units. The number of units used can be changed depending on need. Effluent from the LP-RO system goes to a permeate tank and then onto ultraviolet (UV) disinfection. PH is adjusted with sodium acid and caustic soda. From the UV, the flow can either go straight overboard (photo #17) after being combined with the blackwater system effluent, or can go to storage tanks. The graywater system is not currently operating due to operational problems and no discharges are occurring in MOU waters (can hold for about 2.5 days). The final effluent had been showing high BOD from the graywater system and some higher fecal coliform results. The graywater system has also been having problems with condensate in some of the valves. The refrigerated dryer has not been working properly to dry the valves. Staff has been sending sampling results to Rochem. It is recommended that staff work closely with Rochem to resolve the operational problems.

Blackwater System:

Toilet waste, Galley waste, infirmary drains and crew waste goes to a collection tank (photo #07) and then to a buffer tank (photo #03) and then onto the blackwater treatment system (Rochem UF; ultrafiltration) From the buffer tank, flow goes to prefiltration through the SWECO system (photo #04). Solids are vibrated out and sent to incineration. PH is adjusted after prefiltration. Liquid from the prefiltration filtrate tank (photo #05) goes to the bioreactors (photo #06). From the bioreactors, flow goes through the membranes for ultrafiltration (UF). Effluent from the membranes is disinfected via a separate UV system (photo #08) where turbidity (photo #09) is monitored as well. From the UV, the flow can either go straight overboard after being combined with the graywater system effluent (photo #02), or can go to storage tanks. The blackwater system is currently not discharging in MOU waters.

Samples was not conducted per HAL request. Sampling is not required per the MOU when not approved and not discharging.

Conclusions and Recommendations

Staff seemed very knowledgeable of the protocols and systems.

It is recommended that staff work closely with Rochem to resolve the operational problems of the graywater system.

Attachments:
Photographs

Copies to:

William Morani, Jr., HAL

Bob Diaz, HAL

John Turvey, HAL

Tina Stoltz, HAL

Cornelis Kant, Environmental Officer

Amy Jankowiak, Ecology

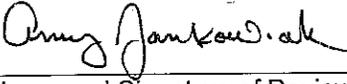
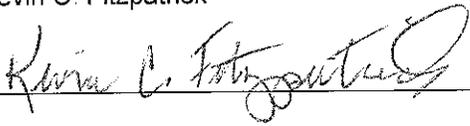
Mark Toy, Health

Michael Cahill, Ecology

Kevin Fitzpatrick, Ecology

Central Files: Holland America Line – HOLLAND OOSTERDAM; WQ 6 1

Section H: Signatures

<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology/Northwest Regional Office/Water Quality Program/Compliance Specialist/(425) 649-7195	9/25/07
<u>Name and Signature of Reviewer</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Kevin C. Fitzpatrick 	Department of Ecology/Northwest Regional Office/Water Quality Section Manager/(425) 649-7033	9/25/07

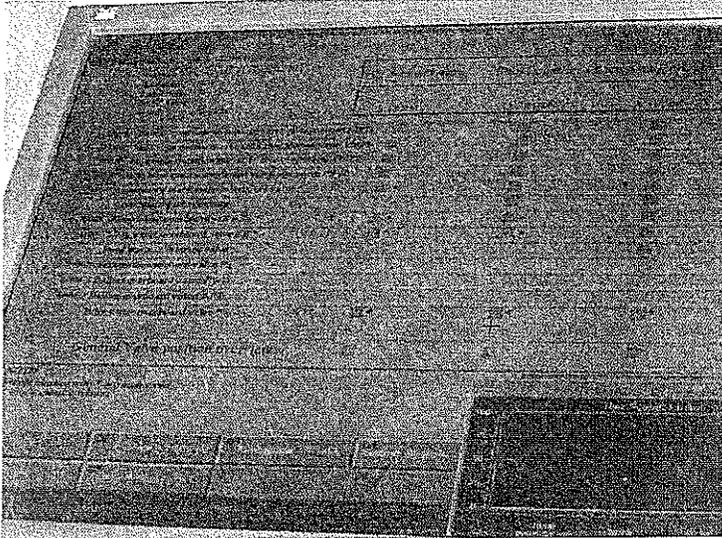


PHOTO #:01 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No :P8250020
DESCRIPTION: OVERBOARD VALVE MONITORING SYSTEM

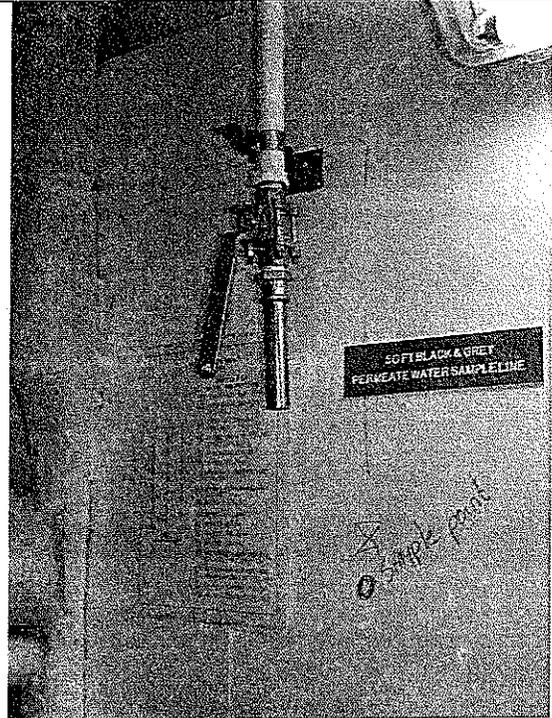


PHOTO #:02 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250022
DESCRIPTION: AWTS EFFLUENT SAMPLE PORT

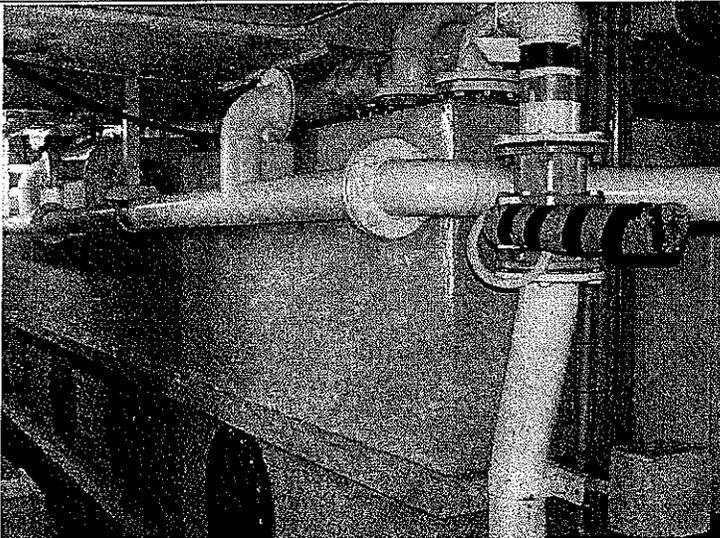


PHOTO #:03 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250023
DESCRIPTION: AWTS - BLACKWATER BUFFER TANK

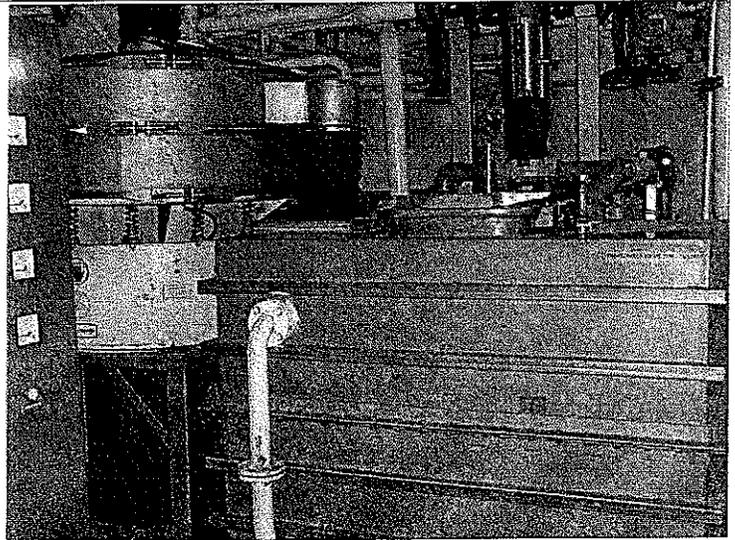


PHOTO #:04 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250025
DESCRIPTION: AWTS - BLACKWATER PREFILTRATION SYSTEM
(SWECO FILTER), SOLIDS SEPARATION

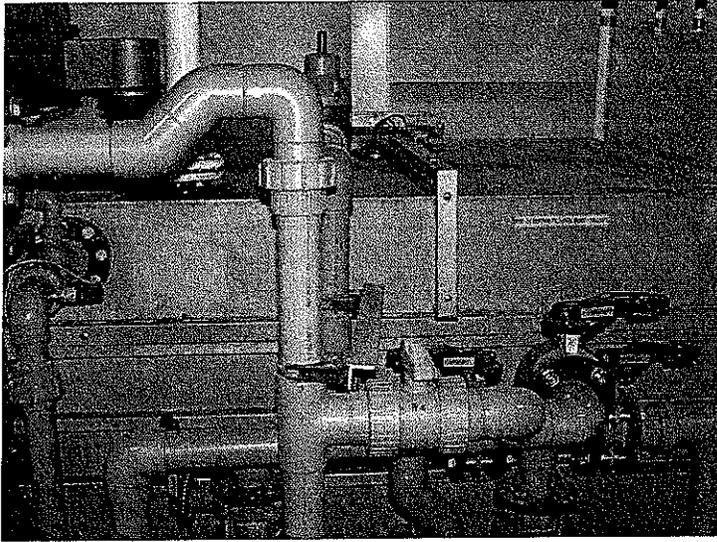


PHOTO #:05 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250026
DESCRIPTION: AWTS – BLACKWATER PREFILTRATION SYSTEM,
FILTRATE SEPARATION

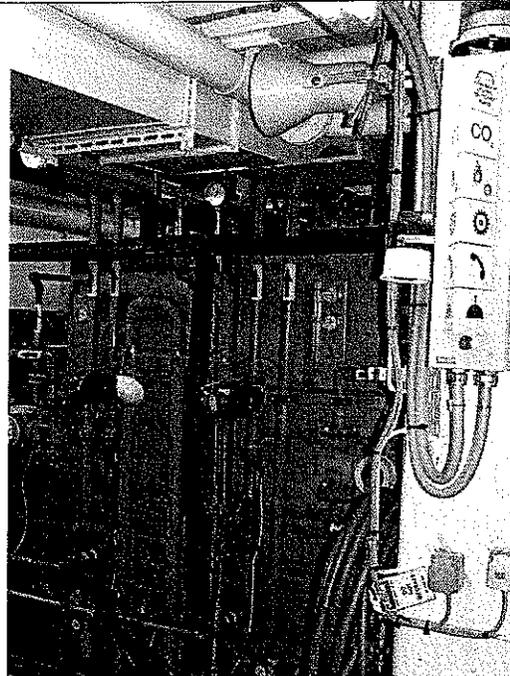


PHOTO #:06 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250027
DESCRIPTION: AWTS – BLACKWATER SYSTEM
BIOREACTORS/ULTRAFILTRATION

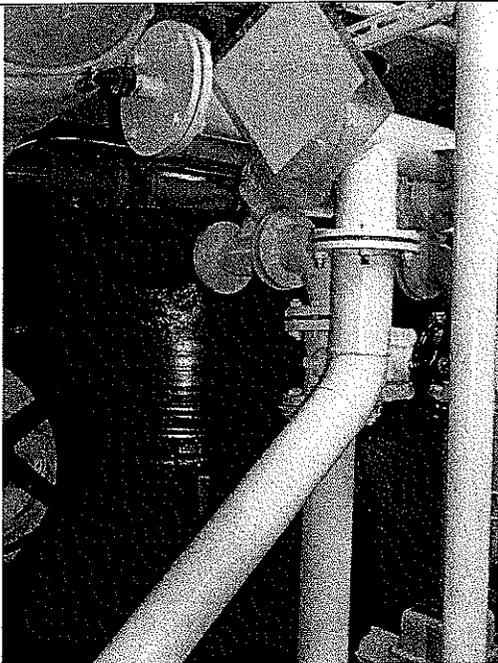


PHOTO #:07 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250028
DESCRIPTION: BLACKWATER COLLECTION TANK

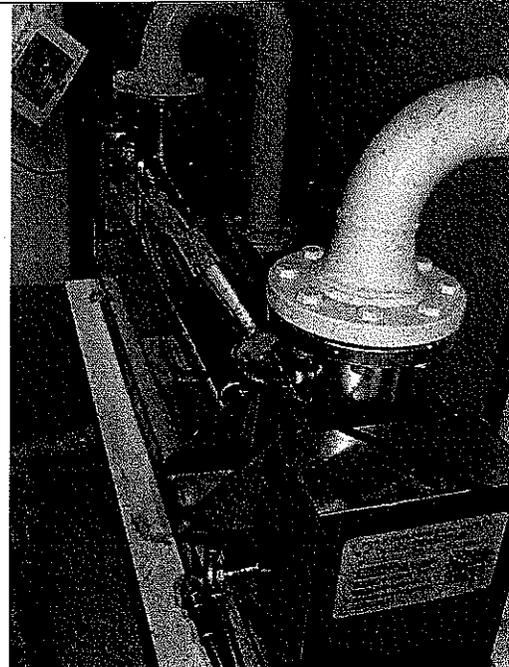


PHOTO #:08 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250029
DESCRIPTION: AWTS – ULTRAVIOLET DISINFECTION SYSTEM

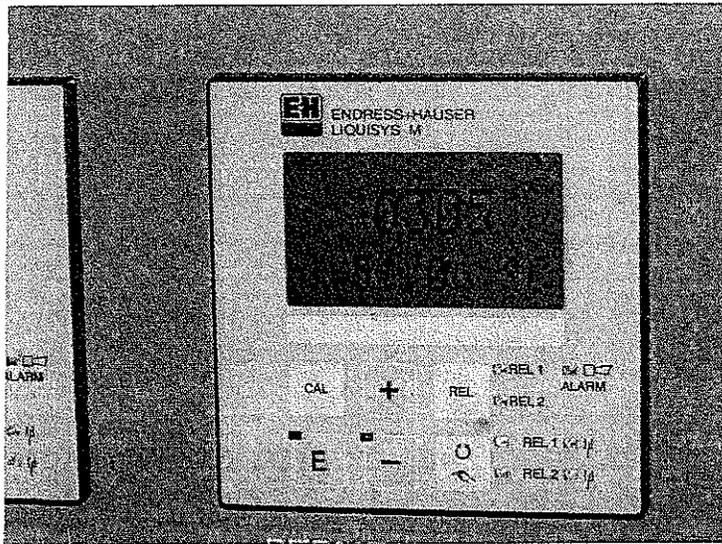


PHOTO #:09 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250030
DESCRIPTION: AWTS - BLACKWATER SYSTEM TURBIDITY
METER

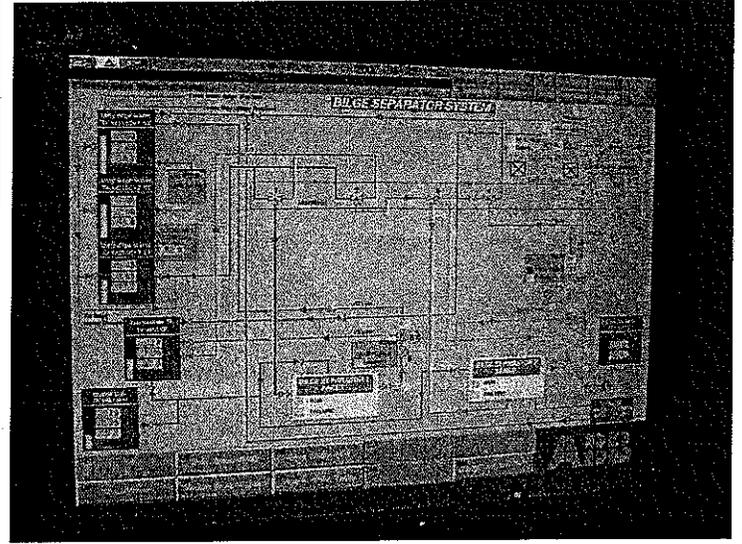


PHOTO #:10 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250035
DESCRIPTION: OILY BILGE SYSTEM

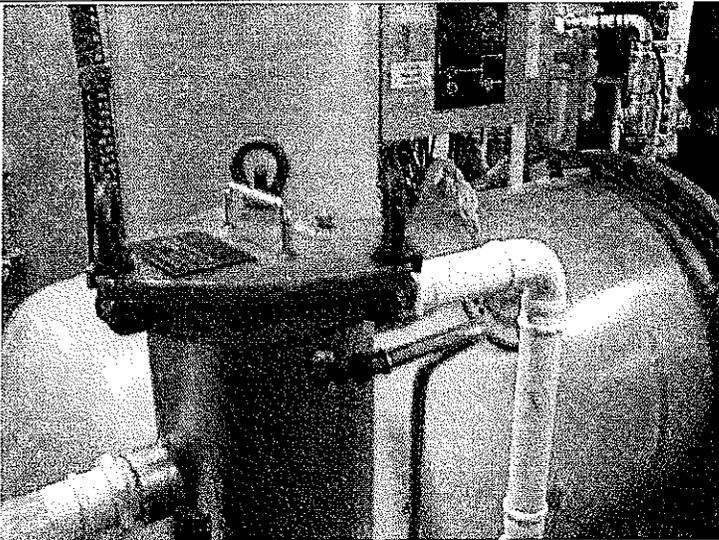


PHOTO #:11 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250036
DESCRIPTION: OILY WATER SEPARATOR (1 OF 2)

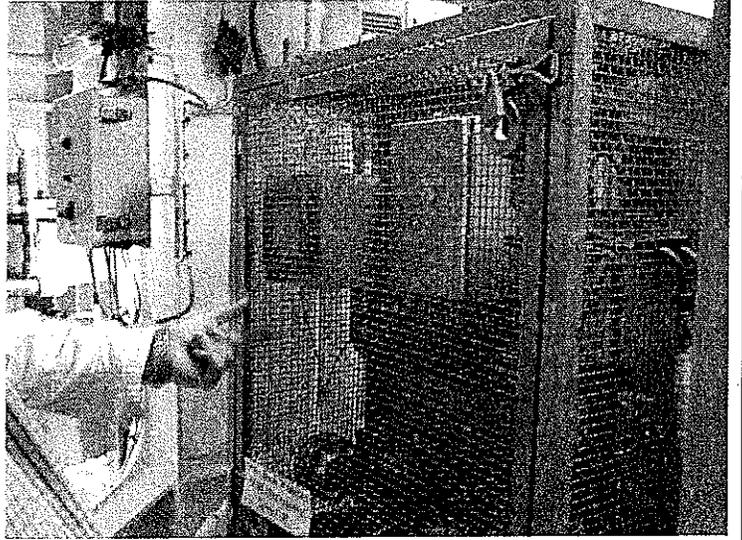


PHOTO #:12 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P8250038
DESCRIPTION: OILY BILGE SYSTEM WHITE BOX

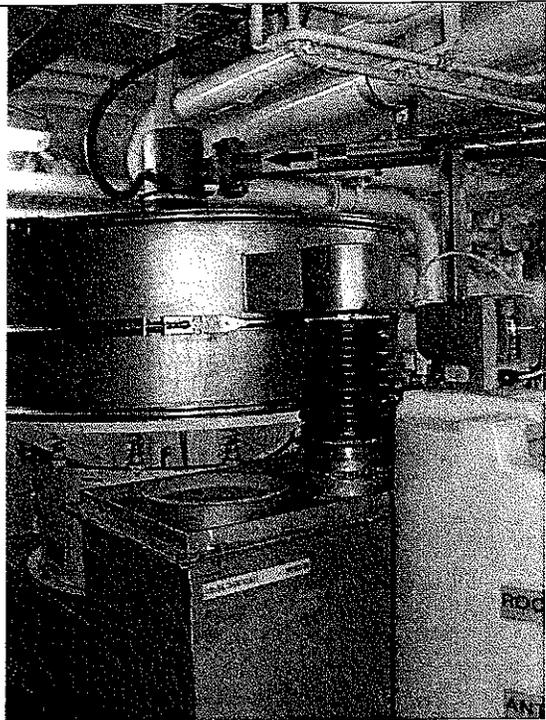


PHOTO #:13 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE NO :P8250039
DESCRIPTION: AWTS – GRAYWATER SYSTEM PRE-FILTRATION
SYSTEM

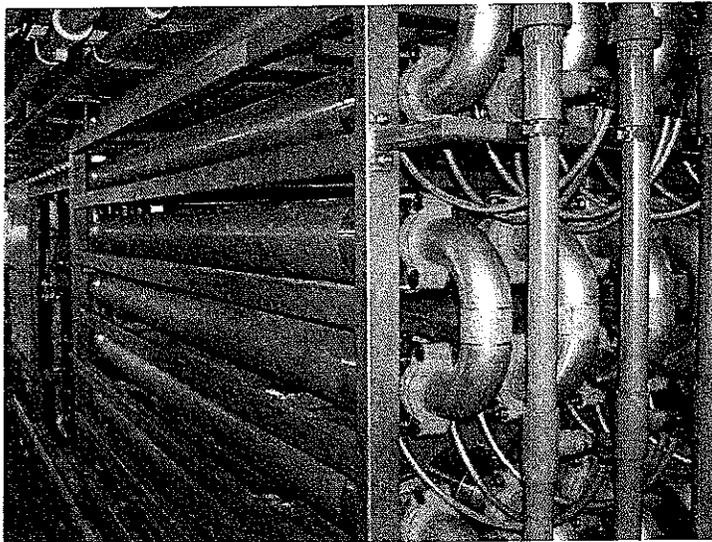


PHOTO #:14 DATE: 08/25/07 TAKEN BY: AMY JANKOWIAK
FILE NO :P8250040
DESCRIPTION: AWTS – GRAYWATER SYSTEM – REVERSE
OSMOSIS



State of Washington Department of Ecology
**Verification of Operating Conditions
of Advanced Wastewater Treatment
Systems for Cruise Ship Discharges**

Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	NORWEGIAN PEARL	Date:	September 2, 2007
Vessel Operator:	NCL (Bahamas) Ltd	Entry Time:	9:30 AM
IMO Number:	9195157	Exit Time:	11:45 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Randy Fiebrandt, August 27, 2007
Location:	Pier 66, Seattle		
On-board contact(s):	Ernst Bugge, Environmental Officer; Daniel Gaza, Environmental Engineer		
Inspector(s):	Amy Jankowiak, Ecology Northwest Regional Office, Water Quality Program; Mark Toy, Department of Health		
# passengers/crew:	~4000 total	Amount of Wastewater: Per VSSP	Design: 1780 m ³ /day blackwater; 1200 m ³ /day graywater through Scanship Generation: 100 m ³ /day blackwater; 1000 m ³ /day graywater
Description of advanced wastewater treatment system (name, type, major components, etc.): Scanship is a biological reactor and ultrafiltration system. The system includes prefiltration, biological treatment via a biofilm process, chemical precipitation, clarification through flotation tanks, polishing filtration and UV disinfection. Approval for continuous discharge from Ecology was granted on May 3, 2007.			

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input checked="" type="checkbox"/>	Operations Center/ Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input checked="" type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other (oil spill notification drill, debunking)

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	NA
<input type="checkbox"/>	Sludge disposal protocol per MOU	NA
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	NA

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input checked="" type="checkbox"/>	Schematics match black/gray wastewater system	System is as depicted in schematics.
<input checked="" type="checkbox"/>	Sludge disposal protocol per MOU	Discharges 12 nm out and outside of the Olympic Coast National Marine Sanctuary Area to Be Avoided per stated protocol.
<input checked="" type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	NCL Headquarters in Miami is notified and local authorities are also contacted. A notification sheet with Ecology's phone numbers were available and viewable on the vessel. A copy of the MOU was on the SEMS system, but it was an old amendment version (No. 1) The current version of the MOU is Amendment No. 3.
<input checked="" type="checkbox"/>	Operations as described in submitted documentation	Operations were as described.
<input checked="" type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Has continuous TSS monitoring.
<input checked="" type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Appears to be functioning properly. Details in narrative.
	<u>Turbidity or equivalent</u> Last calibration: Daily Frequency of readings: continuous Trigger level for alarm: 20 mg/l, calls environmental engineer 30 mg/l switches automatically to hold and does not allow discharge until the problem is fixed and the TSS levels are normal. Recorded turbidity/equivalent levels above triggers: Yes. Automatic shut down is working.	

<input checked="" type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Automatic shutdown appears to be operating properly
<input checked="" type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	3 UV banks available to run in series for effluent. Using 2 of the 3 typically (readings at time of inspection – 60 w/m ² and 78 w/m ²)
<input checked="" type="checkbox"/>	UV replacement bulbs available	There is at least one unit's worth of spares available.
<input checked="" type="checkbox"/>	UV/bulbs cleaned regularly	Yes, the units are cleaned by dosing Metal Bright automatically about every 110 hours. Hand wiping of the bulbs is done about once monthly and is checked weekly.

Section E: General

<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	As of the date of the inspection, sampling has been conducted as required.
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	WET testing not yet required for vessel – in first season of operation.
<input checked="" type="checkbox"/>	Training up to date for system operators	Scanship conducts training on the ship during start-up of the system and handover training occurs. The Chief Engineer, Environmental Officer and Environmental Engineer are all trained by Scanship at a minimum.
<input checked="" type="checkbox"/>	Discharge records maintained	Maintained properly
<input checked="" type="checkbox"/>	Alarms functioning properly	Alarms appear to be functioning properly
	Alarms Shutdowns: Yes High turbidity/TSS warnings: Yes High wastewater levels: Yes UV disinfection (intensity, bulbs, bank out, power failure): Yes	

Section F: Sample Results

Parameter	Effluent Result
Biochemical Oxygen Demand (BOD 5-Day)	<10 mg/l
Total Suspended Solids (TSS)	67 mg/l
Fecal Coliform (MF)	<1 CFU/100 ml
Residual Chlorine	<0.1 mg/l
Ammonia, Nitrogen	0.088 mg/l
pH	7.20 standard units

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, Municipal Compliance Specialist conducted the inspection of the NORWEGIAN PEARL on September 2, 2007 along with Mark Toy, Washington State Department of Health, Office of Shellfish and Water Protection. The main contacts on board the NORWEGIAN PEARL included Ernst Bugge, Environmental Officer and Daniel Gaza, Environmental Engineer. Mr. Gaza operates the Scanship system. Prior notification of the visit was given on August 27, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State* (MOU), as amended including the operating conditions of Advanced Wastewater Treatment System (AWTS). The NORWEGIAN PEARL received approval to discharge continuously per the MOU on May 3, 2007.

The NORWEGIAN STAR was built in 2005 and started service in November of 2006. It is 965 feet long with 15 guest decks, with about a 27-foot draft. Passenger capacity is 4080 total passenger berths. There are typically about 4000 people in total on board including passengers and crew.

Inspection

We arrived boarded the ship at 9:30 am and began with introductions and a plan for the day. We then discussed discharge protocols, non-compliance notifications, and training. We also discussed the process and protocols of various waste streams. We then reviewed the gray and blackwater discharge books and discussed the operation of the Scanship system. We then toured the sludge dryers, garbage and recycling area, food waste, incinerators, ballast and bilge. We then toured the Scanship system. Samples were pulled from the AWTS prior to finalizing the inspection and disembarking the vessel at about 11:45 am.

Non-compliance Notification with the MOU: Notification procedures were known and readily available for non-compliance with the MOU. NCL Headquarters in Miami is notified and local authorities are also contacted. A notification sheet with Ecology's phone numbers were available and viewable on the vessel.

Copy of the MOU: A copy of the MOU was on the SEMS system, but it was an old amendment version (No. 1). The current version of the MOU is Amendment No. 3. The copy of the MOU from Ecology's website was shown to Mr. Bugge. The SEMS system should be updated to include the most recent version of the MOU.

Discharge Types and Protocols:

The latitude and longitudes are recorded in the *Sewage and Graywater Discharge Record Book* along with all other discharge records. Discharge records were well kept and include dates, times, discharge locations, port locations, effluent type, volumes, speed, signatures and remarks. Discharge protocols include a pre-schedule include detailed estimated times for the various types of discharges. Also, prior to any discharge, a notification from the bridge is made, as well as a notification prior to closing discharge ports.

Food waste sent from the galley by chutes to two pulpers (grinders) (photos #04 and #07) and then to a tank (photo #08). The waste is then screened and the liquid is sent to the Scanship system for treatment. The solids screened out are sent to the sewage sludge tank where they are either dried (photos #01 and #03) and incinerated (photos #09 and #10) along with the sludge or held until discharge outside of MOU/Olympic Coast National Marine Sanctuary (OCNMS) waters. Grease is collected separately by filter and sent to the sewage sludge tank as well.

Oily bilge water is treated via two Marinfloc systems (photo #12) to <5 ppm. White boxes (photo #13) are used to assure oil content by monitoring the oil content, and storing the start/stop discharge time, volume, and ship position.

All solid wastes and recyclable materials (except for aluminum) are landed ashore in Victoria including cardboard, medical sharps, hazardous waste (photo #05), and x-ray and photo waste at < 5ppm. Medical waste is incinerated along with food-contaminated cardboard and sludge. Expired medications are collected with hazardous waste. Fluorescent light bulbs are crushed with a mercury removal system (photo #06). Paper is shredded (photo #02) and compacted. Aerosol is removed (photo #05) prior to landing ashore.

Treated effluent from the AWTs is discharged continuously. Laundry water is sent to the Scanship system for treatment. Ballast water is exchanged outside of Washington waters and has ultraviolet (UV) disinfection (photo #11).

The Environmental Officer (EO) has the key for the oily water white boxes and all overboard valves (the Captain and Chief Engineer also have keys, but all discharges go through the EO). The bridge contacts the control room, and the EO opens the locks for discharges.

Scanship Advanced Wastewater Treatment System:

Graywater and blackwater from the ship are collected in a tank - mixed. The wastewater is pumped to two drum screens for pre-screening, followed by biological treatment (biofilm on rotating plastic pieces - 2 tanks in series) (photo #15), chemical precipitation (flocculants, polymer) (photo #14), clarification via flotation tanks (2 tanks) (photo #17), ultrafiltration via polishing filters (2 rotating mesh drums) (photos #18 and #19), and disinfection via ultraviolet light (UV) (photo #20). Solids from the screen press and flotation tanks goes to the sludge tank. Material from the sludge tank is either dried and incinerated, or held until outside MOU/OCNMS waters. A defoamer (photo #16) is added to the bioreactor as needed.

Total Suspended Solids (TSS) is monitored continuously at UV disinfection. If the TSS exceeds 20 mg/l, the system alarms and calls the Environmental Engineer for response. At 30 mg/l, the discharge automatically shuts down and sends the effluent to holding tanks. A discharge is held until the problem is fixed and the TSS levels are normal. During the inspection, TSS trends were looked at. TSS levels have been high, and the automatic shut down has occurred. Often the pressure changes from changing valves is enough to trigger a higher TSS level.

There are three UV banks that are able to run in series for effluent with 14 bulbs each. Only two of the three are needed and typically used at any one time, allowing for cleaning and maintenance. There is one unit's worth of spare bulbs available. The units are cleaned by dosing Metal Bright at automatically about every 110 hours. Hand wiping of the bulbs is done about once a month with checks done weekly.

Sampling:

Samples were taken for Biochemical Oxygen Demand (BOD 5-Day), Total Suspended Solids (TSS), pH, chlorine residual, fecal coliform and ammonia from the effluent of the UV disinfection at the discharge port (photo #21). The samples were put

on ice immediately and were transported to AmTest laboratory in Redmond, Washington that day. Chain of Custody and sampling procedures were followed. All results are in Section F. The result for TSS was 67 mg/l. This result is higher than the results submitted to Ecology for the 2007 season thus far – average results have been about 12 mg/l, with a high of 44 mg/l. Limits for TSS as specified in the MOU are 30 mg/l for a 30-day average, and 45 mg/l for a 7-day average. It is recommended that operations staff look into the possible reasons for the occasional higher TSS results.

Conclusions and Recommendations

The Scanship system appears to be functioning well with the exception of the occasional higher TSS values. It is recommended that operations staff look into the possible reasons for the occasional higher TSS results.

The staff was knowledgeable of the system.

Procedures for discharge appear to be thorough and inclusive of verification.

It is recommended that the SEMS system be updated to include the most recent version of the MOU.

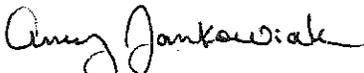
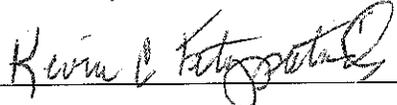
Attachments:

- Photographs
- Sampling Results Report

Copies to:

- Randy Fiebrandt, NCL
- Ernst Bugge, PEARL
- Amy Jankowiak, Ecology
- Kevin Fitzpatrick, Ecology
- Mark Toy, Dept. of Health
- ✓ Central Files: Norwegian Cruise Lines - NORWEGIAN PEARL; WQ 6.1

Section H: Signatures

<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology/Northwest Regional Office/Water Quality Program/Compliance Specialist/(425) 649-7195	9/25/07
<u>Name and Signature of Reviewer</u> Kevin C. Fitzpatrick 	<u>Agency/Office/Telephone</u> Department of Ecology/Northwest Regional Office/Water Quality Section Manager/ (425) 649-7033	<u>Date</u> 9/25/07

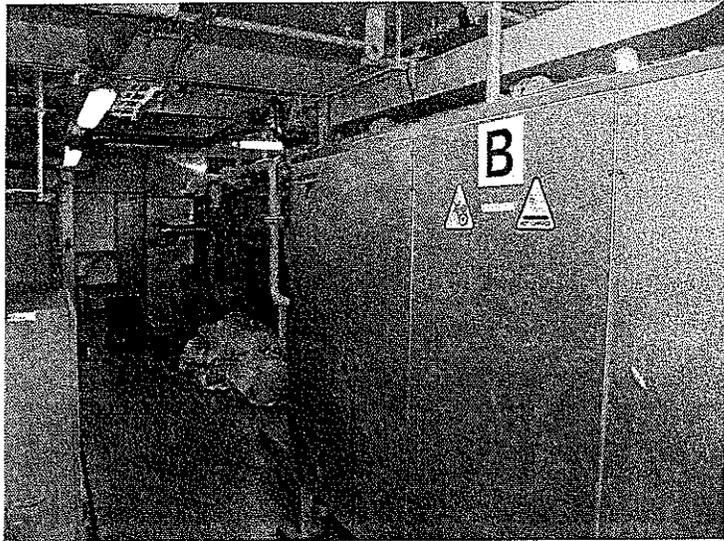


PHOTO #:01 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020014
DESCRIPTION: SLUDGE DRYERS (B – FRONT, A – BACK OF PHOTO)

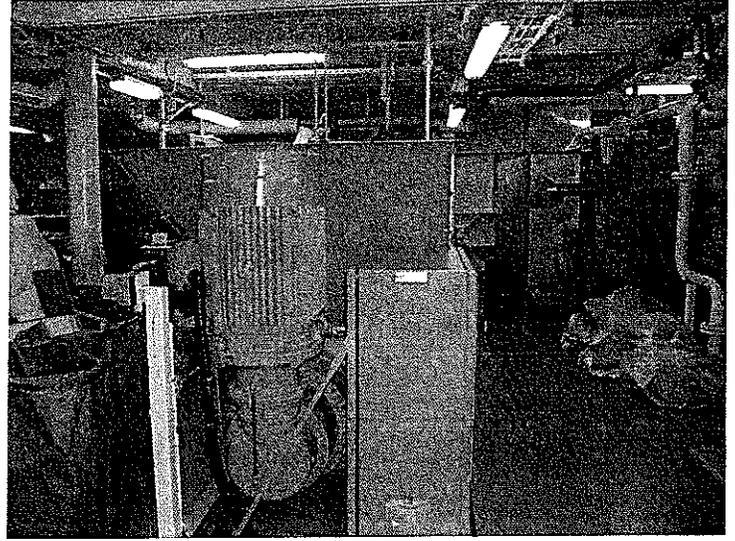


PHOTO #:02 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020015
DESCRIPTION: PAPER SHREDDER

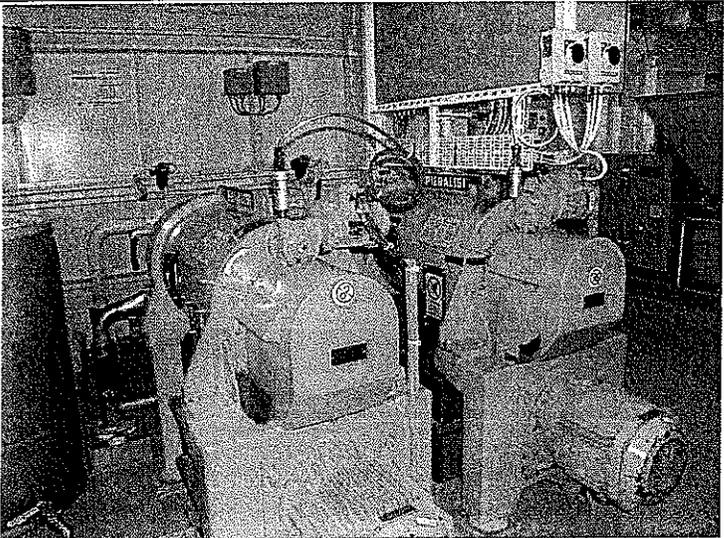


PHOTO #:03 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020018
DESCRIPTION: BIO SLUDGE DECANTERS (CENTRIFUGES)

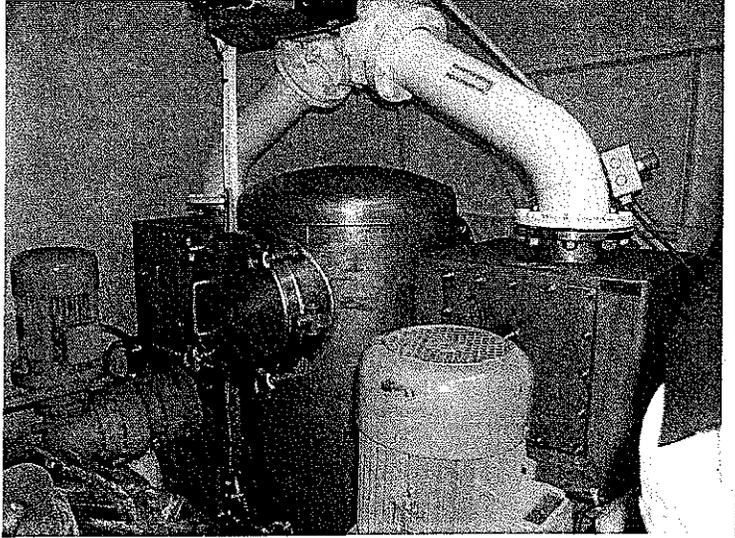


PHOTO #:04 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020019
DESCRIPTION: FOOD WASTE PULPERS

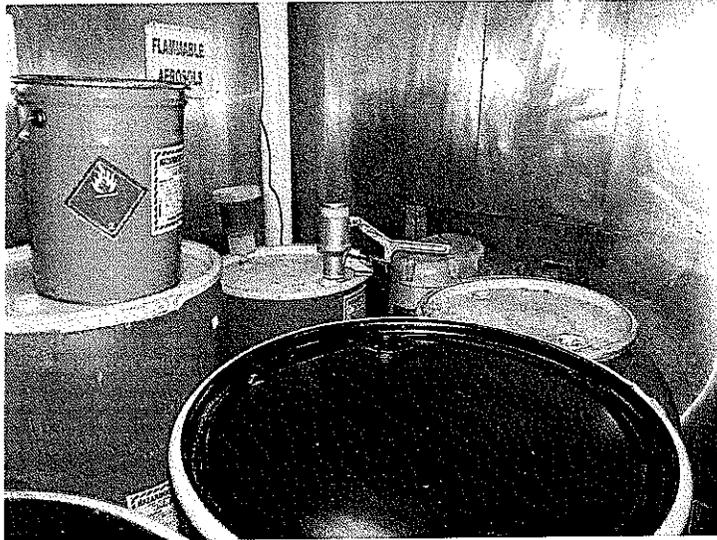


PHOTO #:05 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No : P9020022
DESCRIPTION: HAZARDOUS WASTE STORAGE – AEROSOL
DISPOSAL (BACK OF PHOTO)



PHOTO #:06 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020023
DESCRIPTION: FLUORESCENT BULB CRUSHER – MERCURY
REMOVAL SYSTEM

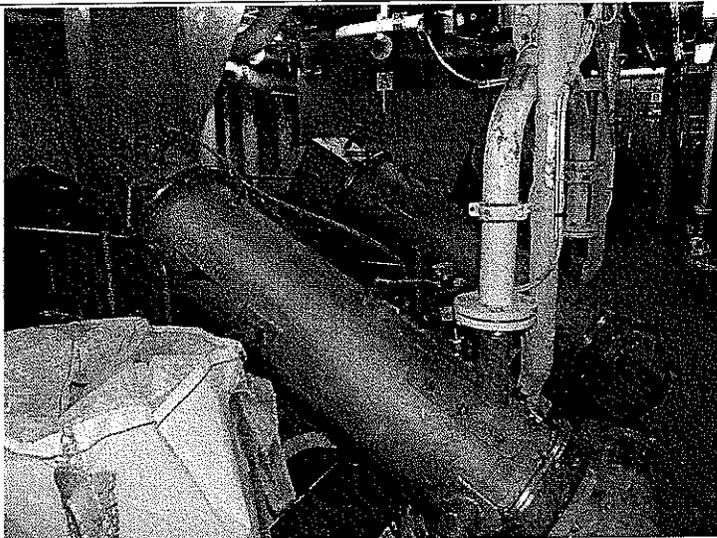


PHOTO #:07 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020024
DESCRIPTION: FOOD WASTE - DEWATERING

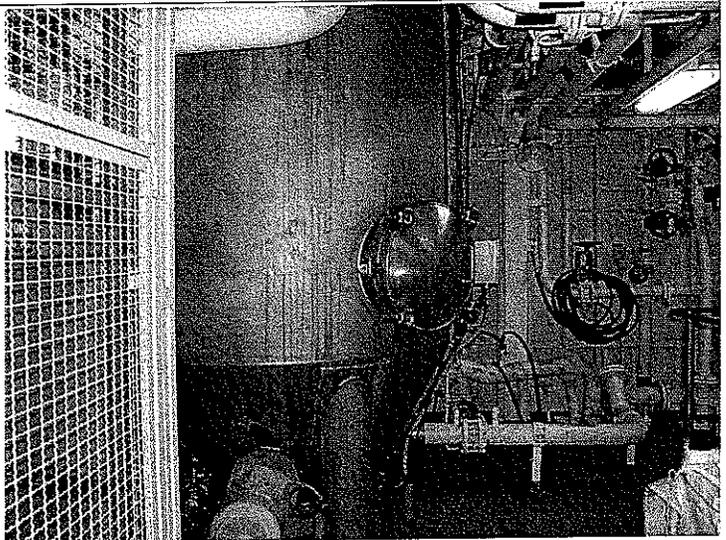


PHOTO #:08 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020025
DESCRIPTION: FOOD WASTE DEWATERING TANK

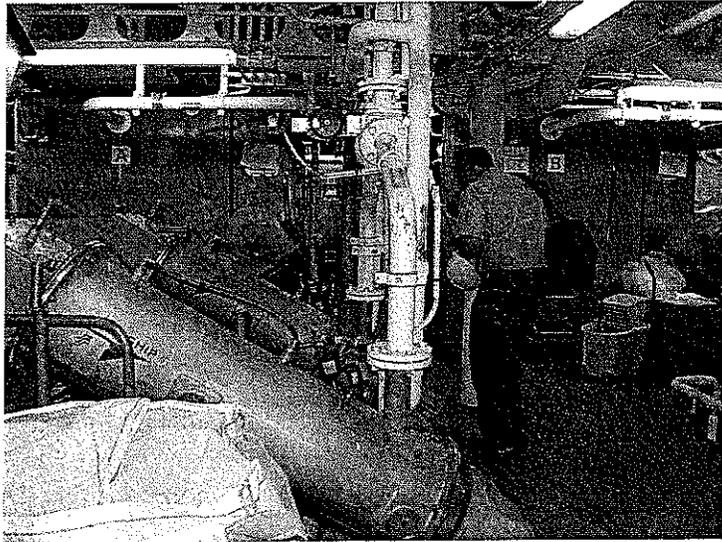


PHOTO #:09 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020027
DESCRIPTION: INCINERATOR SIOLOS

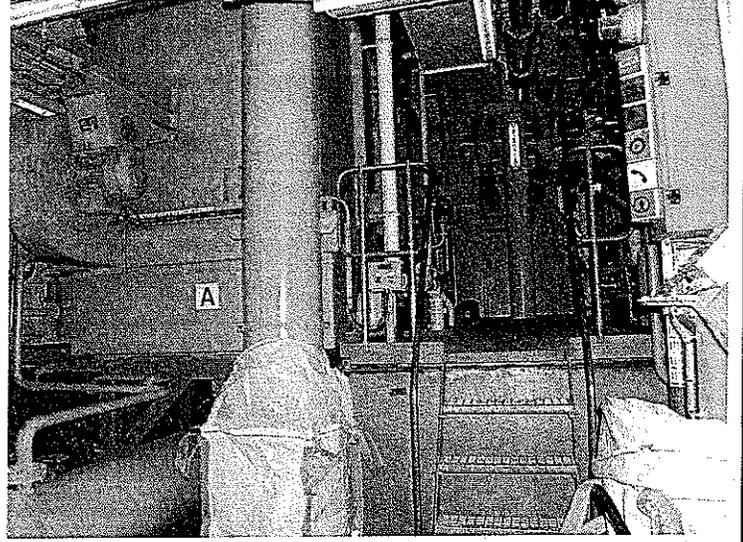


PHOTO #:10 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020030
DESCRIPTION: INCINERATORS

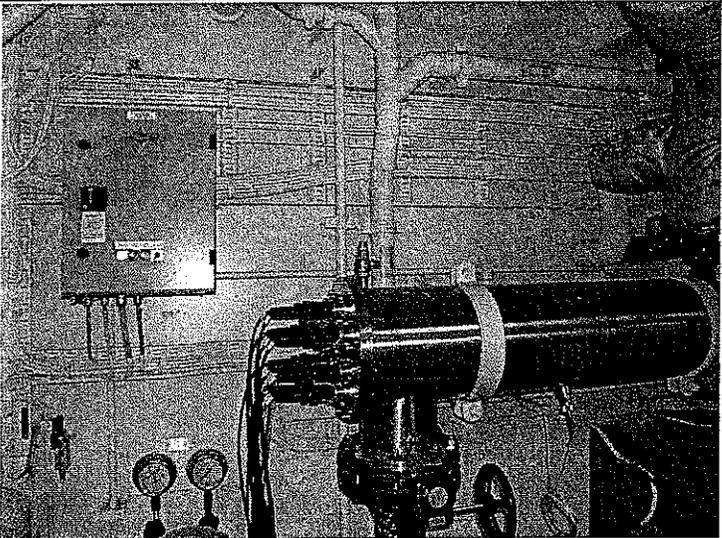


PHOTO #:11 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020031
DESCRIPTION: BALLAST UV DISINFECTION

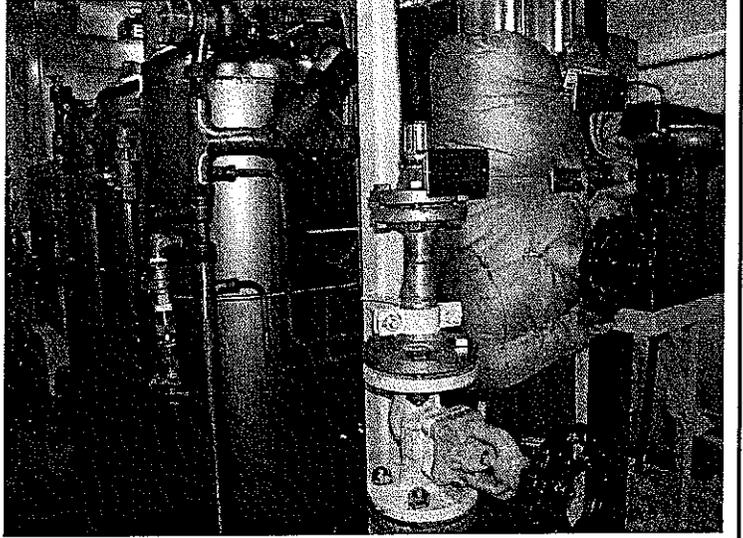


PHOTO #:12 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020032
DESCRIPTION: MARINFLOC OILY BILGE WATER SYSTEM

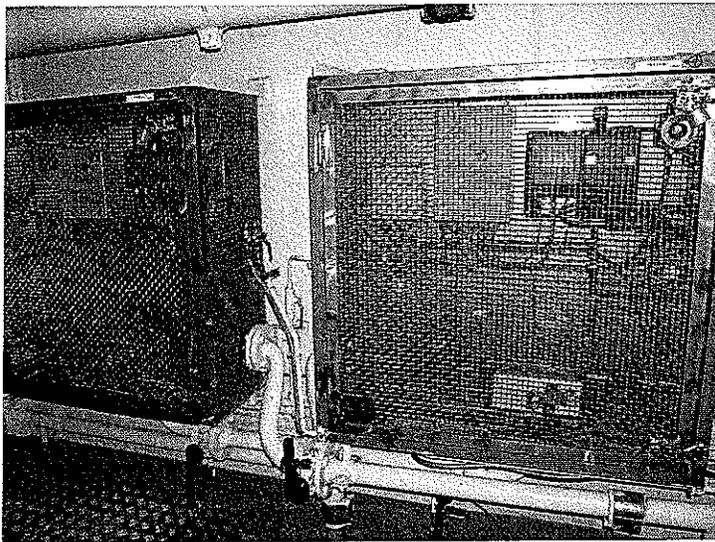


PHOTO #:13 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020033
DESCRIPTION: OILY BILGE WATER SYSTEM WHITE BOXES

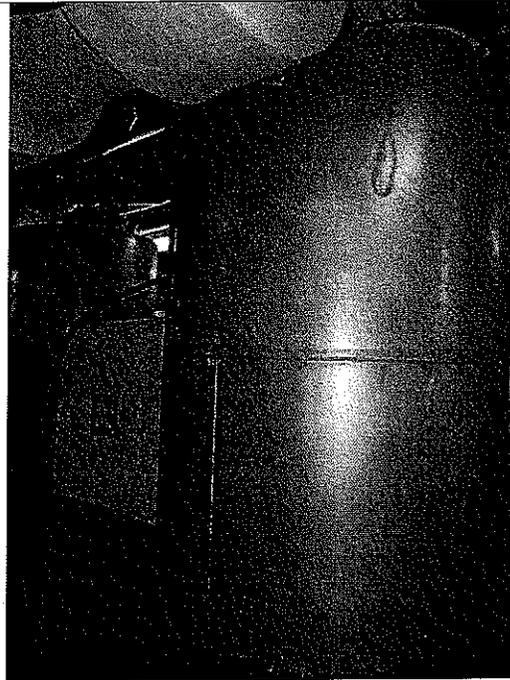


PHOTO #:14 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020034
DESCRIPTION: AWTS: FLOC TANK



PHOTO #:15 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020035
DESCRIPTION: AWTS: BIOREACTOR

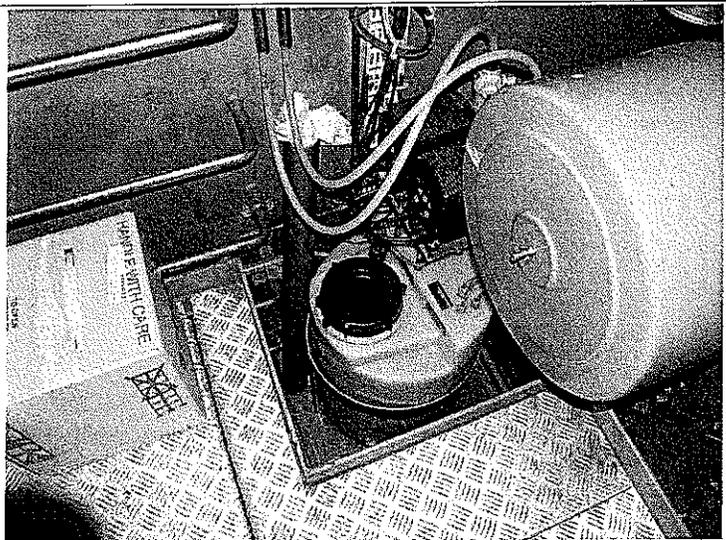


PHOTO #:16 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020037
DESCRIPTION: AWTS: BIOREACTOR DEFOAMER

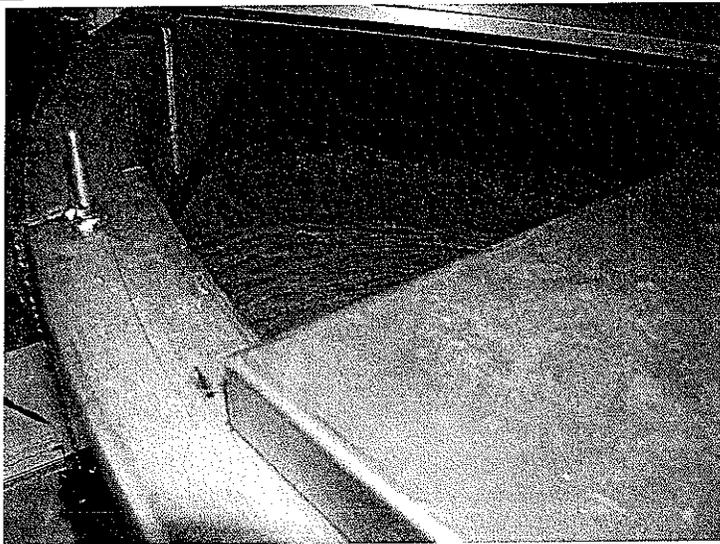


PHOTO #:17 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020038
DESCRIPTION: AWTS: FLOTATION TANK (1 OF 2)

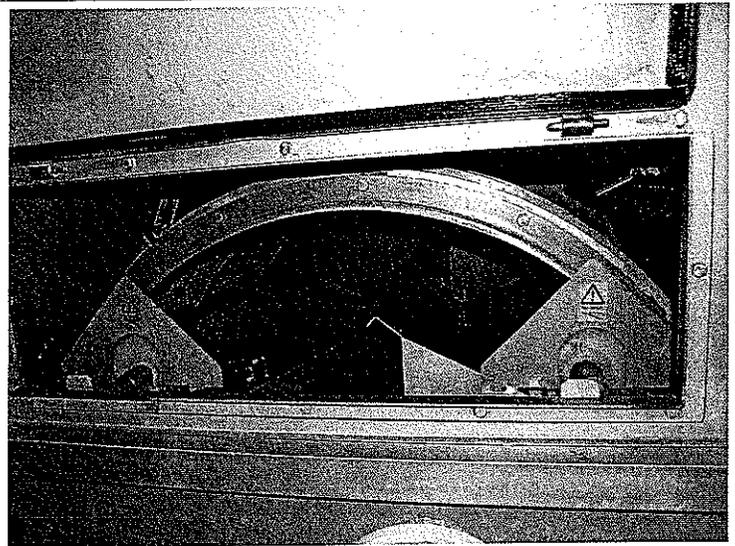


PHOTO #:18 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020040
DESCRIPTION: AWTS: POLISHING FILTER

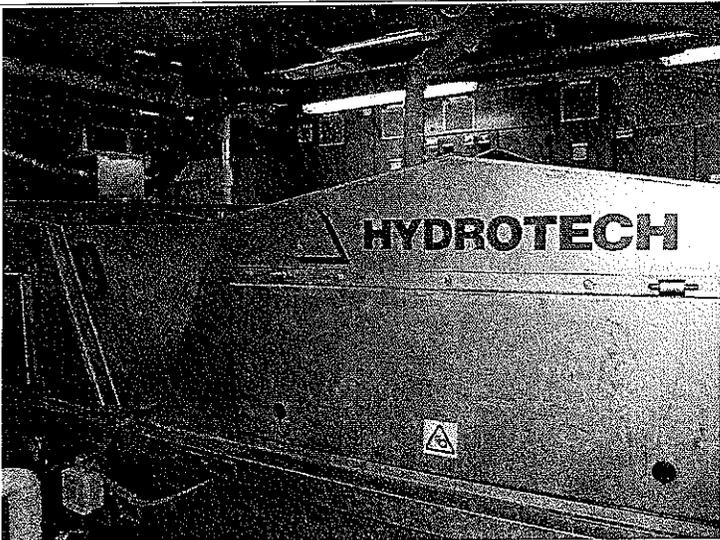


PHOTO #:19 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020041
DESCRIPTION: AWTS: POLISHING FILTER

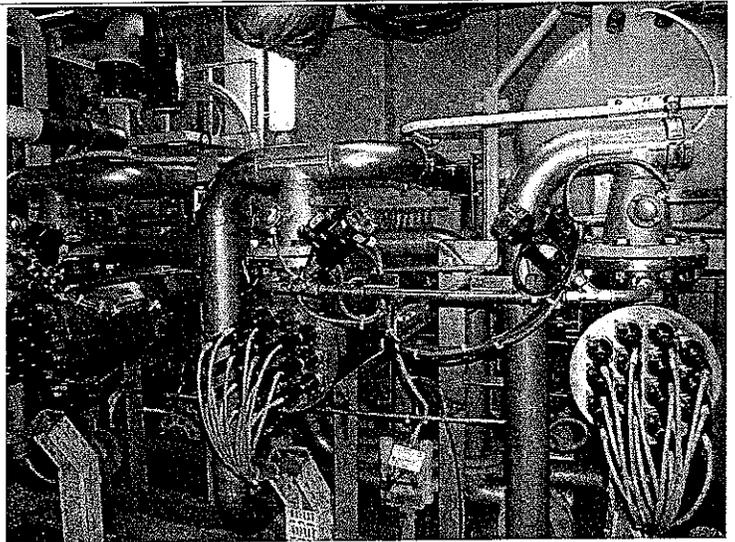


PHOTO #:20 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020042
DESCRIPTION: AWTS: UV DISINFECTION SYSTEM

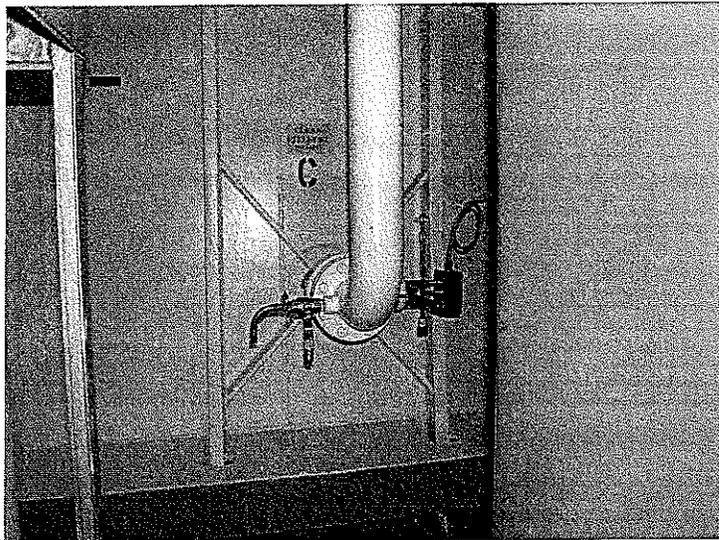


PHOTO #:21 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020046
DESCRIPTION: AWTS: DISCHARGE PORT AND SAMPLING
LOCATION

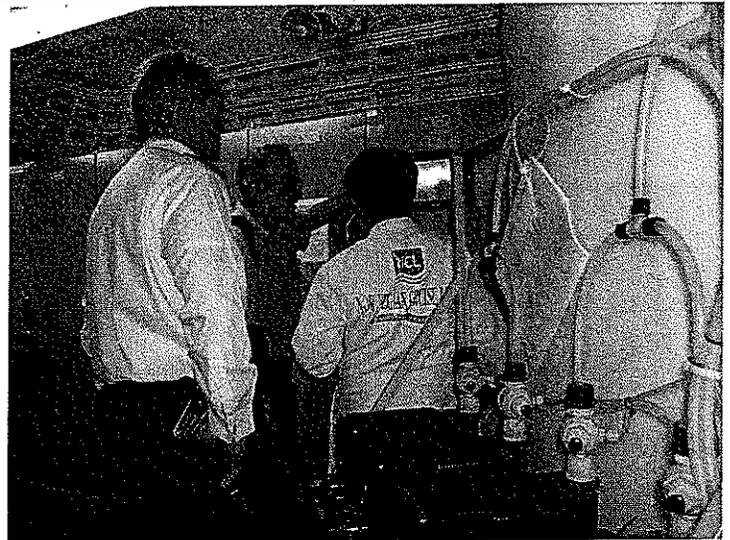


PHOTO #:22 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020047
DESCRIPTION: ERNST BUGGE, DANIEL GAZA, AND MARK TOY
REVIEWING UV ALARMS

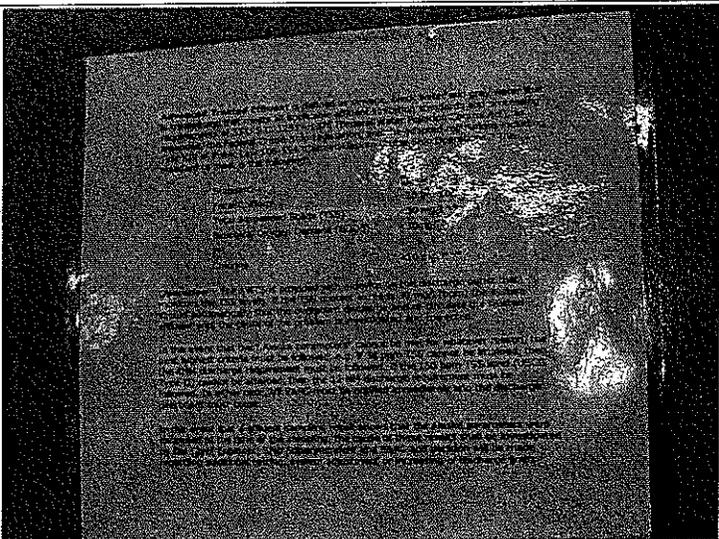


PHOTO #:23 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020048
DESCRIPTION: TSS DISCHARGE PLACARD



PHOTO #:24 DATE: 09/2/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9020049
DESCRIPTION: UV ALARMS PAGE



Am Test Inc.
14603 N E. 87th St.
Redmond, WA 98052
(425) 885-1664

Professional
Analytical
Services

RECEIVED

SEP 18 2007

DEPT OF ECOLOGY

Sep 13 2007
Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008
Attention: Amy Jankowsak

Dear Amy Jankowsak:

Enclosed please find the analytical data for your Norwegian Pearl project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
Pearl-Eff	Water	07-A011175	Micro, CONV, DEM, NUT

Your sample was received on Sunday, September 2, 2007. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis.

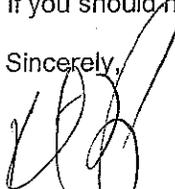
The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,


Kathy Fugiel
President

BACT = Bacteriological
CONV = Conventionals
TC=Total Coliforms

MET = Metals
ORG = Organics

NUT=Nutrients
DEM=Demand

MIN=Minerals
APC=Aerobic Plate Count

Am Test Inc.
14603 N E. 87th St.
Redmond, WA 98052
(425) 885-1664
www.amtestlab.com



Professional
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Services

ANALYSIS REPORT

Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008
Attention: Amy Jankowsak
Project Name: Norwegian Pearl

Date Received: 09/02/07
Date Reported: 9/13/07

AMTEST Identification Number 07-A011175
Client Identification Pearl-Eff
Sampling Date 09/02/07, 11:22
All results reported on an as received basis.

Microbiological

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fecal Coliforms	< 1	CFU/100 ml		1.	SM 9222D	KF	09/02/07 12:00

Conventionals

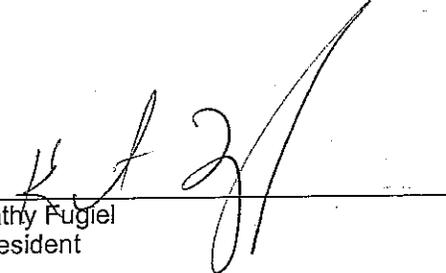
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	7.20	unit			EPA 150.1	KF	09/02/07
Chlorine Residual	< 0.1	mg/l		0.10	EPA 330.5	KF	09/02/07
Total Suspended Solids	67.	mg/l		1.0	EPA 160.2	JR	09/11/07

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
BOD	< 10	mg/l		10.	SM 5210	MRW	09/02/07

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia Nitrogen	0.088	mg/l		0.005	EPA 350.1	TS	09/07/07


Kathy Fugiel
President

AMTEST

LABORATORIES

QC Summary for sample number: 07-A011175

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUPLICATE VALUE	RPD
07-A011175	Chlorine Residual	mg/l	< 0.1	< 0.1	
07-A010975	Ammonia Nitrogen	mg/l	6.6	7.6	14.
07-A011077	Ammonia Nitrogen	mg/l	0.052	0.053	1.9
07-A011241	Ammonia Nitrogen	mg/l	0.047	0.046	2.2
07-A011344	Ammonia Nitrogen	mg/l	0.066	0.076	14.
07-A011268	Total Suspended Solids	mg/l	530	530	0.00
07-A011415	Total Suspended Solids	mg/l	< 1	< 1	
07-A011415	Total Suspended Solids	mg/l	< 1	< 1	
07-A011416	Total Suspended Solids	mg/l	3.0	3.0	0.00

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
07-A011076	Ammonia Nitrogen	mg/l	40.	52.	12.	100.00 %
07-A011189	Ammonia Nitrogen	mg/l	0.096	0.32	0.25	89.60 %
07-A011343	Ammonia Nitrogen	mg/l	35.	41.	5.0	120.00 %
07-A011401	Ammonia Nitrogen	mg/l	0.14	0.34	0.25	80.00 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
pH	unit	7.40	7.42	100. %
BOD	mg/l	200	230	115. %
Chlorine Residual	mg/l	0.50	0.49	98.0 %
Ammonia Nitrogen	mg/l	13	11.	84.6 %
Ammonia Nitrogen	mg/l	18	17.	94.4 %
Ammonia Nitrogen	mg/l	14.	15.	107. %
Total Suspended Solids	mg/l	100	93.	93.0 %
Total Suspended Solids	mg/l	100	90.	90.0 %
Total Suspended Solids	mg/l	100	90.	90.0 %

BLANKS

ANALYTE	UNITS	RESULT
BOD	mg/l	< 10
Chlorine Residual	mg/l	< 0.1
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Total Suspended Solids	mg/l	< 1
Total Suspended Solids	mg/l	< 1
Total Suspended Solids	mg/l	< 1



QC Summary for sample numbers: 07-A011204 to 07-A011209

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUPLICATE VALUE	RPD
07-A011204	Chloride	ug/g	120	91.	27.
07-A011260	Chloride	ug/g	< 10	< 10	
07-A011447	Chloride	ug/g	57.	47.	19.
07-A011204	Fluoride	ug/g	1400	1500	6.9
07-A011259	Sulfur	ug/g	25.2	27.9	10.

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
07-A011259	Chloride	ug/g	< 10	110	120	91.67 %
07-A011209	Fluoride	ug/g	180	1200	1000	102.00 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Chloride	ug/g	43.	39.	90.7 %
Chloride	ug/g	130	130	100. %
Chloride	ug/g	43.	40.	93.0 %
Fluoride	ug/g	100	89.	89.0 %
Sulfur	ug/g	1500	1270	84.7 %
Sulfur	ug/g	1500	1380	92.0 %

BLANKS

ANALYTE	UNITS	RESULT
Chloride	ug/g	< 10
Chloride	ug/g	< 10
Chloride	ug/g	< 10
Fluoride	ug/g	< 25
Sulfur	ug/g	4.00

Client Name & Address: Department of Ecology 3190 160th Ave SE Bellevue, WA 98008	Invoice To: Amy Jankowiak Department of Ecology 3190 160th Ave SE Bellevue WA 98008
Contact Person: Amy Jankowiak	Invoice Contact: Amy Jankowiak
Phone No: 425-649-7195	PO Number:
Fax No: 425-649-7098	Invoice Ph/Fax: 425-649-7195 / 7098
E-mail: ajan461@ecy.wa.gov	Invoice E-mail: ajan461@ecy.wa.gov
Report Delivery: (Choose all that apply) <input checked="" type="checkbox"/> Mail / <input type="checkbox"/> Fax / <input checked="" type="checkbox"/> Email / <input type="checkbox"/> Posted Online	Data posted to online account: YES / NO
Special Instructions:	Web Login ID:

Requested TAT: (Rush must be pre-approved by lab)
 Standard RUSH (5 Day / 3 Day / 48 HR / 24 HR)

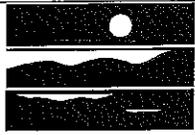
RUSH Request Approved By: _____

Project Name: NORWEGIAN PEARL		Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested								
AmTest ID	Client ID (35 characters max)					BOD (5-Day)	TSS	fecal coliform	pH	residual chlorine	ammonia			
11125	PEARL-EFF	9-2-07	11:22 W		4	1	1	1	1	1				

Collected/Relinquished By: <i>Amy Jankowiak</i>	Date 9-2-07	Time 12:34pm	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By: <i>Kat Jyl</i>	Date 9/2/07	Time 12:30

COMMENTS:





State of Washington Department of Ecology
**Verification of Operating Conditions
of Advanced Wastewater Treatment
Systems for Cruise Ship Discharges**

Northwest Regional Office
3190 160th Ave SE
Bellevue, WA 98008
Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	VISION OF THE SEAS	Date:	September 7, 2007
Vessel Operator:	Royal Caribbean Cruises Ltd.	Entry Time:	9:05 AM
IMO Number:	9116876	Exit Time:	11:00 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Rich Pruitt; 9/4/07
Location:	Terminal 66, Seattle		
On-board contact(s):	James Calhoun, Environmental Officer; Zeljko Radovic, Second Engineer		
Inspector(s):	Amy Jankowiak, Department of Ecology – Northwest Regional Office, Water Quality Program; Mike Dawda, Department of Ecology – Northwest Regional Office, Water Quality Program		
# passengers/crew:	~2500/~760	Amount of Wastewater:	---

Description of wastewater treatment system (name, type, major components, etc.):
Hydroxyl blackwater treatment system. The hydroxyl system is a bioreactor systems with pre-screening, positive flotation, oxidation, ozone, and UV disinfection. Untreated graywater and treated blackwater is held and discharged at greater than 12 nm and outside MOU waters. The vessel is not approved for discharge in Washington MOU waters.

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input type="checkbox"/>	Operations Center/Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	Not Applicable

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Not Applicable
<input type="checkbox"/>	Operations as described in submitted documentation	Not Applicable
<input type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Not Applicable
<input type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Not Applicable
	<u>Turbidity or equivalent</u> : Not applicable Last calibration Frequency of readings: Trigger level for alarm: Trigger level for shutdown: Recorded turbidity/equivalent levels above triggers:	
<input type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Not Applicable
<input type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	Not Applicable
<input type="checkbox"/>	UV replacement bulbs available	Not Applicable
<input type="checkbox"/>	UV/bulbs cleaned regularly	Not Applicable

Section E: General

<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	Not Applicable
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	Not Applicable
<input checked="" type="checkbox"/>	Training up to date for system operators	Not Applicable
<input checked="" type="checkbox"/>	Discharge records maintained	Not Applicable
<input checked="" type="checkbox"/>	Alarms functioning properly	Not Applicable
	<u>Alarms</u> Shutdowns: not applicable High turbidity/TSS warnings: High wastewater levels: UV disinfection (intensity, bulbs, bank out, power failure):	

Section F: Sample Results

Parameter	Effluent Result
Biochemical Oxygen Demand 5-Day (BOD)	Not Applicable
Total Suspended Solids (TSS)	Not Applicable
Fecal Coliform, MF	Not Applicable
Residual Chlorine)	Not Applicable
Ammonia, Nitrogen	Not Applicable
pH	Not Applicable

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, and Mike Dawda, Ecology Northwest Regional Office, Water Quality Program, conducted the inspection of the Royal Caribbean Cruise Line, VISION OF THE SEAS on September 7, 2007. The main contacts on board the VISION OF THE SEAS included James Calhoun, Environmental Officer, and Zeljko Radovic, Second Engineer. Prior notification of the visit was given on September 4, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State* (MOU), as amended. The VISION OF THE SEAS has not requested and is not approved for discharge in Washington State. The vessel is not planned to return to the Seattle-Alaska route next season.

Inspection

We arrived and boarded the ship at 9:05 am and began with introductions and a plan for the day. We then discussed discharge protocols for various waste streams, the water bunkering and production process, garbage and recycling, and the black water Hydroxyl system. Discharge records were reviewed for black water and gray water discharges and showed no discharges in Washington waters for the period reviewed from September 1, 2006 (date of last inspection) to present. We then headed down to the Hydroxyl system to tour the system. Next, we took a look at the water production system, and then the garbage/recycling areas. We concluded the visit and disembarked the vessel at about 11:00 am.

Discharge Protocols:

The VISION OF THE SEAS has not requested, and is not approved to discharge in waters subject to the MOU. The vessel collects and holds all graywater, then discharges at greater than 12 nautical miles and outside of the waters subject to the MOU (including staying outside of the Olympic Coast National Marine Sanctuary). Blackwater is collected and treated through the Hydroxyl system prior to going to holding tanks and then discharges at greater than 12 nautical miles and outside of the waters subject to the MOU. Oily bilge water is treated (oil water separators) and is disinfected with UV prior to being discharged at less than fifteen parts per million. Sludge from the blackwater system is either incinerated or landed ashore for treatment and land application (trucked by Emerald Services to King County Metro system). Air conditioning condensate is collected and sent for use in the laundry. Laundry wastewater is sent to the graywater holding tank. Salt and descaling (Ameroyal – potassium hydroxide (photo #12), is added to prevent scaling on the evaporators (photo #11) at a rate of about 38 meters/1,567 cubic meters) from the water production process is discharged overboard. Pool (salt water) and Jacuzzi (bromine) water is discharged overboard outside of MOU waters. X-ray and photo waste is sent through a silver recovery unit, then collected and landed ashore at <5ppm. Medical waste is collected in its own tank and then sent with the galley wastewater to the graywater tank. Medical sharps are collected and landed ashore along with all other hazardous waste. Medical staff and cleaning staff are trained on proper disposal requirements. Expired medications are logged and incinerated at > 12 nautical miles. Dry garbage and food-contaminated cardboard are incinerated. Plastics, aluminum, tin (photo #13), steel, copper, brass, wood, and office paper are all recycled. Plastic drums are cleaned, de-labeled, and

recycled (photo #14). Fluorescent bulbs are collected and crushed in a mercury removal system (photo #15) and sent ashore. Grease is collected and sent ashore (photo #16). Some cooking oil is recycled ashore. For all discharges, the bridge notifies the control room when coming to an area where discharge is approved and when nearing an area where discharge is not approved. The bridge enters the time, location, and speed of discharges. All overboard ports are padlocked or sealed. The locks and seals are checked once a week and randomly. The keys to the padlock are kept in the control room under the direction of the engineer on duty.

Blackwater System:

Toilet discharges are sent by vacuum system to the collection tank (photo #02). From the tank, the flow is strained by suction through a ¼ inch screen (photo #01). Solids screened out are collected and sent to the incinerator or to the sludge tank (photo #07). Liquid flow is sent to PFM Tank #1 (photo #03), a positive flotation mechanism. Flocculant/polymer is added (photo #05) at this stage to help bring the solids up. Sludge from the BFM is sent to the sludge tank for landing ashore. Liquid flow from PFM Tank #1 moves to the 1st Bioreactor (photo #06) for biological treatment, from there it goes to the 2nd Bioreactor for further treatment. Flow then moves to PFM Tank #2 (photo #04) where more polymer is added. Liquid flow then goes to the oxidation tank (photo #09) for ozone treatment. Effluent from the oxidation tank is disinfected with an ultraviolet disinfection (photo #10) unit and then sent to storage tanks. If the ballast tanks are used for wastewater storage, they are flushed three times before they are considered ballast tanks again. The tanks can hold wastewater for at least two days.

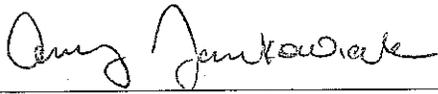
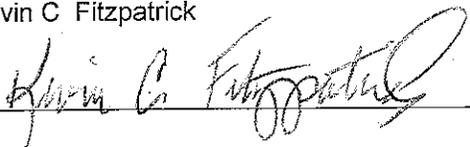
Samples were not taken, as the vessel does not discharge in MOU waters. Discharge records were reviewed and of the dates looked at (September 1, 2006 to present), no discharges occurred on the dates the vessel was in Washington waters.

Conclusions and Recommendations

Mr. Calhoun, Environmental Officer, and Mr. Radovic, Second Engineer (wastewater system operator) were all very knowledgeable of the wastewater system and other environmental systems and protocols.

Attachments:
Photographs

Copies to:
Rich Pruitt, RCCL
James Chapman, EO
Amy Jankowiak, Ecology
Kevin Fitzpatrick, Ecology
Mark Toy, Dept. of Health
Central Files: Royal Caribbean Cruise Line – VISION OF THE SEAS; WQ 6.1

Section H: Signatures		
<u>Name and Signature of Inspector</u> Amy Jankowiak 	<u>Agency/Office/Telephone</u> Department of Ecology/Northwest Regional Office/Water Quality Program/Municipal Compliance Specialist/(425) 649-7195	<u>Date</u> 10/23/07
<u>Name and Signature of Reviewer</u> Kevin C Fitzpatrick 	<u>Agency/Office/Telephone</u> Department of Ecology/Northwest Regional Office/Water Quality Section Manager/(425) 649-7033	<u>Date</u> 10/23/07



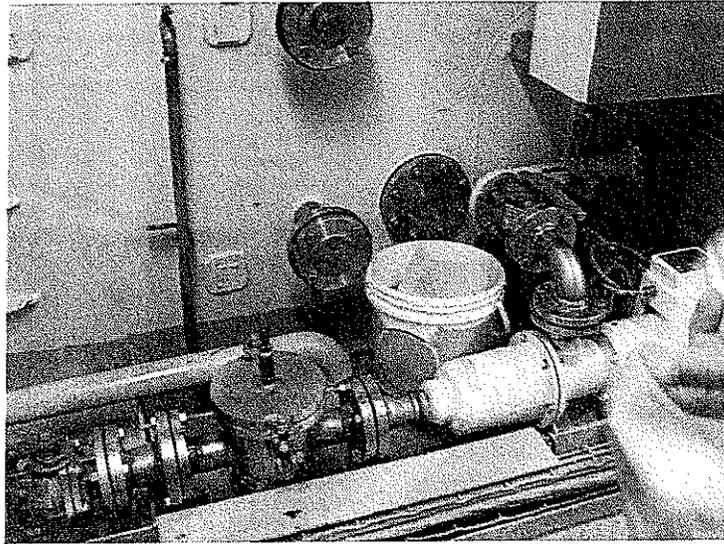


PHOTO #:01 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070021
DESCRIPTION: AWTS: SCREEN (BLACKWATER COLLECTION
TANK IN BACKGROUND)



PHOTO #:02 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070023
DESCRIPTION: AWTS: BLACKWATER COLLECTION TANK
VIEWPOINT

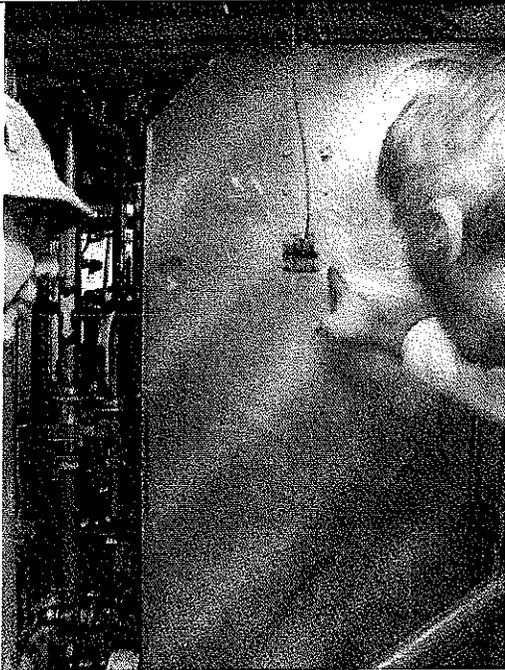


PHOTO #:03 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070022
DESCRIPTION: AWTS: PFM TANK 1(FIRST IN SERIES)

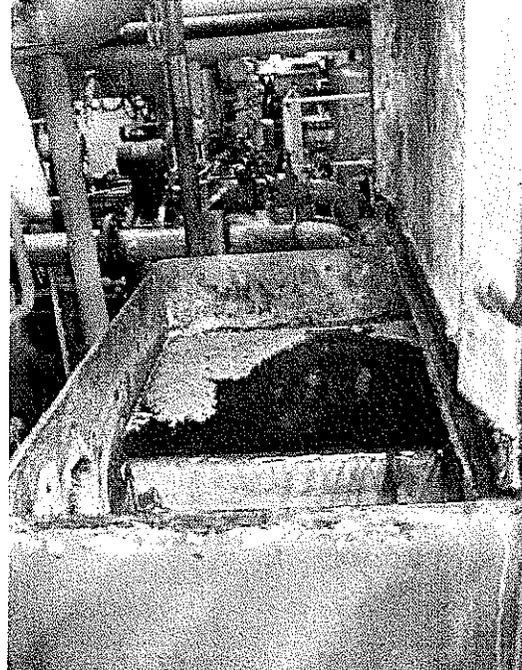


PHOTO #:04 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070024
DESCRIPTION: AWTS: INSIDE OF PFM TANK 2 (EFFLUENT)

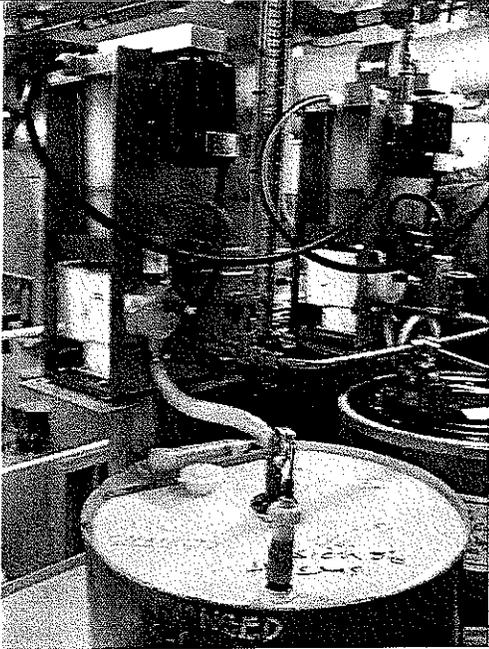


PHOTO #:05 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070025
DESCRIPTION: AWTS: POLYMER SYSTEM FOR PFM TANKS



PHOTO #:06 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070026
DESCRIPTION: AWTS: BIOREACTOR TANK (1 OF 2)

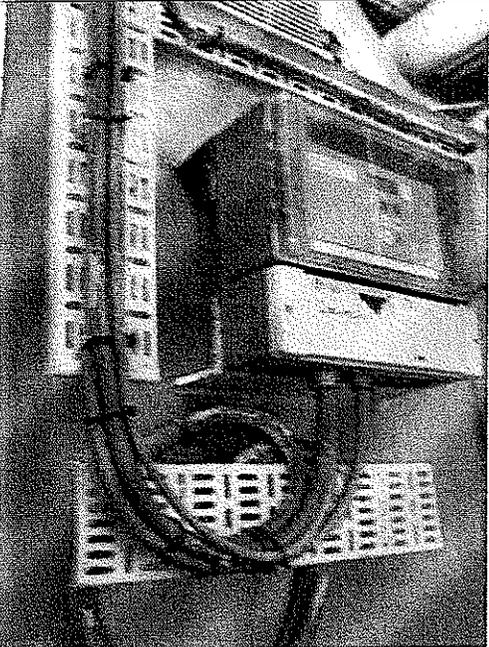


PHOTO #:07 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070027
DESCRIPTION: AWTS: BLACKWATER SLUDGE TANK

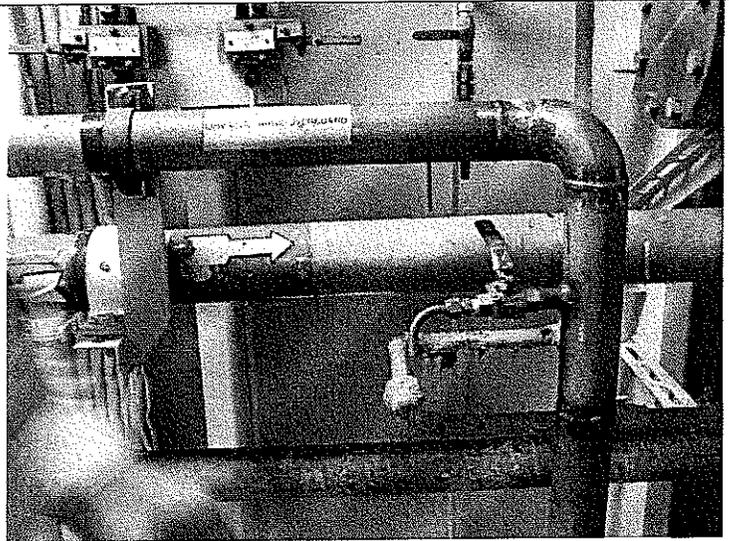


PHOTO #:08 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070028
DESCRIPTION: AWTS: OVERBOARD DISCHARGE SAMPLE PORT

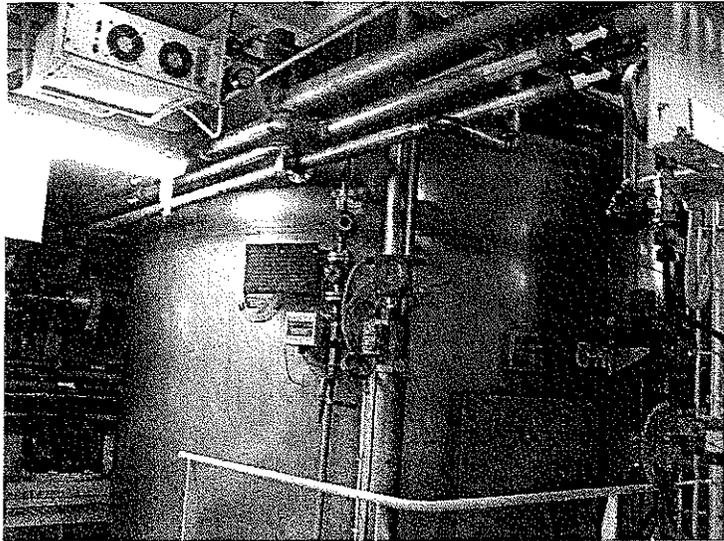


PHOTO #:09 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No :P9070029
DESCRIPTION: AWTS: OXIDATION TANK

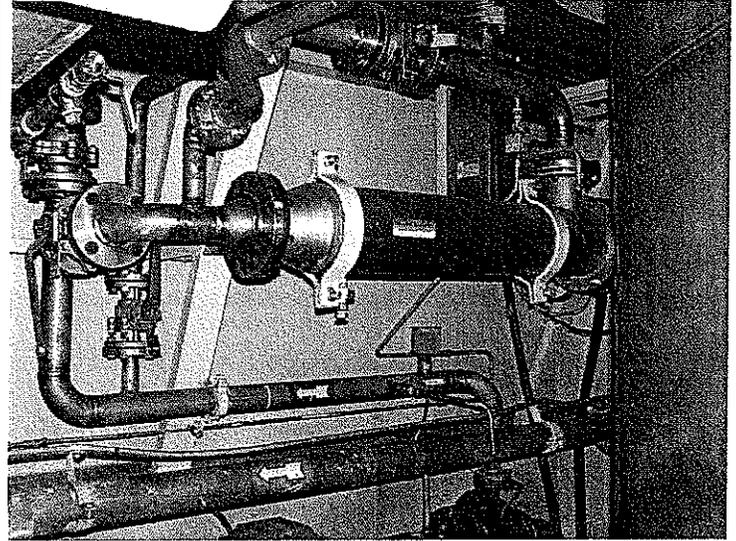


PHOTO #:10 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No :P9070031
DESCRIPTION: AWTS: ULTRAVIOLET DISINFECTION SYSTEM

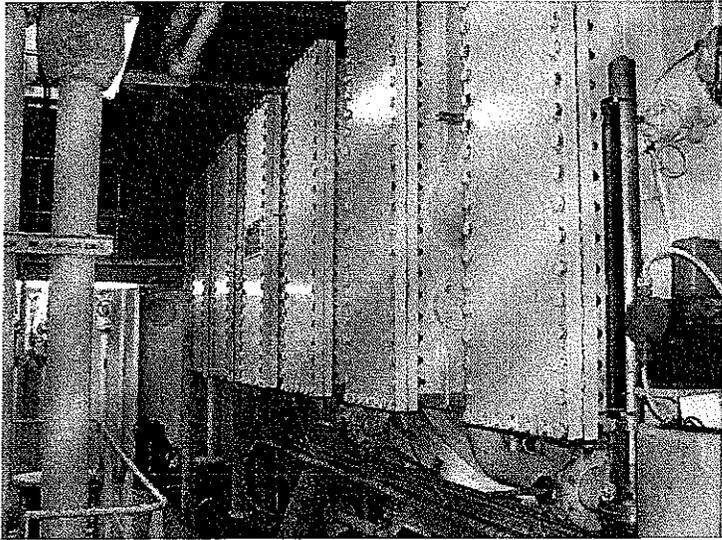


PHOTO #:11 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No :P9070033
DESCRIPTION: WATER PRODUCTION EVAPORATOR (1 OF 2)

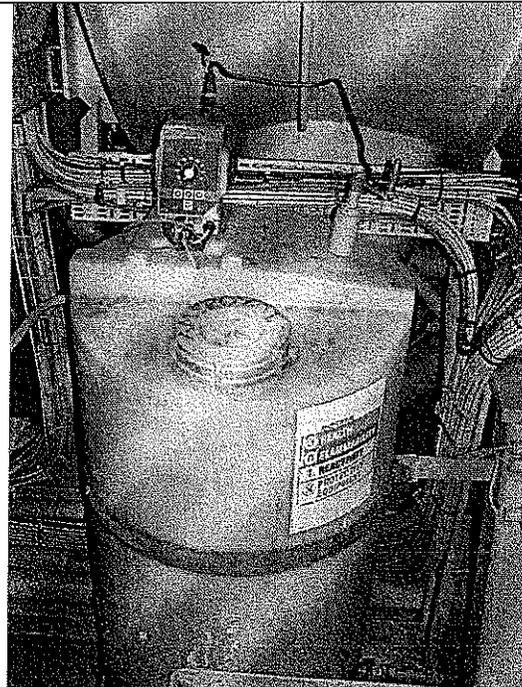


PHOTO #:12 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No :P9070034
DESCRIPTION: WATER PRODUCTION DESCALING CHEMICAL
ADDITION POINT



PHOTO #:13 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070036
DESCRIPTION: GARBAGE ROOM – TIN AND ALUMINUM
RECYCLING



PHOTO #:14 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070041
DESCRIPTION: PLASTIC DRUM RECYCLING



PHOTO #:15 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070042
DESCRIPTION: FLUORESCENT BULB CRUSHING AND MERCURY
REMOVAL SYSTEM

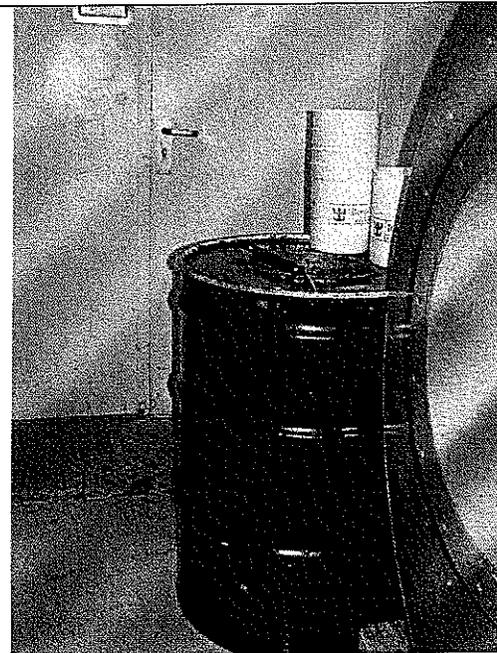
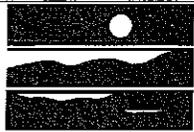


PHOTO #:16 DATE: 09/7/07 TAKEN BY: AMY JANKOWIAK
FILE No.:P9070043
DESCRIPTION: GREASE COLLECTION DRUM



State of Washington Department of Ecology
**Verification of Operating Conditions
 of Advanced Wastewater Treatment
 Systems for Cruise Ship Discharges**

Northwest Regional Office
 3190 160th Ave SE
 Bellevue, WA 98008
 Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	NOORDAM	Date:	September 23, 2007
Vessel Operator:	Holland America Line	Entry Time:	9:15 AM
IMO Number:	9230115	Exit Time:	11:50 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Tina Stoltz; September 17, 2007
Location:	Terminal 30, Seattle		
On-board contact(s):	Tim Capel; Environmental Officer, Verhulst Dirk Johannes, Advanced Wastewater Treatment System Operator/4 th Engineer, and John Turvey, Holland America Line (HAL)		
Inspector(s):	Amy Jankowiak, Department of Ecology – Northwest Regional Office, Water Quality Program, Karen Burgess, Department of Ecology – Northwest Regional Office, Water Quality Program		
# passengers/crew:	~1900/~800	Amount of Wastewater:	---

Description of advanced wastewater treatment system (name, type, major components, etc.):
 Rochem Advanced Waste Water Purification System The Rochem graywater system includes prefiltration, reverse osmosis and UV disinfection. The Rochem blackwater system includes prefiltration, biological treatment via bioreactors, ultrafiltration, and UV disinfection. Approval for discharge at greater than one nautical mile away from port and at greater than six knots from Ecology was granted on August 13, 2007.

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input checked="" type="checkbox"/>	Operations Center/ Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input checked="" type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other

Section C: For vessels discharging ≥ 1nm from berth and ≥ 6 knots only

<input checked="" type="checkbox"/>	Schematics match black/gray wastewater system	Systems appear to match schematics.
<input checked="" type="checkbox"/>	Sludge disposal protocol per MOU	Discharges protocols per MOU
<input checked="" type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	A copy of the current MOU (Amendment No 3) was available from the Environmental Officer, as well as being on the bridge.

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Not Applicable
<input type="checkbox"/>	Operations as described in submitted documentation	Not Applicable
<input type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Not Applicable
<input type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Not Applicable
	<u>Turbidity or equivalent</u> : Not applicable Last calibration Frequency of readings: Trigger level for alarm: Trigger level for shutdown: Recorded turbidity/equivalent levels above triggers:	
<input type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Not Applicable
<input type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	Not Applicable
<input type="checkbox"/>	UV replacement bulbs available	Not Applicable
<input type="checkbox"/>	UV/bulbs cleaned regularly	Not Applicable

Section E: General

<input checked="" type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	Sampling to date conducted as required
<input checked="" type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	Not yet required In first season of approval
<input checked="" type="checkbox"/>	Training up to date for system operators	Not discussed
<input checked="" type="checkbox"/>	Discharge records maintained	Records maintained properly All discharges in 2007 to date in line with MOU requirements.
<input checked="" type="checkbox"/>	Alarms functioning properly	Alarms appear to be functioning properly.
	<u>Alarms</u> Shutdowns: not applicable High turbidity/TSS warnings: High wastewater levels: UV disinfection (intensity, bulbs, bank out, power failure):	

Section F: Sample Results

Parameter	Effluent Result
Biochemical Oxygen Demand 5-Day (BOD)	10 mg/l
Total Suspended Solids (TSS)	7.0 mg/l
Fecal Coliform, MF	<1 CFU/100 ml
Residual Chlorine	0.11 mg/l
Ammonia, Nitrogen	38 mg/l
pH	7.70 standard units (Field result = 7.2 standard units)

Section G: Summary of Findings/Comments

Introduction

Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, and Karen Burgess, Ecology Northwest Regional Office, Water Quality Program, conducted the inspection of the Holland America Line NOORDAM (photo #01) on September 23, 2007. The main contacts on board the NOORDAM included Tim Capel, Environmental Officer, Verhulst Dirk Johannes, Advanced Wastewater Treatment System Operator/4th Engineer, and John Turvey, Holland America Line (HAL). Prior notification of the visit was given on September 17, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the *Memorandum of Understanding Cruise Operations in Washington State* (MOU), as amended. The NOORDAM was approved for discharge of treated black and gray water at greater than one nautical mile from shore and at greater than six knots into MOU waters on August 13, 2007.

The HOLLAND NOORDAM was built about 18 months ago, and is 935 feet long. There are typically about 1900 passengers and about 800 crew. The vessel is powered with on-shore power during port calls in Seattle.

Inspection

We arrived and boarded the ship at about 9:15 am and began with introductions and a plan for the day. We then discussed various waste streams, and the operation of food waste, pool/spa water, water bunkering and production, photo waste, garbage and recycling, oily bilge water and medical wastes. We discussed protocols for discharges. Discharge records were reviewed for black water and gray water discharges, ballast, and oily water discharges. We then headed to the bridge to review discharge procedures and to verify locations of certain discharges (all in Canadian waters). We then looked at the garbage/recycling area (photo #02). We discussed and viewed the black and gray water treatment systems. Samples were taken of the combined black and gray water effluent prior to disembarking vessel at about 11:50 am.

Discharge Types and Protocols:

All discharges to water, with the exception of treated gray and black water and pool/spa water, occur at greater than 12 nautical miles and outside of MOU waters. Black water and Gray water treated by the vessel's advanced wastewater treatment systems (AWTS) can be discharged at greater than one nautical mile from shore and at greater than six knots. No discharges occur in the Olympic Coast National Marine Sanctuary. Pool and spa water uses bromine and is discharged outside of port, while underway.

Food waste is collected from the galley and is sent to a Scanship system for drying (photo #03) and is then incinerated. Grease is collected separately and is incinerated. Used cooking oil is collected and off-loaded in Seattle for recycling about once every five weeks for biodiesel use. Cardboard is collected and off-loaded for recycling/credit. Aerosol cans are de-

pressurized (photo #04) and sent on-shore. Fluorescent light bulbs are crushed on-board with a mercury vapor removal system (photo #06). All materials separated and collected for recycling and the solid waste is off-loaded on-shore. There has been a huge effort to minimize the garbage and hazardous waste materials to be off-loaded. Volumes have gone down since last year. Silver is captured from the photo waste, collected and off-loaded in Victoria. Hazardous waste (photo #07) and medical sharps are off-loaded in Victoria, Canada only. Paper, grease, and some of the solids from the blackwater and graywater treatment systems are incinerated. Expired medications are collected and sent back to the company. The sinks from the medical facility drain to the blackwater system. Laundry water is sent to a holding tank and then discharged outside of MOU waters. The laundry is not sent to the AWTS as the detergents can cause problems for the filters. The biomass from the blackwater system is collected and discharged at greater than 12 nautical miles and outside of MOU waters and the Olympic Coast National Marine Sanctuary.

Potable water is currently bunkered periodically in Juneau and Ketchikan, while the rest is produced by desalination. Steam from the boilers heat up the sea water with low pressure evaporation. The condensate is then chlorinated and adjusted for pH prior to distribution. Salt from the evaporators is sent back to the sea. Scaling is treated with acid and is then neutralized prior to discharge at sea.

Oily bilge water is sent to the 50 ppm oily water separator, then to the intermediate tank and then to the 15 ppm oily water separator. If the effluent does not meet 15ppm, it is automatically sent back for further treatment. The effluent that meets 15 ppm is either discharged at greater than 12 nautical miles and outside of MOU waters or is sent to a clean tank and later discharged. All effluent first goes through the white box (photo #23) for monitoring prior to discharge.

Only upon verification of location between the Bridge and the Engine Control Room (ECR), will a discharge occur at greater than 12 nautical miles and outside of MOU waters. Discharges are tentatively scheduled ahead of time by matrix, but locations are always verified prior to discharges. The ECR requests location verification from the bridge prior to a discharge. The bridge has clear information on where discharges are and are not allowed. The latitude and longitude coordinates are recorded in the *Sewage and Graywater Discharge Record Book* and in the deck log. There is an overboard valve monitoring system on the bridge. The system has four lights:

- >12 nm
- > 4, <12 nm
- <4 nm
- Special Areas

The "special areas light" means no discharge. The computer system "Overboard Valve Monitoring" system details where certain discharges can and cannot take place and includes alarms (including a greater than 6 knots alarm). When any overboard valve is open, the location (lat and long) is automatically recorded (open and close). The date, time and location of both the start and the stop of the discharges are recorded, along with port location, effluent type, volumes, and speed. All discharge records that were reviewed appeared to be in compliance with the MOU. A few locations were plotted at the Bridge for verification of location and were shown to be in Canadian waters prior to Washington approval.

The discharge ports have locks. The Chief Engineer and Environmental Officer are in charge of the keys located in the Engine Control Room. There is a 3 watch system (2nd Engineer, 3rd Engineer and an assistant). The engineers are trained in standard and advanced as well as general wastewater. Verhulst Dirk Johannes, 4th Engineer, has been operating the blackwater and graywater advanced wastewater treatment systems for the past two and a half months.

Blackwater System (Rochem UF; ultrafiltration):

Toilet waste, Galley waste, and infirmary drains are sent to the blackwater vacuum collecting units (5 tanks) (photo #14) and then goes to a buffer tank (photo #15) where graywater retentate mixes along with air. A basket filter collects some solids debris from the waste going into the buffer tank which are collected and incinerated. The waste then goes to the SWECO pre-filtration system (photo #16). Solids (photo #17) are vibrated out and sent to the 5S tank for holding and discharge. Liquid from the prefiltration filtrate tank goes to the bioreactors (photo #18). A defoamer is used when cleaning chemicals affect the system. From the bioreactors, flow goes through the membranes for ultrafiltration (UF) (photo #19). Effluent from the membranes is disinfected via an ultraviolet (UV) disinfection system (photos #20 and #21) where turbidity (TSS) is monitored. PH and conductivity are also monitored on the system. From the UV, the flow can either go straight overboard after being combined with the graywater system effluent, or can go to storage tanks.

Graywater System (low pressure reverse osmosis (LP-RO) treatment system):

Shower/sink wastewater goes into the graywater holding tank (18P) and is sent to prefiltration. The SWECO pre-filtration system (photo #07) vibrated out the solids. Flow then goes through the bag filters (photo #08). Solids from the SWECO and the bag filters are collected and incinerated. The flow then goes to the LP-RO units (photos #09 and #10). Any material that does not pass through the RO units goes to the blackwater buffer tank for further treatment. Effluent from the LP-RO system goes to permeate tanks (photo #11) and then onto UV disinfection (separate from the blackwater UV system) (photos #12 and #13). From the UV, the flow can either go straight overboard after being combined with the blackwater system effluent,

or can go to storage tanks. The system is monitored for pH and conductivity, as well as chlorine residual. Chlorine residual comes from the potable water system and is adjusted coming into the graywater system.

Each of the UV systems has eight bulbs. There are about 20 spare bulbs on board. All of the bulbs are also changed out annually (May of 2007). The system has indicator lights showing the operation of each bulb. The UV systems are cleaned about once a month with an alkaline cleaner. There are alarms on the main components of the treatment systems.

Samples were taken for Biochemical Oxygen Demand (BOD 5-Day), Total Suspended Solids (TSS), pH, chlorine residual, fecal coliform and ammonia from the combined effluent (photo #22) after UV disinfection prior to going to the holding tank. The samples were put on ice immediately and were transported to AmTest laboratory in Redmond, Washington that morning. Chain of Custody and sampling procedures were followed. All results are in Section F.

Conclusions and Recommendations

Staff seemed very knowledgeable of the protocols and systems.

Procedures for discharge appear to be thorough and inclusive of verification.

Attachments:

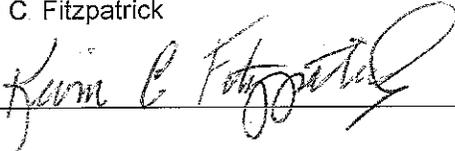
- Photographs
- Laboratory Reports

Copies to:

- William Morani, Jr, HAL
- Bob Diaz, HAL
- John Turvey, HAL
- Tina Stoltz, HAL
- Tim Capel, Environmental Officer
- Amy Jankowiak, Ecology
- Mark Toy, Health
- Kevin Fitzpatrick, Ecology
- Karen Burgess, Ecology

Central Files: Holland America Line – HOLLAND NOORDAM; WQ 6 1

Section H: Signatures

<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak 	Department of Ecology/Northwest Regional Office/Water Quality Program/Municipal Compliance Specialist/(425) 649-7195	10/23/07
<u>Name and Signature of Reviewer</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Kevin C. Fitzpatrick 	Department of Ecology/Northwest Regional Office/Water Quality Section Manager/(425) 649-7033	10/23/07

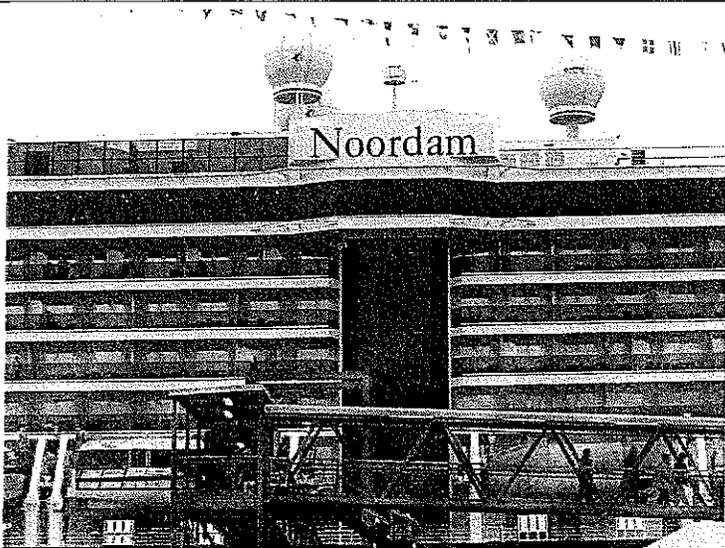


PHOTO #:01 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No : P9230001
DESCRIPTION: NOORDAM VESSEL

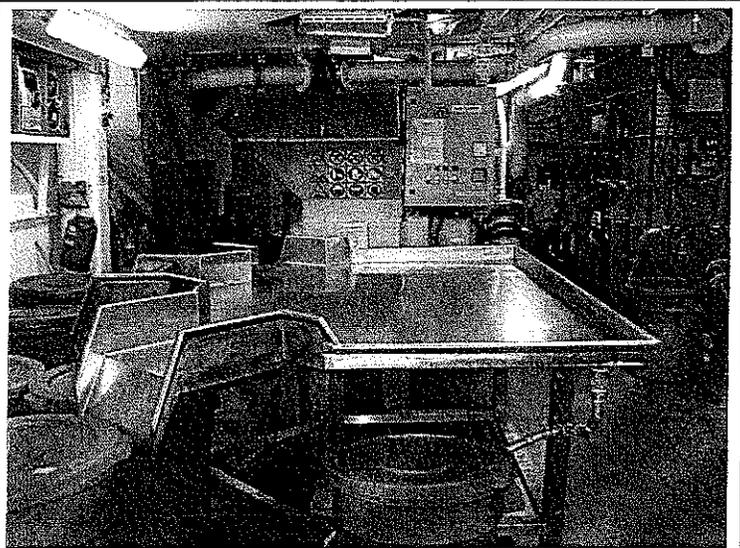


PHOTO #:02 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No : P9230002
DESCRIPTION: GARBAGE/RECYCLING SORTING AREA

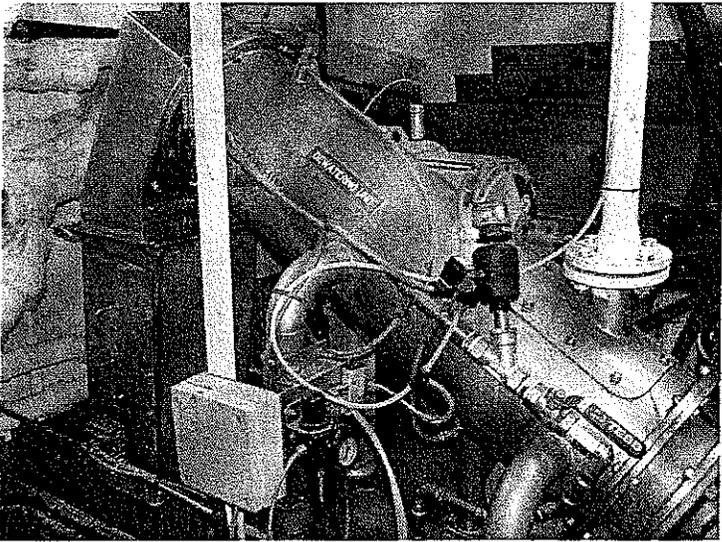


PHOTO #:03 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No : P9230003
DESCRIPTION: FOOD WASTE DEWATERING UNIT

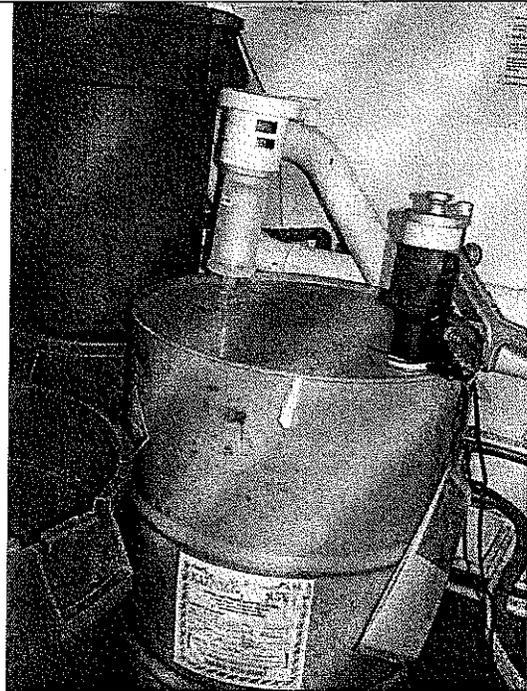


PHOTO #:04 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230004
DESCRIPTION: AEROSOL DISPOSAL SYSTEM



PHOTO #:05 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230005
DESCRIPTION: HAZARDOUS WASTE STORAGE AREA



PHOTO #:06 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230006
DESCRIPTION: FLUORESCENT LIGHT CRUSHING/MERCURY
REMOVAL SYSTEM

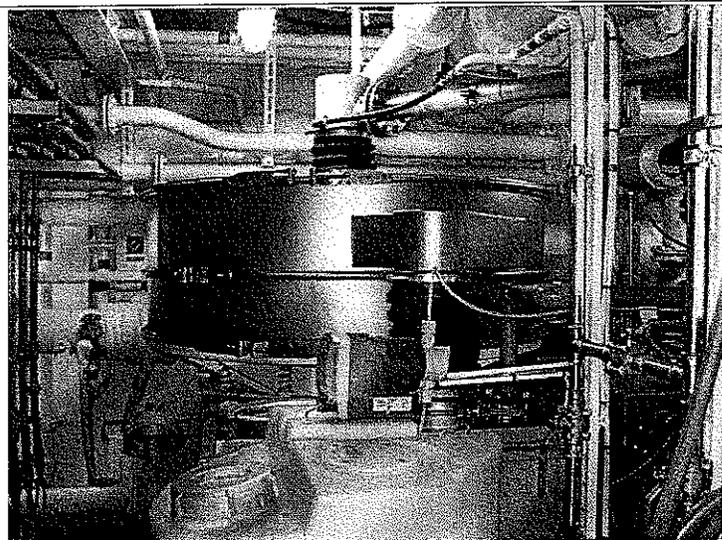


PHOTO #:07 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230008
DESCRIPTION: GRAYWATER SYSTEM (GW) SWECO PRE-
FILTRATION SYSTEM

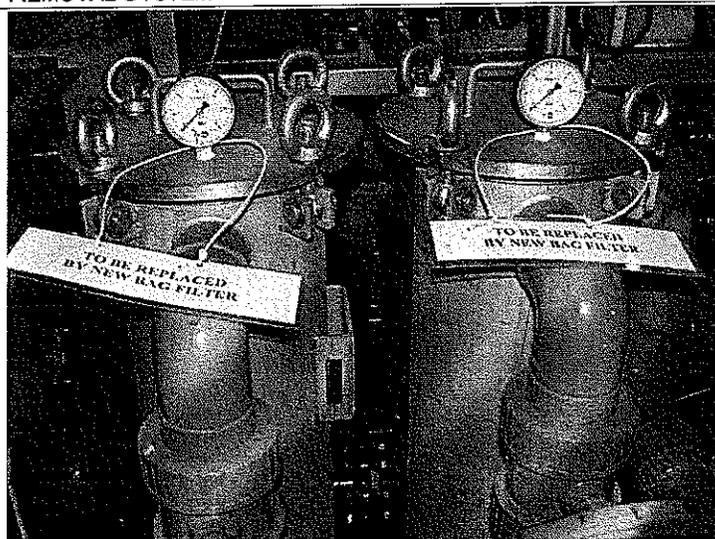


PHOTO #:08 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230009
DESCRIPTION: GW BAG FILTERS

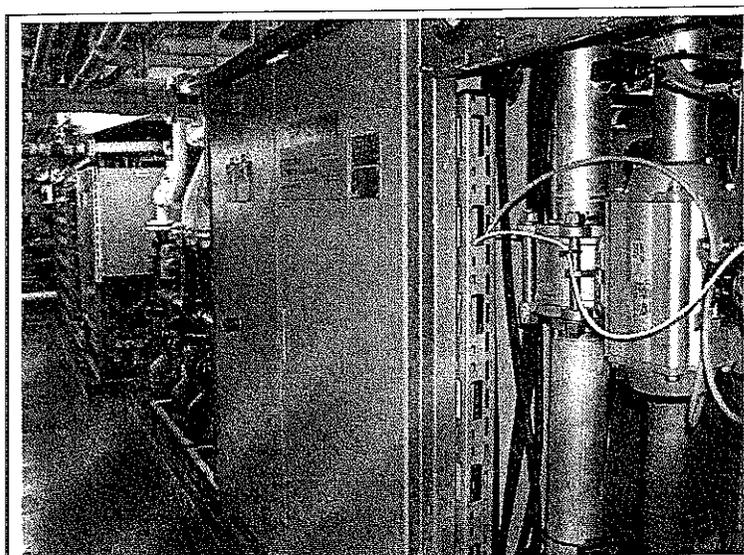


PHOTO #:09 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No : P9230010
DESCRIPTION: GW REVERSE OSMOSIS SYSTEM

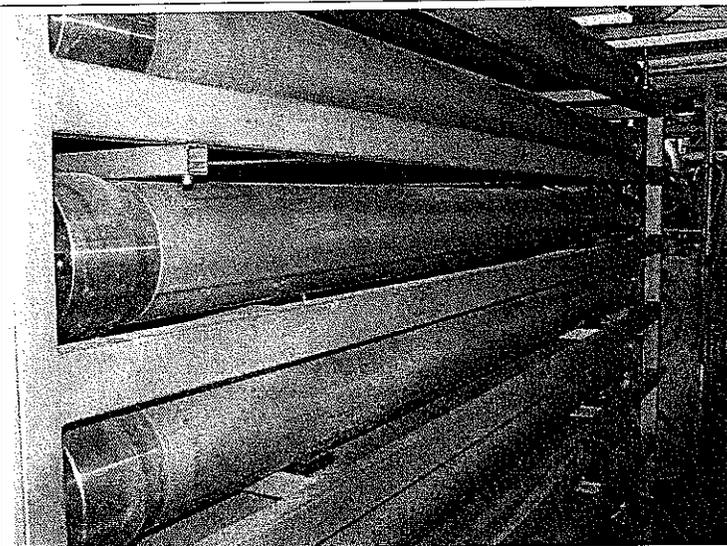


PHOTO #:10 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230011
DESCRIPTION: GW REVERSE OSMOSIS SYSTEM

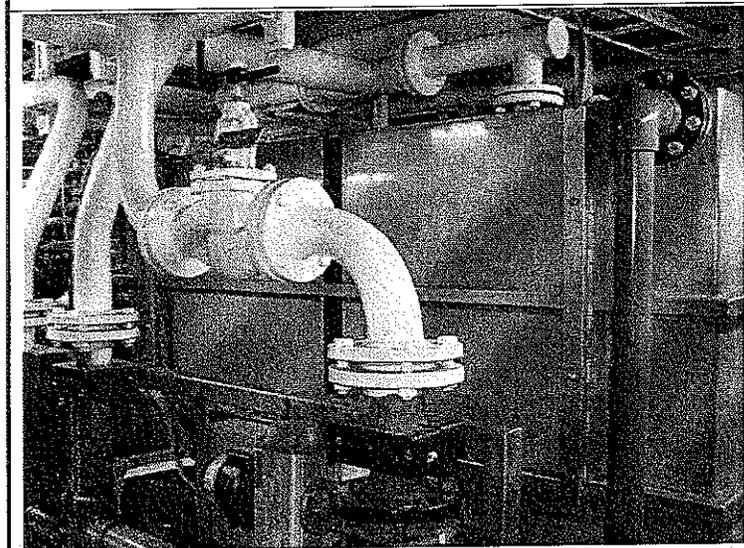


PHOTO #:11 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230012
DESCRIPTION: GW RO PERMEATE TANKS



PHOTO #:12 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230013
DESCRIPTION: GW ULTRAVIOLET LIGHT DISINFECTION SYSTEM

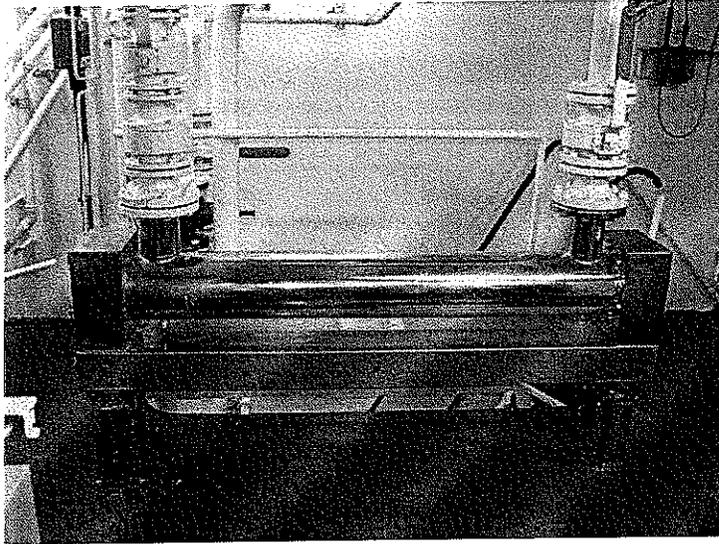


PHOTO #:13 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230014
DESCRIPTION: GW ULTRAVIOLET LIGHT DISINFECTION SYSTEM

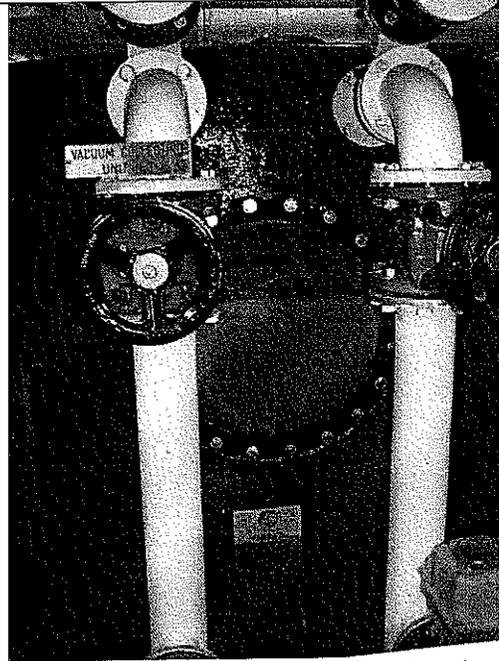


PHOTO #:14 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230018
DESCRIPTION: BLACKWATER SYSTEM (BW) VACUUM
COLLECTING UNIT

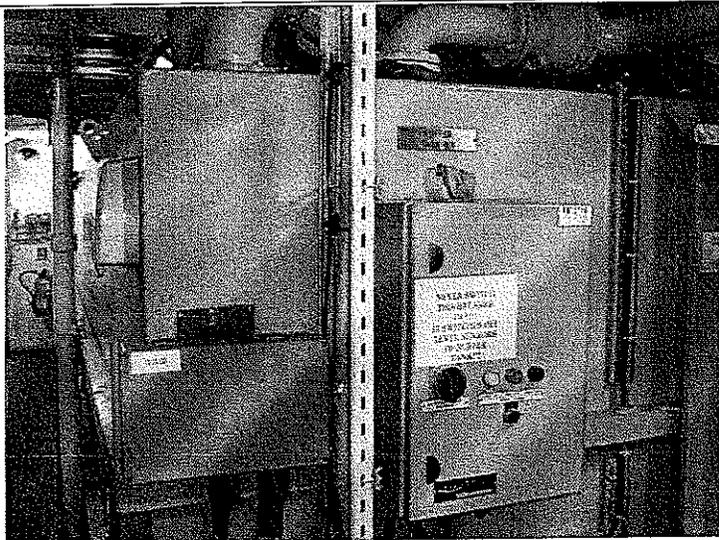


PHOTO #:15 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230019
DESCRIPTION: BW BUFFER TANK

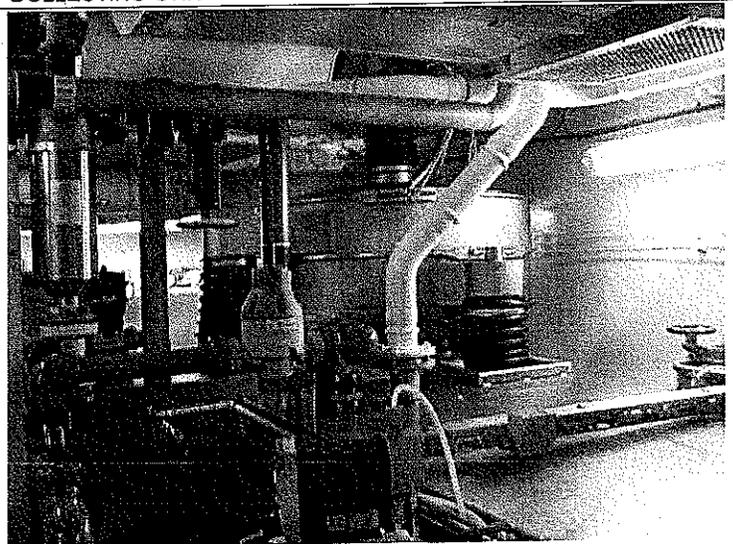


PHOTO #:16 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230020
DESCRIPTION: BW SWECO PRE-FILTRATION SYSTEM



PHOTO #:17 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230021
DESCRIPTION: BW SWECO SOLIDS

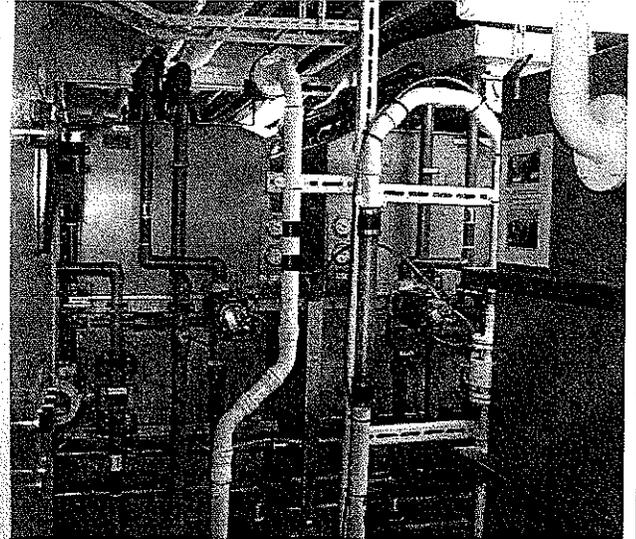


PHOTO #:18 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230022
DESCRIPTION: BW BIOREACTORS (2 OF 3)

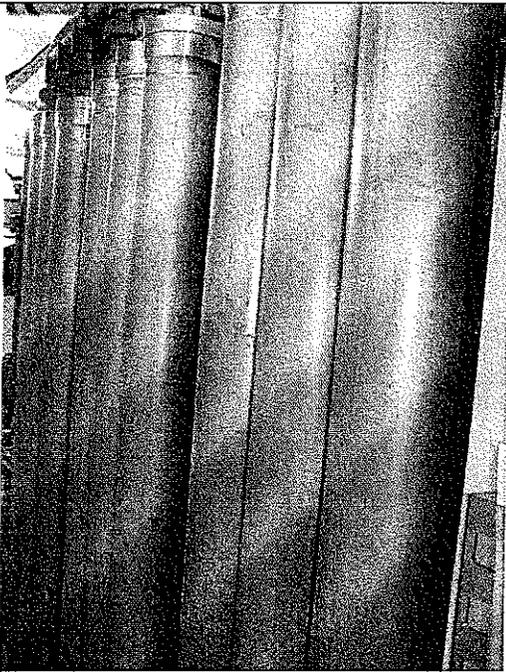


PHOTO #:19 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230023
DESCRIPTION: BW ULTRAFILTERS

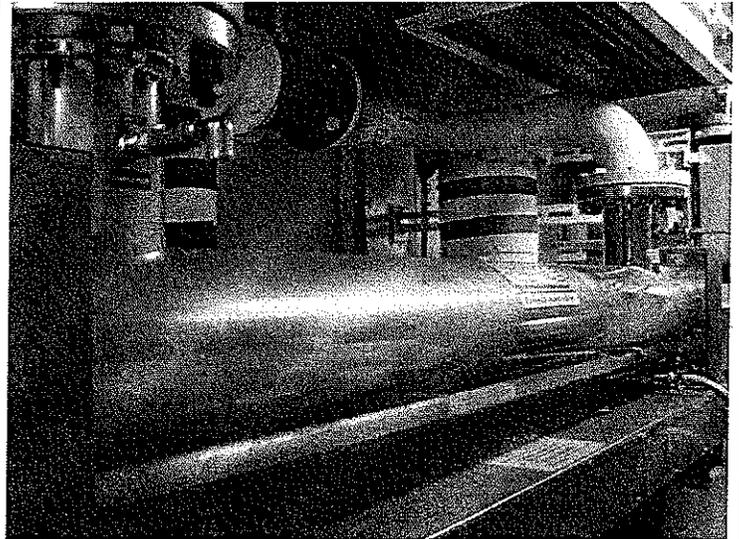


PHOTO #:20 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230025
DESCRIPTION: BW ULTRAVIOLET LIGHT DISINFECTION SYSTEM

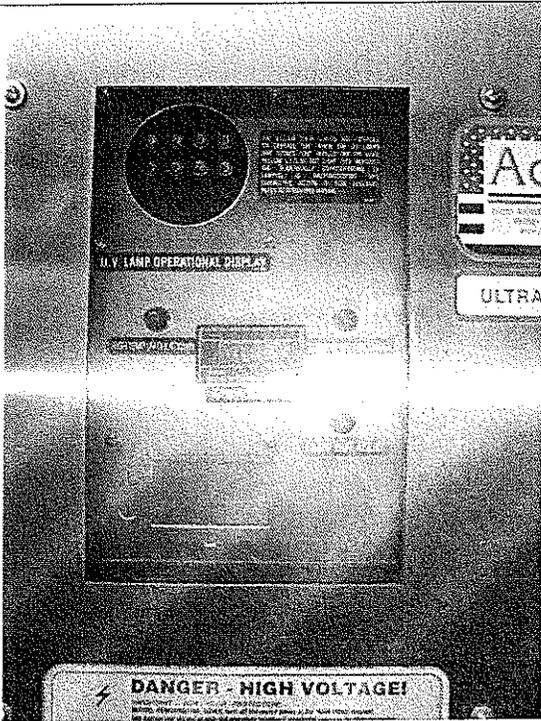


PHOTO #:21 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230026
DESCRIPTION: BW ULTRAVIOLET LIGHT DISINFECTION SYSTEM

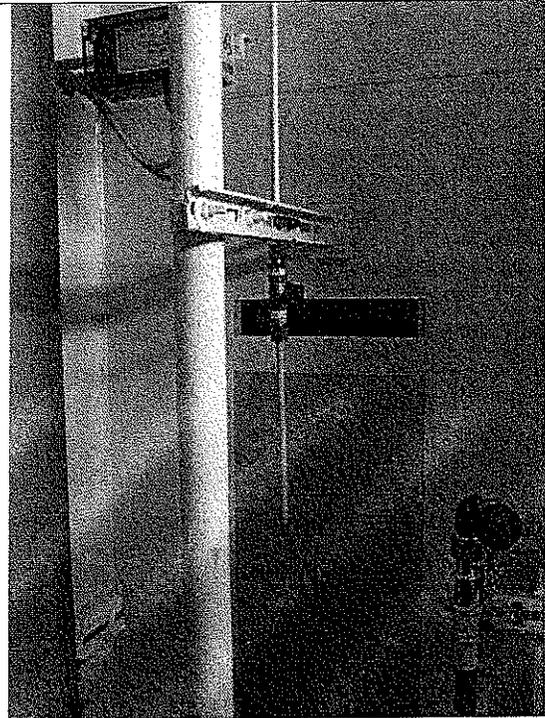


PHOTO #:22 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230027
DESCRIPTION: COMBINED EFFLUENT SAMPLE PORT

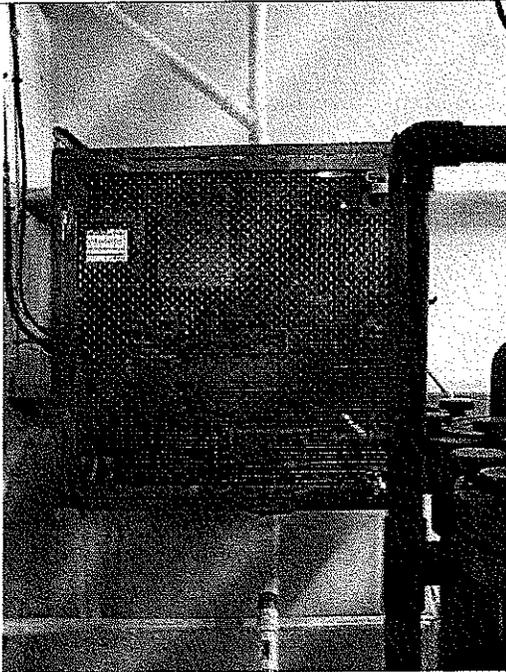


PHOTO #:23 DATE: 09/23/07 TAKEN BY: AMY JANKOWIAK
FILE No.: P9230028
DESCRIPTION: OILY BILGE WATER SYSTEM WHITE BOX



QC Summary for sample number: 07-A012077

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUPLICATE VALUE	RPD
07-A011752	Ammonia Nitrogen	mg/l	77	78	1.3
07-A011806	Ammonia Nitrogen	mg/l	< 0.005	< 0.005	
07-A011875	Ammonia Nitrogen	mg/l	< 0.005	< 0.005	
07-A011868	Total Suspended Solids	mg/l	< 1	< 1	
07-A011790	Total Suspended Solids	mg/l	240	240	0.00

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
07-A012077	Chlorine Residual	mg/l	0.11	0.63	0.50	104.00 %
07-A011804	Ammonia Nitrogen	mg/l	< 0.005	0.24	0.25	96.00 %
07-A011874	Ammonia Nitrogen	mg/l	< 0.005	0.27	0.25	108.00 %
07-A011888	Ammonia Nitrogen	mg/l	0.069	0.31	0.25	96.40 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Chlorine Residual	mg/l	0.25	0.23	92.0 %
Ammonia Nitrogen	mg/l	8.9	8.8	98.9 %
Ammonia Nitrogen	mg/l	4.0	3.8	95.0 %
Ammonia Nitrogen	mg/l	8.9	9.0	101. %
Total Suspended Solids	mg/l	100	100	100. %
Total Suspended Solids	mg/l	100	98.	98.0 %

BLANKS

ANALYTE	UNITS	RESULT
Chlorine Residual	mg/l	< 0.1
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Ammonia Nitrogen	mg/l	< 0.005
Total Suspended Solids	mg/l	< 1
Total Suspended Solids	mg/l	< 1

Am Test Inc.
14603 N.E. 87th St.
Redmond, WA 98052
(425) 885-1664
www.amtestlab.com



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ANALYSIS REPORT

Department of Ecology
3190 160th Ave SE
Bellevue, WA 98008
Attention: Amy Jankowiak
Project Name: Holland Noordam
All results reported on an as received basis.

Date Received: 09/23/07
Date Reported: 10/ 8/07

AMTEST Identification Number 07-A012077
Client Identification Nor-Eff
Sampling Date 09/23/07

Microbiological

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fecal Coliforms	< 1	CFU/100 ml		1.	SM 9222D	KF	09/23/07

Conventionals

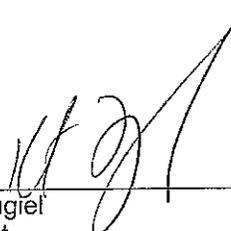
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
pH	7.70	unit			EPA 150.1	KF	09/23/07
Chlorine Residual	0.11	mg/l		0.10	EPA 330.5	KF	09/23/07
Total Suspended Solids	7.0	mg/l		1.0	EPA 160.2	JR	09/25/07

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
BOD	10.	mg/l		10.	SM 5210	MRW	09/23/07

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia Nitrogen	38.	mg/l		0.005	EPA 350.1	TS	09/24/07


Kathy Fugiel
President



Am Test Inc.
14603 N.E. 87th St.
Redmond, WA 98052
(425) 885-1664

Professional
Analytical
Services

RECEIVED

OCT 15 2007

DEPT OF ECOLOGY

Oct 8 2007
Department of Ecology
3190 160yh Ave SE
Bellevue, WA 98008
Attention: Amy Jankowiak

Dear Amy Jankowiak:

Enclosed please find the analytical data for your Holland Noordam project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
Nor-Eff	Water	07-A012077	Micro, CONV, DEM, NUT

Your sample was received on Sunday, September 23, 2007. At the time of receipt, the sample was logged in and properly maintained prior to the subsequent analysis

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Method Detection Limits (MDL's), as opposed to Practical Quantitation Limits (PQL's).

If you should have any questions pertaining to the data package, please feel free to contact me.

Sincerely,

Kathy Fugiel
President

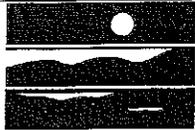
BACT = Bacteriological
CONV = Conventionals
TC=Total Coliforms

MET = Metals
ORG = Organics

NUT=Nutrients
DEM=Demand

MIN=Minerals
APC=Aerobic Plate Count

Faint mirrored text at the bottom of the page, likely bleed-through from the reverse side.



State of Washington Department of Ecology
**Verification of Operating Conditions
 of Advanced Wastewater Treatment
 Systems for Cruise Ship Discharges**

Northwest Regional Office
 3190 160th Ave SE
 Bellevue, WA 98008
 Phone: (425) 649-7000 Fax: (425) 649-7098

Section A: General Information

Vessel Name:	MERCURY	Date:	October 8, 2007
Vessel Operator:	Celebrity Cruises	Entry Time:	9:06 AM
IMO Number:	91006302	Exit Time:	11:45 AM
Vessel Type:	Passenger Ship	Notification (name & date):	Rich Pruitt, 10/04/07
Location:	Pier 66, Seattle		
On-board contact(s):	Andrew Mott, Sanitation Engineer; Noriel Abenir, Sanitation Engineer		
Inspector(s):	Amy Jankowiak, Department of Ecology, Raman Iyer, Department of Ecology, and Mike Dawda, Department of Ecology		
# passengers/crew:	~2000/~850		

Description of advanced wastewater treatment system (name, type, major components, etc):

Biopure is a marine sanitation device including aeration, settling, and chlorination for blackwater only. This system is run at all times.

Rochem Advanced Waste Water Purification System: The Rochem combines blackwater from the Biopure system and graywater and includes prefiltration, reverse osmosis in two stages with aeration and UV disinfection. The Rochem system is only run for about 2 hours for sampling purposes. There is not enough capacity in the AWTS to treat all of the wastewater, therefore it is only used for sampling purposes to retain certification in case there is a need to use the system in special areas.

The vessel has never requested approval for discharge and is not approved for discharge in Washington/MOU waters.

Section B: Areas Evaluated

<input checked="" type="checkbox"/>	Black/Gray wastewater system	<input type="checkbox"/>	Operations Center/Computer system	<input checked="" type="checkbox"/>	Records/Reports	<input checked="" type="checkbox"/>	Sampling/Monitoring
<input checked="" type="checkbox"/>	Discharge locations	<input checked="" type="checkbox"/>	Operations & Maintenance	<input checked="" type="checkbox"/>	Sludge Handling/Disposal	<input checked="" type="checkbox"/>	Other

Section C: For vessels discharging ≥ 1 nm from berth and ≥ 6 knots only

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance) in place	Not Applicable

Section D: For vessels discharging continuously (at berth or within 1 nm of berth)

<input type="checkbox"/>	Schematics match black/gray wastewater system	Not Applicable
<input type="checkbox"/>	Sludge disposal protocol per MOU	Not Applicable
<input type="checkbox"/>	Notification procedures (for contacting Ecology of non-compliance and for system shut down) in place	Not Applicable
<input type="checkbox"/>	Operations as described in submitted documentation	Not Applicable
<input type="checkbox"/>	Daily 24-hour continuous turbidity or equivalent monitoring	Not Applicable
<input type="checkbox"/>	Turbidimeter or equivalent monitoring equipment functioning properly	Not Applicable
<input type="checkbox"/>	Turbidity or equivalent : Not applicable Last calibration Frequency of readings: Trigger level for alarm: Trigger level for shutdown: Recorded turbidity/equivalent levels above triggers:	
<input type="checkbox"/>	Auto shut down or operational controls to insure system shut down if a system upset occurs	Not Applicable

<input type="checkbox"/>	Ultraviolet (UV) light disinfection immediately prior to discharge	Not Applicable
<input type="checkbox"/>	UV replacement bulbs available	Not Applicable
<input type="checkbox"/>	UV/bulbs cleaned regularly	Not Applicable

Section E: General		
<input type="checkbox"/>	Sampling conducted 2/month, 1/month in Seattle (BOD, TSS, fecal coliform, pH, chlorine residual)	Not Applicable
<input type="checkbox"/>	Whole Effluent Toxicity Testing 1 per 2 years	Not Applicable
<input type="checkbox"/>	Training up to date for system operators	Not Applicable
<input type="checkbox"/>	Discharge records maintained	Not Applicable
<input type="checkbox"/>	Alarms functioning properly	Not Applicable
	<u>Alarms</u> Shutdowns: not applicable High turbidity/TSS warnings: High wastewater levels: UV disinfection (intensity, bulbs, bank out, power failure):	

Section F: Sample Results		
	Parameter	Results
	Biochemical Oxygen Demand 5-Day (BOD)	Not Applicable
	Total Suspended Solids (TSS)	Not Applicable
	Fecal Coliform	Not Applicable
	Residual Chlorine	Not Applicable
	Ammonia, Nitrogen	Not Applicable
	pH	Not Applicable

Section G: Summary of Findings/Comments
<p><u>Introduction</u> Amy Jankowiak, Washington State Department of Ecology (Ecology) Northwest Regional Office, Water Quality Program, Mike Dawda, Ecology Northwest Regional Office, Water Quality Program, and Raman Iyer, Ecology Northwest Regional Office, Water Quality Program, conducted the inspection of the Celebrity Cruises MERCURY on October 8, 2007. The main contacts on board the MERCURY included Andrew Mott, Environmental Officer, and Noriel Abenir, Sanitation Engineer. Prior notification of the visit was given on October 4, 2007 for security protocol. The purpose of the inspection was to evaluate compliance with the <i>Memorandum of Understanding Cruise Operations in Washington State</i> (MOU), as amended. The MERCURY has not requested and is not approved for discharge in Washington State.</p> <p><u>Inspection</u> We arrived and boarded the ship at 9:06 am and began with introductions and a plan for the day. We then discussed discharge protocols for various waste streams (blackwater, graywater, biomass-sewage residuals, food waste, oily bilge water, ballast water, pool/spa water, and expired medications) the water bunkering and production process, garbage and recycling, and notification procedures. Discharge records were reviewed for black water and gray water discharges and showed no discharges in Washington waters for the period reviewed from September 21, 2007 (date of first visit of the season in MOU waters) to present. We then headed down to the Biopure and Rochem systems to view the components. Next, we took a look at the oily bilge system and the garbage and recycling areas. We then reviewed oily bilge records (no oily bilge discharges in Washington waters from September 21, 2007 to present date, discussed environmental training and concluded with a de-briefing and disembarked the vessel at about 11:45 am.</p> <p><u>Discharge Protocols:</u> The MERCURY has not requested, and is not approved to discharge in waters subject to the MOU. All blackwater is treated with a marine sanitation device, Biopure, and is discharged outside of MOU waters. Currently, untreated graywater is sent to a holding tank and discharged outside of MOU waters along with the MSD treated blackwater. This season, the vessel is running three or four day cruises between Seattle and Canada, and is discharging all blackwater and graywater in a pre-designated area (box shaped near: 48°17,1N and 123°23,2W) in Canadian waters greater than four nautical miles from shore. The Environmental Officer and vessel staff conducted extensive pre-planning accounting for the vessels itinerary, route, and holding tank capacity in order to assure that all discharges would take place in accordance to regulations and the MOU. Sewage residuals (sludge) is strained and incinerated. Food waste is discharged at greater than 12 nautical miles from shore, as is pool water and bilge water. Spa/Jacuzzi water is discharged outside of MOU waters and at greater than four nautical miles. Expired medications and narcotics are collected and documented by the medical staff and discharged at</p>

greater than 12 nautical miles with witnesses. The vessel does go out to sea briefly during these routes enabling the discharges needed at greater than 12 nautical miles. Ballast water is retained on board and exchanged at greater than 50 nautical miles as needed. The marine sanitation device (MSD), Biopure, is currently the only wastewater system being while the vessel is in MOU waters. The advanced wastewater treatment system (AWTS) Rochem system is not used due to its limited capacity (vessel produces about 800m³/day and the AWTS capacity is about 270m³/day). The vessel has holding capacity of about 1700 m³ which allows for about 48 hours. When a discharge is to occur from the MSD, the engine control room confirms the location (within the box) with the bridge navigation staff. All discharges are logged in the *Sewage and Graywater Discharge Record Book* based on the coordinates from the bridge. Some of the recent discharge records were not readily available in the control room log, and had to be obtained from the Environmental Officer. All overboard ports are locked. The officer on-duty has the keys.

Notifications numbers were posted on the vessel for various environmental emergencies. A posting of Ecology's Northwest Regional Office's phone number for non-compliance of the MOU has been given to staff to also be posted for the vessel's convenience. The environmental officer was aware of the fact that the most current version of the MOU is located on Ecology's website.

Food waste is collected from the galley and is sent through a Somat pulper (photo #16) and discharged outside of 12 nautical miles (outside MOU waters). The liquid from the pulper is recycled back through the pulper. Occasionally the liquid is changed out and sent to the graywater tank. Food waste such as bones is incinerated. Grease is collected and reused in the heavy fuel tanks.

Oily bilge water is treated with the Turbulo and Marinfloc systems (oily water separators) (photo #13). The Turbulo system typically treats to less than 5 ppm, and the Marinfloc then treats to almost zero ppm.

Garbage, recycling, (photo #14) and hazardous waste is collected and sent ashore typically in Victoria or Vancouver, B.C. None of these materials are sent ashore in Seattle. Cardboard is recycled, as well as many other materials including aluminum, glass, and tin. Papers, plastics, food-contaminated cardboard, biohazardous materials, some food waste (bones), oily rags, and sewage residuals are incinerated. Medical sharps, PERC from dry-cleaning are included in hazardous waste off-loads. Photo waste is treated to less than 5 ppm through silver recovery. Fluorescent light bulbs are crushed with the bulb eater with mercury vapor removal (photo #15).

Air conditioning condensate is reused in the laundry. Laundry water is sent to the graywater tank. Potable water is bunkered often, and only a small amount is produced on board with evaporators.

Blackwater and Graywater Systems:

The marine sanitation device (MSD), Biopure (photos #01 #02, and #04), operates by first collecting blackwater into a storage collection tank (photo #03). The wastewater then flows into the Biopure system (four separate identical units) by suction. The system includes basic screening of plastics and larger objects, aeration, pH adjustment, some settling by addition of polymer, and chlorination for disinfection all in one tank partially divided. Solids cleaned out of the tank are strained and incinerated periodically. Effluent from the Biopure system is sent to a holding tank prior to discharge (or is sent to the AWTS if operating). Staff take on-board samples for COD, TSS and fecal coliforms about weekly for process control. Chlorine dosing levels are adjusted based on fecal coliform results. Sampling results from the MSD are only for blackwater. The untreated graywater is either combined with the treated blackwater and sent to a holding tank for discharge, or is sent to the AWTS.

The advanced wastewater treatment system (AWTS) Rochem (photos #07 and #08), is currently only turned on for about two hours prior to sampling to retain certification. The system operates by first taking waste from the holding tanks and sending it to the SWECO screen (photo #10). Solids are vibrated and collected. The solids that are removed are strained and incinerated. The liquid flows to another tank prior to going to the reverse osmosis (RO) membranes (photos #05, #06, and #09). The liquid goes through the 1st stage of the membranes, then onto the aeration tank and then to the 2nd stage of the RO membranes. There are two separate RO units. The membranes are cleaned for about four hours every month with an acid cleanser. Flow is then sent to the permeate tanks and pH is adjusted. From there, the liquid moves to ultraviolet (UV) disinfection (photo #11). Turbidity or TSS is monitored with alarms for shut down. The UV has intensity alarms. The effluent from the UV goes through carbon filtration (photo #12) prior to discharge or recirculation.

Samples were not taken, as the vessel does not discharge in MOU waters. Discharge records were reviewed and of the dates looked at (September 21, 2007 to present), no discharges occurred on the dates the vessel was in Washington waters.

Conclusions and Recommendations

Mr. Mott, the Environmental Officer, was very knowledgeable of the wastewater system and other environmental systems and protocols.

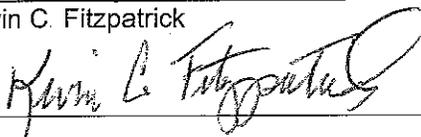
The inspections that occurred in 2006 of the MERCURY vessel yielded the discovery of unauthorized discharges and a fine for the company. The inspection on October 8, 2007 showed a great deal of improvement with understanding the locations of waters of the state, waters of the MOU, and discharge protocols. The Environmental Officer and vessel staff conducted extensive pre-planning accounting for the vessels itinerary, route, and holding tank capacity in order to assure that all discharges would take place in accordance to regulations and the MOU.

At the end of the 2006 season, Celebrity Cruises stated that they would likely install a Hamworthy Membrane Bioreactor advanced wastewater treatment system on board the MERCURY that would have the capacity to treat all of the wastewater produced. A test installation was done on another Celebrity Cruises vessel, but due to technical problems, the Line is reevaluating the technology and configuration. The Line is still committed to installing a new system by the end of 2009.

Attachments:
Photographs

Copies to:
Rich Pruitt, RCCL
Andrew Mott, MERCURY EO
Amy Jankowiak, Ecology
Kevin Fitzpatrick, Ecology
Raman Iyer, Ecology
Mike Dawda, Ecology
Mark Toy, Dept. of Health
Central Files: Celebrity Cruises – MERCURY; WQ 6.1

Section H: Signatures

<u>Name and Signature of Inspector</u>	<u>Agency/Office/Telephone</u>	<u>Date</u>
Amy Jankowiak	Department of Ecology/Northwest Regional Office/Water Quality Program/Municipal Compliance Specialist/(425) 649-7195	
Name and Signature of Reviewer Kevin C. Fitzpatrick 	<u>Agency/Office/Telephone</u> Department of Ecology/Northwest Regional Office/Water Quality Section Manager/(425) 649-7033	<u>Date</u> 11/5/07

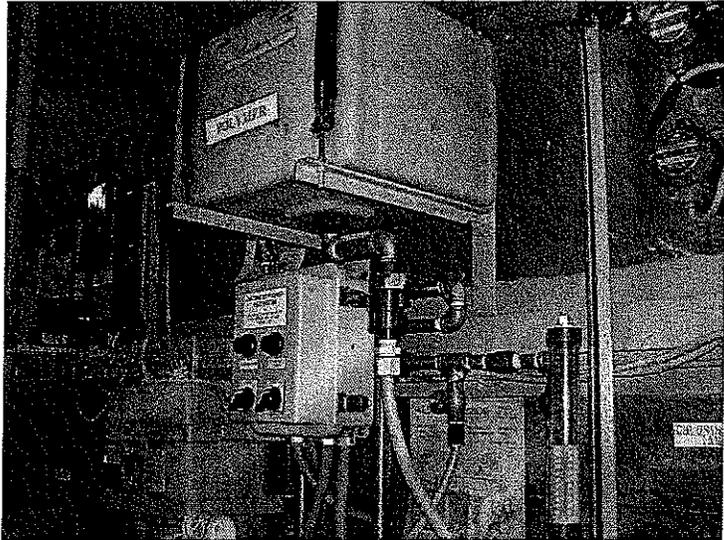


PHOTO #01 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080002
DESCRIPTION: MSD – BIOPURE TANK WITH POLYMER AND
CHLORINE IN FORGROUND



PHOTO #02 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080003
DESCRIPTION: MSD – PH CONTROL, BLOWER CONTROL,
CHLORINE DOSING IN FORGROUND

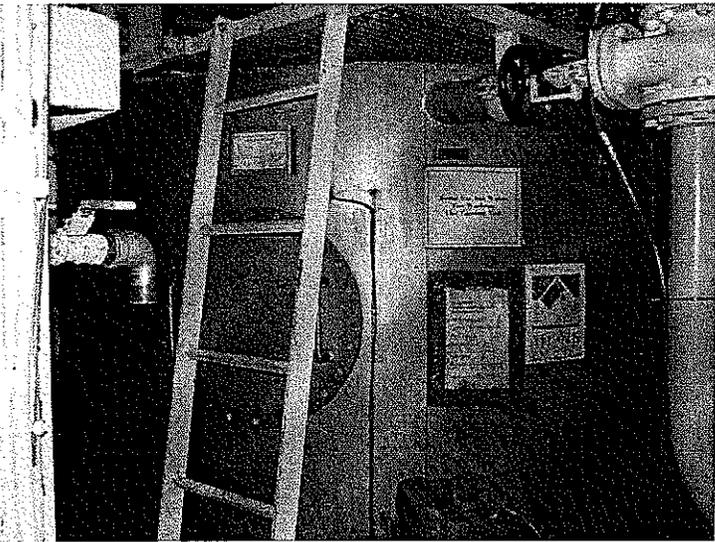


PHOTO #03 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080004
DESCRIPTION: COLLECTION TANK (PRIOR TO MSD)

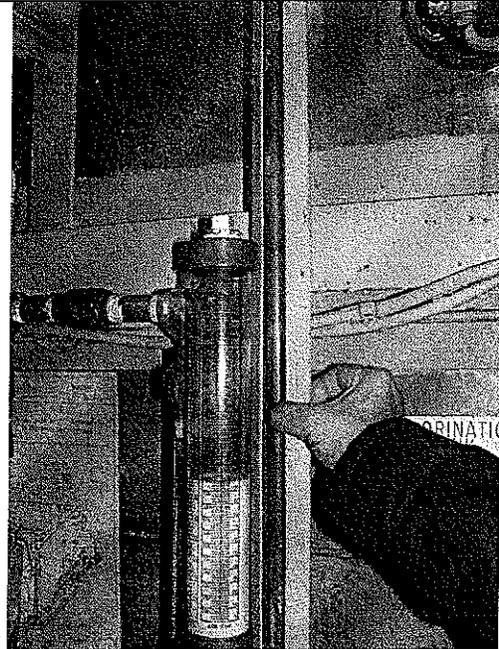


PHOTO #04 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080005
DESCRIPTION: MSD – EFFLUENT TUBE

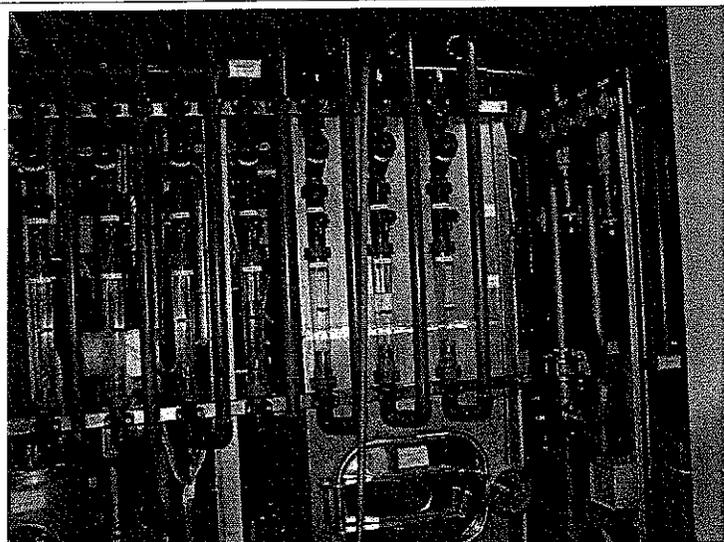


PHOTO #:05 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080006
DESCRIPTION: AWTS - REVERSE OSMOSIS UNIT 1

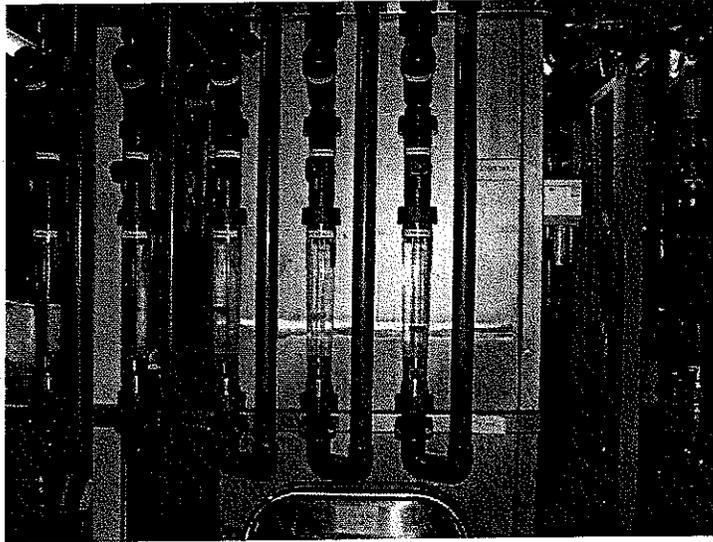


PHOTO #:06 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080007
DESCRIPTION: AWTS - REVERSE OSMOSIS UNIT 2

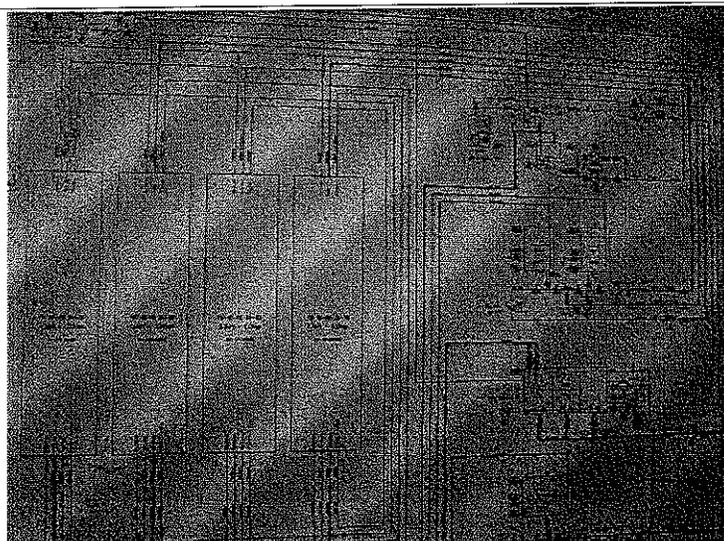


PHOTO #:07 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080008
DESCRIPTION: AWTS - DRAWINGS

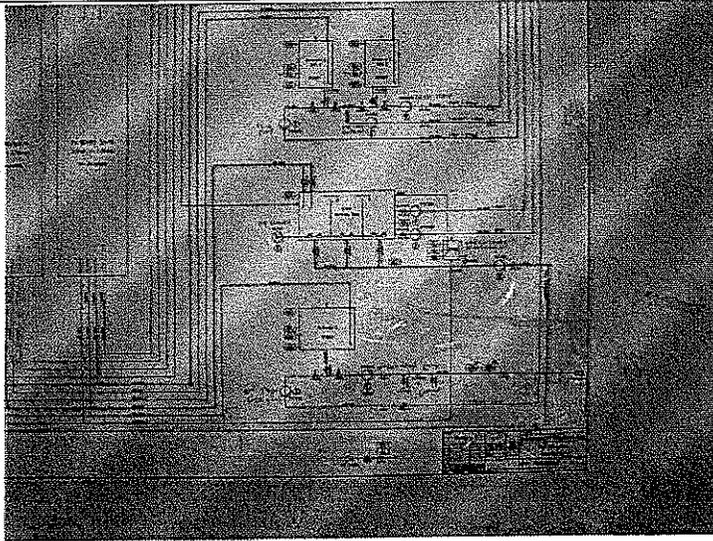


PHOTO #:08 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080009
DESCRIPTION: AWTS - DRAWINGS

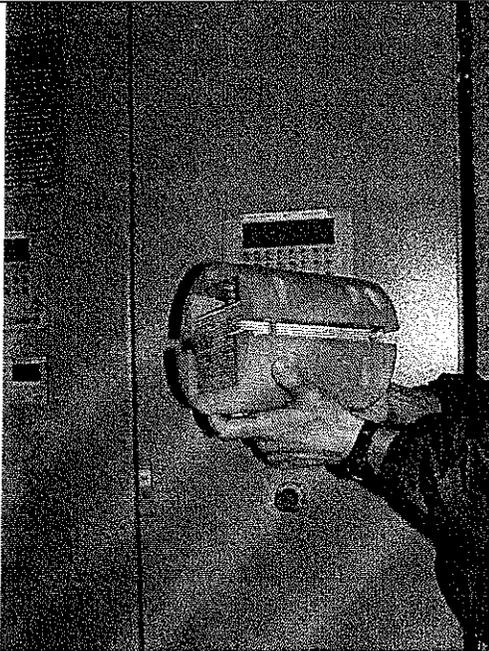


PHOTO #:09 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080011
DESCRIPTION: AWTS – REVERSE OSMOSIS MEMBRANE



PHOTO #:10 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080012
DESCRIPTION: AWTS – SWECO SCREEN

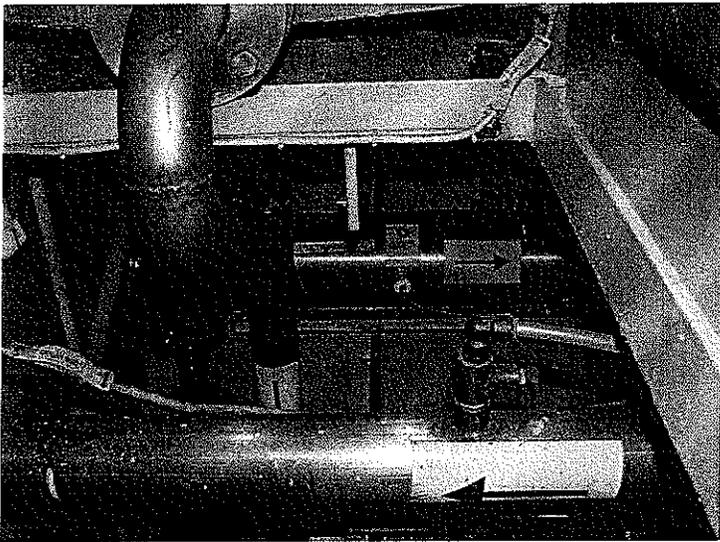


PHOTO #:11 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080014
DESCRIPTION: AWTS – UV DISINFECTION

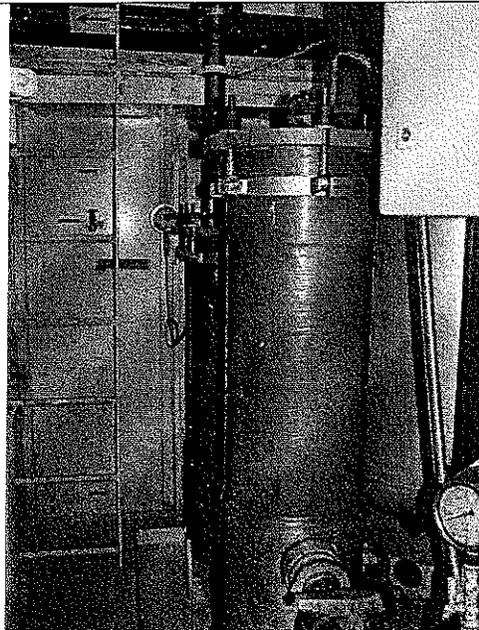


PHOTO #:12 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No.:PA080015
DESCRIPTION: AWTS CARBON FILTERS

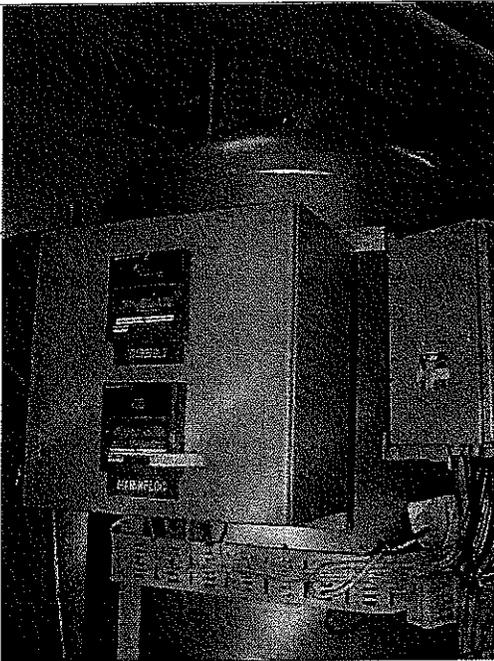


PHOTO #:13 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080016
DESCRIPTION: OILY BILGE TREATMENT SYSTEMS (TURBULO
AND MARINFLOC)



PHOTO #:14 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080018
DESCRIPTION: GARBAGE/RECYCLING AREA



PHOTO #:15 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080020
DESCRIPTION: FLUORESCENT BULB EATER (MERCURY VAPOR
REMOVAL SYSTEM)

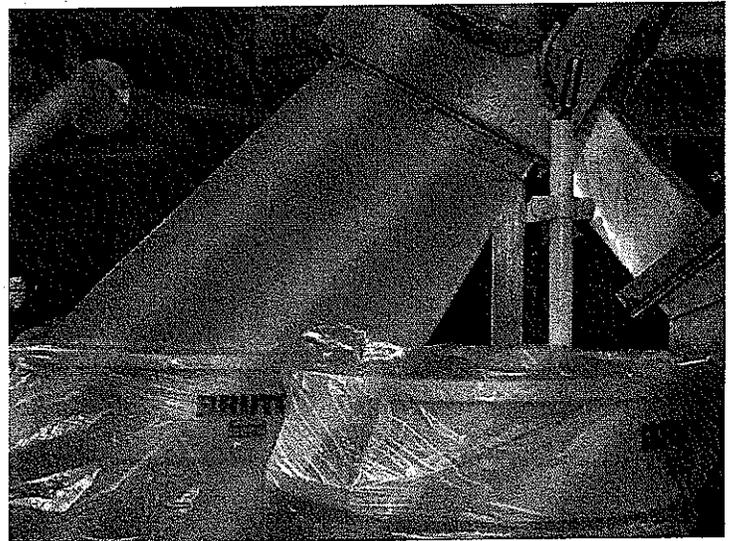


PHOTO #:16 DATE: 10/08/07 TAKEN BY: AMY JANKOWIAK
FILE No :PA080021
DESCRIPTION: FOOD WASTE SOMAT