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COST EFFECTIVENESS STUDY OF WASTEWATER MANAGEMENT SYSTEMS FOR SELECTED U.S. COAST GUARD VESSELS

Volume III - Installation Analysis

Part 6 - POINT HERRON (82')

Sidney Orbach

BRADFORD NATIONAL CORPORATION
1700 Broadway
New York, N.Y. 10019

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FINAL REPORT

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PREPARED FOR

U.S. DEPARTMENT OF TRANSPORTATION

UNITED STATES COAST GUARD

OFFICE OF RESEARCH AND DEVELOPMENT

WASHINGTON, D.C. 20590

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Volume III of a six volume report. Volume III has been published in six parts.

16. Abstract

Each of the 18 candidate Wastewater Management System (WMS) configurations developed in Volume IV was analyzed for installation aboard the POINT HERRON (WPB-82318). The following information was developed: vessel conditions including locations of black water (sewage and garbage grinder slurry) and gray water (galley and turbid) waste sources, vessel/resources capacities and estimated usage rates, determination of viable candidate systems based on installation guidelines and assumptions developed in Volume IV, black and gray wastewater (or sludge) holding tank capacities which can be fitted, installation cost estimates for each viable candidate system, arrangement drawings for WMS equipment and waste sources, installation related effectiveness attribute data.

The analysis was performed in three stages. A preliminary installation analysis was made on the basis of vessel plans available. This was followed by a shipcheck of the vessel to determine the viable candidate systems and obtain required vessel data. The final step consisted of a more detailed analysis of each viable candidate system to develop installation cost estimates and other required installation related information including arrangement drawings and effectiveness attribute data. Cost estimates were developed using a form which analyzes each viable candidate system in terms of standard installation cost elements, each of which has an assumed unit cost.

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COST EFFECTIVENESS STUDY OF WASTEWATER MANAGEMENT SYSTEMS FOR SELECTED U.S. COAST GUARD VESSELS.

Volume III. Installation Analysis

Part 6, POINT HERRON (82')

(10) Sidney Orbach

BRADFORD NATIONAL CORPORATION
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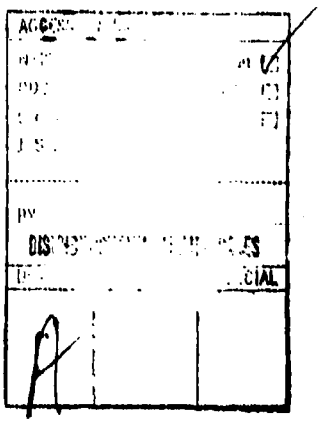
This study was conducted under the technical direction of Mr. Thomas S. Scarano of the Office of Research and Development, U.S. Coast Guard. Mr. Scarano and Lt. Ed Magsig of the Office of Engineering made available the vessel plans and provided valuable assistance in the formulation of the guidelines and assumptions governing this installation analysis.

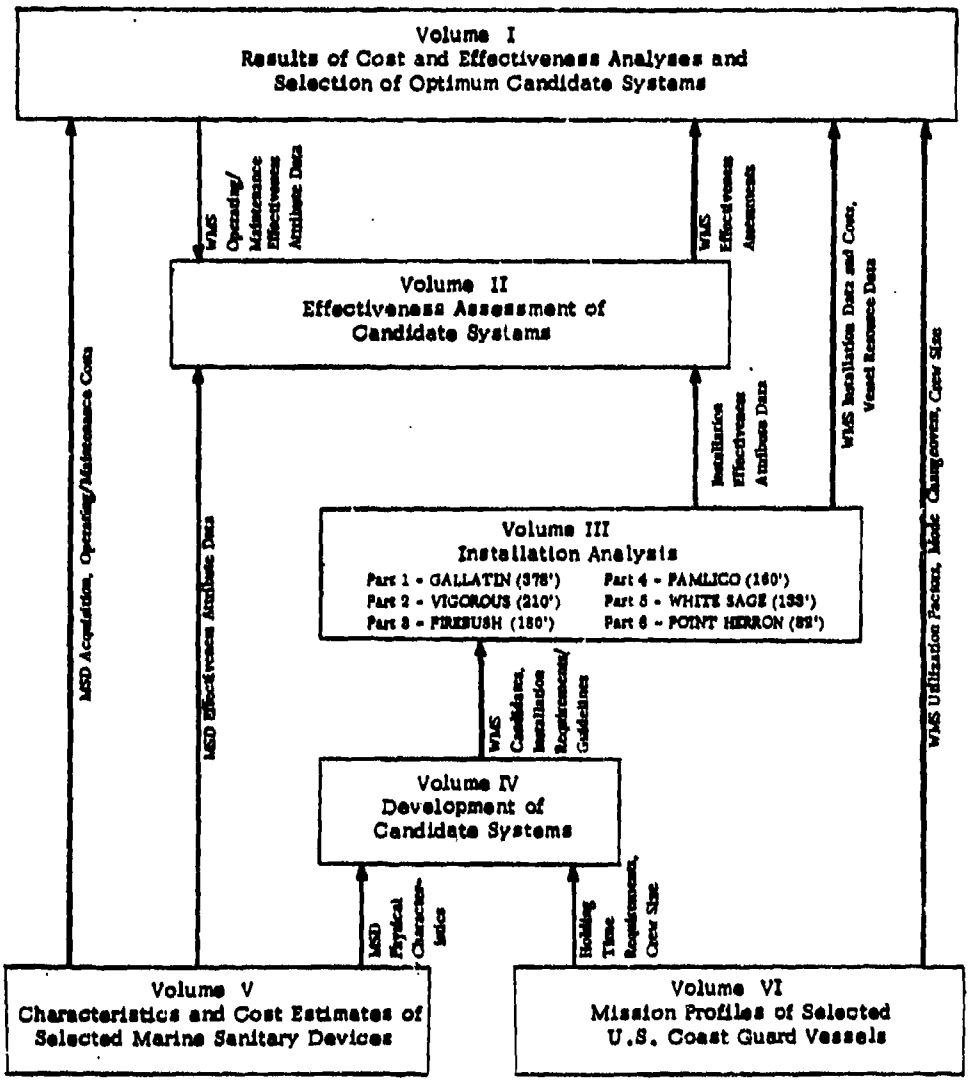
The installation analysis was performed in consultation with George G. Sharp, Inc., 100 Church Street, New York, N.Y. 10007.

The cooperation and assistance of the officers of U.S. Coast Guard Cutter POINT HERRON (WPB-82318) in scheduling the shipcheck and providing the requested vessel data is greatly appreciated.



PREFACE

The relationship among the volumes of the report is depicted below. This relationship does not convey all the information contained within each volume.



SUMMARY OF WMS INSTALLATION COSTS

Vessel: POINT HERRON (82')

WMS No.	Coll/Trans Subsys (Black)	Treatment/Disposal Subsystem TYPE: Black	Gray	Holding Capacity: Black (%)	Gray (%)	INSTALLATION COST ($)
1	Gravity Collect.	Holding Tank	Holding Tank	58	0	2,410
2	Oil Recircul. (Chrysler)	Chrysler + Hld Tnk	Holding Tank	N/A		
3		Chrysler + Incin.	Holding Tank	N/A		
4	Gravity Collect. (Grumman)	Grum Flow Thru + HldTk	Holding Tank	N/A		
5		Grumman Flow Thru + Holding Tank		N/A		
6	Gravity Collect.	Holding Tank	Grum Flow Thru+ HldTnk	N/A		
7	Gravity Collect. (Grumman)	Grum Flow Thru+Incin.	Holding Tank	N/A		
8		Grumman Flow Thru + Incinerator		N/A		
9	Vacuum Collect. (Jered)	Holding Tank	Holding Tank	100	20	5,460
10		Incinerator	Holding Tank	N/A		
11		GATX Evap.	Holding Tank	100	20	4,690
12		Holding Tank	Grum Flow Thru+ Hld Tnk	N/A		
13		Incinerator	Grum Flow Thru + Incin.	N/A		
14	M/T Pump Collect. (GATX)	Holding Tank	Holding Tank	100	20	4,200
15		Incinerator	Holding Tank	N/A		
16		GATX Evap.	Holding Tank	100	20	4,200
17		Holding Tank	Grum Flow Thru+Hld Tnk	N/A		
18		Incinerator	Grum Flow Thru + Incin.	N/A		

N/A - Not a viable candidate system for this vessel.

METRIC CONVERSION FACTORS

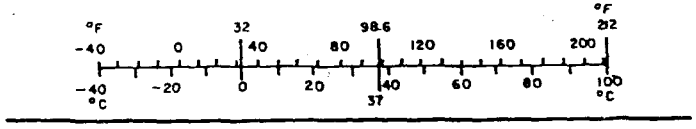
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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INTRODUCTION

OBJECTIVES

The objectives of the installation analysis are as follows:

- Development of pertinent vessel information necessary for the cost and effectiveness analyses, including the following:
  - Existing physical conditions aboard the vessel, especially in compartments where wastewater management system equipments may be installed.
  - Existing wastewater management equipments/systems aboard the vessel (holding tanks, garbage grinders, sewage treatment systems, etc.).
  - Location of black and gray wastewater sources aboard the vessel.
  - Vessel resource capacities and estimated usage rates (prior to system installation).
- Selection of the viable candidate systems as determined on the basis of the feasibility of installation, using the governing installation guidelines and assumptions.
- Determination of the black/gray wastewater (or sludge) holding tank capacities which can be fitted.
- Development of installation cost estimates for each viable candidate system.
- Development of drawings showing the proposed arrangement of the wastewater management system equipments for each viable candidate as well as the arrangement of the black and gray wastewater sources on board the vessel.
- Development of installation related effectiveness attribute data.

ASSUMPTIONS

The pertinent assumptions and guidelines governing the installation analysis are presented in Volume IV of this report, along with the details of each of the 18 candidate wastewater management system concepts in configurations suitable for each vessel included in this study.

APPROACH

The installation analysis was performed in three stages consisting of a preliminary installation analysis, a shipcheck to establish viable system/vessel combinations, and an installation cost analysis all of which are discussed below. Prior to this analysis, visits were made to a number of vessels to inspect installations of the wastewater management subsystems and equipments included in this study.

Preliminary Installation Analysis

The candidate ship's general arrangement drawings and piping diagrams as furnished by the U.S. Coast Guard were reviewed at length to determine existing conditions so that the WMS requirements delineated in Volume IV could be applied to the vessel and a preliminary installation analysis made prior to an actual visit to the ship. This approach was intended to maximize familiarity with the vessel and to determine any possible questionable areas of interest. Each system was investigated as to space requirements, possible equipment locations, relationship to ship's functions (operation, mission, fuel stowage, water capacity, support systems, etc.) and its relationship to the reportedly existing waste disposal system.

In order to obtain as accurate a picture as possible, arrangement drawings to scale were made from the ship's plans of the possible installation spaces and "dummy cut-outs" of WMS equipment (also to scale) were used to determine if a proposed arrangement was feasible and if any problems could be anticipated. The results of the preliminary installation analysis are presented in Appendix A.

Shipchecks To Determine Viable Candidate Systems

Upon completion of the preliminary installation analysis, a detailed shipcheck of the vessel was made. During this visit various factors bearing on the investigation were considered, e.g., support systems (compressed air, sanitary flushing medium, electrical power generation, salt water systems, fresh water systems, fuel oil systems, etc.), correlation between actual ship arrangement and that shown in ship's drawings furnished for the study, relationship of other ship's systems and equipment to the location

and installation of WMS components to determine interferences and relocations, access for shipping WMS equipment aboard, removals, relocations, etc. The drawings prepared during the preliminary installation study were checked out and modified to reflect actual shipboard conditions.

The discussion of the shipcheck results presents a verbal picture of what conditions actually exist aboard the vessel and how these conditions affect the viability determination of each wastewater management system. The installation acceptance or rejection rationale for each candidate WMS is presented, complete with estimated tank sizes, equipment locations, possible space modifications, relocations, limitations, exclusions, and any other such considerations as may be necessary to obtain a lucid understanding of the situation.

Vessel resource capacities (including the source of fresh water) and estimates of usage rates (prior to WMS installation) were obtained from interviews with cognizant officers. The locations of all black water (sewage and garbage grinder slurry) and gray water (galley and turbid) waste sources were determined.

The shipcheck also provided the necessary information to determine the capacities (in gallons) of required black and gray wastewater (or sludge) holding tanks (not part of manufacturer supplied wastewater treatment equipment) which can be accommodated, as well as their configurations (heights). This information was used to determine the black and gray wastewater holding capacities of each viable candidate system (expressed as a percentage of the required holding time). These results are presented on the WMS Equipment Requirements form together with the other equipment types and quantities required in order to synthesize each viable candidate system on the vessel. This WMS Equipment Requirements form served as the starting point for the cost and effectiveness assessments of each viable candidate system.

Installation Cost Analysis

The following were generated as part of the installation cost analysis:

- WMS equipment arrangement drawings for each viable candidate system and arrangement drawings for the black and gray wastewater sources aboard the vessel.
- Installation related effectiveness attribute data.
- Installation cost estimates for each viable candidate system.

The starting point for the installation cost estimates was the condition of the vessel at the time of the shipcheck inspection. Each viable candidate system installation was then analyzed in terms of a fixed set of installation cost elements. The Installation Cost Estimate Form shown in Figure 1 was used to record the estimated requirements for each cost element and the associated cost was computed. Each installation cost element in Figure 1 is discussed below.

(a) Piping - Wherever possible and applicable, existing piping runs were retained for reuse as installed. Pertinent information contained in the available ship's piping plans was used insofar as practicable. New piping runs were estimated from these drawings and the system equipment arrangement drawing prepared.

For estimating purposes of this nature, it is usual marine practice to use a dollars per pound of material to be installed. Therefore, an estimated present-day price, including material and labor to install, was placed at $4.50/lb.

For the sake of uniformity and simplification since the WMS evaluations are comparative, the piping material used is copper-nickel. It is recognized that most waste disposal piping systems under consideration in the U.S. Coast Guard vessels are of copper-nickel, although some PVC (plastic) piping and a small amount of steel is used. Since the established guidelines call for the principal piping (drainage) to be of copper-nickel it was considered that for the relatively small additional piping, such as vents, the use of copper-nickel for all piping components would not adversely influence the overall results. Accordingly, the amounts of each size piping were estimated and a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.

(b) Steel - For this part of the cost estimate only the steel involved in the various shipyard supplied tanks is considered. Foundations are a separately treated item. For these tanks it was considered that one-quarter inch plate would be a good average thickness. Since the tanks would have to be structurally stiffened for proper support, a factor of 30% was added to the plate weight. The weight estimate was derived from the system guideline size requirements translated into configurations as shown on the equipment location and arrangement drawings.

For cost estimating of this nature, it is usual to apply a cost per pound figure. It was considered that a good current price of $0.55/lb. would cover material and labor for fabrication and placing on board. This does not include the cost of fixing the tanks permanently in place by welding. This is a separate consideration.

WMS INSTALLATION COST ESTIMATES

Vessel_____

WMS No._____

Installation Cost Element		Unit	Assumed Unit Cost	Quantity Required (estimated number of units)	Cost ($)
Piping[1]		Pounds	$ 4.50/Lb. (Materials and Labor)	[2]	
Tank Steel[3]		Pounds	$ .55/Lb. (Materials and Labor)	[4]	
Foundations		Pounds	$ .92/Lb. (Materials and Labor)	[5]	
Electric Cables		Feet	$ 2.00/Ft. (Materials and Labor)		
Miscellaneous Installations (pumps, motors, skid-mounted components, etc.)		Man-Hours	$15.00/MH (Labor)		
Access Cuts (in hull, deck plating or bulkhead to provide passageway)		Feet	$ 1.00/Ft. (Labor)		
Welding		Feet	$ 6.00/Ft. (Materials and Labor)		
Removals	Cutting	Hours	$50.00/Hr. [6] (Labor)		
	Other (miscellaneous handling)	Man-Hours	$15.00/MH (Labor)		
Total Installation Cost ($)					

(1) Copper-nickel assumed.
(2) Estimate includes a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.
(3) One-quarter inch plate assumed.
(4) Estimate includes a factor of 30% added to allow for required structural stiffening for proper support.
(5) Estimated on the basis of 10% of the weight which has to be supported.
(6) Based on an assumed cutting rate of 50 ft./hr.

Figure 1

INSTALLATION COST ESTIMATE FORM

(c) Foundations - Supporting steel structure for all components of each WMS (tanks, pumps, MSD, incinerators, etc.) was estimated as approximately 10% of the weight which has to be carried. This is a usual rule of thumb for this type of installation. Fabrication and installation costs for material and labor were taken as $0.92/lb. based on consideration of today's average costs. The weights were estimated from the tank configurations and contents as well as the component weights given in Volume IV.

(d) Electrical Power Cable - The amount of footage was estimated from the ship's arrangement plans and the WMS equipment arrangement drawings prepared, with allowances for the devious routings which could be encountered. Since ship alteration work is usually more complex than new construction, allowance as made for less installation per unit time. Therefore a cost of approximately $2.00/ft. of cable was used to cover material and labor.

(e) Miscellaneous Installations - To cover the installation of various items such as pumps, motors, skid-mounted components, etc. where the activity centers principally around alignments and bolting in place, an estimate was made of the amount of time it would take to perform the tasks for each system installation, since the number and type of components varies. An estimated shipyard labor cost of approximately $15 per man-hour (MH) was considered representative.

(f) Access Cuts - In order to get material and components into the compartments where they would be fitted it could become necessary to temporarily cut the ship's hull, or deck plating or a bulkhead to provide passageway. The number of feet of cutting was estimated for each system installation based on the approximate size of the largest component anticipated. Estimated shipyard cost for such cutting is approximately $1.00/ft.

(g) Welding - This consideration includes securing tanks and non-bolted items and welding back any plating temporarily cut to provide access. An estimate of the number of feet of welding was made for each item in each system and a cost factor of $6.00/ft was considered satisfactory to cover material and labor.

(h) Removals - In cases where some existing equipment would have to be cut and removed from the vessel as no longer required, an estimate was made as to the approximate length of time it would take a team of two men to accomplish certain tasks. Estimated factors of $50/hour for cutting (based on an estimated cutting note of 50 ft/hour) and $15/man-hour (MH) for miscellaneous handling labor were considered representative of such costs.

(i) Other Considerations - The installation cost estimates do not include some shipyard costs which yards to include as a matter of quotation to perform a certain ship modification. Such intangibles would include: cleaning and gas-freeing tanks, temporary removals or modifications to ducts, piping, electric cables, machinery, ship's outfit or furnishings, etc. and re-installation to existing state after the basic modification has been completed; cleaning, preparing and repainting the compartments and parts of the steel work distrubed, use of special rigging and shipyard lifting gear; and other work items which are part of a hipyard's everyday business and which are normal for them to price out.

If a complete ship alteration price is desired, it would involve drawing up a complete set of specification and drawings in sufficient detail for a shipyard's estimating department to analyze at length. If possible, yard personnel would prefer to visit the vessel for a more accurate cost estimate to eliminate or minimize costs which it could possibly have to absorb.

One of the most difficult factors to consider and which is not obvious but which is very much a determinant is the shipyard's workload or backlog. If there is a convenient "hole" in the yard's work schedule, the price could be made attractive since it would provide needed economic continuity for its work force and facilities. Certainly if there is little or no other work in the offing, the yard will be inclined to "buy" the job by bidding lower than it normally would.

Thus it can be seen that there will be additional costs to those detailed herein, if one is interested in a "finished product" price than a comparative estimate.

LIMITATIONS

The installation cost estimating procedures used are considered to be fairly general and applicable for study purposes of this type which places greater emphasis on relative cost among candidate systems rather than on the absolute cost for a given system. However, the installation cost estimates developed herein are based on specific vessel conditions, wastewater management system requirements and the governing installation guidelines and assumptions. Therefore, caution is advised in attempting to use these estimates directly for vessels and/or systems other than those specifically included in this study.

PERTINENT VESSEL INFORMATION

POINT HERRON (82')

Vessel Characteristic	Data
Class	WPB - 82318 Point (82') C Class
Type	Patrol Boat (Small)
Crew Size	8
Home Port	Bay Shore, New York (Fire Island

POINT HERRON (82')

Crew 8 men

Waste Sources

Complete information on the sewage and gray water waste sources is contained in the tabulation sheets forming a part of these introductory remarks.

Existing Arrangement

The vessel is known as a Class "C" ship and is presently operating out of the U.S.C.G. Station at Fire Island, N.Y.

The vessel is not yet fitted with a CHT. All wastes gravitate overboard. The 242-gallon combined sanitary/galley & turbid holding tank installation indicated on USCG Dwg. No. 82 WPB-4801-4 Rev. J, "Secondary Drainage System Alterations Fleet" is scheduled for accomplishment in October, 1976, at the USCG base on Governor's Island in New York City. The Stowage Area up forward under the Crew's Berthing Space is the designated location for the CHT. It was originally assigned for stowage of Engine Room stores but due to dampness in the space, nothing is kept there. Access is only by means of a circular thin manhole plate screwed in place in the Crew's Berthing Space. Inspection indicated that there is just about room to accomplish installation of the CHT and sewage pump shown on the aforementioned drainage drawing.

There is no sanitary flushing water system per se. Each of the waterclosets is fitted with a small electric motor driven pump in its base. A suction line is led from the sea to pump, and each W.C. drains separately by gravity overboard.

Fresh water is stored in a structural tank built into the aft hold (C-201-A). One (1) motor-driven fresh water pump (no hydropneumatic tank) supplies the vessel. The tank has one access manhole port and starboard in its lower vertical aft side.

There is no salt water service system. Machinery components have their own cooling water pumps. The firemain is a dry main system. When water is needed on deck the pump is started up and turned off when no longer needed. If there is no flow overboard the unit has a tendency to overheat since there is no overboard bypass. All fire system piping and equipment components are located in the Engine Room, with risers going to each fire station.

The propulsion engines are started hydraulically. There are no engine starting or ship's service compressed air systems. The air operated ship's horn has its own self-contained compressed air system. Use for other purposes is impossible.

Diesel fuel is gravitated from the fuel storage tanks in the wings to the propulsion engine day tank. There is no fuel oil transfer pump.

There is no mechanical ventilation system serving the hold aft nor the Lazarette. Each space is ventilated by natural supply and natural exhaust via goosenecks on the Main Deck which forms the compartment overheads.

Electrical power is furnished by two (2) 20 KW diesel generator sets. Present daily electrical power consumption is about 4 KW; therefore one unit is a complete standby.

The Hold aft (C-201-A) and the Lazarette (C-202-A) just aft of it are about the only spaces available for stowage of repair parts and consumables, towing line, fenders, injured patient litter transport basket (Stokes Litter) and miscellaneous items for daily use. At present the Hold aft does not have shelving installed, but the vertical supports are fitted. Engine Room stores and repair parts are presently located in the Lazarette. About one-half of the Lazarette is allocated to the ship's steering components.

There are no ballasting provisions. Since this is a comparatively small vessel it is sensitive to rough seas. The stern will occasionally lift out of the water causing vibrations from the propellers and then will slam down causing additional vibration.

All diesel engines exhaust aft through the Hold and Lazarette and out the transom stern. The lines pass along the ship's side port and starboard symmetrically.

The ship has provisions for towing; therefore there are no projections above the height of the tow railing aft (about 38 inches above the Main Deck) and the deck area is kept free for operations. A towing bit is fitted on a combination kingpost and heating boiler stack on the centerline amidships. The towing line stowage reel is fitted in the Hold aft (C-201-A). Its size precludes the possibility of its location anywhere else.

VESSEL RESOURCES

Vessel: POINT HERRON (WPB - 82318) - Point (82') C Class

1. Fresh Water
   a. Source of supply (i.e., storage tank, evaporator) Supplied from off shore source to storage tank
   b. Capacity (# of gals, etc.) Tank capacity - 1385 gals.
   c. Usage rate (# of gpd, etc.) Approx. 100-150 gals. per day

2. Fuel Oil
   a. Tank capacity (# of gals) 2000 gals.
   b. Usage rate (gpd, etc.) Underway - 100-150 gals. per day
      In Port - Winter - 12 gals. per day Summer - 7 gals per day

3. Electric Power
   a. Capacity kw (2) 20 kw Diesel Generators
   b. Usage rate (when) Underway - Constant
   c. Maximum kw used All electrical systems can operate off one (1) generator
   d. Average kwh per day 4 kwh per day

4. Compressed Air
   a. Capacity 135-150 psi - Used only for air horn
      Pressure switch cuts in at 120 psi - cuts out at 150 psi.
   b. Usage rate Constant when air horn is in use
   c. No. of hours compressors ran per day or percentage of time 15% of day in normal weather
      Constantly in foggy weather

5. Capacity of Ventilation Air in CFM
   a. Size of fan Officer in charge stateroom - 60 CFM: Crew's Mess - 120 CFM: Petty Officer Berthing - 30 CFM: Crew's Berthing - 60 CFM
      Galley = Supply Vent 450 CFM Exhaust Vent - 150 CFM: Engine Room = Supply - High Speed 2800 CFM: 2 Sys.:
      2 Sys: Wheel House Window Defroster - High Speed - 40 CFM Low Speed - 20 CFM: Wheel House Console Fan for
      Electronic Equipment - 450 CFM

LOCATION OF BLACK WATER* WASTE SOURCES ABOARD A VESSEL

Vessel: POINT HERRON (WPB - 82318) - Point (82') C Class

Bulkhead Identification Frame #/To #	Level Identification	Compartment Location	Compartment Name	Number of Water Closets	Number of Urinals	Estimate of Number of People Served	Comments
30-40	1	P	C.O. and E.O. Toilet	1	0	2-3	
6-20	2	S	Crew's Head WC	1	0	6	

* Sewage (output from commodes and urinals) and garbage grinder slurry.

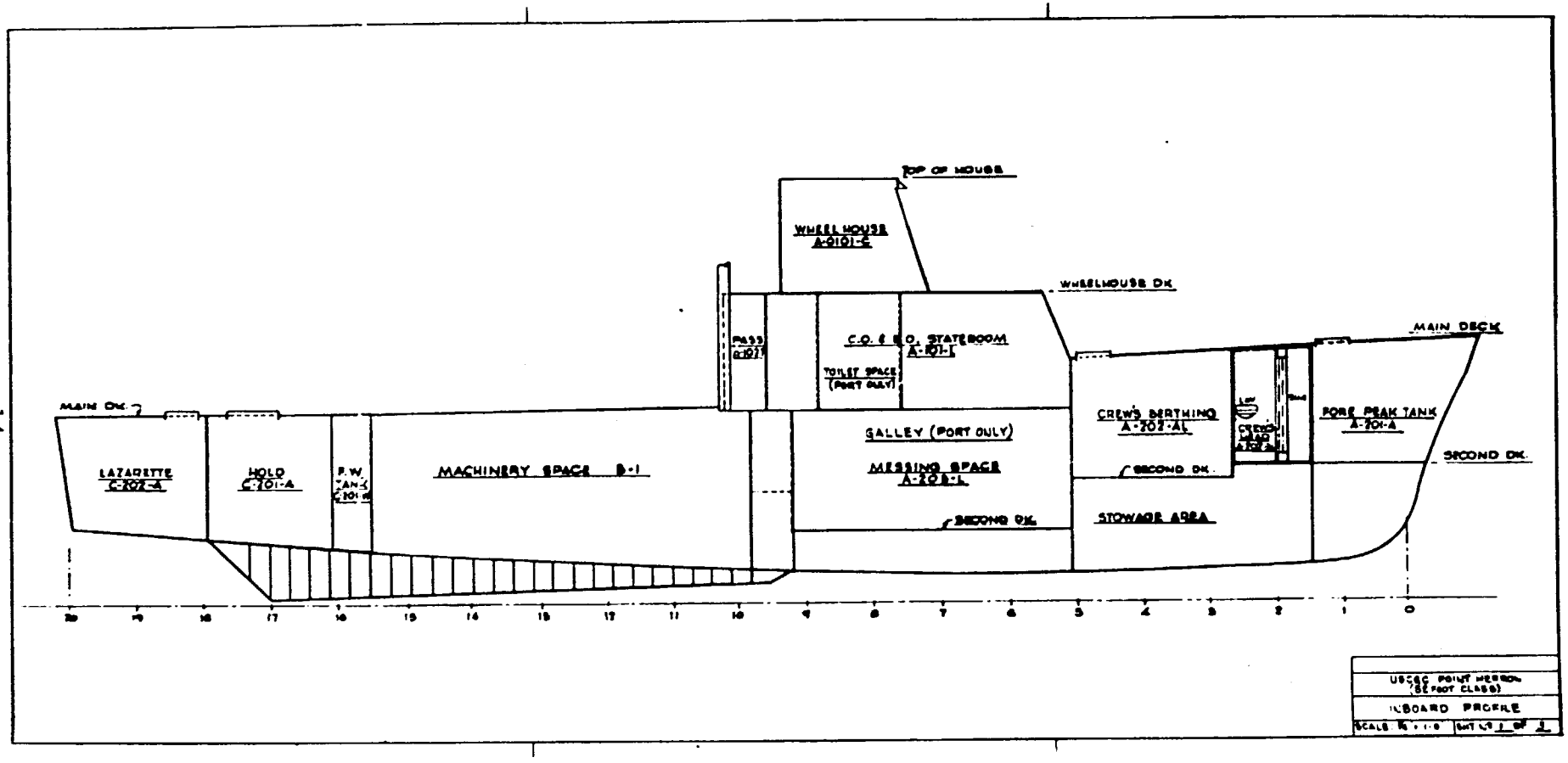
LOCATION OF GRAY WATER* WASTE SOURCES ABOARD A VESSEL

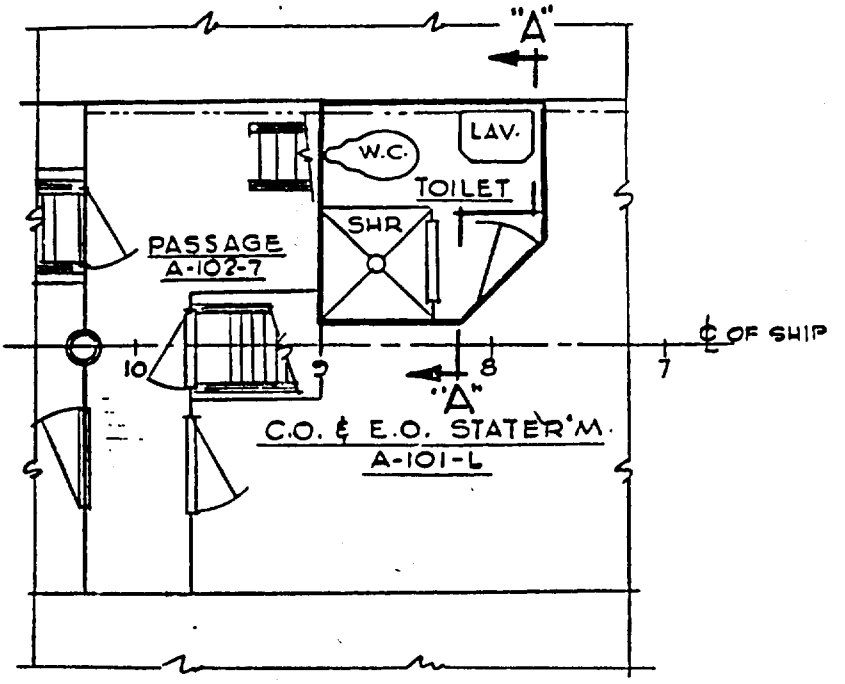
Vessel: POINT HERRON (WPB - 82318) - Point (82') C Class

Bulhead Identification Frame #/To #	Level Identification	Compartment Location	Compartment Name	Waste Source	Comments
30-40	1	P	C.O. and E.O. Toilet	Shower (1)	
30-40	1	P	C.O. and E.O. Toilet	Lavatory (1)	
6-20	2	CL	Crew's Head	Shower (1)	
6-20	2	P	Crew's Head	Lavatory (1)	
20-35	2	P	Galley	Double Sink	

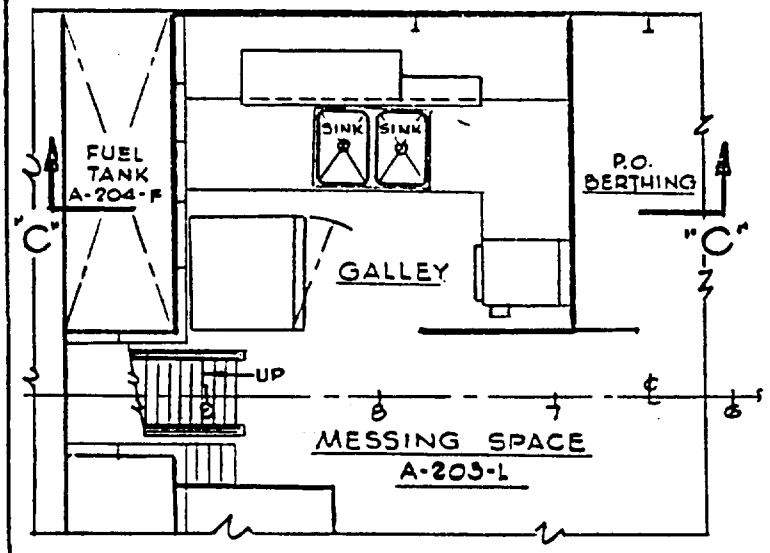
* Galley and turbid wastewater.

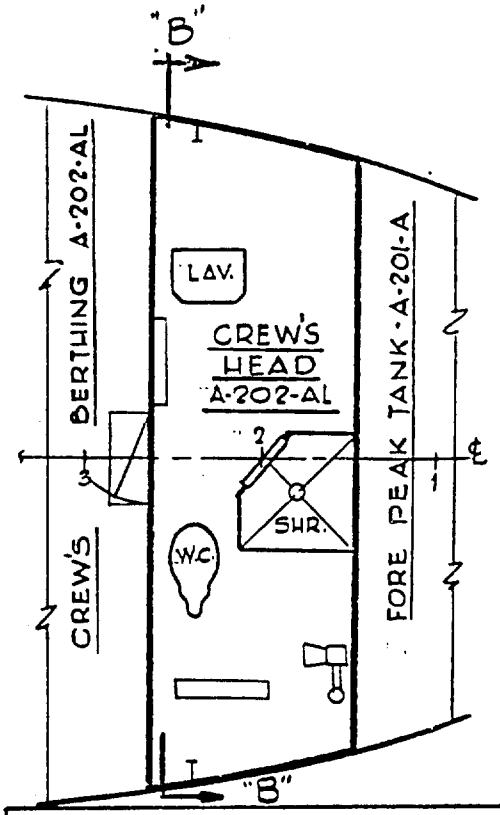
ARRANGEMENT OF BLACK AND GRAY WASTEWATER SOURCES





MAIN DECK
C.O. & E.O. STATEROOM
1/4" = 1'-0"

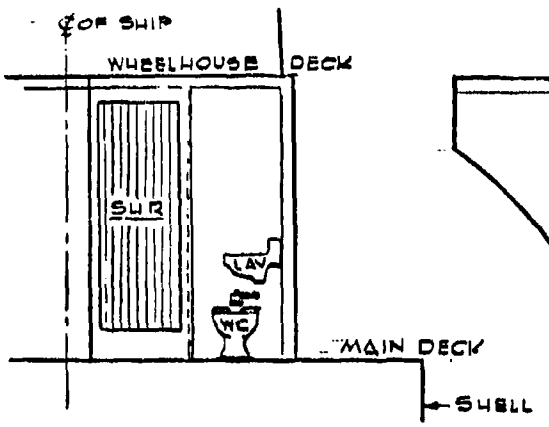




SECOND DECK
GALLEY & CREWS HEAD
1/4" = 1'-0"

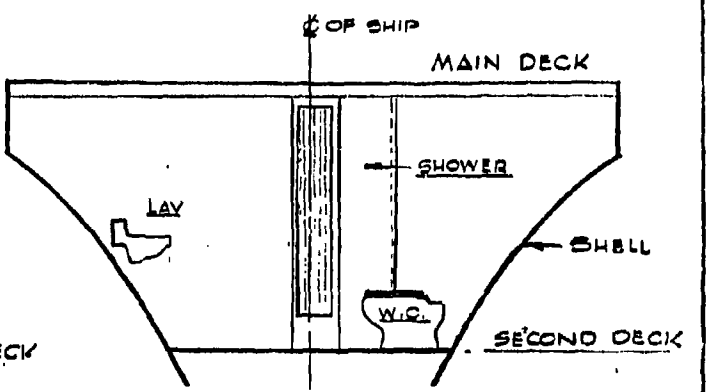
NOTE: FOR SECTIONS "A-A", "B-B" & "C-C" SEE PAGE _____

USCGC POINT HERRON
(82 FOOT CLASS)
C.O. & E.O. STATEROOM
GALLEY & CREWS HEAD
SCALE 1/4" = 1'-0" | SHT Nº 2 OF 3



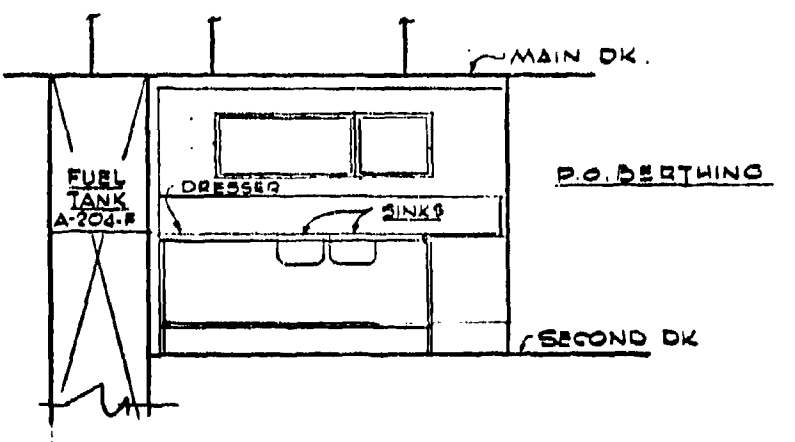
SECTION "A-A"

TOILET · C.O. & E.O. STATERM
A-101-L



SECTION "B-B"

CREW'S HEAD
A-202-AL



SECTION "C-C"

GALLEY

USCGC POINT HERRON (82 FOOT CLASS)
SECTIONS
SCALE 1/4"=1'-0" | SHT Nº 3 OF 3

WMS EQUIPMENT REQUIREMENTS

Vessel POINT HERRON (82')

WMS NUMBER	WMS ACCEPTABILITY: For Installation (Yes/No)	Holding Time (%): Black	Holding Time (%): Gray	Safety (Yes/No) (1)	NUMBER OF FIXTURES: Commodes (2)	NUMBER OF FIXTURES: Urinals (3)	JERED: NUMBER OF VCT's (Sized By Gallons): Small Boat 30	Small Boat 60	Large Boat 120	Large Boat 200	Large Boat 250	JERED: NUMBER OF INCINERATORS: Jered	Thiokol	GATX: Number of M/E Pumps	NUMBER OF EVAPORATORS (Sized By Gallons): 20	40	60	80	GATX: Number of Vacuum Treatment Sections	GATX: Number of Treatment Subsystems	GRUMMAN: Number of Thiokol Incinerators	CHRYSLER: COLLECTION AND RECIRCUL. SUBSYSTEM: Number of Separator Tanks Model A	Model A/B	Model B	Number of P&FM Packages Model A	Model B	CHRYSLER: INCINERATOR SUBSYSTEM: Number of Sludge Surge Tanks Model B	Model C	Number of Incinerators Model A	Model C	TANKS (4): BLACK (Gallons Each Tank)	TANKS (4): GRAY (Gallons Each Tank)
1	Yes	58	0	Yes	2S	0																											242B	0
2	No																																	
3	No																																	
4	No																																	
5	No																																	
6	No																																	
7	No																																	
8	No																																	
9a	Yes	100	20	Yes	2J	0S/1J	1																										105B	242B
10	No																																	
11	Yes	100	20	Yes	2J	0S/1J	1									1			1														0	242B
12	No																																	
13	No																																	
14	Yes	100	20	Yes	2G	0								2																			134B	242B
15	No																																	
16	Yes	100	20	Yes	2G	0								2		1			1														0	242B
17	No																																	
18	No																																	

WMS = Wastewater Management System
P&FM = Pressurization and Fluid Maintenance
(1) Does WMS meet all applicable safety standards?
(2) Letter following entered number means: S = Standard, J = JERED, G = GATX
(3) Letters following entered numbers mean: S = Standard urinal only, S/J = Standard urinals with indicated number of Jered urinal discharge valves, S/G = Standard urinals with indicated number of GATX flushometers.
(4) Letter following entered gallonage denotes tank usage: A = Influent Surge, B = Wastewater holding, C = Sludge holding, D = Intermediate tank not supplied with MSD.

WMS No.	1	9	14
Tank Height	2'-10"	2'-6"	3'-0"

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 1 Full Volume Flush Gravity Collection/Holding Tank for Black Water/Holding Tank for Gray Water

	Required
Sewage Holding Tank	416 gal. (56 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sewage Holding Tank Overboard Discharge Pump	Two (2)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

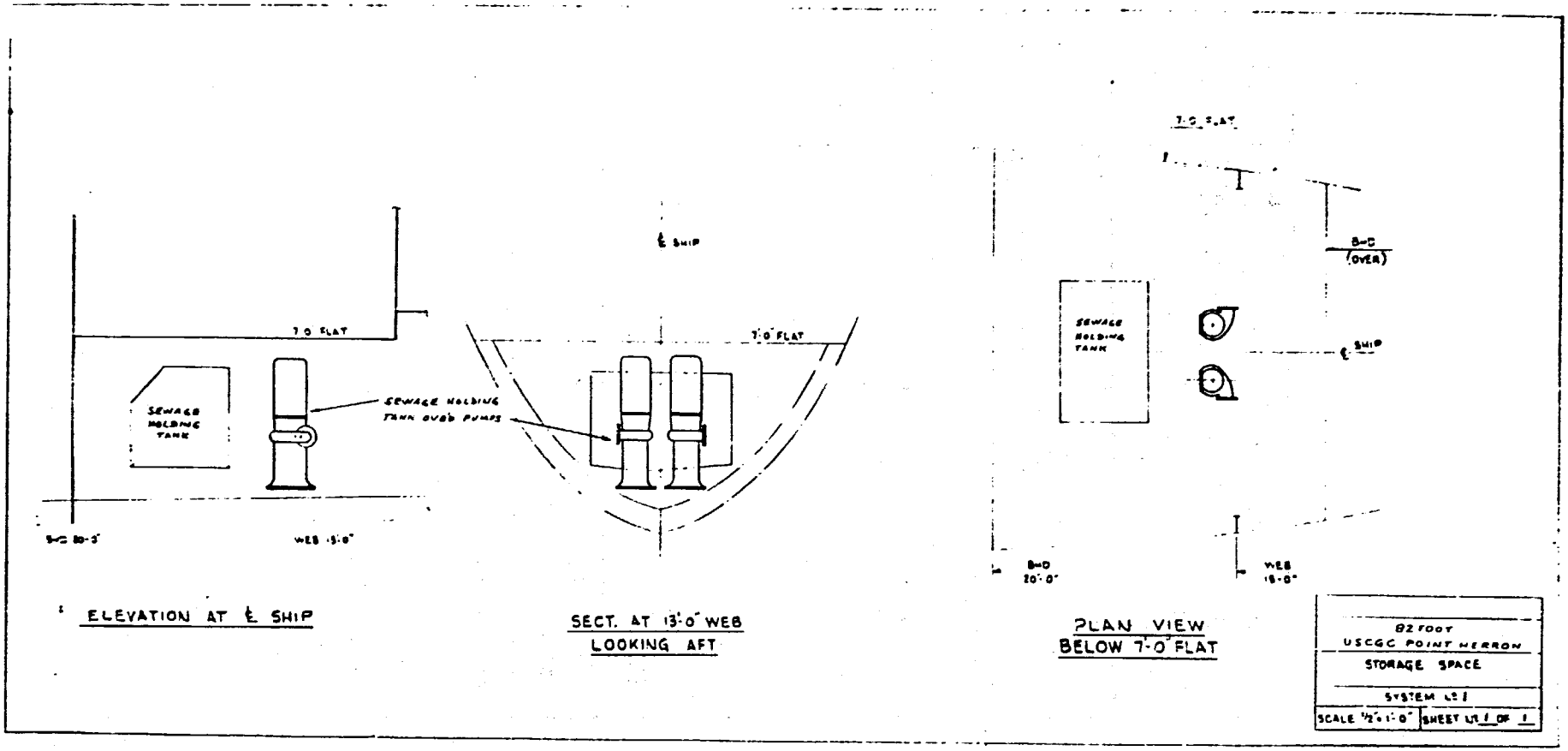
The system is considered to be a viable candidate subject to certain limitations.

Based on the expectation that the CHT installation shipalt indicated on USCG Dwg. No. 82 WPB 4801-4 Rev. J will be accomplished in the near future, sewage retention will be limited to the capacity of that tank (approx. 242 gallons). No galley/turbid holding tank can be fitted for gravity drainage due to extreme space limitations. However, G/T drains can gravitate overboard in unrestricted waters and to the sewage holding tank otherwise. It is anticipated that the secondary drainage system alterations accomplished under the aforementioned drawing will form the basis for reuse to complete the subject waste management system.

It should be noted that there is no sanitary sea water flushing system per se at present. It is also anticipated that the shipalt will provide this. (See shipcheck notes at the beginning of this section.)

There is no ship's service compressed air system fitted; therefore aeration of the CHT will require installation of a new compressor and tank.

PROPOSED WMS EQUIPMENT ARRANGEMENT



WMS INSTALLATION COST ESTIMATES

Vessel POINT HERRON (82')

WMS No. 1

Installation Cost Element		Unit	Assumed Unit Cost	Quantity Required (estimated number of units)	Cost ($)
Piping[1]		Pounds	$ 4.50/Lb. (Materials and Labor)	190[2]	855
Tank Steel[3]		Pounds	$ .55/Lb. (Materials and Labor)	785[4]	432
Foundations		Pounds	$ .92/Lb. (Materials and Labor)	340[5]	313
Electric Cables		Feet	$ 2.00/Ft. (Materials and Labor)	150	300
Miscellaneous Installations (pumps, motors, skid-mounted components, etc.)		Man-Hours	$15.00/MH (Labor)	20	300
Access Cuts (in hull, deck plating or bulkhead to provide passageway)		Feet	$ 1.00/Ft. (Labor)	25	25
Welding		Feet	$ 6.00/Ft. (Materials and Labor)	30	180
Removals	Cutting	Hours	$50.00/Hr.[6] (Labor)		
	Other (miscellaneous handling)	Man-Hours	$15.00/MH (Labor)		
Total Installation Cost ($)					2,405

(1) Copper-nickel assumed.
(2) Estimate includes a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.
(3) One-quarter inch plate assumed.
(4) Estimate includes a factor of 30% added to allow for required structural stiffening for proper support.
(5) Estimated on the basis of 10% of the weight which has to be supported.
(6) Based on an assumed cutting rate of 50 ft./hr.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 2 Full Volume Flush Oil Recirculation and Gravity Collection/ Chrysler System with Sludge Holding Tank for Sewage/Holding Tank for Gray Water

	Required
Sewage Holding Tank	78 gal. (10 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Chrysler Model and Quantity	One (1)-A
Sewage Holding Tank Overboard Discharge Pump	Two (2)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

This system is not considered to be a viable candidate.

There is insufficient space available to permit gravity drainage of sewage to the Chrysler separation tank. Generally the vessels compartmentation sizing and arrangement do not permit a functional arrangement for the Chrysler components.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 3 Full Volume Flush Oil Recirculation and Gravity Collection/ Chrysler System with Incinerator for Sewage/Holding Tank for Gray Water

	Required
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sludge Ejection Tank	20 gal. (2.7 cu. ft.)
Chrysler Model and Quantity	One (1)-A
Incinerator Model and Quantity	One (1)-A
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)
Sludge Ejection Tank Overboard Discharge Pump	One (1)

Discussion

This system is not considered to be a viable candidate.

As in the case of System No. 2 the principal problem is space unavailability for the Chrysler components due to physical sizes.

It has further been ascertained that it would be impossible to provide the incinerator stack run anticipated in the preliminary installation analysis due to extremely limited space and inability to modify the existing boiler stack/kingpost installation.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 4 **Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Holding Tank for Black Water/ Holding Tank for Gray Water**

	Required
Sanitary Influent Surge Tank	42 gal. (5.5 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sludge Holding Tank	25 gal. (4.6 cu. ft.)
Grumman Unit	One (1)
Sanitary Infuluent Surge Tank Overboard Discharge Pump	Two (2)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)
Sludge Holding Tank Transfer Pump	One (1)

Discussion

This system is not considered to be a viable candidate.

There is insufficient space available in any direction (especially the height) for the installation of the Grumman structure and components in the aft hold. There is no other space available.

The fresh water tank was found to be structural and there is no suitable alternative area for a relocation.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 5 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Holding Tank for Combined Black and Gray Waters

	Required
Influent Surge Tank	165 gal. (22 cu. ft.)
Sludge Holding Tank	134 gal. (18 cu. ft.)
Grumman Unit	One (1)
Influent Surge Tank Overboard Discharge Pump	Two (2)
Sludge Holding Tank Transfer Pump	One (1)

Discussion

The system is not considered to be a viable candidate.

As in the case of System No. 4, it was found that there is insufficient space available for the installation of the Grumman WMS structure and components due to physical size.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 6 Full Volume Flush Gravity Collection/Holding Tank for Black Water/Grumman Flow Through System with Sludge Holding Tank for Gray Water

	Required
G/T Influent Surge Tank	123 gal. (16 cu. ft.)
Sewage Holding Tank	416 gal. (56 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Optional Combined Sewage/ Sludge Holding Tank	515 gal. (69 cu. ft.)
Grumman Unit	One (1)
Sewage Holding Tank Overboard Discharge Pump	Two (2)
Sludge Holding Tank Transfer Pump	One (1)

Discussion

The system is not considered to be a viable candidate.

As in the cases of System Nos. 4 and 5, there is insufficient space available for installation of the Grumman WMS structure and its components due to physical size.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 7 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Incinerator for Black Water/Holding Tank for Gray Water

	Required
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sewage Influent Surge Tank	42 gal. (5.5 cu. ft.)
Fuel Oil Day Tank	25 gal. (3.3 cu. ft.)
Grumman Units	One (1)
Incinerator	One (1) Thiokol
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)
Sewage Influent Surge Tank Overboard Discharge Pump	Two (2)

Discussion

The system is not considered to be a viable candidate.

As in the cases of System Nos. 4, 5 and 6, there is insufficient space available for installation of the Grumman WMS structure and components due to physical size. In addition, the installation of an incinerator stack was found to be impracticable.

The fresh water tank was found to be structural and no other space is available to accommodate any contemplated relocation.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 8 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Incinerator for Combined Black and Gray Waters

	Required
Influent Surge Tank	165 gal. (22 cu. ft.)
Fuel Oil Day Tank	25 gal. (3.3 cu. ft.)
Grumman Units	One (1)
Incinerators	One (1) Thiokol
Influent Surge Tank Overboard Discharge Pump	Two (2)

Discussion

The system is not considered to be a viable candidate.

This system is very similar to System No. 7, and as in the cases of System Nos. 4, 5, 6 and 7, there is insufficient space available for installation of the Grumman WMS structure and components due to physical size. In addition, the installation of an incinerator stack and relocation of a structural fresh water tank were found to be impracticable.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 9a JERED Reduced Volume Flush Vacuum Collection/Holding Tank for Concentrated Black Water/Holding Tank for Gray Water

WMS No. 9b JERED Reduced Volume Flush Vacuum Collection/Concentrated Black Water Held in VCT Holding Tank for Gray Water

	Required
Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Sewage Holding Tank	105 gal. (13.9 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sewage Holding Tank Overboard Discharge Pump	Two (2)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

This system option is considered to be a viable candidate.

A fresh water sanitary flushing system would be required.

Due to severe space limitations the G/T holding tank would be limited to the 242 gallon size and location below the crew's berthing area discussed in System No. 1 for that system's sewage holding tank. The G/T holding tank overboard discharge pumps would be located near the tank. G/T wastes would gravitate overboard in unrestricted waters and to the G/T holding tank while in restricted waters and for pierside discharge ashore.

The sewage holding tank can be located in the port aft corner of the aft hold (C-201-A) clear of the hatch.

The vacuum collection tank and vacuum pump can be fitted just forward of the sanitary holding tank, thus locating them under the existing unit heater and clear of the port side access manhole of the fresh water tank.

The sewage holding tank overboard pumps can be fitted on the starboard side of the aft hold, just aft of the fresh water tank and clear of the other access manhole for the tank and the towing line stowage reel.

This will reduce the stowage and service capability of the space considerably.

A new air compressor and tank would have to be supplied since no compressed air is presently available.

Vessel: POINT HERRON (82')

System No. 9 (Cont'd)

Option 9b: System with Vacuum Collection/Holding of Black Water, Gravity Drainage Gray Water, Gray Water Holding Tank.

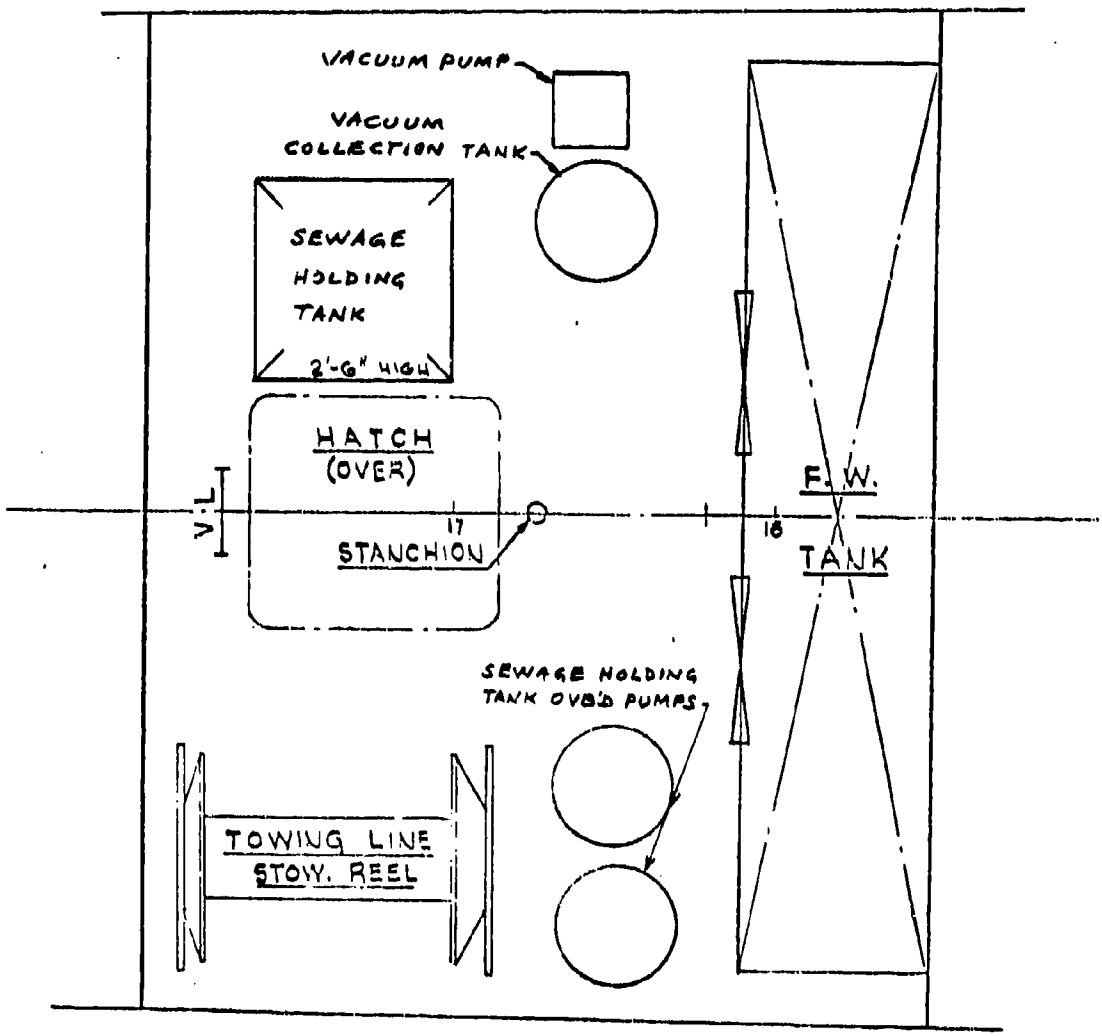
	Required
Vacuum Collection/Holding Tank	200 gal.
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

This system option is not considered to be a viable candidate.

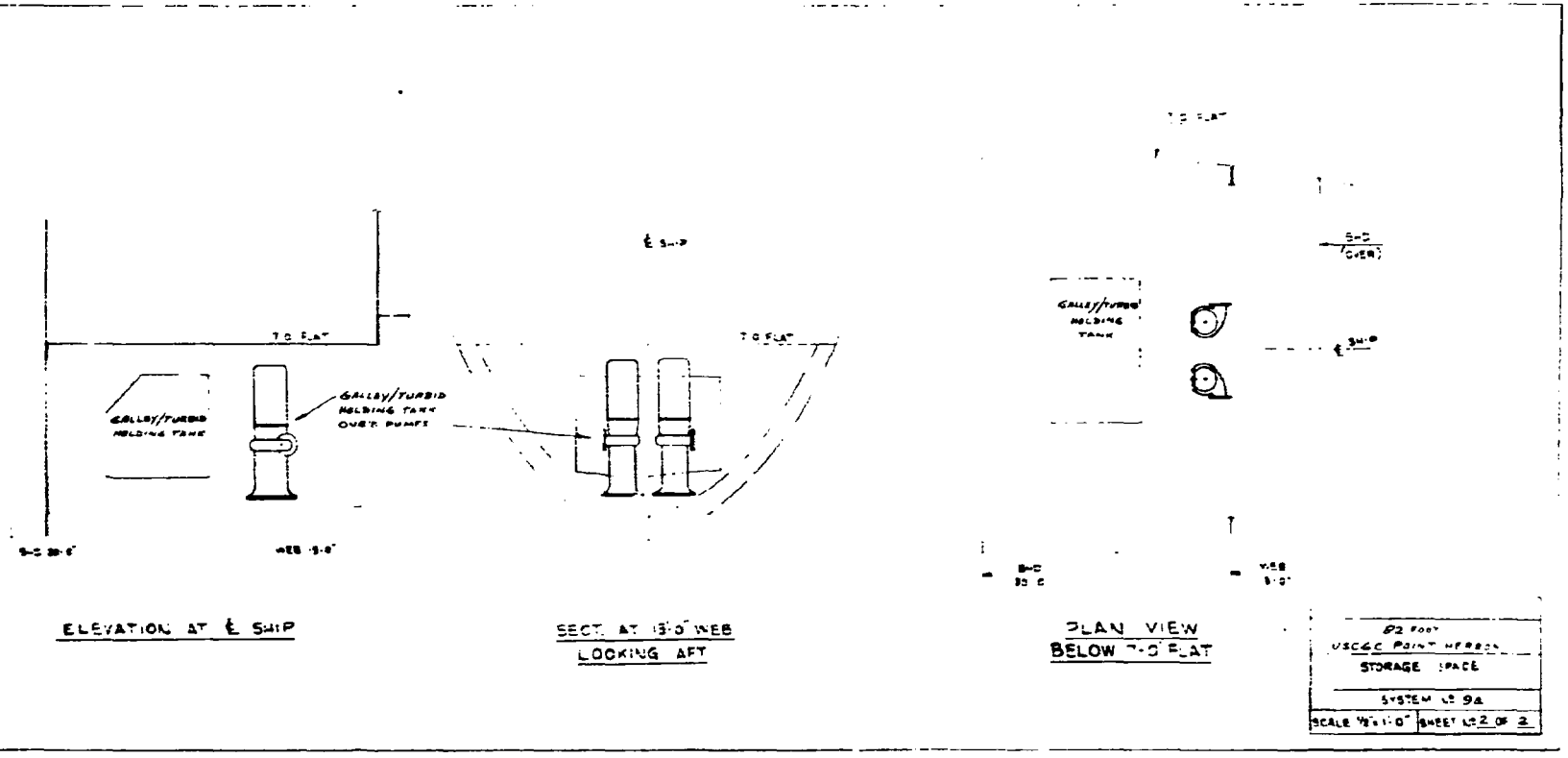
The required configuration of the combined VCT/holding tank cannot be accommodated in the space available.

PROPOSED WMS EQUIPMENT ARRANGEMENT



NOTES: 1. TANK HEIGHT TAKEN FROM FLOOR PLATES.
2. PUMPS NOT TO SCALE

82FT. USCGC POINTHER WPB
HOLD C-201-A SECOND DECK - PLAN
SYSTEM NO. 9a
SCALE: 1/2"=1-0 | SHEET NO. 1 OF 2



ELEVATION AT ℄ SHIP

SECT. AT 13'-0" WEB
LOOKING AFT

PLAN VIEW
BELOW T.O. FLAT

82 FOOT
USCGC POINT HIGGINS
STORAGE SPACE
SYSTEM NO. 9A
SCALE 1/8"=1'-0" | SHEET NO. 2 OF 2

WMS INSTALLATION COST ESTIMATES

Vessel POINT HERRON (82')

WMS No. 9

Installation Cost Element		Unit	Assumed Unit Cost	Quantity Required (estimated number of units)	Cost ($)
Piping[1]		Pounds	$ 4.50/Lb. (Materials and Labor)	600[2]	2,700
Tank Steel[3]		Pounds	$ .55/Lb. (Materials and Labor)	1,285[4]	707
Foundations		Pounds	$ .92/Lb. (Materials and Labor)	580[5]	534
Electric Cables		Feet	$ 2.00/Ft. (Materials and Labor)	250	500
Miscellaneous Installations (pumps, motors, skid-mounted components, etc.)		Man-Hours	$15.00/MH (Labor)	35	525
Access Cuts (in hull, deck plating or bulkhead to provide passageway)		Feet	$ 1.00/Ft. (Labor)	40	40
Welding		Feet	$ 6.00/Ft. (Materials and Labor)	75	450
Removals	Cutting	Hours	$50.00/Hr.[6] (Labor)		
	Other (miscellaneous handling)	Man-Hours	$15.00/MH (Labor)		
Total Installation Cost ($)					5,456

(1) Copper-nickel assumed.
(2) Estimate includes a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.
(3) One-quarter inch plate assumed.
(4) Estimate includes a factor of 30% added to allow for required structural stiffening for proper support.
(5) Estimated on the basis of 10% of the weight which has to be supported.
(6) Based on an assumed cutting rate of 50 ft./hr.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 10 JERED Reduced Volume Flush Vacuum Collection/Incinerator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Vacuum Collection Tank	60 gal.
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Incinerator Feed Tank (Sludge)	6.5 cu. ft.
Fuel Oil Day Tank	18 gal. (2.3 cu. ft.)
Incinerator	One (1) Thiokol
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

The system is not considered to be a viable candidate.

There is insufficient space and access room in the Hold aft (C-201-A) to properly fit the vacuum collection tank, incinerator feed tank, incinerator, fuel oil day tanks and various required pumps. In addition, it appears impracticable to lead an incinerator stack to the weather, especially in the location of the present boiler stack. The VCT configuration makes it impossible also to consider fitting it up forward in the Stowage Space below the Crew's Berthing Area.

The fresh water tank in the Hold aft is built into the structure and cannot be relocated.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 11 JERED Reduced Volume Flush Vacuum Collection/GATX Evaporator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Evaporator (GATX)	One (1) - 40 gal.
Catalytic Oxidizer	One (1)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

The system is considered to be a viable candidate subject to certain limitations.

A fresh water sanitary flushing system will be required since none is fitted at present. Each existing W.C. has its own built in flush pump.

Due to severe space limitations the G/T holding tank would be limited to the 242 gallon size and location below the crew's berthing area discussed in System No. 1 for that system's sewage holding tank. The G/T holding tank overboard discharge pumps would be located near the tank. G/T wastes would gravitate overboard in unrestricted waters and to the G/T holding tank while in restricted waters and for pierside discharge ashore.

The evaporator would fit in the port aft corner of the Hold aft (C-201-A). The catalytic oxidizer and evaporator control box would be located just forward of the evaporator in the space presently occupied by the unit heater. The heater would have to be relocated to the starboard side just aft of the fresh water tank. The vacuum collection tank would be located on the starboard side just aft of the fresh water tank and clear of the tank manhole and the towing line stowage reel. Miscellaneous pumps would be fitted on the ship's centerline just aft of the fresh water tank.

This arrangement will eliminate the availability of shelving space in the Hold.

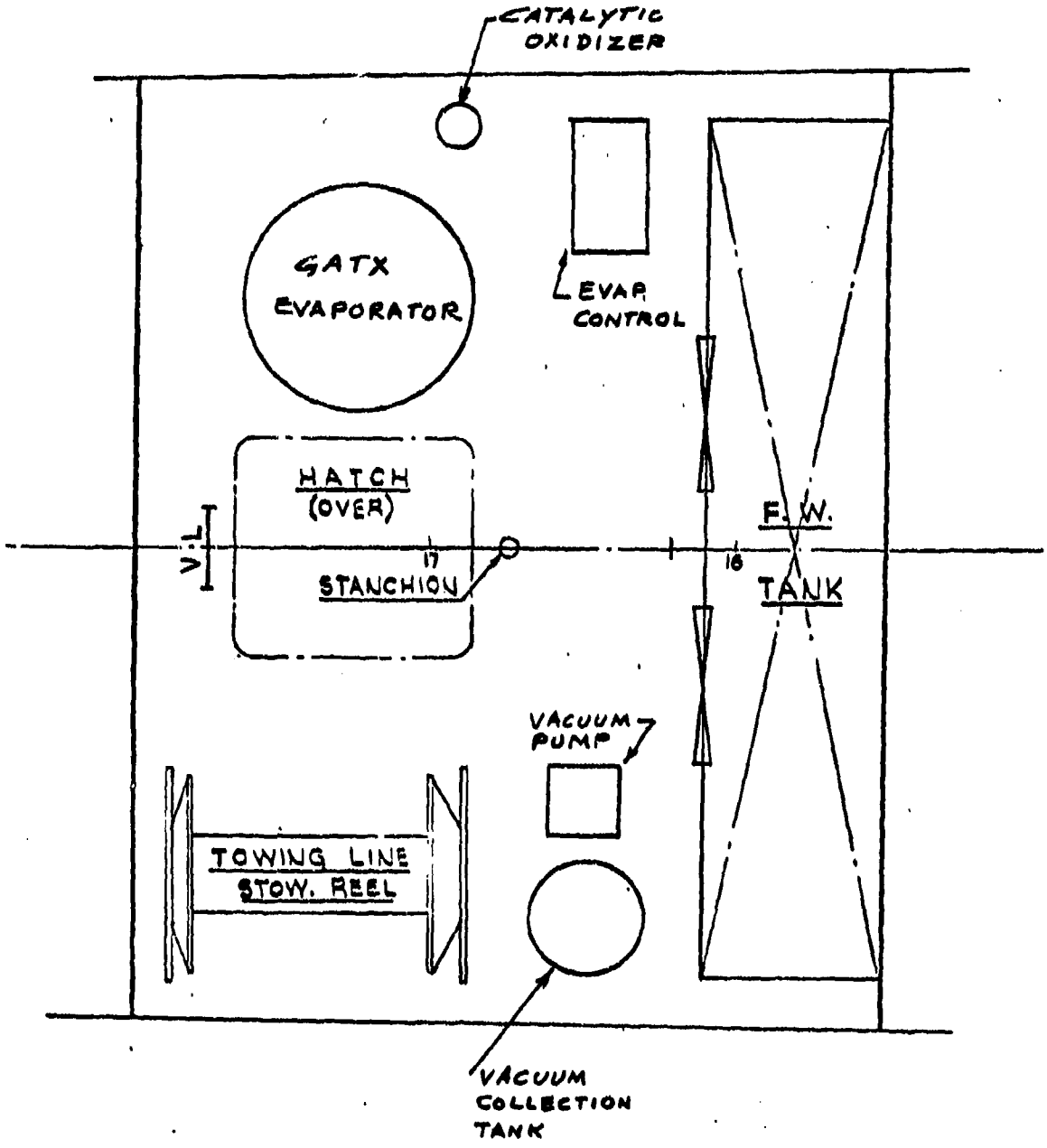
It should be noted that space for piping the evaporator and oxidizer area is rather limited. There is about 2'-6" above the evaporator and about 18 inches on the aft and outboard sides.

Since none is available on the vessel, a supply of compressed air will be required for the catalytic oxidizer. Flush-out water for the evaporator could be supplied from the present fresh water system.

The evaporator diameter makes it marginal for fitting down the present hatch opening.

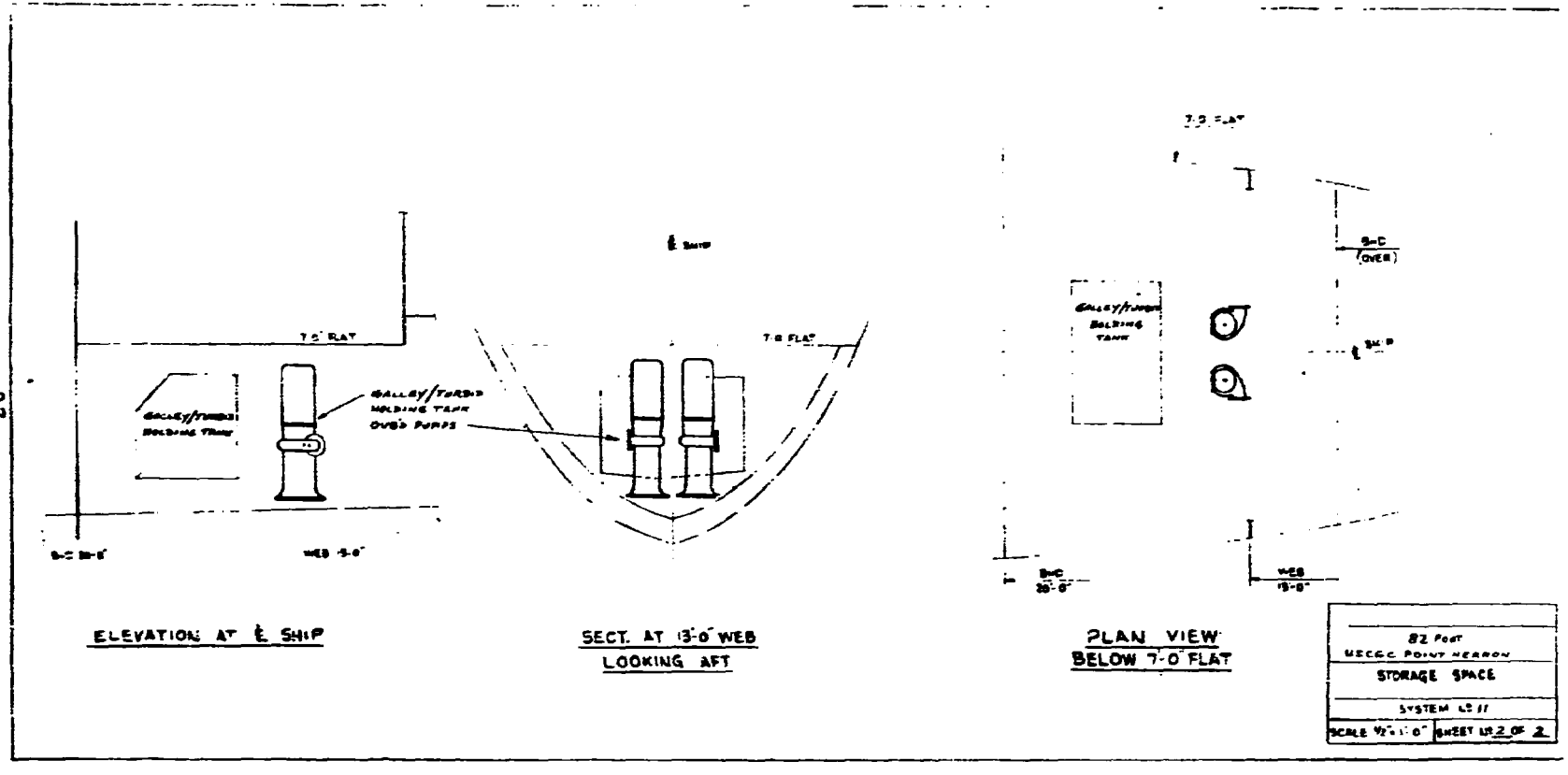
The space will require better ventilation to keep the ambient temperature down.

PROPOSED WMS EQUIPMENT ARRANGEMENT



NOTES : 1. TANK HEIGHT TAKEN FROM FLOOR PLATES
2. PUMPS NOT TO SCALE

82FT. USCGC POINT HERRON
HOLD C-201-A
SECOND DECK - PLAN
SYSTEM NO. II
SCALE: 1/2" = 1'-0" | SHEET NO. 1 OF 2



ELEVATION AT ℄ SHIP

SECT. AT 13'-0" WEB
LOOKING AFT

PLAN VIEW
BELOW 7'-0" FLAT

82 FOOT
USCGC POINT HERRON
STORAGE SPACE
SYSTEM LD 11
SCALE 1/2"=1'-0" SHEET NO 2 OF 2

WMS INSTALLATION COST ESTIMATES

Vessel POINT HERRON (82')

WMS No. 11

Installation Cost Element		Unit	Assumed Unit Cost	Quantity Required (estimated number of units)	Cost ($)
Piping[1]		Pounds	$ 4.50/Lb. (Materials and Labor)	525 [2]	2,363
Tank Steel[3]		Pounds	$ .55/Lb. (Materials and Labor)	785 [4]	432
Foundations		Pounds	$ .92/Lb. (Materials and Labor)	460 [5]	424
Electric Cables		Feet	$ 2.00/Ft. (Materials and Labor)	225	450
Miscellaneous Installations (pumps, motors, skid-mounted components, etc.)		Man-Hours	$15.00/MH (Labor)	35	525
Access Cuts (in hull, deck plating or bulkhead to provide passageway)		Feet	$ 1.00/Ft. (Labor)	40	40
Welding		Feet	$ 6.00/Ft. (Materials and Labor)	75	450
Removals	Cutting	Hours	$50.00/Hr. [6] (Labor)		
	Other (miscellaneous handling)	Man-Hours	$15.00/MH (Labor)		
Total Installation Cost ($)					4,684

(1) Copper-nickel assumed.
(2) Estimate includes a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.
(3) One-quarter inch plate assumed.
(4) Estimate includes a factor of 30% added to allow for required structural stiffening for proper support.
(5) Estimated on the basis of 10% of the weight which has to be supported.
(6) Based on an assumed cutting rate of 50 ft./hr.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 12 JERED Reduced Volume Flush Vacuum Collection/Holding Tank for Concentrated Black Water/Grumman Flow Through System with Sludge Holding Tank for Gray Water

WMS No. 12b JERED Reduced Volume Flush Vacuum Collection/Concentrated Black Water Held in VCT/Grumman Flow Through System with Sludge Holding Tank for Gray Water

	Required
G/T Influent Surge Tank	123 gal. (16 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Sewage Vacuum Collection Tank	30 gal. (4.4 cu.ft.)
Sewage Holding Tank	105 gal. (13.9 cu. ft.)
Grumman Unit	One (1)
Sewage Holding Tank Overboard Discharge Pump	Two (2)

Discussion

This system option is not considered to be a viable candidate.

Due to severe space limitations the G/T holding tank would be limited to the 242 gallon size and location below the crew's berthing area discussed in System No. 1 for that system's sewage holding tank. The G/T holding tank overboard discharge pumps would be located near the tank. G/T wastes would gravitate overboard in unrestricted waters and to the G/T holding tank while in restricted waters and for pierside discharge ashore.

For the reason of insufficient space availability due to physical size as indicated for System Nos. 4, 5, 6, 7 and 8, the Grumman structure and associated components cannot be fitted. The remaining tanks and pumps also cannot be fitted in the Hold due to lack of proper space for accessibility and operation.

The fresh water tank is a structural tank and it cannot be relocated anywhere else.

There is no compressed air system available.

Vessel: POINT HERRON (82')

System No. 12 (Cont'd)

Option 12b: Vacuum Collection/Holding of Black Water. Gravity Drainage of Galley and Turbid Wastes to Flow Through System. Sanitary and Sludge to Holding Tank(s).

	Required
G/T Influent Surge Tank	123 gal. (16 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Sewage Vacuum Collection Tank	200 gal.
Grumman Unit	One (1)

Discussion

This system option is not considered to be a viable candidate.

The combination of the vacuum collection and sewage holding tanks in one unit does not alter the reasons for rejection as indicated for Option 12a.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 13 JERED Reduced Volume Flush Vacuum Collection/Grumman Flow Through System for Gray Water/Incinerator for both Concentrated Black Water and Gray Water Sludge

	Required
Galley/Turbid Surge Tank	123 gal. (16 cu. ft.)
Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Fuel Oil Day Tank	15 gal. (2 cu. ft.)
Grumman Unit	One (1)
Incinerator	One (1) Thiokol
Galley/Turbid Surge Tank Overboard Discharge Pump	One (1)

Discussion

The system is not considered to be a viable candidate.

Due to severe space limitations the G/T holding tank would be limited to the 242 gallon size and location below the crew's berthing area discussed in System No. 1 for that system's sewage holding tank. The G/T holding tank overboard discharge pumps would be located near the tank. G/T wastes would gravitate overboard in unrestricted waters and to the G/T holding tank while in restricted waters and for pierside discharge ashore.

The installation of the Grumman WMS is not possible due to insufficient space availability due to its physical size in the Hold aft as discussed for System Nos. 4, 5, 6, 7, 8, and 12 which are similar in this regard. Further, it appears impracticable to lead an incinerator stack to the weather especially in the vicinity of the existing boiler stack/kingpost. No other consideration is possible.

The fresh water tank is structural and cannot be relocated.

There is no compressed air system available.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 14 GATX Reduced Volume Flush M/T Pump Collection/Holding Tank for Concentrated Black Water/Holding Tank for Gray Water

	Required
Sewage Holding Tank	134 gal. (18 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sewage Holding Tank Overboard Discharge Pump	Two (2)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

The system is considered to be a viable candidate subject to certain limitations.

A fresh water sanitary flushing system would be required.

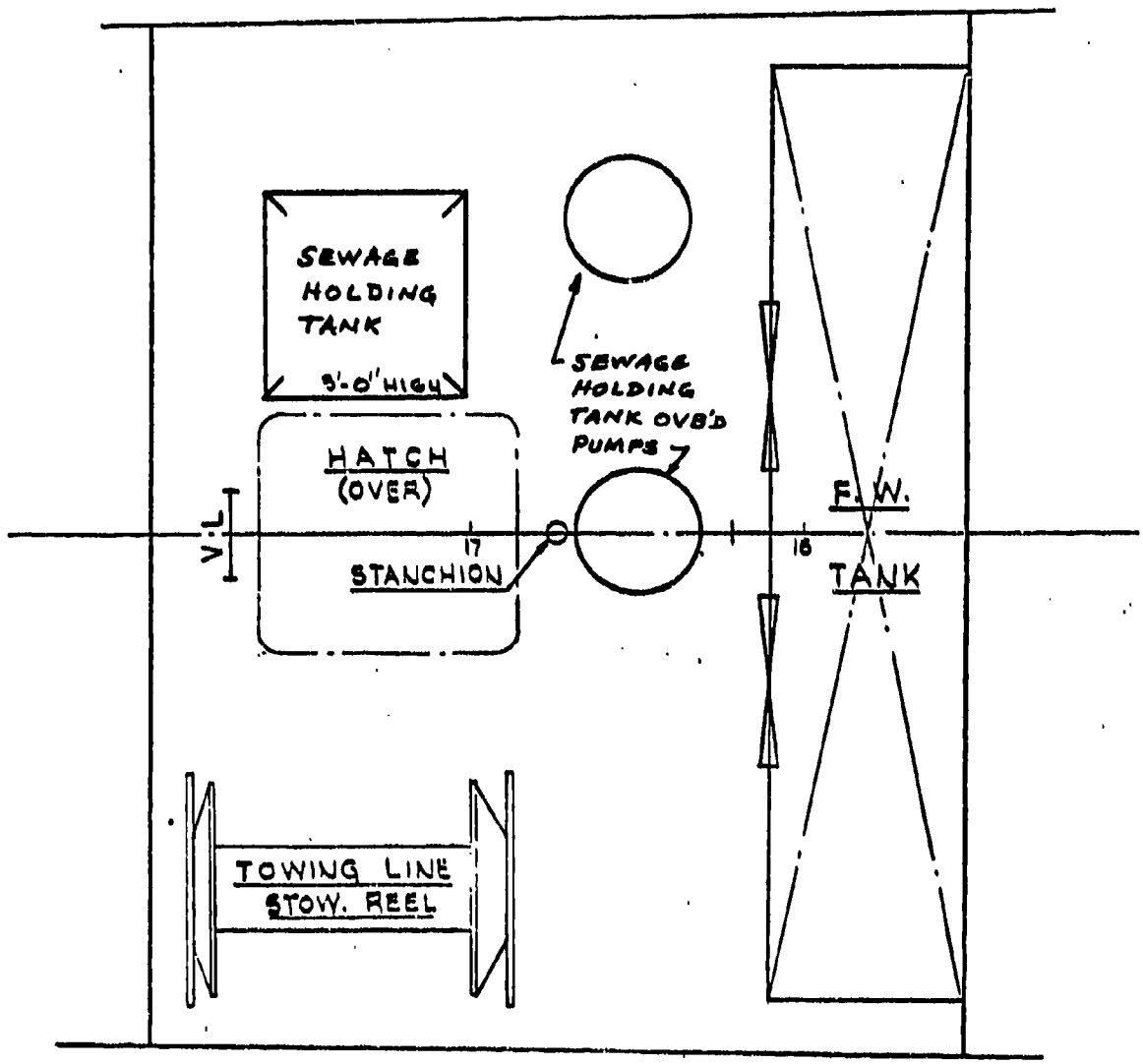
Due to severe space limitations the G/T holding tank would be limited to the 242 gallon size and location below the crew's berthing area discussed in System No. 1 for that system's sewage holding tank. The G/T holding tank overboard discharge pumps would be located near the tank. G/T wastes would gravitate overboard in unrestricted waters and to the G/T holding tank while in restricted waters and for pierside discharge ashore.

The sewage holding tank would be located in the port aft corner of the aft hold (C-201-A), and the sewage overboard pumps just forward of the holding tank but clear of the port manhole of the fresh water tank.

It should be noted that this arrangement will require piping all the black water to the aft Hold and then all forward due to the overboard and pier connection requirements. The overboard and pier connections will probably have been installed as part of the secondary drainage system alteration mentioned in the existing arrangement discussion at the beginning of this section.

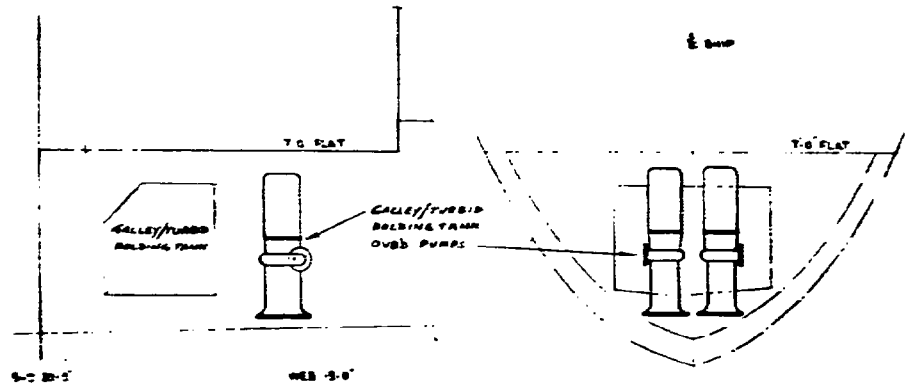
This system will require installation of an air compressor and tank since no ship's service air is available.

The Hold will require better ventilation than the present natural supply and exhaust goosenecks.



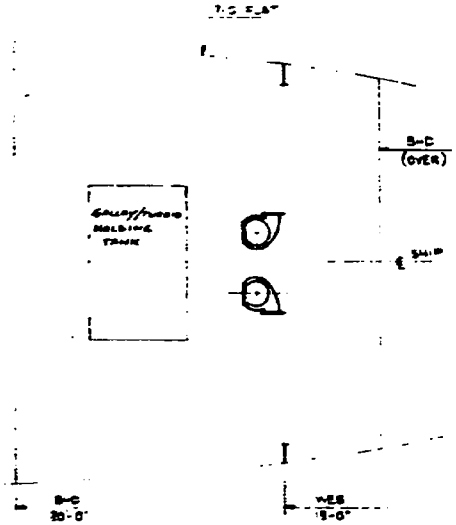
NOTES:
1. TANK HEIGHT TAKEN FROM FLOOR PLATES
2. PUMPS NOT TO SCALE

82FT. USCGC POINT HERRON
HOLD C-201-A SECOND DECK - PLAN
SYSTEM NO. 14
SCALE: 1/2" = 1'-0" | SHEET NO. 1 OF 2



ELEVATION AT ℄ SHIP

SECT. AT 13'-0" WEB
LOOKING AFT



PLAN VIEW
BELOW T-O FLAT

82 FOOT USCGC POINT HERRON	
STORAGE SPACE	
SYSTEM NO. 46	
SCALE 1/2" = 1'-0"	SHEET NO. 2 OF 2

WMS INSTALLATION COST ESTIMATES

Vessel POINT HERRON (82')

WMS No. 14

Installation Cost Element	Unit	Assumed Unit Cost	Quantity Required (estimated number of units)	Cost ($)
Piping[1]	Pounds	$ 4.50/Lb. (Materials and Labor)	320[2]	1,440
Tank Steel[3]	Pounds	$ .55/Lb. (Materials and Labor)	1,320[4]	726
Foundations	Pounds	$ .92/Lb. (Materials and Labor)	565[5]	520
Electric Cables	Feet	$ 2.00/Ft. (Materials and Labor)	250	500
Miscellaneous Installations (pumps, motors, skid-mounted components, etc.)	Man-Hours	$15.00/MH (Labor)	35	525
Access Cuts (in hull, deck plating or bulkhead to provide passageway)	Feet	$ 1.00/Ft. (Labor)	40	40
Welding	Feet	$ 6.00/Ft. (Materials and Labor)	75	450
Removals: Cutting	Hours	$50.00/Hr.[6] (Labor)		
Removals: Other (miscellaneous handling)	Man-Hours	$15.00/MH (Labor)		
Total Installation Cost ($)				4,201

(1) Copper-nickel assumed.
(2) Estimate includes a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.
(3) One-quarter inch plate assumed.
(4) Estimate includes a factor of 30% added to allow for required structural stiffening for proper support.
(5) Estimated on the basis of 10% of the weight which has to be supported.
(6) Based on an assumed cutting rate of 50 ft. /hr.

Vessel: POINT HIRRON (82')

WMS No. 15 GATX Reduced Volume Flush M/T Pump Collection/Incinerator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Incinerator Feed Tank	50 gal. (6.7 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Fuel Oil Day Tank	18 gal. (2.3 cu. ft.)
Incinerator	One (1) Thiokol
Incinerator Feed Tank Overboard Discharge Pump	One (1)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

The system is not considered to be a viable candidate.

Due to severe space limitations the G/T holding tank would be limited to the 242 gallon size and location below the crew's berthing area discussed in System No. 1 for that system's sewage holding tank. The G/T holding tank overboard discharge pumps would be located near the tank. G/T wastes would gravitate overboard in unrestricted waters and to the G/T holding tank while in restricted waters and for pierside discharge ashore.

The incinerator feed tank, incinerator, blower, fuel oil day tanks, and associated pumps cannot be accommodated in the space available in the Hold aft due to physical sizes and proper access for operation. In addition it is not considered practicable due to space limitations to run an incinerator stack forward and to the weather similar to the boiler stack as indicated for similar incinerator installations investigated.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON

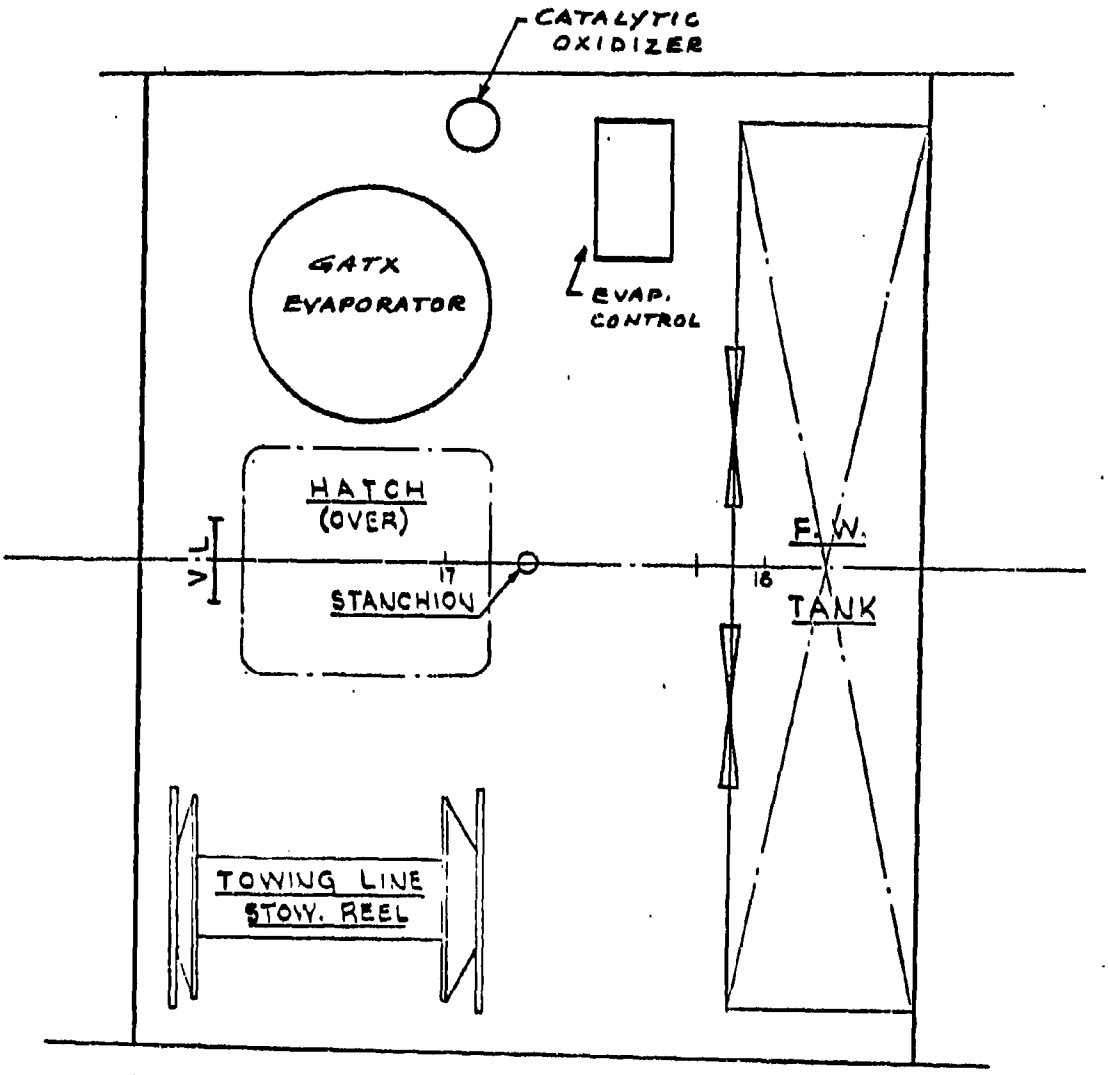
WMS No. 16 GATX Reduced Volume Flush M/T Pump Collection/GATX Evaporator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Evaporator (GATX)	One (1) - 40 gal.
Catalytic Oxidizer	One (1)
Galley/Turbid Holding Tank Overboard Discharge Pump	Two (2)

Discussion

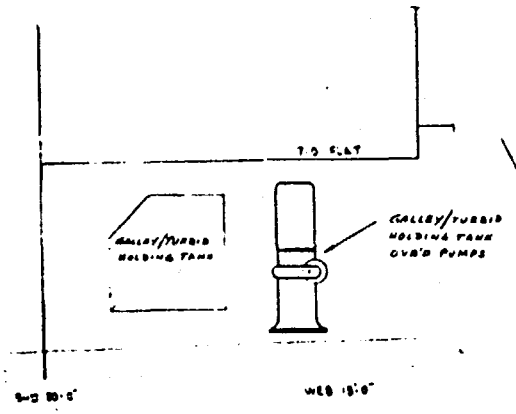
This system is considered to be a viable candidate.

This system is basically the same as System No. 11 except for the manner of collecting the black water. Therefore there is no vacuum collection tank and the remaining system components can be installed as discussed for System No. 11. The same limitations and additions apply.

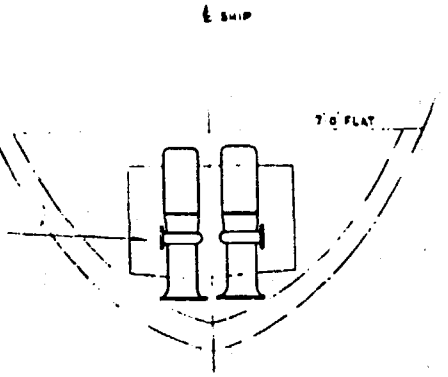


NOTES :
1. TANK HEIGHT TAKEN FROM FLOOR PLATES
2. PUMPS NOT TO SCALE

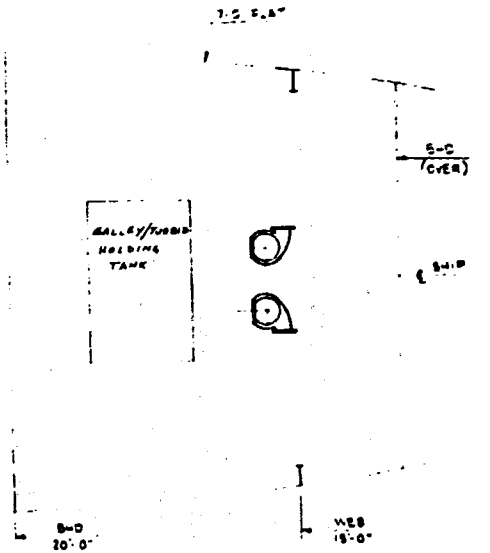
82FT. USCGC POINT HERRON
HOLD C-201-A
SECOND DECK - PLAN
SYSTEM NO. 16
SCALE: 1/2" = 1'-0" | SHEET NO. 1 OF 2



ELEVATION AT ℄ SHIP



SECT. AT 13'-0" WEB
LOOKING AFT



PLAN VIEW
BELOW 7'-0" FLAT

82 FOOT USCGC POINT HERON	
STORAGE SPACE	
SYSTEM Lt 16	
SCALE 1/2" = 1'-0"	SHEET LT 2 OF 2

WMS INSTALLATION COST ESTIMATES

Vessel POINT HERRON (82')

WMS No. 16

Installation Cost Element		Unit	Assumed Unit Cost	Quantity Required (estimated number of units)	Cost ($)
Piping[1]		Pounds	$ 4.50/Lb. (Materials and Labor)	450[2]	2,205
Tank Steel[3]		Pounds	$ .55/Lb. (Materials and Labor)	785[4]	432
Foundations		Pounds	$ .92/Lb. (Materials and Labor)	425[5]	391
Electric Cables		Feet	$ 2.00/Ft. (Materials and Labor)	250	500
Miscellaneous Installations (pumps, motors, skid-mounted components, etc.)		Man-Hours	$15.00/MH (Labor)	35	525
Access Cuts (in hull, deck plating or bulkhead to provide passageway)		Feet	$ 1.00/Ft. (Labor)	40	40
Welding		Feet	$ 6.00/Ft. (Materials and Labor)	50	300
Removals	Cutting	Hours	$50.00/Hr.[6] (Labor)		
	Other (miscellaneous handling)	Man-Hours	$15.00/MH (Labor)		
Total Installation Cost ($)					4,213

(1) Copper-nickel assumed.
(2) Estimate includes a factor of 50% added to allow for valves, flanges, fittings, take-down joints, etc.
(3) One-quarter inch plate assumed.
(4) Estimate includes a factor of 30% added to allow for required structural stiffening for proper support.
(5) Estimated on the basis of 10% of the weight which has to be supported.
(6) Based on an assumed cutting rate of 50 ft./hr.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 17 GATX Reduced Volume Flush M/T Pump Collection/Holding Tank for Concentrated Black Water/Grumman Flow Through System with Sludge Holding Tank for Gray Water

	Required
Sewage Holding Tank	134 gal. (18 cu. ft.)
Influent Surge Tank	123 gal. (16 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Grumman Unit	One (1)
Sewage Holding Tank Overboard Discharge Pump	Two (2)
Sludge Holding Tank Transfer Pump	One (1)

Discussion

The system is not considered to be a viable candidate.

The system is basically similar to System No. 12, except that there is no vacuum collection tank. Therefore, the discussion for System No. 12 applies especially with regard to the inability to fit the Grumman MSD.

DISCUSSION OF INSTALLATION BASED ON SHIPCHECKS

Vessel: POINT HERRON (82')

WMS No. 18 **GATX Reduced Volume Flush M/T Pump Collection/Grumman Flow Through System for Gray Water/Incincerator for both Concentrated Black Water and Gray Water Sludge**

	Required
Sewage Surge Tank	16 gal. (2.2 cu. ft.)
Galley/Turbid Surge Tank	123 gal. (16 cu. ft.)
Fuel Oil Day Tank	15 gal. (2 cu. ft.)
Grumman Unit	One (1)
Incinerator	One (1) Thiokol
Sewage Surge Tank	
Overboard Discharge Pump	One (1)
Transfer Pump	One (1)
Galley/Turbid Surge	
Tank Overboard Discharge Pump	One (1)

Discussion

The system is not considered to be a viable candidate.

The system is quite similar to System No. 13, except that there is no vacuum collection. Therefore, the discussion given for System No. 13 applies especially with regard to the inability to fit the Grumman MSD and the incinerator stack problem.

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82') Sheet 1 of 10

M/E I - ADAPTABILITY FOR SHIPBOARD INSTALLATION

Factor/Subfactor Ident. No.

INSTALLATION CHARACTERISTIC

111 Required black water handling capacity for vessel versus actual capacity of WMS

(a) Actual capacity of WMS equals or exceeds required capacity for vessel.
(b) WMS marginally suitable for vessel (has 95-99% of required capacity).
(c) WMS capacity insufficient for vessel (less than 95% of required capacity).

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	c	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

112 Required gray water handling capacity for vessel versus actual capacity of WMS

(a) Actual capacity of WMS equals or exceeds required capacity for vessel.
(b) WMS marginally suitable for vessel (has 95-99% of required capacity).
(c) WMS capacity insufficient for vessel (less than 95% of required capacity).

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	c	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	c	N/A	c	N/A	N/A

13 Extent of additional support systems or equipment required to accommodate WMS[1]

(a) No additional support systems or equipments required.
(b) Some additional support systems or equipments required.[2]
(c) Many additional support systems or equipments required.[3]

(1) Examples: . Firefighting system must be installed with incinerator.
. Bilge alarm required if large tank is installed above bilge.
. Compressor required on vessels that do not already have one.
. Detectors of toxic or noxious gases should be installed with any system that, as an inherent design feature, uses such gases in processing wastes.

(2) Need for support system/equipment does not significantly reduce WMS suitability for on-board installation.
(3) Suitability of WMS for installation on vessel significantly reduced.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	b	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

21 Extent of fixture modifications required for WMS installation

(a) No fixtures need modification or replacement.
(b) Some fixtures need modification or replacement.
(c) All commodes need replacement and modification of urinal-associated equipment (e.g., urinal discharge valves) is required.
(d) All fixtures need replacement or modification (e.g., replacement or commodes and urinal flushometers).
(e) All fixutres need replacement or modification and each fixture has additional hookup requirements associated with it.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	e	N/A	e	N/A	N/A

Factor/Subfactor Identif. No.

M/E I - ADAPTABILITY FOR SHIPBOARD INSTALLATION (Cont'd)

INSTALLATION CHARACTERISTIC

22 Extent of flush medium supply modifications required for WMS installation

(a) Existing flush medium is used.
(b) WMS requires conversion of flush medium to potable water.
(c) WMS requires conversion of flush medium to recirculating non-aqueous medium.
(d) WMS requires conversion of flush medium to salt water.(1)

(1) Conversion to salt water requires pump re-sizing, tapping into the sea-chest and provision for its corrosive properties. For PAMLICO, salt water would be used if the drain system were converted to a standard flush system (C.G. supplied information).

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

231 Hookup requirements(1) for WMS Collection/Transport subsystem installation

(a) No additional hookup requirements beyond existing ones.
(b) Requires piping for recirculation of flush medium (in existing gravity drain system).
(c) Special and centralized Collection/Transport subsystem required.
(d) Special and non-centralized Collection/Transport subsystem required (includes conversion from reduced flush vacuum collection to a standard gravity drain system, with or without recirculation).

(1) Drain piping; electric cables connecting commode, M/T pump and control panel in GATX, but not in JERED, etc.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	d	N/A	d	N/A	N/A

232 Routing flexibility for drain piping modifications(1) associated with WMS Collection/Transport subsystem installation(2)

(a) Routing is highly flexible.(3)
(b) Routing is moderately flexible, with some restrictions.
(c) Routing is highly inflexible.

(1) Of the three relevant categories of routing of lines (piping, ventilation, electrical), piping is the most important for assessing use of WMS installation.

(2) Notes: . With gravity drainage, lines must always slope downward and require venting.
. Smaller size lines are inherently more flexible.
. With the pump or vacuum Collection/Transport subsystem, sharp bends, rises and long runs can be accommodated in piping.

(3) In all cases, WMS installation is to be considered from the point of view of modifications required to existing conditions.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82') Sheet 3 of 10

M/E I - ADAPTABILITY FOR SHIPBOARD INSTALLATION (Cont'd)

Factor/Subfactor Ident. No.	INSTALLATION CHARACTERISTIC
233	Space requirements for WMS Collection/Transport subsystem installation. (a) No additional space required.[1] (b) Some additional space required.[2] (c) Large amount of additional space required. [1] E.g., M/T pumps in GATX; or small influent surge tank. [2] E.g., large VCT in JERED; or large influent surge tank, if not already installed.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	a	N/A	a	N/A	N/A

234	Modularity of WMS Collection/Transport subsystem (as it affects installation)[1] (a) Degree of modularity of subsystem aids in installation of C/T subsystem. (b) Degree of modularity of subsystem results in some (minimal) difficulty in installation of C/T subsystem. (c) Degree of modularity of subsystem results in moderate difficulty in installation of C/T subsystem. [1] On vessels that do not currently have a WMS, a high degree of modularity aids in installation, and a high degree of subsystem centralization (as in the JERED) results in difficulties for installation.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

238	Vent requirements for WMS Collection/Transport subsystem installation (a) No vents are required other than the existing vents. (b) Few vents are required in addition to the existing vents. (c) Many vents are required in addition to existing vents.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

241	Space requirements for WMS waste Treatment/Disposal subsystem installation (a) Volume required is minimal and dimensions[1] of equipment present no problems in fitting equipment into available compartment space. (b) Volume required is moderate and dimensions[1] of equipment present no problems in fitting equipment into available compartment space. (c) Volume and dimension[1] of equipment do present problem in fitting equipment into available compartment space. (d) Large volume required and dimension[1] of equipment do present problem in fitting equipment into available compartment space. [1] The two main factors are (i) deck area required and (ii) height required.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	a	N/A	b	N/A	N/A

Factor/Subfactor Ident. No.

M/E I - ADAPTABILITY FOR SHIPBOARD INSTALLATION (Cont'd)

INSTALLATION CHARACTERISTIC

242 Hookup requirements[1] for WMS waste Treatment/Disposal subsystem installation

(a) Pipes, ducts and/or cable requirements are minimal.
(b) Pipes, ducts and/or cable requirements are moderate.
(c) Pipes, ducts and/or cable requirements are extensive.

[1] Piping for fuel oil, fresh water, cooling water, compressed air, interconnecting remotely located equipment, overboard discharge line, etc.; electric cables for power supply, remote control panels, etc.; ducting for ventilation, etc.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

243 Degree of modularity of WMS waste Treatment/Disposal (as it affects installation)[1]

(a) Degree of modularity of subsystem aids in installation of T/D subsystem.
(b) Degree of modularity of subsystem results in some (minimal) difficulty in installation of T/D subsystem.
(c) Degree of modularity of subsystem results in moderate difficulty in installation of T/D subsystem.

[1] Decentralization of components may require additional hookups and piping runs.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	c	N/A	N/A	a	N/A	c	N/A	N/A

244 Vent requirements for WMS waste Treatment/Disposal subsystem installation[1]

(a) No vents are required.
(b) Vents are required.

[1] Vents that are only internal to the compartment in which subsystem is located are not considered here.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	a	N/A	b	N/A	N/A

245 Exhaust stack requirements for WMS waste Treatment/Disposal subsystem installation[1]

(a) Exhaust not required.
(b) Exhaust required, size of stack relatively small and stack can be run via existing ship's stack enclosure (fiddley).
(c) Exhaust required, size of stack relatively large and stack can be run via existing ship's stack enclosure.
(d) Exhaust required, size of stack relatively small and stack cannot be run via existing ship's stack enclosure.
(e) Exhaust required, size of stack relatively large and stack cannot be run via existing ship's stack enclosure.

[1] Notes: . Electric incinerator requires small (2") exhaust.
. Fuel incinerator requires large (10") exhaust.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82')

M/E I - ADAPTABILITY FOR SHIPBOARD INSTALLATION (Cont'd)

Factor/Subfactor Item. No.

INSTALLATION CHARACTERISTIC

25 Ease of installing WMS support equipment[1]

(a) No support equipment required.
(b) Some support equipment required but easy to install.
(c) Much support equipment required and difficult to install.

[1] Examples:
- Firefighting system must be installed with incinerator.
- Bilge alarm required if large tank is installed above bilge.
- Compressor required on vessels that do not already have one.
- Detectors of toxic or noxious gases should be installed with any system that, as an inherent design feature, uses such gases in processing wastes.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	b	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

26 Ease of compensating for added weight of WMS

(a) No or minimal compensation for added weight required.
(b) Moderate compensation for added weight required.
(c) Extensive compensation for added weight required.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	a	N/A	b	N/A	N/A

271 Extent of SHIPALTS (permanent modifications) required for WMS installation[1]

(a) No SHIPALTS required.
(b) Minor SHIPALTS required.
(c) Extent of SHIPALTS required is moderate.
(d) Extensive SHIPALTS required.

[1] Foundations, enlarged doors/hatches, increased capacity requirements for air compressor, etc.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	c	N/A	c	N/A	N/A

272 Extent of temporary modification[1] required for WMS installation

(a) No temporary modifications required.
(b) Temporary modifications required are minor.
(c) Extent of temporary modifications required are moderate.
(d) Temporary modifications required are extensive.

[1] Cutting access openings, etc.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82')

Factor/Subfactor Ident. No.

M/E I - ADAPTABILITY FOR SHIPBOARD INSTALLATION (Cont'd)

INSTALLATION CHARACTERISTIC

31 Effect of WMS on vessel stability

(a) No effect on existing stability characteristics of vessel.
(b) Some effect on existing stability characteristics of vessel, easily compensated for.
(c) Severe effect on existing stability characteristics of vessel, compensation required extensive modifications to vessel (e.g., no tankage in Point Herron).

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	a	N/A	c	N/A	N/A

32 Effect of WMS on vessel trim and list

(a) No effect on trim or on list.
(b) Some easily compensated for effect on trim or list.
(c) Compensation for effect on trim or list requires extensive modification to vessel.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	a	N/A	c	N/A	N/A

33 Effect of WMS on normal range of vessel

Vessel resource capacity and usage rates.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data					- Presented on Vessel Resource Data Sheet -													

34 Degree of space trade-off/reallocation required for WMS installation

(a) No space trade-off/reallocation required.
(b) Minimal degree of space trade-off/reallocation required.
(c) Moderate degree of space trade-off/reallocation required.
(d) High degree of space trade-off/reallocation required.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	b	N/A	b	N/A	N/A	b	N/A	b	N/A	N/A

M/E II - PERFORMANCE

PERFORMANCE CHARACTERISTIC

12 WMS per capita wet weight (lb)[1] - W_I

[1] Drain piping material is assumed to be copper-nickel (Cu-Ni).

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	586	N/A	N/A	N/A	N/A	N/A	N/A	N/A	937	N/A	788	N/A	N/A	920	N/A	703	N/A	N/A

M/E II - PERFORMANCE (Cont'd)

Factor/Subfactor Ident. No.	PERFORMANCE CHARACTERISTIC
18	WMS per capita volume (ft^3)(1) - V_i (1) Volumes are calculated as follows: . Fixture volumes are calculated using smallest space envelopes. . Pipe volume is the volume of a square tube with side = outside diameter of pipe. . Other equipment: Deck area: smallest rectangle enclosing all equipment in a single package plus extra dimension area required for operation and maintenance. Height: either maximum height of equipment, or full compartment height, if space above package is not usable for any other purposes.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	81.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	89.9	N/A	95.4	N/A	N/A	90.4	N/A	85.4	N/A	N/A

Factor/Subfactor Ident. No.	PERFORMANCE CHARACTERISTIC
21	Adequacy of WMS black water holding times HT_b - % of required black water holding time met by WMS(1) (1) A WMS which employs an incinerator is considered to meet 100% of the required holding time. The holding time of a WMS which employs a holding tank (for wastewater or sludge) is determined by the ratio of available tank capacity to required capacity.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	58	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100	N/A	100	N/A	N/A	100	N/A	100	N/A	N/A

Factor/Subfactor Ident. No.	PERFORMANCE CHARACTERISTIC
22	Adequacy of WMS gray water holding times HT_g - % of required gray water holding time met by WMS(1) (1) A WMS which employs an incinerator is considered to meet 100% of the required holding time. The holding time of a WMS which employs a holding tank (for wastewater or sludge) is determined by the ratio of available tank capacity to required capacity.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20	N/A	20	N/A	N/A	20	N/A	20	N/A	N/A

Factor/Subfactor Ident. No.	PERFORMANCE CHARACTERISTIC
311	Effect of peak hydraulic loads in black water stream on WMS performance $GIST_b$ - % of required Grumman (or other) influent surge tank capacity in black water stream met by installation.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	--	N/A	N/A	--	N/A	--	N/A	N/A

Factor/Subfactor Ident. No.	PERFORMANCE CHARACTERISTIC
312	Effect of peak hydraulic loads in gray water stream on WMS performance $GIST_g$ - % of required Grumman influent surge tank capacity in gray water stream met by installation.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	--	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	N/A	--	N/A	N/A	--	N/A	--	N/A	N/A

Factor/Subfactor Ident. No.	PERFORMANCE CHARACTERISTIC
331	Ability of black water portion of WMS to handle additional personnel (on a long-term basis) HTC_b - % of required black water (or sludge) holding tank capacity met by installation.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	58	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100	N/A	--	N/A	N/A	100	N/A	--	N/A	N/A

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82')

Factor/Subfactor Ident. No.

M/E II - PERFORMANCE (Cont'd)

PERFORMANCE CHARACTERISTIC

332 Ability of gray water portion of WMS to handle additional personnel (on a long term basis)
HTC_g - % of required gray water (or sludge) hodling tank capacity met by installation.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20	N/A	20	N/A	N/A	20	N/A	20	N/A	N/A

M/E IV - PERSONNEL SAFETY

SAFETY CHARACTERISTIC

21 Hazard of explosive potential for operator/maintainer due to inherent WMS design.

I - Installation Index (for personnel safety)

(a) Likelihood of hazardous situation is not increased due to location of any portion of WMS.
(b) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to working or berthing area.
(c) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to fuel storage area.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

22 Hazard of explosive potential for operator/maintainer due to procedural error/equipment failures of WMS.

I - Installation Index (for personnel safety)

(a) Likelihood of hazardous situation is not increased due to location of any portion of WMS.
(b) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to working or berthing area.
(c) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to fuel storage area.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

31 Hazard of fire ignition potential due to inherent WMS design

I - Installation Index (for personnel safety)

(a) Likelihood of hazardous situation is not increased due to location of any portion of WMS.
(b) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to working or berthing area.
(c) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to fuel storage area.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

32 Hazard of fire ignition potential due to procedural errors/equipment failures of WMS.

I - Installation Index (for personnel safety)

(a) Likelihood of hazardous situation is not increased due to location of any portion of WMS.
(b) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to working or berthing area.
(c) Likelihood of hazardous situation is increased due to proximity of any portion of WMS to fuel storage area.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82')

M/E V - HABITABILITY

Factor/Subfactor Ident. No.

HABITABILITY CHARACTERISTIC

41 Heat generation for nearby personnel[1] due to inherent WMS design

I - Installation Index (for heat)

(a) Location of WMS is not likely to raise heat level due to proximity to working and berthing areas.
(b) Location of WMS is likely to raise heat level due to proximity to working and berthing areas.

[1] For operator/maintainer/adjacent berthing and working areas.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

42 Heat generation for nearby personnel[1] due to procedural errors/equipment failures of WMS

I - Installation Index (for heat)

(a) Location of WMS is not likely to raise heat level due to proximity to working and berthing areas.
(b) Location of WMS is likely to raise heat level due to proximity to working and berthing areas.

[1] For operator/maintainer/adjacent berthing and working areas.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

5 Noise level for personnel in vicinity of WMS[1]

I - Installation Index (for noise)

(a) Location of WMS is not likely to raise noise level due to proximity to working and berthing areas.
(b) Location of WMS is likely to raise noise level due to proximity to working and berthing areas.

[1] For operator/maintainer/adjacent berthing and working areas.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

6 Vibration levels for nearby personnel[1] produced by WMS machinery

I - Installation Index (for vibration)

(a) Location of WMS is not likely to raise vibration level due to proximity to working and berthing areas.
(b) Location of WMS is likely to raise vibration level due to proximity to working and berthing areas.

[1] For operator/maintainer/adjacent berthing and working areas.

WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	a	N/A	a	N/A	N/A	a	N/A	a	N/A	N/A

WMS INSTALLATION EFFECTIVENESS ATTRIBUTE DATA

Vessel POINT HERRON (82')

Factor/Subfactor Identif. No.																		
M/E VI - RELIABILITY																		
RELIABILITY CHARACTERISTIC																		
22	Extent of WMS configuration redundancy WMS equipment requirements.																	
WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data					- Presented on WMS Equipment Requirement Data Form -													
M/E VII - MAINTAINABILITY																		
MAINTAINABILITY CHARACTERISTIC																		
131	Accessibility of replaceable WMS components I - Installation index (for accessibility) (a) High degree of physical clearance around WMS equipment. (b) Moderate degree of clearance around WMS equipment. (c) Very tight, i.e., very little clearance around WMS equipment.																	
WMS #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Data	c	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A	c	N/A	N/A	c	N/A	c	N/A	N/A

CONCLUDING REMARKS

The following are points of consideration and observation relevant to this vessel, some of which have been included in the shipcheck observations, and are reiterated for emphasis and convenience.

(a) The vessel as shipchecked had not yet been brought up to class by the installation of a waste management system which had been approved as a shipalt. However, since the installation was scheduled for completion not long after the visit, all facets of the study were performed as if the vessel were outfitted for the alteration drawings provided by the U. S. Coast Guard.

(b) The vessel would have to be fitted with small but additional piping systems such as flushing water, sea water cooling, and compressed air.

(c) The aft hold (C-201-A) would most likely require a ventilation system modification.

(d) The fire fighting system would require reassessment for adequacy.

(e) There are no ballasting provisions per se. Any weight compensations would have to be at the expense of on-board material.

(f) The general arrangement of the ship is such that practically no space is available for rearrangement. The only compartment available for relocation of some of the repair parts and consummables presently in the aft hold (C-201-A) is the Lazarette (C-202-A) just aft of it. Even with the WMS equipment stowed as proposed in the shipcheck observations, the aft hold will be still on the "tight" side.

The small size of the vessel and its arrangement preclude the possibility of installing any of the more complex WMS configurations and those with large components. Incinerator stack installations were found to be practical impossibilities. Therefore, systems which could utilize the class arrangement provided by the aforementioned shipalt were found to be more easily adaptable. Maximum reuse of existing (or future existing) piping runs and connections would be required.

(g) In order to ship components aboard for some of the viable WMS it will be necessary to make some small cuts in the vessel, but it is anticipated that none will be in vital areas such as the complex bottom structure. The deck areas would be the most logical choices.

(h) The present structural arrangement of the ship lends itself readily to the installation of required equipment support foundations in the areas proposed by the shipcheck report and drawings.

APPENDIX A

PRELIMINARY INSTALLATION ANALYSIS

POINT HERRON (82')

Vessel Characteristic	Data
Class	WPB - 82318 Point (82') C Class
Type	Patrol Boat (Small)
Crew Size	8
Home Port	Bay Shore, New York (Fire Island

SUMMARY OF PRELIMINARY INSTALLATION ANALYSIS RESULTS

POINT HERRON (82')

WMS No.	TYPE: Coll/Trans Subsys (Black)	TYPE: Treatment/Disposal Subsystem: Black	TYPE: Treatment/Disposal Subsystem: Gray	SYSTEM ACCEPTABILITY FOR INSTALLATION(1)
1	Gravity Collect.	Holding Tank	Holding Tank	Yes
2	Oil Recircul. (Chrysler)	Chrysler + Hld Tnk	Holding Tank	No
3		Chrysler + Incin.	Holding Tank	No
4	Gravity Collect. (Grumman)	Grum Flow Thru+HldTk	Holding Tank	Yes
5		Grumman Flow Thru + Holding Tank		Yes
6	Gravity Collect	Holding Tank	Grum Flow Thru+HldTnk	Yes
7	Gravity Collect. (Grumman)	Grum Flow Thru+Incin.	Holding Tank	Yes
8		Grumman Flow Thru + Incinerator		Yes
9	Vacuum Collect. (Jered)	Holding Tank(2)	Holding Tank	Yes
10		In inerator	Holding Tank	Yes
11		GATX Evap.	Holding Tank	Yes
12		Holding Tank(3)	Grum Flow Thru+Hld Tnk	Yes
13		Incinerator	Grum Flow Thru + Incin.	Yes
14	M/T Pump Collect. (GATX)	Holding Tank	Holding Tank	Yes
15		Incinerator	Holding Tank	Yes
16		GATX Evap.	Holding Tank	Yes
17		Holding Tank	Grum Flow Thru+Hld Tnk	Yes
18		Incinerator	Grum Flow Thru + Incin.	Yes

(1) Based on:
- Information contained in available vessel plans.
- WMS installation requirements.
- WMS installation criteria and guidelines.

(2) Two subchoices available for WMS No. 9 as follows:
- 9a - Concentrated black water transferred from VCT to holding tank (acceptable for all vessels).
- 9b - Concentrated black water held in VCT (acceptable for Point Herron only).

(3) Two subchoices available for WMS No. 12 as follows:
- 12a - Concentrated black water transferred from VCT to holding tank (acceptable for all vessels).
- 12b - Concentrated black water held in VCT (acceptable for Point Herron only).

POINT HERRON (82')

Crew: 8 men

Sanitary Fixtures: 2 Waterclosets, 2 showers, 2 lavatories

Existing Arrangement:

(a) One (1) 242 gallon retention tank located below crew's berthing area.

(b) Retention tank receives sanitary wastes as well as galley and turbid wastes.

(c) Gravity drainage overboard selectively, i.e. all galley and turbid or only turbid.

(d) Retention tank can be pumped overboard and to shore facility. One (1) sewage pump (30 gpm) is fitted to serve this tank.

Vessel: POINT HERRON (82')

WMS No. 1 Full Volume Flush Gravity Collection/Holding Tank for Black Water/Holding Tank for Gray Water

	Required
Sewage Holding Tank	416 gal. (56 cu. ft.)
Galley/Turbid Holding Tank	1, 188 gal. (159 cu. ft.)

Discussion

The system is acceptable subject to certain limitations.

It is not possible to provide all the required holding tankage capability for either the black water or the gray water. There is insufficient space available to provide gravity drainage due to the design configuration of the vessel.

The maximum black water holding tankage capability appears to be that presently installed as the 242 gal. retention tank.

The existing arrangement permits gravity drainage of gray water directly overboard since the manifolding is above the waterline. Therefore, in keeping with the guidelines and criteria established for WMS installations, no minimum gray water handling capability has to be provided.

Vessel: POINT HERRON (82')

WMS No. 2 Full Volume Flush Oil Recirculation and Gravity Collection/ Chrysler System with Sludge Holding Tank for Sewage/Holding Tank for Gray Water

	Required
Sewage Holding Tank	78 gal. (10 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Chrysler Model and Quantity	One (1)-A

Discussion

The installation is considered to be impracticable for the principal reason that there is insufficient space available anywhere which will permit gravity drainage of sewage to the Chrysler separation tank. The vessel's internal configuration and arrangement will permit gravity drainage only to the space below the crew's berthing area, and this is where a small retention tank (34 in. H. x 34 in. W. x 54 in. L.) is located. This space will not be adequate for the component sizes required.

Gravity drainage is also required to a Galley/Turbid Holding Tank. The only apparent location for such a tank would be also where the present retention tank is located, but its size would be drastically limited and could not be accommodated with a Chrysler unit.

As far as a Sewage Holding Tank is concerned, it's required size is small and does not depend on gravity drainage for its location.

Vessel: POINT HERRON (82')

WMS No. 3 Full Volume Flush Oil Recirculation and Gravity Collection/ Chrysler System with Incinerator for Sewage/Holding Tank for Gray Water

	Required
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sludge Ejection Tank	20 gal. (2.7 cu. ft.)
Chrysler Model and Quantity	One (1)-A
Incinerator Model and Quantity	One (1)-A

Discussion

This installation appears to be impracticable for essentially the same reasons as given under the discussion of System No. 2. The principal impedement is the inability to properly locate the Chrysler components.

For record purposes, the incinerator could possibly be located in the aft hold (C-201 A), with its stack running through the bulkhead, into the machinery space and up to the weather.

Vessel: POINT HERRON (82')

WMS No. 4 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Holding Tank for Black Water/ Holding Tank for Gray Water

	Required
Sanitary Influent Surge Tank	42 gal. (5.5 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Sludge Holding Tank	25 gal. (4.6 cu. ft.)
Grumman Unit	One (1)

Discussion

The installation can possibly be accomplished based on the following contingencies:

(a) The Grumman main structure dimensions are slightly large for the space available. The only apparently available space is in the aft hold (C-201-A). The deck height appears to be about the same height as the Grumman structure (approximately 7 feet). If the WMS frame height can be modified to suit, the unit can be fitted vertically.

The shortest dimension (length) would run fore and aft, with the width running athwartship. This orientation would be to starboard of the vessel's centerline, such that the existing hatch and vertical ladder access will be cleared. However, there will be no access around the Grumman structure unless one-half of the existing fresh water tank (C-201-W) is relocated. It may be possible to relocate the fresh water further aft in the Lazarette (C-202-A). These changes would entail loss of existing shelving and miscellaneous reorientation of equipment.

Based on an acceptable arrangement of the Grumman structure, the sludge holding tank and sludge transfer pump would be located nearby in that same compartment.

(b) The present 242 gallon retention tank below the crew's berthing (A-202-AL) modified to form two (2) separate tanks; viz. a 42 gallon sanitary influent surge tank (as required) and the remainder allocated to gray water holding. The space around and immediately forward of these tanks would be used for the two (2) surge tank pumps and the two (2) Galley/Turbid holding tank discharge pumps.

Vessel: POINT HERRON (82')

System No. 4 (cont'd.)

As indicated above, the maximum tank volume required for holding gray water cannot be realized. Space availability and the requirement for gravity drainage prevent any sizeable tank to be installed for gray water holding.

Vessel: POINT HERRON (82')

WMS No. 5 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Holding Tank for Combined Black and Gray Waters

	Required
Influent Surge Tank	165 gal. (22 cu. ft.)
Sludge Holding Tank	134 gal. (18 cu. ft.)
Grumman Unit	One (1)

Discussion

This system is similar for the most part to that discussed under System No. 4, the major exception being that there is no separate Galley/Turbid Holding Tank and associated discharge pumps.

Subject to essentially the same space considerations as mentioned for System No. 4, this system also could possibly be practicable.

The influent surge tank, surge tank pump and surge tank discharge pumps could be located under the crew's berthing area (A-202-AL) in place of the existing retention tank.

The sludge holding tank and pumps would be fitted in the same compartment as the Grumman system.

Vessel: POINT HERRON (82')

WMS No. 6 Full Volume Flush Gravity Collection/Holding Tank for Black Water/Grumman Flow Through System with Sludge Holding Tank for Gray Water

	Required
G/T Influent Surge Tank	123 gal. (16 cu. ft.)
Sewage Holding Tank	416 gal. (56 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Optional Combined Sewage/Sludge Holding Tank	515 gal. (69 cu. ft.)
Grumman Unit	One (1)

Discussion

The installation of this system is acceptable subject to certain limitations.

Due to the vessel's configuration, gravity drainage would have to be limited to tankage located below the crew's berthing space (A-202-AL) where a 242 gal. retention tank exists.

If the required space is allocated for the gray water influent surge tank, the maximum available space remaining would accommodate only approximately 25% of the required black water holding tankage.

For information purposes, the following is anticipated:

(a) The Grumman structure would have to be able to fit into the aft hold (C-201-A), with attendant modification or relocation of the fresh water tank (C-201-W).

(b) The sludge holding tank and pump would have to be located in the same compartment as the Grumman structure. The optional combined sewage/sludge holding tank does not appear feasible due to lack of space.

Vessel: POINT HERRON (82')

WMS No. 7 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Incinerator for Black Water/Holding Tank for Gray Water

	Required
Gray Water Holding Tank	1,188 gal. (159 cu. ft.)
Sewage Influent Surge Tank	42 gal. (5.5 cu. ft.)
Fuel Oil Day Tank	25 gal. (3.3 cu. ft.)
Grumman Units	One (1)
Incinerator	One (1) Thiokol

Discussion

This system is similar in many respects to System No. 4. Basically its installation may be possible subject to certain contingencies. The principal considerations are as follows:

(a) Due to the inclusion of a Thiokol incinerator, the width of the Grumman structure becomes approximately 2 - 1/2 feet greater. This would necessitate trying to fit the structure in the forward end of the aft hold (C-201-A), with the width running athwartship. However, this would apparently infringe on the forward edge of the hatch opening. The fresh water tank would have to be relocated, possibly to the Lazarette (C-202-A). The towing line stowage reel location would also have to be modified to clear the Grumman structure.

The fuel oil day tank is small enough to fit near the Grumman structure.

The incinerator stack will have to be led forward into the machinery space and up to the weather.

(b) As in the case of System No. 4, the sewage influent surge tank and the G/T holding tank and pumps would have to be fitted below the crew's berthing space in place of the existing retention tank. However, the gray water holding capacity available would be approximately 242 gallons which is significantly less than that required.

Vessel: POINT HERRON (82')

WMS No. 8 Full Volume Flush Gravity Collection/Grumman Flow Through System with Sludge Incinerator for Combined Black and Gray Waters

	Required
Influent Surge Tank	165 gal. (22 cu. ft.)
Fuel Oil Day Tank	25 gal. (3.3 cu. ft.)
Grumman Units	One (1)
Incinerators	One (1) Thiokol

Discussion

This system is similar in many respects to System No. 5, except that there is an incinerator in lieu of a sludge holding tank.

The installation of this system would be practicable subject in part to the same space considerations as mentioned for System No. 5. There is one additional space consideration; viz. the inclusion of a Thiokol incinerator. The incinerator and fuel oil day tank space requirements are discussed under System No. 7 and would be the same as for that system.

The influent surge tank and associated pumps would apparently be located below the crew's berthing area in the area of the existing retention tank.

Vessel: POINT HERRON (82')

WMS No. 9a JERED Reduced Volume Flush Vacuum Collection/Holding Tank for Concentrated Black Water/Holding Tank for Gray Water

WMS No. 9b JERED Reduced Volume Flush Vacuum Collection/Concentrated Black Water Held in VCT Holding Tank for Gray Water

Option 9a

	Required
Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Sanitary Holding Tank	105 gal. (13.9 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)

Discussion

The installation for the most part appears feasible, except that the required gray water holding tank maximum capacity will not be possible to attain. Due to the requirement of gravity drainage and the configuration of the vessel, it appears that the gray water tankage capacity will be limited to approximately the same as the existing retention tank (242 gallons) located below the crew's berthing space. The gray water holding tank discharge pumps would be located near the tank.

The vacuum collecting tank, vacuum pumps, sewage holding tank and miscellaneous pumps apparently can be fitted in the aft hold (C-201-A) with slight modification of the space arrangement.

Option 9b

	Required
Vacuum Collection and Holding Tank	200 gal.
Galley/Turbid Holding Tank	1,188 gal (159 cu. ft.)

Discussion

The system installation appears feasible with the same limitation to the gray water holding tank as indicated in Option 9a.

Vessel: POINT HERRON (82')

System No. 9 (cont'd.)

Equipment locations would be as in Option 9a and the sanitary holding tank will, of course, be eliminated. The headroom in the aft hold (C-201-A) may possibly be close for a 6 ft. high VCT/holding tank combination.

Vessel: POINT HERRON (82')

WMS No. 10 JERED Reduced Volume Flush Vacuum Collection/Incinerator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Vacuum Collection Tank	60 gal.
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Incinerator Feed Tank (Sludge)	6.5 cu. ft.
Fuel Oil Day Tank	18 gal. 2.3 cu. ft.
Incinerator	One (1) Thiokol

Discussion

The system installation appears to be feasible but the gray water holding capacity will be limited to approximately the same as the existing 242 gallon retention tank below the crew's berthing space. The gray water discharge pumps would have to be located there also.

The vacuum collection tank, pumps, incinerator feed tank (sludge tank), incinerator, and fuel oil day tank apparently can be fitted in the aft hold (C-201-A), with minor modifications to the hold arrangement.

Vessel: POINT HERRON (82')

WMS No. 11 JERED Reduced Volume Flush Vacuum Collection/GATX Evaporator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Evaporator (GATX)	One (1) - 40 gal.
Catalytic Oxidizer	One (1)

Discussion

The system installation appears to be feasible but the gray water holding capacity will be limited to approximately the same as the existing 242 gallon retention tank below the crew's berthing space. The gray water discharge pumps would have to be located there also.

The vacuum collection tank, pumps, evaporator and oxidizer can apparently be fitted in the aft hold (C-201-A), with minor modification to the hold arrangement.

Vessel: POINT HERRON (82')

WMS No. 12a JERED Reduced Volume Flush Vacuum Collection/Holding Tank for Concentrated Black Water/Grumman Flow Through System with Sludge Holding Tank for Gray Water

WMS No. 12b JERED Reduced Volume Flush Vacuum Collection/Concentrated Black Water Held in VCT/Grumman Flow Through System with Sludge Holding Tank for Gray Water

Option 12a

	Required
G/T Influent Surge Tank	123 gal. (16 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Sewage Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Sewage Holding Tank	105 gal. (13.9 cu. ft.)
Grumman Unit	One (1)

Discussion

The system installation appears to be feasible provided the Grumman structure height can be accommodated and access is provided around the structure. The structure would be fitted on the port side of the aft hold (C-201-A). The sludge holding tank, sewage holding tank, vacuum collection tank and the various pumps associated with these items would be located on the starboard side of the hold. This would entail relocation of the fresh water tank possibly to the Lazarette (C-202-A) and the loss of the shelving in the hold. Other items presently located in the hold may also have to be relocated.

The Galley/Turbid Influent Surge Tank would have to be located below the crew's berthing space (A-202-AL) in the place of the existing 242 gallon retention tank. Its discharge pumps would also have to be located near the tank.

System No. 12 (cont'd.)

Option 12b

Discussion

Equipment required is the same as listed for Option 12a except that the sewage holding tank is deleted and the vacuum collection tank is 200 gallons.

The system installation appears to be feasible subject to the same comments as for Option 12a. Further, since the Sewage Holding Tank function has been incorporated in the Vacuum Collection Tank, it appears that the space thus made available can be utilized for the larger size Vacuum Collection and Holding Tank.

Vessel: POINT HERRON (82')

WMS No. 13 JERED Reduced Volume Flush Vacuum Collection/Grumman Flow Through System for Gray Water/Incinerator for both Concentrated Black Water and Gray Water Sludge

	Required
Gray Water Surge Tank	123 gal. (16 cu. ft.)
Vacuum Collection Tank	30 gal. (4.4 cu. ft.)
Fuel Oil Day Tank	15 gal. (2 cu. ft.)
Grumman Unit	One (1)
Incinerator	One (1) Thiokol

Discussion

The system installation appears to be feasible provided the Grumman structure height can be accommodated and access is provided around the structure. The structure would be fitted on the port side of the aft hold (C-201-A) with the long dimension (width) running athwartship. The fuel oil day tank would be fitted adjacent thereto.

The sewage vacuum collection tank could be located on the starboard side of the aft hold.

The existing fresh water tank would have to be relocated, possibly to the Lazarette (C-202-A).

The gray water surge tank would be fitted below the crew berthing space (A-202-AL) in the area presently occupied by the 242 gallon retention tank. The associated gray water pumps would be located near the surge tank.

The incinerator stack would be led to the machinery space and to the weather.

Vessel: POINT HERRON (82')

WMS No. 14 GATX Reduced Volume Flush M/T Pump Collection/Holding Tank for Concentrated Black Water/Holding Tank for Gray Water

	Required
Sewage Holding Tank	134 gal. (18 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)

Discussion

The system installation appears to be feasible but the required Galley/Turbid Holding Tank capacity cannot be accommodated due to the configuration of the vessel.

Galley and Turbid wastes can be gravitated to a holding tank located below the crew's berthing space (A-202-AL). The tank would be limited to the existing 242 gallon retention tank located there. Associated pumps would be located near the G/T holding tank.

Since sewage wastes will be transported to the sewage holding tank via macerator/transfer pumps, the tank can be located in the aft hold (C-201-A). The tank discharge pumps may also be located nearby in this compartment.

Vessel: POINT HERRON (82')

WMS No. 15 GATX Reduced Volume Flush M/T Pump Collection/Incinerator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Incinerator Feed Tank	50 gal. (6.7 cu. ft.)
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Fuel Oil Day Tank	18 gal. (2.3 cu. ft.)
Incinerator	One (1) Thiokol

Discussion

The system installation appears to be feasible. However, the required Galley/Turbid Holding Tank capacity cannot be fitted due to the vessel configuration. The incinerator feed tank, incinerator, fuel oil day tank and blower would be located in the aft hold (C-201-A). Sewage would be transported to the incinerator feed tank via macerator/transfer pumps.

The Galley/Turbid Holding Tank would be located with associated pumps below the crew's berthing space (A-202-AL) and would be limited to the size of the existing 242 gallon retention tank.

Vessel: POINT HERRON (82')

WMS No. 16 GATX Reduced Volume Flush M/T Pump Collection/GATX Evaporator for Concentrated Black Water/Holding Tank for Gray Water

	Required
Galley/Turbid Holding Tank	1,188 gal. (159 cu. ft.)
Evaporator (GATX)	One (1) - 40 gal.
Catalytic Oxidizer	One (1)

Discussion

The system installation appears feasible and is similar to System No. 11 except that black water here is collected via macerating/transfer pumps in lieu of vacuum collection. However, due to space limitation, the gray water required holding capacity cannot be accommodated. It will be limited to approximately the same as the existing 242 gallon retention tank below the crew's berthing space. The gray water discharge pumps would have to be located there also.

The evaporator, oxidizer and pumps can apparently be fitted in the aft hold (C-201-A), with minor modification to the hold arrangement.

Vessel: POINT HERRON (82')

WMS No. 17 GATX Reduced Volume Flush M/T Pump Collection Holding Tank for Concentrated Black Water/Grumman Flow Through System with Sludge Holding Tank for Gray Water

	Required
Sewage Holding Tank	134 gal. (18 cu. ft.)
Influent Surge Tank	123 gal. (16 cu. ft.)
Sludge Holding Tank	99 gal. (13 cu. ft.)
Grumman Unit	One (1)

Discussion

The system installation appears feasible and is similar to System No. 12 (Option a) with the exception that black water collection here is via macerator/transfer pumps in lieu of vacuum collection.

The black water equipment would be located and arranged in the aft hold (C-201-A) similar to System No. 12 and subject to the same contingencies as far as fitting the Grumman system structure.

The gray water influent surge tank would be located where the existing 242 gallon retention tank is, below the crew's berthing space (A-202-AL).

Vessel: POINT HERRON (82')

WMS No. 18 GATX Reduced Volume Flush M/T Pump Collection/Grumman Flow Through System for Gray Water/Incincerator for both Concentrated Black Water and Gray Water Sludge

	Required
Black Water Surge Tank	16 gal. (2.2 cu. ft.)
Gray Water Surge Tank	123 gal. (16 cu. ft.)
Fuel Oil Day Tank	15 gal. (2 cu. ft.)
Grumman Unit	One (1)
Incinerator	One (1) Thiokol

Discussion

The system installation appears to be practicable and is quite similar to System No. 13, except for the method of black water collection. Therefore, the black water surge tank, Grumman structure (including incinerator protrusion), fuel oil day tank, and associated pumps could possibly be fitted and arranged in the aft hold (C-201-A) similar to System No. 13 and subject to the same space consideration for the Grumman structure. The fresh water tank would have to be similarly relocated possibly to the Lazarette (C-202-A).

The gray water surge tank and pumps could be located where the existing 242 gallon retention tank is fitted in the space below the crew's berthing compartment (A-202-AL).