ANNEX 1 – SOBA Multi-State Conservation Grant Proposal: Pump-Out Equipment Standards and Life-Cycle Testing

OBJECTIVE: The objective of this proposal is to: (1) develop a standard method for evaluating the effectiveness of commercially available pump-out equipment; and (2) to determine the estimated lifecycle of currently available pump-out equipment.

NEED: This proposal addresses the *National Conservation Need #4*: Programs that enhance and improve the ability of states to administer their agency and manage the wildlife resources of their state.

There are currently 49 states out of a total of 56 states and territories participating in the Clean Vessel Act (CVA) program. This proposal will benefit all 49 states and territories that are currently participating in the CVA program as well as any future additional participants. The Clean Vessel Act program has spent over $80 million for the installation and replacement of pump-out facilities nationwide. Never before has such a huge sum of government funds been expended for equipment without even a minimum performance standard being established. In order to make decisions regarding "the right equipment for the right application," a standard testing method needs to be developed and independent testing of available equipment is needed to ensure the best use of funds. This project will provide the state agencies with much needed information and assistance that have been unavailable or difficult to obtain in the past. As a result, the agencies administering the CVA program will improve the cost effectiveness of the program and their responsibilities.

During the past seven years of the CVA program, many manufacturers have developed and introduced pump-out equipment to meet the new demand for pump-out and dump-station applications. Much of the equipment in the industry is relatively new in design, and certainly new enough that "proven track records" of reliability are unavailable. Grantees are bombarded daily with pamphlets and sales literature from companies claiming to have a "better mouse trap" except in this case, it's a pump-out station or dump-station. New materials, different suction methods, misleading pumping information, and the lack of past product performance data make proper equipment selection difficult at best.

As new or original pump-out equipment begins to need repair or replacement in the next five years, information needs to be made available to CVA agencies and their partners that will allow them to select replacement equipment that will be the best value choice for a particular application.

The need for a unified effort to address the lack of information and standards has been a constant topic of discussion at the States Organization for Boating Access (SOBA) national conferences for the past 5 years. (SOBA since 1996 has hosted an annual conference that brings together the various fish and game agencies that administer the CVA program.) To date, there has been no coordinated effort made to provide or establish minimum standards, as well as provide independent equipment testing under realistically simulated conditions that will allow states and users to select the best equipment for the dollar.

RESULTS AND EXPECTED BENEFITS:

This proposal meets the *National Conservation Need #4*: Programs that enhance and improve the ability of states to administer their agency…" The need for this information is well documented and conducting a single source-testing regimen is much more cost effective that letting each state conduct their own testing program. This proposal will provide the States with information that will allow them to expend program funds in a more cost effective manner.

The test results will put to an end any doubts or misconceptions about:
-which unit(s) perform and which unit(s) do not perform under the test conditions;
-which unit(s) resists the effects of the environment better than other units; and
-which unit(s) broke down during the evaluation and how long it took to fix them.

Based on the evaluation findings, the States will be better able to select what unit best suits their specific needs without second guessing their design and without being mislead by any preconceived notions that the designer may have about a particular brand of pump-out unit.

The developed standards and testing results will be published and distributed to CVA coordinators on both the State and Federal level and to industry representatives. In addition, the information can be made available via the worldwide web at the SOBA website, if deemed appropriate. It is estimated that between 5-10% of the pump-out equipment installations fail prematurely or do not perform to expected levels. Given the $80,000,000 expenditure of CVA funds, to date, this proposal could result in a savings of $4-8 million dollars in CVA expenditures. The total requested for this proposal is less than 3% of the $10,000,000 that is currently spent each year on pump-out equipment!

APPROACH TO DEVELOP EQUIPMENT MINIMUM STANDARDS AND CONDUCT LIFE CYCLE TESTING OF EQUIPMENT

A. BACKGROUND

During the past five years of the CVA program, many manufactures have developed and introduced pump-out equipment to meet the new demand for pump-out and dump-station applications. Much of the equipment in the industry is relatively new in design and certainly new enough that “proven track records” of reliability are unavailable. Grantees are bombarded daily with pamphlets and sales literature from companies claiming to have a better pump-out station. New materials, different suction methods, misleading pumping information, and the lack of past product performance data make proper equipment selection difficult at best.

As new or original pump-out equipment begins to need repair or replacement in the next five years, information needs to be made available to CVA grantees that will allow them to select replacement equipment that will be the best value choice for a particular application. The following discussion represents a brief overview of the proposed scope of the pump-out station testing.

B. NEED

Pump-out equipment manufacturers all offer statistics regarding the capability of their equipment. What is needed is an assessment of the capability of their equipment at 1, 100, 500 and 1000 hours of operation. Also, what is the capability for pumping a realistic medium that includes paper products, sand, plastic and foam cups, plastic bags and other common materials dumped into boat holding tanks. An assessment of the equipment to withstand environmental effects, such as salt spray and ultraviolet exposure, is also needed in order to make decisions for new or replacement pump-out equipment.

The pump-out equipment testing needs to address the following issues.

1) Misleading pumping information is a major cause of unit failure and is the main reason an independent test is needed. The word "misleading" is used because the industry will only guarantee that their pump-out units will produce the promised results the first time they are used with clean, unrestricted piping. Since the goal of the Clean Vessel Act is to enable a boater access to a working vessel waste disposal facility at all times, this is unacceptable. If a boater attempts to pump-out their boat with a broken pump-out unit, the integrity of the program is put into doubt. Because, in that boaters mind, the odds are high that the next facility is probably not working either. The pump-out testing will compare the manufacturer's published pump-out station performance against laboratory results.

2) The performance and reliability of the pump-out equipment over an estimated life cycle needs to be accessed.

3) The useful life cycle of the pump-out equipment with regards to its construction materials and the environment the unit is working in, needs to be assessed. (A pump-out may be adequately constructed for services on inland water, but corrode away within a few years when located on the harsh coastal environment.)

4) Provide a performance comparison between the diaphragm, peristaltic and vacuum pump-out systems. Industry representatives constantly claim that their type of pump-out system is superior to other types with no scientific testing to back these claims up. By having the three types of units tested in a fair unilateral, unbiased environment, a conclusion can finally be drawn as to what type of pump-out is the industry benchmark on performance.)

C. OBJECTIVES

Key Personnel/Independent Testing Facility: In order to produce viable test results, an independent, nationally recognized testing facility should be selected. SOBA has been in contact with Underwriters Laboratories (UL) and all cost estimates herein are based upon UL performing the testing. UL labs have been testing and certifying marine products since 1969 and are recognized internationally as a leader in their field. For more information on the UL testing facilities visit their website at www.ul.com/marine.

Develop Test Criteria: SOBA working with a test panel shall develop fair and reasonable testing criteria. A draft of the Evaluation Criteria can be found in Section E, "Test Criteria", of this proposal. SOBA shall create a test panel (estimate 8–10 members) consisting of industry representatives and CVA grant coordinators to provide input for the test criteria. The grant coordinator and test panel will meet once to initiate the input for the test criteria and again to review and provide final comment on the final draft criteria.

Monitor Testing Progress: The SOBA Board (8 members) will have an active involvement in the development and review of the testing criteria and testing progress. The SOBA Board will meet three times each year, for approximately ½ to 1 full day (6 meetings total) to develop testing criteria, and monitor and review the testing progress. The grant coordinator will make quarterly reports to the SOBA Board and to the USFWS. (The testing regimen proposed is unique to this industry and will require vigilant monitoring. As the testing progresses, changes may have to be made to the testing criteria to insure that the results will produce viable and usable information.)

The grant coordinator will make presentations at the annual SOBA conference (2 meetings) to update the SOBA members on the testing progress. In addition, a representative of the testing lab may be also be brought to the annual SOBA conferences (2 meetings) to present the testing theory, methodology and findings. (A laboratory representative will require honorarium and travel expenses to attend the SOBA conference.)

Obtain Test Samples: The vessel waste disposal industry branches into three different categories of pump-out units. These are the diaphragm, peristaltic, and vacuum based pump-out systems. Ideally, every pump-out unit from all known pump-out manufactures would be tested in order to achieve a true unilateral test field. However, there are currently 18 different manufactures of pump-out equipment, and in addition, many different models from each manufacture. Therefore, this initial testing regiment will be conducted on a representative sample of pump-outs. This representative group will consist of approximately five diaphragm pump-outs, four peristaltic pump-outs, and four vacuum pump-outs meeting a predetermined minimum "stock" specification.

Publish Evaluation Findings: One hundred copies of the results will be published and distributed to CVA coordinators on both the State and Federal level and to industry representatives. A draft shell of the final report format can be found below in Section C. "Report Format." In addition, the information can be made available via the worldwide web at the SOBA website if deemed appropriate.

Rating System: A numerical rating system shall be developed as a means to interpret the findings of the test. The following should be incorporated into the rating systems major headings:

-Overall Volume Pumped
-Average Weekly Flow
-Average Test Flow
-Beginning Test Average Flow vs. End of Test Average Flow
-Broken Units
    *Cost to Repair
    *Length of Time to Repair
-Corrosion Resistance
-Resistance to deterioration due to elements (sun, salt, rain, etc.)
-Ability to pass foreign objects

Report Format: The following major headings should be used in the Final Report:

- Objective
- Define the differences between diaphragm, peristaltic, and vacuum pumping systems.
- Description of pump-out units tested
- Testing procedures
- Testing environment
- Rating systems
- Results
- Conclusion

D. ASSUMED PARAMETERS

Life-Cycle: The assumed average useful life cycle of a typical pump-out is 10 years. A typical pump-out in a medium use area pumps 175 gallons per day according to a study developed by the Oregon State Marine Board on the "Effects of Boat Waste at Municipal Wastewater Treatment Facilities." Over a 10-year period, a typical pump-out will pump 638,750 gallons of fluid.

Accelerated Life-Cycle: Assuming a pump-out has a minimum acceptable working flow of 10 g.p.m., the 10-year life cycle volume could be accomplished in an Accelerated Life Cycle volume in as little as 45 days of continuous pumping or in 90 days of split pumping (10 minutes pumping, 10 minutes resting).

Piping Network: Due to our nations extreme environmental diversity, choosing a piping network that's representative of all the possible conditions that a pump-out could encounter is impossible. The following piping network is recommended as a median network that would represent 60% of the possible conditions a pump-out unit would face.

Suction Head: Shall be eight vertical feet as measured from the tip of the pump-outs' hose nozzle to the base of the pump-out unit.

Discharge Head: Pump-out shall discharge through a 2" diameter, schedule 40, PVC piping. The discharge head shall simulate a 10' vertical rise and a 200' horizontal run with six (6) 90-degree bends and a gate valve. Distance is as measured from the base of the pump-out unit to the invert of the discharge line.

Run Time: All units shall be started and stopped simultaneously except when being individually tested. This will ensure that all the units have an opportunity to an equal run time and are therefore playing on the same field. If a unit should malfunction and need to be turned off until repairs can be made, then only that particular unit will be turned off. This will be done to prevent all the units from suffering subtraction of evaluation points due to falling short of the life cycle pumping volume in 90 days.

Environment: In order to create a worst-case scenario, a representative coastal environment will be created. The test shall simulate the salt-water marine environment complete with misters to imitate sea spray.

E. TEST CRITERIA

Any stationary pump-out with a 30' suction hose may be admitted to this test. The suction pool shall be filled with fluid that has similar properties to the fluid held in a typical boat holding tank. Sufficient chemicals need to be determined to imitate this mixture. Soft solids that range in diameter of up to one inch must also be added to simulate typical solids found in a boat holding tank. Care shall be taken to maintain a consistent chemical pool level throughout the testing process. The pool shall be checked weekly and corrected as necessary.

Suction lift will be 8' (vertical - as measured from the nozzle of the 30' hose to the base of the pump-out unit). The hose shall only be unrolled enough to make submerging of the nozzle possible in the suction pool. The discharge head shall simulate a 10' vertical rise (as measured from the base of the pump-out unit) and a 200' horizontal run through a 2" diameter pipe, schedule 40 PVC pipe.

The average flow (in g.p.m.) shall be logged weekly. The average flow shall be acquired mechanically or through computation, for all units. After the average weekly flow has been logged, the unit shall be simultaneously forced to pump dry by lifting all the nozzles out of the suction pool for a period of 30 seconds and the units shall then be shut off.

The units shall then be tested individually to see how long it takes to pump 30 gallons of water through the unprimed system and the results logged (Average Test Flow). The units shall be pumped dry again for a period of 30 seconds. All nozzles shall be repositioned back in the suction pool and started simultaneously.

The test shall last for a period of 90 days, during which time the equipment shall be concurrently subjected to continuous UV exposure and a saltwater spray. One scratch shall be made on each unit's exterior housing, pump body, and interior frame. These scratches shall simulate accidental, but likely blemishes that occur during installation. The scratches shall be approximately 4" in length and not more than 1/64" in depth. As much as humanly possible, care shall be taken to ensure that all units have identical marks. Photographs of each unit shall be taken as well as close up photos of the scratches. The units shall be checked monthly to monitor physical changes (i.e.: fading, cracking, etc.). Pictures of each unit shall be taken each month to record any changes.

Any defective/broken units that need to be repaired during the test (i.e., hole in diaphragm, broken switches, etc.) shall have the incident logged and then shall be fixed to allow continuing the testing. Logging of the incident shall include description of which parts failed, how long it took to fix the unit (including time to receive the applicable parts once ordered), and the price of the replacement parts.

Pictures shall be taken with the units in the same position, lighting and background as the ones at the beginning of the test.

At the conclusion of the life cycle testing, a separate test shall be run to determine the ability of each pump-out to pass materials not commonly associated with the characteristics of sewage, but commonly found in boat holding tanks. These components are rags, paper towels, paper and Styrofoam cups, and personal hygiene products. This test shall consist of attempting to pump a 50-gallon tank of fresh water containing a predetermined quantity of each of the above products through the pump-out equipment. Each product shall be tested separately. The ability of the pump-out equipment to pass these materials through the discharge piping shall be recorded and rated.

F. SCHEDULE

The proposed project is anticipated to take approximately 24 months to complete. The approximate time frame is as follows:

Contact members for Review Panel	1^{st} – 4^{th} month
Develop Test Criteria	5^{th} – 8^{th} month
Conduct Equipment Life Cycle Testing	9^{th} – 18^{th} months
Draft Final Report	18^{th}- 22^{nd} months
Final Report	22^{nd} – 24^{th} month