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DECENTRALIZED WASTEWATER TREATMENT O&M SERVICE PROVIDER TRAINING PROGRAM

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This final report contains no patentable inventions or discoveries.

2005

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ABSTRACT AND BENEFITS

Abstract:

The Operation and Maintenance (O&M) Service Provider Program has been established to provide training on the operation and maintenance of onsite wastewater treatment system. The focus of these materials is single-family residential systems. The US EPA, along with state and local government entities recognize the importance of decentralized wastewater treatment systems as an essential component of the wastewater infrastructure. Through routine inspections and proper operation and maintenance, onsite wastewater treatment systems can be a permanent and effective part of our wastewater infrastructure. These training materials are intended to provide a knowledge base for service providers in this growing industry.

Benefits:

- Addresses the critical need for education and training for decentralized wastewater treatment practitioners who provide operation and maintenance for onsite wastewater treatment systems.
- Provides training materials for developing a base level of knowledge for operation and maintenance service provider practitioners.
- Establishes a national basis for best practices among O&M service providers.

Keywords: Onsite wastewater treatment systems, management, monitoring, inspection, operational checklists

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Not applicable

LIST OF ACRONYMS

CIDWT	Consortium of Institutes for Decentralized Wastewater Treatment
EB	Executive Board of the CIDWT
EPA	Environmental Protection Agency
NAWT	National Association of Waste Transporters
NCSU	North Carolina State University
NDWRCDP	National Decentralized Water Resources Capacity Development Project
NEHA	National Environmental Health Association
NETSC	National Environmental Training and Services Center
NOWRA	National Onsite Wastewater Recycling Association
NRCS	Natural Resource Conservation Service
PE	Professional Engineer
PI	Principal Investigator
PM	Project Manager
TAMU	Texas A&M University
URI	University of Rhode Island
USDA	U. S. Department of Agriculture
WERF	Water Environment Research Foundation
WOSSA	Washington On-Site Sewage Association

EXECUTIVE SUMMARY

Decentralized wastewater treatment systems provide the wastewater infrastructure for 25% of the U.S. population. In some states, approximately 40% of new construction is being served by decentralized systems. These systems must function properly to effectively treat wastewater. O&M service providers must be able to arrive at clear answers concerning whether or not the system is functioning properly. If different operators reach different conclusions regarding the status of the same system, there is a problem. Service providers should be able to evaluate an onsite wastewater treatment technology and conclude whether that technology is acceptable or unacceptable. The Operational Checklists from the O&M Service Provider Program use a quantitative analysis that measures the current status of the technology. If use of the checklists results in a decision that a component is unacceptable, the service provider can then determine the next step in a plan of action for the system: maintenance, upgrade, repair, or further investigation.

An experienced O&M service provider may be able to analyze the functionality of a system with qualitative results, but this training targets service providers entering the industry. The products of this project capture information necessary to perform O&M service procedures, data collection, and use of operational checklists. This information can be integrated into the O&M professional's business model and used to analyze and report ongoing critical and essential information. The forms may be used to evaluate commercial or industrial systems; however, additional operational checklists may be needed to accurately assess the operational status of systems other than those serving single-family residences.

The O&M Service Provider program provides a complete package that can be used to train service providers. The manual and associated presentations provide details on onsite wastewater treatment technologies and thorough instructions on the use of the component-based Operational Checklists that comprise the core of the program. The instructor's guide includes valuable information on developing a training program, selecting an agenda, planning and conducting a workshop, advice on continuing education, sample homework and exam questions as well as a comprehensive list of training resources.

This report describes the process utilized to develop the O&M Service Provider materials. A writing team was established representing expertise with the various technologies, climatic differences, and regional interests regarding the use of onsite wastewater treatment systems. An industry review team guided the scope format and breath of the materials to insure coverage of relevant topics for practitioners conducting operation and maintenance. A broader review of the materials provided input from manufacturers, designers, installers, operation and maintenance practitioners, regulators, and educators. Finally, a series of pilot training events allowed an assessment of material completeness and effective conveyance of the information to the practitioners.

Project participants shared their knowledge and expertise. Their critical review and guidance shaped the training manual and accompanying instructional materials into a complete training program.

CHAPTER 1.0

INTRODUCTION

1.1 Purpose of O&M Service Provider Training

A large number of trained professionals are needed to service onsite wastewater treatment systems. A service provider can only perform between 5 and 15 O&M service visits a day depending upon technology and proximity of the facilities. Texas alone is installing 25,000 advanced onsite wastewater treatment systems every year. As the number of systems installed increases, the numbers of trained professionals who can understand, operate, and maintain these evolving systems must also increase. More sophisticated management will come at some increased cost. However, better management will allow the use of alternative onsite wastewater treatment systems and facilitate development of new technologies. It also increases system reliability, resulting in lower long-term cost. A specific training program is needed to develop and maintain the expertise of onsite wastewater treatment system professionals who will operate and maintain these systems.

The O&M Service Provider Program represents a comprehensive introductory component of a training/certification program for service providers who operate and maintain single-family residential onsite wastewater treatment systems.

1.1.1 Objective

The objectives of these training materials are to:

- Clarify the responsibilities of the O&M service provider
- Familiarize O&M service providers with standardized terminology, techniques, and procedures for various onsite wastewater treatment system technologies.
- Promote uniform communication between service providers and their clientele.
- Establish a benchmark for competency of service providers and enhance the overall status of the onsite wastewater treatment profession.

By achieving the above objectives, the program ensures that participants are able to accurately assess the operational status of treatment components. This will lead to increased long term system reliability.

1.2 Operation and Maintenance Training Materials

The training materials that were developed during this project include:

- Operation and maintenance training manual
- Standardized operation and maintenance forms (operational checklists)
- Instructors guide
- PowerPoint presentations with instructor notes
- Examination materials

1.3 Glossary of Terms

Lack of consistency in terminology is a barrier to acceptance of nationally developed training materials and guidance documents. Standardization of commonly used terms and definitions will facilitate the continued exchange of information both in the academic realm and in the field. Definition of terms associated with operation and maintenance was one of the first tasks achieved in the project in order to standardize technology terms in the operational checklists. Please see Glossary of Terms for a complete list of terms that are associated with operation and maintenance activities.

1.4 Definition of O&M Activities

The onsite wastewater treatment system service industry consists of a variety of specialists that include installers, designers, pumpers, and more. This project defines what an O&M service provider is, and the types of activities that they should be knowledgeable in. The O&M professional performs a variety of services for the end user (system owner) that include:

- Assessing the onsite wastewater treatment system to determine operational status.
- Performing routine activities required to keep the system operational.
- Responding to emergencies in a timely manner.
- Collecting and recording information regarding operational status of treatment components and recommending timely maintenance, replacement, or pumping of various components as required.
- Monitoring system performance through collection and analysis of effluent samples when appropriate.
- Reporting system operational status and/or system performance to the homeowner, regulatory community, and others.
- Serving as an informational resource for the homeowner.

Troubleshooting of onsite wastewater treatment systems requires advanced knowledge and is not considered a function of the entry level O&M service provider.

CHAPTER 2.0

PROJECT PHILOSOPHY

2.1 O&M Service Provider Program Project Implementation and Development

In January 2004, the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) was awarded funding to develop training materials describing a national best practice standard for conducting O&M service visits of onsite wastewater treatment systems serving residential facilities. These best practice standards are presented as operational checklists for the various onsite wastewater treatment technologies currently in use. This training package and the checklists have been developed with the support of the Environmental Protection Agency (EPA), Water Environment Research Foundation (WERF), National Decentralized Water Resource Capacity Development Project (NDWRCDP), CIDWT and others listed in the acknowledgements of this publication.

One of the chief concerns of the writing team was quality assurance of the materials. To this end, an extensive review and revision process was followed. The development process for these materials was groundbreaking in its approach. The process was conducted in several stages and various forums including:

1. Writing team meetings
2. Structured review meetings
3. Peer review
4. CIDWT Executive Board review
5. Pilot teaching

The project began with a conference call among the project writing team members in January 2004. During this call, a project outline was established, tasks were assigned and the nature of the review committee was discussed. Two reviewers were chosen by each of the five participating institutions. Because the product is intended for use on a national basis, the writing and review teams were chosen from many different states across the country. The writing team relied on the practical experience of the review team to strengthen the material. Thus, the review team consisted primarily of individuals that work in the field either as O&M service providers or for related entities.

The first drafts of the materials were developed through compilation of current training materials used by members of the writing team in their individual state or region. The writing team members exchanged information electronically to develop the draft manual and the operational checklists in preparation for the first of two structured review meetings held over the course of the project. At these review meetings, 15 to 30 individuals were able to review the current materials and comment directly to the principal author and the writing team members.

2.1.1 Writing and Review Team Meetings

The first draft outline and completed operational checklist forms were dispersed to the review team before the first structured review team meeting held concurrently with the Pumper Show in February 2004. At this meeting, the general concepts and key points to be covered in the material was discussed and the nature of the project deliverables was agreed upon. However, the majority of time was spent on collecting comments on the content of the operational checklists from the reviewers.

The first writers' meeting was held after the American Society of Agricultural Engineers (ASAE) Onsite Symposium in March 2004 (Appendix A). At this meeting, the writers reviewed the comments and edits received at the previous meeting and identified action items. The writers also approved the outline and draft forms, and drafted PowerPoint presentations to be used in pilot training classes. Thereafter, the next draft of the materials was compiled and disseminated via mail to the review team.

The second writers' meeting was held concurrently with the National Environmental Health Association (NEHA) annual conference in May 2004. During this meeting, the writers performed further review of the draft PowerPoint's and manual and initial review of draft graphics, evaluation forms and exam questions. Details regarding the five pilot training events were also discussed.

An entire morning session of the actual NEHA conference was devoted to presenting information on the National O&M Service Provider Program project. During this session, members of the project writing team gave individual presentations on the nature of and approach to O&M training and certification in their state and/or region. An additional presentation provided an overview of the national project, illustrating the groundbreaking methods to be used in development and review of the program.

The second meeting with the review team was held in July 2004. At this stage, the writing team presented the operational checklists simultaneously with the associated PowerPoint presentation directly to the reviewers in a classroom setting (Appendix B). Comments on the comprehensiveness and accuracy of these materials were collected manually during the meeting. Reviewers were specifically asked to provide input on implementing a service contract using the Operational Checklists. This information was subsequently integrated into Chapter 1 of the Training Manual. The review team provided comments on the manual via hard copies returned subsequently by mail. This process led to preparation of the third draft of the service provider manual.

Additional writers' meetings (referred to as "development days") occurred during the five pilot training events. The team spent time before, during and after each of these events to conduct rigorous review and revision of the materials. These highly productive, face-to-face sessions were indispensable in the development process.

2.1.2 Peer Review Process

The peer review process extended beyond the review meetings. The manual was sent to over two-hundred reviewers (Appendix C). Although the response varied, peer reviewers provided constructive criticism that enhanced the end product. Current drafts of the materials were posted on the CIDWT website (www.onsiteconsortium.org) throughout this process.

The writers responded to each peer review comment individually. Options for responses included:

1. Briefly explain how you addressed a comment if you agreed with it. (i.e., suggestion or modification incorporated; text added/deleted; etc.)
2. If you did not address a comment because you disagreed with it, provide rationale (i.e., comment was technically incorrect; comment is beyond scope of work; etc.) and brief explanation.
3. If you disagreed with a comment, but made changes for clarification purposes, provide rationale and briefly explain clarification(s) made.

2.1.3 Pilot Training

Five pilot training events were used to introduce the program nationally (Appendix D). These training events allowed assessment of the completeness of the Operational Checklists and effectiveness of the training materials in real-world settings. These training events began in June 2004 and continued through June 2005. Events were held in the southeast (North Carolina), the southwest (Arizona), the northwest (Washington) the northeast (Rhode Island) and the upper-midwest (Minnesota). Pilot teaching consisted of presenting the material either in a workshop setting or as part of a continuing education course. The agendas for these events varied slightly, reflecting the state or regional preference of certain technologies over others. This allowed assessment of the comprehensive nature of the materials and the versatility of the curriculum.

Notably, two of the events were sanctioned by state certification or registration entities, demonstrating the adaptability of the program. The North Carolina training event was sanctioned by the state commission that oversees operator certification. Thus, persons who attended the training (and met other applicable requirements) were deemed qualified to sit for the NC Subsurface Operators' certification examination. Soon after the Rhode Island pilot training event, participants took an examination. Those passing the exam were registered by the University of Rhode Island Cooperative Extension (URI-CE) Onsite Wastewater Training Center as having successfully completed and passed the Innovative and Alternative Systems Operation and Maintenance Service Provider Training Class. Successful participants are also registered with the Rhode Island Department of Environmental Management (RIDEM). Databases listing qualified personnel are available to communities with wastewater management programs that require training and registration of onsite wastewater treatment system inspectors.

Evaluation forms distributed after each pilot training event included questions phrased as a direct restatement of the Learning Objectives to measure the relative success in meeting those objectives (Appendices E-I).

Before, during and after pilot training, the writing team continued to review the materials for completeness, consistency and technical content. The following questions were addressed during the reviews:

1. Is the entire product here?
2. Is it in the correct format?
3. Are the concepts correct?
4. Does it meet the requirements for the deliverables?
5. Is the material relevant to regional location?

If the product was deemed unacceptable, the writers added or changed materials in the product until it was deemed acceptable. These sessions were essentially supplemental writers' meetings and allowed for significant revision and improvement of the manual, the PowerPoint presentations and the Instructor's Guide.

2.1.4 CIDWT Executive Board Review

Members of the CIDWT Executive Board were sent hard copies of the O&M Service Provider Training Manual and associated presentations and directed to review the materials as part of the quality control program (Appendix J). A description of the deliverables for the project accompanied this request. Board members were asked to review the materials relative to the following items:

- Completeness of discussion on the topics included in the table of contents.
- Appropriate presentation of material for practitioners entering the O&M profession.
- Appropriateness of the manual for delivery of a two-day (minimum) classroom instruction program.
- Completeness of the standardized operational checklists.

As these reviews were returned, comments and suggestions were considered and adopted or rejected as appropriate using the same approach outlined under **Peer Review Process** in this chapter.

CHAPTER 3.0

WEB SITE DEVELOPMENT

3.1 Web Site (www.onsiteconsortium.com)

The Centre for Water Resources Studies (located at Dalhousie University, Nova Scotia, Canada) developed and has hosted the web site for the CIDWT since 1996. One of the first actions of this project was to upgrade this site. This site is an interactive, dynamic web site that that acts as:

- A public communication center for those seeking onsite wastewater information.
- A contact center for CIDWT members.
- A private communication forum for the CIDWT working groups.
- A repository and delivery mechanism for the training materials produced by the CIDWT committees.
- A communication hub where CIDWT member institutions are able to list and update program and research information.

The web site was developed in association with Artisan Web Press (AWP) a division of Dalhousie University Computing and Information Services. Jordan Mooers manages the web development project to ensure that the CIDWT's objectives are met. His work on the website is now directly funded by the CIDWT thus ensuring its continued availability.

The specific goals of the web site relative to this project were to provide a professional, dynamic web site; create a higher profile for the CIDWT; and facilitate the communication, research, and training efforts of the onsite wastewater treatment community. Although no number of hits has been recorded, anecdotal information from practitioners, regulators, and even concerned citizens suggest the web site is being accessed and the information available is being used.

The members of the writing team used this website as a way to facilitate communication. With a username and password, the team had the ability to upload, download and review text and PowerPoint files. This reduced mailing and printing costs for the project, and allowed the product to be reviewed and edited several times between official prints and reviews. Many of the files were too large to be emailed.

A summary of the project (including a link to the brochure for the O&M pilot training events) was posted at multiple locations on the website. Currently, the Operational Checklists and a list of O&M Service Provider training events are posted on the website to facilitate use of the O&M Service Provider program deliverables.

CHAPTER 4.0

TARGET AUDIENCE AND EXPECTED USES

4.1 Overview

The O&M Service Provider Program training manual presents basic concepts that are required for full understanding of processes and technologies common to decentralized wastewater treatment operation and maintenance. The manual is aimed at entry level and established practitioners providing operation and maintenance for wastewater treatment systems. In addition to operation and maintenance service providers, other groups such as the following will benefit directly from these materials: state, county, and local regulators who provide wastewater management oversight, system designers who may be required by local code to provide operation and maintenance criteria on plans to obtain system design approval, and installers. The educational materials developed through this program will provide the training needed for certification.

Concepts covered in this manual are specific to operation and maintenance of onsite wastewater treatment systems. Troubleshooting is not covered in the materials. The purpose of the checklists is to standardize operation and maintenance of systems by allowing service providers to determine if the system is acceptable or unacceptable.

Project materials include a text for student use, slide presentations, and various problem sets for use in and out of the classroom. If used in its entirety, this program will require approximately 16 to 24 hours of course time. Additional time is required if a field day is included. Instructors are encouraged to present only those topics in this module that serve the needs of their specific audience. To facilitate selective use of module concepts, lecture notes, slides, and problem sets are divided according to their relative topic.

4.2 Characteristics of the Target Audience

The target audience of the O&M Service Provider Program includes service providers for single family onsite wastewater treatment systems (septic systems). Designers, installers, local regulators, and engineers may find this training useful as well as home and business owners.

4.3 Expected Uses

This training program is intended for use by trainers who have attended a Train the Trainer Academy conducted by CIDWT. These trainers can use this material to establish and conduct training or certification programs in their state or region.

Trainers who attended the first Train the Trainer Academy in July 2005 have already started to plan O&M Service Provider Training programs. The National Association of Wastewater Transporters held a program in Ohio in November 2005, the University of Minnesota conducted a program in January 2006 and the University of Wisconsin conducted a program in February 2006.

CHAPTER 5.0

O&M SERVICE PROVIDER PROJECT MATERIALS DEVELOPMENT PROCESS

5.1 Writer's Meetings

Writer's meetings were conducted periodically throughout the project to assess project status, scope project deliverables and efficiently collaborate on writing materials. Three writer meetings were held during the project. The first meeting was held after the American Society of Agricultural Engineers (ASAE) Onsite Symposium in March 2004. This meeting focused on the review of the Operation and Maintenance operational checklists. These checklists were drafted during the review team meeting conducted in February. The second writers' meeting was held concurrently with the National Environmental Health Association (NEHA) annual conference in May 2004. This meeting focused on development of a complete draft of the training manual. This was a significant accomplishment in preparation for the first pilot training held in Bolivia, North Carolina in June 2004. The last writers' meeting was conducted in April 2005. This meeting's focus was to assess project status and evaluate the scope of remaining project deliverables. This last meeting was critical to finalizing a plan for completing the project. Participation in writer meetings is documented in Table A-1. Time and financial constraints prevented some writers from participating in every meeting.

5.1.1 Development Days

Writer's meetings were also held in conjunction with all the pilot training events. The writers used these meetings to review the material to be used in the pilot training event, and to incorporate changes and brainstorm new ideas. These meetings, referred to as development days, were invaluable for successful and timely completion of the project.

5.2 Industry Review Team

The success of this project is attributable to the strong review and guidance provided by the team of industry reviewers. The industry review team members were selected as follows. Each participating organization identified and selected two individuals from their state or region. In addition, one delegate was selected from each of several national organizations including the National Association of Wastewater Transporters (NAWT), National Environmental Health Association (NEHA), National Onsite Wastewater Recycling Association (NOWRA), and the National Environmental Training and Services Center (NETSC). Individuals were also welcome to attend the review meetings.

The first industry review team meeting was conducted in Nashville, Tennessee in February 2004. The meeting focused on defining the project scope and drafting the operational checklists for the technologies to be included in the training manual. The writers presented initial concepts for the checklists and the industry review team provided guidance on format, layout and critical items for evaluation. Following an intense two-day meeting, the writers had an ample amount of information to condense into the operational checklists. A second review meeting

was scheduled for February 2005 following three pilot training events. The industry review team insisted this date was too distant and desired the second meeting to follow the first pilot training event. This second meeting was held in South Padre Island, Texas in July 2004. The training manual was finalized at this meeting.

5.3 Distributions of the Draft Training Manual

The list of individuals who received a draft of the training manual for review is provided in Table C-1. The information is organized in alphabetical order and the draft they received is noted with an X. The last column is used to denote individuals that provided comments on the manual. A broader industry review of the training manual was desired to capture comments on completeness of the manual and operational checklists. Three drafts of the manual were distributed for review. The first two drafts were targeted to writers, industry review team members and individuals requesting a draft for review. The third draft was distributed to the broadest group of the industry. The reviewers provided excellent comments on the training manuals. The majority of comments on the scope and quality of the material was positive and included constructive comments for improvement. Some reviewers reacted negatively to the scope of the material, but provided constructive comments. Most comments were incorporated into the manual, but some were deemed to be outside the scope of this project and were excluded. Responses to all comments were documented in hard copy.

5.4 Pilot Training

The pilot training sessions provided the writing team valuable insight to the execution of training materials. Since the nature of each class varied, the writers were able to see how a variety of teaching styles worked on different crowds and gained insight on how to adapt the material. The evaluation results can be found in appendices E-I.

5.4.1 First Pilot Training Event in Bolivia, NC

The first public review of the O&M Service Provider Program took place in Bolivia, NC in June 2004 at a three day training school targeted toward persons wishing to become certified as NC Subsurface Wastewater Treatment System Operators. The venue was a classroom setting and 46 participants attended. The majority were from North Carolina with five traveling from out of state.

The agenda and some presentations required minor adaptation to meet the state's Needs to Know. The first two days consisted of modules taught by various instructors. These were presented electronically using PowerPoint while printouts of slides were distributed to the students. The students were also given the O&M manual for reference to the operational checklist which comprises the foundation of the program. A math review was included to prepare them specifically for the North Carolina certification examination. The third day was a field day conducted at the adjacent training and demonstration center. A program evaluation was developed specifically for this class and was completed by all participants. Comments received were generally positive. The writers and reviewers took notes on all presentations, which were incorporated into the power points and manuals before the next review team meeting.

One outcome of this first event was the development of a detailed program evaluation sheet to measure the effectiveness of the training. The format on the evaluation developed for Bolivia was subsequently adapted and used at succeeding pilot training events. Another result

was that a math segment became a fully developed presentation in the Service Provider program, instead of being included as part of other chapters or simply as an Appendix.

5.4.2 Second Pilot Training Event in Tucson, AZ

This two day training event was held in August 2004 in a small hotel conference room which presented challenges with regard to space and obstructed views. The audience, which was the smallest group of the five events, included 18 participants (15 from Arizona, 3 from out of state). Many of these were designers or regulators and they tended to pose many questions on the subject of design during the training sessions. This seemed quite disruptive to the schedule so the writing team resolved to establish a policy whereby questions must be kept within the scope of the project (i.e., O&M) at future training events. However, it also became clear that the project materials would be quite valuable to decentralized wastewater treatment system designers. Designers who are familiar with O&M requirements may tend to design systems that allow access to system components and facilitate maintenance activities. The evaluations for this pilot training session were generally positive.

5.4.3 Third Pilot Training Event in Tacoma, WA

The next pilot training took place approximately one month after the Tucson event in September 2004 and drew the largest number of attendees of any of the events. Fifty-nine people attended this two-day workshop in Tacoma, Washington at a hotel conference facility. Three of the attendees were from Oregon and the rest were from Washington. The state of Washington has extensive regulatory requirements for persons who perform operation and maintenance. Thus, the audience was comprised almost entirely of practitioners who were already employed in this capacity, but had varying levels of expertise. The feedback received on program evaluations was quite valuable. The majority indicated that of all the materials, the operational checklists were most valuable to them. Those with limited knowledge felt that they had learned a lot about the O&M aspects of the industry, but even those with extensive skills felt that the workshop was a valuable and worthwhile experience.

During the debriefing after this event, the writing team discussed the issue of speaker notes. It was agreed that each author would be responsible for providing detailed speaker notes for the PowerPoint presentations. Also, discussion of the nature and content of the Instructor Guide began at this time.

5.4.4 Fourth Pilot Training Event in Kingston, RI

The two day indoor training event in May 2005 was conducted in a 120 seat auditorium used for most of the University of Rhode Island Cooperative Extension New England Onsite Wastewater Training Center classes. This was arguably the finest of all the facilities used for pilot training as the site featured stadium seating with no obstructed views. Thirty-seven people representing individuals from private sector, municipal wastewater management programs, and state regulatory agencies attended the class. Most were from Rhode Island and the remainder came from surrounding states. Nineteen of the attendees were system designers, ten were service providers, five were municipal wastewater management specialist, one person was a State regulatory official, and four others were uncategorized wastewater professionals. Various instructors delivered training materials using a lecture type delivery and answered questions as they occurred throughout their presentations. The oral presentations and PowerPoint slides followed the O&M manual content. The importance of directing the attendees to the appropriate pages in their manual and slide handouts became apparent.

All writers took notes on presentations, but a specific effort was made to monitor the speaker notes and slides. One member of the writing team was designated to review each slide during the training event. This person was familiar with all of the materials, but had not been able to attend two previous events and could thus review the training with a 'fresh eye". Thus, specific comments were made on slide quality and clarity and specific technical points were captured in the notes pages of the presentations. These were reviewed and incorporated into slides and manuals as appropriate before the Minnesota Pilot testing. An evaluation of the class was completed by all attendees. The comments received were constructive and positive.

5.4.5 Fifth Pilot Training Event in Brainerd, MN

This was the final offering as a demonstration and was conducted just five weeks after the Rhode Island program in June 2005. The meeting was held in a large hotel conference room and attended by 42 persons. Because Minnesota regulations require Continuing Education for licensing, some of the participants attended simply to log their hours. The fact that some were compelled to attend because of regulation was reflected in their comments on program evaluations. The majority of the participants (particularly those who intended to work in O&M) indicated that the course was excellent and the material was well organized. The class was also attended by a number of non-Minnesotans and their comments were mainly positive. One attendee wanted to buy 100 copies of the draft manual but was told he had to wait for the final draft.

During the development days before and after this event, the writing team fleshed out the Instructor's Guide, discussed the Train the Trainer event and proceeded with work on the Final Report for the project.

CHAPTER 6.0

OUTLINE OF TRAINING MANUAL

6.1 Outline

The materials developed for the O&M Service Provider Training manual follow the outline below. Each of the chapters has been reviewed repeatedly, and revised following the reviews. Information is provided elsewhere in this report regarding details on the development and review process for each set of materials.

I. Introduction
   - A. Definition of Terms
   - B. What is an O&M Service Provider?
   - C. How does an O&M Professional Function?
   - D. What is an Onsite Wastewater Treatment System?
   - E. Program Implementation and Development
   - F. Why perform O&M service visits?
   - G. Why is an O&M service provider program important?
   - H. Defining the role of management
   - I. Monitoring and Maintenance Frequency
   - J. Procedures for Implementing O&M program and use of O&M Checklists
   - K. Introduction to Wastewater
   - L. Evaluation of Onsite Wastewater Treatment Components

II. Safety
   - A. Management of Safety
   - B. How Accidents Happen
   - C. Creating a SH&E Policy is the First Step
   - D. Safety Hazards
   - E. Lifting Injury Prevention
   - F. Surface Discharge of Sewage and Effluent
   - G. First Aid
   - H. Emergency Numbers to keep on Hand

III. Business and Industry Ethics
   - A. Business and Industry Ethics
   - B. Definition of ethics: A comparison of ethics and laws
   - C. How one builds or loses credibility through ethical questions
   - D. How one builds or loses personal respect through ethical questions
   - E. How one builds or loses personal admiration through ethical questions
   - F. Ethics from the viewpoint of personal, public and peer group perceptions

IV. Site Assessment
   - A. Operation and Maintenance

V. Pretreatment Components- Tanks
   - A. Holding Tanks

B. Septic Tanks, Trash Tanks, and Processing Tanks

VI. Pump Tanks, Pumps, and Controls
- A. Pump tanks
- B. Pumps
- C. Calculating Flow
- D. Pump: Demand Dosed (PDD)
- E. Pump: Timer Dosed (PTD)

VII. Pretreatment Components- Advanced
- A. Distal Head
- B. Air release Valve
- C. Media Filters
- D. Single-Pass Media Filters
- E. Recirculating Media Filters
- F. Types of Media Filters
- G. Operation and Maintenance for all Media Filters
- H. Aerobic Treatment Units
- I. Constructed Wetlands
- J. Lagoons
- K. Disinfection
  - i. Chlorine
  - ii. Ultraviolet Light
  - iii. Ozone

VIII. Final Treatment and Dispersal Components
- A. Gravity Distribution Systems
- B. Evapotranspiration (ET) Beds
- C. Low-Pressure Drainfield
- D. Media Filters Used as Drainfield Options
- E. Drip Distribution
- F. Spray Distribution
- G. Discharging Systems

IX. Math
- A. Basic Terms
- B. Basic Equations
- C. Units of Measure and Calculations
- D. Additional Sample Problems
- E. Calculating Recirculation Ratios
- F. Table A.1 Conversion Factors
- G. Table A.2 Friction Loss
- H. Table A.3 Allowance in Equivalent Length of Pipe for Friction Loss in Valves and Threaded Fittings
- I. Table A.4 Pipeline Volume
- J. Table A.5 Flow Velocities
- K. Table A.6 Orifice Flow for Various Orifice Sizes and Pressure Heads
- L. Table A.7 Flow Through Orifices, Pressure Manifolds
- M. Table A.8 Flow Through Orifices, LPP

CHAPTER 7.0

PROJECT AWARENESS AND DISSEMINATION

7.1 Introduction

This project was advertised using the CIDWT website, brochures for the pilot training events, presentations at conferences across the country, articles, and word of mouth. The brochure can be found in Appendix L.

The manual is available for purchase through Midwest Plan Service (http://www.mwpshq.org/). The O&M Service Provider Program will be taught across the country and used in training and certification programs by trainers that have attended the Train the Trainer Academy conducted by the CIDWT. The manuals can also be used by university students as part of a decentralized wastewater treatment course.

7.2 Presentations

1. Lesikar, B.J. 2003. Operations and management of onsite systems, National Onsite Wastewater Recycling Association 12th annual conference and exhibition, November 4-5, 2003. Nashville, Tennessee.
2. Lesikar, B.J, N. Deal, G. Loomis, and J. Stonebridge. 2004. A Project to Define and Refine Operation, Maintenance and Monitoring of Onsite/Decentralized Wastewater Systems. National Environmental Health Association 2004 Annual Educational Conference & Exhibition. May 8-12, 2004. Anchorage Alaska.
3. Gustafson D.M. and B.J. Lesikar. 2004. O&M Service Provider Program. 13th Annual Technical Education Conference and Exposition. National Onsite Wastewater Recycling Association. Hyatt Regency Hotel, Albuquerque Conference Center. November 7-10, 2004. Albuquerque, New Mexico.
4. Lesikar, B.J. 2005. O&M Service Provider Program. Advanced Onsite Wastewater Treatment Systems. Maryland Onsite Wastewater Professional Association. Annapolis Sheraton Hotel, January 21, 2005. Annapolis, Maryland.
5. Gustafson, D.M.. 2005. O&M Service Provider Program. Minnesota Onsite Sewage Contractors Association Annual Meeting. March 21-23, 2005. Duluth, MN.

7.3 Distribution of O&M Service Provider Informational Brochure

1. Tenth National Symposium on Individual and Small Community Sewage Systems, March 21-24, 2004. Sacramento California.
2. North Carolina Subsurface Wastewater Systems Operator School, June 7-9, 2005, Bolivia, NC.
3. 20th Annual North Carolina Onsite Wastewater Conference, October 11-13, 2005, Raleigh, NC.
4. Onsite Systems and Technology A to Z. 13th Annual Technical Education Conference and Exposition. National Onsite Wastewater Recycling Association. Hyatt Regency Hotel, Albuquerque Conference Center. November 7-10, 2004.

5. Workshop on Decentralized Wastewater for Puerto Rico, December 2-3, 2004. San Juan, Puerto Rico.
6. Workshop on Decentralized Wastewater for the Virgin Islands, December 6-7, 2004. St. Thomas, Virgin Islands.
7. 16th Annual Onsite Sewage Treatment & Disposal Conference, Auburn University, January 19 & 20. Auburn, Alabama.
8. On-Site Wastewater Treatment Systems Inspection and Training Program, Delaware Technical College, January 29-30, 2005, Georgetown Delaware
9. Ohio Water Quality & Waste Management Conference. Ohio State University Extension. February 3-4, 2005. Columbus, Ohio
10. Direct mailing to 325 registered septic system inspectors and community wastewater management specialist in Rhode Island in preparation for May 11 – 12, 2005 pilot testing.
11. Second Northeast Onsite wastewater Treatment Short Course & Equipment Exhibition. March 29-31, 2005. Groton, CT.
12. Minnesota O&M Service Provider Program. Direct mailing to over 3000 registered onsite wastewater treatment specialists. Brainerd, MN pilot training. June 15-16, 2005.
13. Arizona O&M Service Provider Training Program. Direct mailing and postings. Tucson, AZ pilot training. August 24-25, 2004.
14. Washington O&M Service Provider Program. Direct mailings and postings. Tacoma, WA pilot training. September 16-17, 2004.

7.4 Articles and Papers

1. Lesikar, B.J, N. Deal, G. Loomis, and J. Stonebridge. 2004. A Project to Define and Refine Operation, Maintenance and Monitoring of Onsite/Decentralized Wastewater Systems. National Environmental Health Association 2004 Annual Educational Conference & Exhibition. May 8-12. Anchorage Alaska.
2. Rulseh, T.J. 2004. Pumper Interview: O&M: A Better Way. (Interview of Dr. Bruce Lesikar) Pumper Magazine. www.pumper.com . December 2004.

APPENDIX A

WRITERS MEETING ATTENDANCE

Table A-1. Writers Participation at Writing Team Meetings (D.D.= Development day)

Last Name	First Name	ASAE March 2004	NEHA May 2004	1st D.D. June 2004	2nd D.D. August 2004	3rd D.D. September 2004	3rd Writer's Meeting April 2005	4th D.D. May 2005	5th D.D. June 2005
Deal	Nancy	X	X	X	X	X	X	X	X
Gustafson	Dave	X	X	X	X	X	X	X	X
Hoover	Mike			X					
Kalen	David						X	X	X
Lesikar	Bruce	X	X	X	X	X	X		X
Lindbo	Dave	X		X				X	X
Loomis	George	X	X	X	X	X	X	X	X
O'Neill	Courtney			X	X		X	X	X
Rubin	Robert			X					
Stonebridge	Jerry	X	X	X		X			
Thomas	John		X	X		X			

APPENDIX B

INDUSTRY REVIEW TEAM

Table B-1. Individuals Participating in Industry Review Meetings

Last Name	First Name	Company	Nashville, TN	South Padre, TX
Banister	Tim	Tri-County Wastewater Mgmt		X
Bannister	Dean	Bannister Septic	X	
Burnham	David	Burnham Excavating, Inc.	X	X
Davis	Kenneth	Axis Enterprises, Inc.	X	X
Davis	K.	Coastal Plains Environmental Group		X
Deal	Nancy	NCSU Soil Science Cooperative Extension	X	X
Ebelherr	Doug	NEHA	X	
Fox	Bruce	National Association of Wastewater Transporters	X	X
Griffin	Molly	Texas Cooperative Extension		X
Gustafson	Dave	University of Minnesota	X	X
Himschoot	Robert	Crews Environmental	X	X
Hoover	Mike	North Carolina State University	X	
Inman	J.R.	N.W. Cascade/FloHawks	X	X
Jobin	Justin	OWT Center URI-NRS Dept.	X	X
Kalen	David	OWT Center URI-NRS Dept.	X	X
Konsler	Tom	Orange County Health Dept	X	X
Larson	Eric	Septic Check, Inc.		X
Lesikar	Bruce	Texas Cooperative Extension	X	X
Lindbo	Dave	North Carolina State University	X	X
Lindsay	Lorene	National Environmental Training and Services Center	X	X
Loomis	George	OWT Center URI-NRS Dept.	X	X
O'Neill	Courtney	Texas Cooperative Extension		X
Stasiunas	Tim	StaCon Corporation	X	X
Stonebridge	Jerry	Stonebridge Construction Co.	X	X
Stuth	Bill	AquaTest Inc.		X
Thomas	John	Washington OnSite Sewage Association	X	X
Wivoda	Bill	Wivoda Construction		X

APPENDIX C

DISTRIBUTIONS OF DRAFT TRAINING MATERIAL

Table C-1. Individuals Distributed Drafts of Training Manuals

Last Name	First Name	Company	1st Distribution	2nd Distribution	3rd Distribution	3rd Edits Received
Adams	Mark	Northstar Engineering		X	X	
Aguirre	Frank	Septic Systems Express	X	X	X	X
Alexander	Donald	VA Department of Health			X	X
Allen	Tartt	Alabama Onsite Training Center			X	
Amoozegar	Aziz	North Carolina State University			X	
Ashburn	Paul	Ashco A Corporation		X		
Ballavance	Brett	Minnesota Pollution Control Agency			X	X
Banathy	Tibor	Wastewater Training and Research Center			X	X
Bannister	Tim	Tri-County Wastewater Mgmt	X	X	X	
Bannister	Dean	Bannister Septic	X	X	X	
Benson	Ralph	Clermont County General Health District			X	X
Bishop	Colin	Orenco Systems			X	
Blodig	Alison	Biomicrobes, Inc.			X	X
Borgeson	Karen	SJE-Rhombus			X	
Bounds	Terry	Orenco Systems, Inc.			X	X
Brogdon	Jennifer	TVA, Environmental Engineering Services			X	
Buchanan	John	U.T. Biosystems	X		X	X
Burks	Bennette	Consolidated Treatment Systems			X	X
Burnham	David	Burnham Excavating, Inc.	X	X	X	
Bush	Daniel	Septic Technologies, Inc.			X	
Byers	Matthew	Zoeller Pump Co.			X	X
Cashell	Peg	Utah Water Research Laboratory			X	
Clark	Mary	Stone Environmental Inc.		X		
Converse	James	Biological Systems Engineering University of Wisconsin			X	
Cotton	Dave	Wastewater Technologies, Inc.			X	
Cruver	Sally	Salcor Incorporated			X	
Cruz	Sonia	State of Florida- Dept of Health			X	
Dallemand	Barbara	Church and Associates, Inc.			X	X
Davis	Kenneth	Axis Enterprises, Inc.	X	X	X	
Davis	Mike	Kentucky Onsite Wastewater Training Center			X	
Davis	K.	Coastal Plains Environmental Group	X	X	X	
Deal	Nancy	NCSU Soil Science Cooperative Extension	X	X	X	X

Last Name	First Name	Company	1st Distribution	2nd Distribution	3rd Distribution	3rd Edits Received
Deal	Glendon	USDA- Rural Development-Rural Utilities Service		X		
Dix	Steve	Technical Service Director Infiltrator Systems, Inc.			X	
Douglas	Bruce	Stone Environmental Inc.			X	
Douglas	Bruce	Questa Engineering Corporation			X	
Ebelherr	Doug	NEHA	X	X	X	
Elmer	Peg	Dept of Housing, Vermont			X	
Fox	Bruce	National Association of Wastewater Transporters	X	X	X	
Farrell-Poe	Kitt	University of Arizona			X	X
Frederick	Rod	Environmental Protection Agency	X	X	X	X
Griffin	Molly	Texas A&M University	X	X	X	
Gross	Mark	University of Arkansas-Dept of Civil Engineering			X	
Gustafson	Dave	University of Minnesota	X	X	X	X
Guy	Brenda	Delta Environmental Products, Inc.			X	
Hairston	James	Alabama Cooperative Extension			X	
Hanson	Adrian	NMSU/SWEDTI Center			X	
Himschoot	Robert	Crews Environmental	X	X	X	X
Hoover	Mike	North Carolina State University	X	X	X	X
Inman	J.R.	N.W. Cascade/FloHawks	X	X	X	
Jablecki	Joe	University of Alabama-Birmingham			X	
Jex	Richard	Utah State University			X	
Jobin	Justin	OWT Center URI-NRS Dept.	X	X	X	X
Johnson	George	Ecological Tanks, Inc.			X	
Jowett	Craig	Waterloo Biofilter Systems, Inc.			X	
Kalen	David	OWT Center URI-NRS Dept.	X	X	X	X
Keckeisen	Loraine	Delhi College of Technology			X	
King	Robert	EPARCO			X	
Kinne	Larry	SUNY- Morrisville			X	
Konsler	Tom	Orange County Health Dept	X	X	X	X
Larson	Eric	Septic Check, Inc.	X	X	X	
Lee	Brad	Purdue University			X	
Lee	Robert	Loudoun County Environmental		X		
Lenning	Dave	Alternatives Northwest	X	X	X	
Lesikar	Bruce	Texas A&M University	X	X	X	X
Lindbo	Dave	North Carolina State University	X	X	X	X
Lindsay	Lorene	National Environmental Services Center	X	X	X	
Long	Dawn	American Septic Service LLC			X	
Loomis	George	OWT Center URI-NRS Dept.	X	X	X	X
Loudon	Ted	Michigan State University			X	
Mahmood	Ramzi	California State University-Sacramento			X	
Manthey	Michael	The MESS Co., LLC		X	X	
McBride	Karen	Rural Community Assistance Corporation		X		
McKinney	Jerry	Clearstream, Inc.			X	

Last Name	First Name	Company	1st Distribution	2nd Distribution	3rd Distribution	3rd Edits Received
Miles	Randall	Soil Science University of Missouri			X	
Miller	Patricia	WVU Extension Service			X	
Mokma	Delbert	Michigan State University			X	
Mori	John	National Small Flows Clearing House			X	
Nelson	Doug	Knight Treatment Systems			X	
Nelson	Valerie	Coalition for Alternative Wastewater Treatment			X	
Oakley	Stewart	CSU- Chico			X	
O'Driscoll	John-Paul	Alabama Dept of Public Health			X	
Ogden	Michael	Natural Systems International, LLC		X		
Olson	Jon	Olson Sewer Service, Inc.	X	X	X	
O'Neill	Courtney	Texas A&M University	X	X	X	X
Papish	Uri	Oregon Department of Environmental Quality		X		
Peacock	Carl	VA Tech 7 VA Department of Health			X	
Peat	Raymond	Bio-Microbics, Inc.			X	
Perez	Richard	VT Technical College			X	
Piluk	Richard	Anne Arundel County Health Dept			X	
Powell	Morgan	Kansas State University			X	
Price	Michael	Norweco, Inc.			X	X
Rock	Chet	University of Maine			X	
Rogers	Tom	Northwest Cascade, Inc.			X	
Rubin	Robert	North Carolina State University		X	X	X
Rupp	Gretchen	MSU Extension Service			X	
Sanders	Paul	Clermont County Health District		X		
Shepard	Andrea	National Decentralized Water Resources Capacity Dev Proj.			X	
Sherman	Kevin	Florida Onsite Wastewater Association		X	X	X
Shon	Won	Aquamake Water Resource Group, LLC		X		
Shuman	Benjamin	USDA- Rural Development-Rural Utilities Service		X		
Siegrist	Robert	Colorado School of Mines			X	
Smithson	Anthony	Lake County Health Department			X	
Snowden	Jeff	Snowden Onsite Septic, Inc.			X	
Stasiunas	Tim	StaCon Corporation	X	X	X	
Stonebridge	Jerry	Stonebridge Construction Co.	X	X	X	X
Stuth	Bill	AquaTest Inc.	X	X	X	
Tartt	Allen	Alabama Onsite Training Center			X	
Thomas	John	Washington OnSite Sewage Association	X	X	X	X
Trammel	Clifford	California Onsite Wastewater Association			X	
Tyler	Jerry	Tyler and Associates			X	
Waller	Donald	Director of CWRS Dalhousie University			X	

Last Name	First Name	Company	1st Distribution	2nd Distribution	3rd Distribution	3rd Edits Received
Wecker	Stephen	Onsite Consulting Services	X	X	X	
Weil	Claude	University of Guelph			X	
White	Kevin	University of South Alabama			X	
Williams	Jerry	Delaware Tech and Comm College			X	
Wingert	Howard	Concrete Sealants			X	
Wivoda	Bill	Wivoda Construction	X	X	X	
Woldt	Wayne	University of Nebraska Lincoln			X	
Wright	Denise	Indiana State Dept of Health			X	X
Yeager	Tom	Kennedy/Jenks Consultants			X	

APPENDIX D

PILOT EVENT AGENDAS

Table D-1. Agenda for First Pilot Training Event in Bolivia, NC. (June 7-9, 2004)

Times	Monday June 7, 2004	Instructor
8:00-8:30	Registration	
8:30-8:45	Welcome	**Gustafson**
8:45-9:15	National O&M Service Provider Program Introduction	**Lesikar**
9:15-9:45	NC Laws and Rules Operator Responsibilities	**Gustafson**
9:45-10:15	Introduction to Wastewater	**Reid**
10:15-10:30	Break	
10:30-11:00	Safety	**Thomas**
11:00-12:00	Basic Principles	**Lindbo**
12:00-12:45	Lunch	
12:45-1:15	Site Assessment	**Lindbo**
1:15-2:00	Pretreatment: Tanks O&M	**Gustafson**
2:00-3:00	Pump Systems O&M Break	**Gustafson**
3:15-3:45	Pump Systems O&M (continued)	**Gustafson**
3:45-4:45	Math	**Deal**
	Tuesday June 8, 2004	
8:00-9:00	Media Filters O&M	**Loomis**
9:00-9:30	ATUs O&M	**Lesikar**
9:30-10:00	Disinfection (Chlorine, UV) Break	**Lesikar**
10:15-10:45	Final Treatment and Dispersal: Gravity trenches	**Gustafson**
10:45-11:30	Final Treatment and Dispersal: LPP Lunch	**Loomis**
12:15-12:45	Final Treatment and Dispersal: Drip	**Lesikar**
12:45-1:15	Collection Systems	**Lindbo**
1:15-1:30	Industrial Process Wastewater	**Berkowitz**
1:30-2:15	Large Systems O&M	**Berkowitz**
2:15-2:45	Business and Industry Ethics Break	**Lesikar**
3:00-3:30	Overall System Report	**Deal**
3:30-4:00	Contracts (30)	**Swift**
4:00-5:00	NC Issues	
	Wednesday June 9, 2004	
8:00-5:00	Field Day: Rain or Shine Schedule to be announced	

Table D-2. Agenda for Second Pilot Training Event in Tucson, AZ (August 24-25, 2004)

Times	Tuesday August 24, 2004	Instructor
7:30-8:00	Registration	
8:00-8:10	Welcome	**Farrell-Poe**
8:10-9:00	National O&M Service Provider Program Introduction	**Lesikar/Gustafson**
9:00-9:45	Introduction to Wastewater	**Loomis**
9:45-10:00	Break	
10:00-10:45	Site Assessment	**Deal**
10:45-11:15	Safety	**Thomas**
11:15-12:00	Math	**Deal**
12:00-1:00	Lunch	
1:00-1:30	Business and Industry Ethics	**Lesikar**
1:30-2:15	Pretreatment Components: Tanks	**Gustafson**
2:15-3:00	Pumps and Pump Tanks	**Gustafson**
3:00-3:15	Break	
3:15-4:00	Pump- Demand and Timer Dosed Systems	**Gustafson**
4:00-5:00	Pretreatment Components- Advanced: Media Filters	**Loomis**
	Wednesday August 25, 2004	
8:00-9:00	Homework	**Gustafson**
9:00-9:45	Pretreatment Components- Advanced: ATU's	**Lesikar**
9:45-10:00	Break	
10:00-11:00	Constructed Wetlands, ET Beds, and Lagoons	**O'Neill**
11:00-12:00	Final Treatment and Dispersal: Gravity Trenches	**Gustafson**
12:00-1:00	Lunch	
1:00-1:45	Final Treatment and Dispersal: LPD	**Loomis**
1:45-2:15	Final Treatment and Dispersal: Bottomless Sand Filters, Mounds and Bottomless Peat Filters	**Loomis**
2:15-3:00	Pretreatment Components- Advanced: Disinfection	**O'Neill**
3:00-3:15	Break	
3:15-4:00	Final Treatment and Dispersal: Drip Distribution, Spray Distribution, and Discharging Systems	**Lesikar**
4:00-4:45	Completion of Reports and Discussion	**Gustafson/Lesikar**
4:45-5:00	Evaluations	**Farrell-Poe**

Table D-3. Agenda for Third Pilot Training Event in Tacoma, WA (September 16-17, 2004)

Times	Thursday September 16, 2004	Instructor
7:30-8:00	Registration	
8:00-8:05	Welcome	**Thomas**
8:05- 9:20	National O&M Service Provider Program Introduction	**Lesikar/Gustafson**
9:20-10:00	Introduction to Wastewater	**Loomis**
10:00-10:15	Break	
10:15-11:00	Site Assessment	**Deal**
11:00-12:00	Safety	**Thomas**
12:00-1:00	Lunch	
1:00-1:30	Math	**Deal**
1:30-2:00	Business and Industry Ethics	**Lesikar**
2:00-2:10	Break	
2:10-3:10	Pretreatment Components: Tanks	**Gustafson**
3:10-4:00	Pumps and Pump Tanks	**Gustafson**
4:00-4:15	Break	
4:15-5:00	Pump- Demand and Timer Dosed Systems	**Gustafson**
	Friday September 17, 2004	
8:00-8:45	Homework	**Gustafson**
8:45-9:45	Pretreatment Components- Advanced: Media Filters	**Loomis**
9:45-10:00	Break	
10:00-10:45	Pretreatment Components- Advanced: ATU's	**Lesikar**
10:45-11:15	Constructed Wetlands	**Gustafson**
11:15-12:00	Final Treatment and Dispersal: Gravity Trenches	**Gustafson**
12:00-1:00	Lunch	
1:00-1:30	Final Treatment and Dispersal: LPD	**Loomis**
1:30-2:00	Final Treatment and Dispersal: Bottomless Sand Filters, Mounds and Bottomless Peat Filters	**Loomis**
2:00-2:15	Break	
2:15-3:00	Pretreatment Components- Advanced: Disinfection	**Deal**
3:00-3:45	Final Treatment and Dispersal: Drip Distribution, Spray Distribution	**Lesikar**
3:45-4:00	Break	
4:00-4:45	System Evaluation and Discussion	**Gustafson/Lesikar**
4:45-5:00	Evaluations	**Thomas**

Table D-4. Agenda for Fourth Pilot Training Event in Kingston, RI (May 11-12, 2005)

Times	Wednesday May 11, 2005	Instructor
7:30-8:00	Registration	
8:00-8:15	Welcome	**Loomis**
8:15- 9:20	National O&M Service Provider Program Introduction	**Gustafson**
9:20-10:00	Introduction to Wastewater	**Loomis**
10:00-10:15	Break	
10:15-11:00	Site Assessment	**Deal**
11:00-11:30	Personal Safety	**Gustafson**
11:30-12:00	Math	**Deal**
12:00-1:00	LUNCH	
1:00-1:30	Business and Industry Ethics	**O'Neill**
1:30-2:30	Pretreatment Components: Tanks	**Kalen**
2:30-3:20	Pumps and Pump Tanks	**Gustafson**
3:20-3:35	Break	
3:35-5:00	Pump- Demand and Timer Dosed Systems	**Gustafson**
5:00	Distribute Homework Assignment and Conclude	**Gustafson**
	Thursday May 12, 2005	
8:00-8:45	Homework Review	**Gustafson**
8:45-10:15	Pretreatment Components- Advanced: Media Filters	**Loomis**
10:15-10:30	Break	
10:30-11:45	Pretreatment Components- Advanced: ATU's	**O'Neill**
11:45-12:45	LUNCH and distribute class evaluations	
12:45-1:30	Final Treatment and Dispersal: Gravity Trenches	**Gustafson**
1:30-2:00	Final Treatment and Dispersal: LPD	**Loomis**
2:00-2:30	Final Treatment and Dispersal : Bottomless Sand Filters, Mounds, and Bottomless Peat Filters	**Kalen**
2:30-3:15	Pretreatment Components – Advanced: Disinfection	**Deal**
3:15-3:30	Break	
3:30-4:15	Final Treatment and Dispersal: Drip Distribution	**Gustafson**
4:15-5:00	System Evaluation and Discussion	**Gustafson**
5:00	Collect Class Evaluations and Class Concludes	**O'Neill**

Table D-5. Agenda for Fifth Pilot Training Event in Brainerd, MN (June 15-16, 2005)

Times	June 15, 2005	Instructor
7:30-8:00	Registration	
8:00-8:10	Welcome	**Gustafson**
8:10-8:40	National O&M Service Provider Program Introduction	**Lesikar**
8:40-9:00	Implementation of an O&M Service Provider Program	**Gustafson**
9:00-9:45	Introduction to Wastewater	**Loomis**
9:45-10:00	Break	
11:00-11:30	Site Assessment	**Lindbo**
11:02-11:28	Safety	**Gustafson**
10:30-11:00	Business and Industry Ethics	**Lesikar**
11:30-12:00	Math	**Deal**
12:00-1:00	Lunch	
1:00-1:45	Pretreatment Components: Tanks	**Gustafson**
1:45-3:15	Pumps, Pump Tanks & Controls	**Gustafson**
3:15:3:30	Break	
3:30-5:00	Pretreatment Components- Advanced: Media Filters	**Loomis/Kalen**
	June 16, 2005	
8:00-8:30	Homework	**Gustafson**
8:30-9:45	Pretreatment Components- Advanced: ATU's	**Lesikar**
9:45-10:00	Break	
10:00-10:30	Constructed Wetlands	**Lesikar**
10:30-11:45	Final Treatment and Dispersal: Gravity Trenches	**Gustafson**
11:45-12:45	Lunch	
12:45 -1:15	Pretreatment Components- Advanced: Disinfection UV/ Chlorine	**Loomis/Lesikar**
1:15-2:00	Final Treatment and Dispersal: LPD	**Loomis/ Kalen**
2:00-2:45	Final Treatment and Dispersal: Bottomless Sand Filters, Mounds and Bottomless Peat Filters	**Loomis**
2:45-3:00	Break & Handout Evaluations	
3:00-4:00	Final Treatment and Dispersal: Drip Distribution	**Lesikar**
4:00-4:45	Completion of Reports and Discussion	**Gustafson/Lesikar**
4:45-5:00	Class Evaluations	

APPENDIX E

RESULTS FROM FIRST PILOT TRAINING EVENT EVALUATIONS IN BOLIVIA, NC

Table E-1. Overall Evaluation (5=most valuable and 1=least valuable) (N=19)

Question	Mean
Objectives of this program were:	4.42
Organization and presentation of the material was:	4.26
Operational checklists as descriptors of O&M Service:	4.68
PowerPoints presenting the material were:	4.53
My expectations were:	4.39
Overall, I would consider this program:	4.47
My attendance to this program should prove:	4.58

Table E-2. Presentation Evaluation Regarding Knowledge Gained (5=most valuable and 1=least valuable) (N=19)

Question	Mean
National 0&M Service Provider Introduction:	4.53
NC Laws and Rules/Operator Responsibilities:	4.21
Introduction to Wastewater:	4.47
Safety:	4.32
Basic Principles and Systems:	4.58
Site Assessment:	4.58
Pretreatment-Tanks O&M:	4.68
Pump Systems O&M:	4.58
Math:	4.16
Media Filters O&M:	4.53
ATU's O&M:	4.37
Disinfection (Chlorine UV):	4.37
Final Treatment and Dispersal-Gravity Trenches:	4.42
Final Treatment and Dispersal-LPP:	4.42
Final Treatment and Dispersal-Drip:	4.37
Collection Systems:	4.37
Industrial Process Wastewater:	4.26
Large System O&M:	4.32
Business and Industry Ethics:	4.21
Overall System Report:	4.37
Contracts:	4.44

Table E-3. Presentation Evaluation in Regard to Increasing Your Ability to Perform Your Job (5=most valuable and 1=least valuable) (N=19)

Question	Mean
National 0&M Service Provider Introduction:	4.31
NC Laws and Rules/Operator Responsibilities:	4.13
Introduction to Wastewater:	4.19
Safety:	4.13
Basic Principles and Systems:	4.56
Site Assessment:	4.38

Pretreatment-Tanks O&M:	4.38
Pump Systems O&M:	4.38
Math:	3.88
Media Filters O&M:	4.31
ATU's O&M:	4.31
Disinfection (Chlorine UV):	4.25
Final Treatment and Dispersal-Gravity Trenches:	4.25
Final Treatment and Dispersal-LPP:	4.38
Final Treatment and Dispersal-Drip:	4.06
Collection Systems:	4.00
Industrial Process Wastewater:	4.38
Large System O&M:	4.31
Business and Industry Ethics:	4.19
Overall System Report:	4.38
Contracts:	4.25

Table E-4. Class Segment Evaluation in Regard to Their Value to you this Week (4=most valuable and 1=least valuable) (N=19)

Question	Mean
Classroom Presentations:	3.59
Math Review:	2.76
Written O&M Manual:	3.59
Written NC Manual (Blue):	3.47
PowerPoint Handouts:	3.56
Field Day:	4.00

E.1 Free Response Questions

E.1.1 What were your expectations for this program?

- Learn what's needed to know to pass exam and professionally O&M Subsurface Wastewater.
- High quality and this program was that
- To advance my knowledge & become a certified operator
- Information and instruction for the exam
- Assistance in design of small wastewater disposal systems
- Did not have any
- Gain CEU's for SC P.G.
- Hope to learn enough to be able to understand subsurface systems, and run a new one being installed in Martin County.

E.1.2 Do you feel this course has adequately prepared you to sit for the Subsurface System Operator's Examination? Why or why not?

- I feel my math skills are not up to speed.
- N/A, But probably would be pretty good
- Very good course information for the exam was presented and also in the book
- Still need to read the blue book and should be able to pass the test
- I feel that every aspect of this field was covered fully

- Yes I feel very well prepared for the test.
- Yes this course covered more info than needed
- Not real sure. I would have liked to have seen a practice test.
- Yes all potential applications were covered.
- Hope so
- Yes, I think there was a lot of pre prep involved
- Yes, I knew very little before the class

E.1.3 Do you feel adequately prepared to perform Operation and Maintenance on systems in the real world? Why or why not?

- Yes
- With already acquired skills / maybe
- Will better be able to answer this after the field trip
- I do not. I have not seen all types of systems in real life yet.
- Yes my knowledge has improved enough now to maintain a system.
- With my abilities probably not completely
- Yes with the check sheets it will be hard to miss a given area
- No – Lack experience - operational topics in class mostly lacked depth - need to eliminate unnecessary topics or shorten
- Need field experience (onsite demonstration)
- Yes due to all the hands on in the field
- Feel good about LPP - Need some hands on for others because I have no prior experience.
- Yes a lot better than before
- Yes the system that I will be dealing with will be a totally new system, so I can watch it from the beginning being assembled.

E.1.4 Where did you receive information on this program?

- Internet
- Friend who previously attended
- Bolivia
- Work
- Mail
- Rowan Health Dept.
- Nancy Deal, Dr. Lindbo
- Onsite Consortium and NC State
- Enviracon
- My employer
- Health Dept.
- Regulations Conference
- Brususcvick Co. H.D.
- Carteret Health Dept.
- BCHD

- Maint. Dept. Martin Co. Schools

E.1.5 Please provide comments about this program for us to include in our next brochure.

- Do not use SS # for I.D. unless you plan to give me a job. Shorten either subjects or presentations.
- I would expect the folks in attendance to come prepared to listen to the presentations with out going over the power point presentations word for word. A little variety might help.
- Vast wealth of knowledge from across the country all rolled up in one package.
- Would / Could be better to mix presentations and hands on instead of all hands on the 3rd day. However, quality of presentations overrode this situation.
- Good class, I can not always hear the speakers.
- More time during the lectures for questions instead of at break. Making the students feel less intimidated when answering during the lecture instead of acting as if the question is holding up the program. Try not to be so pushed to get through all of the material in such a hurry.
- Impressive speakers, I enjoyed it. Some topics seem irrelevant to anything except test taking…. Is that O.K.?
- The focus on checklists is a great driver for the course material.
- Very informative, helpful
- Excellent staff - Excellent Effort
- Get out with plenty of lead time
- I believe you all know the works, well done, I'm glad I survived
- I think this course should be one more day longer, too much material in a short period. An O/M Association is not a bad idea.

APPENDIX F

RESULTS FROM SECOND PILOT TRAINING EVENT EVALUATIONS IN TUCSON, AZ

Table F-1. Overall Evaluation (5=most valuable and 1=least valuable)

Question	Mean
Objectives of this program were:	4.40
Operational checklists as descriptors of O&M Service:	4.86
PowerPoints presenting the material were:	4.64
Organization and presentation of the material was:	4.57
Manual was clearly written and organized:	4.43
My expectations were:	4.40
Overall, I would consider this program:	4.67
My attendance to this program should prove:	3.71
Rate your knowledge of O&M prior to this course:	4.80
I gained knowledge through participation in this course:	4.64

Table F-2. Class Segment Evaluation in Regard to Their Value to you this Week (5=most valuable and 1=least valuable)

Question	Mean
Classroom Presentations:	4.64
Written O&M Manual:	4.25
Operational Checklists:	4.33
PowerPoint Handouts:	4.38

Table F-3. Presentation Evaluation Regarding Knowledge Gained (5=most valuable and 1=least valuable)

Question	Mean
National 0&M Service Provider Introduction:	4.43
Introduction to Wastewater:	3.86
Site Assessment:	4.36
Safety:	4.36
Pretreatment Components-Lagoons:	4.17
Business and Industry Ethics:	4.08
Pretreatment Components-Tanks:	4.29
Pumps and Pump Tank:	4.57
Pump-Demand and Timer Dosed Systems:	4.57
Pretreatment Components-Advanced-Media Filters:	4.36
Pretreatment Components-Advanced-ATU's:	4.50
Pretreatment Components-Advanced-Constructed Wetlands:	4.30
Final Treatment and Dispersal-Gravity Trenches:	4.24
Final Treatment and Dispersal-Low Pressure Distribution:	4.55
Final Treatment and Dispersal-BSF/Mounds:	4.50
Final Treatment and Dispersal-Bottomless Peat Filters:	4.33
Pretreatment Components-Advanced-Disinfection:	3.75
Final Treatment and Dispersal-Drip Distribution:	4.60
Pretreatment Components-ET Beds:	3.80

Table F-4. Presentation Evaluation- Who do you feel should attend this training program? Rank the value of this course to the following potential audiences. (5=most valuable and 1=least valuable)

Question	Mean
Local Regulators:	4.80
Designers:	4.53
Engineers:	4.62
Business Owners:	3.70
Installers:	4.64
Homeowners:	2.88
Service Crews:	4.64
Site Evaluators:	4.60
Decision Makers:	4.58

F.1 Free Response Questions

F.1.1 What were your expectations for this program?

- Was unsure, thought it might be somewhat of an expansion of NAWT, found it to be very complimentary to NAWT.
- Learn how to design systems to be more efficient and meet regulations & build systems to work as intended for the owner.
- Note: Advertising brochure (for this training event) did not indicate that ONLY home units would be covered.
- Overview of possible systems for use in large volume rest areas, not necessarily residential units.
- Making it a required for license in the county with certification.
- Learn of current topics on onsite wastewater and O&M procedures.
- Learn what is or what should be accomplished during the O&M inspection.
- Find good inspection format to establish standard protocols.
- To gain as much knowledge as I can to educate homeowners & public on the importance of wastewater treatment.
- Refresher course in standard practices and regulations of ISDS.
- Learn alternative system components; use, O&M, field observations, etc.

F.1.2 Do you feel adequately prepared to perform Operation and Maintenance on systems in the real world? Why or Why not?

- Yes, this was a very good refresher in nicely presented manual; with info, have an organized approach to be effective with knowledge.
- Yes.
- Yes, previous experience and the operational checklists.
- Conventional- yes – simple pump units, yes.
- Yes, I have gained valuable knowledge to do so, also to educate public. Plus lots of information is available to do so; should questions come up.
- No. Need on-site walk thru all of the components of wastewater systems.
- 70%-30%...need field demo or equipment in class.

- No, this course needs a field trip, or at least bring some of the components to the class.
- From this training not really because- I would actually need to do it for a while- however the background was great!
- No, but this class is very helpful is learning the systems.
- Topics were relevant & practical. I am most interested from standpoint of a regulator.
- Yes, especially with the checklists- so I don't forget small items.
- No, need equipment etc. to start. Need to apprentice under someone.

F.1.3 Do you think you will use the operational checklists as a part of your business? Why or why not?

- Yes, provides good checklist both also allows for professional service provided for the customer as to what was done.
- Yes, for presale inspection program per AAC R18-9-A316.
- Yes.
- Yes, I will have to modify my way.
- Yes, when I verify a P.E.'s final inspection for an alternative system, I will take the checklists.
- Yes, it's a good tool to use to promote a good understanding of O&M; and a good tool for record keeping.
- Yes, required as minimum for licensed O&M service providers.
- Later when regulation provides for performance based permitting of on-site system.
- Possible in future.
- Not to that point in Arizona yet. When it happens=yes, will use a revised version of the checklist.
- They will be recommended to all the service providers.
- Will attempt to distribute for use by inspectors.
- Yes, I will provide it to the designers and caretakers of the systems.
- Not currently providing service, just designing systems, but will use comments as base in design.
- Yes, I feel they might be helpful when inspecting new installations & foiled alternative systems- as a guide in designing.

F.1.4 Is there a method that would help you use the operational checklists more effectively?

- Electronically, maybe PDA format to be field friendly, that way accurate records can be kept easier.
- Have forms available online.
- Have check lists in manual in a place for easier access.
- Have them readily available.
- Hands on training or video tape of training.

- Yes, a field trip where we go over the checklist while looking at the systems!
- Check list in Regulators- add what we should check with O&M business- adjust some presentations, to stay on schedule.
- Practice in class/practicum.

F.1.5 Do you feel the time utilized to present the different technologies was appropriate? If no, please provide suggestions?

- Yes, wetlands/ET much too fast, should have not been rushed through.
- Yes.
- Yes, but hands on would re-enforce the training.
- Yes, BUT. The but is that the AZ rule requires the designer to prepare the O&M plan that specifies tasks and schedule for the treatment & dispersal technologies proposed for use & at the conclusion of construction. R18-9-A309(B) and (C).
- Need more time or less of the odd, site specific questions from the audience.
- It was kind of lengthy. It is good to cover lot of info, but in two days…..it was too much.
- Recommend more time on the technologies and a lot less on general subjects like safety and ethics. The first 5 hours of day 1 contained a lot of really basic information.
- Some of the presentations were too long. Too drawn out. Overall it was good, except for the fact that we got a little behind.
- Remove or reduce those listed as not necessary on item 3.
- Many sections redundant. Not necessary to go through every checklist.
- Need some activities- show a series of slides, hand out a permit and let students fill it out.
- Yes, but hands on would re-enforce the training.
- No- Advanced Media Filters.
- I needed to hear about the lagoons, but this topic was completely skipped.
- I am not sure. I have seen most, but I am not sure I am typical.

F.1.6 What was the most helpful information presented through this training program?

- I really liked all of the math sections; Nancy's basics with all the basic equations were great! Dave's problems w/ homework were what I think are some of the basics of this program. How to work forward & backwards through equation is essential.
- ATU's- info on management- O&M, mitigation- payment for services.
- Coverage of components of alternative systems – Having appendix A with explanation of why to use it
- History & experience with systems.
- Mounds……Discussion of how advanced systems work.
- O&M on sand river.
- Day 2.

- Filters, TV's and chlorinator.
- Discussions of operation, maintenance and management.
- Math, safety, really everything.
- Everything, but the more passive the system the more appropriate for our pest areas.
- I feel that all of the information was helpful, because it's all used together to perform O&M. All information should be included on future presentations.
- The materials should be incorporated in a national certification program for conventional & alternative system inspection. Materials would be reproduced for designers to use in specifying O&M plans for their designs. A design without as built drawings & O&M plan is not a system.

F.1.7 How did you receive this information?

- Very well.
- From Supervisor at work.
- Kitt.
- Mail.
- Pamphlet.
- Word of mouth.
- University of Arizona.
- Upper management of ADOT.
- NAWT.

F.1.8 What is your general impression of this training program?

- Beyond my expectation, really come away w/ great info and even some new info.
- Speakers for this program were all very good & effective.
- Good. Recommend having hand out equal to what is presented in power-point discussion. Have further training on site to work through O&M evaluation.
- I liked the training information- I found the lectures were more beneficial when their was life experience behind the training.
- Was very impressed.
- Very good start, but how does program relate to NAWRA?
- Good but too redundant.
- Very good! But I wanted to hear "Lagoons". However, I did not know that this was residential focused only. This information was not a part of the advertisement. Such a focused audience may discourage others from attending, but it is still a valuable learning source.
- I initially thought this would be a refresher course, but it was much more. I have gained new knowledge that is both helpful and enlightening. Excellent, thank you.
- Good training, I would suggest others to attend this training, very good job!
- Very beneficial to everyone having anything to do with wastewater. Points out the importance of not installing & forgetting the system, but maintaining a healthy working system.

- Necessary. One formatting comment: Max student "retention time" is about 90 minutes….you really can't go 2 ½ or 3 hours without a break. Take 5-10 min every 90 min for break…you can find this time by ruffing down intro to WW to 15 minutes and ethics/safety to 5 minutes each. Thanks for the course.
- Need more time for presentations of some material. A lot of information to process in 2 days. I believe all instructors did a great job and they see the need for conformity in inspection and knowledge.
- Need to give people a break more often and design activities for student participation.

F.1.9 MISC Comments

- Would like to see an example of an actual operator's tool box; or maybe include an example of tools for each component. (Preferred tools) WOULD LIKE TO SEE THIS OFFERED AS A CERTIFICATION.
- Forms should be put into ACROBAT – full version when you create them & enable the fill option so we can fill them in on laptop on the field – put the forms on web.
- Tell students where the checklists are located when they are mentioned, pictures on homework (Problem #5) are unrecognizable. Drainfield is usually represented as media filter.

APPENDIX G

RESULTS FROM THIRD PILOT TRAINING EVENT EVALUATIONS IN TACOMA, WA

Table G-1. Overall Evaluation (5=most valuable and 1=least valuable) (N=54)

Question	Mean
Objectives of this program were:	4.45
Operational checklists as descriptors of O&M Service:	4.51
PowerPoints presenting the material were:	4.35
Organization and presentation of the material was:	4.32
Manual was clearly written and organized:	4.53
My expectations were:	4.16
Overall, I would consider this program:	4.39
My attendance to this program should prove:	4.18
Rate your knowledge of O&M prior to this course:	3.52
I gained knowledge through participation in this course:	4.22

Table G-2. Class Segment Evaluation in Regard to Their Value to you this Week (5=most valuable and 1=least valuable) (N=54)

Question	Mean
Classroom Presentations:	4.35
Written O&M Manual:	4.47
Operational Checklists:	4.63
PowerPoint Handouts:	4.16

Table G-3. Presentation Evaluation Regarding Knowledge Gained (5=most valuable and 1=least valuable)

Question: Instructor	N	Mean
National 0&M Service Provider Introduction:	51	4.52
Introduction to Wastewater:	46	4.50
Site Assessment:	47	4.46
Safety:	46	4.48
Pretreatment Components-Lagoons:	42	4.27
Business and Industry Ethics:	44	4.82
Pretreatment Components-Tanks:	48	4.71
Pumps and Pump Tank:	51	4.59
Pump-Demand and Timer Dosed Systems:	42	4.40
Pretreatment Components-Advanced-Media Filters:	54	4.19
Pretreatment Components-Advanced-ATU's:	53	4.25
Pretreatment Components-Advanced-Constructed Wetlands:	54	4.40
Final Treatment and Dispersal-Gravity Trenches:	54	4.20
Final Treatment and Dispersal-Low Pressure Distribution:	54	4.02
Final Treatment and Dispersal-BSF/Mounds:	54	3.96
Final Treatment and Dispersal-Bottomless Peat Filters:	54	3.94
Pretreatment Components-Advanced-Disinfection:	54	4.27
Final Treatment and Dispersal-Drip Distribution:	54	4.10
Pretreatment Components-ET Beds:	54	4.46

Table G-4. Presentation Evaluation- Who do you feel should attend this training program? Rank the value of this course to the following potential audiences. (5=most valuable and 1=least valuable)

Question	N	Mean
Local Regulators:	48	4.61
Designers:	47	4.24
Engineers:	49	3.90
Business Owners:	49	3.23
Installers:	47	4.34
Homeowners:	50	2.35
Service Crews:	48	4.51
Site Evaluators:	49	3.93
Decision Makers:	49	3.85

G.1 Free Response Questions:

G.1.1 What are your expectations for this program?

- To learn more about maintaining different systems in Washington and other parts of country.
- Review/refresh knowledge of on-site system.
- To get more knowledge on the different types of systems, and the different types of maintenance that is performed on them.
- To gain information and to learn what an O&M Service Provider does.
- To learn about operations and maintenance of OWTS's.
- Learn to inspect system properly.
- Expand understanding; exposure to new methods/ideas from other parts of country.
- To gain more CEU and pick up a few more ideas of different opinions in the O&M community.
- Learn nationwide standards for O&M, current O&M practices.
- Refresher
- Increase knowledge. Expand my ability to perform accurate recognition and repair.
- O&M info to help my company in near future.
- To learn more about how to deal with customers and contracts and most important about performing O&M service. Thank you!
- To learn more about sewage treatment.
- Learn a standard for O&M forms and checklists contracts.
- More info on how to monitor and diff expectations for O&M companies.
- To get a baseline standard to build a sound O&M program from.
- Learn methods and info for implementing a management program and training in our county.
- To receive information and resource to pass on to installer/providers in my area.
- I want to gain insights to provide better designs to my clients and instructions for installers and O&M Contractors.
- To give me a general overview to aid me in design decision.

- Take my O&M test, get license.
- Gain additional and brushup knowledge to enable successful test result to acquire O&M license.
- To comply with precise requirements.
- Enjoyment. Learning. And Credits (not necessarily in that order).
- Less than I received.
- To learn about [waste management].
- Learn O&M procedures so I can design features into new system to facilitate O&M.
- Participate in continuing development of this program.
- O&M for professionals more of a conference? Better, more down to earth and more useful than I expected.
- Thought program was old O&M with emphasis on hands-on the system. Was surprised to see a better program.

G.1.2 Do you feel adequately prepared to perform Operation and Maintenance on systems in the real world? Why or why not?

- Yes
- Yes. Well rounded class. Good networking potential.
- Yes, because I learned a lot and I have blue book in case I missed some information.
- Yes. On gravity, SF PD systems.
- Yes. Good overview to O&M troubleshooting info would be helpful. Discussing specific products (PBF, ATU by MFG) would be very helpful.
- Yes, I have more of an understanding than before these classes.
- Yes. My objective was to learn as much as I could about septic systems and my expectations were more than met.
- Yes. I have promoted and continue to promote O&M as the key to survival and acceptance of on-site /decentralized systems.
- There are some that I would like to be more familiar with.
- Adequate. I still have a lot to learn.
- Yes - training and real world experience.
- Almost.
- For the most part – would need more hands on.
- Yes, need more info.
- I have the right forms to complete the O&M. I do not have all the measuring equipment to do
- O&M on some systems.
- Yes: Due in large to experience coupled with support units such as this to learn other industry standards.
- Yes, because I have background in this field. If I were a new employee DR? I don't feel info was elementary enough. Most items were covered very quickly!
- Yes, years of experience along with some education.

- Yes, but not because of this course – for someone new, more "real" world or hands-on experience would be useful.
- I feel I can perform O&M properly in the real world because I have been doing them for a little while and this class just sharpened my skills.
- Yes, 20 years installing and troubleshooting. Taken a lot of O&M classes.
- Yes, onsite experience and material presented here.
- Yes. 12 years experience functional knowledge more in some areas than others. Also genuine care for environmental impact to Mother Earth as well as concern to educate users to prevent failures O&M will accomplish this.
- Yes, however, as a designer, I will be using this knowledge to provide direction to the homeowners and O&M providers who take care of these installations.
- Yes. However, as a regulator the course has given me tools to use in developing O&M for local jurisdiction.
- No, because I design. But it has given me good insight.
- No, I'm a regulator.
- Yes, because of this course and the checklists gives me a good start.
- This has been a good informational class, and filled in some blanks I had for O&M.
- No. Need to see more real world systems and learn from people who have done it for years.
- No.
- No. On the job training is always good to have. Things are always are different in the field.
- Not on all systems. More hands on experience with all systems would be helpful. The regulatory needs are not available in Oregon currently (poor guidance).
- No, not this complete range of systems, not until get hands on stage.

G.1.3 Do you think you will use the operational checklists as a part of your business: Why or why not?

- Yes to keep track of each customer.
- Yes, they are full of info one may not think of on site.
- Yup. I have developed several checklists and I plan to upgrade to these and tailor them to each specific system.
- Absolutely!! We have nothing else.
- Yes to keep track of all details of operation.
- Yes - I will include these checklists as part of my O&M manuals for homeowners.
- Should I follow through to become an O&M professional I would use these forms for sure.
- Very good and complete forms!
- Yes, I practice in jurisdictions without O&M programs. Beginning an O&M program with a thorough inspection process seems like the right thing to do.
- Yes. Extremely helpful. I'm taking home an enormous amount of info that will be very useful for me to inspect systems.

- Yes, but not because of this course – for someone new, more "real" world or hands on experience would be useful.
- Yes. To help set a standard of practice.
- Yes, Oregon DEQ has no plans to pr??? county with resources for O&M.
- Yes - to help standardize our industry and to help reduce liability by making sure nothing is forgotten.
- Yes. They are good....not too much or too little.
- Yes, tracking hard copy storage of information.
- In some cases for instance initial site assessment, I currently use forms adopted by King County as well as a version of the evaluation.
- Already do. Will compare this to mine.
- I will use aspects of them. Can we get this in MS Word for customization?
- Maybe, it will make sure nothing is forgotten. Plus have good written records.
- Yes, but might want to condense them into a packet.
- We have already applied out own checklists for our systems, but we will revamp with these new ideas.
- Yes for a reference.
- Maybe. They are useful and good documentation. These could be helpful for reporting as well. They are extensive and may be time consuming.
- Yes, maybe not but important info.
- If I were in business, I would for sure.
- Some portion. Don't like the layout.
- Not. I'm a regulator.
- No, have my own I like better.
- No, because I design.
- No, I am happy with my system of maintenance based on the county Health Department.
- Will promulgate to Clark County Inspectors.
- I regulate but I would use these in the set up a county O&M program.
- Complexity is ok when problems are present if everything is normal then a condensed version is all that is needed.
- So time is not wasted evaluating the site when you get there. All info is present and up to date.

G.1.4 Is there a method that would help you use the operational checklists more effectively? Please describe?

- No.
- These checklist appear to cover everything of importance.
- Not particularly. I like the way it's laid out.
- Highlighted areas. Overall very good, thanks.
- Frequency
- I currently utilize experience and repetition of proper techniques to increase effectiveness and efficiency.

- I use them everyday, and I think it is the only way to collect the information on these systems.
- Experience on sites.
- Web site with downloadable forms would be a very nice resource. Also, email notification of updates and a way to provide feedback to you.
- I'm not experienced enough to know yet. To me there is more than adequate, there concise and complete.
- A copy machine operational checklists help to remember small details you may forget or have overlooked. Having copies of the sheet you showed us in our manual would be perfect. You can note every detail.
- Real world application isn't picking a system; it is verifying basic operations and locating those that need additional help.
- Start from the beginning and go to the last component.
- Less detail, simplify forms.
- Yes as a checklist.
- Need check list for the source (the homeowners).
- Yes - more information on the operation and parameters of some of the probe testing equipment.

G.1.5 Do you feel the time utilized to present the different technologies was appropriate? If no, please provide suggestions?

- Adequate time was taken. It may be a good idea to point at references for further study if desired.
- Yes - would suggest some regional research before presenting to exclude methods not used locally. I.E. - peat systems.
- Yes. The time was very well spent. You may wish to get region specific. Some regions use technologies that are not used in other parts of the county.
- Yes, helpful, continue to do this.
- I think they did a great job with the time management.
- Yes. For disinfection portion, those who are not used may have problems with field service.
- Yes, but some of the technologies are not approved in WA.
- Yes. A lot of info to cover.
- Only interjection would be to only cover technologies actually used in a geographical area.
- Peat filters not common in WA. Peat filters were discussed by brand name, textile filters were not.
- No peat filters in our area. Very few if none, recirculating systems in our area. Drip fields were on design besides O&M.
- Additional time needed when discussions on different technologies presented.
- Very informative.
- OK, but it was <u>all</u> review.
- The time utilized was perfect. Not a minute was wasted. Every topic was covered in depth.

- 90% was utilized well. 10% - trouble shooting, etc. gets off the O&M content of course - Presentation and time needs to be graded on this form.
- Some of the basics should have been known - didn't need to cover them - Too much info on designing.
- No. More time per subject. One hour attention span. More breaks.
- Except for the math. Being such an important topic because it is used for all systems to analyze flow and such. We should have spent a little more time with that.
- Making the math equations in a simple flow chart for usage by "normal" people would be a help.
- On simpler and general knowledge spend less time. Spend more on specifics.
- Safety section could use a sample or example safety program or plan. Ethics section is too general and would benefit from addressing local issues in the region the class is given.
- More time on safety, more time on ethics and good business practice.
- The ATU portion was done too fast because the previous module went too long.
- No. Pretreatment units dragged. Almost too much information.

G.1.6 What was the most helpful information presented through this training program?

- Business and industry ethics.
- Overview of media filters.
- Math, final treatment and dispersal systems.
- When to pump; (2) safety; (3) math (no order)
- ATU.
- The O&M checklist and the soil scientist explaining how microbiology portion works.
- Calculating flow rates and drawdowns.
- My math is very rough around the edges. As math proved very beneficial for me the operational checklist is also very useful.
- Measuring tank volume port.
- Overview of all systems and media filters. Discussion of problems and possible solutions.
- All things unknown to me, constructed wetlands, peat filters.
- I found all useful. The ethics part is a difficult section.
- Items that are "red flag" issues.
- I liked the safety section and the discussion of what O&M means and maintaining proper contracts.
- Great general overview.
- The variety of all the topics discussed being how new I am to the field.
- Pretty much all of it. My knowledge was limited before this course. I believe now I've learned enough to be dangerous! Very enjoyable and educational.
- Standardization.
- Info - how to design to make O&M easier.

- Checklists, O&M manual and discussions that occurred during the class, lunch and break time.
- Comprehensive! Forms were very good. I will be using these in my design manuals. Thank you!
- The O&M checklist and the soil scientist explaining how microbiology portion works.
- Descriptions of systems, components, procedures, etc.
- Learn more about the O&M program and what it means.
- Learning more about the different kinds of systems like drip, wetlands, etc.
- Checklists and setting a standard for O&M.
- The operational checklists to get providers standardized in what they need to look at.
- The division of the management plan to operation, maintenance etc. Also, the checklists.
- Regulation in coming stay up on technologies.
- The blue covered book pulls all the info together to one source. And index would have been helpful.
- Various systems.
- Beyond Ole and Swen and the fact that cats are a good septic tank addictive, it was interesting on the different technologies.
- I appreciated the many general over controlling concepts that were word smithed into easy to understand and often funny presentations.
- Overall confidence in my ability.
- Other tech and designers.
- Personal experience. Pictures.

G.1.7 How did you receive information on this program?

- WOSSA
- Friends
- Local regulator
- John Thomas
- My secretary
- Managers
- Owner of company “Alex Mauck”
- Boss
- Co-worker
- Internet
- Mail
- Flyer
- County inspector.
- From Kitsay County
- King County
- Health Department

G.1.8 What is your general impression of this training program?

- Great! More room for comments on summary form
- Well worth the time and great to talk with others in the industry.
- It was a valuable class to take, and well instructed.
- Good, speakers were adequate, some were good, none were bad.
- Very good and very expensive.
- Very informative for everyone.
- Outstanding. With limited knowledge coming into programs I received a large amount of info in a short time. I learned what I needed to inspect existing systems in our county. Excellent course but you need a section to evaluate the presentations of each subject. I will help you manage time and gray matter.
- Well planned and presented.
- This was a good class. You brought in top notch instructors.
- A lot of material covered. Keep it up, filter it, and refine it. All O&M people, regulators, designers need this course.
- Very educational
- In this part of the country, constructed wetlands are a waste of time, even if there were units around here; they don't work and are not an approved option for single family residential permits. The information is interesting but NOT USEFUL. For O&M as built is more important than design. (B) You should regularly mention review of County/Health Department records to locate and get a copy of the As Built drawing prior to any inspection. (C) Talk more about sampling - rules etc. (D) Event counter on Rhombus Timer panel is not very useful.
- Good start. I look forward to seeing the progression of this program. Please develop a formal program for designers. I would help to do this if you like.
- Very informative. NOTE: Page 5 of PowerPoint document for ATU's does not have #6 horizontal setting, chamber picture!
- Pretty good. Put too much time on systems not applicable to our area, speakers tend to repeat each other.
- Great. I would like to talk more about a few practical items. Overall cost in industry contracts, etc.
- The impression I got from this program was to broaden my knowledge of not only O&M but safety. Install and other knowledge I feel I needed. Thank you.
- Good start. Needs to be 3 days - with more photos/discussion of troubleshooting. O&M is important but we need troubleshooting help as much, if not more, than a good general background - as their O&M course provides. Dave is a fine presenter, but his voice volume makes it painful to sit in the first 2 rows.
- It's a good training program, but some of this didn't apply to the source of correct. (???)
- (Good) A lot of the same information given. In a different way each time.
- As an installer and O&M provider I didn't prefer the homework. The business ethics isn't something we will pick up from a class. Either you have them or you don't. Most of the info is presented in a basic format, and in depth look into

actual working problems would be a plus for those who have been performing this work for several years.

- Should be given general focus to be used as a tool of education to the Nation and possibly outside world relating to the specifics of course study allowing some level of equality among professionals everywhere.
- This is a good class for people just starting out in the business.
- Need more variety of learning methods - like dividing into groups to do problem solving, bring examples of filters for hands on learning. I like the handouts and materials - very specific, good to use as references later.
- Very good program. Gustafson's humor and oration is excellent. Keeps audience's attention.
- I like it! I will recommend it to the O&M people in my county when the program becomes available.
- Excellent overall but more time for discussions when different technologies presented.
- I thought for a work in progress it was informative. I think the class should be more state or region oriented and specific.
- Good use of time and discussions were pertinent.
- Very good program. Could easily be 3 days. System evaluations are excellent.
- Excellent program for all onsite professionals showing the need for O&M and presenting the tools to implement a program. Additional tools: digging/pry bar, rope/chain, spare parts/filters, flagging or caution tape, traffic cones, whisk or broom.
- Very good. It could help dividing information about specific categories of systems into longer intensive sessions that are separate form the main class.
- Very energetic cramming course on O&M.
- I will integrate some parts into the CCHD Inspection O&M program.
- Excellent content. I will continue to enhance my program with these tools and possibly include the dangers of meth labs into safety section. What to recognize before inspection. During inspection. Thank you! Please send any more info to stevewolfe@qwest.net

APPENDIX H

RESULTS FROM FOURTH PILOT TRAINING EVENT EVALUATIONS IN KINGSTON, RI

Table H-1. Overall Evaluation (5=most valuable and 1=least valuable) (N=37)

Question	Mean
Objectives of this program were:	4.46
Operational checklists as descriptors of O&M Service:	4.38
PowerPoints presenting the material were:	4.33
Organization and presentation of the material was:	4.11
Manual was clearly written and organized:	4.14
My expectations were:	3.85
Overall, I would consider this program:	4.17
My attendance to this program should prove:	4.20
Rate your knowledge of O&M prior to this course:	2.92
I gained knowledge through participation in this course:	4.44

Table H-2. Class Segment Evaluation in Regard to Their Value to you this Week (5=most valuable and 1=least valuable) (N=37)

Question	Mean
Classroom Presentations:	4.45
Written O&M Manual:	4.25
Operational Checklists:	4.12
PowerPoint Handouts:	3.94

Table H-3. Presentation Evaluation Regarding Knowledge Gained (5=most valuable and 1=least valuable) (N=37)

Question: Instructor	Mean
National 0&M Service Provider Introduction:	4.15
Introduction to Wastewater:	4.19
Site Assessment:	4.21
Safety:	4.18
Math:	3.91
Business and Industry Ethics:	3.67
Pretreatment Components-Tanks:	4.12
Pumps and Pump Tank:	4.21
Pump-Demand and Timer Dosed Systems:	4.15
Pretreatment Components-Advanced-Media Filters:	4.15
Pretreatment Components-Advanced-ATU's:	3.97
Final Treatment and Dispersal-Gravity Trenches:	4.18
Final Treatment and Dispersal-Low Pressure Distribution:	4.21
Final Treatment and Dispersal-BSF/Mounds:	4.12

Final Treatment and Dispersal-Bottomless Peat Filters:	4.06
Pretreatment Components-Advanced-Disinfection:	4.00
Final Treatment and Dispersal-Drip Distribution:	4.21
System Evaluation:	4.21

Table H-4. Presentation Evaluation- Who do you feel should attend this training program? Rank the value of this course to the following potential audiences. (5=most valuable and 1=least valuable)

Question	N	Mean
Local Regulators:	38	4.39
Designers:	38	4.21
Engineers:	38	4.00
Business Owners:	38	3.06
Installers:	37	4.41
Homeowners:	37	1.97
Service Crews:	38	4.53
Site Evaluators:	38	3.97
Decision Makers:	38	4.08

H.1 Free Response Questions

H.1.1 Do you feel adequately prepared to perform Operation and Maintenance on systems in the real world? Why or Why not?

- No, feel that more training is needed on pump, floats, and counter panel
- Need to study mounds extensively first. Information is provided to portion them.
- Yes- need more experience with the several check forms.
- Could use some actual experience
- Yes. Good guides and better understanding of what to look for and why.
- Yes. Do it for a living. 12+ years experience in O&M
- Yes, we have to see after test
- Need more training for O&M proprietary components
- There are not that many systems in RI.
- No I would feel more comfortable with some hands on exposure.
- Yes- to some of the system. No to some due to lack of actual experience
- No, (too much material) I would like to take this course one more time. It would be very helpful.
- Not completely for my self need more training
- Yes but maybe a hands on class could be made for a little help
- Yes, I've had experience in building commercial pump stations and also installation of Advantex Systems, FAST, etc.
- No, very general information. A lot of information all at one time, would be very comfortable to team up with someone with more experience at this point in time.
- No. Not a practical form of work. Much too complicated for in class education. Very little consistency among systems. It took 5 professional students to present this stuff to a group of blue collar workers. In the real world this is too time consuming to pay enough to make a living on.
- Yes, tips for O&M

- Yes, have some experience but gained considerable knowledge from presentations
- Not yet- I don't have it all assimilated yet. I require reading to absorb the material explained verbally in presentations.
- Maybe I now know there is a lot that I didn't know about.

H.1.2 Do you think you will use the operational checklists as a part of your business? Why or why not?

- Yes.
- Yes, complete list I don't need to reinvent the "wheel" (form)
- I am not in O&M business, if as part of a work activity, an A/I system- yes absolutely- they facilitate comprehensive attention to system and show order of operations. Very well developed forms.
- Yes- in full or in part as they apply to our state.
- Partially- somewhat cumbersome
- Yes, definitely if this type of work is performed
- Would use parts of them geared more towards my own business
- It will help me "communicate" with inspectors
- I will pick and choose to make unique forms, save on # of pages. I need to bring out to field and prevent me from writing down N/A on my lines.
- Yes, will help you with what to inspect
- I would like to hopefully. We're so busy with what we're doing. Hopefully our company will have time in the future.
- Yes, will combine with current ones
- Hopefully
- Yes- complete and concise
- No but I needed to know what should be done in normal O&M so I can assure my clients that they are setting value for their investment
- Parts of them, no way will I be able to fill out 12 forms per site
- Checklists appear lengthy and complicated to fill out. (i.e. expensive for system owners)
- No, we have standard lists for our systems
- They are but seem to be too many- odor question asked on every list is redundant
- No too many forms
- Absolutely. They will provide uniformity in field and good documentation to the office and client.
- Yes- very good guide to cover all concerns to properly maintain the ISDS and serve my clients
- Yes. Only way to identify and record past and future problems.
- Yes, much information to use

H.1.3 Is there a method that would help you use the operational checklists more effectively?

- Feel checklist is OK

- No
- All of them together
- Online tracking software with reports in PDA
- Computerized database incorporated
- Not until I actually experience some O&M
- Would need to work on developing one
- Share and combine to appropriate technology
- Practical use would require the be identifiably organized by the user for each system visible
- Not that I can cook up now
- Could reference list as provided in single sheet handed out. All forms also in one location at Appendix B
- Loose copies outside of the book also

H.1.4 Do you feel the time utilized to present the different technologies was appropriate? If no, please provide suggestions?

- Yes except for the drip loop systems
- Yes, for a 2 day course. Each item could use a day to cover
- Yes, for me, it was well spent. I neither design, permit or perform O&M on these systems.
- In most cases, yes- felt that ethics and ATUs went fast- there maybe no end to the ethics presentation
- No. too much time spent on basics (remember we all took insp too) and rushed through complicated and very specific math and alternative system information and we were expected to be familiar with some of this.
- I gain more from touching, and feeling technologies. Training site incorporated into class could be helpful but time consuming. An actual innovative inspection would also be greatly received
- Yes
- Yes- tighten up slightly. Seemed to lag and speed up
- More time could be allocated relating the class time with field time
- Yes- I presume that the discussion of when each system option is most appropriate is reserved for design course work.
- I would eliminate systems not likely to be used in regional area
- A little more time on troubleshooting. If there are problems identified more homeowners want answers before you leave site.
- No. need more time to discuss controlled systems.
- Way too much material for two days only- feel rushed- consider a 3 day class
- Felt each technology was utilized fine

H.1.5 What was the most helpful information presented through this training program?

- Just the overall picture of the class

- Too much to digest at this time to answer now
- Getting into the finer tuning of components, pumps, timers of different designs of systems.
- Review of all types of systems that refresh my memory and gave me tools to better serve my clients
- Dosing
- Detailed explanation by presentations on specific items on issues to cause focus and best understanding of important elements
- Various types of systems
- Standardized procedures, in general will help ensure proper O&M
- Realization that there are lots of options
- All info found and personal concept with staff and other contractors.
- The whole course
- System O&M experience of presentations
- The style of presentation- time taken to answer questions
- Need to tighten up timing to fit comfortably in the time allocated. Lunch shortened to 30 minutes? Start earlier? Stay later?
- Explain option of various technologies and their applications
- The math, how to calculate pumps, recirc tanks, timers. Would have liked more time spent on this section, my understanding is much better at this point
- Sizing and calculations (perspective)
- Following a standard procedure for all systems and all components

H.1.6 How did you receive this information?

- Web
- US mail- past student
- Directly from URIOWT
- URI
- Through training center
- Consortium meeting
- Little Froggie
- From NAWT in Delaware
- By direct notification
- Work
- George Loomis suggested at prior course

H.1.7 What is your general impression of this training program?

- Nice program, should have more hands on demonstration
- Very good but an awful lot of information in a short amount of time concerned about test.
- Very good information that was presented well. I knew a lot about the pieces of each type of system. This course dealt with the smaller specifics of each component.

- Great! Two days well spent.
- Needs more time spent on info. Some presentations were repetitive of other sections of presentations. i.e. cleaning…
- I like the message of bringing professionalism to the business. It is a tough sell since we are just getting owners educated that they must pump tank.
- It's a great start. RI needs to adopt it as a certification program
- Great program though a practical component would have been invaluable
- Intense- well done presentations
- Very informative maybe should be in 3 days rather than 2
- Had expected more hands on and specific technology review/ inspection/ adjustment!!
- Too much too fast and need more time between class and test. Maybe 2 weeks
- Well done, informative, intense for a "novice"!
- Overwhelming at times. Glad to have time to digest before testing. Would like more time to focus on inspecting tanks, pump chambers, pumps, control panels, timers.
- Too much a personal project for a small enthusiastic group without a practical approach to daily use. Very good information given but no one will be prepared in the real world because of this course. Expectations for super analyzing every aspect of these systems can not be realized in a work environment.
- Valuable course- time well spent. Will work to get service folks in tune with what is comprehensive O&M and give the industry a start instead of black eyes
- A wonderful comprehensive training system. Thank you to all who contributed, reviewed, modified and presented.
- Well researched and thought out
- A little too academic not enough practical. Not sure about conflicts with system manufacturers about O and E. Needed more time spent on practical inspections process.

H.1.8 MISC Comments

- I did enjoy the class, group of speakers, and did learn a lot, just makes me realize I still have a lot to learn in the practical side.
- Realtors should also attend the program, along with designers, installers, etc.
- It would be nice to have a final version of the manual once all the beta bugs are worked out
- Page #'s were difficult
- Homework questions were vague and often misworded
- Next time: Special section on determining/ adjusting of recirc ratios. Don't let Kalen teach it!

APPENDIX I

RESULTS FROM FIFTH PILOT TRAINING EVENT EVALUATIONS IN BRAINERD, MN

Table I-1. Overall Evaluation (5=most valuable and 1=least valuable)

Question	N	Mean
Objectives of this program were:	27	4.31
Operational checklists as descriptors of O&M Service:	27	4.04
PowerPoints presenting the material were:	27	4.23
Organization and presentation of the material was:	27	4.15
Manual was clearly written and organized:	27	4.27
My expectations were:	27	3.96
Overall, I would consider this program:	27	4.19
My attendance to this program should prove:	27	4.19
Rate your knowledge of O&M prior to this course:	27	3.22
I gained knowledge through participation in this course:	27	4.42

Table I-2. Class Segment Evaluation in Regard to Their Value to you this Week (5=most valuable and 1=least valuable)

Question	N	Mean
Classroom Presentations:	27	4.32
Written O&M Manual:	27	4.20
Operational Checklists:	27	4.28
PowerPoint Handouts:	27	4.12

Table I-3. Presentation Evaluation Regarding Knowledge Gained (5=most valuable and 1=least valuable)

Question:	N	Mean
National 0&M Service Provider Introduction:	27	4.12
Implementation of an O&M Service Provider Program:	27	4.04
Introduction to Wastewater:	27	4.04
Safety:	27	3.73
Business and Industry Ethics:	27	3.88
Site Assessment:	28	3.93
Math:	27	4.00
Pretreatment Components-Tanks:	27	4.04
Pumps , Pump Tanks and Controls:	27	4.15
Pump- Demand and Timer Dosed Systems:	27	4.07
Pretreatment Components-Advanced-Media Filters:	27	4.16
Pretreatment Components-Advanced-ATU's:	27	4.19
Pretreatment Components- Constructed Wetlands:	27	4.08
Final Treatment and Dispersal-Gravity Trenches:	27	4.16
Pretreatment Components-Advanced-Disinfection:	27	4.00
Final Treatment and Dispersal-Low Pressure Distribution:	27	4.04
Final Treatment and Dispersal-BSF/Mounds:	27	4.00
Final Treatment and Dispersal-Bottomless Peat Filters:	27	3.96
Final Treatment and Dispersal-Drip Distribution:	26	3.96
System Evaluation:	27	4.14

Table I-4. Presentation Evaluation- Who do you feel should attend this training program? Rank the value of this course to the following potential audiences. (5=most valuable and 1=least valuable)

Question	N	Mean
Local Regulators:	27	4.46
Designers:	27	4.67
Engineers:	27	3.79
Business Owners:	27	3.17
Installers:	27	4.50
Homeowners:	27	2.64
Service Crews:	27	3.96
Site Evaluators:	27	3.88
Decision Makers:	26	3.95

I.1 Free Response Questions

I.1.1 Do you feel adequately prepared to perform Operation and Maintenance on systems in the real world? Why or Why not?

- I've had very limited hands on, I get much more from hands on or at least having the units to see
- Yes
- No- need site visits- need to see, smell, learn by doing
- Yes- I have information and an idea on operation
- Yes- not that difficult is our area
- 60% ready- would like to have done some classes on specific septic systems in MN
- Yes, because I'm so smart now
- The class has helped in my ability to implement an O&M training course for Lake County
- Mostly, would like to actually see or have hands on demos, helps to remember the info better especially for things we don't see there often.
- No- need hands on as part of course- not familiar with a lot of presentation i.e. peat filters, UV, wetlands, etc.
- Yes, with systems I am very familiar with
- This program gave a good oversight as to what will be expected
- Yes, the forms are a good guide
- Not really
- N/A- but is good info for regulators- gives and offers a variety of info
- No- a lot of these systems I haven't installed or worked with
- Yes- lots of theory, no practical GOP yet we have enough info to begin doing this
- No- not my field

I.1.2 Do you think you will use the operational checklists as a part of your business? Why or why not?

- Yes. Co. should require for point of sale and renewal of operating permits

- May be mandatory in county for permit approval
- Probably no, because there are too many, 4-5 pieces of paper. Where do you store this?
- At the time no- most of MN including our county is not ready for O&M
- Yes- to help prevent future problems
- Some of them may come in handy
- Yes, industry standards, liability
- They will give good ideas for installing and design
- Yes, very informative checklist that provides a reminder if nothing else
- Yes
- Maybe- if required by state/county
- Some, currently do mostly inspections at installation- but would be good to make recommendations at design review and install.
- Yes. We will use it as part of our new coded revisions
- Yes, nice layout covers everything
- Yes, good back ground info
- Not sure
- Yes- I want to keep record for future use and to record how clean it operates
- We will promote their use to our service area and see about hosting training sessions.
- In the future- we don't have a lot of mechanical systems here

I.1.3 Is there a method that would help you use the operational checklists more effectively?

- will combine checklists
- Would be great if they were recreated as a laptop/PDA electronic format. Would save time filing, retrieving data, seeing the patterns, transcribing errors from bad hand writing!
- Use it first, then pick over it
- Not sure at this time
- Hands on demo
- Are they available on the internet?
- A lot of the info is repeated- they need to make easy (consider that there will be a variety of people using them)
- Condense
- Put together a technology packet (typical) with supplemental sheets if necessary

I.1.4 Do you feel the time utilized to present the different technologies was appropriate? If no, please provide suggestions?

- some could have been summarized
- Yes, think outside the box
- Yes
- Yes, It would need to have more information on the designs of them

- Yes, it was interesting to see the variety of systems being used
- No, really didn't apply to me however it did give some good ideas
- Who would want all that stuff?
- No- feel items portraying to MN should be hands on / field examples
- Okay- could actually add a day, to allow more time for discussion- hands on, detail. Not have to rush. Could always leave early if done early
- This was an excellent 2 day course. I would recommend it to my peers.
- Like to have more specific details for systems in this area
- Not really- will still need to refer to book(s) when need to address a new technology
- I think we would have to space it out into smaller chunks- it was a long day and it was hard to keep to the time allowances

I.1.5 What was the most helpful information presented through this training program?

- It was all good- there just isn't many in my service area
- Information from other states
- The systematic working through each form and checklist. Learning what to pass on to the pumpers.
- All
- First presentation introducing forms and need for contract
- Forms- need overall form
- Operational checklist sheets
- The training manuals with the worksheets
- The concept of an O&M industry. It may be a new business venture.
- Wastewater and pretreatment components
- It was interesting the ways that other states approach wastewater.
- Chemistry and mound
- That will probably be an O&M certification in the future
- The program/format for the initial assessment
- The first 3 hours education/ implement with government- people

I.1.6 How did you receive this information?

- brochure (mailed)
- MN program mailing
- U of M flyer
- It brought more awareness
- Cont. Ed. Info
- ISTS class schedule
- My boss- Tony Smithson
- On-site class schedule
- Website
- Last class

- Great Lakes Collaborative U of MN and MSU

I.1.7 What is your general impression of this training program?

- This will work- but would have to be done in MI in Jan/Feb. or online in the evening or first thing in the morning. Better if it could be offered, one day a week in segments in March. Video examples would be more impact than still photos? Can be incorporated to PPT.
- That we realize we need to treat sewage
- Very well organized and presented. Will try to attend other training seminars sponsored by the U of M.
- It's new and interesting- but also felt like an infomercial.
- This training provided more info that I thought I would get. Definitely explained some things better than the design installer classes so. Great class. Designers, Installers, inspectors should be required to go through this!
- A lot of info condensed into 2 days- need hands on.
- Extremely well qualified presenters
- A lot of new ideas
- Some of the presentations were way too basic (i.e. math) and a lot of the materials covered did not apply to my job. However, the presenters did give a perspective from another state or location.
- It was good and gave some good and new info- the presenters did a good job and were very knowledgeable.
- I think it will be hard to implement a national program
- PPE needs to be more specific
- Thanks for the redundant basic knowledge in a new format. The real value of the course is somewhere in the zero to .5 range. If I was not imprisoned here for the credits, I would have asked for a refund and left. On a Positive note, the chocolate chip cookies were awesome. Thanks
- Too much repeat information- this was a continuing ED course- too much information was basic information
- I found it informational but some of it pertained to systems not used in Minnesota… and I do realize this program was for other states also. I feel this program will be beneficial to homeowners (users)
- Love it!
- Well thought out- very good job. Covered everything well- very impressed
- Refreshing new information
- Very good program introducing a very good product.

I.1.8 MISC Comments

- Better definition of roles and responsibility would help
- #11 should include State and County Reps and County Commissioners
- Slide "Hydrologic Cycle" page 23 Day 1 shows wastewater leaving Drainfield. Should wording be "recycled" or "treated effluent"?

- All presentations were done well. Some just spoke louder than others and I gained some knowledge from each (some more interesting than others)
- My knowledge of systems is limited as I have not attended a designer class.
- Round table discussions would be better for continuing ED
- There should be some slides of actual onsite O&M situations- you show a lot of "new" sites.
- Forms should be user friendly without a lot of duplication
- Does the designer class reinforce that the systems need to be maintained and accessible? If not, it should (as well as the Installer's class)
- Maybe this should interact with the troubleshooting classes

APPENDIX J

CONSORTIUM EXECUTIVE BOARD

Table J-1. Consortium Executive Board Members

Board Member	Position	Affiliation
Bruce Lesikar	Chair	Texas A&M University
Mark Gross	Past Chair	University of Arkansas
Kitt Farrell-Poe	Chair Elect	University of Arizona
David Gustafson	Practitioner/Training Center Chair	University of Minnesota
John Higgins	Advisory Chair	Northeast Environmental Corporation
George Loomis	At Large Delegate	University of Rhode Island
Randy Miles	Legislative/Policy Chair	North Carolina State University
Aziz Amoozegar	Research Chair	North Carolina State University
Paul Trotta	University Curriculum Chair	University of Northern Arizona

APPENDIX K

DESCRIPTION OF EXPERTISE

Table K-1. Writing Team Description of Expertise

Name	Description of expertise
Frank Aguirre	Onsite wastewater treatment system designer. Works with the philosophy of interactions with homeowners to maintain positive customer relations and a professional business service.
Nancy Deal	Extension Associate with over 10 years experience in the regulatory sector and 7 years in extension teaching and course development
Dave Gustafson	Associate Extension Specialist: Onsite Sewage Treatment, Expertise: Water Resource Management and Policy
Mike Hoover	Professor and University Extension Specialist with over 30 years experience in extension, teaching and research
Justin Jobin	Experienced O&M service provider, especially for Innovative & Alternative wastewater technologies. Wastewater Specialist with the RI Onsite Wastewater Training Center.
David Kalen	Designs courses and conducts practitioner training short courses on onsite wastewater treatment systems. Manager of New England Onsite Wastewater Training Center at the University of Rhode Island.
Bruce Lesikar	Teacher and researcher on appropriate utilization of wastewater treatment technologies for management of wastewater onsite. Conducts practitioner training short courses on onsite wastewater treatment systems. Director of Onsite Wastewater Treatment Training Centers located in Texas.
David Lindbo	Associate Professor and University Extension Specialist with over 15 years experience in extension, teaching and research
George Loomis	University Extension Specialist with responsibilities in onsite wastewater treatment, environmental soil science; over 25 years experience in teaching and research
Courtney O'Neill	Project coordinator. Extension Assistant with Texas Cooperative Extension
Jerry Stonebridge	System installer and O&M Service Provider. Instrumental in implementation of the onsite designer certification program in Washington State and for the formation of the Washington State Onsite Sewage Association
John Thomas	Executive Director and Training Director, WOSSA, technical writer/reviewer of Onsite training programs.

Table K-2. Official Review Team Description of Expertise

Name	Description of expertise
Tim Banister	Owner Tricounty Wastewater Management, Inc. Owns, operates and manages a company responsible for O&M of decentralized wastewater systems through out the Piedmont Region of North Carolina. He has served as a committee member responsible for revising the North Carolina Subsurface Wastewater System Operator training curriculum. He assists in the instruction for several O&M short course offered by NCSU Soil Science Dept.
David Burnham	President of RI Independent Contractor's Association. Experienced designer and installer of Innovative & Alternative wastewater systems. Experienced O&M service provider. Helps to deliver training for several short courses at the RI Onsite Wastewater Training Center.
Kenneth Davis	Designer, installer, and operation and maintenance practitioner for aerobic treatment units, drip distribution systems and spray distribution systems.
J.R. Inman	General Manager of several divisions of Northwest Cascade (O&M service company) Over 20 years of experience in the onsite industry. Instructor for O&M classes for the Northwest Onsite Training Center

	of WOSSA.
Tom Konsler	Environmental Health Specialist with over 20 years experience in small scale wastewater management.
Eric Larson	Owner and operator of full onsite professional management service in central Minnesota, with over 10 years experience in the onsite industry.
John Olson	Owner and operator of a full service onsite wastewater treatment system management service, Septic Check, Inc. Over 20 years professional service in the onsite industry.
Tim Stasiunas	Owner and operator of Wastewater Technologies, Inc. Experienced designer and installer of Innovative & Alternative wastewater systems. Experienced O&M service provider. Helps to deliver training for several short courses at the RI Onsite Wastewater Training Center.
Bill Stuth, Sr.	Over 45 years experience in all aspects of wastewater treatment; inventor of several onsite products including the Nibbler Wastewater Treatment System for commercial systems, and the Nibbler Jr. for residential systems.

APPENDIX L

O&M PROGRAM BROCHURE

The following two pages contain the O&M Service Provider Program brochure printed from a PDF format.

Consortium of Institutes for Decentralized Wastewater Treatment

The Consortium is a group of universities, institutions and training entities organized to develop training materials and class curricula, and to conduct research benefiting the onsite wastewater treatment industry.

Operation & Maintenance Service Provider Program for the Onsite Wastewater Treatment Industry

The Consortium is implementing a training program that presents a standardized method for evaluating the status of treatment, distribution and dispersal technologies used in onsite wastewater treatment. This program will establish a benchmark for monitoring, operation and maintenance activities. Standardization of maintenance practices helps you compete for jobs and clarifies communication with your clients.

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O&M

Service Provider Program for the Onsite Wastewater Treatment Industry

Consortium of Institutes for Decentralized Wastewater Treatment

Funded by the Water Environment Research Foundation through a grant from the U.S. EPA's Decentralized Water Resources Capacity Development Project

Who should attend?

This course will directly benefit professionals who service onsite wastewater treatment systems. Regulators, installers and designers will gain a better understanding of the activities performed during monitoring, operation and maintenance, and how proper design and installation can facilitate these activities.

Why participate?

This course will improve your ability to perform as a service provider for onsite wastewater treatment technologies. Some of the benefits are:

- Increased knowledge regarding management of onsite wastewater treatment systems.
- Standardized checklists for conducting maintenance visits.
- Improved ability to identify symptoms and diagnose problems associated with wastewater treatment technologies.
- Identification of simple but critical items to note when conducting a maintenance visit.

What is the training format?

This program is lecture-style with PowerPoint slides to aid in discussion. The lectures focus on the items associated with each technology that should be checked and recorded on the maintenance checklists. The checklists provide a standard template from which to conduct maintenance visits.

What are the benefits?

You will benefit professionally and financially through participation in the course. Some noted benefits are:

- Clarification of monitoring, operation and maintenance that will lead to an improved relationship with your clients.
- Improved communication with your clients through the use of standardized maintenance checklists.
- Reduced time for evaluating system function during maintenance visits.
- Streamlined collection of and improved access to critical information through use of checklists.
- Improved ability to compete in the marketplace because of standardization of services.
- A national standard of work that will reduce your liability when conducting monitoring, operation or maintenance.

Are continuing education credits available?

Please check with your certifying entity regarding approval for continuing education.

Course dates, locations and contacts*

June 7-9, 2004**
Bolivia, North Carolina
Joni Tanner, North Carolina State University
919.513.1678
joni_tanner@ncsu.edu

August 24-25, 2004
Tucson, Arizona
Kitt Farrell-Poe, University of Arizona
928.782.3836
kittfp@ag.arizona.edu

September 16-17, 2004
Tacoma, Washington
John Thomas, Washington Onsite Sewage Association
253.297.2837
johnthomas49@msn.com

May 11-12, 2005
Kingston, Rhode Island
George Loomis, University of Rhode Island
401.874.4558
gloomis@uri.edu

June 13-14, 2005
Brainerd, Minnesota
Greg Miller, University of Minnesota
800.322.8642
mille599@umn.edu

**Contact individuals for arrangements and associated fees.*
***The North Carolina program includes an extra day that will be conducted at their training center.*

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GLOSSARY OF TERMS

Acceptable is a condition in which a component is performing its intended purpose and is considered to be in an operable state.

Compensation is the action of being paid a fair price for a proper service.

Inspection is the process of identifying the current status of a system for reporting purposes.

Failure is a condition in which a component or all the entire system is not performing its intended purpose.

Maintenance is the action of performing routine activities to ensure proper performance, extend the life of the system, or meet performance requirements.

Management is a term describing all the steps necessary to conduct operational services, including maintenance, monitoring, and compensation.

Mitigation is the act of fixing a system that is in failure. Fixing the system should be preceded by an evaluation of all the components (source, collection and storage, pretreatment, final treatment, and dispersal) to determine the reason for the malfunction. Certain jurisdictions may require a permit before mitigation occurs.

Monitoring is the action of verifying performance requirements for a regulatory authority.

Operation is the action of assessing the functionality of each component of the system while it is in service.

Performance Requirements are specific and measurable parameters that effluent must meet.

Repair is the action of fixing or replacing substandard or damaged components. Repairs may be required repairs, recommended repairs, or upgrades.

Replacement is the process of exchanging a component with an equivalent component.

Reporting is the action of submitting a detailed report of O&M activities performed on a system.

Service is the action of performing activities such as, but not limited to, inspection, assessment, and maintenance of system components.

Troubleshooting is the act of identifying and correcting sources of system malfunction. It is not included in this training program.

Unacceptable is a condition in which a component is not operable. This condition indicates the need for implementing maintenance, upgrades, repairs, or further investigation.

Upgrade is the action of creating a better system by adding or modifying a component to improve the level of treatment provided.

Contact Information

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