National Decentralized Water Resources Capacity Development Project

Model Decentralized Wastewater Practitioner Curriculum

North Carolina State University
Raleigh, North Carolina

March 2005

Model Decentralized Wastewater Practitioner Curriculum

Submitted by North Carolina State University

Raleigh, NC

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The educational materials (modules) referred to in this report are available from:

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ABSTRACT

The Project Team developed a model decentralized wastewater field practitioners training curriculum for use throughout North America. The curriculum consists of a series of noncredit short courses organized similar to a college curriculum. The primary topics that the curriculum addresses are:

- Onsite and decentralized planning issues
- Onsite wastewater technology
- Soil and site evaluation
- Design and engineering
- Installation and inspection
- Operation, monitoring and maintenance
- Troubleshooting and repair
- Rules and regulations

High priority subtopics in four areas of this curriculum were selected for full development of detailed training modules including trainers' guides and audio-visual educational materials. These basic foundations of the curriculum are:

- Soil and site evaluation
- Water movement and treatment in soils
- Decentralized technology overview
- Septic tanks.

Through this project a web site was developed to facilitate the development, assessment, and electronic delivery of these training materials and their distribution to trainers who will deliver the training to the end-users. The course materials can be viewed online in PDF format at www.onsiteconsortium.org. Copies of the materials on CD-ROM are available through either of the following contacts:

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National Small Flows Clearinghouse
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1 INTRODUCTION

Onsite wastewater treatment systems that serve individual homes and businesses, along with clustered wastewater treatment systems that treat wastewater from multiple facilities at nearby communal treatment and drainfield areas, have been jointly termed “decentralized” wastewater treatment systems. Decentralized systems have been contrasted to “centralized” systems that provide for collection of wastewater from entire large communities and/or regional areas followed by treatment and disposal at one location. The decentralized concept urges treatment, proactive management, reuse, and recycling to the maximum practical extent as close to where the wastewater is generated as possible. Thereby, the decentralized approach eliminates the costs, disruptions, environmental hazards, and land-use influences of a conveyance system that moves pollution from place to place. Decentralized technologies are used by about 25% of the population across the US. Additionally, 35% to 40% of new development uses decentralized technologies. While the use of decentralized systems varies from state to state, it can be quite extensive in some locations.

The effect of poor implementation of all aspects—from siting to design to installation to maintenance—of decentralized wastewater concepts by field practitioners can result in negative public health and environmental consequences. Many wastewater professionals are inadequately educated in the use of decentralized wastewater treatment strategies. Some individuals attempt to further educate themselves through attendance at workshops on decentralized subjects. This project provides extensively reviewed, nationally accepted training materials to enhance the training opportunities for field practitioners. The overall goals of the project are to

- Elevate the decentralized wastewater treatment approach into the mainstream by coordinating the expertise from the broad knowledge base of academic and advisory consortium delegates
- Develop a draft model curriculum for training practitioners
- Provide four high-quality, peer-reviewed, electronically-based, practitioner training modules
- Establish an enhanced communications network

The central concept of the materials developed in this project follows the model developed by the Northwest Onsite Training Center in the state of Washington. This center was the first to develop a curriculum of short courses that offer training opportunities for practitioners from the novice to the experienced professional. The Northwest Onsite Training Center’s curriculum is organized similar to a college curriculum. The classes, or short courses, begin with the basics and build upon each other to lay the foundations for more advanced courses in each topical area. The courses are organized by topical subject matter areas and are described in a curriculum catalog.

Course numbers are similar the numbering used for college courses and express the relative course difficulty. The course description includes a list of prerequisites needed to successfully complete each subsequent short course. The specific core areas that Washington utilized have been modified through evaluation and expansion of the training curricula utilized by North Carolina State University, University of Rhode Island, Texas A&M University, University of Minnesota, Michigan State University, and other training centers and programs. The culmination of this effort is the development of a Model Curriculum that is discussed in Chapter 5.

In addition to a Draft Model Practitioner Curriculum, four modules have been fully developed. These high-priority subtopics were selected for full development of detailed training materials including an instructor guide, suggested course outlines, text, and PowerPoint presentations. These basic foundations of the curriculum are:

- Soil and site evaluation
- Water movement and treatment in soils
- Decentralized technology overview
- Septic tanks

Through this project a web site was developed to facilitate the development, assessment, and electronic delivery of these materials and their distribution to personnel who will deliver the training to the end-users. The specifics of these materials are discussed in their respective chapters.

2 OVERVIEW OF THE REVIEW PROCESS

As part of the development of any curriculum it is critical to have comprehensive peer review prior to making the materials available to the general public. Materials for this project have been reviewed in several stages and forums including:

- Structured review meetings
- Use of specific peer reviewers for individual modules
- Test teaching
- Consortium Executive Board review

In addition, cross-project review with the University Curriculum Development project (Gross *et al*. 2005) was coordinated by the project manager. Furthermore, the full project team [principal investigator (PI) and module lead writers] met in Raleigh, NC, August 2001 to coordinate efforts for both the writing and review of materials. A second meeting of this group plus the PI of the University Curriculum Development Project occurred in Plymouth, NC in April 2002 to further coordinate efforts and discuss the format of the module materials.

Structured Review Meetings

Three structured review meetings were held during this project. At these meetings a group of 25 to 40 individuals were able to review the current materials and comment directly to the principal author and the writing team members. A list of attendees at each of these meetings is compiled in Appendix A. Note that since the writers were also reviewers of other materials besides their own, their names are also included in the list.

The original writers' meeting to review materials was held in Orlando, FL in January 2002. At this meeting, the general concepts of the modules were discussed. The major outcome of this meeting was the establishment of six basic points each module would discuss:

1. A general description of the module
2. The projected audience
3. General course goals
4. Learning objectives

5. Scope of information to be covered

6. Methods of delivery

In addition each writing team began to develop an outline for their respective module.

The second meeting was held as an Academy in June 2002 in Flagstaff, AZ. At this meeting materials were further developed and the participants were able to see actual PowerPoint presentations and critique them. This meeting was organized so that similar materials from both the University and Practitioner projects were reviewed by the same audience. This format enabled for the first cross-project review of materials. There were three major outcomes from this meeting. First, a general outline for onsite wastewater training and education was developed and adopted by the group (Appendix B). Second, terminology was standardized. This standardization has lead to the development of a draft glossary of terms by several members of the consortium. However, this glossary is not part of the deliverables for this project. Third, the need for an additional review meeting was illustrated. This third meeting was held in Raleigh, NC in January 2003. Drafts of the PowerPoint presentations were subjected to a rigorous review. Breakout sessions were conducted and reviewers provided detailed suggestions and comments to the authors. Comments from this meeting were far more extensive than those from the Flagstaff meeting as there was much more material to review. The overall outcome of this meeting was to add more responsibility to the Practitioner Project Manager's (PM's) position. The PM became responsible for coordinating detailed cross-project reviews between the University and Practitioner Projects. Due to this increased responsibility and need, the project was extended to June 2004.

In addition to the above mentioned meetings, a preliminary meeting was held in March 2000 in Raleigh, NC. Although held prior to the official start date of the venture, this meeting was a critical element and was paid for with pre-award funds from the project. This meeting served as an initial review of the project concept and was attended by the University Curriculum project leader Dr. Mark Gross. This meeting ensured that the two projects would be coordinated at some level. Additionally, it brought together Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) academic and advisory delegates to ensure a consistent approach and coordination of both projects as they began.

Peer Review

The peer review process extended beyond the review meetings. Each writing team established a review team. These individuals were sent materials on a periodic basis and were asked to comment on them either verbally, electronically, or by written comments. The peer reviewers provided constructive criticism that enhanced the end product both in terms of technical content and clarity. Several peer reviewers volunteered materials to be included with the final materials. For example, see reviews from the Soils and Site Evaluation Module in Appendix E.

Supplemental peer review by industry representatives was solicited for specific materials when comments indicated a need for broader perspectives. The materials were posted to the CIDWT web site (www.onsiteconsortium.org) throughout this process and regularly updated as revisions were made.

Test Teaching

As part of the project deliverables all modules had to be test taught at least once. All incidents of planned test teaching have been completed. Evaluation forms and summaries of evaluations were submitted to the PM. Questions posed to class participants were phrased as a direct restatement of the learning objectives to try to measure the relative success of meeting those objectives. The overwhelming majority of evaluations indicated mean numeric responses of greater than four out of five points. A response of five was indicative of high-quality materials and effective delivery. Additionally, written statements provided on forms were generally positive. The PM collected the forms and all authors received copies of evaluations of their materials.

Consortium Executive Board Review

The CIDWT Executive Board (EB) reviewed the materials for completeness and for content. The following questions were addressed during the review:

1. Is the module complete?

2. Is it in the correct format?

3. Are the concepts correct?

4. Are the concepts consistent with its “sister” materials in the University curriculum?

5. Does it meet the requirements for the deliverables?

If the module was deemed unacceptable (a NO answer to #5) the lead writer was asked to add to or change materials in the module and have it re-reviewed by the EB. This process resulted in additional revision and the end product has been significantly improved. In addition to the process outlined above, supplemental review by EB members was solicited to clarify specific technical information in various materials.

Cross-Project Review

Cross-project review has been ongoing since the Orlando Academy in January 2002. During that and subsequent meetings in Flagstaff (June 2002) and Raleigh (January 2003), reviewers discussed parallel materials simultaneously and addressed issues of consistency accordingly. As previously shown, a component of the Consortium Executive Board review was an assessment of how parallel chapters or parts of chapters compared for consistency.

Reviews performed by board members indicated that all materials were acceptable from this standpoint. Additionally, the PM performed a certain amount of cross-project review as materials were prepared for web site posting. Where discrepancies were noted, the PM contacted the affected authors and requested that they review the information and come to a consensus on each issue. All such issues have been addressed and reconciled. The PM requested that reviewers from the Raleigh and Orlando Academy meetings volunteer to do comparative reviews but this attempt did not produce significant alterations to materials.

3 WEB SITE DEVELOPMENT

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

- Public communication center for those seeking wastewater information
- Contact center for consortium members
- Private communication forum for the consortium working groups
- Repository and delivery mechanism for the curriculum and training materials produced by the consortium committees
- Communication hub where consortium 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 consortium's objectives are met. His work on the web site is now directly funded by the consortium, 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 Consortium of Institutions for Decentralized Wastewater Treatment; and facilitate the communication, research, and training efforts of the onsite community. Although no number of hits has been recorded, anecdotal information from practitioners, regulators, and even concerned citizens suggests that the web site is being accessed and the information available is being used.

4 USE OF MATERIALS FOR PRACTITIONER TRAINING

Each module in the Practitioner Curriculum contains specific information on using the materials. A general overview of information offered to potential users is described in this chapter as follows.

Considering the nature of the subject of onsite/decentralized wastewater treatment, it is important that training be a cooperative effort among academic, extension, regulatory, and private industry partners. Such collaboration offers opportunities for effective delineation and communication of training objectives and offers different personnel the opportunity to express concerns and clarify technical information.

Because the bulk of the materials are presented in PowerPoint format, instructors should have at least a rudimentary grasp of its use and manipulation. This enables one to not only add and subtract photos of local/state/regional particulars, but also to expand upon the notes pages already included in the presentations.

As with all practitioner training, the instructor must have a firm grasp on the nature of their audience in order to present the appropriate level of detail and target key issues for emphasis. This provides a point of beginning when choosing which materials to present. Additionally, the available time and resources that an instructor has will influence his or her use of these training tools.

The availability of a field site where technologies can be viewed and/or operated will enhance the training experience when using the Technology Overview and Septic Tanks Modules. For septic tanks, a visit to a tank manufacturing yard is a valuable experience for participants. In situations where field sites and training centers are unavailable, instructors have other options. These include bringing small system components into the classroom and using video segments of larger components to cover the topics. The Soils and Site Evaluation and Water Movement and Soil Treatment Modules would, likewise, be enhanced by outside activities that illustrate key points in the materials. Barring this option, video presentations, soil monoliths, and scale model demonstrations can still provide an effective means of conveying concepts related to soils.

5 MODEL NATIONAL CURRICULUM

Overview

The model national practitioner training curriculum for decentralized wastewater is a series of coordinated short courses that build one upon another. This structure is similar to a college curriculum, but these courses are framed within the context of the field practitioner's educational needs. The curriculum has been developed in a planning framework that addresses appropriate adult education principles and training program administration/management strategies.

The Model Practitioner Curriculum is an example that coordinators of training centers and programs can use to either develop a curriculum of short courses or enhance existing curricula. The National Practitioner Curriculum was never intended to be a "perfect" final curriculum. Instead, it was developed to serve as a tool that could be appropriately adapted and used by those who develop training for field practitioners in decentralized wastewater treatment and related professions. Therefore, the audiences for the curriculum include training specialists who plan and organize training programs, not the training recipients themselves. These trainers might include cooperative extension specialists, university and technical college outreach specialists, state and provincial regulatory program leaders, and private-sector training organizations that develop a coordinated curriculum of short-course training programs.

It is recommended that trainers review the National Practitioner Curriculum for use as a potential basis for (or adjunct to) meeting the local needs of training organizations and targeted improvements in the "State of Practice" (SOP).

Table 5-1
Writing Team

Name and Contact Information	Description of Expertise
Mike Hoover (Lead) Soil Science Dept. Box 7619 North Carolina State University Raleigh, NC 27695 E-mail: mike_hoover@ncsu.edu	Professor and University Extension Specialist with over 30 years experience in extension, teaching, and research.
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David Gustafson University of Minnesota Bios stems and Ag. Engineering 311 BioAgEng, 1390 Eckles Avenue St. Paul, MN 55108 gusta002@umn.edu	Associate Extension Specialist with 20 years experience in onsite sewage treatment and water resource management and policy.
Dave Lenning Northwest Alternatives 680 East Island Lake Drive Shelton, WA 98584 dlenning@hctc.com	Developer and former director of the Washington Onsite Wastewater Training Center; consultant and trainer in the area of onsite wastewater treatment; instructor at University of Washington at Seattle in public health and onsite wastewater treatment.
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Jordan Mooers, M.A.Sc., P.Geo. Nova Scotia Department of Transportation and Public Works Environmental Services phone: (902) 424-2723 fax: (902) 424-7544 mooersjo@gov.ns.ca	Hydrogeologist with the Nova Scotia Government; 10 years onsite wastewater research, 3 years in consulting, 3 years with public works.

Table 5-2
Review Team

Name and Contact Information	Description of Expertise
Randy Miles Soil Science Department University of Missouri The School of Natural Resources 302 Anheuser-Busch Natural Resources Building Columbia, MO 65211	Professor of Soil Science; over 25 years experience in teaching and research.
Tom Konsler Orange County Environmental Health Department 306 C Revere Road Hillsborough, NC 27278 tkonsler@co.orange.nc.us	Environmental Health Specialist with 20 years experience in small-scale wastewater management.
Anthony Smithson Lake County Health Department 3010 Grand Av. Waukegan, IL 650085 asmithson@co.lake.il.us	30 years regulatory experience in onsite wastewater field; Manager, Onsite Wastewater Treatment System Program (Lake County, IL); OWW Technical Section Chair, (NEHA).
David V. Linahan Yerkes Associates, Inc. 1444 Phoenixville Pike West Chester, Pa 19380 dlinahan@yerkes-assoc.com	Director of Sanitary Engineering; specialist in municipal sewer planning; wastewater treatment plant operator; Certified Sewage Enforcement Officer (PA); 25 years experience in wastewater.
Robert B. Mayer, PE American Manufacturing, Inc. P.O. Box 549 Manassas, VA 20108-0549 800-345-3132	President, American Manufacturing Inc. 30 years experience in the onsite wastewater field.

Additional review was provided by all attendees at the Flagstaff, AZ and Raleigh, NC meetings (see Appendix A for complete list).

Interactions With Module Writers

The Practitioner Model National Curriculum was distributed to the writing team (the leaders for the other modules) for review and discussion.

Summary of Comments and Actions Taken Following the Review Meeting in Flagstaff, June 2002 and Raleigh, 2003

The overall model national practitioners curriculum was introduced and reviewed at the Flagstaff meeting. The model curriculum was reviewed by a group of reviewers in more detail at the Raleigh meeting.

Summary of Actions Taken in Response to Comments From Specific Reviewers

There has been a suggestion that the Practitioner and University curricula (PC and UC respectively) should follow the same outline and that the PC should be changed to be exactly parallel to the global consortium curriculum that was developed for project consistency and for long-range planning for the consortium. This might seem logical from a purely classification point of view regarding the technologies, but does not make good sense from an educational viewpoint for the students who will be going through these curricula, nor for the instructors who will be teaching them. The global consortium curriculum is technology-focused, not audience-focused. This type of focus is fine for long-range planning, coordination, identifying gaps or holes in the materials, but will assuredly become confusing for the student and the instructor. In other words, the global consortium curriculum is unquestionably important for internal use, but is inappropriate for use in the educational settings for these projects.

The Practitioner Curriculum (PC) and the University Curriculum (UC) address different specific audiences and priorities that are clearly not identical. Hence, these project curricula are not identical to each other and should not be bent and twisted to make them so. The global consortium curriculum will not be directly appropriate for either the PC or UC. When developing educational material, the focus must be on the students and their needs, not on the technology.

Specific review comments regarding course catalogs, descriptions, and agendas follow.

Septic Systems Basics and Planning Issues

During review, it was suggested that some additional courses be added to this course catalog. This was done, course descriptions were developed, and they are included in the revised curriculum.

Onsite Wastewater Technologies

During review it was suggested that some technologies may not be addressed in the two one-day introductory Tech courses (originally Tech 100 and 102). At first, it was decided that the Tech 100 course will only cover traditional gravity systems and that more advanced technologies will be introduced in Tech 102. Additionally, the Tech 102 short-course agenda would be refined to also introduce collection systems, constructed wetlands, and wastewater reuse technologies. However, after review of the Technology Overview Module itself, the decision was made to use a two-day short course to deliver that module. Therefore, the Tech 100 and Tech 102 one-day short courses were then combined into a new two-day short course (Tech 100: Technology Overview) so that the PC remains consistent with that module.

In addition, there was some disagreement regarding two points. First, it was thought that constructed wetlands should be in a separate course by itself. Second, there was disagreement regarding introducing all technologies together in one overview course (Tech 100) vs. having introductory courses for each and every technology. A decision was made to use one overview

course rather than an approach that included an overview course for each technology; however, the need for additional overview courses has been accommodated by including a series of broader introductory courses in the PC.

One additional point of disagreement during review concerned Tech 103: Local Rules and Regulations. Reviewers felt that rules and regulations should not be included in the Onsite Wastewater Technologies part of the course catalog, but that a separate course catalog on regulatory and permit issues should be developed. This regulatory and permit issues course was developed.

Design and Engineering

Reviewers felt that other professional requirements of students should be listed, such as indicating in the curriculum when the person taking the courses should also be a PE or licensed soil scientist. However, that type of requirement is an issue that varies by locality or state (for example, can designers design systems or do they have to be designed by a PE, and at what system size is that determination made?), so it is not possible to generalize such an issue for this curriculum.

Summary of Comments From the Consortium Executive Board and Actions Taken

The EB reviewer requested that the course overview descriptions be more descriptive and less colloquial. This approach was rejected since these courses are not intended for the university audience and the exact approach used for that audience is not what is needed for training center directors desiring to develop a “sellable” curriculum. In this case, the general course descriptions in the course catalogs will be used by training center directors as base starting language for them to develop course overviews included in brochures for marketing purposes. In the end, the EB reviewers found the materials acceptable after changes were made. Specific review comments are compiled in Appendix C.

6 SOIL AND SITE EVALUATION MODULE

Overview

The Soil and Site Evaluation Module addresses the use of soil morphology, landscape description, interpretation of data, and non-soil data for onsite wastewater applications. The module consists of a guide beginning with the basics of soil science (definitions, formation, and morphology) and proceeding to details regarding specific problem areas (water table monitoring, restrictive horizons, and mineralogy). Each chapter in the guide consists of written reference materials (as follows) and a slide set with notes. These notes can, in some cases, be considered a script, but the authors feel each instructor should develop his or her own script to complement their personal teaching style. Additionally the module contains suggested agenda for numerous short courses. These materials include details on soil morphology (soil horizons, color, texture-field and lab methods of determination, structure, consistence, redoximorphic features-mottles, landscape evaluation/slope type, drainage concerns, and landscape position), soil and landscape relationships, and non-soil issues that must be considered for a complete site evaluation. Additionally, details on the use of county soil survey (NRCS) publications are discussed.

The associated text is designed as a supplement for both instructors and students. It is not meant to be a comprehensive discussion of soil morphology, genesis, or other topics. These subjects are covered in great detail in excellent reference texts such as *The Nature and Properties of Soils* (Brady and Weil 1999), *Soil Science Made Simple*, (Kohnke and Franzmeier 1995), *Environmental Soil Physics* (Hillel 1998), and *Soil Classification and Genesis* (Buol *et al*. 1997). The text should be viewed as a clarification of the slide sets and as supplemental information that relates soil properties to the subject of onsite wastewater treatment and dispersal.

It is strongly suggested that those who teach this material in a practitioner course be soil scientists with experience beyond the field of wastewater. This recommendation recognizes the concept that soil science is a multidisciplinary field requiring a wide breadth of knowledge in order to adequately understand and convey its principles to those who may only see soil as "dirt." The authors fully intended to create more material for this module than a practitioner could learn in a one-day session. The authors contend that, by first illustrating the importance of soils disciplines beyond onsite wastewater (OSWW), they can enhance the learning experience and provide the practitioner with a more complete understanding of the science. The authors also recognize that all do not share their view; thus the slide sets are not arranged as stand-alone short courses (although several could be presented as such). Instead the authors expect that an individual instructor will pick and choose the materials that he or she sees as most appropriate for the specific audience. This approach makes these materials highly flexible and adaptable for use at multiple skill levels with a variety of instructional techniques.

Table 6-1
Writing Team

Name and Contact Information	Description of Expertise
David Lindbo (Lead Writer) Soil Science Dept. Box 7619 North Carolina State University Raleigh, NC 27695 david_lindbo@ncsu.edu	Associate Professor and University Extension Specialist with over 15 years experience in extension, teaching, and research.
Delbert L. Mokma Department of Crop and Soil Sciences Michigan State University East Lansing, MI 48824-1325	Professor of Soil Science; over 25 years experience in teaching and research.
Mark H. Stolt 112 Kingston Coastal Institute Dept. of NRS University of Rhode Island Kingston, RI 02881	Associate Professor of Soil Science; over 15 years experience in teaching and research.
Randy Miles University of Missouri The School of Natural Resources 302 Anheuser-Busch Natural Resources Building Columbia, MO 65211-7250	Professor of Soil Science; over 25 years experience in teaching and research.
Scott Greene Guilford County Environmental Health 311 Aldridge Road Archdale NC 27263	Environmental Health Specialist with 15 years experience in small-scale wastewater management.
Mike Hoover Soil Science Dept. Box 7619 North Carolina State University Raleigh, NC 27695 mike_hoover@ncsu.edu	Professor and University Extension Specialist with over 30 years experience in extension, teaching and research.
Paul D. Trotta P.E., Ph.D. Department of Civil and Env. Engineering Northern Arizona University (NAU) Campus Box 15600 Flagstaff, AZ 86011 Paul.trotta@nau.edu	Teacher and professional engineer with over 25 years experience.

Table 6-2
Review Team

Name and Contact Information	Description of Expertise
Aziz Amoozegar Soil Science Dept N C State Unit Box 7619 Raleigh NC 27695-7619	Professor of Soil Science; over 25 years experience in teaching and research.
Maynard Beery	Soil Scientist
Jay Bell University of Minnesota 570 Borlaug Hall 1991 Upper Buford Circle St. Paul, MN 55108	Professor of Soil Science; over 25 years experience in teaching and research.
Russell J. Chateauneuf, P.E., Chief Groundwater & Wetlands Protection R.I. Dept. of Environmental Management 235 Promenade Street Providence, RI 02908 phone: 401-222-4700 Ext 7700 fax: 401-222-6177	Soil Scientist, RIDEM ISDS Director
Peter Fletcher Pfdigsoil@aol.com	Soil Scientist/Private Consultant
Bruce Gruner he_gruner@ingham.org	Registered Sanitarian
Tom Konsler Orange County Environmental Health Dept. 306 C Revere Road Hillsborough, NC 27278 tkonsler@co.orange.nc.us	Environmental Health Specialist with 20 years experience in small-scale wastewater management.
Brad Lee Department of Agronomy Purdue University Lilly Hall of Life Sciences 915 West State Street West Lafayette, IN 47907-2054	Assistant Professor of Soil Science; over 5 years experience in teaching and research
George Loomis Department of NRS University of Rhode Island Kingston, RI 02881	University Extension Specialist with responsibilities in onsite wastewater treatment, environmental soil science; over 25 years experience in teaching and research.

Table 6-2
Review Team (Cont.)

Carl Peacock 508 Ayles Bury Drive Chesapeake, VA 23322-9100	Former state regulator of onsite wastewater treatment systems with 30 years experience.
Jim Turenne Soil Scientist/Ground Penetrating Radar Specialist USDA-Natural Resources Conservation Service 15 Cranberry Highway, West Wareham, MA. 02576 jim.turenne@mawestware.fsc.usda.gov	Rhode Island Department of Environmental Management Individual Sewage Disposal Systems Director.
Jerry Tyler Department of Soil Science University of Wisconsin-Madison 1525 Observatory Drive Madison, WI 53706-1299	Professor of Soil Science; over 25 years experience in teaching and research.
Joe Valentine DelVal Soils Consultants Inc. 4050 Skyron Drive, Suite A1 Doylestown, PA 18901	Private consultant with 25 years experience.

Additional review was provided by all attendees at the Flagstaff, AZ and Raleigh, NC meetings (see Appendix A for complete list).

Interactions With Module Writers

A meeting of the writing team was held in March 2002 in Plymouth, NC. This meeting focused on review of materials and all writers delivering slide sets for the module. Additional face-to-face meetings to discuss progress and review materials were held at Soil Science Society of America (SSSA) annual meetings. In addition to face-to-face meetings, draft materials were sent to the writers on a regular basis for critical reviews.

Summary of Comments and Actions Taken Following the Review Meetings in Flagstaff, June 2002 and Raleigh, 2003

Comments from the two review meetings focused on areas where photos were not being used well to explain a specific point. Notes were made of these areas and additional verbiage was added to the user notes and/or arrows were added pointing out areas of concern in the photos. In a few cases new photos were inserted.

Summary of Actions Taken in Response to Comments From Specific Reviewers

Reviewers' comments were similar to the comments heard at the review meetings. In most cases the response to the comments was to make changes to improve clarity. In one instance a web site was suggested as a possible source for additional photos. This suggestion was used.

Summary of Comments From the Consortium Executive Board and Actions Taken

The EB review suggested that a statement be added indicating who should be teaching these materials. This statement was added to the text.

Results of Test Teaching

The lead writer has taught materials from this module 14 times over the last 3 years. Additionally, some of the introductory soils material has been used by the University Curriculum developers at the undergraduate level. The overall results are very positive. The biggest complaint is that the handouts are not in color. This complaint can be overcome by suggesting the student go to the web site to view the slides. The major action taken as a result of the test teaching comments is clarification of specific points on slides and the use of new photos where needed. The specific reviews from classes taught are summarized in Appendix E.

Dissemination of the Module Beyond the Consortium Web Site

To date, materials have been sent to anyone who asks for a copy. More than 30 CDs have been sent. Once the final product is produced, individuals will be directed to the web site to view the materials on line or provided with information on how to obtain CDs.

Materials To Be Developed in the Future

Additional photos are needed of different soil environments. Much of the materials cover eastern, southeastern, and midwestern areas. An expansion to deal with more arid soil issues is needed. Additionally, more advanced techniques for land-use planning and mapping are needed. Finally, a series of courses (another module) needs to be developed that fully integrates the information collected during the site and soil evaluation into the system design process.

7 WATER MOVEMENT AND TREATMENT IN SOILS MODULE

Overview

The Water Movement and Treatment in Soils Module addresses the

- Basics of water movement in the vadose zone and upper saturated zone of soil
- Measurement, calculation, and interpretation of saturated hydraulic conductivity (Ksat)
- Use of Darcy's Law and simple models to assess and simulate water movement in soils and the upper portion of the groundwater system
- Treatment of wastewater in soils

These materials can be used in different combinations and in a variety of settings. They are meant to provide an overview of the topics of water movement and soil treatment as they occur in individual sewage treatment systems and are not intended as a comprehensive reference. The focus of the module is on an introduction to water movement and soil treatment processes related to application of sewage effluent. Emphasis is placed on distinct flow patterns in the soil under onsite systems and how those patterns change over time. The PowerPoint presentations and accompanying written materials can be used together or individually. The video is an effective teaching tool that can be incorporated into any number of other educational formats. The goal is that the pieces can be used, edited, switched, and formatted to meet the needs of the different audiences. All of these elements imply that the educator must consider and establish clear goals and objectives for the intended educational experience.

Table 7-1
Writing Team

Name and Contact Information	Description of Expertise
David Gustafson (Lead Writer) University of Minnesota Biosystems and Ag. Engineering 311 BioAgEng, 1390 Eckles Avenue St. Paul, MN 55108 gusta002@umn.edu	Associate Extension Specialist with 20 years experience in Onsite Sewage Treatment and Water Resource Management and Policy.

Table 7-1
Writing Team (Cont.)

Name and Contact Information	Description of Expertise
James Anderson University of Minnesota Soil, Water and Climate 503 Soils, 1991 Upper Buford Circle St. Paul, MN 55108 ander045@umn.edu	Professor and Extension Soil Scientist with over 30 years experience in extension, teaching and research.
Aziz Amoozegar Soil Science Dept N C State Unit Box 7619 Raleigh NC 27695-7619	Professor of Soil Science; over 25 years experience in teaching and research.

Table 7-2
Review Team

Name and Contact Information	Description of Expertise
Barbara Dallemand, Engineer Church and Associates, Inc, 4501 Wadsworth BV Wheat Ridge, CO 80033	Onsite Wastewater Consultant
Nancy Deal Vernon James Center Soil Science Dept. North Carolina State University 207 Research Station Road Plymouth, NC 27962 nancy_deal@ncsu.edu	Project Manager with responsibilities in onsite wastewater treatment; over 10 years experience in the regulatory sector and 5 years in extension teaching.
Tom Konsler Environmental Health Supervisor Orange County Environmental Dept. 306-C Revere Road Hillsborough, NC 27278 tkonsler@co.orange.ncu	Environmental Health Specialist with 20 years experience in small-scale wastewater management.
David Lindbo Soil Science Dept. Box 7619 North Carolina State University Raleigh, NC 27695 david_lindbo@ncsu.edu	Associate Professor and University Extension Specialist with over 15 years experience in extension, teaching and research.

Table 7-2
Review Team (Cont.)

Name and Contact Information	Description of Expertise
George Loomis Department of NRS University of Rhode Island Kingston, RI 02881	University Extension Specialist with responsibilities in onsite wastewater treatment, environmental soil science; over 25 years experience in teaching and research.

Additional review was provided by all attendees at the Flagstaff, AZ and Raleigh, NC meetings (see Appendix A for complete list).

Interactions With Module Writers

The process of developing the practitioners Water Movement and Soil Treatment Module included development of a "needs to know" list and then a draft of the proposed module. During the first writers meeting in North Carolina, the needs to know list was discussed and a plan and timeline were developed for the module. Content for the accompanying video was discussed. The initial draft module was not discussed by writers and reviewers at the meeting held in January 2002 in Florida.

A draft was submitted to the writers and reviewers prior to the June 2002 meeting in Flagstaff, AZ. The draft was introduced and extensively reviewed at the Flagstaff meeting. At this same time visuals for the module were also reviewed. The reviewers submitted comments, which were subsequently incorporated into the current module. A redraft of the module was developed with input from both writers and reviewers in the months following the Flagstaff meeting and resubmitted to the reviewers. After the redraft was resubmitted, an extensive review of the material was made at a special meeting between David Lindbo and Dave Gustafson in September 2003. Following that meeting, a near-final draft of the module and the associated PowerPoint was developed during the spring and summer of 2004.

Summary of Comments and Actions Taken Following the Review Meeting in Flagstaff, June 2002 and Raleigh, 2003

As indicated above, following the Flagstaff meeting a fairly extensively revised module was developed. At this meeting the need for a significant change in format was identified and incorporated into the module. The soil treatment portion was discussed but was limited due to the lack of a contract for the soil treatment presentation in the University Curriculum sister project. There was a requirement to coordinate these components, but the lack of a contract made coordination impossible. A draft PowerPoint was submitted and mailed to the reviewers.

Summary of Actions Taken in Response to Comments From Specific Reviewers

David Lindbo has provided significant reviews and input on at least three occasions and his input has been integrated into the module. The comments are in actuality too extensive to summarize in detail. George Loomis also became a very active reviewer and contributor to the overall content of the module. Most other comments received have been editorial in nature and have been incorporated as appropriate. In addition, Nancy Deal provided editorial review of the module and the final draft of the PowerPoint presentation.

Summary of Comments From the Consortium Executive Board and Actions Taken

The Consortium Executive Board has provided encouragement and suggestions on the Practitioner Water Movement and Treatment in Soils Module. As a result of Executive Board suggestions, both modules have been carefully reviewed by authors and numerous exchanges of correspondence have resulted in increased consistency.

Results of Test Teaching

The module has been used by the lead authors in presentations to numerous groups in different settings. It has been used in regular classes conducted for the Minnesota Onsite Sewage Treatment Training program, which provides training for Minnesota State licensing, in partnership with the Minnesota Pollution Control Agency. It has also been test taught by David Lindbo in North Carolina, South Carolina, and California to a mixed group of regulators, consultants, operators, and installers. For the most part, the comments received during test teaching were positive and resulted in few suggested modifications.

Dissemination of the Module Beyond the Consortium Web Site

The module has been duplicated and distributed by the Minnesota Onsite Wastewater Training Program and as part of materials distributed during the teaching of the following courses:

- Introduction to Onsite Systems—A three-day class on the basics of onsite wastewater treatment taught to entry-level local health department professionals and contractors.
- Continuing Education for Licensing—A two-day course taught to designers, local health department professionals, and contractors.

The module has also been incorporated into the National Association of Wastewater Transporters Inspection Education Program. Parts of the module were also used in training sessions for the Alberta Onsite Wastewater Contractors Association.

Materials To Be Developed in the Future

The module is reasonably complete, based upon the input received from reviewers and from class participants to whom the module has been taught. This module is only an introduction to the topic. Another level is necessary to apply the topics to specific onsite system design. Development of landscape loading rates and system design is a clear next step. Also, the completion of the soil treatment information in the University Curriculum will expand the soil treatment component of the module.

8 TECHNOLOGY OVERVIEW MODULE

Overview

The Technology Overview Module is basic introductory training material for the initial short courses in the curriculum. This module standardizes technological terminology and introduces onsite and cluster technologies from the basic gravity-flow conventional septic system (including gravel-free trench options) to more advanced treatment units and improved distribution and dispersal technologies.

The Technology Overview Module can be used in a variety of ways. It is essentially designed as a multi-day course, which can be presented in two consecutive days, two one-day sessions, or in a series of smaller modules. If a demonstration site is available where participants can view the different technologies, more time may be needed. The module can also be used by colleges and universities to form the outline for a semester-long course on onsite/decentralized sewage systems.

Table 8-1
Writing Team

Name and Contact Information	Description of Expertise
Dave Lenning (Lead Writer) Alternatives Northwest 680 East Island Lake Drive Shelton, WA 98584 dlenning@hctc.com	Developer and former director of the Northwest Onsite Wastewater Training Center; consultant and trainer in the area of onsite wastewater treatment; instructor at University of Washington at Seattle in public health and onsite wastewater treatment.
Tibor Banathy California Wastewater Training & Research Center California State University, Chico Chico, CA 95929-0930 tbanathy@csuchico.edu	Teacher and trainer for onsite and decentralized wastewater systems with over 10 years of experience in decentralized wastewater system design and instruction
David Gustafson University of Minnesota Biosystems and Ag. Engineering 311 BioAgEng, 1390 Eckles Avenue St. Paul, MN 55108 gusta002@umn.edu	Associate Extension Specialist with 20 years experience in onsite sewage treatment and water resource management and policy.

Table 8-1
Writing Team (Cont.)

Name and Contact Information	Description of Expertise
Bruce Lesikar Associate Professor Texas A&M University 301 E. Scoates Hall College Station, TX 77843-2117 b-lesikar@tamu.edu	Professor and Associate Department Head for Extension Programs; over 20 years experience in teaching, extension, and research.
Steve Wecker Onsite Consulting Services P.O. Box 226 Wauna, WA 98395-0226 swecker@usa.net	Registered Sanitarian; Owner of design/consulting firm; Local health departments.
Denise Wright Indiana Dept. of Health Sanitary Engineering 5E2 North Meridian Street Indianapolis, IN 46204d hwright@isdh.state.in.us	Environmental Scientist for state's residential onsite sewage program.

Table 8-2
Review Team

Name and Contact Information	Description of Expertise
Terry Bounds Vice President Orenco Systems, Inc. 814 Airway Avenue Sutherlin, OR 97479 tbounds@orenco.com	Vice President Orenco Systems, Inc. Extensive experience in designing structurally sound, watertight septic tanks; author of numerous papers on design of septic tanks for both domestic and large-flow applications.
Jennifer Brogdon TVA Environmental Engineering Services East 1101 Market Street MR 2U Chattanooga, Tennessee 37402 phone: 423/751-8397 jnbrogdon@tva.gov	Designer and researcher in the field of decentralized wastewater systems.
John R. Buchanan Associate Professor Biosystems Engineering Department University of Tennessee 2506 E.J. Chapman Drive Knoxville, TN 37996-4531 jbuchan7@utk.edu	Director of the Tennessee Onsite Wastewater Training Center; teacher and researcher in the area of onsite wastewater treatment.

Table 8-2
Review Team (Cont.)

Name and Contact Information	Description of Expertise
James C. Converse Department of Biological Systems Engineering University of Wisconsin 460 Henry Mall Madison, WI 53706 jcconverse@facstaff.wisc.edu	Professor with over 25 years experience in research and teaching associated with onsite wastewater treatment; faculty member of the Small Scale Waste Management Project, University of Wisconsin; Developer of the Pressure Dosed Wisconsin Mound
Mike Davis Kentucky Onsite Wastewater Assoc. 1500 Bypass North US 127 Lawrenceburg, KY 40342 mike.davis@kctcs.net	Director, Kentucky Onsite Wastewater Training Center.
Nancy Deal Vernon James Center Soil Science Dept. North Carolina State University 207 Research Station Road Plymouth, NC 27962 nancy_deal@ncsu.edu	Project Manager with responsibilities in onsite wastewater treatment; over 10 years experience in the regulatory sector and 5 years in extension teaching.
Stan Fincham Advanced Environmental Systems P.O. Box 50356 Sparks, NV 89435	Vice President, Business Development.
Adrian Hanson Professor of Environmental Engineering Frank M. Tejeda Center New Mexico State University Las Cruces, NM 88003 athanson@nmsu.edu	Teacher and researcher in environmental engineering. Special expertise in wetlands, particularly vegetated submerged beds (VSBs).
John Higgins Northeast Environmental Corporation 68 Fairview Street South Hadley, MA septicsystem@comcast.net	Regulator and instructor with Massachusetts Department of Health during the project; over 20 years of experience in onsite wastewater systems.
Mike Hoover Soil Science Dept. Box 7619 North Carolina State University Raleigh, NC 27695 mike_hoover@ncsu.edu	Professor and University Extension Specialist with over 30 years experience in extension, teaching, and research.

Table 8-2
Review Team (Cont.)

Name and Contact Information	Description of Expertise
Tom Konsler Environmental Health Supervisor Orange County Environmental Dept. 306-C Revere Road Hillsborough, NC 27278 tkonsler@co.orange.ncu	Environmental Health Specialist with 20 years experience in small-scale wastewater management.
Jim Kreissl Environmental Consultant 737 Meadowview Drive Villa Hills, KY 41017 jkreissl1@home.com	Retired US UPA environmental engineer. Author of numerous US EPA publications and professional papers.
Ted Loudon Agricultural Engineering Department Michigan State University 222 Farrall Hall East Lansing, MI 48824 loudon@msu.edu	Professor and University Extension Specialist with over 25 years experience in extension teaching and research.
Kevin Sherman Executive Vice President Florida Onsite Wastewater Assoc. P.O. Box 1282 Lake Alfred, FL 33850 osmc2001@yahoo.com	Executive Vice President Florida Onsite Wastewater Assoc. Assisted in the establishment of the Florida State Wastewater Training Center; former state regulator.
Bill Stuth, Sr. Aqua Test, Inc. 31424 W Lk. Morton Dr. SE Kent, WA 98042 phone: 253-630-3820 cell phone: 206-571-6652	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.

Additional review was provided by all attendees at the Flagstaff, AZ and Raleigh, NC meetings (see Appendix A for complete list).

Interactions With Module Writers

The process of developing the Practitioner Technology Overview Module initially included reaching agreement on the following items:

- What is the topic?
- Who is (are) the audience(s)?
- What is the course goal?

- What are the learning objectives?
- What are you trying to cover?
- How do you plan to do this?

Drafts were developed for and discussed by members of both the writing team and reviewers present at each of the following meetings:

- January 2002 in Orlando, FL
- June 2002 in Flagstaff, AZ
- January 2003 in Raleigh, NC

Between each of the meetings mentioned, members of the writing and review teams reviewed the latest drafts of both the written material and the PowerPoint presentations. Photographs of various technologies were sent to the lead writer by many members of the writing and review teams. Some of these photographs were placed in the PowerPoint presentation; others were added to the companion catalog of photographs and diagrams, which is part of the module.

After the January 2003 meeting, the draft went through two revisions, each due to comments received from writing and review team members or in response to suggestions for changes from pre-testing that was conducted by various writing and review team members.

Summary of Comments and Actions Taken Following the Review Meeting in Flagstaff, June 2002 and Raleigh, 2003

As mentioned, drafts were developed for and discussed at each of the meetings. Further drafts resulted from comments and suggestions received at the meetings, as well as from drafts reviewed between the meetings.

Summary of Actions Taken in Response to Comments From Specific Reviewers

Comments were received from each member of the review team, most of which were received at the review meetings. At least once during the process, written comprehensive comments were received from the following individuals:

- Tibor Banathy
- Jim Converse
- Nancy Deal
- Mike Davis
- Mark Gross
- John Higgins
- Mike Hoover
- Tom Konsler
- Jim Kreissl
- Kevin Sherman
- Bill Stuth, Sr.

These comments were either incorporated into the next draft or were discussed by the writing and review team members present at the meetings with decisions made to not incorporate all comments or incorporate them in ways to satisfy comments from more than one reviewer. Additionally, Nancy Deal has provided editorial review and suggestions on illustrations that have been incorporated. A copy of these comments and the author's responses are included in Appendix H.

Summary of Comments From the Consortium Executive Board and Actions Taken

Comments received from the executive board have been positive and in general have indicated agreement with the form and content of the module. Editorial suggestions have been provided and incorporated.

Results of Test Teaching

The author received copies of evaluations from individuals who have tested the materials (Bruce Lesikar, Nancy Deal, Paul Trotta, Mark Gross, David Lindbo, and Mike Davis). Changes were made to both the text and PowerPoint presentation based on those comments. One comment that was not fully accounted for was that a number of slides had too much text on them. The author agrees with the comment, but as mentioned previously, is hesitant to make the presentation any longer than the more than 250 slides that currently make up the presentation. As users of the module work with its, hopefully they can make the changes they like, add photos, either from the included slide catalog or from their own catalog, and add or reduce the text depending on their situation. The summaries from the test teaching are included in Appendix I.

Dissemination of the Module Beyond the Consortium Web Site

As mentioned in the last section, this module, in whole or in part, has been used by instructors at universities, training programs, and conferences throughout the US. Use of the module included the following:

- The Environmental Training Institute for Small Communities in Morgantown, WV (2002 and 2003)
- Northern Arizona University
- Texas A&M University
- University of Arkansas
- University of Minnesota
- University of Tennessee
- An annual onsite wastewater conference in Minnesota

Additionally, Mike Davis has modified the package using terms and diagrams used in Kentucky for use at the Kentucky Onsite Wastewater Training Center.

Materials To Be Developed in the Future

Information in this module is already dated. New technologies have been and are being developed and used. Existing technologies are either being modified or used in other ways. One of the challenges for this module will be keeping it current. Currently, no plan exists for ensuring that this is done.

9 SEPTIC TANKS MODULE

Overview

The Septic Tank Module emphasizes the importance of high-quality, watertight, structurally sound tanks. Tanks manufactured with all commonly used materials are included in the presentation. The physical separation functions of the tank and the hydraulic and biological processes involved as they influence tank selection and sizing are covered. Theoretical and scientifically documented benefits of different tank configurations, outlet and inlet baffle combinations, and effluent filter use are included. Tank management (including various procedures for determining the required frequency of accumulated solids removal) is discussed. The importance of tank access is discussed in detail. This section focuses not only on access but also on the fact that tank/riser seams and pipe penetrations must be watertight.

The Practitioner Septic Tank Module is intended to be a summary of septic tank function, design, and use for presentation to practitioners in the onsite wastewater field. The module is divided into seven major sections, typical of the contents of sections needed in a module for any onsite system component. The sections are titled:

- Overview
- Design
- Tank Construction
- Watertightness Testing
- Installation
- Operation and Maintenance
- Troubleshooting
- Abandonment Procedures

This material is designed to provide complete information for a class on septic tanks for those who deal with them in one role or another on a daily basis. The intention is not to make tank designers of participants but to prepare them to select quality tanks, understand how they operate, properly use and maintain them, and be able to advise others on these points. An instructor can also select parts of the material for presentation to other audiences such as homeowners, designers, and policy makers who need a basic understanding of tanks.

Where the entire module is presented to practitioners, two to three hours of instruction time will be needed. The materials can be most effectively presented at a training center where instructors can use actual tanks to illustrate key issues. For other audiences, specific material can be selected and tailored to fit the time available for instruction.

Table 9-1
Writing Team

Name and Contact Information	Description of Expertise
Ted Loudon (Lead Writer) Agricultural Engineering Department Michigan State University 222 Farrall Hall East Lansing, MI 48824 loudon@msu.edu	Professor and University Extension Specialist with over 25 years experience in extension teaching and research.
Terry Bounds Vice President, Orenco Systems, Inc. 814 Airway Avenue Sutherlin, OR 97479 tbounds@orenco.com	Vice President, Orenco Systems, Inc. Extensive experience in designing septic tanks; author of numerous papers on design of septic tanks for both domestic and large-flow applications.
James C. Converse Department of Biological Systems Engineering University of Wisconsin 460 Henry Mall Madison, WI 53706 jcconverse@facstaff.wisc.edu	Professor; over 25 years experience in research and teaching associated with onsite wastewater treatment; faculty member of the Small Scale Waste Management Project, University of Wisconsin; Developer of the Pressure Dosed Wisconsin Mound.
Tom Konsler Environmental Health Supervisor Orange County Environmental Dept. 306-C Revere Road Hillsborough, NC 27278 tkonsler@co.orange.ncu	Environmental Health Specialist with 20 years experience in small-scale wastewater management.
Chet Rock Associate Dean College of Engineering 205 AMC University of Maine—Orono Orono, ME 04469	Professor of Civil Engineering with experience in septic tank function.

Table 9-2
Review Team

Name and Contact Information	Description of Expertise
Colin Bishop Orenco Systems, Inc. 814 Airway Avenue Sutherlin, OR 97479 cbish@yahoo.com	Former county regulator for onsite wastewater treatment systems.

Table 9-2
Review Team (Cont.)

Name and Contact Information	Description of Expertise
J. Edward Pennypacker, President JEP CO Sales, Inc. 271 Hafner Road Royersford, PA 19468 ed@jepcosales.com	Supplier of products related to manufacture of pre-cast concrete structures; active member of numerous pre-cast concrete and onsite industry trade organizations. Over 27 years experience in the pre-cast concrete and onsite/decentralized industries.
Charles Pickney Onsite Systems, Inc. 7638 River Road Nashville, TN 37209 onsite@mindspring.com	Professional Engineer; over 15 years experience in consulting and management in onsite wastewater systems.
Kevin Sherman Executive Vice President Florida Onsite Wastewater Association P.O. Box 1282 Lake Alfred, FL 33850 Osmc2001@yahoo.com	Executive Vice President, Florida Onsite Wastewater Assoc. Assisted in the establishment of the Florida State Wastewater Training Center; former state regulator.
Michael Stidham EZ Set Tank Company, Inc. P.O. Box 176 Haymarket, VA 20168 mstidham@ezsettank.com	Manufacturer of components used in the pre-cast concrete and onsite/decentralized wastewater industries. Active member of numerous pre-cast concrete and onsite industry trade organizations. Over 15 years experience in the pre-cast concrete and onsite/decentralized industries.
Howard Wingert, President Concrete Sealants, Inc. P.O. Box 176 New Carlisle, OH 45371 hwingert@conseal.com	Manufacturer of sealants for concrete, fiberglass, and poly septic tanks. Twenty years experience in the pre-cast concrete industry, including septic tank applications; active member of several ASTM standards committees as well as the NPCA Education Committee and Education Foundation.

Additional review was provided by all attendees at the Flagstaff, AZ and Raleigh, NC meetings (see Appendix A for complete list).

Interactions With Module Writers

The process of developing the Practitioner Septic Tank Module included first development of a "needs to know" list and then a draft module. The initial draft module was discussed by writers and reviewers at the meeting held in January 2002 in Florida. The module was reviewed at that meeting and compared with the material going into the University Curriculum Septic Tank Module. Suggestions were made for revision of both modules. Following the meeting in Florida, a revised draft was developed and submitted back to the writing committee. A revised draft was submitted to the writers and reviewers prior to the June 2002 meeting in Flagstaff, AZ. The draft was extensively reviewed at the Flagstaff meeting and visuals for the module were also reviewed.

A re-draft of the module was developed with input from both writers and reviewers following the Flagstaff meeting and submitted back to that group for review. Another extensive review of the manuscript was conducted at a special meeting of most of the writers and several reviewers in January 2003. Following that meeting, a near-final draft of the module and the associated PowerPoint was developed during 2004. Supplemental review by writing team members resulted in the incorporation of selected comments into both the text and PowerPoint.

Summary of Comments and Actions Taken Following the Review Meeting in Flagstaff, June 2002 and Raleigh, 2003

As indicated above, following the Flagstaff meeting a fairly extensively revised module was developed. The Septic Tank Module was not extensively discussed at the Raleigh meeting in January 2003 except as it related to the University Curriculum Septic Tank Module. Because neither Dr. Loudon nor Mr. Bounds were able to attend the Raleigh meeting, a special meeting at the end of January 2003 of the Practitioner Septic Tank Module writing committee was held. Following that meeting, the near-final draft of the module was written along with the PowerPoint presentation.

Summary of Actions Taken in Response to Comments From Specific Reviewers

The most active reviewers of the Practitioner Septic Tank Module (Jim Converse and Tom Konsler) are now listed as authors because of their extensive input. Mr. Konsler has provided significant reviews and input on at least three occasions and his input has been integrated into the text. The comments are in actuality too extensive to summarize in detail. Dr. Converse also became an especially active reviewer and, in fact, a contributor to the overall content of the module, so he is now listed as a member of the writing team. Dr. Converse moderated the review of the module at the Raleigh meeting in January 2003 and provided extensive input following the meeting in Flagstaff in 2002.

Kevin Sherman provided a complete review of the manuscript following the Flagstaff meeting in 2002 and his comments were incorporated into the material at that time. Most other comments received have been editorial in nature and have been incorporated as appropriate. In addition, Nancy Deal has provided editorial review of the module and helped improve the final draft of the text and the PowerPoint presentation. Supplemental review by industry representatives resulted in the incorporation of selected comments in both the text and PowerPoint.

Summary of Comments From the Consortium Executive Board and Actions Taken

The Consortium Executive Board has provided encouragement and suggestions for making the Practitioner Septic Tank Module and the University Curriculum Septic Tank Module consistent with each other. As a result of executive board suggestions, both modules have been reviewed by both lead authors and numerous exchanges of correspondence have resulted in increased consistency between the two modules. In some cases, materials from one module have been used

in the other module, but for the most part the result has been wording changes and modifications to ensure that the modules are consistent in theory and recommendations.

Results of Test Teaching

The Practitioner Septic Tank Module has been taught by the lead author to numerous groups in different settings. It has been used at the Michigan Onsite Wastewater Training and Education Center, used in a test teaching fashion at the Minnesota Onsite Wastewater Conference, and at a special training program held for contractors being certified for installation of proprietary system components. Summaries of responses received on questionnaires circulated at those test teaching events are summarized in the attached Appendix K. For the most part, the comments received during test teaching were positive and have resulted in only a few modifications to the module.

Dissemination of the Module Beyond That Through the Consortium Web Site

The module has been duplicated and distributed at the Michigan Onsite Wastewater Training and Education Center as part of materials distributed during the teaching of the following courses:

- Onsite 101—A two-day class on the basics of onsite wastewater treatment taught to entry-level local health department professionals and contractors.
- Onsite System Design—A two-day course taught to designers of onsite systems.
- Existing System Evaluator Class—A two-day class taught to home inspectors to prepare them to be inspectors of onsite systems for property transaction inspections.

Materials To Be Developed in the Future

The Septic Tank Module is reasonably complete, based upon the input received from reviewers and from class participants to whom the module has been taught. However, rapid advances in the onsite/decentralized industry will probably result in the materials becoming outdated rather quickly. There is currently no structured plan or funding source in place to update these materials. One document that has been suggested is the development of a model standard that would describe a program that would result in the production and use of structurally sound watertight septic tanks. Many states and organizations are struggling with the process of developing a standard, what the content of the standard should be, and how tanks should be tested to verify that they meet the requirements of the standard.

10 MARKETING AND DISSEMINATION OF MATERIALS

Project authors, principal investigators (PIs), and the project manager (PM) have received regular inquiries about using the materials in various training venues. Additionally, curriculum materials have been used in at least two venues without any notification to the PM or the PIs. Clearly, despite the draft status of materials, the fact that they are available and of high quality became well-known during the development phase. Throughout the latter phases of the project, the PI and several authors took advantage of every opportunity to discuss the curriculum project and present samples of the materials in a variety of settings including state and national conferences. During these presentations, care has been taken to inform participants that the acknowledgement slide must be included in any use of the materials. Also, users are requested to provide feedback to the PM and the author if the materials are amended or improved. (There is currently no funded mechanism for updates to be performed.) The curriculum materials are available as Adobe Acrobat PDF files on the Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) web site (www.onsiteconsortium.org).

The curriculum materials will be distributed on CD and DVD to identified training entities as well as to authors, reviewers, and consortium-member institutions. Reproduction and initial distribution will be handled by North Carolina State University (NCSU) Communications Services and will include two CDs (one University Curriculum CD and one Practitioner Curriculum CD) and one DVD (the Practitioner Water Movement and Soil Treatment video). After the initial distribution, inquiries for additional copies will be handled by the following contacts:

NC State University
e-mail: currorders@ncsu.edu
Phone: 252-793-4428 Ext.126
Fax: 252-793-5142

National Small Flows Clearinghouse
e-mail: nsfc_orders@mail.nesc.wvu.edu
Phone: 800-624-8301
Fax: 304-293-8651
(NSFC Catalog No. WWPKTR10)

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Gross, M. A., N. E. Deal, J. R. Buchanan, A. Kenimer, B. J. Lesikar, T. L. Loudon, S. Oakley, R. W. Seabloom, P. Trotta, and S. D. Wallace. 2005. *University Curriculum Development for Decentralized Wastewater Management*. Project No. WU-HT-01-06. Prepared for the National Decentralized Water Resources Capacity Development Project, Washington University, St. Louis, MO, by the University of Arkansas, Fayetteville, AR.

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12 ACRONYMS AND ABBREVIATIONS

CIDWT	Consortium of Institutes for Decentralized Wastewater Treatment
EB	Executive Board of the CIDWT
Ksat	Saturated Hydraulic Conductivity
LTAR	Long term acceptance or application rate
NDWRCDP	National Decentralized Water Resources Capacity Development Project
NRCS	Natural Resource Conservation Service
OSWW	Onsite wastewater
PC	Practitioner Curriculum
PE	Professional Engineer
PI	Principal Investigator
PM	Project Manager
UC	University Curriculum
USDA	United States Department of Agriculture
US EPA	United States Environmental Protection Agency

A PARTICIPANTS IN REVIEW MEETINGS

Table A-1
Review Meetings

	Orlando	Flagstaff	Raleigh
Aziz Amoozegar		x	x
Jim Anderson		x	
Tibor Banathy	x	x	x
Colin Bishop	x	x	
Jennifer Brogdon	x	x	x
John Buchanan	x	x	x
Jim Converse	x	x	x
Robin Craft	x		x
Sonia Cruz	x		
Barbara Dallemand	x		
Mike Davis	x		
Nancy Deal	x	x	x
Steve Dix			x
Kitt Farrell-Poe	x	x	
Stan Fincham		x	x
John Gibi	x		
Scott Greene	x	x	x
Mark Gross	x	x	x
Dave Gustafson		x	x
Adrian Hanson		x	
John Higgins	x		
Mike Hoover	x	x	x
John Hoornbeeck	x		
Ann Kenimer			x
Richard Jex	x	x	

Table A-1
Review Meetings (Cont.)

	Orlando	Flagstaff	Raleigh
Tom Konsler	x	x	x
Jim Kreissl			x
Brad Lee	x	x	x
David Lenning	x	x	x
Bruce Lesikar	x	x	x
David Lindbo	x	x	x
George Loomis		x	x
Ted Loudon	x	x	
Randy Miles	x	x	x
Del Mokma		x	x
Jordan Mooers		x	
Carl Peacock	x		x
Rick Phalunas	x		
Charles Pickney	x		
Robert Seabloom	x	x	x
Andrea Shephard		x	x
Kevin Sherman	x	x	
Jerry Stonebridge		x	
John Thomas		x	
Paul Trotta	x	x	x
Jerry Tyler	x	x	x
Joe Valentine		x	x
Don Waller	x	x	
John Williams	x	x	x
Denise Wright	x		

B ONSITE WASTEWATER TRAINING AND EDUCATION OUTLINE

This outline lists a complete range of education and training program topics in the field of onsite/decentralized wastewater. Topics that were significantly addressed through the Practitioner and/or University Curriculum projects are indicated by the inclusion of the author's initials with the title of the topic. The outline was initially developed during the Flagstaff Academy held in June 2002 and has been updated to reflect changes over time.

I General Introduction

A Constants, Units, and Conversions

1 System of Units—SI and American Systems-AK*

2 Unit Conversions-AK

3 Balancing Units-AK

B Overview of Wastewater Characteristics

1 Physical Characteristics-AK/MG

2 Temperature-AK/MG

3 Turbidity-AK/MG

4 Chemical Characteristics-AK/MG

5 Biological Characteristics-AK/MG

C Basic Engineering Principles

1 Conservation of Mass-AK

2 First-Order Reactions-AK

3 Sedimentation-AK

D Fundamental Hydraulics-AK/PT

E Public and Environmental Health Concepts

1 Prescriptive-Based Codes

2 Performance-Based Codes

F Flow Calculations

1 Hydraulic Loading

2 Organic Loading

3 Wastewater Type-MG

II Planning

A Land Use

B Environmental Concerns

C Risk Assessment

D Scale (Individual, Subdivision, Watershed)

E Distributed Infrastructure

III System And Materials Management

A Systems Management

1 Business

2 Data Collection and Telemetry

3 Data Management

4 Wastewater Management Structure

B Materials Management

1 Septage/Biosolids Management-BL

2 Treatment, Handling and Storage-BL

IV Wastewater Processes

- A Chemical
  - 1 Nitrogen-SO
  - 2 Phosphorous
  - 3 VOCs/HCs
- B Biological
  - 1 Aerobic Processes-BS/JB
  - 2 Anaerobic Processes-BS/JB
- C Physical
  - 1 Filtration
  - 2 Sedimentation-AK
  - 3 Flotation

V Soil and Site Evaluation

- A Introduction to Soils-DL/PT
- B Soil Morphology-DL/PT
- C Soil Treatment-DG/JA
- D Water Movement-DG/JA
- E Soil Interpretations-DL/PT
- F Mapping (different scales)
- G Site Evaluation-PT/DL
- H Hydrology
- I Performance Predictive Tools (Modeling)

VI Onsite Technology

A Overview-DLen

1 Septic Tanks-TL/BS

2 Drainfields-PT

3 Media Filters-TL

4 ATUs-BS/JB

5 Disinfection-MG

6 Collection

7 Mounds

8 Surface Application-BL

9 Distribution-BL/PT

10 Wetlands-BS/SW

11 Pumps and Controls-PT

B Design

1 Septic Tanks-TL/BS

2 Drainfields-PT

3 Media Filters-TL

4 ATUs-BS/JB

5 Disinfection-MG

6 Collection

7 Mounds

8 Surface Application-BL

9 Distribution-BL/PT

10 Wetlands-BS/SW

11 Pumps and Controls-PT

C Installation

1 Septic Tanks-TL/BS

2 Drainfields-PT

3 Biofilters (Media Filters)-TL

4 ATUs-BS

5 Disinfection-MG

6 Collection

7 Mounds

8 Surface Application-BL

9 Distribution-BL/PT

10 Wetlands-BS/SW

11 Pumps and Controls-PT

D Monitoring and Inspection

1 Septic Tanks-TL/BS

2 Drainfields-PT

3 Media Filters-TL

4 ATUs-BS/JB

5 Disinfection-MG

6 Collection

7 Mounds

8 Surface Application-BL

9 Distribution-BL/PT

10 Wetlands-BS/SW

11 Pumps and Controls-PT

E Operation and Maintenance

1 Septic Tanks-TL/BS

2 Drainfields-PT

3 Media Filters-TL

4 ATUs-BS/JB

5 Disinfection-MG

6 Collection

7 Mounds

8 Surface Application-BL

9 Distribution-BL/PT

10 Wetlands-BS/SW

11 Pumps and Controls-PT

VII Troubleshooting and Resolution

A Tools

B Processes

VII Regulatory and Permit Issues

A National Code

B State Code

C Local Code

D Process Involved in Getting a Permit

E Process to Evaluate a New Technology

*Initials of author of materials on this topic in either the Practitioner Curriculum or the University Curriculum

AK–Ann Kenimer

BL–Bruce Lesikar

BS–Bob Seabloom

DG–David Gustafson

DL–David Lindbo

DLen–Dave Lenning

JA–Jim Anderson

JB–John Buchanan

MG–-Mark Gross

PT–Paul Trotta

SO–Stewart Oakley

TL–Ted Loudon

SW–Scott Wallace

C REVIEW COMMENTS FOR THE DRAFT NATIONAL CURRICULUM

Executive Board Review of Overall Draft Curriculum—March 2004

Submitted by Dr. Randy Miles, University of Missouri

I have reviewed the Practitioner Curriculum for a second time and find the module to be vastly improved and complete. I believe it should be stated somewhere in the document that which improvements in technology, different/more stringent codes, our understanding of onsite systems etc. that the needs of the practitioner and accessory professional groups will constantly be changing; therefore, the curriculum and course offerings must also be changing and flexible. Thus, curriculum development will probably be ongoing.

All of the 8 chapters in the curriculum cover the subject adequately. I somewhat wonder about having the rules chapter in the curriculum as I would assume that rules and regulations would be covered (or implied) within various components technical matter in many settings. I also believe that the links section should probably also include other sources besides the consortium web site based materials.

This module is most acceptable. The authors should be commended in getting many of the last minute pieces to the curriculum together.

Executive Board Review of Overall Draft Curriculum—August 2003

Submitted by Dr. Randy Miles, University of Missouri

1. **Is the entire module there?**

   No! Much of the needed information is in the module but not in the proper format. Some additional information is needed! (See number 2)

2. **Is the module in the correct format?**

   No! I strongly believe this module should be formatted in much the same manner in which an academic curriculum should be presented. I suggest the following format/template points for each course:

A. Department name: (i.e. Soils, Septic, etc)

B. Course number: i.e. 1, 120, 300 etc to coincide with the level (intro, secondary, graduate-level (or master-level))

C. Title of the course: A very descriptive title of 3 to 6 words.

D. A solid, technical description of the course. Not items like....."in this course you will learn....." One must assure that the fundamental principles, technical components etc covered in the course are systematically depicted in the course description. Some of the items in the current module could be used.....other info presented could be used for the PR brochures.

E. Course prerequisites/corequisites needed. Such as what previous courses i.e. Soils 1 and Soils 2 are prerequisites for Soils 100. The prerequisite may be a course in another department (i.e. Septic) or a particular number of credits (or CEUs) from a specific department (i.e. 10 previous credits or CEUs in Soils are needed take Soils 350 Advanced Soil Descriptions.

F. Course credits or CEU's for the course: this should include the number of days or contact hour's

G. Course Format: lecture; lab analysis; field trip etc

H. Qualifications (at least general) of the instructor: I mention this so that someone new to practitioner training in the onsite arena realizes that many professions and experiences are needed to derive a solid course curriculum. For example a soil physicist may be needed to teach a specific unit of a soil water movement module component not just a "soil scientist"

3. **Are the concepts correct?**

   At this point No! Once the suggested formatting mentioned in 2 is put in place I could envision a "yes" to this question.

4. **Are the concepts consistent with the "sister" modules in the academic sector?**

   Not really because there is not a "sister" module in academic sector. However, the author may want to skim over some the modules to provide organization to some of the courses suggested and appropriate sequencing.

5. **Does this module meet the requirements of the deliverables?**

   Presently No. However, once the curriculum is placed in a consistent fashion, where each course and the specific curriculum are fully covered in a consistent manner and sequencing, I could easily envision the answer to be "yes".

In summary much of the information needed for the curriculum is there. It just needs to be formatted in a consistent, fully explained manner. This organization will also assist in making the curriculum flow chart much more meaningful to the overall curriculum depiction.

Reviewer Name: David V. Linahan, No Date Provided

With a rating scale of 1 (Disagree) to 5 (Agree) please respond to the following questions:

1. The Practitioner Curriculum provides an appropriate course training structure for field practitioners: 5

2. The seven subject matter areas (1-septic system basics, 2-onsite technologies, 3-site evaluation, 4-design and engineering, 5-installation, 6-monitoring and O&M, and 7-troubleshooting and repair) in the Curriculum are appropriate for a practitioner audience: 5

3. The eight short courses listed for the Septic System Basics course catalog are an appropriate list of courses for the curriculum: 5

4. The thirteen short courses listed for the Onsite Technology course catalog are an appropriate list of courses for the curriculum: 5

5. The thirty-two short courses listed for the Site Evaluation course catalog are an appropriate list of courses for the curriculum: 5

6. The fourteen courses listed for the Design and Engineering course catalog are an appropriate list of courses for the curriculum: 5

7. The seven short courses listed for the Installation course catalog are an appropriate list of courses for the curriculum: 5

8. The thirteen short courses listed for the Operation and Maintenance course catalog are an appropriate list of courses for the curriculum: 5

9. The three short courses listed for the Repair and Troubleshooting course catalog are an appropriate list of courses for the curriculum: 5

10. The six study majors (site evaluator, designer, installer, operator/service provider, time-of-sale inspector, and regulator) include the appropriate recommended courses for those majors: I am having difficulty either opening the spread sheet or understanding the question.

Comments on the curriculum structure:

How many hours of study (Classroom time) is expected for each courses (how short is a “short course” certainly each course will vary somewhat. Is it expected that a curriculum subject say the Septic System Basic would be a one or two day. Also, I might suggest word smithing “Basic”, and tailor two curriculums, one for those with experience and those without experience. Both leaving the both students at the same end point. I have found that mixing people with beginning

and advanced experience, particularly field personnel, many of those with "limited experience" like to display to prowess. Then those with lesser experience and less experience as a student often get intimidated and are afraid to ask questions.

Robert B. Mayer, PE, No Date of Review Provided

With a rating scale of 1 (Disagree) to 5 (Agree) please respond to the following questions:

1. The Practitioner Curriculum provides an appropriate course training structure for field practitioners: 5
2. The seven subject matter areas (1-septic system basics, 2-onsite technologies, 3-site evaluation, 4-design and engineering, 5-installation, 6-monitoring and O&M, and 7-troubleshooting and repair) in the Curriculum are appropriate for a practitioner audience: 4
3. The eight short courses listed for the Septic System Basics course catalog are an appropriate list of courses for the curriculum: 4
4. The thirteen short courses listed for the Onsite Technology course catalog are an appropriate list of courses for the curriculum: 2
5. The thirty-two short courses listed for the Site Evaluation course catalog are an appropriate list of courses for the curriculum: 4
6. The fourteen courses listed for the Design and Engineering course catalog are an appropriate list of courses for the curriculum: 2
7. The seven short courses listed for the Installation course catalog are an appropriate list of courses for the curriculum: 4
8. The thirteen short courses listed for the Operation and Maintenance course catalog are an appropriate list of courses for the curriculum: 4
9. The three short courses listed for the Repair and Troubleshooting course catalog are an appropriate list of courses for the curriculum: 2
10. The six study majors (site evaluator, designer, installer, operator/service provider, time-of-sale inspector, regulator) include the appropriate recommended courses for those majors: 3

Comments on the curriculum structure:

I strongly agree with the curriculum structure. I think it is a good idea for providing a method for practitioners and other interested parties to understand the basics of onsite and to be able to continue to learn as much information that is available.

Comments on the curriculum subject matter areas and lists of short courses:

I would recommend you look at the NOWRA Onsite wastewater design criteria which groups items in 5 areas, Treatment, Recycle, Planning, Safety, Nuisance. The subject matter for the various practitioners could address these items more directly.

I do have two major areas of concern about the subject matter.

I. **Engineering without a license;**

I would agree that there is a significant place for a non-engineer designer in the industry. However, we should not promote engineering without a license. It becomes even more critical when more alternatives are being used and practitioners think they are not much more complex than traditional systems.

After the overview subject matter courses, the targeted courses should be clear in their subject matter to extend the engineering education for experienced engineers into onsite, or on the other hand to show non-engineer designers how to apply a pre-engineered system to appropriate site conditions.

This can be extended to other curriculum such as soils scientists. Don't try to make engineers soils scientists and don't try to make soils scientists engineers, teach them how to communicate their specialties to the other practitioners.

II. **Technology vs. Technical processes;**

It appears that after training to the traditional septic system, an emphasis is placed on proprietary technology. I believe Processes should get significant attention. Most proprietary technology uses standard unit process designs or enhanced unit processes that have been around for a long time. Many manufacturers then in order to gain market advantage will make claims that their secondary treatment system will enhance a soil based dispersal system better than another manufacturers' secondary treatment system. One of the goals of this education should be to provide information necessary for the practitioner to "separate the wheat from the chaff" in these matters.

Comments on the major fields of study (majors) and lists of recommended courses:

This matrix of 44 courses integrating 6 practitioners groups is more than a weekend job.

Anthony Smithson, No Date of Review Provided

With a rating scale of 1 (Disagree) to 5 (Agree) please respond to the following questions:

1. The Practitioner Curriculum provides an appropriate course training structure for field practitioners: 5
2. The seven subject matter areas (1-septic system basics, 2-onsite technologies, 3-site evaluation, 4-design and engineering, 5-installation, 6-monitoring and O&M, and 7-troubleshooting and repair) in the Curriculum are appropriate for a practitioner audience: 5
3. The eight short courses listed for the Septic System Basics course catalog are an appropriate list of courses for the curriculum: 5
4. The thirteen short courses listed for the Onsite Technology course catalog are an appropriate list of courses for the curriculum: 5
5. The thirty-two short courses listed for the Site Evaluation course catalog are an appropriate list of courses for the curriculum: 3
6. The fourteen courses listed for the Design and Engineering course catalog are an appropriate list of courses for the curriculum: 4
7. The seven short courses listed for the Installation course catalog are an appropriate list of courses for the curriculum: 5
8. The thirteen short courses listed for the Operation and Maintenance course catalog are an appropriate list of courses for the curriculum: 4
9. The three short courses listed for the Repair and Troubleshooting course catalog are an appropriate list of courses for the curriculum: 5
10. The six study majors (site evaluator, designer, installer, operator/service provider, time-of-sale inspector, regulator) include the appropriate recommended courses for those majors: did not review

Comments on the curriculum structure:

Some classes may be too specific (a one day course on soil texture, for instance). Along similar lines, suggesting prerequisite courses or “packages” (i.e. the soil structure course really requires the soil texture and soil wetness training to be useful in practice)

Comments on the curriculum subject matter areas and lists of short courses:

All in all, I think this is extremely thorough. In the O&M section, I thought a class for regulatory agencies (maybe "Business Practices for Regulatory Agencies") might be good….venturing into the field of operating permits is not an easy undertaking…politics, economics, staffing…..there are huge considerations. The "field" issues (sampling, etc.) are well covered, but we can use all the help we can get on the administrative concerns.

Comments on the major fields of study (majors) and lists of recommended courses:

Did not review.

Please provide any specific positive or negative comments on the Model Curriculum:

Extraordinarily comprehensive. As a practitioner, I don't particularly like using the "septic" term, but I understand the practicality when courses are intended for non-industry. I think I would hope that additional funding is provided toward the completion of detailed course agendas and materials.

Tom Konsler, No Date Provided

With a rating scale of 1 (Disagree) to 5 (Agree) please respond to the following questions:

1. The Practitioner Curriculum provides an appropriate course training structure for field practitioners: 5

2. The seven subject matter areas (1-septic system basics, 2-onsite technologies, 3-site evaluation, 4-design and engineering, 5-installation, 6-monitoring and O&M, and 7-troubleshooting and repair) in the Curriculum are appropriate for a practitioner audience: 5

3. The eight short courses listed for the Septic System Basics course catalog are an appropriate list of courses for the curriculum: 4

   It seems as though there may be a good bit of overlap between Septic 2 and Septic 100 and 101.

4. The thirteen short courses listed for the Onsite Technology course catalog are an appropriate list of courses for the curriculum: 5

5. The thirty-two short courses listed for the Site Evaluation course catalog are an appropriate list of courses for the curriculum: 5

6. The fourteen courses listed for the Design and Engineering course catalog are an appropriate list of courses for the curriculum: 4

   All course descriptions not yet complete.

7. The seven short courses listed for the Installation course catalog are an appropriate list of courses for the curriculum: 5

8. The thirteen short courses listed for the Operation and Maintenance course catalog are an appropriate list of courses for the curriculum: 5

9. The three short courses listed for the Repair and Troubleshooting course catalog are an appropriate list of courses for the curriculum: 4

   - If it can be arranged, Repair 101 participants should go to 2 real-life failing systems and learn to use their senses and to look for clues in diagnosing failing systems.
   - It seems that another repair course is needed after troubleshooting to guide participants in how to choose repair options (do I save or replace an older tank? Do I try to salvage the whole or parts of a failing drainfield? How do I choose between 2 or 3 viable repair options? Etc.) This should include multi-faceted approaches such as wasteflow modifications, site modifications, of-site potential, etc.
   - There should also be a one day course for regulators in how to go from diagnoses to repair including regulatory enforcement issues, condemnation, pump and haul interim options, public health nuisances, etc.

10. The six study majors (site evaluator, designer, installer, operator/service provider, time-of-sale inspector, regulator) include the appropriate recommended courses for those majors: 5

    I think Operators and Time of Sale Inspectors should be required to take TECH 100.

Comments on the curriculum structure:

See notes above

Comments on the curriculum subject matter areas and lists of short courses:

See notes above

Comments on the major fields of study (majors) and lists of recommended courses:

See notes above

Please provide any specific positive or negative comments on the Model Curriculum:

The structure and content of the Model Curriculum as a whole looks great! Very well thought out and organized.

D REVIEW COMMENTS FOR SOIL AND SITE EVALUATION

The Consortium Executive Board Review, August 2003

Submitted by Dr. Randy Miles, University of Missouri

1. **Is the entire module there?**

   Yes! The module is very complete. It covers many of the general aspects of soils as well as specific areas of soils needed to understand the siting, design, and functions of onsite systems in the soil landscape.

2. **Is the module in the correct format?**

   Yes! The module covers the various disciplines of soils in the proper format and sequence.

3. **Are the concepts correct?**

   In general yes. The fundamentals are well covered! There are some regional biases relative to soils that are not completely discussed. It will behoove the individuals teaching some of the soils units to provide some of the regional "dialect" to the unit to meet the purpose of the module for that region. It is impossible to cover all of the regional bias in the module.

4. **Are the concepts consistent with the "sister" modules in the academic sector?**

   For the most part yes. The items covered under the site assessment area in the academic module are more numerous in diversity and cover less details on soils per se.

5. **Does this module meet the requirements of the deliverables?**

   Definitely yes! This is quite a comprehensive coverage of soils relative to the deliverables.

In summary the module is complete. One of my perceived problems is that one who uses this module who is not a soil scientist (and/or with little soil science experience or training) could see that he/she could use this module "out of the box". I strongly urge the lead author to write a preface to this module which depicts the need for the user to call on local soil scientists in the area/region to assist with realizing the appropriate soils information for the area/region (i.e. fragipans are not in Iowa etc)

Response

The review is correct about regional biases and need for qualified instructors. Throughout module in the notes section it is stated that the presenter use local/regional photos whenever possible. In the Preface to the Text it is strongly suggested that the presenter use local soil scientist and/or should be well versed in the soils and onsite wastewater issues of the area.

Jim Turenne, Soil Scientist/Ground Penetrating Radar Specialist, USDA Natural Resources Conservation Service

I have reviewed the power point presentations for the soils module. I am not sure what the format of the final product will be (just the *.ppt files, an interactive CD type program, or an html program). Is the module set to be viewed by lay people or are they set up for an instructor to show to an audience to clarify some of the slides/terms? I always prefer html so they can be viewed on all computers and you can add the notes to the slides. The notes are important to explain the slides, if an individual is viewing them in the "slide show" mode of power point.

Here are some general comments:

I think the presentations are excellent, lot of nice profiles and landscapes. I have found that people prefer looking at soils rather than reading about them. There is some repetition between the modules (the intro section has several slides repeated in the other sections) which is fine but it would be nice to show different photos for the examples if they are available. I have a bunch of images of soil profiles, geology, and land form maps posted at http://nesoil.com/images/images.htm. I also have some power point presentations on soil properties posted at: http://nesoil.com/properties/index.htm feel free to use whatever, I can send higher resolution images if needed.

Chapter 2: Glacial Land Forms:

Mark mentioned that these modules are developed to cover soils on a Nation-wide basis. I would modify this section a bit here for use in the glaciated Northeast to cover some of our landscapes and add examples of soil/landscape/geology since it is very important for septic systems in the area.

I would add an overview on glacial history (include a map to show glaciated areas) and separate the parent materials into the dominant types; till, fluvial, lacustrine, marine and then post glacial-eolian, organic, alluvial, anthrotransported. Slide 3 just says “till” I would add the definition of till to the slide. Next cover till land forms-drumlins, moraines, etc. I have some images of drumlins that may be of interest (http://nesoil.com/images/drumlins.htm and http://nesoil.com/images/tillcut.htm). Slide 14 goes into fluvial deposits, I would add a slide to define fluvial deposits and landforms (I have a nice topo of fluvial landforms on the images page 2 and some outcrops). Slides 29 on go into Dune deposits, I wouldn’t consider these glacial and may fit better in an eolian (or is it Aeolian-the NSH does not recommend using aeolian because its obsolete and says use eolian-whatever).

Section 2:

Slopes and Landscapes-Pete Fletcher has some nice sketches that show the relationships of hydrology and landscape position (see: http://nesoil.com/properties/formation/sld015.htm for an example). This section goes into detail about ditching and draining sites, is this a recommended practice in other areas? I would caution about draining areas particularly in densely settled areas where the water being drained may flood someone downhill or to make sure the area is not a wetland before draining (assuming that wetlands will still be protected by the time the module is released).

Section 3:

Texture: If the notes will not be made visible I would add the definition of soil texture and add a bit on the importance of texture for septic systems.

Problem Areas-Need to add some more info on Anthro-transported material, how to describe fill material. Many States in NE do not allow systems constructed on fill or to use the depth to water table determined from the fill surface rather from the surface of the original soil. I have some photos of fill material on the images section (Aquents, Tihonet Series, Psamment, and cranberry bed).

Section 4:

Principals of soil and site evaluation: A section on using soil surveys and other reference materials would be good. We are very big on teaching people to be prepared before going into a test pit and getting as much site info a possible.

Restrictive Horizons-I have some photos of soils with ortstein at:
http://nesoil.com/images/massasoit.htm

Let me know if you need more info on these comments. Again, the modules look great, a lot of work must have went into the production of them and I think they will be very useful for training purposes. If I can help out with anything let me know.

Carl Peacock

I have only two comments on the slide sets (1-Soil Structure and 2-Soil Mineralogy and Consistence). They are (1) take out the ferns or put less text on each slide and (2) bullets that are highlighted or bolded should also have a different color so it will stand out better. I support your Preface and think that you have developed an outstanding Soil Module for interested individuals.

John Williams, October 31, 2002

The "Needs to Know" outlines are excellent and have been adequately expanded or contracted to address the needs of your three identified target audiences.

The most impressive document on this CD is the Power Point presentation on soils and landforms. This is the basis for understanding the "world" of soil science in my opinion. If an individual understands these concepts, they will go very far in understanding and communicating information about the soil as a resource. The sketches of coastal plain landforms in cross section are very descriptive and beneficial in understanding soil forming process in this highly variable environment. The graphics and photographs in this presentation (also shared in many other presentations) are excellent and are so clear that they should insure that any presenter will be able to convey the desired concept. These graphics and photos are universal teaching tools and will hold student's interest.

I was disappointed with the restrictive horizon presentation. This is a difficult module because these features are very regional. If you are in a region without these features, you care nothing about them. If these features are present in your region, you may over estimate their importance and become shy about using these type soils due to lack of understanding of the variability of these properties. I believe that this presentation must be tuned into local conditions and then explained in excruciating detail in order to fully understand the processes. Practically, if I am a soil scientist in Southeastern NC, I am greatly concerned about spodic horizons cemented with humic and fulvic acids and desperately want more information about them. I do not want to sit through a class to learn about Orsteins and Petrocalcic layers in order to pick up a scrap of information about my regional conditions. I would also encourage you to address Ray Daniels, NCSU work on possible causes of formation of spodosols in the text. Dr. Daniels carries a lot of weight in this area and his findings need to be at least heard, even if these findings contrast with more modern research by yourself and others.

The saprolite presentation was particularly interesting. I am glad to see research that I performed 10 years ago being utilized today. I would encourage you to add a slide that Vepraskas has that shows an entire pit wall with dyed pores. This slide is a very visual reminder that most water flows through macropores in soil or saprolite. This slide also reinforces the similarities of saprolite to soil with respect to flow patterns and potential treatment of wastewater. Buol's paper on saprolite was also an excellent study in saprolite morphology, however, Vepraskas's Power Point presentation is much more geared toward understanding the usability of saprolite.

The presentations and modules that I have reviewed are all professional, well thought out, and will achieve the educational objective. You have collected a wonderful collection of slides of soils and landscapes that make your presentations stand out. Your attention to detail and desire to communicate accurate information is appreciated.

E RESULTS OF TEST TEACHING OF SOIL AND SITE EVALUATION MODULE (SELECTED)

The course numbers provided on the following pages are those assigned by the North Carolina Soils and Onsite Wastewater Academy; therefore, they do not necessarily match the titles in this curriculum.

Soils 100—Getting the Dirt on Soils

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=26)
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area	**4.72**
The visuals completely cover the topic area	**4.73**
The discussion notes completely cover the topic area	**4.69**
I gained a better understanding of why soils are important	**4.85**
I gained a better understanding of what soils are.	**4.77**
I gained a better understanding of how soils form.	**4.48**
I gained a better understanding of how to describe soils.	**4.69**
I gained a better understanding of how to interpret soil data.	**4.73**
I gained a better understanding of how soils are involved in wastewater treatment.	**4.73**

What specific recommendations would you provide for the text.

Add ID#s to lecture slides

A better copy-less contrasty

Good job

Some reprinted slides need bigger text

That you use color to make this text useful

Maybe better photos

What specific recommendations would you provide for the visuals.

More “less distinct” examples… what you run into more often in the field

Would like to have a CD Rom of slides for future reference

Good job

More of the same--good stuff

Go ahead and laminate the cards

Too bad colors don’t reproduce on notebook

What specific recommendations would you provide for the notes.

More legibility

Please give specific positive comments on the topic/module.

This was an informative crash into soils.

Clean, entertaining presentation.

Good course, very informative. Especially understood things better why we were in the field.

Very clear, covered a lot of ground for one session.

I thought the lecture, visuals and text covered soils very well. I have had soil classes in relation to fertilizers and plants. Good to see another angle to soils topic (in relation to wastewater treatment)

A great refresher course.

Information is very informative

A very informative introductory coarse on soils related to sub-surface/sewage treatment and disposal

Coarse was interesting and informative even for a environmental health specialist with close to 20 years experience. *Also the Vernon James Agricultural Complex (Plymouth) is a excellent place to hold workshops for soils.

I am a novice at soils. Coarse was well laid out and Instructor was knowledgeable. Coarse material was well laid out and followed coarse well.

Excellent talk

Good job

Very good class/complete for one day-- packed for sure

Turn the heat up

Good basics on soils and wastewater systems

I think the eval form should still include an option to evaluate the instructor(s) clarity of explanations use of examples ability to understand and answer questions posed by students

Well Done! Instructor does splendid job of keeping a potentially "sleeper" moving to hold your attention.

Excellent job in such a little time.

Very good instructor. Learned a lot from him in a short amount of time.

Soils 100—Getting the Dirt on Soils

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=15)
11/19/2003 Raleigh, NC
Instructor: David Lindbo

Question	Mean
The text covers the topic area	**4.73**
The visuals completely cover the topic area	**4.73**
I gained a better understanding of why soils are important	**4.80**

I gained a better understanding of what soils are. **4.73**

I gained a better understanding of how soils form. **4.33**

I gained a better understanding of how to describe soils. **4.53**

I gained a better understanding of how to interpret soil data. **4.47**

I gained a better understanding of how soils are involved in wastewater treatment. **4.60**

What specific recommendations would you provide for the visuals.

Color pics in handouts

None, Very good

Excellent presentation, will have to download on P.C.

More hands on less slides

The copies in manual need to be in color

Very good

Visuals help to better understand the lecture material

Soil profiles insitu samples in plastic clear cylinders from various counties

What specific recommendations would you provide for the lecture.

Good instructor

None very interactive, not just lecture. Participation in sharing gives comfortable atmosphere with learning capability

More field work

Keep up the good work!

What specific recommendations would you provide for the field.

None Soil views excellent Beats Pittsbou have been to fields for other demonstrations as well

Stop the rain

Covered area

Very Good, Different types of soil

No Rain

I think the field is very helpful in a higher level of understanding. But when finished w/ field examples the students should be able to sit and be comfortable

Please give specific positive comments on the topic/module.

Food was great

Overall very informative. Really highlights the importance of not paying enough attention to the most important aspect of subsurface disposal fields

Class was very informative--excellent instructor

Greatly enjoyed and learned from the course. Excellent instructor. Also learned the correct ways of anylizing soils

Very good

Instructor emphasized key points well

Thought it was a good job, simply touching base on numerous topics

I was thinking of becoming a soil scientist before I took this class. Definitely able to apply materials to other than class specifics. Ie environmental, drilling, etc.

Soils 100—Getting the Dirt on Soils

Audience: University Students (n=17)
Instructor: Dr. Bruce Lesikar

Question	Mean
The text completely covers the topic area	**4.41**
The visuals completely cover the topic area	**4.53**
The discussion notes completely cover the topic area	**4.19**
I gained a better understanding of why soils are important	**4.53**

I gained a better understanding of what soils are. **4.41**

I gained a better understanding of how soils form. **4.06**

I gained a better understanding of how to describe soils. **4.24**

I gained a better understanding of how to interpret soil data. **4.35**

I gained a better understanding of how soils are involved in wastewater treatment. **4.71**

What specific recommendations would you provide for the text.

Some of the figures did not appear when I tried to view the text.

Sloppy visuals.

Good

More detailed explanation about the types of soils and their specific importance to the wastewater treatment

There are notes of things “to be added” ex (page 24), add those things if deemed necessary

The text covered the topic well, but in some areas navigating the document was a little confusing

Examples are everything

The text is very descriptive; however, it would be helpful to include some pictures to demonstrate the point

I know it is a text file, but a few pictures would be helpful.

I felt that the text, visuals, and notes adequately described the material.

What specific recommendations would you provide for the visuals.

I did not get a good idea of how soils form.

More examples of the different types of transports.

Make them neater.

Good

Visuals were good.

Very thorough--a condensed presentation might be nice for presenting a general overview (intro does a pretty good job of this). Slide 31 of the intro is huge--is that on purpose?

The visuals could use more consistent formatting, but did include a large number of pictures to illustrate concepts.

Possibly add arrows to point to features of interest since people could be viewing without a professor guiding them through.

Liked how the varying slopes on a hill are labeled.

I felt that the text, visuals, and notes adequately described the material.

What specific recommendations would you provide for the notes.

Notes go well with the text.

They look good.

I would suggest filling in the outline form a little.

Couldn't find notes.

I felt that the text, visuals, and notes adequately described the material.

Please give specific positive comments on the topic/module.

Very good overview.

Very thorough, provided insight for how soil affects more than just wastewater treatment.

It was very detailed.

It is good lecture for a person understanding, although I don't have any background for soil.

Everything was clear and concise.

Very important topic for construction purposes.

Provides students good knowledge of soil and site and how soil is important to onsite

treatment system.

Text is very thorough.

This was a very detailed module with plenty of information and different aspects of soils.

I did learn more about how soils relate to wastewater distribution

Very informative.

Would like to see more of which treatment options work best for which soils.

Overall it was very organized and everything flowed together well.

Soils 101—Introduction to Soil Morphology

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=12)
6/2-3/04 Fletcher, NC
Instructor: David Lindbo

Question	Mean
The text covers the topic area	**4.33**
The visuals completely cover the topic area	**4.67**
I gained a better understanding of topographic relation to land use.	**4.42**
I gained a better understanding of soil horizons relation to land use.	**4.67**
I gained a better understanding of soil formation relation to land use.	**4.50**
I gained a better understanding of soil description relation to land use.	**4.50**
I gained a better understanding of profile interpretation relation to land use.	**4.75**

What specific recommendations would you provide for the visuals?

Color and more clear reproduction of slides in handbook

Color pics in books

More breaks

Color plates in manual

Naturally improve clarity on handouts

Please use color where needed. On many of the frames in the textbook. Slides were in color but were B&W in the book.

More details, background info

More detailed, clearer photos

What specific recommendations would you provide for the lecturer(s)?

They all did excellent job

Earlier break after lunch 1st day

Shorter lectures

Since you are describing soils as they pertain to OSWW systems you might include a copy of OSWW rules for reference.

What was the most beneficial part of the course?

Field profile interpretations and David's explanation of each--excellent job

Classroom and field evaluations of soils via pits and color photos.

Fri. A.M. soil profile and loadings discussion--Fri. Aft. Soil Pit Discussion

In field

Understanding permeability of different soil horizons

Field work

Good balance of classroom and field exercise.

Field examination of pits

Field exercises

To gain an overall perspective of how all the components act in a dynamic process.

What was the least beneficial part of the course?

It was all good.

It was all good.

evaluation form

Lunch (too many carbs)

Soil taxonomy discussion.

Please give specific positive comments that can be used in a promotional brochure.

This was the most beneficial course I have ever taken to help me test soils. (J.C. Moore)

Great setting, good people to work with, informative information (Richard C)

Fabulous! (Mike Tuohy)

"Eye-opening! A wild exzillerating ride into the world of soils and wastewater processes."

Soil 102—Redoximorphic Features

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=30)
10/04 Raleigh, NC
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area	**4.37**
The visuals completely cover the topic area	**4.40**
The discussion notes completely cover the topic area	**4.33**
I gained a better understanding of how redoximorphic features form.	**4.40**
I gained a better understanding of how to interpret redoximorphic features.	**4.47**

What specific recommendations would you provide for the text.

Better pictures--clearer(color)

Very good presentation.

More discussion notes clearly explaining subjects.

Monday morning--in fact mornings period is tough for me to learn new stuff even if my job or life depended on it. Don't laugh, but evening classes or a book or video would do well for those who don't do mornings

Ok

Great and very informative.

Discussion of horizons and their formation prior to discussion of redoximorphic features

What specific recommendations would you provide for the visuals.

Great and very informative.

More actual soil samples profiles exhibiting redox features.

Fine

Good

What specific recommendations would you provide for the notes.

Bring us up to slide for participation.

Copies of pictures could be better.

Hard to see some of the pictures.

Provide more clear details.

Bullet lines for each picture-- your too fast for me to take notes therefore I will probably not remember much.

Great and very informative.

Please give specific positive comments on the topic/module.

Wow

Great and very informative.

Learned that high chroma mottles (reddish) are the more true indicator of depth to SHWT.

Great subject matter and instruction. Well delivered-- still I'm the dummy.

Overall well put together. Dr. Lindbo is very knowlegeble and approachable.

Information will be a valuable tool for my staff.

Good review.

Great presentation.

David as usual always does an excellent job explaining the material and making his audience feel comfortable.

Slides w/ scale indicators were effective.

Soils 102—Soil Wetness

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=8)
7/18/2002 Bolivia, NC
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area	**4.50**
The visuals completely cover the topic area	**4.63**
The discussion notes completely cover the topic area	**4.38**
I gained a better understanding of how redoximorphic features form.	**4.75**
I gained a better understanding of how to interpret redoximorphic features.	**4.63**
I gained a better understanding of how to instrument a site.	**4.25**
I gained a better understanding of how to interpret water table data	**4.13**

What specific recommendations would you provide for the text.

Good job

Two day seminar

Have copies of referenced materials

Do not use the “plant-like” graphics in the text --- cannot read some text

What specific recommendations would you provide for the visuals.

Good job

If possible allow students to operate different types of measuring instruments, to gain a more hands on or to learn the different types.

What specific recommendations would you provide for the notes.

Possibly allow more field time within the course.

Color photos

Is it possible to have colored copies of the slides in the notes? Get rid of the vegetation in the corner of slide notes.

Clearer photocopies

Please give specific positive comments on the topic/module.

Very good, one of better courses I’ve taken

Make this a 2 day class with drainmod training and more on calibration method.

I enjoyed those program very much and feel that my understanding of redoximorphic features is greatly improved.

Very good job Dave *Need ISI chamber in field! Ha! Ha!

Instructor able to explain topic very well to allow the layman a better understanding.

Soil 102—Redoximorphic Features

Audience: Regulators (n=32)
Instructor: David Lindbo

Question	Mean
The visuals completely cover the topic area	**4.34**

I gained a better understanding of how redoximorphic features form.	**4.31**
I gained a better understanding of how to interpret redoximorphic features.	**4.06**

What specific recommendations would you provide for the text.

What specific recommendations would you provide for the visuals.

Excellent

What specific recommendations would you provide for the notes.

Please give specific positive comments on the topic/module.

Soil 103—Introduction to Soil Structure

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=11)
6-10-03
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area.	**4.64**
The visuals completely cover the topic area.	**4.82**
The discussion notes completely cover the topic area.	**4.55**
I gained a better understanding of what structure is.	**4.82**
I gained a better understanding of how to describe structure.	**4.64**
I gained a better understanding of how structure forms.	**4.00**
I gained a better understanding of how to use structure to adjust LTAR.	**3.82**

What specific recommendations would you provide for the text.

Electronic files for laptops- onsite

I think the provided text was all right.

Excellent

Good-sufficient

text will be a useful reference

Explain more on the goods and bads in soil conditions

What specific recommendations would you provide for the visuals.

Color print in the manuals

Better slide show on soils that are in real locations goods and bads

Visuals were excellent

good-sufficient

Provided visuals were fine

What specific recommendations would you provide for the notes.

Bibliography

Better photocopy

good-sufficient

more pits in the field/possibly fewer “container” samples

Some personnel experience from soil testing over the years

Adjustments should be made to the pictures on the handouts

Very informative. No recommendations

Please give specific positive comments on the topic/module.

Having soil samples to inspect were most educational.

After looking and reviewing approx. 50 samples from across the state, I had a better understanding of soil structures and how to evaluated them.

This was the best "in the field" training I've had in soils identification. Thanks

Instructor had good motivation knew his stuff

An excellent course-very informative and useful

Great "Hands On" Experience. Gave me a better view of how to perform site evaluation. Test pits should be used "if possible" more often.

Dr. Lindbo had excellent technical skills and also was able to explain things in laymens terms.

I will better understand my soil science subcontractors.

Excellent course. Have better understanding of soil structure now.

Soil 103—Introduction to Soil Structure

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=19) Raleigh, NC
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area	**4.42**
The visuals completely cover the topic area	**4.21**
The discussion notes completely cover the topic area	**4.42**
I gained a better understanding of what structure is.	**4.58**
I gained a better understanding of how to describe structure.	**4.47**
I gained a better understanding of how to use structure to adjust LTAR.	**4.37**

What specific recommendations would you provide for the text.

Again a lot of material in short time frame for people to assimilate.

Better pictures(clearer and maybe color)

What specific recommendations would you provide for the visuals.

Great

Perhaps more hands on samples

What specific recommendations would you provide for the notes.

Copies of some pictures could be better

Please give specific positive comments on the topic/module.

Very good presentation

Good

As usual excellent job.

Slides w/ scale indicators were effective.

Soil 103—Introduction to Soil Structure

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=10)
4-06-04, Bolivia, NC
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area.	**4.5**
The visuals completely cover the topic area.	**4.5**
I gained a better understanding of what structure is.	**4.6**
I gained a better understanding of how to describe structure.	**4.6**
I gained a better understanding of how structure forms.	**4.3**
I gained a better understanding of how to use structure to adjust LTAR.	**4.3**

What specific recommendations would you provide for the text?

Text was very informative and well laid out. Provides excellent understanding of basic soil structure.

The instructor did an excellent job going over each sample to classify soils.

Use color print.

More backhoe pits to evaluate, although understand 1 day course.

What specific recommendations would you provide for the visuals?

Visuals and sample variations were excellent

Good visuals

Good visuals

What specific recommendations would you provide for the notes?

No Comments; Very Pleased

good notes.

Please give specific positive comments on the topic/module.

Better understanding

Course was excellent in working with consultants/Health dept. folks/others (Will Baetow)

Allowed for a more basic approach when laying out and design of onsite system.

Instructor was excellent about answering questions. (Gerald Strickland)

Great course. (Frank R. Lee)

Good visuals, Great lecture, Interacts well with the individuals taking course. (Mason Allen)

Very needed: timely

Soils 104—Soil Texture

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=11)
5/12/03, Raleigh, NC
Instructor: David Lindbo

Question	Mean
The text completely covers the topic area	**4.64**
The visuals completely cover the topic area	**4.55**
The discussion notes completely cover the topic area	**4.55**
I gained a better understanding of how determine texture in the field	**4.64**
I gained a better understanding of how determine texture in the laboratory.	**4.64**
I gained a better understanding of use texture to assign LTAR.	**4.55**
I gained a better understanding of different texture systems.	**4.55**

What specific recommendations would you provide for the text.

Add the calculations in the hydrometer and lab texture determination

What specific recommendations would you provide for the visuals.

More slides of silt and clay Not just sands

Better padores

What specific recommendations would you provide for the notes.

Please give specific positive comments on the topic/module.

A very useful seminar for all OSWW professionals.

Fun and dirty. You never stop learning. It was helpful to unlearn practices that have not been helpful in my daily work.

Good overview of soil texture. Include another day for more detail and to review lab test data.

This course was extremely helpfully in helping me to determine LTAR and realize texture is only part of the equation.

Great help in understanding loading rates and roles of sanitaries.

I enjoy Dave’s class as usual.

Very good information--presentation was excellent Enjoyed course very much.

F REVIEW COMMENTS FOR WATER MOVEMENT AND TREATMENT IN SOIL

The Consortium Executive Board Review—March 2004

Submitted by Dr. Randy Miles, University of Missouri

Overall, the video and supporting materials are better than in my initial review of the same materials (there is a video now). I have the following specific comments relative to the

Video and supporting materials:

1. The introduction of the video appears to take up a relatively larger portion of the video relative to the technical aspects of the video. While this intro is not bad it takes away from the technical depth of the clip.

2. It is my understanding that this video should compliment the use with the original "How water moves in soil" (1959 Gardner video) or the more recent water movement video from Arizona State. I believe use with the original Gardner video would be most appropriate as that film is more technically sound. From my experience, the Arizona video is more "glittery" for today's student but is not as sound technically. Perhaps some instructor tips for use with each specific film would be appropriate.

3. One of the first clips of water movement in gravity distribution within the cross-section of a trench, illustrates the water movement near the base of the trench "down trench" in a manner which looks like a fire hose under pressure. This is one of the major glaring mis-illustrations in the video.

4. The illustration of trench orientation and length relative to water mounding is very good and should be picked up by all students.

5. Other illustrations like capillary fringe are good. The ending kind of leaves one "in the air" in that one sees a drip dispersal area being knifed in with little discussion except for the ending. This point would have been a great opportunity to discuss the principles of drip dispersal and unsaturated flow.

6. The associated materials such as the PowerPoint slides, explanations etc are very useful and good for the needs of the curriculum. I would add that it needs to be stated explicitly to the novice/instructors that the principles of water movement are not as simple and straight forward as they may seem at first. The instructor should thoroughly view the video and PPT illustrations and accessory materials a minimum of 2 times before using.

7. The materials as a whole are acceptable for use in the practitioners setting. The video clip could have been slightly better organized, more thorough, and contained "in the field" time lapse movement of effluent in soil/trench/bed settings.

The Consortium Executive Board Review—August 2003

Submitted by Dr. Randy Miles, University of Missouri

1. **Is all of the module there?**

No. The video is not completed.

2. **Is the module in the correct format?**

Yes. Some reorganization work is needed (see below).

3. **Are the concepts correct?**

In general yes. However, it is difficult for me to fully and completely answer yes without viewing the video component. There needs to be some reorganization so that specific target audiences (installer, designer etc) can be completely informed about water movement to the level needed for that practitioner.

4. **Are the concepts consistent with the "sister" modules in the academic sector?**

There is not a sister module for this area in the academic curriculum.

5. **Does this module meet the requirements of the deliverables?**

No! The movie video is not completed. Also, organization of the material in a different manner and delineation of the target audience (i.e. installer, designer etc.) for each component of the module is necessary. The depiction of water movement and associated treatment is difficult to depict just by the nature of the subject. This module needs more work to bring it up to the deliverables. I believe the writing team has the capabilities to provide the requirements for the module.

G RESULTS OF TEST TEACHING WATER MOVEMENT AND TREATMENT IN SOIL

Audience: Regulators, Installers, Engineers, Soil Scientists, Consultants (n=28)
1/26/04, MOSTCA in MN
Instructor: Dave Gustafson

Question	Mean
The text completely covers the topic area	**4.27**
The visuals completely cover the topic area	**4.31**
The video helped in the understanding of the topic.	**4.45**
The discussion notes completely cover the topic area.	**4.28**
I gained a better understanding of how saturated flow effects systems.	**4.47**
I gained a better understanding of how unsaturated flow effects systems.	**4.31**
I gained a better understanding of how Biomat is formed.	**4.42**
I gained a better understanding of how mounding effects systems.	**4.38**
I gained a better understanding of what is LTAR.	**4.42**
I gained a better understanding of how LTAR effects systems.	**4.42**

What specific recommendations would you provide for the text.

I'd like to see more detail on all the great reasons for shallow systems and keeping treatment in the root and oxygen zone

More in depth more time

What specific recommendations would you provide for the visuals.

Re-draw the old Wisc. Visual on Biomat/soil type Impairs. good illustration but needs to be sharper

None-they get better every year

A little more readable.

What specific recommendations would you provide for the notes.

I have studied and researched this subject well beyond the average so it's not new to me-but feel it is very thorough for people in the business.

Sand does not pull water side ways--slows gravelless system down after 8 yrs

Please give specific positive comments on the topic/module.

These courses are very necessary for the average person--Great job! (Mike Jungbauer)

Show the video first. (Jeremy Clunk)

Well presented. (Greg Vertheiw)

We learn more on Soils all the time.

To me and can see I need more class time on this topic to get a better understanding of the water movement

thanks for this day.

Good basic understanding

Soil 220—Soil Water Movement

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=14)
10/9/03
Instructor: David Lindbo

Question	Mean
Understand how the hydrologic cycle relates to onsite systems.	**4.50**
Understand the types of flow associated with onsite systems and their relation to treatment.	**4.43**
Understand the relevance of Darcy's Law.	**3.93**
Gain knowledge of how lateral flow, mounding and drainage relate to flow patterns and system performance.	**4.57**

What specific recommendations would you provide for the visuals?

Visuals were excellent

Visuals were very good Graphics of K Sat tests would be helpful.

You are a pro at PowerPoint. Some hands on visuals would be helpful

What specific recommendations would you provide for the examples?

Put example in book-- one of them was not included in our slides. Examples were good and easy to follow.

Plan to demonstrate in FIELD the use of Falling head permeameter on other soil tests to measure K Sat--Conductivity.

Give some examples or assignments to class groups and later compare them Results w/ yours.

Please give specific positive comments on the topic/module that can be used in a promotional brochure.

Enjoy how you promote discussion and your openness to questions and comments. You are thorough w/ subject matter; but you are covering quite a bit of information.

There appeared to be 1 too many soil scientists in the room for this class!

Soil 220—Soil Water Movement

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=22)
5/26/04
Instructor: David Lindbo

Question	Mean
The visuals cover the topic area	**4.90**
The handouts helped in understanding the subject.	**4.57**
Understand how the hydrologic cycle relates to onsite systems.	**4.50**
Understand the types of flow associated with onsite systems and their relation to treatment.	**4.45**
Understand the relevance of Darcy's Law.	**4.52**
Gain knowledge of how lateral flow, mounding and drainage relate to flow patterns and system performance.	**4.62**
Understand more about biomat formation, and waste water treatment in general.	**4.52**

What specific recommendations would you provide for the visuals?

Starting with just the basic picture and then adding componets to the picture is an outstanding learning aid. Good job.

Be sure they all work prior to their presentation

None, they are some of the best I've seen.

I enjoyed the scale model of water movement and want to see new models.

Check DVD player before class. Many of the slides in the notebook are difficult to read. A font contrasting w/pic would help.

Good visuals

No suggestions, visuals were good.

They were all good.

Print--B&W needs to be lighter

Possible color pages in some of the diagrams

Excellent visuals, especially enjoyed slides on lab experiment showing water movement in 1/2 scale tank. Look forward to seeing results from future models

What specific recommendations would you provide for the lecturer(s)?

A+

1 more break per class

None. Very good presentation from my perspective.

The lecturer was outstanding. Very interesting and knowledgeable.

Keep it coming

None good job

Good job at teaching to a diversity of different backgrounds/experiences

Provide milk to go with the chocolate cake!

What was the most beneficial part of the course?

A continued discussion of water movement which always helps understanding and knowledge

Entire course very beneficial and no other speaker could have pulled it off.

The clarity with which the instructor explained Darcy's Law and its relevence.

Illustrations and case examples shown in the power point presentation.

Understanding of hydrolic loading--mounding and Ksat vs. LTAR

The pics of the wetting front from Amoozegar's lab experiment were awesome! Visualizing groundwater flow is always useful.

Knowledge of how lateral flow work in the system (photos of 1/2 scale system set up in sand bed)

Treatment of sewage

Found out about additives

I am not involved in this industry so it was very interesting to learn more about treatment.

All of it. Hearing about different systems was the best.

To gain knowledge on water movement is soil. To learn more on the dydrologic cycle and how it effects wastewater systems

Logical and repetitions good

Everything

Through presentation of all aspects of soil water movement and treatment.

Audience interaction--Instructors knowledge of subject matter; Instructors presentation style; Instructors ability to keep audience involved

Everything was beneficial

The information presented in Soils 220 provides the scientific basis for daily decisions, bridging the void between academic concepts and real-world applications. Good job

What was the least beneficial part of the course?

None each part let to the next

Lunch

Good Course

What wasn't of interest to me professionally was interesting personally.

Everything beneficial

I had heard some of it in other continuing ed. Classes

Any knowledge gained is useful.

Not enough time for discussions interspersal

Nothing

No complaints

Cold room in the morning!

Please give specific positive comments that can be used in a promotional brochure.

Great course (Frank R. Lee)

I've never heard Darcy's Law explained so well! (Margaret Finley) P.S. Excellent lunch

Excellent information for the practicioner. Illustrations and Examples were very easy to follow. (Chris Keiger)

Good class Good visuals

The slides were good and the instructor was humorous and knowledgable.

This course is great and very informative for anyone in the soils, or waste treatment field. (Samuel Edgar Pegram)

I learned a lot.

Helps reinforce existing knowledge about soil water movement. (Bill Marlin)

Excellent, informative course. Were your thinking cap to reap the benefits. (Kim Warren)

As an environmental health specialist, I can describe this class in one word: RELEVENT. (Minor Barnette)

H REVIEW COMMENTS FOR TECHNOLOGY OVERVIEW MODULE

The Consortium Executive Board Review—July 2003

Submitted by Paul Trotta, Northern Arizona University

1. **Is all of the module here?**

   Answer :Yes

2. **Is it in the correct format?**

   Answer :Yes

3. **Are the concepts correct?**

   Answer : Material provided is correct and comprehensive.

4. **Are the concepts consistent with its "sister" project in the academic curriculum?**

   Answer: N.A. There is no general overview of technologies and/or onsite & decentralized, in general, in the academic curriculum

5. **Does it meet the requirements for the deliverables? (defined, in part, by a minimum one hour lecture)**

   Answer: YES The material does meet the stated Course Goals and Learning Objectives and stands as a well written and well organized overview of the relevant technologies for onsite & decentralized. Good Job !

Comments from Jim Kreissl, Environmental Consultant—October 2003

Author's response to comments indicated in CAPS

- p16-The material on composting toilets implies that these are managed by the homeowner. Bad idea. Although there are some tasks that the homeowner must commit to, a professional service provider must handle excess solids for disposal and perform regular inspections. Otherwise, there is an unacceptable risk to the occupants. Also, the need for heaters and fans requires similar management inspection and power, none of which are noted in the writeup. LANGUAGE IS NOT AS STRONG AS JIM WOULD LIKE
- 32-D.8.d says some ON is converted to NH3, should change to almost all ON converts to NH4-N. DONE.
- 36-O/M info should also decry practice of disinfecting tanks after pumping. "Siameter" should be "diameter". DONE.
- 38-In (c) "significant" should be "very high". DONE.
- 39-"Periodic" inspection should be changed to "annual". DONE.
- 41-Statement regarding fixed film (FF) "usually" having media below water line is false. Typical FF ATUs have film above waterline unless RBC-type. Classification of FF-enhanced suspended growth systems as a type of FF ATU is wrong. Either make separate or as subset of SG. MAY NOT SATISFY JIM'S CONCERN.
- 44-D8 should add that ATUs cannot remove more than 2 logs of FC, so actual effluent FC may vary. DONE.
- 45-Consortium's basic error in classifying FF ATU and media filters together starts biting here. Once thru MFs do not use coarse media such as gravel or foam cubes and meet performance needs. Eliminate these media from discussion makes rest OK. ???
- 47-Discussion of once-thru MFs should note that these units are used in place of ATUs for less O/M, better removals, and far better reliability. Also, eliminate foam cubes as above. DONE.
- 49-In 3rd line replace "that" with "may" to make a sentence. DONE.
- 50-In (F) change FC removals for once-thrus to 3-4 logs. DONE.
- 55-Under 1.j the discussion should note the documented performance problems of tablet chlorinators to either overdose or underdose due to tablet problems, and the need for frequent (eg, 4/yr)inspection and correction. DONE.
- 57-Lagoon discussion should include need to use multiple small cells to minimize short-circuiting. DONE.
- 72-Discussion on distribution should include use of half-pipes or chambers to fully utilize infiltrative surface. Otherwise, most goes unused and effective application rates are much higher than nominal rate. SEE P. 75.

- 86-I am concerned about inclusion of beds without the negative recommendations that are included with seepage pits (see below). As Chinese laundry say, “no oxygen no organic breakdown” and this is what you have with beds. Discussion should discourage them. NOT AS STRONG A DISCOURAGEMENT AS JIM WOULD LIKE.
- 88-As above, and even more egregious, why include seepage pits? I cannot even buy the use justification that there is no space for anything else. Go offsite or use a holding tank (I won’t use the other option here!). NOT AS MUCH AS JIM WOULD LIKE.
- 97-The spray irrigation discussion does not include the normal setback requirements that exacerbate the size requirement problem. DONE.

Again, I consider these comments to be easily dealt with, and the overall module seems quite good for the audience. Regards, Jim

Review by Nancy Deal, Project Manager, NCSU—January 2003

Author’s response is in CAPS.

- Figure 1, page 3: Text is not legible. REDRAWN.
- Figure 5, page 7: Perhaps use a black and white graphic for more clarity. REDRAWN.
- Figures 7 and 8, page 11: Text not legible. REDRAWN.
- Figure 13, p 17: Label alarm. NO CHANGE.
- Figure 14, page 19. Typical one-compartment septic tank
- Line indicating pipe elevations misleads reader: it looks as though pipe goes all the way Figure 15, page 20. Typical two-compartment septic tank
- Implies compartments are 50/50. REPLACED.
- Figure 25, page 29: Typical system using media filter
- Comments in Raleigh will change the look of the media filter component. NO CHANGE.
- Figure 28, page 32: Typical multiple pass media filter using a septic tank as the Recirculating/mixing tank
- Text unclear REPLACED.
- Figure 37, page 43: Better figure? REPLACED.

Comments on Technology Overview Module by Mike Davis

David you and your team have done a great job. Please consider the following comments on part one and two many of which I am sure you are aware.

I found no problems with the Part 1 PDF file.

Part 2 PDF file

Missing figures 16, 20, 22, 23, 24, 26, 27, 28, 46, 48, 55,

Page 26

(b) Fixed (Attached) Growth Unit
(ii) Please make a distinction between submerged units (FAST) and trickling fixed units.

Page 27 -Consider moving the SBR into the suspended growth section

Page 33

5. Constructed Wetland
a. v. (4) Occasionally, a layer of bark …

Consider adding: However, this may result in addition debris accumulating in the wetland accelerating plugging of the system

Page 34

(i) Last sentence. Consider: This is not sterilization.

Page 37

7. Other
(a) Lagoons

Consider inserting: We have had several children drown in these units in Kentucky

(xiii) Lagoon also represent a safety concern for drowning and should be properly fenced and secured to prevent access by children and animals.

Page 41

3. Other pertinent information
e. Period needed at end of sentence.

Page 50

(2) What does it consist of.
(b) (ii) Period needed at end of sentence.
(iii) Period needed at end of sentence.

Page 51

(5) Design Consideration
(f) Last sentence 12 o' clock

Page 52

(iv) Dripline Network
(2)(i)(ii)(iii)(iv) Period needed at end of sentences.

Page 53

(3) (d) Period needed at end of sentence.

(4) (a) (d) (e) Period needed at end of sentences.

Component Purpose
1. and 2 Period needed at end of sentences.

Page 55

1. d. Second sentence delete second period

Page 57

(e) Installation Consideration
(ii) Consider: It is critical that " trench installation does not occur in water saturated soil conditions as smearing and compaction will occur."

Page 65

(3) (b) Period needed at end of sentence.

Technology Overview PowerPoint

David this is great. I would consider a few more pictures to break the text frames but is excellent the way it is.

Technical Overview by Bill Stuth—Summer 2003

Review Report

Page 7: Illustration would be more user friendly if the lines leaving the building were identified as grey and black water.

Page 8: Figure 4, the outlet line from the septic tank appears to be running up hill.

Page 11: Under "Gravel or crushed rock", #5, "and cover material over the excavation"?

Page 11: Under "Other pertinent information", #3, Is it necessary for the gravel to be properly graded and sorted and does it really have an effect on root penetration?

#4, I question this statement in that it could be misused if left in its present form. If left, shouldn't it also refer to the moisture content of the soil. Too wet would cause smearing; too dry would cause dust and silts.

Page 16: The illustration for gravity sewer is too small and confusion. Not user friendly.

Page 20: Page number does not appear.

Page 23: Numbers 4 & 5 should be reversed, inlet before outlet. Illustration should be reversed. This one shows flow right to left. This section seems to be lacking information on how a septic tank vents or breaths.

Page 24: #7, this illustrates why venting is so important. It is generally only extremely hazardous if the venting is not present.

Page 26: Illustration #16 does not show any means of venting between compartments.

#8 should probably have an illustration.

Page 29: Figure #18, again this should show venting.

Page 37: #1, "slowly in an unsaturated flow"?

Page 39: Recirculation (multiple-pass). a. Description. Again unsaturated flow.

Page 40: #7, "high strength wastewater" I did not find this term earlier in the document. Earlier terms were quality and quantity.

Page 56: Figure #40, needs to have a better explanation of when you use a step-down. Normally used in an equal distribution system when one of the disposal lines has to have a drop in the line due to the topography.

Page 58: The first two statements "Must be watertight and placed on a stable base" & There should be undisturbed soil between the drop box and where the infiltrative surface in the trench begins" should be eliminated or qualified.

"How does it work" #2, the statement that a this rapidly happens because the biomat forms on the bottom and sidewall---this statement is only true if the system is receiving septic tank effluent, not true if it utilizes treated effluent.

Page 62: Figure 46. This drawing is the reason we have so many problems with siphons. This drawing needs to show the relationship between the siphon and the discharge point.

Page 66: #7, I have never seen the "weak points" of using valves. Should you have an explanation as to why they are "weak points"?

Page 71 In the chart, beds should be included. The document does refer to beds but is lacking in an explanation of beds.

Powerpoint Presentation

Slide 29: "Options for Distribution Media" Refer to response to page 11 of document.

Slide 90: "Pretreatment Option, Media filter, single-pass option, SF with pump reservoir. This illustration is very poor and should not be used.

Slide 100: "Pretreatment Options", refers to meter. The only time I saw meter used in this document.

Slide 82: Dosed-flow distribution, dosing devices, Siphon. Refer to response to page 26 of document.

General Comments

I think this is a very good document. The only thing I would questions is that it is titled "Technical Overview" although a few sections go to great depths of explanation while others simple provide an overview.

For a paper of this quality some of the illustrations could use improvement.

Since this document is being developed to serve a varied audience, it will definitely need simplification for some of the audiences, and the instructors must be very knowledgeable in this field as some of the statements presented may be challenged.

RESULTS OF TEST TEACHING TECHNOLOGY OVERVIEW MODULE

Summary of Test Teaching by Dave Lenning, Alternatives Northwest

Name of Module: Technology Overview

Name of lead writer: Dave Lenning

Date presented: July 31–August 1, 2003

Number of attendees: 28

Name of person presenting materials: Dave Lenning & Steve Wecker

Location of presentation: NETCSC 2003 Small Community Training Institute, Morgantown, WV

Sections presented: The entire package was presented using the 2-day outline and option. The "Collection and Transmission" section was cut very short, like it probably will be in most onsite wastewater training settings. Access to a partially completed demonstration site was available and used for the types of technologies they had displayed.

Setting of Presentation: One session of a workshop-a 2-day session which was part of a 4-day training institute that had 3-4 concurrent sessions.

Summary of Course Evaluations

Actions taken/changes made as a result of the evaluation process: (NOTE: If you are not the author, please offer suggestion for changes that are indicated as a result of presenting the materials.)

Some minor wording changes were made due to comments in the class. Additional photographs/diagrams were added to the PowerPoint presentation, as well as a few minor wording changes. Also, some minor revisions to the order of slides in the PowerPoint presentation were made.

Summary of Test Teaching by John Buchanan, Ph.D., University of Tennessee

Name of Module: Technology Overview

Name of lead writer: Dave Lenning

Date presented: November 25, 2003

Number of attendees: 11 Engineering students

Name of person presenting materials: John Buchanan

Location of presentation: University of Tennessee, College of Engineering. Civil Engineering 380, Unit Processing of Water and Wastes

If this was a presentation of only part of the materials, please indicate which sections were presented:

I reduced the number of slides in the PowerPoint presentation to match the timing of one 75 minute class period

Setting of Presentation:

__X__ Part of a one-semester course

_____ One session of a workshop

_____ Full short-course

Summary of Course Evaluations: Attach copy of evaluation sheet with:

1. Numeric averages of responses to each question.

2. A summary of the written responses received.

Actions taken/changes made as a result of Evaluations: (If you are not the author, please offer suggestions for changes as a result of having presented the materials.)

The original edition of the Technology Overview was intended to be a class that was six hours in duration and for practitioners. Most of the negative comments seem to center around trying to cram this much information into 75 minutes. Recommendation would be to create a Technology Overview PowerPoint that is more specific toward the academic curriculum.

Question	Mean
The text completely covers the topic area.	**3.9**
The text was easy to understand and follow.	**3.5**
The text made me better understand the importance of onsite systems	**4.3**
I gained a better understand of the different technologies available.	**4.6**
I gained a better understanding of how different technologies function.	**4.0**
I better realize the differences between the various technologies.	**4.4**

What specific recommendations would you provide for the Text?

Some of the explanations were confusing. Make the explanations more clear.

At times I thought it was a little too wordy.

What specific recommendations would you provide for the visuals?

None, the slides were well laid out.

Have more visuals--they are very helpful in understanding the info.

The visuals were fine.

Some visuals were hard to understand.

Make them clear for each system.

What specific recommendations would you provide for the notes?

There were a lot for the time provided.

There were too many to cover in the time allotted.

No notes provided for this lecture.

Good none needed.

Please give specific positive comments on the topic/module.

The topic was well presented.

Illustrations were very descriptive and correlated well with text.

It brought up a lot of concept that had not occurred to me.

Very interesting, I was previously unknowledgeable about some of the topics.

It gave me a greater understanding on common wastewater treatment systems.

Good visuals on info.

Technology Overview: Advanced Pretreatment

Audience: Regulators, Installers, Engineers, Soil Scientists, Consultants (n=12)
1/26/04, MOSTCA in MN
Instructor: Nancy Deal

Question	Mean
The visuals completely covered the topic area.	**4.25**
I gained a better understanding of the different advanced pretreatment technologies discussed.	**3.92**
I gained a better understanding of how these advanced pretreatment technologies function.	**4.17**
I better realize the differences between the various technologies discussed.	**4.00**
I will be able to make better decisions regarding these technologies in my job.	**3.67**

What specific recommendations would you provide for the visuals?

What specific recommendations would you provide for the speaker?

No discussion of sand/gravel filters were presented--add to program

" Couldn't read handwriting" R.O.C.

Please give specific positive comments on the topic/module.

Good general information about advanced treatment and continual O&M comments

I really enjoyed the discussion.

Technology Overview

Audience: Engineering Students
Fall Semester 2003, University of Arkansas
Instructor: Mark Gross

Question	Mean
The text completely covers the topic area.	**4.14**
The visuals completely cover the topic area.	**4.5**
The discussion notes completely cover the topic area.	**4.21**
I gained a better understanding of the different technologies available.	**4.71**
I gained a better understanding of how different technologies function.	**4.5**
I better realize the differences between the various technologies.	**4.21**
I will be able to make better decisions regarding technologies in my job.	**4.14**

What specific recommendations would you provide for the text?

More explanations on images--organization

The text version, while more in depth than the powerpoints, is less clear and harder to understand.

Start the presentation with a brief discussion of septic tanks for idiots. This class is the first time I've ever discussed or seen diagrams of septic tanks.

Pictures could be labeled more clearly.

None

Label all pictures i.e. septic tanks--label each picture as to what kind of tank it is, what it's made of, etc.

Nothing, Very good explanations in the text.

What specific recommendations would you provide for the visuals?

Make more notes for the specific pictures such as tell what the picture shows and a short fact or two about it at the bottom of the slide.

Bigger, clearer, More prices.

On some slides it was a little unclear what type of unit was represented.

The visuals should give the different stages in the treatment options.

Good as is.

The visuals were very good. They helped me learn how the products actually work.

Add pointers on the photos to better show functions and names of the parts on different systems.

Pictures could be labeled more clearly.

None

Visuals are great. I liked that they are not just drawings but are actual pictures of the equipment in most cases.

Maybe a trip to a site to see a system installation.

Very good real life examples.

What specific recommendations would you provide for the notes?

More pros and cons for using systems.

The notes should explain in depth the process that takes place in the treatment options.

Good as is.

If this is used for a class I would make notes a little more in depth than in outline form.

None--they are well laid out.

They were good.

None--They were well prepared.

Good supplement to the overview--good visuals. More detailed.

I have not read the notes yet.

Please give specific positive comments on the topic/module.

It seems very in depth.

Good images--good overview--lots of information

It gives a thorough introduction to all the topics and latest technologies. IT is organized well.

Very comprehensive. Dr. Gross did a good job explaining the advantages and disadvantages of the different technologies.

Generally, the module gives me a better understanding of the technologies available to me for wastewater treatment.

This topic is very interesting and the pictures and your thoughts help me understand the various things throughout the topic. Very thorough. Covers a lot of ground in a well laid out format.

Good module. Explains all types of treatment well.

Everything has been presented well so far.

Overall great module. Like to see all the technology that's out there (good or bad). Better prepared to make decisions about selection of components & design of system--Good visuals.

There are a lot of good pictures that allow us to see what is going on and what we are using.

Very well put together PowerPoint. Might could be a little shorter.

Technology Overview

Audience: Engineering students (n=20)
Fall Semester 2003, Texas A&M University
Instructor: Bruce Lesikar

Question	Mean
The text completely covers the topic area.	**4.3**
The visuals completely cover the topic area.	**4.2**
The discussion notes completely cover the topic area.	**4.2**
I gained a better understanding of the different technologies available.	**4.55**
I gained a better understanding of how different technologies function.	**4.1**
I better realize the differences between the various technologies.	**4.21**
I will be able to make better decisions regarding technologies in my job.	**4.05**

What specific recommendations would you provide for the text?

The text was informative and easy to read but seemed a bit too long.

Give more info on alternative technologies where they are being used--how well they work.

Very detailed pictures describing the system types--discusses overall parts of systems in case new to some students.

No specific changes needed.

Possibly more true example of real projects.

Easy to read and understand--looks good.

I think it would be good to include a complete system and how all the components are connected.

What specific recommendations would you provide for the visuals?

Vivid and descriptive.

More visuals.

Pictures work better for looking at system types.

Some of it seemed to be a little redundant.

Show more pictures of actual systems vs. drawn designs. Better pictures of how everything goes together could also be used. Pictures help keep everyone interested.

More close-up detail.

Perhaps could label the specific parts directly onto the overall diagram--i.e. Figure 14, 15.

It was a lot of material at once, but since Dr. Lesikar stated it was a broad overview, it was a good way to get a better grip on the technologies available.

The slides were somewhat too wordy. More of an outline format would be ideal.

What specific recommendations would you provide for the notes?

More on the composition of wastewater.

Detailed pictures for systems.

I thought the notes were very helpful. They covered the basics without going into a lot of detail.

Please give specific positive comments on the topic/module.

Good teaching style. I learn something I don't have. So I like it.

Helps to start up, great introduction to various processes.

The module provides a good introduction to wastewater treatment technologies.

Good detail for each specific technology.

The technology overview provides sufficient information on the different systems in an "easy-to-understand" way. The layout is well organized, and explanations of the visuals make sense. Some texts and notes do not flow well together, but this one does.

Good source of info--contains lots of good and useful information.

Well organized.

I think it did give a nice overview and was broad enough to cover the options available.

Overall, it presented a good overview of technology.

I learned exactly how much I haven't learned yet.

I wasn't aware or never fully understood how the technologies worked or their purpose. The technology overview gave an adequate and easy-to-understand description of the various components, which I feel will lead to a better overall understanding of wastewater treatment

Very thorough for being so brief.

The slides/notes/text did a very good job of outlining the material. This was my first experience with this technology, so I have no complaints.

It is interesting and will help in the career path that I have chosen.

It is detailed and through and provides enough information it is neither overwhelming as a newcomer or below someone formerly in wastewater.

Tech 102: Introduction to Onsite Technologies

Audience: Regulators, Subsurface operators, Engineers, Soil Scientist, Consultants (n=8)
4/18/04 Bolivia. NC
Instructor: David Lindbo

Question	Mean
The course cover the topic area.	**5.00**
Improve understanding how various technologies function.	**5.00**
Improve understanding the important differences between technologies.	**5.00**
Improve understanding how technologies can be effectively used for wastewater treatment and disposal.	**4.83**
Improve understanding how to determine the opportunities for using different onsite technologies on limited soils and sites in their area.	**4.50**
List the differences in design, installation process and operation needs of these technologies.	**4.60**

What specific recommendations would you provide for the visuals?

Pictures of problems you might run into in the field.

They were very good but a few typos should be corrected.

Excellent

Visuals were excellent

What specific recommendations would you provide for the lecturer(s)?

Thought what the presented was great.

They were good. The instructor encouraged questions and discussion.

Great job.

Excellent

What was the most beneficial part of the course?

All of it was good.

The survey of new technologies in use in NC.

Excellent overview of different systems.

Better understanding of system operation.

What was the least beneficial part of the course?

The field demonstrations, while complementary to the lecture, could be condensed somewhat. [Students were} Sometimes when goaded by questions, it was like beating a dead horse.

Was all good.

Please give specific positive comments that can be used in a promotional brochure.

Great information presented by great lecturer. (Harold Peaisin)

More thoroughly organized and comprehensive than others I have attended. Quite valuable! (Dan F. Amos)

It was very comprehensive and helpful to me to share with our town council. To give them an alternative to central sewer. (Gerald C. Strickland)

Please suggest additional courses that you would be interested in attending.

Maintenance of other onsite systems.

Tech 202

Subsurface system design

It would be helpful to have approx. costs for comparison of systems.

Additional soil texture classification if not already scheduled.

J REVIEW COMMENTS FOR SEPTIC TANKS MODULE

Consortium Executive Board Review—July 2003

Submitted by George Loomis, University of Rhode Island

1. **Is all of the module here?**

   Answer: No, it has several placeholders in text for figures, but they are not there.

2. **Is it in the correct format?**

   Answer: No, it lacks a table of contents, list of figures, list of tables

3. **Are the concepts correct?**

   Answer: Yes the concepts appear correct.

4. **Are the concepts consistent with its "sister" project in the academic curriculum?**

   Answer: Yes-It appears that they are, after looking through it again the two documents are conceptually consistent.

5. **Does it meet the requirements for the deliverables? (defined, in part, by a minimum one hour lecture)**

   Answer: Yes. And inclusion of other material will certainly add to it. I think the document will be fine once other materials are supplied.

Consortium Executive Board Review—March 2004

Submitted by George Loomis, University of Rhode Island

1. **Is all of the module here?**

   Answer: yes

2. **Is it in the correct format?**

   Answer: yes

3. **Are the concepts correct?**

   Answer: Yes the concepts appear correct.

4. **Are the concepts consistent with its "sister" project in the academic curriculum?**

   Answer: Yes - It appears that they are.

5. **Does it meet the requirements for the deliverables? (defined, in part, by a minimum one hour lecture)**

   Answer: Yes.

K RESULTS OF TEST TEACHING FOR SEPTIC TANKS MODULE

Onsite Wastewater Systems 101 Workshop

Audience: Installers (n=32)
Onsite Wastewater Systems 101 Workshop March 12-13, 2004, MI
Instructor: Ted Loudon

Question	Mean
The presentation covers the topic of Septic Tanks in an understandable fashion.	**4.93**
The visuals provide enhanced understanding of the topic area	**4.81**
The presentation helped improve my understanding of septic tanks	**4.65**
I gained a better understanding of how Septic Tanks function	**4.37**
I gained a better understanding of effluent filters	**4.31**
I gained a better understanding of how Septic Tanks are designed	**4.5**
I gained a better understanding of maintenance and operation of Septic Tanks	**4.5**

What specific recommendations would you provide for the presentation:

I was satisfied with the speakers, the setup and the facility.

Covered well.

None, most info provided was already known.

Would not change anything.

It seemed as though the handout materials addressed topics in a different order than the slides did (within the tanks sections)

None.

Line up slides work book pages.

What specific recommendations would you provide for the visuals:

Possibly color pictures.

Covered well.

Visuals explain it well.

None-they were great.

Maybe make a cut away septic tank with a glass side to give a better visual of the layers.

None.

Please give specific recommendations for improving the topic/module:

None. The presentation was informative and complete.

Have an operating tank to show.

Thought it was covered well.

None.

None.

I particularly liked the homemade sludge judgment devices they add to the understanding.

Maybe discuss ways the tank may be fixed in the field if a small crack has been found.

Audience: Regulators, Installers, Engineers, Soil Scientists, Consultants (n=20)
January 25-28, 2004, MOSTCA Conference, MN
Instructor: Ted Loudon

Question	Mean
The presentation covers the topic of Septic Tanks in an understandable fashion.	**4.85**
The visuals provide enhanced understanding of the topic area	**4.69**
The presentation helped improve my understanding of septic tanks	**4.52**
I gained a better understanding of how Septic Tanks function	**4.32**
I gained a better understanding of effluent filters	**4.16**
I gained a better understanding of how Septic Tanks are designed	**4.20**
I gained a better understanding of maintenance and operation of Septic Tanks	**4.32**

What specific recommendations would you provide for the presentation:

I think testing tanks is gone beyond common sense. The tanks are good quality and you are going too far.

Should have been Min. standards.

Show problems; show solutions.

More info on aerobic tanks.

All tanks are 2 piece the difference is where the joint is. We need to stress the importance of the joint seal not such much the mid seam joint.

What specific recommendations would you provide for the visuals:

The man standing outside the tank in straight up and down hole safety issue.

Min. standards.

Show tough sites tough situations.

Good.

Please give specific recommendations for improving the topic/module:

Put outlet baffle so it stays on for ever--finding baffles on bottom of tank (stainless steel rivets of bags with plastic baffle on bottom of tank).

The cement around fastner eats out and drops off--have plastic tank (good ones) cement cracks.

How does excavation and backfilling impact tanks. Strength, sales, pipe sagging. Overall program very informative.

Good job.

Go to what we are doing and require in Minnesota.

Provide more actual situations.

More info on aerobic tanks.

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