Model Code Framework for the Decentralized Wastewater Infrastructure

VOLUME II

CODE DESIGN PHILOSOPHY AND GUIDANCE

NOWRA
National Onsite Wastewater Recycling Association

March 2007

IMPORTANT NOTE

The Model Code Framework for the Decentralized Wastewater Infrastructure remains a work in progress. Its three major elements are code structure, user guidance, and evaluation of treatment components. While each element can stand alone, the three are intended to work together. Volume I and Volume II—essentially completed at this time—represent, respectively, the first two elements; they are particularly important because they address specific code issues and policy options. The tools for evaluating the performance of confined treatment components (pretreatment) and the unconfined-soil component remain in development.

The protocol for evaluating the pretreatment components—currently under beta testing by the Florida Department of Health (FDOH)—is near completion. The joint objectives of NOWRA and FDOH are to (1) perfect the evaluation protocol and the performance classification matrices, (2) have FDOH and NOWRA jointly administer the protocol, and (3) have FDOH incorporate the protocol into the Florida state code.

The protocol for evaluating the unconfined-soil component has been more difficult to develop and is about half-way to completion. Work on documents concerned with the scientific aspects is complete; the implementation document is still in development. The completed soil-evaluation/classification documents should be available at the next NOWRA Annual Conference.

Adopted by the NOWRA Board of Directors on June 8, 2006.

Produced and published by
National Onsite Wastewater Recycling Association, Inc.
3540 Soquel Ave, Ste A, Santa Cruz, CA95062
831-464-4884
nowra@nowra.org • www.nowra.org

www.modelcode.org

ACKNOWLEDGEMENTS

The following members of NOWRA'S Code Guidance Committee are recognized for their contributions and reviews of this volume: Bennette Burks, Matt Byers, Jean Caudill, Ed Corriveau, Mike Hines, Rodney Ruskin, and Tony Smithson, and Wilder Lucas (posthumous). For their significant contributions of thought and written materials, the following persons also are recognized: Tibor Banathy, Paul Booher, Mike Corry, James Kreissl, Patricia Miller, Richard Otis, and David Venhuizen.

The NOWRA Board of Directors and the members of the committee responsible for producing Volume I, *Workbook for Writing the Cod*e, gave solid support and valuable input throughout the overall framework-development process.

The Office of Water, United States Environmental Protection Agency (U.S. EPA) and the National Decentralized Water Resources Capacity Development Project (NDWRCDP) gave significant financial support to the development of this volume. Many other organizations and individuals provided additional financial support.

* * *

DOCUMENTARY SUPPORT

The following United State Environmental Protection Agency (U.S. EPA) resources should be used to supplement the information in this volume. They can be downloaded or ordered through the National Center for Environmental Publications at http://www.epa.gov/ncepihom/ordering.htm or from the specific agency as follows:

U.S. EPA Onsite Wastewater Treatment Systems Manual (2002)
http://www.epa.gov/ORD/NRMRL/Pubs/625R00008/625R00008.htm

U.S. EPA Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems (2003)
http://www.epa.gov/owm/septic/pubs/septic guidelines.pdf

U.S. EPA Management Handbook (Draft 2003)
http://www.epa.gov/owm/septic/pubs/septic_management_handbook.pdf

CONTENTS

CHAPTER 1

INTRODUCTION

BACKGROUND

In July 1999, the National Onsite Wastewater Recycling Association (NOWRA) adopted the *Model Framework for Unsewered Wastewater Infrastructure* (see Appendix A) to identify the critical components necessary to achieving the goal of "sustainable development while protecting human health and the environment." The paper identified seven critical components:

1. Performance requirements that protect human health and the environment
2. System management to maintain performance within the established performance requirements
3. Compliance monitoring and enforcement to ensure system performance is achieved and maintained
4. Technical guidelines for site evaluation, design, construction, operation, and for acceptable prescriptive designs for specific site conditions and use
5. Education/training for all practitioners, planners, and owners
6. Certification/licensing for all practitioners to maintain standards of competence and conduct
7. Program reviews to identify knowledge gaps, implementation shortcomings, and necessary corrective actions.

In 2000, the NOWRA Board of Directors authorized work to proceed on addressing the seven components identified in the 1999 paper. The specific purpose of the continuing work was to craft a comprehensive framework on which state-level codes for decentralized wastewater-treatment systems should be written. *Model Code Framework for the Decentralized Wastewater Infrastructur*e is the outcome of that mandate. It comprises two documents: Volume I – *Workbook for Writing the Code* and this document, Volume II – *Code Design Philosophy and Guidance.* Hereinafter, those documents will be referred to concisely as follows:

- The whole work will be referred to as: Model Code Framework
- Volume I will be referred to as: Workbook
- Volume II will be referred to as: Guidance book

An Executive Summary of the work is available, separately.

The Model Code Framework provides the tools and the knowledge to propel to a new level the performance-based regulation of onsite, cluster, and other systems for decentralized wastewater treatment. Its two volumes apply the principal of "informed choice" to addressing the performance issues applicable to wastewater-management solutions. "Informed choice" means that policy makers and citizens at all affected levels participate in setting and applying regulations; they understand the regulatory options and the benefits and costs associated with each option. In the subject case, it means specifically that they have the knowledge to shape the management of human and environmental benefits and risks that are associated with using decentralized wastewater recycling in their community. This process maximizes the value of regulation by balancing benefits, costs, and risks at levels appropriate to the immediate community The Workbook applies the principal and process of "informed choice" in three ways, with many opportunities for its use to be found within each category:

1. Jurisdictions adopting a performance-based code have choices of requirements and language for (a) varying levels of management and quality assurance, (b) the varying health and environmental risks associated with varying local conditions, and (c) the varying capabilities of regulatory authorities and service providers.
2. Classification Matrices allow state and local jurisdictions to choose from a range of output performance measurements to deliver the desired level of risk reduction necessary to protect human health and the natural environment.
3. System designers can choose treatment components that are rated in the Classification Matrices and use Soil-Component parameters to meet the required output performance specified for the site. Alternatively, they can propose systems designed to meet specified performance requirements and quality-assurance requirements in the adopted code.

The Workbook and this Guidance book will continue to evolve with the increased understanding of both micro- and macro-scale impacts of wastewater-management practices. The field of decentralized wastewater treatment is becoming integrated with other efforts in water-resource management, including storm water management, water reuse and recycling, and watershed planning. All those efforts will influence "informed choice" related to wastewater management. As technology advances and scientific research is applied to treatment and dispersal mechanisms, approaches to wastewater management will acquired more "informed choices."

The two volumes are intended to be used in tandem to inform and support state-level regulatory personnel in their crafting of codes that are responsive to local environmental conditions, priorities of local communities, and priorities of local government entities. The realistic assessment of the local capacity for wastewater-infrastructure management is a critical component of the code-writing process. A rational evaluation of risk factors and of the extent to which community interests and capacities can be focused on protecting human health and the environment is the foundation of a reasonable and effective code.

GUIDANCE FOR REGULATORS, POLICY MAKERS, AND THE GENERAL PUBLIC

The purpose of a regulatory code for decentralized wastewater-treatment systems is to protect human health and the environment. It must be reasonable if it is to be effective. The evaluation and reduction of risk should be the basis for code development decisions, but choices must be made in the context of a variety of potentially competing resource-protection issues.

To determine the reasonableness of a proposed regulation, all segments of the population must be invited to assess its impact, with the intent to affect an alignment of aims (i.e., align community interests and capacities to achieve the selected or required level of performance and protection). Provision of the resources and support for the regulatory capacity necessary to enforce the regulation must be a critical part of this alignment. A code cannot meet its purpose without political and community support.

Code adoption is a method of risk management. The evaluation of *risk* related to wastewater treatment can and should be conducted in an objective and deliberative manner. The adoption of performance *requirements* based on the level of risk that society is willing to accept is a more subjective process. All parties need to understand that it is impractical to expect total elimination of risk (i.e., adopting a numerical performance goal of zero). The cost of assuring that an adopted performance provision can be met must be understood and balanced against the value of the reduced risk. If the value of the reduced risk is high enough, then it may be expected that the resources necessary to enforce the adopted provision will be provided. If those resources are not provided, there can be no assurance that risk will be abated.

Under the Model Code Framework, performance requirements for differing localities are established based on the differing levels of evaluated or perceived risks to human health and the environment. Within the decision-making structure, there are critical elements and levels of management practice that may be adopted as quality assurance provisions to achieve the desired performance. In aligning support for the adoption of a code based on performance requirements and quality management practices, regulators need to weigh the demands of implementing the code against the value of improved water quality, reduced public health risks, preservation of property values, and protection of investments in decentralized wastewater infrastructure. Local officials, industry practitioners, and the general public need to be informed and involved in identifying those benefits if they are to be expected to support the imposed requirements, including the education and enforcement elements.

GOALS, PURPOSES, AND INTENT

A critical first step in the development of a performance-based code is the formulation of purpose statements that will direct decision making. In the subject context, the overriding purpose is to protect human health and the environment. That goal can be restated more precisely: "The code is intended to reduce to an acceptable level the risk of harm to public health and the natural environment." That statement can be extended with sub-statements that guide the code-writing process more specifically.

Statements of intent are discussed in more detail in Chapter 6, "How to Use the Model Code Framework," but could include statements such as the following:

- The risk-reduction goals of the governmental body writing a code reflect an obligation to protect citizens and to meet applicable environmental and public health regulations.
- Recognizing that decentralized wastewater-treatment systems are only one of many contributors of risk to human health and the natural environment, efforts to reduce the share of the impact from these systems shall be balanced on a cost/benefit basis through integrated water-resource management strategies.
- The code shall provide a range of performance-based requirements and management practices with related guidance to allow governmental units the ability to make informed choices when adopting code provisions that reflect the level of risk associated with varying conditions.
- The code shall support the planning and zoning intentions of local governments by helping to ensure that decentralized wastewater-treatment systems are available to support the structure envisioned by zoning decisions. The code shall ensure that decentralized wastewater-treatment systems can provide sustainable and cost-effective solutions within a continuum of wastewater infrastructure options, including integration with larger wastewater-collection and -treatment facilities.
- The authority and responsibilities of various practitioners in the decentralized wastewater-treatment industry shall be clearly articulated in the code with associated quality-assurance requirements to achieve conformance with the applicable standards of practice.
- Adopted code provisions have the force and effect of law. Enforcement shall be equitable and reasonable. Education will be the primary focus of enforcement to promote compliance, reserving punitive enforcement action for cases where education and notification of compliance requirements do not achieved adequate performance.

PERFORMANCE-BASED AND PRESCRIPTIVE ELEMENTS OF A CODE

A code must approach the issue of performance-based requirements versus prescriptive requirements in a systematic manner, recognizing that use of some prescriptive requirements can be an integral part of a performance-based code. The Model Code Framework provides a hierarchical sequence of code-development steps that moves from purpose statements to performance-based requirements to prescriptive requirements. The following is an example of this sequence:

1. High-level purpose statement: Protect public health and natural environment
2. Statement of intent: Protect estuaries from nutrient overload
3. Drainage basin TMDL for nitrogen: All sources contributing nitrogen in the drainage basin shall not exceed a cumulative total load of X lb/yr (mass loading standard)

4. Performance-based requirement for decentralized wastewater-treatment systems in specified basin: <20 mg/l TN and <15 mg/l N-nitrate in 90% of effluent samples from a pretreatment component
5. Prescriptive requirements for achieving compliance with performance-based requirements: Evaluation and listing of pretreatment components that are "deemed to comply" with the adopted performance-based requirements.
6. Non-prescribed designs for achieving compliance with performance-based requirements: Plan review and assessment of engineered designs (those not conforming to the listed prescriptions under Step 5) with respect to the performance-based requirements
7. Quality Assurance: Monitor installed systems to assure their compliance with adopted performance-based requirements and to assure that the applicable management practices are being followed.

Step 5 is an example of a prescriptive solution within a performance-based code. Historically, prescriptive codes allow only specified system designs or listed components; they do not recognize defined purposes or performance-based requirements; and they provide for only limited design options. Alternative design options need to proceed through a lengthy and sometimes costly approval process. A performance-based code can allow for non-prescriptive solutions (those not specifically prescribed in the code or not listed as "deemed to comply") as described under Step 6. Finally, a performance-based code must include the quality assurance requirements.

Without acknowledged purposes and established performance-based requirements, innovation is thwarted and compliance becomes mere comparison of solutions to prescriptions. The goal "to reduce to an acceptable level the risk of harm to the public health and the natural environment" cannot be achieved in the most effective and cost efficient manner under those constraints. Jurisdictions are cautioned not to limit solutions to "deemed to comply" prescriptions that meet adopted-performance-based requirements.

The example used here only relates to system design. Similar opportunities for more responsive regulations are realized when this approach to purpose and performance are applied to the full range of people and organizations associated with a sustainable decentralized wastewater infrastructure.

Development of the NOWRA Model Code Framework

The transition of state and local codes from the prescriptive type to the performance-based type is an evolutionary process. Many jurisdictions have made significant progress and shared in the development of the two volumes of the Model Code Framework. NOWRA members regularly met at various locations around the country and worked together on the multiple tasks involved in developing the Model Code Framework. Many other partners shared their state and regional experience with performance-based code development efforts through formal interviews and through participation in code meetings held from May 2001 through 2004.

The Model Code Framework is intended to promote the adoption of performance-based codes by state and local jurisdictions. It provides resources supported by the best available data, science, and expert opinion. (Many current codes contain restrictions that are only supported by opinion and tradition.) The content of the two volumes of the Model Code Framework challenges these traditions and attempts to expose the myths associated with many current practices and regulatory structures.

No governmental unit is required to adopt the precise structure or language of the Workbook. However, the fact that it was developed with industry-wide support, the best knowledge available from experts in the field, and significant regulator participation creates a strong argument for its use. The resources, processes, and code provisions of the Workbook are realized in the following interrelated components and development structures:

- **Classification Matrices** – Successively more stringent output parameters of wastewater constituents are arrayed in matrices—output parameters on the vertical axis and probability values on the horizontal axis. The matrices serve two functions:
  - ***Classification.*** The matrices provide a method for classifying the outputs of treatment-train constituents. The purpose is to classify (as opposed to judge) designs or components.
  - ***Performance Measures.*** Classification categories serve as performance measures that can be adopted as performance-based standards in state or local codes.

  Another resource—related to the matrices—classifies the performance of the Soil Component, which may be referenced in the code.
- **Evaluation** – The Workbook resource provides an avenue for classifying treatment-train designs and components into the categories defined by the matrices. The protocol includes an application process, content requirements for submitted specification manuals, and the proofs needed to support applicant claims and classification in the matrices. Listed design/specification manuals contain maintenance and monitoring requirements. NOWRA evaluation processes could also be applied to certification of individuals and organizations.
- **Guidance** – This Guidance book was developed to assist state and local jurisdictions in the development, adoption, and implementation of performance-based provisions. Guidance is provided to support the process of aligning desired levels of risk reduction to appropriate performance-based requirements and quality assurance management provisions.
- **Code Language** – The code language is provided to support and implement selected performance-based requirements. Code language options address both the selection of quality assurance management practices that are often absent in current codes and the administration/enforcement issues common to all codes. A checklist of necessary authorizing ordinances and statutes is also provided.

- **Design Manuals** – Design manuals are prescriptive solutions to performance-based requirements. Specification manuals for commonly used designs can be created, evaluated, and listed. To "prime the pump," NOWRA encourages the submission of generic design manuals for evaluation and listing and may develop sample manuals as needed for small-volume applications. Proprietary component manuals may be developed and submitted as described in Item 2 above.

There are numerous factors within the industry that make this national approach to code writing a highly important endeavor. When applied, there tend to be minimal variations between codes adopted by the multiple local jurisdictions and by the many states. Less variation increases market size for new products and designs and fosters innovation, higher quality, and lower costs.

The need to secure local approval in thousands of jurisdictions for every new product and design makes innovation and deployment of effective decentralized wastewater-treatment systems very difficult. Many regulating agencies do not have the technical expertise available to do adequate evaluation. The Model Code Framework classifies systems and components against performance measures in the matrices and lists the categories that can be met within specified outcomes and probability values. If local and state regulators have confidence in the NOWRA classification process, they are likely to approve the use of listed systems and components without requiring additional product testing.

Codes currently being used often ignore the status of maintenance and monitoring of installed systems as well as other quality assurance management practices. This has resulted in large numbers of uncorrected system malfunctions or failures that increase risks to the public health and the natural environment. The variations among state and local codes also create many problems for homeowners, realtors, and builders. It is time to finally resolve these long standing problems to properly support the growing demand for managed decentralized wastewater-treatment infrastructure.

CHAPTER 2

CORE PRINCIPLES

ALIGNMENT OF AIMS

The Model Code Framework promulgates a process of code development that results in an adopted code that pleases, or at least aligns the aims, of all the groups affected by its provisions. If this alignment of aims is achieved during the code development process, the code will be adopted with broad community support. The Model Code Framework provides for alignment of aims in the following manner:

- ***Code options are provided*** – The Model Code Framework provides for use of a range of regulatory options that allow the most appropriate government jurisdiction to match code requirements to risks of harm to public health and the natural environment. Where its knowledge of local conditions is a paramount factor, a local jurisdiction decides the level of regulation necessary to provide an acceptable level of protection.
- ***Purpose of provisions are clear*** – Each requirement is developed in a three-part process that lists the purpose of the requirement, provides a range of performance options that achieve the purpose, and code language that defines a measurable performance-based requirement. Guidance is provided to assist in making choices on code requirements.
- ***Requirements* are based on science** – The requirements suggested in the Model Code Framework were developed by national experts from all areas of the decentralized wastewater-treatment industry, including scientists, engineers, regulators, contractors, manufacturers, soil evaluators, and academic researchers. The requirements are backed by current science; where the science is not settled, the expert opinion of the group is used.

The Model Code Framework provides options for as many levels of system performance and quality-assurance management practices as are needed to match state and local conditions, capabilities, and politics. The written code should reflect the community's capacity to implement requirements intended to reduce the health and environmental risks associated with decentralized wastewater-treatment systems. It is recognized that states and local communities have different capabilities to administer and enforce codes. The Model Code Framework informs and supports code development processes and provides options that allow adopting jurisdictions to choose code requirements appropriate to their circumstances.

There are benefits to be gained from using an informed-choice approach to the selection of performance-based code requirements over the traditional prescriptive code requirements that often limit choice. Since risks vary with human and natural environments, options should be available to match choices for regulatory solutions to the level of desired risk reduction. When applied to local communities in their local environments, an informed-choice approach facilitates the alignment of aims among politicians, regulators, industry, homeowners and the general public. Code requirements that meet the objectives of the community and assure protection of public health and the natural environment tend to be readily adopted and enforced.

BALANCED CODE PROVISIONS

The core philosophy of the Model Code Framework is to minimize reliance on statewide requirements and prescriptions in code design. A statewide approach tends to be of the "one size fits all" type, although, in fact, that one size actually fits very few. As a result, statewide requirements are inevitably over specified (too strict for the risk) in some environments and under specified (risk ignored, no code provision) in others. Those circumstances can result in political opposition to a proposed code when a substantial number of statewide provisions make no sense relative to local risk factors. They can also result in the inability to pass codes that are appropriate in some situations. For example, a code provision to reduce nitrogen in onsite wastewater may be judged appropriate when a high density of onsite systems near a shoreline have been shown to contribute to pollution, as may be demonstrated through a Coastal Zone Management Plan. The same provision may gain little or no support for scattered housing in agricultural areas where tons of nitrogen are applied as crop fertilizer and there is no evidence of impacts from the dispersed onsite systems.

Local jurisdictions often resolve an overly restrictive statewide code provision by ignoring it, by granting selective variance approvals, or by creating de facto substandards:

1. *Simply ignoring a provision of statewide code or omitting it from the local code.* The resulting total lack of enforcement of a statewide code provision creates a general disrespect for the law and undermines the expectation of voluntary compliance with all regulations, whether these are required through federal, state, or local code provisions.

2. *Enforcing the provision for some circumstances or individuals and not for others, as in selective variance approvals or case-by-case enforcement action by a regulator.* Some jurisdictions attempt to address a statewide standard in a politically acceptable manner by granting variances and applying selective enforcement so as not to create a local political or legal backlash.

3. *Creating de facto substandards, such as applying a local nitrate standard of 25 mg/l when the statewide code requires a maximum standard of 10 mg/l.* Creating de facto law and enforcing substandard provisions shifts the power to make law from formal lawmaking processes by the legislature or designated authority (subject to hearings and legal standards) to informal creation by individual regulators or local departments.

To avoid these types of local responses to unreasonable statewide provisions, the Model Code Framework encourages the adoption of code provisions that are responsive to local conditions and can be applied in a fair and equitable manner. Balanced code provisions promote fair application and enforcement of the code as well as increased respect for and compliance with the code.

Elements of a Performance-based Code

Prior to discussing elements of a performance-based code, the differences between prescriptive codes and performance codes need to be clarified:

> "Prescriptive code" means an administrative regulation that specifies the means to achieve an objective and excludes other processes that achieve the same objective.

Some prescriptive codes contain "performance provisions" that link the output of a specific system design to a "performance requirement." Absent performance-based requirements for all treatment systems and the general ability to utilize alternate designs without first securing a code change, both the provision and the code remain prescriptive.

> "Performance code" means an administrative regulation that specifies the ends or results of a process or activity and allows the general use of solutions that demonstrate achievement of the objective requirement or standard.
>
> "Performance-based standard" means a clear statement, either numeric or narrative, of a measurable, achievable condition or output of a process that is applied at a specific point or place, that permits a clear pass/fail determination, and that allows multiple solutions. "Performance-based requirement" is a substitute term.

Performance-based standards/requirements can be applied to:

- Treatment, conveyance, and distribution systems
- Certification of people and organizations
- Quality-assurance and administrative processes

A fully developed performance-based code contains the following elements as applied to the regulation of treatment systems:

1. Performance-based requirements are adopted or authorized in code language that sets the output requirements for treatment systems. The Model Code Framework creates a mechanism for local adoption of performance-based standards either by proposing a standard or by providing a mechanism for doing so.
2. An evaluation process is used to determine compliance of the component or system design with the applicable standard. There are generally three methods for evaluating systems or components. One or all can be employed in an evaluation program.

a. Deemed to comply – The system is evaluated by performance testing and then listed as complying with a specific performance-based standard or with a designer's or manufacturer's claim of performance. With proper operation and maintenance, it is expected that the systems will perform in the field as it did during the evaluation period.

b. Process monitoring – The system components are routinely checked during operation to see if each is functioning properly, with adjustment or repair as needed. A properly operating system is expected to produce output that meets the standard.

c. Output monitoring – The output of the installed system is evaluated against the appropriate standard. Monitoring can be continuous or based on periodic sampling, but should be required to meet a statistically valid sampling protocol if an expectation of performance is based solely on this method of evaluation.

3. Adopted performance-based standards reflect the level of risk associated with the site and the surrounding environment or conditions. The first two elements establish the link between the individual system and the adopted performance standard. This third element establishes the link between site risks and the adopted standards. Because risk varies by area, adopted performance-based standards should also vary. This de-emphasizes adoption of countywide or statewide standards except when a minimum level of acceptable risk is being established.

4. The capacity and delivery of services by regulators and industry professionals are assessed and linked to the utilization of system designs and processes. This element is related to the performance of people versus systems and becomes especially critical when more complex system designs are used in areas with high risk conditions. Failure to provide the necessary level of professional support increases the risk and jeopardizes the purpose and goals of performance-based requirements. Capacity and responsibility issues are discussed below.

5. The least-studied element of a performance-based code is the alignment of aims between the decentralized wastewater-treatment industry and the general public served by the industry and its regulatory structures. Regulation delivers a public-safety service at a cost. The service is risk reduction. The cost is time, money, and constraints or conditions placed on citizens' use of their land. The alignment of aims between the public, industry professionals, and regulators relative to risk reduction and cost is critical to successful adoption and implementation of performance-based codes.

Capacity for Implementation of Code Provisions

When considering the various provisions in the code structure, it is essential that the adopting jurisdiction evaluates the available capacity for implementation. Beyond matching performance-based provisions with the varying levels of risk to human health and the environment, the selection process must also take into account the resources available to support each provision under consideration. If resources are inadequate, or if there is insufficient support to expand capacity to meet the provision, then it should not be adopted.

Areas where "capacity" is an issue include regulatory staffing levels and competencies, professional training opportunities and requirements, qualified practitioner availability and licensing / certification programs, data management systems for permitting and monitoring records, residuals-management options, financial assistance for system repair and replacement, and effective program auditing and oversight. That list is not exhaustive and reflects components of the Model Code Framework and program elements of the *U.S. EPA Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems* (2003). These capacities are explored in greater detail in Chapter 5, Quality Assurance through Management.

It is expected that an adopted code will include a significant number of provisions related to quality-assurance-management practices that are considered prerequisites to the implementation or application of other code provisions. Ideally, a state-level code would incorporate such prerequisite provisions to provide local authorities with clear direction on the capacities needed to adopt and implement each portion of the state code at the local level. The Model Code Framework strongly promotes such capacity considerations in the selection of code provisions and performance-based standards.

Responsibility Placed on Regulators and Industry

Regulators at the state and local levels are increasingly challenged to enhance their knowledge and expertise in order to provide effective oversight of a widely diverse and dispersed wastewater infrastructure. In many cases, regulatory agencies are severely understaffed, providing little time or opportunity for staff training and professional development. Often, state-level staff members working in related areas of water-resource protection are not engaged in an integrated approach that includes decentralized wastewater-treatment infrastructure. In addition, many regulators perform duties that could be handled, and should be handled, by non-regulatory professionals.

The Model Code Framework Committee spent significant time reviewing the issues of regulator/contractor responsibilities and professional conflict of interest. Table 2-1 was developed to reflect the Committee's position on these issues. The Committee clearly stated that a regulator should conduct only those activities and responsibilities defined as regulatory roles. Regulator performance of activities that are the responsibility of non-regulatory professionals was determined to be a significant conflict of interest to be prohibited in adopted codes.

The Model Code Framework was developed with a strong philosophical basis in classification and informed choice. Given this philosophy, it contains very few outright prohibitions. Consequently, the Committee's decision to place such a definitive prohibition on the role of the regulator is evidence of the strong sentiments concerning that issue.

TABLE 2-1. Conflict of Interest for Individuals Serving Multiple Roles.

					REGULATOR					
ROLE	Owner	Site Evaluator	Designer	Constructor	Inspector	Plan Reviewer	Monitor	Operator	Pumper	Vendor
Owner	X	1	1	1	2	2	2	1	1	1
Site Evaluator		X	1	1	2	2	2	1	1	1
Designer			X	1	2	2	2	1	1	1
Constructor				X	2	2	2	1	1	1
Inspector					X	1	1	2	2	2
Plan reviewer						X	1	2	2	2
Monitor							X	2	2	2
Operator								X	1	1
Pumper									X	1
Vendor										X
	Scale: 1 = Potential conflict. A consumer protection issue that can be avoided by practices such as disclosure and information. 2 = Significant conflict that should be prohibited by rule.									

Both the competency and integrity of the regulator role is recognized as being of extreme importance to the advancement of the professional capacity of all segments of the Decentralized Wastewater-Treatment industry and integrated approach to water resource management. The primary regulator roles of code implementation and oversight, along with outreach, technical assistance, and education for system owners, industry professionals, and public officials, are seen as sufficiently critical to demand resource allocations that adequately support a high level of regulatory capacity free from conflicts of interest.

Likewise, there are significant capacity issues related to industry professionals and other non-regulatory personnel working in water-resource management areas. Public-sector personnel need to become familiar with interrelated water-quality and -quantity issues and actively support integrated water-resource management solutions. Demonstration of professional integrity, adherence to professional codes of ethics, and compliance with standards of practice need to become the norm for the industry. Industry professionals also have a role in the education of system owners, other industry professionals, and public officials, including regulators. Assurances of professional competency through education/training and licensing/certification are addressed in Chapter 5.

CHAPTER 3

CORE STRUCTURES

The Classification Matrices and the Soil Component are critically integral to the Model Code Framework. Both were developed in adherence to the philosophy of classification and informed choice. Classification is inherent to the study of soils, but the usefulness of its application in establishing performance measures is less evident. This chapter describes and justifies the classification approach to development of these core structures of the Model Code Framework.

CLASSIFICATION MATRICES

A basic task of the Model Code Framework Committee was the development of performance-based provisions. The task was divided into two approaches:

1. Numeric performance matrices that classify treatment components by measures of system output and output variability
2. Narrative performance-based requirements that define (1) the range within which output parameters are acceptable and (2) management practices that ensure compliance with that output range.

The numeric performance provisions are incorporated in the Classification Matrices used to categorize a range of performance measures for constituents of interest. The relationship of the Classification Matrices to the Soil Component is explained in the related support document for the soil-component resource. The narrative performance provisions are addressed in Chapter 5, Quality Assurance through Management.

The two axes of a matrix define the system output for each constituent as follows:

- The vertical axis presents discrete values of constituents that cover the full range of output values from raw sewage to drinking water.
- The horizontal axis presents probability values, in the form of percentages, that categorize the variability in the system component's output performance.

Vertical Axis (y-axis): Constituents of Interest. The destination of the waste stream determines the constituents of interest. The two primary discharge destinations are subsurface and surface and reflect the output of the treatment train. Seven constituents of interest are identified in Table 3-1.

TABLE 3-1. Y-axis Constituents and Classification Levels by Destination of Final Effluent.

Constituent	Effluent Destination		
	End of Treatment Train Discharge		Classification Levels
	Subsurface	Surface	
Fecal Coliform	X	X	<1, $<10^1$, <200, $<10^3$, $<10^4$, $<10^5$, $<10^6$, and $>10^6$ cfu/100ml
Total Nitrogen	X	X	0, <2, < 10, <20, <60, <90, <120, >120 mg/L
Nitrate	X	X	0, <2, < 10, <20, <60, <90, <120, >120 mg/L
Total Phosphorus	X	X	0, <1, <5, <10, <35, >35 mg/L
BOD_5		X	0, <1, <5, <10, <20, <30, <200, <350, <500, <1000, and >1000 mg/L
Total Suspended Solids		X	0, <1, <5, <10, <20, <30, <200, <350, <500, <1000, and >1000 mg/L
pH		X	7, 6 or 8, 5 or 9, 4 or 10, 3 or 11, and <3 or >11

Horizontal Axis (x-axis): Output Variability. The quality-assurance/quality-control features of a product design and maintenance program attempt to control performance variability. The horizontal axis of the matrix classifies the quality-assurance/quality-control performance results, expressed as probabilistic values, each stated as a percentage of occurrence—50%, 75%, 90%, 95%, and 99%.

As an example, Figure 3-1 shows the numeric matrix for nitrate with an evaluated nitrate-reducing component listed in the various classifications. The shaded blocks represent the classification pattern of the component. This classification example

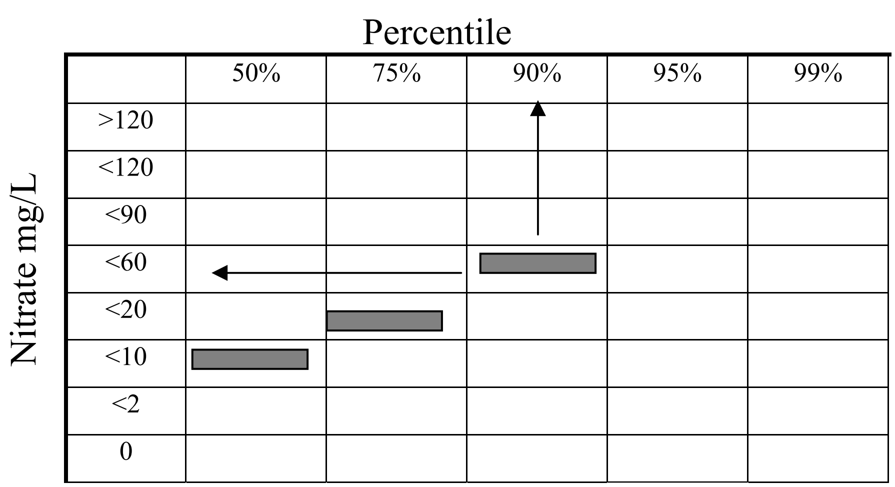

FIGURE 3-1. Numeric matrix for nitrate and an evaluated nitrate-reducing component.

shows performance levels for nitrate below 10 mg/L, 50% of the time, below 20 mg/L, 75% of the time, and below 60 mg/l, 90% of the time. When qualifying in one box, a component automatically qualifies in all boxes to the left and above, as shown by the arrows. The classification matrices are included as Appendix A in the Workbook.

The percentage values in the Classification Matrix relate directly to the reliability of the component performance—the higher the percentage, the greater is the level of reliability that can be expected.

There are many factors that contribute to system and component reliability; the Component Evaluation Process in the Model Code Framework assesses some of them. Quality assurance management practices also contribute significantly to the reliability level.

COMPONENT EVALUATION

A major purpose of the Model Code Framework is to help in standardizing the industry, especially in the area of product development. Since performance-based codes may require that components or system designs meet specific output-performance standards for constituents of concern in designated areas or under identified risk conditions, it is important to be able to qualify and quantify component or system performance. The standardizing process is critical if the decentralized wastewater-treatment industry is to advance. The Procedures for Administering Confined Treatment Component Database and Matrix and the subsequent listing of components to the Classification Matrices can address this industry need.

Historically, state and local jurisdictions have independently developed codes for decentralized wastewater-treatment systems without reference to a national model. For example, differences among state codes make it difficult to develop and market treatment products. In response to this, the Non-Soil Treatment Technology Database and Matrix (under development as an Appendix to the Workbook) will serve to classify components and bring them into a national forum, thereby avoiding the continual “re-invention of the wheel” in each jurisdiction.

Product verification and certification programs attempt to provide a level of assurance for the reliability of an evaluated component. While it is very challenging to provide assurances of reliability over long periods of time under variable operating conditions, that is what must be achieved to establish national acceptance of a “deemed to comply” solution to evaluation of system compliance with performance-based requirements. A system or component is considered to be robust when it can meet or exceed an adopted level of performance over time and variable operating conditions. The soil is a good example of a treatment component that has proven to be very robust when used appropriately.

THE SOIL COMPONENT

Decentralized wastewater-treatment systems are composed of a series of components, each with influent specifications and effluent expectations. The last component in the treatment train produces the final output of the system. Defining the necessary effluent quality for this output is the primary regulatory target of a performance-based code.

In the case of subsurface systems, the final effluent quality, after passing through the soil-treatment component, is difficult to measure. To avoid the necessity for measuring performance after the soil component, the Model Code Framework inserts a Soil-Component element that assigns treatment values to various soil characteristics. Once the final output effluent quality requirements are defined and integrated with the treatment information provided by the Soil Component, the system design decisions are directed to the upstream distribution system and pretreatment components to assure that the influent to the soil component has the appropriate characteristics.

Since the pretreatment components provide easier access for measurement of output performance than the soil component, those upstream components can be evaluated for treatment capabilities with given influent requirements. A system designer will then be able to link compatible components into a treatment train that includes the specific soil characteristics as a definable part Additional guidance and support documents are provided for using the Non-Soil Treatment Technology Database and Soil Component of the Model Code Framework.

POINT OF STANDARDS APPLICATION

In the case of subsurface systems, performance-based requirements are expected to be met following treatment within the soil component. While the defined soil-treatment boundary is the point of standards application, the Soil Component provides a mechanism to design backward from that final treatment boundary in the soil. In the case of surface discharge, where there is no expectation of soil treatment, the point of standards application is the system effluent from the final non-soil-treatment component.

Depending on the receiving environment for a surface discharge or a reuse/recycle system, or the influent requirements for distribution to a soil treatment component, the constituents of interest will vary. They may include the additional three noted in Table 3 (BOD_5, total suspended solids, and pH), other constituents such as FOG (fats, oils, and grease), and constituents of unique concern to a local receiving environment or the tolerance of a manufactured component. In all cases, the performance-based standard must be defined along with the point in the treatment train at which the standard is to be applied.

When performance-based standards are adopted, the point at which the standards are to be applied must be defined.

CHAPTER 4

SELECTING PERFORMANCE-BASED STANDARDS

One of the most critical objectives of the Model Code Framework is to encourage state and local authorities to use "informed choice" in the selection of performance-based standards. Performance-based standards for decentralized wastewater-treatment systems established at the state level are influenced by broad public health and environmental concerns related to the protecting the quality of drinking water, surface water, and groundwater. Yet those standards may be too restrictive or too lenient given local conditions. Statewide standards are often adopted with very limited information on the actual contribution and relative impact of contaminants from decentralized wastewater-treatment systems.

It is reasonable for states to establish performance-based standards for decentralized wastewater-treatment systems to achieve generalized levels of protection related to bacteria in swimming, contact and other public waters. On the other hand, numeric performance-based standards adopted and applied statewide for other constituents such as nutrients would likely be unreasonable due to the wide variation in local risk factors. The Model Code Framework anticipates that local performance-based standards for nitrogen and phosphorus would be adopted as needed for areas such as watersheds with established TMDLs for specific nutrients or targeted Coastal Zone Management goals, where there is community interest in protecting local resources at risk of nutrient impacts. It is considered appropriate that a local jurisdiction would adopt performance-based standards that reflect the level of risk or prioritization of resource protection within its area of jurisdiction.

A number of factors must be taken into consideration when selecting numeric performance-based standards. These include clear goals with realistic and achievable standards, responsiveness to local risk conditions, balance between risk reduction and costs, and practical means of measuring and assuring performance.

CLEAR GOALS AND REALISTIC PERFORMANCE-BASED STANDARDS

Goals must be clearly defined with a primary focus on public health and environmental protection. The process must serve to reveal ulterior motives—such as increasing/decreasing development—that should be addressed through other regulatory means. Many of these potentially divisive issues should be addressed through the alignment of aims discussed earlier in this volume.

Wastewater-treatment goals, and any proposed numeric performance-based standards, must be realistic and achievable. Are there reliable and affordable treatment systems available to meet the standards? Does the responsible regulatory authority have the capacity to assure owner accountability for system performance? It is important to consider these and other "reality checks" early in the process of considering the adoption of numeric performance-based standards.

RESPONSIVENESS TO LOCAL RISK CONDITIONS

In reality, the process of an informed-choice selection of performance-based standards will involve many other considerations. The U.S. EPA *Onsite Wastewater Treatment Systems Manual* (2002) devotes an entire chapter to establishing performance-based requirements for treatment systems. Many of the evaluation methods and tools for assessing resource vulnerability and the capacity of the receiving environment discussed in Chapter 3 of the U.S. EPA manual are technically complex. Two less complex approaches (Hoover, 1998 and Otis, 1999) are also presented and are more easily applied at the local level where there may be limited resources for dealing with risk.

The Hoover approach uses a vulnerability-assessment method that emphasizes public input. This approach is well suited to aligning the aims of the community during the process of selecting performance-based standards. The following three components of risk assessment and management are involved in the process:

1. Identifying ground-water and surface-water resources and the relative perceived value of each resource to the community
2. Assessing vulnerability of each resource with designations of low, moderate, high, and extreme vulnerability due to conditions such as soil properties and depth to limitations in the soil profile
3. Developing management-control measures dependent upon the value and vulnerability of each resource.

The second step reinforces the importance of small-scale risk consideration associated with site and soil evaluation for the proper siting and design of treatment systems. The third step emphasizes the importance of stricter quality-assurance requirements in response to a community's agreed need for increased protection of a vulnerable and valued local resource.

In another approach, Otis provides a simplified method of assessing the probability of environmental impact in the absence of extensive detailed data to support informed choices. This approach is presented in the form of a decision tree for estimating the relative probability of wastewater sources impacting water resources. The process allows decision makers and other community members to progress through a series of environmental-sensitivity assessment to assign a qualitative estimate of the relative probability of impact. Limitations on the data available to assess building density, well construction, travel time of treated wastewater, fate of groundwater discharge, and impacts to aquifers, surface water, and point-of-use resources will certainly affect the ultimate determination of relative impact. However, the process itself should assist participants in understanding the relative impacts and the rationale for varying performance-based standards.

Whether simple or complex, the processes for evaluating local risk and resource-protection priorities require that decision makers have access to adequate technical expertise to support those processes. That support may be in the form of a paid consultant, an experienced person from a nearby jurisdiction that has successfully adopted and implemented performance-based standards, an academic with access to the technical resources of a local college or university, or other knowledgeable personnel.

While the selection of performance-based provisions related to quality-assurance management practices (narrative performance-based standards) may require less technical support, a local jurisdiction considering the adoption of numeric performance-based standards for decentralized wastewater-treatment systems must access the necessary expertise to explore contributing factors and relative impacts.

Decision-makers need to have a good understanding of the conditions in their local community that will impact risk evaluation and the prioritization of resource-protection goals. The following is a short list of the types of conditions that may warrant local adoption of numeric performance-based standards or the application of state-level numeric performance-based standard:

- Shallow soil over rapidly permeable coarse sand, gravel, or bedrock
- Vulnerable unconfined or sole-source aquifer used for drinking water
- Shellfish harvest area bordering a high density of decentralizes wastewater-treatment systems
- Risk of contamination to surface waters that serve as recreational or economic resources for the community.

These or other types of conditions would need to be identified to evaluate risk and to identify resource-protection priorities. If there is a known or perceived impact to prioritized resources, it is important to establish reasonable evidence that decentralizes wastewater-treatment systems are a significant contributor. This step may involve some form of sanitary survey or system inventory for existing systems, or projections of increased risk or impacts from future development on available lots or large parcels of undeveloped land. In the latter case, the goal may be to manage impacts from anticipated higher densities of decentralized wastewater-treatment systems in sensitive areas.

When adoption of performance-based standards is under consideration, complementary or alternative management options need to be considered also. It may be that selection of alternative management practices would be more cost effective than establishing strict performance-based standards. If it is decided that numeric performance-based standards are necessary, assuring that adopted standards can be met will still require additional management practices. A full range of options needs to be considered as to effectiveness and capacity for implementation.

The guidance offered in the Model Code Framework cannot provide a step-by-step process for considering the adoption of numeric performance-based standards, since the process must be tailored to the resources of the local jurisdiction. The Hoover and Otis approaches provide relatively simple structures for such a process, and there are examples and case studies for both simple and complex approaches available from U.S. EPA and other resources. Considering the local adoption of numeric performance-based standards needs to be a well-informed and deliberative process with adequate resources and expertise available to evaluate risk, prioritize resource protection goals, provide a reasonable estimate of current and future impacts, and assess management options and capacity for implementation.

BALANCING RISK REDUCTION AND COSTS

There is an inherent desire to eliminate risk, but zero risk is economically impractical, as is selecting a numeric performance-based standard of zero. In reality, health and safety regulations attempt to reduce risk to a reasonable level at an acceptable cost. This balancing of risk reduction and cost cannot and should not be avoided in the process of considering performance-based standards.

Just as there are cost limitations and technical limits to the detailed determination of risk conditions, likewise there are cost and technical limits to the selection of performance-based standards. For example, it is not known if selecting 10 mg/l Nitrogen-Nitrate as an influent standard for soil treatment components in vulnerable areas will protect drinking water sources better than a standard of 20 mg/l, yet there are definite cost penalties associated with selection of the more stringent standard. Similarly, various levels of standards may be selected with small relative differences, such as TSS/BOD standards of 30, 20, 10, and 5 mg/l for new treatment systems used in defined areas of relative assumed risk. If existing systems, meeting only the least stringent 30 mg/L standard, are not shown to be causing an impact in the highest risk areas and the new systems meeting the various standards are not producing quantifiable improvements in the areas of concern, can the higher treatment system costs be justified?

Also of great importance in considering costs and benefits is the issue of relative contributions of contaminants from sources of pollution. If the nutrient contribution from decentralized wastewater-treatment systems is minimal relative to other sources of nutrient loading to the environment, it is not likely to be cost effective to implement nitrogen or phosphorus standards for these systems. On the other hand, a community whose economy is dependent on the harvest of local shellfish may be very willing to bear the cost of a strict pathogen standard for local wastewater-treatment systems if shown to be a major source of bacteria contamination and cause for closing the shellfish beds. When costs, benefits, and sources of pollution are being considered, the cost of a scientifically sound watershed study to identify and quantify contributing sources may be a worthwhile investment prior to adopting more stringent pathogen and nutrient standards for wastewater-treatment systems in a given area of concern.

If the cost is too high for protection against an unproven level of risk, the more stringent standard will be revoked, ignored, or selectively enforced. If costs related to stricter performance-based standards provide benefits related to a proven level of need for public health, environment, and local-resource protection, the added costs are very likely to be accepted. Concerns and issues related to fairness and equity in the adoption and enforcement of regulations were discussed earlier in this volume. Some of these issues can be resolved through a reasoned and balanced consideration of performance-based standards and supporting management options.

MEASURING PERFORMANCE

In the process of selecting performance-based standards, it is necessary to consider how compliance with the standards will be measured. Treatment-system performance can be measured or monitored in the various ways described earlier in this volume. Projecting and measuring impacts of selected performance-based standards at the watershed level, drinking water source, or other vulnerable resource is not as easily addressed.

When dealing with nutrients such as nitrogen and phosphorus, the measurement of greatest interest is mass loading, particularly when dealing with TMDL limits in stream segments or watersheds. When performance-based standards are selected based on nutrient concentrations (mg/l), those selected standards should be related to the anticipated mass load over a period of time. The volumes associated with the nutrient concentrations must be considered, as well as issues related to water conservation that may increase nutrient concentrations in effluents, yet not increase the nutrient mass loading to the environment. In addition, when reuse and recycling are being considered and those nutrients are being used as resources, the selected performance-based standards may not be applicable in measuring large-scale nutrient impacts from the systems.

More complex considerations also must be addressed when performance-based standards related to pathogen reduction are being selected. If decentralized wastewater-treatment systems are targeted as potential sources of bacterial contamination, as could occur in a TMDL study, it is important to have some assurance that other possible sources of pathogen or bacterial contamination have been considered. If decentralized wastewater-treatment systems are a minor contributing source, applying aggressive and expensive standards to those systems may not significantly reduce the contaminant load. Assessment of the sources of contamination and the sensitivity of the receiving environment, along with water-quality attainment and preservation goals, are critical to the selection of performance-based standards for wastewater systems.

PROMOTION OF AN INTEGRATED PROCESS

The complexity of an informed-choice process should not be a barrier to the selection of performance-based standards and adoption of performance-based provisions. As many working in watershed protection programs and integrated water resource efforts have come to realize, it is only through the exploration of interrelated issues by multiple affected and interested parties that truly effective solutions can be developed and supported. Approaches such as those presented in the U.S. EPA manual, as well as other approaches designed to address local conditions, provide a means for community members to evaluate their resources and align the aims of the community in the process. The Model Code Framework encourages and builds on this alignment of aims, providing the Classification Matrices, Evaluation Process, and Soil Treatment Tables as tools for the development and implementation of performance-based requirements and decentralized wastewater-treatment codes that protect human health and the environment.

The quality of management practices is as important as the quality of performance-based standards in assuring acceptable system performance—management practices, too, must be selected with consideration for existing or attainable local capacity and support. Chapter 5, Quality Assurance through Management, addresses that additional area where informed choice and the alignment of community aims are critical. Chapter 6, How to Use the Workbook, summarizes the code-writing process to manage risks to public health and the environment while beneficially aligning the interests and capacities of local jurisdictions and communities.

CHAPTER 5

QUALITY ASSURANCE THROUGH MANAGEMENT

Selection of adequate system performance-based requirements and allowing deployment only of systems that are expected to meet those requirements do not assure that the desired performance level will be met in practice. How the systems are operated and maintained—i.e., how they are managed—significantly affects the quality of their performance.

Quality assurance through management supports the primary regulatory premise that decentralized wastewater-treatment systems can provide a high level of public health and environmental protection if properly planned, sited, designed, and installed—and if operated and maintained with a proper degree of management oversight. “Management oversight” is used here in the broadest sense and should not be equated merely with maintenance oversight. The following quotation provides a comprehensive description of what management entails

> “Management of decentralized systems is implementation of a comprehensive, life-cycle series of elements and activities that address public education and participation, planning, performance, site evaluation, design, construction, operation and maintenance, residuals management, training and certification / licensing, inspections / monitoring, corrective actions, recordkeeping / inventorying / reporting, and financial assistance and funding. Therefore a management program involves in varying degrees, regulatory and elected officials, developers and builders, soil and site evaluators, engineers and designers, contractors and installers, manufacturers, pumpers and haulers, inspectors, management entities, and property owners. Establishing the distinct roles and responsibilities of the partners involved is very important to ensuring proper system management.”
>
> *—Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems (U.S. EPA, 20030*

Ideally, regulation should serve as a method of risk reduction and risk management. The Model Code Framework offers a flexible and responsive process that supports adoption of provisions for quality-assurance management that allow for risk-reduction decisions associated with decentralized wastewater treatment and the local environment. That structure clearly defines roles and responsibilities and provides mechanisms for accountability in terms of level of quality-assurance management and risk reduction. A comprehensive management program requires both community support and adequate regulatory/private sector capacity and professional competency.

Benefits derived from an effective management structure are first and foremost the protection of public health and the environment. A further purpose for adopting and implementing robust quality-assurance management is to ensure system performance and a sustainable decentralized wastewater-treatment infrastructure. A significant benefit to focusing on sustainability is the protection of property values through life-time investment in wastewater infrastructure by communities and individual property owners. Local jurisdictions may have many other reasons and anticipated benefits from the adoption of management practices that address the needs of their communities.

Voluntary National Guidelines for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems (U.S. EPA, 2003), provides five model management structures, each dealing with roles and responsibilities within a series of thirteen program elements. An in-depth review of those thirteen elements is provided in Chapter 2 of *Handbook for Management of Onsite and Clustered (Decentralized) Wastewater Treatment Systems* (U.S. EPA, Draft 2003). Referred to here as the U.S. EPA Management Handbook, this resource should be considered as a companion document to this chapter.

This chapter continues with discussions of quality assurance within the context of those thirteen subjects.

QUALITY ASSURANCE BY SUBJECT

1. Public Education and Participation

This Guidance book has previously addressed the importance of alignment of aims, which would be an expected outcome from a thorough program of public education and community participation. Public education should have a wide focus and target audiences, including outreach to the general public, policy makers, and those listed in the previous quotation concerning management. The benefits of an informed public are many, including the consumers' ability to make decisions regarding wastewater alternatives, to better maintain their systems, and to access competent service providers. An informed public is more likely to understand the need for management of quality assurance matters and consequently to support the adoption of regulatory provisions concerning such management.

Broad topics such as roles and responsibilities need to be openly presented to the community at large, clarifying the extent and limits of responsibility for each of the various parties. Presentation of such broad topics can lead to more specific discussions with targeted groups. An example of an outcome from these more targeted discussions would be the development of templates for disclosure language or disclaimers applicable to the varying service-provider roles.

Other topics, such as the importance of proper site selection and subsequent site protection for locations of decentralized wastewater-treatment system, should be addressed broadly but also targeted as critical responsibilities to property owners, developers, and contractors. While site selection, evaluation, and protection would be specifically addressed in the adopted code, early public education serves to create an understanding of the related code provisions and their importance to system performance. Many other methods of addressing this first element are detailed in the U.S. EPA Management Handbook.

2. Planning

Planning, land use, and environmental protection have recently found many common intersection points within communities facing water, wastewater, stormwater, and land-resource decisions. Even though wastewater treatment is a critical factor in land development, planners typically have had very little to do with determining how and where a community's wastewater treatment will occur. Planners are frequently left to react to municipal decisions on sewer-line extensions, connection policies, and allocation of new capacity. In unsewered communities, planners have historically relied, for better or for worse, on the ability of land to support conventional septic systems as a de facto method of regulating development.

The Model Code Framework attempts to neutralize this traditional use of septic systems for land-use control by supporting desirable land-use patterns that determine infrastructure decisions, instead of the reverse. For communities around the country working to achieve desirable land-use patterns, environmental goals, and sustainable infrastructure policies, managed decentralized wastewater-treatment options provide flexible tools for integrating wastewater treatment with land-use planning and environmental protection. This approach also challenges communities to first define community goals, and then consider wastewater-treatment solutions that best serve those goals, instead of allowing the infrastructure to determine land-use outcomes. Land-use plans supported by effective wastewater regulation allow the private sector to explore creative development patterns that meet defined communities goals.

For planners, and communities overall, the management of decentralized wastewater-treatment systems presents opportunities and challenges. Implementing managed decentralized wastewater-treatment solutions that serve community land use goals first requires adjusting traditional financial, regulatory, and administrative viewpoints established around centralized sewer systems. It also requires extensive work in educating citizens, officials, regulators, and funding agencies about alternative approaches, including potential benefits from reuse, recycling, watershed recharge, and the potential for integrating wastewater treatment with water-resource management. This education must start with recognition of all wastewater systems, ranging from publicly-owned collection-and-treatment systems to privately-owned individual onsite systems, as components of a community's infrastructure that should be responsibly managed to protect the environment and public health and to achieve water-quality goals.

It must be recognized also that desirable or undesirable development patterns may exist with centralized or decentralized wastewater options depending on the community's land-use regulations. While management of onsite and cluster systems offers a new tool for achieving land-use and environmental goals, major advances in wastewater-treatment technology have the potential to undermine those very same goals. Onsite technologies that treat wastewater to a very high degree can result in an extremely clean effluent that can safely be dispersed on almost any parcel of land. Some state and local codes may permit wastewater to be dispersed in areas much smaller than required by a conventional septic system. In the absence of adequate land use regulation and zoning, planners and local officials may see this as a threat to their communities rather than a benefit.

If used in a coordinated manner, the Model Code Framework can address existing and future wastewater-treatment needs through integrating wastewater-treatment approaches with other community planning and land-use goals. To maintain community support, there should be assurance that property owners' investment in managed decentralized wastewater-treatment systems is long term, with little risk of having to invest in central sewer within the expected life of the decentralized systems. There must be a commitment to adopting code provisions that promote investment in sustainable wastewater-treatment infrastructure and support community resource-protection goals but do not substitute for land use, planning, and zoning regulations.

Ideally, the adopted code would include quality-assurance management provisions that effectively interface with comprehensive community planning. Planning documents related to wastewater-treatment infrastructure must include or identify institutional mechanisms to insure that management programs will be in place to support development. Oversight, funding, and fiscal responsibilities must be addressed in such plans to provide a structure for the adoption of quality-assurance management provisions in local wastewater regulations.

3. Performance-based Requirements

Chapter 4 addressed selection of performance-based requirements. Previous discussions of regulatory and industry performance expectations are expanded in this chapter. Since performance-based requirements are at the core of the Model Code Framework, the reader is referred to related areas of the guidance for more in depth coverage of that subject.

The overarching issues that must be confronted when considering provisions for managing quality-assurance related to performance-based requirements are briefly discussed in the following paragraphs. In jurisdictions involved with Coastal Zone Management, TMDL implementation, or NPDES Phase II Storm Water regulations, these issues may already be familiar territory. However, the Model Code Framework can help any community establish priorities in both the planning and implementation of solutions for wastewater-treatment management that will help assure that performance-based requirements are met.

If regulation serves to reduce and manage risks associated with wastewater treatment, there must be some consensus as to what constitutes a risk before code provisions are adopted. In many areas “a little sewage on the ground” from a poorly performing system produces little cause for alarm until a nuisance complaint is filed during a neighborhood feud or a property transfer is delayed or canceled due to “onsite wastewater system malfunction.” Often efforts to more fairly assess system performance through routine operational inspections are rebuffed as intrusive, or, when accepted, the resulting inventory of system failures becomes a bewildering problem that the community is unprepared or unwilling to address.

On the other hand, efforts at risk reduction can be taken to the extreme, where the standards established attempt to eliminate risk rather than manage it, resulting in unnecessary expense, inability to achieve unrealistic performance-based standards, probable backlash from affected parties, and potential loss of community support. It is critical to build consensus for performance-based requirements that are protective of public health and the environment, and then codify quality-assurance management provisions that will equitably assure the their attainment. Where sensitive environments or conditions warrant stricter performance-based standards and the value of this added protection is understood by the community, more comprehensive quality-assurance management provisions will likely be accepted.

4. Site Evaluation

A site evaluation for a decentralized wastewater system should clearly define the conditions of both the site and the surrounding area to assess the level of risk. The site may range in size from a single lot for an individual home, to a subdivision for multiple homes, to a large parcel designated for a cluster system, to a small community or village assessing a decentralized wastewater-treatment system as an option. Assessment of the surrounding area should consider watershed-scale issues and related concerns such as source-water protection as well as relevant planning and zoning requirements. The extent of the site evaluation should be determined by the anticipated wastewater characteristics and the sensitivity of the site and surrounding area to impact from that wastewater. Since the level of risk will vary, the site evaluation process must be thorough enough to identify localized and surrounding risk factors in order to effectively direct the level of quality-assurance management.

Often with prescriptive codes, the site evaluation is merely an assessment to verify that local conditions comply with the requirements of a code that allows a prescribed or accepted system. It is assumed that compliance with code requirements will assure protection of public health and the environment. From state to state, there is wide variation in prescriptive siting requirements, such as vertical and horizontal setbacks. Also there is a growing body of evidence that such prescriptive provisions do not always provide the expected protection. This is of particular concern in more vulnerable populations and environmentally sensitive areas where local risk factors are not detected through a prescribed site-evaluation process.

In the case of a performance-based code, the site evaluation is the basis for the design of a system that meets the performance-based requirements dictated by the site, local area, and water-quality objectives. When performance is prioritized, the quality and breadth of the site evaluation is recognized as the critical foundation for system design and permit-approval decisions. Thus, quality-assurance provisions related to site evaluation in a performance-based code are of critical importance.

Adopted code provisions must address both the level of detail required in the site evaluation and the competency of the evaluator. The Model Code Framework committee determined that the use of the Soil Component for system design must be conditioned upon the level and quality of both the site evaluation and the soil evaluation. Specific guidance is provided with the options for site and soil evaluations and the performance of qualified professionals.

5. System Design, Treatment Component Selection, and Regulatory Review

The design of a system should be conducted in the context of site evaluation and performance-based requirements. This context must also serve as the basis for the regulatory review of a design, with the designer providing a clear justification for design choices based on the projected performance of the system related to regulatory risk-reduction goals. At the same time, there is need for design-review criteria that allow for designer flexibility and innovation.

A major dilemma facing the decentralized wastewater-treatment industry is the lack of understanding and agreement on the performance of natural, constructed, and manufactured treatment components. The wastewater-treatment capacity of natural systems, such as the Soil Component, is difficult to quantify due to inherent variability and the limited amount of scientific research conducted to support both regulatory and design decisions. The Model Code Framework provides a Soil Component measure that estimates soil treatment performance for varying conditions and distribution designs. It is important that both designers and reviewers understand the rationale and related science used to estimate soil-treatment performance when using the Soil Component.

Likewise, designers and reviewers need to understand the limitations and capacities of constructed and manufactured treatment and/or dispersal components selected for a proposed system design. For the most part, standards and evaluation protocols for an array of constituents of interest are not yet widely accepted or incorporated into state codes. Even in cases where a standard such as ANSI/NSF Standard 40 has been widely adopted for manufactured aerobic treatment units, actual field performance is still questioned, particularly in the absence of adequate quality-assurance management, and due to results from regulatory sampling programs that often do not apply statistically valid protocols.

The Classification Matrices and Component Evaluation process for treatment components and systems offers a mechanism for supporting existing and developing evaluation protocols and test centers, and allows for consideration of all available data. The variability and reliability of data need to be better understood in order to predict performance norms for existing and new treatment technologies. Predicting performance trends is important to insure that performance levels align with risk-reduction goals. Preliminary research to develop a statistical model to assess data along with a decision-support system to classify the quality of data sources was used in the development of the Component Evaluation process.

The Classification Matrices and Component Evaluation process do not establish performance standards, but rather provide information related to the level and reliability of performance data. The resulting constituent-specific matrices for an evaluated component or system provide a higher level of component-performance information for both industry and regulatory personnel. The underlying Evaluation Process database does not remain static, but allows for continuing input of performance data.

It should be recognized that standardization can limit design flexibility and potentially thwart innovative treatment solutions that may be provided through non-prescribed designs. There is a tension and potential barrier to implementing regulatory criteria for review of performance-based designs when the customer's interest in having maximum flexibility is presumed to be in conflict with the regulator's interest in assuring performance and protection of public health and the environment through standardization. Greater regulatory capacity and competency is needed to accommodate the review of non-prescribed designs. This also requires consumer and community support for the added costs to support an effective design-review process. In addition, adopting higher level quality-assurance elements related to operation permits, licensing, inspections, compliance monitoring, and reporting mechanisms can support the use of less-standardized non-prescribed designs.

6. Construction

System performance issues related to construction are primarily affected by the quality of the installation and thus the competency of the installer. Traditional pre-cover regulatory inspections have very limited value in assuring performance, and can only partially verify compliance with any prescriptive installation requirements. The U.S. EPA Management Handbook provides an overview of broader construction-related considerations including more thorough and flexible approaches to inspection. Other tools related to construction assurances include legal approaches such as contracts, insurance, and performance bonds. Of particular importance is the installer's attention to professional standards of practice and a system of accountability to assure adherence to those standards. NOWRA supports Standards of Installation Practice and national certification including the U.S. EPA-funded development of an installer credential program by the National Environmental Health Association (NEHA).

7. Operation and Maintenance

Ultimately, the homeowner or property owner is responsible for system operation and maintenance (O&M), whether by conducting duties personally, by contracting directly with a service provider, or paying service fees to a Responsible Management Entity (RME). Owner performance-based requirements must not be overlooked or relegated when evaluating quality-assurance code provisions related to O&M responsibility. While owner accountability is politically challenging, both at the state and local levels, it must be addressed if performance-based code provisions are to be effective in protecting public health, the environment, and the property values of all owners.

O&M must be considered in the design and construction of systems, with code provisions requiring safe and accessible maintenance and monitoring components such as risers, inspection/sampling ports, alarms, and control panels. As with construction, service-provider standards of practice and licensing/certification requirements are important quality-assurance tools. Quality-assurance provisions should require designers and manufacturers to provide effective O&M and monitoring components and training of service providers in their use. Manufacturer-qualified, designer-qualified, and/or management-program-qualified service providers could be an additional licensing/certification requirements for specified systems, components, or designs. They should be mandatory for non-prescribed system designs.

An operation permit is another quality-assurance management tool that is particularly important with advanced treatment systems and non-prescribed system designs. For effective O&M programs, operation permits must be renewable and revocable, and should be applicable to all systems permitted in a performance-based code. A time frame for operation-permit renewal linked to the frequency of inspection and/or monitoring should correspond to the level of risk associated with the system and site. The necessary compliance monitoring, corrective action, record keeping, and reporting associated with effective use of operation permits and other management tools are discussed under the quality-assurance elements that follow.

8. Residuals Management

For managed systems, it might be expected that more domestic septage and other residuals will be collected for treatment, reuse, or disposal than would otherwise be collected when property owners are not encouraged or required to have residuals removed from their systems. Planning for the projected volume of residuals to be managed and the availability of facilities or sites for treatment, reuse, or disposal must occur early in the process of considering quality-assurance management options. Also, the variation in the volume of the residuals generated by different treatment processes may be significant and should be assessed when technologies are evaluated. Stakeholders should be engaged in discussions concerning the responsibility for properly managing the residuals generated by their wastewater-treatment systems.

For example, a very questionable but well-intentioned requirement for septic-tank pumping every 3 to 5 year can result in significant and unnecessary increases in collected residuals, high costs for collection, and misuse of a limited capacity for treatment, reuse, or disposal. A more reasonable and equitable plan might be mandatory monitoring of scum and sludge volume, with collection required only if the sludge and scum layers exceed or are calculated to exceed (prior to the next monitoring event) specified limits based on tank design. This would result in lower volumes of collected residuals, lower maintenance and transportation costs, and less demand on the limited capacity of residuals receiving facilities or sites. Residuals management provides a good example of the need to project the impact of quality-assurance-management options in advance of selecting code provisions.

9. Training and Certification/Licensing

The importance of establishing measures of competency for site evaluators, designers, installers, O&M service providers, and inspectors is repeatedly discussed in the related management-program elements. The U.S. EPA Management Handbook provides details on various approaches and identifies national organizations, including NOWRA, that are engaged in training and certification/licensing efforts. The success of these efforts should be measured by the level of accountability attained—that should help to assure continuing public confidence in the performance of decentralized wastewater-treatment professionals.

Competency issues related to safety, ethics, and evolving standards of practice can be effectively addressed with oversight structures such as state licensing boards supported by national certification programs. To the extent that those resources are available, code provisions should require licensing and certification for all professionals so as to reduce the level of local regulatory responsibility in this area. That step would not reduce or remove local management responsibility for reviewing professionals' performance and subsequent reporting of misconduct or non-compliance with certification or licensing requirements.

Any system of accountability for professional performance must include code provisions that allow for revocation or suspension of a license or certification and enforcement of prohibitions or limitations on the scope of professional practice. Limitations should address such issues as owners conducting installation and O&M services, and prohibitions on professional practice in the absence of manufacturer, designer, or management training or qualification requirements. It is critically important that adopted code provisions define clear roles, responsibilities, and certification/education requirements for all parties, including owners and regulators, as well as industry professionals.

10. Inspection and Monitoring

Inspection and monitoring can be synonymous terms, but they are frequently viewed as describing, respectively, different levels of performance assessment. Inspection can be broad in application: regulatory-compliance review of system installations and operational-performance review, which is commonly associated with monitoring. Monitoring is sometimes considered to be limited to sampling for component-effluent quality, groundwater contamination, or watershed impacts, but it can include operational inspections for assessing system performance and/or performance of O&M service providers.

The use of sampling as a monitoring requirement for system performance should be limited because of the high cost of conducting effective protocols. When used as a compliance tool, great care must be taken in the selection of target parameters and the reasonableness of their application to performance. System designs with sampling requirements should only be permitted where there is a high level of regulatory and industry professional competency and accountability. Additional quality-assurance-management provisions and monitoring covering reuse of treated wastewater are addressed under Code Provisions and Code Language Options, Water Use Standards in the Model Code Framework.

In adopting code provisions related to inspections and monitoring, consideration should be given to their application to broader water quality regulations such as NPDES permits and other federal, state, and local water-program requirements. (Federal programs are detailed in the U.S. EPA Management Guidelines.) The code provisions should focus on proper operation and preventive maintenance to assure long-term system performance rather than on the more traditional evaluation for system failure or malfunction.

11. Corrective Actions and Enforcement (Accountability)

A code requirement or a program for quality-assurance management is only as effective as its provisions for assuring compliance. Compliance is often viewed narrowly as it relates to monitoring and inspections or to defined enforcement mechanisms such as nuisance-abatement and property-transfer provisions as described in the U.S. EPA Management Handbook. In developing and implementing an effective performance-based code, the issues of compliance, corrective action, and enforcement must be viewed in their broadest senses and must provide for systemic accountability in all matters covered by the code.

Two of the seven components underlying the Model Code Framework (See Chapter 1, Introduction) address both the broad and narrow issues of accountability:

3. Compliance monitoring and enforcement to ensure system performance is achieved and maintained;

7. Program reviews to identify knowledge gaps, implementation shortcomings and necessary corrective actions.

Some statutes and codes adopted at the state level incorporate broad accountability through state audits of local programs. In the absence of or in addition to the state oversight, local provisions should be adopted to establish an audit function. Building on the community involvement necessary for an alignment of aims in adopting a local code, it might be effective to assign this review function to a local advisory committee.

12. Record Keeping, Inventory, and Reporting

For an effective audit, there must be adequate records and reporting mechanisms that document the performance of the systems and their management. Record-keeping and reporting capabilities are even more critical in the day-to-day implementation of quality-assurance provisions. Tracking of owner/service provider/inspector compliance with monitoring and inspection requirements and recording system-performance information in an easily retrievable and useable format are necessities. Interactive web-based computer software is available for these purposes, but significant cost, capacity, and privacy concerns must be adequately addressed.

A more basic issue that, currently, is not adequately addressed is the actual inventory of systems by responsible jurisdictions. While absence of a basic inventory does not have to be an absolute barrier to considering performance-based code provisions, the deficiency must be addressed if potential risks associated with current conditions and practices are to be identified.

If quality assurance provisions are intended to reduce and manage risks to human health and the environment and address community interests or concerns, there must be an evaluation of the existing wastewater-treatment infrastructure at least in terms of its impact on the local community and surrounding environment. System inventories and lot-by-lot assessments can provide a strong foundation for local consensus building.

13. Financial Assistance and Funding

This last program element of the thirteen addressed in the U.S. EPA Management Handbook is related to the second element, Planning, in that it is essential to the issues of financial assistance and funding. The existence of an up-to-date, comprehensive wastewater management plan can significantly affect the allocation of limited resources to support a management program or to fund infrastructure projects involving decentralized wastewater-treatment systems. Good planning that results in access to funding will encourage public support for code goals.

A wide range of financial issues are associated with adopting performance-based provision. Since financing issues related to system management are addressed in the draft U.S. EPA Management Handbook, this discussion will focus on the need to assess economic impacts related to system performance-based standards and the inequity in the allocation of public funds for wastewater infrastructure. Both of these are public policy issues that need to be an integral part of the community-involvement process prior to code adoption.

A proposed statewide performance-based standard or code provision could be subject to formal cost-benefit analyses through statute, but it is more likely that an informal analysis will occur for code provisions that are adopted locally. This process may be a gross estimate of the costs of implementation balanced against the socio-economic gains from improved public health and environmental resource protection. As discussed previously, if the benefits are identified in advance of code adoption and serious effort is made to align the aims of the community, acceptance and financing of code development and implementation should be forthcoming.

A related financing issue is the inequitable manner in which public funding for wastewater infrastructure is applied. While significant tax dollars continue to be allocated for centralized wastewater-treatment infrastructure, institutional mechanisms are just starting to develop for allocating tax dollars to decentralized infrastructure. These mechanisms need to be explored and expanded at both state and local levels with attention to legitimate investment in private infrastructure that is providing public benefit. For example, an inspection program and system upgrades funded by homeowners in an older subdivision bordering a recreational water reservoir could provide significant benefit to the wider community in maintaining water quality. Had a sewer system been installed for those homes, a comparable level of water quality protection would likely have been paid for by some form of public funding. Public dollars channeled through local economic-development programs and state revolving-loan programs should support private infrastructure initiatives where public benefit is derived.

NOWRA AND U.S. EPA MANAGEMENT MODELS

One of the positive outcomes of local decision making is the creativity and home-grown solutions that can result. Many of the decisions related to the consideration and adoption of provisions for quality-assurance management will be strongly influenced by local capacity, but the process itself allows the local community to reevaluate that capacity. The range of options in the Model Code Framework and the the U.S. EPA Management Models provide decision makers with room to grow from more limited but manageable prescriptive codes to more flexible performance-based codes requiring more complex provisions for quality-assurance management.

The use of the terms “models” and “framework” is critical to understanding the intended application of the U.S. EPA Management Models and the NOWRA Model Code Framework. Neither is intended to provide a management program or code provisions that can be adopted wholesale with little adjustment to local conditions and capacities. It is expected and appropriate that performance-based requirements and quality-assurance provisions will vary even within local jurisdictions in relation to risk-reduction goals. It is through the process of fully considering the wide range of options presented in the guidance literature that true progress is made in understanding the value of a code and the benefits it will provide.

The remaining chapter of this Guidance book provides general guidance on the critical process of adopting state and local performance-based codes. The more specific guidance provided in the resource on Code Provisions and Code Language Options also assists in that process. The overall process challenges decision makers to clearly identify the roles and responsibilities of all involved parties and to give very careful consideration to the intended and unintended consequences of selected code provisions.

CHAPTER 6

HOW TO USE THE MODEL CODE FRAMEWORK

The Model Code Framework is both a process and a variety of resources offered by NOWRA to advance the field of decentralized wastewater-treatment through regulatory evolution and integration into broader water-resource management goals. Since those goals vary widely across regions and within states, the Model Code Framework process and its resources must be flexible and widely applicable. Building upon the principles discussed already, this final chapter suggests approaches to the use of the *Framework for a Code* processes and resources. NOWRA recognizes that the development, adoption, and implementation of a performance-based code versus a traditional prescriptive code will be a unique process for each state and local jurisdiction.

NOWRA, through the Model Code Framework, is (1) promoting state-level regulation that recognizes national resources for certification and performance verification of products and professionals and (2) suggesting a statewide structure for local adoption of performance-based requirements and code provisions. The ultimate goal is to achieve more responsive and integrated regulation that focuses on performance and supports sustainable wastewater-treatment infrastructure that is protective of human health and the environment.

FRAMEWORK IN ACTION

The challenge of implementing a flexible, locally responsive performance-based code will require regulators to be more engaged in horizontal community involvement processes versus more traditional vertical chain-of-command approaches. The Model Code Framework creates opportunities for involvement by regulators, decentralized wastewater-treatment professionals, the general public, local officials, and many others engage in the development, adoption, and implementation of performance-based codes. An alignment of aims is at the core of a successful performance-based code both in its initiation and its ongoing evolution. Just as the Model Code Framework has and will continue to evolve with input from participants in the process, state and local regulatory processes aimed at the adoption of performance-based provisions will only succeed and flourish with a strong foundation of stakeholders aligned and committed to the process. Ultimately they form the constituency that is required to gain the necessary political support for implementation.

Requirements for stakeholder participation should be adopted in a performance-based code.

There are numerous examples and potential mechanisms for engaging stakeholders in the regulatory process. They range from statutory requirements with explicit advisory-group responsibilities to informal education meetings in local communities. Certainly some methods are more effective than others, but a key function of any method must be the identification of common aims and purposes. Those decisions should be reached in the context of broader water-resource management and wastewater-infrastructure goals. The formal establishment of goals, purposes, and statements of intent is a critical precursor to the adoption of performance-based provisions (see Chapter 1, Goals, Purpose, and Intent).

Purpose statements must be incorporated into a performance-based code and provide a context for integration with other related water-resource and infrastructure-management goals.

PRINCIPLES IN ACTION

Integration of purpose statements with other related goals can only occur when the stakeholder base is broad and decisions-makers are well informed. The Model Code Framework is founded on "informed-choice" but recognizes that all of the necessary information for decision-making is seldom available, including much of the science or data for risk evaluation and models for predicting the outcome of risk-reduction strategies. In the absence of all the facts, it is necessary to make defensible decisions that are derived from a reasonable rational process aimed at meeting established goals. Unfortunately, these conditions set the stage for strong competing interests providing contrary "facts" that can stall or subvert the decision-making process. This is where a strong stakeholder group and committed regulatory personnel, with aligned aims and clear purpose statements, can be prepared to face the political pressures that will likely be brought to bear.

Purpose statements must be widely distributed early in the process and must remain in the forefront to focus the discussions and decisions in the code-development process.

Decisions related to effluent standards or performance requirements for wastewater-treatment systems are ripe for these types of controversies, and are complicated by the need to consider both local impacts and broad scale or even global impacts. A locality, for example, might experience a very low risk of nitrate contamination to local groundwater resources due to soil and geological conditions, yet nitrogen "runoff" may have a cumulative impact downstream. This is dramatically demonstrated by the nutrient impact from upstream watersheds in the "dead zone" expanding into the Gulf of Mexico from the mouth of the Mississippi River. Though wastewater systems are not likely to be a major contributor of nutrients in that case, some stakeholders may feel that any contribution needs to be considered. It is very important that the broad range of potential risks and impacts from multiple sources are considered, but it is just as important to ensure that the comparative risk and impact associated with decentralized wastewater-treatment infrastructure are not overstated.

Decisions on performance-based requirements are often made with incomplete information on impacts, risks, and all sources of potential contamination. The decision-making process demands transparent and balanced deliberation.

Any deliberation process that is crippled with insufficient information will arrive at imperfect decisions, resulting in regulations that will need continuous revision. Even with the implementation of performance-based provisions, installation permits will continue to be issued and wastewater treatment systems will continue to operate under imperfect performance management of systems, professionals, and regulatory oversight structures. Effective management systems will only evolve with a concurrent evolution in regulation, requiring a feedback mechanism that supports capacity building and accountability.

Performance-based codes must specify prerequisite capacity requirements for implementation of performance-based provisions. They must establish a mechanism for accountability at all levels—from treatment system and system owner, to treatment component and industry professional, to regulation and regulator.

NATIONAL, STATE, LOCAL IMPLEMENTATION

Table 6-1 provides an outline for the following discourse on the adoption of state and local regulation as it relates to the Model Code Framework and other national resources. The orientation of the decentralized wastewater-treatment field toward performance-based codes and management is clearly evident in the three U.S. EPA publications listed under ACKNOWLEGEMENTS on page ii and noted in Table 6-1. Such national guidance and related national initiatives under the Clean Water Act and other federal regulations recognize or support the use of managed decentralized wastewater-treatment systems as sustainable infrastructure that can help achieve goals for water quality, public health, and environmental protection. In most cases, those federal regulations and initiatives related to sanitary wastewater are implemented at regional U.S. EPA, state, tribal, or local levels of government.

The Model Code Framework focuses guidance on state and local jurisdictions. The first column of Table 6-1 lists items related to federal, state, and local jurisdictions that are applicable to the development of performance-based codes. The last box in that column lists three regulatory functions related to implementation, all of which will be discussed with emphasis on the accountability necessary for an effective performance-based code.

TABLE 6-1. From National Guidance to State Framework to Local Implementation.

REGULATORY LEVELS	RESOURCES
<u>National / Federal</u>: High Level Purpose Statements and Guidance Resources • Public health and environmental protection • "Fishable, swimable, and drinkable" waters • Protection of source water • Watershed approach to solutions • Integrated water resource management • *Onsite Wastewater Treatment System Manual* • *Voluntary National Guidelines for Management of Onsite and Cluster (Decentralized) Wastewater Treatment Systems* • *Draft USEPA Management Handbook*	• NOWRA Framework for a Cod*e* for Decentralized Wastewater-Recycling Infrastructure • National Credentials for Professionals (ex. NSF Inspector, NEHA Certified Installer, etc.)
<u>State Level</u>: Purpose Statements, Performance Requirements, and Regulatory Framework • State level advisory groups • Recognition and promotion of performance requirements • Adoption of state level code provisions • Recognition and adoption of national resources such as certification programs • Roles and responsibilities defined for all parties • Framework for local adoption of performance requirements and code provisions options • Promotion of local water resource planning (ex. Coastal Zone Management, State-certified 208, and Watershed plans) • TMDL development and implementation Implementation *****	• National Product Testing – Verification and Certification • Matrices and Evaluation Process in NOWRA Framework for a Cod*e* for Decentralized Wastewater-Recycling Infrastructure
<u>Local Level</u>: Statements of Intent; Local Adoption of Performance Standards and Code Provisions within State Framework • Ongoing outreach and public participation • Statements of intent as foundation for action • Risk considerations and local resources • Selection of performance standards and requirements • Assessment of capacity for implementation • Adoption of code provisions (within a state regulatory framework as applicable) Implementation *****	• • Support Document for the Soil Component in NOWRA Framework for a Cod*e* for Decentralized Wastewater-Recycling Infrastructure
*** Permit Review / Management Oversight** *** Education / Enforcement** *** Accountability / Feedback**	• Provisions and Language Options with Guidance NOWRA Framework for a Cod*e* for Decentralized Wastewater-Recycling Infrastructure

The second column of Table 6-1 provides a list of resources in the Model Code Framework and related national resources that can significantly support both state and local code-development processes. More detailed information on the Matrices and Evaluation Process, Soil Component Treatment Calculations, the Code Provisions, and Language Options is provided in other documents of the Model Code Framework and on NOWRA website. These resources have also been briefly introduced and discussed in earlier sections of this Guidance book. (Note: The Matrices and Evaluation Process and the Soil Component Treatment Calculations are still in development.)

All of these Model Code Framework resources and related national resources can be used to develop and implement state and local performance-based codes. The resources are expected to provide common ground for advancing the industry and regulatory structures that are necessary to support a well-managed decentralized wastewater-treatment infrastructure. The societal and economic benefits that can be derived from effectively managed decentralized wastewater-treatment infrastructure cannot be fully realized until the industry matures and regulations support an efficient management system.

STATE-LEVEL REGULATION

Just as states apply federal regulations and initiatives in a manner that takes into account the unique conditions within each state jurisdiction, it is reasonable to apply state regulations in a similar manner to accommodate the unique conditions found in local jurisdictions or regional areas within a state. While large watershed impacts reach beyond most political boundaries as noted earlier in the example of runoff to the Mississippi River, impacts from small-scale, localized wastewater-treatment systems are often most effectively addressed at the local level. Consistent with a local watershed approach, state-level regulatory requirements related to TMDL implementation and source-water protection can inform a state framework for adoption of local regulation.

> *A state-level performance-based code would include a framework of requirements to support the implementation of locally adopted regulations. They would include local effluent standards to manage decentralized wastewater-treatment systems, and thereby reduce their impacts on public health and the environment to a level of risk acceptable to the state and to local citizens.*

By adopting a regulatory framework that allows for locally adopted treatment standards, a state may appear to be relinquishing its responsibility and authority for water resource protection. That is not the case if the state framework includes provisions for a state oversight role that ensures local accountability. In many cases, the arrangement should enhanced water-resource protection due to the ability to apply stricter performance criteria locally if driven by higher localized risk conditions or identified sources of impact.

> *Strict effluent-performance standards applied statewide are inappropriate and often politically unacceptable, yet a statewide framework can support a state's water resource and public health protection goals though the over-*

sight of locally adopted performance-based requirements based on identified risk factors, existing impacts, and local resource protection goals.

The major wastewater constituents listed in the NOWRA Matrices include fecal coliform (bacteria), total nitrogen, nitrate, and total phosphorus. Most states have established performance-based standards related to bacteria using either or both fecal coliform and E.coli as indicator organisms. Given the proven public health risks associated with pathogens in wastewater, it is reasonable that statewide bacterial standards be established. In the case of phosphorus and the nitrogen constituents of wastewater, the aspects of beneficial use, varied soil-treatment capacities, and limited understanding of impacts and risk factors make it very unlikely that a statewide standard can be justified.

The Model Code Framework promotes limiting statewide performance-based standards for wastewater constituents to only bacterial or pathogen indicators. It recommends establishing a state-level requirement for local jurisdictions to identify local risk factors or known impacts from nutrient constituents of wastewater and to adopt local performance-based standards for specific nutrient constituents as necessary.

The West Central Florida Coast is one of the largest shellfish harvesting areas in the world. In many areas, Clearwater to Panama City Beach, the depth increases by only about 1 foot per mile. The city of Cedar Key in Levy County was just beginning to develop a subdivision and the shellfish industry wanted assurances that their industry would not be shut down as a result of excessive fecal contamination. In addition, the Florida Department of Health (FDOH) had added concerns about nitrogen in the springs emerging from the Suwannee River system. Levy County adopted an ordinance for onsite wastewater systems based on the following recommendations from FDOH:

- **Fecal Coliform (FC)**—The FC standard for shellfish harvesting areas is ≤ 14 FC colonies/100 ml. The goal should be BDL (below detectable limits).
- **CBOD5 (carbonaceous biological oxygen demand) and TSS (total suspended solids)**—FDOH Advanced Secondary Treatment Standards require that these pollutants each be maintained at equal to or less than 10 mg/l. Fecal coliform is a major concern in the shellfish harvesting environment. The lower the BOD and TSS of the effluent entering into the onsite wastewater system drainfield the better the chance of attaining very low fecal coliform colonies.
- **TN (total nitrogen) and TP (total phosphorus)**—It is unclear as to what levels of nitrogen and phosphorus would be detrimental to the shellfish harvesting environment. In confined estuaries excessive nitrogen and phosphorus can contribute to excessive underwater plant growth that will eutrophy under certain weather conditions, resulting in reduced dissolved oxygen and the potential to kill off other organisms. The treatment method designed to remove the CBOD5 and the TSS should also be designed to reduce the Kjeldahl nitrogen (ammonia and organic nitrogen) to nitrate. By recirculating the nitrate effluent back to the primary treatment the nitrate is driven off in the gaseous form and the TN is reduced. Nitrogen exists in normal domestic residential wastewater at levels of between 35–45 mg/l. Fifty percent reductions can be achieved by recirculation, and many of the advanced secondary treatment systems are designed to achieve between 10 and 20 mg/l of TN.

Phosphorus exists in normal domestic residential wastewater at levels between 6 to 10 mg/l. Phosphorus removal requires the addition of another treatment component and adds significant cost to the system. Unless proven necessary, it is not recommended that treatment for phosphorus be required. Since the treatment module is added to the system, it could be added at a later date if found necessary. Plant uptake will further add to the reduction of both nitrogen and phosphorus.

—Excerpts from Recommendations for OSTDS in Shellfish Harvesting Areas. Florida Department of Health - July 31, 2003

FIGURE 6-1. Florida Department of Health recommendations in shellfish harvesting areas.

Figure 6-1 presents an example of state-level regulation from the Florida Department of Health. It is not necessarily representative of the Model Code Framework approach, but does provide a context for this guidance topic. In the example, state-level standards for three wastewater constituents are discussed.

Other state regulations may specify BOD and TSS standards as indicators of pollution or, more often, as limits (e.g. < 30 mg/l of BOD/TSS) for soil-absorption-area sizing reductions based on allowable increases in soil loading rates. Even lower incremental BOD/TSS limits such as <5, <10, <15, and <20 mg/l have been adopted in some codes as performance-based standards for pretreatment-component effluent applied for variations in marginal soil or site conditions. In reality, variability in component performance may well exceed a 5 to 10 or even 20 mg/l BOD/TSS range. Moreover, it is not proven that a 30 mg/l of BOD/TSS effluent will significantly impact soil treatment any more than a 5 mg/l of BOD/TSS effluent, yet the cost to consistently meet a 5 mg/l standard could be very high.

When establishing state or local performance-based standards for effluent applied to soil, it is important to assess the benefit to be derived from adopting a very strict standard or incremental standards for wastewater constituents.

In any regulatory process, a legitimate mechanism for feedback and accountability for the purpose of the regulation must be established. Often a legislative statute will establish the scope of state regulation but will seldom specifically acknowledge the underlying intent or purpose. Advisory groups or technical panels may be established by statute or through agency ad hoc committees. These formal mechanisms for guiding or soliciting input into the state regulatory process must include defined roles and responsibilities that are accountable to a stated purpose. Establishing a legitimate means for assessing varied or conflicting positions can circumvent single-interest issues that may undermine the intended purpose of the regulation.

Formal feedback mechanisms, such as state advisory groups, provide accountability and responsiveness to stakeholder input and concerns and are a necessary component of a performance-based code.

Another mechanism for regulatory accountability at the state level is integration of regulations that have a common purpose, such as Coastal Zone Management plans, TMDL development and implementation, source-water protection efforts, and 208 wastewater planning. Codes for decentralized wastewater-treatment systems should support the broad goals of water-resource protection and water- and wastewater-infrastructure plans, but should also aim to inform these related regulatory processes of the potential benefits derived from the use of decentralized wastewater-treatment infrastructure.

A state-level performance-based code should be developed and implemented in a manner that clearly defines and establishes its contribution and relevance to broader water-resource and public-health goals and should incorporate code provisions that are consistent with related state-level regulations.

State-level regulation can recognize and utilize national resources that will provide efficiencies in areas related to the performance of products and professionals. The Matrices and Evaluation Process in the Model Code Framework provides a classification resource that can be used as a screening mechanism in state-level product approval. National certification and training programs can supplement and support state professional credentials requirements.

Incorporation of national programs that complement state performance and accountability requirements for products and professionals is strongly recommended to conserve limited state funds.

A state-level framework needs to establish clear roles and responsibilities for decentralized wastewater-treatment system owners, management entities, service providers, regulators, and any other parties engaged in complying with a pertinent performance-based code. Often homeowners, property owners, or off-site system owners are not held accountable for the ongoing performance and operation of the wastewater-treatment system—they are only held accountable when a failure or malfunction is identified. Likewise, the ongoing performance of industry professionals, including private and public-sector individuals, is seldom reviewed unless a significant problem occurs.

A mechanism for ongoing or periodic performance review of wastewater-treatment systems, system owners, and industry professionals (including regulators) must be included in a state-level performance-based code.

The structure of requirements for supporting implementation of locally adopted regulations was introduced in the first paragraph of this section, State-Level Regulation. A state structure should promote code options that allow local jurisdictions to adopt code language that meets the purpose and intent of the state regulation. A series of code options, such as those suggested in the Model Code Framework, establishes a potential progression of local regulations that could be adopted according to available management capacity and level of risks in the local jurisdiction. With a performance-based code, the state structure must promote local flexibility but not to the extent that rigid prescriptive language finds its way into local code elements, limiting solutions for effective decentralized wastewater treatment.

A state structure should be flexible enough to accommodate local amendments to code provisions so long as they promote the purpose and intent of the state code. A state code must be responsive to local conditions yet prohibit local prescriptive requirements that would undermine the benefits and cost-effective use of decentralized wastewater-treatment infrastructure.

State jurisdictions could expand on existing state level code provisions by adding or allowing multiple options or means to meet performance goals or requirements that are responsive to purpose statements incorporated in the state code. State codes can incorporate criteria that would allow local jurisdictions to adapt applicable state code provisions as needed, conditional upon state goals and requirements being met and demonstrated local capacity to implement the adapted code provisions. When allowing local flexibility, state statute and state codes must establish state oversight responsibility and authority for local code review and local program audits. Such mandatory accountability mechanisms are necessary to assure that the broader water-resource and public-health responsibilities of state and federal regulatory authorities are being met.

State regulatory performance-based requirements should be clearly stated in the code and should allow for local flexibility in meeting state requirements subject to demonstrated local capacity and mandatory state review and audit.

LOCAL ADOPTION OF REGULATIONS

Much has already been said about the importance of stakeholder involvement. Ongoing outreach and public participation efforts at the local level are most critical and effective at reaching the regulated community. Informed citizens become more receptive and responsible customers in communities where added cost may accompany implementation of a decentralized wastewater-treatment infrastructure. A receptive, informed community is more likely to adopt a long term view where anticipated benefits may justify added costs. It is important that these benefits be well defined at the start of a performance-based code process and that clear statements of intent include the value of those benefits to the community at large. Local stakeholder groups will always consider the costs associated with proposed regulations, and will likely demand that "any extra cost" be proven necessary.

Well defined and clearly articulated statements of intent that address anticipated costs and benefits and are aligned with community interests and resource-protection goals must serve as the foundation for successfully adopting and implementing local performance-based codes or provisions.

The statements of intent must remain in the forefront of all subsequent code-adoption processes and serve as the benchmark for decision-making. Attention to cost does not detract from decisions if it serves to identify real barriers to successful implementation of proposed code provisions and supports resource allocation for necessary capacity building. The cost of added capacity to implement an adopted code will ultimately come from the consumer either directly as operation permit fees, service contracts, or responsible management entity charges or indirectly though tax-supported budget allocations.

Local capacity must be integrated into the cost/benefit decision process and balanced against the stated intent of proposed regulation. In this way, more creative approaches to implementation, such as an expansion in a managed private sector role, can be explored.

Nowhere is it more critical to have stakeholder participation than in the evaluation and relative ranking of risk, impacts, and local resource-protection goals. Methods of gathering input and assigning levels of concern are varied, with some described earlier in this Guidance book. Whatever the method used, it must be a broad-based, inclusive process that is recognized as legitimate to the participants and the community at large.

The outcome of an evaluation and ranking process must be specific enough in identifying risks, impacts, and resource-protection goals to allow for subsequent decisions on proposed performance-based requirements and to determine if there is a need for the adoption of local performance standards for constituents of concern.

The evaluation and ranking process must include scientifically defensible data from varied sources, such as TMDL and other watershed studies, documented sewage nuisance locations and densities, soil and geological conditions, source-water protection boundaries, water and wastewater infrastructure needs, and recreation and economic values associated with local water resources (i.e. lakes, rivers, streams, wetlands, and groundwater). Tools such as GIS can help participants visualize a complex integration of factors that will affect decisions. In some areas, there may be sufficient data, financial resources, and expertise available for development of a computer model to project potential impacts from wastewater constituents.

In gathering and analyzing available data on potential sources of wastewater impacts, attention must be given to the relative level of risk compared to other sources of contributing pollution. In other words, care must be taken to not overemphasize the impacts and risks associated with decentralized wastewater-treatment systems in order to implement provisions or standards where none are needed.

Nutrients provide an example of a sometimes misplaced concern and overreaction in addressing impacts from decentralized wastewater-treatment systems. Even though nitrogen, particularly nitrate, and phosphorus are getting much more attention in the research on component- and soil-treatment capabilities, there are areas of the country where those constituents do not pose a risk. Where the risks and impacts are real or highly probable, as in localized phosphorus loading to inland lakes bordered by porous soils, nitrogen loading in coastal areas, and nitrate contamination of vulnerable groundwater resources, adoption of appropriate performance-based requirements should occur.

In cases where constituent-specific performance-based standards are adopted, code provisions must be very clear about the purpose of the performance-based standard and assure that it is applied only in areas with identified risks or impacts.

As noted in the previous section on state-level regulation, local code-development and -adoption processes should ideally occur within a state framework. In some cases, a state structure may not exist, such that local jurisdictions may chose to apply directly a national framework such as the Model Code Framework and refer to performance-based codes that are developing in other states and locales.

When a state performance-based code is in place, consistent accountability across the local jurisdictions and effective recognition of local variations in risk and capacity is likely to occur, along with a reciprocal flexibility and responsiveness at the local and state levels.

THE CODE IN ACTION

No matter how well state and local codes are developed and adopted, the true test of their effectiveness is in their application. While jurisdictional authorities and owner and professional responsibilities may be well defined, it is the ultimate performance of each individual—reviewing a design, manufacturing a component, providing service, or complying with a permit—that will determine the overall success of a decentralized wastewater-treatment infrastructure.

Regulation must establish the individual level of accountability within a structure that will not overburden the process.

Permit Review / Management Oversight

Individual permit review is often identified as a regulatory bottleneck or a barrier to legitimate design approval. In the former case, where regulator reviewers are overloaded and public budgets will not support more regulatory staff, there are ways to utilize private-sector resources to assist in permit review. To avoid the latter case where the process is a barrier, permit review must incorporate flexibility and competent reviewers so that both non-prescribed designs and those with components "deemed to comply" can receive legitimate consideration in a timely manner. Very prescriptive regulatory design criteria can be a cause for delay of permit approval or can result in outright denial. As an example, strict application of conservative design-flow rates can create a barrier to permit approval for cost-effective legitimate designs.

Figure 6-2 relates to the foregoing example and suggests an approach that could allow for more flexible review criteria. The Model Code Framework Committee had numerous discussions concerning alternative approaches to the determination and designation of daily design flow. While "Guided Prescription" is not a term or approach specifically addressed in the Model Code Framework, the summary provided in Figure 6-2 promotes the use of rational criteria for design review.

Responsibilities associated with design review require more expertise and judgement (i.e., human resources) than management-oversight responsibilities that are amenable to implementation through the use of computer database programs, internet interfaces, and system telemetry resources. These tools are becoming more common in applications for management of decentralized wastewater-treatment systems and will be critical to the implementation of a responsive regulatory structure.

Both the availability of information-technology resources and the competency and capacity of human resources need to be assessed in advance of adoption and implementation of code provisions intended to assure the fair and effective application of oversight and management requirements necessary for the implementation of performance-based codes.

This approach parallels other aspects of the Model Code. For example, a "prescription" for a certain type of treatment unit could be approved, but it would be based upon a rational analysis of how a system meeting that "prescription" would perform under managed conditions. In a similar fashion, design flow rates could continue to be set by an adopted prescriptive formula, but the adopting authority would provide an analysis of the factors to be input to the prescription. The selection of design flow rates would then become an "informed" decision rather than merely following a prescription for which the original rationale may be lost over time. A "Guided Prescription" approach to setting design flow rates would require that a designer provide a review and discussion of what might be reasonably expected to be the contributing population related to facility characteristics and what might be reasonably expected to be the per capita flow rate. The following criteria could be adopted by the regulatory authority:

- A designer can use the adopted prescriptive formula for daily design flow or offer an analysis on the probability of a designer-recommended daily design flow being sufficient under prescribed specifications for occupancy and per capita flow rates. For example, one could show that if the occupancy prescription was that the number of people is presumed to be one plus the number of bedrooms, statistically this occupancy would be exceeded X% of the time, or if there is a prescribed per capita flow rate, statistically this rate would be exceeded X% of the time. The designer would need to make a case that the designer-recommended daily design flow would very infrequently exceed the prescribed values or formula for daily design flow. The adopting authority would determine what level of risk (probability of exceeding daily design flow) should be accepted versus the cost of over-sizing some portion of the system. This approach could allow for design flow rates that are not so routinely excessive, as is often the case with inflexible daily design flow volumes prescribed in many codes.
- It would be important for the adopting authority to have criteria for peak flow versus average flow because it impacts upon risk. A system that provides flow equalization could be fully or partially immune (depending on the details of the flow equalization scheme) to flow peaking, so that any "safety factor" for peaking would be less relevant. A system where the flows are simply passed through as received would not only need to consider the average flows, but also a multiplier for peaking. Thus, the designer's case for the selected daily design flow must include a discussion of how the system design can or cannot cope with peak flows, and what that implies for the proposed design flow rate.

Under this approach to setting design flow rates there would need to be a caveat that the designer is always responsible for taking into account any information available that may indicate flows from the facility in question that would be "out of bounds" relative to the prescribed design flow rates.

—Summarized from a discussion of the NOWRA Model Code Framework Committee, September 2003

FIGURE 6-2. A "Guided Prescription" approach to setting design flow rates.

Education and Enforcement

Education and enforcement are complementary regulatory responsibilities, both being necessary to ensure implementation and compliance. The process in the Model Code Framework promotes education and "informed choice" as effective proactive approaches, reserving enforcement action as a method of last resort that is critical to preserving a fair and equitable application of regulation. An educational process that explains the purpose and requirements of regulations to the appropriate responsible parties can foster cooperation and compliance. While "ignorance of the law" may not be a defense, it most certainly is a reflection on the regulatory authority's efforts to educate the regulated community.

> *Targeted educational campaigns that "inform" the regulated groups of their roles and responsibilities followed by mechanisms to assess overall accountability and compliance set a foundation for fair and equitable enforcement.*

Manageable mechanisms for accountability in areas such as system-operation oversight and professional-credential requirements must be in place to support effective enforcement programs, but just as important is the commitment to exercise enforcement responsibility. The Model Code Framework holds that the local adoption of code provisions promotes enforcement because it is more likely that the regulations will be perceived as reasonable and applicable to the local jurisdiction conducting enforcement. This certainly is contingent upon an early alignment of aims, an ongoing public participation process, and educational efforts to "inform" the regulated community.

Failure to enforce code provisions, whether from lack of resources or lack of political will, undermines public trust in the regulatory process and reduces the value of community-engagement efforts.

As expected in the adoption of local code provisions, methods of conducting oversight and enforcement also must pass a "reasonableness" test. One failing example is the regulatory use of statistically invalid sampling programs for compliance monitoring of installed systems. Not only is there significant cost associated with such an inappropriate approach, but its use is not "reasonable" because it does not accurately judge performance. The monetary cost can extend well beyond sampling and analysis when results lead to expensive unjustified enforcement action and unnecessary system upgrade or replacement. The non-monetary cost is the loss of public support and credibility in an adopted management program.

To be sustainable and meet community public health and environmental protection goals, oversight and enforcement mechanisms must balance costs and benefits and be judged fair and reasonable by the regulated community.

Accountability / Feedback

Just as a state regulatory structure that allows adoption of local code provisions should incorporate processes for auditing local jurisdictions, so too must it include a feedback mechanism for local jurisdictions to propose changes to the state regulations. In turn, the local jurisdiction should gather input from its local stakeholders and share this feedback with state regulatory authorities.

Local lessons learned must be included in a formal feedback loop to better inform the process for periodic review and improvement of state and local regulations. Feedback should specifically address management goals for decentralized wastewater-treatment systems and related regulations governing public health, environmental protection, water quality, and water-resource infrastructure.

It is becoming more common for governmental bodies to establish accountability and feedback processes for judging the effectiveness of regulation. This positive step supports the intent of a performance-based code to be responsive to advances in technology, management systems, and professional skills. More importantly, effective political and regulatory processes for feedback and accountability are needed to respond to any evidence of new impacts or emerging health and environmental risks.

> *The real value of a performance-based code rests in the necessity for accountability and a responsive regulatory structure that addresses treatment systems, professionals, and organizations for the purpose of managing risk to public health and environmental resources.*

By way of conclusion and summary, recommendations to be found in the Model Code Framework for the assignment of national, state, and local responsibility related to the regulation and management of a sustainable decentralized wastewater-treatment infrastructure are presented in Figure 6-3.

The Model Code Framework provides a process and resources for advancing the management of decentralized wastewater-treatment infrastructure and promoting its regulatory evolution and integration into broader goals for water-resource management. Within the primary goal of protecting public health and environmental resources, the Model Code Framework focuses on the following objectives:

- Provide an affordable decentralized wastewater-treatment method and management structure for any site where local and state law allow development

Responsibility	National	State	Local
Code Framework Development and Implementation	NOWRA Code Framework Committee	Adopt Code Framework provisions and resources, making state level choice decisions	Adopt Code Framework provisions and resources within state framework, making local level choice decisions
Professional personnel classification, evaluation and certification	National Organizations: NOWRA, NEHA, NSF, etc.	Require certification for major skill areas statewide. Adopt and recognize national certifications statewide	Accept state adopted national certifications – modifications at local level prohibited by state code.
Evaluation, classification and listing of treatment components	National centers for evaluation and certification (ETV, NSF, etc.) & NOWRA Component Classification Matrices	Recognize NOWRA classification program for treatment components	Accept state recognition of treatment components – no modification at local level permitted
Adoption of treatment performance requirements	NOWRA Classification Matrices, Soil Treatment Tables, and guidance documents serve as resources	Set minimum performance requirements for risks that are statewide & support integrated approach (watershed, TMDL, etc.) for local risk consideration	Adopt treatment performance requirements based on site and area risk factors including capacity for implementation

FIGURE 6-3. Recommendations for assignment of responsibility.

- Assess local risk and cost/benefit of decentralized wastewater-treatment solutions
- Include management assurances to extend system life and preserve property values
- Support adoption of reasonable and responsive state and local performance-based codes
- Ensure professional competency through national certification programs and training
- Provide a classification process for treatment components at the national level to replace unique local and state product-evaluation programs.

In recognition of variation across regions and within states, the process in the Model Code Framework is intended to be flexible and its resources widely applicable. The process and resources will evolve over time.

APPENDIX A

The National Onsite Wastewater Recycling Association, Inc.

Web Site: http://www.nowra.org

MODEL FRAMEWORK FOR UNSEWERED WASTEWATER INFRASTRUCTURE

INTRODUCTION

The National Onsite Wastewater Recycling Association (NOWRA) was founded in 1992. Its principal purpose is to educate and serve its members and the public by promoting sound federal, state, and local policy, improving standards of practice, and advancing public recognition of unsewered wastewater infrastructure. To achieve this mission, NOWRA has developed a model framework. This framework is structured as a guide in which to establish future national policy for onsite systems and NOWRA's complimentary programs and activities.

THE GOAL OF THE MODEL FRAMEWORK

Achieve sustainable development while protecting human health and environmental quality.

NOWRA believes that attaining this goal will provide enduring opportunities to our members and enhance the quality of living for the public. Traditional "prescribed" models cannot achieve the goal of sustainability. In fact a "prescribed" model is detrimental to achieving such a goal because it largely ignores local environmental sensitivities and thwarts innovation. Furthermore, a "prescribed" model approach is unable to adequately balance human health and environmental protection with economic development pressures.

WHAT IS THE MODEL FRAMEWORK?

The Model Framework is a number of critical components necessary to achieve the Goal. It is based on achieving performance excellence in all components affecting the onsite wastewater treatment system; performance of the treatment system, system owner, system practitioners (site evaluators, designers, installers, pumpers, operators, and regulators), and system regulatory agencies.

The Model Framework consists of seven components:

1. Performance requirements that protect human health and the environment;
2. System management to maintain performance within the established performance requirements;
3. Compliance monitoring and enforcement to ensure system performance is achieved and maintained;
4. Technical guidelines for site evaluation, design, construction, operation and acceptable prescriptive designs for specific site conditions and use;
5. Education/training for all practitioners, planners, and owners;
6. Certification/licensing for all practitioners to maintain standards of competence and conduct; and
7. Program reviews to identify knowledge gaps, implementation shortcomings and necessary corrective actions.

Collectively, these components create a total system of performance excellence. While each stands alone in its own function, NOWRA believes diminution of one within the system prevents the goal of sustainable development from being realized. Therefore, NOWRA is promoting this framework inclusively and each of the principles equally.

HOW THE COMPONENTS WORK

Performance Requirements: The Model Framework recognizes that onsite wastewater treatment systems are not 'disposal' systems but are systems that discharge treated and cleaned wastewater to ground and/or surface waters. This model recognizes that sensitivities of water resources to treated wastewater discharges vary and that water quality standards therefore should reflect the specific site characteristics. Further, performance requirements must be specific and measurable to allow credible performance compliance monitoring of all systems. Methodologies for determining appropriate water quality performance requirements must be established by regulatory agencies based on risk management procedures.

System Management: To maintain system performance within the established performance requirements, perpetual management of all systems must be provided. Management may be provided by the owner or through third parties that may be private, quasi-public, public/private, or public. Ultimately, all treatment systems should be maintained on an equivalent basis. Perpetual management should be provided in a manner that the treatment system and its servicing is transparent to the user. It should not matter to the user what type of system or management is needed for the property.

Compliance Monitoring and Enforcement: Governmental regulatory agencies must have continuous oversight of the performance of all onsite wastewater treatment systems. The system owner (either property owner or management district) is responsible for maintaining compliance. Renewable *operating permits* issued to the responsible party (property owner, management district, or sanitary/utility district) by the governmental agency occurs only after acceptable performance is documented, and is the more reliable method of regulatory surveillance of performance.

Technical Guidelines: Guidelines for site evaluation, design, construction, and operation are critical aids to owners and practitioners to inform them of acceptable methods for achieving compliance with performance requirements. These should include prescriptive designs that are capable of meeting the performance requirements under specific site conditions and intended uses. However, they are only optional designs and are not intended to be required designs. Owners may submit alternative and/or innovative designs for approval provided the owner assures performance to meet the established requirements.

Education and Training: The most critical element to ensure that consistency is achieved is Education. Education of the public and college and technical school students is needed. Also, a training component to ensure that all practitioners are knowledgeable in standards of practice is essential.

Licensing/Certification: Licensing/certification of all practitioners is the fundamental link to maintain high standards of competence and conduct. Continuing education is a central tenet of this Model Framework for licensing and certification programs. The licenses/certifications should be limited in term but renewable following documentation of minimum continuing education requirements. Also, they must be revocable if the holder is found to be negligent or fraudulent.

Program Reviews: This Model Framework must be grounded in good science, engineering, appropriate statutory authorities and sound management practices. Shortcomings in the management programs must be identified to direct needed and appropriate research, enabling legislation, education, etc. necessary to implement appropriate corrective actions to achieve our goal of sustainable development.

NOWRA'S DIRECTION

NOWRA intends for this Model Framework to be the "national" Model in building and maintaining onsite wastewater infrastructure. NOWRA intends to use this framework to identify and plan programs and actions that are beneficial to its members and the public.

"Making the Difference in Onsite"