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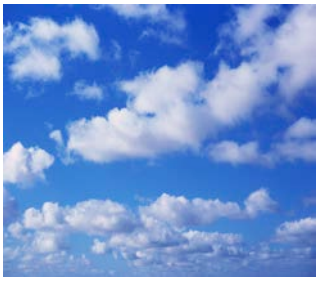

Process Evaluation of Total Coliform Rule Implementation in Minnesota and Texas

Promoting Environmental Results

Through Evaluation

Acknowledgements

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EXECUTIVE SUMMARY

ES.1 PURPOSE AND APPROACH

The Total Coliform Rule (TCR) (40 CFR Parts 141 and 142), published on June 29, 1989, is a key component in the U.S. Environmental Protection Agency's (EPA's) program to protect drinking water quality. The rule applies to all of the approximately 155,000 public water systems (PWSs) in the United States, which provide drinking water to 292 million consumers. The rule is designed to protect consumers against waterborne illness related to E. Coli and fecal coliform. Exposure to these organisms can result in adverse gastrointestinal health effects and can lead to even more severe effects in sensitive populations such as children and the elderly. The rule sets maximum contaminant levels (MCLs) for total coliform and fecal/E coli in drinking water and requires systems to monitor for total coliform and to report monitoring results to EPA or to states with authority delegated by EPA.

This report presents the results of a process evaluation of TCR implementation in Minnesota (Minnesota Department of Health) and Texas (Texas Commission on Environmental Quality). The evaluation focuses on:

- State-level resource allocation in implementing the TCR.
- The process that each state follows in implementing the TCR and to what extent intended implementation is mirrored in actual implementation.
- The impact of various factors on program implementation in each state.
- Performance measures used by each state to track performance and to what extent those measures can be improved.
- Outcome data related to implementation of the rule in each state.

ERG used a case study approach to obtain in-depth information about implementation of the TCR in each state. ERG primarily used data obtained through detailed site visits at each state and from the EPA Logic Model Reporting Tool (LMRT). ERG conducted a thematic analysis of these data to provide information to answer the evaluation questions presented below.

This concentrated review is meant to provide each state with new insights into its program, as well as an opportunity to learn from one another. The purpose of this evaluation is not to compare the two states, however. Rather, this report treats each state separately but presents information in parallel.

The evaluation questions for this project are:

(1) Using relevant categories of expenditure how are state FTE/$ allocated across the program activities to implement the TCR provisions?

(2a) How do the following factors affect program delivery related to MCL violations?
- State organizational structure
- State resources
- Other factors in the state's span of control.

(2b) How do the following factors affect program delivery related to monitoring and reporting (M/R) violations?
- State organizational structure
- State resources
- Other factors in the state's span of control.

(3a) What processes/procedures does the state follow with respect to MCL violations?

(3b) Regarding MCL violations, is the state implementing the TCR in the way that it intends?
(3c) What processes/procedures does the state follow with respect to M/R violations?
(3d) Regarding M/R violations, is the state implementing the TCR in the way that it intends?
(4a) What performance metrics are being used by the state to measure the efficiency and/or effectiveness of TCR implementation?
(4b) What recommendations can be made for improving the performance metrics being used by the state to measure efficiency/effectiveness of TCR implementation?
(5) Based on the recommendations in Question 4b (i.e., the performance metrics that the state should use to measure efficiency/effectiveness of TCR implementation) and on the best available data, what is the state's current level of efficiency/ effectiveness in implementation of TCR?

Questions 2a and 2b and questions 3a through 3d focus on responses to MCL and M/R violations. States perform a much broader set of activities beyond responding to MCL and M/R violations, however, such as performing violation prevention activities and responding to total coliform (TC) positives that are not associated with violations. Thus, in performing the analysis for question sequence 2, we look broadly at how various themes and factors, identified through this project, affect the delivery of the TCR program in each state. Additionally, for question sequence 3, we look broadly at whether each state's actual implementation meets it intended implementation, not just focusing on MCL or M/R violations.

For each state, we present findings related to:

- Resource allocation (evaluation question 1)
- Comparing intended to actual implementation (evaluation questions 3a through 3d)
- Factors affecting implementation (evaluation questions 2a and 2b)
- Performance measurement (evaluation questions 4a, 4b, and 5)
- Outcomes associated with program implementation

Finally, we present our recommendations for each state.

ES.2 MINNESOTA

Minnesota's Department of Health (MDH) Drinking Water Protection Division (DWP) has the primary responsibility of implementing the TCR in Minnesota.

ES.2.1 Resources

Information provided by MDH indicates that it has 98 staff who implement the TCR program in some capacity. All of these staff support other drinking water requirements, however, in addition to the TCR program.[1] Based on data provided by MDH during ERG's on-site visit, ERG estimates that MDH expends 10.9 FTEs in performing TCR-related work. These hours include time to respond to TC positives and MCL and acute MCL violations (including performing technical assistance and sending out violation notices), perform sanitary surveys, collect samples from non-community water systems (NCWSs), and perform outreach activities (performing training, attending conferences, sending out newsletters). Resources in Minnesota tend to be focused on providing on-site assistance to systems. MCL or acute MCL violations in Minnesota almost always involve visits to the systems to assist the systems in complying and to reduce the chances of future violations at the systems. Furthermore, MDH considers

[1] This topic is discussed in more detail in Section 4.2.1, "Thematic Analysis Related to Program Implementation," "Staffing."

sanitary surveys a form of on-site assistance and provides a significant amount of assistance during a sanitary survey. Details of MDH's resource allocation include:

- *System-specific technical assistance related to violations*—MDH spends 1.5 FTEs annually providing technical assistance to systems that have had MCL and acute MCL violations (additional effort is incurred in the administrative response to the violation/event and is discussed below).

- *Violation prevention, system specific (excluding sanitary surveys)*—MDH spends 355 hours annually providing assistance to systems that have TC positives without violations. MDH spends 3.5 FTEs annually in collecting samples from NCWSs on annual monitoring.

- *Sanitary surveys*—MDH spends 4 FTEs of labor time annually on performing sanitary surveys.

- *Violation prevention, non system-specific*—MDH spends 675 hours annually in developing and delivering training, attending conferences, developing guidance documents, and publishing newsletters. Furthermore, MDH's operator certification program spends 215 hours annually reviewing approximately 1,300 new and renewal license applications.

- *Administrative responses to health-based violations and TC positives not leading to violations*—Much of MDH's response to these events is composed of providing assistance to the system, which is included under system-specific assistance above. MDH's non-assistance response activities involve 540 hours annually for entering samples into databases and issuing notices of violation.

- *Administrative response to M/R violations*—MDH also spends approximately 170 hours annually for M/R violation-related tasks such as responding to violations (e.g., sending notices of violation), calling labs to verify results, sending reminder postcards to systems to collect follow-up samples, and entering manually submitted data. The MDH lab spends 1,975 hours annually processing samples.

ES.2.2 Comparison of Intended to Actual Implementation

ERG's assessment of intended versus actual implementation was two-pronged. First, we compared MDH's logic model, assumed to represent intended implementation, with the data collected during the site visits, assumed to represent actual implementation. Second, we provided observations on MDH's actual implementation viewed through a set of themes we developed from data collected during interviews with MDH.

Our comparison of MDH's intended with actual implementation found the following:

- *Although Minnesota Drinking Water Information System (MNDWIS) currently meets MDH's needs, making improvements to the system or performing additional analysis/queries using the system are constrained by limited funding and staff time.* These constraints limit the ability of MDH to use MNDWIS to measure performance based on the program logic model.

- *Discussions between MDH staff during the site visit indicated some gaps in knowledge about the capabilities of MNDWIS data.* In the MDH logic model, MNDWIS is a resource for all

activities. If the full capabilities of MNDWIS are not being utilized, this restricts MNDWIS's value as a resource.

- *MDH field staff are not consistently entering information on assistance site visits into MNDWIS.*[2] Without complete data on site visits, MDH cannot track the performance of what it considers to be one of its most effective tools.

- *The database used by the MDH laboratory and the data that are submitted by private labs are not depicted in the logic model.* A more complete version of the logic model would include the Laboratory Information Management System LIMS and data from private labs alongside MNDWIS to better depict data flows.

- *The MDH logic model does not include a number of activities that MDH identified as its most effective activities to ensure public health.* Facility oversight, plan review, and well construction activities (management, inspection and source water protection) are all activities not included in the logic model that MDH considered among its most effective tools. If these are among MDH's most effective tools for implementing the program, then they should be reflected in the logic model.

- *The MDH logic model does not give proper weight to site visits.* MDH places a significant emphasis on its on-site work with systems. We suggest increasing the visibility of the on-site assistance in the model to better represent the emphasis that is placed on these visits in actual implementation.

- *MDH does not track performance measures that represent logic model elements.* During the site visit, MDH indicated that it does not formally track performance measures for its program. The logic model contains a number of elements that could be tracked.

In our thematic analysis related to program implementation, we reviewed and assessed a number of observations related to the themes we developed. Table ES-1 summarizes the themes we assessed and the relevant observations.

Table ES-1. Summary of Thematic Analysis of TCR Implementation in Minnesota

Theme and Description	Observation on MDH Implementation
Program Organization—An assessment of how the state's TCR program is organized	MDH treats acute MCL and MCL violations with the same high level of priority.
	MDH uses a decentralized structure to implement its TCR program, which places MDH staff closer to systems geographically and also allows staff to become familiar with specific systems.
	MDH's communication between offices and staff involved in implementing the TCR can be improved.
Staffing—An assessment of how the state has chosen to staff its program and how that staff has impacted implementation	MDH staff are responsible for more than the TCR, which allows public water systems (PWSs) to have a single point of contact for both technical assistance and compliance related to all drinking water rules.

[2] This observation does not apply to sanitary surveys, however.

Enforcement Function—An assessment of how (organizationally) each state has chosen to implement TCR-related enforcement for M/R violations and how this relates to TCR implementation	MDH field staff are not involved in the enforcement process, allowing them to maintain a cooperative relationship with the systems. This separation allows MDH field staff to be comfortable communicating with and visiting PWSs because the enforcement function is separated from technical assistance provided in the field.
	Enforcement is less of an emphasis at MDH. For MDH, compliance determinations are a form of compliance assistance as opposed to being precursors to enforcement.
Relationship with Labs and Partners—An assessment of how the state has organized its relationship with labs and partners	MDH maintains many of its own labs and contracts with many smaller labs to ensure that samples can be processed quickly. MDH indicated that having its own labs allows it to be notified promptly when positive samples occur. Furthermore, according to MDH, since they collect samples for NCWSs on annual monitoring, having its own labs allows for more efficient processing of sample results from NCWSs. MDH also partners with 40 county health departments to administer the rule.
Relationship with PWSs—An assessment of the relationships that the state maintains with the systems and how those relationships impact TCR implementation	MDH uses a cooperative approach with systems to maintain compliance. Notably, MDH will actively work with systems that have TC positive results and violations to assess the issue and develop a solution.
	MDH performs a significant amount of on-site assistance and treats violations as opportunities to solve problems.
	MDH collects samples for NCWSs on annual monitoring. This removes the possibility of noncompliance with reporting requirements from smaller systems where such noncompliance may be more likely and in collecting these samples MDH can educate new owners and operators
Data Management—An assessment of how the state manages TCR-related data and how that data management relates to implementation	MDH's data management is flexible and comprehensive and can be used by MDH staff to explore issues and find trends.
Implementation of Federal Requirements—An assessment of how the state implements certain federal requirements	MDH conducts sanitary surveys more frequently than required. This allows MDH staff to be more familiar with systems and to identify issues at systems in a timelier manner.
	MDH allows for reduced compliance monitoring for many systems. Reducing the frequency of monitoring allows MDH itself to take on the responsibility for monitoring many systems.

ES.2.3 Factors Affecting Program Implementation

The primary factors that appear to affect program implementation in Minnesota are:

- *A large number of small non-community water systems (NCWSs) in Minnesota.* According to the FY 2008 federal Safe Drinking Water Information System (SDWIS/FED) inventory data, 86 percent of systems in Minnesota are non-community water systems serving 1,000 consumers or fewer. In the United States as a whole, only 74 percent of systems are NCWSs serving fewer than 1,000 consumers. Thus, Minnesota has a disproportionate share of small NCWSs. Based on our analysis, this fact drives how MDH has implemented the program. Examples of the influence that this factor has on implementation include:

- MDH relies on a cooperative approach with PWSs because of the large number of small systems. The idea is that smaller systems are more likely to meet their requirements under the TCR if MDH works with them to attain and maintain compliance.
- MDH staff perform a significant amount of on-site assistance. Small systems need assistance to better understand drinking water protection and to ensure compliance.
- MDH staff are responsible for more than the TCR program. This situation allows the staff that visit PWSs to better assist those systems in all aspects of water quality.
- MDH uses a decentralized approach to implementation to better serve the large number of small systems. This approach allows MDH staff to become familiar with the small systems and with the owners and operators of those systems.
- MDH collects samples from most NCWSs, which ensures that the samples get collected and that public health threats are monitored.
- MDH allows for reduced monitoring for small systems to allow them to reach compliance and to ensure that MDH can collect the needed samples.

- *The geography of the state of Minnesota.* Minnesota is a large state, which has influenced implementation in a number of ways:

  - MDH employs a decentralized structure to ensure that staff are in the field to perform the site visits that are part of the program.
  - MDH staff are responsible for more than the TCR program, which allows field staff to assist water systems in a number of areas when on site. It also reflects a basic resource constraint: a decentralized program cannot employ program-specific experts for multiple programs.
  - MDH maintains its own labs to ensure that samples are analyzed in a timely manner.
  - MDH collects samples for many NCWSs. Sending out samples to labs for the small systems can pose logistical issues due to the size of the state. That is, the samples may need to be driven to drop off points far away. By collecting the samples, MDH avoids many sample invalidation issues.

- *The cooperative approach with PWSs emphasized by MDH.* MDH's cooperative approach has a profound influence on how the program is implemented:

  - MDH's field staff are not responsible for enforcement. Under the cooperative approach, MDH field staff can focus on compliance assistance while enforcement is handled by MDH central office.
  - MDH's focus is on providing on-site assistance rather than enforcement. This typifies the cooperative approach. MDH visits systems to assist them in overcoming compliance issues.
  - MDH collects samples for NCWSs on annual monitoring. Collecting samples from these systems allows MDH staff to better educate owners and operators of these systems.
  - MDH conducts sanitary surveys more often than required under federal law. More frequent sanitary surveys allow MDH staff to visit systems more often and offer assistance once there.
  - MDH allows reduced monitoring at many systems. This approach helps meet the needs of these systems by reducing the burden of sampling.

ES.2.4 Performance Measurement

ERG recommends that MDH develop and track three measures:

1. *The effectiveness of on-site assistance*—This measure would track the extent to which systems that are visited during a certain timeframe experience a "public health event," such as a violation or total coliform (TC) positive, in a subsequent time period.

2. *The time it takes MDH to respond to MCL and acute MCL violations*—This measure would provide a sense of how quickly MDH is responding to violations that represent the largest public health threats. MDH should set a series of tiered targets (e.g., targets for percentage of violations responded to on the same day or within 24 hours) and track its progress toward attaining those targets.

3. *The time it takes MDH to return MCL and acute MCL violations to compliance*—This measure would provide a sense of the impact that MDH is having on systems. Once again, MDH should set a series of tiered targets. Tracked along side the response time measure, the two measures provide a logic model framework approach to measurement: the responses are activities/outputs that in turn should generate the returns to compliance (outcomes).

ES.2.5 Outcome Evidence

For Minnesota, we tabulated data on four sets of outcomes:

- *The occurrence of repeat violations*—For MCL and acute MCL violations, almost 80 percent of systems with violations between 2004 and 2008 had just one violation. Another 15.7 percent of systems with violations had one repeat violation during the period. For M/R violations, almost 85 percent of systems with violations had one or two violations during the period.

- *The distribution of returns to compliance for MCL and acute MCL violations*—ERG tabulated data from the LMRT on responses to MCL and acute MCL violations and the time to return those violations to compliance. These data showed that MDH reported responding to almost all (99.7 percent) of these violations on the same day and to all of them within 30 days. Within 30 days, MDH reported that just more than half were determined to have returned to compliance and within 90 days approximately three-fourths were reported as returned to compliance.

- *The distribution of responses to M/R violations*—These data indicated that MDH reported responding to 36.7 percent of M/R violations within one week and to all within 90 days.

- *Type of responses and timeframes to return to compliance for small NCWSs*—According to the LMRT data, there were 1,386 MCL or acute MCL violations in Minnesota among small NCWSs between 2004 and 2008. Of these, MDH reported a return to compliance in 97.5 percent of the cases with a median time to return to compliance of 25 days for these cases.

ES.2.6 Recommendations

ERG developed three recommendations for MDH to consider based on our findings:

- ***Build a system for sharing program knowledge.*** In the comparison of actual versus intended implementation, we found that staff across different areas of the program showed some gaps in awareness of activities being performed in other areas of the program. We view this as a lack of detailed program knowledge on the part of MDH staff of areas outside of their specific area of responsibility. This is not to say that MDH staff were uninformed. Many of the staff we talked with did know *in general* how other aspects of the program worked. However, there were many instances in which MDH had conversations among themselves to better understand the nuances of program implementation outside of their particular area. Thus, ERG recommends that MDH develop a system to transfer the details of program knowledge across program areas. This could be done through a process that is similar to the site visit ERG performed where MDH staff sit and discuss implementation of the program from multiple perspectives. This type of information sharing will help the staff responsible for different areas in better serving the systems they are responsible for.

- ***Conduct an outcome evaluation related to the use of a cooperative approach with systems.*** MDH should consider performing a more detailed outcome evaluation that addresses the effectiveness of its use of a cooperative approach with systems. The evaluation should address:
    - Whether or not the use of a cooperative approach is meeting MDH's objectives.
    - If a more formal approach would be a more effective means of protecting public health.
    - The benefits of using a cooperative approach from both MDH's and a system's perspective.

- ***Consider implementing the performance measures we recommend.*** Three new performance measures were identified for MDH. We recommend MDH consider implementation of these measures to provide a sound basis for program management.

ES.3 TEXAS

The Texas Commission for Environmental Quality (TCEQ) is responsible for implementing the TCR in Texas.

ES.3.1 Resources

Based on data provided by TCEQ, ERG has estimated that TCEQ expends 27.9 FTEs annually in administering the TCR program in Texas. The majority of that time, however, is allocated to performing comprehensive compliance investigations (CCIs) (sanitary surveys), with TCEQ spending 80 percent of the total hours on CCIs. Details of the TCEQ resource allocation include:

- *System-specific technical assistance related to violations*—TCEQ spends approximately 210 hours annually on violation-related directed assistance referrals (DARs) conducted by the Texas Rural Water Association and approximately 900 labor hours annually responding to violation-related assistance requests over the phone.

- *Violation prevention, system specific (excluding sanitary surveys)*—TCEQ spends approximately 390 hours annually on violation prevention-related directed assistance referrals (DARs) conducted by the Texas Rural Water Association and approximately 300 labor hours annually responding to violation prevention assistance requests over the phone.

- *Sanitary surveys*—TCEQ spends 22.3 FTEs annually performing CCIs (sanitary surveys).

- *Violation prevention, non-system specific*—TCEQ spends 1.1 FTEs on performing non-system specific compliance assistance such as developing guidance documents, attending conferences, sending reminder letters to PWSs, creating Consumer Confidence Report (CCR) templates, and reviewing and approving third-party operator certification training course information.

- *Administrative responses to health-based violations and TC positives not leading to violations*—TCEQ staff spend 12 hours each day (1.5 FTE annually) providing desk-based responses to MCL and acute MCL violations. Some of these tasks could be automated.

- *Administrative responses to M/R violations*—TCEQ spends 1.33 FTEs annually in providing desk-based responses to M/R violations. Enforcement follow-up to M/R violations is performed by the TCEQ Office of Compliance and Enforcement (OCE), which spends 1,600 hours annually responding to TCR violations.

ES.3.2 Comparison of Actual to Intended Implementation

ERG's assessment of intended versus actual implementation is two-pronged. First, we compared TCEQ's logic model, assumed to represent intended implementation, with the data collected during the site visits, assumed to represent actual implementation. Second, we provided observations on TCEQ's actual implementation viewed through a set of themes we developed from data collected during interviews with TCEQ.

Our comparison of TCEQ's intended to actual implementation found the following:

- *Data issues are detracting from TCEQ's ability to make compliance determinations and to work with systems.* Our analysis of resource expenditures found that TCEQ spends approximately 12 labor hours each day performing data-related tasks that could be automated. This labor time is spent compiling faxed sampling reports, entering those data into a database, and performing QA/QC on the entered data. A significant amount of this time could be recouped through automation.

- *The TCEQ logic model does not reflect how TCEQ field staff are used in the program.* TCEQ regional staff are involved in implementation of the TCR, but these staff are primarily experts in PWS requirements related to capacity, design, and operation, not in specific TCR-related requirements. The regional staff use the TCR staff in Austin as "consultants" on TCR issues. This relationship should be reflected in the logic model.

- *TCEQ's implementation of the TCR does not include most of the output and outcome measures that the logic model tracks.* During the site visit, TCEQ indicated that it tracks the numbers of total MCL and acute MCL violations, the number of notices of violation that are sent, and the numbers of systems that are classified as significant non-compliers. The TCEQ

logic model includes several other output and outcomes that TCEQ does not currently track (e.g., responses to violations, PWSs that stay in or return to compliance), however. TCEQ has, however, adopted the state version of SDWIS (SDWIS/State) as its database of record and has begun to modify that database to accommodate tracking many of these output measures.

- *There is a clear "wall" between enforcement and OPR's implementation of the TCR.* In our discussion with TCEQ's TCR program and with TCEQ's Office of Compliance and Enforcement (OCE), which handles enforcement cases, we identified a distinct hand-off point from the TCR program to OCE. Furthermore, based on our discussions with TCEQ, it appears that once the hand-off occurs, there is little interaction between the two offices. OPR indicated, however, that there is daily interaction at the staff level on cases and quarterly meetings at the management level. Nevertheless, OPR did agree with the observation that a "wall" exists and that it may be difficult to bring down due to the structure of TCEQ.

- *TCEQ has an issue with the timeliness of reporting from labs.* A noted issue from the site visit with TCEQ is that labs are often slow in reporting sampling results to TCEQ. Systems perform their sampling in the proper timeframe and then send their results to labs. The labs then submit the results to TCEQ *after* the deadline for systems to submit sampling results. TCEQ does not issue violations to the systems since the delay is due to the labs, not the systems. Allowing late submissions from labs reduces the accuracy and timeliness of the data being used by TCEQ to determine compliance. TCEQ noted, however, that it has started to increase the amount of electronic reporting from labs, which should reduce the incidence of late reporting.

In our thematic analysis related to program implementation in Texas, we reviewed and assessed a number of observations related to the themes we developed. Table ES-2 summarizes the themes we assessed and the relevant observations.

Table ES-2. Summary of Thematic Analysis of TCR Implementation in Texas

Theme and Description	Observation on TCEQ Implementation
Program Organization—An assessment of how the state's TCR program is organized	TCEQ has located its TCR program within the TCEQ Office of Permitting and Registration (OPR). As noted by TCEQ itself, this puts the program at odds with the rest of the office in which it is located. All other OPR programs involve permitting and licensing of facilities while the TCR program is focused on public health issues.
	TCEQ uses a centralized approach to implementing the program. ERG has characterized TCEQ as "centralized" because the primary staff involved in implementing the rule are concentrated at TCEQ headquarters within OPR and those staff cover all types of systems.
Staffing—An assessment of how the state has chosen to staff its program and how that staff has impacted implementation	The TCR program within OPR has six dedicated staff to implement the program. These staff perform no other responsibilities other than implementing the TCR in Texas.

Theme and Description	Observation on TCEQ Implementation
Enforcement Function—An assessment of how (organizationally) each state has chosen to implement TCR-related enforcement for M/R violations and how this relates to TCR implementation	TCEQ Office of Permitting and Registration (OPR) sends enforcement cases to the Office of Compliance and Enforcement (OCE). TCEQ has separated its enforcement from other aspects of the program.
Relationship with Labs and Partners—An assessment of how the states has organized its relationship with labs and partners	TCEQ has partnered with the Texas Rural Water Association (TRWA) to provide assistance to systems. TRWA provides in-depth technical expertise in PWS issues and can provide detailed, system-specific assistance to PWSs.
Relationship with PWSs—An assessment of the relationships that the state maintains with the systems and how those relationships impact TCR implementation	TCEQ provides a significant amount of assistance to the systems through responses to telephone inquiries. TCEQ spends a significant amount of time providing technical assistance to systems over the phone. Specifically, four of TCEQ's staff respond to 100 to 200 calls per month each at about 10 minutes per call.
	TCEQ does not make any distinctions by system type, size, or source water in deciding how to respond to violations and other issues that arise at systems. TCEQ noted that it strives for consistency in applying the rule across all systems in Texas.
Data management—An assessment of how the state manages TCR-related data and how that data management relates to implementation	TCEQ spends a significant amount of time processing data to determine compliance. Each day, TCEQ staff compile hard copy data (sampling results) that are faxed/sent from labs. The data are entered and reviewed, and compliance determinations are made. TCEQ staff spend approximately 12 hours each day compiling faxed sampling reports, entering those data into a database, sending out violation notices, and performing QA/QC on the entered data. Letters are then distributed to systems in violation (MCL, acute MCL, or M/R). This is a significant daily effort by TCEQ, which could be automated.
Implementation of Federal Requirements—An assessment of how the state implements certain federal requirements.	TCEQ requires disinfection of all systems. TCEQ requires all systems to maintain a disinfectant residual of 0.2 mg/l chlorine. This is a historical fact of TCEQ's implementation of the drinking water protection. TCEQ expects that given the climate in Texas (warm most of the year), disinfection provides an effective means of reducing coliform contamination.

ES.3.3 Factors Affecting Program Implementation

The primary factors that appear to affect program implementation in Texas are:

The location of the TCR program in OPR. The fact that TCEQ has located its TCR implementation program in OPR has helped shape the program indirectly, but in important ways. For the most part, we expect that the program's location in an office that is focused on permits has led the program to "insulate" itself from the rest of the office. Specifically, TCEQ's centralized approach to implementing the program and using six dedicated staff is reflective of being within an office whose primary purpose is dissimilar to the mission of the TCR program (protecting public health). This has led to the concentration of the program to just a few individuals within OPR.

Geographic distribution of systems in Texas. Texas is a large state and its systems are located all over the state. Furthermore, there are many large systems that may be politically influential that are located far from Austin. In response to this large geographic distribution:

- TCEQ has adopted its centralized approach to ensure consistency across systems. Additionally, given the large number of systems and their distribution it may not be feasible, with respect to resources, for Texas to locate staff in field offices across the state.
- TCEQ's Office of Permitting and Registration (OPR) hands off its enforcement cases to the Office of Compliance and Enforcement (OCE), which has regional offices.

TCEQ's centralized approach. TCEQ's centralized approach is reflected in its concentration of key program staff in Austin and the fact that these staff deal with all types of systems. The centralized approach has led to:

- A communication "wall" between the TCR program and the enforcement program. There is a distinct hand-off of cases from OPR to OCE with little communication following the hand-off.
- TCEQ providing a significant amount of assistance to systems *over the phone*, rather than on site. TCEQ staff provide close to 1,200 hours of assistance over the phone annually. This stems from the fact that the TCR program has no regional presence. TCEQ field staff involved in implementation are not within the TCR program and tend to rely on the TCR staff as consultants.

ES.3.4 Performance Measurement

ERG has four recommendations related to performance measurement for TCEQ. First, TCEQ should improve the quality of the "returns to compliance" data that are reported to SDWIS/FED. These data represent a key outcome but are limited in detail (few distinct dates reported), limited in availability (no dates reported after June 30, 2006), and limited in scope (no data for MCL and acute MCL violations). Without more precise reporting of outcomes, effective performance measurement is not possible. EPA Region 6 staff noted that TCEQ has taken steps to resolve these reporting issues. The three other recommendations are for performance measures that TCEQ should track:

- *The time it takes to return violations to compliance*—This measure would allow TCEQ to track its response times to violations. Timely response to a violation is a key step in returning violators to compliance.

- *The time it takes to respond to violations*—These data would provide TCEQ with a sense of the effect its responses to violations are having on compliance.

- *The time that violations remain unresolved*—This measure would allow TCEQ to track outstanding returns to compliance. That is, what percentage of violations have not been returned to compliance after 30 days, or after 60 days, etc.

ES.3.5 Outcome Evidence

For TCEQ, ERG tabulated three sets of outcomes from the LMRT data for 2004-2008:

- *The occurrence of repeat violations*—For MCL and acute MCL violations, almost 80 percent of systems with violations between 2004 and 2008 had only one violation, and 93.6 percent of systems had only one or two violations. For M/R violations, however, only 51.7 percent of systems with a violation during the period had just one violation, meaning that 48.3 percent of systems with violations between 2004 and 2008 had more than one M/R violation. Furthermore, 9.3 percent of systems with M/R violations had seven or more violations during the period.

- *The distribution of response timeframes and times to return to compliance for MCL and Acute MCL violations*—TCEQ reported responding to 80.5 percent of these violations within one week and 81 percent within 30 days. Furthermore, these tabulations provided evidence that TCEQ outcome data are in need of improvement. Specifically, these data are limited in detail (few distinct dates reported), limited in availability (no dates reported after June 30, 2006), and limited in scope (no data for MCL and acute MCL violations). As noted previously, Region 6 has indicated that TCEQ has taken steps to resolve these issues.

- *Type of responses for M/R violations*—This tabulation showed that TCEQ reported that its most common response to an M/R violation is to issue a formal notice of violation.

ES.3.6 Recommendations

We developed four recommendations for TCEQ to consider based on our findings:

- ***Perform a process evaluation of TCR implementation in Texas.*** In our evaluation, we identified a number of ways in which TCR implementation in Texas can be improved at the Agency level. The biggest issue we identified was the "wall" of communication. As noted in our discussion of actual versus intended implementation, we found that there are differences in how communication was viewed between the TCR program and other areas of TCEQ involved in implementation. This was particularly evident with respect to enforcement where there is a clear "wall" between the TCR program and enforcement of M/R violations. This indicated a need to improve communication across TCEQ elements involved in program implementation. We believe that TCEQ would benefit from performing a process evaluation of how TCR is implemented in Texas with the goals of improving the efficiency and effectiveness of TCR implementation.

- ***Develop a strategy to deal with late reporting by labs.*** As noted, there is an issue with the timeliness of data reported from some labs. That is, some labs submit the data late to TCEQ even if the system has submitted to the lab on time. Without timely and accurate data, TCEQ will have difficulty in effectively managing its program. Thus, we recommend that TCEQ develop a strategy to deal with late reporting by labs, involving EPA Region 6 in the process. Discussions with TCEQ following our on-site visit indicated that TCEQ has taken steps to modernize its data system to allow for electronic reporting by labs, which would allow for timelier reporting by labs.

- ***Ensure that data reported to SDWIS/FED are complete.*** As we noted in discussing outcomes, outcome data in the LMRT are not complete. TCEQ should work to ensure timely

and complete reporting of outcome data to SDWIS/FED, which provides date feeds into the LMRT. Such reporting would allow for use of LMRT by TCEQ to track program performance.

- ***Consider implementing the performance measures we recommend.*** Three new performance measures have been recommended for TCEQ. Tracking those three new measures would provide a sound basis for program management. However, a prerequisite to tracking those measures is to implement the recommendations on the two previous bullets.

SECTION ONE: INTRODUCTION

The Total Coliform Rule (TCR) (40 CFR Parts 141 and 142), published on June 29, 1989, is a key component in the U.S. Environmental Protection Agency's (EPA's) program to protect drinking water quality. The rule applies to all of the approximately 155,000 public water systems (PWSs) in the United States, which provide drinking water to 292 million consumers. The rule is designed to protect consumers against waterborne illness related to E. Coli and fecal coliform. Exposure to these organisms can result in adverse gastrointestinal health effects and can lead to even more severe effects in sensitive populations such as children and the elderly. The rule sets maximum contaminant levels (MCLs) for total coliform and fecal/E. coli in drinking water and requires systems to monitor for total coliform and report monitoring results to EPA or to states with authority delegated by EPA.

Minnesota and Texas are two of the states that have obtained delegated authority (also known as primacy) for implementing the TCR. In Minnesota, the Minnesota Department of Health (MDH), Drinking Water Protection Division (DWP) implements the TCR. In Texas, the Texas Commission on Environmental Quality (TCEQ), Office of Permitting and Registration (OPR) implements the TCR with enforcement of TCR-related violations being performed by the Office of Compliance and Enforcement (OCE).[3] Though implementation of the rule in each state differs, states can obtain primacy for administering the rule by implementing policies and procedures that are no less stringent than the requirement under the TCR.
state

This report summarizes the results of a process evaluation of the implementation of the TCR in Minnesota and Texas. A process evaluation examines how a program is implemented, rather than focusing on the program's outcomes or whether a program has achieved its goals and/or targets. This evaluation will assist EPA and states—and in particular Minnesota and Texas—in understanding how various factors influence program implementation and will provide information to help program managers understand how intended implementation can differ from actual implementation. The goals of the evaluation were to:

- Provide a basis for developing a method that states can use to assess implementation of the TCR. This evaluation uses Minnesota and Texas as case studies in developing this method, but the approach can be generalized to other states with primacy over TCR implementation.

- Provide insights for state program managers into how a logic model-based approach to program assessment can be used.

- Identify indicators and data sources that states can use for more rigorous evaluation, measurement, and assessment in the future.

- Inform regulatory development of the revised TCR/Distribution Rule.

To meet these goals, Eastern Research Group, Inc. (ERG) assessed:

- State-level resource allocation in implementing the TCR.

- The process that Minnesota and Texas follow in implementing the TCR and to what extent intended implementation is mirrored in actual implementation.

[3] In this report, ERG will refer to MDH/DWP as MDH and TCEQ/OPR as TCEQ to avoid clutter and to be clear regarding which state is being discussed.

- The impact of various factors on program implementation in each state.

- The performance measures being used by each state to track performance and to what extent those measures can be improved.

- Outcome data related to implementation of the rule in each state.

This concentrated review is meant to provide each state with new insights into its program, as well as an opportunity to learn from one another. The purpose of this evaluation is not to compare the two states, rather, this report attempts to treat each separately, but present information in parallel.

Section 2 of the report provides details on the focus of the evaluation, discussing the logic models that were developed for the study, the evaluation questions that were specified as part of the study design, and a number of definitions and scope decisions that bounded the evaluation. Section 3 reviews the data sources and methods used in conducting the evaluation. It also presents a set of themes derived from the data collection. Section 4 presents the results for each evaluation question, providing a separate treatment for each state. Finally, Section 5 presents ERG's recommendations for program improvement.

SECTION TWO: EVALUATION FOCUS

2.1 LOGIC MODELS

In preparing for this evaluation, the Minnesota Department of Health (MDH) and the Texas Commission on Environmental Quality (TCEQ), in coordination with EPA's Office of Ground Water and Drinking Water (OGWDW) and EPA Regions 5 and 6, developed logic models for TCR implementation activities in each state. Figures 2-1 and 2-2 present the logic models for MDH and TCEQ, respectively. Logic models are intended to represent the program theory and describe how the program's resources, activities, and outputs flow to customers, who in turn use the outputs from the program to effect short- and intermediate-term outcomes, which eventually lead to long-term outcomes. The framework depicted in Figures 2-1 and 2-2 for MDH and TCEQ can be described in terms of the following logic model elements:

- **Resources** are the basic inputs of funds, staffing, and knowledge dedicated to the program and are the starting point for understanding the program's logic. For TCR implementation in Minnesota and Texas, resources include the funds used in implementing the rule, the partners that are involved in implementation, and the staff used in implementing the TCR.

- **Activities** are the specific actions taken by programs in support of program goals, and **outputs** are the products that result from those activities. To implement the TCR, Minnesota and Texas perform a variety of compliance determination and tracking activities, respond to violations and other events (e.g., Total Coliform-positive results that are not violations), perform outreach and training, conduct sanitary surveys, and take enforcement actions against systems in violation of monitoring and reporting (M/R) requirements. MDH collects routine samples from non-community water systems (NCWSs) on annual monitoring schedules and delegates program authority to county-level health departments. The outputs that stem from these activities include the responses each state takes toward violations, the numbers of PWSs that are reached through outreach and training, and the site visits that each state conducts.

- **Customers** are the beneficiaries of the activities and users of the outputs provided. The primary customers for TCR implementation in Minnesota and Texas are the public water systems. Customers also include technical assistance providers (TAPs) in Texas and the local county health departments in Minnesota.

- **Short-term outcomes** are changes in the customers' awareness, attitudes, understanding, knowledge, and skills resulting from program outputs. To effectively implement the TCR, each state must ensure that PWSs stay in compliance, which requires understanding how to stay in compliance and the steps needed to correct issues that arise. Minnesota further needs to ensure that its delegated county health departments and their field staff understand program requirements. TCEQ must work with TAPs that have a firm understanding of the rule's requirements.

- **Intermediate-term outcomes** involve changes in behavior that are broader in scope than short-term outcomes. For each state, attaining intermediate-term outcomes means that PWSs maintain the technical, managerial, and financial (TMF) capacity to comply with the rule. The intermediate-term outcomes also involve the delegated county health departments in Minnesota, MDH field staff, and TAPs in Texas improving their service delivery while working with the PWSs.

- **Long-term outcomes** are the ultimate goal of the program. They reflect a change in condition in terms of an improved environment. For both Minnesota and Texas, the goal is to ensure safe drinking water for consumers.

Although not explicitly depicted in Figures 2-1 and 2-2, numerous **contextual and external factors** affect program implementation and delivery. They are either positive or negative influences on the ability of a program to achieve its goals. In the context of the TCR, these factors include the geographic nature, climate, and distribution of PWSs within each state, as well as the program's philosophy (e.g., cooperative) and the type of agency (health department for MDH and environmental agency for TCEQ) where the responsible state agency is housed.

Included in the two logic models are EPA Regions 5 and 6 (top of each model) and also other providers (bottom of each model) that play a role in TCR implementation. MDH and TCEQ each appear in the middle row of its respective models. The inclusion of the EPA Regions and the other providers highlights the interactions between each state and these entities. This evaluation focuses on TCR implementation by MDH and TCEQ.

2.2 EVALUATION QUESTIONS

The evaluation questions for this project are:[4,5]

(1) Using relevant categories of expenditure, how are state FTE/$ allocated across the program activities to implement the TCR provisions?

(2a) How do the following factors affect program delivery related to MCL violations?
- State organizational structure
- State resources
- Other factors in the state's span of control

(2b) How do the following factors affect program delivery related to monitoring and reporting (M/R) violations?
- State organizational structure
- State resources
- Other factors in the state's span of control.

(3a) What processes/procedures does the state follow with respect to MCL violations?

(3b) Regarding MCL violations, is the state implementing the TCR in the way that it intends?

(3c) What processes/procedures does the state follow with respect to M/R violations?

(3d) Regarding M/R violations, is the state implementing the TCR in the way that it intends?

(4a) What performance metrics are being used by the state to measure the efficiency and/or effectiveness of TCR implementation?

(4b) What recommendations can be made for improving the performance metrics being used by the state to measure efficiency/effectiveness of TCR implementation?

(5) Based on the recommendations in Question 4b (i.e. the performance metrics that the state should use to measure efficiency/effectiveness of TCR implementation) and based on the best available data, what is the state's current level of efficiency/ effectiveness in implementation of TCR?

[4] Appendix A includes a brief overview of the evolution of the evaluation questions for this project.

[5] To simplify discussion later in the report, we will refer to questions that have the same number as a "question sequence." That is, questions 2a and 2b will be referred to as question sequence 2; questions 3a through 3d will be referred to as question sequence 3, and questions 4a and 4b will be referred to as question sequence 4.

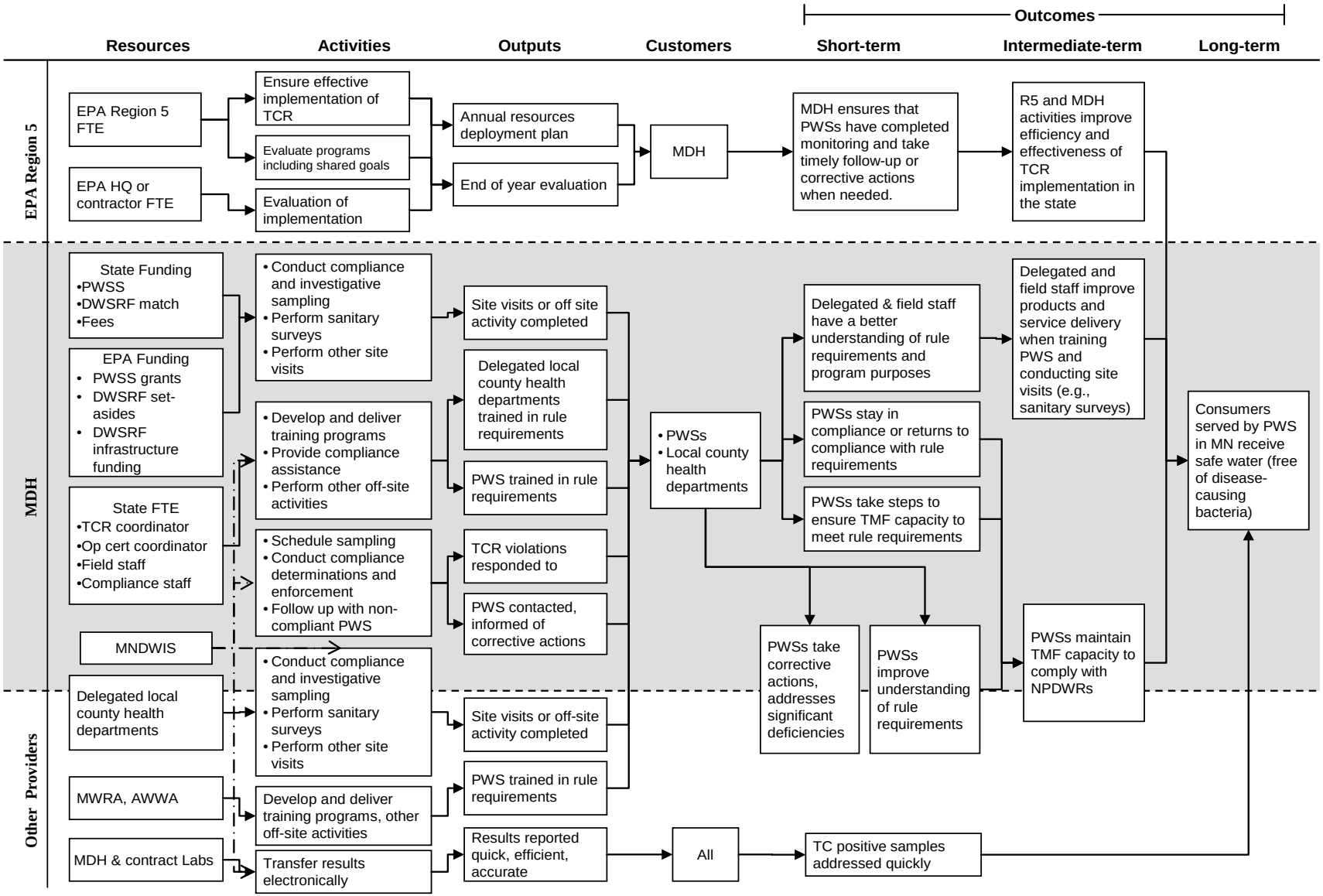

Figure 2-1. MDH TCR Implementation Logic Model

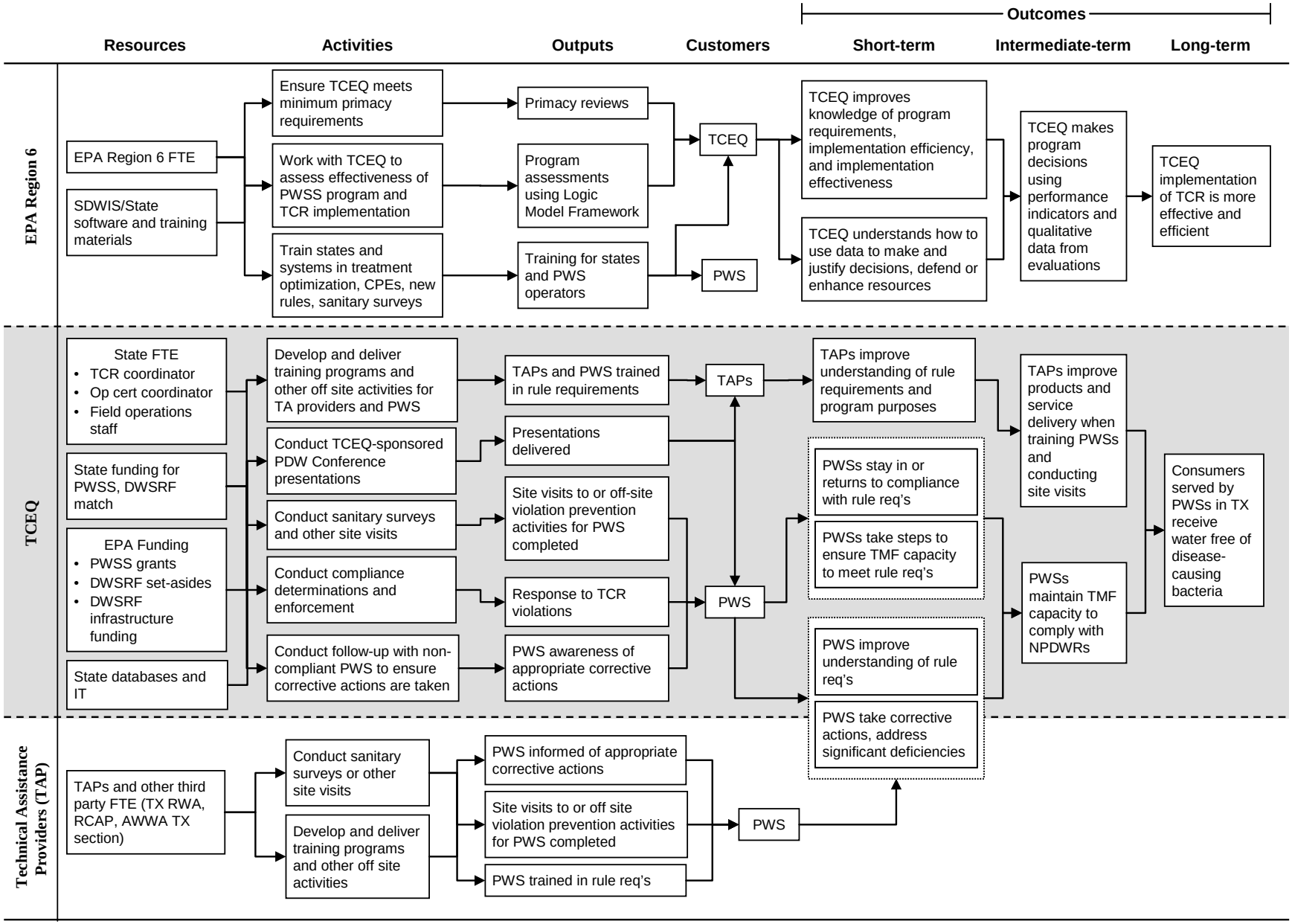

Figure 2-2. TCEQ TCR Implementation Logic Model

Questions 2a and 2b and questions 3a through 3d focus on responses to MCL and M/R violations. States perform a much broader set of activities beyond responding to MCL and M/R violations, however, such as performing violation prevention activities and responding to total coliform (TC) positives that are not associated with violations. Thus, in performing the analysis for question sequence 2, ERG evaluated broadly how various themes and factors, identified through this project, affect delivery of the TCR program in each state. Additionally, for question sequence 3, ERG evaluated broadly whether each state's actual implementation meets it intended implementation, not just focusing on MCL or M/R violations.

Furthermore, as discussed in Section 3.2.1, ERG used a thematic analysis approach in this evaluation. Briefly, we identified a number of themes from the data collected through the detailed site visits we performed for this project, and we view the evaluation questions through these themes. The usefulness of this approach is two fold. First, it allows for a structured approach to assessing and interpreting the information collected through the qualitative interviews conducted during the site visits. Second, it allows the use of quantitative data in a structured fashion to support the conclusions drawn from the qualitative data.

2.3 DEFINITIONS AND SCOPE

This section discusses the scope of the evaluation based on the logic model, the refined evaluation questions, and decisions made during discussions among ERG, EPA (including Regions 5 and 6), MDH, and TCEQ.

Logic Model Elements. The evaluation covers all elements of the logic model discussed in Section 2.1, although the primary focus is on the resources, activities, outputs, and customers. To support conclusions and provide context to the thematic analysis, we also tabulate outcome data from the Logic Model Reporting Tool (LMRT).

Expenditure Categories. The logic models illustrated in Figures 2-1 and 2-2 contain a number of state-level activities and associated outputs. For the purpose of evaluation question 1, we have categorized these activities and outputs into six groups:

- *System-specific technical assistance related to violations*—These activities include on-site visits by state staff or state partners or any form of direct contact with specific systems to assist those systems in solving issues related to health-based violations.

- *Violation prevention, system specific (excluding sanitary surveys)*—These are activities associated with preventing violations and include state response to TC positives not associated with violations and sanitary surveys.

- *Sanitary surveys*—As defined at 40 Code of Federal Regulations (CFR) 141.2, "…an onsite review of the water source, facilities, equipment, operation and maintenance of a public water system for the purpose of evaluating the adequacy of such source, facilities, equipment, operation and maintenance for producing and distributing safe drinking water."

- *Violation prevention, non-system-specific*—These activities include training and outreach materials.

- *Administrative responses to health-based violations and TC positives not leading to violations*—Each state performs a variety of activities related to health-based violations. Both

states' activities involve compliance determinations. Each state also provides some level of response to TC positives that do not lead to violations.

- *Administrative response to M/R violations*—As with heath-based violations, both states track data and make compliance determinations. Minnesota also collects samples from many non-community water systems.

Entities. The evaluation focuses on the states of Minnesota and Texas. The evaluation does not focus on activities performed by the EPA Regions or by public water systems independent of the activities being performed by the two states.

Timeframe. The timeframe for this evaluation is governed by the timeframes of the data used in the evaluation. The site visit interviews generally covered "current" practices used by each state. These visits were performed in January of 2009, and thus the information derived from those visits should be interpreted to reflect practices in place and viewpoints held at or around that time. We also used data from the Logic Model Reporting Tool (LMRT). These data reflect actions taken by the states as well as PWS characteristics and compliance from January 2004 through December 2008. We were also provided with documents intended to reflect the standard operating procedures (SOPs) in Minnesota and Texas. Most of the documents provided by MDH and TCEQ were dated within the last five years. Finally, both MDH and TCEQ extracted data from their internal data sources for use in the analysis; these data generally reflect events occurring in the 2007 to 2008 timeframe.

Public Water System (PWS) Distinctions. A number of aspects of the evaluation require consideration of how states respond to different types of systems. In these cases, ERG has used the following stratifications of PWSs:

- Community water systems (CWSs) versus non-community water systems (NCWSs).

- Systems with surface water sources or ground water under the direct influence of surface water versus systems with ground water sources.

- Systems serving more than 1,000 consumers versus those serving less than 1,000 consumers. For the purpose of this report, we refer to systems that serve more than 1,000 consumers as large systems and ones that serve less than 1,000 consumers as small systems.

One–to-One Comparison Between Minnesota and Texas. A one-to-one comparison between Minnesota and Texas is not feasible because each state operates and implements its program differently. The purpose of this evaluation is to assess implementation of the program within each state and not to compare the two states. The results of this evaluation can be used by other states as a model framework to assess their own implementation of the TCR.

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SECTION THREE: DATA SOURCES AND METHODOLOGY

3.1 DATA SOURCES

Four data sources are used for this evaluation:

- *Site-Visit Data*—ERG conducted site visits to both MDH and TCEQ and facilitated detailed interviews with program managers, field staff, data experts, and other key staff from each program. Each site visit took place over three days and lasted two full work-days.

- *Logic Model Reporting Tool (LMRT) Data*—EPA and states have collected information on activities conducted by states under the Safe Drinking Water Act, including responses to violations and outcome data. These data are compiled in the federal version of the Safe Drinking Water Information System (SDWIS/FED) and then are extracted into the LMRT.

- *Source Documents*—The two states provided documents that describe state policy and standard operating procedures in response to TCR M/R and MCL violations.

- *Other Program Data From States*—The two states also provided data on outcomes and program activities.

3.1.1 Site Visits

Site visits involved collecting detailed information on the actual implementation of each program and on program priorities. ERG visited TCEQ from January 6 to January 8, 2009, and visited MDH from January 27 to January 29, 2009.

During each site visit, ERG performed a similar set of interviews. They can be described as follows:

- *Introductory Interview*—ERG interviewed the state program's management and key personnel. The purpose of the interview was to:
  - Discuss the program's philosophy, structure, and context.
  - Discuss the roles and responsibilities of the different agencies, offices, and staff within the state.
  - Discuss each state's implementation of the TCR.
  - Review the performance measures used by the state and other measures that the state expects would be useful.
- *Detailed Interview*—ERG reviewed how each state responded to different events at PWSs (e.g., TC positives without violations, health-based violations, and M/R violations) and also discussed violation prevention activities performed by the state. ERG also collected information on the resources expended by each state related to responding to these events and performing these activities.
- *Data Expert Interview*—ERG discussed data used by the state in tracking the program.
- *Supplementary Interviews*—ERG conducted interviews of other key state staff involved in the implementation of the program. These interviews covered topics not covered in other interviews and included:
  - Operator certification
  - Labs
  - Source water protection

    - Well management
    - Enforcement
- *Wrap-up Interview*—ERG brought the key state staff together on the last day to wrap up the visit, ask any outstanding questions, and clarify information.

Appendix B includes the interview guides that were used in conducting the TCEQ site visit, and Appendix C includes the guides used during the MDH site visit.[6] The two sets of guides are nearly identical with the exception of minor changes to reflect the names and subtle nuances associated with each state.

Assessment of Limitations. The site visits yield interview data, which must be evaluated with some assumptions in mind. That is, we assume that the interviewees are providing accurate representations of the situations and processes we are asking about. For this project, representations might be inaccurate if interviewees in Minnesota and Texas were not familiar with or had poor recollection of how their state responds or the process used in a certain situation. We expect, however, that the information we collected from each state has a high degree of accuracy. First, the interviews were conducted with staff at the state level that are directly involved in program implementation. Second, we interviewed multiple staff from each state simultaneously, which allowed the interviewees to discuss responses to questions amongst themselves and to provide us with a comprehensive response.[7] Third, each site visit involved a representative from the EPA Regional office. In many cases the Regional representative was able to provide a broader view of the state's policies and procedures within the context of the EPA Region. Finally, we allowed for a final wrap-up interview to clarify or revisit issues or answers discussed during the visit.

3.1.2 Logic Model Reporting Tool Data

The Logic Model Reporting Tool (LMRT) tracks state-level data related to the Safe Drinking Water Act (SDWA) from the federal Safe Drinking Water Information System (SDWIS/FED). For this evaluation, the LMRT provided data in July 2009 for Minnesota and Texas for January 2004 through December 2008. The data provide information on the numbers and types of violations, the tier of violations, responses by the states to violations, the time in which states took to respond to violations, and PWS compliance outcomes (e.g., returned to compliance, time to return to compliance). In addition, the data also track information on system types, sizes, and other characteristics of systems. The breadth of data in the LMRT allows us to 1) evaluate outcomes that are associated with program implementation, 2) assess differences in outcomes across PWS system types (see Section 2.3), and 3) determine changes over time in the data.

Assessment of Limitations. The LMRT data are maintained by EPA's OGWDW and are subject to the data quality requirements set forth by that office. One potential limitation of using these data for this analysis has to do with matching the timeframe of the LMRT data to the timeframe involved in the site visit interviews. The LMRT data we are using spans from 2004 to 2008. The site visits occurred in January 2009 and covered "current" policies and procedures and presumably reflected how the state implemented the TCR in 2008. Regardless, we do not expect this to be an issue for the analysis because each state program has been relatively stable over the last few years.[8]

[6] There were no pre-defined scripts for the wrap-up interviews, but this time was reserved for clarifying information collected previously or covering questions from other interviews that could not fit into allotted time slots.
[7] In fact, in many cases the interview process itself was a learning process for the interviewees. Many of the interviewees indicated that the concentrated program review provided them with new information and insights into their own programs.
[8] Stability of the program was discussed during the site visits with each state.

3.1.3 Source Documents

Questions 3a through 3d involve comparing intended and actual implementation of the TCR. One component of intended implementation is what each state has documented in its standard operating procedures (SOPs) documents. Appendix D provides a list of these source documents.

Assessment of Limitations. The source documents are meant to be used as one input into characterizing intended implementation. The documents provided by Minnesota provide a characterization of how the program is intended to operate. On the other hand, the SOPs for Texas are not documented to a significant degree.

3.1.4 Other Program Data From States

During and following the site visits, each state made its own internal data available to ERG. These additional data were the result of requests made by ERG or were provided by the states to add to ERG's understanding of the programs. These data included information on:

- TC positives with and without violations
- System characteristics
- Numbers of violations and characteristics of those violations
- Operator certification programs
- Sanitary surveys
- Training and outreach events

In performing the analyses for this report, however, ERG focused on the LMRT data as the primary source of quantitative information.

3.1.5 Data Quality Requirements

In conjunction with EPA (Evaluation Support Division [ESD] and OGWDW), ERG developed a set of data quality requirements for each data source used in this evaluation. These are presented in Table 3-1. All data presented in this report meet these data quality requirements.

Table 3-1. Data Quality Requirements for Each Data Source

Source	Data Quality Requirements
Site Visit Interviews	• *Transparent*—Data provided by each state during the interviews should be information that can be provided in a public report. • *State-Level Consensus of Provided Facts*—Facts provided by each state should reflect a consensus view from the state staff involved in providing the information. • *Non-Disputed Presentation*—ERG's presentation of facts provided by each state should not be disputed by the respective states.
Logic Model Reporting Tool (LMRT) Data	*Note: LMRT data are developed and maintained by EPA's OGWDW and must meet data quality requirements for OGWDW purposes. The data quality requirements here reflect the needs of this project.* • *Valid*—Data should measure what they purport to measure. • *Complete*—LMRT data should be free of significant gaps (e.g., missing facilities) for items related to PWS compliance and actions taken by states with respect to the TCR. • *Accurate*—LMRT data should be accurately measured for each data element (e.g., violations should be accurately classified and attributed to the correct facilities).

Source	Data Quality Requirements
Source Documents	• *Available*—Documents (or the information contained therein) provided by the states should be available to the public to ensure that conclusions based on information provided in the documents can be verified by interested parties.
Other State-Supplied Data	• For qualitative data: same as site visit interviews requirements. • For quantitative data: same as LMRT data.

3.2 ANALYTICAL METHOD: THEMATIC ANALYSIS

Our overarching methodological approach for this evaluation can be described as a thematic analysis based on case studies of Minnesota and Texas.

3.2.1 Description of Thematic Analysis

Thematic analysis involves collecting qualitative data in a structured manner and then analyzing those data for recurring ideas and concepts. Recurrent ideas or concepts are identified by looking for trends, common words, or repeated concepts. For example, in ERG's site visit with MDH, a concept that emerged was the cooperative nature of MDH's relationships with PWSs. This concept was stated explicitly by MDH staff but was also evident in MDH's approach with PWSs (e.g., MDH indicated that it worked with PWSs that have health-based violations to ensure that violations and the associated public health risks do not recur). TCEQ's approach to PWSs differs from MDH's and can be described as a formal approach to PWSs. A theme that encompasses the information from both states is "relationship with PWSs." ERG developed themes that 1) summarize recurrent ideas and concepts from each state and 2) are general enough to encompass information from both states.

Identifying and developing themes occurred throughout the evaluation process. ERG developed a set of interview guides based on the evaluation questions. Following the on-site interviews, ERG developed the set of themes, based on the interviews, which appear in Table 3-2. The structure for developing these themes was flexible: some of the themes represent broadly defined ideas, and others represent narrowly defined ideas—and some can be considered as subcategories of other themes. The important criterion for a good theme is that it reflects an important concept for assessing TCR implementation in Minnesota and Texas. We expect that this set of themes is general enough, however, to be applicable to TCR programs in other states. Finally, most of the themes also include assessment factors which are specific aspects of the theme where data can be analyzed and which allow us to provide a more focused discussion.

Table 3-2. Qualitative Themes

Theme	Description
Program Organization	• An assessment of how the two states' TCR programs are organized. Assessment factors include: o Structural organization of the program. o Overall functionality of the agency in which the TCR program is housed. o Priorities and goals of the TCR program and/or state agency. o Communication between parts of the program (e.g., between field offices and central program office, between different offices responsible for implementation).
Staffing Structure	• An assessment of how the two states have chosen to staff their programs and how that staff has impacted implementation. Assessment factors include: o Extent to which the states have dedicated staff to TCR implementation. o Staff educational backgrounds. o Levels of staffing.
Agency and Program History	• An assessment of how the history of each state's program has influenced current implementation.
Enforcement Function	• An assessment of how (organizationally) each state has chosen to implement TCR-related enforcement for M/R violations and how this relates to TCR implementation. Assessment factors include: o Location (organizationally) of the enforcement function. o Handling of complaints. o Emphasis placed on enforcement.
State Factors	• An assessment of how state-specific factors have impacted TCR implementation in the two states. Assessment factors include: o Geography o Climate
Relationship With Labs and Partners	• An assessment of the how the two states have organized their relationships with labs and partners. Assessment factors include: o Whether or not the labs are part of the state. o The roles (outreach, communication, training) played by partners in TCR implementation.
Relationship With PWSs	• An assessment of the relationships that the two states maintain with the systems and how those relationships impact TCR implementation. Assessment factors include: o Philosophy on relationship with PWSs. o Approach to working with "bad actors."
Characterization of the PWS Population Within Each State	• An assessment of how the characteristics of PWSs in each state relate to TCR implementation. Assessment factors include: o Geographic distribution of PWSs. o Distributions of PWSs across size, source water, and types.
Data Management	• An assessment of how both states manage TCR-related data and how that data management relates to implementation. Assessment factors include: o The process used by each state to collect and manage large quantities of data. o The nature of the database(s) being used by the state. o The number of databases used by each state and the integration of those databases.

Theme	Description
Implementation of Federal Requirements	• An assessment of how each state implements certain federal requirements and how that relates to TCR implementation overall at the state level. Assessment factors include: o Requirements for sampling. o Exemptions allowed for sampling requirements. o Invalidation of samples. o Sanitary surveys.
Measuring Program Efficiency and/or Effectiveness	• An assessment of how each state measures program efficiency and/or effectiveness. Assessment factors include: o Performance metrics. o Program efficiency. o Barriers to measurement. o Most effective activities. o Key roadblocks to program effectiveness.
Resources	• An assessment of resources employed by each state in implementing the TCR program, including how each state leverages its resources.

3.2.2 Using Thematic Analysis in This Evaluation

ERG used the themes in Table 3-2 to inform our answers to the evaluation questions. Certainly, it is possible to answer the evaluation questions without applying themes; however, given the significant amount of information available from the site visits and LMRT data, a non-themed approach would result in a "laundry list" of information and data that is relevant for each question. The value of the thematic approach is that it provides a structure to the answers and conclusions. Applying the thematic approach in this evaluation requires an answer to two questions:

- Which themes relate to each question and how?
- What do the data and information collected for each relevant theme say about the evaluation question?

Section 3.3 answers the first of these questions, and Section 4 discusses the second.

The thematic approach is particularly useful for question sequences 2 and 3, where multiple themes apply and where we can organize the answer to the evaluation question around the themes. For question sequence 2 (factors that influence program implementation), we use the themes to organize responses related to which factors affect implementation. For question sequence 3 (comparing intended to actual program implementation), the themes are used to provide insights into program implementation within each state.

3.3 LINKING EVALUATION QUESTIONS TO DATA SOURCES AND THEMES

This section provides a link among the data that are available for each evaluation question, the themes that are associated with each question, and the analytical approaches used for each question.

3.3.1 Evaluation Question 1—Resource Allocation

Question Statement. "(1) Using relevant categories of expenditure how are state FTE/$ allocated across the program activities to implement the TCR provisions?"

Data. ERG collected data on labor time and non-labor resources spent on different aspects of each state's program during the site visits. These data are divided into six categories of expenditures:

- System-specific technical assistance related to violations
- Violation prevention, system specific (excluding sanitary surveys)
- Sanitary surveys
- Violation prevention, non system-specific
- Administrative responses to health-based violations and TC positives not leading to violations
- Administrative responses to M/R violations

Relevant Themes. The following themes are relevant for assessing resource allocation:

- Staffing structure
- Resources

Analytical Tasks. For each state separately, we compared the information on FTE expenditures, divided into the categories of expenditures, to get a sense of where each state has focused its resources. We combined this quantitative data with our own qualitative assessment of what we heard during the on-site interviews.

3.3.2 Evaluation Question Sequence 2—Factors That Affect Implementation

Question Statement. Question sequence 2 consists of two separate questions:

(2a) How do the following factors affect program delivery related to MCL violations?
- State organizational structure
- State resources
- Other factors in the state's span of control.

(2b) How do the following factors affect program delivery related to monitoring and reporting (M/R) violations?
- State organizational structure
- State resources
- Other factors in the state's span of control

As noted in Section 2.2, however, we use a broader interpretation of this question to evaluate themes and factors that affect delivery of the TCR program in each state.

Data. ERG collected a significant amount of interview data from each state on their implementation and delivery of the TCR during the site visits. The interviews in those visits focused on a number of themes and how they relate to program implementation in general.

Relevant Themes. In answering this question sequence, all themes are relevant. In our approach we attempt to relate the themes and their specific assessment factors (see Table 3-2) to one another to determine the various effects on implementation.

Analytical Tasks. For each state separately, we reviewed the data collected through the site visits and then assessed how the various themes and factors related to implementation. This required making semi-causal statements of the form "Factor A has most likely led to Implementation Characteristic X." To

make these statements, we needed to be able to determine how the factors and/or themes related to program delivery. ERG focused on what we considered to be definitive links between the factors/themes and program delivery. These were themes that appear to pass a simple common-sense test or where the state has specifically indicated the relationship between the factor/theme and its program delivery. The introduction to Section 4.3 provides more details on our approach to performing this aspect of the analysis.

3.3.3 Evaluation Question Sequence 3—Comparing Intended to Actual Implementation

Question Statement. Question sequence 3 consists of four specific questions:

(3a) What processes/procedures does the state follow with respect to MCL violations?
(3b) Regarding MCL violations, is the state implementing the TCR in the way that it intends?
(3c) What processes/procedures does the state follow with respect to M/R violations?
(3d) Regarding M/R violations, is the state implementing the TCR in the way that it intends?

Data. During the site visits, ERG collected a significant amount of information on the procedures that each state follows in implementing the TCR. The site visit data are used to represent actual implementation and to develop the themes that we used to provide insights into each state's implementation of the rule. ERG uses each state's logic model to represent intended implementation. States provided ERG with documentation on SOPs, to the extent that documentation was available. The LMRT data can also be used to compare intent with quantitative information on what the state has actually done in implementing the TCR. In particular, we use the LMRT data to tabulate the times it takes each state to respond to violations and the types of responses made by each state.

Relevant Themes. The following themes are relevant for comparing intended to actual implementation:

- Program organization
- Staffing
- Enforcement
- Relationships with labs and partners
- Relationship with PWSs
- Data management
- Implementation of federal requirements

Analytical Tasks. ERG's approach to comparing intended to actual implementation involves three distinct aspects. First, we use each state's logic model to represent its intended implementation and compare that to the information collected through the site visits (actual implementation). Second, we provide observations based on the themes we developed. These observations are meant to provide insights into each program viewed through the themes. Finally, we tabulate LMRT data to provide additional information on actual implementation. Although we were provided with documents that were meant to reflect intended implementation, these documents did not prove useful for characterizing intended implementation.

3.3.4 Evaluation Question Sequence 4—Assessing Performance Measures

Question Statement. Question sequence 4 comprises two separate questions:

(4a) What performance metrics are being used by the state to measure the efficiency/ effectiveness of TCR implementation?
(4b) What recommendations can be made for improving the performance metrics being used by the state to measure efficiency/effectiveness of TCR implementation?

Data. During the site visits, ERG asked multiple staff in various interviews about performance measures that MDH and TCEQ use to track efficiency and effectiveness of TCR implementation. Many of the interview discussions also touched on how each state viewed efficiency and effectiveness of its program. Thus, we collected information on each state's thoughts on efficiency and effectiveness. Finally, the LMRT data and the data provided by each state provide an indication of what is available for use in developing performance measures.

Relevant Themes. The relevant themes for assessing current performance measures and in recommending improved measures are:

- Measuring program efficiency and/or effectiveness
- Resources
- Data management

Analytical Tasks. ERG analyzed the information compiled from the interviews with the information from the background documents to identify potential performance measures. ERG reviewed the 1) the recommendations for performance measures collected during the site visits, 2) information on program priorities and emphasis collected during the site visits, and 3) available data. ERG also relied on its experience and best professional judgment in developing recommendations for improving the performance metrics for each state.

3.3.5 Evaluation Question 5—Assessing Current Performance

Question Statement. "(5) Based on the recommendations in Question 4b (i.e. the performance metrics that the state should use to measure efficiency/effectiveness of TCR implementation) and on the best available data, what is the state's current level of efficiency/ effectiveness in implementation of TCR?"

Data. ERG used the LMRT data to provide a sense of what current performance would look like under the recommended measures.

Relevant Themes. The following themes are relevant for measuring current performance based on recommended measures:

- Measuring program efficiency and/or effectiveness
- Resources
- Data management

Analytical Tasks. ERG used the LMRT data to provide estimates or sample calculations for the recommended performance measures from Question 4b.

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SECTION FOUR: RESULTS

This section presents the results of the evaluation using the methods described in Section 3. In presenting the results, we have altered the order of the evaluation questions slightly to better reflect a logical flow of information.[9]

4.1 RESOURCE ALLOCATION

Evaluation Question (1): Using relevant categories of expenditure, how are state FTE/$ allocated across the program activities to implement the TCR provisions?

This section provides ERG's analysis for evaluation question 1. During the site visits, we collected information on the time and resources spent on different aspects of implementing the program. Appendix E of this report presents detailed tables with the results of that data collection. In this section, we summarize that information along with the qualitative information we heard during the site visits to provide an assessment of how each state has allocated its resources to implement the program. As noted in Section 2.3, we divide expenditures into six categories:

- System-specific technical assistance related to violations
- Violation prevention, system specific (excluding sanitary surveys)
- Sanitary surveys
- Violation prevention, non system-specific
- Administrative responses to health-based violations and TC positives not leading to violations
- Administrative responses to M/R violations

We organize our assessment of resource allocation around these six categories.

4.1.1 Minnesota

Table 4-1 provides ERG's assessment of how MDH has allocated its resources across the six expenditure categories. Additional details are provided in Appendix E, Table E-1. Information provided by MDH indicates that the department has 98 staff who support the TCR program in some capacity. All of these staff support other programs in addition to the TCR program, however[10] and none of these staff are employed full-time in the TCR program. Based on data provided by MDH during ERG's on-site visit, ERG has estimated that MDH expends 10.9 FTEs in performing TCR-related work. These hours include time to respond to TC positives and MCL and acute MCL violations (including performing technical assistance and sending out violation notices), perform sanitary surveys, collect samples from NCWSs, and perform outreach activities (performing training, attending conferences, sending out newsletters). Appendix F contains an organizational chart for MDH's Drinking Water Protection Section.

[9] Specifically, we have presented question sequence 3 prior to question sequence 2.
[10] Staffing is discussed in more detail in Section 4.2.1, "Thematic Analysis Related to Program Implementation," "Staffing."

Table 4-1. Assessment of MDH Resource Allocation Across Expenditure Categories

Category	Assessment
System-specific technical assistance related to violations	• MDH allocates a significant amount of resources to system-specific violation prevention, performed during responses to MCL and acute MCL violations. Based on data provided by MDH, the agency spends between 4 and 32 hours for each event (e.g., an MCL violation) and responds to approximately 575 events annually for a total of 1.5 FTEs annually to provide technical assistance in response to MCL and acute MCL violations.
Violation prevention, system specific (excluding sanitary surveys)	• MDH's response to a system with a TC positive without a violation is to perform a visit to assist the system in solving the issue and to avoid the violation. In responding to approximately 120 of these events annually, MDH spends 355 labor hours. • MDH spends 3.5 FTEs annually in collecting samples from NCWSs on annual monitoring.
Sanitary surveys	• MDH performs approximately 2,750 sanitary surveys annually (three-fourths of which are NCWSs and the remaining being CWSs). Based on data provided by MDH, these surveys require approximately 4 FTEs of labor.
Violation prevention, non-system-specific	• Compared to system-specific violation prevention, MDH allocates relatively few resources to non-system-specific violation prevention. MDH develops and delivers training, attends conferences, develops guidance documents, and publishes newsletters. Based on information provided by MDH, the total labor time spent on this annually totals 675 hours. • MDH's operator certification program spends 215 hours annually reviewing approximately 1,300 new and renewal license applications.
Administrative responses to health-based violations and TC positives not leading to violations	• Much of MDH's response to these events is composed of providing assistance to the system. Estimates of the assistance-related resources are discussed under system-specific violation prevention above. MDH's non-assistance response activities for these events include entering samples into databases and issuing notices of violation. These responses take between 1 and 2 hours per event. In responding to approximately 700 of these events annually, MDH expends 540 hours.
Administrative responses to M/R violations	• MDH spends approximately 170 hours annually for M/R violation-related tasks. This activity includes responding to violations (e.g., sending notices of violation), calling labs to verify results, sending reminder postcards to systems to collect follow-up samples, and entering manually-submitted data. • MDH labs process approximately 3,950 samples annually, which takes a half-hour per sample, on average, for a total of 1,975 hours annually.

4.1.2 Texas

Table 4-2 provides an assessment of TCEQ's resource allocation for TCR implementation across the six expenditure categories. The information in Table 4-2 is based on the detailed table in Appendix E, Table E-2 and our interviews with TCEQ. Based on data provided by TCEQ, ERG has estimated that TCEQ expends 27.9 FTEs annually in administering the TCR program in Texas. The majority of that time, however, is allocated to performing comprehensive compliance investigations (CCIs) (sanitary surveys), with TCEQ spending 80 percent of the total hours on CCIs. TCEQ also spends a significant amount of time performing data-related tasks that could be automated, including entering submitted data related to both health-based and M/R violations. Appendix F contains an organizational chart for TCEQ.

Table 4-2. Assessment of TCEQ Resource Allocation Across Expenditure Categories

Category	Assessment
System-specific technical assistance related to violations	• TCEQ spends an estimated 210 hours annually on violation-related directed assistance referrals (DARs) conducted by the Texas Rural Water Association. • As part of its daily activities, four of TCEQ's staff respond to between 100 and 200 calls per month each, at about 10 minutes per call. TCEQ estimates that between 70 and 80 percent of these calls are related to violations. Using the mid-point of these ranges implies TCEQ responds to an estimated 5,400 violation-related calls annually and spends an estimated 900 labor hours responding to those calls.
Violation prevention, system specific (excluding sanitary surveys)	• TCEQ spends an estimated 390 hours annually on violation prevention-related directed assistance referrals (DARs) conducted by the Texas Rural Water Association. • As noted above, four of TCEQ's staff respond to between 100 and 200 calls per month each, at about 10 minutes per call. TCEQ also estimates that between 20 and 30 percent of these calls are violation prevention-related. Using the mid-point of these range implies TCEQ responds to an estimated 1,800 calls annually and spends an estimated 300 labor hours.
Sanitary surveys	• TCEQ spend a significant amount of time performing sanitary surveys, referred to as comprehensive compliance investigations (CCIs) in Texas. CCIs take anywhere from 15 to 24 labor hours to perform (depending on system type, size, and water source), and TCEQ conducts about 2,500 annually for a total of 22.3 FTEs annually.
Violation prevention, non-system-specific	• TCEQ spends 1.1 FTEs on performing non-system-specific compliance assistance such as developing guidance documents, attending conferences, sending reminder letters to PWSs, creating Consumer Confidence Report (CCR) templates, and reviewing and approving third-party operator certification training course information.
Administrative responses to health-based violations and TC positives not leading to violations	• Responding to MCL and acute MCL violations is more of an administrative desk-based task for TCEQ. Each day TCEQ staff compile samples submitted by systems, enter sample data into a database, update the PWS inventory, perform data QA/QC, call labs to verify results, call systems to discuss results, and send out letters and notices of violation. These tasks involve approximately 12 hours of staff time each day and in total, these activities result in TCEQ spending 1.5 FTEs annually.
Administrative response to M/R violations	• M/R violation determination by TCEQ is a desk-based administrative task. TCEQ's daily activities for M/R violations include determining whether or not violations have occurred, uploading electronic submissions into TCEQ's database, entering paper submissions, and responding to inquiries by systems. In total TCEQ spends 1.33 FTEs annually, responding to approximately 425 M/R violations. • Enforcement follow-up to M/R violations is performed by the TCEQ Office of Compliance and Enforcement (OCE). Some time is spent coordinating with OCE, but for the most part OCE takes the case once M/R violations occur. For most cases, OCE spends only a few hours in following up. In some cases with more significant violations, OCE can spend several hundred labor hours to enforce compliance. OCE indicated they are involved with close to 100 TCR cases each year, spending about 16 hours on most cases or 1,600 hours annually.

4.2 IMPLEMENTATION: COMPARING INTENDED TO ACTUAL IMPLEMENTATION, AND THEMES RELATED TO ACTUAL IMPLEMENTATION

This section compares each state's intended and actual implementation, provides a thematic analysis of each state's actual implementation, and tabulates LMRT data related to program implementation in each state. In so doing, this section provides an answer to evaluation question sequence 3.

Evaluation Question (3):
- *(3a) What processes/procedures does the state follow with respect to MCL violations?*
- *(3b) Regarding MCL violations, is the state implementing the TCR in the way that it intends?*
- *(3c) What processes/procedures does the state follow with respect to M/R violations?*
- *(3d) Regarding M/R violations, is the state implementing the TCR in the way that it intends?*

In comparing intended to actual implementation, we use the state-level logic model presented in Section 2.1 as a representation of intended implementation and compare that to the information we collected on actual implementation during our site visits. In addition to comparing intended and actual implementation, we perform a thematic analysis related to program implementation in each state. Specifically, we use the themes discussed in Section 3.2 to provide further observations and insights into each state's implementation. The thematic analysis is meant to supplement the intended versus actual comparison to provide insights into aspects of program implementation where an intended to actual comparison cannot be made. Finally, we tabulate LMRT data to further inform our review of state-level implementation.

4.2.1 Minnesota

Comparison of Intended to Actual Implementation

Although the Minnesota Drinking Water Information System (MNDWIS) currently meets MDH's needs, making improvements to the system or performing additional analysis/queries using the system are constrained by limited funding and staff time. This lack of resources limits the ability of MDH to use MNDWIS to measure performance based on the program logic model. Specifically, without staff time to develop and run queries and reports for performance measurement purposes and without funding to expand and improve upon MNDWIS, MDH's ability to use the database as a performance measurement tool will be limited.

Discussions between MDH staff during the site visit indicated some gaps in knowledge about the capabilities of MNDWIS data. During the site visit, ERG noticed that MDH staff working on the TCR program were unaware of the full capabilities of the MNDWIS database. For example, during one discussion, the staff person responsible for NCWSs in a specific part of the state indicated that having certain data would be valuable. That person was informed by MDH's data expert that such data are available in MNDWIS and the data expert agreed to begin providing those data. Although this was not a frequent occurrence in the discussions, it does highlight that some MDH staff are unaware of the full capabilities of MNDWIS. In the MDH logic model, MNDWIS is a resource for all activities. If the full capabilities of MNDWIS are not being utilized, MNDWIS's value as a resource will be restricted. ERG expects that this is related to MDH's centralized approach to program implementation (to be discussed in more detail below).

MDH field staff are not consistently entering information on assistance site visits into MNDWIS.[11] MDH indicated that this omission occurs because some staff are not aware those data can be entered. In reviewing its data, MDH found that between 2002 and 2009 only 140 site visits were entered into MNDWIS. Furthermore, of those 140, 63 had been entered by one engineer. MDH also indicated that site visits are one of its most effective tools for ensuring public health. MDH's cooperative approach with systems relies on these visits. Additionally, as will be discussed in Section 4.3.1, Minnesota has a disproportionate number of small NCWSs. MDH has indicated that the most effective method to deal with these systems is to provide on-site assistance. Without complete data on site visits, MDH cannot track the performance of what it considers to be one of its most effective tools.

The database used by the MDH laboratory (Minnesota Department of Public Health, Public Laboratory Division, Environmental Health Section) and the data that are submitted by private labs are not depicted in the logic model. The MDH lab uses a system called the Laboratory Information Management System (LIMS), and private labs submit data for processing by MDH into MNDWIS, which is used to determine compliance. A more complete version of the logic model would include LIMS and data from private labs, alongside MNDWIS, to better depict data flows.

The MDH logic model does not include a number of activities that MDH identified as its most effective activities to ensure public health. During our discussion with MDH staff, we asked about their viewpoint on what were the most effective activities they performed. The list they provided included:

- Facility oversight and facility visits
- Plan review
- Training
- Well construction activities (management, inspection, and source water protection)
- Working with partners American Water Works Association (AWWA) and Minnesota Rural Water Association (MRWA)

Facility visits are included, as well as training and working with AWWA and MRWA, but, as discussed below, are not given the proper weight in the model. The other activities are not in the logic model. If these are MDH's most effective tools for implementing the program, then they should be reflected in the logic model. A number of these activities typify MDH's cooperative approach and, according to MDH, are effective means of reaching the large number of small NCWSs in Minnesota. This inclusion would allow MDH to track the effects of the activities on outcomes in the logic model framework.

The MDH logic model does not give proper weight to site visits. During our site visits, MDH repeatedly pointed to the importance of their on-site work with systems and their frequent use of on-site assistance. Minnesota has a large number of small NCWSs and MDH indicated that these visits are an essential component in its program to protect public health. Additionally, MDH characterizes its approach as a cooperative approach and these visit typify that approach. Although the MDH logic model does include on-site assistance, it is not represented in the model with the proper emphasis. Specifically, the model includes on-site assistance as an output flowing from a box that includes "other site visits" as one component. We suggest increasing the visibility of the on-site assistance in the model to better represent the importance that these visits have for MDH's actual implementation.

MDH does not track performance measures that represent logic model elements. During the site visit, MDH indicated that it does not formally track performance measures for its program, but indicated that it would have the ability to do so through MNDWIS. The MDH logic model includes outputs related

[11] This observation does not apply to sanitary surveys, however, which are also a form of site visit.

to site visits, training (both county health department officials' and PWS's), responses to violations, and PWSs being informed of corrective actions, however. The model also includes outcomes related to:

- County health officials and field staff having an improved understanding of rule requirements and program purposes.
- PWSs staying in or returning to compliance with rule requirements.
- PWSs taking steps to ensure technical, managerial, and financial (TMF) capacity to meet the rule's requirements.
- PWSs having an improved understanding of the rule's requirements.
- PWSs taking corrective actions (to remedy violations) and address significant deficiencies.

If the logic model is used for program management, then key output and outcome elements that appear in the model should be tracked in some form as performance measures.

Thematic Analysis Related to Program Implementation

Program Organization

- *MDH treats acute MCL and MCL violations with the same high level of priority.* According to MDH, this decision is reflective of the agency being a public health department.

- *MDH uses a decentralized structure to implement its TCR program.* Our characterization of the decentralized nature of the program stems from the fact that the MDH staff that implement the program are: a) geographically dispersed and b) responsible for subsets of the systems (e.g., some staff are responsible for CWSs while others are responsible for NCWSs). MDH's central office staff are involved in program management, compliance determination, and laboratory analysis, and field staff handle sanitary surveys and sample collection. In being geographically closer to the systems, MDH staff visit systems more readily and also get to know the systems in more detail, which was reflected in the site visits by the MDH field staff, who indicated that they are generally familiar with the systems in their area. This decentralized structure stems from the fact that Minnesota has a disproportionate number of small NCWSs (see Section 4.3.1) and is a geographically large state.

- *MDH's communication between offices and staff involved in implementing the TCR can be improved.* One observation we made during our site visit interviews was that there was significant learning that took place among MDH staff regarding different aspects of the program. This is an indication to us that MDH staff working on one aspect of the program (e.g., NCWSs) do not have full knowledge of other aspects of the program. This reflects the decentralized structure used by MDH to implement the TCR. Our observation that improvement is needed comes from MDH's use of a cooperative approach to implement the program. We expect a cooperative approach would benefit from good communication within the program itself.

Staffing

- *MDH staff are responsible for more than TCR.* Staff are organized by function and PWS type but handle implementation of multiple rules. On one hand, having staff that are not focused solely on TCR may lead to less emphasis on TCR-specific issues; however, having staff be responsible for multiple regulatory requirements allows PWSs to have a single point of contact for both technical assistance and compliance related to all drinking water rules.

Additionally, when visiting a system for a non-TCR issue, the same staff can identify TCR-related issues. Having staff be responsible for more than TCR is reflective of the large number of small NCWSs in Minnesota (see Section 4.3.1) and the large geographic size of Minnesota.

Enforcement

- *MDH field staff are not involved in the formal enforcement process, allowing them to maintain a cooperative relationship with the systems.* In particular, for M/R violations, compliance determination and enforcement are handled by the central office staff. For MCL and acute MCL violations, central office and field staff collaborate on compliance determinations, but central office staff perform enforcement. Thus, field staff are never put in a position of having to maintain a cooperative relationship with a system and having to enforce against that same system. MDH field staff are involved in the enforcement response to MCL and acute MCL violations by providing assistance to the systems, but this should be considered more of an informal response to the systems and is clearly focused on providing technical assistance.

- *Enforcement is less of an emphasis at MDH than performing assistance.* For MDH, compliance determinations are a form of compliance assistance, as opposed to a precursor to enforcement. For example, for NCWSs with MCL violations, MDH places its initial emphasis on calling and working with the system to resolve the issue rather than on issuing a notice of violation. MDH's emphasis on assistance reflects its cooperative approach. Once again, MDH's first response to violating systems can be viewed as more of an informal response.

Relationship With Labs and Partners

- *MDH maintains many of its own labs and contracts with many smaller labs to ensure that samples can be processed quickly.* MDH indicated that having its own labs allows it to be notified promptly when positive samples occur. Furthermore, according to MDH, because the department collects samples for NCWSs on annual monitoring, having its own labs allows for more efficient processing of sample results. Additionally, given that Minnesota is a large state, contracting with smaller private labs allows for processing of samples within a short timeframe to avoid sample invalidation.

- *MDH partners with 40 county health departments to administer the rule.* In partnering with these health departments, MDH ensure a local presence for the systems and leverages its own resources.

Relationship With PWSs

- *MDH uses a cooperative approach with systems to maintain compliance.* Working cooperatively was one aspect stated specifically by MDH and was further evidenced in many of the discussions with MDH. Notably, MDH actively works with systems that have TC positive results and MCL violations to assess the issues and develop solutions. MDH's cooperative approach is a hallmark of its program and is reflective of the large number of small NCWSs in Minnesota.

- *MDH performs a significant amount of on-site assistance and treats violations as opportunities to solve problems.* MDH field staff considered working with the systems to solve compliance problems to be a priority, reflecting the cooperative approach by MDH. MDH staff visit sites in response to violations and may even assist with disinfecting and with assessing why the violations occurred. According the MDH, these visits can take 30 minutes to four hours. Thus, MDH spends a significant amount of resources on site-specific assistance for systems. Furthermore, Minnesota has a large number of small NCWSs and MDH considers on-site assistance to be an effective means of dealing with those systems.

- *MDH collects samples for many NCWSs.* Collecting samples from these systems reinforces the cooperative approach described above, especially considering that Minnesota has a large number of small NCWSs. It also removes the possibility of noncompliance with reporting requirements from smaller systems where such noncompliance is more likely. Furthermore, in collecting these samples, MDH can educate new owners and operators.[12]

Data Management

- *MDH's data management is flexible and comprehensive and can be used by MDH staff to explore issues and find trends.* The MNDWIS database forms a comprehensive database and links to multiple other state-level databases. This network provides MDH staff with a large amount of data in what MDH staff described as a user-friendly format. Furthermore, the database can be used to generate custom queries, and MDH employs two data experts to perform such queries.[13] This large degree of flexibility in data analysis allows for the use of significant amounts of data to explore potential issues and for MDH staff to assist facilities.

Implementation of Federal Requirements

- *MDH conducts sanitary surveys more frequently than required.* This activity allows MDH staff to be familiar with systems and to identify issues at systems in a timelier manner. It is consistent with the cooperative approach described above. It also allows MDH to be more proactive in protecting public health and allows MDH staff to be on site at systems more frequently.

- *MDH allows for reduced compliance monitoring for NCWSs.* Reducing the frequency of monitoring for NCWSs allows MDH itself to perform the monitoring for many systems. Additionally, MDH sends reminders to CWSs that are on reduced monitoring to ensure that those systems do not neglect to perform their monitoring.

LMRT Data Related to Implementation

ERG used data on violation response times and response types to provide a sense of actual implementation. Figure 4-1 provides a tabulation of how long it took MDH to respond to MCL and acute MCL violations and M/R violations that occurred between 2004 and 2008 for all system types in Minnesota. By 30 days following the violation, almost all M/R violations had a reported response. Furthermore, by 90 days, all M/R violations had a reported response. For MCL and acute MCL violations, almost all (99.7 percent) had a reported response on the same day and all had a response within 30 days.

[12] MDH noted that NCWSs often have higher owner/operator turnover than other systems.
[13] These two staff are primarily responsible for maintaining the system but are also responsible for running the custom queries.

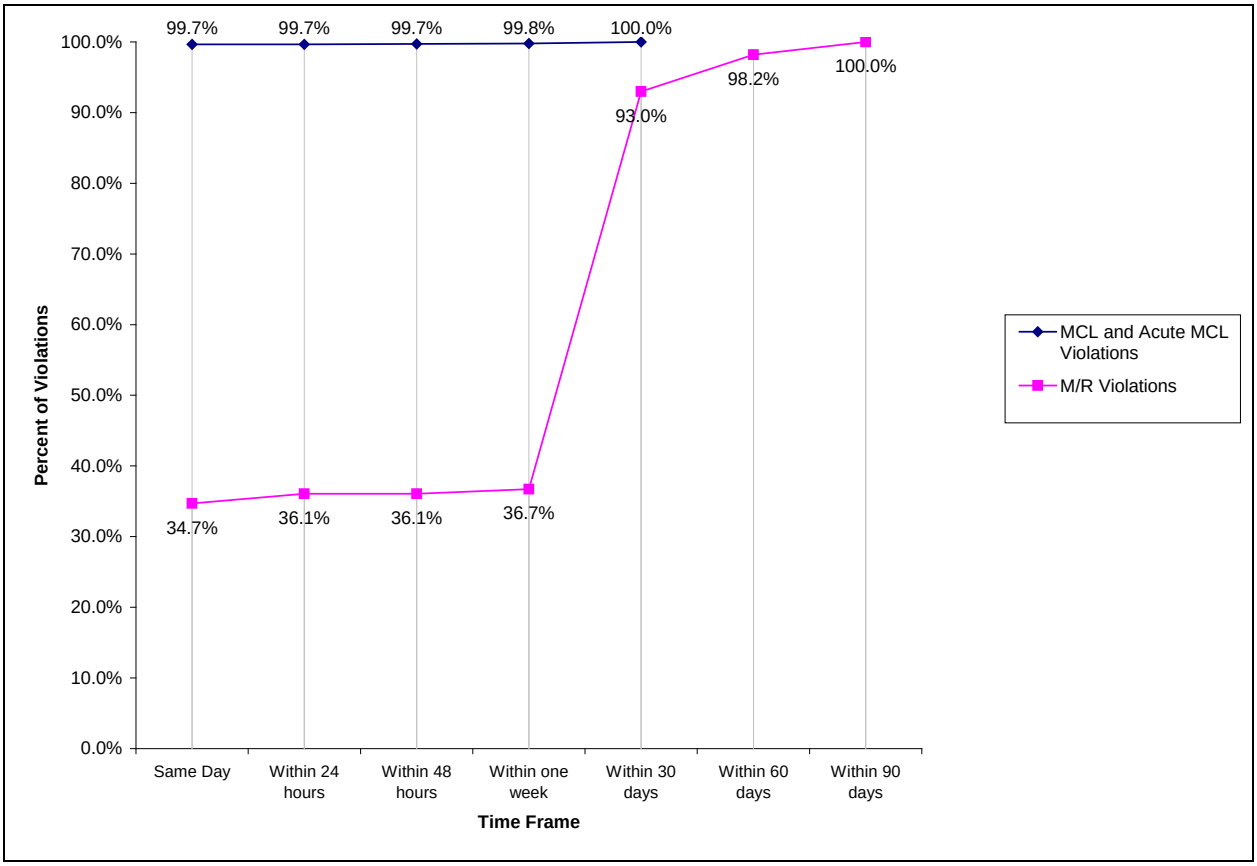

Figure 4-1. MDH – Reported Response Timeframes for MCL and Acute MCL Violations and M/R Violations (Source: LMRT data extracted in July 2009)

Table 4-3 presents LMRT data on MDH's reported first response to MCL and acute MCL violations combined and to M/R violations among small (fewer than 1,000 consumers) NCWSs. MDH's predominant reported response to all types of violations among these small systems is to issue a formal violation notice. However, LMRT data do not necessarily contain informal responses by states. Thus, MDH's more informal responses to violations could not be tabulated here.

Table 4-3. MDH - First Reported Responses to MCL and Acute MCL Violations and to M/R Violations at NCWSs Serving Less Than 1,000 Consumers, 2004-2008.

Agency First Response		Numbers of Systems	Percentage of Total
Code	**Description**		
MCL and Acute MCL Violations			
SFH	State Boil Water Order Issued	2	0.1%
SFJ	State Formal Notice of Violation Issued	1,136	82.0%
SIA	State Violation/Reminder Notice	221	15.9%
SIB	State Compliance Meeting Conducted	10	0.7%
SIC	State Technical Assistance Visit	7	0.5%
SIE	State PN Requested	5	0.4%
SOX	State Compliance Achieved (RTC)	5	0.4%
TOTALS		***1,386***	***100%***
M/R Violations			
SFJ	State Formal Notice of Violation Issued	188	98.0%
SIA	State Violation/Reminder Notice	2	1.0%
SOX	State Compliance Achieved (RTC)	2	1.0%
TOTALS		***192***	***100%***

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

4.2.2 Texas

Comparison of Intended to Actual Implementation

Data issues are detracting from TCEQ's ability to make compliance determinations and to work with systems. Our analysis of resource expenditures found that TCEQ spends approximately 12 labor hours each day performing data-related tasks that could be automated. This labor time is spent compiling faxed sampling reports, entering those data into a database, and performing QA/QC on the entered data. A significant amount of this time could be recouped through automation, especially the time that is spent on manual data entry (6 hours per day). Freeing up these hours (and hence, FTEs) would allow TCEQ to spend more time on compliance determinations and on working with systems to avoid and resolve problems.

The TCEQ logic model does not reflect how TCEQ field staff are used in the program. The core TCR program staff are located at TCEQ headquarters in Austin, reflecting the centralized approach by TCEQ. TCEQ regional staff are also involved in implementation of the TCR, but these staff are primarily experts in PWS requirements related to capacity, design, and operation (Texas Administrative Code Chapter 290, Subchapter D) and not in TCR-related requirements (Texas Administrative Code Chapter 290, Subchapter F). According to TCEQ's TCR program staff, the regional staff use the TCR staff in Austin as "consultants" on TCR issues. This is reflective of the large geographic size of Texas. This relationship, however, should be reflected in the logic model. Specifically, the regional (field) staff should be depicted as customers of the headquarters staff to reflect the actual relationship employed in Texas between these two groups.

TCEQ's implementation of the TCR does not include most of the output and outcome measures that the logic model tracks. During the site visit, TCEQ indicated that they track counts of total violations

broken out by MCL and acute MCL violations, the number of notices of violation that are sent, and the numbers of systems that are classified as significant non-compliers; however, the TCEQ logic model includes output boxes for:

- TAPs and PWSs trained in the rule requirements
- Conference presentations delivered
- Site visits and offsite violation prevention activities
- Responses to violations
- PWS awareness of appropriate corrective actions

Short-term outcomes in the logic model include:

- TAPs have an improved understanding of rule requirements and program purposes.
- PWSs stay in or return to compliance with rule requirements.
- PWSs take steps to ensure technical, managerial, and financial capacity to meet the rule's requirements.
- PWSs have an improved understanding of the rule's requirements.
- PWSs take corrective actions (to remedy violations) and address significant deficiencies.

The number of notices of violation represents an output measure that fits within the "response to violations" output category, but other responses to violations are not being tracked, such as direct assistance referrals (DARs) and other technical assistance. This is a significant gap in tracking outputs, considering that TCEQ spends approximately 600 hours annually on DARs and another 1,200 hours annually on responding to technical assistance requests over the phone.[14] This is a significant amount of resources not being tracked by output measures and reflect data issues in general at TCEQ. TCEQ's tracking of violations is similarly defined as the logic model outcome of PWSs staying in or returning to compliance, but the numbers of violations is not the same as the number of systems that are staying in or returning to compliance. Furthermore, if the logic model is used for program management, then output and outcome elements that appear in the model should be tracked in some form as performance measures.

Further discussions with TCEQ following ERG's visit indicated that TCEQ has formally adopted the state-level version of SDWIS (SDWIS/State) as its database of record. Furthermore, TCEQ added site visit and training codes into SDWIS/State, which will allow TCEQ to track and report on these aspects of the logic model. The following text box describes the codes added by TCEQ to better track site visits and training directed at systems.

Activity codes and descriptions added by TCEQ to SDWIS/State
CAPD - Capacity development assessment
CNST - Construction inspection
CPEV - Comprehensive performance evaluation
EMRG - Emergency assistance
ENGR - Engineering work, plans review, etc
FENF - Formal enforcement
IENF - Informal enforcement
INVG - Investigation of complaints
LOCD - Locational updates to facilities or components

[14] The number of hours for technical assistance over the phone is derived from the resource estimates in Section 4.1. TCEQ indicated that four staff members answer between 100 and 200 calls monthly at about 10 minutes per call. Taking the mid-point of the number of calls (150), the number of hours is calculated as: [4 staff]×[150 calls]×[10 minutes per call]×[12 months per year]÷[60 minutes per hour].

PUBH - Public hearing or other public informational sessions
SITE - Site visit (non-CCI) such as population, affiliations, mega qc reviews, etc.
SMPL - Out of ordinary sample collection
SNSV - Sanitary survey (CCI)
SRCE - Source water inspection
SRF - State revolving fund grant support
SSVF - Sanitary survey followup
TECH - Technical assistance
TRNG - Training
TRTP - Water treatment plant site visit
SWAP - Source water protection work (anything our swap folks do)
WSHD - Watershed evaluation
XCON - Cross connection control program assistance, inspections, etc.

There is a clear "wall" between enforcement and OPR's implementation of the TCR. TCEQ's enforcement effort tends to focus on formal administrative procedures against violating systems. In our discussion with TCEQ's TCR program and with TCEQ's Office of Compliance and Enforcement (OCE), which handles enforcement cases, we identified a distinct hand-off point from the TCR program to OCE for handling the administrative enforcement procedures. Furthermore, based on our discussions with TCEQ, it appears that once hand-off occurs, there is little interaction between the two offices, partly reflecting the centralized approach taken by TCEQ in implementing the TCR program. This is further confirmed by the TCEQ organizational chart which appears in Appendix F of this report. In that chart, the TCR program is located in the Water Supply Division within the Office of Permitting and Registration. Enforcement of TCR violations is handled by the Enforcement Division within OCE. The connection between the TCR program and the Enforcement Division is at the Deputy Director level. In TCEQ's organization, Deputy Directors report directly to the TCEQ Executive Director's Office. Thus, the connection between the TCR program and the enforcement function is at the highest level of TCEQ. OPR indicated, however, that there is daily interaction at the staff level on cases and quarterly meetings at the management level. Nevertheless, OPR did agree with the observation that a "wall" exists, and that it may be difficult to bring down due to the structure of TCEQ.

TCEQ has an issue with the timeliness of reporting from labs. A noted issue from the site visits is that labs are often slow in reporting sampling results to TCEQ. Systems perform their sampling in the proper timeframe and then send their results to labs. Often, the labs submit the results to TCEQ *after* the deadline for the systems to submit their sampling results. TCEQ does not issue violations to the systems for the late results since the delay is due to the labs and not the systems. Region 6 noted that without the ability to enforce against the labs and without a timeliness component of lab certification, there is little that can be done to ensure samples are submitted on time. Allowing late submissions from labs reduces the accuracy and timeliness of the data being used by TCEQ to determine compliance. Since our on-site visit in January, TCEQ has indicated that it has started to increase the amount of electronic reporting from labs, which involved hiring a contractor to modernize the data collection system. TCEQ expects that this electronic reporting will reduce the incidence of late reporting by labs.

Thematic Analysis Related to Program Implementation

Program Organization

- *TCEQ has located its TCR program within the TCEQ Office of Permitting and Registration (OPR).* As noted by TCEQ, this arrangement puts the program at odds with the rest of the office in which it is located. All other OPR programs involve permitting and licensing of

facilities, while the TCR program is focused on public health issues. TCEQ has mitigated this arrangement, however, by using a centralized approach to implementation.

- *TCEQ uses a centralized approach to implementing the program.* ERG has characterized TCEQ as "centralized" because the primary staff involved in implementing the rule are concentrated at TCEQ headquarters within OPR, and those staff cover all types of systems. TCEQ field staff that implement TCR requirements tend to be experts in PWS requirements related to capacity, design, and operation (Texas Administrative Code Chapter 290, Subchapter D) and not in TCR-related requirements (Texas Administrative Code Chapter 290, Subchapter F). This leads to the TCR program staff at TCEQ headquarter acting as consultants to the field staff. Additionally, other offices within TCEQ implement various aspects of the rule such as enforcement, sanitary surveys, and operator certification. Most of TCEQ's TCR-related implementation takes place in OPR, however.

Staffing

- *The TCR program within OPR has six dedicated staff to implement the program.* These staff perform no other responsibilities other than implementing the TCR in Texas, reflecting TCEQ's centralized approach.

Enforcement

- *TCEQ's Office of Permitting and Registration (OPR) sends enforcement cases to the Office of Compliance and Enforcement (OCE).* TCEQ has separated its enforcement from other aspects of the program and the enforcement effort tends to focus on formal administrative procedures.

Relationship With Labs and Partners

- *TCEQ has partnered with the Texas Rural Water Association (TRWA) to provide assistance to systems.* TRWA provides in-depth technical expertise in PWS issues and can provide detailed and system-specific assistance to PWSs. As noted above, the TCEQ approach is centralized, with the primary technical staff being located in Austin. Additionally, field staff who implement some requirements are not TCR experts and tend to rely on the expertise of the Austin staff. Using TRWA allows TCEQ to extend technical capabilities to systems across the state.

Relationship With Systems

- *TCEQ provides a significant amount of assistance to the systems through responses to telephone inquiries.* As discussed in Section 4.1.2, TCEQ spends a significant amount of time providing technical assistance to systems over the phone, reflecting its centralized approach. This assistance is provided by the staff at TCEQ headquarters. As part of its daily activities, four of TCEQ's staff respond to 100 to 200 calls per month each at about 10 minutes per call.

- *TCEQ does not make any distinctions by system type, size, or source water in deciding how to respond to violations and other issues that arise at systems.* TCEQ noted that it strives for consistency in application of the rule across all systems in Texas.

Data Management

- *TCEQ spends a significant amount of time processing data to determine compliance.* Each day, TCEQ staff compile hard copy data (sampling results) that are faxed/sent from labs. The data are entered and reviewed, and compliance determinations are made. TCEQ staff spend approximately 12 hours each day compiling faxed sampling reports, entering those data into a database, sending out violation notices, and performing QA/QC on the entered data. Letters are then distributed to systems in violation (MCL, acute MCL, or M/R). This is a significant daily effort by TCEQ, which could be automated.

Implementation of Federal Requirements

- *TCEQ requires disinfection of all systems.* TCEQ requires all systems to maintain a disinfectant residual of 0.2 mg/l chlorine, not just surface-water based PWSs. This is a historical fact of TCEQ's implementation of drinking water protection. TCEQ expects that given the climate in Texas (warm most of the year), disinfection provides an effective means of reducing coliform contamination.

LMRT Data Related to Implementation

Table 4-4 presents data on the type of first responses TCEQ directs at MCL and acute MCL violations combined and to M/R violations, as reported in the LMRT data. In reviewing the percentage distribution of responses across systems, these data indicate a high degree of consistency of response across PWS type.[15] The most consistent feature of these data are that TCEQ almost always responds with a violation/reminder notice.

[15] There are some differences between small and large systems in terms the distribution of response across response types, but these differences are slight.

Table 4-4. TCEQ – First Reported Responses to MCL and Acute MCL Violations and M/R Violations by PWS Type, 2004-2008

Code	Description	Community Water Systems				Non-Community Water Systems			
		Large		Small		Large		Small	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
MCL and Acute MCL Violations									
SIA	State Violation/Reminder Notice	258	86.6%	132	86.3%	15	100%	165	84.2%
SIE	State PN Requested	30	10.0%	16	10.4$	0	0%	19	9.7%
SIF	State PN Received	10	3.4%	5	3.3%	0	0%	12	6.1%
TOTALS		***298***	***100%***	***153***	***100%***	***15***	***100%***	***196***	***100%***
M/R Violations									
INA	System Inactivation	2	0.4%	8	0.3%	0	0%	19	0.6%
SFO	State Administrative Order (with penalty) Issued (SAO)	0	0%	3	0.1%	0	0%	8	0.2%
SIA	State Violation/Reminder Notice	451	92.2%	2,182	78.9%	50	92.6%	2,770	80.8%
SIE	State PN Requested	31	6.3%	305	11.0%	3	5.6%	277	8.1%
SOX	State Compliance Achieved (RTC)	5	1.0%	268	9.7%	1	1.8%	353	10.3%
TOTALS		***489***	***100%***	***2,766***	***100%***	***54***	***100%***	***3,427***	***100%***

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

4.3 FACTORS THAT INFLUENCE IMPLEMENTATION

This section assesses factors that affect program implementation, providing an answer to evaluation question sequence 2. We began with the set of observations on actual implementation we made in the thematic analysis in Section 4.2 for each state. For each observation we made, we assessed the extent to which various themes or factors (e.g., parts of the themes or aspects of implementation) would likely influence the observed fact. That is, we made an assessment of the logical link between the observation and their likely "causes." In cases where we identify one observation as a cause of another observation, we then looked at the causes of the first observation to formulate a sense of root causes. In this way, we are able to focus in on a few factors that are the largest influence on how each state has implemented its program.

Evaluation Question (2)

(2a) *How do the following factors affect program delivery related to MCL violations?*
- *State organizational structure*
- *State resources*
- *Other factors in the state's span of control.*

(2b) How do the following factors affect program delivery related to Monitoring and Reporting (M/R) violations?
- *State organizational structure*
- *State resources*
- *Other factors in the state's span of control.*

4.3.1 Minnesota

Table 4-5 presents our observations on actual implementation and the factors related to those observations organized by theme. A review of the themes and factors column indicates that three factors are most prevalent:

- A large number of small NCWSs in Minnesota
- The geography of the state of Minnesota
- The cooperative approach with PWSs emphasized by MDH

Table 4-5. MDH Summary of Themes and Factors Affecting Observations on Actual Implementation of TCR

Theme	Observation on Actual Implementation	Themes/Factors Affecting Implementation [a]
Program Organization	MDH treats acute MCL and MCL violations with the same high level of priority.	• Agency history.
	MDH uses a decentralized structure.	• Geography (State Factors theme). • Climate (State Factors theme). • A large number of small systems in Minnesota (Characterization of PWS Population theme).
	MDH's communication between offices and staff involved in implementing the TCR can be improved.	• Decentralized structure of program (Program Organization theme). • Staff responsible for more than TCR (Staffing).
Staffing	MDH staff are responsible for more than TCR.	• Geography (State Factors theme). • A large number of small systems in Minnesota (Characterization of PWS Population theme). • Decentralized structure of program (Program Organization theme).

Theme	Observation on Actual Implementation	Themes/Factors Affecting Implementation [a]
Enforcement	MDH field staff are not involved in the enforcement process, allowing them to maintain a cooperative relationship with the systems.	• Cooperative approach with PWSs (Relationship with PWSs theme).
	Enforcement is less of an emphasis at MDH than providing assistance.	• Cooperative approach with PWSs (Relationship with PWSs theme).
Relationships With Labs and Partners	MDH maintains many of its own labs and contracts with many smaller labs to ensure that samples can be processed quickly.	• Geography (State Factors theme). • Decentralized structure of program (Program Organization theme).
	MDH partners with 40 county health departments to administer the rule.	
Relationship With PWSs	MDH uses a cooperative approach with systems to maintain compliance.	• A large number of small systems in Minnesota (Characterization of PWS Population theme).
	MDH performs a significant amount of on-site assistance and treats violations as opportunities to solve problems.	• Cooperative approach with PWSs (Relationship with PWSs theme). • Decentralized structure of program (Program Organization theme).
	MDH collects samples for many NCWSs.	• A large number of small systems in Minnesota (Characterization of PWS Population theme). • Geography (State Factors theme). • Cooperative approach with PWSs (Relationship with PWSs theme).
Data Management	MDH's data management is flexible and can be used by MDH staff to explore issues and find trends.	• Decentralized structure of program (Program Organization theme). • Staff responsible for more than TCR (Staffing).
	Making improvements to the system or performing additional analysis/queries using the system are constrained by limited funding and staff time.	• Resources
	Gaps in knowledge exist about the capabilities of MNDWIS data.	• Decentralized structure of program (Program Organization theme).
	The database used by the MDH laboratory and the data that are submitted by private labs are not depicted in the logic model.	• None identified
	MDH field staff are not consistently entering information on assistance site visits into MNDWIS.	• Decentralized structure of program (Program Organization theme).
Implementation of Federal Requirements	MDH conducts sanitary surveys more frequently than required.	• Cooperative approach with PWSs (Relationship with PWSs theme). • Locating program within health department (Program Organization theme)

Theme	Observation on Actual Implementation	Themes/Factors Affecting Implementation [a]
	MDH allows for reduced monitoring for many systems.	• Cooperative approach with PWSs (Relationship with PWSs theme). • Decentralized structure of program (Program Organization theme). • A large number of small systems in Minnesota (Characterization of PWS Population theme).
Performance Measurement	The MDH logic model does not include a number of activities that MDH identified as its most effective activities to ensure public health.	• None identified.
	The MDH logic model does not give proper weight to site visits.	• None identified.
	MDH does not track performance measures that represent logic model elements.	• None identified.

[a] This column lists themes or factors (a specific aspect of a theme) that affect program implementation. In cases where we present a factor, we list the theme that it is organized under in parentheses.

A Large Number of Small NCWSs in Minnesota. According to the FY 2008 SDWIS/FED inventory data, 86 percent of systems in Minnesota are NCWSs serving 1,000 consumers or fewer. In the United States as a whole, only 74 percent of systems are NCWSs serving fewer than 1,000 consumers. Thus, Minnesota has a disproportionate share of small NCWSs. Based on our analysis, this fact drives how MDH implements the program. Examples of the influence that this factor has on implementation include:

- MDH relies on a cooperative approach with PWSs because of the large number of small systems. The idea is that smaller systems are more likely to meet their requirements under the TCR if MDH works with them to attain and maintain compliance.
- MDH staff provide a significant amount of on-site assistance. Small systems need assistance to better understand drinking water protection and to ensure compliance.
- MDH staff are responsible for more than the TCR program. This arrangement allows the staff that visit PWSs to better assist those systems in all aspects of water quality.
- MDH uses a decentralized approach to implementation to better serve the large number of small systems. This approach allows MDH staff to become familiar with the small systems and with the owners and operators of those systems.
- MDH collects samples from most NCWSs to ensure those samples are collected and that public health threats are monitored.
- MDH allows for reduced monitoring for small systems to allow them to reach compliance and to ensure that MDH can collect the needed samples for the systems where it is collecting the samples.

The Geography of the State of Minnesota. Minnesota is a large state, and this has influenced implementation in a number of ways:

- MDH employs a decentralized structure to ensure that staff are in the field to perform the site visits that are part of the program.

- MDH staff are responsible for more than the TCR program, which allows field staff to assist water systems in a number of areas when on site. It also reflects a basic resource constraint: a decentralized program cannot employ program-specific experts for multiple programs.
- MDH maintains its own lab to ensure samples are analyzed in a timely manner, as well as contracts with small labs.
- MDH collects samples for many NCWSs. Sending out samples to labs for the small systems may pose logistical issues due to the size of the state. That is, the samples may need to be driven to drop-off points far away. By collecting the samples, MDH avoids sample invalidation issues.

The Cooperative Approach With PWSs Emphasized by MDH. MDH's cooperative approach has a profound influence on how the program is implemented. It results in the following:

- MDH's field staff are not responsible for enforcement. Under the cooperative approach, MDH field staff can focus on compliance assistance, while enforcement is handled by MDH central office.
- MDH's focus on providing on-site assistance, which typifies the cooperative approach. MDH visits systems to assist them in overcoming compliance issues.
- MDH's reduces the emphasis on enforcement. In using a cooperative approach, MDH indicated that enforcement is a much lower priority.
- MDH collects samples for NCWSs on annual monitoring, which allows MDH staff to better educate owners and operators of these systems.
- MDH conducts sanitary surveys more often than required under federal law, which allows MDH staff to visit systems more often and offer assistance once there.
- MDH allows reduced monitoring at many systems, which helps meet the needs of these systems by reducing the burden of sampling.

4.3.2 Texas

Table 4-6 presents our observations on actual implementation and the factors related to those observations organized by theme. Based on our analysis, there are no clear, strong influences on implementation in Texas. Based on the information in Table 4-6 and our discussions with TCEQ, however, we have identified three factors that may be the strongest influences on implementation in Texas:

- The location of the TCR program in OPR
- The geographic distribution of systems in Texas
- TCEQ's centralized approach

Table 4-6. TCEQ Summary of Themes and Factors Affecting Observations on Actual Implementation of TCR

Theme	Observations on Actual Implementation	Factors Affecting Implementation [a]
Program Organization	TCEQ has located its program within the TCEQ Office of Permitting and Registration (OPR).	• Agency history.
	TCEQ uses a centralized approach to implement the program.	• Location of program in OPR (Program Organization theme). • Geographic distribution of systems (Characterization of PWS population).

Theme	Observations on Actual Implementation	Factors Affecting Implementation [a]
	There are differing views on the level and quality of communication between different offices that implement the TCR.	• None identified.
	The TCEQ logic model does not reflect how TCEQ field staff are used in the program.	• Centralized approach (Program Organization theme).
Staffing	TCEQ uses six dedicated staff to implement the program.	• Resources. • Location of program in OPR (Program Organization theme).
Enforcement	TCEQ's Office of Permitting and Registration (OPR) sends enforcement cases to the Office of Compliance and Enforcement (OCE).	• Geographic distribution of systems (Characterization of PWS population).
	There is a clear "wall" between enforcement and other aspects of TCR implementation.	• Centralized approach (Program Organization theme). • Communication (Program Organization)
Relationships With Labs and Partners	TCEQ has issues with the timeliness of reporting from labs.	• Data management.
	TCEQ has partnered with TRWA to provide assistance to systems.	• Geographic distribution of systems (Characterization of PWS population).
Relationship With PWSs	TCEQ provides a significant amount of assistance to the systems through responses to telephone inquiries.	• Centralized approach (Program Organization theme). • Technical effectiveness. • Technical accuracy.
	TCEQ does not make any distinctions by system type, size, or source water in deciding how to respond to violations and other issues that arise at systems.	• Consistency.
Data Management	TCEQ spends a significant amount of time processing data to determine compliance.	• Agency history.
	Data issues are detracting from TCEQ's ability to make compliance determinations and to work with systems.	• Agency history.
Implementation of Federal Requirements	TCEQ requires disinfection of all systems.	• Agency history.
Performance Measurement	TCEQ's implementation of the TCR does not include most of the output and outcome measures that the logic model tracks.	• None identified.

[a] This column lists themes or factors (a specific aspect of a theme) that affect program implementation. In cases where we present a factor, we list the theme that it is organized under in parentheses.

The Location of the TCR Program in OPR. The fact that TCEQ has located its program in OPR has helped shape the program indirectly, but in important ways. We surmise that the program's location in an office that is focused on permits has led the program to "insulate" itself from the rest of the office. Specifically, TCEQ's centralized approach to implementing the program and using six dedicated staff is reflective of being within an office that is dissimilar to the mission of the TCR program (protecting public health). This has led to the concentration of the program to just a few individuals within OPR.

Geographic Distribution of Systems in Texas. Texas is a large state, and its systems are located all over the state. Furthermore, there are many large systems that may be politically influential that are located far from Austin. In response to this large geographic distribution:

- TCEQ has adopted its centralized approach to ensure consistency across systems and to mitigate the influence of larger systems. Additionally, given the large number of systems and their distribution, it may not be feasible, with respect to resources, for Texas to locate staff in field offices across the state.
- TCEQ's Office of Permitting and Registration hands off its enforcement cases to the Office of Compliance and Enforcement (OCE), which has regional offices.

TCEQ's Centralized Approach. TCEQ's centralized approach is reflected in its concentration of key program staff in Austin and the fact that these staff deal with all types of systems. The centralized approach has led to:

- A communication "wall" between the program and the enforcement program. There is a distinct hand-off of cases from OPR to OCE, with little communication following the hand-off.
- TCEQ providing a significant amount of assistance to systems *over the phone*, rather than on site. TCEQ staff provide close to 1,200 hours of assistance over the phone. This stems from the fact that the TCR program has no regional presence. TCEQ field staff who are involved in implementation are not within the TCR program and tend to rely on the TCR staff as consultants.

4.4 PERFORMANCE MEASUREMENT

In this section, we focus on performance measurement issues by answering evaluation question sequence 4 and evaluation question 5. For each state we summarize:

- Current effectiveness and efficiency performance metrics.
- The state's ideas for good measures.
- The barriers they face to implementing improved measures.
- Our recommendations for improved performance measurement and an assessment of their performance based on our recommended measure.

The focus of our discussion is primarily on the last item.

Evaluation Question (4) and (5):

(4a) *What performance metrics are being used by the state to measure the efficiency and/or effectiveness of TCR implementation?*

(4b) What recommendations can be made for improving the performance metrics being used by the state to measure efficiency/effectiveness of TCR implementation?

(5) Based on the recommendations in Question 4b (i.e. the performance metrics that the state should use to measure efficiency/effectiveness of TCR implementation) and on the best available data, what is the state's current level of efficiency/ effectiveness in implementation of TCR?

4.4.1 Minnesota

Current Measures of Effectiveness and Efficiency. MDH currently does not track its efficiency or effectiveness. The primary reason is that it does not have the staff time to devote to performance

measurement. When MDH does generate performance data, it is usually in response to requests from EPA Region 5.

MDH's Ideas for Good Measurement. In our discussions with MDH, a number of ideas for good performance measures were identified:

- Number of waterborne disease outbreaks
- Number of repeat non-compliers
- Number of corrective actions taken after violations
- Number of site visits and surveys related to the causes of system issues as measure of responsiveness

Barriers to Measurement. MDH's primary barrier to performing measurement is the availability of staff time. In general, data management and data availability for performance measurement is not seen as an issue for MDH. They are fairly confident that the MNDWIS database can be used to track performance when needed.

ERG Recommendation for MDH Performance Measurement and Assessment of Current Performance Based on Recommended Measures. ERG recommends that MDH focus on developing measures that reflect MDH's core program components. We recommend that MDH develop measures that reflect:

- The effectiveness of its on-site assistance
- The time MDH spends to respond to MCL and acute MCL violations
- The time MDH spends to return MCL and acute MCL violations to compliance

These measures are discussed below. The three performance measures we recommend are all based in LMRT data which is available to TCEQ, as well as to other states.

Effectiveness of On-site Assistance

A measure of on-site assistance effectiveness would reflect the extent to which MDH site visits are reducing public health incidents. The purpose of this measure would be to track the number of incidents that occur at systems following visits by MDH. MDH would set a target level (not to exceed) for the measure and then track the measure over time.

The first step in developing this measure is to define the concept of a "drinking water public health incident." This could include MCL violations, M/R violations, and TC positives that are not associated with a violation, deficiencies found during sanitary surveys, as well as other events that can be linked to a specific system. We recommend that MDH take a broad view here and go beyond administrative or regulatory issues. These should be events that MDH would expect to see reduced or eliminated following visits to systems.

Next, MDH will need to define "reference periods" and "tracking periods." Site visits occurring during the same reference period will be tracked together.[16] For example, MDH may want to consider setting three month reference periods that correspond to annual quarters (e.g., January-March, April-June, July-September, October-December). Each reference period (e.g., October 2009-December 2009) would

[16] Along with the definition of an "public health concern," MDH would also need to define what "visits" are in scope for the measurement of this metric.

have a corresponding tracking period. If MDH uses a six month tracking period, then a October 2009-December 2009 reference period would have a tracking period that runs through June 2010. That is, for systems visited between October 2009 and December 2009, MDH would track the number of public health incidents occurring at those systems through June 2010.[17]

Hypothetical example. MDH visits 120 systems between October 2009 and December 2009. Those 120 systems can be called the "cohort for the fourth quarter 2009 reference period." Using a six month tracking period that ends in June 2010, MDH would count the number of incidents that occur at those 120 systems during the tracking period. If there are 75 incidents at those systems during the tracking period, the incidence rate per 100 systems for the 10/09-12/09 cohort would be 62.5 (=(75/120)×100).

The steps in calculating this measure are:

- Identify the systems that are visited during a specific reference period.
- For the systems visited in the reference period, count the number of incidents (e.g., violations, etc.) that occur within the tracking period.

To provide a concrete example of how this measure can be calculated, ERG used data from the LMRT to calculate a sample set of incident rates over time. These calculations are provided in Table 4-7. In the table, we used three month reference periods and nine month follow-up periods.[18] In Table 4-7, we also used systems with violations in the reference period to formulate the reference period cohorts. In MDH's application of this measure, they should focus on systems that were visited and not just ones that had violations. The table presents the start and end date for each reference period, the number of systems that had a violation in the reference period, the end date of the tracking period and the number of incidents at reference period systems. The incident rate is then calculated by dividing the number of incidents at the reference period systems by the number of systems in the reference period and then multiplying by 100. The data in the table show the rate to be somewhat variable over the time period, although that variability appears to decline over time and the incident rate appears to be trending downward over time. MDH should, however, focus on a target value which they attempt to stay below.[19] Figure 4-2 provides a graphical representation of the same data with a target value of 30 incidents per 100 systems drawn on the figure. Appendix G provides details on how we used the LMRT data to calculate the rates in the table.

[17] The tracking period is *through* six months following the end of the reference period and not the six months after the reference period. That is, if a system visited during a reference period has an "incident" during the reference period, that incident should count as part of the measure. For example, suppose MDH uses a three month reference period and six month tracking period and MDH visits a system on October 15, 2009 (October 2009 – December 2009 reference period). If that system has incidents on November 30, 2009 (still within the reference period) and on January 15, 2010 (after the end of the reference period, but before the end of the tracking period) then both incidents should be tabulated as part of the measure.

[18] The reference periods end with the January 2008 – March 2008 period since this was the last three-month period in the data that had at least nine months of follow-up data in the LMRT.

[19] An appropriate analogy would be that of an upper tolerance limit in a control chart. Businesses routinely set upper tolerance limits on production/manufacturing parameters and track whether they remain under those limits.

Table 4-7. MDH – Example of Calculating the Site Visit Effectiveness Rate (Incident Rate) for Three Month Reference Periods and Nine Month Tracking Periods Between January 2004 and December 2008 Using All System Types in The Calculations.

Reference Period			Tracking Period		Incident Rate [a]
Start Date	End Date	Number of (Unique) Systems With Violations	End Date	Number of Incidents at Reference Period Systems	
1/1/2004	3/31/2004	50	12/31/2004	36	72.0
4/1/2004	6/30/2004	129	3/30/2005	21	16.3
7/1/2004	9/30/2004	157	6/30/2005	28	17.8
10/1/2004	12/31/2004	72	10/1/2005	17	23.6
1/1/2005	3/31/2005	45	12/31/2005	25	55.6
4/1/2005	6/30/2005	168	3/30/2006	44	26.2
7/1/2005	9/30/2005	198	6/30/2006	63	31.8
10/1/2005	12/31/2005	98	10/1/2006	33	33.7
1/1/2006	3/31/2006	51	12/31/2006	30	58.8
4/1/2006	6/30/2006	163	3/30/2007	40	24.5
7/1/2006	9/30/2006	164	6/30/2007	50	30.5
10/1/2006	12/31/2006	75	10/1/2007	24	32.0
1/1/2007	3/31/2007	45	12/31/2007	16	35.6
4/1/2007	6/30/2007	145	3/30/2008	32	22.1
7/1/2007	9/30/2007	166	6/30/2008	38	22.9
10/1/2007	12/31/2007	113	10/1/2008	33	29.2
1/1/2008	3/31/2008	50	12/31/2008	16	32.0

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

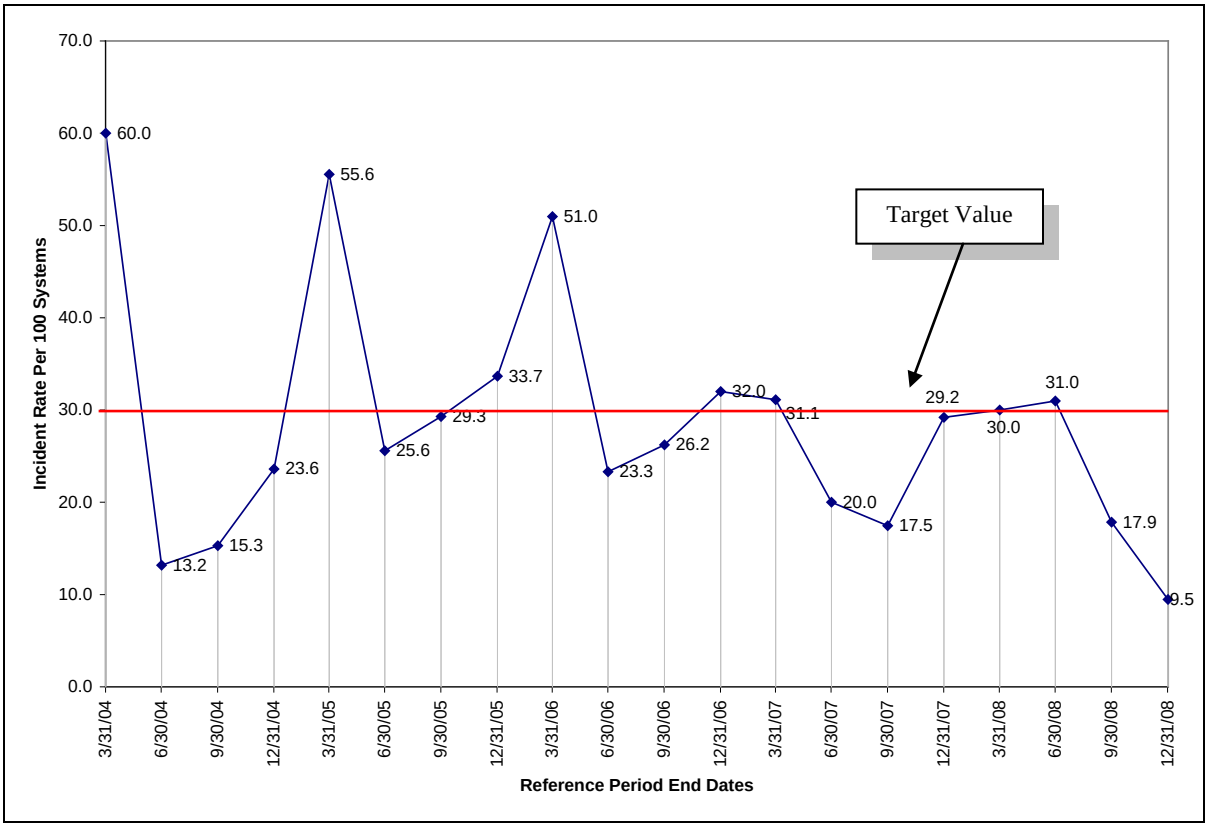

Figure 4-2. MDH – Sample Incident Rate Calculation, Values Over Time, Three Month Reference Period and Nine Month Tracking Period (Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009)

Time to Respond to and Return to Compliance MCL and Acute MCL Violations

MDH should track the time it takes to respond to MCL and acute MCL violations and the time it takes to return those violations to compliance. This tracking will allow MDH to assess its timeliness in responding to and rectifying violations that pose the most severe public health risks. Table 4-8 summarizes data on the timeframes MDH reports to have taken to respond to MCL and acute MCL violations and return those violations to compliance for violations occurring in 2004 to 2008. The table presents the numbers (and percentages of total) that were responded to and returned to compliance over various timeframes. We suggest that MDH track information similar to the data presented in Table 4-8. Furthermore, ERG also suggests that MDH set tiered targets. That is, MDH should set targets for multiple levels of response (e.g., within 24 hours, within one week, within 30 days) and multiple levels of return to compliance. For example, MDH could set targets for:[20]

- The percentage of violations responded to within 24 hours
- The percentage of violations responded to within one week
- The percentage of violations returned to compliance within 30 days
- The percentage of violations returned to compliance within 60 days

Table 4-8. MDH – Reported Timeframes to Respond to MCL and Acute MCL Violations and to Return Those Violations to Compliance, 2004 - 2008

	Number of Violations Reported As Responded To Within Timeframe		Number of Violations Reported As Returned To Compliance Within Timeframe	
Timeframe	**Number**	**Percentage**	**Number**	**Percentage**
Same Day	1,477	99.7%	6	0.4%
Within 24 hours	1,477	99.7%	16	1.1%
Within 48 hours	1,478	99.7%	56	3.8%
Within one week	1,479	99.8%	346	23.3%
Within 30 days	1,482	100.0%	789	53.2%
Within 60 days	1,482	100.0%	1,018	68.7%
Within 90 days	1,482	100.0%	1,136	76.7%
Within 120 days	1,482	100.0%	1,209	81.6%
Within 240 days	1,482	100.0%	1,289	87.0%
Within one year	1,482	100.0%	1,373	92.6%
Within two years	1,482	100.0%	1,415	95.5%
More than two years	0	0.0%	67	4.5%

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

[20] These timeframes are for illustration and are not necessarily recommended timeframes.

4.4.2 Texas

Current Measures of Effectiveness and Efficiency. TCEQ has no formal measures of program efficiency or effectiveness, but it does track the number of significant violations and notices of violation issued.

TCEQ's Ideas for Good Measurement. In our discussions with TCEQ, staff indicated a number of ideas for what would make good performance measures. These ideas were:

- Timeframe to process incoming data
- Timeframe to determine compliance and number of determinations that are made
- How training relates to compliance
- The number of technical assistance calls and referrals

Barriers to Measurement. TCEQ suffers from two significant barriers to measurement. First, with only six staff dedicated to the program in OPR, little staff time is available for performance measurement tasks. Second, TCEQ does not have a database in place that links together all aspects of the program. TCEQ staff spend a significant amount of time entering hard copy data to assess compliance. Furthermore, the database where entry occurs is not linked to other sources of information on systems in Texas. TCEQ staff also noted that they cannot link to OCE's database to extract enforcement-related information.

ERG Recommendation for TCEQ Performance Measurement and Assessment of Current Performance Based on Recommended Measures. ERG's recommendations for improving TCEQ's performance measurement deal with data issues and recommended measures for TCEQ to consider implementing. First, in terms of data issues, we recommend that TCEQ should improve the quality of the "returns to compliance" data that are reported to SDWIS/FED. The three performance measures we recommend are:

- Timeframe to return all violations to compliance
- Timeframe to respond to violations
- Amount of time that violations remain unresolved

Each of these are discussed below. The three performance measures we recommend are all based in LMRT data which is available to TCEQ, as well as to other states.

Improved Detail of Reported Data on Returns to Compliance (Outcomes)

In reviewing the LMRT data for TCEQ as part of this evaluation, ERG noticed a number of data issues. First, the data in LMRT that we reviewed reports return-to-compliance dates at specific points in time. Specifically, only 10 distinct return-to-compliance dates are reported in the 2004 to 2008 LMRT data, all corresponding to the end of fiscal quarters, and none after June 30, 2006.[21] Additionally, no MCL or acute MCL violations are reported as being returned to compliance. This information is misleading if TCEQ in fact knows that systems with those violations have been returned to compliance. Thus, the data in LMRT on returns to compliance from TCEQ are limited in detail (few dates reported), limited in availability (no dates reported after June 30, 2006), and limited in scope (no data for MCL and acute MCL violations). Improved details of reporting would allow for better tracking of trends and more

[21] These dates are: 3/31/2004, 6/30/2004, 9/30/2004, 12/31/2004, 3/31/2005, 6/30/2005, 9/30/2005, 12/31/2005, 3/31/2006, and 6/30/2006.

informative analysis. The lack of these return dates in the LMRT, however, should not be taken to indicate that systems are not being returned to compliance. The issue has to do with reporting of those data to SDWIS/FED. Additional discussions with TCEQ and Region 6, however, indicated that these data issues likely stem from TCEQ moving from a test phase of SDWIS/State to full use of SDWIS/State. Region 6 also noted that TCEQ is working on fixing the issue.

Time to Respond to Violations and Return Violations to Compliance

We are recommending that TCEQ track and report the time it takes to respond to all violations and to return violations to compliance. Table 4-9 presents violation response times for MCL and acute MCL violations and M/R violations.[22] Data such as those in Table 4-9 can be used to track violation response times. We suggest that TCEQ track information similar to the data presented in Table 4-9 but include returns to compliance for each type of violation. Furthermore, ERG also suggests that TCEQ set tiered targets. Examples of tiers include:

- The percentage of violations responded to within 24 hours
- The percentage of violations responded to within one week
- The percentage of violations returned to compliance within 30 days
- The percentage of violations returned to compliance within 60 days

Table 4-9. TCEQ – Reported Timeframes to Respond to MCL, Acute MCL, and M/R Violations, 2004- 2008

Timeframe	Violation Response			
	Number of MCL or Acute MCL Violations Reported As Responded To Within Timeframe		Number of M/R Violations Reported As Responded To Within Timeframe	
	Number	Percentage	Number	Percentage
Same Day	7	0.00%	636	9.30%
Within 24 hours	33	4.00%	636	9.30%
Within 48 hours	536	80.40%	636	9.30%
Within one week	536	80.50%	638	9.40%
Within 30 days	537	81.00%	5,263	78.10%
Within 60 days	539	81.30%	5,270	78.20%
Within 90 days	558	84.20%	5,607	83.20%
Within 120 days	594	89.70%	5,995	89.00%
Within 240 days	661	99.80%	6,717	99.70%
Within one year	662	100.00%	6,729	99.90%
Within two years	662	100.00%	6,732	99.90%
More than two years	-	-	4	0.10%

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.
[a] All of the violations returned to compliance after 60 days were reported to be returned to compliance in 61 days.

[22] We are recommending that TCEQ also track the return to compliance for MCL/acute MCL violations and M/R violations. The LMRT data for TCEQ do not present returns to compliance for MCL and acute MCL violations and returns to compliance for M/R violations are not required to be reported to SDWIS/Fed. Thus, we have not presented returns to compliance data in Table 4-9.

Timeframes of Unresolved Violations

Finally, we recommend that TCEQ track the time that violations remain unresolved. For example, given TCEQ's focus on compliance, knowing the percentage of violations that are not resolved (not returned to compliance) within 60 days might be a useful program management tool. Table 4-10 presents data that can highlight how this information is calculated. As can be seen in the table, 90 percent of the unresolved M/R violations as of April 1, 2006 are at least 60 days old.[23] TCEQ should set targets for reducing the number and/or percentage of cases that linger past a specific cut-off date (e.g., no more than 40 percent of unresolved cases greater than 90 days). This type of measure will also assist TCEQ in tracking down cases that tend to linger.

Table 4-10. TCEQ – Number of Days for Unresolved M/R Violations as of April 1, 2006

Violation Ages (in Days)	Number of Violations	Reverse Cumulative Distribution [a]
0 - 30	69	100%
31 - 60	138	97%
61 - 90	0	90%
91 - 120	95	90%
121 - 180	166	85%
181 - 365	501	77%
> 365	1,097	53%
TOTAL	***2,066***	**-**

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

Note: Table 4-10 was calculated using older data in LMRT due to the fact that more recent violations in Texas reported to the LMRT are listed as not returned to compliance. Thus, ERG chose April 1, 2006 as a "reference date" to calculate the numbers in the table. That is, we identified the number of TCR violations in LMRT that had an awareness date before April 1, 2006 and then subtracted any of those that were reported as returned to compliance. This left 2,066 violations that did not have a reported resolution and that had an awareness date before April 1, 2006. From that, we calculated the age distribution of those violations as of April 1, 2006. The "age" of the violation was calculated as the difference in days between April 1, 2006, and the violation awareness date. The ages are tabulated in the table.

[a] This is the number that are at least as old as the lower bound of the violation age. For example, 85 percent of cases are at least 121 days old.

4.5 OUTCOMES RELATED TO PROGRAM IMPLEMENTATION

This section provides tabulations of outcomes related to program implementation in each state using data from the LMRT. The goal of the section is to provide a sense of the outcomes that are associated with each state's implementation of TCR. Although the specific tabulations differ for each state, we provide three types of outcome data. First, we tabulate the incidence of recurrent violations for each state. Second, we tabulate data on the time each state has taken to return violations to compliance. These data are also tabulated and discussed in Section 4.4. Here, however, the nature of the presentation

[23] See the notes to Table 4-10 for details on why 4/1/06 is used.

is on what the data say about state outcomes, rather than on indicating potential performance measures. (We also present data on the time it has taken each state to respond to violations for context.) Finally, we cross-tabulate the data on the time it takes each state to return violations to compliance with the first type of response (enforcement action type) each state makes in response to violations.

4.5.1 Minnesota

For Minnesota, we tabulate data on four sets of outcomes:

- *The number of repeat violations*—These data show the extent to which systems in the state have recurring compliance problems.

- *The distribution of response times and returns to compliance for MCL and acute MCL violations*—These violations are MCL and acute MCL violations and represent the largest public heath risks.

- *The distribution of response times for M/R violations*—MDH's response to M/R violations presents a distinct contrast to the response to MCL and acute MCL violations.

- *Type of responses and timeframes to return to compliance for small NCWSs*—These tabulations link the types of responses MDH took (first response type) for violations between 2004 and 2008 at small NCWSs and the return to compliance times for those violations. We focus on small (fewer then 1,000 population served) NCWSs since they comprised 95 percent of all violations between 2004 and 2008.

Table 4-11 summarizes data on the number of repeat violations at systems in Minnesota for 2004 through 2008. For MCL and acute MCL violations, almost 80 percent of systems with violations between 2004 and 2008 had just one violation. Another 15.7 percent of systems with violations had one repeat violation during the period. For M/R violations, almost 85 percent of systems with violations had one or two violations during the period. To place these numbers into perspective, the annual average number of systems in Minnesota between FY04 and FY08[24] was 7,458.[25] Thus, the 236 systems with repeat violations represent less than three percent of the annual average number of systems in Minnesota and the 83 systems with repeat M/R violations represent approximately one percent of the annual average number of systems in MN.

[24] It should be noted that the time frames in Table 4-11 are calendar years and not fiscal years.
[25] The number of systems changes annually. Since the repeat violation calculation is done over five years, we used the annual average number of systems over a corresponding time frame. Data to calculate the annual average were taken from EPA's FACTOIDS reports for FY04 – FY08 (http://www.epa.gov/safewater/databases/sdwis/howtoaccessdata.html).

Table 4-11. MDH – Incidence of Repeat Violations Among All PWSs in Minnesota Between 2004 and 2008.

Number of Violations	MCL and Acute MCL Violations		M/R Violations	
	Number of Systems	Percentage of Total	Number of Systems	Percentage of Total
1	938	79.9%	175	67.8%
2	184	15.7%	44	17.1%
3	40	3.4%	19	7.4%
4	8	0.7%	9	3.5%
5	3	0.3%	2	0.8%
6	0	0.0%	4	1.6%
7 or more	1	0.1%	5	1.9%
TOTALS	**1,174**	**100%**	**258**	**100%**

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

Figure 4-3 presents the time Minnesota took to respond to MCL and acute MCL violations between 2004 and 2008 and the time it took to return those violations to compliance. We can see from the figure that MDH responded to almost all MCL or acute MCL violations within the same day and all of these violations within 30 days. The reported returns to compliance for MCL and acute MCL violations are distributed over a longer timeframe compared to the responses. Within 30 days, just more than half are returned to compliance and within 90 days approximately three-fourths are reported as returned to compliance.

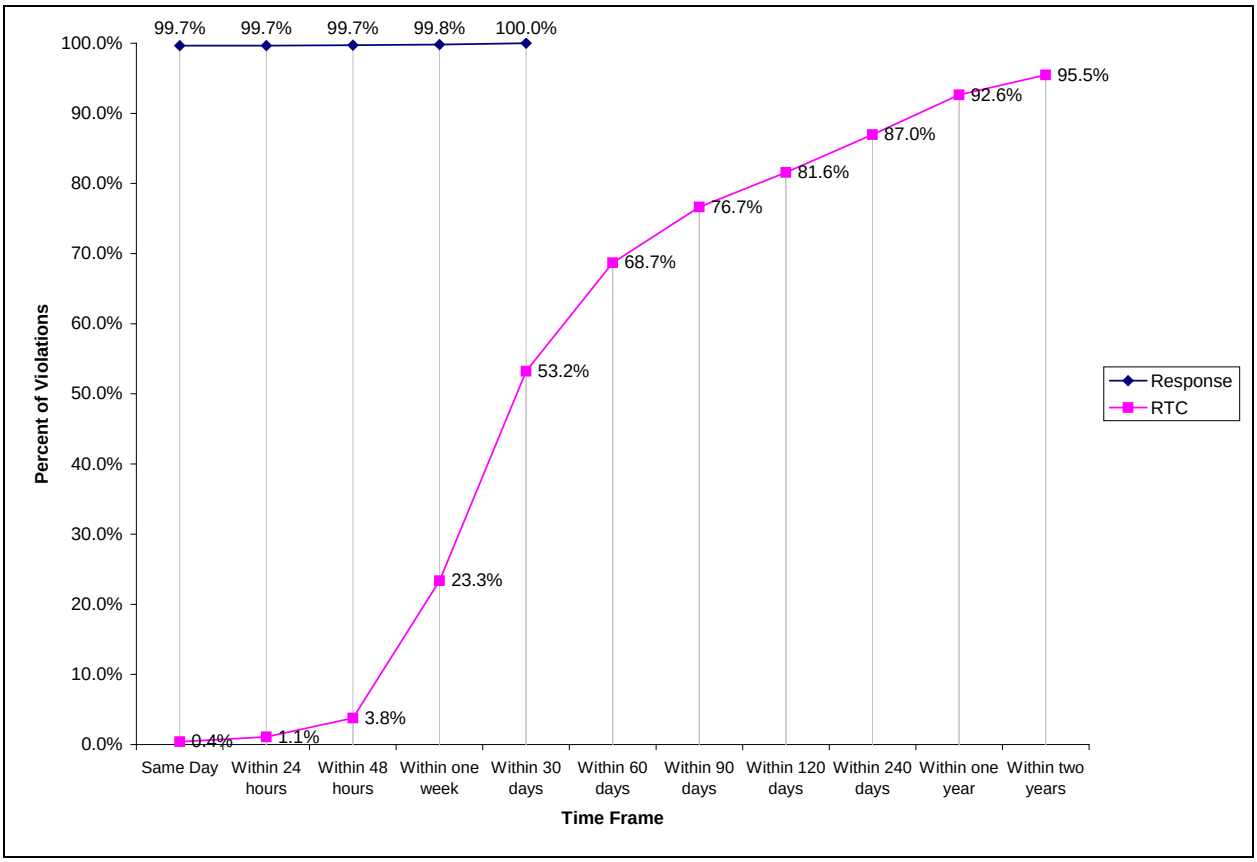

Figure 4-3. MDH – Reported Timeframes to Respond to MCL and Acute MCL Violations and the Reported Timeframes to Return Those Violations to Compliance, 2004 – 2008 (Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009)

Figure 4-4 provides the timeframes of MDH's responses to M/R violations and, for comparison, the timeframes to respond to MCL and acute MCL violations (repeated from Figure 4-3 above). MDH responds to almost all MCL and acute MCL violations on the same day. In contrast, MDH reports responding to approximately one-third of M/R violations within one week.

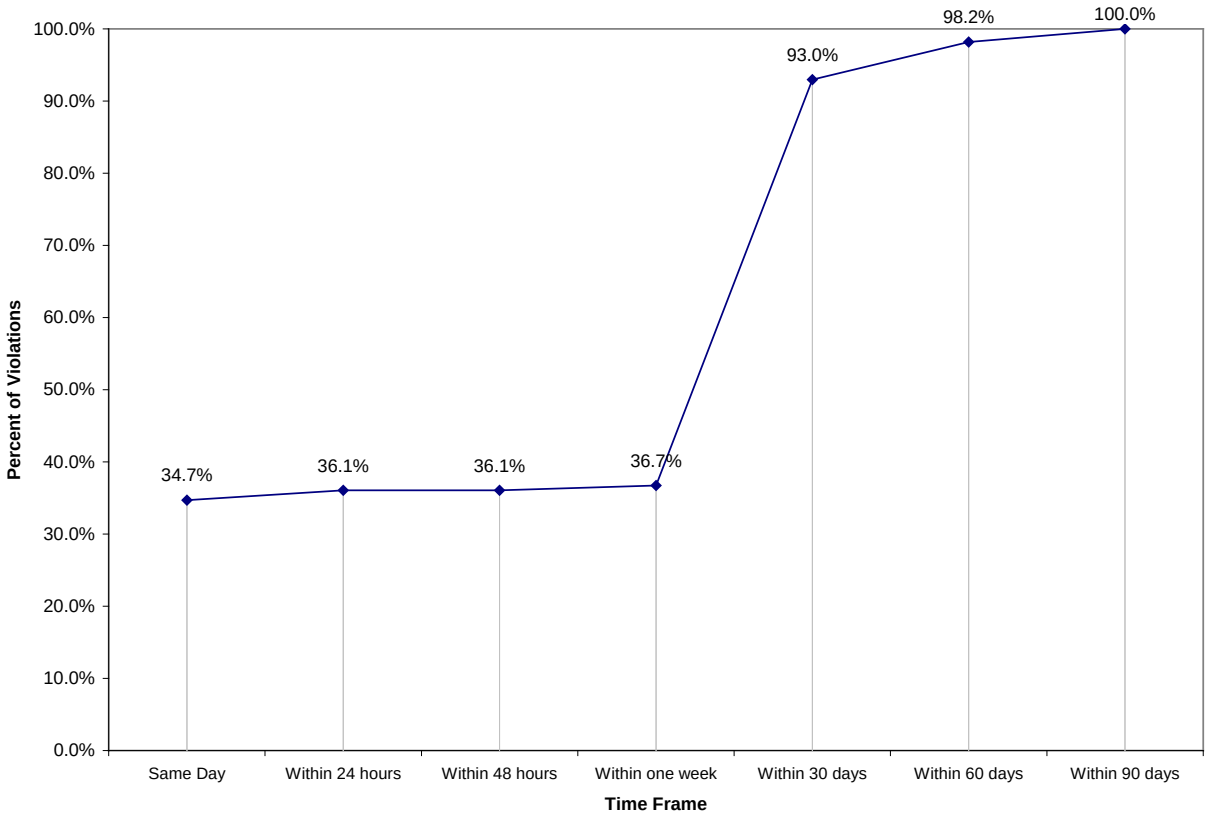

Figure 4-4. MDH – Reported Timeframes to Respond to M/R Violations, 2004 – 2008 (Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009)

Table 4-12 presents data on MDH's reported first response to all violations at small NCWSs from 2004 to 2008 and the time to return those violations to compliance associated with each first response for MCL and acute MCL violations. We focus on NCWSs because these systems accounted for 95 percent of all violations in 2004 to 2008 in Minnesota.[26] MDH was able to achieve a return to compliance among 97.5 percent of MCL and acute MCL violations at NCWSs (1,324/1,386) during the timeframe. One quarter of these were returned to compliance within 8 days, and one half were returned to compliance within 25 days. The most common first reported response (82 percent of violations; 1,136/1,386) from MDH was to issue a formal notice of violation. As with MCL and acute MCL violations, the most common reported response for M/R violations (188 of 192 violations) was for MDH to issue a formal notice of violation.

[26] According to the FY 2008 SDWIS inventory data, 86 percent of systems in Minnesota are NCWSs serving 1,000 consumers or fewer.

Table 4-12. MDH – First Reported Response Type, Number of Violations Reported As Returned to Compliance, and the Reported Time Frames to Return to Violations to Compliance for Non-Community Water Systems Serving Less Than 1,000 Consumers, 2004 - 2008.

AGENCY FIRST RESPONSE		All Non-Community Water Systems With Violations	RETURNS TO COMPLIANCE			
Code	Description		Systems Returned to Compliance	Median Number of Days	25th Percentile Number of Days	90th Percentile Number of Days
Acute MCL and MCL Violations						
SFH	State Boil Water Order Issued	2	2	6	1	6
SFJ	State Formal Notice of Violation Issued	1,136	1,076	26	8	26
SIA	State Violation/Reminder Notice	221	219	21	8	21
SIB	State Compliance Meeting Conducted	10	10	14.5	6	14.5
SIC	State Technical Assistance Visit	7	7	23	10	23
SIE	State PN Requested	5	5	35	34	35
SOX	State Compliance Achieved (RTC)	5	5	0	0	0
TOTALS		***1,386***	***1,324***	***25***	***8***	***25***
M/R Violations						
SFJ	State Formal Notice of Violation Issued	188	[a]	[a]	[a]	[a]
SIA	State Violation/Reminder Notice	2	[a]	[a]	[a]	[a]
SOX	State Compliance Achieved (RTC)	2	[a]	[a]	[a]	[a]
TOTALS		***192***	***[a]***	***[a]***	***[a]***	***[a]***

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.
[a] Returns to compliance data for M/R violations are not required to be reported to SDWIS/FED.

4.5.2 Texas

For Texas, we tabulated three sets of outcomes:

- *The number of repeat violations*—These data show the extent to which systems in the state have recurring compliance problems.

- *The distribution of response timeframes and times to return to compliance for M/R violations*—The data indicate an issue with TCEQ's reporting on outcomes by showing an output (response to a violation) alongside its intended outcome.

- *Type of response for M/R violations*—This tabulation indicates the types of responses TCEQ has to M/R violations.

The fact that only return-to-compliance data are available for M/R violations limits the scope of this analysis. Outcomes related to MCL and acute MCL violations, which represent more serious public health risks, cannot be assessed due to a lack of data. Furthermore, the TCEQ return-to-compliance information is reported on select dates (i.e., end of fiscal quarters) and only include dates through June 30, 2006 for the 2004 to 2008 LMRT data. As noted in Section 4.2.2, a communication "wall" exists between OPR and OCE in TCEQ, which may be limiting the ability of TCEQ to accurately track and then report returns to compliance for MCL and acute MCL violations, since the Office of Compliance and Enforcement is responsible for generating the actual return to compliance but OPR is responsible for reporting on that return. Furthermore, as also previously noted, this lack of data is not reflective of a lack of returns to compliance by systems, but is a reporting issue and TCEQ is taking steps to resolve the reporting issue.

Table 4-13 summarizes data on the number of repeat violations at systems in Texas for 2004 to 2008. For MCL and acute MCL violations, almost 80 percent of violations between 2004 and 2008 are one-time violations during that time period, and 93.6 percent have only one or two violations during the time period. For M/R violations, however, only 51.7 percent of systems with a violation during the period had just one violation, meaning that 48.3 percent of systems that had violations between 2004 and 2008 had more than one M/R violation. Furthermore, 9.3 percent of systems with M/R violations had seven or more violations during the period. To place these numbers into perspective, the annual average number of systems in Texas between FY04 and FY08[27] was 6,596.[28] Thus, the 101 systems with repeat MCL or acute MCL violations represent less than two percent of the annual average number of systems in Texas and the 1,089 systems with repeat M/R violations represent less than 17 percent of the annual average number of systems in TX.

Table 4-13. TCEQ – Incidence of Repeat Violations Among All PWSs in Texas Between 2004 and 2008.

Number of Violations	MCL and Acute MCL Violations		M/R Violations	
	Number of Systems	Percentage of Total	Number of Systems	Percentage of Total
1	413	80.7%	1,166	51.7%
2	66	12.9%	400	17.7%
3	25	4.9%	215	9.5%
4	2	0.4%	133	5.9%
5	4	0.8%	77	3.4%
6	1	0.2%	54	2.4%
7 or more	1	0.2%	210	9.3%
	512	100%	2,255	100%

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

[27] It should be noted that the time frames in Table 4-13 are calendar years and not fiscal years.

[28] The number of systems changes annually. Since the repeat violation calculation is done over five years, we used the annual average number of systems over a corresponding time frame. Data to calculate the annual average were taken from EPA's FACTOIDS reports for FY04 – FY08 (http://www.epa.gov/safewater/databases/sdwis/howtoaccessdata.html).

Figure 4-5 summarizes the timeframe for TCEQ to respond to M/R violations and return systems to compliance for M/R violations between 2004 and 2008. TCEQ reports responding to only 9.4 percent of those violations withn a week and all within 90 days.

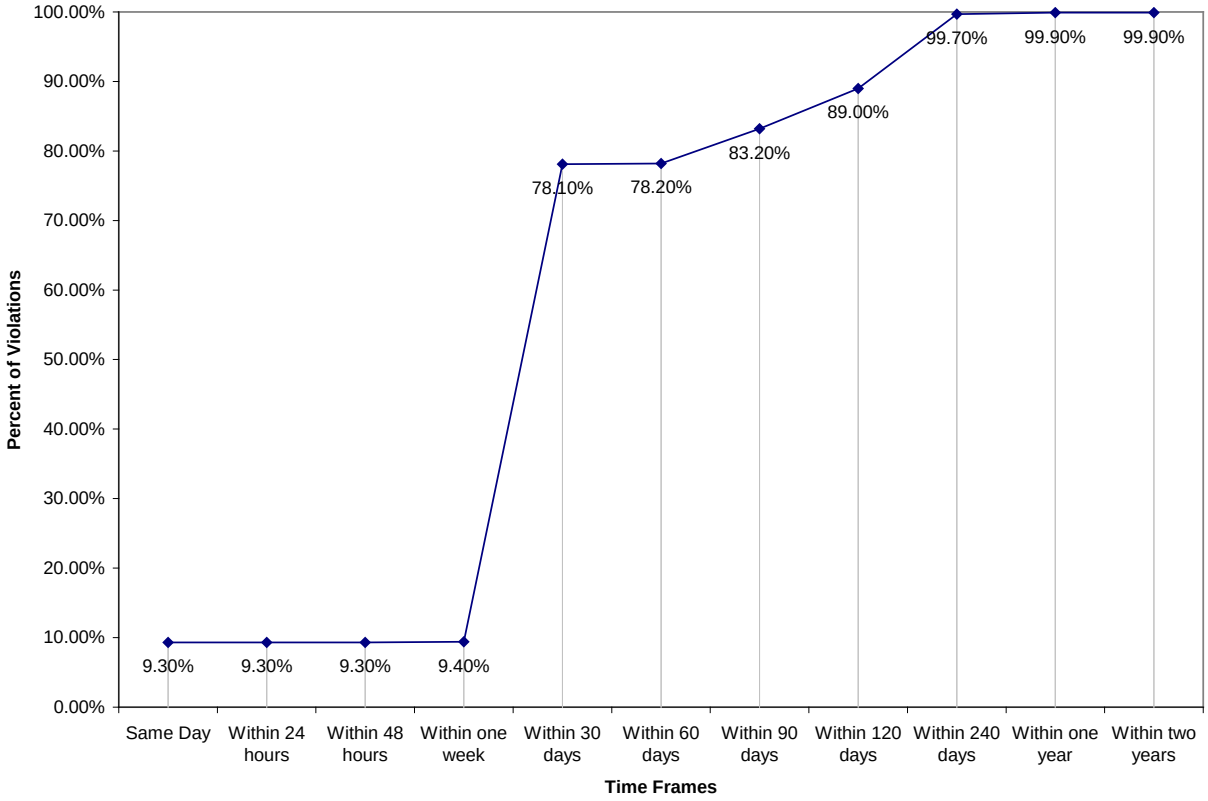

Figure 4-5. TCEQ – Reported Timeframes to Respond to M/R Violations, 2004 – 2008 (Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009)

Table 4-14 provides data on the types of responses TCEQ has taken in response to M/R violations from 2004 to 2008. The most common response TCEQ reports for these violations is to issue a formal notice of violation. However, the LMRT data do not contain information on informal responses to violations.

Table 4-14. TCEQ – First Reported Response Type, Number of Violations Returned to Compliance, and the Timeframes to Return to Violations to Compliance M/R Violations, 2004-2008

AGENCY FIRST RESPONSE		All Systems With Violations
Code	**Description**	
INA	System Inactivation	29
SFO	State Administrative Order (with penalty) Issued (SAO)	11
SIA	State Violation/Reminder Notice	5,453
SIE	State PN Requested	616
SOX	State Compliance Achieved (RTC)	627
TOTALS		***6,736***

Source: Logic Model Reporting Tool (LMRT) data extracted in July 2009.

SECTION FIVE: SUMMARY AND RECOMMENDATIONS

5.1 MINNESOTA

5.1.1 Summary of Key Findings

Resources. Information provided by MDH indicates that the department has 98 staff who support the TCR program in some capacity. All of these staff support other programs in addition to the TCR program, however. Based on data provided by MDH during ERG's site visit, ERG estimates that MDH expends 10.9 FTEs in performing TCR-related work. Highlights of MDH's resource allocation include:

- *System-specific technical assistance related to violations*—MDH spends 1.5 FTEs annually providing technical assistance to systems that have had MCL and acute MCL violations (additional effort is incurred in the administrative response to the violation/event and is discussed below).

- *Violation prevention, system specific (excluding sanitary surveys)*—MDH spends 355 hours annually providing assistance to systems that have TC positives without violations. MDH spends 3.5 FTEs annually in collecting samples from NCWSs on annual monitoring.

- *Sanitary surveys*—MDH spends 4 FTEs of labor time annually performing sanitary surveys.

- *Violation prevention, non system-specific*—MDH spends 675 hours annually in developing and delivering training, attending conferences, developing guidance documents, and publishing newsletters. Furthermore, MDH's operator certification program spends 215 hours annually reviewing approximately 1,300 license applications.

- *Administrative responses to health-based violations and TC positives not leading to violations*—Much of MDH's response to these events is composed of providing assistance to the system, which is included under system-specific assistance above. MDH's non-assistance response activities involve 540 hours annually for entering samples into databases and issuing notices of violation.

- *Administrative responses to M/R violations*—MDH also spends approximately 170 hours annually for M/R violation-related tasks such as responding to violations (e.g., sending notices of violation), calling labs to verify results, sending reminder postcards to systems to collect follow-up samples, and entering manually submitted data. The MDH lab spends 1,975 hours annually processing samples.

Comparison of Actual to Intended Implementation and Thematic Analysis. In comparing MDH's intended to actual implementation ERG found that, for the most part, MDH's actual implementation is in line with its intended implementation. The area where actual and intended does not match well has to do with what aspects were included or emphasized in the MDH logic model. The logic model (Figure 2-1) depicts MDH's intended implementation of the TCR program. However, ERG found:

- The database used by the MDH laboratory and the data that are submitted by private labs are not depicted in the logic model.

- The MDH logic model does not include a number of activities that MDH identified as its most effective activities to ensure public health.

- The MDH logic model does not give proper weight to site visits.

- MDH does not track performance measures that represent logic model elements.

Another key finding in our comparison of intended to actual and the associated thematic analysis is that there are some communication and information flow issues in MDH's implementation of the TCR. We found there were gaps in knowledge about the capabilities of MNDWIS, that MDH staff are not consistently entering information on site visits in MNDWIS, and that tracking performance is an area where MDH can devote additional resources.

Based on the data we collected as part of this project, MDH's program can best be described as:

- *Decentralized*—MDH staff that implement the program are located across the state and those staff are responsible for more than just the TCR program.

- *Cooperative approach to systems*—MDH focuses on working cooperatively with the systems. This is highlighted by the fact that MDH conducts sanitary surveys more frequently than required, they perform technical assistance visits in response to violations, they collect samples from many NCWSs, and they place less of an emphasis on enforcement. Additionally, MDH field staff who work directly with systems to provide assistance are not involved in the formal enforcement process, allowing them to maintain their cooperative approach with the systems.

- *Data-rich*—In the interviews we conducted, most MDH staff viewed MDH's MNDWIS database as a key asset of the program. Overall, MNDWIS is a comprehensive and flexible system that can be used for effective program management. Despite this, however, MDH does *not* devote resources to use the system for performance measurement at this point and at least one key output (assistance visits) is not tracked to a large extent in the database.

Factors that Influence Implementation. In assessing the factors that influence implementation in Minnesota, we identified three primary drivers: the large number of NCWSs in the state, the geography of the state, and MDH's cooperative approach.

According to the FY 2008 SDWIS/FED inventory data, 86 percent of systems in Minnesota are NCWSs serving 1,000 consumers or fewer. In the United States as a whole, only 74 percent of systems are NCWSs serving fewer than 1,000 consumers. Thus, Minnesota has a disproportionate share of small NCWSs. These systems are more likely to need assistance since they tend to have high staff turnover and tend to have less knowledge of drinking water issues. The large number of small NCWSs has led MDH to pursue its cooperative approach with the systems, to perform significant amounts of assistance, to have its field staff not be involved in formal enforcement, and to collect samples for many NCWSs.

The size of the state has also influenced its implementation. Due to the large size of the state, MDH has pursued a decentralized approach to implementation, maintains its own lab and contracts directly with other labs, and collect samples for many small NCWSs. Its (geographically) decentralized approach allows MDH to have staff that are familiar with specific systems and its use of its own and contracted labs allows MDH to avoid many sample invalidation issues.

By far, the hallmark of the MDH implementation is its cooperative approach. The cooperative approach MDH takes with systems leads, above all else, to a focus on providing on-site assistance to

systems. MDH's cooperative approach is also typified by its collecting samples from many small NCWSs, its performing sanitary surveys at a higher frequency than required, and its allowing for reduced monitoring from many systems. In collecting samples and performing more frequent sanitary surveys, MDH is able to be on site more often at system to provide assistance. Additionally, violations or TC positives are viewed by MDH as opportunities to provide assistance and to help systems avoid future issues. Finally, MDH places less of an emphasis on formal enforcement and keeps its field staff, who provide the assistance, out of the formal enforcement process. MDH's response to systems tends to start with an informal process centered on assistance.

Performance Measurement. ERG recommends that MDH develop and track three measures:

- *The effectiveness of its on-site assistance*—This would track the extent to which systems that are visited during a certain timeframe experience a "public health event," such as a violation or TC positive, in a subsequent time period.

- *The time it takes MDH to respond to MCL and acute MCL violations*—This would provide a sense of how quickly MDH is responding to violations that represent the largest public health threats.

- *The time it takes MDH to return MCL and acute MCL violations to compliance*—Tracking this measure would provide a sense of the impact that MDH is having on systems.

Outcome Evidence. For Minnesota, we tabulated data on four sets of outcomes:

- *The occurrence of repeat violations*—For MCL and acute MCL violations, almost 80 percent of systems with violations between 2004 and 2008 had just one violation. Another 15.7 percent of systems with violations had one repeat violation during the period. For M/R violations, almost 85 percent of systems with violations had one or two violations during the period.

- *The distribution of response times and returns to compliance for MCL and acute MCL violations*— ERG tabulated data from the LMRT on responses to MCL and acute MCL violation and the time to return those violations to compliance. These data showed MDH reported responding to almost 99.7 percent of violations on the same day and all violations within 30 days. Furthermore, within 30 days, just more than half are returned to compliance and within 90 days approximately three-fourths are reported as returned to compliance.

- *The distribution of response times for M/R violations*—These data indicated that MDH reported responding to 37 percent of M/R violations within one week and almost all within 60 days.

- *Type of responses and timeframes to return to compliance for small NCWSs*— According to the LMRT data, MDH's most common response to all violations was to issue a formal notice of violation. Of these, MDH reported a return to compliance in 95 percent of the MCL and Acute MCL cases with a median time to return to compliance of 25 days for these cases.

5.1.2 Recommendations

We developed three recommendations for MDH to consider based on our findings:

- ***Build a system for sharing program knowledge.*** In the comparison of actual versus intended implementation, we found that staff across different areas of the program showed some gaps in awareness of activities being performed in other areas of the program. We view this as a lack of detailed program knowledge on the part of MDH staff of areas outside of their specific area of responsibility. This is not to say that MDH staff were uninformed. Many of the staff we talked with did know *in general* how other aspects of the program worked. There were many instances, however, in which MDH had conversations among themselves to better understand the nuances of program implementation outside of their particular area. Thus, ERG recommends that MDH develop a system to transfer the details of program knowledge across program areas. This could be done through a process similar to the site visit ERG performed where MDH staff discuss implementation of the program from multiple perspectives. This type of information sharing will only help the staff responsible for different areas in better serving the systems for which they are responsible.

- ***Conduct an outcome evaluation related to the use of a cooperative approach with systems.*** MDH should consider performing a more detailed outcome evaluation that addresses the effectiveness of its use of a cooperative approach with systems. The evaluation should address:
    - Whether or not the use of a cooperative approach is meeting MDH objectives.
    - If a more formal approach would be a more effective means of protecting public health.
    - The benefits of using a cooperative approach from both MDH's and a system's perspective.

- ***Consider implementing the performance measures we recommend.*** Three new performance measures were identified for MDH. We recommend MDH consider implementing these measures. Tracking those three new measures would provide a sound basis for program management.

5.2 TEXAS

5.2.1 Summary of Key Findings

Resources. Based on data provided by TCEQ, ERG has estimated that TCEQ expends 27.9 FTEs annually in administering the TCR program in Texas. The majority of that time, however, is allocated to performing Comprehensive Compliance Investigations (CCIs) (sanitary surveys), with TCEQ spending 80 percent of the total hours on CCIs. TCEQ also spends a significant amount of time performing data-related tasks that could be automated, including entering submitted data related to both health-based and M/R violations. Highlights of TCEQ's resource allocation include:

- *System-specific technical assistance related to violations*—TCEQ spends an estimated 210 hours annually on violation-related directed assistance referrals (DARs) conducted by TRWA and an estimated 900 labor hours annually responding to violation-related assistance requests over the phone.

- *Violation prevention, system specific (excluding sanitary surveys)*—TCEQ spends an estimated 390 hours annually on violation prevention-related directed assistance referrals (DARs) conducted by TRWA and an estimated 300 labor hours annually responding to violation prevention assistance requests over the phone.

- *Sanitary surveys*—TCEQ spends 22.3 FTEs annually performing sanitary surveys (CCIs)

- *Violation prevention, non-system specific*—TCEQ spends 1.1 FTEs on performing non-system specific compliance assistance such as developing guidance documents, attending conferences, sending reminder letters to PWSs, creating Consumer Confidence Report (CCR) templates, and reviewing and approving third-party operator certification training course information.

- *Administrative responses to health-based violations and TC positives not leading to violations*—TCEQ staff spend 12 hours each day (1.5 FTE annually) providing desk-based responses to MCL and acute MCL violations. Some of these tasks could be automated.

- *Administrative responses to M/R violations*—TCEQ spends 1.33 FTEs annually in providing desk-based responses to M/R violations. Enforcement follow-up to M/R violations is performed by the TCEQ Office of Compliance and Enforcement (OCE), which spends 1,600 hours annually responding to TCR violations.

Comparison of Actual to Intended Implementation and Thematic Analysis. ERG's assessment of TCEQ's intended and actual implementation found that, for the most part, TCEQ's actual implementation was in line with its intended implementation. ERG also found that TCEQ is not tracking some outcome and output measures identified in its logic model and that the logic model does not adequately depict how TCEQ uses its field staff.

The overriding issue at TCEQ, however, has to do with data availability. ERG found that TCEQ staff spend an estimated 12 hours per day performing tasks that could be automated. However, since our site visit at TCEQ, further discussions with TCEQ have indicated they have started using SDWIS/State as its database of record, which will improve its ability to make data available.

Data availability is an issue with lab reporting. Labs often submit sampling results to TCEQ *after* the deadline for systems to submit their sampling results. TCEQ does not issue violations to the systems since the delay is due to the labs and not the systems. Allowing late submissions from labs reduces the accuracy and timeliness of the data being used by TCEQ to determine compliance. TCEQ indicated, however, that it has begun modernizing its system to begin accepting electronic responses, which will allow for timelier reporting by labs.

Another significant issue we found has to do with communication between OPR and the TCEQ Office of Compliance and Enforcement (OCE), which handles TCR-related enforcement. TCEQ's enforcement effort tends to be focused on formal administrative procedures. We found that there is a "wall" between OPR and OCE in implementing these procedures. This is partly reflective of TCEQ's structure: the connection between OPR and OCE is at the Deputy Director level, the highest level at which they can connect (see organizational chart in Appendix F). OPR indicated that there is daily interaction at the staff level on cases and quarterly meetings at the management level, however. Nevertheless, OPR did agree with the observation that a "wall" exists and that it may be difficult to bring down due to the structure of TCEQ.

Overall, two concepts emerged from the data we collected in assessing TCEQ's implementation of the TCR program:

- *Centralized*—The TCEQ program is concentrated among six individuals in the Water Quality Division of the Office of Permitting and Registration at TCEQ. These six individuals handle only TCR-related work. This centralized approach is typified by TCEQ's provision of over the phone assistance to systems (rather than site visits) and the "wall" of communication between OPR and the Office of Enforcement and Compliance.

- *In need of data improvements*—As detailed above, data issues are an overriding concern at TCEQ. However, TCEQ has indicated it has been taking steps to overcome these issues by increasing its ability to accept electronic submittals from labs and by adopting SDWIS/State as its database or record.

Factors Affecting Program Implementation. ERG's review found that three factors have tended to influence TCEQ's implementation the most: TCEQ has located its program within OPR which has led to the program being "insulated" from TCEQ, Texas is a geographically large state, and TCEQ's approach is a centralized approach.

The location of the TCR program in OPR goes hand in hand with its centralized approach. These aspects are important to understanding the program's implementation. TCEQ uses six individuals to implement the program in an Office that performs tasks that are inherently dissimilar to the tasks performed by the TCR program. Specifically, the TCR program staff are concerned with public health-related issues while the rest of OPR is concerned with environmental permitting-related issues. This means the TCR staff are dedicated staff and do not work outside of the TCR program. Furthermore, this may be responsible for the "wall" of communication between OPR's TCR program and the Office of Compliance and Enforcement (OCE) which enforces TCR violations. Finally, the assistance provided by TCEQ staff is primarily over the phone since the dedicated staff are located in Austin (and Texas is a large state). On-site assistance is then provided by TRWA through DARs.

Performance Measurement. ERG developed four recommendations related to performance measurement for TCEQ. The first deals with the data that TCEQ would need to use for performance measurement, and the remaining three are recommended performance measures:

- *TCEQ should improve the quality of the returns to compliance data that are reported to SDWIS/FED.* Returns to compliance data in the LMRT, which draws its data from SDWIS/FED, are limited in detail (few distinct dates reported), limited in availability (no dates reported after June 30, 2006), and limited in scope (no data for MCL and acute MCL violations). Without more precise reporting of outcomes, effective performance measurement is not possible.

- *The time it takes to return violations to compliance*—This measure would allow TCEQ to track its response times to violations. Timely response to a violation is a key step in returning violators to compliance.

- *The time it takes to respond to violations*—These data would provide TCEQ with a sense of the effect its responses to violations are having on compliance.

- *The time that violations remain unresolved*—This measure would allow TCEQ to track outstanding returns to compliance. That is, what percentage of violations have not been returned to compliance after 30 days, or after 60 days, etc.

Outcome Evidence. For TCEQ, ERG tabulated three sets of outcomes:

- *The occurrence of repeat violations*—For MCL and acute MCL violations, almost 80 percent of systems with violations between 2004 and 2008 have only one violation, and 93.6 percent of systems have only one or two violations. For M/R violations, however, only 51.4 percent of systems with a violation during the period had just one violation, meaning that 48.3 percent of systems with violations between 2004 and 2008 had more than one M/R violation. Furthermore, 9.3 percent of systems with M/R violations had seven or more violations during the period.

- *The distribution of response timeframes for M/R violations*— TCEQ reported responding to 80.5 percent of these violations within one week, but only 81 percent within 30 days. Furthermore, these tabulations provided evidence that TCEQ outcome data are in need of improvement. Specifically, these data are limited in detail (few distinct dates reported), limited in availability (no dates reported after June 30, 2006), and limited in scope (no data for MCL and acute MCL violations). Region 6 has indicated that TCEQ has taken steps to resolve these issues.

- *Type of responses for M/R violations*—This tabulation showed that TCEQ most common response to M/R violation was to issue formal notices of violation.

5.2.2 Recommendations

We developed four recommendations for TCEQ to consider based on our findings:

- ***Perform a process evaluation of TCR implementation in Texas.*** In our evaluation, we identified a number of ways in which TCR implementation in Texas can be improved at the Agency level. The biggest issue we identified was the "wall" of communication. As noted in our discussion of actual versus intended implementation, we found that there are differences in how communication was viewed between the TCR program and other areas of TCEQ involved in implementation. This was particularly evident with respect to enforcement where there is a clear "wall" between the TCR program and enforcement of M/R violations. This

indicated a need to improve communication across TCEQ elements involved in program implementation. We believe that TCEQ would benefit from conducting a process evaluation of how TCR is implemented in Texas with the goals of improving the efficiency and effectiveness of TCR implementation.

- ***Develop a strategy to deal with late reporting by labs.*** As noted, some labs submit data to TCEQ late, even if the system has submitted to the lab on time. Without timely and accurate data, TCEQ will have difficulty effectively managing its program. Thus, we recommend that TCEQ develop a strategy to deal with late reporting by labs, involving EPA Region 6 in the process. Discussions with TCEQ following our on-site visit with TCEQ indicated that TCEQ has taken steps to modernize its data system to allow for electronic reporting by labs, which would allow for more timely reporting by labs.

- ***Ensure that data reported to SDWIS/FED are complete.*** As we noted in discussing outcomes, outcome data in the LMRT are not complete. TCEQ should work to ensure timely and complete reporting of outcome data to SDWIS/FED. Such reporting would allow for use of LMRT, which takes data from SDWIS/FED, by TCEQ to track program performance. As noted in Section 4.4.2, TCEQ has taken steps to improve its reporting.

- ***Consider implementing the performance measures we recommend.*** Three new performance measures have been recommended above for TCEQ. Tracking those three new measures would provide a sound basis for program management.