I. Introduction

Water quality trading can be a cost-effective, environmentally sound local solution to improving water quality. Generally, water quality trading (WQT) involves a party facing relatively high pollutant reduction costs compensating another party to achieve less costly pollutant reduction with the same or greater water quality benefit. Water quality trading can be a useful tool for water quality enhancement in the right circumstances, and some dischargers will welcome the flexibility it can provide.

The United States Environmental Protection Agency (EPA) has supported the concept and implementation of water quality trading for several years. Activities have included the preparation of the "Draft Framework for Watershed-Based Trading" issued in 1996 and financial support to a number of watershed-based trading efforts including those on the Tar-Pamlico River in North Carolina, in Long Island Sound and the Chesapeake Bay, and in the Lower Boise and Snake Rivers in Idaho. Several water quality trading markets are currently operating, with others under development. Most of these markets are focused on either phosphorus or nitrogen-based trading, though increasing interest has emerged for trading sediment runoff, biological oxygen demand, and temperature.

Experience to date with water quality trading indicates a number of economic, environmental, and social benefits. Economic benefits can include: allowing dischargers to take advantage of economies of scale and treatment efficiencies that vary from source to source; reducing the overall costs of achieving water quality objectives in a watershed; and providing the means to manage growth while protecting the environment. Environmental benefits can include: achieving water quality objectives more quickly; encouraging further adoption of pollutant prevention and innovative technologies; engaging more nonpoint sources in solving water quality problems; and providing collateral benefits such as improved habitat and ecosystem protection. From a social standpoint, trading efforts have helped foster productive dialog among watershed stakeholders and helped create incentives for water quality improvement activity from a full range of dischargers.

In January 2003, EPA took a major step to advance water quality trading with the issuance of its *Water Quality Trading Policy.* The policy further enables and supports the adoption of market-based programs for improving water quality. The policy acknowledges that the progress made towards restoring and maintaining the chemical, physical, and biological integrity of the nation's waters under the 1972 Clean Water Act (CWA) and its National Pollutant Discharge Elimination System (NPDES) permits has been incomplete.[1] When the policy was issued, 40 percent of rivers, 45 percent of streams, and 50 percent of lakes that had been assessed in the United States failed to support their designated uses.[2] Faced with these challenges, stakeholders are seeking innovative, supplementary ways to achieve federal, state, tribal, and local water quality goals. EPA's policy specifically endorses the use of "water quality trading" for certain pollutants where it can help achieve Clean Water Act goals.

[1] *Water Quality Trading Policy* (EPA, January 2003)
[2] Ibid.

This Handbook provides a means for assessing your watershed's potential to take advantage of this innovative water quality approach. The Handbook assesses the likely viability of watershed-scale trading conducted in the context of a Total Maximum Daily Load (TMDL) or equivalent framework. The analytical approach assumes that a TMDL has been completed and will contribute valuable data on pollutant loadings, the overall pollutant 'cap' or bounding limit on trading activity, and watershed conditions. TMDLs and similar frameworks function as "pollutant budgets" for waterways, estimating the total pollutant load that a specific watershed or segment can assimilate without exceeding water quality standards. Water quality standards are established by states at levels that protect the designated use(s) of each water body such as recreation, fishery, or source of drinking water.

Once established, the TMDL total allowable load is allocated across point sources and nonpoint sources located in the watershed. Point source facilities that have NPDES permits may receive more stringent discharge limits based on a TMDL. This can provide the impetus or "driver" for trading, as sources seek lower cost, environmentally equivalent pollutant reductions. TMDLs are the leading, albeit not the only, market drivers for water quality trading markets today. (It should be noted that the original TMDL allocation scheme may influence the degree to which trading can effectively reduce TMDL implementation costs.) In some cases, pollutant load reductions made before a TMDL was established have been incorporated into a trading marketplace; however, this Handbook does not address pre-TMDL trading.

To conduct the WQT assessment outlined in the handbook, key watershed stakeholders and clean water authorities will need to be engaged. You may also want to consult with specialists in areas such as finance or agricultural best management practices. The handbook helps you identify what you need to know, with whom you might consult, and where to find the information needed to determine whether WQT is right for your watershed. A similar analytical approach has been used to conduct screening level WQT assessments of several watersheds with limited expertise and resources, taking between one to three months to complete. The size and complexity of your watershed, along with availability of data, will be key factors in how readily you can conduct a WQT assessment.

Even if this assessment ultimately indicates that your watershed has limited or no potential for watershed scale trading, other trading opportunities may exist. Markets, in and of themselves, can often create opportunities not easily recognized in advance analysis. While the approach in this Handbook attempts to screen for appropriate watershed scale markets, the potential for unexpected benefits in any market argues for, at minimum, not precluding trading as an option in your watershed. Moreover, smaller scale trading may apply in your area. Options include site specific offsets (where an individual NPDES permit holder arranges for equivalent control from an alternative discharge source) and intra-plant trades (where an individual NPDES permit holder trades between its own discharge points).

The viability of trading in the TMDL context depends on conditions discussed in EPA's Water Quality Trading Policy, among others. These include: a market structured within the current CWA regulatory framework; voluntary participation and public input; a suitable pollutant; and sufficient differences in control costs among sources. Experience with trading programs to date provides insight into the opportunities and challenges trading may present in your watershed. Success in watershed scale trading markets will be influenced by several factors, including the:

- pollutant to be reduced and the physical characteristics of the watershed;
- cost of pollutant control for individual dischargers;
- mechanisms used to facilitate trading; and
- ability and willingness of stakeholders to embrace and participate in trading.

This Handbook will help you assess the environmental, economic, and technical factors that will influence the ability to create and sustain a water quality trading market. The purpose of this Handbook is to help assess if water quality trading is worth pursuing in your watershed. Developing a trading program can be an ambitious undertaking with few short cuts to the work that needs to be done. Water quality trading also has many connections to other programs and processes, such as TMDLs and NPDES permits, likely requiring time and resource commitments from people in those areas. Thus, before embarking on the effort to develop a watershed scale trading program it is helpful to assess whether threshold conditions for trading exist.

During the assessment, you will focus on each of the individual factors that make trading viable. As you examine these factors, you will organize information into a comprehensive view of relevant local conditions. You will need to obtain some information from other stakeholders in your watershed. Your efforts will be simpler if most stakeholders understand a common terminology. This Handbook will help provide that common terminology, giving you a methodology for organizing critical information into a logical, easy-to-follow format.

The first chapter of the Handbook—Pollutant Suitability—addresses whether a "common" or “tradeable” commodity exists that is important to helping meet water quality goals. Certain pollutants and watershed conditions are more suitable for trading than others. Pilot projects around the country have demonstrated that nutrients can be successfully traded. Less information is available about trading other pollutants. After reading the Pollutant Suitability chapter and examining the pollutant characteristics and watershed conditions, you will be better able to decide whether to pursue trading.

The second chapter—Financial Attractiveness—addresses how to evaluate the economics of a water quality trading market through consideration of the financial viability of potential individual and aggregate trades. The financial attractiveness of trading depends on whether the incremental costs of trading are less than the incremental costs of control options otherwise available to an individual. Incremental cost (essentially a hybrid of marginal and average cost) is the average cost of control for the increment of reduction required to meet compliance obligations. Incremental cost represents a good approximation of the upper-bound of a source’s willingness to pay others within the watershed to alter their discharging behavior. For trading to be financially attractive, the difference in incremental costs between dischargers must, at a minimum, be sufficient to cover trade transaction costs and offset any sense that trading partners may have of increased risk of noncompliance. Assessing the incremental cost ranges associated with specific transactions provides information on whether trading—in practice—will be financially attractive to potential market participants. After reading the Financial Attractiveness chapter, exploring the example provided, and employing the tools/methodologies discussed, you will be able to make a more informed decision about whether to pursue trading.

The Market Infrastructure chapter will help you determine whether the market framework needed to facilitate trading can be built. The analysis will not provide a specific blueprint for creating a market, but will highlight likely market functions and challenges, and identify ways in which your watershed can benefit from lessons learned in other markets. After reading the Market

Infrastructure chapter, exploring the examples provided, and reflecting on the lessons from the rest of the Handbook, you will better understand the watershed's unique market infrastructure needs and possible market mechanisms suited for the watershed.

Finally, the Stakeholder Readiness chapter addresses the level of stakeholder interest and support needed to pursue water quality trading. In addition to working with environmental agencies, if you decide to pursue trading, you will need to work with other potential participants and stakeholders in the watershed. Stakeholders may need to be persuaded that time spent exploring trading opportunities will lead to worthwhile alternative approaches. Parties with the greatest potential to supply and/or use pollutant reductions are necessary participants. In addition there should be engagement with and opportunities for input by non-discharging stakeholders including citizen's groups. After reading this chapter, you should have a better understanding of how to identify and engage other stakeholders.

The Handbook offers common themes that are important to your assessment and market creation efforts. Among these is the recognition that the potential benefits of water quality trading are accompanied by a variety of real or perceived transaction risks for participants and market development costs. Potential trade participants will face the possibility that, despite their hard work, the market they desire will not emerge. After a market emerges and trading begins, transaction costs will be associated with information gathering, trade execution, and compliance efforts. While all water quality management approaches have associated costs, the attractiveness of water quality trading markets will be affected by these cost and uncertainty factors. Lessons learned from other markets as discussed in this Handbook will help you assess whether costs and risk can be managed in your watershed to support a viable market that reaps the cost-effectiveness and environmental benefits of water quality trading.