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**RE:** **Task 1 Crosscut Analysis of Clearinghouse Structures for Water Quality Trading in North America**

## 1.0 SCOPE OF CLEARINGHOUSE CROSSCUT ASSESSMENT

This crosscut analysis draws from water quality trading (WQT) experiences in Ohio, Pennsylvania, North Carolina, Colorado, Connecticut, Virginia, and Ontario. A tabular summary captures relevant program information of existing trading program applications for Newtrient WQT framework considerations. The analysis targets those trading program components specified in the U.S. EPA 2003 WQT Policy (U.S. EPA 2003) and other functional elements determined by the Project Team.

The purpose of this effort is to focus on existing environmental clearinghouse frameworks and identify various clearinghouse elements and structures relevant to market-based water quality programs being pursued by Newtrient. This memorandum serves as the deliverable for this task. It includes a tabular summary of program/policy elements and lessons learned from the development and implementation of previous clearinghouses to support the development framework options and forecast potential obstacles recognizing immediate clearinghouse interests in Wisconsin. Published information on these selected programs or clearinghouses more broadly is used to support a summary of lessons learned that is presented in Section 5 of this document. A detailed compilation of program information used for the crosscut analysis presented herein is being provided under separate cover.

## 2.0 EXISTING CLEARINGHOUSES CONSIDERED FOR ASSESSMENT

Water quality trading programs exist throughout the U.S. and Canada, each offering unique approaches for addressing relevant water quality concerns. U.S. programs are based on EPA policy, but can vary substantially in how they are implemented and/or administered. The crosscut analysis therefore includes a select number of WQT programs relevant to market-based water quality programs. These include current state programs (PENNVEST, Long Island Sound, Virginia Nutrient Credit Exchange, Cherry Creek Basin Trading, Chatfield Reservoir Trading, Tar-Pamlico Nutrient Trading, and Neuse River Basin Total Nitrogen Trading), a watershed-based pilot program (Great Miami River Watershed Trading), and two Provincial programs (South Nation and Lake Simcoe Phosphorus Offset Program). Though other trading programs have contemplated clearinghouse structures, these selected examples represent those with a history and record of development and trading activity and are relevant to Newtrient's considerations for dairy and more broadly for agriculture. The following section provides a summary of the programs examined herein for the crosscut analysis.

## **2.1 Long Island Sound (Connecticut, USA)**

The Long Island Sound Study (LISS), which started in 1985 with direction from the US EPA, highlighted low dissolved oxygen, toxic contamination, pathogen contamination, floatable debris, habitat degradation and water quality degradation as environmental problems in the Long Island Sound. An EPA-approved TMDL was established in 2001, which called for about 64% nitrogen reductions from municipal point sources by 2014. In 2002, Connecticut's Nitrogen Credit Exchange (NCE) was established and allowed point source to point source trading between 79 publicly owned treatment works (POTWs), with 80 POTWs now participating. The Nitrogen Credit Advisory Board (NCAB) oversees day to day operations as well as implements key actions, like facilitating the buying and selling of credits, to keep the NCE functional. In 2012, nitrogen reductions of 67% exceeded the 65% reduction targeted in the 2014 waste load allocations (Stacey 2015).

## **2.2 Lake Simcoe Phosphorus Offset Program (Ontario, Canada)**

Excessive and increasing inputs of nutrients, particularly phosphorus, threaten the cold-water fishery and recreational opportunities in Lake Simcoe. In 2009, the Lake Simcoe Protection Plan (LSPP) was established by the Ontario government to focus phosphorus reduction requirements as well as call for water quality trading (O'Grady and Zukovs 2015). The Lake Simcoe Phosphorus Offset Program, managed by the Lake Simcoe Region Conservation Authority, is focused on improving water quality through urban stormwater credit trading (XCG 2014). The Authority purchases all eligible offset credits derived from treatment retrofits of existing municipal storm sewer systems, maintains a pool of credits to supply offsets to eligible uses, and reviews project applications to generate and purchase offsets (O'Grady and Zukovs 2015). Buyers are developers that are unable to capture all stormwater on-site with new residential development. Offsets are purchased at a 2.5:1 ratio.

## **2.3 PENNVEST (Pennsylvania, USA)**

Pennsylvania DEP implemented a water quality trading program to regulate point sources in the Potomac and Susquehanna River watersheds in December 2004. This program's market structure is made up of bilateral trading and a clearinghouse (Jones et al 2015). Pennsylvania Infrastructure Investment Authority (PENNVEST) is a state financing authority for municipal water projects that took on the role of a central clearinghouse to serve as a financial intermediary in this Chesapeake Bay only, water quality trading market (Ohara, et al. 2012; Jones et al. 2015).

## **2.4 South Nation Total Phosphorus Management Program (Ontario, Canada)**

In the South Nation River Watershed, 90% of phosphorus load comes from nonpoint sources (O'Grady and Zukovs 2015). The Ministry of Environment created the Total Phosphorus Management Program to allow point sources to discharge phosphorus if they buy phosphorus credits from nonpoint sources anywhere in the watershed (O'Grady and Zukovs 2015). A 4:1 trading ratio is required for this program (O'Grady 2008). The South Nation Conservation (SNC) is the sole broker between nonpoint sources and point sources, manages all transactions, manages compliance reports for phosphorus control, and uses farmers as field representatives to build credibility within the agricultural community (O'Grady and Zukovs 2015).

## **2.5 Virginia Nutrient Credit Exchange (Virginia, USA)**

The Virginia Nutrient Credit Exchange Association was set up to coordinate and facilitate trading among members of the Chesapeake Bay Watershed Nutrient Credit Exchange Program, which was signed into

law in March 2005. Initially, trading occurred between established WWTPs and any new or expanding WWTPs required to offset any phosphorus or nitrogen load increases. In 2012, additional legislation was passed that expanded trading to allow new and expanding WWTPs to acquire credits from authorized municipal separate storm sewer systems (MS4s), confined animal feeding operations (CAFOs), and industrial stormwater (World Resources Institute, undated).

## **2.6 Great Miami River Watershed Trading Pilot (Ohio, USA)**

In the Great Miami River Watershed, agriculture and other nonpoint sources are the main cause of nitrogen and phosphorus impairment, which ultimately contributes to the Gulf of Mexico hypoxia. Until recently, the Great Miami River trading program was facilitated by local soil and water conservation districts (SWCDs) as credit aggregators for farmers. The Miami Conservancy District (MCD) serves as a central clearinghouse for credits. As of January 2014, the MCD had contracted with farmers for 572 tons of agricultural nutrient discharge reductions to the Great Miami River under the WQT program (Hall and Hall 2015). In 2013, the program began the transfer of management from the MCD to a Great Miami River Watershed Joint Board consisting of 14 soil and water conservation districts, with a focus to create a sustainable, locally led solution to water quality issues in this watershed (Great Miami River Watershed Joint Board Project; Hall and Hall 2015).

## **2.7 Colorado Water Quality Control Commission (Chatfield Reservoir Trading and Cherry Creek Basin Colorado, USA)**

Chlorophyll *a* and eutrophication concerns in the Chatfield Reservoir led to the establishment of a phosphorus total maximum annual load (TMAL) and trading program. The Chatfield Watershed Authority acts as a clearinghouse for this program through which nonpoint sources can deposit credits into a credit pool and point sources can purchase credits through this pool. All trades are approved through the Water Quality Control Commission on a case-by-case basis, which may result in differing trading ratios (Breetz et al. 2004).

Rapid urbanization in the Cherry Creek Watershed contributed to increased runoff, instream erosion, and point source phosphorus into the reservoir (Paulson 2000). In 1985 the State of Colorado's administrative agency, the Colorado Water Quality Control Commission implemented a 35 ug/L total phosphorus standard and established an annual TMDL of 14,270 lbs of P. The need for immediate P allocation and the desire to obtain P credits for the authority's nonpoint source achievements were driving factors for the implementation of the trading program (Paulson et al. 2000).

In 2004, both the Cherry Creek and Chatfield Reservoir, along with the Dillon Reservoir program, adopted the Colorado Pollutant Trading Policy. This program allows for trading of all pollutants except toxic or bioaccumulative toxic pollutants.

## **2.8 North Carolina Nutrient Offsets and Trading (Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading) (North Carolina, USA)**

In September 1989, the entire Tar-Pamlico River Basin was classified as Nutrient Sensitive Waters because of upper Pamlico River eutrophication. The Department of Environmental Management imposed stricter nutrient discharge limits on point sources despite 80% of nutrient loading came from nonpoint sources (Breetz et al. 2004). The Tar-Pamlico Basin Association, a coalition of point sources, formed in response to these limits and collaborated with the Environmental Defense Fund and the Tar-Pamlico River Foundation to develop a cost-effective alternative to address both point and nonpoint sources. The plan was finalized in 1992 (Breetz et al. 2004). The program is similar to an exceedance tax on an

association of point sources that is applied to more cost-effective nonpoint source controls (K&A undated).

In 1995, excessive nutrient loading and eutrophication in the Neuse River as well as needed reductions in total nitrogen in the Neuse River Estuary prompted the State to pass House Bill 1339, which established a 30% nitrogen reduction goal over 5 years (Fisher and Kelly 2015). The State also developed the Neuse Nutrient Sensitive Waters (NSW) Management Strategy that included rules for adaptive management requirements to reduce phosphorus and nitrogen loads. These rules allow for dischargers to join a group compliance association for point-to-point trading. The Compliance Association (made up of 22 point source members) has a group nitrogen discharge cap made up of the sum of the individual caps (Fisher and Kelly 2015). This trading program is similar in structure to the Tar-Pamlico Program, where nonpoint source offsets are more like exceedance taxes on a group of dischargers (K&A undated).

### **3.0 CLEARINGHOUSE ELEMENTS**

In reviewing existing clearinghouse frameworks and their many roles in facilitating markets, several key elements emerge that are present across most clearinghouses. The following section identifies these elements and provides working definitions for important components of each. In Section 4, variation in how these elements are structured or addressed across clearinghouses is examined to identify useful trends, the basis for how key decisions about these elements were made, and to forecast potential opportunities and obstacles during the development of a Wisconsin clearinghouse. Thus, the definitions presented below provide supporting information for the crosscut analysis found in Section 4. These are presented under eight categories of clearinghouse information including:

- General considerations
- Crediting
- Clearinghouse financing
- Administrative costs
- Market functions
- Administrative functions
- Assurances
- Registries

#### **3.1 General Clearinghouse Information**

- **Location** refers to which watershed, state, or territory is within the clearinghouse's operational boundary.
- **Country** refers to country that the clearinghouse operates in. All clearinghouses reviewed in this assessment are in the United States or Canada.
- **Managing Entity** refers to the entity managing operation of clearinghouse.
- **Service Area** refers to the scale at which the clearinghouse operates at (typically watershed, territory, or state).
- **Service Area Size** refers to the square miles within a clearinghouse operational boundary.
- **Eligible Participants** refers to whether point source and/or nonpoint sources are authorized to participate in the clearinghouse-led program.
- **Regulatory Driver** refers to any known local or regional regulation or policy that is driving demand for water benefit outcomes within the clearinghouse operational boundary.

- **Supporting Entities** refers to any actors that support the operation of the clearinghouse. This may include third-party verifiers, credit brokers, aggregators, and stakeholders that participate in the review of projects or credits.
- **Roles of Supporting Entities** refers to the specific role that Supporting Entities play in supporting the operation of the clearinghouse.
- **Activity** refers to whether the clearinghouse is known to be active or inactive.
- **Noted Major Obstacles** refers to any explicit obstacles or barriers to the successful adoption or operation of the clearinghouse documented in literature.
- **Clearinghouse Principles** refers to any stated founding principles for the clearinghouse.
- **Enabling Legislation** refers to the specific legislation that sanctions the operation of the clearinghouse.

### **3.2 Credit Information**

- **Pollutant** refers to the water quality pollutant being transacted in the clearinghouse's program.
- **Volume of Credit Sales** refers to the latest known volume of credits transacted through the clearinghouse.
- **Credit Trading Ratio** refers to the ratio applied to the calculated pollutant load reduction for credits within the clearinghouse's program.
- **Credit Pricing** refers to the latest known price that a credit transacted at through the clearinghouse.

### **3.3 Clearinghouse Financing**

- **Clearinghouse Financing Method** refers to how the clearinghouse is financed. This may be through user fees, transaction fees, or local/state funding.
- **Financing Amount** refers to the amount of money that is financing the clearinghouse through the *Clearinghouse Financing Method*. Depending on the *Clearinghouse Financing Method*, this amount may be a dollar amount per transaction, per user, or a lump sum.

### **3.4 Clearinghouse Administrative Costs**

- **Annual Administrative Cost** refers to the annual sum for the operation of the clearinghouse. The details of these administrative costs are provided if specified by the clearinghouse.
- **Number of Administrative Staff** refers to the number of administrative staff required to operate the clearinghouse. Full-time and part-time staff details are provided if specified by the clearinghouse.

### **3.5 Market Functions**

- **Credit Purchase Pricing Method** refers to how the purchase price of a credit is determined. This may be determined via market-based methods such as an auction, contract methods such as a water quality trade contract, or a fixed price.
- **Credit Sale Pricing Method** refers to how the sale price of a credit is determined. This may be determined via market-based methods such as an auction or reverse auction, contract methods such as a water quality trade contract, or some form of administratively determined pricing.
- **Method for Transacting Credits** refers to where buyers will go to purchase credits, which may be done via directly contacting the clearinghouse, submitting a form to the clearinghouse, or an online registry/auction.

- **Frequency of Credit Sale** refers to how frequently credits are offered for sale by the clearinghouse.

### **3.6 Administrative Functions**

- **Clearinghouse Administrative Role Function in Protocol** refers to the role of the clearinghouse in relation to the protocol. This may specify project review, verification, certification, and/or registration of credits.
- **Payment/Collection Process** refers to how the clearinghouse facilitates the payment or collection process of transacted credits.
- **Fund Management** refers to how collected payments by the clearinghouse are managed.
- **Contracting Process** refers to how the clearinghouse facilitates the process of completing a contract between the clearinghouse and credit buyers and sellers or between a credit buyer and credit seller.
- **Ease of Transaction** refers to the overall simplicity of the process for a credit buyer to purchase a credit.

### **3.7 Assurances**

- **Regulatory Recognition of Managing Entity** refers to the whether the entity managing the clearinghouse is a regulatory entity. A managing entity that would have regulatory recognition would include government departments.
- **Regulatory Recognition of Credit Quantification Method** refers to whether the prescribed credit quantification method utilized in the clearinghouse may pose any exposure due to uncertainty surrounding the quantification method. If the prescribed quantification method is approved by a regulatory recognized managing entity, it will be considered to have regulatory recognition.
- **Regulatorily Liable Entity for Project Failure** refers to the entity that will be liable if the credit-generating project fails.
- **Environmental Assurance of Risk Management for Project Failure** refers to the method used by the clearinghouse or the clearinghouse's program to provide environmental assurances if a project fails. These risk management methods may include providing a surplus pool of credits, credit retirement provisions, or requirements for credit insurance.
- **Method of Regulatory Liability Management for Clearinghouse** refers to any provisions for the clearinghouse to manage regulatory liability. This may include management options such as indemnification clauses.

### **3.8 Registries**

- **Clearinghouse Relationship with Credit Registration Process** refers to the clearinghouse's role in facilitating credit registration.
- **Use of Publicly Accessible Online Registry to Register and Track Credits** refers to which registry is being used to track or register credits.
- **Use of Publicly Accessible Online Registration to Register and Track Projects** refers to which registry is used to track or register associated credit-generating projects.

## **4.0 CROSSCUT ANALYSIS RESULTS**

Tables 1-8 consider elements noted above for each of the eight categories across the eight programs examined. A narrative is provided for each table. This information is derived from a detailed compilation of program data presented in the Excel spreadsheet being provided under separate cover.

### **4.1 Clearinghouse Information**

#### *Geographic Location and Service Area*

All of the clearinghouses operate within a watershed scale service area. The watershed scale of the majority of clearinghouses is also reflected in the moderate size of most service areas (1,000-10,000 square miles).

#### *Eligible Trading Participants*

Six of the eight clearinghouses were designed to facilitate water quality trading between point sources and nonpoint sources. The notable exceptions to this are the Long Island Sound, which was created to facilitate point source to point source trading, and the Lake Simcoe Phosphorus Offset Program, which was designed exclusively for nonpoint source to nonpoint source trading of urban stormwater.

#### *Regulatory Drivers and Supporting Entities*

A regulatory driver and supporting entities were present for all clearinghouses. Regulatory drivers within clearinghouse service areas were evenly split between TMDLs and other legislation or planning efforts. All clearinghouses at a minimum utilized some State or Provincial level department as a supporting entity in clearinghouse operation. The role that supporting entities served was not uniform with varying capacities of credit brokering, third-party verifying, and supporting the overall development of the clearinghouse. Additionally, three clearinghouses utilized local entities to support the clearinghouse including the Lake Simcoe Phosphorus Offset Program's use of local municipalities as third-party verifiers, the Great Miami River Watershed Trading Pilot's use of the water conservation subdistrict as a credit broker, and the North Carolina Nutrient Offsets and Trading program's local Neuse River Compliance Association to perform administrative functions.

#### *Trading Activities/Obstacles*

All clearinghouses are currently active. However, some clearinghouses have run into difficulties related to a lack of transparency, high administrative burdens or low market demand for credits. Four clearinghouses had noted these difficulties:

- *Long Island Sound:* A lack of transparency around the development of the program stalled the passing of the enabling legislation until after a more open development process was adopted. Additionally, the program is reliant on continued availability of Clean Water Funds to operate the clearinghouse. Moreover, there have been credit shortages despite credit sales. (This are sometimes referred to as 'paper credits', i.e., there are not real reductions to represent credits sold.)
- *South Nation TP Management Program:* A lack of outreach led many farmers to have an impression that the program was a "license to pollute" for point sources and hesitancy to participate in early program startup efforts. This resulted in a re-initiated effort with much broader upfront public education and outreach. This overcame barriers with farmer misperceptions for what is now a still functioning program for over two decades.
- *Colorado Water Quality Control Commission:* The Chatfield Reservoir Trading Program suffered from low demand caused by both limited regulatory pressure on point sources and administrative burden. The program did not have sufficient funds to verify nonpoint source reduction projects that were required to undergo a complex project review system and

extensive water quality monitoring before credits could be sold. Additionally, the Cherry Creek Basin Program suffered from the same issues and had a rigorous application process that presented a high transaction cost for applicants.

- *North Carolina Nutrient Offsets and Trading*: Both of North Carolina Nutrient Offsets and Trading program ran into issues of low market demand as the regulatory requirement for point source nitrogen reduction in both programs were met without need for offsets. Additionally, cost-sharing presented the Tar-Pamlico Nutrient Trading program with difficulty predicting funding and staffing needs in the program's Phase 2, when the Association was no longer required to make minimum payments to fund administrative functions.

#### *Clearinghouse Principles and Legislation*

All clearinghouses provided explicit founding principles involving the improvement of water quality, with five out of eight also including principles for restoration of ecological integrity. Half were established through specific legislation (Long Island Sound, PENNVEST, Virginia Nutrient Credit Exchange, North Carolina Nutrient Offsets and Trading) and two through enabling policy (Lake Simcoe Phosphorus Offset Program, Colorado Credit Corporation). South Nation TP Management Program and the Great Miami River Watershed Trading Pilot were not established through legislation or policy and were instead considered pilots.

#### *Long Island Sound*

Public Act No. 01-180 was passed in July, 2001 (three months after the USEPA approved the Long Island Sound TMDL) which enabled the creation of Connecticut's Nitrogen Credit Exchange program and the Nitrogen Credit Advisory Board. The enabling legislation defined the governance of the Advisory Board and authorized the Advisory Board's clearinghouse responsibilities including:

- overseeing and executing all nitrogen exchanges
- purchasing and sale of nitrogen credits
- establishing account of funds from credit sales for administration of the program and projects
- establishing estimated annual value of nitrogen credits

The legislation also defined the annual date at which the clearinghouse would purchase all available nitrogen credits. Additionally, the methodology for estimating the annual value of nitrogen credits is defined in the legislation as the total annual project cost divided by the reduction of equivalent pounds.

#### *Lake Simcoe Phosphorus Offset Program*

The Lake Simcoe Region Conservation Authority Strategic Plan (2016-2020) released by the Lake Simcoe Region Conservation Authority (LSRCA) calls for the development of a phosphorus offset program to achieve zero phosphorus discharge from new development, resulting in the development of the 2017 Phosphorus Offsetting Policy. The operation and responsibilities of LSPOP Administrator role however are not defined explicitly in the policy and instead simply summarized in a summary report of the program (XCG 2014). This document outlines the role of the LSPOP Administrator and governance. Responsibilities assigned to the LSPOP Administrator include:

- contracting buyers and sellers
- assuring the quality and quantity of offsets
- determining offset costs
- maintaining a back-up pool of offsets
- tracking and reporting of phosphorus reductions
- contract enforcement
- staff training requirements

### ***PENNVEST***

The adoption of § 96.8 *Use of offsets and tradable credits from pollution reduction activities in the Chesapeake Bay Watershed* in 2010 codified PADEP's nutrient trading policy and PADEP's role in the nutrient trading policy. Section 96.8 requires the PADEP to certify and register credits. Pennsylvania legislation does not specify PADEP's work with PENNVEST, who's role is to serve as the clearinghouse for auction transactions.

### ***South Nation Total Phosphorus Management Program***

The South Nation Total Phosphorus Management Program was initiated as a pilot application of Policy 2, Section 3 of Ontario's Provincial Water Quality Objectives (PWQO). The policy simply states that areas that do not meet PWQOs shall not be degraded further and that all practical measures shall be taken to address water quality. South Nation Conservation ran the program as a pilot with no associated policy, guidance, or legislation related to SNC's role in the South Nation Total Phosphorus Management Program.

### ***Virginia Nutrient Credit Exchange***

The Virginia Nutrient Credit Exchange and Virginia Nutrient Credit Exchange Association were codified into Virginia Law through § 62.1-44.19. The Virginia Nutrient Credit Exchange Association's authorized roles and governance are defined in Section 62.11-44:17. The legislation defines the composition appointment, and terms of the Association and authorizes the Association to conduct the following:

- develop a form of agreement between buyers and sellers
- assist permittees in identifying buyers and sellers
- coordinate planning to ensure sufficient credits are available each year
- perform duties and functions necessary to effectively and efficiently implement the N Credit Exchange Program

### ***Great Miami River Watershed Trading Pilot***

The Great Miami River Watershed Trading Pilot was implemented prior to the anticipated nutrient regulations released. Due to the delay in this regulation, the program continued as an official pilot for years until Ohio Administrative Code established rules on a voluntary statewide water quality trading program. There is no policy, guidance, or legislation related to the clearinghouse as it operated as a pilot by the Miami Conservancy District.

### ***Colorado Water Quality Control Commission (Chatfield Reservoir Trading and Cherry Creek Basin)***

The 2004 Colorado Pollutant Trading Policy specifies that the Water Quality Control Division (division) of the Colorado Department of Health and Environment will review and approve trades in the absence of a statutory or regulatory provision delegating such authority to another entity. However the policy also contains language for another entity to perform clearinghouse roles including language requiring an appropriate entity such as a nonprofit corporation established for

such purposes or a “volunteer” government entity to register all credits. The policy also states that as a state policy and not a state regulation, the Division would have little oversight authority over “voluntary” actions between nonpoint sources.

***North Carolina Nutrient Offsets and Trading (Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading)***

North Carolina’s nutrient offset credits were codified in state legislation Section 143-214.26. This legislation authorizes a government entity to purchase nutrient offset credits but does not delegate or specify any authorized responsibilities of a clearinghouse entity.

**Table 1** General Clearinghouse Information

<b>Clearinghouse Elements</b>	<b>Long Island Sound</b>	<b>Lake Simcoe Phosphorus Offset Program</b>	<b>PENNVEST</b>	<b>South Nation TP Management Program</b>	<b>Virginia Nutrient Credit Exchange</b>	<b>Great Miami River Watershed Trading Pilot</b>	<b>Colorado Water Quality Control Commission*</b>	<b>North Carolina Nutrient Offsets and Trading**</b>
Is the Clearinghouse in the USA?	X		X		X	X	X	X
Is the Clearinghouse in Canada?		X		X				
Is the Clearinghouse Service Area a Watershed?	X	X	X	X	X	X	X	X
Is the Service Area Size under 1,000 square miles?							X	
Is the Service Area Size 1,000 – 10,000 square miles?	X	X		X	X	X		X
Is the Service Area Size over 10,000 square miles?			X					
Are Eligible Trading Participants Point Source to NonPoint Source?			X	X	X	X	X	X
Are Eligible Trading Participants Point Source to Point Source?	X							
Are Eligible Trading Participants NonPoint Source to NonPoint Source?		X			X			

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Is the Regulatory Driver a TMDL?	X		X		X		X	X
Is the Regulatory Driver other legislation or planning?		X		X		X		
Are Supporting Entities State or Provincial level departments?	X	X	X	X	X	X	X	X
Are Supporting Entities local level municipalities or watershed groups?		X				X		X
Are there Credit Brokers as Supporting Entities?						X		
Are there Third-Party Verifiers as Supporting Entities?		X						
Are there Other Supporting Entities?	X		X	X				X
Are there Current Active Trades?	X	X	X	X	X	X	X	X
Noted Obstacles included lack of transparency in the development process.	X			X				
Noted Obstacles included high administrative staff time and costs.	X						X	X
Noted Obstacles included lack of demand.							X	X
Clearinghouse Principles included improvement of water quality	X	X	X	X	X	X	X	X
Clearinghouse Principles included restoration of ecological integrity	X	X	X	X				X

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Is Clearinghouse established through Legislation?	X		X		X		X	X
Is Clearinghouse established through policy or pilot program?		X		X		X		

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

## 4.2 Credit Information

### *Pollutant*

Nearly all clearinghouses facilitated phosphorus trading (with the exception of Long Island Sound), while five facilitated nitrogen trading, and one for combined phosphorus, nitrogen, and total suspended sediment (PENNVEST).

### *Credit Volume*

Of the five clearinghouses with known volume of credit sales, the Long Island Sound and PENNVEST clearinghouses exhibited a relatively high volume of credit trades with a credit sale volume over 9,000 credits. However, the remaining three clearinghouses with known credit sale volume (South Nation TP Management Program, Colorado Water Quality Control Commission, and North Carolina Nutrient Offsets and Trading Program) managed a volume of credit sales between 1-10 credits. The Miami Conservancy District pilot program has purchased pre-compliance Ag reduction credits on the order of 572 tons of phosphorus and nitrogen through five WWTP investors between 2005 and 2014.<sup>1</sup>

### *Trading Ratio*

A credit trading ratio was applied in nearly all clearinghouse applications except the Long Island Sound. These trading ratios range from as low as 1:1 (Great Miami River Watershed Trading Pilot) to as high as 4:1 (South Nation TP Management Program). These were applied only to traded credits.

<sup>1</sup> The large amount of credits generated and transacted by the Miami Conservancy District is attributed to factors such as the regulatory certainty of the program for point source dischargers, social acceptance of the program among WWTPs and municipalities and associated social incentive to invest in their local watershed, and the program's low trading ratio. Use of reverse auctions with farmers that have not otherwise received funding from conservation programs under the Farm Bill has driven nutrient credit prices to some of the lowest in U.S. trading programs.

*Price*

Credit prices ranged from less than \$10 to over \$1,000. Credit prices in the programs that exceeded \$1,000 (Lake Simcoe Phosphorus Offset Program, Virginia Nutrient Credit Exchange and Colorado) were driven by new development regulations and typically reflected costs for urban stormwater treatment to generate tradable credits.

**Table 2** Credit Information

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission *	North Carolina Nutrient Offsets and Trading**
Pollutant being traded is Nitrogen	X		X		X	X		X
Pollutant being traded is Phosphorus		X	X	X	X	X	X	X
Pollutant being traded is Total Suspended Sediment			X					
Is the Volume of Credit Sale over 9,000 credits?	X		X			X		
Is the Volume of Credit Sale between 1-10 credits?				X			X	X
Is the Volume of Credit Sale Unknown?		X			X			
Is the Credit Trading Ratio 2:1?	none				X		X	X
Is the Credit Trading Ratio 2.5:1?	none	X						
Is the Credit Trading Ratio 3:1?	none		X					
Is the Credit Trading Ratio 4:1?	none			X				
Does the Credit Trading Ratio range from 1:1 to 3:1?	none					X		

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Credit Price is less than \$10***	X		X			X	dnf	
Credit Price is between \$10-\$100***							dnf	X
Credit Price is between \$100-\$1,000***				X			dnf	
Credit Price is greater than \$1,000***		X			X		dnf	

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

\*\*\*Credit Prices vary between being per kg, lb., “residential unit” and unitless “credit”  
dnf = data not found

### 4.3 Financing and Administrative Costs

#### *Clearinghouse Financing*

Half of the clearinghouses were financed strictly through state or grant funding while PENNVEST and the North Carolina Nutrient Offsets and Trading program had supplemental funding through fees applied to every credit transaction. Of the clearinghouses with known initial financing amounts, the Great Miami River Watershed Trading Pilot and North Carolina Nutrient Offsets and Trading required more than \$ 1 million.

**Table 3** Clearinghouse Financing

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Is the Clearinghouse State-funded?	X	dnf			dnf	X	X	X
Is the Clearinghouse Grant-funded?		dnf		X	dnf	X		
Is the Clearinghouse Financed through each transaction?		dnf	X		dnf		X	X
Financing Amount is less than \$1 million	dnf	dnf	dnf	X	dnf		dnf	
Financing Amount is greater than \$1 million	dnf	dnf	dnf		dnf	X	dnf	X

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

dnf = data not found

#### 4.4 Administrative Costs

Annual administrative costs varied with the responsibilities of the clearinghouse in their respective water quality programs. Programs such as the Lake Simcoe Phosphorus Offset Program, the Great Miami River Watershed Trading Pilot and Cherry Creek Basin had annual budgets close to or exceeding \$500,000 due to programmatic requirements for extensive monitoring, planning, research, and technical documentation. Programs that required less technical and more administrative functions from the clearinghouse saw lower administrative costs such as Long Island Sound and North Carolina’s Tar-Pamlico Nutrient Trading and staffing costs equivalent to one or two full-time staff positions.

**Table 4** Clearinghouse Administrative Cost

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Is the Annual Administrative Cost less than \$200,000?	X		dnf	X	dnf			X
Is the Annual Administrative Cost more than \$200,000?		X	dnf		dnf	X	X	
Number of Staff Required is equal to or less than 2 FTEs.	X	dnf	dnf	dnf	dnf	dnf	dnf	X

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

dnf = data not found

#### 4.5 Market Functions

##### *Credit Purchase Pricing/ Sale Pricing*

Different methods are used by clearinghouses to generate the price at which a credit will be purchased from a generator and the price that the credit will be sold. These prices can be market-based using techniques such as auctions and reverse auctions, or administratively determined. PENNVEST was the only clearinghouse using a purely auction-based pricing method for both the purchase and sale of a credit. The Virginia Nutrient Credit Exchange uses a mixed approach to price setting where market-based prices for offsets generated by nonpoint sources and an administratively determined set price for offsets generated by point sources within the Virginia Water Quality Improvement Fund. The Great Miami program has consistently used a reversed auction to obtain low-cost Ag credits representing what some have described as a ‘buyers’ market’. The program targets ‘low-hanging fruit’ by working only with producers that have not otherwise accept conservation funding under the Farm Bill or other related programs.<sup>2</sup> Outside of these three exceptions, pricing was largely administratively determined to be fixed or dynamic based on models, audits, and project costs.

##### *Transacting Credits and Frequency of Credit Sale*

Three of the clearinghouses allow credit buyers to transact credits online without having to directly contact the clearinghouse. These include the Virginia Nutrient Credit Exchange, the North Carolina

<sup>2</sup> Where few conservation practices are being implemented, new practices often generate substantial loading reductions compared to operations where there are already numerous practices in place where additional conservation efforts yield minimal benefit in comparison.

Nutrient Offsets and Trading Program, and PENNVEST’s use of the online auction IHS MARKIT. The remaining five clearinghouses required credit buyers to reach out to the clearinghouse directly for every individual transaction. This is a reasonable option for programs such as the South Nation TP Management Program and Colorado Water Quality Control Commission as both programs had a very low volume of credit sales.

**Table 5** Market Function

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Credit Purchase Pricing Through Auction			X					
Credit Purchase Pricing is Fixed Minimum Price					X			X
Credit Purchase Pricing Through Trade		X						
Credit Purchase Pricing Through Yearly Audits	X							
Credit Purchase Pricing Determined Administratively Based on Cost						X	X	
Credit Purchase Pricing Through Modeling				X				
Credit Sale Pricing Determined Through Auction			X					dnf
Credit Sale Pricing Determined Through Reverse Auction						X		dnf
Credit Sale Pricing Determined Through Trade		X						dnf
Credit Sale Pricing Determined Through Yearly Audits	X							dnf
Credit Sale Pricing Determined Through Modeling				X			X	dnf

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Credit Sale Pricing Determined Through Mixed Market and Fixed Price Approach					X			dnf
Transact Credits by Contacting Clearinghouse	X	X		X		X	X	
Can Transactions be Made Online?			X		X			X
Does Credit Sale Happen Annually?	X	dnf	X	X	X	***	dnf	dnf
Does Credit Sale Happen Quarterly?		dnf	X				dnf	dnf

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

\*\*\*Credit Sale occurs when funds are available.

dnf = data not found

Credit sales for the five clearinghouses that offered credit sale events occurred on an annual basis. The exception to this is PENNVEST, which not only provides an annual “spot” auction of credits, but also a quarterly forward-contract auction for future credits to be delivered in successive years. Forward contracts are viewed as desirable for buyers seeking long-term assurances that credits will be provided for future compliance years at a predetermined price and are utilized in part to promote market activity. Starting from 2010, PENNVEST initially offered forward contracts for compliance years 2010-2015. However since 2015, PENNVEST has only offered forward contract auctions for the current compliance year (as opposed to spot auctions which typically take place near the end of the compliance year). An indicator of PENNVEST’s focus on providing forward contract auctions and buyer demand for forward contracts can be seen in Table 6 and Table 7 where the number of credits transacted in PENNVEST through forward contract auctions is significantly greater than through the annual spot auction in nearly all compliance years. This disparity is also captured in Figure 1 and Figure 2. Additionally, the volume of credits transacted per compliance year during the longer 2012-2015 forward contract period is much greater than the shorter one year forward contract length seen after 2015. However, it is unclear if this difference in the number of transacted credits is due to the reduction in forward contract periods or a sharp reduction in market demand.

Although forward contracts are more desirable for regulated point source buyers due to their predictable price and availability, they may provide more financial risks for the clearinghouse. If a buyer defaults on a forward contract, PENNVEST is obligated to purchase the credits from the contracted sellers. PENNVEST is also obligated to purchase replacement credits if a contracted seller defaults, which may have to be purchased at a higher price at the spot auction. PENNVEST manages some of this financial risk by requiring buyers to provide a future revenue pledge, pay up-front, or provide another appropriate form of collateral and requiring sellers to provide evidence of credit certification and copies of agreements with farmers (if seller is an aggregator).

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**Table 6** Forward Contract Auction Activity and Results for PENNVEST from 2010-2018

		Total Credits Sold by Year of Auction*								Total Credits Sold by Compliance Year	
		2010	2011	2012	2013	2014	2015***	2016	2017		2018
Credit Compliance Year**	2010	No Winners for Auction									None
	2011	41,000 (N)									41,000 (N)
	2012	No Winners for Auction		93,874 (N), 600 (P)							93,874 (N), 600 (P)
	2013	21,000 (N)	Auction Cancelled	33,000 (N)	110,000 (N), 800 (P)						164,000 (N), 800 (P)
	2014	No Winners for Auction		39,000 (N)	16,000 (N)	23,000 (N), 3,456 (P)					78,000 (N), 500 (P)
	2015	No Winners for Auction		39,000 (N)	10,000 (N)	19,000 (N)	13,000 (N), 500 (P)				81,000 (N), 500 (P)
	2016							17,303 (N)			17,303 (N)
	2017								7,773 (N), 1,200 (P)		7,773 (N), 1,200 (P)
	2018									767 (N)	767 (N)

\*Total of forward auction credits sold per year (forward auction rounds per year varies).

\*\*Year in which credits are valid.

\*\*\*Beginning in 2015, credits were only available for the current credit compliance year.

(N) = nitrogen, (P) = phosphorus.

Light gray = Not applicable.

Dark gray = Credits not available for auction for that credit compliance year.

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**Table 7** Comparison of Nutrient Credits Sold by Auction Type

		Total Forward Auction Nitrogen Credits Sold	Total Forward Auction Phosphorus Credits Sold	Total Spot Auction Nitrogen Credits Sold	Total Spot Auction Phosphorus Credits Sold	Percent Nitrogen Credits Sold at Forward Auction	Percent Phosphorus Credits Sold at Forward Auction
Credit Compliance Year**	2010	0	0	0	0	N/A	N/A
	2011	41,000	0	20,859	700	66%	0%
	2012	93,874	600	5,123	181	95%	77%
	2013	164,000	800	775	20	100%	98%
	2014	78,000	500	895	55	99%	90%
	2015	81,000	500	20301	580	80%	46%
	2016	17,303	0	0	700	100%	0%
	2017	7,773	1,200	0	107	100%	92%
	2018***	767	0	0	0	100%	N/A

\*Total of Auction Credits Sold Per Year (Auction Rounds per year varies)

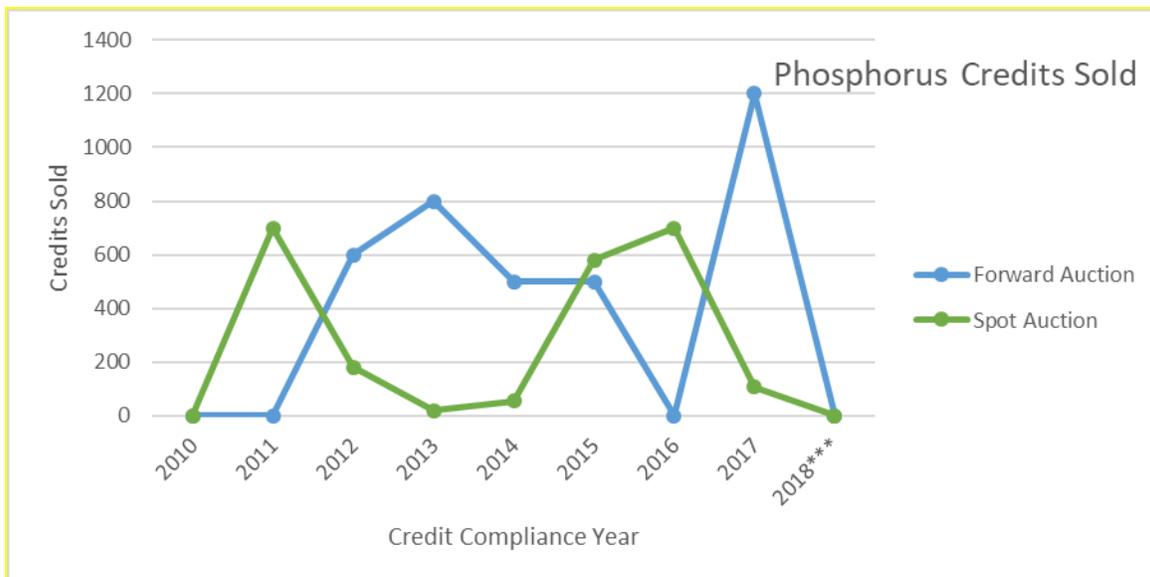
\*\*Year in which Credits are Valid

\*\*\*Spot auction takes place in November, has not occurred for 2018 at the time of this writing

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**Figure 1** Nitrogen Credits Sold by Auction Type



**Figure 2** Phosphorus Credits Sold by Auction Type

#### 4.6 Administrative Functions

##### *Additional Clearinghouse Administrative Functions*

This assessment revealed that is not uncommon for clearinghouses to take on additional roles outside of facilitating market functions. Although the majority of clearinghouses may only facilitate one or two of these functions, Lake Simcoe Phosphorus Offset Program and PENNVEST are structured to manage far more administrative tasks than the others including facilitating credit verification, credit certification, payment collection (Lake Simcoe), fund management, and contracting. Note that PENNVEST is the only clearinghouse in this assessment to use a third party to manage payment and collection as this function is provided by IHS MARKIT.

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**Table 8** Administrative Functions

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Clearinghouse Role is to Facilitate Verification of Credits	dnf	X	X		***	X	X	***
Clearinghouse Role is to Facilitate Certification of Credits	dnf	X	X		***		X	
Clearinghouse Role is to Act as a Broker	dnf			X				
Payments are Deposited into a Fund to be Used for Agricultural Projects	dnf	dnf		X	dnf	dnf	dnf	dnf
Payments are Collected Through a Third Party	dnf	dnf	X		dnf	dnf	dnf	dnf
Fund Management is Through Clearinghouse	dnf	X	X		dnf		X	
Fund Management is Through Other Entity	dnf			X	dnf	X		X
Contracting Process Through Clearinghouse Managing Entity	dnf	X	X	X	dnf	X	X	dnf

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

\*\*\*The State assumes this role.

dnf = data not found

#### 4.7 Assurances

##### *Regulatorily Liable Entity*

Regulated point sources that purchase credits from all programs are regulatory obligated to meet permit requirements if the purchased credits default due to project failure. Some of these programs, such as PENNVEST do provide Force Majeure provisions which will waive these requirements in the case of pollutant reduction activity failure due to uncontrollable or

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**Department of Agriculture, under cooperative agreement number 68-3A75-18-109** unforeseeable circumstances. PENNVEST provides these provisions in both legislation and their Rulebook.

*Environmental Assurances*

Provisions for environmental assurances for project failure were present for six of the clearinghouses evaluated. However, programs approached environmental assurances in different ways. Four clearinghouses (Lake Simcoe Phosphorus Offset Program, PENNVEST, South Nation TP Management Program, Great Miami River Watershed Trading Pilot) addressed environmental assurances for project failure by utilizing a surplus pool of credits. Long Island Sound used a true-up period approach that allows point sources to purchase contemporaneous credits in advance for use in future years.

**Table 9** Assurances

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Regulatory Recognition of Managing Entity	X	X	X	X	X	X	X	X
Regulatory Recognition of Credit Quantification Method	X	X	X	X	X	X	X	X
Is Regulatorily Liable Entity for Project Failure the Buyer?	X	dnf	X	X	X	X	X	X
Is Environmental Assurance in the Form of a Surplus Pool of Credits?		X	X	X	dnf	X	dnf	dnf
Is Environmental Assurance Through True-up Period?	X		X		dnf		dnf	dnf
Method of Regulatory Liability Management for Clearinghouse is Indemnification Clause			X					
Method of Regulatory Liability Management for Clearinghouse is not provided in data reviewed	X	X		X	X	X	X	X

\*The Colorado Water Quality Control Commission approves trades for the Chatfield Reservoir Trading and Cherry Creek Basin.

\*\*The North Carolina Nutrient Offsets and Trading covers trades for Tar-Pamlico Nutrient Trading and Neuse River Basin Total Nitrogen Trading.

dnf = data not found

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#### 4.8 Credit Registration

The assessment found that five clearinghouses utilized a registry to track projects and credits. All of the three clearinghouses that provided a publicly accessible registry were able to provide this service through a third party.

**Table 10** Registration

Clearinghouse Elements	Long Island Sound	Lake Simcoe Phosphorus Offset Program	PENNVEST	South Nation TP Management Program	Virginia Nutrient Credit Exchange	Great Miami River Watershed Trading Pilot	Colorado Water Quality Control Commission*	North Carolina Nutrient Offsets and Trading**
Clearinghouse Facilitates Registration Process	dnf	dnf			X	X	X	
Third Party Facilitates Registration Process	dnf	dnf	X	X				X
Use of Publicly Accessible Online Registry to Register and Track Credits	dnf		X		X	dnf	dnf	X
Use of Publicly Accessible Online Registration to Register and Track Projects	dnf	X	X	X	X	dnf	dnf	X

dnf = data not found

## 5.0 LESSONS LEARNED FROM EXISTING CLEARINGHOUSES

A number of additional clearinghouse documents were reviewed to identify “lessons learned” that are applicable to the development of a Wisconsin clearinghouse. These are additional to those used for summarizing program details. Some of these were prepared by K&A, while others were from other national organizations focused on trading or from peer-reviewed literature. Presented as bullet points, these were organized into the clearinghouse elements described in Section III. In general, several documents identified a clearinghouse mechanism to facilitate water quality trading programs, noting that a trusted intermediary such as a clearinghouse can be a useful and effective means to lower transaction costs and provide important assurances to market participants and interested stakeholders (K&A 2013; EPRI 2011; Newburn and Woodward 2011).

### 5.1 Clearinghouse Information

- Clearinghouse structure should seek to minimize transaction costs and minimize risk to buyers and sellers (K&A 2016).
- Establish a “common vocabulary” and set of definitions to facilitate communication among multiple stakeholders (NNWQT 2015).

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- Align clearinghouse structure and operations with other water quality management goals and programs (K&A 2013).
- Clearly delineate water quality goals, measures of success, and benefits of individual projects to achieving those goals (NNWQT 2015; Greenhalgh and Selman 2012).
- Ensure that clear drivers for trading exist, such as numeric water quality criteria or limits for nutrients (K&A 2016).
- Establish clear protocols and clearly defined roles for the clearinghouse and supporting entities (NNWQT 2015).
- Ensure that there is robust market supply and demand, for example, including broad eligibility for participation, allowing for credit generation both upstream and downstream of a potential buyer, and including provisions for trading within larger (rather than smaller) watersheds (PENNVEST 2017; Comer 2015; K&A 2013, 2016; Greenhalgh and Selman 2012).
- Limited state regulatory oversight may improve farmer participation rates (K&A 2013).

## **5.2 Credit Information**

- Ensure that credit generation methods provide robust quantification of the benefits to water quality (NNWQT 2015).
- Carefully consider trade ratios with a goal to ensure environmental benefit (supporting higher trade ratios), but also maximize credit pricing (supporting lower trade ratios) (Comer 2015; K&A 2016).
- Flexible and defensible trade ratios based on site-specific factors may improve credit prices as compared to fixed ratios (K&A 2013).
- Avoid excessive margins of safety as they can unnecessarily drive credit prices higher and limit the pool of credit buyers (K&A 2013).
- Ensure that credits are an attractive source of new revenue to sellers (Talberth et al. 2010).
- Five-year monitoring period of BMP performance should be required before credits becoming available creates barriers to participation (Colorado) (K&A 2013).
- Where possible, use credit “stacking” to maximize benefits of trade (EPRI 2011).

## **5.3 Clearinghouse Financing**

- Clearinghouses run by a state financing authority can provide stability to a market-based trading program (PENNVEST 2017).

## **5.4 Clearinghouse Administrative Costs**

- Seek to minimize start-up and transaction costs (NNWQT 2015).
- Align clearinghouse goals and activities with existing cost-share programs; maximize the use of available cost-sharing programs to reduce seller’s costs to get to a baseline condition, thus reducing costs to generate a credit (Talberth et al. 2010).
- If possible, work with soil and water conservation districts to maximize longstanding relationships and trust, and support access to funds from federal conservation programs (EPRI 2011; Newburn and Woodward 2011).

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## **5.5 Market Functions**

- Seek to provide stable credit valuation and pricing (EPRI 2011).
- Consider optimal timing of auctions (PENNVEST 2017).
- Reverse auctions may fail to reflect actual cost to the credit generator to implement a conservation practice (Comer 2015).

## **5.6 Administrative Functions**

- Regularly communicate with the public and other stakeholders using a “common vocabulary” (NNWQT 2015).
- Ensure that technical assistance is available (EPRI 2011).
- Ensure that all procedures/protocols are consistent and transparent (EPRI 2011).
- Simplify/minimize paperwork (EPRI 2011).

## **5.7 Assurances**

- Take a holistic look at risk management to minimize risks to buyers and sellers (NNWQT 2015); avoid assigning liability to a regulated point source if a credit seller defaults (PENNVEST 2017).
- Minimize risk of default and associated consequences (EPRI 2011) using risk assurances such as a 90-day grace period to remedy failed BMPs (K&A 2016).
- Use insurance credits or credit reserves to address liability concerns (Greenhalgh and Selman 2012).
- Use consistent, science-based modeling to quantify credits (K&A 2016; Greenhalgh and Selman 2012).
- Provide stable BMP reduction efficiency estimates that are not subject to adjustments that may be perceived as unfair or self-serving (K&A 2013).
- Minimize the threat of legal challenges through efforts such as the use of robust science and verification protocols (K&A 2013).

## **5.8 Registration**

Reduce transaction costs by using existing marketplaces and registries (such as NutrientNet) where possible (Greenhalgh and Selman 2012).

## **6.0 CONCLUSIONS**

The assessment of clearinghouse frameworks and clearinghouse elements found that the range of approaches taken to address environmental, policy, and market considerations and the resulting volume of credit sale varied considerably from clearinghouse to clearinghouse. However, the assessment found commonalities and trends when analyzing the approaches taken. Nearly unanimous findings across all clearinghouses include a watershed-scale service area, operation or strong support of the clearinghouse by a state/provincial department, explicit recognition of a credit quantification method, and no provision for completely absolving point sources of regulatory liability in the event of a project failure except in rare circumstances.

The majority of clearinghouses were operated by existing government agencies including the South Nation TP Management Program, Colorado Water Quality Control Commission, Lake Simcoe Phosphorus Offset Program, North Carolina Nutrient Offset and Trading. The Virginia Nutrient Credit Exchange is unique in that the clearinghouse is operated by an association of

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point source dischargers authorized by state legislation to facilitate water quality trading. The three clearinghouses with the highest volume of transacted credits are the Long Island Sound, Great Miami River Watershed Trading Pilot, and PENNVEST. The Long Island Sound is operated by a board that is made up of a blend of state officials and members of the public including officials from publicly-owned treatment works and municipalities. The Great Miami River Watershed Trading Pilot was operated by the Miami Conservancy District until 2013 and is now operated the Great Miami River Watershed Joint Board which consists solely of soil and water conservation districts. PENNVEST is operated by a state financing authority for municipal water projects and works in conjuncture with the Pennsylvania Department of Environmental Protection who is mandated by state legislation to certify and register credits.

The majority of clearinghouses were established through the codification of the clearinghouse in state legislation such as the Long Island Sound, PENNVEST, Virginia Nutrient Credit Exchange, and North Carolina Nutrient Offset and Trading. However, this is not the only avenue of establishment as clearinghouses for the South Nation Total Phosphorus Management Program and Great Miami River Watershed Trading Pilot were implemented as pilots by government agencies.

Clearinghouses in this assessment provided a variety of administrative services that often included the verification of credits and facilitation of contracting processes. Clearinghouses most commonly provided environmental assurances for project failure through a surplus pool of credits, although other approaches such as a true-up period were also utilized. In terms of market functions, clearinghouses generally operate using a more standard annual credit offering to buyers. PENNVEST diverged from the other clearinghouses with their use of quarterly forward contract auctions, which provided more desirable credits that could be purchased at a pre-determined price and quantity, at the tradeoff of more financial exposure to the clearinghouse. Although credits were generally offered on an annual basis, the method of credit pricing differed across clearinghouses including traditional auction-based pricing, reverse-auctions, and administratively determined pricing, with the most common method for pricing the purchase and sale of credits being administratively determined. The reverse-auction approach utilized by the Great Miami program may favor the interests of buyers over sellers as it was designed to create cost effective credits for point sources and may not recognize the full cost of conservation practices accrued by credit generators.

Although regulatory liability for buyers and financial liability for the clearinghouse was not completely absolved in any of the clearinghouses, these uncertainties could be mitigated by provisions in guidance or legislation. PENNVEST represents a good example of this kind of risk mitigation. PENNVEST can waive regulatory liability for buyers through provisions that accounted for project failure due to unforeseeable circumstances. Financial exposure for PENNVEST is mitigated by creating financial eligibility and collateral requirements for forward contract buyers and verification requirements for forward contract sellers. In the case of PENNVEST, these provisions were provided in the state legislation and in the PENNVEST Rulebook.

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