Final Report
**Hudson River Foodway Logistics Analysis**

Table of Contents




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## EXECUTIVE SUMMARY

This study was performed by Roberta Weisbrod, Sustainable Ports, under contract with the Lower Hudson Long Island Resource Conservation and Development Council, Inc. The objective of this study is to determine the feasibility of moving agricultural products from upstate New York to the consumers in New York City for the benefit of the economy and health of the State's citizens. The results of the study are that maritime transport of agricultural produce carried in either containers or trucks is feasible.

The infrastructure for maritime transport of produce was investigated in terms of the capabilities of four upstate New York ports. The Port of Albany can accommodate containers on barge but not trucks on barges, while the Port of Coeymans can accommodate trucks as well as containers on barge. Kingston and Newburgh lack the infrastructure for transferring both containers and trucks to barges. In addition the capability of six New York City terminals was also evaluated.

In terms of operations, the time of transit from the Port of Albany and the nearby Port of Coeymans using barges is approximately 18 hours and 16 hours respectively. Maritime transport in NYS is therefor able to deliver produce far more rapidly than that coming from the west coast and Florida.

The costs of maritime transport are highly dependent on scale. The unit cost of transporting trucks and containers was calculated, on the basis of minimal and maximal loading, between ten trucks and 100 containers respectively. The final calculation of unit costs will depend upon obtaining valid information on the amount of agricultural produce that could be expected from upstate New York for the New York City market.

Clearly the critical step needed to determine the feasibility of maritime transport is to determine how much food can actually expected to be aggregated at one time for transport and sale in New York City (with some possibly for export). From this information the number of containers and/or trucks that could be filled with produce for sale in NYC can be determined. This is important because the more units that can be loaded onto maritime transport the lower the cost per unit.

In the absence of knowing how much produce could be expected, the costs and feasibility were explored over minimum and maximum conditions of scale. The minimum condition was the number of trucks needed to fill the smallest barge we could lease – ten trucks. The maximum condition was the number of containers that needed to meet the ILA's four-hour minimum work time in New York City. Four hours are needed to unload 100 containers. Because of the ability to stack containers the same size barge could be used for both the trailers and the containers.

In order to fully answer the question of the cost of maritime service, the strong need is to find out how much food is produced, or producible, for market in NYC in terms

of weight, volume, truck load, or pallet, and in terms of how much and what type of products could be produced in a week. With that information in hand the economic feasibility of maritime transport on the Hudson can be determined.

Initially when the project was proposed it was thought that a food hub – (a logistic center that contained refrigerated warehousing for aggregation, processing and sorting) would provide value added when coupled with maritime transport. However preliminary findings that there are no refrigerated warehouses near the Hudson River Valley makes that business model impossible at the present time. Studies are underway by others to locate food hubs,[1] which could improve the marketability of upstate agricultural, produce, and possibly change the dynamics for maritime transport.

## OBJECTIVE OF THIS STUDY

As stated in the Memorandum of Agreement between the New York City Soil and Water Conservation District and Sustainable Ports, this report is on the study of:

> *"the transportation logistics of distributing agricultural products from the Hudson Valley to New York City using waterborne transportation"*

The objective of this study and report is to describe the operation and feasibility of bringing agricultural produce from upstate New York to New York City using transport on the Hudson River for part of the trip. Several possible options for waterborne transport have been described and evaluated.

## BACKGROUND

Over the past decade or so, a number of individuals and organizations, prominent among them the New York City Soil and Water Conservation District, have had the goal of transporting agricultural products by water to New York City. In 2010 and 2011, several of these individuals and organizations met to refine their vision. This work builds on these discussions that were held at the New Amsterdam market office. The work also builds on a fairly robust literature. See Appendix I for a list of studies and reports.

The reasons for this interest in waterborne transport of food and agricultural products on the Hudson are that it would satisfy multiple purposes, include:

- Reduce truck based emissions and energy use;
- Reduce roadway wear and tear;
- Provide fresh locally-sourced food for NYC residents and restaurants;
- Open up markets in NYC for upstate farms that would be otherwise difficult to access by truck given cost, time and time-uncertainty of the truck mode;

[1] The Hudson Valley Food Hubs Initiative http://pattern-for-progress.org/hv-food-hubs

- Add to the critical mass of maritime transport and help bring about a resilient marine highway network.

## WORK PLAN

The Memorandum of Agreement between the Lower Hudson Long Island Resource Conservation and Development Council referred to the proposal by Sustainable Ports Task 1 as the Work Plan. The Work Plan elements for Task 1 can be found in the attached Memorandum of Agreement on pages 8-10.

The summary of the Work Plan as initially formulated is:
Task 1 Transportation Logistic Analysis
1.1 Identify logistic hubs for product aggregation and processing.
   (a) Site identifications
   (b) Site Criteria
   (c) Mapping
1.2 Riverfront sites.
   (a) Identify/map ports
   (b) Determine port suitability
1.3 Define Catchment areas for each river port.
   (a) Map catchment areas
   (b) Identify key logistic hubs
   (c) Select river port(s) and logistic hub(s)

Sustainable Ports added another task, Task 1.4 Estimate cost and conditions for waterborne transport of produce on the Hudson River.

## METHODOLOGY

To determine how food could be transported via the Hudson River by water, and whether it was feasible, this study relied heavily on extensive interviews with logistics providers as well as literature sources and electronic databases. In addition team members made site visits in connection with this study and in connection with other studies. Appendix I lists the literature sources and electronic databases.

*Assumptions.* When this study was proposed several assumptions were stated. Further research challenged the validity of the assumptions.

- It was assumed that maritime transport would be by trucks on barges only; analysis showed that containers on barges were also feasible.
- It was assumed that Hudson River Valley farms would be the major source of produce for maritime transport; instead it was realized that farms west and north of the Hudson Valley were more likely to benefit from maritime transport.

- It was hypothesized that a food hub could be developed that would create the added value making maritime transport attractive. That hypothesis might still be valid in the future, but it was not testable without in depth analysis of the potential quality of existing facilities, none of which are refrigerated warehouses although as cold storage they might be upgradable with adequate investment.

An operative assumption is that the refrigeration for maritime transport will be electrified. Food will be collected and transported in electric Transport Refrigerated Units (eTRU) and the charge will be maintained through Energy Storage Modules as described in "Electrifying the Hudson Food Corridor".[2] Note that refrigerated trailers and containers transported on barges may carry, preserving quality, all manner of fruit, vegetables, dairy and meat products. While not specifically evaluated in this report, due note is made that Washington county produces meat and a new marketing cooperative has formed for shipping beef to NYC.[3]

## APPROACH AND FINDINGS

The following describes how the tasks were approached and what the findings are.

### Task 1.1 Identify logistic hubs for product aggregation and processing

The reason for identifying logistic hubs for product aggregation, processing and sorting was to look for an extra value-added in connection with maritime transport. The reasoning was that if agricultural produce from the Hudson River valley could be combined and sorted according to its destination it could be directly delivered to the wholesale, retail, restaurant and institutional customers. Under current business models however 'barge transported agricultural products would be required to make a stop at distributor's warehouses to maintain relationships and delivery logistics desired by the customer'. [4]

This food hub business model supposed a site near the Hudson River in which agricultural produce from a series of farms in the Hudson Valley could be aggregated in a refrigerated warehouse and sorted for precise delivery to outlets in New York City.[5] One implication of this business model is that it might reduce the need for use of refrigerated warehouses in New York City for sorting some products prior to distribution to wholesaler, retail operations, restaurants, schools, and hospitals.

*Farms*

The first step in exploring this business model was to identify concentrations of dense agricultural areas near refrigerated warehouses. The operative assumption was that dense

[2] "Electrifying the Hudson River Food Corridor: A Conceptual Design" (Feb. 2012) by New West Technologies for NYSERDA. http://www.ces-ltd.com/uploads/news/id61/Electrifying%20the%20Hudson%20River%20Food%20Corridor%20-%20A%20Conceptual%20Design.pdf

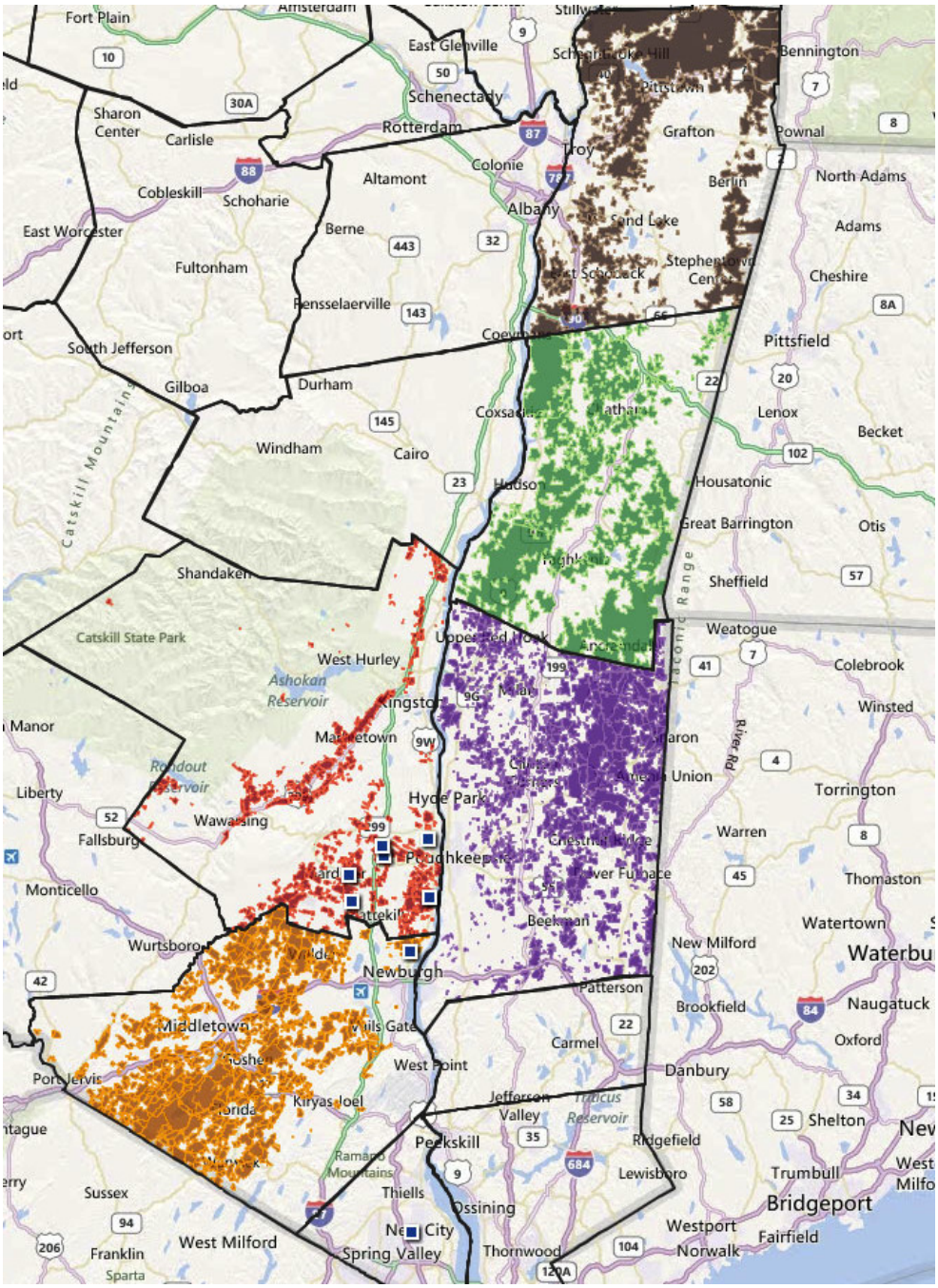
[3] Steve Hadcock, Cornell Cooperative Extension, July 2012.

[4] Karp Resources comment August 23, 2012.

[5] For example, a South Street Seaport barge landing with ten trucks could go to the New Amsterdam market, to anyone of many restaurants in the area, to Beekman Downtown Hospital and to area public schools and schools of higher education.

agricultural areas in the counties near the Hudson River would be the prime source of product. This assumption has to be modified by the fact that the location of agricultural districts does not give any indication about the number of farms, scale of production, or type of products grown; the identification is used was a surrogate to identify possible regions of agricultural production density.[6] These areas can be found in this Figure 1.

**Figure 1: Agricultural districts in counties near the Hudson River**




[6] Based on Karp Resources comment letter August 23, 2012.

Rensselaer, Dutchess, Columbia and Orange counties seem to have the highest density of agricultural districts.

*Refrigerated warehouses*

To explore the food hub business model the refrigerated warehouses in which the sorting could take place up state were sought. The directory of the North American International Association of Refrigerated Warehouses (IARW) was accessed for members located in New York State and then in the Hudson River Valley. There were none located in the Hudson River valley. Indeed compared to other states New York has a relatively small amount of refrigerated warehouse space, less than half the amount possessed by nearby Pennsylvania for example.[7]

A search through Manta, the search engine for commercial businesses, also could find no refrigerated warehouses, although there were cold storage facilities listed, facilities that in most cases were clearly associated with specific farms. See table I for the list of facilities. These facilities were mapped and their location compared to the location of dense agricultural areas as shown in Figure 1, with the idea that the cold storage facilities might be expandable and upgradable. Although in concept cold storage facilities could serve as potential aggregation sites for Hudson Valley agricultural produce prior to transport to New York City by barge, these facilities would have to be examined on a case-by-case basis.

**Table 1: Cold Storage Facilities in the Hudson River Valley region**

| Name | Address | Town, County | Miles to Hudson River |
|---|---|---|---|
| J Van Duser Farms | 421 New Hurley Rd, | Walkill, Orange | 8 |
| Frank Donato & Son | 2184 Route 44 55 | Modena. Ulster | 10 |
| Middle Hope Cold Strg | 5360 Route 9W | Newburgh, Orange | 2 |
| Melford G Hurd & Sons | 76 Hurds Road | Clintondale, Ulster | 5 |
| A Zimmerman & Son | 310 Station Road | Highland, Ulster | 6 |
| Hepworth Farms | 1635 Route 9W | Milton, Ulster | 0.5 |
| Conn Freezer Warehous | 1666 Route 9W | Milton NW | 0.5 |
| Pavero Cold Storage | 10 North Road | Highland, Ulster | 1 |
| Manco | 8 Rosemont Drive | New City, Rockland | 4 |

Members of the TAC were specifically queried about the location of any refrigerated warehouses in the Hudson River Valley and they could offer none. None of the facilities in Table 1 were listed as public refrigerated warehouses. Indeed this lack has been recognized: Pattern for Progress, funded by the New World Foundation, is researching the potential need for food distribution infrastructure in the Hudson Valley.[8] We concluded that the food hub business model – upstate sorting -- could not take place in the absence of refrigerated warehouses, although it could be explored whether the existing cold storage facilities could be upgraded appropriately. (That being said, should Hudson Valley Food Hubs be developed, the dynamic could change for other logistic advances including maritime transport).

[7] Public Refrigerated Capacity by US state http://www.gcca.org/public-refrigerated-capacity-by-us-state.html
[8] The Hudson Valley Food Hubs Initiative http://pattern-for-progress.org/hv-food-hubs

Subsequently another business model was considered -- no warehouse sorting -- in which the trucks go directly from farm to consumer either at farmers markets or through Community Supported Agriculture (CSA). This model would require close coordination of a series of independent farms to travel to the same port to access their diverse customers on the same day. The landing should have access to several farmers markets and CSA pick up sites. More critically given the varying days of the week of farmers markets and CSA pick ups it is hard to imagine achieving the coordination of farmers and market days on a particular day of the week. This model will not be explored further.

*Conclusion*. Given the current lack of refrigerated warehousing in the Hudson River Valley, doesn't allow the kind of aggregation, processing and/or and pre-sorting for delivery near Hudson River ports, we therefore concluded that in most cases the downstate sorting business model would be the operative model, which requires the sorting of produce in refrigerated warehouses in NYC. This business model would require the use of facilities such as Hunts Point, or the new Fresh Food Campus at Oak Point, and/or perhaps food processors at Sunset Park, or possibly a new facility that could be created in Red Hook near Phoenix Beverage at the Red Hook Container Terminal[9]. This business model could accommodate both truck on barge and container on barge.

**Task 1.2 Riverfront sites – ports and terminals**

*Ports*
This next task was to identify sites on the riverfront that could accommodate food transport from upstate New York. When the MOA was written and agreed to, the TAC and Sustainable Ports both assumed that food would be transported on the Hudson by tug and barge combinations carrying trucks. Containers on barge were not initially considered because of the labor costs and infrastructure needs. Subsequent analysis, to be described below, indicated that truck on barge had its own infrastructure needs and costs and container on barge had significant economies of scale. Container on barge as a means of moving agricultural product down the Hudson was considered and evaluated as well as trailer on barge.

*Tug and barge transport*
But first things first: Why a tug and barge combination? Why not use a (self-propelled) ship to move either trucks or containers down the Hudson. There are several reasons why ships are not being considered – at this time.

- Tug and barge combinations are generally cheaper than vessels in that they require far fewer crew than ships.
- The additional speed that a ship could make (about 23 knots) the trip to Albany (about 6 hours), as opposed to 8 knots for a tug and barge would be 12 hours shorter on a trip from Albany. The fuel costs for faster vessels are generally significantly higher.

[9] All of these sites, Hunts Point, Oak Point, Red Hook and Sunset Park, could provide back haul. See page 14 about NYC terminals.

- The time advantage that ships achieve might have limited value for upstate shippers of produce to NYC. There would be the savings of twelve hours less of time to chill the containers or trailers on board. To get to NYC at 5 AM a 23 know ship would have to leave at 11 PM while an 8-knot tug-barge could leave at 11 AM the day before. Produce from upstate whether by swift vessel or slow tug barge would still get to NYC far faster and fresher than competitors from the mid west, west coast, Florida, and Canada.
- Last but certainly not least there are no suitable vessels for the scale we are contemplating, (ones that would carry from ten trucks to one hundred containers). This is a constant finding of marine highway reports.[10]
- Nonetheless things could change in the future, and a suitable vessel could be built for the purpose of transporting food to NYC.[11]

(a) Identify/Map ports

*Upstate ports*

The rationale for this task is that it is necessary to know the origin port in order to determine time and cost of the waterborne service. This selection of the port is a function of logistics model (whether container on barge or truck on barge). Upstate New York ports were intensively evaluated. Potential New York City terminals were identified and less intensively reviewed at this time.

In the Hudson River Valley four ports were identified and described in terms of location, infrastructure and capabilities. The ports so identified are Albany, Coeymans, Kingston and Newburgh. The technical memoranda for the ports are attached. The following table is a summary of location, infrastructure and capabilities as they relate to this project. Distance is measured in nautical miles to the Battery. (Potential New York City terminals can be measured in reference to the Battery; Red Hook was used as the NYC terminal; it is minutes away from the Battery by water).

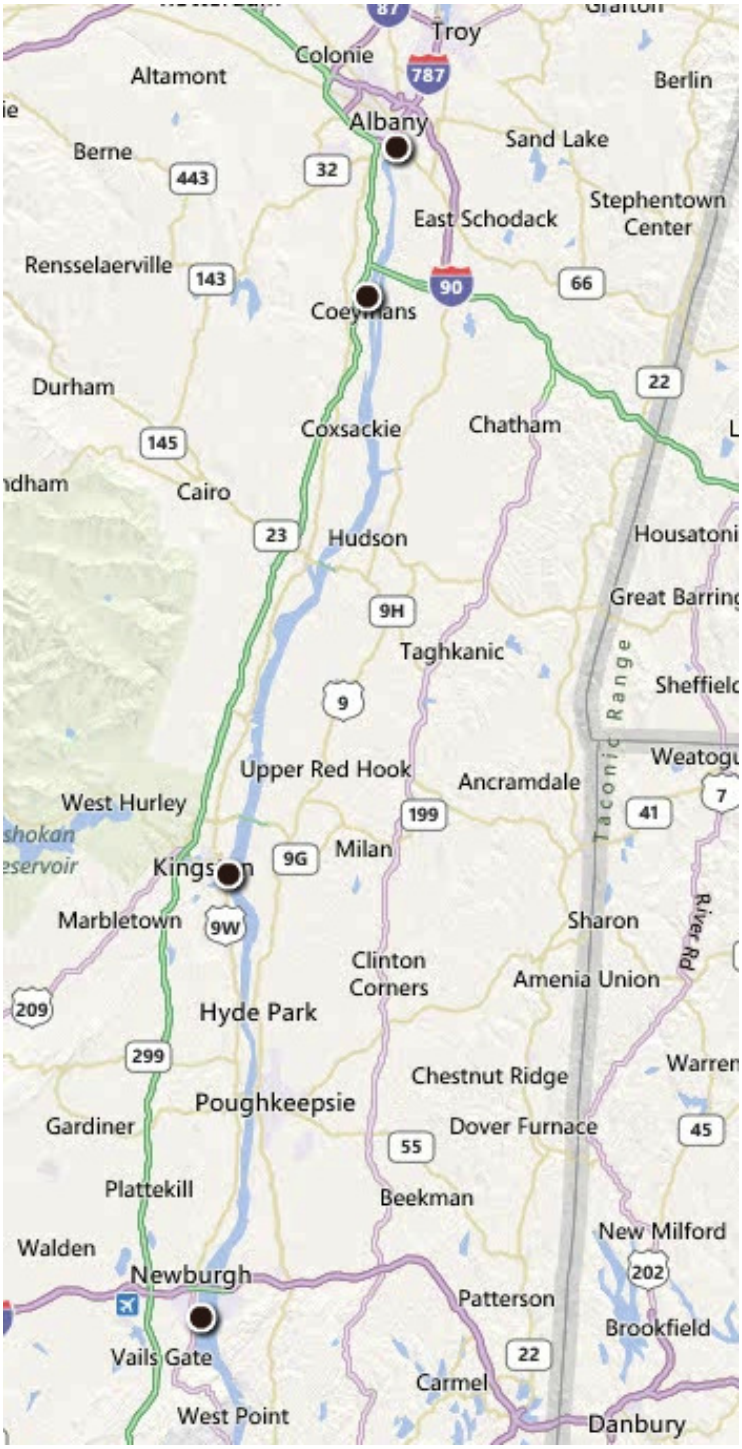
**Table 2: Hudson River Ports**

| Port | Distance | Infrastructure | Other factors |
|---|---|---|---|
| Albany | 126nm | Container cranes | Cannot handle RoRo at either east or west terminal |
| Coeymans | 110nm | Truck ramp | Can handle containers |
| Kingston | 80 nm | Neither | |
| Newburgh | 52 nm | Neither | |

[10] The latest report is from Lloyd's List: Built in the USA (May 23, 2012) http://www.lloydslist.com/ll/sector/containers/article398945.ece

[11] Jim Barker who owns and operates Seastreak and also designs ships has designed a trailer ship for marine highway purposes that could have value for the Hudson River Foodway.

**Figure 2: Map showing the location of the ports of Albany, Coeymans, Kingston and Newburgh.**



## About the ports

The Port of Albany

The Port of Albany had operated a container-on-barge service between the international port terminals of the Port of NY/NJ and the Port of Albany. The Port Authority of New York/New Jersey (PANY/NJ) sponsored the service, which they called the Port Inland Distribution Network (PIDN). The service was initiated and trialed for three years with the use of a Congestion Mitigation and Air Quality grant ($3.3 million) supplemented with $1.2 million from the PANY/NJ; it functioned from April 2003 through March 2006.[12] It was discontinued because the inadequate amounts of business couldn't obviate the need for a subsidy. Albany's experience operating the PIDN gives the assurance that the Port has the equipment and expertise that can readily handle container-on-barge.

**Figure 3: Aerial photograph of the Port of Albany. Note that there are facilities on both sides of the Hudson River.**

On the other hand a truck-on-barge service is not likely at the Port of Albany on its major west of Hudson terminals because of the geometry of the dock and the width of the river. The height of the dock above the water at low tide is 16-17 feet; at high tide it is 12 feet.[13] (The Hudson River at Albany has a 4-5 foot tidal range). Because of the relative narrowness of the river, it is actually not possible to build a ramp with the required grade for trucks with a sufficient length that would not impede navigation. According to Reno Mastrocola of TTS Marine, which builds and sells ramps and other maritime freight systems, the incline of the ramp should be 7-8% although a steeper 10-11% ramp is feasible. Using the steeper incline a ramp would have to be 204 feet long. Even if the ramp were designed to be used only during high tide, it would still to be 168 feet long.[14] Therefore since a ramp cannot be built, truck-on-barge service at the west of

[12] Peter Zantal, Port Authority of New York/New Jersey, personal communication May 18, 2012.
[13] Richard Hendrick, Port of Albany manager, personal communication Mar. 27,2012
[14] Reno Mastrocola Communication Mar. 28, 2012

the Hudson section of the Port of Albany is not possible, given current dock heights. Neither can a suitable RoRo ramp be built on the east side of the Hudson terminals; the dock height is approximately 15 feet.[15]

In addition to its container capabilities, the Port of Albany has facilities that might be useful for enhanced agricultural business at the port. There is a US Department of Agriculture office on site as well as a grain elevator.

**Figure 4: Container crane at the Port of Albany**

[15] Hal Betters, Albany Port District Commission, July 9, 2012

The Port of Coeymans[16]
The Port of Coeymans has a ramp for driving trucks on and off the barge (roll on-roll-off service, RORO service) for maritime transport. The cost of the service for driving the trucks is $100 per truck per move either on or off the barge.[17] Therefore the round trip cost is $200 in addition to the cost of the tug barge service and the cost of operations in NYC. See Figure 5: Port of Coeymans.

**Figure 5: Port of Coeymans[18]**

The ports of Kingston and Newburgh do not have equipment that could move trucks onto barges or containers onto barges. They are also close enough to NYC that there is no compelling reason to drop the load onto a vessel. They will not be considered in subsequent discussions.

See Attachments for in-depth discussions of the infrastructure for all ports mentioned above.

(b) Determine port suitability: What problems does maritime transport solve for upstate farms and for downstate consumers and processors?

*No value added for Hudson Valley farms.*
The most northerly Hudson River port from New York City, Albany, is 150 miles and 2 hours 49 minutes by truck to the Battery in New York City.[19] The Port of Coeymans is 136 miles to the Battery. Farms close to the ports of Albany and Coeymans are also close to New York City in that they are approximately 3 hours away. (By water the Port of Albany is 126 nm to the Battery, or at 7 knots (8 mph), or 18 hours; the Port of Coeymans is 110 nm and at 7 knots, 15.7 hours.) We concluded that given that the food hub business model was inoperative, there was no value added for Hudson River Valley farmers and middlemen in not going directly by truck to New York City.

[16] Stephen Kelly – VP sales and operations Port of Coeymans 518-756-2164, skelly@pmterminal.com
[17] Stephen Kelly Port of Coeymans
[18] www.portofcoeymans.com
[19] Google maps

*Recognizing the potential value of maritime transport*
At the first meeting the TAC realized that while it didn't make sense for Hudson Valley farmers to use the river for transport, it might make sense for those in farms further away from the Hudson Valley, those north and west of the river. There were several reasons for this conclusion. Farms north and west of the Hudson River were in regions where the real estate values were lower so that the produce could be offered at lower cost. On the other hand farms in these parts of the state had more difficulty accessing the large New York City market. In fact for many of those farms the distance was such that the Federal Motor Carrier Safety rules limiting the hours of service for truck drivers could affect the cost of transport to New York City, necessitating either a second driver or paying a trucker for long rest periods.[20]

*About terminals in New York City*
Although the focus of this study is on the feasibility of getting produce to New York City we took it a step further and considered the benefits of various terminals in New York City. The terminals which are noted briefly in this section are Hunts Point Produce Market; Oak Point Fresh Food Campus; Pier 40; South Street Seaport; Red Hook Container Terminal; Sunset Park various piers.

**Table 3: Overview of potential New York City terminals**

| Name | Location | Capability | Notes |
|---|---|---|---|
| Hunts Point PM | South Bronx | Neither | Potential; backhaul |
| Oak Point FFC | South Bronx | In development | High potential; backhaul |
| Pier 40 | HR, Manhattan | Neither | Unlikely |
| South Street | ER, Manhattan | Neither | Unlikely, but good customer base |
| Red Hook | NYH, Brooklyn | Container cranes; Truck potential | Phoenix as backhaul |
| Sunset Park | NYH, Brooklyn | Potential | Process food backhaul |

**About the terminals in New York City:**

*Hunts Point Produce Market* (and Meat Market and Fish Market).
As of 2006, when Hunts Point Produce Market Logistic Enhancement Study was completed, the Hunts Point market area had the potential to establish a marine terminal for containers or trucks on barges. This was the conclusion of the study (sponsored by NYSDOT and NYSERDA), which Sustainable Ports participated in working on maritime transport, as well as the refrigerated warehousing and wholesale market benchmarking sections of the study.

[20] Most of the subsequent discussion focused on farms west of Hudson including Wayne County because of the region's density of agricultural districts. In future evaluations it is recommended that counties north of the Hudson, in particular Clinton Country, for apples, (where an apple slicer machine prepares Empire apples for NYC) and Washington County, for beef, (where a new cooperative for shipping to NYC is being formed).

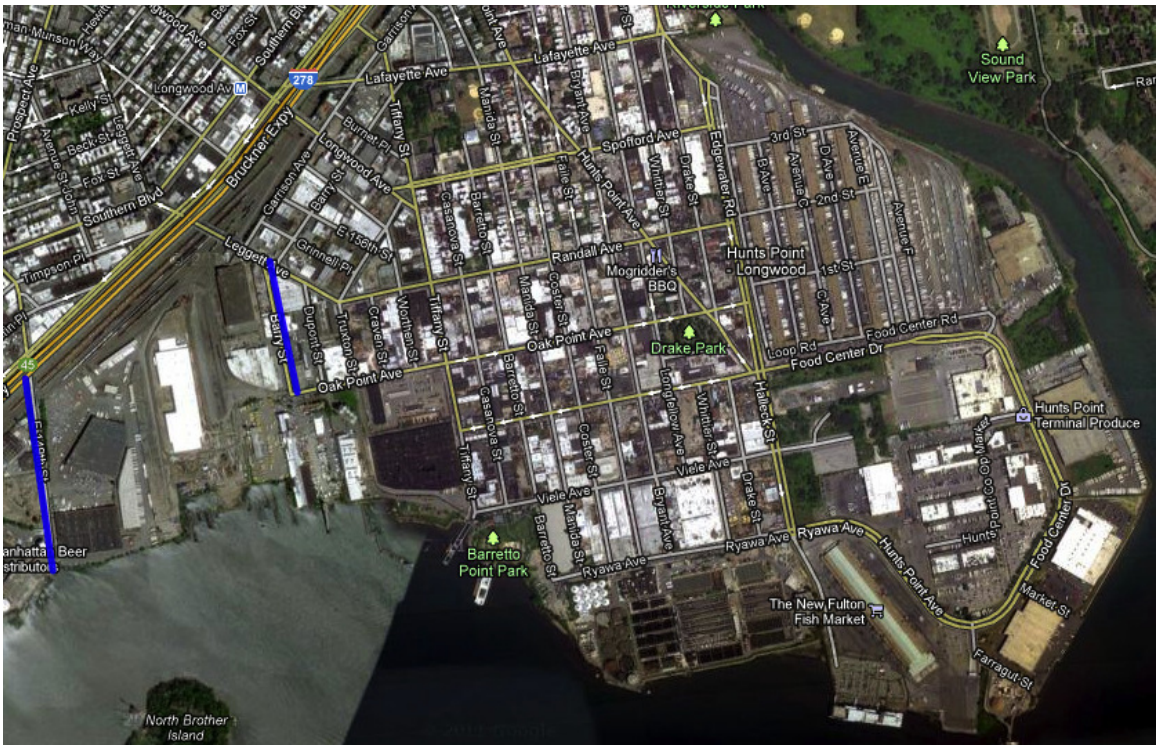



**Figure 6: Aerial photograph showing the Hunts Point peninsular with food markets indicated and showing (between the blue lines) the Oak Point Fresh Food Campus. Courtesy of Paul Lipson.**

*Oak Point Fresh Food Campus.* Sustainable Ports Roberta Weisbrod and study project manager Shino Tanikawa visited the facility in late 2011 and learned that the facility is being developed as a logistics center for food to be brought in by land and sea. Currently the 28-acre site has a Jetro cash and carry wholesale food business.

*Pier 40.* At Houston Street and the Hudson River, Roberta Weisbrod Sustainable Ports was part of a team attempting to establish a waterborne cargo transport facility (to bring air cargo from Newark Airport to the pier for sorting in the then FedEx sort operation). Results were positive in terms of the economics of transport, especially given the congestion at the early morning delivery times. Twelve years later, further research is required to determine what part if any of the pier would be available for a truck barge operation.

*South Street Seaport.* Roberta Weisbrod was the Coordinator of the Waterfront section of Seaport Speaks, an extensive planning charrette for the South Street Seaport.[21] At the South Street Seaport waterfront space not only is at a premium for marshaling trucks or containers, but there is no space for a terminal capable of

[21] http://www.seaportspeaks.org/book/Report.pdf; also see "On the Waterfront: South Street Seaport, Treasure for the City, Is Suddenly in Play" By Roberta Weisbrod, http://www.nysun.com/new-york/on-the-waterfront-south-street-seaport-treasure/35040/

handling containers or trucks at this time. Given the competing uses it would be unlikely in the future.

*Red Hook Container Terminal*. Roberta Weisbrod had visited several times when the terminal was operated by American Stevedoring in the context of working for New York City Economic Development Corporation, as well as subsequently. The facility has container cranes that have been actively engaged in operating a cross-harbor container on barge service. There is space for the establishment of a RoRo ramp. Phoenix beverage[22] now has the lease to the facility [23] and could potentially provide beer and beverages for back haul back up the Hudson. Why beer and other beverages are good candidates for back haul is the large market and the fact they are heavy weight products. (Trucks are limited against carrying heavy overweight loads; this is not a problem for vessels.) Further study would be required to determine the feasibility of a truck on barge service.

*Sunset Park.* Sustainable Ports Roberta Weisbrod was a consultant on a project proposed by Constantine Sidamon-Eristoff for a deepwater port in Sunset Park Brooklyn (in 2000). She visited and researched conditions at Pier 4 (at 58th Street). Prior to that she also was the project initiator for NYC EDC's Cross Harbor Railroad project in 1998 and visited several sites on the waterfront from 23rd, 41st and 65th street. At this time further study would be required to determine the feasibility of use of parts of Sunset Park for a maritime food terminal. South Brooklyn Industrial Development Corporation, which encompasses Sunset Park, has as among its members, a large number, twenty-four, food processors and food distributors[24]. As such they might generate food products for the backhaul either at a Sunset Park terminal or at nearby Red Hook.

**Task 1.3 Define Catchment areas for each river port.**

When this task was initially defined it was assumed that the farms selected would be near the Hudson River and the final choice of farms would be near logistics centers – places where food could be aggregated, stored and sorted in refrigerated warehouses.

In view of the fact that there are no refrigerated warehouses near the Hudson River and more importantly the conclusion drawn by the consultant and TAC team that the real value added was not for farms on the Hudson (that could readily go by truck to New York City) – but for those farms north and especially west of the Hudson River. Farms north and west of the Hudson that are at a distance that the Federal

[22] According to Hoover's, about Phoenix, "The company, one of New York City's largest beer distributors, is the exclusive distributor of Heineken, Amstel Light in both the City and Long Island. Its fleet of some 150 trucks delivers a range of alcoholic and other beverage brand names, such as Miller, Peroni, Pilsner Urquell, Guinness Stout, Harp Lager, Smirnoff's Ice, Drinks Americas' Trump Vodka, and most Brooklyn Brewery products. The company unloads approximately 20,000 containers, including up to 12 million cases of beer, a year from freighters at two piers in Red Hook, Brooklyn." Twenty thousand containers a year are approximately 40 containers per week.

[23] Phoenix Beverage in Red Hook http://www.nycedc.com/success-story/phoenix-beverage

[24] www.sbidc.org/members

Motor Carrier Safety Administration Hours of Service rule[25] would be otherwise hampered by the long distance to the markets of New York City to which they couldn't make a round trip within the HOS limitations for one driver (eleven hour limit) and would either have to pay for driver's ten hour rest time or hire another driver, both options adding to the cost.

In view of these considerations we mapped areas of farm concentrations west and north of the Hudson River. [26] This assumption has to be modified by the fact that the location of agricultural districts does not give any indication about the number of farms, scale of production, or type of products grown; the identification is used was a surrogate to identify possible regions of agricultural production density.[27] Cayuga and Yates counties appear to have the densest concentrations of farming districts. In addition, Karen Karp, Karp resources, suggested that the Rochester and Batavia area be a focus for agricultural export to New York City. Indeed, Wayne County is the number 1 county statewide for apple production and the state's fifth highest agriculture producing county.[28] See Figure 7. Wayne County will be used as a point of origin for agricultural transport for the purposes of calculating comparative costs.

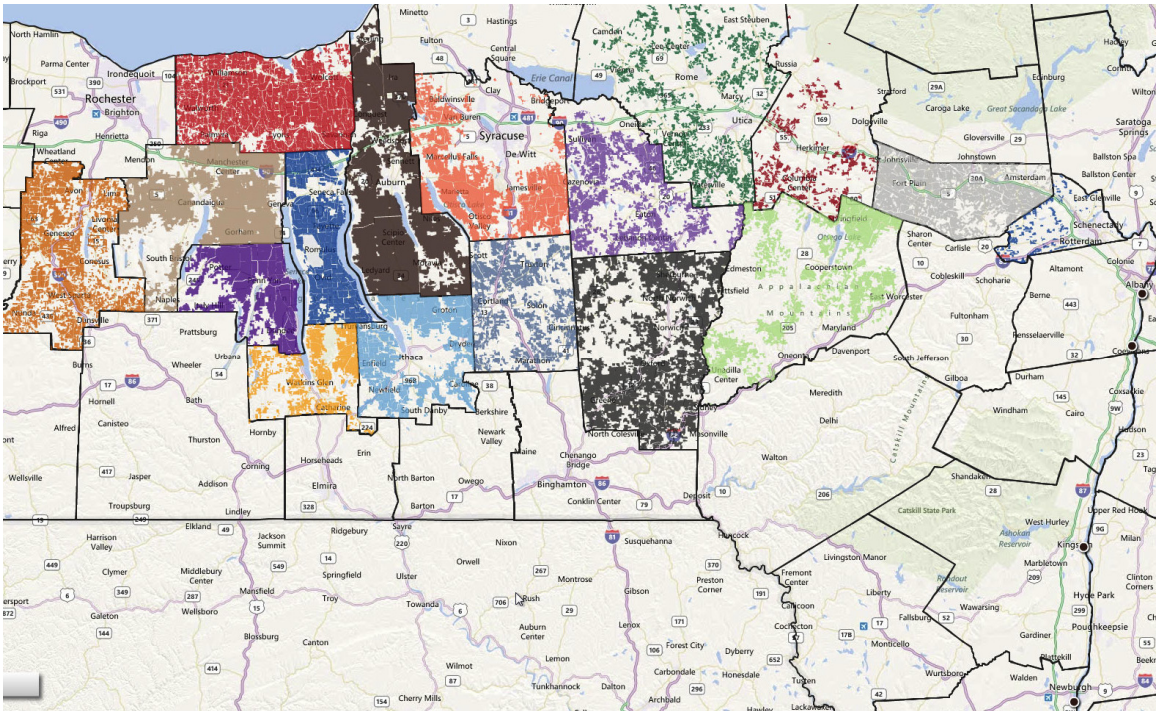



**Figure 7: Showing agricultural districts in counties west of Hudson.**

[25] http://www.fmcsa.dot. gov/rules-regulations/topics/hos/index.htm
[26] Prepared by HabitatMap, based on information from Cornell University Geospatial Information Repository.
[27] Karp Resources comment August 23, 2012.
[28] 2007 Agricultural Census by county – Wayne County (www.agcensus.usda.gov)

Although counties north of the Hudson River were not evaluated in this report note is made of their potential as sources for water transport to NYC in particular apples from Clinton County, where an apple slicing machine processes Empire apples for the NYC market[29], and beef from Washington County, for which a marketing cooperative is being formed[30].

### Task 1.4 Feasibility of use of maritime transport[31]

The following are first level estimates of comparative costs of the maritime leg of bringing agricultural product between the upper Hudson River and New York City.

The comparison is the costs of transporting container on barge to trailer on barge from the Albany area to Red Hook. Red Hook is just south of the Battery, has a terminal that could readily be used for containers, and could have feasibility for operating trailer on barge service upon acquisition and attachment of a ramp.

### 1.4.1 Port of Albany to Red Hook Container Terminal: Container-on-barge

***Costs***

Lease Barge:

- Need barge that can carry 100 containers because there is an ILA mandated 4-hour minimum for labor that 100 containers would fulfill.[32][33]
- Dimensions of barge: 180 ft. x 43 ft. is appropriate size. (This assumes containers are stacked four high[34]; 100 containers would need adequate deck space for 25 containers' footprint, stacked four high. Containers are 20 feet long and 8 feet wide.
- Cost of lease of barge is $9500/month if leased for 3 or more months.

Operational Costs per trip:

| | |
|---|---|
| For barge, assume 4 trips/month or per trip, round trip: | $2375[35] |
| Lease of tug and crew and fuel $400/hour[36]; trip to Albany at 7 knots = 18 hours = | $14,400 |
| Labor, Albany, to load 100 containers, $200 container | $20,000 |
| Labor, Brooklyn terminal, unload 100 containers (est.) | $20,000 |
| Total cost | $56,775 |
| **Per container** | **$ 567.75** |
| Round trip cost[37][38] | $111,175 |

[29] Steve Hadcock, Cornell Cooperative Extension, July 2012 (Review comments).
[30] Steve Hadcock, Cornell Cooperative Extension, July 2012 (Review comments).
[31] This task was not specified in the MOA but honors the spirit of the contract.
[32] Cost of barge, from Joe Hughes, Hughes Marine.
[33] John Nardi, New York Shipping Association about the 4 hour minimum. Rich Hendricks about the requirement for 100 containers to take advantage of the 4 hour minimum.
[34] http://www.aimu.org/Papers/OnDeck.pdf
[35] $2375/week is ¼ cost of monthly lease of barge.
[36] Cost of tug, crew and fuel, from vendors Eastern Barge Service and Coastline Marine.
[37] Round trip – everything is doubled except the cost of the barge.
[38] It is possible with efficiencies by the stevedores loading and unloading at the same time that the dockside costs could be reduced.

**Per container round trip** **$ 1111.75**

Other fees at Port of Albany, not added in this estimate:

- Port tariff of $30/loaded container/day
- Security $41/hour overnight weekdays (14 hours – from 5 PM to 7 AM) and 24 hours on weekends and holidays. (Assume daytime loading)
- Dockage is $1.55 per foot /day or for 180 ft. barge = $279 (Adds minimal amount to bill --$2.79/container).

**Figure 8: Container crane at Port of Albany**

### 1.4.2 Port of Coeymans to Red Hook Container terminal: Truck-on-barge

*Assumptions about truck size*
For the following calculations the truck size was assumed to include a 53 ft. trailer. Fifty-three foot trailer trucks are not allowed in New York City except for connecting links to Westchester and Long Island, links, which don't encompass Hunts Point or Red Hook.[39]

*Discussion about truck size*
*If 53 ft. trailers were used to bring produce to the wholesale terminals on the Hunts Point or Oak Point peninsulas or at a refrigerated warehouse on Red Hook, they would be unloaded into the refrigerated warehouses for resale and distribution. The unloaded trailers would be rolled onto the barge and either filled with backhaul or return empty.*

*Alternatively 48 ft. trailers would be employed. Their use would have the virtue of allowing direct distribution from the barge to points of sale. It would have the negative impact of increasing the cost of stevedoring and labor for transporting the same volume of produce. The cost of stevedoring – driving the truck onto the barge, is a per truck cost not pro-rated for volume; the cost of driving the truck from farm to city is also by the truck and not by volume.*

*What is the volume difference? Assuming the widths of the trailers are 102" (8.5') and the heights are 13'6" (13.5') then the difference in cubic volume between the 53ft (6081.75 cf) trailer and the 48 footer (5508 cf) is 573.75 cf, which is an increase of about 10% in volume assuming complete filling. If we could fit another truck on the barge to compensate for the loss of volume, the cost per truck on the barge would be $1580 ($17,375/11); that would be more than offset by the increased fuel and labor incurred by transport from farm to port.*

Size of barge: smallest possible (180 ft. x 43 ft. – for 9-12 trucks)

| | Trailer size | |
|---|---|---|
| Operational cost per trip | 53ft | 48ft |
| Lease of barge | $2375 | 2375 |
| Lease of tug and crew and fuel (16 h) @ $400/hr. | $12,800 | $12,800 |
| Labor at Port of Coeymans $100/truck = | 1,000 | 1100 |
| Labor at Brooklyn, est. | 1,000 | 1100 |
| Total cost | $17,175 | $17,375 |
| **Cost per truck** | **$ 1,717.50** | **$1,579.55** |
| Round trip cost | $31,175[40] | $32,375 |
| **Round trip per truck** | **$3,117.50** | **$2,943.18** |

[39] https://www.dot.ny.gov/about-nysdot/faq/are-53-foot-long-trailers-allowed-in-nyc
[40] For the round trip cost, everything is doubled except for the cost of the barge.

Should 48 ft. tractor-trailer trucks be used to maintain the same volume of goods another truck would have to be added to make up for the 10% per truck reduction in volume. This would add $200 to the total cost of the trip.

Note: Because container operations are charged by the hour the crew works (above a 4 hour minimum) and truck operations are charged by the truck, the latter doesn't benefit from an economy of scale to the degree that container operations do.

**Table 4: Comparative costs container on barge and truck on barge**

| Component | Operation | Albany->Red Hook Containers | Coeymans->Red Hook Trucks |
|---|---|---|---|
| Barge | Lease | $2375[41] | $2375 |
| Tug+ crew+ fuel | Hire @ $400/hr. | $7,200 | 6,400[42] |
| Truck -> Barge | Drive on-off | | 2000[43] |
| Container->Barge | Lift on-Lift off | $40,000[44] | |
| Port Costs | Security/dockage | Not included | Not included |
| Total one way | | $56,775 | $17,175 |
| Number of units | | 100 | 10 |
| **Cost per unit** | | **$567.75** | **$1717.50** |
| Total RT[45] | | $111,175 | $31,175 |
| **Cost per unit RT** | | **$1111.75** | **$3117.50** |

Comparing containers and trailers[46]

| | 20 ft. container | 48 ft. trailer | 53 ft. trailer |
|---|---|---|---|
| Cubic feet | 1360 | 3000 | 4013 |

***Comparison of costs: container-on-barge vs. trailer-on-barge.***
Container is 20 ft. long. The container can be filled in the field and brought by flatcar truck to the port. A 53 ft. trailer is more than twice the size of a twenty-foot container. A truck on barge, one way, costs 1717.50, while the container costs $567.75. Depending on the size of the truck and assuming the density of filling were the same a 53 ft. trailer could hold 2.95 times as much goods by volume as a 20 ft. container. Pro-rated by volume, the cost of container transport (under the assumptions cited) would be $567.75 x 2.95 = $1675, or slightly less than the actual 53 ft. water transport cost of $1717.50. A 48 ft. trailer has the capacity equivalent

[41] Barge can be leased @9500/month if leased for 3 or more months; this assumes four trips/month so $2375/month.
[42] Coeymans is 110 nm from the Battery. At 7kn, nearly 16 hours. At $400/hour, $6400.
[43] Cost of driving truck on or off barge is $100 or $200 round trip. For ten trucks, $2000.
[44] Cost to lift container is $200/container.
[45] Assumes empty container or trailer in return trip
[46] These values vary slightly among models of trailers.

to 2.21 times the capacity of a twenty ft. container; prorated the trailer would cost 2.21 x 567.75 = $1255, which is significantly less than $1579.55 cost of the 48 ft. trailer when transported by water.

How to reduce costs:

- Use more fuel-efficient vessels.
- Use lower cost fuel – like LNG.
- Use the barge multiple times during the week instead of once (economy of scale).
- Scale up. The cost benefits of large quantities of produce are greater with containers.
- Multiple barge tows of either truck on barge or container on barge share the cost per barge load, vastly reducing the major cost of tug + fuel + crew, but requiring tight coupling with other businesses to meet schedule.
- Find back haul to share costs.
- Negotiate. Negotiate. Negotiate.

*Is there another possibility for maritime transport?*

Jim Barker, owner and operator of Seastreak, is considering contracting for the building of a truck ferry that could hold 40 trucks. Its specifications and estimated operating costs are shown below.

| Truck ship as yet unbuilt[47] |
|---|
| * 40 trucks, 20 knots, 6 Pax.<br>* Time to Albany approx. 7 hours<br>* Burns 300-350 gal/hour<br>* Jim Barker, vessel out to bid (approx. $30 million)<br>* To Albany @ diesel $3.30/gal =$1000/hour<br>* About $7000 in fuel,<br>* Unit cost: $175/truck in fuel + stevedoring $200 truck = **$375/truck**<br>* Plus labor costs on board – roughly competitive with container-on-barge without needing enormous economy of scale. |

Note that these costs do not factor in the amortization of the vessel, which at a cost of $30 million over a 30-year period is approximately $1 million/year, or about

[47] James Barker, Seastreak, personal communication.

$20,000/week or for a once a week journey, $500/truck. An actively used vessel could reduce the unit cost for amortization.

**The amount of agricultural product determines type and size of vessel**
The size of the vessel needs to be appropriate to the amount of agricultural products anticipated. At this time the estimate of the amount of production is not available. For the purposes of this study evaluations were made for ten trucks for truck-on-barge and 100 TEU for container-on-barge.

The critical questions that need to be answered in order to truly calculate the costs and benefits of the maritime service are: What quantity of agricultural produce could be expected to be brought to the ports of Albany and/or Coeymans? Of the quantity of food, what is their economic value?

Karp Resources is undertaking a survey to determine where the best point of origin for agricultural production suitable for transport. They will find out where there are areas of dense production of produce by farmers who confidently want to market to New York City. When the centroid of food production is determined then we will be able to specify what size barge and which logistic model (trailer vs. container) will be needed to accommodate the expected quantity of produce. This information may inform the decision of which Hudson River port makes the most sense. Upon receipt of the information we will undertake the calculations and complete the report.

**Conclusions**
Transport of food down the Hudson River is feasible and has benefits. It is not clear whether the extra time and the lack of a clear competitive cost advantage that a river transport leg would incur outweighs the benefits of avoiding congestion and unreliable delivery times due to road incidents. For those farmers that would have to compensate for the Hours of Service limitation imposed by the FMCSA with an additional driver or paying a driver for non-productive hours it is needs to be determined by the New West Team whether the cost of container or trailer on barge would compensate the additional cost the hours of service regulations impose.

Nonetheless the cost of maritime transport is not insignificant but could be reduced by several strategies, such as use of alternative fuels, scaling up the volumes of produce, and coordination with other users of maritime service both for back haul and multiple tows.

**Suggested next Steps: Outstanding questions**

1. Size of the market – Economy of Scale

When the size of the potential market is determined, Sustainable Ports will recalculate the costs of maritime transport for the estimated quantity of agricultural products.

2. Size and nature of back haul (NYC to upstate NY)

The calculations on the cost of maritime transport assumed that the trucks or containers would return empty to the port of Albany or Coeymans. The costs would be far less if the trucks and containers were to be filled on the return trip. One possibility as yet unexplored (and beyond the scope of this contract) is filling the return trip with beverages such as beer and wine (whose quality might be preserved in hot weather by use of modest refrigeration) in the refrigerated trailers/containers.

**Appendix I. Reports and related documents on the Hudson River Foodway**

"Electrifying the Hudson River Food Corridor: A Conceptual Design" (Feb. 2012) by New West Technologies for NYSERDA http://www.ces-ltd.com/uploads/news/id61/Electrifying%20the%20Hudson%20River%20Food%20Corridor%20-%20A%20Conceptual%20Design.pdf

"State of Agriculture in the Hudson Valley" by Glynwood Institute (2010) http://www.glynwood.org/files/2011/02/State_of_Ag_2010.pdf See page 7: Getting to market. *Lack of infrastructure (processing etc.) prevents Hudson River Valley farms from taking advantage of its access to NYC market.*

http://www.ers.usda.gov/Publications/err99/err99.pdf (*About how apples are distributed to and from the Syracuse area).*

"Hudson River Foodway Corridor" prepared by Joseph Heller, USDA (2010) http://nyharborshipping.files.wordpress.com/2010/08/hrfoodway2eml.pdf

Hunts Point Produce Market Logistic Enhancement Study 2006 (NYSERDA sponsored study)

The Role of Agriculture Within New York State, Report by Comptroller Thomas DiNapoli (February 2010). Data is from 2007. http://www.osc.state.ny.us/reports/other/agriculture21-2010.pdf

http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/New_York/cp36111.pdf

http://geocommons.com/maps/95827 *On line view of maps associated with Hudson River Foodway produced by HabitatMap.*

**Appendix II: Memoranda on the Ports of Albany, Coeymans, Kingston and Newburgh.**

**Kingston**

Navigation:
Kingston, New York, is on the north bank of Rondout Creek. The entrance to Rondout Creek is off the West bank of the Hudson River 80 nm north of the Battery. The entrance is well marked with channel markers and has a 14' controlling depth (2008) from the entrance to the 2nd highway bridge, just less than 1 nm.

At the entrance there is a wooden mud-dyke structure, although old, it does keep the channel from silting up with mud and it provides a good visual orientation for the channel.

Description of Port Resources:
1. The street running along side of Rondout Creek on the north side is called the East Strand. It looks like good access from the various large roadways.
2. The bank on that side has deteriorated, and has no real pier infrastructure until you get to the bridge. Starting from east, the county has a small, emergency vessel at a dock as the shoreline gets more regular.
3. Moving west there is a former scrap yard, a stretch where the shoreline has eroded badly.
4. The next mile of shore line is owned by Mr. Ianucci. It is an undeveloped, deteriorated, formerly industrial edge. At the western end of the property the surviving buildings of the Cornell Steamboat Company, a tugboat company from 19th and early 20th century. (These buildings house the Historic Kingston Waterfront Museum).
5. Continuing westward is the site Cornell Buildings, a restaurant and the Hudson River Maritime Museum. All have small vessel docks and marinas on their creek frontage, which makes this stretch not viable.
6. Adjacent to the HRMM, just under the first highway bridge there is a Kingston Town Dock, which is in good shape and at the end of a major street. The Eastern half of the dock is used for a dinner boat type vessel, the western part is available.

Local Contact:
Ann Loeding

Conclusion:
The Port facilities are minimal. There are 2 potential sites for port activity: /1/ The use of the Kingston Town dock for short term operation, or infrequent activity is probably viable. /2/ The property from the restaurant, east, to the County dock is owned by Mr. Ianucci and I believe can be accessed. Being sheltered with acceptable depths and a 4' rise and fall of tide makes the eastern end of the Ianucci property

viable by providing basic infra structure on the site. A spud barge and ramp would need to be employed to provide a docking and loading facility.

**Newburgh**

Navigation:
New burgh, New York is on the West bank of the Hudson River. It is 52 nm north of the Battery. It is an easy approach from the river. All the piers are T-type wharfs that are built to span the shallows on the shoreline. The configuration provides easy docking by being parallel to the current. The currents are strong in Newburgh, estimated at 2-4 in the summer and more in the downstream direction after heavy rain and during the spring freshets. At that time there is little, if any, flood tide. The pierhead line has 22-32 feet of depth. (Please see chart).

The town dock, Newburgh Landing, is at the city's center. There are marinas to the north and south. Further s south is a shipyard with 2 very large piers going out into the river. Below that are five oil terminal docks, all active. They support a pipeline going out to the manifold at the end of the pier. The manifold takes the hoses from the barges and ships enabling them to discharge product. Tank farms are located upland of all these oil docks.

Description of Port Resources:
1. Roadways include the Newburgh Beacon Bridge, Route 84 and local streets (see map).
2. Newburgh Landing, which is stout and could accommodate a tug and barge or another vessel of comparable size. The Steel Style's Shipyard (Steelways Inc.) has 2 very large (4000 feet) piers going out into the river. These two locations appear to be the only viable docking area for loading of produce.

Local Contact:
John Vargo

Conclusion:
The Port facilities are minimal. There are 2 potential sites for port activity: /1/ The use of Newburgh Landing, which has a tour boat concession running out of it, the Pride of the Hudson. /2/ The shipyard Pier could be an excellent resource, but would have to be developed with the owner.

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## Appendix III: Memorandum of Understanding – Work plan

### Task 1 Transportation Logistic Analysis

**1.1 Identify logistic hubs for product aggregation and processing.** To a degree this task depends on knowing where the major agricultural regions are. The agricultural consultant will provide this information in fine scale in terms of products, quantities, seasonality, market, and marketability to NYC. (In the event that that information is not immediately available we would work with NYS Department of Agriculture and Markets as well as the Hudson Valley growers and the TAC to gather information on a series of these areas of high density of agricultural production with a focus on products that have a market in New York City.)

(a) *Site Identifications.*

We consulted the International Refrigerated Warehouse Association database and could find no refrigerated warehouses in the Hudson River Valley. The concept of a refrigerated warehouses means facilities whose space and services are available for customers from other businesses.

We also searched for refrigerated storage facilities in the Hudson River Valley. These are facilities that are associated with a particular business. We found the following facilities:
(b) *Site Criteria.*
(c) *Mapping.*
**Product: Technical Memorandum**

**1.2 Riverfront sites.**
(a) *Identify/map ports*.
**(b)** *Determine port suitability*.
**Product: Technical Memorandum**

**1.3 Define Catchment areas for each River Port**.
(a) *Map catchment areas*.
(b) *Identify key logistic hubs*
(c) *Select river port(s) and logistic hub(s)*

**Work Plan**

**Task 1 Transportation Logistic Analysis 1.1 Identify logistic hubs for product aggregation and processing.** To a degree this task depends on knowing where the major agricultural regions are. The agricultural consultant will provide this information in fine scale in terms of products, quantities, seasonality, market, and marketability to NYC. (In the event that that information is not immediately available we would work with NYS Department of Agriculture and Markets as well as the Hudson Valley growers and the TAC to gather information on a series of these areas of high density of agricultural

production with a focus on products that have a market in New York City.)
(a) *Site Identifications.* With the general agricultural information in mind we will locate logistic hubs in the agricultural sections of the Hudson Valley. Our methodology will be to use industrial property databases. Sources include NYS Economic Development, the Commercial and Industrial Real Estate Brokers of NYS, as well as directly from industrial real estate brokers like Cushman and Wakefield and CBR Ellis.
Siting of public refrigerated warehousing although not strictly speaking necessary for the business model assumed above will also be sought as part of a long term vision that the Hudson River Foodway could also be used for export of produce as well as processed foods. There are a number of databases that provide lists of refrigerated warehouses, including the International Association of Refrigerated Warehouses and the New York State Association of Refrigerated Warehouses. The public refrigerated warehouses in the Hudson Valley will be mapped and those adjacent to or in industrial real estate that could qualify as logistics hubs given special notice.
(b) *Site Criteria*. Criteria will include minimum size to allow trucks parking and staging; other criteria to be used in weighting will be distance from agricultural areas, distance to riverport, infrastructure; access to trucks (physical access as well as lack of tolls between hub and agriculture area and river port). Logistic hubs in or near river ports would be ideal. Infrastructure that would allow electric plugs for hook ups to hybrid electric diesel refrigerated trucks is also important. We will make site visits to potential logistics hubs. Other factors such as whether substantial capital investments are necessary for actual use would also be considered.
(c) Mapping. Possible sites will be mapped on our GIS. Their attributes (square footage, infrastructure, security, etc.) will be readily accessible links on the map.

**Product: Technical Memorandum**
**1.2 Riverfront sites.**
Most of the potential ports have port organizations with written marketing information that can be accessed as a first instance. Army Corps Port series is also useful for the larger ports and for describing terminals; although often outdated, the information serves as a base for further investigation and update. We will make landside site visits of potential ports. If there is an opportunity to visit the port from the waterside (during the Pegasus tour or with Our Hudson), we will do so.
(a) *Identify/map ports*. Identify and map all river ports and terminals between the Port of Albany and Newburgh. The rationale for considering only ports north from Newburgh is that more southern ports are too readily accessible by truck to NYC.
**(b)** *Determine port suitability*. Criteria will include land and water access to truck and barge and adequate space for truck marshaling. Data sources are the ports' marketing materials and information from the Corps of Engineers Port series. Our subconsultant, Pam Hepburn has visited most of the ports over a 35 year long career; she continues to co-lead with the Waterfront Museum barge visits to Hudson River ports. We will make landside visits to selected ports and if feasible we will visit likely ports by water.

**Product: Technical Memorandum**
**1.3 Define Catchment areas for each River Port**.
The catchment area is defined in this project as the area of agricultural production that

would be served by the river port and the logistic hub. For the purposes of this study, subject to the TAC approval, we will define the primary catchment area as space within 1 hour travel time to the river port and or the logistic hub. The secondary catchment area is 90 minutes travel from the agricultural area to the river port. The GIS map will create an overlay that shows the boundaries of the primary and secondary catchment area.
(a) *Map catchment areas*. Catchment areas will be an overlay on the GIS maps that show agricultural concentrations and river ports.
(b) *Identify key logistic hubs* within catchment area of the river port. (c) *Select river port(s) and logistic hub(s)* based on agricultural density and minimal distance. This exercise will help define agricultural production market locations that maximize logistic efficiency.