

DATA AND INFORMATION REPORT

Long Island Sound Marine Spatial Planning Initiative

Prepared by the Connecticut-New York Bi-State
Marine Spatial Planning Working Group

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Table of Contents

REPORT AUTHORS.....	II
LIST OF TABLES	IV
LIST OF FIGURES.....	IV
EXECUTIVE SUMMARY	V
I. INTRODUCTION AND PURPOSE.....	1
II. WORKING GROUP	1
A. OVERVIEW OF CT-NY BI-STATE MARINE SPATIAL PLANNING WORKING GROUP.....	1
B. DATA & INFORMATION TEAM.....	2
C. DATA AND INFORMATION WORK PLAN	2
III. CONTEXT: THE ROLE OF GEOSPATIAL DATA IN SPATIAL PLANNING	2
IV. DATA INVENTORY	3
A. OVERVIEW	3
B. METHODS	4
1. <i>Criteria</i>	8
C. FINDINGS: DATA INVENTORY	9
D. FINDINGS: DATASETS IN DEVELOPMENT	12
i. <i>Forthcoming Biological Datasets</i>	12
ii. <i>Forthcoming Ocean Use Datasets</i>	12
E. FINDINGS: DATA GAPS	13
V. DATA PORTALS	14
A. OVERVIEW	14
B. METHODS	16
C. FINDINGS	18
VI. DATA STANDARDS	24
A. OVERVIEW	24
B. METHODS	25
C. FINDINGS	26
VII. NEXT STEPS.....	26
1. IDENTIFY HIGH-PRIORITY DATASETS, EVALUATE DATASET QUALITY, AND ADD DATASETS TO THE NY GATEWAY	27
2. BUILD THE LIS FOCUS AREA PAGE OF THE NY GATEWAY	28
3. EXPLORE ADDITIONAL NEXT STEPS IN SUPPORT OF A SOUND MARINE PLAN	28
VIII. REFERENCES.....	30
APPENDIX I. LIS MSP BASELINE DATA INVENTORY.....	31
APPENDIX II: TABLES AND FIGURES.....	32
APPENDIX III. BACKGROUND ON THE NY GATEWAY CONSENSUS STATEMENT	44

List of Tables

Table 1. LIS MSP baseline inventory data sources.....	5
Table 2. Information collected for datasets in the LIS MSP baseline inventory.....	6
Table 3. Baseline data inventory data categories and subcategories	7
Table 4. Criteria used to screen datasets for inclusion in inventory	8
Table 5. Summary of datasets included in final baseline LIS MSP data inventory	11
Table 6. Summary of data portals reviewed for LIS MSP	32
Table 7. Options for developing a new LIS MSP data portal	38
Table 8. Summary matrix of data standards.....	40

List of Figures

Figure 1. Screenshot from the Northeast Ocean Data Portal viewer, showing one data layer (Shellfish Management Areas).....	15
Figure 2. Mock-up of a LIS Focus Area page with links to story maps.....	20
Figure 3. Mock-up of NY Gateway landing page.....	21
Figure 4. Mock-up of NY Gateway's map viewer.....	22

Executive Summary

This document lays the groundwork for the geospatial data and information components of a potential future Long Island Sound marine spatial planning (MSP) initiative. Presented herein are the results of a nearly two-year research and pre-planning process (2012-2014) led by the Data and Information Team (“D&I Team”) of the Connecticut-New York Bi-State Marine Spatial Planning Working Group (“Working Group”). The D&I Team, including representatives from the states of CT and NY and from key non-governmental partners, has performed key background tasks in support of a future LIS MSP initiative. The team sought to: (a) identify and evaluate available LIS geospatial datasets for potential use in a future Sound Marine Plan; (b) evaluate data standards to be applied to individual datasets and MSP data processes; and (c) explore options for aggregating and sharing these data through one or more publicly-accessible data portals.

As a result of this process, the team developed a comprehensive LIS MSP baseline inventory comprising 361 geospatial datasets, which together form the starting point for the data analysis that would need to be accomplished in support of LIS MSP. In developing this inventory, the team also identified a series of datasets in development as well as a few data gaps, both of which should be considered in further developing this inventory in support of LIS MSP. Second, the team recommended the adoption of the data standards used in the NY Department of State, Office of Planning & Development’s Geographic Information Gateway (NY Gateway) for use in standardizing all geospatial data in support of MSP. Third, the team recommended the adoption of the NY Gateway for use as a data portal in support of LIS MSP. This recommendation was supported by the entire LIS MSP Working Group, which includes the states of CT and NY, as evidenced by a consensus statement drafted by the group (dated September 3, 2014).

This report concludes with recommended next steps for the D&I Team to pursue in support of LIS MSP. These include identifying high priority datasets, evaluating dataset quality, and adding datasets to the NY Gateway, as well as building out the LIS Focus Area of the NY Gateway. These also include additional next steps in support of LIS MSP, such as revisiting data gaps; building communication with other data suppliers; ensuring new data products are integrated; and reviewing data and map products produced by other planning processes for use in LIS. Last, these include continuing discussion with the broader Working Group and partners about how to advance the usability of geospatial data and tools described herein in support of LIS MSP.

I. Introduction and Purpose

This document lays the groundwork for the geospatial data and information components of a potential future Long Island Sound marine spatial planning (MSP) initiative. Presented herein are the results of a nearly two-year research and pre-planning process (2012-2014) led by the Data and Information Team (“D&I Team”) of the Connecticut-New York Bi-State Marine Spatial Planning Working Group (“Working Group”). The objectives of the D&I Team’s pre-planning work were to identify and evaluate available Long Island Sound geospatial datasets in order to develop a baseline inventory; evaluate existing data standards for potential future use at a Long Island Sound scale; and explore options for aggregating, visualizing and sharing these data through one or more publicly-accessible data portals. This work has been conducted in preparation for using geospatial data in support of a future Sound Marine Plan. In this document, “Sound Marine Plan” refers to the plan that may result from a potential future Long Island Sound marine spatial planning (LIS MSP) process, and “LIS MSP” refers more broadly to the planning process as a whole.

II. Working Group

A. Overview of CT-NY Bi-State Marine Spatial Planning Working Group

The CT-NY Bi-State Marine Spatial Planning Working Group is an informal, unofficial body that has been meeting regularly since 2012 with the goal of creating the enabling conditions for a LIS MSP effort. The Working Group was formed following workshops and discussions about MSP for the Sound and recognition that Long Island Sound, as an intensely utilized, ecologically important water body, needed and deserved its own marine spatial plan.

The Working Group is made up of voluntary participants from key state and federal agencies (e.g. ex-officio staff members of the CT Dept. of Energy and Environmental Protection (CT DEEP), NY Dept. of State (NY DOS) and NY Dept. of Environmental Conservation (NY DEC), the Environmental Protection Agency (EPA), and the National Oceanic and Atmospheric Administration (NOAA)), regional ocean governance entities (e.g. the Northeast Regional Ocean Council and the Northeast Regional Planning Body), trade organizations (the CT Marine Trades Association), other user interests (the Coastal Conservation Association), conservation organizations (e.g. The Nature Conservancy and the Connecticut Fund for the Environment) and Connecticut and New York Sea Grant programs. The Working Group has worked to form consensus on the purposes and potential guiding principles that may be appropriate for MSP in

the Sound, what types of data and information would be important for MSP, and what options may make the most sense with regard to shaping and implementing a LIS MSP process. As an unofficial effort, the Working Group is assisting in doing background work in support of the States of New York and Connecticut who would have the ultimate authority should they decide to pursue an official MSP process. One of the notable benefits of the Working Group is that it has fostered and facilitated the cooperation and coordination of the States of Connecticut and New York in addressing LIS MSP.

The Working Group conducts conference calls and meets in person about eight times per year and has identified sub-teams - the Framework Team and the D&I Team - to carry out work plans and complete work products. These two teams conduct calls approximately once a month. This Data and Information Report is a major product of the D&I Team and overall Working Group. Please see the Sound Marine Planning Framework Report, a major product of the Framework Team, for more information on the Working Group.

B. Data & Information Team

To produce this Data and Information Report, the D&I Team was formed in the fall of 2012. Please see the inside cover for members and their affiliations.

C. Data and Information Work Plan

In 2013, the D&I Team developed a two-year work plan to shape the research and planning necessary for initiating the development of geospatial data and information that could support a future Sound Marine Plan. The D&I Team's work plan sought to: (a) identify and evaluate available Long Island Sound datasets in order to develop a baseline inventory; (b) evaluate existing data standards for potential future use at a Long Island Sound scale; and (c) explore options for aggregating, visualizing and sharing these data through one or more Northeastern-focused publicly-accessible data portals. These items were considered the key tasks necessary to provide a foundation for understanding and preparing for the geospatial data and information needs of a LIS MSP process.

III. Context: The Role of Geospatial Data in Spatial Planning

Geospatial data and information are foundational to MSP because they can be used to create maps that can help improve planning and decision-making for marine areas.

Geospatial data refers to the information found on a map that helps a map user see and understand a place. In technical terms, geospatial data are digital data that include explicit geographic positioning information, allowing the data to be analyzed and/or visualized from a geographic perspective. Overlaying geospatial data can allow us to discern spatial patterns and relationships between features. They can also help us understand temporal patterns - historic, current, and seasonal/annual conditions. Last, through modeling, geospatial data can help us gain insight into potential future conditions. The MSP approach has become prevalent in marine management in recent years due in part to technological developments that have made it easier to collect, aggregate, analyze and visualize this type of geospatial data characterizing the marine environment (Young et al., 2007). Geospatial data are critical to MSP because they enable planners and stakeholders to understand and visualize the biophysical, social, and legal attributes of a marine area, observe spatial and temporal variations, gaps, and overlaps between attributes, and to inform decisions based on this scientific information.

Geospatial data analysis, conducted within the framework of a Geographic Information System (GIS), is necessary for the initial assessment of the planning area as well as for the development of management scenarios such as the identification of ecologically or socially important areas (Stelzenmuller, Lee, South, Foden, & Rogers, 2013). Geospatial data can also be used to facilitate plan implementation assessment (Stelzenmuller et al., 2013) and, when presented in a user-friendly data portal or interactive decision support tool, can be used to build inter-organizational collaboration and stakeholder participation (e.g. Merrifield et al., 2013). For these reasons, the Working Group included among its priorities a series of pre-planning tasks focused specifically on geospatial data and information.

IV. Data Inventory

A. Overview

Developing a baseline inventory of datasets is a necessary precursor for marine spatial planning. In particular it is necessary for defining and analyzing existing conditions through the process of inventorying and mapping existing natural resources and human uses in the management area (Ehler & Douvère, 2009). Accordingly, a baseline data inventory was assembled and a database was developed comprising multiple geospatial datasets relevant to any potential future LIS MSP processes. This effort was necessary because a comprehensive database for all of Long Island Sound does not currently exist. Further, existing biophysical, social, and legal geospatial data – information that would be necessary for a Sound Marine Plan

- are currently held by multiple different entities, including different government agencies, non-governmental organizations, and regional organizations.

The resultant LIS MSP baseline data inventory is a, non-exhaustive¹ geospatial database that the D&I team recommends as a starting point for a future Sound Marine Plan. Datasets included in the inventory may be appropriate for potential inclusion in a data portal and for use in characterizing, assessing, and developing management scenarios for a LIS MSP planning area. The inventory was designed to address the biophysical, social, and legal topics that would need to be addressed through a LIS MSP process (see list of data categories below under “Methods”). For example, datasets included characterizations of habitat for fish and birds; shellfish management areas; and maintained shipping channels, to name a few. The inventory, primarily intended as a tool for LIS spatial planners, may have some broader public utility, including the ability to visualize the types of geospatial data that exist for LIS in one place. The inventory is not in itself a publicly-accessible data portal through which individuals can view and interact with geospatial data, but is intended as a foundation for the future development of such a portal. The inventory currently exists as a Microsoft Excel workbook comprising multiple worksheets (see Appendix I). It was last updated on October 10, 2014 and will require ongoing updates in order to remain relevant and useful. Presented herein is a discussion of the methods used to develop this inventory and key findings. Proposed next steps, including future use of this inventory, are included in Section VII at the end of this report.

B. Methods

The LIS MSP baseline inventory was developed through review of eight different data sources. These sources each include data inventories and were selected based on their geographic extent with regard to Long Island Sound, relevance to coastal and marine issues, and credibility.² Sources included the Northeast Ocean Data Portal; the Mid-Atlantic Data Portal; the New York Department of State, Office of Planning & Development’s Geographic Information Gateway (NY Gateway) inventory; the Long Island Sound Study inventory; the Long Island Sound Ecological Assessment; the Long Island Cable Fund Mapping Initiative; the Long Island Sound Resource Center; and the NOAA Marine Cadastre (see Table 1).³

¹ Non-exhaustive is meant to indicate that the inventory process could not support a full investigation of all possible data sources, but rather was able to address well-known repositories of data as well as the results of recent similar MSP efforts.

² Credible data sources included state and federal agencies; regional quasi-governmental initiatives such as the Northeast Ocean Data Portal; non-governmental organizations; and academic sources.

³ These source projects have widely varying scopes and offer more valuable resources and functions than the data inventories utilized for this LIS work.

Table 1. LIS MSP baseline inventory data sources

Data Inventory	Geographic Area	Description
Northeast Ocean Data Portal	Northeast region, from ME south to NY	Data resource and decision support tool for ocean planning from the Gulf of Maine to Long Island Sound
Mid-Atlantic Data Portal	Mid-Atlantic region, from NY south to VA	Data platform for ocean planning across the five-state Mid-Atlantic region (NY, NJ, DE, MD, and VA)
New York Gateway Inventory	New York State	Catalogues the data that the NY Department of State's Office of Planning and Development hosts on their NY Gateway
Long Island Sound Study Inventory	Long Island Sound	The result of an exercise (2011) to provide a list of relevant CT/NY coastal spatial data to support the EPA Long Island Sound Study's Stewardship Sites Working Group (dataset updated in May 2014; not publicly available)
Long Island Sound Ecological Assessment	Long Island Sound	LISEA data are intended to enhance spatial understanding of LIS submerged habitats with the goal of reducing conflicts between ecological resources and human uses
Long Island Cable Fund Mapping (site should be publicly accessible soon)	Long Island Sound	An inventory generated from the results of a pilot seafloor mapping effort in a corridor of Western LIS from Bridgeport CT to Port Jefferson, NY
Long Island Sound Resource Center	Long Island Sound	Central clearinghouse for information and data related to LIS
NOAA Marine Cadastre	National coverage - oceans & Great Lakes	Integrated marine information system that provides data, tools, and technical support for ocean

Individual datasets from the eight sources were first listed in individual Excel worksheets, organized by tabs according to the source. They were then compiled into one Excel document, along with relevant dataset descriptors, such as dataset name, original data source, and spatial extent (see Table 2). Data were then organized into categories and subcategories corresponding to those used in other relevant data portals (the Northeast Ocean Data Portal and the NY Gateway), in order to facilitate future information sharing between sources. These portals were considered relevant because they already house LIS-specific data, and integrating with these two portals in the future will be important. The main categories were **Administrative Boundaries; Ocean Uses; Biology; Physical Environment; Cultural and Demographic; Climate Change;** and **Water Quality** (see Table 3). Categories and subcategories were selected to address biophysical, social and legal data needs that would need to be addressed in a typical MSP process and were designed to evolve over time as the inventory expands.

Table 2. Information collected for datasets in the LIS MSP baseline inventory

LIS MSP Inventory Fields	Description
Original Data Category	Category from original inventory
Original Data Sub-Category	Subcategory from original inventory
LIS MSP Category	See Table 3 below for categories
LIS MSP Subcategory	See Table 3 below for Subcategories
LIS MSP Category and Subcategory	LIS Inventory category and subcategory concatenated together
Dataset Name	Name of dataset
Dataset Description	Information about the dataset (text copied directly from dataset source)
Dataset Format	Raster, polygon, point, line
Link to Map	Link to see data in a map viewer (if there is one)
LIS Spatial Extent	Spatial location in/around Long Island Sound
Time Period of Dataset	Timeframe captured in dataset or published date
Original Data Source(s)	Originator of dataset
Final Data Product Source	Originator of final data product
Metadata	Does this dataset have metadata (description of data)?
Metadata Date	When the metadata created/published/updated
Dataset Coordinate System	Coordinate system of dataset
Link to download final data product	From where the dataset can be downloaded
Webservice link	URL that allows online sharing of geospatial information between one or more external databases and/or data portals
LIS MSP Inventory Addition/Update	Date the dataset was added into the LIS MSP Inventory
Inventory Updater	D&I data reviewer
Excel Tab	Inventory Tab in Inventory Excel Sheet
ID	Inventory Abbreviation plus unique ID for data layer (Unique ID for each dataset)
Use in Final LIS Baseline Inventory?	Final Dataset Recommendations for LIS baseline inventory
Notes	Notes/comments as we selected final dataset recommendations

Table 3. Baseline data inventory data categories and subcategories

Long Island Sound MSP Categories	Long Island Sound MSP Subcategories	Example Data
Administrative Boundaries	Jurisdictional	Counties, states, marine jurisdictions, US Coast Guard Districts
	Planning	No Discharge Zones, Coastal Geographic Names, Orthoimagery, Digital Floor Insurance Rate Maps, Waste Water Discharges
Ocean Uses	Energy Infrastructure	Tidal Hydrokinetic Projects, Turbine Locations, Electrical Transmission Substations, Electrical Transmission Lines, Submarine Cables, Submarine Pipelines
	Industrial	Petroleum Product Terminals, EPA regulated Facilities, Ocean Disposal Sites
	Navigation	Pilot boarding areas, aids to navigation, maintained channels, anchorages, and Automatic Identification Systems (AIS) datasets
	Commercial Fishing	Aquaculture, shellfish management areas, Vessel Monitoring Systems (VMS) and Vessel Trip Report (VTR) commercial fishery datasets
	Recreation	Recreational Boating, Recreational Fishing, Wildlife Viewing, Diving, Swimming
Biology	Birds	Important bird areas, Waterfowl areas, bird conservation areas, nest sites, bird distribution maps
	Marine Mammals	Marine Mammal Habitat, N. Atlantic Right Whale Seasonal Management Areas, Harbor Seal Winter areas and wintering locations
	Sea Turtles	No Datasets in inventory yet
	Corals	No Datasets in inventory yet
	Fish	Essential Fish Habitat, Species Richness, total biomass, fish persistence
	Shellfish	Zebra Mussel Distribution
	Plankton	Chlorophyll A (all seasons), Zooplankton (all seasons)
Physical Environment	Habitat	Coastal Wetlands, LIS Ecological Assessment (LISEA) Ecological marine units, LISEA Ecologically Notable Places, Eelgrass, Natural Heritage Areas, Artificial Reefs
	Geological	Shoreline, sediment, geologic seabed forms from LISEA, post glacial deposits
	Chemical	Copper content, lead content, nitrogen content (sample locations in LIS)
	Oceanographic	Sea surface temp, tidal currents, bathymetry, turbidity, wave and tidal stream resource potential, salinity distributions
Cultural & Demographic	Cultural & Demographic	Population, tribal lands, national register sites
Climate Change	Climate Change	Coastal Vulnerability Index, NOAA Sea Level Rise Scenarios
Water Quality	Water Quality (regulatory)	EPA 303d impaired waters, total maximum daily load

1. Criteria

Once the inventory record of all of the datasets was compiled and organized, the datasets were systematically screened and evaluated for potential inclusion in the final baseline inventory. The following criteria were used: **relevance** to LIS MSP; **no redundancy** with other datasets; **currentness**; and **spatial extent** with regard to Long Island Sound (see Table 4). Currentness was only applied as a criterion to regulatory and planning boundaries, and not to historic datasets or datasets collected over time, which would allow for trend analysis. Datasets that met all of these criteria were coded as “yes” and selected for inclusion in the final LIS MSP baseline inventory. Datasets that only met some of these criteria were coded as “maybe,” for potential further evaluation at a later date. Datasets that did not meet these criteria, particularly if they were irrelevant to LIS MSP, were coded as “no,” and notes were kept justifying these discussions.

Table 4. Criteria used to screen datasets for inclusion in inventory

Criteria	Description
Relevant to LIS MSP	Will the dataset help advance/support LIS MSP efforts?
Redundancy	When multiple datasets containing the same information were identified (e.g., 3 instances of AIS shipping data from 2011), the dataset from the most authoritative source with web map services available was selected for the final inventory.
Currentness	For datasets with information collected at different points in time, the most current dataset was recommended for the final inventory (e.g., aids to navigation). NOTE: this criterion was not applied to datasets where historical information may be informative (e.g., assessing change over time in fish populations); it was only applied to datasets whose quality depend on the most currently available information (e.g., aids to navigation, which are important offshore features for the shipping industry).
Spatial extent	If datasets contained information that did not overlap with the spatial extent of Long Island Sound at any location (e.g., Outer Continental Shelf lease blocks), these datasets were not recommended for the final inventory.
Method of Applying Criteria	
Yes	Datasets that met all of the above-listed criteria were coded “yes” in the “Use in Final LIS Baseline Inventory?” field.
Maybe	Datasets that met some of the above-listed criteria were coded “maybe” in the “Use in Final LIS Baseline Inventory” field. An explanation justifying a “maybe” decision for each dataset can be found in the “Notes” field. <i>*Additionally, if some datasets did not have enough documentation to make an informed final decision, they were coded “maybe.”</i>
No	Datasets that did not meet the above-listed criteria, particularly if they were irrelevant to LIS MSP or were redundant of a more authoritative data source, were coded “no” in the “Use in Final LIS Baseline Inventory.” An explanation justifying a “no” decision for each dataset can be found in the “Notes” field.

NOTE: The process described above is a first step in identifying datasets useful for LIS MSP. As appropriate, datasets initially coded “no” or “maybe” can be added to the final inventory if the application of the evaluation criteria was wrong, or if there is a strong universal buy-in to include the dataset. Also, datasets initially coded “yes” can be removed as new, better data become available, or if the LIS MSP work group decides those datasets should be removed from the final inventory.

This process resulted in a reasonably comprehensive baseline inventory of geospatial datasets deemed credible and appropriate by the D&I Team for potential future use in a LIS data portal and in a future Sound Marine Plan. The inventory also resulted in the identification of some data gaps as well as some datasets in development for potential future inclusion in the inventory; these were identified anecdotally through the process of compiling and screening the data inventory. See “Findings” below in sections IV.C, D and E for discussion of these findings.

It is important to note that there are limitations to this inventory. The LIS MSP baseline inventory is current as of October 10, 2014. Additionally, this inventory is non-exhaustive; this work plan could not support a full investigation of all possible data sources, but rather was able to address well-known repositories of data as well as the results of recent similar MSP efforts. It is possible that datasets or sources may have been missed or set aside prematurely. Moreover, most of the individual data portals used to develop this inventory are periodically updated. Therefore, the inventory was designed with the intention that it will be periodically updated moving forward with the goal of integrating new datasets, addressing new data needs, and reconsidering the use of existing datasets as needed.

C. Findings: Data Inventory

A total of 507 datasets were initially identified from the eight different source inventories discussed above. After applying the screening criteria outlined in section IV.B.1, 361 datasets were coded “yes,” (i.e., recommended for inclusion in the final baseline inventory;) 50 were coded “maybe”; and 96 were coded “no.” Of the 361 recommended datasets, 133 (37%) were classified under the Biology category; 106 (29%) Physical Environment; 76 (21%) Ocean Uses; 35 (10%) Administrative Boundaries; 5 (1%) Climate Change; 3 (1%) Cultural & Demographic; and 3 (1%) Water Quality. See Table 5 below for further details.

Taken together, the majority of these recommended datasets characterize the biophysical characteristics of the Sound (66% total for Biology and Physical Environment). This is due to the large number of LIS Cable Fund Mapping datasets (24% of the original 507) in the inventory; this project has focused specifically on characterizing the benthic biology and physical oceanographic environment of a particular area of the Sound selected as a pilot (Battista & O'Brien, In press). Additional areas in LIS that were prioritized by stakeholders through a vetting process will be covered by the Cable Fund Mapping Study in the future and will likely include

some, but not necessarily all, of the data types provided by the pilot study (K. O'Brien pers. comm. 2014).⁴

It is possible that the lower percentage categories (e.g. 1% Climate Change) may indicate data gaps or deficiencies. However, this would need to be assessed through closer examination of the data. See Section VII, Next Steps, for further discussion.

Based on this analysis, the D&I Team finds that these 361 recommended datasets (71% of the total 507) represent the best-known geospatial data currently available that can provide a foundation for LIS MSP. These datasets represent a starting point for future development of a LIS data portal. They can be used to better characterize existing use and natural resource patterns and relationships, anticipate future changes, assess the compatibility of future potential uses/projects, and develop management scenarios for a future Sound Marine Plan. Specifically, these data can potentially be used to create maps characterizing the many Long Island Sound uses and natural resources that would be considered in a LIS MSP process. Future portal developers and spatial planners should further screen these datasets before using them in support of LIS MSP.

⁴ For additional information on the LIS Cable Fund Mapping Study please contact Kevin O'Brien, CT Dept. of Energy and Environmental Protection.

Table 5. Summary of datasets included in final baseline LIS MSP data inventory

LIS MSP Category and Subcategory	Count of Datasets	Percent of Category	Percent of Subcategory
Administrative Boundaries:			
Jurisdictional	18	9.70%	51.43%
Administrative Boundaries: Planning	17		48.57%
Biology: Birds	11	36.84%	8.27%
Biology: Fish	6		4.51%
Biology: Habitat	101		75.94%
Biology: Marine Mammals	2		1.50%
Biology: Plankton	12		9.02%
Biology: Shellfish	1		0.75%
Climate Change: Climate Change	5		1.39%
Cultural & Demographic: Cultural & Demographic	3	0.83%	100.00%
Ocean Uses: Commercial Fishing	20	21.05%	26.32%
Ocean Uses: Energy Infrastructure	9		11.84%
Ocean Uses: Industrial	8		10.53%
Ocean Uses: Navigation	24		31.58%
Ocean Uses: Recreation	15		19.74%
Physical Environment: Chemical	8	29.36%	7.55%
Physical Environment: Geological	59		55.66%
Physical Environment: Oceanographic	39		36.79%
Water Quality: Water Quality	3	0.83%	100.00%
SUM: Total recommended datasets in final baseline inventory	361		
Total layers evaluated in development of inventory	507		

D. Findings: Datasets in Development

Through the process of developing this inventory, the D&I Team identified a variety of different data collection efforts currently under way which, when completed in the next one to two years, may be important additions to this baseline inventory and to a future Sound Marine Plan. These include a number of initiatives taking place under the auspices of the Northeast Regional Planning Body (NE RPB), the Northeast Regional Ocean Council (NROC), and the Northeast Ocean Data Portal, as well as initiatives led by the NOAA National Marine Fisheries Service and The Nature Conservancy. Additionally, the Seafloor Mapping project conducted through the LIS Cable Fund is working to develop additional physical and biological datasets, which are forthcoming. Relevant geospatial data development initiatives include, but are not limited to, those listed below. The D&I Team recommends that these initiatives and the resultant datasets, when completed, be reviewed for potential inclusion in the inventory and in a future data portal and Sound Marine Plan.

i. Forthcoming Biological Datasets

- Scientists from Duke University and the NOAA National Centers for Coastal Ocean Science (NCCOS) are generating predictive models of sea turtle, marine mammal, fish, and seabird distributions. This Marine Life Characterization project is being conducted for the [Northeast RPB](#) and results will be displayed on the [Northeast Ocean Data Portal](#) (Northeast Ocean Data Portal, n.d.)⁵
- The [Northeast Ocean Data Portal](#) team is leading an effort to create a historical eelgrass page, incorporating coastal wetlands, and creating a habitat story map (Northeast Ocean Data Portal, n.d.).
- The Nature Conservancy is updating its [Northwest Atlantic Marine Ecoregional Assessment](#) Benthic Habitat model using Video Survey datasets being developed by the University of Massachusetts – Dartmouth School for Marine Science and Technology (K. Weaver pers. comm. 2014).⁶

ii. Forthcoming Ocean Use Datasets

- [SeaPlan](#) is leading an effort to characterize the for-hire boating industry in the Northeast, including LIS (K. Starbuck pers. comm. 2014).⁷

⁵ For further information on this and other forthcoming Northeast Ocean Data Portal datasets please contact Nick Napoli, Ocean Planning Manager, [Northeast Regional Ocean Council](#).

⁶ For additional information please contact Sally McGee, Northeast Marine Program Director, [The Nature Conservancy Eastern Resource Office](#), Boston, MA.

⁷ For additional information please contact Andy Lipsky, Senior Partner, [SeaPlan](#).

- [SeaPlan, Surfrider and Point97](#) are leading an effort, in support of the NE RPB, to characterize recreational activities, such as kayaking, surfing, wildlife watching, etc., in the Northeast. This dataset will include LIS (SeaPlan, 2014).
- The [Northeast Ocean Data Portal](#) team is updating recreational datasets to include: The Nature Conservancy's secured lands dataset (conserved lands-state/national parks, sanctuaries, etc.), boat launches, water trails, beaches, and National Parks Service boundaries (Northeast Ocean Data Portal, n.d.)
- The [Northeast Ocean Data Portal](#) team is leading an effort to create a regional dataset for the National Register of Historic Places (K. Weaver pers. comm. 2014).⁸
- The [NOAA National Marine Fisheries Service](#) is leading an effort to use a new modeling process to analyze commercial fishing Vessel Trip Report (VTR) data, which will generate higher resolution and more accurate data that can be analyzed by attributes including fish stock, gear type, port, and year (S. Benjamin pers. comm. 2014).⁹

E. Findings: Data Gaps

The D&I Team found that the 361 recommended datasets included in the LIS MSP baseline data inventory represent a comprehensive starting point for a future Sound Marine Plan because they characterize many of the natural resources, human uses and legal parameters that would need to be considered. While many available datasets may need to be augmented and updated to best support a robust LIS MSP process, given the ongoing collection of new data, as well as necessary updates to existing data, there are no significant data gaps that would provide an immediate impediment to beginning such a process.

However, through the process of developing this inventory, the D&I Team did identify a small number of data gaps. These included existing Long Island Sound datasets that are incomplete, available for only part of the Sound, or out-of-date. Gaps also included data that could potentially be useful for LIS MSP but were absent from the inventory, either because they don't exist or because the D&I Team was unable to identify them through the inventory development process.

⁸ For further information please contact Nick Napoli, Ocean Planning Project Manager, [Northeast Regional Ocean Council](#).

⁹ For further information please contact Sharon Benjamin, GIS and Fisheries Specialist, [NMFS Social Sciences Branch](#), Falmouth, MA.

Data gaps include, but are not limited to, the following:

- Shellfish habitat suitability data (CT data are out of date and NY does not have such a dataset)
- A contiguous dataset of shoreline characterization (substrate type) and coastal erosion data for the entire LIS coastline
- Coastal risk/vulnerability data for the northern LIS (CT) coastline

It is important to emphasize that these data gaps are only a first step; there are likely additional data gaps or data update needs not identified through this inventory development process that should be addressed in support of LIS MSP. It may be that additional screening will be needed, once LIS MSP goals and objectives are better refined, to identify additional data gaps that must be addressed in order to respond to MSP goals. The D&I Team recommends that the issue of data gaps be addressed and updated again in the future in the interest of better defining and prioritizing future research needs in support of LIS MSP.

V. Data Portals

A. Overview

In addition to the Data Inventory, a review was conducted of various options for aggregating, visualizing and sharing geospatial data with LIS MSP planners and stakeholders through one or more web-based data portals. This effort was necessary because there is currently no single website or viewer through which planners and stakeholders can access all LIS geospatial data relevant to the development of a Sound Marine Plan or use for LIS in general. Establishing one or more publicly accessible data portals with geospatial data relevant to LIS MSP is important so that planners and stakeholders can view, explore, and interact with relevant geospatial data, including those datasets identified through the baseline data inventory described above in section IV.

A data portal is a web-based point of entry through which users can access, view and potentially interact with geospatial data. Many data portals allow diverse users – such as interested stakeholders, experienced planners, technical professionals and decision-makers - to view and interact with geospatial data through a web-based map viewer. For example, see Figure 1, which shows the options available to users of the Northeast Ocean Data Portal's viewer.

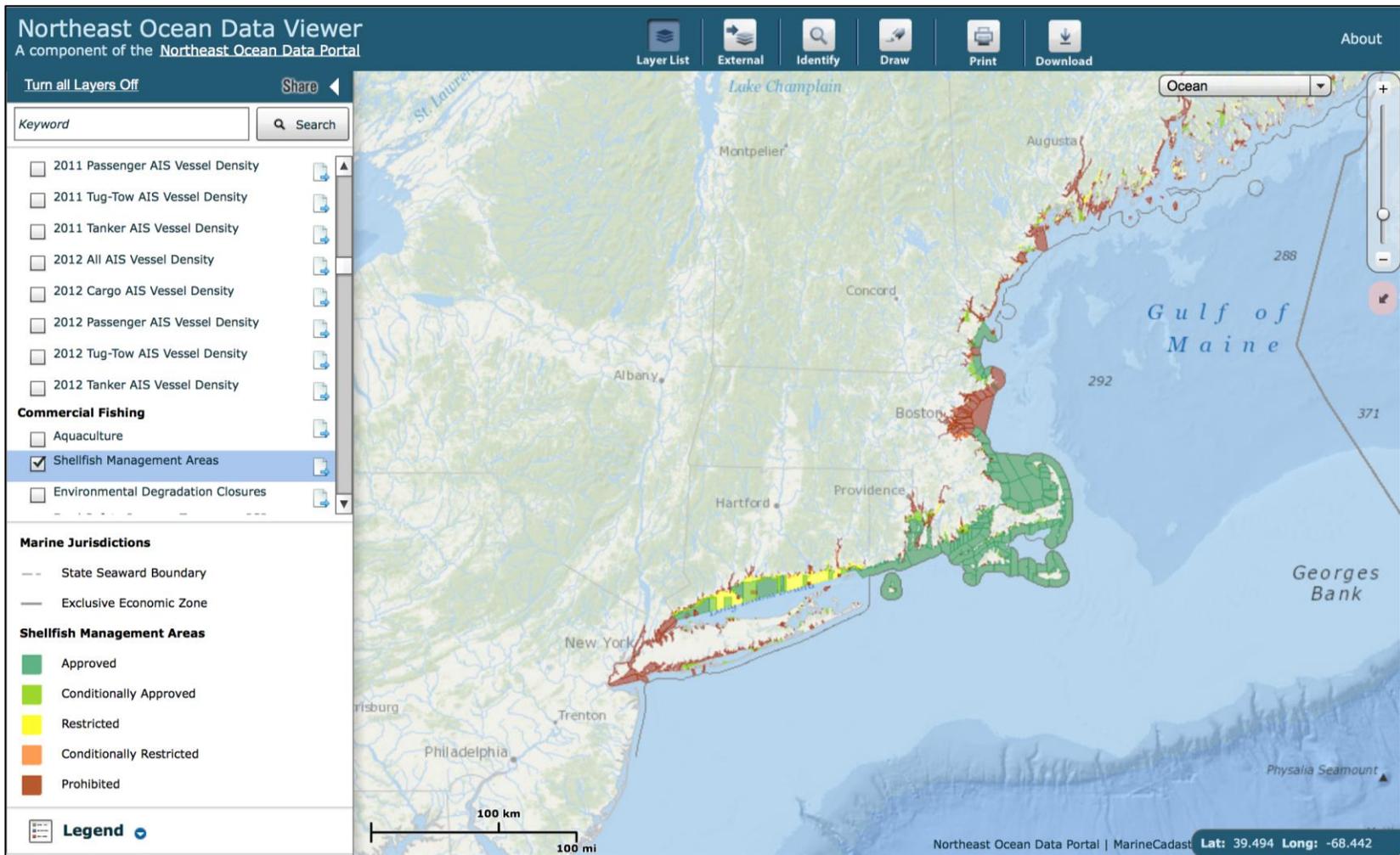


Figure 1. Screenshot from the Northeast Ocean Data Portal viewer, showing one data layer (Shellfish Management Areas).

Key attributes of most contemporary data portals are that they enable the user to access multiple authoritative datasets from different data sources in one place; do not require the user to have GIS software or experience; and enable the user to interact with the data in multiple ways. For example, a stakeholder interested in learning more about Long Island Sound could use a data portal to: view geospatial data in a map format; manipulate his or her view by selecting and overlaying different datasets; zoom into particular areas; or customize, save, share, and print a map. MSP planners and other technical professionals can use a data portal to conduct planning exercises using the same functions, and additionally can download datasets for manipulation in a GIS or access metadata (which offers details about what the data represents or describes as well as its source, age and method of development) or additional technical information about the dataset.

Whereas one dedicated data portal is not a strict requirement for MSP, data portals are increasingly established in connection with MSP initiatives. For example, data portals have been established in both the Northeast and Mid-Atlantic in connection with these regions' MSP initiatives. Data portals are especially useful for MSP because they make a diversity of datasets (e.g., natural resource and human use data) from multiple organizations (e.g., government agencies, academic institutions, non-profit organizations, and stakeholders) available in one location. Thus, a data portal helps build the integrated management approach and the inter-organizational coordination and collaboration that is the hallmark of MSP. Moreover, data portals help build public engagement in participation in MSP. A data portal provides a public interface for a MSP initiative and can also help build public participation through the inherently interactive nature of a portal. Stakeholders can view, interact with, and share MSP data and maps using the data portal. In some cases, a data portal can even be used to solicit stakeholder feedback on data products or to allow stakeholders to create, edit, and/or suggest new data for potential inclusion in a MSP initiative (e.g. [SeaSketch](#)). For example, the [UK's Marine Planning Portal](#) enables stakeholders to log in and comment on draft data layers and on the marine planning evidence base as a whole.

B. Methods

To explore options for aggregating and sharing geospatial data as part of a Sound Marine Plan, the D&I Team evaluated the potential advantages and disadvantages, with respect to LIS MSP, of using one or more portals; reviewed several existing data portals; and investigated options for designing a new data portal. These actions were taken with the objectives of understanding how data portals currently support LIS MSP initiatives in general and identifying data portal options for supporting a Sound Marine Plan.

First, the team considered the potential advantages and disadvantages of using one dedicated portal for MSP versus multiple portals. This was an important consideration because a future Sound Marine Plan would by definition involve two states, both of which have their own datasets and institutional needs.

The advantages of using one dedicated portal were identified as:

- a. One portal provides access to all relevant MSP datasets, and links to other portals and web services, in a central place;
- b. All data are managed consistently through one set of data standards;
- c. Planners and stakeholders only have to learn the structure and functions of one portal; and
- d. One portal provides a cohesive public face for a MSP initiative, facilitating stakeholder outreach and education.

Additionally, one portal can be a mechanism for fostering bi-state collaboration and cooperation.

The potential disadvantages of using one dedicated portal are that:

- a. One portal, unless perfectly customized, may not include all relevant data, functions and services;
- b. One portal would presumably have one main focus and scale, whereas multiple portals may be beneficial as they provide flexibility in focus and scale;
- c. One portal may be challenging for two states to jointly manage; and
- d. One portal could be overwhelming and unwieldy given the amount of information present.

Second, the D&I Team qualitatively reviewed six existing data portals for their features and tools, and for ways they could support or are supporting LIS MSP. These included two federal portals, [NOAA Digital Coast](#) and the [NOAA Marine Cadastre](#); one regional portal designed to support MSP, the [Northeast Ocean Data Portal](#); one Long Island Sound-focused portal, the [Long Island Sound Resource Center](#); and two state portals, **New York's Geographic Information Gateway (NYGateway)** and [CT Environmental Conditions Online](#) (CT ECO), which is publicly available. Each portal was reviewed in depth for summary characteristics including the type of data and information; intended audience; creator or sponsor; mechanisms for user engagement; update frequency; its potential advantages and disadvantages with regard to LIS MSP; and ways in which it could potentially support LIS MSP. See Table 6 in Appendix II for a detailed summary of each portal's characteristics. The purpose of this research was to both understand the ways in which a portal could support LIS MSP, and to potentially identify one portal which could be used to best support a future Sound Marine Plan.

Additionally the D&I Team investigated options for developing a new portal for the purposes of supporting a Sound Marine Plan. Two options were identified: developing a LIS-specific version of [SeaSketch](#), a web-based decision support tool that would include some portal functions, and building a new portal. SeaSketch is an interactive web-based tool for viewing marine spatial data designed by the University of California at Santa Barbara to support collaborative spatial planning and management exercises; the SeaSketch team could be contracted to develop and support a LIS-specific viewer. Alternatively, a new portal could be developed explicitly to support LIS MSP. NY DOS's experience designing and developing the NY portal was used to assess the potential advantages, disadvantages, and costs of pursuing this option. The potential cost of developing a LIS-specific application of SeaSketch would vary significantly depending on the options and features selected; the potential cost of a new portal, based on NY's experience, is approximately \$280,500. See Table 7 in Appendix II for a detailed summary of both options.

C. Findings

The D&I Team's review of data portals resulted in the identification of several portals that could effectively support a future Sound Marine Plan (see Table 6 and Table 7). Through this research process, the D&I Team considered the LIS circumstances and the pros and cons of different options, and concluded that utilizing a single data portal would be preferable to using multiple portals, and that it would be more cost-effective to utilize an existing portal rather than pay to develop a new one.

It is within the context of this research that the NY DOS invited the Working Group to utilize the NY Gateway , as a potentially primary data portal for use in LIS MSP. Through this research process and through regular D&I Team and Working Group conference calls, a consensus was ultimately reached that the NY Gateway provided the strongest available option for advancing LIS MSP. This decision was based on numerous factors. The NY Gateway is being developed as a highly functional, user-friendly data portal. NY DOS is committed to supporting the NY Gateway's continued development and growth, and intends to host the NY Gateway well into the future; it would be challenging for Work Group members to obtain the financial resources and staffing capacity necessary to develop and host an equivalent dedicated portal. Moreover, in addition to utilizing the NY Gateway, Working Group members were invited to participate in aspects of the portal's ongoing development and to contribute to the portal datasets included in the baseline data inventory.

The Working Group's strong commitment to the NY Gateway was a major driving factor in reaching this consensus. NY DOS has committed to developing and hosting the NY Gateway through a one and a half year contract with Stone Environmental (October 2013 – March 2015) to develop the NY Gateway's functionality. Additionally, NY DOS has a three-year contract with Stone Environmental to provide cloud storage space and application hosting (May 2013 – April 2016) and will pursue a new contract when this contract expires.

Two features of the NY Gateway that will be particularly useful in supporting a Sound Marine Plan are the LIS focus area and the implementation of story maps. DOS plans to develop a featured LIS focus area as a key part of the NY Gateway ; this is part of DOS's scope of work with Stone Environmental and would be developed in support of LIS MSP. A LIS focus area page would include a link to a map viewer populated with LIS geospatial data, a sidebar with links to other relevant resources, and story maps which present selected LIS issues and/or information in greater depth. See Figure 2 for a mock-up of what the LIS focus area page might look like, and see Figure 3 and Figure 4 for mock-ups of the NY Gateway's landing page and map viewer.

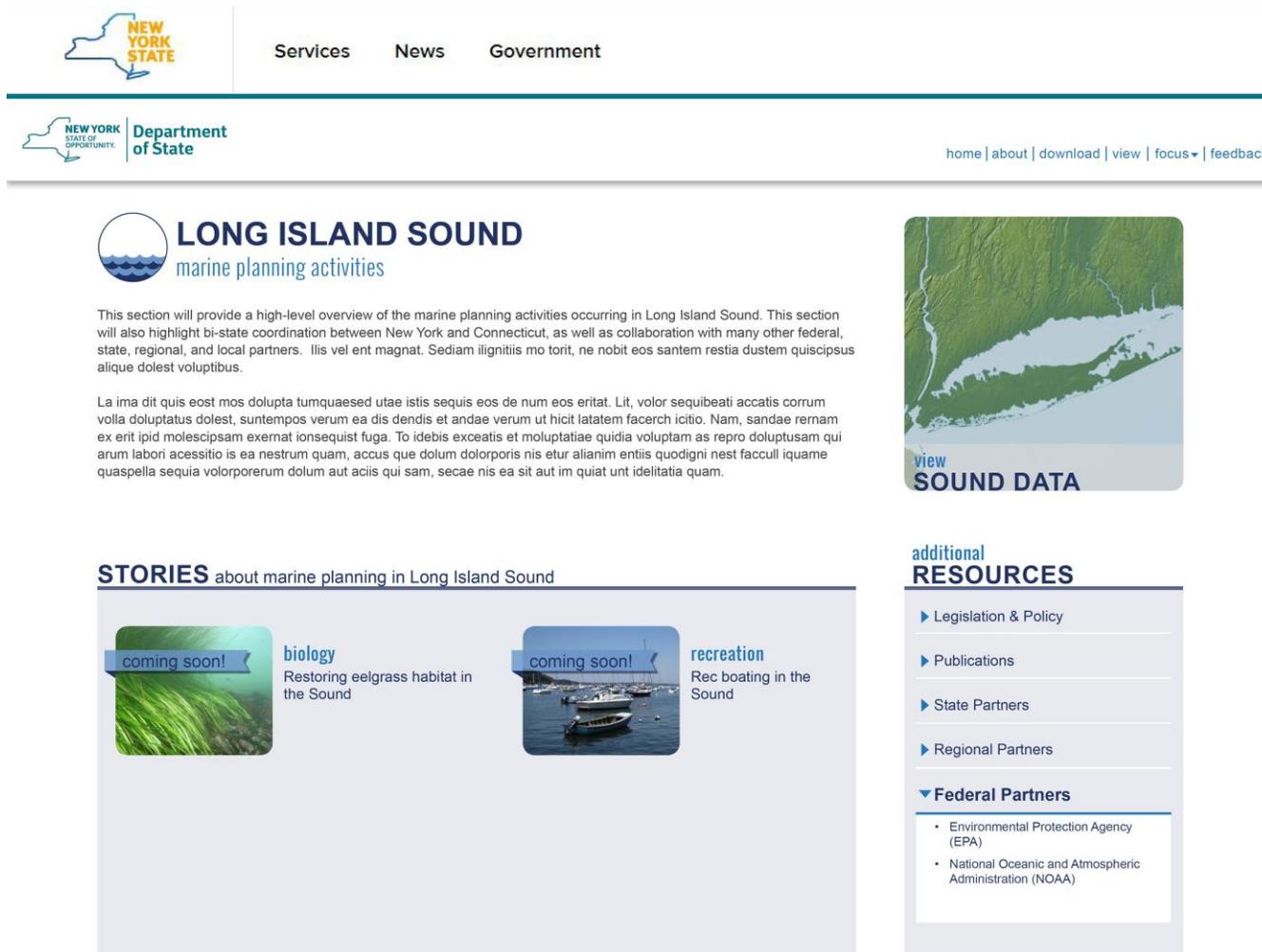


Figure 2. Mock-up of a LIS Focus Area page with links to story maps.

(Note: this mock-up is only an example. The final content for such a page would be developed through coordination between the states of NY and CT as described in Section VII.2 of this report. In addition, this mock-up is representative of the NY Gatewayfocus area page layout and general aesthetic, but NY DOS is still in the process of implementing new statewide branding guidelines. Website styling may change in the future.)

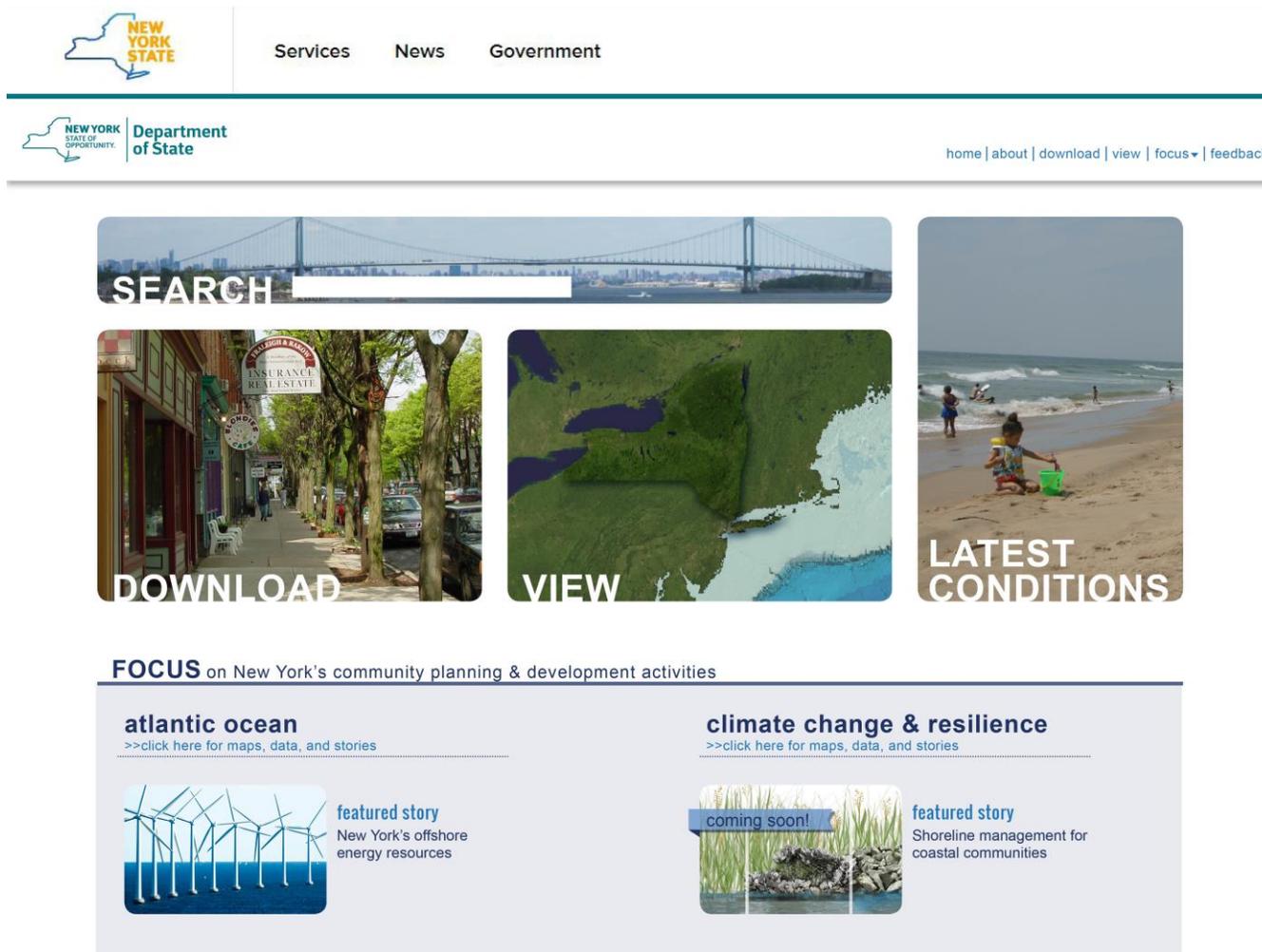


Figure 3. Mock-up of NY portal landing page

(Note: this mock-up is only an example of the NY Gateway . In addition, this mock-up is representative of the NY Gateway focus area page layout and general aesthetic, but NY DOS is still in the process of implementing new statewide branding guidelines. Website styling may change in the future.)

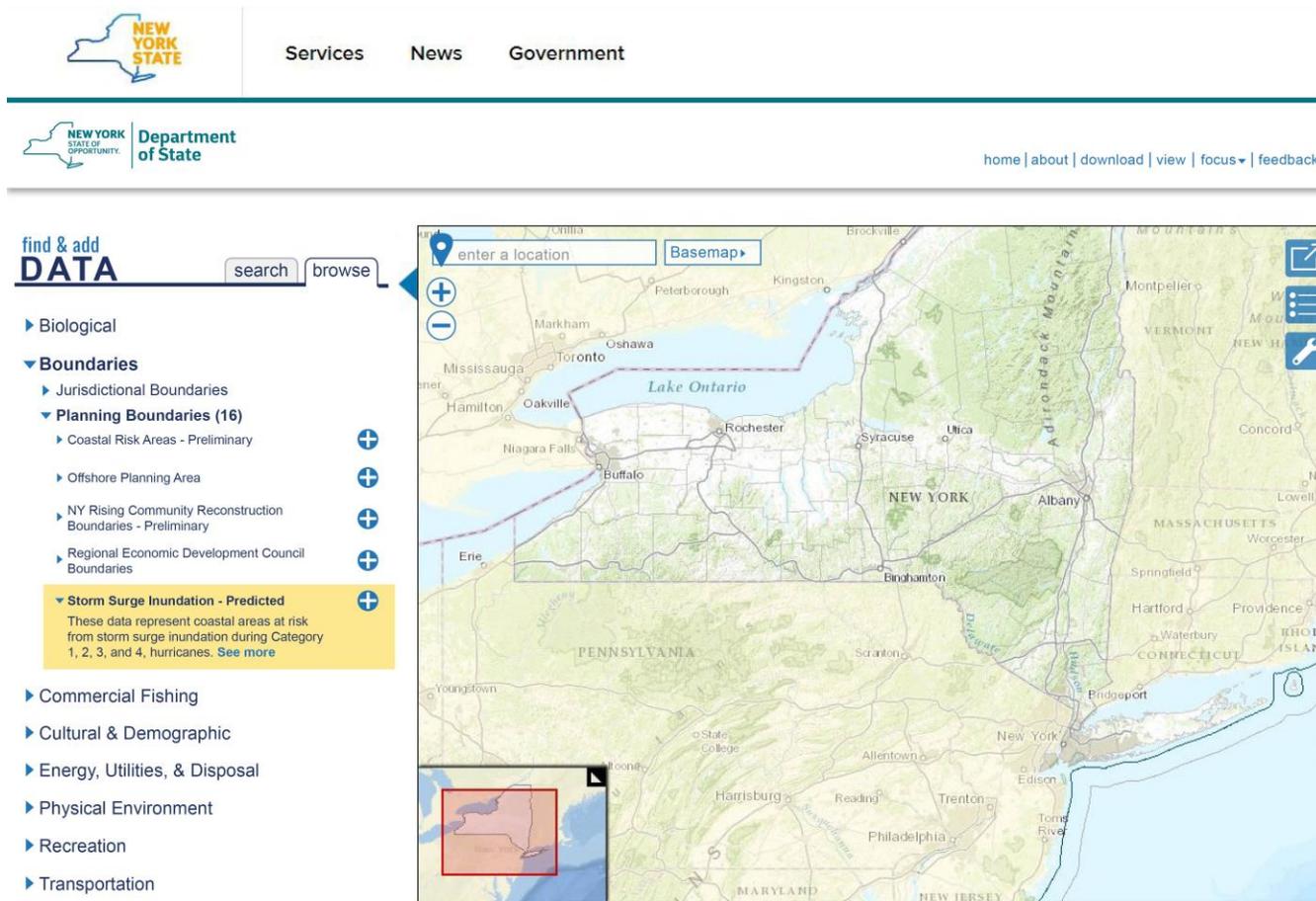


Figure 4. Mock-up of the NY portal's map viewer

(Note: this mock-up is only an example of the NY Gateway . In addition, this mock-up is representative of the NY Gateway focus area page layout and general aesthetic, but NY DOS is still in the process of implementing new statewide branding guidelines. Colors and fonts may change in the future, as will the top banner to accommodate the new NY DOS logo.)

Within the LIS Focus Area, a user will be able to access and interact with a broad range of LIS-related data, which is one of the major values of the NY Gateway for LIS. A major component of the LIS Focus Area page would be story maps - interactive, illustrated stories that combine web-based maps with text, photo, video, and other graphic devices in order to tell a compelling story. They are used to highlight case studies, showcase community success stories, and demonstrate how geographic information is collected, analyzed, and utilized to improve planning and decision-making. DOS has invited the Work Group to participate in developing LIS story maps to the extent possible. Work Group members from both states would be able to identify content for story maps (focusing on topics upon which both states agree) and would be able to review and/or edit final story maps before their posting. Story maps are of particular interest because they can be developed immediately and would provide an opportunity for building bi-state collaboration and consensus building in support of a future bi-state Sound Marine Plan initiative.

It is important to note that other highly-functional data portals exist, such as the Northeast Ocean Data Portal, and that there may be some level of support for a Sound Marine Plan through these portals. However, it is not certain that a LIS MSP effort could identify one of these portals as a primary home, in that LIS may not be a sufficient focus of the portal and/or that these portals may have restrictions that could limit the utility of the portal for a LIS MSP effort. Additionally, using the NY Gateway as a primary data portal does not mean that the LIS MSP effort cannot use or will not need the support of other portals. For example, data sharing tools such as web map services could enable the NY Gateway to utilize data from other data portals. A web map service is an HTTP interface that allows sharing of geospatial information between one or more external databases; for example, data available as map services on the Northeast Ocean Data Portal could be imported into and viewed on the NY Gateway and vice versa.

The Working Group's consensus to utilize the NY Gateway is codified in a consensus statement that was developed by the Working Group and approved by members on September 3, 2014. The process of developing consensus on this issue began during an August 2014 call of the Working Group which was attended by 13 members of the Working Group, including representatives of key NY and CT state agencies (CT DEEP, NY DEC and NY DOS). All members on the call voted to approve supporting the NY Gateway and agreed that a consensus statement should be developed and then circulated to the entire Working Group. This statement was drafted and circulated to all Working Group members, who were polled about their support of this statement. Members responded affirmatively, including representatives of the NY and CT state agencies, and no Working Group members dissented. See Appendix III for

the complete Consensus Statement document, which includes further background on this agreement.

“The Working Group (WG) finds that the NY Gateway provides an excellent data and information portal that can support the goals of the LIS MSP Work Group in its efforts to advance preparation for an official LIS MSP process. The States of CT and NY are the only parties who can make a decision regarding the ultimate use of the NY portal in an official LIS MSP process; however, the NY Gateway will likely be an excellent option for an official LIS MSP process, particularly one that supports a bi-state approach. Actions taken today that advance integration of a bi-state approach in supporting access to and use of geographic data on LIS, such as through WG support, are warranted. This position is further indicated given that the NY Gateway is being developed now and there may not be the same opportunity in the future. It is therefore the consensus view of the WG that the WG should continue to take actions that support the development of the NY Gateway as a vehicle for bi-state cooperation on LIS geographic data, including working with NYS on development of its Gateway to the extent possible and appropriate.”

VI. Data Standards

A. Overview

The D&I Team examined various standards that can be applied to individual datasets and/or to data processes that could support LIS MSP. This will help ensure the quality and consistency of not only data used in a LIS MSP initiative, but also the ways in which data from different sources could or should be aggregated in a data portal, shared among stakeholders, and/or used together to perform planning and analysis tasks.

In broad terms, “standards” are any form of measure, rule, or model to codify an agreed-upon practice or norm. This is evident in systems of weights and measures such as the metric system. Here, various units are well defined and there are rules explaining how they can be combined. Further, these definitions and rules are not place or user-dependent; they can be universally applied in a consistent manner. For example, there are 100 centimeters in 1 meter everywhere.

Within the context of geospatial data, standards can apply both to individual datasets (e.g., the accuracy of water quality sampling locations) and to data-related processes (e.g., how to decide which sets of historic aerial photography to include in a data portal). In order to facilitate the

appropriate use of these data, a third standard that provides a detailed description of a dataset's characteristics, known as metadata, can be applied. In order to effectively support a Sound Marine Plan, data standards should be in place for individual datasets, data-related processes, and metadata. Doing so provides a structure that describes datasets in a common way such that users can fully understand their characteristics and, in turn, identify appropriate applications of the data.

For further information on data standards, please see a briefing paper prepared by the Environmental Protection Agency (Kohn, 2003).

B. Methods

The goal of this review was to understand the range of approaches to data standards and to identify one or more options for data standards to be applied in a LIS MSP process. To do this, the D&I Team built from the work described in Section V by using a subset of the data portals to explore what, if any, standards they employed and how they were used. Beyond simply providing a consistent framework for this review, the portals themselves present a range of different scales (e.g., national, regional and state) and a range of different institutions (e.g. federal government, state, regional quasi-governmental entities) that provide a broad spectrum of design, uses, and potential stakeholder groups. The individual data portals reviewed are the Marine Cadastre (federal); the Mid-Atlantic Ocean Data Portal and the Northeast Ocean Data Portal (regional quasi-governmental); and the CT Environmental Conditions Online and the NY portal (state).

In addition to the portals, the D&I team also reviewed a set of federal standards published by the Federal Geographic Data Committee (FGDC) for developing metadata. The FGDC is an interagency committee that promotes the coordination of geospatial data on a national basis. Many of the individual data portals reviewed herein utilize FGDC metadata standards for their holdings.

This was not an exhaustive or quantitative analysis; data standards and portals were evaluated qualitatively with the goal of understanding context and identifying options for data standards for use in LIS MSP.

C. Findings

The D&I team first evaluated the basic attributes of the FGDC data standards, and the standards used in the five other portals listed above. The team then considered the potential advantages and disadvantages of applying each approach to LIS given the unique needs of LIS MSP. See Table 8 in Appendix II for summary attributes of these different data standards.

After reviewing the range of data standards considered in this work plan, the D&I Team recommends applying New York’s data standards used in the development of its Gateway to all future LIS MSP geospatial data-related work. The reasons for this are:

- As discussed above in the “Data Portal” section, the Working Group has reached a consensus on supporting the development of the NY Gateway as a vehicle for bi-state cooperation on LIS geographic data, which may include a future official LIS MSP process. Adopting a different set of data standards other than those utilized in the NY portal could cause barriers to efficient integration.
- The NY Gateway data standards are considered to be high quality, utilizing FGDC standards, and are similar to those of the external data portals used to develop the LIS MSP data inventory– the Marine Cadastre, the Mid-Atlantic Ocean Data Portal, and the Northeast Ocean Data Portal (which are under development). All of these data portals have standards that address common data issues, such as data quality, geographic scope and extent, currentness, and credibility. Moreover, two of these data portals (the Mid-Atlantic Ocean Data Portal and the Northeast Ocean Data Portal) have been developed to support MSP.

However, it is important to note that situations may occur in the future that are outside the scope of the system as originally conceived by New York State, and so changes to these standards may need to be considered as data integration proceeds and/or when an official LIS MSP process begins.

VII. Next Steps

The tasks outlined below are recommended next steps for building upon the work described in this report. These next steps would convert the data products generated by the D&I Team – data inventory, data portal recommendation, and data standards recommendation – into publicly accessible information on the NY Gateway to support LIS MSP planning, management, and public outreach activities.

1. Identify high-priority datasets, evaluate dataset quality, and add datasets to the NY Gateway

The tasks described below can likely be performed by members of the D&I Team, with occasional input from the entire Working Group and outside resources.

- Identify high-priority datasets for LIS MSP that meet all data standard requirements, and in particular, are relevant to LIS MSP. For those that do not meet data standards, identify steps that must be taken to update data. In addition to relevance, the D & I Team may also consider prioritizing datasets in terms of ease of access (i.e., Is the dataset currently maintained and easily obtainable via web mapping services?).
- Verify that each high-priority dataset has complete and accurate metadata. If metadata do not exist or are incomplete, the D & I Team will need to reach out to the data originator/source and request assistance in the development of metadata. Datasets without complete metadata will be assigned a lower priority for inclusion in the portal, to allow for development or receipt of proper metadata.
- Obtain identified high-priority datasets and associated metadata. If not available through web mapping services, data will need to be obtained from the originator/source.
- Determine how the data will be displayed in an online map viewer. This will require discussions about symbology, data classification, use of a slider bar to show change over time, and other considerations.
- Determine how the data will be browsed/searched in an online data portal. This will require agreement on the category/subcategory assigned to each dataset and the tags associated with each dataset.
- Work with the NY Gateway team to implement a data upload protocol to ensure all information relevant to the dataset (metadata and symbology) is uploaded to the NY Gateway efficiently and successfully. *NOTE: All of the LIS-relevant data uploaded to the NY Gateway will be viewable on the main map viewer, as well as on a LIS Focus Area map viewer. The LIS Focus Area map viewer only provides access to LIS-relevant data, whereas the main map viewer contains all data available on the NY Gateway.*
- Because new data will become available over time and existing data will be updated, the steps listed above should be iterative. The D&I Team should also consider developing a data maintenance and data archiving plan to ensure datasets, including the baseline inventory, remain relevant and up-to-date.

2. Build the LIS Focus Area page of the NY Gateway

- Form a new working group, comprising members of the D&I Team, the Framework Team, and potentially others, to undertake the tasks described below.
- Develop a high-level, concise description about LIS marine planning efforts to be posted on the LIS Focus Area page.
- Develop a list of additional resource links. These links will take users to external websites that contain information relevant to LIS marine planning, such as publications, legislation/policy, data & tools, and state/federal partnerships.
- Select a few key datasets to serve as base layers on the LIS Focus Area map viewer (e.g., watershed boundaries, municipal boundaries, benthic sediment type, bathymetry, monitoring buoys, etc.). These datasets will automatically load when the LIS Focus Area viewer is launched.
- Develop at least one or two illustrated stories that use geographic information to tell discrete stories about the LIS and LIS planning efforts. The development of story content will require a significant time commitment. Once the story and graphics are drafted, the story will be reviewed by outside experts to ensure the story's scope is appropriate and the content is accurate. This step may require the development of a detailed work plan in itself.

3. Explore Additional Next Steps in support of a Sound Marine Plan

- The D&I Team should engage in continued discussion with the broader Working Group and other partners to determine how to advance the usability of geospatial data and tools described herein in support of LIS MSP.
- The D&I team should establish informal partnerships or lines of communication with data suppliers to ensure D&I Team awareness of updates to LIS-relevant datasets.
- The D&I Team should revisit data gaps again in the future in the interest of better defining and prioritizing future research needs in support of LIS MSP. In particular, the D&I Team should reevaluate categories and sub-categories for which very few datasets were found (see Table 5 above). For example, the Cultural & Demographic included only 3 datasets comprising less than 1% of the inventory; this and other low-number

categories should be evaluated in order to determine whether these numbers are an indicator of data gaps that should be prioritized.

- The D&I Team should revisit data in development again in the future to ensure all available, relevant datasets are incorporated into the inventory and the NY Gateway.
- Once LIS MSP goals and objectives are identified and refined, appropriate officials involved in the LIS MSP process and/or the D&I Team and other Working Group members should consider rescreening the 361 recommended datasets included in the baseline data inventory. Rescreening these datasets will enable the team to further prioritize datasets that are most useful for MSP and identify additional data gaps relevant to LIS MSP that may not have initially been evident. The D&I Team may consider beginning this step prior to an official process, using goals and objectives used by similar MSP processes.
- The D&I Team, or a team set up for this purpose under an official LIS MSP process, should review maps and other data products produced in connection with the Northeast and Mid-Atlantic regional planning processes – both those completed and in development – to assess their potential applicability to a LIS MSP process.

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Appendix I. LIS MSP Baseline Data Inventory

See Microsoft Excel spreadsheet attached.

Appendix II: Tables and Figures

Table 6. Summary of data portals reviewed for LIS MSP

Portal Name	Overview	Portal functionalities	Frequency of data updates	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Additional ways portal can support LIS MSP
1. Northeast Ocean Data Portal	<p>*Information resource/decision support tool for ocean planning from the Gulf of Maine to Long Island Sound.</p> <p>*Provides access to data, maps, tools, and other ocean planning information.</p> <p>*Includes approximately 100 hosted datasets and connections to some external services and sources.</p> <p>*Developed/maintained by a working group comprising gov't. agencies and NGOs.</p>	<p>*View, interact with and share maps pre-loaded with data addressing key themes (e.g. commercial fishing, marine mammals.</p> <p>*Use the data explorer to view and interact with all data, metadata, and services.</p> <p>*Download data for use in a GIS; users also have access to a rest endpoint where they can connect to NEOD services to display data in their own portals, viewers, etc.</p>	<p>*Updated monthly/bi-monthly as new datasets are created or datasets are updated; provide news updates on forthcoming data products.</p>	<p>*Three ways of interacting with data, including creation of customizable maps.</p> <p>*Thematic maps for ease of user access.</p> <p>*Portal team has regular interaction with government, universities and NGOs.</p> <p>*Regular maintenance, updates, and development of new datasets.</p>	<p>* Regional, not site- or state specific.</p>	<p>*LIS is within the portal's spatial extent for existing and new data.</p> <p>*Provides access to regional mapping tools and regional data from ME to NY.</p> <p>*Provides access to regional datasets as map services that any portal can ingest.</p> <p>*Many datasets used in LIS MSP Data Inventory come from this portal, and more datasets are under development that will be useful for LIS MSP.</p> <p>*Data standards are similar in nature to the New York Geographic Information Gateway .</p> <p>**NE Ocean Data team can provide: advice on data needs, development, and gaps, and can provide input and review of data products, their visualization, and incorporation into map themes or stories, using their knowledge of federal, regional and state datasets and MSP.</p> <p>**Portal can provide server space and password-protected data viewers for internal review of interim data products or data catalogs.</p> <p>*NE Ocean Data team would consider additional requests by CT, NY or LIS Working Group.</p> <p><i>PLEASE NOTE: Items marked with two asterisks (**) are additional services that could be provided dependent on scope, cost and level of effort.</i></p>

Portal Name	Overview	Portal functionalities	Frequency of data updates	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Additional ways portal can support LIS MSP
2. NY Department of State, Office of Planning & Development's Geographic Information Gateway (NY Gateway)	<ul style="list-style-type: none"> * Upon release, will present information related to all OPD programs as a Focus Area (e.g. Atlantic Ocean, LIS, Climate Change & Resilience). * Currently presents data from the NY Offshore Atlantic Ocean Study (2013); other focus areas under development. 	<ul style="list-style-type: none"> * View data hosted by NY DOS and select other web services (e.g. Marine Cadastre) in a map viewer or in Google Earth. * Interact with data by searching for and adding data layers, changing the base map, or zooming in/out. * Access metadata and download data in a variety of formats. * View data from 3rd party websites on real-time coastal and ocean conditions. * Learn about "Focus Areas" by accessing data, reading story maps and linking to additional resources. * Provide feedback and share via social media. 	<ul style="list-style-type: none"> * Expected to be updated as new content becomes available (monthly – bimonthly basis). 	<ul style="list-style-type: none"> * Free platform hosting relevant geographic information. * Downloadable data are compatible with both ArcGIS and GoogleEarth (open source option). * Data search functionality. * Focus Area pages provide access to geographic data and other information. * Story maps tell focused stories about data and offshore planning activities; unique feature/outreach tool not included in other portals. * Provides access to a wide range of NY-related geographic data and information. * Long-term hosting and development are NY DOS 	<ul style="list-style-type: none"> * Limited map tools; currently, users cannot draw or measure features or perform address searches. * Provides access to non-marine data and information (either a pro or a con). 	<ul style="list-style-type: none"> * Potential partnership between NY DOS and LIS MSP team provides opportunities to customize the NY Gateway to address LIS MSP needs. * NY plans to create a LIS Focus Area as part of the NY Gateway. * LIS MSP team would work with NY DOS to customize the design and develop the content for the LIS Focus Area and story maps. * Funding and expertise is available for website maintenance. Stone Environmental is working with NY DOS to ensure NY can maintain the site without permanent support from Stone. * All data would be evaluated based on NY data standards prior to upload; if metadata are incomplete, NY DOS will obtain complete metadata that conforms to data standards.

Portal Name	Overview	Portal functionalities	Frequency of data updates	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Additional ways portal can support LIS MSP
				priorities.		
3. NOAA Digital Coast	<p>*Collection of geospatial data and tools, trainings, and case studies for coastal managers.</p> <p>*Includes data on coastal watersheds nationwide; provided in multiple data formats.</p> <p>*Includes data and information from government agencies.</p> <p>*Managed by NOAA in collaboration with non-governmental partners.</p> <p>*Includes a data registry/inventory and a supplemental data viewer.</p>	<p>*Search for datasets by characteristics or themes (e.g. benthic, hazards & climate). Data can be previewed, downloaded, or accessed via web service.</p> <p>*Search for and use or download pre-developed tools to perform analyses.</p> <p>*Access training resources.</p>	<p>*Not defined, but Digital Coast is often willing to accept data of appropriate standards from partners or the coastal management community.</p>	<p>*Provides additional resources (tools, training) beyond data visualization/distribution.</p> <p>*Digital Coast is interested in working with variety of coastal professionals to provide data, tools, and resources.</p>	<p>*National in scope; may not adequately reflect local regional needs “out of the box.”</p>	<p>*Digital Coast is always looking for ways to support coastal management via data hosting/providing access to data and resources.</p> <p>*Digital Coast is more than just data. Also hosts and supports tools/ toolkits, training options, stories, and application techniques/resources.</p>

Portal Name	Overview	Portal functionalities	Frequency of data updates	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Additional ways portal can support LIS MSP
4. NOAA Marine Cadastre	<p>*Integrated marine information system providing data, tools and support for renewable energy siting and other ocean planning efforts.</p> <p>*Co-sponsored by BOEM and NOAA and hosts data from a range of different government agencies.</p> <p>*Includes a data viewer with regional maps, thematic maps, and story maps and a data inventory.</p>	<p>*Read case studies about how these data support ocean planning.</p> <p>*Search for and download data and metadata and create custom maps.</p> <p>*View and browse geographic data utilizing a map viewer. User can zoom in/out; identify features; change the basemap and map extent; draw and measure features; access web service and metadata.</p>	<p>*Regularly updated as new data are available.</p>	<p>*Authoritative source that is well maintained.</p> <p>*Web services are available for all data layers.</p> <p>*Map viewer provides tools that allow users to customize and share maps.</p> <p>*Users can download datasets, metadata and create custom maps.</p>	<p>*Data are often a coarse spatial resolution (nation- or region-wide) and often do not have coverage in LIS.</p> <p>*Datasets are limited in scope – largely focused on renewable energy planning and jurisdictional boundaries.</p>	<p>*Provides LIS team with access to authoritative data maintained by the federal government.</p> <p>*Provides National Viewer and access to nationwide datasets through web map services.</p> <p>*The Marine Cadastre team is responsive and readily available to troubleshoot technical issues.</p>

Portal Name	Overview	Portal functionalities	Frequency of data updates	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Additional ways portal can support LIS MSP
<p>5. Long Island Sound Resource Center</p>	<p>*Established in 1988 as a central clearinghouse for LIS-related data and information.</p>	<p>*Search and download oblique photographs of CT's coast. *Identify CT public access locations. *Explore data characterizing LIS habitats and geology. *Learn about scientific research, data and maps related to LIS. *Search an inventory of spatial data.</p>	<p>*Data are not updated.</p>	<p>*Designed to store and serve spatial data as well as research, publications, posters, and other coastal/estuarine data. *Good source of geologic data for LIS.</p>	<p>*Infrastructure needs replacing (e.g. running ArcIMS; server is at end of useful lifespan). Unclear if it will be replaced or if data will be integrated into another location.</p>	<p>*None identified because of uncertain future of this portal.</p>

Portal Name	Overview	Portal functionalities	Frequency of data updates	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Additional ways portal can support LIS MSP
6. CT Environmental Conditions Online (CT ECO)	<p>*Collaboration of CT DEEP and the UCONN Center for Land Use Education and Research.</p> <p>*Includes maps and tools for sharing CT environmental and natural resource data with decision makers and the general public.</p> <p>*Data contributed by state and federal agencies and UCONN programs.</p>	<p>*View geospatial data characterizing CT environmental resources separately or in conjunction with other envt'l natural resource information.</p> <p>*View high-res. Orthophotography.</p> <p>*View maps through map catalogs (PDFs), a series of thematic map viewers, an advanced map viewer, and through ArcGIS Online.</p> <p>*Access data and resource guides.</p> <p>*Access map services sources to download GIS data.</p> <p>*Access training resources.</p>	There is no well-defined update schedule.	<p>*Reasonably well-configured setup to view and access data. Has capabilities for novice and more advanced users.</p> <p>Can provide data as well as web-services.</p> <p>Documentation is multi-tiered as well, making it easy to use.</p>	*Potential drawback is lack of current resources to easily expand data catalog and create new products and services. Depending on scope of desired changes, funding sources may need to be provided.	*Designed to serve as a central point for CT environmental data, but could be configured to serve/host other regional data if the delivery parameters were largely similar.

Table 7. Options for developing a new LIS MSP data portal

Option	Overview	Users can....	Update frequency	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Costs for developing in support of LIS MSP
SeaSketch	<p>*Web-based tool for viewing marine spatial data developed by the McClintock lab at the Marine Science Institute of UC Santa Barbara.</p> <p>*Provides a customized visualization interface; unique features are participatory forums through which users can interact, draw features, and provide feedback.</p> <p>*Contact is Dr. Will McClintock (will@ucsb.edu).</p>	<p>*Turn on and off preloaded datasets, zoom to specific areas, change basemaps, draw features.</p> <p>*Interact and communicate with others in a virtual forum setting, draw features, and provide feedback and comments relating to data and features.</p> <p>*Analytical reports can be generated on the fly while users interact.</p> <p>*Users cannot download data.</p> <p>*Project administrators can load datasets and connect to external services such as the Northeast Ocean Data Portal.</p>	<p>*Project administrators have full control and can update when needed.</p>	<p>*Great for collaborative planning and stakeholder engagement.</p> <p>*Could function as a standalone viewer.</p> <p>*Analytic reports (can develop based on needs).</p> <p>*Can connect to external services (e.g. NY portal).</p> <p>*Support from SeaSketch is available to get the project moving.</p>	<p>*Would have to start from scratch, organizing structure, data, etc.</p> <p>*Would have to determine group for managing and updating datasets, metadata, etc.</p> <p>*Could be costly.</p> <p>*Users cannot download data; this could be developed for a fee.</p> <p>*Basic viewer with no story maps, etc.</p>	<p>*A LIS MSP specific SeaSketch viewer would be developed and supported, at a cost to LIS, through a contractual agreement. SeaSketch can create a detailed project prospectus and refined cost estimates. Initial cost estimates are as follows based on Feb 2014 correspondence with W. McClintock:</p> <p>*\$5,000/year for the license</p> <p>*\$5,000/year for an Amazon Web Services instance (including ArcGIS Server for free) to host map services and geoprocessing services</p> <p>*\$6,500 per 40 hours of support (minimum).</p> <p>*Additional fees for service at a standard rate of \$165.29/hr.</p> <p>*Simple analytics (overlay of several layers, meaningful, project-specific report) cost around \$13k.</p>

Option	Overview	Users can....	Update frequency	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP	Costs for developing in support of LIS MSP
New portal	This would be a new portal developed from the ground up. NY DOS' experience developing the NY Gateway was used as a reference point for pros, cons, and costs.	TBD	TBD	<ul style="list-style-type: none"> *Standalone product (no state hosting) *Opportunity to determine look and feel as a group; e.g. could customize content around LIS MSP topics *Work Group would have the ability to quickly identify, screen, and upload data/make decisions about website content (internal review process vs. internal & external review process) 	<ul style="list-style-type: none"> *Requires from scratch, organizing structure/data, look/feel, messaging, metadata, team *Requires a permanent team responsible for adding new content, managing and updating existing datasets, metadata, archiving old data, coordinate with data providers/partners, conduct public outreach, etc. *Costly, requiring funding for website development and maintenance, hosting services, technical support, public outreach, etc. *Requires assembling team for portal interface design, development, management, and data/metadata development 	Cost estimate (based on NY Gateway) Task A: Data Collection and Management: *\$7,500 Develop data acceptance standards *\$10,000 Mapping support *\$13,000 Priority data assessment Task B: Develop/ Deploy Atlas and Data Portal: *\$36,000 Assist with Design Spec Dev't. *\$194,000 Application Dev't. *\$20,000 Documentation and Training TOTAL: \$280,500

Table 8. Summary matrix of data standards

I. Organizations Promulgating Data Standards

Organization	Data Description Standard Required?	Summary – Description Standard	Data Process Description Required/ Provided	Notes	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP
Federal Geographic Data Committee (FGDC)	Yes	Detailed standards for metadata; endorses both internal and external standards	No	<p>*The FGDC promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis through the National Spatial Data Infrastructure, a physical, organizational, and virtual network designed to enable the development and sharing of the nation's digital geographic information resources.</p> <p>*FGDC data standards are most applicable to datasets rather than data processes, standardizing the way data should be described rather than how data might be valued, etc.) They are most applicable to metadata for spatial datasets.</p> <p>*FGDC endorses internal standards (from within the Federal government) and external standards (from non-federal organizations).</p>	<p>*Nationally/ internationally recognized</p> <p>*Vetted, well represented of many data types LIS MSP will likely use</p> <p>*For federally created/supported datasets, FGDC minimum standards are typically applied (i.e., most of federal data can be expected to provide a minimum level of standardization)</p> <p>*Endorses acceptance of and integration with international data standards (e.g., International Standards Organization 19115)</p> <p>*Can be created using various metadata tools</p>	<p>*Can be difficult/time-consuming to apply if a LIS MSP dataset is lacking standardization (e.g., research may be required to compile needed facts)</p> <p>*Non-federal data can be hit or miss (in both FGDC metadata existence or quality)</p>

II. Data Standards Used by Data Portals

Portal	Data Description Standard Required?	Summary - Description Standard	Data Process Standards Required/ Provided?	Notes	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP
CT Environmental Conditions Online	Yes	Three versions of increasing detail and complexity, all based on FGDC data standards: Data Guides (basic level); Resource Guides (intermediate level); Complete FGDC Metadata (advanced level)	No	*Provides standards relevant to describing data, but does not address process-level issues such as data quality evaluations or distribution standards.	*Well-conceived level of data description standards (includes basic, intermediate and fully compliant FGDC records users can select from based on their needs/experience, etc.) Basic and intermediate take key points from FGDC and present them in easy to digest formats.	*Would require substantial work to provide multi-tiered data descriptions for data that does not currently have them *Nothing to address issues of data quality for inclusion
NY Gateway	Yes	FGDC Metadata/ISO	Yes – addresses: Inclusion; distribution	*Standards have been developed and/or endorsed to address both datasets and processes. *Data standards rely on previously developed templates from FGDC and ISO *Includes processes define steps to address data quality, lineage, relevancy, and storage/distribution.	*Vetted, representative of many data types LIS MSP will likely use *Covers data and data processes *Standards are designed specifically to support data portal functionality LIS MSP group envisions needing. *Locally conceived, LIS specific	*As new partners, data streams, data categories, etc., are incorporated into the NY Gateway, instances may be encountered that have not been considered and therefore might require re-thinking and/or changing standards.

Portal	Data Description Standard Required?	Summary - Description Standard	Data Process Standards Required/ Provided?	Notes	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP
Marine Cadastre	Yes	FGDC Metadata/ISO	Yes – addresses: Inclusion	<p>*Marine Cadastre has standards that apply to their data viewer and data registry.</p> <p>*Standards address requirements for data descriptions (e.g., FGDC metadata) as well as guidance for inclusion (what should or should not be provided by the viewer/registry.)</p>	<p>*Vetted, well represented of general data types LIS MSP will likely use;</p> <p>*Provides some process guidance to enable determinations on what data could/should be provided.</p>	<p>*Designed to work within a national system, and may not be best suited to regional uses without modifying/re-evaluating process level standards, such as methods used to generate the dataset and the dataset’s spatial extent, resolution, and accuracy.</p>
Northeast Ocean Data Portal	In development, but assumed comparable to the NY Gateway	In development, but assumed comparable to NY Gateway	In development, but assumed comparable to NY Gateway	<p>*Contains similar scope/function to the NY Gateway (above) but at present does not currently have a fully vetted and complete data/process standards document. However, one is in development and based in large part on the NY Gateway. As such, comparable pros and cons can be reasonably assumed.</p>	N/A (in development)	N/A (in development)

Portal	Data Description Standard Required?	Summary - Description Standard	Data Process Standards Required/ Provided?	Notes	Advantages for use in LIS MSP	Potential drawbacks for use in LIS MSP
Mid-Atlantic Data Portal	Yes	FGDC and/or other relevant national/ international standards	Yes – addresses: inclusion	*Defines steps to address evaluating and including data within the portal (include measures and groups/entities responsible for decision making) *Requires authoritative base-level data descriptions (FGDC metadata)	*Vetted, representative of many data types LIS MSP will likely use *Provides descriptions of data and data processes relevant to evaluating data quality and relevance to LIS MSP	*Some mandatory criteria may be too exclusive, and what constitutes “appropriate methods” for assessing data are not well defined within the standard. (However, it is noted that objective criteria and “best professional judgment” should balance out in an evaluation process.)

Appendix III. Background on the NY Department of State, Office of Planning & Development's Geographic Information Gateway (NY Gateway) Consensus Statement

Working Group Consensus Statement

August Working Group Conference Call Re: New York Geographic Information Gateway
September 3, 2014

Background:

The CT-NY Bi-State MSP Working Group (Working Group) conference call on August 1, 2014 addressed questions and next steps concerning Working Group recognition and potential involvement in the New York Geographic Information (NY Gateway),. As a result of the discussion there was general enthusiasm about the NY Gateway and how it could help advance LIS MSP. It was agreed that the consensus reached on the call be articulated in writing to: 1) be reviewed by Working Group members not on the call so all members have a chance to weigh in (and the consensus statement amended if needed), 2) assure the State of CT is comfortable before assuming that consensus has been reached and 3) be able to provide NY DOS with a clear statement regarding Working Group involvement once the consensus statement is finalized.

Working Group members on the call included: David Blatt, Karen Chytalo, Sylvain DeGuise, Nathan Frohling, Jeff Herter, Wilhelmina Innes, Katie Lund, Liz Podowski, Tiffany Smythe, David Sutherland, Grant Westerson, Katherine Weaver and Bill Wise

Discussion Items and Findings:

- The Working Group has learned about the functionality and usability of the NY Gateway through Working Group calls and a July 10, 2014 web-ex.
- Obtaining the financial resources and staffing capacity to develop and host a Gateway capable of serving LIS MSP needs is a daunting task. The NY Gateway is and will become a highly functional, well-supported data portal that has the capacity to provide for many if not most of the needs of a potential LIS MSP effort, now and into the future.
- Other portals exist (e.g. NE Data Portal) and there may be some level of support for the LIS MSP effort through these portals. However, it is not certain that a LIS MSP effort can identify these portals as a primary portal home for LIS. Additionally, recommending the NY Gateway as a primary data portal does not mean that the LIS MSP effort can't use or won't need the support of other portals, which may in fact remain critical depending on how the process emerges.
- The Working Group does not contemplate an advantage in there being two primary LIS MSP portals if there can be one.
- NY DOS has indicated that it intends to include LIS on the NY Gateway and that it plans to host the NY Gateway well into the future.

- NY DOS has invited the Working Group to utilize and participate in the NY Gateway as a potentially primary data portal for use in LIS MSP.
- NY DOS has asked the Working Group to clarify its position on the NY Gateway and in particular whether the Working Group is interested in participating in contributing to its development.

Draft Consensus Statement:

“The Working Group finds that the NY Gateway provides an excellent data and information portal that can support the goals of the CT-NY Bi-State Marine Spatial Planning Working Group in its efforts to advance preparation for an official LIS MSP process. The States of CT and NY are the only parties who can make a decision regarding the ultimate use of the NY Gateway in an official LIS MSP process; however, the NY Gateway will likely be an excellent option for an official LIS MSP process, particularly one that supports a bi-state approach. Actions taken today that advance integration of a bi-state approach in supporting access to and use of geographic data on LIS, such as through Working Group support, are warranted. This position is further indicated given that the NY Gateway is being developed now and there may not be the same opportunity in the future. It is therefore the consensus view of the Working Group that the Working Group should continue to take actions that support the development of the NY Gateway as a vehicle for bi-state cooperation on LIS geographic data, including working with NY DOS on development of the NY Gateway to the extent possible and appropriate.”

Practical Interpretation of Statement:

The involvement and support of the Working Group has been discussed for 1) contributing to the functionality of the NY Gateway for LIS MSP and 2) contributing to the creation of story maps about LIS.

Functionality: The D&I Team’s LIS MSP Baseline Data Inventory serves as a contribution to the functionality of the NY Gateway. There may be further ways in which Working Group contributions can be made toward the NY Gateway LIS functionality, such as potential integration of data layers to provide greater clarity and/or insight into the data.

Story maps:* The story map feature received considerable discussion on the 7/31/14 Working Group call. This resulted in support for Working Group engagement in helping develop the LIS story map(s) to the extent feasible. This support was based on considering that: 1) proposed content would be topics that both states could agree on, 2) the Working Group would have the opportunity to propose, add and/or edit story content, 3) the Working Group, including the State of CT, would have to be comfortable with final content and how it is presented, 4) the process would provide an early venue for building bi-state collaboration and consensus building and as such support an important, broader LIS MSP goal, 5) Working Group involvement could aid in assuring story maps reflect a bi-state perspective and potentially serve a larger bi-state audience, 6) NY would provide examples and assistance in facilitating Working Group input, 7) actual Working Group input could be either through the existing D&I Team, a new team,

individuals or the Working Group as a whole and be set up once it is clear that there is sufficient individual interest and availability within the Working Group to participate.

**Story maps are illustrated, interactive online modules that can be used to highlight case studies, showcase community success stories, and demonstrate how geographic information is collected, analyzed, and utilized to improve planning and decision-making. Story maps combine text with a wide range of graphic devices, including diagrams, photographs, interactive maps, movies, and graphs.*