



**SALINITY DATA MANAGEMENT
BEST PRACTICES
WORKSHOP REPORT**

AUGUST 3-4, 2005

**CHARLESTON, SOUTH CAROLINA
HOSTED BY**



NOAA Coastal Services Center
LINKING PEOPLE, INFORMATION, AND TECHNOLOGY

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SUMMARY

The National Oceanic and Atmospheric Administration (NOAA) Coastal Services Center hosted a workshop focused on data management for real-time *in-situ* salinity data in Charleston, South Carolina, during the first week of August 2005. Participants in the workshop included representatives from NOAA offices and representatives from regionally based coastal ocean observing systems.

The workshop's goal was to create a "best practices" guide for users who collect, manage, and archive real-time, *in-situ* salinity data. This guide would include three topical areas:

1. Accurate quality control of salinity data
2. Management of metadata
3. Effective data dissemination to various users

Unfortunately, the goal was not quite met. Each of the workshop's topics required more in-depth discussions and debate than time allowed. Yet, the workshop made significant progress. The participants approved a concise set of quality control parameters for salinity. They narrowed the vast list of metadata parameters to a manageable level that future workshops can more fully address. Finally, the group formed a working group to focus on a data access and dissemination routine based on Web services. While salinity data will be the focus of this working group's efforts, the workshop attendees realize that data access and dissemination is a wide-ranging topical area that cuts across many oceanographic variables, and will require input and support from the broader coastal and oceanographic community.

This report presents the results of the salinity workshop, as well as some recommendations for future, similar workshops.

BACKGROUND

The Integrated Ocean Observing System (IOOS) is a developing initiative composed of three "framework" subsystems:

- Observing subsystem
- Data and communications subsystem
- Modeling and analysis subsystem

Much work has been done related to all three subsystems, but much more work is needed. This workshop focused on the data and communications subsystem, with a particular emphasis on the required information for documenting the collection and management of *in-situ* real-time salinity data, describing the quality of the data, and describing the method(s) for exchanging the data.

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The impetus for this workshop and the resulting outcomes build on the efforts of the Quality Assurance of Real-Time Oceanographic Data (QARTOD) workshops that have been sponsored by the National Data Buoy Center (NDBC) and the Center for Operational Oceanographic Products and Services (CO-OPS) over the last few years. Both QARTOD workshops have shown the value of bringing experts together to discuss the necessary data requirements to ensure high-quality data are available to users. As related components of the data management process, metadata and data access and transport have also been discussed at the QARTOD meetings and were specifically addressed during the salinity workshop.

The workshop goals are described below. The intent was to develop a best practices guide (i.e., a “cookbook” or “recipe”) for salinity data management with IOOS as the framework for the “cookbook.” Additionally, a workshop process applicable to any number of ocean and coastal parameters was a desired outcome.

Workshop Goal Statement

Using the developing Integrated Ocean Observing System (IOOS) and the Data Management and Communications (DMAC) efforts as a framework reference, this workshop will

- Implement a process to create draft best practices for managing *in-situ* real-time and near-real-time salinity data. Best practices for salinity data management will focus on the minimum information required to manage and make salinity data accessible to any user.
- Capture the best practices in a written document and submit to Ocean.US/DMAC with the intent of having them adopted for use and improvement by the IOOS community.
- Document the *process* for these workshops and share freely so that other groups might address other IOOS core variables.

To accomplish these goals in the short time frame allowed, a small group of individuals were asked to participate (Appendix A). Numerous documents relevant to salinity data management efforts were shared by the participants before the workshop. As detailed in the workshop agenda (Appendix B), a “straw man” was presented as a starting point for each component and the full group worked through the process (with the help of Dave Eslinger as facilitator) for each component of salinity data. The group then split into writing teams to capture the discussions and agreements relevant to each component. The efforts of these deliberations are captured below in each component section.

QUALITY CONTROL

Overview

Bill Burnett, lead for the quality control section, gave an overview on how the quality control straw man and templates were created. Most of the slides presented in the

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overview came from QARTOD II, templates derived from notes provided before the workshop, and discussions between NDBC and CO-OPS (while they are defining their operational quality control policies).

Some of the questions used to start and focus the discussion:

- What real-time quality control tests should be applied?
- What categories of real-time quality descriptor flags should be required?
- What real-time calibration flags should be required?

Discussion and Results

Real-time Quality Control Tests

The group agreed upon the following quality control scheme, indicators, and terminology for data providers:

Table 1: Quality Control Flags

Indicator	Value	Flag	Data Release Policy
Green	3	No flag	Pass – data released
Yellow	2	Soft flag	Caution – review before release
Red	1	Hard flag	Fail – data not released

Data that are flagged yellow should not be released to the public until the data can be reviewed.

The group agreed upon the following required and recommended real-time quality control checks (Table 2) for both hard and soft flags. This list constitutes the minimum suite of criteria checks (Table 3) associated with real-time data delivery. According to the agreed-upon quality control scheme, failure of one of these range-bound checks would cause a hard or soft flag and a determination upon review of whether the data would be released (soft) or not released (hard).

Table 2: Quality Control Checks

<p><u>Required – apply the following tests to measured parameters—if applicable</u></p> <ul style="list-style-type: none"> • Climatological range • Gradient • Persistence • Message integrity
<p><u>Recommended</u></p> <ul style="list-style-type: none"> • Biofouling • Other derived variables • Independent verification

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- | |
|--|
| <ul style="list-style-type: none"> • Nearest neighbor • Power • Density |
|--|

Table 3: Quality Control Check Criteria and Associated Flag

Category	Criteria	Flag	Criteria	Flag
REQUIRED				
Climatological Range	0 – 50 PSU (practical salinity units)	Hard	Determined by data provider	Soft
Gradient Range	Determined by data provider	Hard	Determined by data provider	Soft
Persistence			Determined by data provider – should be conductivity that is checked	Soft
Message Integrity	No bit or parity errors	Hard		
RECOMMENDED				
Biofouling	Biofouling measurements exceed threshold for sensor	Hard	Determined by data provider	Soft
Other Derived Variables	Compare to derived data such as speed of sound, specific gradient, etc.	Hard	Determined by data provider	Soft
Nearest Neighbor	Compare salinity observations to nearest neighbor (sensor or platform within 5 km)	Hard	Determined by data provider	Soft
Independent Verification	Compare observations with local expertise, model data, and remotely sensed data for same time period	Hard	Determined by data provider	Soft
Density	Density inversions with depth	Hard	Determined by data provider	Soft
Power	Power reports at 50% potential	Hard	Determined by data provider	Soft

Almost all the criteria have both hard and soft boundary checks. The hard flags tend to be more liberal of a constraint indicating gross or instrument bounds that should never be exceeded. The bounds set for the soft flags should have tighter (conservative) constraints that better represent the environment in which the sensor has been placed. In many cases, anomalous but real salinity events may trigger a soft flag (thus the need for data review) but should never trigger a hard flag. Hard flags should indicate a bad sensor.

Real-time Quality Descriptors

The group discussion culminated in the following observations:

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- There are two principal customer groups for real-time salinity data:
 1. Those users that are principally interested in the salinity observation for immediate application (e.g., maritime community). The group agreed that this customer group would be best served by an ensemble flag released with each data record.
 2. Those customers interested in archived full record (e.g., academia, oil and gas industry). The group agreed that data streams should contain the following quality descriptor flags:
 - Flags for each hard parameter
 - Ensemble flag linked to release of data
 - Flags for soft flags, if affordable
- To meet the needs of these two customer groups, it is probable that two data sets will have to be provided:
 1. Real-time observations (value 3 data only)
 2. Archived observations (data with all values)

Parking Lot Issues

- How do you deal with biofouling as a variable – different values for different regions?
- Semantics – “level” vs. “stage” vs. “?”
- Data dissemination – Are we doing “real time” or some archive? What about post processing for better quality control (QC) – how do you notify the users?
- Data stream continuity – reflect QC per some time step or over a period?
- Sensor calibration in QC, not a separate data check.

METADATA

Overview

Julie Bosch and Mike Moeller, leads for the metadata section, led the group through discussions of data dictionaries and through identification of what information is needed when discovering, accessing, and using a salinity data set.

Discussion and Results

Given:

- DMAC specifies the use of Federal Geographic Data Committee (FGDC) metadata standard.
- NDBC provided an example of information it needs from data providers (Appendix C). This information was used as a “straw man” to begin discussing what information was required for metadata.

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- An example FGDC metadata record developed using the NDBC example can be found in Appendix D.
- Metadata are defined as information about a data set. Their purpose is for data discovery, assessment, access, use, exchange and transport, and archiving.
- Data providers can capture metadata in any format they choose but will need to provide an FGDC-formatted metadata record to IOOS.

The purpose of this workshop from a metadata perspective was to develop a list of items that would need to be included in a metadata record. As mentioned, NDBC participants provided a list of information they require from data providers who are submitting data to their system. This list would form the framework to discuss what metadata information would be required and what would be recommended.

The metadata discussion began with a look at data dictionaries. It was initially hoped that a set of terms specific to salinity data could be identified and defined to form the framework for an IOOS salinity data dictionary. However, the discussion became fragmented and the group confused as to what was being described and what was being asked of the group. In the end, a consensus was reached that established four elements that would be required for any term included in an IOOS data dictionary. These were

- Source (contributing organization or data dictionary version)
- Standard name (e.g., "Salinity")
- Definition (e.g., "Mass of salt content of water sample")
- Units (e.g., "PSU")

In addition to these required elements, there were 20 recommended elements for each term.

- Short name
- Long name
- Category
- Character format
- Abbreviation
- NetCDF data type
- Dependency
- Data dimension (e.g., XYZ/sta ID)
- Domain of valid values
- "codes" – listed as part of domains
- Geophysical valid range
- Datum
- Standard version
- Version
- Comments and notes
- User
- Special usage
- Related terms
- Ancillary data

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- Station naming convention

In the end, no decisions were made regarding a data dictionary for IOOS salinity data beyond the above list of required and recommended information for any term used by data providers.

The metadata portion of the discussion consisted of two parts. The first presenting the NDBC metadata example and second explained how metadata were used to populate the example FGDC record (which was presented as a straw man for metadata development). Julie Bosch made some very good recommendations concerning the way information was incorporated into Section 5 – Entity and Attribute Information. The metadata group worked through the NDBC example and identified each item as required, recommended, or to be removed (Appendix E). The straw man FGDC metadata record was updated to reflect these recommendations.

The group recognized that not all the information that could be considered metadata should be captured within an FGDC record. For example, there may be information within an XML schema or data transport structure that may not fit well in the structure of the FGDC format and would be better defined elsewhere.

To accommodate a majority of IOOS users, the FGDC standard can easily be extended. Extending the standard will be addressed when elements are defined that are not included in the current structure of the standard.

DATA TRANSPORT

Overview

John Ulmer, lead for the data transport section, provided an overview of the Simple Object Access Protocol/eXtensible Markup Language (SOAP/XML) technology and presented it as a relatively straightforward and simple approach to sharing *in-situ* salinity data.

Discussion and Results

- The workshop supports the use of SOAP/XML as a candidate data-sharing technology.
- NDBC and CO-OPS will collaborate to produce a robust, full-treatment XML schema. Fiscal year 2006 work will start in approximately November.
- In the short term, a small team will draft a “light” salinity schema (“salty slim”), pulling schema content from existing efforts (Marine XML; Southeast Coastal Ocean Observing System, or SEACOOS; National Weather Service, or NWS; U.S. Geological Survey, or USGS, information; and any relevant international efforts).

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- Schema development will start for fixed point. Add directional degrees of freedom.
- The schema development effort will make sure DMAC data transport is relevant to the quality assurance and quality control (QA/QC) and metadata portions of the workshop.
- Application developer has responsibility on the client side to process beyond any characteristic other than date range and station.
- Workshop data transport team will address the following Web service methods doing 1, 2, and 3 (if resources allow) in the short term, and waiting on 4 and 5.
 - 1 – GetCapabilities (returns all other available methods with input types and return types)
 - 2 – GetLatestByStation (parameter, station_identifier)
 - 3 – GetDateRangeByStation (parameter, station_identifier, start_date, end_date)
 - 4 – GetLatestByBoundingBox (parameter, upper_left, lower_right)
 - 5 – GetDateRangeByBoundingBox (parameter, upper_left, lower_right, start_date, end_date)
- Data providers can add entities and attributes as long as they do not corrupt the base schema.

The Data Transport Working Group (DTWG) consists of

- John Ulmer (facilitator) – NOAA Coastal Services Center
- Shelly Fornea – NOAA NDBC
- Andrea Hardy – NOAA CO-OPS
- Jeremy Cothran – University of South Carolina
- Charles Seaton – Oregon Health and Sciences University
- Charlton Purvis – Consultant

Parking Lot Issues from the Workshop

1. Long-term durability of the standards development process. Who cares for salinity schema, and who says when we go from light to full?
Suggestion: Coastal Services Center will work this issue in short term until NDBC or CO-OPS is ready to publish its schema. CO-OPS may have Web resources available in the near future to serve as a host site for the Data Transport Working Group efforts.

There will be a future need to be able to pass QC-level requirements in the data request. Further pursuit of this must wait until resources are available.

Activity of the DTWG to Date

E-mail correspondence with the DTWG has been initiated and the following approach has been adopted.

The DTWG will produce:

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1. One or more XML schemas defining the format of a SOAP/XML response.
2. Basic description and definition of the GetCapabilities method.
3. Basic description and definition of the GetLatestBySensor method.
4. If time allows, a basic description and definition of the GetDateRangeBySensor method.

The general process to be used by the data transport working group follows. Given SOAP/XML as the architectural basis for the transport of real-time or near-real-time *in-situ* salinity data, this group will

1. Identify and survey existing XML schemata (or other data models such as the SEACOOS NetCDF data model).
2. From that survey, select or generate a light XML schema that may be largely based on one or more of those surveyed or may be an aggregation of some of their parts.
3. Produce basic descriptions of several rudimentary SOAP/XML Web Service methods. They will include
 - GetCapabilities – which will return a list of the other methods available with their associated input variables and outputs.
 - GetLatestBySensor (parameter_name, station or sensor identifier)
 - if time allows, GetDateRangeBySensor (parameter_name, sensor_id, start_date_time, end_date_time)

Some boundaries applied to the development of the light salinity schema:

- The first schema will be developed to handle data from a fixed sensor.
- If resources allow, that schema will be extended to handle moving sensors.
- Note that the DTWG does not intend to build the be-all, end-all schema for in-situ data. NDBC and CO-OPS have a broader effort planned for fiscal year 2006. The output of the DTWG should be a schema and group of SOAP/XML Web service methods that are immediately available for implementation.
- An overly complex schema will hinder adoption and implementation. Ideally, “salty slim” (the light schema) will be valuable and effective as a data exchange tool and will help prepare the ground for growing more complex and sophisticated solutions, such as that which will come out of the CO-OPS/NDBC effort.

RECOMMENDED NEXT STEPS

Some of the possible next steps for this or other groups interested in revising or completing the requirements for salinity data management in an IOOS context are as follows:

- Complete specifications of thresholds and criteria for quality checks.
- Specify and define quality descriptor flags.
- Address parking lot issues for quality control.
- Develop metadata template that incorporates FGDC requirements and additional user requirements.
- Specifically define data dictionary and its use.

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- Develop “place” for quality control information in metadata record.
- Develop “place” for quality control information in data transport schema.

The workshop participants also agreed strongly on the need to refine the workshop process itself so that future efforts can make use of the lessons learned. Since this was the first of the “more focused” workshops, a number of lessons learned are available to those groups that decide to hold future workshops.

To assist in planning for future workshops, a companion document on the workshop process, lessons learned, and recommendations for changes to format, methods, agenda, etc. will be made available shortly. Both of these documents can be obtained from either the NOAA Coastal Services Center (www.csc.noaa.gov) or from the Ocean.US Data Management and Communications (dmac.ocean.us/index.jsp).

APPENDIX A

Participants List

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APPENDIX B

Agenda

Day 1 (Wednesday August 3, 2005)

Time	Topics	Lead person(s)
7:30-8:00 AM	Continental breakfast	
8:00-8:40 AM	<p>Welcome and orientation to workshop goals and methods</p> <p><u>Objectives:</u> All workshop participants will:</p> <ul style="list-style-type: none"> • Be familiar with other workshop participants. • Know the purpose of the workshop. • Know the expected outputs for each segment of the workshop, and the final workshop product. • Be able to explain the anticipated outcome and benefits of the workshop product (document). • Understand the process, and the role of the facilitator(s). <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Introductions of participants and planning group, as appropriate. • Presentation of workshop goals, and justification of need. • Discussion of anticipated results or outcomes of each activity and how they relate to subsequent activities and the final product. Discussion of the facilitator(s) and their role(s). • Group discussion (and Q and A) of benefits to participants of anticipated outcomes. 	<p>People: Jim Boyd</p>
8:40-9:15 AM	<p>Introduction of Workshop Components and Process</p> <p><u>Objectives:</u> Participants will:</p> <ul style="list-style-type: none"> • Understand the components/sections to be covered. • Understand the process used to gather information. • Understand the interim “products” for each covered section. <p><u>Activities:</u> Step through the process to be followed of each</p>	<p>People: Jim Boyd, Dave Eslinger</p>

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Time	Topics	Lead person(s)
	<p>section. Same process for each section (this is just a rundown of what we will do...not doing it here):</p> <ul style="list-style-type: none"> • Process explanation <ul style="list-style-type: none"> • Straw man/templates introduced • Distinguish between “required” elements and “recommended” elements (possibly not for all sections). • Present list of starting point questions (from QARTOD) • General facilitated brainstorm session, or brainstorm ideas on sticky pads – post on flip charts (one for “required, one for recommended) • Review straw man/template to see how the elements fit the template. Revise as necessary. • Input on explanatory text that might be needed. • Any additional ideas/concerns put in “parking lot.” • Questions and answers 	
<p>9:15-10:15 AM</p>	<p>Data Quality Section</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • List of quality flags and descriptors (required and recommended here?) • Agreement on quality flags and descriptors • Draft template for quality flags and/or descriptors <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Straw man/template introduction • Starting point questions introduction – based on QARTOD • Brainstorm session on required and recommended elements 	<p>People: Dave Eslinger, Bill Burnett</p>
<p>10:15-10:30 AM</p>	<p>Break</p>	
<p>10:30-11:30 AM</p>	<p>Data Quality Section (continued)</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Agreement on quality flags and descriptors • Draft template for quality flags and/or descriptors <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Reconcile required and recommended 	<p>People: Dave Eslinger, Bill Burnett</p>

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Time	Topics	Lead person(s)
	<ul style="list-style-type: none"> • Fit elements to template and/or revise as necessary • Bulleted list of additional explanatory text items • Identify parking lot issues 	
<p>11:30 AM-1:00 PM</p>	<p>Lunch (on your own)</p>	
<p>1:00-3:00 PM</p>	<p>Metadata (Data Attributes) Section</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • List of required “elements” • List of recommended “elements” • Draft template for required and recommended elements • Definition of data dictionary and salinity data characteristics to include • Bulleted list of additional explanatory text items • Parking lot list for additional issues <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Discussion of DMAC guidance • Straw man/template introduction • Starting point questions introduction – based on QARTOD • Brainstorm session on required and recommended elements • Reconcile required and recommended • Data dictionary straw man/template introduction • Brainstorm session on salinity “data dictionary” elements • Reconcile required and/or recommended “dictionary” elements • Feedback to QA/QC component? • Bulleted list of additional explanatory text items • Identify parking lot issues 	<p>People: Dave Eslinger, Mike Moeller, Julie Bosch</p>
<p>3:00-3:15 PM</p>	<p>Break</p>	
<p>3:15-5:00 PM</p>	<p>Writing Session</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Capture data quality and metadata work as written text <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Break into two groups (quality, metadata) 	<p>People: Bill Burnett, Mike Moeller Julie Bosch</p>

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Time	Topics	Lead person(s)
	<ul style="list-style-type: none"> ○ Move back and forth, share, etc... as necessary ● Take flip charts, existing notes, discussion from earlier and write (for each section): <ul style="list-style-type: none"> ○ List of required elements ○ List of recommended elements ○ Any necessary definitions ○ Templates for capturing this information ○ Additional explanatory text ○ List or “future” considerations for others to explore (i.e., possibly parking lot issues) 	
5:00-5:15 PM	Recap of Day – Plan for Next Day	
5:15 PM	Adjourn Happy hour at Hank’s (if desired) Dinner on your own	

Day 2 (Thursday August 4, 2005)

Time	Topics (objectives, methods/activities, and time breakdown)	Lead person(s) responsible, materials and equipment
7:30-8:00 AM	Continental breakfast	
8:00-8:15 AM	<p>Welcome and recap of previous day. Preview of days’ activities, anticipated output, and next steps.</p> <p>Objectives:</p> <ul style="list-style-type: none"> ● All participants will start the day “on the same page” and with a common understanding of the process for the day, and how the previous day feeds into it <p>Activities:</p> <ul style="list-style-type: none"> ● Recap previous day’s work and output ● Preview plan for the day and expected output 	<p>People: Jim Boyd</p>

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Time	Topics (objectives, methods/activities, and time breakdown)	Lead person(s) responsible, materials and equipment
<p>8:15-10:15 AM</p>	<p>Data Access/Transport Section</p> <p>Objectives:</p> <ul style="list-style-type: none"> • List or requirements for data access/transport • Template or “example” code for packaging the required elements • Bulleted list of additional explanatory text items • Parking lot list for additional issues <p>Activities:</p> <ul style="list-style-type: none"> • Discussion of DMAC guidance • Discussion of existing methods • Straw man/template introduction • Starting point questions introduction • Brainstorm session on required and recommended elements • Reconcile required and recommended elements • Fit requirements/recommendations to template and/or revise as necessary • Feedback to QA/QC and metadata components • Bulleted list of additional explanatory text items • Identify parking lot issues 	<p>People: Dave Eslinger, John Ulmer</p>
<p>10:15-10:30 AM</p>	<p>Break</p>	
<p>10:30 AM-Noon</p>	<p>Writing Session(s)</p> <p>Objectives:</p> <ul style="list-style-type: none"> • Capture data access/transport work as written text • Continue writing session for data quality and/or metadata as necessary <p>Activities:</p> <ul style="list-style-type: none"> • Break into one, two, or three groups as needed to write data access/transport section and finish/refine quality and/or metadata sections <ul style="list-style-type: none"> ○ Move back and forth, share, etc... as necessary • Take flip charts, existing notes, discussion from earlier and write (for each section): <ul style="list-style-type: none"> ○ List of required elements ○ List of recommended elements ○ Any necessary definitions ○ Templates for capturing this information 	<p>People: John Ulmer</p>

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Time	Topics (objectives, methods/activities, and time breakdown)	Lead person(s) responsible, materials and equipment
	<ul style="list-style-type: none"> ○ Additional explanatory text ○ List or “future” considerations for others to explore (i.e., possibly parking lot issues) 	
Noon-1:15 PM	Lunch (on your own)	
1:15-2:15 PM	<p>Finalize Written Sections</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Polish text and prepare for report out <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Decide on report out format (text, PowerPoint, narrative, etc.) • Prepare report out 	<p>People: Bill Burnett, Julie Bosch, Mike Moeller, John Ulmer</p>
2:00-3:00 PM	<p>Report Out</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Present and consensus on the details <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Group reports 	<p>People: TBD</p>
3:00-3:15 PM	Break	
3:15-4:00 PM	<p>Parking Lot Issues</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Identify issues to highlight as needing further work (in the final report) <p><u>Activities:</u></p> <ul style="list-style-type: none"> • Run through parking lot lists • Mark ones that need to be in the report 	<p>People: Dave Eslinger, Jim Boyd</p>
4:00-4:30 PM	<p>De-brief on Workshop and Process</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Solicit open feedback to make the workshop process better 	<p>People: Dave Eslinger, Jim Boyd</p>

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Time	Topics (objectives, methods/activities, and time breakdown)	Lead person(s) responsible, materials and equipment
	<p><u>Activities:</u></p> <ul style="list-style-type: none"> • What worked? • What did not work? • What would you change? • Is this adaptable to other IOOS variables? • Would you feel comfortable organizing and running a workshop based on this process? 	
4:30-5:00 PM	<p>Next Steps</p> <p><u>Objectives:</u></p> <ul style="list-style-type: none"> • Determine who does what to get a final salinity best practices report completed • Determine who does what to get a final best practices workshop process report completed <p><u>Activities:</u></p> <ul style="list-style-type: none"> • List tasks with responsible parties for salinity report • List tasks with responsible parties for workshop process report 	<p>People: Dave Eslinger, Jim Boyd</p>
5:00 PM	Adjourn (Happy hour!)	

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APPENDIX C

Information Required by NDBC from External Data Providers

Metadata for Salinity and Temperature Data Provider Stations			
Use this spreadsheet to communicate required processing and display information to NDBC. The completed form should be emailed to ndbc. Questions about the form should be emailed to the same address.			
Station IDs will be provided by NDBC. This blue background indicates a field that will be filled in by NDBC.			
1. Operator Information			
Operator (text for Owned and Maintained by credit on NDBC web site)			
Operator URL (Optional, will be hyperlinked from NDBC website to Owner)			
Name of Operator Contact			
Phone Number of Operator Contact			
Operator email address to be used by NDBC for notification of outages and for MMS contact			
IP address of FTP delivery server			
FTP Account ID (on NDBC ftp server)			
NDBC accepts other kinds of ocean and weather data. Do you wish to be contacted about providing other types of data to NDBC?			
2. Unique Station Information			
	Station 1		Station 2
Station Type (e.g., Mooring (Subsurface or Surface floatation), Fixed Platform, Bottom Mount, Cast, Drifting)			
If moored, type of mooring (Taut, Catenary, etc)			
Platform/Station Name			
Platform Deployment Date (date when platform was last deployed: yyyyymmdd)			
Latitude (deg min sec)			
Longitude (deg min sec)			
Datum used for Lat/Long			
Water depth (m)			
Station ID			
WMO Message Format(s) (e.g., FM64, FM13, FM18, FM65)			
GTS Routing Identifiers			
Site elevation (m) (Required if weather data provided)			
Site photo (optional)			
3. Instrument Information (for each unit on Platform)			
	Unit 1	Unit 2	Unit 1
Instrument ID or serial number			
Instrument Manufacturer (e.g. SeaBird Electronics)			
Instrument model (e.g.37-IMP MicroCat)			
Date of Last Calibration/Calibration Facility (e.g. 20030224/Manufacturer)			
Instrument Deployment Date (yyyyymmdd)			
Recovery time (real-time; recovered bi-annually, etc.)			
Instrument depth (meters)			
Vertical Datum Reference for Instrument depth (sea level at time of installation, mean sea level, mean lower low water?)			
Time data reference (GMT required)			
Number of sampling periods per hour			
Number of Samples in the Sampling Period			
Sampling period (minutes, 0 = Instantaneous)			
Clock time represents middle, beginning, or end of period?			

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Information required by NDBC from external data providers (continued)

Metadata for Salinity and Temperature Data Provider Stations	
Use this spreadsheet to communicate required processing and display information to NDBC. The completed form should be emailed to ndbc. Questions about the form should be emailed to the same address.	
Station IDs will be provided by NDBC. This blue background indicates a field that will be filled in by NDBC.	
4. Sensor Information for Instrument	
Temperature Sensor Present ?	
Temperature Data Precision (e.g. 0.001 for 3 decimal places)	
Temperature Units (degrees Celsius required)	
Temperature Standard (e.g., ITS90, IPTS-68(75))	
Temperature Valid Maximum	
Temperature Valid Minimum	
Conductivity Sensor Present ?	
Conductivity Data Precision (e.g. 0.001 for 3 decimal places)	
Conductivity Units (e.g. S/m)	
Conductivity Valid Maximum	
Conductivity Valid Minimum	
Has Pressure Loading Compensation Been Applied to Conductivity?	
Salinity	
Salinity Data Precision (e.g. 0.001 for 3 decimal places)	
Salinity Accuracy	
Salinity Units (psu required)	
Salinity Scale Conventions (e.g. "PSS-78")	
Salinity Valid Maximum	
Salinity Valid Minimum	
Pressure Sensor Present ?	
Pressure Data Precision (e.g. 0.1)	
Pressure Units (psi, decibars, or meters)	
Pressure Valid Maximum	
Pressure Valid Minimum	
Pressure Corrected for Sea-level Pressure	
Method of Sea-level Pressure Correction (dynamic from observation or mean sea-level pressure)	
5. QA/QC Flags for Data Variables (Flags indicate operators confidence level in provided data)	
Flag Values (e.g. 0,1,2,3,4,-9)	
Flag Meanings (e.g. good, suspect, bad, not_evaluated, interpolated, missing)	
Flag Conventions/Reference (e.g. QARTOD II)	
QA/QC Procedures Applied (e.g. None, Range_Checking, Salinity_Despiked, ...)	

APPENDIX D

The following metadata example features those elements suggested as "essential" from the FGDC's "Metadata Quick Guide." Element-specific information from that document is colored blue. The text in red represents the information required by NBDC, as shown in Appendix C. This information was mapped to the appropriate element within the FGDC structure.

Identification_Information:

Citation:

Citation_Information:

Originator: **Operator**

Publication_Date:

The date that the data were published or otherwise made available. Remember format: YYYY/MM/DD.

Title:

Minimum – where, what, when,

Best practice: who, why, resolution, filename, source e.g. "Aquifer Systems and Recharge Potential in Louisiana from LDEQ source data, Geographic NAD83, LOSCO (1999) [aqrgeog3dpdeq]"

Online_Linkage: **Operator URL**

Description:

Abstract:

Be sure to include

- general content and features
- data set form (GIS, CAD, image, Dbase)
- geographic coverage (county/city name)
- time period of content (begin and end date or single date)
- special data characteristics or limitations

Purpose:

Supplemental_Information:

A comment field in which you can:

- place information that is not elsewhere covered
- "front" important information such as related studies, data set limitations, and notifications

Time_Period_of_Content:

Time_Period_Information:

Single_Date/Time:

Multiple_Dates/Times:

Range_of_Dates/Times:

Currentness_Reference:

The context for the Time_Period_of_Content. For example: an orthophotograph may have been compiled and delivered in June (publication date) but flown in February (ground condition).

Status:

Progress:

The status of the data set, this field has a fixed domain of: "Complete", "In Work", and "Planned." Note that federal agencies must create metadata for planned data acquisitions estimated at a cost of \$500,000 or greater as of FY05) to enable discovery by potential data development partners.

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: **Longitude (degrees, minutes, seconds)**

East_Bounding_Coordinate: **Longitude (degrees, minutes, seconds)**

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North_Bounding_Coordinate: Latitude **(degrees, minutes, seconds)**
South_Bounding_Coordinate: Latitude **(degrees, minutes, seconds)**

Keywords:
Theme:
Theme_Keyword_Thesaurus:
Theme_Keyword:
Include broad and specific terms and use controlled vocabularies (thesauri) when possible.
– Include at least one ISO Topic Category (see page 8) referencing the associated Theme_Keyword_Thesaurus as "ISO 19115 Topic Category"
– Include additional descriptive terms to qualify Topic Category

Place:
Place_Keyword_Thesaurus:
Place_Keyword:
Include specific and regional references such as:
– city or county name
– state
– state acronym
– regional descriptions and references e.g., Appalachia, Puget Sound, DelMar Peninsula,
etc.

Stratum:
Stratum_Keyword_Thesaurus:
Stratum_Keyword:
For use in atmospheric, geologic, and oceanographic data, e.g., ionosphere, surface,
seafloor

Temporal:
Temporal_Keyword_Thesaurus:
Temporal_Keyword: For use in scientific and historical data, e.g., diurnal, Ming dynasty,

Machine Age

Access_Constraints:
Any restrictions or legal prerequisites to accessing the actual data set. Commonly applies to data sets that are exempt from public records laws such as endangered species, personal health, and intellectual properties.

Use_Constraints:
Any restrictions or legal prerequisites to using the data set. Common constraints include:
– must read and fully comprehend the metadata before data use
– acknowledgment of the Originator when using the data set as a source
– sharing of data products developed using the source data set with the Originator
– data should not be used beyond the limits of the source scale
– the data set is NOT a survey document and should not be utilized as such

Point_of_Contact:
Contact_Information:
Contact_Person_Primary:
Contact_Person: **Name of Operator Contact**
Contact_Organization: **Name of Organization for Operator Contact**
Contact_Position:
Contact_Address:
Address_Type:
Address:
City:
State_or_Province:
Postal_Code:
Country:
Contact_Voice_Telephone: **Phone number of Operator Contact**
Contact_Electronic_Mail_Address: **Operator e-mail address to be used by NDBC for notification of outages and for MMS contact**
Hours_of_Service:

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Data_Set_Credit:

Identify others that should be recognized for their contributions to the data set. This includes data development contractors as discussed, above, for Originator.

Native_Data_Set_Environment:

Optional but highly recommended

- software and version
- operating system and version
- platform

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

How sure are you that it IS a pine tree?

Assessments as to how "true" the attribute values may be. May refer to field checks, cross-checks with other documents, statistical analysis of values, and parallel independent measures. It does NOT refer to the positional accuracy of the feature.

Logical_Consistency_Report:

Did you check for bad values and conditions?

Tests used to check for data inconsistencies including topological checks (clean and build), and database QA/QC routines such as: Are the X values always between "0" and "100"? Are all "Y" values text format? Does value Z always equal the sum of values "R" and "S"?

Completeness_Report:

Is there anything I might expect to be in the data set that isn't?

Identification of data omitted from the data set that might normally be expected, as well as the reason for the exclusion. This may include geographic exclusions, "data were not available for the South Shores neighborhood"; categorical exclusions "municipalities with populations under 1,000 were not included"; and definitions used "floating marsh was mapped as land".

Positional_Accuracy:

Horizontal_Positional_Accuracy:

Horizontal_Positional_Accuracy_Report:

How sure are you that the pine tree is where you say it is?

Assessments as to the horizontal or vertical location of the feature. May refer to field checks, Maximum Allowable PDOP, survey quality, cross-checks with other locational references, etc.

Vertical_Positional_Accuracy:

Vertical_Positional_Accuracy_Report:

Lineage:

Source_Information:

Source_Citation:

Citation_Information:

Originator:

Publication_Date:

Title:

Process_Step:

Process_Description:

Describe QC process and flag definitions in this section. Alternately, use the Entity/Attribute section (as shown later in this example record) to capture this information.

Can be a single collective description or individual process steps based upon;

- stages of processing
- incorporation of sources
- project milestone

Process_Date:

Process_Contact:

Contact_Information:

Contact_Person_Primary:

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Contact_Person: The individual responsible for the data processing and "putting" the data together.

Contact_Organization:

Contact_Organization_Primary:

Contact_Organization:

Contact_Person:

Contact_Position:

Cloud_Cover:

Leave blank for GIS and digital map files

– include values for imagery and photography

NOTE: this fields requires an integer, text responses should not be used.

– "0" through "99" indicate percent of the image obscured by cloud cover

– "100" indicates the value is unknown.

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference:

Any precise method of locating the data sans coordinates. Includes:

– Geographic Names Index System (GNIS) place names

– Public Land Survey System (PLSS) locations

– Federal Information Processing System (FIPS) location codes

Direct_Spatial_Reference_Method: Indicate "vector" or "point" or "raster". Cannot select more than one.

Point_and_Vector_Object_Information:

SDTS_Terms_Description:

SDTS_Point_and_Vector_Object_Type:

for GIS files use "Autocapture" feature of SMMS or ArcCatalog to populate

– see SDTS Definition Object Types at

http://mcmweb.er.usgs.gov/sdts/SDTS_standard_nov97/part1b10.html#152231

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic:

Latitude_Resolution:

Longitude_Resolution:

Geographic_Coordinate_Units:

Planar:

Map_Projection:

Grid_Coordinate_System:

Local_Planar:

Planar_Coordinate_Information:

Planar_Coordinate_Encoding_Method:

Coordinate_Representation:

Abscissa_Resolution:

The smallest distance that can exist between two points. The value is almost always the same for both the X axis (abscissa) and the Y axis (ordinate) but may differ for non-square pixels.

Vector data – This is commonly the "fuzzy tolerance" or "clustering" setting that establishes the minimum distance at which two points will NOT be automatically converged by the data collection device (digitizer, GPS, etc.)

Raster data – The values normally represent the pixel size, e.g. for Thematic Mapper (TM) imagery, the value would be "30".

Note: this must be a real number and the units of measure are recorded as Planar_Distance_Units (4.1.2.4.4) (see next item).

Ordinate_Resolution:

Distance_and_Bearing_Representation:

Distance_Resolution:

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Bearing_Resolution:
Bearing_Units:
Bearing_Reference_Direction:
Bearing_Reference_Meridian:
Planar_Distance_Units:

The units of measures for the Coordinate_Representation (abscissa/ordinate resolution) or the Distance_and_Bearing_Representation. For the TM example provided above the units of measure would be "meters. For the fuzzy tolerance example provided above, the units of measure would commonly be "millimeters".

Local:
Local_Description:
Local_Georeference_Information:
Geodetic_Model:
Horizontal_Datum_Name:
Ellipsoid_Name:
Semi-major_Axis:
Denominator_of_Flattening_Ratio:
Vertical_Coordinate_System_Definition:
Depth_System_Definition:
Depth_Datum_Name:
Depth_Resolution:
Depth_Distance_Units:
Depth_Encoding_Method:
Entity_and_Attribute_Information:
Detailed_Description:
Entity_Type:
Entity_Type_Label: **Unique Station Information**
Entity_Type_Definition:
Entity_Type_Definition_Source:
Attribute:
Attribute_Label: **Station ID**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **WMO Message Format**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **GTS Routing Identifiers**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Station Type**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain: **(e.g., Mooring (Subsurface or Surface flotation), Fixed Platform, Bottom Mount, Cast, Drifting)**
Attribute:
Attribute_Label: **Type of Mooring**

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Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Unrepresentable_Domain:

Attribute:

Attribute_Label: **Platform/Station name**

Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Unrepresentable_Domain:

Attribute:

Attribute_Label: **Platform Deployment Date**

Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Unrepresentable_Domain:

Attribute:

Attribute_Label: **Latitude**

Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Range_Domain:
 Range_Domain_Minimum:
 Range_Domain_Maximum:
 Attribute_Units_of_Measure:
 Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Longitude**

Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Range_Domain:
 Range_Domain_Minimum:
 Range_Domain_Maximum:
 Attribute_Units_of_Measure:
 Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Datum used for Lat/Long**

Attribute_Definition:

Attribute_Definition_Source:
Attribute_Domain_Values:
 Unrepresentable_Domain:

Attribute:

Attribute_Label: **Water depth**

Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Range_Domain:
 Range_Domain_Minimum:
 Range_Domain_Maximum:
 Attribute_Units_of_Measure:
 Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Site Elevation**

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Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
 Range_Domain:
 Range_Domain_Minimum:
 Range_Domain_Maximum:
 Attribute_Units_of_Measure:
 Attribute_Measurement_Resolution:

Attribute:
 Attribute_Label: **Site Photo**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:

Detailed_Description:
 Entity_Type:
 Entity_Type_Label: **Instrument Information**
 Entity_Type_Definition:
 Entity_Type_Definition_Source:
 Attribute:
 Attribute_Label: **Instrument ID**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:
 Attribute:
 Attribute_Label: **Instrument Manufacturer**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:
 Attribute:
 Attribute_Label: **Instrument Model**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:
 Attribute:
 Attribute_Label: **Date of Last Calibration**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:
 Attribute:
 Attribute_Label: **Calibration Facility**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:
 Attribute:
 Attribute_Label: **Instrument Deployment Date**
 Attribute_Definition:
 Attribute_Definition_Source:
 Attribute_Domain_Values:
 Unrepresentable_Domain:

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Attribute:

Attribute_Label: **Recovery Time**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Vertical Datum Reference for Instrument Depth**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Time Data Reference**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Number of sampling periods per hour**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Number of samples in Sampling Period**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Sampling Period**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Clock time represents middle, beginning, or end of period?**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Detailed_Description:

Entity_Type:

Entity_Type_Label: **Sensor Information for Instrument**

Entity_Type_Definition:

Entity_Type_Definition_Source:

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Attribute:

Attribute_Label: **Temperature sensor present**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Temperature Data Precision**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Temperature Units**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Temperature Standards**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Temperature Valid Minimum**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Temperature Valid Maximum**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Conductivity sensor present**

Attribute_Definition:

Attribute_Definition_Source:

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Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Conductivity Data Precision**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum:
Range_Domain_Maximum:
Attribute_Units_of_Measure:
Attribute_Measurement_Resolution:
Attribute:
Attribute_Label: **Conductivity Units**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Conductivity Valid Minimum**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum:
Range_Domain_Maximum:
Attribute_Units_of_Measure:
Attribute_Measurement_Resolution:
Attribute:
Attribute_Label: **Conductivity Valid Maximum**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum:
Range_Domain_Maximum:
Attribute_Units_of_Measure:
Attribute_Measurement_Resolution:
Attribute:
Attribute_Label: **Has pressure loading compensation been applied to conductivity**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Salinity**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Salinity Data Precision**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Range_Domain:

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Range_Domain_Minimum:
Range_Domain_Maximum:
Attribute_Units_of_Measure:
Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Salinity Accuracy**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Salinity Units**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Salinity Scale Conventions**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Salinity Valid Minimum**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Salinity Valid Maximum**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Range_Domain:

Range_Domain_Minimum:

Range_Domain_Maximum:

Attribute_Units_of_Measure:

Attribute_Measurement_Resolution:

Attribute:

Attribute_Label: **Pressure Sensor present**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Unrepresentable_Domain:

Attribute:

Attribute_Label: **Pressure Units**

Attribute_Definition:

Attribute_Definition_Source:

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Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Pressure Valid Minimum**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum:
Range_Domain_Maximum:
Attribute_Units_of_Measure:
Attribute_Measurement_Resolution:
Attribute:
Attribute_Label: **Pressure Valid Maximum**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Range_Domain:
Range_Domain_Minimum:
Range_Domain_Maximum:
Attribute_Units_of_Measure:
Attribute_Measurement_Resolution:
Attribute:
Attribute_Label: **Pressure corrected for Sea-level pressure**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Attribute:
Attribute_Label: **Method of Sea-level pressure correction**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Unrepresentable_Domain:
Detailed_Description:
Entity_Type:
Entity_Type_Label: **QC Flags for Data Variables**
Entity_Type_Definition:
Entity_Type_Definition_Source:
Attribute:
Attribute_Label: **Flag values**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Attribute:
Attribute_Label: **Flag meanings**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Attribute:
Attribute_Label: **Flag Conventions/Reference**
Attribute_Definition:
Attribute_Definition_Source:
Attribute_Domain_Values:
Attribute:

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Attribute_Label: **QC procedures applied**

Attribute_Definition:

Attribute_Definition_Source:

Attribute_Domain_Values:

Overview_Description:

Entity_and_Attribute_Overview:

Provide an overview description if:

your database is well-documented as a data dictionary, data specification manual, or some other format, AND you can provide data consumers a citation for the document and, if applicable, a Web site link to the document.

your database is minimal and you can adequately describe in a short descriptive paragraph. For example, for a black and white orthophotograph, you may want to indicate that each pixel will have a gray scale value between 0 (black) and 255 (white). Be sure to explain any unclear attribute labels and codes.

Distribution_Information:

Distributor:

Contact_Information:

Contact_Person_Primary:

Contact_Person:

Contact_Organization:

Contact_Organization_Primary:

Contact_Organization:

Contact_Person:

Contact_Position:

Resource_Description: **IP address of FTP delivery server**

Distribution_Liability:

Metadata_Reference_Information:

Metadata_Date:

Metadata_Contact:

Metadata_Standard_Name:

Metadata_Standard_Version:

Metadata_Access_Constraints:

Metadata_Use_Constraints:

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APPENDIX E

Required and Recommended Salinity Metadata Elements – Based on NDBC Template in Appendix C

Metadata for Salinity and Temperature Data Provider	Conditionality
Use this spreadsheet to communicate required processing and display information to NDBC. The completed form should be emailed to NDBC. Questions about the form should be emailed to the same address.	
Station IDs will be provided by NDBC. This blue background indicates a field that will be filled in by NDBC.	
1. Operator Information	
Operator (text for Owned and Maintained by credit on NDBC web site)	Required
Operator URL (Optional, will be hyperlinked from NDBC website to Owner)	Required (rename as Data Resource Location)
Name of Operator Contact	Required
Phone Number of Operator Contact	Required
Operator email address to be used by NDBC for notification of outages and for MMS contact	Required
IP address of FTP delivery server	remove
FTP Account ID (on NDBC ftp server)	remove
NDBC accepts other kinds of ocean and weather data. Do you wish to be contacted about providing other types of data to	Required
2. Unique Station Information	
Station Type (e.g., Mooring (Subsurface or Surface floatation), Fixed Platform, Bottom Mount, Cast, Drifting)	Required
If moored, type of mooring (Taut, Catenary, etc)	Recommended
Platform/Station Name	Required
Platform Deployment Date (date when platform was last deployed: yyyyymmdd)	Recommended
Latitude (deg min sec)	Required
Longitude (deg min sec)	Required
Datum used for Lat/Long	Required
Bottom depth (m)	Required
Source of bottom water depth	Recommended
Station ID	Required
ID Source	Required
Data Format(s) (e.g. acsi, csv, FM64, FM13, etc)	Recommended
GTS Routing Identifiers	remove
Site elevation (m) (Required if weather data provided)	remove
Site photo (optional)	remove
3. Instrument Information (for each unit on Platform)	
Instrument ID or serial number	recommended
Instrument Manufacturer (e.g. SeaBird Electronics)	required
Instrument model (e.g.37-IMP MicroCat)	required
Date of Last Calibration/Calibration Facility (e.g. 20030224/Manufacturer)	required
Calibration coefficient availability	recommended
Instrument Deployment Date (yyyyymmdd)	recommended
Recovery time (real-time; recovered bi-annually, etc.)	recommended
measurement depth (s) (meters)	required
Vertical Datum Reference for measurement depth (sea level at time of installation, mean sea level, mean lower low water?)	required
Time data reference (GMT required) (time zone)	required
Number of sampling periods per hour	required
Number of Samples in the Sampling Period	required
Sampling period (minutes, 0 = Instantaneous)	required
Averaging period	required
Time stamp represents middle, beginning, or end of period?	required

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**Required and Recommended Salinity Metadata Elements – Based on NDBC
Template in Appendix C (continued)**

Metadata for Salinity and Temperature Data Provider	Conditionality
4. Sensor Information for Instrument	
Temperature Sensor Present ?	required
Temperature Data Precision (e.g. 0.001 for 3 decimal places)	recommended
Temperature data accuracy	recommended
Temperature Units (degrees Celcius required)	required
Temperature Standard (e.g., ITS90, IPTS-68(75))	recommended
Temperature Valid Maximum	required
Temperature Valid maximum definition	required
Temperature Valid Minimum	required
Temperature Valid Minimum Definition	required
Conductivity Sensor Present ?	
Conductivity Data Precision (e.g. 0.001 for 3 decimal places)	recommended
Conductivity accuracy	recommended
Conductivity Units (e.g. S/m)	required
Conductivity Valid Maximum	required
Conductivity Valid Maximum definition	required
Conductivity Valid Minimum	required
Conductivity Valid Minimum definition	required
Has Pressure Loading Compensation Been Applied to Conductivity?	remove
Salinity	
Salinity Data Precision (e.g. 0.001 for 3 decimal places)	recommended
Salinity data Accuracy	recommended
Salinity Units (psu required)	required
Salinity Scale Conventions (e.g. "PSS-78")	required
Salinity Valid Maximum	required
Salinity Valid Maximum definition	required
Salinity Valid Minimum	required
Salinity Valid Minimum definition	required
Pressure Sensor Present ?	
Pressure Data Accuracy	recommended
Pressure Data Precision (e.g. 0.1)	recommended
Pressure Units (psi, decibars, or meters)	required
Pressure Valid Maximum	required
Pressure Valid Maximum definition	required
Pressure Valid Minimum	required
Pressure Valid Minimum definition	required
5. QA/QC Flags for Data Variables (Flags indicate operators confidence level in provided data)	
Flag Values (e.g. 0,1,2,3,4,-9)	required
Flag Meanings (e.g. good, suspect, bad, not_evaluated, interpolated, missing)	required
Flag Conventions/Reference (e.g. QARTOD II)	recommended
QA/QC Procedures Applied (e.g. None, Range_Checking, Salinity_Despiked, ...)	recommended
6. Processing	
Pressure Corrected for Sea-level Pressure	required
Method of Sea-level Pressure Correction (dynamic from observation or mean sea-level pressure)	required
What correction applied if any to the data?	required
7. Data Telemetry	
Telemetry Frequency	Required
Telemetry System Type	recommended