Kachemak Bay Research Reserve (KAC) NERR Water Quality Metadata
January – December 2002
Latest Update: September 11, 2003

I. Data Set and Research Descriptors

1) Principle Investigators & Contact Persons:

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2) Entry Verification:

For the Homer, Homer Dolphin, and Seldovia sites, the 15 minute data are uploaded to the PC from the YSI Model 6200 Data Acquisition System via modem at 60 minute intervals. For the Port Graham and Bear Cove sites, the data are uploaded to the PC from the YSI Model 6600 datasonde. The text files are initially viewed with Ecowatch software and graphs are produced to look for suspect data, as may result from probe failure. Notes are made of any unusual data, and sensors are reconditioned as necessary.

The text data files are run through a Matlab routine created by Scott Pegau for processing. This routine is attached at the end of this report. For the Homer and Seldovia permanent sites, a separate sonde reading was taken, in addition to the reading stored in the DCP, for backup purposes in the event of power or modem failure. For periods when two sets of data are recorded the routine returns the averages of the two data sets. Due to changes in sampling during the year the routine is set to only output data every half-hour. Data that were recorded when the instruments were out of the water are deleted from the beginning and end of each record. These data are identified by unusual

depth and salinity data (usually near zero). The routine outputs a data file listing the missing data points, fills all cells that do not contain data with periods, and finds and removes all data points that fall outside the range of what the data logger is designed to measure or are out of realistic ranges for Kachemak Bay. The routine then processes the data through several filters to flag and remove suspect data points that are greater than 4 standard deviations from data gathered in the 24 hour period surrounding the point. In addition, a graphing capability is included to produce single and multi-parameter graphs on a monthly or yearly basis. The routine outputs monthly files with column widths formatted to the correct number of decimal places based on YSI sensor specifications.

Anomalous data are evaluated to determine whether to flag or delete the suspect values. Data are flagged if they fall outside the normal values seen at the site or outside the range of measurements and accuracy established for the sensors. Data outside the "normal" range of water quality for a particular site were investigated for validity based on weather data, field observations, QC checks, and instrument diagnostics. Data are deleted if anomalies are attributed to sensor malfunction or fouling of the sensors by aquatic organisms, debris, or sediment. Fouling of sensors is detected by comparing in-situ sensor readings with measurements. In addition, sensor readings that differ significantly (>10%) from calibration standards suggest that the sensor was fouled during deployment. After corrections are made to the text files and anomalies noted in the metadata report, the edited files are exported as tab delimited (*.txt) and sent to the CDMO. Monthly raw (*.dat) files are also sent to the CDMO for archival. Katie Gaut and Scott Pegau are responsible for these tasks.

3) Research Objectives:

The YSI electronic data loggers are programmed to measure the water temperature, specific conductivity, dissolved oxygen, pH, and turbidity conditions at 15-minute intervals. Two permanent and two seasonal instruments

are located in Kachemak Bay. The permanent sites are located on the northeast side of the bay at the end of the Homer spit and the second on the southwest side of the bay in Seldovia. The seasonal moorings are located at endpoints of the Bay, Port Graham and Bear Cove, spanning a 40 mile distance.

The circulation in Kachemak Bay is driven primarily by the 10 meter tidal flux. Regional circulation is characterized by generally cyclonic ocean currents in the Gulf of Alaska flowing onto the shelf off of Cook Inlet. Nutrient rich bottom water is upwelled and mixed with surface water. These enriched waters stream into Kachemak Bay, the inflow tending to stay along the southern shore and the Port Graham and Seldovia instruments, while water flowing out of the bay stays along the Inner Bay and north shore, flowing past the Bear Cove and Homer instruments. These trapped coastal flows separate the bay into two distinct ecosystems and the instruments are positioned to reflect this distinction.

As the inflowing water proceeds up the bay, fresh water runoff from the surrounding ice fields and watersheds dilute the salinity and increase the sediment load in the path of the Bear Cove and then Homer instrument. The inflowing water, in the path of the Port Graham and Seldovia instruments, therefore, initially supports a marine system while the north out flowing water of the Bear Cove, and Homer sites, is more estuarine. The Kachemak Bay water quality instruments capture this difference with deployments along the north and south shores. These seasonal moorings monitor the degradation of the marine water along and across the axis of the bay. These data will be used to supplement studies on primary productivity, larval distribution, settlement, recruitment, growth rates, community dynamics, and biodiversity in the bay.

4) Research Methods:

The permanent sites of Homer and Seldovia have YSI 6600 Sonde Data Loggers connected to 6200 Data Acquisition Systems that are used for data collection. The Data Acquisition System is connected via modem to a computer at the Research Reserve. The raw data is collected in 15-minute intervals, stored on the 6200 DCP and interrogated, or downloaded, by our office computer hourly. Both

instruments are housed in ABS pipe mounted vertically on the ferry docks of Homer and Seldovia. The pipes are positioned to ensure that the sensors are approximately 1 meter above the bottom.

Port Graham and Bear Cove have YSI 6600 Sonde Data Loggers attached to seasonal moorings in an average of 10 meters (mean tide) of water and constructed to ensure the data logger rested 1 meter above the bottom.

Calibration and deployment occurred monthly during winter months and biweekly during summer month (weather dependent), using methods outlined in the YSI Operating and Service Manual. After cleaning the data loggers, the dissolved oxygen (DO) membrane is replaced and allowed to burn in for 12 hours before the DO sensor is calibrated in water-saturated air. The pH, conductivity, depth, and turbidity sensors are calibrated using the following standards purchased from YSI (except depth): pH 7 and 10, conductivity standards of 50 mS/cm, respectively, and depth of 0. Turbidity standard of 100 NTU is purchased through Riccia. Errors in the calibration of the turbidity sensors adversely affected turbidity data collected once the new turbidity probes were attached.

5) Site Location and Character:

Kachemak Bay is located approximately 150 miles south of Anchorage, on the western shore of the Kenai Peninsula. Kachemak Bay, at 59.6° N and 151.5° W, is a temperate regional fjord with hydrographic conditions unique among the NERR system estuaries. The tidal range of 9 meters is the second largest in the world and salinity ranges from near zero at stream mouths to 34.0 at the entrance to the inner Bay. The bay is 24 miles wide at its mouth and approximately 36 miles long. The head of Kachemak Bay is located to the northeast at the Fox River Flats, and the mouth lies to the southwest, along a line between Anchor Point and Point Pogibshi. Kachemak Bay is split into inner and outer Bays by the four mile long Homer Spit that extends into the Bay from the northern shoreline. The Kachemak Bay NERR comprises the entire inner Bay and the outer Bay. Water flows between the inner and outer Bays through a narrow opening formed between the Spit and the southern shoreline. The Bay has an

average depth of 25 fathoms (150 feet) and a maximum of 100 fathoms (600 ft).
Fresh water introduced primarily by the Fox, Bradley, and Martin rivers and
Sheep Creek at the head of the Bay, flows along the northwest shore of the inner
Bay. Peak release of fresh water from Bradley Creek alone results in flows of
1200 cubic feet per second. This peak flow occurs in conjunction with the warmest summer temperatures.

The Bear Cove data logger site is the eastern endpoint monitoring site and
located on the southern side of the Inner Bay at 59.6833N, 151.1250W. It is
mounted 1 meter above the bottom in an average of 10 meters of water (mean tide)
on a seasonal mooring. The bottom habitat is predominantly sand and pollutants
in the area are few. The site is primarily influenced by the glacial Portlock
and Grewingk Rivers. This innermost site has salinity ranges between 20.1 and
31.9 ppt, due to the stratified nature of the water column. The stratification
is a result of freshwater runoff in the summer months. During low tide, the
instrument detects the upper section of the stratified water column and records
low salinity levels. With a tidal range of 8.2m, at high tide the instrument
rests in the lower, more marine section of the stratified water column and
higher salinities are recorded. During the winter months, the system reverts
more marine-like with little glacial runoff at a minimum and a near constant
salinity of 32 ppt. The access to Bear Cove is limited to boat and weather
dependent. During the winter months, icing of the inner bay and strong winds
from the east make access to the site impossible. Due to these factors, the
deployment period for this site is limited to June to October.

The Homer YSI data logger site is located on the north side of Kachemak Bay at
59.6029° N, 151.4081° W. From January 2002 until November 2002, the instrument
was mounted 1 meter above the bottom on the ferry terminal dock in water
fluctuating between 1.8 and 10.8 meters. Data for the Homer site was collected
through November 20, 2002, which was then removed after a storm destroyed the

datalogger mount.

In October 2002, relocation for the Homer datalogger site began due to a more desirable location that became available after the installation of a new ferry dock. The Homer Dolphin datalogger site began collecting data October 24, 2002 at latitude 59.6028°N, and longitude 151.4081°W. This new site, called Homer Dolphin, places the instrument 1 meter from the bottom in water fluctuating between 8.0 and 17.0 meters. At both locations the bottom habitat is predominantly sand. Pollutants in the area are primarily due to the excessive boat traffic at the entrance of the Homer harbor. Throughout the year, salinity has ranged from 20.5 to 31.7 ppt at both of these sites, as the instrument's location in the stratified water column is dependent on tide height, with a tidal range of 8.1m. As with Bear Cove, it is predominately an estuarine environment during summer months when glacial runoff is highest and during the winter months, the system reverts more marine-like with glacial runoff at a minimum.

The Seldovia YSI data logger site is located on the south side of Kachemak Bay at 59.4413°N, 151.7186°W, approximately 15 miles west of the Homer site and 11 miles east of the Bear Cove site. As with the Homer site, it is situated on the ferry terminal dock, one meter above the bottom and located in water fluctuating between 5 and 13.3 meters. The access to Seldovia is limited to boat or air, as the site is remotely located off the highway system. The power and phone line connection are occasionally inoperative due to the remote location and position at the end of the power grid. The bottom habitat is predominantly rocky substrate. Pollutants in the area are minimal. Throughout the year, salinity has ranged from 30 to 35.9 ppt at this site with a tidal range of 8m.

The Port Graham data logger site is the western endpoint monitoring site, located at the mouth of Kachemak Bay and the entrance to Cook Inlet at 59.3383°N 151.8917°W. It is situated off the coast of the native village of Nanwalek, and approximately 40 miles from the innermost site at Bear Cove. All

water entering the bay, conceptually, passes by the Port Graham site, and is a true marine environment, with salinity ranging from 26.4 to 32.5 and a tidal range of 7.7m. It is mounted 1 meter above the bottom in 10 meters of water (mean tide) on a seasonal mooring. The bottom habitat is predominantly rocky substrate and near a kelp bed. The pollutants in the area are few. The access to Port Graham is limited to boat and weather dependent. During the winter months extreme weather conditions of the outer Bay and Cook Inlet make access to the site impossible. Due to these factors, the deployment period at this site is limited to June – October.

6) Data Collection Period:

Monitoring at the Homer and Seldovia sites was continuous throughout 2002. Monitoring at the Bear Cove site began on June 18, 2002 at 11:30. Due to inclement weather conditions, the Bear Cove mooring was unable to be retrieved in the Fall and will be recovered in the Spring. The data presented runs through September 11, 2002 at 11:00, but upon retrieval of the currently deployed instrument, data will be available through approximately mid October 2002. Monitoring at the Port Graham site was conducted between June 21, 2002 at 10:00 and October 2, 2002 at 12:30. Deployment and retrieval dates and times for following months are listed below:

Began	Ended	Sonde	Comments
Homer Site			
11/27/01, 10:30	01/07/02, 16:30	ioco778	none
01/12/02, 13:00	02/20/02, 11:30	oico778	fish in guard
02/20/02, 12:00	03/11/02, 11:00	Zeus	fish in guard
03/11/02, 11:30	03/12/02, 15:30	Cortez	lg fish in guard
03/12/02, 16:00	04/16/02, 09:00	Zeus	low turb (-9.8)
04/19/02, 11:30	05/27/02, 19:30	Zeus	sea slug in guard
05/29/02, 15:30	07/02/02, 14:30	Cortez	none
07/02/02, 15:00	07/30/02, 20:30	Zeus	DO punct; low turb(89)
07/30/02, 21:00	08/28/02, 14:30	Neptune	
08/28/02, 15:00	10/01/02, 14:00	Cortez	Do recond, new turb
10/02/02, 05:00	11/15/02, 14:00	Zeus	15 hr interval set, not 15 min.
11/15/02, 14:00	11/20/02, 12:30	Cortez	
Homer Dolphin site			
10/24/02, 10:00	11/07/02, 13:00	Neptune	
11/19/02, 10:30	12/10/02, 10:00	Zeus	

12/10/02, 10:30	01/07/03, 14:30	Neptune	
Seldovia Site			
12/09/01, 13:30	01/11/02, 16:30	ico778	no data /modem dwn
01/11/02, 17:00	02/21/02, 09:30	**New**	none
02/21/02, 10:00	03/13/02, 11:00	Neptune	High SpCon(57.7)/ Doreco
03/13/02, 11:30	04/22/02, 09:30	Cortez	none
04/22/02, 11:00	04/24/02, 12:00	Nautilus	moved to CI 4/24 ; Turbhigh(136)
04/24/02, 14:00	05/28/02, 10:30	Cortez	none
05/28/02, 11:30	06/18/02, 15:30	Zeus	none
06/18/02, 16:00	07/04/02, 09:00	Neptune	DO punct;Installed new turbprobe
07/04/02, 10:00	08/01/02, 14:00	Cortez	DO recond; new turb probe
08/01/02, 14:30	09/04/02, 12:30	Zeus	DO punct, Serpulids present
09/04/02, 13:00	10/09/02, 18:00	Neptune	
10/09/02, 18:30	11/14/02, 14:00	Cortez	DO punct; Turb wiper stop
11/14/02, 14:30	12/09/02, 10:30	Neptune	
12/09/02, 11:00	01/07/03, 10:45	Cortez	recondition DO, Turbidity wiper not functioning
Port Graham Site			
06/21/02, 10:00	07/10/02, 08:30	Calypso	none
07/10/02, 09:30	07/28/02, 10:30	Neptune	none
07/28/02, 18:00	09/03/02, 20:00	Calypso	BAD pH
09/03/02, 20:30	10/02/02, 12:30	Kozloff	Wiper NOT functioning
Bear Cove Site			
06/18/02, 11:30	07/02/02, 08:30	Kozloff	none
07/03/02, 18:30	07/31/02, 14:30	Triton	none
08/01/02, 20:00	09/11/02, 11:00	Triton	DO punt

7) Distribution

According to the Ocean and Coastal Resource Management Data Dissemination Policy for the NERRS System-wide Monitoring Program, NOAA/ERD retains the rights to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine

Reserves Division, Office of Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.
NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site, from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page http://cdmo.baruch.sc.edu. Data are available in text tab-delimited format, Microsoft Excel spreadsheet format and comma-delimited format.

8) Associated Researchers and Projects:

Additional instruments deployed seasonally monitor the degradation of the marine water along and across the axis of the bay. These data are being used to supplement studies on primary productivity, larval distribution, settlement, recruitment, growth rates, community dynamics, and biodiversity in the bay.

In August 2000, 2001,and 2002, the spatial distribution of Nereocystis leutkeana kelp beds was mapped in the Kachemak Bay Research Reserve using low altitude aerial photography. The photos were taken using a medium-format camera and a light fixed-wing aircraft to produce vertical and oblique digital imagery of individual kelp beds. These images were geometrically corrected and the kelp beds delineated. The polygon data were entered into a GIS so that estimates of areal extent and adjacency can be compared among beds and among years. Results of 2000 and 2001 data (2002 still in processing) to date indicate a >10% decline in surface area of kelp beds. This was mostly due to the inundation of rocky habitat by sand over a small subtidal bench near the Homer Spit. The variability of each kelp bed area and density will be tracked over time as an

indicator of change and kelp community health. We intend to continue these surveys for a minimum of ten years to track the kelp beds through at least one major cycle of known oceanic variability (the El Nino/Southern Oscillation). The correlative work stemming from aerial surveys will help focus our experimental studies to determine the mechanisms of observed changes in population sizes and density. In order to attribute the shifts in spatial patterns to specific agents of change, on-going research by our science staff is focusing on the effects of light limitation, salinity, and herbivore on kelp growth rates.

II.Physical Structure Descriptors

9) Variable Sequence, Range of Measurements, Units, Resolution, and Accuracy:

YSI 6600 Datalogger Sonde

Variable	Range of Measurements	Resolution	Accuracy
Date	1-12, 1-31, 00-99 (Mo,Day,Yr)	1 mo, 1 day, 1 yr	NA
Time	0-24, 0-60, 0-60 (Hr,Min,Sec)	1 hr, 1 min, 1 s	NA
Temp	-5 to 45 (c)	0.01 C	+/- 0.15C
Sp COND	0-100(mS/cm)	0.01mS/cm	+/-0.5% Of reading + 0.001mS/Cm
Salinity	0-70 Parts per thousand (ppt)	0.01 ppt	+/- 1% of Reading or 0.1 ppt, (whichever is greater)
DO	0-200 (% air saturation)	0.1% @air sat	+/-2% @air Saturation
DO	200-500 (% air saturation	0.1% @ air sat	+/- 6% @ Saturation
DO	0-20 (mg/l)	0.01 mg/l	+/- 0.2mg/l
DO	20-50 (mg/l)	0.01 mg/l	+/- 0.6mg/l
Depth (shallow)	0-9.1 (m)	0.001m	+/- 0.018m
PH	2-14 units	0.01 units	+/- 0.2units
Turb	0-1000 NTU	0.1 NTU	+/- 5% of Reading or 2 NTU (whichever is greater)

Data columns are separated by tabs. Each file contains a two line column header at the top of the page which identifies measurements and

units for each column.

10) Coded variable indicator and variable code definitions:

File definitions: YSI deployment site/file definition/month/year (ex: HOwq0701
= Homer water quality data from July of 2001).
BC = Bear Cove
HO = Homer
SE = Seldovia
PG = Port Graham
DL = Homer Dolphin

11) Data anomalies:

Note: Outliers in the data are defined to be any point greater than 4 standard
deviations from the mean of the 24 hour period surrounding that point. Points
flagged as an outliers were removed from the dataset.
Note: Between sonde rotations we typically encounter the following jumps in data
as a result of calibration offsets and probe accuracy:

pH: +/- 0.01
DO %: +/- 10
DO Conc:+/- 1 mg/l

January 1--31 2002

Homer

a) Following the sonde deployment on 1/12, 13:00, incompatibilities of programming and setup was experienced between the 6200 DCP and 6600 sonde. Due
to these differences in setup, the column headings are reported incorrectly on
the raw data, but properly aligned for the edited version.
b) Time gaps appear at the following period, due to no instrument deployed.
1/7, 17:00 - 1/12, 12:30
c) A DO percent outlier was removed by software on 01/12 13:00
d) A pH outlier was removed at 01/12 13:00

Seldovia
a) For the sonde deployment between the periods of 01/11, 17:00 and 01/12,
12:30, incompatibilities of programming and setup was experienced between the
6200 DCP and 6600 sonde. Due to these differences in setup, DO Concentration

and Specific Conductivity data were not recorded for this period.
b) Time gaps appear during the following periods, possibly due to a power surge or interruption in relaying data. No data is recorded for the following periods.
1/01, 00:00 - 1/11, 16:30
c) High turbidity values were removed at 01/15 00:00, 01/27 08:30
d) Turbidity outliers were removed at 01/19 14:00, 01/26 20:00
e) A pH outlier was removed at 01/17 22:30
f) Do (% and mg/L) were deleted for the following dates/times due to probe malfunction. Probe had to be reconditioned for next deployment.
01/11/02 17:00 through 02/21/02 09:30

February 1-28, 2002

Homer
a) Following the sonde deployment on 02/20, 11:30, incompatibilities of programming and setup was experienced between the 6200 DCP and 6600 sonde. Due to these differences in setup, the column headings are reported incorrectly on the raw data, but properly aligned for the edited version.
b) There is a suspect drop in salinity that appears to be the result of a low calibration offset during the following deployment: 2/20, 12:00 – 3/11, 11:00
c) Turbidity >400 was removed at 02/25 07:30
d) Turbidity < -2 was removed at 02/20 11:30, 02/23 08:30, 02/23 23:30 - 02/24: 01:30
e) Turbidity outliers were removed at 02/09 17:30, 02/12 04:00, 02/23 02:00
f) PH outlier was removed at 02/09 17:00

Seldovia
a) There is suspect high DO during the end of the 01/02 deployment period, especially with the drop of DO values with the deployment of the next sonde on 2/21, 10:00. A punctured membrane is suspected during the following period:
1/12,12:45 – 2/21, 09:45
b) High specific conductivity and salinity were recorded during the following deployment period. Data has been deleted: 2/21 10:00 - 3/13 11:00
c) Negative turbidity was removed at 02/21 10:00
d) Turbidity outliers were removed at 02/12 11:00, 02/19 16:30, 02/26 03:00

e) PH outliers were removed at 02/03 13:00, 02/05 15:00, 02/07 10:00, 02/08 01:00, 02/23 14:00, 02/25 09:00 - 09:30,
f) Do (% and mg/L) were deleted for the following dates/times due to probe
malfunction. Probe had to be reconditioned for next deployment.
01/11/02 17:00 through 02/21/02 09:30

March 1 – 31, 2002

Homer

a) During mid-deployment the data and time are recorded twice in the data,
causing the columns headings to be reported incorrectly on the raw data. The
6200 was re-configured after the error was found and started reporting data
correctly. 3/11/02 16:00 – 3/12/02 14:45
b) During the following time period the 6600 was reporting depth in feet and
conversion to meters was performed.
3/1/02 00:00 – 3/28/02 11:00
c) Following the sonde deployment on 03/12 15:00, incompatibilities of programming and setup was experienced between the 6200 DCP and 6600 sonde. Due
to these differences in setup, the column headings are reported incorrectly on
the raw data, but properly aligned for the edited version.
d) Time gaps appear during the following periods, possibly due to a power
surge or interruption in relaying data. No data is recorded for these periods.
3/28, 11:30 – 3/28, 13:00
e) PH was out of range and deleted 03/11 16:00 – 03/12/02 15:00, 03/15 05:30
f) Turbidity was not recorded for deployment 03/12 15:00 – 04/16 09:00.

Seldovia
a) Following the sonde deployment on 03/13 11:30, incompatibilities of programming and setup was experienced between the 6200 DCP and 6600 sonde. Due
to these differences in setup, the column headings are reported incorrectly on
the raw data, but properly aligned for the edited version.
b) Time gaps appear during the following periods, possibly due to a power

surge or interruption in relaying data. No data is recorded for the following
periods: 03/28 17:00
c) High specific conductivity and salinity were recorded during the following
deployment period. Data were deleted: 2/21 10:00 - 3/13 11:30
d) High turbidity values were removed from 03/13 14:00, 03/28 14:00 - 3/31
23:30
e) Turbidity outliers were removed from 03/09 12:30, 03/10 19:00, 03/11
23:00, 03/26 20:00

April 1-30, 2002

Homer
a) The first deployment, during the following time period, contains data
collected from the 6600 via 6200 DCP, in 15 minute intervals.
04/01 00:00 – 04/16 09:00
b) The second deployment, during the following time period, contains data
collected directly from the 6600, in 30 minute intervals.
04/19 11:30 – 04/30 23:45
c) Time gaps appear during the following period. Loss of data a result of
hard-drive failure of receiving DCP computer. No data is recorded for these
periods.
04/08 00:30 – 01:00
d) A pH outlier was removed 04/30 00:00
e) Following the sonde deployment on 03/12 15:00, incompatibilities of
programming and setup was experienced between the 6200 DCP and 6600 sonde. Due
to these differences in setup, the column headings are reported incorrectly on
the raw data, but properly aligned for the edited version.
f) Turbity outliers were removed at 04/21 06:30, 04/22 07:30, 04/28 08:30
g) Turbidity was not recorded for deployment 03/12 15:00 – 04/16 09:00.

Seldovia
a) Time gaps appear during the following period because of a hard-drive
failure on the logging computer. 04/16 09:00 –04/22 10:30
b) Time gaps appear during the following periods, possibly due to a power
surge or interruption in relaying data. No data is recorded for these periods:
4/08 01:00 – 01:30
c) Following the sonde deployment on 03/28, 14:00, (continuing until 04/22,

11:00) incompatibilities of programming and setup was experienced between the
6200 DCP and 6600 sonde. Due to these differences in setup, the column headings
are reported incorrectly on the raw data, but properly aligned for the edited
version.
d) The pH data from the following deployment is suspect: 4/22 11:00 – 4/24
12:00
e) PH outliers were removed at 04/01 14:00, 04/03/02 19:00, 04/04/02 06:00,
04/07 01:00, 04/11 04:00
f) Turbidity outliers were removed at 04/25 22:00, 04/27 19:00
g) An error in setup caused DO percent, DO concentration, and Salinity to not
be recorded between 4/24 14:00 and 5/28 11:00
h) High turbidity values were removed from 04/01 00:00 – 04/16 08:30

May 1-31, 2002

Homer
a) Time gaps appear during the following period. Loss of data a result of
hard-drive failure of receiving DCP computer. No data is recorded for these
periods. 5/08 14:30 – 5/08 15:30, 5/30 09:00
b) Turbidity outliers were removed at 05/01 11:00, 05/03 06:00, 05/15 12:30, 05/18 13:30, 05/21 15:00, 05/23 05:00, 05/25 18:30, 05/27 05:00

Seldovia
a) An error in setup caused DO percent, DO concentration, and Salinity to not
be recorded between 4/24 12:30 and 5/28 10:30
b) Turbidity outliers were removed at 05/07 10:00, 05/10 13:00, 05/13 13:30, 05/15 03:30, 17:00, 05/17 18:30, 05/23 16:00, 05/29 23:30

June 1-30, 2002

Homer
a) Time gaps appear during the following period. Loss of data a result of
hard-drive failure of receiving DCP computer. No data is recorded for these
periods. 6/20 15:30
b) High turbidity values were removed at 06/04 18:30, 06/14 11:30, 22:00,
06/15 21:30, 06/16 09:30, 06/26 16:00, 17:00, 18:00
c) Turbidity outliers were removed at 06/06 19:00, 06/07 18:00, 06/08 08:00, 06/11 21:30, 06/13 17:00, 06/20 01:00, 22:30, 06/21 19:30, 06/24 19:00
d) A DO percent and DO concentration outlier was removed at 06/25 15:30,

Seldovia
a) There is a suspect DO drop during the following deployment period: 5/28
11:30 – 6/18 15:30
b) The DO membrane was punctured and data removed for the following time
period:
6/18 16:00 - 7/4 09:00
c) Negative turbidity values, most likely caused by an error in calibration
technique were removed from 06/18 16:00, 17:00 - 06/19 12:30, 17:30, 18:30,
19:30 - 06/20 02:30, 03:30 - 06:00, 07:00 - 13:00, 14:00 - 16:30, 17:30 -
18:00, 19:00 - 19:30, 20:30 - 06/21 03:00, 04:00 - 05:30, 07:00, 08:00 - 08:30,
09:30, 10:30 - 15:00, 17:30, 18:30 - 06/22 04:00, 06:00, 12:00 - 14:00, 15:00,
16:30 - 18:00, 19:30 - 06/23 03:30, 04:30, 08:00 - 09:30, 10:30, 13:30 - 16:00,
18:00, 19:30 - 20:00, 21:00, 22:00 - 06/24 03:00, 05:00, 06:00, 10:30, 11:30,
12:30, 14:00 - 17:00, 18:30, 21:00 - 22:00, 23:00 - 06/25 04:30, 06:00, 10:00 -
10:30, 11:30 - 12:30, 13:30 - 17:00, 19:30 - 20:30, 21:30 - 23:00, 06/26 00:00
- 03:00, 04:00, 05:00 - 05:30, 06:30, 06/27 01:00 - 04:00, 09:30, 11:00, 12:00,
13:30 - 16:00, 17:00 - 17:30, 22:00 - 06/28 04:00, 05:00 - 05:30, 09:30, 11:30
- 14:30, 15:30 - 18:00, 22:30 - 06/29 06:00, 07:30, 12:30 - 14:30, 15:30 -
18:00, 19:00 - 21:30, 22:30 - 23:30, 06/30 00:30 - 05:00, 06:00 - 08:00, 09:00,
11:00, 13:00 - 13:30, 15:30 - 18:30, 19:30 - 20:30,
d) All turbidity data 06/18 1600 through the end of the month is suspect
because of calibration.
e) Turbidity outliers were removed on 06/01 13:30, 06/03 14:30, 06/09 18:00,
06/14 22:00, 06/17 12:30, 06/20 16:30, 06/27 13:00

Port Graham
a) The sonde during the following deployment period experienced a pH sensor
failure. The pH data for this deployment is deleted: 6/21 10:00 – 7/10 08:30
b) Negative turbidity data was deleted during the following deployment period: 6/21 10:00 – 7/10 08:30

Bear Cove
a) Data does not begin until 6/18 11:30
b) Turbidity reported a –22 in 0 post-cal, yet recorded no negative data

during the deployment. The turbidity data is suspect for this deployment period: 6/18 11:30 - 7/02 08:30

c) Turbidity outliers were removed on 06/21 14:00, 06/22 20:00

July 1-31, 2002

Homer

a) The DO membrane was punctured and data deleted for the following time period: 7/2 15;00 – 7/30 20:30

b) High turbidity values were removed at 07/01 09:00, 07/12 22:00, 07/13 10:00, 07/24 01:30, 07/29 22:00

Seldovia

a) The DO membrane was punctured and data removed for the following time period: 6/18 16:00 - 7/4 09:00

b) Negative turbidity data was removed from 07/01 01:00, 02:30, 04:00 – 05:30, 08:30, 17:30 - 19:00, 20:30, 21:30, 22:30 - 07/02 00:30, 01:30, 02:30 – 04:00, 05:00, 06:00, 07:00 - 08:00, 09:30, 15:00 - 18:00, 19:00 - 07/03 03:30, 04:30, 05:30 - 19:00, 20:30 - 21:30

c) All turbidity data before 07/04 09:30 should be considered suspect.

Port Graham

a) The sonde during the following deployment period experienced a pH sensor failure. The pH data for this deployment is deleted: 6/21, 10:00 – 7/10, 08:30

b) The sonde during the following deployment had experienced pH failure and probe was removed during this deployment: 7/28 18:00 – 9/3 20:00

c) A DO outlier was removed from 07/10 09:30

d) Turbidity outliers were removed from 07/15 05:30, 07/16 05:00, 07/17 08:30, 07/20 06:30, 07/22 00:30.

Bear Cove

a) The mooring was moved to deeper water from 7/3 18:30 to 7/9 7:30, then moved back to it's original location:

b) pH outliers were removed on 07/07 05:00, 07/08 04:30

c) A high turbidity value was removed on 07/12 20:00

d) Turbidity outliers were removed on 07/07 06:00, 07/08 06:00, 07/11 22:00, 07/14 01:00, 07/18 12:30 07/26 22:00,

August 1-31, 2002

Homer

a) Turbidity data is negative and removed for the following deployment period: 8/28 15:00 – 10/1 14:00
b) A turbidity outlier was removed 08/25: 07:30.
c) DO membrane was punctured during following deployment and data is suspect:
8/28 15:00 – 10/1 14:00

Seldovia
a) The DO membrane was puncture and data deleted for the following time
period: 8/1 14:30 – 9/4 13:30
b) Negative turbidity due to incorrect calibrations have been removed for
8/1 14:30 – 9/4 13:30

Port Graham
a) Data gaps exits on 8/31 11:30, 14:00, 16:30 - 17:30 due to possible battery problems
b) The sonde during the following deployment had experienced pH failure and
probe was removed during this deployment: 7/28 18:00 – 9/3 20:00
c) High turbidity values were removed on 08/22 23:30, 08/23 00:30, 06:00,
15:00, 08/24 16:00, 08/26 10:00, 08/27 10:00, 08/30 12:30, 08/31 00:30 - 01:00, 12:30 - 13:30, 20:00, 23:30
d) A DO outlier was removed on 08/25 11:30
e) Turbidity outliers were removed on 08/01 01:30, 08/14 04:00, 08/18 03:30, 08/19 09:30, 23:30, 08/21 21:30, 08/2: 10:00, 08/24 07:30.

Bear Cove
a) DO membrane was punctured during following deployment and data were deleted: 8/1 20:00 – 9/11 11:00
b) A suspect drop in pH is reported during the following period: 8/28 15:00
– 8/30 20:30
c) A pH outlier was removed on 08/18 04:00
d) Turbidity outliers were removed on 08/08 07:30, 08/11 06:30, 08/15 14:30, 08/19 08:30, 08/21 08:00, 08/24 05:00, 08/28 04:00, 08/29 19:30, 08/31 07:00

September 1-30, 2002

Homer
a) Turbidity data is negative and removed for the following deployment period: 8/28 15:00 – 10/1 14:00
b) DO membrane was punctured during following deployment and data is suspect:
8/28 15:00 – 10/1 14:00

Seldovia

a) The DO membrane was puncture and data deleted for the following time
period: 8/1 14:30 – 9/4 13:30
b) Turbidity data is negative because of incorrect calibration and is removed
up to 9/4 13:30
c) Turbidity data after 9/4 13:30 remains negative, but within the instrument
accuracy so it has been retained. It should be considered suspect data.
d) High Turbidity value (174 NTU) on 09/06/02 02:30 considered suspect.

Port Graham
a) The sonde during the following deployment had experienced pH failure and
probe was removed during this deployment: 7/28 18:00 – 9/3 20:00
b) There is a suspect drop in specific conductivity and salinity during the
following period: 9/20 00:00 – 9/20 13:00
c) Turbidity data is negative and removed for the following deployment
period: 9/3 20:30 – 10/2 12:30
d) Turbidity anomalies for the following period were removed: 09/01 01:00,
19:30; 09/02 02:00, 06:30, 23:00; 09/03 08:00

Bear Cove
a) Data gaps exist on 9/7 00:00, 04:00, 05:30, and 07:30-08:30 because of
unknown problems with the instrument.
b) A pH outlier was removed on 09/05: 00:30
c) Turbidity outliers were removed on 09/01 07:30, 09/04 03:30, 09/05 05:30,
09/06 04:30, 09/08 15:30
d) The last instrument recovery occurred on 9/11 at 11:00, no data exists
after that time.
e) DO membrane was punctured during following deployment and data were
deleted: 8/1 20:00 – 9/11 11:00

October 1-31, 2002

Homer
a) Turbidity wiper was covering optic during the following deployment periods
and all turbidity data have been deleted: 10/01 14:30 – 10/31 11:00 and 10/31
14:00.
b) The unattended sampling interval was set to 15 hours instead of 15 minutes
due to an error in programming during the following deployment interval: 10/02
05:00 – 11/15 14:00
c) DO percent errors were removed at 10/14 12:00, 10/27 13:00

d) DO membrane was punctured during following deployment and data is suspect:
8/28 15:00 – 10/1 14:00
e) Negative turbidity data removed 10/01 00:00 – 10/01 14:00

Seldovia
a) There is a suspect drop in pH that appears to be the result of a low
calibration offset during the following deployment: 10/9 18:30 – 11/14 14:15
b) There is a suspect rise in DO for an unknown reason during the following
deployment period: 10/9 18:30 – 11/14 14:15
c) Turbidity data until 10/12 10:30 remains negative but normally within the
instrument accuracy. This data has been retained, but should be considered
suspect.
d) The following turbidity data was negative below the accuracy of the instrument and has been removed:
10/10 04:00, 10:00, 18:00, 19:00 – 21:00
10/12 04:30, 09:30 – 10:00
10/12 11:00 – 10/31 23:30
e) High turbidity value 10/5 04:00 (326 NTU) suspect. Possibly caused by fish.
f) DO (% and mg/L) were deleted for the following dates/times due to membrane
puncture:
10/13/02 13:00 through 11/14/02 14:00

Port Graham
a) Turbidity readings for the following deployment were all negative and
deleted: 9/3 20:30 – 10/2 12:30

Homer Dolphin
a) An initial test deployment began on 10/24 10:00
b) A DO outlier was removed on 10/26 23:30
c) PH ouliers were removed on 10/25 23:00, 10/26 23:30
d) Turbidity outliers were removed on 10/25 08:30, 10/31 09:30

November 1-30, 2002

Homer
a) The unattended sampling interval was set to 15 hours instead of 15 minutes
due to an error in programming during the following deployment interval: 10/02
05:00 – 11/15 14:00
b) High turbidity values were removed at 11/01 05:00, 20:00, 11/02 11:00,
11/03 02:00, 17:00, 11/04 08:00, 23:00, 11/05 14:00, 11/06 05:00, 20:00,

11/07 11:00, 11/08 02:00, 17:00, 11/09 08:00, 23:00, 11/10 14:00, 11/11 05:00,
20:00, 11/12 11:00, 11/13 02:00, 17:00, 11/14 08:00, 23:00, 11/15 14:00, 11/16
08:30 – 11/17 09:00, 11/18 10:00 – 17:30
c) A DO percent and concentration outlier was removed at 11/15 14:00
d) A pH outlier was removed at 11/15 14:00
e) The Homer site was removed on 11/20 13:00 after a storm destroyed the
mount. Future data will be collected at the Homer Dolphin site
f) Negative turbidity values less than –2 were deleted for the following dates/times:
11/20/02 04:00 – 05:30

Seldovia
a) Turbidity data 11/1 00:00 – 11/14 14:30 remains negative below the instrument accuracy and has been removed. Turbidity data after this time remain
near zero, but typically within the stated instrument accuracy. Values <-2 have
been removed. The negative values are likely a combination of poor calibration
technique, instrument accuracy, and clear water.
b) A pH outlier was removed on 11/24 23:00
c) There is a suspect drop in salinity for an unknown reason during the
following period: 11/10 08:30 – 11/14 15:00. Data retained.
d) Turbidity for the following dates/times were deleted because they fell
outside the 4 standard deviation: 11/16 21:30, 11/19 20:30, 11/21 00:30, 11/29
08:00.
e) DO (% and mg/L) were deleted for the following dates/times due to membrane
puncture:
10/13/02 13:00 through 11/14/02 14:00

Homer Dolphin
a) DO and pH outliers were removed on 11/02 18:00, 11/19 21:00, 11/20 21:00, 11/21 21:30, 11/28 02:30(DO only). These outliers may be the result of
a fish processing effluent pipe
in the area. The effects of the effluent remain unknown at this time.
b) Turbidity outliers were removed at 11/01 00:00, 11/02 04:00
c) High turbidity values were removed at 11/23 08:30, 13:00

December 1-31, 2002

Homer Dolphin
a) DO percent outliers were removed on 12/01: 18:30, 12/03: 20:00, 12/04:

21:00, 12/05: 21:30, 12/07: 23:00, 12/08: 11:30, 12/14: 17:00, 12/16: 18:00,
12/18: 19:30, 12/19: 20:00, 12/22: 22:00, 12/25: 23:30, 12/29: 16:00, 12/30:
17:30.
b) DO concentration outliers were removed on 12/01: 18:30, 12/04: 21:00,
12/18: 19:30, 12/19: 20:00, 12/25: 23:30, 12/30: 17:30.
c) pH outliers were removed on 12/01: 18:30, 12/02: 19:30, 12/03: 20:30,
12/04: 21:00, 12/05: 21:30, 12/12: 01:30, 12/16: 18:00, 12/18: 19:30-20:00,
12/19: 20:00-20:30, 12/25: 23:30, 12/30: 17:30-18:00. The DO and pH outliers are all low values and may be the result of a fish processing effluent
pipe in the area. The effects of the effluent remain unknown at this time.
d) Turbidity outliers were removed at 12/03: 06:00, 12/07: 21:30, 12/18:
09:00, 12/19: 13:00

Seldovia
a) Turbidity data through the month remains near zero, but typically within
the stated instrument accuracy. Values <-2 have been removed. The negative
values are likely a combination of poor calibration technique, instrument accuracy, and clear water.
b) High Turbidity data (>400 NTU) were removed on 12/26 12:30 – 12/27 06:00
c) PH outliers were removed on 12/06 09:30, 12/07 00:00
d) DO (% and mg/L) are suspect for deployment 12/09/02 11:00 through 12/31/02
23:30. Low DO reading (66.4%) at post deployment calibration check. DO electrode
had to be reconditioned prior to following deployment.
e) Turbidity outliers were removed 12/07 17:30 and 12/29 18:30.

12) Missing Data:

Missing data are denoted by a period in the data set. Data are missing
due to equipment failure where no probes deployed, maintenance/calibration of
equipment, elimination of obvious outliers, or elimination of data due to calibration (both pre and post) problems. For more details about missing data,
contact the Research Coordinator at the Kachemak Bay Research Reserve.

13) Post Deployment Information

End of Deployment Post-Calibration Readings in Standard Solutions:
** n/r = not recorded**

Site	Date	Conductivity (Std:50.0)	pH (Std:7)	Turbidity (Std:0)	DO (Air Sat) (Std:100%)	Depth (m)
HO	01/07/02	**	**	**	**	**
	02/20/02	47.80	7.08	0.00	108.0	0.102
	03/11/02	48.9	7.08	4.5	103.0	0.305
	03/12/02	49.72	6.83	2.1	93.2	0.209
	04/18/02	48.7	7.01	-9.8	104.9	0.217
	04/19/02	49.7	6.93	5.0	104.2	0.003
	05/27/02	54.4	7.02	0.5	98.2	-0.204
	07/02/02	50.01	6.88	2.2	105.9	0.182
	07/30/02	49.87	7.06	5.1	DO Punct	0.086
	08/28/02	50.45	7.22	14.1	96.6	-0.153
	10/01/02	49.65	7.01	-5.3	97.8	-0.049
	11/15/02	49.92	6.99	4.8	106.2	-0.257
	11/20/02	50.75	6.79	-3.3	97.5	-0.084
SE	01/11/02	49.32	7.02	0.02	102.0	0.002
	02/21/02	**	**	**	**	**
	03/13/02	57.7	7.17	**	98.3	-0.117
	04/22/02	51.1	6.86	0.8	**	**
	05/28/02	50.24	7.09	-0.1	102.0	0.01
	06/18/02	49.7	7.01	2.00	**	0.292
	07/04/02	50.02	6.88	**	**	0.03
	08/01/02	**	**	**	96.2	**
	09/04/02	50.33	7.05	-7.3	DO Punct	-0.21
	10/09/02	49.48	6.96	1.7	101.6	0.129
	11/14/02	50.88	7.01	-1.4	117.1	-0.173
	12/09/02	49.8	7.15	0.4	95.5	-0.195
	01/07/03	49.16	6.74	-1.1	66.4	0.260
DL	11/07/02	50.55	7.06	1.4	92.9	-0.137
	12/10/02	49.91	6.87	-0.3	103.1	0.115
	01/07/03	48.61	7.09	0	105.3	0.262
BC	07/02/02	49.95	6.98	-22.0	DO Punct	0.033
	07/31/02	49.90	7.1	-0.5	105.2	0.03
	09/11/02	50.61	6.96	-0.5	DO Punct	-0.629
PG	07/10/02	59.61	6.99	-9.0	99.2	0.052
	07/28/02	50.10	7.03	0.0	98.5	0.002
	09/03/02	50.40	9.42	0.8	97.8	**
	10/02/02	50.05	7.02	-7.1	**	-0.074

14) Other Remarks/Notes

a) There were a few instances at this NERR site where turbidity recorded small
negative values (-0001 and -0002). Because turbidity has a range of accuracy of

+/-2 NTU, the technician did not edit or deleted these values in any way.

b) Below is the matlab routine used to process water quality data

```
% kbsonde.m  This routine converts the sonde data the CDMO format
% W. Scott Pegau  1/10/2003


clear all

%Adding some operating triggers  1= yes  0=no
print_graphs=0;
process_monthly=1;
access_on=0;
chl_on=0;
fluor_on=0;
tmint=30;  % this is the binning time interval
st_id='SEwq'; % the letter designator for the station


%set up variables and matrix needed to parse the data
date_time=[]; temper=[]; cond=[]; sal=[]; doperc=[]; doconc=[]; pH=[];
depth=[];
turb=[];
chl=[]; fluor=[]; errcode = [];
w=',';
fignumber = 2;

% Read in all *.cdf comma delimited files

[file_list,n_file]=list_file('*.cdf'); %currently assumes that
list_file.m and
all *.cdf files are
in the working directory

for i=1:n_file  %Begin loop to read in the data and append into a single
matrix
   file_name_current_in=file_list(i,:);

   %chl_on=1;        % to re-turn on switches, if were turned off in
prior loop
   %fluor_on=1;

   % remove empty characters from each filename
   fname_length=size(file_name_current_in,2);
   j=0;
   while file_name_current_in(1,fname_length-j)==' '
      file_name_current_in=file_name_current_in(1,1:fname_length-j-1);
      j=j+1;
   end


   fname_length=size(file_name_current_in,2); %let the user know the file
being
```

```
processed
   fprintf( '%s\n',file_name_current_in);

%Begin reading the data in
   fid=fopen(file_name_current_in);


%assume 2 lines of header in a .cdf file
HDR=fgetl(fid);  %DETERMINE THE NUMBER AND NAME OF VARIABLES HERE
units=fgetl(fid);  %DETERMINE THE UNITS OF THE VARIABLES HERE

%determine the variables in the file
    ww=findstr(HDR,w); %find commas in the header
    ww=[ww length(HDR)]; %accounts for a header beyond the last comma
    fprintf(' %d Variables in the file \r\n',length(ww))
%determine the variables of interest
  %this set of routines looks through the header to determine where the
desired
data is
    dc=findstr(HDR,'Date'); dcc=find(ww>dc); date_col=dcc(1);
    dc=findstr(HDR,'Time'); dcc=find(ww>dc); time_col=dcc(1);
    dc=findstr(HDR,'Temp'); dcc=find(ww>dc); temp_col=dcc(1);
    dc=findstr(HDR,'SpCond'); dcc=find(ww>dc); cond_col=dcc(1);
    dc=findstr(HDR,'Salinity'); dcc=find(ww>dc); sal_col=dcc(1);
    dc=findstr(HDR,'DO%'); if ~isempty(dc); dcc=find(ww>dc);
doperc_col=dcc(1);
end;
    dc=findstr(HDR,'DO %'); if ~isempty(dc); dcc=find(ww>dc);
doperc_col=dcc(1);
end;
    dc=findstr(HDR,'DO Conc'); dcc=find(ww>dc); doconc_col=dcc(1);
    dc=findstr(HDR,'Depth'); dcc=find(ww>dc); depth_col=dcc(1);
    dc=findstr(HDR,'pH'); dcc=find(ww>dc(1)); pH_col=dcc(1);
    dc=findstr(HDR,'Turbidity'); dcc=find(ww>dc); turb_col=dcc(1);
    dc=findstr(HDR,'Chloro');
        if isempty(dc);
            no_chl=1;
            fprintf('No chlorophyll data.  Chlorophyll processing off.
\r\n');
    else;
            no_chl=0;
            dcc=find(ww>dc); chl_col=dcc(1);
        end;
    dc=findstr(HDR,'Fluor');
        if isempty(dc);
            no_fluor=1;
            fprintf('No fluorescence data.  Fluor turned off \r\n');
        else;
            no_fluor=0;
            dcc=find(ww>dc); fluor_col=dcc(1);
        end;


    clear ww;
```

```
while 1; %read in each line of data and parse the data out
    a=fgetl(fid);
    if ~ischar(a), break, end;
    a=strcat(',',a,','); %add commas at the beginning and end of the
string for
parsing
    ww=findstr(a,w); %find commas

    %separate the date information
    if strcmp(a(ww(date_col)+1),'"'); %this if statement is necessary if
a file
was
manipulated in excel prior to being input into this routine
    d=datenum(a(ww(date_col)+2:ww(date_col+1)-
2))+datenum(a(ww(time_col)+2:ww(time_col+1)-2));  %reads in date and time
columns
    date_time=[date_time;d]; %store as number in a vector
    else
    d=datenum(a(ww(date_col)+1:ww(date_col+1)-
1))+datenum(a(ww(time_col)+1:ww(time_col+1)-1));  %reads in date and time
columns
    date_time=[date_time;d]; %store as number in a vector
    end

     %read in the data
     tt=str2num(a(ww(temp_col)+1:ww(temp_col+1)-1)); temper=[temper;tt];
     tt=str2num(a(ww(cond_col)+1:ww(cond_col+1)-1)); cond=[cond;tt];
     tt=str2num(a(ww(sal_col)+1:ww(sal_col+1)-1)); sal=[sal;tt];
     tt=str2num(a(ww(doperc_col)+1:ww(doperc_col+1)-1));
doperc=[doperc;tt];
     tt=str2num(a(ww(doconc_col)+1:ww(doconc_col+1)-1));
doconc=[doconc;tt];
     tt=str2num(a(ww(depth_col)+1:ww(depth_col+1)-1)); depth=[depth;tt];
     tt=str2num(a(ww(pH_col)+1:ww(pH_col+1)-1)); pH=[pH;tt];
     tt=str2num(a(ww(turb_col)+1:ww(turb_col+1)-1)); turb=[turb;tt];
     if chl_on
         if no_chl;
             tt=NaN;
             chl=[chl;tt];
         else;
             tt=str2num(a(ww(chl_col)+1:ww(chl_col+1)-1));
             chl=[chl;tt];
         end;
     end;
    if fluor_on;
        if no_fluor;
            tt=NaN;
            fluor=[fluor;tt];
        else;
             tt=str2num(a(ww(fluor_col)+1:ww(fluor_col+1)-1));
             fluor=[fluor;tt];
        end;
    end;
```

```
 end;
  fclose(fid);

end

%SORT THE DATA BY DATE

tdata=[date_time temper cond sal doperc doconc depth pH turb chl ]; %
removed
fluoro
ttdata=sortrows(tdata,1);
date_time=ttdata(:,1); temper=ttdata(:,2); cond=ttdata(:,3);
sal=ttdata(:,4);
doperc=ttdata(:,5); doconc=ttdata(:,6); depth=ttdata(:,7);
pH=ttdata(:,8);
turb=ttdata(:,9);
if chl_on; chl=ttdata(:,10); end;
if fluor_on; fluor=ttdata(:,11); end;


%BEGIN CLEANING UP THE DATA

%throw out obvious bad or missing data
%the limits are in part from CDMO absolute rejection criteria
%I trust the cals on temperature the most so if it is out the rest of the
data
is assumed to be
garbage
good_data=find(temper>-5&temper<40&cond>10&depth>0);  %finding "good"
temperature and conductivity data (conductivity test to ensure in water)

    date_time=date_time(good_data); %only keep "good" data
    temper=temper(good_data);
    cond=cond(good_data);
    sal=sal(good_data);
    doperc=doperc(good_data);
    doconc=doconc(good_data);
    depth=depth(good_data);
    pH=pH(good_data);
    turb=turb(good_data);
    if chl_on; chl=chl(good_data); end;
    if fluor_on; fluor=fluor(good_data); end;


%identify gaps caused by bad or missing data
   kk=find(diff(date_time)>(tmint*.0104166667/15+.001));
   fnamr=fopen('report.txt','w');
    for i=1:length(kk);
        fprintf(fnamr,'Data gap between %s %s
\r\n',datestr(date_time(kk(i))),datestr(date_time(kk(i)+1)));
    end
```

```
%print the time covered by this data
    fprintf('\r\n Begining date %s \r\n',datestr(date_time(1)));
    fprintf('End date %s \r\n',datestr(date_time(end)));

%PROBABLY WANT PLOTS OF LARGE DATA SET TO IDENTIFY PROBLEMS

%process complete months of data

[Y,M,D,H,MI,S]=datevec(date_time); %separate out the date info
%begin looping over years
     for I=Y(1):Y(end);       %loop over years
        yyy=find(Y==I);
        %plot the years worth of data to look for oddities
        yjd=date_time(yyy)-datenum(I-1,12,31);
        stdate=min(yjd); endate=max(yjd);
        subplot(7,1,1); plot(yjd,temper(yyy),'k'); axis([stdate endate -2
15]);
ylabel('Temperature');
        subplot(7,1,2); plot(yjd,sal(yyy),'k'); axis([stdate endate 22
33]);
ylabel('Salinity');
        subplot(7,1,3); plot(yjd,doperc(yyy),'k'); axis([stdate endate 80
130]);
ylabel('DO
percent');
        subplot(7,1,4); plot(yjd,depth(yyy),'k'); axis([stdate endate 2
17]);
ylabel('Depth');
        subplot(7,1,5); plot(yjd,pH(yyy),'k'); axis([stdate endate 7.5
8.5]);
ylabel('pH');
        subplot(7,1,6); plot(yjd,turb(yyy),'k'); axis([stdate endate -100
200]);ylabel('Turbidity');
        if chl_on; subplot(7,1,7); plot(yjd,chl(yyy),'k'); axis([stdate
endate -
10
30]);ylabel('Chlorophyll'); xlabel('Julian day'); end;
        set(gcf,'Paperposition',[.5 .5 7 10])
        year_title=num2str(Y(yyy(1))); subplot(7,1,1); title(year_title);
        pause(5);

        if print_graphs; print; end


        for J=1:12;  %loop over months
            mmm=find(M(yyy)==J); %find data within a month
            if ~isempty(mmm)&process_monthly; %continue if data in the
month is
available
                mmm=mmm+yyy(1)-1; %adjust month pointer to full data set
```

```
 ftemper=[]; fcond=[]; fsal=[]; fdoperc=[]; fdoconc=[]; fdepth=[];
fpH=[];
fturb=[];
fchl=[]; fjd=[]; % ffluor=[];


                    mdate_time=date_time(mmm); %pull out the single month
of
data to work
with
                    mtemper=temper(mmm);
                    mcond=cond(mmm);
                    msal=sal(mmm);
                    mdoperc=doperc(mmm);
                    mdoconc=doconc(mmm);
                    mdepth=depth(mmm);
                    mpH=pH(mmm);
                    mturb=turb(mmm);
                    if chl_on; mchl=chl(mmm); end;
                    if fluor_on; mfluor=fluor(mmm); end;
                    mjd=mdate_time-datenum(I-1,12,31);

                    %save monthly data in matlab file
                    fnm=datestr(datenum(I,J,1),2);
                    fnam=strcat(st_id,fnm(1:2),fnm(7:8));
                    fprintf('Year is %u and month is %u
\r\n',Y(mmm(1)),M(mmm(1)));
                    if chl_on; eval(['save ' fnam ' mjd mdate_time
mtemper mcond
msal mdoperc
mdoconc mdepth mpH mturb mchl']);
                    else eval(['save ' fnam ' mjd mdate_time mtemper
mcond msal
mdoperc
mdoconc mdepth mpH mturb']);
                    end;

                    %loop through the month averaging available data into
15 min
intervals and
filling gaps with NaN
                    %also applying a filter to the data
                    date_int=tmint*.0104166667/15;
                    fnamo=strcat(fnam,'.txt');
                    fido=fopen(fnamo,'w');
                    fprintf(fido,'Date \t Time \t Temp \t SpCond \t Sal
\t DO \t
DO \t Depth \t pH
\t Turb \r\n');
                    fprintf(fido,'MM/DD/YYYY \t hh:mm:ss \t C \t mS/cm \t
ppt \t
percent \t
mg/L \t m \t \t NTU \r\n');
```

```
                    if access_on;
                        % open output files and put headers on

fida1=fopen(strcat(fnam,'temperAccess.txt'),'w');

fida2=fopen(strcat(fnam,'CondAccess.txt'),'w');

fida3=fopen(strcat(fnam,'SalinityAccess.txt'),'w');
                        fida4=fopen(strcat(fnam,'DOAccess.txt'),'w');

fida5=fopen(strcat(fnam,'DepthAccess.txt'),'w');
                        fida6=fopen(strcat(fnam,'pHAccess.txt'),'w');

fida7=fopen(strcat(fnam,'TubidityAccess.txt'),'w');
                        if chl_on;
fida8=fopen(strcat(fnam,'ChlAccess.txt'),'w'); end;
                        fprintf(fida1, 'StationCode \t TimeCode \t
Depth \t
Temp(C) \r\n');
                        fprintf(fida2, 'StationCode \t TimeCode \t
SpCond
\r\n');
                        fprintf(fida3, 'StationCode \t TimeCode \t
Salinity
\r\n');
                        fprintf(fida4, 'StationCode \t TimeCode \t
DOperc \t
DOConc \r\n');
                        fprintf(fida5, 'StationCode \t TimeCode \t
Depth
\r\n');
                        fprintf(fida6, 'StationCode \t TimeCode \t pH
\r\n');
                        fprintf(fida7, 'StationCode \t TimeCode \t
Turbidity
\r\n');
                        if chl_on; fprintf(fida8, 'StationCode \t
TimeCode
\t Chl \r\n'); end;
                    end;

                  for II=datenum(I,J,1):date_int:datenum(I,J+1,1);
                      cdate=datestr(II,23); ctime=datestr(II,13);
                      cjd=II-datenum(I-1,12,31);
                      ll=find(mdate_time>(II-
date_int/2)&mdate_time<(II+date_int/2)); %find
data +-7.5 minutes from desired output time
                      lm=find(mdate_time>(II-.5)&mdate_time<(II+.5));
%find
data within 12
hours for filtering purpose (should expand to allow data out of the
month)
                      if isempty(ll); %missing data is listed as NaN
```

```
                              ctemper=NaN; ccond=NaN; csal=NaN;
cdoperc=NaN;
                              cdoconc=NaN; cdepth=NaN; cpH=NaN; cturb=NaN;
cchl=NaN;
                              %save data in CDMO formatted tab delimited
text
files
                              fprintf(fido,'%s \t %s \t %04.1f \t %06.2f \t
%04.1f
\t %05.1f \t %04.1f \t
%05.2f \t %04.1f \t %05.0f \r\n',cdate, ctime, ctemper,ccond, csal,
cdoperc,
cdoconc,
cdepth, cpH, cturb);

                              %save filtered data to compare against raw
data
                              ftemper=[ftemper;ctemper];
fcond=[fcond;ccond];
fsal=[fsal;csal];
fdoperc=[fdoperc;cdoperc]; fjd=[fjd;cjd];
                              fdoconc=[fdoconc;cdoconc];
fdepth=[fdepth;cdepth];
fpH=[fpH;cpH];
fturb=[fturb;cturb]; fchl=[fchl;cchl]; %ffluor=[ffluor;ffluor];

                         else;  %use nanmean so that filters can be put in
place
before this step


                              ctemper=nanmean(mtemper(ll));
ccond=nanmean(mcond(ll));
csal=nanmean(msal(ll)); cdoperc=nanmean(mdoperc(ll));
                              cdoconc=nanmean(mdoconc(ll));
cdepth=nanmean(mdepth(ll));
cpH=nanmean(mpH(ll)); cturb=nanmean(mturb(ll));
                              if chl_on; cchl=nanmean(mchl(ll)); end;
%                              if fluor_on; cfluor=nanmean(mfluor(ll));
end;

                              %ADDING INDIVIDUAL COMPONENT FILTERS
                              %BEWARE OF ALL FILTERS
                                 %absolute data rejection filters as
specified by
CDMO or more
restrictive based on realistic values
                              if ctemper<-2|ctemper>25; ctemper=NaN;
errcode=[errcode; 1,II];  end;
%CDMO -5 to 45
                              if ccond<0|ccond>100; ccond=NaN;
errcode=[errcode;
2,II];
end;%CDMO cond 0 to 100
```

```
                            if csal<10|csal>36; csal=NaN;
errcode=[errcode;
3,II]; end; %CDMO
salinity 10 to 36
                            if cdoperc<0|cdoperc>200; cdoperc=NaN;
cdoconc=NaN;
errcode=[errcode; 4, II]; end; %CDMO dopercent 0 to 200
                            if cpH<4|cpH>12; cpH=NaN; errcode=[errcode;
5,II];
end; %CDMO pH
2 to 14


                            if cturb>400; cturb=NaN;
errcode=[errcode;6,II];
end;
                            if cturb<-2; cturb=NaN;
errcode=[errcode;7,II]; end;
                            if chl_on&cchl>50; cchl=NaN;
errcode=[errcode;8
,II]; end;
                            if chl_on&cchl<0; cchl=NaN; errcode=[errcode;
9,II];
end;
%                            if fluor_on&cfluor<0; cfluro=NaN;
fprintf(fnamr,'negative
fluorescence on %s \r\n',datestr(II)); end;

                               %outlier filter; the filter looks for data
within
12 hours of the data point
and removes the data point if it is
                               % more than 4 standard deviations from the
mean
(not applied to
temperature and salinity because of the two layer system)

                            if
cdoperc>(nanmean(mdoperc(lm))+4*nanstd(mdoperc(lm)))|cdoperc<(nanmean(mdo
perc(l
m))-4*nanstd(mdoperc(lm)));
                                cdoperc=NaN;
                                errcode=[errcode; 10,II];
                            end;
                            if
cdoconc>(nanmean(mdoconc(lm))+4*nanstd(mdoconc(lm)))|cdoconc<(nanmean(mdo
con
c(lm))-4*nanstd(mdoconc(lm)));
                                cdoconc=NaN;
                                errcode=[errcode; 11,II];
                            end;
                            if
cpH>(nanmean(mpH(lm))+4*nanstd(mpH(lm)))|cpH<(nanmean(mpH(lm))-
4*nanstd(mpH(lm)));
                                cpH=NaN;
```

```
                                errcode=[errcode; 12,II];
                            end;
                            if
cturb>(nanmean(mturb(lm))+4*nanstd(mturb(lm)))|cturb<(nanmean(mturb(lm))-
4*nanstd(mturb(lm)));
                                cturb=NaN;
                                errcode=[errcode; 13 ,II];
                            end;
                            if
chl_on&(cchl>(nanmean(mchl(lm))+4*nanstd(mchl(lm)))|cchl<(nanmean(mchl(lm
))-
4*nanstd(mchl(lm))));
                                cchl=NaN;
                                errcode=[errcode; 14,II];
                            end;
%                            if
fluor_on&(cfluor>(nanmean(mfluor(lm))+4*nanstd(mfluor(lm)))|cfluor<(nanme
an(mchl
(l
m))-4*nanstd(mfluor(lm))));
%                                cfluor=NaN;
%                                fprintf(fnamr,'Fluorescence outlier on
%s
\r\n',datestr(II));
%                            end;

                            %Print out the data in CDMO format
                            fprintf(fido,'%s \t %s \t %04.1f \t %06.2f \t
%04.1f
\t %05.1f \t %04.1f \t
%05.2f \t %04.1f \t %04.0f \r\n',cdate, ctime, ctemper, ccond, csal,
cdoperc,
cdoconc,
cdepth, cpH, cturb);

                            %save filtered data to compare against raw
data
                            ftemper=[ftemper;ctemper];
fcond=[fcond;ccond];
fsal=[fsal;csal];
fdoperc=[fdoperc;cdoperc]; fjd=[fjd;cjd];
                            fdoconc=[fdoconc;cdoconc];
fdepth=[fdepth;cdepth];
fpH=[fpH;cpH];
fturb=[fturb;cturb];
                            if chl_on; fchl=[fchl;cchl]; end;
 %                           if fluor_on; ffluor=[ffluor;cfluor]; end;

                        %SET UP TO OUTPUT ACCESS DATA FILES
                        % only want filtered data without any NaNs
                         if access_on;
                            [AY,AM,AD,AH,AMI,AS]=datevec(II); % develop
the time
code
```

```
                                AYS = num2str(AY);
                                AJDS = num2str(floor(II-datenum(I-1,12,31)));
                                if length(AJDS)== 1; AJDS=strcat('00',AJDS);
end;
                                if length(AJDS)== 2; AJDS=strcat('0',AJDS);
end;

                                AHS = num2str (AH);
                                if length(AHS) ~= 2;
                                    AHS = strcat('0', AHS);
                                end;
                                AMS = num2str (AMI);
                                if length(AMS) ~= 2;
                                    AMS = strcat('0', AMS);
                                end;

                                TimeCode = strcat(AYS(3:4),AJDS,AHS,AMS);
                                    %output the Access data
                                        accessdepth='Low';
                                        if ~isnan(ctemper); fprintf(fida1,'%s
\t %s
\t %s \t %04.2f \r\n',st_id,
TimeCode, accessdepth, ctemper); end;
                                        if ~isnan(ccond); fprintf(fida2,'%s
\t %s \t
%06.2f \r\n',st_id,
TimeCode, ccond); end;
                                        if ~isnan(cdoperc); fprintf(fida4,'%s
\t %s
\t %05.1f \t %04.1f
\r\n',st_id, TimeCode, cdoperc, cdoconc);  end;
                                        if ~isnan(csal); fprintf(fida3,'%s \t
%s \t
%04.1f \r\n',st_id,
TimeCode, csal); end;
                                        if ~isnan(cdepth); fprintf(fida5,'%s
\t %s
\t %05.2f \r\n',st_id,
TimeCode, cdepth);  end;
                                        if ~isnan(cpH); fprintf(fida6,'%s \t
%s \t
%04.1f \r\n',st_id,
TimeCode, cpH); end;
                                        if ~isnan(cturb); fprintf(fida7,'%s
\t %s \t
%05.0f \r\n',st_id,
TimeCode, cturb); end;
                                        if ~isnan(cchl); fprintf(fida8,'%s \t
%s \t
%05.0f \r\n',st_id,
TimeCode, cchl); end;
  %                                      if ~isnan(cfluor); fprintf(fida9,'%s
\t %s
\t %05.0f \r\n',st_id,
```

```
TimeCode, cfluor); end;
                                  end;

                        end;
                    end;
                     fclose(fido);
                     if access_on;

fclose(fida1);fclose(fida2);fclose(fida3);fclose(fida4);fclose(fida5);fcl
ose(fid
a6);
                         fclose(fida7);
                     end;
                     if chl_on; fclose(fida8); end;
   %                  if fluoro_on; fclose(fida8); end;



                    %plot the monthly data

                    figure(fignumber);
                    subplot(3,1,1); plot(mjd,mdepth,'-
k',fjd,fdepth,'.r');
ylabel('Depth');
                    subplot(3,1,2); plot(mjd,mtemper,'-
k',fjd,ftemper,'.r');
ylabel('Temperature');
                    subplot(3,1,3); plot(mjd,msal,'-k',fjd,fsal,'.r');
ylabel('Salinity'); xlabel('Julian
Day');
                    set(gcf,'Paperposition',[.5 .5 7 10])
                    subplot(3,1,1); title(fnam);
                    plotfnam1= strcat(fnam, '1');
                    if print_graphs; print; end;
                    fignumber=fignumber+1;

                    figure(fignumber);
                    subplot(4,1,1); plot(mjd,mdoperc,'-
k',fjd,fdoperc,'.r');
ylabel('DO percent');
                    subplot(4,1,2); plot(mjd,mpH,'-k',fjd,fpH,'.r');
ylabel('pH');
                    subplot(4,1,3); plot(mjd,mturb,'-k',fjd,fturb,'.r');
ylabel('Turbidity');
                    if chl_on; subplot(4,1,4); plot(mjd,mchl,'-
k',fjd,fchl,'.r'); ylabel('Chlorophyll');
xlabel('Julian Day'); end;
                    set(gcf,'Paperposition',[.5 .5 7 10])
                    subplot(4,1,1); title(fnam);
                    plotfnam2= strcat(fnam, '2');
                    if print_graphs; print; end;
                    fignumber=fignumber+1;
                    pause(5)
```

```
            end
        end
    end;
            for errloop=1:14;
                % Finds all errcodes of each number
                kk=find(errcode(:,1)==errloop);
                % Assigning messages for error codes
                if errloop==1; errprint='Temperature Out of Range';end;
                if errloop==2; errprint='Sp Cond Out of Range';end;
                if errloop==3; errprint='Salinity Out of Range';end;
                if errloop==4; errprint='DO Percent Out of Range';end;
                if errloop==5; errprint='pH  Out of Range';end;
                if errloop==6; errprint='High Turbidity';end;
                if errloop==7; errprint='Negative Turbidity';end;
                if errloop==8; errprint='High Chlorophyll';end;
                if errloop==9; errprint='Negative Chlorophyll';end;
                if errloop==10; errprint='DO Percent Outlier';end;
                if errloop==11; errprint='DO Conc Outlier';end;
                if errloop==12; errprint='pH Outlier';end;
                if errloop==13; errprint='Turbidity Outlier';end;
                if errloop==14; errprint='Chlorophyll Outlier';end;
                % Prints error code message
                fprintf(fnamr,'\r\n %s %s \r\n',errprint, ':');
                % Cycles through errors of same errcode
                for count=1:length(kk);

                    if count == 1;
                        fprintf(fnamr, '\r\n %s: ',
datestr(errcode(kk(count),2),6));
                        if (errcode(kk(count+1),2)-errcode(kk(count),2))
>
(tmint*.0104166667/15+.001);
                          fprintf(fnamr, '%s, ',
datestr(errcode(kk(count),2),15));
                        else
                          begseq=errcode(kk(count),2); %start of sequence
                          begcount=count;
                        end

                    elseif count==length(kk);
                       if (errcode(kk(count),2)-errcode(kk(count-1),2)) <
(tmint*.0104166667/15+.001); %is sequential with previous
                           endseq=errcode(kk(count),2);
                              if begcount>1&(floor(begseq)-
floor(errcode(kk(begcount-1),2)))<1;
                                  if (floor(endseq)-floor(begseq))>=1;
                                      fprintf(fnamr,'%s - %s:
%s',datestr(begseq,15), datestr(endseq,6),
datestr(endseq,15));
                                  else;
                                      fprintf(fnamr,'%s - %s,
',datestr(begseq,15), datestr(endseq,15));
                                  end;
```

```
                                else
                                  if (floor(errcode(kk(count),2))-
floor(errcode(kk(count-1),2)))>=1;
                                      fprintf(fnamr,'\r\n %s: %s,
',datestr(errcode(kk(count),2),6),
datestr(errcode(kk(count),2),15));
                                  else;
                                      fprintf(fnamr,'%s, ',
datestr(errcode(kk(count),2),15));
                                  end;

                                end;
                           elseif  (floor(errcode(kk(count),2))-
floor(errcode(kk(count-1),2)))>1;
                              fprintf(fnamr,'\r\n %s: %s,
',datestr(errcode(kk(count),2),6),
datestr(errcode(kk(count),2),15));
                           else;
                              fprintf(fnamr,'%s, ',
datestr(errcode(kk(count),2),15));
                           end;
                       else;
                           if (errcode(kk(count),2)-errcode(kk(count-1),2))
<
(tmint*.0104166667/15+.001); %is sequential with previous
                            if (errcode(kk(count+1),2)-
errcode(kk(count),2)) >
(tmint*.0104166667/15+.001); %check if at end of sequence
                                endseq=errcode(kk(count),2);
                             if begcount>1;
                              if (floor(begseq)-
floor(errcode(kk(begcount-
1),2)))<1;
                                if (floor(endseq)-floor(begseq))>=1;
                                    fprintf(fnamr,'%s - %s: %s, ',
datestr(begseq,15), datestr(endseq,6),
datestr(endseq,15));
                                else;
                                    fprintf(fnamr,'%s - %s, ',
datestr(begseq,15), datestr(endseq,15));
                                end;
                             else;
                                if (floor(errcode(kk(count),2))-
floor(errcode(kk(count-1),2)))>=1;
                                    fprintf(fnamr,'\r\n %s: %s - %s: %s,
',datestr(begseq,6),
datestr(begseq,15),datestr(endseq,6), datestr(endseq,15));
                                else;
                                    fprintf(fnamr,'\r\n %s: %s - %s, ',
datestr(begseq,6),
datestr(begseq,15),datestr(endseq,15));
                                end;
                             end;
                            else;
```

```
                                    if (floor(endseq)-floor(begseq))>=1;
                                        fprintf(fnamr,'\r\n %s: %s - %s: %s,
',datestr(begseq,6),
datestr(begseq,15),datestr(endseq,6), datestr(endseq,15));
                                    else;
                                        fprintf(fnamr,'%s - %s, ',
datestr(begseq,15),datestr(endseq,15));
                                    end;
                                end;
                            end;
                        else; %not in sequence with previous
                            if (errcode(kk(count+1),2)-
errcode(kk(count),2)) <
(tmint*.0104166667/15+.001); %check if at begining of sequence
                                begseq=errcode(kk(count),2); %start of
sequence
                                begcount=count;
                            else;
                                if (floor(errcode(kk(count),2))-
floor(errcode(kk(count-1),2)))>=1;
                                    fprintf(fnamr,'\r\n %s: %s,
',datestr(errcode(kk(count),2),6),
datestr(errcode(kk(count),2),15));
                                else;
                                    fprintf(fnamr,'%s, ',
datestr(errcode(kk(count),2),15));
                                end;
                            end;
                        end;
                    end;
                end;

        fclose(fnamr);
```