Appendix N. Methodological and procedural changes in Old Dominion University's Chesapeake Bay Water Quality Monitoring Program.

Change	Date	Parameters Effected
Started sampling above and below pycnocline when a pycnocline was detected at designated stations.	March, 1985	All nutrients
ODU used a YSI oxygen meter in conjunction with a RS-5 salinometer from 1984 to April, 1986. Depth was calculated with meter markings on the cable. Switched to a Hydrolab Surveyor II from May, 1986 to February 1997. This has built in depth meter.	May, 1986	Salinity, dissolved oxygen, pH, depth, conductivity, temperature
Started sampling at 1/3 and 2/3 of the water column when a pycnocline was not detected at designated stations.	October, 1987	All nutrients
Started analyzing PC/PN, PP and TDN. Dropped the following parameters: TP, TOC, TKN and DKN. CBP decision.	1988	Total phosphate, nitrogen and carbon
Started collected the Elizabeth River cruise. There are 6 stations as follows: ELI2, EBE1, WBE1, LAF1, SBE2 and SBE5.	February, 1989	Not applicable
Stopped acidifying TDP, NH4F and NO23F samples. Freeze samples instead.	February, 1990	Total dissolved phosphate, ammonia, nitrate-nitrite
Started rinsing sample bottles with filtered nutrient before adding sample to bottle.	August, 1990	Nutrients
Station LAF1 dropped from Elizabeth River monitoring cruise	August ,1990	Not applicable
Started collecting fluorometry data	December, 1990	Not applicable
Started using co-mounted system (sampling T) so profile data and sampling pump on same system and samples collected at same time as data. Prior to this the samples were collected in one area of the boat and the profile was done in another.	August, 1991	All parameters
Samples for PC/PN filtered with vacuum filtration $\leq$15 psi instead of pressure filtration (were filtered using a syringe prior to this). Change implemented at request of AMQAW.	January, 1992	Particulate carbon and nitrogen.
Chlorophyll samples filtered on Whatman® GF/F filters. Prior to this used Whatman® GF/C filters. Change implemented at request of AMQAW	January,1992	Chlorophyll *a* and phaeophytin
Starting collecting light data with Li-Cor sensors	January, 1993	-
Tributary enhancement project. Added two stations near LE5.5 called LE5.5A and LE5.5B. Added parameters biogenic silica and particulate inorganic phosphate. This was only in effect for this one year.	January-December, 1994	Biogenic silica and particulate inorganic phosophate
Laboratory moved from Applied Marine Research Laboratory building on 45th Street in Norfolk near ODU to Nauticus in downtown Norfolk	May 1994	-
ODU started sampling entire VA mainstem. Prior to this ODU sampled and analyzed samples for 8 stations in lower Bay and VIMS sampled and analyzed rest of BAY for WQ.	January, 1996	All at ODU's original 8 stations.

Appendix N. Continued.

Change	Date	Parameters Effected
Dropped DOC. CBP decision.	January, 1996	Dissolved organic carbon
Switch from Scientific Instruments Corporation® autoanalyzer to Skalar® autoanalyzer	January, 1996	Nitrate-nitrite, total dissolved nitrogen, particulate phosphate, silicate
Change station name from LE5.5 to LE5.5-W, because station switched to 0.6 miles west of where originally collected.	September, 1996	All parameters for station LE5.5
The Water Quality Laboratory Manager Position is eliminated. Mr. Steven Sokolowski, who has been the head of WQL since 1984, is no longer employed by WQL. Ms. Suzanne C. Doughten, as Supervisor of Water Quality Laboratory, is now in charge of day to day field and laboratory operations.	March, 1997	-
Switched from a Hydrolab Surveyor II to a YSI 6000 sonde.	March, 1997	Salinity, DO, Specific conductivity, pH, depth, temperature
Switch to Turner® digital flurometer from Turner® analog fluorometer	April, 1997	Fluorometry
Switch to less NaOH in the oxidizing reagent	May, 1997	Total dissolved nitrogen
Switch from manual method to analyze orthophosphorus to automated method on the Skalar® autoanlyzer.	May, 1997	Orthophosphate
Switch from Scientific Instruments Corporation® autoanalyzer to Skalar® autoanalyzer	May, 1997	NH4F
Discontinue using dichromic acid bath for cleaning labware	May, 1997	Particulate nitrogen, phosphorus and carbon, total dissolved phosphorus and orthophosphate
Discontinue cleaning tin cups	May, 1997	Particulate nitrogen and carbon
Switch from manual method to analyze to automated method on the Skalar® autoanlyzer.	July, 1997	Total dissolved phosphorus and nitrite
Switched to Unicam® UV1 spectrophotometer for chlorophyll analysis. Perkin Elmer spectrophotometer using previously was no longer operational.	January, 1998	Chlorophyll *a* and phaeophytin
Added two stations to the Elizabeth River monitoring cruise: SBA1 And SBD4	January, 1998	-
Switch from 25 mL oxygen loop to 10 mL oxygen loop on Carlo Erba® N/A 1500	April, 1998	Particulate nitrogen and carbon

Appendix N. Continued.

Change	Date	Parameters Effected
Stopped collecting Winkler DO samples for every depth a sample is collected on the Bay and the ER. Only collect one in morning and one in afternoon to check probe (more if necessary due to not matching).	October, 1998	Winkler dissolved oxygen
Added two stations to the Elizabeth River monitoring cruise: SBD1 and SBC1	October, 1998	-
Switch to 2cm cell, filtration pressure <10 psi and do not filter to dryness	January, 1999	Chlorophyll *a* and phaeophytin
Discontinue collecting light data with sensor that points up.	April, 1999	EPARD_Z
Switch to grinding in centrifuge tube and adding known volume of acetone	April, 1999	Chlorophyll *a* and phaeophytin
Stop collecting absorbances for 480 and 510 for the chlorophyll *a* analysis at the request of the CBP and Rick Hoffman of Virginia DEQ.	July, 1999	Carotenoids
Laboratory moves from Nauticus in downtown Norfolk to 4211 Colley Ave. near ODU. Building owned by ODURF, laboratory section previously housed a laboratory from ODU's Chemistry Department.	January, 2000	-
Switch to taking mainstem chlorophyll samples from fluorometer instead of carboy used for nutrients. Change implemented by AMQAW to standardize fluorometry methods. Will use these samples in fluorometry calibrations curves.	January, 2000	Chlorophyll *a* and phaeophytin, and fluorometry
Instead of field blanks for every 10 samples, doing one field blank per day.	January, 2000	none
Water Quality Laboratory of Old Dominion University was transferred from the Applied Marine Research Laboratory to the Chemistry and Biochemistry Department of Old Dominion University. Dr. John R. Donat assumed the position of Director of the Water Quality Laboratory, replacing Dr. Alan W. Messing.	May, 2001	-
ODU started using a CE Instruments Flash EA 1112 Elemantal Analyzer. A method comparison study between this new instrument and the Carlo Erba NA 1500 was completed (the instrument used prior to May 2001). The results are reported in A Comparion of Two Instruments for the Determination of Particulate Carbon and Particulate Nitrogen Concentrations in Estuarine Water Samples. In addition, started using 25mm GF/F filters for filtration of PC/PN instead of 13mm GF/F filters. This is because new instrument can accept larger filters. In past the largest volume that could be filtered was 50mL, now up to 250 mL can be filtered. New filtration towers employed.	May, 2001	PC/PN
Four stations on the Elizabeth River monitoring cruise were discontinued due to funding constraints in the state of Virginia. These were SBA1, SBD4, SBD1 and SBC1.	November, 2002	ER cruise

Appendix N. Continued.

Change	Date	Parameters Effected
Start analyzing FSS/VSS in addition to TSS at all stations in the Bay and ER. This is to help determine if the suspended solids are organic in nature (which would have a high VSS) or terrestrial as in run off (which would have a high FSS). To accomplish this change all filters for TSS/FSS/VSS are combusted at 550°C for 30 minutes in addition to rinsing them.	January, 2002	All CBP and ER TSS.
Start using R/V Slover for CBP	January, 2003	none
Start using R/V Slover for ER	March, 2003	none
Switch from using Chloromine-T to aspartic acid as standard for PC/PN analyses	April, 2003	PC/PN
Start using rosette bottles to collect samples instead of sampling pump	July, 2003	none
Added two extra cruises to CBP mainstem monitoring to access dissolved oxygen. One cruise was added to June and one to September	2004	CBP mainstem cruise
Start using new procedure to collect Licor data. Will use secchi to determine depths to collect light data, and stop when underwater reading is <1% of reading at 0.5 meters.	June, 2004	Light/KD
Start using a new sampler, integrator and software for the Skalar analysis. The new software is windows based versus dos based. The software package is called FlowAccess	June, 2004	NO23F, NO2F, TDN, TDP, PP, PO4F, SIF and NH4F.
Start analyzing color dissolved organic matter (CDOM) at the surface for all ER and CBP stations once a month for July - October 2005 and April - June 2006. This is for the submerged aquatic vegetation (SAV) program.	July, 2005	CDOM
Collect vertical fluorometry using Wet Star® fluorometric probe. Collect data every 1 meter. Chlorophyll samples now collected from go-flow where nutrient samples are collected.	November, 2005	Vertical fluorometry
Stopped funding the two extra cruises to CBP mainstem monitoring to access dissolved oxygen. Only one cruise will be sampled in June and September. (NOTE: In 2006 due to boat problems could not sample Bay in Feb., so did 2 June cruises that year).	2006	CBP mainstem cruise
Switched to Shimadzu ® 2401PC spectrophotometer for chlorophyll analysis	January, 2006	CHLA and PHEO
Stopped writing down wavelengths for chlorophyll analysis, this data is captured electronically. This change is due to new instrumentation. Oral permission given for this change by Mary Ellen Ley, QA officer CBP, and Rick Hoffman of Virginia DEQ>	July, 2006	CHA/PHEO
Added back one extra cruise to CBP mainstem monitoring to access dissolved oxygen. One extra cruise was added to June.	2007	CBP mainstem cruise
Added DOC analysis to surface samples in CBP mainstem and Elizabeth River where phytoplankton is collected, to help with a phytoplankton index that was developed.	2007	Stations SBE5, CB6.4, CB6.1, CB7.3E, CB7.4, WE4.2, LE3.6 and LE5.5-W.

Appendix N. Continued.

Change	Date	Parameters Effected
Stopped standardizing nitrite stock. Instead are buying a separate standard to confirm calibration accuracy.	July, 2007	NO2F/NO23F/TDN
Started using a 10 mL fixed volume macropipettor instead of a class A volumetric pipette to dispense TDN/TDP samples, spikes and duplicates.	July, 2007	TDN/TDP
Started using a 10 mL fixed volume bottle top dispenser instead of a class A volumetric pipette to extract PP samples and duplicates.	July, 2007	PP
Stopped collecting winkler dissolved oxygen samples on cruise. Will check DO calibration against a chart.	January, 2008	DO
Stopped funding the extra June cruise to CBP mainstem monitoring to access dissolved oxygen. Only one cruise will be sampled in June.	January, 2008	
At end of day on the R/V, will fill nutrient filtration flasks with Type I reagent water and let it sit overnight. Use new graduated cylinders each day. Instituted this at request of AMQAW.	January, 2008	Nutrients.
Do not apply correction factor to physiochemical profile data if it is out of range during post-calibration. It is noted that it was out of range, and the data is either submitted with an problem code or it is not submitted at all. Instituted this at request of AMQAW.	January, 2008	salinity, DO, Specific conductivity, pH, depth, WTEMP
Switched from YSI 6000 sonde to YSI 6600 sonde with an optical DO probe.	April, 2008	salinity, DO, Specific conductivity, pH, depth, WTEMP
Collecting 2 field splits on the Chesapeake Bay Monitoring cruise in addition to the 2 replicate splits collected. Instituted this at request of AMQAW.	May, 2008	NO23F, NH4F, PO4F, NO2F, TDN, TDP, SIF
Collecting 1 field split on the Elizabeth River Monitoring cruise. Instituted this at request of AMQAW.	May, 2008	NO23F, NH4F, PO4F, TDN, TDP
Collecting 1 field split on the Elizabeth River or Chesapeake Bay Monitoring cruise for the DOC analysis. Instituted this at request of AMQAW.	May, 2008	DOC
Pycnocline calculation changed. Subtract bottom where collected sampled by surface and divide by that. Previously divided by depth of the station. Instituted this at request of AMQAW.	May, 2008	NO23F, NH4F, PO4F, TDN, TDP, TSS, FSS, CHLA, PHEO, PC, PN, PP
Collect equipment blank once a year that also goes through filtration equipment. Instituted this at request of AMQAW	May, 2008	NO23F, NH4F, PO4F, TDN, TDP, TSS, FSS, CHLA, PHEO, PC, PN, PP