Kinder Morgan Southeast Terminals - Richmond 2
VA0058378
Fact Sheet Attachments

Attachment No. 1

Flow Frequency Determination

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY
Piedmont Regional Office
4949-A Cox Road Glen Allen, Virginia 23060

SUBJECT: Flow Frequency Determination / 303(d) Status
Kinder Morgan Southeast Terminals – Richmond 2 (VA0058378)

TO: Jeremy Kazio

FROM: Jennifer Palmore, P.G.

DATE: February 1, 2013

COPIES: File

The Kinder Morgan - Southeast Terminal facility discharges to the James River in Richmond, VA. The outfall is located at rivermile 2-JMS105.76. Flow frequencies have been requested for use in developing effluent limitations for the VPDES permit.

The river is tidally influenced at the proposed discharge point. Flow frequencies cannot be determined for tidal waters. Therefore, dilution ratios should be used in determining the permit limits, as was done in past permit cycles. However, the freshwater inflow at the fall line of the James River (I-95 bridge) is being included for informational purposes. The flow frequencies were developed based on a drainage area comparison between the fall line and the USGS continuous record gage on the James River at the Route 45 bridge in Cartersville (#02035000). The gage has been in operation from 1898 through present, but the flow in the James has been regulated since December 1979 by guaranteed releases from Gathwright Dam (Lake Moomaw) and therefore, the flow frequencies for the gage were developed based on data since 1980 only. The data for the reference gage and the fall line are presented below.

James River at Cartersville, VA (#02035000):
Period of record 1980-2003
Drainage area = 6,257 mi^2

1Q30 = 540 cfs	High Flow 1Q10 =1530 cfs
1Q10 = 638 cfs	High Flow 7Q10 = 1810 cfs
7Q10 = 717 cfs	High Flow 30Q10 = 2220 cfs
30Q10 = 918 cfs	HM = 3020 cfs
30Q5 = 1020 cfs	

James River at fall line:
Drainage Area = 6,755 mi^2

1Q30 = 583 cfs (377 MGD)	High Flow 1Q10 =1652 cfs (1068 MGD)
1Q10 = 689 cfs (445 MGD)	High Flow 7Q10 = 1954 cfs (1263 MGD)
7Q10 = 774 cfs (500 MGD)	High Flow 30Q10 = 2397 cfs (1549 MGD)
30Q10 = 991 cfs (641 MGD)	HM = 3260 cfs (2107 MGD)
30Q5 = 1101 cfs (712 MGD)	

This analysis does not address any withdrawals, discharges, or springs influencing the flow of the James River between Cartersville and the fall line. The high flow months are January through May.

The receiving stream is designated as tidal freshwater in the Virginia Water Quality Standards; therefore, the freshwater Aquatic Life Use criteria should be applied. The area is considered as Migratory Spawning and Nursery habitat.

During the 2010 305(b)/303(d) Integrated Water Quality Assessment, the James River was assessed as a Category 5A water ("A Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).") The applicable fact sheets are attached. The river was impaired of the Recreation Use due to E. coli violations, of the Aquatic Life Use due to inadequate submerged aquatic vegetation (SAV), excessive chlorophyll_a, and low dissolved oxygen, and of the Fish Consumption Use due to a VDH advisory for PCBs. In addition, mercury and kepone are considered non-impairing observed effects. The Wildlife Use was fully supporting.

During the draft 2012 Assessment, the receiving stream was considered Category 5D ("The Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.") The draft fact sheets are attached. The river was impaired of the Recreation Use due to E. coli violations, of the Aquatic Life Use due to inadequate submerged aquatic vegetation (SAV), excessive chlorophyll_a, low dissolved oxygen, and inadequate benthic community, and of the Fish Consumption Use due to a VDH advisory for PCBs. In addition, mercury and kepone are considered non-impairing observed effects. The Wildlife Use was fully supporting.

Water quality data from monitoring station 2-JMS104.16 is attached. The station is located on the James River at buoy 166 and is approximately 1.6 mile downstream of the discharge.

Kinder Morgan was included in the James River and Tributaries – City of Richmond Bacterial TMDL, which was approved by the EPA on 11/4/2010 and by the SWCB on 6/29/2012. The discharge was modeled, but was not assigned an E. coli wasteload allocation because the facility is not permitted for fecal coliform control.

The facility was also addressed in the Chesapeake Bay TMDL, which was approved by the EPA on 12/29/2010. The TMDL allocates loads for total nitrogen, total phosphorus, and total suspended solids to protect the dissolved oxygen and submerged aquatic vegetation acreage criteria in the Chesapeake Bay and its tidal tributaries. The discharge was included in the aggregated loads for non-significant wastewater dischargers in the upper James River tidal freshwater estuary (JMSTF2). The nutrient allocations are administered through the Watershed Nutrient General Permit; the TSS allocations are considered aggregated and facilities with technology-based TSS limits are considered to be in conformance with the TMDL.

The James River has historically been considered a Tier 1 water due to the Richmond-Crater Water Quality Management Plan. The plan allows the steady-state dissolved oxygen to fall to 5.0 mg/L, which was the applicable water quality standard at the time that the plan was adopted.

If you have any questions concerning this analysis, please let me know.

VA0058378
RG-R

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Peter W. Schmidt
Director

Water Regional Office
Post Office Box 6030
Glen Allen, Virginia 23058
(804) 527-5020

Gerard Seeley, Jr.
Regional Director

August 24, 1994

Mr. Pat M. Kinder
Project Engineer
Koch Materials Company
P.O. Box 2338
Wichita, Kansas 67201

RE: Mixing Zone Study for Outfall 001

Dear Mr. Kinder:

A meeting was held on July 19, 1994, with representatives from your company and the Virginia DEQ. I asked for that meeting in order to discuss results of biological and chemical monitoring from outfall 001, and, based on those results, the need for a Toxicity Reduction Evaluation (TRE) for that outfall. We agreed that imposition of a TRE would be postponed while KMC investigated whether a dilution/mixing study could provide some relief by redefining what would be considered an "acceptable" level of toxicity.

Your company hired Greeley and Hanson as consultants, and has since completed a mixing study of outfall 001. The consultants used the CORMIX3 software program, and based the model on the assumption that 001 would be extended via diffuser 20 feet offshore. The model predicted a dilution factor of 20:1 under critical "worst case" flow conditions.

Mr. Dale Phillips (DEQ/OWRM) has reviewed the material submitted by KMC and concluded that the dilution predicted as a result of extending the outfall 20 feet offshore is reasonable. He agreed with using a 20:1 dilution for the calculation of acute limits since the effluent should be diluted to that extent within minutes of discharge. You have proposed installing a 4" PVC pipe to extend the current outfall 001 discharge to the outside edge of the terminal dock. The discharge would occur just below the surface of the river at the end of the dock.

Based on Mr. Phillips approval of the dilution/mixing study results, a new acute toxicity test endpoint for a passing test needs to be calculated. The endpoint would only be applicable if KMC is able to obtain permission from the proper authorities, and

subsequently installs the proposed diffuser structure. Using the 20:1 dilution factor, the new acute test endpoint will equal the acute waste load allocation (WLAa) and is calculated as below:

The WLA for acute toxicity is calculated by the following equation:

.3 TUa x 20 = 6 TUa, where .3 is the acute criterion applied at the edge of the allocated impact zone, and 20 is the dilution factor. The 6 TUa is converted to an LC50 value by the following equation:

100/6 = 16.7% effluent, .

At this time a TRE will not be necessary because all four acute toxicity tests conducted to date have been non-toxic (LC50 > 16.7%). I recommend that KMC continue the semiannual monitoring on outfall 001 as per the TMP in the permit. All test results will be evaluated at the end of the two year monitoring period using the new test endpoint to determine if a TRE is warranted. If you have any further questions or comments please do not hesitate to contact us.

Sincerely,

J. Mason Harper

J. Mason Harper
Environmental Engineer

cc: Mr. Wayne Ferguson, KRC
Ms. Sherry Tostenson, DEQ

VF 5070
RIG-R

AUG 1994
PRO

KOCH

KOCH MATERIALS COMPANY

August 17, 1994

Ms. Sherry L. Tostenson
Environmental Engineer
Piedmont Regional Office
Department of Environmental Quality
Commonwealth of Virginia
P.O. Box 6030
Glen Allen, VA 23058

Dear Ms. Tostenson:

Pursuant to our meeting on July 19, 1994, at the Koch Materials Company (KMC) fuels terminal in Richmond, KMC contacted several mixing zone consultants regarding Outfall 001 at the fuels terminal. Ultimately, KMC chose Greeley and Hansen to perform the mixing zone study, and the results of the study have been enclosed for your examination.

Greeley and Hansen used CORMIX3 computer software to model Outfall 001 from the oil/water separator. Based on the model, which was designed using "worst case" flow conditions and the assumption that the discharge from Outfall 001 would be relocated to the outside edge of the terminal's dock, Greeley and Hansen recommended a dilution factor of 20 be used for the allocated impact zone. A dilution factor of 20 would correspond to a WET test requirement of 5% effluent.

KMC proposes the installation of a 4" PVC pipe to extend the current Outfall 001 discharge to the outside edge of the terminal's dock. The effluent from Outfall 001 would subsequently discharge slightly below the surface of the river at the outside edge of the dock. Such an extension was evaluated in the CORMIX3 model, and the model indicated that the extension would provide better dilution than does the current discharge location.

In lieu of the mixing zone results, KMC requests that amendments be made to the fuels terminal's VPDES permit (VPDES Permit Number VA0058378) to account for the proposed dilution factor of 20.

Sincerely,

KOCH MATERIALS COMPANY

Pat M. Kinder

Pat M. Kinder
Project Engineer

cc w/enclosures: Mr. Wayne Ferguson, KRC - Richmond
Mr. Mason Harper, Virginia DEQ
Mr. Rick Johnson, KMC - Wichita
Mr. Dale Phillips, Virginia DEQ

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AUG 1994

GREELEY AND HANSEN
ENGINEERS
5711 ALLENTOWN ROAD, SUITE 302, CAMP SPRINGS, MD 20746 • (301) 899-3333

August 12, 1994

Mr. Pat M. Kinder
Koch Materials Company
4111 E. 37th Street, North
Wichita, KS 67220

Subject: Allocated Impact Zone Analysis for the Koch Materials Company Fuel Terminal in Richmond, Virginia

Dear Mr. Kinder:

This letter presents the results of a dilution evaluation for the single port outfall (outfall 001) on the James River at the Koch Materials Company (KMC) fuel terminal in Richmond, Virginia. The evaluation is based on the computer model CORMIX3, developed by the USEPA to simulate surface discharges into ambient waters.[1]

Input data for CORMIX3 were provided by KMC and are summarized as follows:

Terminal discharge flow rate (max)	200 gpm	(0.013 m^3/s)
Discharge pipe diameter	4 in.	(0.102 m)
7Q10 river flow rate	465.3 MGD	(20.39 m^3/s)
River width	500 ft.	(152.4 m)
Outfall distance from shore	20 ft.	(6.09 m)
Depth of water at outfall (min)	16 ft.	(4.87 m)

Additional input data calculated or estimated by Greeley and Hansen are as follows:

River temperature	25 C
Effluent temperature	25 C
Average river depth	20 ft. (6.09 m)
Bank slope at outfall	38.64°

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1 Jones, G.R. and G.H. Jirka, 1991, "CORMIX3: An Expert System for the Analysis and Prediction of Buoyant Surface Discharges." DeFrees Hydraulic Laboratory, School of Civil and Environmental Engineering, Cornell University.

The CORMIX3 model result demonstrates that a 17 fold dilution factor is available to the discharge in about 1 minute. It should be noted that the model run was based on the following "worst case" conditions:

- 7Q10 flow with no tidal effects
- Slack tide depth in the river (16' depth at outfall)
- Maximum oil/water separator flow rate (200 gpm) is assumed to be continuous (it actually operates an average of only 40 minutes per month)

Based on these conditions (e.g. the minimal operational use of the oil/water separator and, therefore, the short term use of the outfall), the CORMIX3 model output may be used to conservatively estimate the allocated impact zone in the James River. Although the CORMIX3 predicted dilutions are large, they likely overstate the potential environmental impact of KMC's small discharge. Under typical river flow (including tidal effects) and fuel terminal operating conditions, even more dilution would be available at the outfall.

The CORMIX3 model output is enclosed. A summary of effluent plume dimensions, dilution factors and elapsed time is shown as follows:

Plume Downstream Distance (M)	Plume Width (M)	Dilution Factor	Elapsed Time (Approximate, min:sec)
0.00	0.34	1.0	0:00
0.52	2.50	3.9	0:10
1.60	4.66	6.8	0:20
3.25	6.81	9.6	0:30
5.48	8.97	12.5	0:40
8.28	11.13	15.4	0:50
10.08	12.33	17.0	0:56
:	:	:	:
88.41	14.38	23.7	60:00

These CORMIX3 model results can be used to evaluate the recent effluent analytical results. According to the data provided by KMC (file LAB_DATA.XLS) several results appear to have the potential to

exceed the permit requirements. The largest excursion relative to the permit limit was for benzene (7-1-93) at 7.4 mg/L which is about 7 times higher than the permit limit. However, the CORMIX3 model shows that sufficient dilution exists to meet this limit in about 25 seconds. The whole effluent toxicity (WET) tests on fathead minnows (pimephales promelas) and daphnia resulted in LC50's of 35% effluent. Sufficient dilution exists to meet this value in less than 10 seconds.

Virginia Water Quality Standards (WQS) require the following to establish mixing zones:

- Free movement of passing or drifting organisms through the water body in question.
- No lethality to passing or drifting aquatic organisms.

The WQS also allow "allocated impact zones" (i.e. acute mixing zones) within the mixing zone where the concentration of the effluent with the receiving water will be greatest. Mixing within these allocated impact zones shall be as quick as practical and shall be sized to prevent lethality to passing aquatic organisms.[2] It is necessary therefore, to establish that no lethality occurs in an allocated impact zone, that it is sufficiently small so as not be block passage of organisms and that mixing is rapid.

The criteria given for lethality is from the USEPA Technical Support Document for Water Quality-based Toxics Control (TSD) which reads as follows:

> "The criterion maximum concentration (CMC) is used as a means to prevent lethality or other acute effects..... The CMC describes the condition under which lethality will not occur if the duration of the exposure to the CMC level is less than 1 hour."[3]

The TSD goes on to state that a way for a discharger to demonstrate no lethality, "... is for the discharger to provide data to the State regulatory agency showing that a drifting organism would not be exposed to 1-hour average concentrations exceeding the CMC..."[4]

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2 Commonwealth of Virginia, Water Quality Standards, VR 680-21-01.2ff.

3 USEPA, 1991, Technical Support Document for Water Quality-based Toxics Control, PD 91-127415, page 72.

4 IBID, pg 73

August 12, 1994

To evaluate an allocated impact zone for KMC it is necessary to consider the WET tests since other permitted constituents (i.e. Benzene, toluene and xylenes) do not have CMC's. The dilution required for an LC50 of 35% effluent is 2.9. CORMIX3 predicts this dilution will be available within 10 seconds -- far less than one hour. Therefore, we conclude that no lethality is occurring due to KMC's outfall 001. The mixing is rapid (i.e. 10 seconds) and occupies very little river area ($0.52 \times 2.5 = 1.3\ m^2$). Acute toxicity is typically based on a one hour exposure duration. CORMIX3 predicts a 23.7 fold dilution in one hour within the near-field region. The near-field region is defined as the zone of strong initial mixing. However, after one minute, the dilution factor does not rise as rapidly indicating that mixing slows and river flow becomes dominant. Because mixing is predicted to be less rapid after the initial minute and taking into consideration the conservative modeling assumptions, we recommend a dilution factor for the allocated impact zone dilution equal to 20. This value should be both environmentally protective and permitted within the Virginia WQS.

Based on an allocated impact zone dilution factor of 20, the WET test requirement in the VPDES permit should read as follows:

Dilution factor	20
WET test requirement	5.0% effluent

Historic WET testing meets the 5.0% effluent criterion, therefore, no toxicity should exist due to the KMC effluent from outfall 001. We recommend that KMC present this information to the State and request that the toxicity reduction evaluation (TRE) be waved. KMC should request amendments to their VPDES permit which reflect the allocated impact zone mixing conditions calculated above.

I hope this mixing zone analysis is sufficient to meet your needs. If you have questions or require further discharge permitting assistance, please do not hesitate to call.

Very truly yours,

GREELEY AND HANSEN

Mark T. Kennedy

Enclosure
MTK/csr

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                  CORMIX: CORNELL MIXING ZONE EXPERT SYSTEM
                      CORMIX v.2.10          May 1993
SITE NAME/LABEL:                  Koch Materials Company Richmond VA
  ORIGINAL design case:           Acute mix zone
  ORIGINAL file name:             koch31
  Start of main session:          08/11/94--11:16:18

DESIGN ITERATION number:          1
  NEW DESIGN CASE:                Acute mix zone
  NEW FILE NAME:                  koch32
Using subsystem CORMIX3:          Buoyant Surface Discharges
  Start of iteration session:     08/11/94--13:29:36
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = bounded
  Width                           BS      =        152.4 m
  Channel regularity                      = 1
  Ambient flowrate                QA      =        20.39 m^3/s
  Average depth                   HA      =         6.09 m
  Depth at discharge              HD      =         4.87 m
  Ambient velocity                UA      =       0.0219 m/s
  Darcy-Weisbach friction factor  F       =       0.0386
    Calculated from Manning's n           =          .03
  Wind velocity                   UW      =            2 m/s
Stratification Type               STRCND  = U
  Surface temperature                     =           25 degC
  Bottom temperature                      =           25 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                 RHOAS   =     997.0455 kg/m^3
  Bottom density                  RHOAB   =     997.0455 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:             Buoyant Surface Discharge
  Discharge located on                    = right bank/shoreline
  Discharge configuration                 = protruding discharge
  Distance from bank to outlet    DISTB   =         6.09 m
  Discharge angle                 SIGMA   =           90 deg
  Depth at discharge              HD      =         4.87 m
  Bottom slope at discharge       SLOPE   =        38.64 deg
  Circular pipe diameter                  =         .102 m
    Equivalent rectangular discharge:
    Discharge cross-section area  AO      =       0.0081 m^2
    Discharge channel width       BO      =       0.0801 m
    Discharge channel depth       HO      =          .10 m
    Discharge aspect ratio        AR      =         1.27
  Discharge flowrate              QO      =     0.012587 m^3/s
  Discharge flowrate              QO      =     0.012587 m^3/s
  Discharge velocity              UO      =         1.55 m/s
  Discharge temperature (freshwater)      =           25 degC
    Corresponding density         RHOO    =     997.0455 kg/m^3
  Density difference              DRHO    =            0 kg/m^3
  Buoyant acceleration            GPO     =        .0000 m/s^2
  Discharge concentration         CO      =              7.4 ppm
  Surface heat exchange coeff.    KS      =            0 m/s
  Coefficient of decay            KD      =            0 /s
-----------------------------------------------------------------------------
```

```
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  =       0.09 m        Lm  =       6.36 m        Lb  =       0.0 m
  LM  =    99999.0 m
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
  Densimetric Froude number       FRO    =    99999.0 (based on LQ)
  Channel densimetric Froude no.  FRCH   =    99999.0 (based on HO)
  Velocity ratio                  R      =      70.73
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                          = no
  Water quality standard specified         = no
  Regulatory mixing zone                   = yes
  Regulatory mixing zone specification     = distance
  Regulatory mixing zone value             =          762 m, or m^2
  Region of interest                       =      1600.00 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   =     SA1 |
  *-----------------------*
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):
-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at water surface and at centerline of discharge channel:
           6.09 m from the right bank/shore.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at edge of NFR =            .3088 ppm
  Dilution at edge of NFR                =         23.9
  NFR Location:                        x =        97.10 m
    (centerline coordinates)           y =        14.46 m
                                       z =          .00 m
  NFR plume dimensions:        half-width =         3.98 m
                                 thickness =         4.13 m
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is equal or about about equal to the surrounding
  ambient water density at the discharge level.
  Therefore, the effluent behaves essentially as NEUTRALLY BUOYANT.
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Plume becomes vertically fully mixed at       187.28 m downstream.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                =          .035852 ppm
  Corresponding dilution                 =        206.4
  Plume location:                      x =       762.00 m
    (centerline coordinates)           y =        -6.09 m
                                       z =          .00 m
  Plume dimensions:            half-width =        19.42 m
                                 thickness =         6.09 m
******************** FINAL DESIGN ADVICE AND COMMENTS *********************
```

REMINDER: The user must take note that HYDRODYNAMIC MODELING by any known technique is NOT AN EXACT SCIENCE.
Extensive comparison with field and laboratory data has shown that the CORMIX predictions on dilutions and concentrations (with associated plume geometries) are reliable for the majority of cases and are accurate to within about +-50% (standard deviation).
As a further safeguard, CORMIX will not give predictions whenever it judges the design configuration as highly complex and uncertain for prediction.
****
DESIGN CASE: Acute mix zone
FILE NAME: koch32
Subsystem CORMIX3: Buoyant Surface Discharges
END OF SESSION/ITERATION: 08/11/94--13:34:24
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

```
CORMIX3 PREDICTION FILE:
333333333333333333333333333333333333333333333333333333333333333333333333333333
                    CORNELL MIXING ZONE EXPERT SYSTEM
Subsystem CORMIX3:                                          Subsystem version:
 Buoyant Surface Discharges                  CMX3 v.2.10            May 1993
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:          Koch^Materials^Company^Richmond^VA
 Design case:              Acute^mix^zone
 FILE NAME:                cormix\sim\koch32  .cx3
 Time of Fortran run:      08/11/94--13:33:11

ENVIRONMENT PARAMETERS (metric units)
 Bounded section
 BS     =    152.40  AS     =    928.12  QA     =     20.39
 HA     =      6.09  HD     =      4.87
 UA     =      .022  F      =      .039 USTAR = .1528E-02
 UW     =     2.000 UWSTAR= .2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  997.0456

DISCHARGE PARAMETERS (metric units)
 BANK  =  RIGHT     DISTB =      6.09  Configuration: protruding discharge
 Circular discharge pipe:
 DO     =      .102 AO     =      .008
 Dimensions of equivalent rectangular discharge:
 BO     =      .080 HO     =      .102 AO     = .8100E-02  AR     =      1.273
 SIGMA =     90.00  SLOPE =     38.64
 UO     =     1.554 QO     =      .013        = .1259E-01
 RHOO   =  997.0456  DRHOO = .0000E+00  GPO    = .0000E+00
 CO     = .7400E+01  CUNITS=  ppm
 IPOLL =  1          KS     = .0000E+00  KD     = .0000E+00

FLUX VARIABLES (metric units)
 QO     = .1259E-01  MO     = .1956E-01  JO     = .0000E+00
 Associated length scales (meters)
 LQ     =      .09  LM     =  99999.00  Lm     =      6.37  Lb     =       .00

NON-DIMENSIONAL PARAMETERS
 FRO    =  99999.00  FRCH  =  99999.00  R      =     70.73

FLOW CLASSIFICATION
 333333333333333333333333333333333333333333
 3  Flow class (CORMIX3)       =    SA1    3
 3  Applicable layer depth HS =     4.87  3
 333333333333333333333333333333333333333333

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 CO     = .7400E+01  CUNITS=  ppm
 NTOX   =  0
 NSTD   =  0
 REGMZ  =  1
 REGSPC=  1          XREG   =    762.00  WREG   =       .00  AREG   =       .00
 XINT   =   1600.00  XMAX   =   1600.00

X-Y-Z COORDINATE SYSTEM:
   ORIGIN is located at the WATER SURFACE and at center of discharge
     channel/outlet:      6.09 m  from the RIGHT bank/shore.
```

X-axis points downstream
Y-axis points to left as seen by an observer looking downstream
Z-axis points vertically upward (in CORMIX3, all values Z = 0.00)
NSTEP = 50 display intervals per module

BEGIN MOD301: DISCHARGE MODULE (FLOW ESTABLISHMENT)

Profile definitions:
BV = Gaussian 1/e (37%) vertical thickness
BH = Gaussian 1/e (37%) horizontal half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
.00	.34	0.00	1.0	.740E+01	.11	.06

Cumulative travel time = 0. sec

END OF MOD301: DISCHARGE MODULE (FLOW ESTABLISHMENT)

BEGIN MOD317: WEAKLY DEFLECTED JET (3-D) WITH LEESIDE RECIRCULATION ZONE

Surface JET into a crossflow

Profile definitions:
BV = Gaussian 1/e (37%) vertical thickness
BH = Gaussian 1/e (37%) horizontal half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	Elapsed Time
.00	.34	0.00	1.0	.740E+01	.11	.06	0
.03	.58	0.00	1.3	.561E+01	.14	.09	(1.12 sec)
.07	.82	0.00	1.6	.451E+01	.17	.11	
.11	1.06	0.00	2.0	.378E+01	.19	.14	
.16	1.30	0.00	2.3	.325E+01	.22	.17	
.22	1.54	0.00	2.6	.285E+01	.25	.19	
.28	1.78	0.00	2.9	.254E+01	.28	.22	
.35	2.02	0.00	3.2	.229E+01	.30	.24	
.43	2.26	0.00	3.6	.208E+01	.33	.27	
.52	2.50	0.00	3.9	.191E+01	.35	.30	10 sec
.61	2.74	0.00	4.2	.176E+01	.38	.32	
.71	2.98	0.00	4.5	.164E+01	.41	.35	
.81	3.22	0.00	4.8	.153E+01	.43	.38	
.93	3.46	0.00	5.2	.144E+01	.46	.40	
1.05	3.70	0.00	5.5	.135E+01	.49	.43	
1.18	3.94	0.00	5.8	.128E+01	.51	.46	
1.31	4.18	0.00	6.1	.121E+01	.54	.48	
1.45	4.42	0.00	6.4	.115E+01	.57	.51	
1.60	4.66	0.00	6.8	.110E+01	.59	.53	20 sec
1.76	4.90	0.00	7.1	.105E+01	.62	.56	
1.92	5.14	0.00	7.4	.100E+01	.65	.59	
2.09	5.38	0.00	7.7	.960E+00	.67	.61	
2.27	5.62	0.00	8.0	.922E+00	.70	.64	
2.45	5.86	0.00	8.3	.886E+00	.72	.67	
2.64	6.10	0.00	8.7	.854E+00	.75	.69	
2.84	6.34	0.00	9.0	.823E+00	.78	.72	
3.04	6.58	0.00	9.3	.795E+00	.80	.75	
3.25	6.81	0.00	9.6	.769E+00	.83	.77	

- each line reflects one 1.12 sec time step — (56 sec / 50 steps)

3.47	7.05	0.00	9.9	.744E+00	.86	.80
3.70	7.29	0.00	10.3	.721E+00	.88	.82
3.93	7.53	0.00	10.6	.699E+00	.91	.85
4.17	7.77	0.00	10.9	.679E+00	.94	.88
4.42	8.01	0.00	11.2	.659E+00	.96	.90
4.67	8.25	0.00	11.5	.641E+00	.99	.93
4.94	8.49	0.00	11.9	.624E+00	1.01	.96
5.20	8.73	0.00	12.2	.607E+00	1.04	.98
5.48	8.97	0.00	12.5	.592E+00	1.07	1.01
5.76	9.21	0.00	12.8	.577E+00	1.09	1.04
6.05	9.45	0.00	13.1	.563E+00	1.12	1.06
6.35	9.69	0.00	13.5	.550E+00	1.15	1.09
6.65	9.93	0.00	13.8	.537E+00	1.17	1.11
6.96	10.17	0.00	14.1	.525E+00	1.20	1.14
7.28	10.41	0.00	14.4	.513E+00	1.23	1.17
7.60	10.65	0.00	14.7	.502E+00	1.25	1.19
7.94	10.89	0.00	15.1	.491E+00	1.28	1.22
8.28	11.13	0.00	15.4	.481E+00	1.30	1.25
8.62	11.37	0.00	15.7	.471E+00	1.33	1.27
8.97	11.61	0.00	16.0	.462E+00	1.36	1.30
9.33	11.85	0.00	16.3	.453E+00	1.38	1.33
9.70	12.09	0.00	16.7	.444E+00	1.41	1.35
10.08	12.33	0.00	17.0	.436E+00	1.44	1.38

Cumulative travel time = 56. sec

Some concentration build-up near bank/shore due to recirculation effects.
Find concentration and thickness values for the RECIRCULATION REGION
at end of MOD329!

END OF MOD317: WEAKLY DEFLECTED JET (3-D) WITH LEESIDE RECIRCULATION ZONE

BEGIN MOD327: STRONGLY DEFLECTED JET (3-D) WITH LEESIDE RECIRCULATION ZONE

Profile definitions:
BV = Gaussian 1/e (37%) vertical thickness
BH = Gaussian 1/e (37%) horizontal half-width, normal to trajectory
S = hydrodynamic centerline dilution
C = centerline concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH
10.08	12.33	0.00	17.0	.436E+00	3.49	3.35
11.82	12.71	0.00	18.1	.408E+00	3.60	3.46
13.56	12.88	0.00	18.7	.397E+00	3.65	3.51
15.30	12.99	0.00	19.0	.389E+00	3.69	3.55
17.04	13.09	0.00	19.3	.383E+00	3.72	3.57
18.78	13.17	0.00	19.6	.378E+00	3.74	3.60
20.52	13.24	0.00	19.8	.374E+00	3.76	3.62
22.26	13.30	0.00	20.0	.370E+00	3.78	3.64
24.00	13.36	0.00	20.2	.366E+00	3.80	3.66
25.74	13.41	0.00	20.4	.363E+00	3.81	3.67
27.48	13.46	0.00	20.5	.361E+00	3.83	3.69
29.22	13.51	0.00	20.7	.358E+00	3.84	3.70
30.96	13.55	0.00	20.8	.356E+00	3.85	3.71
32.70	13.59	0.00	21.0	.353E+00	3.87	3.72
34.44	13.63	0.00	21.1	.351E+00	3.88	3.74
36.19	13.66	0.00	21.2	.349E+00	3.89	3.75
37.93	13.70	0.00	21.3	.347E+00	3.90	3.76
39.67	13.73	0.00	21.4	.345E+00	3.91	3.77
41.41	13.77	0.00	21.5	.344E+00	3.92	3.78

Elapsed Time

56 sec

2:15

3:34

$\left(\frac{4017-56}{50}\right) = 79.22$ sec

Time step

43.15	13.80	0.00	21.6	.342E+00	3.93	3.79	
44.89	13.83	0.00	21.7	.340E+00	3.94	3.80	
46.63	13.86	0.00	21.8	.339E+00	3.95	3.81	
48.37	13.89	0.00	21.9	.337E+00	3.96	3.81	
50.11	13.91	0.00	22.0	.336E+00	3.96	3.82	
51.85	13.94	0.00	22.1	.334E+00	3.97	3.83	
53.59	13.97	0.00	22.2	.333E+00	3.98	3.84	
55.33	13.99	0.00	22.3	.332E+00	3.99	3.85	
57.07	14.02	0.00	22.4	.331E+00	4.00	3.85	
58.81	14.04	0.00	22.5	.329E+00	4.00	3.86	
60.56	14.06	0.00	22.6	.328E+00	4.01	3.87	
62.30	14.09	0.00	22.6	.327E+00	4.02	3.87	
64.04	14.11	0.00	22.7	.326E+00	4.02	3.88	
65.78	14.13	0.00	22.8	.325E+00	4.03	3.89	
67.52	14.15	0.00	22.9	.324E+00	4.04	3.89	
69.26	14.17	0.00	22.9	.323E+00	4.04	3.90	
71.00	14.20	0.00	23.0	.322E+00	4.05	3.91	
72.74	14.22	0.00	23.1	.321E+00	4.06	3.91	
74.48	14.24	0.00	23.1	.320E+00	4.06	3.92	
76.22	14.26	0.00	23.2	.319E+00	4.07	3.92	
77.96	14.27	0.00	23.3	.318E+00	4.07	3.93	
79.70	14.29	0.00	23.3	.317E+00	4.08	3.94	
81.44	14.31	0.00	23.4	.316E+00	4.08	3.94	
83.18	14.33	0.00	23.5	.315E+00	4.09	3.95	
84.93	14.35	0.00	23.5	.314E+00	4.09	3.95	
86.67	14.37	0.00	23.6	.314E+00	4.10	3.96	
88.41	14.38	0.00	23.7	.313E+00	4.11	3.96	1 hour
90.15	14.40	0.00	23.7	.312E+00	4.11	3.97	
91.89	14.42	0.00	23.8	.311E+00	4.12	3.97	
93.63	14.43	0.00	23.8	.310E+00	4.12	3.98	
95.37	14.45	0.00	23.9	.310E+00	4.13	3.98	
97.11	14.47	0.00	24.0	.309E+00	4.13	3.99	

Cumulative travel time = 4017. sec

Some concentration build-up near bank/shore due to recirculation effects.
Find concentration and thickness values for the RECIRCULATION REGION
at end of MOD329!

END OF MOD327: STRONGLY DEFLECTED JET (3-D) WITH LEESIDE RECIRCULATION ZONE

BEGIN MOD329: STRONGLY DEFLECTED PLUME WITH LEESIDE RECIRCULATION ZONE

This flow region is INSIGNIFICANT in spatial extent and will be by-passed.

The near-shore RECIRCULATION REGION extends back to the discharge location:
Concentration C within that region: .154E+00
Layer thickness BV within that region: 4.13

END OF MOD329: STRONGLY DEFLECTED PLUME WITH LEESIDE RECIRCULATION ZONE

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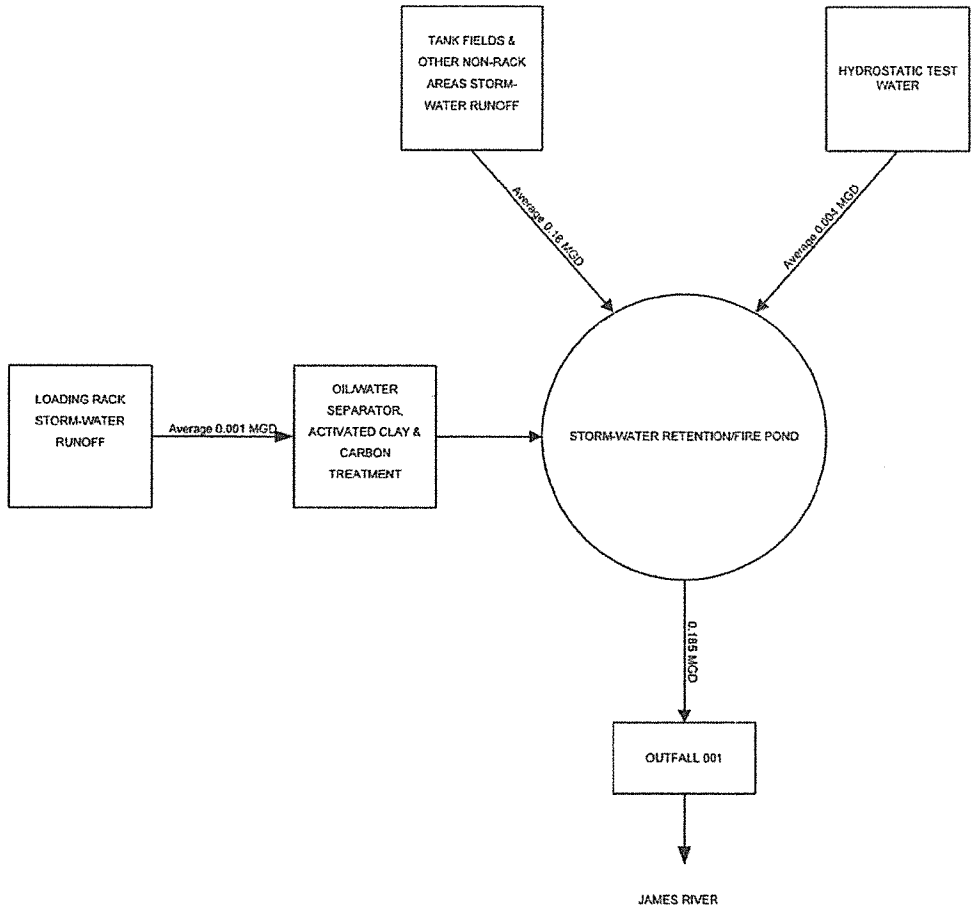
* End of NEAR-FIELD REGION (NFR) **

Kinder Morgan Southeast Terminals - Richmond 2
VA0058378
Fact Sheet Attachments

Attachment No. 2

Schematic Diagram

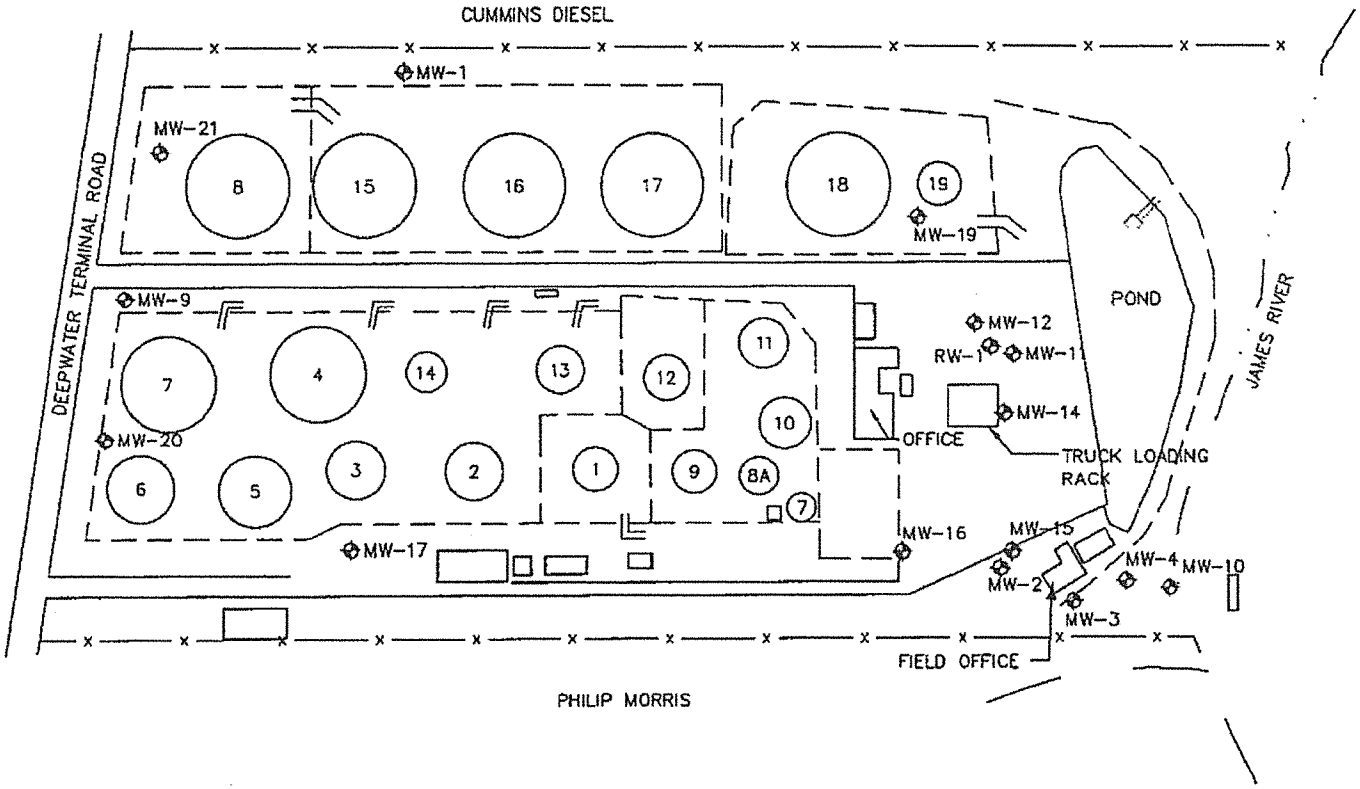


MGD MILLION GALLONS PER DAY

NOT TO SCALE

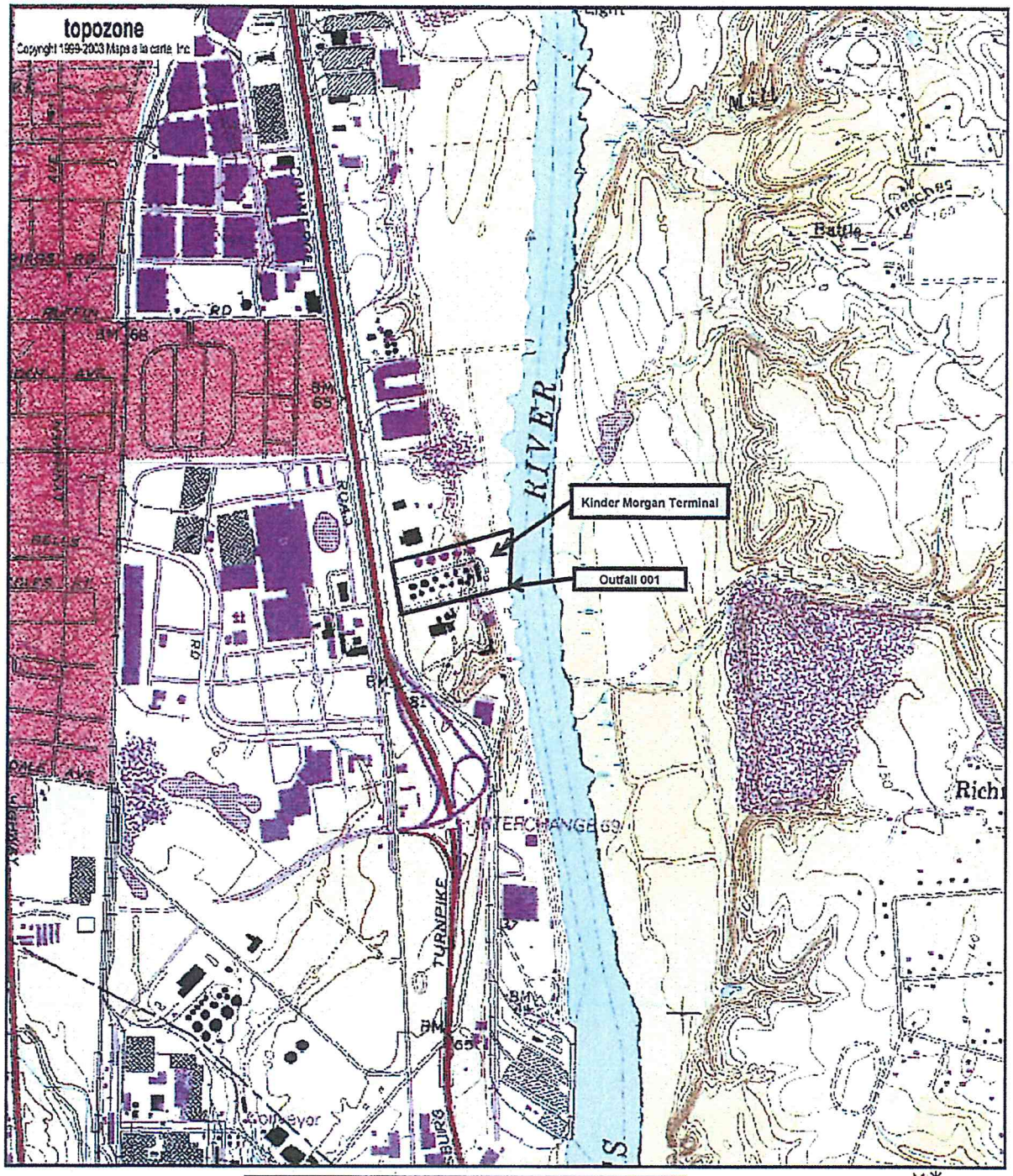
STORM-WATER RUNOFF BASED ON 43.65" RAINFALL PER YEAR WITHOUT INFILTRATION OR EVAPOTRANSPIRATION

Kinder Morgan, Richmond 2 Terminal, VPDES Permit VA0058378 Renewal, EPA Form 3510-2C			
QES	Line Drawing and Water Balance (Line IIA)	11/15/07	QES Job. No. 109-010


CUMMINS DIESEL
MW-1
MW-21
8
15
16
17
18
19
MW-19
DEEPWATER TERMINAL ROAD
MW-9
7
4
14
13
12
11
10
MW-20
6
5
3
2
1
9
8A
7
MW-17
OFFICE
MW-12
RW-1
MW-11
MW-14
TRUCK LOADING RACK
POND
JAMES RIVER
MW-16
MW-15
MW-2
MW-4
MW-10
MW-3
FIELD OFFICE
PHILIP MORRIS

Attachment No. 3

Location Map



0 0.3 0.6 0.9 1.2 1.5 km

0 0.2 0.4 0.6 0.8 1 mi

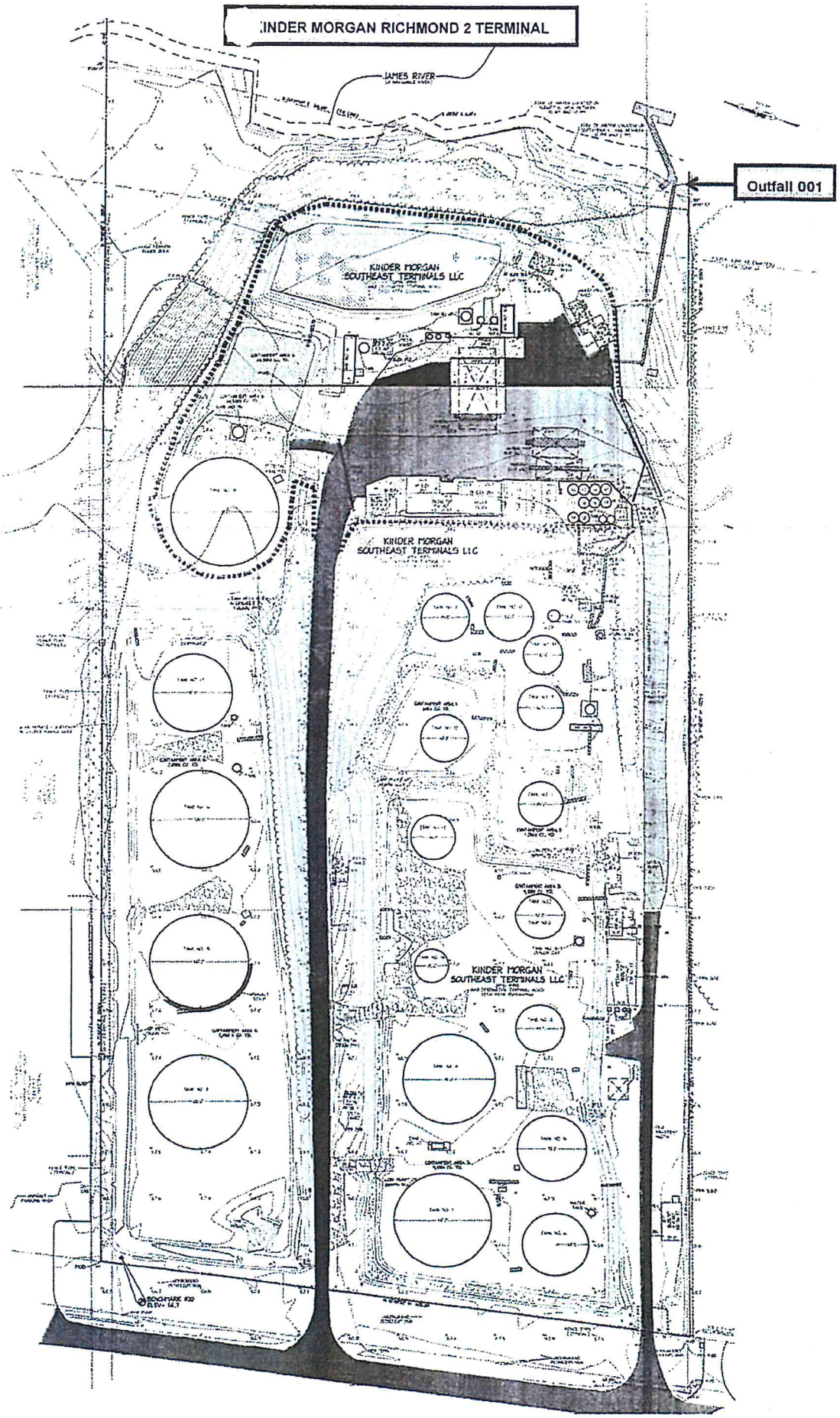
37° 28' 17"N, 77° 25' 25"W (NAD83/WGS84)

USGS Drewrys Bluff (VA) Quadrangle

Projection is UTM Zone 18 NAD83 Datum

M=-10.064
G=-1.475

Topographic Map
VPDES Permit Renewal VA0058378
Kinder Morgan Richmond 2 Terminal


KINDER MORGAN RICHMOND 2 TERMINAL
JAMES RIVER
Outfall 001
KINDER MORGAN
SOUTHEAST TERMINALS LLC
KINDER MORGAN
SOUTHEAST TERMINALS LLC
KINDER MORGAN
SOUTHEAST TERMINALS LLC

Kinder Morgan Southeast Terminals - Richmond 2
VA0058378
Fact Sheet Attachments

Attachment No. 4

Ambient Water Quality Data & 303(d) Fact Sheets

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	7/22/1968	S	0.3	30	7.5		5			
2-JMS104.16	9/8/1968	S	0.3	26.67	7		1			
2-JMS104.16	3/20/1969	S	0.3	11.11	7.2		10.39			
2-JMS104.16	6/19/1969	S	0.3	25.56	6.7		6.2			
2-JMS104.16	10/2/1969	S	0.3	23.33	7.2		7			
2-JMS104.16	4/21/1970	S	0.3	16.11	7.5		8			
2-JMS104.16	5/8/1970	S	0.3	17.78	7.2		8.5			
2-JMS104.16	6/18/1970	S	0.3	26.67	6.8		3.2			
2-JMS104.16	7/2/1970	S	0.3	27.22	6.9		2.4			
2-JMS104.16	7/22/1970	S	0.3	27.78	7.2		1			
2-JMS104.16	8/15/1970	S	0.3	31.11	7.3		4.4			
2-JMS104.16	8/26/1970	S	0.3	27.78	6.7		3			
2-JMS104.16	9/9/1970	S	0.3	28.33	7.2		2.8			
2-JMS104.16	5/6/1971	S	0.3	17.22	7.6		7.8			
2-JMS104.16	6/13/1971	S	0.3	23.33	8.3		8			
2-JMS104.16	7/23/1971	S	0.3	28.33	7.7		6.4			
2-JMS104.16	8/3/1971	S	0.3	30.56	7.6		6			
2-JMS104.16	8/31/1971	S	0.3	28.33	7.3		6			
2-JMS104.16	9/26/1971	S	0.3	21.11	8		7			
2-JMS104.16	10/27/1971	S	0.3	18.89	7		9.2			
2-JMS104.16	5/2/1972	S	0.3	19.44	7.3		8.2			
2-JMS104.16	6/17/1972	S	0.3	26.67	7.6		6			
2-JMS104.16	7/8/1972	S	0.3	21.11	7.3		9.2			
2-JMS104.16	7/31/1972	S	0.3	23.89	8		7.8			
2-JMS104.16	8/9/1972	S	0.3	26.67	7.5		7.8			
2-JMS104.16	8/20/1972	S	0.3		7.5		7			
2-JMS104.16	9/5/1972	S	0.3	25	7.3		6			
2-JMS104.16	10/4/1972	S	0.3	20	7.5		7.6			
2-JMS104.16	5/3/1973	S	0.3	17.78	7.1		7.8			
2-JMS104.16	6/6/1973	S	0.3	26.11	8		8			
2-JMS104.16	6/9/1973	S	0.3	27.22	7.9		1.3			
2-JMS104.16	7/15/1973	S	0.3	29.44	7.7		6.8			
2-JMS104.16	9/29/1973	S	0.3	29.44	7.5		4.4			
2-JMS104.16	5/26/1974	S	0.3	23.33	7.3		9			
2-JMS104.16	6/7/1974	S	0.3	21.67	7.5		9			
2-JMS104.16	6/27/1974	S	0.3	24.44	7.3		7.2			
2-JMS104.16	7/2/1974	S	0.3	26.67	7.5		7.7			
2-JMS104.16	7/26/1974	S	0.3	26.11	8		6.8			
2-JMS104.16	8/5/1974	S	0.3	27.22	7.6		7.2			
2-JMS104.16	8/30/1974	S	0.3	28	7.5		7.2			
2-JMS104.16	9/26/1974	S	0.3	22	7.5		7.4			
2-JMS104.16	10/25/1974	S	0.3	15	8		9.5			
2-JMS104.16	5/1/1975	S	0.3	16.11	7.5		9.6			
2-JMS104.16	6/4/1975	S	0.3		7.3		7.7			
2-JMS104.16	6/24/1975	S	0.3	29.44	9		8.8			
2-JMS104.16	6/30/1975	S	0.3	25.56	7.4		7.8			
2-JMS104.16	7/28/1975	S	0.3	26.67	7.5		7.6			
2-JMS104.16	8/13/1975	S	0.3	28.89	8.5		6.8			
2-JMS104.16	8/16/1975	S	0.3	28.89	8.3		6.8			
2-JMS104.16	9/3/1975	S	0.3	23.33	7.5		7.9			
2-JMS104.16	10/1/1975	S	0.3	20	7.5		9.2			
2-JMS104.16	2/12/1976	S	0.3	5.56	7.5		12.79			
2-JMS104.16	3/11/1976	S	0.3	12.22	7.7		10			
2-JMS104.16	5/4/1976	S	0.3	19	7.5		9.2			
2-JMS104.16	6/7/1976	S	0.3	21.11	7.2		8.5			
2-JMS104.16	5/22/1978	S	0.3	20.5	8.5		9			
2-JMS104.16	6/15/1978	S	0.3	25.5	8.5		4.7			
2-JMS104.16	7/11/1978	S	0.3	29	8.1		5.6			
2-JMS104.16	8/3/1978	S	0.3	29.5	7.5		6			
2-JMS104.16	9/25/1978	S	0.3	24	8.3		7.4			
2-JMS104.16	12/12/1978	S	0.3	7	7.5		12			
2-JMS104.16	4/24/1979	S	0.3	18	7.6		8.7			
2-JMS104.16	5/19/1980	S	0.3	21	8.5		8.4			
2-JMS104.16	7/16/1980	S	0.3	30	8.5		7.2			
2-JMS104.16	10/20/1980	S	0.3	19	7.3		6			
2-JMS104.16	7/27/1981	S	0.3	27.5	8.2		6.7			
2-JMS104.16	9/8/1981	S	0.3	25	7.8		7.7			
2-JMS104.16	5/13/1982	S	0.3	23	9		6.2			
2-JMS104.16	6/24/1982	S	0.3	24	7.5		7.1			
2-JMS104.16	8/9/1982	S	0.3	27.5	7.8		5.4			

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	10/28/1982	S	0.3	13.5	7.7		11.1			
2-JMS104.16	11/18/1982	S	0.3	9	7.3		11.3			1
2-JMS104.16	5/17/1983	S	0.3	18.5	8		9.7			
2-JMS104.16	6/28/1983	S	0.3	29.5	7.4		7.2			1
2-JMS104.16	7/28/1983	S	0.91	27.5	7.8		7.3			0.4
2-JMS104.16	8/16/1983	S	0.91							0.5
2-JMS104.16	8/30/1983	S	0.91	29.5	8		7.4			0.4
2-JMS104.16	9/27/1983	S	0.91	21	8		7.8			0.5
2-JMS104.16	10/12/1983	S	0.91							0.4
2-JMS104.16	6/29/1988	S	1	25	7.87	6.62			0	0.8
2-JMS104.16	6/29/1988	M	3	24.5		6.3			0	
2-JMS104.16	6/29/1988	M	5	24.4		6.34			0	
2-JMS104.16	6/29/1988	B	7	24.4	7.82	6.08			0	
2-JMS104.16	7/18/1988	S	8	31	7.44	5			0	
2-JMS104.16	7/18/1988	S	1	31	7.68	6.5			0	
2-JMS104.16	7/18/1988	M	3	31		5.6			0	
2-JMS104.16	7/18/1988	M	5	31		5.4			0	
2-JMS104.16	7/18/1988	M	7	31		5.1			0	
2-JMS104.16	7/18/1988	B	8	31	7.44	5			0	
2-JMS104.16	8/1/1988	S	1	29	7.48	6.59			0	1.2
2-JMS104.16	8/1/1988	M	3	28.2		6.38			0	
2-JMS104.16	8/1/1988	M	5	28		6.22			0	
2-JMS104.16	8/1/1988	B	7	28	7.37	6.21			0	
2-JMS104.16	8/15/1988	S	1	29.3	8.07	7.89			0	0.6
2-JMS104.16	8/15/1988	M	3	28.8		6.51			0	
2-JMS104.16	8/15/1988	M	5	28.6		6.27			0	
2-JMS104.16	8/15/1988	M	7	28.6		6.12			0	
2-JMS104.16	8/15/1988	B	8	28.6	7.87	6.01			0	
2-JMS104.16	9/12/1988	S	1	24.5	7.6	6.7			0	1.5
2-JMS104.16	9/12/1988	M	3	24.3		6.6			0	
2-JMS104.16	9/12/1988	M	5	24.1		6.6			0	
2-JMS104.16	9/12/1988	M	7	24		6.5			0	
2-JMS104.16	9/12/1988	B	8	23.9	7.32	6.4			0	
2-JMS104.16	9/27/1988	S	1	22.6	7.48	6.7			0	1.4
2-JMS104.16	9/27/1988	M	3	22.4		6.7			0	
2-JMS104.16	9/27/1988	M	5	22.4		6.7			0	
2-JMS104.16	9/27/1988	M	7	23.3		6.7			0	
2-JMS104.16	9/27/1988	B	9	22.3	7.4	6.7			0	
2-JMS104.16	10/11/1988	S	1	16.15	7.81	9.14			0	1.3
2-JMS104.16	10/11/1988	M	3	16.1		9.17			0	
2-JMS104.16	10/11/1988	M	5	16		9.13			0	
2-JMS104.16	10/11/1988	M	7	15.9		9.07			0	
2-JMS104.16	10/11/1988	B	8	15.9	7.65	9.04			0	
2-JMS104.16	10/26/1988	S	1	14	7.58	8.33			0	0.6
2-JMS104.16	10/26/1988	M	3	14		8.28			0	
2-JMS104.16	10/26/1988	M	5	13.9		8.31			0	
2-JMS104.16	10/26/1988	M	7	13.9		8.31			0	
2-JMS104.16	10/26/1988	M	9	13.9		8.76			0	
2-JMS104.16	10/26/1988	B	11	13.9	7.44	8.4			0	
2-JMS104.16	10/26/1988	S	1	14.2	8.11	9.61			0	1.4
2-JMS104.16	10/26/1988	M	3	14.2		9.59			0	
2-JMS104.16	10/26/1988	M	5	14.1		9.61			0	
2-JMS104.16	10/26/1988	M	7	14.1		9.6			0	
2-JMS104.16	10/26/1988	B	8	14.1	7.83	9.57			0	
2-JMS104.16	11/14/1988	S	1	11.4	7.61	10.57			0	1.4
2-JMS104.16	11/14/1988	M	3	11.3		10.64			0	
2-JMS104.16	11/14/1988	M	5	11.3		10.67			0	
2-JMS104.16	11/14/1988	M	7	11		10.68			0	
2-JMS104.16	11/14/1988	B	8	11	7.64	10.66			0	
2-JMS104.16	12/20/1988	S	1	2.68	7.62	14.15			0	0.7
2-JMS104.16	12/20/1988	M	3	2.65		14.21			0	
2-JMS104.16	12/20/1988	M	5	2.61		14.25			0	
2-JMS104.16	12/20/1988	M	7	2.59		14.2			0	
2-JMS104.16	12/20/1988	B	9	2.6	7.59	14.18			0	
2-JMS104.16	1/11/1989	S	1	5.83	7.54	12.57			0	1.4
2-JMS104.16	1/11/1989	M	3	5.7		12.49			0	
2-JMS104.16	1/11/1989	M	5	5.81		12.46			0	
2-JMS104.16	1/11/1989	M	7	5.66		12.45			0	
2-JMS104.16	1/11/1989	B	8	5.66	7.58	12.52			0	
2-JMS104.16	2/8/1989	S	1	6.49	7.65	12.12			0	1.5

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	2/8/1989	M	3	6.14		12.22			0	
2-JMS104.16	2/8/1989	M	5	6.06		12.29			0	
2-JMS104.16	2/8/1989	M	7	5.96		12.38			0	
2-JMS104.16	2/8/1989	B	9	5.89	7.75	12.42			0	
2-JMS104.16	3/15/1989	S	1	8.04	7.35	11.89			0	0.9
2-JMS104.16	3/15/1989	M	3	7.84		11.92			0	
2-JMS104.16	3/15/1989	M	5	7.83		11.89			0	
2-JMS104.16	3/15/1989	M	7	7.82		11.84			0	
2-JMS104.16	3/15/1989	B	8	7.82	7.36	11.85			0	
2-JMS104.16	3/28/1989	S	1	13.2	7.35	10.6			0	0.7
2-JMS104.16	3/28/1989	M	3	13.04		10.61			0	
2-JMS104.16	3/28/1989	M	5	12.98		10.57			0	
2-JMS104.16	3/28/1989	M	7	12.99		10.57			0	
2-JMS104.16	3/28/1989	B	8	13		10.56			0	
2-JMS104.16	4/13/1989	S	1	11.46	7.2	10.59			0	1.1
2-JMS104.16	4/13/1989	M	3	11.5		10.54			0	
2-JMS104.16	4/13/1989	M	5	11.48		10.49			0	
2-JMS104.16	4/13/1989	M	7	11.32		10.55			0	
2-JMS104.16	4/13/1989	B	9	11.34	7.26	10.54			0	
2-JMS104.16	3/13/1990	S	1	14.31	7.56	9.75			0	2
2-JMS104.16	3/13/1990	M	3	14.2		9.75			0	
2-JMS104.16	3/13/1990	M	5	14.22		9.7			0	
2-JMS104.16	3/13/1990	B	7	14.26	7.58	9.69			0	
2-JMS104.16	3/28/1990	S	1	10.52	7.42	11.02			0	1.4
2-JMS104.16	3/28/1990	M	3	10.51		11.02			0	
2-JMS104.16	3/28/1990	M	5	10.45		11.01			0	
2-JMS104.16	3/28/1990	M	7	10.49		10.99			0	
2-JMS104.16	3/28/1990	B	8	10.52	7.46	10.92			0	
2-JMS104.16	4/10/1990	S	1	12.23	7.17	10.58			0	
2-JMS104.16	4/10/1990	M	3	12.23		10.58			0	
2-JMS104.16	4/10/1990	M	5	12.23		10.58			0	
2-JMS104.16	4/10/1990	M	7	12.21		10.59			0	
2-JMS104.16	4/10/1990	B	8	12.21	7.2	10.46			0	
2-JMS104.16	4/25/1990	S	1	18.73	7.46	8.72			0	1.2
2-JMS104.16	4/25/1990	M	3	18.6		8.71			0	
2-JMS104.16	4/25/1990	M	5	18.66		8.69			0	
2-JMS104.16	4/25/1990	B	7	18.6	7.57	8.66			0	
2-JMS104.16	5/9/1990	S	1	20.19	7.42	8.31			0	1.1
2-JMS104.16	5/9/1990	M	3	20.05		8.3			0	
2-JMS104.16	5/9/1990	M	5	20.07		8.32			0	
2-JMS104.16	5/9/1990	B	7	20.07	7.55	8.31			0	
2-JMS104.16	5/31/1990	S	1	18.36	7.27	9.17			0	
2-JMS104.16	5/31/1990	M	3	18.34		9.18			0	
2-JMS104.16	5/31/1990	M	5	18.34		9.15			0	
2-JMS104.16	5/31/1990	B	7	18.33	7.33	9.12			0	
2-JMS104.16	6/14/1990	S	1	25.2	7.35	7.67			0	0.9
2-JMS104.16	6/14/1990	M	3	24.72		7.63			0	
2-JMS104.16	6/14/1990	M	5	24.49		7.63			0	
2-JMS104.16	6/14/1990	M	7	24.49		7.63			0	
2-JMS104.16	6/14/1990	B	8	24.5	7.38	7.56			0	
2-JMS104.16	6/27/1990	S	1	28.62	7.51	7.54			0	
2-JMS104.16	6/27/1990	M	3	27.93		7.01			0	
2-JMS104.16	6/27/1990	M	5	27.64		6.97			0	
2-JMS104.16	6/27/1990	B	7	27.61	7.39	7			0	
2-JMS104.16	7/10/1990	S	1	30.17	7.77	8.18			0	0.8
2-JMS104.16	7/10/1990	M	3	29.58		8.14			0	
2-JMS104.16	7/10/1990	M	5	29.08		6.7			0	
2-JMS104.16	7/10/1990	B	7	29.01		6.24			0	
2-JMS104.16	7/24/1990	S	1	30.9	7.54	7.43			0	1.4
2-JMS104.16	7/24/1990	M	3	30.49		6.83			0	
2-JMS104.16	7/24/1990	M	5	30.41		6.86			0	
2-JMS104.16	7/24/1990	M	7	30.16		7			0	
2-JMS104.16	7/24/1990	B	8	30.14	7.36	7.12			0	
2-JMS104.16	8/7/1990	S	1	27.56	7	6.75			0	1.2
2-JMS104.16	8/7/1990	M	3	27.17		6.82			0	
2-JMS104.16	8/7/1990	M	5	27.05		6.81			0	
2-JMS104.16	8/7/1990	B	7	27	7	7.03			0	
2-JMS104.16	8/23/1990	S	1	25.98	7.15	7.17			0	1.5
2-JMS104.16	8/23/1990	M	3	25.66		7.2			0	
2-JMS104.16	8/23/1990	M	5	28.57		7.26			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	8/23/1990	M	7	25.47		7.36			0	
2-JMS104.16	8/23/1990	B	9	25.48	7.16	7.65			0	
2-JMS104.16	9/6/1990	S	1	27.94	7.5	8.54			0	1.4
2-JMS104.16	9/6/1990	M	3	27.15		7.66			0	
2-JMS104.16	9/6/1990	M	5	26.89		7.38			0	
2-JMS104.16	9/6/1990	M	7	26.79		7.24			0	
2-JMS104.16	9/6/1990	B	8	26.8	7.39	7.24			0	
2-JMS104.16	9/24/1990	S	1	22.03	7.62	9.18			0	1.3
2-JMS104.16	9/24/1990	M	3	21.53		8.01			0	
2-JMS104.16	9/24/1990	M	5	21.43		7.92			0	
2-JMS104.16	9/24/1990	B	7	21.43	7.49	8.16			0	
2-JMS104.16	10/9/1990	S	1	23.61	7.24	8.31			0	1.8
2-JMS104.16	10/9/1990	M	3	22.97		7.88			0	
2-JMS104.16	10/9/1990	M	5	22.83		7.67			0	
2-JMS104.16	10/9/1990	M	7	22.82		7.53			0	
2-JMS104.16	10/9/1990	B	8	22.73	7.23	7.46			0	
2-JMS104.16	10/25/1990	S	1	15.92	7.31	9.31			0	0.2
2-JMS104.16	10/25/1990	M	3	15.92		9.3			0	
2-JMS104.16	10/25/1990	M	5	15.92		9.28			0	
2-JMS104.16	10/25/1990	M	7	15.93		9.27			0	
2-JMS104.16	10/25/1990	B	9	15.94	7.38	9.27			0	
2-JMS104.16	11/7/1990	S	1	14.72	7.2	9.76			0	1
2-JMS104.16	11/7/1990	M	3	14.66		9.79			0	
2-JMS104.16	11/7/1990	M	5	14.51		9.86			0	
2-JMS104.16	11/7/1990	B	7	14.38	7.17	9.88			0	
2-JMS104.16	12/12/1990	S	1	6.41	7.08	12.83			0	2.2
2-JMS104.16	12/12/1990	M	3	6.41		12.89			0	
2-JMS104.16	12/12/1990	M	5	6.43		12.98			0	
2-JMS104.16	12/12/1990	B	7	6.46	7.04	13.02			0	
2-JMS104.16	1/14/1991	S	1	6.43	7.04	12.06			0	0.1
2-JMS104.16	1/14/1991	M	3	6.43		12.22			0	
2-JMS104.16	1/14/1991	B	9	6.43	7.03	12.11			0	
2-JMS104.16	2/25/1991	S	1	6.98	7.27	12.32			0	1.5
2-JMS104.16	2/25/1991	M	3	6.98		12.39			0	
2-JMS104.16	2/25/1991	M	5	6.95		12.4			0	
2-JMS104.16	2/25/1991	B	7	6.96	7.29	12.5			0	
2-JMS104.16	3/6/1991	S	1	10.04	7.16	11.18			0	0.1
2-JMS104.16	3/6/1991	M	3	10.04		11.14			0	
2-JMS104.16	3/6/1991	M	5	10.04		11.14			0	
2-JMS104.16	3/6/1991	M	7	10.05		11.19			0	
2-JMS104.16	3/6/1991	B	8	10.04	7.18	11.18			0	
2-JMS104.16	3/20/1991	S	1	10.62	6.99	11			0	0.7
2-JMS104.16	3/20/1991	M	3	10.61		10.99			0	
2-JMS104.16	3/20/1991	M	5	10.63		10.99			0	
2-JMS104.16	3/20/1991	B	7	10.63	7.01	10.99			0	
2-JMS104.16	4/3/1991	S	1	12.09	6.9	11.2			0	0.5
2-JMS104.16	4/3/1991	M	3	12.07		11.21			0	
2-JMS104.16	4/3/1991	M	5	12.09		11.25			0	
2-JMS104.16	4/3/1991	B	7	12.09	6.87	11.37			0	
2-JMS104.16	4/23/1991	S	1	14.12	7.06	10.53			0	1.3
2-JMS104.16	4/23/1991	M	3	13.96		10.51			0	
2-JMS104.16	4/23/1991	M	5	13.97		10.56			0	
2-JMS104.16	4/23/1991	B	7	13.97	7.07	10.73			0	
2-JMS104.16	5/2/1991	S	1	20.52	7.06	8.45			0	1.5
2-JMS104.16	5/2/1991	M	3	20.44		8.51			0	
2-JMS104.16	5/2/1991	M	5	20.42		8.51			0	
2-JMS104.16	5/2/1991	M	7	20.41		8.42			0	
2-JMS104.16	5/2/1991	B	8	20.41	7.08	8.52			0	
2-JMS104.16	5/16/1991	S	1	26.73	7.44	6.98			0	1.9
2-JMS104.16	5/16/1991	M	3	26.93		7.03			0	
2-JMS104.16	5/16/1991	M	5	26.38		7.03			0	
2-JMS104.16	5/16/1991	B	6	26.14	7.38	7.15			0	
2-JMS104.16	6/13/1991	S	1	26.96	7.32	7.22			0	1.5
2-JMS104.16	6/13/1991	M	3	26.92		7.12			0	
2-JMS104.16	6/13/1991	M	5	26.8		7.05			0	
2-JMS104.16	6/13/1991	M	7	26.79		7.05			0	
2-JMS104.16	6/13/1991	B	8	26.77	7.36	7.06			0	
2-JMS104.16	6/27/1991	S	1	26.37	7.18	7.2			0	1
2-JMS104.16	6/27/1991	M	3	26.2		7.09			0	
2-JMS104.16	6/27/1991	M	5	26.2		7.16			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	6/27/1991	B	7	26.18	7.19	7.2			0	
2-JMS104.16	7/16/1991	S	1	29.16	7.15	6.31			0	0.6
2-JMS104.16	7/16/1991	M	3	29.07		6.33			0	
2-JMS104.16	7/16/1991	M	5	28.88		6.29			0	
2-JMS104.16	7/16/1991	B	7	28.88	7.17	6.45			0	
2-JMS104.16	7/30/1991	S	1	24.27	6.85	7.47			0	0.6
2-JMS104.16	7/30/1991	M	3	24.26		7.51			0	
2-JMS104.16	7/30/1991	M	5	24.26		7.54			0	
2-JMS104.16	7/30/1991	B	6	24.25	6.67	7.72			0	
2-JMS104.16	8/13/1991	S	1	26.75		7.64			0	0.5
2-JMS104.16	8/13/1991	M	3	26.49		7.71			0	
2-JMS104.16	8/13/1991	M	5	26.39		7.79			0	
2-JMS104.16	8/13/1991	B	7	26.39		7.81			0	
2-JMS104.16	8/27/1991	S	1	27.32	7.31	6.85			0	1.5
2-JMS104.16	8/27/1991	M	3	26.98		6.87			0	
2-JMS104.16	8/27/1991	M	5	26.79		6.88			0	
2-JMS104.16	8/27/1991	M	7	26.55		6.86			0	
2-JMS104.16	8/27/1991	B	8	26.45	7.27	7.06			0	
2-JMS104.16	9/12/1991	S	1	27.08		8.95			0	1.2
2-JMS104.16	9/12/1991	M	3	26.89		8.95			0	
2-JMS104.16	9/12/1991	M	5	26.64		8.55			0	
2-JMS104.16	9/12/1991	M	7	26.57		8.55			0	
2-JMS104.16	9/12/1991	B	8	26.53		8.68			0	
2-JMS104.16	10/1/1991	S	1	21.52	7.38	7.88			0	1.6
2-JMS104.16	10/1/1991	M	3	21.68		7.94			0	
2-JMS104.16	10/1/1991	M	5	21.56		7.9			0	
2-JMS104.16	10/1/1991	B	7	21.54	7.39	7.9			0	
2-JMS104.16	10/10/1991	S	1	19.55	7.55	8.74			0	2.3
2-JMS104.16	10/10/1991	M	3	19.4		8.75			0	
2-JMS104.16	10/10/1991	M	5	19.32		9.11			0	
2-JMS104.16	10/10/1991	B	7	19.18		9.1			0	
2-JMS104.16	10/28/1991	S	1	18.81	7.1	8.55			0	2
2-JMS104.16	10/28/1991	M	3	18.79		8.65			0	
2-JMS104.16	10/28/1991	M	5	18.71		8.76			0	
2-JMS104.16	10/28/1991	B	7	18.64	7.12	8.88			0	
2-JMS104.16	11/18/1991	S	1	10.92	7.29	10.36			0	2.2
2-JMS104.16	11/18/1991	M	3	10.92		10.53			0	
2-JMS104.16	11/18/1991	M	5	10.93		10.87			0	
2-JMS104.16	11/18/1991	M	7	10.9		11.04			0	
2-JMS104.16	11/18/1991	B	8	10.81	7.31	11.26			0	
2-JMS104.16	12/11/1991	S	1	9.71	7.23	10.97			0	0.9
2-JMS104.16	12/11/1991	M	3	9.71		10.97			0	
2-JMS104.16	12/11/1991	M	5	9.71		10.93			0	
2-JMS104.16	12/11/1991	M	7	9.71		11.37			0	
2-JMS104.16	12/11/1991	B	9	9.68	7.38	11.37			0	
2-JMS104.16	1/9/1992	S	1	7.13	7.04	12.98			0	0.5
2-JMS104.16	1/9/1992	M	3	7.13		13.6			0	
2-JMS104.16	1/9/1992	M	5	7.14		13.55			0	
2-JMS104.16	1/9/1992	B	7	7.13	7.09	13.49			0	
2-JMS104.16	2/10/1992	S	1	5.05	8.26	13.64			0	3
2-JMS104.16	2/10/1992	M	3	5.05		13.76			0	
2-JMS104.16	2/10/1992	M	5	5.02		13.73			0	
2-JMS104.16	2/10/1992	B	7	5.03	8.24	13.67			0	
2-JMS104.16	3/24/1992	S	1	8.81	7.24	11.9			0	1.2
2-JMS104.16	3/24/1992	M	3	8.77		12.4			0	
2-JMS104.16	3/24/1992	M	5	8.77		12.5			0	
2-JMS104.16	3/24/1992	B	6	8.78	7.23	12.51			0	
2-JMS104.16	4/7/1992	S	1	11.15	7	10.87			0	2.1
2-JMS104.16	4/7/1992	M	3	11.15		10.87			0	
2-JMS104.16	4/7/1992	M	5	11.16		10.95			0	
2-JMS104.16	4/7/1992	B	7	11.19	6.94	11.02			0	
2-JMS104.16	4/21/1992	S	1	20.03	7.92	8.43			0	2.1
2-JMS104.16	4/21/1992	M	3	19.98		8.45			0	
2-JMS104.16	4/21/1992	M	5	19.94		8.44			0	
2-JMS104.16	4/21/1992	B	7	19.93	7.8	8.45			0	
2-JMS104.16	5/6/1992	S	1	17.87	7.42	8.96			0	1.6
2-JMS104.16	5/6/1992	M	3	17.83		8.94			0	
2-JMS104.16	5/6/1992	M	5	17.74		8.95			0	
2-JMS104.16	5/6/1992	B	6	17.73	7.2	8.96			0	
2-JMS104.16	5/27/1992	S	1	19.05	7.39	8.66			0	1.6

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	5/27/1992	M	3	18.86		8.7			0	
2-JMS104.16	5/27/1992	M	5	18.76		8.7			0	
2-JMS104.16	5/27/1992	M	7	18.71		8.69			0	
2-JMS104.16	5/27/1992	B	8	18.71	7.29	8.72			0	
2-JMS104.16	6/18/1992	S	1	22.96	7.44	8.06			0	1.4
2-JMS104.16	6/18/1992	M	3	22.93		8.08			0	
2-JMS104.16	6/18/1992	M	5	22.82		8.08			0	
2-JMS104.16	6/18/1992	B	7	22.7	7.34	8.08			0	
2-JMS104.16	7/6/1992	S	1	27.17	7.46	7.36			0	1.6
2-JMS104.16	7/6/1992	M	3	26.84		7.22			0	
2-JMS104.16	7/6/1992	M	5	26.8		7.3			0	
2-JMS104.16	7/6/1992	B	6	26.8	7.46	7.32			0	
2-JMS104.16	7/20/1992	S	1	30.6	7.75	7.9			0	1.2
2-JMS104.16	7/20/1992	M	3	29.9		7.35			0	
2-JMS104.16	7/20/1992	M	5	29.82		7.59			0	
2-JMS104.16	7/20/1992	B	7	29.51	7.17	7.21			0	
2-JMS104.16	9/1/1992	S	1	26.72	7.55	7.97			0	1.8
2-JMS104.16	9/1/1992	M	3	26.13		7.46			0	
2-JMS104.16	9/1/1992	M	5	26.07		7.39			0	
2-JMS104.16	9/1/1992	B	7	26.02	7.3	7.48			0	
2-JMS104.16	10/8/1992	S	1	17.36	7.62	9.13			0	1.9
2-JMS104.16	10/8/1992	M	3	17.24		9.19			0	
2-JMS104.16	10/8/1992	M	5	17		9.3			0	
2-JMS104.16	10/8/1992	M	7	16.85		9.6			0	
2-JMS104.16	10/8/1992	B	9	16.81	7.49	9.91			0	
2-JMS104.16	11/2/1992	S	1	14.37	7.13	9.8			0	2.4
2-JMS104.16	11/2/1992	M	3	14.24		9.83			0	
2-JMS104.16	11/2/1992	M	5	14.17		9.82			0	
2-JMS104.16	11/2/1992	B	7	14.19	7.11	9.94			0	
2-JMS104.16	11/17/1992	S	1	8.04	7.68	11.9			0	0.6
2-JMS104.16	11/17/1992	M	3	7.97		11.93			0	
2-JMS104.16	11/17/1992	M	5	7.98		11.92			0	
2-JMS104.16	11/17/1992	B	7	7.97	7.74	11.9			0	
2-JMS104.16	12/15/1992	S	1	5.09	7.27	12.93			0	0.4
2-JMS104.16	12/15/1992	M	3	5.11		12.93			0	
2-JMS104.16	12/15/1992	M	5	5.1		12.93			0	
2-JMS104.16	12/15/1992	M	7	5.1		13			0	
2-JMS104.16	12/15/1992	B	8	5.1	7.18	13.06			0	
2-JMS104.16	1/14/1993	S	1	6.66	7.42	12.35			0	0.7
2-JMS104.16	1/14/1993	M	3	6.66		12.42			0	
2-JMS104.16	1/14/1993	M	5	6.65		12.42			0	
2-JMS104.16	1/14/1993	B	7	6.65	7.2	12.49			0	
2-JMS104.16	2/9/1993	S	1	5.45	7.52	13.32			0	2.4
2-JMS104.16	2/9/1993	M	3	5.3		13.34			0	
2-JMS104.16	2/9/1993	M	5	5.21		13.38			0	
2-JMS104.16	2/9/1993	M	7	5.13		13.36			0	
2-JMS104.16	2/9/1993	B	8	5.13	7.38	13.43			0	
2-JMS104.16	3/10/1993	S	1	7.76	7.3	11.99			0	0.4
2-JMS104.16	3/10/1993	M	3	7.76		12			0	
2-JMS104.16	3/10/1993	M	5	7.76		12			0	
2-JMS104.16	3/10/1993	B	7	7.76	7.18	12.2			0	
2-JMS104.16	4/8/1993	S	1	10.83	7.3	11.14			0	0.9
2-JMS104.16	4/8/1993	M	3	10.83		11.12			0	
2-JMS104.16	4/8/1993	M	5	10.81		11.13			0	
2-JMS104.16	4/8/1993	M	7	10.79		11.12			0	
2-JMS104.16	4/8/1993	B	9	10.81	7.3	11			0	
2-JMS104.16	4/28/1993	S	1	16.3	7.39	9.86			0	1.2
2-JMS104.16	4/28/1993	M	3	16.2		9.89			0	
2-JMS104.16	4/28/1993	M	5	16.2		9.89			0	
2-JMS104.16	4/28/1993	B	7	16.2	7.34	9.97			0	
2-JMS104.16	5/6/1993	S	1	20.56	7.41	9.01			0	1.7
2-JMS104.16	5/6/1993	M	3	20.5		8.99			0	
2-JMS104.16	5/6/1993	M	5	20.47		8.87			0	
2-JMS104.16	5/6/1993	M	7	20.47		8.87			0	
2-JMS104.16	5/6/1993	B	9	20.48	7.28	8.87			0	
2-JMS104.16	6/2/1993	S	1	23.92	7.55	7.93			0	1.6
2-JMS104.16	6/2/1993	M	3	23.57		7.9			0	
2-JMS104.16	6/2/1993	M	5	23.32		7.94			0	
2-JMS104.16	6/2/1993	M	7	23.17		7.94			0	
2-JMS104.16	6/2/1993	B	8	23.13	7.35	7.9			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	6/7/1993	S	1	22.94	7.16	8.32			0	0.9
2-JMS104.16	6/7/1993	M	3	22.86		8.38			0	
2-JMS104.16	6/7/1993	M	5	22.83		8.37			0	
2-JMS104.16	6/7/1993	B	7	22.82	7.06	8.44			0	
2-JMS104.16	6/22/1993	S	1	29.33	7.85	7.17			0	2.2
2-JMS104.16	6/22/1993	M	3	29.14		7.29			0	
2-JMS104.16	6/22/1993	M	5	29.01		7.51			0	
2-JMS104.16	6/22/1993	B	6	28.84	7.42	7.55			0	
2-JMS104.16	7/7/1993	S	1	31.39	7.63	6.62			0	2
2-JMS104.16	7/7/1993	M	3	30.96		6.52			0	
2-JMS104.16	7/7/1993	M	5	30.88		6.41			0	
2-JMS104.16	7/7/1993	B	7	30.62	7.45	6.62			0	
2-JMS104.16	7/21/1993	S	1	30.72	7.52	6.92			0	2.1
2-JMS104.16	7/21/1993	M	3	29.92		6.7			0	
2-JMS104.16	7/21/1993	M	5	29.62		6.52			0	
2-JMS104.16	7/21/1993	M	7	29.45	7.27	6.36			0	
2-JMS104.16	8/4/1993	S	1	29.57	7.84	7.75			0	1.8
2-JMS104.16	8/4/1993	M	3	29.2		7.33			0	
2-JMS104.16	8/4/1993	M	5	29.16		7.3			0	
2-JMS104.16	8/4/1993	M	7	29.11	7.58	7.3			0	
2-JMS104.16	8/18/1993	S	1	29.52	7.51	7.17				1.6
2-JMS104.16	8/18/1993	M	3	29.11		6.99				
2-JMS104.16	8/18/1993	M	5	29		6.98				
2-JMS104.16	8/18/1993	B	7	28.9	7.38	6.98				
2-JMS104.16	9/2/1993	S	1	30.35	7.6	7			0	1.3
2-JMS104.16	9/2/1993	M	3	29.96		6.7			0	
2-JMS104.16	9/2/1993	M	5	29.7		6.46			0	
2-JMS104.16	9/2/1993	B	6	29.69	7.44	6.55			0	
2-JMS104.16	9/20/1993	S	1	24.58	7.58	7.44			0	2.3
2-JMS104.16	9/20/1993	M	3	24.27		7.15			0	
2-JMS104.16	9/20/1993	M	5	24.24		7.13			0	
2-JMS104.16	9/20/1993	M	7	24.25		7.16			0	
2-JMS104.16	9/20/1993	B	8	24.25	7.5	7.18			0	
2-JMS104.16	10/5/1993	S	1	19.78	8.49	8.9			0	2.9
2-JMS104.16	10/5/1993	M	3	19.69		8.83			0	
2-JMS104.16	10/5/1993	M	5	19.61		8.83			0	
2-JMS104.16	10/5/1993	M	6	19.53	8.39	8.79			0	
2-JMS104.16	12/2/1993	M	1	7.94	7.17	11.95			0	0.4
2-JMS104.16	12/2/1993	M	3	7.79		11.95			0	
2-JMS104.16	12/2/1993	M	5	7.78		12.01			0	
2-JMS104.16	12/2/1993	M	7	7.79		12.06			0	
2-JMS104.16	12/2/1993	B	8	7.79	7.2	12.08			0	
2-JMS104.16	2/17/1994	S	1	4.72	7.42	13.09			0	0.6
2-JMS104.16	2/17/1994	M	3	4.74		13.15			0	
2-JMS104.16	2/17/1994	M	5	4.71		13.21			0	
2-JMS104.16	2/17/1994	M	7	4.72		13.28			0	
2-JMS104.16	2/17/1994	B	8	4.71	7.42	13.35			0	
2-JMS104.16	3/21/1994	S	1	9.73	7.6	11.16			0	1.5
2-JMS104.16	3/21/1994	M	3	9.72		11.13			0	
2-JMS104.16	3/21/1994	M	5	9.73		11.13			0	
2-JMS104.16	3/21/1994	B	7	9.73	7.61	11.19			0	
2-JMS104.16	4/14/1994	S	1	16.72	7.82	9.89			0	1.6
2-JMS104.16	4/14/1994	M	3	16.55		9.9			0	
2-JMS104.16	4/14/1994	M	5	9.9		9.9			0	
2-JMS104.16	4/14/1994	M	7	16.43		9.88			0	
2-JMS104.16	4/14/1994	B	8	16.38	7.7	9.91			0	
2-JMS104.16	5/23/1994	S	1	21.1	9.09	9.84			0	0.8
2-JMS104.16	5/23/1994	M	3	20.51		8.67			0	
2-JMS104.16	5/23/1994	M	5	20.27		7.9			0	
2-JMS104.16	5/23/1994	M	7	20.17		7.84			0	
2-JMS104.16	5/23/1994	B	9	20.03	8.59	7.59			0	
2-JMS104.16	6/9/1994	S	1	26.75	8	8.55			0	1.2
2-JMS104.16	6/9/1994	M	3	26.3		7.57			0	
2-JMS104.16	6/9/1994	M	5	25.98		6.69			0	
2-JMS104.16	6/9/1994	M	7	25.81		6.74			0	
2-JMS104.16	6/9/1994	B	9	25.68	7.45	6.73			0	
2-JMS104.16	7/7/1994	S	1	31.87	7.59	7.75			0	1.1
2-JMS104.16	7/7/1994	M	3	30.6		6.91			0	
2-JMS104.16	7/7/1994	M	5	30.16		6.4			0	
2-JMS104.16	7/7/1994	M	7	30.04		6.26			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	7/7/1994	B	9	29.96	7.25	6.05			0	
2-JMS104.16	8/11/1994	S	1	28.4	8.16	8.7			0	1.5
2-JMS104.16	8/11/1994	M	3	27.56		8.18			0	
2-JMS104.16	8/11/1994	M	5	27.35		8.2			0	
2-JMS104.16	8/11/1994	M	7	27.22		8.11			0	
2-JMS104.16	8/11/1994	B	8	26.99	7.67	7.8			0	
2-JMS104.16	9/8/1994	S	9	24.03	7.86	7.6			0	
2-JMS104.16	9/8/1994	S	1	25.48	8.12	8.03			0	1.3
2-JMS104.16	9/8/1994	M	3	24.4		7.73			0	
2-JMS104.16	9/8/1994	M	5	24.19		7.76			0	
2-JMS104.16	9/8/1994	B	7	24.03		7.65			0	
2-JMS104.16	10/17/1994	S	9	15.79	8	9.27				
2-JMS104.16	10/17/1994	S	1	16.98	8.42	10.81				
2-JMS104.16	10/17/1994	M	3	16.52		9.76				
2-JMS104.16	10/17/1994	M	5	16.01		9.43				
2-JMS104.16	10/17/1994	B	7	15.96		9.38				
2-JMS104.16	11/30/1994	S	8	8.66	7.7	11.76			0	
2-JMS104.16	11/30/1994	S	1	9.05	7.67	11.71			0	2
2-JMS104.16	11/30/1994	M	3	8.89		11.7			0	
2-JMS104.16	11/30/1994	M	5	8.91		11.71			0	
2-JMS104.16	11/30/1994	B	7	8.69		11.75			0	
2-JMS104.16	12/6/1994	S	8	9.79	7.55	10.92			0	
2-JMS104.16	12/6/1994	S	1	9.97	7.56	10.94			0	2.2
2-JMS104.16	12/6/1994	M	3	9.96		10.96			0	
2-JMS104.16	12/6/1994	M	5	9.89		10.92			0	
2-JMS104.16	12/6/1994	B	7	9.81		10.91			0	
2-JMS104.16	1/25/1995	S	9	5.14	7.6	12.98			0	
2-JMS104.16	1/25/1995	S	1	5.15	7.65	12.95			0	0.8
2-JMS104.16	1/25/1995	M	3	5.16		12.96			0	
2-JMS104.16	1/25/1995	M	5	5.15		12.97			0	
2-JMS104.16	1/25/1995	B	7	5.14		12.96			0	
2-JMS104.16	2/27/1995	S	1	8.19	7.72	11.78			0	1.6
2-JMS104.16	2/27/1995	M	3	7.94		11.74			0	
2-JMS104.16	2/27/1995	M	5	7.96		11.72			0	
2-JMS104.16	2/27/1995	B	7	7.99		11.72			0	
2-JMS104.16	2/27/1995	S	9	8.02	7.67	11.72			0	
2-JMS104.16	3/23/1995	S	1	13.75	7.64	10.28			0	1.7
2-JMS104.16	3/23/1995	M	3	13.7		10.27			0	
2-JMS104.16	3/23/1995	M	5	13.62		10.28			0	
2-JMS104.16	3/23/1995	B	7	13.67		10.28			0	
2-JMS104.16	3/23/1995	S	8	13.65	7.62	10.28			0	
2-JMS104.16	4/18/1995	S	1	16.6	7.71	9.15			0	1.8
2-JMS104.16	4/18/1995	M	3	16.3		9.11			0	
2-JMS104.16	4/18/1995	B	5	16.25		9.11			0	
2-JMS104.16	4/18/1995	S	7	16.23	7.68	9.06			0	
2-JMS104.16	5/23/1995	S	1	23.88	7.33	8.02			0	1.9
2-JMS104.16	5/23/1995	S	8	22.91	7.26	8.17			0	
2-JMS104.16	6/20/1995	S	1	25.77	7.4	7.72			0	1.2
2-JMS104.16	6/20/1995	M	3	24.98		7.71			0	
2-JMS104.16	6/20/1995	B	5	24.87		7.73			0	
2-JMS104.16	6/20/1995	S	6	24.85	7.26	7.81			0	
2-JMS104.16	7/18/1995	S	1	31.04	7.66	7.06			0	0.7
2-JMS104.16	7/18/1995	M	3	30.82		7.03			0	
2-JMS104.16	7/18/1995	M	5	30.7		6.87			0	
2-JMS104.16	7/18/1995	B	7	30.71		6.78			0	
2-JMS104.16	7/18/1995	S	8	30.7	7.49	6.78			0	
2-JMS104.16	8/23/1995	S	1	29.75	8.33	8.7			0	0.9
2-JMS104.16	8/23/1995	M	3	29.1		7.84			0	
2-JMS104.16	8/23/1995	M	5	28.68		7.09			0	
2-JMS104.16	8/23/1995	B	7	28.65		6.86			0	
2-JMS104.16	8/23/1995	S	9	28.65	7.74	6.8			0	
2-JMS104.16	9/21/1995	S	1	23.3	8.22	8.79			0	1.4
2-JMS104.16	9/21/1995	M	3	22.83		8.06			0	
2-JMS104.16	9/21/1995	M	5	22.69		7.95			0	
2-JMS104.16	9/21/1995	B	7	22.51		7.88			0	
2-JMS104.16	9/21/1995	S	9	22.48	7.8	7.9			0	
2-JMS104.16	10/19/1995	S	1	17.3	7.31	9.07			0	1
2-JMS104.16	10/19/1995	M	3	16.85		9.27			0	
2-JMS104.16	10/19/1995	M	5	16.58		9.27			0	
2-JMS104.16	10/19/1995	M	7	16.36		9.31			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	10/19/1995	B	9	16.38	7.34	9.27			0	
2-JMS104.16	11/20/1995	S	8	6.4	7.35	12.26			0	
2-JMS104.16	11/20/1995	S	1	6.4	7.4	12.38			0	0.7
2-JMS104.16	11/20/1995	M	3	6.37		12.34			0	
2-JMS104.16	11/20/1995	M	5	6.42		12.27			0	
2-JMS104.16	11/20/1995	B	7	6.43		12.27			0	
2-JMS104.16	12/14/1995	S	1	2.8	7.37	13.64			0	1.3
2-JMS104.16	12/14/1995	M	3	2.77		13.6			0	
2-JMS104.16	12/14/1995	M	5	2.77		13.58			0	
2-JMS104.16	12/14/1995	B	7	2.75		13.56			0	
2-JMS104.16	12/14/1995	S	8	2.75	7.37	13.56			0	
2-JMS104.16	1/29/1996	S	1	4.36	7.34	13.28			0	0.1
2-JMS104.16	1/29/1996	M	3	4.36		13.26			0	
2-JMS104.16	1/29/1996	M	5	4.36		13.28			0	
2-JMS104.16	1/29/1996	M	7	4.36		13.3			0	
2-JMS104.16	1/29/1996	B	9	4.35		13.3			0	
2-JMS104.16	1/29/1996	S	11	4.35	7.26	13.46			0	
2-JMS104.16	2/20/1996	S	1	4	7.44	13.3			0	1
2-JMS104.16	2/20/1996	M	3	4		13.3			0	
2-JMS104.16	2/20/1996	M	5	4		13.3			0	
2-JMS104.16	2/20/1996	B	7	4		13.31			0	
2-JMS104.16	2/20/1996	S	9	4	7.44	13.29			0	
2-JMS104.16	3/25/1996	S	1	9.31	7.36	11.8			0	0.7
2-JMS104.16	3/25/1996	M	3	9.27		11.76			0	
2-JMS104.16	3/25/1996	B	5	9.27		11.77			0	
2-JMS104.16	3/25/1996	S	7	9.26	7.34	11.79			0	
2-JMS104.16	4/29/1996	S	8	19.29	8.19	8.37			0	
2-JMS104.16	4/29/1996	S	1	19.6	8.44	8.63			0	1.5
2-JMS104.16	4/29/1996	M	3	19.46		8.52			0	
2-JMS104.16	4/29/1996	M	5	19.4		8.42			0	
2-JMS104.16	4/29/1996	B	7	19.27		8.3			0	
2-JMS104.16	5/15/1996	S	9	18.47	7.57	9.42			0	
2-JMS104.16	5/15/1996	S	1	18.54	7.78	9.66			0	1
2-JMS104.16	5/15/1996	M	3	18.54		9.58			0	
2-JMS104.16	5/15/1996	M	5	18.52		9.49			0	
2-JMS104.16	5/15/1996	B	7	18.48		9.44			0	
2-JMS104.16	6/18/1996	S	1	26.9	7.46	7.86			0	0.7
2-JMS104.16	6/18/1996	M	3	26.54		7.73			0	
2-JMS104.16	6/18/1996	M	5	26.36		7.73			0	
2-JMS104.16	6/18/1996	B	7	26.36		7.73			0	
2-JMS104.16	6/18/1996	S	8	26.35	7.38	7.73			0	
2-JMS104.16	7/23/1996	S	8	27.28	7.36	6.88			0	
2-JMS104.16	7/23/1996	S	1	27.76	7.6	7.32			0	1.5
2-JMS104.16	7/23/1996	M	3	27.51		7.26			0	
2-JMS104.16	7/23/1996	M	5	27.35		7.11			0	
2-JMS104.16	7/23/1996	B	7	27.29		7			0	
2-JMS104.16	8/20/1996	S	1	28.12	7.68	7.35			0	1.3
2-JMS104.16	8/20/1996	M	3	27.7		7.31			0	
2-JMS104.16	8/20/1996	B	5	27.66		7.31			0	
2-JMS104.16	8/20/1996	S	7	27.52	7.53	7.27			0	
2-JMS104.16	9/24/1996	S	8	20.13	7.72	8.79			0	
2-JMS104.16	9/24/1996	S	1	20.66	7.78	8.75			0	0.9
2-JMS104.16	9/24/1996	M	3	20.45		8.78			0	
2-JMS104.16	9/24/1996	M	5	20.15		8.79			0	
2-JMS104.16	9/24/1996	B	7	20.13		8.77			0	
2-JMS104.16	10/22/1996	S	9	14.63	7.3	9.78			0	
2-JMS104.16	10/22/1996	S	1	15	7.32	9.75				0.7
2-JMS104.16	10/22/1996	M	3	14.88		9.75			0	
2-JMS104.16	10/22/1996	M	5	14.64		9.77			0	
2-JMS104.16	10/22/1996	B	7	14.64		9.78			0	
2-JMS104.16	11/19/1996	S	1	6.45	7.47	12.12			0	1.9
2-JMS104.16	11/19/1996	M	3	6.45		12.13			0	
2-JMS104.16	11/19/1996	M	5	6.45		12.13			0	
2-JMS104.16	11/19/1996	B	7	6.45		12.17			0	
2-JMS104.16	11/19/1996	S	8	6.43	7.4	12.24			0	
2-JMS104.16	12/10/1996	S	1	5.21	7.19	12.87			0	0.5
2-JMS104.16	12/10/1996	M	3	5.19		12.85			0	
2-JMS104.16	12/10/1996	M	5	5.19		12.82			0	
2-JMS104.16	12/10/1996	B	7	5.19		12.73				
2-JMS104.16	12/10/1996	S	9	5.19	7.18	12.7			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	2/18/1997	S	3	6.14		13.66			0	
2-JMS104.16	2/18/1997	M	5	6.12		13.66			0	
2-JMS104.16	2/18/1997	M	7	6.1		13.72			0	
2-JMS104.16	2/18/1997	B	8	6.1	7.23	13.81			0	
2-JMS104.16	2/18/1997	S	1	6.14	7.28	13.65			0	0.7
2-JMS104.16	3/18/1997	S	1	9.72	7.7	11.48			0	1.5
2-JMS104.16	3/18/1997	M	3	9.74		11.37			0	
2-JMS104.16	3/18/1997	M	5	9.72		11.4			0	
2-JMS104.16	3/18/1997	B	7	9.73		11.42			0	
2-JMS104.16	4/22/1997	S	1	14.08	7.64	9.83			0	1.6
2-JMS104.16	4/22/1997	M	3	14.04		9.8			0	
2-JMS104.16	4/22/1997	M	5	14.01		9.8			0	
2-JMS104.16	4/22/1997	B	7	13.99		9.82			0	
2-JMS104.16	4/22/1997	S	9	14.01	7.52	9.84			0	
2-JMS104.16	5/28/1997	S	1	21.99	7.67	7.92			0	1.7
2-JMS104.16	5/28/1997	M	3	21.5		7.86			0	
2-JMS104.16	5/28/1997	M	5	20.79		7.76			0	
2-JMS104.16	5/28/1997	B	7	20.74		7.78			0	
2-JMS104.16	5/28/1997	S	8	20.72	7.44	7.8			0	
2-JMS104.16	6/24/1997	S	7	29.21	7.92	6.81			0	
2-JMS104.16	6/24/1997	S	1	30.2	8.55	7.4			0	1.6
2-JMS104.16	6/24/1997	M	3	29.75		7.16			0	
2-JMS104.16	6/24/1997	B	5	29.39		7.05			0	
2-JMS104.16	7/15/1997	S	1	30.85	8.61					
2-JMS104.16	7/15/1997	S	8	29.24	7.66					
2-JMS104.16	8/19/1997	S	9	30.55	7.57	6.24			0	
2-JMS104.16	8/19/1997	S	1	30.71	7.71	6.55			0	1.1
2-JMS104.16	9/23/1997	S	1	24.19	8.31	8.07			0	1.7
2-JMS104.16	9/23/1997	S	6	23.55	8.27	8.07			0	
2-JMS104.16	10/21/1997	S	1	15.48	7.85	10.02			0	2.6
2-JMS104.16	10/21/1997	S	7	14.65	7.74	9.86			0	
2-JMS104.16	11/18/1997	S	6	7.68	7.52	12.03				
2-JMS104.16	11/18/1997	S	1	7.94	7.56	11.95				1
2-JMS104.16	12/10/1997	S	1	5.67	7.63	12.31				1.6
2-JMS104.16	12/10/1997	M	3	5.67		12.3			0	
2-JMS104.16	12/10/1997	B	5	5.65		12.28				
2-JMS104.16	12/10/1997	S	8	5.67	7.58	12.28				
2-JMS104.16	1/21/1998	S	1	5.51	7.85	10.78				0.6
2-JMS104.16	1/21/1998	M	3	5.51		10.83				
2-JMS104.16	1/21/1998	M	5	5.51		10.84				
2-JMS104.16	1/21/1998	B	7	5.5		10.95				
2-JMS104.16	1/21/1998	S	8	5.5	7.83	10.98				
2-JMS104.16	3/17/1998	S	9	7.09	7.65	13.03				
2-JMS104.16	3/17/1998	S	1	7.08	7.64	13				1.2
2-JMS104.16	3/17/1998	M	3	7.08		12.99				
2-JMS104.16	3/17/1998	M	5	7.08		12.99				
2-JMS104.16	3/17/1998	B	7	7.08		12.99				
2-JMS104.16	4/21/1998	S	1	14.8	7.49	10.9				0.3
2-JMS104.16	4/21/1998	M	3	14.78		10.9				
2-JMS104.16	4/21/1998	M	5	14.77		10.9				
2-JMS104.16	4/21/1998	B	7	14.78		10.9				
2-JMS104.16	4/21/1998	S	9	14.78	7.48	10.9				
2-JMS104.16	5/19/1998	S	7	23.02	7.82	8.61				
2-JMS104.16	5/19/1998	S	1	23.18	7.91	8.78				1.3
2-JMS104.16	5/19/1998	M	3	23.08		8.68				
2-JMS104.16	5/19/1998	B	5	23.04		8.62				
2-JMS104.16	6/23/1998	S	1	28.14	8.05	7.83				0.9
2-JMS104.16	6/23/1998	M	3	27.94		7.5				
2-JMS104.16	6/23/1998	M	5	27.77		7.29				
2-JMS104.16	6/23/1998	B	7	27.73		7.14				
2-JMS104.16	6/23/1998	S	9	27.72	7.79	7.11				
2-JMS104.16	7/21/1998	S	1	31.4	8.26	7.89				
2-JMS104.16	7/21/1998	M	3	30.55		7.32				
2-JMS104.16	7/21/1998	B	5	30.04		6.91				
2-JMS104.16	7/21/1998	S	7	29.9	8.07	6.84				
2-JMS104.16	8/18/1998	S	8	27.89	7.71	7.21			0	
2-JMS104.16	8/18/1998	S	1	28.81	7.89	7.5			0	1.4
2-JMS104.16	8/18/1998	M	3	28.13		7.45				
2-JMS104.16	8/18/1998	M	5	27.98		7.35				
2-JMS104.16	8/18/1998	B	7	27.9		7.21				

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	9/22/1998	S	1	27.7	7.86	6.92			0	1
2-JMS104.16	9/22/1998	M	3	27.5		6.88				
2-JMS104.16	9/22/1998	M	5	27.31		6.63				
2-JMS104.16	9/22/1998	B	7	27.15		6.72				
2-JMS104.16	9/22/1998	S	9	27.12	7.85	6.75			0	
2-JMS104.16	10/20/1998	S	8	19.15	7.87	8.67				
2-JMS104.16	10/20/1998	S	1	19.46	7.87	8.64				1.7
2-JMS104.16	10/20/1998	M	3	19.3		8.68				
2-JMS104.16	10/20/1998	M	5	19.24		8.66				
2-JMS104.16	10/20/1998	B	7	19.2		8.63				
2-JMS104.16	11/18/1998	S	9	12.54	7.6	10.64			0.2	
2-JMS104.16	11/18/1998	S	1	12.62	7.72	10.73			0.2	2.7
2-JMS104.16	11/18/1998	M	3	12.57		10.72			0.2	
2-JMS104.16	11/18/1998	M	5	12.54		10.68			0.2	
2-JMS104.16	11/18/1998	B	7	12.54		10.64			0.2	
2-JMS104.16	12/15/1998	S	9	8.77	7.23	12.49				
2-JMS104.16	12/15/1998	S	1	8.77	7.28	12.33				1.2
2-JMS104.16	12/15/1998	M	3	8.77		12.37				
2-JMS104.16	12/15/1998	M	5	8.77		12.37				
2-JMS104.16	12/15/1998	B	7	8.77		12.42				
2-JMS104.16	1/19/1999	S	1	5.4	7.35	12.59				0.5
2-JMS104.16	1/19/1999	M	3	5.39		12.62				
2-JMS104.16	1/19/1999	M	5	5.4		12.63				
2-JMS104.16	1/19/1999	M	7	5.4		12.61				
2-JMS104.16	1/19/1999	B	9	5.38	7.35	12.58				
2-JMS104.16	2/23/1999	S	1	5.61	7.29	12.51				1.4
2-JMS104.16	2/23/1999	M	3	5.54		12.51				
2-JMS104.16	2/23/1999	M	5	5.49		12.52				
2-JMS104.16	2/23/1999	B	7	5.48	7.21	12.4				
2-JMS104.16	3/23/1999	S	1	9.73	7.18	11.08				0.7
2-JMS104.16	3/23/1999	M	3	9.72		11.16				
2-JMS104.16	3/23/1999	M	5	9.71		11.3				
2-JMS104.16	3/23/1999	B	7	9.71	7.11	11.1				
2-JMS104.16	4/20/1999	B	8	16.49	8.05	8.76			0.1	
2-JMS104.16	4/20/1999	S	1	16.75	8.37	8.88			0.1	1.4
2-JMS104.16	4/20/1999	M	3	16.59		8.79			0.1	
2-JMS104.16	4/20/1999	M	5	16.54		8.78			0.1	
2-JMS104.16	4/20/1999	M	7	16.53		8.79			0.1	
2-JMS104.16	5/20/1999	B	7	20.6	7.46	8.35				
2-JMS104.16	5/20/1999	S	1	21.19	7.48	8.39				1.3
2-JMS104.16	5/20/1999	M	3	20.62		8.36				
2-JMS104.16	5/20/1999	M	5	20.6		8.35				
2-JMS104.16	6/22/1999	B	8	22.35	7.3	8.03			0	
2-JMS104.16	6/22/1999	S	1	22.85	7.37	7.82				1.1
2-JMS104.16	6/22/1999	M	3	22.62		7.72				
2-JMS104.16	6/22/1999	M	5	22.57		7.6				
2-JMS104.16	6/22/1999	M	7	22.35		7.86				
2-JMS104.16	7/20/1999	S	1	30.3	7.87	8.38				1.1
2-JMS104.16	7/20/1999	M	3	29.55		6.97				
2-JMS104.16	7/20/1999	M	5	29.41		6.78				
2-JMS104.16	7/20/1999	B	6	29.36	7.45	6.71				
2-JMS104.16	8/17/1999	S	1	30.22	8.43	11.3			0.2	0.9
2-JMS104.16	8/17/1999	M	3	29.3		8.32			0.2	
2-JMS104.16	8/17/1999	M	5	29.14		7.84			0.2	
2-JMS104.16	8/17/1999	B	7	29	7.62	7.41			0.2	
2-JMS104.16	9/21/1999	S	1	21.57	7.23	8.92			0	1.1
2-JMS104.16	9/21/1999	M	3	21.5		9.01			0	
2-JMS104.16	9/21/1999	M	5	21.5		9.01			0	
2-JMS104.16	9/21/1999	M	7	21.07		8.8			0	
2-JMS104.16	9/21/1999	B	8	20.88	7.13	8.9			0	
2-JMS104.16	10/28/1999	B	7	13.17	7.56	9.41			0.1	
2-JMS104.16	10/28/1999	S	1	13.64	7.6	9.68			0.1	2.9
2-JMS104.16	10/28/1999	M	3	13.41		9.63			0.1	
2-JMS104.16	10/28/1999	M	5	13.23		9.65			0.1	
2-JMS104.16	11/18/1999	S	1	9.8	7.71	10.27			0	2.2
2-JMS104.16	11/18/1999	M	3	9.97		10.59			0	
2-JMS104.16	11/18/1999	M	5	9.87		10.61			0	
2-JMS104.16	11/18/1999	B	7	9.85	7.64	10.58			0	
2-JMS104.16	12/21/1999	M	7	7.16		11.64			0	
2-JMS104.16	12/21/1999	B	9	7.13	7.43	11.65			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	12/21/1999	S	1	7.16	7.45	11.76			0	0.8
2-JMS104.16	12/21/1999	M	3	7.16		11.67			0	
2-JMS104.16	12/21/1999	M	5	7.16		11.81			0	
2-JMS104.16	1/18/2000	B	9	3.39	7.47	13.6			0	
2-JMS104.16	1/18/2000	S	1	3.35	7.5	13.03			0	1.5
2-JMS104.16	1/18/2000	M	3	3.35		13.19			0	
2-JMS104.16	1/18/2000	M	5	3.35		13.28			0	
2-JMS104.16	1/18/2000	M	7	3.39		13.39			0	
2-JMS104.16	2/23/2000	B	9	7.25	7.38	11.85			0	
2-JMS104.16	2/23/2000	S	1	7.33	7.43	11.78			0	0.3
2-JMS104.16	2/23/2000	M	3	7.34		11.83			0	
2-JMS104.16	2/23/2000	M	5	7.29		11.82			0	
2-JMS104.16	2/23/2000	M	7	7.3		11.85			0	
2-JMS104.16	3/28/2000	B	8	13.98	7.4	9.92			0	
2-JMS104.16	3/28/2000	S	1	14.05	7.47	9.87			0	0.9
2-JMS104.16	3/28/2000	M	3	13.98		9.84			0	
2-JMS104.16	3/28/2000	M	5	13.97		9.85			0	
2-JMS104.16	3/28/2000	M	7	13.97		9.87			0	
2-JMS104.16	4/24/2000	B	8	16.57	7.24	9.54			0	
2-JMS104.16	4/24/2000	S	1	16.67	7.3	9.35			0	0.7
2-JMS104.16	4/24/2000	M	3	16.6		9.4			0	
2-JMS104.16	4/24/2000	M	5	16.59		9.4			0	
2-JMS104.16	4/24/2000	M	7	16.58		9.45			0	
2-JMS104.16	5/23/2000	B	9	22.2	7.42	7.1			0	
2-JMS104.16	5/23/2000	S	1	22.33	7.43	6.99			0	1.3
2-JMS104.16	5/23/2000	M	3	22.29		7.11			0	
2-JMS104.16	5/23/2000	M	5	22.22		6.6			0	
2-JMS104.16	5/23/2000	M	7	22.19		7.05			0	
2-JMS104.16	6/20/2000	B	8	28.2	7.55	6.57			0.1	
2-JMS104.16	6/20/2000	S	1	28.74	7.67	7.07			0	
2-JMS104.16	6/20/2000	M	3	28.39		6.52			0	
2-JMS104.16	6/20/2000	M	5	28.22		6.67			0.1	
2-JMS104.16	6/20/2000	M	7	28.19		6.49			0.1	
2-JMS104.16	7/18/2000	B	9	27.96	7.29	6.47			0	
2-JMS104.16	7/18/2000	S	1	29.08	7.64	7.89			0	1.2
2-JMS104.16	7/18/2000	M	3	28.48		6.94			0	
2-JMS104.16	7/18/2000	M	5	28.06		6.67			0	
2-JMS104.16	7/18/2000	M	7	28.04		6.63			0	
2-JMS104.16	8/22/2000	B	8	25.82	7.82	7.29			0	
2-JMS104.16	8/22/2000	S	1	26.38	8.04	7.5			0	1.2
2-JMS104.16	8/22/2000	M	3	26.38		7.3			0	
2-JMS104.16	8/22/2000	M	5	25.86		7.21			0	
2-JMS104.16	8/22/2000	M	7	25.83		7.19			0	
2-JMS104.16	9/26/2000	B	10	20.47	7.56	8.07			0.1	
2-JMS104.16	9/26/2000	S	1	20.52	7.57	7.85			0.1	1.3
2-JMS104.16	9/26/2000	M	3	20.52		7.99			0.1	
2-JMS104.16	9/26/2000	M	5	20.52		8.02			0.1	
2-JMS104.16	9/26/2000	M	7	20.47		8			0.1	
2-JMS104.16	9/26/2000	M	9	20.47		8			0.1	
2-JMS104.16	10/24/2000	B	8	18.43	7.66	7.87			0	
2-JMS104.16	10/24/2000	S	1	19.03	7.67	8.08			0	2
2-JMS104.16	10/24/2000	M	3	18.56		7.98			0	
2-JMS104.16	10/24/2000	M	5	18.5		7.92			0	
2-JMS104.16	10/24/2000	M	7	18.45		7.69			0	
2-JMS104.16	1/23/2001	S	1	2.68	7.05	13.77			0	0.3
2-JMS104.16	1/23/2001	M	3	2.66		13.76			0	
2-JMS104.16	1/23/2001	B	5	2.64	7.05	13.73			0	
2-JMS104.16	2/20/2001	S	1	8.9	7.75	11.58			0.1	0.8
2-JMS104.16	2/20/2001	M	3	8.54		11.56			0.1	
2-JMS104.16	2/20/2001	M	5	8.26		11.67			0.1	
2-JMS104.16	2/20/2001	B	7	8.21	7.69	11.63			0.1	
2-JMS104.16	3/27/2001	S	1	9.46	7.08	12.32			0.1	0.4
2-JMS104.16	3/27/2001	M	3	9.39		12.33			0.1	
2-JMS104.16	3/27/2001	M	5	9.34		12.45			0.1	
2-JMS104.16	3/27/2001	M	7	9.34		12.47			0.1	
2-JMS104.16	3/27/2001	B	8	9.31	7.08	12.73			0.1	
2-JMS104.16	4/24/2001	S	1	21.47	8.6	9.04			0	0.8
2-JMS104.16	4/24/2001	M	3	21.04		8.57			0	
2-JMS104.16	4/24/2001	M	5	20.65		7.89			0	
2-JMS104.16	4/24/2001	B	7	20.69	6.77	6.5			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	6/19/2001	S	1	28.56	8.53	8.4			0.1	1.1
2-JMS104.16	6/19/2001	M	3	27.98		8.08			0.1	
2-JMS104.16	6/19/2001	M	5	27.28		7.84			0.1	
2-JMS104.16	6/19/2001	M	7	27.11		7.65			0.1	
2-JMS104.16	6/19/2001	B	8	27.07	7.49	7.55			0.1	
2-JMS104.16	7/24/2001	S	1	28.2	7.79	7.78			0	1
2-JMS104.16	7/24/2001	M	3	27.62	7.57	7.09			0	
2-JMS104.16	7/24/2001	M	5	27.53	7.44	7.06			0	
2-JMS104.16	7/24/2001	B	6	27.47	7.37	6.8			0	
2-JMS104.16	8/21/2001	S	1	28.78	7.7	6.46			0	0.9
2-JMS104.16	8/21/2001	M	3	28.69		6.38			0	
2-JMS104.16	8/21/2001	M	5	28.64		6.66			0	
2-JMS104.16	8/21/2001	M	7	28.67		6.47			0	
2-JMS104.16	8/21/2001	B	8	28.61	7.64	6.81			0	
2-JMS104.16	9/18/2001	S	1	24.35	8.32	8.18			0.2	0.9
2-JMS104.16	9/18/2001	M	3	23.46		6.89			0.2	
2-JMS104.16	9/18/2001	M	5	23.24		6.94			0.2	
2-JMS104.16	9/18/2001	M	7	22.96		7.09			0.2	
2-JMS104.16	9/18/2001	B	8	22.8	7.95	7.22			0.2	
2-JMS104.16	10/16/2001	S	1	19.51	7.92	9.12			0.3	1.1
2-JMS104.16	10/16/2001	M	3	19.38		8.86			0.3	
2-JMS104.16	10/16/2001	M	5	19.37		8.88			0.3	
2-JMS104.16	10/16/2001	M	7	19.35		8.75			0.3	
2-JMS104.16	10/16/2001	B	8	19.33	7.82	8.82			0.3	
2-JMS104.16	11/27/2001	S	1	12.42	7.79	10.22			0	2.7
2-JMS104.16	11/27/2001	M	3	11.77		10.41			0	
2-JMS104.16	11/27/2001	M	5	11.68		10.56			0	
2-JMS104.16	11/27/2001	M	7	11.67		10.63			0	
2-JMS104.16	11/27/2001	B	8	11.69	7.75	10.84			0	
2-JMS104.16	12/12/2001	S	1	11.83	7.6	10.09			0	1.9
2-JMS104.16	12/12/2001	M	3	11.79		10.16			0	
2-JMS104.16	12/12/2001	M	5	11.72		10.2			0	
2-JMS104.16	12/12/2001	M	7	11.72		10.32			0	
2-JMS104.16	12/12/2001	B	9	11.34	7.54	10.55			0.1	
2-JMS104.16	1/22/2002	S	1	5.69	7.61	12.63			0	2.7
2-JMS104.16	1/22/2002	M	3	5.65		12.78			0	
2-JMS104.16	1/22/2002	M	5	5.63		12.94			0	
2-JMS104.16	1/22/2002	B	7	5.6	7.45	13.29			0	
2-JMS104.16	2/19/2002	S	1	8.13	7.78	11.51			0.09	2
2-JMS104.16	2/19/2002	M	3	7.75		11.22			0.09	
2-JMS104.16	2/19/2002	M	5	7.23		11.36			0.09	
2-JMS104.16	2/19/2002	B	7	7.23	7.66	12.21			0.09	
2-JMS104.16	3/19/2002	S	1	12.8	7.75	9.05			0.13	1.6
2-JMS104.16	3/19/2002	M	3	12.8		9.11			0.13	
2-JMS104.16	3/19/2002	M	5	12.74		8.97			0.13	
2-JMS104.16	3/19/2002	M	7	12.76		9.14			0.13	
2-JMS104.16	3/19/2002	B	8	12.69	7.67	9.26			0.13	
2-JMS104.16	4/16/2002	S	1	23.5	7.58	7.66			0.7	2.1
2-JMS104.16	4/16/2002	M	3	22.69		7.72			0.7	
2-JMS104.16	4/16/2002	M	5	22.3		7.73			0.7	
2-JMS104.16	4/16/2002	B	7	21.87	7.45	7.77			0.7	
2-JMS104.16	5/30/2002	S	1	27.12	7.63	6.67			0	1.4
2-JMS104.16	5/30/2002	M	3	26.51	7.55	6.43			0	
2-JMS104.16	5/30/2002	M	5	26.36	7.53	6.47			0	
2-JMS104.16	5/30/2002	M	7	26.2	7.53	6.33			0	
2-JMS104.16	5/30/2002	B	8	26.18	7.54	6.21			0	
2-JMS104.16	6/25/2002	S	1	28.64	7.63				0	0.9
2-JMS104.16	6/25/2002	M	3	28.57	7.64				0	
2-JMS104.16	6/25/2002	M	5	28.49	7.52				0	
2-JMS104.16	6/25/2002	M	7	28.46	7.53				0	
2-JMS104.16	6/25/2002	B	8	28.4	7.48				0	
2-JMS104.16	7/23/2002	S	1	30.3	7.57	6.25			0	
2-JMS104.16	7/23/2002	M	3	30.06	7.49	5.85			0	
2-JMS104.16	7/23/2002	M	5	29.98	7.48	5.77			0	
2-JMS104.16	7/23/2002	M	7	29.95	5.74	7.48			0	
2-JMS104.16	7/23/2002	B	8	29.96	7.48	5.75			0	
2-JMS104.16	8/13/2002	S	1	29.05	8.29	9.39			0	1.2
2-JMS104.16	8/13/2002	M	3	28.18	7.95	8.18			0	
2-JMS104.16	8/13/2002	M	5	28.18	7.78	7.53			0	
2-JMS104.16	8/13/2002	B	7	28.03	7.72	7.34			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	9/24/2002	S	1	26.16	7.75	8.39			0	1
2-JMS104.16	9/24/2002	M	3	26.08	7.41	7.52			0	
2-JMS104.16	9/24/2002	M	5	25.85	7.41	7.07			0	
2-JMS104.16	9/24/2002	M	7	25.76	7.38	6.9			0	
2-JMS104.16	9/24/2002	B	8	25.71	7.36	6.89			0	
2-JMS104.16	10/22/2002	S	1	16.56	7.93	8.32			0	1.7
2-JMS104.16	10/22/2002	M	3	16.48	7.92	8.12			0	
2-JMS104.16	10/22/2002	M	5	16.38	7.91	8.17			0	
2-JMS104.16	10/22/2002	M	7	16.37	7.92	8.2			0	
2-JMS104.16	10/22/2002	B	9	16.27	7.92	8.45			0	
2-JMS104.16	11/19/2002	S	1	10.23	7.13	12.19			0	0.4
2-JMS104.16	11/19/2002	M	3	10.23	7.12	11.93			0	
2-JMS104.16	11/19/2002	M	5	10.23	7.13	11.95			0	
2-JMS104.16	11/19/2002	M	7	10.22	7.12	12.08			0	
2-JMS104.16	11/19/2002	B	8	10.23	7.13	12.32			0	
2-JMS104.16	12/10/2002	S	1	2.45	7.6	14.31			0	2.6
2-JMS104.16	12/10/2002	M	3	2.46	7.59	14.59			0	
2-JMS104.16	12/10/2002	M	5	2.45	7.58	14.53			0	
2-JMS104.16	12/10/2002	B	7	2.46	7.57	15.66			0	
2-JMS104.16	1/21/2003	S	1	2.2	7.65	14.47			0	1.8
2-JMS104.16	1/21/2003	M	3	2.2	7.62	14.45			0	
2-JMS104.16	1/21/2003	M	5	2.2	7.6	14.68			0	
2-JMS104.16	1/21/2003	M	7	2.2	7.6	14.76			0	
2-JMS104.16	1/21/2003	B	8	2.19	7.56	15.05			0	
2-JMS104.16	2/25/2003	S	1	4.62	7.01	13.04			0	0.1
2-JMS104.16	2/25/2003	M	3	4.61	6.96	13.05			0	
2-JMS104.16	2/25/2003	M	5	4.6	6.93	13.13			0	
2-JMS104.16	2/25/2003	M	7	4.6	6.93	13.31			0	
2-JMS104.16	2/25/2003	M	9	4.61	6.89	13.37			0	
2-JMS104.16	2/25/2003	B	10	4.61	6.93	13.53			0	
2-JMS104.16	3/18/2003	S	1	11.57	7.72	10.48			0	1.4
2-JMS104.16	3/18/2003	M	3	11.5	7.71	10.49			0	
2-JMS104.16	3/18/2003	M	5	11.4	7.69	10.68			0	
2-JMS104.16	3/18/2003	M	7	11.32	7.69	10.4			0	
2-JMS104.16	3/18/2003	B	9	11.29	7.71	10.63			0	
2-JMS104.16	5/27/2003	S	1	17.19	6.8	9.44			0	
2-JMS104.16	5/27/2003	M	3	17.17	6.86	9.46			0	
2-JMS104.16	5/27/2003	M	5	17.17	6.85	9.52			0	
2-JMS104.16	5/27/2003	M	7	17.17	6.88	9.52			0	
2-JMS104.16	5/27/2003	B	8	17.17	6.89	9.28			0	
2-JMS104.16	6/24/2003	S	1	21.53	7.68	8.7			0	0.5
2-JMS104.16	6/24/2003	M	3	21.4	7.68	8.7			0	
2-JMS104.16	6/24/2003	M	5	21.38	7.67	8.75			0	
2-JMS104.16	6/24/2003	M	7	21.4	7.66	8.79			0	
2-JMS104.16	6/24/2003	B	9	21.41	7.67	8.87			0	
2-JMS104.16	7/15/2003	S	1	26.69	7.69	8.06			0	0.4
2-JMS104.16	7/15/2003	M	3	26.57	7.63	8.02			0	
2-JMS104.16	7/15/2003	M	5	26.44	7.58	7.84			0	
2-JMS104.16	7/15/2003	M	7	26.41	7.56	7.79			0	
2-JMS104.16	7/15/2003	B	9	26.41	7.56	7.93			0	
2-JMS104.16	8/26/2003	S	1	29.41	8.38	7.82			0	1
2-JMS104.16	8/26/2003	M	3	28.86	8.26	7.64			0	
2-JMS104.16	8/26/2003	M	5	28.35	8.15	7.62			0	
2-JMS104.16	8/26/2003	M	7	27.96	8.2	7.77			0	
2-JMS104.16	8/26/2003	B	8	27.64	8.01	7.58			0	
2-JMS104.16	9/24/2003	S	1	21.03	7.45	12.18			0	0.2
2-JMS104.16	9/24/2003	M	3	21.03	7.45	12.18			0	
2-JMS104.16	9/24/2003	M	5	21.03	7.44	12.2			0	
2-JMS104.16	9/24/2003	B	6	21.01	7.43	12.18			0	
2-JMS104.16	10/28/2003	S	1	15.06	7.63	9.41			0	2.3
2-JMS104.16	10/28/2003	M	3	15.07	7.63	9.46			0	
2-JMS104.16	10/28/2003	M	5	15.08	7.63	9.37			0	
2-JMS104.16	10/28/2003	M	7	15.06	7.62	9.65			0	
2-JMS104.16	10/28/2003	B	8	15.06	7.61	9.98			0	
2-JMS104.16	11/18/2003	S	1	10.47	7.57	10.33			0	0.4
2-JMS104.16	11/18/2003	M	3	10.46	7.5	10.32			0	
2-JMS104.16	11/18/2003	M	5	10.45	7.54	10.32			0	
2-JMS104.16	11/18/2003	M	7	10.45	7.52	10.38			0	
2-JMS104.16	11/18/2003	B	9	10.45	7.52	10.49			0	
2-JMS104.16	12/16/2003	S	1	4.36	7.34	12.57			0	0.4

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	12/16/2003	M	3	4.34	7.3	12.69			0	
2-JMS104.16	12/16/2003	M	5	4.33	7.29	12.53			0	
2-JMS104.16	12/16/2003	M	7	4.34	7.25	12.38			0	
2-JMS104.16	12/16/2003	B	9	4.36	7.25	12.49			0	
2-JMS104.16	2/25/2004	S	1	6.35	7.78	12.55			0	1.7
2-JMS104.16	2/25/2004	M	3	6.33	7.77	12.59			0	
2-JMS104.16	2/25/2004	M	5	6.34	7.75	12.76			0	
2-JMS104.16	2/25/2004	M	7	6.38	7.74	12.81			0	
2-JMS104.16	2/25/2004	B	8	6.32	7.71	12.64			0	
2-JMS104.16	3/23/2004	S	1	10.45	7.73	11.3			0	
2-JMS104.16	3/23/2004	M	3	10.32	7.75	11.27			0	
2-JMS104.16	3/23/2004	M	5	10.26	7.75	11.36			0	
2-JMS104.16	3/23/2004	B	7	10.28	7.73	11.44			0	
2-JMS104.16	4/20/2004	S	1	17.61	7.42	9.45				
2-JMS104.16	4/20/2004	M	3	17.53	7.39	9.49			0	
2-JMS104.16	4/20/2004	M	5	17.53	7.38	9.49			0	
2-JMS104.16	4/20/2004	M	7	17.52	7.36	9.51			0	
2-JMS104.16	4/20/2004	B	8	17.55	7.38	9.68				
2-JMS104.16	5/18/2004	S	1		8.07					1.1
2-JMS104.16	5/18/2004	M	3		7.73					
2-JMS104.16	5/18/2004	M	5		7.58					
2-JMS104.16	5/18/2004	B	7		7.62					
2-JMS104.16	6/15/2004	S	1	25.31	7.41	7.6			0	0.6
2-JMS104.16	6/15/2004	M	3	24.62	7.39	7.64			0	
2-JMS104.16	6/15/2004	M	5	24.58	7.4	7.63			0	
2-JMS104.16	6/15/2004	M	7	24.46	7.39	7.63			0	
2-JMS104.16	6/15/2004	B	9	24.46	7.4	7.55			0	
2-JMS104.16	7/20/2004	S	1	28.63	8.38	7.32			0	0.9
2-JMS104.16	7/20/2004	M	3	28.49	8.3	6.96			0	
2-JMS104.16	7/20/2004	M	5	28.35	8.27	7.13			0	
2-JMS104.16	7/20/2004	M	7	28.12	8.19	7.4			0	
2-JMS104.16	7/20/2004	B	8	28.2	8.21	7.07			0	
2-JMS104.16	8/17/2004	S	1	25	7.51	6.8			0	0.7
2-JMS104.16	8/17/2004	M	3	24.6	7.52	6.73			0	
2-JMS104.16	8/17/2004	M	5	24.3	7.5	7.02			0	
2-JMS104.16	8/17/2004	M	7	24.1	7.44	7.14			0	
2-JMS104.16	8/17/2004	B	9	24.2	7.45	7.07			0	
2-JMS104.16	9/21/2004	S	1	20.73	7.71	8.65			0	0.4
2-JMS104.16	9/21/2004	M	3	20.55	7.71	8.62			0	
2-JMS104.16	9/21/2004	M	5	20.51	7.7	8.59			0	
2-JMS104.16	9/21/2004	M	7	20.52	7.71	8.71			0	
2-JMS104.16	9/21/2004	B	9	20.52	7.78	8.63			0	
2-JMS104.16	10/19/2004	S	1	15.89	7.93	9.26			0	1.1
2-JMS104.16	10/19/2004	M	3	15.87	7.89	9.29			0	
2-JMS104.16	10/19/2004	M	5	15.8	7.83	9.38			0	
2-JMS104.16	10/19/2004	M	7	15.77	7.82	9.4			0	
2-JMS104.16	10/19/2004	B	8	15.76	7.86	9.44			0	
2-JMS104.16	11/16/2004	S	1	9.25	7.54	11.34			0	0.5
2-JMS104.16	11/16/2004	M	3	9.23	7.56	11.28			0	
2-JMS104.16	11/16/2004	M	5	9.23	7.52	11.4			0	
2-JMS104.16	11/16/2004	M	7	9.21	7.5	11.37			0	
2-JMS104.16	11/16/2004	B	8	9.2	7.54	11.4			0	
2-JMS104.16	12/14/2004	S	1	8.11	7.75	11.53			0	0.4
2-JMS104.16	12/14/2004	M	3	8.14	7.76	11.6			0	
2-JMS104.16	12/14/2004	M	5	8.13	7.71	11.61			0	
2-JMS104.16	12/14/2004	M	7	8.16	7.69	11.65			0	
2-JMS104.16	12/14/2004	B	9	8.14	7.79	11.64			0	
2-JMS104.16	1/26/2005	S	1	0.68	7.67	13.88			0	0.9
2-JMS104.16	1/26/2005	M	3	0.68	7.67	13.89			0	
2-JMS104.16	1/26/2005	M	5	0.68	7.67	13.92			0	
2-JMS104.16	1/26/2005	M	7	0.7	7.7	13.99			0	
2-JMS104.16	1/26/2005	B	9	0.7	7.77	14.15			0	
2-JMS104.16	2/15/2005	S	1	7.26	7.74	11.62			0	2.2
2-JMS104.16	2/15/2005	M	3	7.25	7.75	11.7			0	
2-JMS104.16	2/15/2005	M	5	7.25	7.73	11.68			0	
2-JMS104.16	2/15/2005	M	7	7.26	7.75	11.74			0	
2-JMS104.16	2/15/2005	B	8	7.2	7.79	12			0	
2-JMS104.16	3/22/2005	S	1	10.57	7.72	10.99			0	1.7
2-JMS104.16	3/22/2005	M	3	10.34	7.71	10.95			0	
2-JMS104.16	3/22/2005	M	5	10.31	7.71	10.9			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	3/22/2005	M	7	10.31	7.73	10.81			0	
2-JMS104.16	3/22/2005	B	8	10.31	7.76	10.87			0	
2-JMS104.16	4/19/2005	S	1	16.3	7.6	9.18			0	0.9
2-JMS104.16	4/19/2005	M	3	16.3	7.58	9.2			0	
2-JMS104.16	4/19/2005	M	5	16.2	7.6	9.33			0	
2-JMS104.16	4/19/2005	M	7	16.2	7.6	9.3			0	
2-JMS104.16	4/19/2005	B	8	16.2	7.62	9.26			0	
2-JMS104.16	5/24/2005	S	1	20	7.45	7.94			0	0.7
2-JMS104.16	5/24/2005	M	3	19.99	7.42	8			0	
2-JMS104.16	5/24/2005	M	5	19.98	7.41	7.98			0	
2-JMS104.16	5/24/2005	M	7	19.99	7.52	8.07			0	
2-JMS104.16	5/24/2005	B	9	19.99	7.6	8.12			0	
2-JMS104.16	6/21/2005	S	1	26.9	7.81	7.55			0	0.8
2-JMS104.16	6/21/2005	M	3	25.9	7.68	7.34			0	
2-JMS104.16	6/21/2005	M	5	25.5	7.55	7.22			0	
2-JMS104.16	6/21/2005	M	7	25.1	7.44	7.22			0	
2-JMS104.16	6/21/2005	B	9	25	7.48	7.24			0	
2-JMS104.16	7/19/2005	S	1	33.12	7.86	7.24			0	0.9
2-JMS104.16	7/19/2005	M	3	31.26	7.54	6.67			0	
2-JMS104.16	7/19/2005	M	5	30.81	7.43	6.61			0	
2-JMS104.16	7/19/2005	M	7	30.82	7.45	6.63			0	
2-JMS104.16	7/19/2005	B	8	30.82	7.47	6.57			0	
2-JMS104.16	8/23/2005	S	1	29.8	7.7	6.66			0	1.2
2-JMS104.16	8/23/2005	M	3	29.7	7.68	6.62			0	
2-JMS104.16	8/23/2005	M	5	29.6	7.7	6.66			0	
2-JMS104.16	8/23/2005	M	7	29.6	7.64	6.61			0	
2-JMS104.16	8/23/2005	B	9	29.6	7.62	6.6			0	
2-JMS104.16	9/20/2005	S	1	28.1	7.9	7.06			0	0.6
2-JMS104.16	9/20/2005	M	3	27.9	7.82	6.83			0	
2-JMS104.16	9/20/2005	M	5	27.9	7.78	6.83			0	
2-JMS104.16	9/20/2005	B	7	27.9	7.77	6.8			0	
2-JMS104.16	10/18/2005	S	1	18.9	7.72	8.76			0	1.2
2-JMS104.16	10/18/2005	M	3	18.8	7.66	8.25			0	
2-JMS104.16	10/18/2005	M	5	18.8	7.31	6.04			0	
2-JMS104.16	10/18/2005	B	6	18.8	7.3	5.49			0	
2-JMS104.16	11/15/2005	S	0.3		7.77	9.78				
2-JMS104.16	11/15/2005	S	1	14.6	7.77	9.78			0	1.6
2-JMS104.16	11/15/2005	M	3	14.5	7.76	9.75			0	
2-JMS104.16	11/15/2005	M	5	14.38	7.78	9.8			0	
2-JMS104.16	11/15/2005	M	7	14.2	7.81	9.76			0	
2-JMS104.16	11/15/2005	B	9	14.3	7.88	9.78			0	
2-JMS104.16	12/13/2005	S	1	3.85	7.17	12.93				
2-JMS104.16	12/21/2005	S	1	2.9	7.56	13.36			0	0.6
2-JMS104.16	12/21/2005	M	3	2.9	7.55	13.35			0	
2-JMS104.16	12/21/2005	M	5	2.9	7.54	13.29			0	
2-JMS104.16	12/21/2005	M	7	2.9	7.52	13.34			0	
2-JMS104.16	12/21/2005	B	8	2.8	7.49	13.56			0	
2-JMS104.16	1/17/2006	S	1	5.9	7.54	12.57			0	0.4
2-JMS104.16	1/17/2006	M	3	5.9	7.52	12.59			0	
2-JMS104.16	1/17/2006	M	5	5.8	7.39	12.61			0	
2-JMS104.16	1/17/2006	M	7	5.8	7.32	12.54			0	
2-JMS104.16	1/17/2006	B	8	5.8	7.33	12.79			0	
2-JMS104.16	2/21/2006	S	1	6	7.21	12.4			0	2.9
2-JMS104.16	2/21/2006	M	3	6.03	7.1	12.44			0	
2-JMS104.16	2/21/2006	M	5	6.32	7.2	12.43			0	
2-JMS104.16	2/21/2006	M	7	6.21	7.1	12.5			0	
2-JMS104.16	2/21/2006	B	8	6.1	7.11	12.61			0	
2-JMS104.16	3/20/2006	S	1	12.9	8.1	10.2				2.7
2-JMS104.16	3/20/2006	M	3	12.9	8.1	10.2				
2-JMS104.16	3/20/2006	M	5	12.8	8.1	10.3				
2-JMS104.16	3/20/2006	B	7	12.6	8	10.3				
2-JMS104.16	4/26/2006	S	1	19.9	7.6	8			0	0.8
2-JMS104.16	4/26/2006	M	3	19.8	7.6	8.1			0	
2-JMS104.16	4/26/2006	M	5	19.8	7.6	8			0	
2-JMS104.16	4/26/2006	M	7	19.8	7.6	8.1			0	
2-JMS104.16	4/26/2006	B	9	19.8	7.6	8.1			0	
2-JMS104.16	5/15/2006	S	1	20.6	7.6	7.7			0	1.4
2-JMS104.16	5/15/2006	M	3	20	7.6	7.7			0	
2-JMS104.16	5/15/2006	M	5	19.9	7.6	7.7			0	
2-JMS104.16	5/15/2006	M	7	19.9	7.6	7.6			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	5/15/2006	B	8	19.9	7.6	7.6			0	
2-JMS104.16	6/21/2006	S	0.3	28.4	7.8	7			0	
2-JMS104.16	7/24/2006	S	1	29.8	7.9	6.9			0	1.4
2-JMS104.16	7/24/2006	M	3	29.2	7.9	6.8			0	
2-JMS104.16	7/24/2006	M	5	28.6	7.6	6.4			0	
2-JMS104.16	7/24/2006	M	7	28.5	7.6	6.4			0	
2-JMS104.16	7/24/2006	B	9	28.4	7.6	6.4			0	
2-JMS104.16	8/22/2006	S	1	28.8	7.9	7.3			0	0.8
2-JMS104.16	8/22/2006	M	3	28.8	7.9	7.3			0	
2-JMS104.16	8/22/2006	M	5	28.8	7.9	7.3			0	
2-JMS104.16	8/22/2006	M	7	28.8	7.9	7.2			0	
2-JMS104.16	8/22/2006	B	8	28.8	7.8	7			0	
2-JMS104.16	9/27/2006	S	1	22.5	8.1	8.7			0	
2-JMS104.16	10/30/2006	S	1	12.2	7.5	10.2			0	0.5
2-JMS104.16	10/30/2006	M	3	12.1	7.5	10.2			0	
2-JMS104.16	10/30/2006	M	5	12.1	7.5	10.3			0	
2-JMS104.16	10/30/2006	B	7	12.1	7.5	10.4			0	
2-JMS104.16	11/15/2006	S	1	12.7	7.4	9.8			0	0.6
2-JMS104.16	11/15/2006	M	3	12.7	7.4	9.8			0	
2-JMS104.16	11/15/2006	M	5	12.7	7.4	9.9			0	
2-JMS104.16	11/15/2006	M	7	12.7	7.4	9.8			0	
2-JMS104.16	11/15/2006	B	9	12.7	7.4	10			0	
2-JMS104.16	12/18/2006	S	1	8.1	7.3	12			0	
2-JMS104.16	1/24/2007	S	1	4.3	7.8	12.4			0	2
2-JMS104.16	1/24/2007	M	3	4.2	7.8	12.4			0	
2-JMS104.16	1/24/2007	M	5	4.2	7.8	12.5			0	
2-JMS104.16	1/24/2007	B	7	4.2	7.8	12.6			0	
2-JMS104.16	2/20/2007	S	1	2.4	7.2	13.4			0	0.3
2-JMS104.16	2/20/2007	M	3	2.4	7.2	13.4			0	
2-JMS104.16	2/20/2007	M	5	2.4	7.1	13.4			0	
2-JMS104.16	2/20/2007	B	6	2.4	7	13.5			0	
2-JMS104.16	3/19/2007	S	1	8.6	7.2	11.7			0	0.2
2-JMS104.16	3/19/2007	M	3	8.5	7	11.6			0	
2-JMS104.16	3/19/2007	M	5	8.5	7	11.6			0	
2-JMS104.16	3/19/2007	M	7	8.5	7	11.6			0	
2-JMS104.16	3/19/2007	B	9	8.5	6.9	11.7			0	
2-JMS104.16	4/30/2007	S	1	19.8	7.6	8.6			0	1.2
2-JMS104.16	4/30/2007	M	3	19	7.6	8.8			0	
2-JMS104.16	4/30/2007	M	5	19	7.5	8.8			0	
2-JMS104.16	4/30/2007	M	7	18.8	7.5	8.8			0	
2-JMS104.16	4/30/2007	B	8	18.8	7.5	8.8			0	
2-JMS104.16	5/30/2007	S	1	28.6	8.4	7.1			0	1.8
2-JMS104.16	5/30/2007	M	2	28	8.2	6.8			0	
2-JMS104.16	5/30/2007	M	3	27.8	8.1	6.9			0	
2-JMS104.16	5/30/2007	M	4	27.7	8	6.9			0	
2-JMS104.16	5/30/2007	M	5	27.4	7.9	7			0	
2-JMS104.16	5/30/2007	M	6	27.1	7.8	6.9			0	
2-JMS104.16	5/30/2007	M	7	27	7.7	6.9			0	
2-JMS104.16	5/30/2007	B	8	27	7.7	6.9			0	
2-JMS104.16	6/18/2007	S	1	26.7	8.3	7.5			0	1.6
2-JMS104.16	6/18/2007	M	2	26.4	8.2	7.6			0	
2-JMS104.16	6/18/2007	M	3	26.3	8.1	7.7			0	
2-JMS104.16	6/18/2007	M	4	26.1	8	7.6			0	
2-JMS104.16	6/18/2007	M	5	26	7.9	7.9			0	
2-JMS104.16	6/18/2007	M	6	25.9	7.8	7.5			0	
2-JMS104.16	6/18/2007	B	7	25.2	7.4	7.4			0	
2-JMS104.16	7/23/2007	S	1	28.2	8.1	7.5		7.8	0	1.8
2-JMS104.16	7/23/2007	M	2	27.8	8	7.4		7.8	0	
2-JMS104.16	7/23/2007	M	3	27.4	7.9	7.4		7.7	0	
2-JMS104.16	7/23/2007	M	4	27.3	7.9	7.3		7.6	0	
2-JMS104.16	7/23/2007	M	5	27	7.8	7.3		7.5	0	
2-JMS104.16	7/23/2007	B	6	26.9	7.7	7.2		7.4	0	
2-JMS104.16	8/20/2007	S	1	27.8	7.4	5.8		6.1	0	0.5
2-JMS104.16	8/20/2007	M	2	27.8	7.4	5.8		6.1	0	
2-JMS104.16	8/20/2007	M	3	27.7	7.4	5.8		6	0	
2-JMS104.16	8/20/2007	M	4	27.7	7.4	5.7		5.9	0	
2-JMS104.16	8/20/2007	M	5	27.6	7.4	5.7		5.9	0	
2-JMS104.16	8/20/2007	M	6	27.6	7.4	5.7		5.9	0	
2-JMS104.16	8/20/2007	B	7	27.6	7.4	5.7		5.9	0	
2-JMS104.16	9/24/2007	S	1	24.1	7.9	7.5				1.4

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	9/24/2007	M	2	24.3	7.9	7.6				
2-JMS104.16	9/24/2007	M	3	24.1	7.9	7.5				
2-JMS104.16	9/24/2007	M	4	24	7.9	7.5				
2-JMS104.16	9/24/2007	M	5	24	7.8	7.4				
2-JMS104.16	9/24/2007	M	6	24	7.8	7.4				
2-JMS104.16	9/24/2007	M	7	23.8	7.8	7.2				
2-JMS104.16	9/24/2007	B	8	23.7	7.7	7.2				
2-JMS104.16	10/22/2007	S	1	22.8	8.1	8.9			0	0.8
2-JMS104.16	10/22/2007	M	2	22	7.8	7.7			0	
2-JMS104.16	10/22/2007	M	3	21.9	7.7	7.6			0	
2-JMS104.16	10/22/2007	M	4	21.8	7.7	7.6			0	
2-JMS104.16	10/22/2007	M	5	21.8	7.8	7.7			0	
2-JMS104.16	10/22/2007	M	6	21.8	7.8	7.7			0	
2-JMS104.16	10/22/2007	M	7	21.7	7.8	7.9			0	
2-JMS104.16	10/22/2007	B	8	21.7	7.8	7.9			0	
2-JMS104.16	11/13/2007	S	1	10.8	7.8	10.7			0	3.4
2-JMS104.16	11/13/2007	M	2	10.6	7.8	10.6			0	
2-JMS104.16	11/13/2007	M	3	10.6	7.8	10.6			0	
2-JMS104.16	11/13/2007	M	4	10.5	7.8	10.7			0	
2-JMS104.16	11/13/2007	M	5	10.4	7.8	10.8			0	
2-JMS104.16	11/13/2007	M	6	10.4	7.8	10.8			0	
2-JMS104.16	11/13/2007	B	7	10.4	7.8	10.8			0	
2-JMS104.16	12/10/2007	S	1	6.5	7.6	12.2			0	3.4
2-JMS104.16	12/10/2007	M	2	6.5	7.5	12.1			0	
2-JMS104.16	12/10/2007	M	3	6.5	7.5	12			0	
2-JMS104.16	12/10/2007	M	4	6.4	7.5	11.9			0	
2-JMS104.16	12/10/2007	M	5	6.3	7.5	11.9			0	
2-JMS104.16	12/10/2007	M	6	6.3	7.5	11.9			0	
2-JMS104.16	12/10/2007	M	7	6.4	7.5	12			0	
2-JMS104.16	12/10/2007	B	8	6.4	7.5	12.1			0	
2-JMS104.16	1/23/2008	S	1	3	7.3	13.5			0	2.8
2-JMS104.16	1/23/2008	M	2	3	7.4	13.5			0	
2-JMS104.16	1/23/2008	M	3	3	7.3	13.6			0	
2-JMS104.16	1/23/2008	M	4	3	7.3	13.6			0	
2-JMS104.16	1/23/2008	M	5	3.1	7.3	13.7			0	
2-JMS104.16	1/23/2008	M	6	3.1	7.4	13.7			0	
2-JMS104.16	1/23/2008	B	7	3.1	7.4	13.7			0	
2-JMS104.16	2/14/2008	S	1	5.5	7	12.2			0	1.8
2-JMS104.16	2/14/2008	M	2	5.4	7	12.3			0	
2-JMS104.16	2/14/2008	M	3	5.4	7	12.2			0	
2-JMS104.16	2/14/2008	M	4	5.4	7	12.2			0	
2-JMS104.16	2/14/2008	M	5	5.4	7	12.2			0	
2-JMS104.16	2/14/2008	M	6	5.4	7	12.2			0	
2-JMS104.16	2/14/2008	B	7	5.4	7	12.2			0	
2-JMS104.16	3/18/2008	S	1	12.8	7	10.3			0	2
2-JMS104.16	3/18/2008	M	2	12.7	7	10.3			0	
2-JMS104.16	3/18/2008	M	3	12.6	7	10.3			0	
2-JMS104.16	3/18/2008	M	4	12.4	6.9	10.3			0	
2-JMS104.16	3/18/2008	M	5	12.1	6.9	10.3			0	
2-JMS104.16	3/18/2008	M	6	12.1	6.9	10.3			0	
2-JMS104.16	3/18/2008	M	7	12.1	6.9	10.3			0	
2-JMS104.16	3/18/2008	B	8	12.1	6.9	10.2			0	
2-JMS104.16	4/15/2008	S	1	16.2	6.9	9.1			0	1.7
2-JMS104.16	4/15/2008	M	2	16	6.8	9.1			0	
2-JMS104.16	4/15/2008	M	3	16	6.8	9			0	
2-JMS104.16	4/15/2008	M	4	16	6.8	9			0	
2-JMS104.16	4/15/2008	M	5	16	6.8	9			0	
2-JMS104.16	4/15/2008	M	6	15.9	6.8	9			0	
2-JMS104.16	4/15/2008	M	7	15.9	6.8	9			0	
2-JMS104.16	4/15/2008	B	8	15.9	6.8	9			0	
2-JMS104.16	5/22/2008	S	1	19.1	7.6	8.7				0.9
2-JMS104.16	5/22/2008	M	2	19	7.6	8.8				
2-JMS104.16	5/22/2008	M	3	18.9	7.6	8.8				
2-JMS104.16	5/22/2008	M	4	18.9	7.6	8.8				
2-JMS104.16	5/22/2008	M	5	18.9	7.6	8.9				
2-JMS104.16	5/22/2008	B	6	18.9	7.6	8.8				
2-JMS104.16	6/17/2008	S	1	29.7	7.6	6			0	1
2-JMS104.16	6/17/2008	M	2	29.5	7.6	5.7			0	
2-JMS104.16	6/17/2008	M	3	29.4	7.6	5.7			0	
2-JMS104.16	6/17/2008	M	4	29.4	7.6	5.6			0	

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	6/17/2008	M	5	29.4	7.5	5.7			0	
2-JMS104.16	6/17/2008	B	6	29.4	7.5	5.8			0	
2-JMS104.16	7/15/2008	S	1	29.3	8.1	6.5			0	1.2
2-JMS104.16	7/15/2008	M	2	29	8	6.5			0	
2-JMS104.16	7/15/2008	M	3	28.7	8	6.5			0	
2-JMS104.16	7/15/2008	M	4	28.6	7.9	6.4			0	
2-JMS104.16	7/15/2008	M	5	28.5	7.9	6.2			0	
2-JMS104.16	7/15/2008	M	6	28.5	7.9	6.3			0	
2-JMS104.16	7/15/2008	M	7	28.5	7.9	6.3			0	
2-JMS104.16	7/15/2008	B	8	28.5	7.9	6.3			0	
2-JMS104.16	9/16/2008	S	1	26.4	7.4	6			0	1.2
2-JMS104.16	9/16/2008	M	2	26.4	7.4	6			0	
2-JMS104.16	9/16/2008	M	3	26.4	7.4	6			0	
2-JMS104.16	9/16/2008	M	4	26.4	7.4	6			0	
2-JMS104.16	9/16/2008	M	5	26.4	7.3	6			0	
2-JMS104.16	9/16/2008	M	6	26.4	7.3	6			0	
2-JMS104.16	9/16/2008	M	7	26.4	7.3	6			0	
2-JMS104.16	9/16/2008	M	8	26.4	7.3	6			0	
2-JMS104.16	9/16/2008	B	9	26.4	7.3	6			0	
2-JMS104.16	10/21/2008	S	1	18.2	7.7	8			0	1.7
2-JMS104.16	10/21/2008	M	2	18.1	7.7	7.9			0	
2-JMS104.16	10/21/2008	M	3	18	7.7	7.9			0	
2-JMS104.16	10/21/2008	M	4	17.4	7.7	8.3			0	
2-JMS104.16	10/21/2008	M	5	17.3	7.7	8.5			0	
2-JMS104.16	10/21/2008	M	6	17.3	7.7	8.7			0	
2-JMS104.16	10/21/2008	B	7	17.3	7.7	9			0	
2-JMS104.16	11/24/2008	S	1	5.9	7.8	13.3			0	2.2
2-JMS104.16	11/24/2008	M	2	5.9	7.8	13.2			0	
2-JMS104.16	11/24/2008	M	3	5.9	7.8	13.3			0	
2-JMS104.16	11/24/2008	M	4	5.9	7.8	13.2			0	
2-JMS104.16	11/24/2008	M	5	5.9	7.8	13.2			0	
2-JMS104.16	11/24/2008	M	6	5.9	7.8	13.3			0	
2-JMS104.16	11/24/2008	M	7	5.8	7.8	13.3			0	
2-JMS104.16	11/24/2008	B	8	5.9	7.9	13.4			0	
2-JMS104.16	12/9/2008	S	1	4.2	7.9	13.9			0	2.5
2-JMS104.16	12/9/2008	M	2	4.2	8	13.9			0	
2-JMS104.16	12/9/2008	M	3	4.2	8	13.9			0	
2-JMS104.16	12/9/2008	M	4	4.2	8	13.9			0	
2-JMS104.16	12/9/2008	M	5	4.2	8	13.9			0	
2-JMS104.16	12/9/2008	M	6	4.2	8.1	14			0	
2-JMS104.16	12/9/2008	B	7	4.2	8.1	13.9			0	
2-JMS104.16	1/21/2009	S	1	0.9	7.5	14			0	0.7
2-JMS104.16	1/21/2009	M	2	0.9	7.5	14			0	
2-JMS104.16	1/21/2009	M	3	0.9	7.5	14			0	
2-JMS104.16	1/21/2009	M	4	0.9	7.5	14			0	
2-JMS104.16	1/21/2009	M	5	0.9	7.4	14.1			0	
2-JMS104.16	1/21/2009	M	6	0.9	7.4	14.2			0	
2-JMS104.16	1/21/2009	M	7	0.9	7.4	14.3			0	
2-JMS104.16	1/21/2009	M	8	0.9	7.4	14.4			0	
2-JMS104.16	1/21/2009	B	9	0.9	7.4	14.4			0	
2-JMS104.16	2/19/2009	S	1	7.3	6.9	11.5			0	2.6
2-JMS104.16	2/19/2009	M	2	7.3	6.8	11.5			0	
2-JMS104.16	2/19/2009	M	3	7.3	6.8	11.6			0	
2-JMS104.16	2/19/2009	M	4	7.3	6.8	11.8			0	
2-JMS104.16	2/19/2009	M	5	7.6	6.5	11.8			0	
2-JMS104.16	2/19/2009	M	6	7.6	6.5	11.6			0	
2-JMS104.16	2/19/2009	M	7	7.6	6.5	11.7			0	
2-JMS104.16	2/19/2009	B	8	7.4	6.2	11.3			0	
2-JMS104.16	3/17/2009	S	1	9.3	7.5	10.7			0	1.2
2-JMS104.16	3/17/2009	M	2	9.3	7.5	10.7			0	
2-JMS104.16	3/17/2009	M	3	9.3	7.5	10.8			0	
2-JMS104.16	3/17/2009	M	4	9.3	7.5	10.8			0	
2-JMS104.16	3/17/2009	M	5	9.3	7.5	10.7			0	
2-JMS104.16	3/17/2009	M	6	9.3	7.5	10.8			0	
2-JMS104.16	3/17/2009	M	7	9.3	7.5	10.7			0	
2-JMS104.16	3/17/2009	M	8	9.2	7.4	10.9			0	
2-JMS104.16	3/17/2009	B	9	9.2	7.5	11			0	
2-JMS104.16	4/30/2009	S	1	20.4	7.4	8.6				1.1
2-JMS104.16	4/30/2009	M	2	20.4	7.4	8.6				
2-JMS104.16	4/30/2009	M	3	20.2	7.4	8.6				

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	4/30/2009	M	4	20.2	7.4	8.6				
2-JMS104.16	4/30/2009	M	5	20.1	7.4	8.6				
2-JMS104.16	4/30/2009	M	6	20.1	7.4	8.6				
2-JMS104.16	4/30/2009	B	7	20.1	7.4	8.6				
2-JMS104.16	5/19/2009	S	1	18.8	7.6	9.4				0.2
2-JMS104.16	5/19/2009	M	2	18.7	7.6	9.4				
2-JMS104.16	5/19/2009	M	3	18.7	7.7	9.5				
2-JMS104.16	5/19/2009	M	4	18.7	7.7	9.5				
2-JMS104.16	5/19/2009	M	5	18.7	7.7	9.5				
2-JMS104.16	5/19/2009	M	6	18.7	7.7	9.4				
2-JMS104.16	5/19/2009	M	7	18.7	7.7	9.4				
2-JMS104.16	5/19/2009	B	8	18.7	7.7	9.2				
2-JMS104.16	6/16/2009	S	1	25.2	7.4	7.7				0.6
2-JMS104.16	6/16/2009	M	2	25	7.4	7.8				
2-JMS104.16	6/16/2009	M	3	25	7.4	7.8				
2-JMS104.16	6/16/2009	M	4	24.9	7.4	7.7				
2-JMS104.16	6/16/2009	M	5	25	7.4	7.5				
2-JMS104.16	6/16/2009	M	6	25	7.4	7.3				
2-JMS104.16	6/16/2009	B	7	25	7.4	7.3				
2-JMS104.16	7/21/2009	S	1	28.3	7.7	6.5				1.3
2-JMS104.16	7/21/2009	M	2	28.1	7.7	6.5				
2-JMS104.16	7/21/2009	M	3	28.1	7.7	6.6				
2-JMS104.16	7/21/2009	M	4	28	7.7	6.6				
2-JMS104.16	7/21/2009	M	5	28	7.7	6.5				
2-JMS104.16	7/21/2009	M	6	28	7.7	6.4				
2-JMS104.16	7/21/2009	M	7	28	7.7	6.3				
2-JMS104.16	7/21/2009	B	8	28	7.7	6.4				
2-JMS104.16	8/18/2009	S	1	30.3	8.5	7.6				1
2-JMS104.16	8/18/2009	M	2	29.4	8.1	6.6				
2-JMS104.16	8/18/2009	M	3	29.3	8	6.6				
2-JMS104.16	8/18/2009	M	4	29.3	7.9	6.4				
2-JMS104.16	8/18/2009	M	5	29.2	7.9	6.4				
2-JMS104.16	8/18/2009	M	6	29.2	7.9	6.3				
2-JMS104.16	8/18/2009	M	7	29.2	8	6.3				
2-JMS104.16	8/18/2009	B	8	29.2	8	6.3				
2-JMS104.16	9/15/2009	S	1	24.5	7.9					1.1
2-JMS104.16	9/15/2009	M	2	23.8	7.8					
2-JMS104.16	9/15/2009	M	3	23.8	7.7					
2-JMS104.16	9/15/2009	M	4	23.7	7.8					
2-JMS104.16	9/15/2009	M	5	23.7	7.8					
2-JMS104.16	9/15/2009	M	6	23.7	7.8					
2-JMS104.16	9/15/2009	M	7	23.7	7.8					
2-JMS104.16	9/15/2009	M	8	23.7	7.8					
2-JMS104.16	9/15/2009	B	9	23.7	7.8					
2-JMS104.16	10/28/2009	S	1	16.6	7.6	8.1				1.1
2-JMS104.16	10/28/2009	M	2	16.2	7.6	8				
2-JMS104.16	10/28/2009	M	3	16	7.6	7.9				
2-JMS104.16	10/28/2009	M	4	16	7.6	7.9				
2-JMS104.16	10/28/2009	M	5	16	7.6	7.9				
2-JMS104.16	10/28/2009	M	6	16	7.6	8				
2-JMS104.16	10/28/2009	B	7	16	7.6	8.2				
2-JMS104.16	11/9/2009	S	1	13.4	7.8					1.6
2-JMS104.16	11/9/2009	M	2	13.2	7.8					
2-JMS104.16	11/9/2009	M	3	13	7.8					
2-JMS104.16	11/9/2009	M	4	13	7.8					
2-JMS104.16	11/9/2009	M	5	13	7.8					
2-JMS104.16	11/9/2009	M	6	12.9	7.8					
2-JMS104.16	11/9/2009	M	7	13	7.8					
2-JMS104.16	11/9/2009	B	8	12.9	7.8					
2-JMS104.16	12/8/2009	S	1	6.6	6.9	12.1				0.5
2-JMS104.16	12/8/2009	M	2	6.6	6.9	12.1				
2-JMS104.16	12/8/2009	M	3	6.6	6.9	12.1				
2-JMS104.16	12/8/2009	M	4	6.6	6.8	12.2				
2-JMS104.16	12/8/2009	M	5	6.6	6.8	12.2				
2-JMS104.16	12/8/2009	M	6	6.6	6.8	12.2				
2-JMS104.16	12/8/2009	B	7	6.6	6.7	12.2				
2-JMS104.16	1/25/2010	S	1	7.5	7.5	11.1				0.3
2-JMS104.16	1/25/2010	M	2	7.4	7.5	11				
2-JMS104.16	1/25/2010	M	3	7.4	7.5	10.9				
2-JMS104.16	1/25/2010	M	4	7.4	7.5	10.9				

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	1/25/2010	M	5	7.4	7.5	10.8				
2-JMS104.16	1/25/2010	M	6	7.4	7.5	10.7				
2-JMS104.16	1/25/2010	M	7	7.4	7.4	10.6				
2-JMS104.16	1/25/2010	B	8	7.4	7.4	10.6				
2-JMS104.16	2/17/2010	S	1	2.8	7.6	12.8				1
2-JMS104.16	2/17/2010	M	2	2.8	7.6	12.8				
2-JMS104.16	2/17/2010	M	3	2.7	7.6	12.8				
2-JMS104.16	2/17/2010	M	4	2.7	7.6	12.8				
2-JMS104.16	2/17/2010	M	5	2.7	7.6	12.8				
2-JMS104.16	2/17/2010	M	6	2.7	7.6	12.9				
2-JMS104.16	2/17/2010	B	7	2.7	7.5	12.9				
2-JMS104.16	3/4/2010	S	1	5.6	7.7	12.7				1.1
2-JMS104.16	3/4/2010	M	2	5.7	7.6	12.7				
2-JMS104.16	3/4/2010	M	3	5.6	7.6	12.7				
2-JMS104.16	3/4/2010	M	4	5.6	7.6	12.7				
2-JMS104.16	3/4/2010	M	5	5.6	7.6	12.7				
2-JMS104.16	3/4/2010	M	6	5.6	7.6	12.7				
2-JMS104.16	3/4/2010	M	7	5.6	7.6	12.7				
2-JMS104.16	3/4/2010	B	8	5.6	7.6	12.7				
2-JMS104.16	4/6/2010	S	1	18.5	7.6	9.5				1.1
2-JMS104.16	4/6/2010	M	2	18.4	7.6	9.5				
2-JMS104.16	4/6/2010	M	3	18.3	7.5	9.4				
2-JMS104.16	4/6/2010	M	4	18.3	7.5	9.4				
2-JMS104.16	4/6/2010	M	5	18.3	7.5	9.4				
2-JMS104.16	4/6/2010	M	6	18.3	7.5	9.4				
2-JMS104.16	4/6/2010	B	7	18.3	7.5	9.4				
2-JMS104.16	5/4/2010	S	1	23.7	8.4					0.8
2-JMS104.16	5/4/2010	M	2	23.6	8.3					
2-JMS104.16	5/4/2010	M	3	23.6	8.3					
2-JMS104.16	5/4/2010	M	4	23.5	8.2					
2-JMS104.16	5/4/2010	M	5	23.5	8.1					
2-JMS104.16	5/4/2010	M	6	23.5	8.1					
2-JMS104.16	5/4/2010	B	7	23.5	8.1					
2-JMS104.16	6/2/2010	S	1	26.5	7.5					0.4
2-JMS104.16	6/2/2010	M	2	26.3	7.4					
2-JMS104.16	6/2/2010	M	3	26.2	7.4					
2-JMS104.16	6/2/2010	M	4	26.2	7.4					
2-JMS104.16	6/2/2010	M	5	26.2	7.4					
2-JMS104.16	6/2/2010	B	6	26.2	7.4					
2-JMS104.16	7/7/2010	S	1	30.8	8.6	9.8				1.2
2-JMS104.16	7/7/2010	M	2	30.5	8.5	9.5				
2-JMS104.16	7/7/2010	M	3	30.2	8.4	9.1				
2-JMS104.16	7/7/2010	M	4	30.1	8.2	8.7				
2-JMS104.16	7/7/2010	M	5	29.4	7.8	7.7				
2-JMS104.16	7/7/2010	M	6	28.8	7.4	6				
2-JMS104.16	7/7/2010	M	7	28.7	7.3	5.7				
2-JMS104.16	7/7/2010	B	8	28.6	7.3	5.1				
2-JMS104.16	8/3/2010	S	1	29	8	8.2				1
2-JMS104.16	8/3/2010	M	2	28.5	7.8	7.5				
2-JMS104.16	8/3/2010	M	3	28.2	7.7	7.2				
2-JMS104.16	8/3/2010	M	4	28.1	7.7	7				
2-JMS104.16	8/3/2010	M	5	28.1	7.7	7				
2-JMS104.16	8/3/2010	M	6	28.1	7.7	7				
2-JMS104.16	8/3/2010	B	7	28.1	7.7	6.9				
2-JMS104.16	9/8/2010	S	1	27.3	8.1	7.9				0.9
2-JMS104.16	9/8/2010	M	2	27.3	8.1	7.8				
2-JMS104.16	9/8/2010	M	3	27.3	8	7.8				
2-JMS104.16	9/8/2010	M	4	27.2	8	7.4				
2-JMS104.16	9/8/2010	M	5	27.2	8	7.6				
2-JMS104.16	9/8/2010	M	6	27.1	7.9	7.4				
2-JMS104.16	9/8/2010	B	7	27.1	7.9	7.4				
2-JMS104.16	10/5/2010	S	1	18.6	7.7			9.5		0.8
2-JMS104.16	10/5/2010	M	2	18.3	7.7			9.4		
2-JMS104.16	10/5/2010	M	3	18.4	7.7			9.4		
2-JMS104.16	10/5/2010	M	4	18.4	7.7			9.4		
2-JMS104.16	10/5/2010	M	5	18.2	7.7			9.4		
2-JMS104.16	10/5/2010	M	6	18.2	7.7			9.4		
2-JMS104.16	10/5/2010	M	7	18.2	7.7			9.3		
2-JMS104.16	10/5/2010	M	8	18.2	7.7			9.3		
2-JMS104.16	10/5/2010	B	9	18.2	7.7			9.3		

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	11/2/2010	S	1	14.7	7.8	10.2			0	1.3
2-JMS104.16	11/2/2010	M	2	14.7	7.8	10.2			0	
2-JMS104.16	11/2/2010	M	3	14.7	7.8	10.2			0	
2-JMS104.16	11/2/2010	M	4	14.6	7.8	10.2			0	
2-JMS104.16	11/2/2010	M	5	14.5	7.8	10.2			0	
2-JMS104.16	11/2/2010	M	6	14.4	7.8	10.3			0	
2-JMS104.16	11/2/2010	M	7	14.4	7.8	10.3			0	
2-JMS104.16	11/2/2010	M	8	14.4	7.8	10.3			0	
2-JMS104.16	11/2/2010	B	9	14.3	7.8	10.3			0	
2-JMS104.16	1/4/2011	S	1	3.3	7.8	13.7				2
2-JMS104.16	1/4/2011	M	2	3.3	7.8	13.7				
2-JMS104.16	1/4/2011	M	3	3.3	7.8	13.7				
2-JMS104.16	1/4/2011	M	4	3.3	7.8	13.7				
2-JMS104.16	1/4/2011	M	5	3.3	7.8	13.7				
2-JMS104.16	1/4/2011	M	6	3.3	7.8	13.7				
2-JMS104.16	1/4/2011	B	7	3.3	7.8	13.7				
2-JMS104.16	2/1/2011	S	1	3.9	7.6	13.3				1
2-JMS104.16	2/1/2011	M	2	3.9	7.6	13.3				
2-JMS104.16	2/1/2011	M	3	3.8	7.6	13.3				
2-JMS104.16	2/1/2011	M	4	3.8	7.6	13.3				
2-JMS104.16	2/1/2011	M	5	3.8	7.5	13.3				
2-JMS104.16	2/1/2011	M	6	3.8	7.5	13.3				
2-JMS104.16	2/1/2011	M	7	3.8	7.5	13.3				
2-JMS104.16	2/1/2011	M	8	3.8	7.5	13.3				
2-JMS104.16	2/1/2011	B	9	3.8	7.4	13.2				
2-JMS104.16	3/1/2011	S	1	12.2	7.5	10				1.3
2-JMS104.16	3/1/2011	M	2	12.1	7.5	10				
2-JMS104.16	3/1/2011	M	3	12	7.5	10				
2-JMS104.16	3/1/2011	M	4	11.8	7.5	10				
2-JMS104.16	3/1/2011	M	5	11.8	7.5	9.9				
2-JMS104.16	3/1/2011	M	6	11.8	7.4	9.9				
2-JMS104.16	3/1/2011	M	7	11.8	7.4	9.9				
2-JMS104.16	3/1/2011	M	8	11.8	7.4	9.9				
2-JMS104.16	3/1/2011	B	9	11.7	7.4	9.9				
2-JMS104.16	4/14/2011	S	1	16.5	7.7	10				1.7
2-JMS104.16	4/14/2011	M	2	16.5	7.7	10				
2-JMS104.16	4/14/2011	M	3	16.5	7.7	10				
2-JMS104.16	4/14/2011	M	4	16.4	7.7	10				
2-JMS104.16	4/14/2011	M	5	16.4	7.7	10				
2-JMS104.16	4/14/2011	M	6	16.4	7.7	10				
2-JMS104.16	4/14/2011	M	7	16.5	7.7	10				
2-JMS104.16	4/14/2011	M	8	16.4	7.7	9.9				
2-JMS104.16	4/14/2011	B	9	16.4	7.7	9.9				
2-JMS104.16	5/3/2011	S	1	19.2	7.4	9.6				0.2
2-JMS104.16	5/3/2011	M	2	19.1	7.4	9.6				
2-JMS104.16	5/3/2011	M	3	19.1	7.4	9.6				
2-JMS104.16	5/3/2011	M	4	19.1	7.4	9.6				
2-JMS104.16	5/3/2011	M	5	19	7.4	9.6				
2-JMS104.16	5/3/2011	M	6	19	7.4	9.6				
2-JMS104.16	5/3/2011	M	7	18.8	7.4	9.6				
2-JMS104.16	5/3/2011	B	8	18.8	7.5	9.8				
2-JMS104.16	7/19/2011	S	1	29.6	7.8	6.4				0.8
2-JMS104.16	7/19/2011	M	2	29.4	7.7	6.1				
2-JMS104.16	7/19/2011	M	3	29.4	7.6	6				
2-JMS104.16	7/19/2011	M	4	29.4	7.5	6				
2-JMS104.16	7/19/2011	M	5	29.4	7.5	6				
2-JMS104.16	7/19/2011	B	6	29.3	7.5	5.9				
2-JMS104.16	8/2/2011	S	1	32.1	7.7	5.9				1.1
2-JMS104.16	8/2/2011	M	2	32	7.7	5.8				
2-JMS104.16	8/2/2011	M	3	31.8	7.6	5.5				
2-JMS104.16	8/2/2011	M	4	31.7	7.6	5.4				
2-JMS104.16	8/2/2011	M	5	31.7	7.6	5.3				
2-JMS104.16	8/2/2011	M	6	31.7	7.6	5.1				
2-JMS104.16	8/2/2011	B	7	31.7	7.5	5.1				
2-JMS104.16	9/22/2011	S	1	22.5	7.9	8.2				1.3
2-JMS104.16	9/22/2011	M	2	22.3	7.9	8.1				
2-JMS104.16	9/22/2011	M	3	22.3	7.9	8				
2-JMS104.16	9/22/2011	M	4	22.2	7.9	8				
2-JMS104.16	9/22/2011	M	5	22.2	7.9	7.9				
2-JMS104.16	9/22/2011	M	6	22.2	7.8	7.8				

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	9/22/2011	B	7	22.2	7.8	7.8				
2-JMS104.16	10/4/2011	S	1	18.8	7.7	8.6				0.9
2-JMS104.16	10/4/2011	M	2	18.7	7.8	8.7				
2-JMS104.16	10/4/2011	M	3	18.7	7.8	8.6				
2-JMS104.16	10/4/2011	M	4	18.7	7.8	8.7				
2-JMS104.16	10/4/2011	M	5	18.6	7.8	8.7				
2-JMS104.16	10/4/2011	M	6	18.6	7.7	8.6				
2-JMS104.16	10/4/2011	M	7	18.6	7.7	8.5				
2-JMS104.16	10/4/2011	B	8	18.5	7.7	8.5				
2-JMS104.16	11/1/2011	S	1	12.7	7.7	10.9				1.4
2-JMS104.16	11/1/2011	M	2	12.7	7.7	10.8				
2-JMS104.16	11/1/2011	M	3	12.7	7.7	10.9				
2-JMS104.16	11/1/2011	M	4	12.7	7.7	10.9				
2-JMS104.16	11/1/2011	M	5	12.6	7.6	10.9				
2-JMS104.16	11/1/2011	M	6	12.6	7.6	10.9				
2-JMS104.16	11/1/2011	B	7	12.6	7.6	11				
2-JMS104.16	12/6/2011	S	1	9.16	7.54	11.25				0.6
2-JMS104.16	12/6/2011	M	2	9.12	7.54	11.27				
2-JMS104.16	12/6/2011	M	3	9.11	7.54	11.31				
2-JMS104.16	12/6/2011	M	4	9.07	7.54	11.28				
2-JMS104.16	12/6/2011	M	5	9.07	7.54	11.31				
2-JMS104.16	12/6/2011	M	6	9.07	7.55	11.22				
2-JMS104.16	12/6/2011	M	7	9.06	7.55	10.66				
2-JMS104.16	12/6/2011	B	8	9.07	7.6	10.04				
2-JMS104.16	1/5/2012	S	1	3.93	7.66	13.42				1.1
2-JMS104.16	1/5/2012	M	2	3.9	7.66	13.48				
2-JMS104.16	1/5/2012	M	3	3.91	7.66	13.61				
2-JMS104.16	1/5/2012	M	4	3.95	7.66	13.61				
2-JMS104.16	1/5/2012	M	5	3.93	7.67	13.61				
2-JMS104.16	1/5/2012	M	6	3.95	7.67	13.63				
2-JMS104.16	1/5/2012	M	7	3.95	7.66	13.76				
2-JMS104.16	1/5/2012	B	8	3.94	7.64	13.81				
2-JMS104.16	2/7/2012	S	1	7.82	7.73	11.84				1.9
2-JMS104.16	2/7/2012	M	2	7.39	7.72	11.92				
2-JMS104.16	2/7/2012	M	3	7.28	7.71	11.89				
2-JMS104.16	2/7/2012	M	4	7.26	7.7	11.87				
2-JMS104.16	2/7/2012	M	5	7.23	7.68	11.9				
2-JMS104.16	2/7/2012	M	6	7.14	7.66	11.94				
2-JMS104.16	2/7/2012	M	7	7.14	7.61	11.93				
2-JMS104.16	2/7/2012	B	8	7.12	7.55	11.87				
2-JMS104.16	3/6/2012	S	1	8.77	7.78	12.16				0.3
2-JMS104.16	3/6/2012	M	2	8.73	7.78	12.21				
2-JMS104.16	3/6/2012	M	3	8.69	7.79	12.2				
2-JMS104.16	3/6/2012	M	4	8.68	7.78	12.18				
2-JMS104.16	3/6/2012	M	5	8.68	7.78	12.15				
2-JMS104.16	3/6/2012	M	6	8.69	7.77	12.19				
2-JMS104.16	3/6/2012	M	7	8.68	7.78	12.24				
2-JMS104.16	3/6/2012	B	8	8.67	7.75	12.25				
2-JMS104.16	4/12/2012	S	1	15.13	7.91	9.6				1.5
2-JMS104.16	4/12/2012	M	2	14.89	7.9	9.6				
2-JMS104.16	4/12/2012	M	3	14.83	7.89	9.54				
2-JMS104.16	4/12/2012	M	4	14.81	7.87	9.67				
2-JMS104.16	4/12/2012	B	5	14.81	7.85	9.64				
2-JMS104.16	5/3/2012	S	1	19.8	7.64	8.22				1
2-JMS104.16	5/3/2012	M	2	19.57	7.64	8.28				
2-JMS104.16	5/3/2012	M	3	19.42	7.64	8.39				
2-JMS104.16	5/3/2012	M	4	19.32	7.65	8.4				
2-JMS104.16	5/3/2012	M	5	19.34	7.64	8.4				
2-JMS104.16	5/3/2012	B	6	19.33	7.64	8.42				
2-JMS104.16	6/14/2012	S	1	26.42	8.52	7.99				0.9
2-JMS104.16	6/14/2012	M	2	26.41	8.51	7.96				
2-JMS104.16	6/14/2012	M	3	26.31	8.46	7.98				
2-JMS104.16	6/14/2012	M	4	26.15	8.33	7.91				
2-JMS104.16	6/14/2012	M	5	26.1	8.25	7.77				
2-JMS104.16	6/14/2012	M	6	25.95	8.12	7.7				
2-JMS104.16	6/14/2012	M	7	25.87	8.05	7.65				
2-JMS104.16	6/14/2012	B	8	25.82	7.82	7.05				
2-JMS104.16	7/19/2012	S	1	32.56	8.01	6.63				1
2-JMS104.16	7/19/2012	M	2	31.73	7.82	6.02				
2-JMS104.16	7/19/2012	M	3	31.64	7.79	5.83				

Station ID	Collection Date	Depth Desc	Depth	Temp Celcius	Field Ph	Do Probe	Do Winkler	Fdt Do Optical	Salinity	Secchi Depth
2-JMS104.16	7/19/2012	M	4	31.42	7.66	5.34				
2-JMS104.16	7/19/2012	M	5	31.34	7.61	5.08				
2-JMS104.16	7/19/2012	M	6	31.24	7.56	4.9				
2-JMS104.16	7/19/2012	B	7	31.22	7.55	4.83				
2-JMS104.16	8/7/2012	S	1	30.56	8.01	6.19				1.2
2-JMS104.16	8/7/2012	M	2	30.46	7.99	6.17				
2-JMS104.16	8/7/2012	M	3	30.25	7.92	5.95				
2-JMS104.16	8/7/2012	M	4	30.08	7.87	5.92				
2-JMS104.16	8/7/2012	M	5	30.08	7.85	5.91				
2-JMS104.16	8/7/2012	B	6	30.08	7.79	5.84				
2-JMS104.16	9/20/2012	S	1	23.99	7.6	6.24				1.6
2-JMS104.16	9/20/2012	M	2	23.06	7.58	6.13				
2-JMS104.16	9/20/2012	M	3	23.05	7.56	6.15				
2-JMS104.16	9/20/2012	M	4	23.05	7.56	6.17				
2-JMS104.16	9/20/2012	M	5	23	7.56	6.1				
2-JMS104.16	9/20/2012	M	6	22.99	7.54	6.19				
2-JMS104.16	9/20/2012	B	7	23.01	7.4	4.52				
2-JMS104.16	10/23/2012	S	1	18.45	8.15	8.78				1.8
2-JMS104.16	10/23/2012	M	2	17.65	8.23	8.78				
2-JMS104.16	10/23/2012	M	3	17.51	8.3	8.85				
2-JMS104.16	11/6/2012	S	1	11.42	8.11	10.38				1.6
2-JMS104.16	11/6/2012	M	2	11.42	8.11	10.37				
2-JMS104.16	11/6/2012	M	3	11.42	8.1	10.41				
2-JMS104.16	11/6/2012	M	4	11.41	8.09	10.42				
2-JMS104.16	11/6/2012	M	5	11.38	8.08	10.44				
2-JMS104.16	11/6/2012	M	6	11.39	8.07	10.49				
2-JMS104.16	11/6/2012	M	7	11.38	8.04	10.47				
2-JMS104.16	11/6/2012	B	8	11.35	8.02	8.64				
2-JMS104.16	12/4/2012	S	1	8.78	8.18	12.02				2.8
2-JMS104.16	12/4/2012	M	2	8.68	8.19	12.07				
2-JMS104.16	12/4/2012	M	3	8.34	8.16	12.07				
2-JMS104.16	12/4/2012	M	4	8.33	8.15	12.05				
2-JMS104.16	12/4/2012	M	5	8.3	8.12	11.94				
2-JMS104.16	12/4/2012	B	6	8.26	7.43	8.85				
2-JMS104.16	1/8/2013	S	1	5.15	8.06	13.49				1.3
2-JMS104.16	1/8/2013	M	2	5.12	8.06	13.51				
2-JMS104.16	1/8/2013	M	3	5.09	8.05	13.56				
2-JMS104.16	1/8/2013	M	4	5.02	8.06	13.55				
2-JMS104.16	1/8/2013	M	5	5	8.05	13.56				
2-JMS104.16	1/8/2013	M	6	4.95	8.05	13.62				
2-JMS104.16	1/8/2013	B	7	4.95	8.05	13.66				
90th Percentile				**28.8**	**8.0**					
10th Percentile				**5.4**	**7.2**					

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
2-JMS104.16	02/17/1994 16:05	S	1	R	42	
	03/21/1994 15:20	S	1	R	55	
	04/14/1994 15:50	S	1	R	50	
	05/23/1994 16:35	S	1	R	50	
	06/09/1994 15:55	S	1	R	66	
	09/08/1994 15:20	S	1	R	96	
	10/17/1994 16:10	S	1	R	83	
	11/30/1994 15:35	S	1	R	69	
	12/06/1994 16:25	S	1	R	75	
	01/25/1995 15:30	S	1	R	53	
	02/27/1995 15:30	S	1	R	54	
	03/23/1995 16:20	S	1	R	56	
	04/18/1995 16:15	S	1	R	65	
	05/23/1995 15:35	S	1	R	40	
	06/20/1995 16:00	S	1	R	57	
	07/18/1995 15:50	S	1	R	66	
	08/23/1995 16:20	S	1	R	90	
	09/21/1995 15:10	S	1	R	110	
	10/19/1995 15:55	S	1	R	59	
	11/20/1995 16:10	S	1	R	65	
	12/14/1995 15:30	S	1	R	47	
	01/29/1996 16:00	S	1	R	26	
	02/20/1996 15:30	S	1	R	86	
	03/25/1996 15:30	S	1	R	56	
	04/29/1996 11:00	S	1	R	59	
	05/15/1996 15:05	S	1	R	50	
	06/18/1996 15:20	S	1	R	50	
	07/23/1996 16:00	S	1	R	59	
	08/20/1996 15:15	S	1	R	85	
	09/24/1996 15:20	S	1	R	56	
	10/22/1996 15:00	S	1	R	49	
	11/19/1996 15:40	S	1	R	58	
	12/10/1996 15:50	S	1	R	41	
	02/18/1997 16:25	S	1	R	38.2	
	03/18/1997 15:55	S	1	R	61.5	
	04/22/1997 16:00	S	1	R	64.9	
	05/28/1997 16:30	S	1	R	56	
	06/24/1997 16:05	S	1	R	60.1	
	07/15/1997 16:00	S	1	R	76.2	
	08/19/1997 15:45	S	1	R	67.7	
	09/23/1997 15:35	S	1	R	60.7	
	10/21/1997 15:30	S	1	R	70.2	
	11/18/1997 15:45	S	1	R	57.9	
	12/10/1997 16:00	S	1	R	70.8	
	01/21/1998 16:15	S	1	R	44.3	
	03/17/1998 15:55	S	1	R	42.3	
	04/21/1998 15:45	S	1	R	33.9	
	05/19/1998 15:45	S	1	R	46.3	
	06/23/1998 16:15	S	1	R	62.5	
	07/21/1998 16:00	S	1	R	81.4	
	08/18/1998 15:55	S	1	R	71	

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
	09/22/1998 18:00	S	1	R	87.8	
	10/20/1998 16:50	S	1	R	134	
	11/18/1998 15:45	S	1	R	83	
	12/15/1998 16:00	S	1	R	76	
	01/19/1999 15:45	S	1	R	78	
	02/23/1999 15:30	S	1	R	60	
	03/23/1999 16:00	S	1	R	48	
	04/20/1999 17:00	S	1	R	68	
	05/20/1999 15:45	S	1	R	62	
	06/22/1999 15:40	S	1	R	62.7	
	07/20/1999 16:45	S	1	R	85.8	
	08/17/1999 16:35	S	1	R	96.5	
	09/21/1999 16:45	S	1	R	36.5	
	10/28/1999 15:35	S	1	R	70.6	
	11/18/1999 16:00	S	1	S1	119.3	
	12/21/1999 15:40	S	1	R	51.6	
	01/18/2000 16:35	S	1	R	63.9	
	02/23/2000 14:35	S	1	R	51	
	03/28/2000 15:45	S	1	S1	84	
	04/24/2000 16:15	S	1	R	39	
	05/23/2000 17:55	S	1	R	54	
	06/20/2000 16:55	S	1	R	60.1	
	07/18/2000 17:05	S	1	R	78	
	08/22/2000 15:50	S	1	R	65.2	
	09/26/2000 17:05	S	1	S1	139.7	
	10/24/2000 15:50	S	1	R	81.5	
	11/28/2000 17:00	S	1	R	104	
	01/23/2001 14:30	S	1	R	53.4	
	02/20/2001 13:50	S	1	R	54	
	03/27/2001 15:15	S	1	R	30.3	
	04/24/2001 14:10	S	1	R	48	
	06/19/2001 15:00	S	1	R	52.8	
	07/24/2001 15:00	S	1	R	44.9	
	08/21/2001 16:00	S	1	R	59.5	
	09/18/2001 16:45	S	1	R	55.7	
	10/16/2001 15:35	S	1	R	120	
	11/27/2001 16:00	S	1	R	52.7	
	12/12/2001 15:15	S	1	R	109	
	01/22/2002 16:00	S	1	R	85	
	02/19/2002 15:35	S	1	R	44.1	
	03/19/2002 16:00	S	1	R	56.5	
	04/16/2002 16:10	S	1	S1	105.1	
	05/30/2002 17:10	S	1	R	66.4	
	06/25/2002 15:45	S	1	R	100	
	07/23/2002 15:25	S	1	R	114	
	08/13/2002 16:00	S	1	R	118	
	09/24/2002 16:10	S	1	R	107	
	10/22/2002 15:30	S	1	R	128	
	11/19/2002 15:40	S	1	R	32.3	
	12/10/2002 15:45	S	1	R	66.8	
	01/21/2003 16:00	S	1	R	56.3	

					00900	
					HARDNESS, TOTAL (MG/L AS CACO3)	
Sta Id	Collection Date Time	Depth Desc	Depth	Container Id Desc	Value	Com Code
	02/25/2003 12:09	S	1	R	46.7	
	03/18/2003 16:10	S	1	R	54.3	
	05/27/2003 13:17	S	1	R	34.6	
	06/24/2003 15:30	S	1	R	49.2	
	07/15/2003 15:30	S	1	R	50	
	08/26/2003 16:30	S	1	R	56.2	
	09/24/2003 14:27	S	1	R	22.8	
	10/28/2003 16:00	S	1	R	70.4	
	11/18/2003 15:15	S	1	R	48	
	12/16/2003 15:30	S	1	R	40	
	02/25/2004 15:30	S	1	R	63.5	
	03/23/2004 15:00	S	1	R	53.4	
	04/20/2004 15:00	S	1	S1	98.9	
	05/18/2004 15:30	S	1	R	58	
	06/15/2004 15:30	S	1	R	48	
	07/20/2004 15:15	S	1	R	62.7	
	08/17/2004 15:30	S	1	R	58.6	
	09/21/2004 15:00	S	1	R	63.1	
	10/19/2004 15:00	S	1	R	34	
	11/16/2004 15:00	S	1	R	44	
	12/14/2004 15:45	S	1	R	50	
	01/26/2005 15:20	S	1	R	56	
	02/15/2005 15:15	S	1	R	70	
	03/22/2005 15:45	S	1	R	56	
	04/19/2005 16:15	S	1	R	58.2	
	05/24/2005 15:00	S	1	R	44	
	06/21/2005 15:20	S	1	R	80	
	07/19/2005 15:30	S	1	R	64	
	08/23/2005 16:00	S	1	R	68	
	09/20/2005 15:20	S	1	R	110	
	10/18/2005 16:00	S	1	R	56	
	11/15/2005 15:00	S	1	R	102	
	12/21/2005 15:40	S	1	R	52	
	01/17/2006 15:15	S	1	R	76	
	02/21/2006 15:30	S	1	R	55	
	03/20/2006 15:45	S	1	R	64	
	04/26/2006 15:30	S	1	R	51	
	05/15/2006 15:40	S	1	R	54	
	07/24/2006 15:00	S	1	R	90	
	08/22/2006 15:30	S	1	R	106	
	10/30/2006 15:30	S	1	R	52	
	11/15/2006 14:50	S	1	R	38	
	01/24/2007 15:15	S	1	R	56	
Average					**65**	

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River

TMDL ID: G01E-01-BAC **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.2581 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1996

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Estuarine James River from the fall line at Mayos Bridge downstream to the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E.coli

The James River from the fall line to the Appomattox River has been assessed as not supporting of the Recreation use support goal based on the results of a summer special study in the fall zone. The special study was designed to monitor the effects of summertime rain and combined sewer overflow (CSO) events on water quality in the James River and to monitor the effects of Richmond's CSO abatement efforts.

The segment has been included on the Impaired Waters list for fecal coliform since 1996. During the 2004 and 2006 cycles, the bacteria standard changed to E.coli for those stations with enough data. Some of the areas in this segment had converted to the E.coli standard, for others the fecal coliform standard was still in effect. During the 2008 cycle, the impairment was converted solely to E. coli. The TMDL for bacteria is due in 2010.

Bacteria impairment is noted at the following stations during the 2010 cycle:
2-JMS110.30
2-JMS104.16
2-JMS099.30

Although station 2-JMS087.01 is currently passing (5/50), the downstream extent will remain the same for this cycle due to the historical impairment and the marginal passing rate.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and should not be included in the bacterial impairment, which only included the "estuarine James River".

IMPAIRMENT SOURCE: NPS - Urban, CSO

The source of the impairment in this section of the river is believed to be urban runoff from the tributary drainage basin and from combined sewer overflow events from the City of Richmond's combined sewer system.

The City is currently undertaking CSO abatement efforts. It is recommended that the ongoing CSO special study be continued to gauge the effects of CSO abatement efforts on water quality in this segment.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River and Various Tributaries

TMDL ID: G01E-03-PCB **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2014

IMPAIRED SIZE: ~325 - Stream mile **Watershed:** VAP-G01E

INITIAL LISTING: 2002

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Hampton Roads Bridge Tunnel

Estuarine James River from the fall line to the Hampton Roads Bridge Tunnel, including several tributaries listed below.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Fish Tissue - PCBs, VDH Fish Consumption Restriction

During the 2002 cycle, the James River from the Fall line to Queens Creek was considered not supporting of the Fish Consumption Use due to PCBs in multiple fish species at multiple DEQ monitoring locations.

During the 2004 cycle, a VDH Fish Consumption Restriction was issued from the fall line to Flowerdew Hundred and the segment was adjusted slightly to match the Restriction. In addition, in the 2004 cycle, the Chickahominy River from Walkers Dam to Diascund Creek was assessed as not supporting the Fish Consumption Use because the DEQ screening value for PCBs was exceeded in 3 species during sampling in 2001.

During the 2006 cycle, the VDH restriction was extended on 12/13/2004 to extend from the I-95 bridge downstream to the Hampton Roads Bridge Tunnel and include the tidal portions of the following tributaries:

Appomattox River up to Lake Chesdin Dam
Bailey Creek up to Route 630
Bailey Bay
Chickahominy River up to Walkers Dam
Skiffes Creek up to Skiffes Creek Dam
Pagan River and its tributary Jones Creek
Chuckatuck Creek
Nansemond River and its tributaries Bennett Creek and Star Creek
Hampton River
Willoughby Bay and the Elizabeth R. system (Western, Eastern, and Southern Branches and Lafayette R.) and tributaries St. Julian Creek, Deep Creek, and Broad Creek

The advisory was modified again on 10/10/2006 to add Poythress Run.

The impairments were combined. The TMDL for the lower extended portion is due in 2018.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and is not included in the VDH Fish Consumption Advisory.

IMPAIRMENT SOURCE: Unknown

The source of the PCBs is considered unknown.

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River Tidal Freshwater (Upper) Estuary

TMDL ID: JMSTFU-SAV-BAY **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5998 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Shallow Water Use - Not Supporting

IMPAIRMENT: Aquatic Macrophytes

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

During the 2006 cycle, the CB water quality standards were implemented. The Upper Tidal Freshwater James River from the fall line to the Appomattox fails the Shallow Water Use SAV criteria.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The tributary strategy for the James River assigned sources and allocations.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River

TMDL ID: G01E-02-CHLA **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 5.5117 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFu/JMSTFI boundary at the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Not Supporting

IMPAIRMENT: Chlorophyll

The James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

A special site-specific chlorophyll standard for the mainstem James River was adopted during the 2008 cycle. The upper tidal freshwater segment exceeds both the spring and summer seasonal means.

Farrar Gut was mistakenly combined with the mainstem in previous assessments. The stream is a separate waterbody and should not be included in the chlorophyll a impairment, which only includes the mainstem James River.

IMPAIRMENT SOURCE: Point sources, Nonpoint Sources

The James River Tributary Strategy was developed to bring the river into attainment.

RECOMMENDATION: Problem Characterization

2010 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River Tidal Freshwater (Upper) Estuary

TMDL ID: JMSTFU-DO-BAY **2010 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5749 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Dissolved Oxygen

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

The CB water quality standards were implemented during the 2006 cycle. The 30-day dissolved oxygen criteria was met during the 2006 and 2008 cycles; however, during the 2010 cycle, the segment failed the summer 30-day Open Water dissolved oxygen criteria. The rest-of-year standard was met.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The tributary strategy for the James River assigned sources and allocations.

RECOMMENDATION: Problem Characterization

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River

TMDL ID: G01E-01-BAC **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.2581 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1996

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Estuarine James River from the fall line at Mayos Bridge downstream to the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Recreation Use - Not Supporting

IMPAIRMENT: E.coli

The James River from the fall line to the Appomattox River has been assessed as not supporting of the Recreation use support goal based on the results of a summer special study in the fall zone. The special study was designed to monitor the effects of summertime rain and combined sewer overflow (CSO) events on water quality in the James River and to monitor the effects of Richmond's CSO abatement efforts.

The segment has been included on the Impaired Waters list for fecal coliform since 1996. During the 2004 and 2006 cycles, the bacteria standard changed to E.coli for those stations with enough data. Some of the areas in this segment had converted to the E.coli standard, for others the fecal coliform standard was still in effect. During the 2008 cycle, the impairment was converted solely to E. coli. The TMDL for bacteria was due in 2010.

Bacteria impairment is noted at multiple stations during the 2012 cycle. Although several stations in the lower part of the impairment are currently passing, the segment size will remain the same for this cycle due to the historical impairment, the marginal passing rate, and several violation rates which would otherwise be considered observed effects.

The James River and Tributaries - City of Richmond Bacterial TMDL was approved by the EPA on 11/4/2010. The river is considered Category 4A.

IMPAIRMENT SOURCE: Nonpoint Sources, CSOs, Point Sources, MS4s

Bacteria were allocated to point and nonpoint sources, including CSOs, and MS4s.

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: **James River and Various Tributaries**

TMDL ID: **G01E-03-PCB** **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2014

IMPAIRED SIZE: ~325 - Stream mile **Watershed:** VAP-G01E

INITIAL LISTING: 2002

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Hampton Roads Bridge Tunnel

Estuarine James River from the fall line to the Hampton Roads Bridge Tunnel, including several tributaries listed below.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Fish Consumption Use - Not Supporting

IMPAIRMENT: Fish Tissue - PCBs, VDH Fish Consumption Restriction

During the 2002 cycle, the James River from the Fall line to Queens Creek was considered not supporting of the Fish Consumption Use due to PCBs in multiple fish species at multiple DEQ monitoring locations.

During the 2004 cycle, a VDH Fish Consumption Restriction was issued from the fall line to Flowerdew Hundred and the segment was adjusted slightly to match the Restriction. In addition, in the 2004 cycle, the Chickahominy River from Walkers Dam to Diascund Creek was assessed as not supporting the Fish Consumption Use because the DEQ screening value for PCBs was exceeded in 3 species during sampling in 2001.

During the 2006 cycle, the VDH restriction was extended on 12/13/2004 to extend from the I-95 bridge downstream to the Hampton Roads Bridge Tunnel and include the tidal portions of the following tributaries:

Appomattox River up to Lake Chesdin Dam
Bailey Creek up to Route 630
Bailey Bay
Chickahominy River up to Walkers Dam
Skiffes Creek up to Skiffes Creek Dam
Pagan River and its tributary Jones Creek
Chuckatuck Creek
Nansemond River and its tributaries Bennett Creek and Star Creek
Hampton River
Willoughby Bay and the Elizabeth R. system (Western, Eastern, and Southern Branches and Lafayette R.) and tributaries St. Julian Creek, Deep Creek, and Broad Creek

The advisory was modified again on 10/10/2006 to add Poythress Run.

The impairments were combined. The TMDL for the lower extended portion is due in 2018.

IMPAIRMENT SOURCE: Unknown

The source of the PCBs is considered unknown.

RECOMMENDATION: Toxic Source Assessment

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River Tidal Freshwater (Upper) Estuary

TMDL ID: JMSTFU-SAV-BAY **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5998 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Shallow Water Use - Not Supporting

IMPAIRMENT: Aquatic Macrophytes

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

During the 2006 cycle, the CB water quality standards were implemented.

During the 2012 cycle, the Upper Tidal Freshwater James River from the fall line to the Appomattox fails the Shallow Water Subuse's submerged aquatic vegetation (SAV) and water clarity criteria. The TMDL was approved by the EPA on 12/29/2010, therefore the segment is considered a Category 4A water. However the TMDL ID was not available at the time of the 2012 assessment.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

The Chesapeake Bay TMDL allocates total nitrogen, total phosphorus, and total suspended solids to point- and nonpoint sources throughout the Bay watershed.

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River

TMDL ID: G01E-02-CHLA **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 5.5117 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 2008

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFu/JMSTFl boundary at the Appomattox River.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting, Open Water Subuse - Not Supporting

IMPAIRMENT: Chlorophyll

The James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

A special site-specific chlorophyll standard for the mainstem James River was adopted during the 2008 cycle. During the 2012 cycle, the upper tidal freshwater segment exceeds the summer seasonal mean however it is in compliance with the spring mean.

The Chesapeake Bay TMDL was approved by the EPA on 12/29/2010, therefore the impairment will be considered Category 4A. However, the TMDL ID was not available at the time of the 2012 assessment.

IMPAIRMENT SOURCE: Point sources, Nonpoint Sources

The Chesapeake Bay TMDL allocates total nitrogen, total phosphorus, and total suspended solids from point and nonpoint sources across the Bay watershed as well as atmospheric sources.

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River Tidal Freshwater (Upper) Estuary

TMDL ID: JMSTFU-DO-BAY **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 4A **TMDL DUE DATE:** 2010

IMPAIRED SIZE: 6.5749 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 1998

UPSTREAM LIMIT: Fall line

DOWNSTREAM LIMIT: Tidal Freshwater/Oligohaline Boundary

The James River Tidal Freshwater Upper estuary, which extends from the fall line to approximately the Appomattox River, including tributaries.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Dissolved Oxygen

The mainstem James River from the Appomattox River to the Chickahominy River was originally listed on the 1998 list as fully supporting but threatened of the Aquatic Life Use goal based on chlorophyll_a exceedances. During the 1998 cycle, EPA extended the segment upstream to the fall line and downgraded the river to not supporting the Aquatic Life Use, citing nutrient concerns.

In previous cycles, the mainstem James River had acceptable dissolved oxygen levels. In addition the entire tidal freshwater portion (fall line to just above the Chickahominy River) has good benthic community based on the results from the Chesapeake Bay Benthic Index of Biological Community; therefore the James River from the fall line to the oligohaline boundary was considered impaired solely for Nutrients/Eutrophication Biological Indicators (EPA Overlist).

The CB water quality standards were implemented during the 2006 cycle. The 30-day dissolved oxygen criteria was met during the 2006 and 2008 cycles; however, during the 2010 cycle, the segment failed the summer 30-day Open Water dissolved oxygen criteria. The rest-of-year standard was met.

During the 2012 cycle, the Chesapeake Bay TMDL was approved by the EPA on 12/29/2010 and addresses dissolved oxygen and submerged aquatic vegetation impairments throughout the Chesapeake Bay and its tidal tributaries. The upper James River estuary was once again fully supporting of both the Open Water 30-day mean criteria, however EPA policy indicates that it must remain listed until all dissolved oxygen criteria can be assessed,therefore it is Category 4A.

IMPAIRMENT SOURCE: Nonpoint Source, Point Source

There does not appear to be a current dissolved oxygen impairment in the upper James River estuary

RECOMMENDATION: Implementation

2012 Fact Sheets for 303(d) Waters

RIVER BASIN: James River Basin **HYDROLOGIC UNIT:** 02080206

STREAM NAME: James River

TMDL ID: G01E-02-EBEN **2012 IMPAIRED AREA ID:** CB-JMSTFU

ASSESSMENT CATEGORY: 5A **TMDL DUE DATE:** 2024

IMPAIRED SIZE: 31.5967 - Sq. Mi. **Watershed:** VAP-G01E

INITIAL LISTING: 2012

UPSTREAM LIMIT: Fall Line (Mayos Bridge)

DOWNSTREAM LIMIT: Appomattox River

Mainstem James River from the fall line at Mayos Bridge downstream to the JMSTFI/JMSOH boundary.

CLEAN WATER ACT GOAL AND USE SUPPORT:

Aquatic Life Use - Not Supporting

IMPAIRMENT: Benthic Macroinvertebrates

During the 2012 cycle, the mainstem James River within the tidal freshwater estuary was impaired of the Aquatic Life Use due to an inadequate benthic community based on the Chesapeake Bay Benthic Index of Biological Integrity.

This is supported by benthic alteration at 2010 Coastal 2000 stations 2CJMS055.04 and 2CJMS084.70, which were considered Category 5A. The source is "possibly cumulative chronic effects of metals and PAHs in the sediment".

IMPAIRMENT SOURCE: Unknown

The source of the impairment is unknown.

RECOMMENDATION: Problem Characterization

Kinder Morgan Southeast Terminals - Richmond 2
VA0058378
Fact Sheet Attachments

Attachment No. 5

VPDES Wastewater Facility Inspection Report

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
PIEDMONT REGIONAL OFFICE
4949-A Cox Road, Glen Allen, Virginia 23060
(804) 527-5020 Fax (804) 527-5106
www.deq.virginia.gov

Preston Bryant
Secretary of Natural Resources

David K. Paylor
Director

September 18, 2009

Ms. Linda Grady, Terminal Manager
Kinder Morgan, South East Terminal
4110 Deepwater Terminal Rd.
Richmond, VA 23234

Re: VPDES permit No. VA0058378

Dear Ms. Grady:

On September 15, 2009 I performed a VPDES permit inspection of Kinder Morgan's South East Terminal at 4110 Deepwater Terminal Rd. I have enclosed a copy of the report regarding the inspection.

In general, I found the facility in good order and in compliance with its VPDES permit requirements. Since there are no Compliance Recommendations (recommendations which require a written response) in the report you need not respond to this correspondence unless you or your staff have questions, comments or information you would like included in DEQ's records.

Please thank Mr. McKinley for his assistance in performing the inspection.

Sincerely,

Charles Stitzer
Environmental Inspector

Enclosure (1)
Cc: DEQ Water Compliance File

Virginia Department of Environmental Quality

WASTEWATER FACILITY INSPECTION REPORT

FACILITY NAME: Kinder Morgan, South East Terminal		**INSPECTION DATE:**	September 15, 2009
		INSPECTOR	Charles Stitzer
PERMIT No.: VA0058378		**REPORT DATE:**	September 17, 2009
TYPE OF FACILITY: ☐ Municipal ☑ Small Minor ☑ Industrial ☐ Federal		**TIME OF INSPECTION:**	Arrival: 1415 / Departure 1530
		TOTAL TIME SPENT (including prep & travel)	6 hours
PHOTOGRAPHS: ☑ Yes ☐ No		**UNANNOUNCED INSPECTION?** ☐ Yes ☑ No	
REVIEWED BY / Date: M Dave 9-18-09 Kw 9/21/09			
PRESENT DURING INSPECTION: Robert McKinley			

TECHNICAL INSPECTION

1. Has there been any new construction? • If so, were plans and specifications approved? Comments:	☐ Yes ☑ No
2. Is the Operations and Maintenance Manual approved and up-to-date? Comments:	☑ Yes ☐ No
3. Are the Permit and/or Operation and Maintenance Manual specified licensed operator being met? Comments: **N/A**	☐ Yes ☐ No
4. Are the Permit and/or Operation and Maintenance Manual specified operator staffing requirements being met? Comments: **N/A**	☐ Yes ☐ No
5. Is there an established and adequate program for training personnel? Comments: **OJT**	☑ Yes ☐ No
6. Are preventive maintenance task schedules being met? Comments:	☑ Yes ☐ No
7. Does the plant experience any organic or hydraulic overloading? Comments: No organic component in SW.	☐ Yes ☑ No
8. Has there been any bypassing or overflows since the last inspection? Comments:	☐ Yes ☑ No
9. Is the standby generator (including power transfer switch) operational and exercised regularly? Comments: **N/A**	☐ Yes ☐ No
10. Is the plant alarm system operational and tested regularly? Comments: **(Security and O/W separator)**	☑ Yes ☐ No
11. Is sludge disposed of in accordance with the approved sludge management plan? Comments: **Dredging of storm water basin has never become necessary**	☐ Yes ☐ No
12. Is septage received? • If so, is septage loading controlled, and are appropriate records maintained? Comments: **N/A**	☐ Yes ☑ No
13. Are all plant records (operational logs, equipment maintenance, industrial waste contributors, sampling and testing) available for review and are records adequate? Comments:	☑ Yes ☐ No

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0058378

TECHNICAL INSPECTION (CONT.)

14. Which of the following records does the plant maintain?

☐ Operational logs ☐ Instrument maintenance & calibration

☐ Mechanical equipment maintenance ☐ Industrial Waste Contribution (Municipal facilities)

Comments: **COC, COAs, DMRs and correspondence with DEQ are maintained.**

15. What does the operational log contain?

☐ Visual observations ☑ Flow Measurement ☑ Laboratory results ☐ Process adjustments

☑ Control calculations ☐ Other (specify)

Comment: **Records/logs adequate for operation of sedimentation basin and O/W seperator**

16. What do the mechanical equipment records contain?

☑ As built plans and specs ☑ Manufacturers instructions ☑ Lubrication schedules

☑ Spare parts inventory ☑ Equipment/parts suppliers

☐ Other (specify)

Comments:

17. What do the industrial waste contribution records contain (Municipal only)?

☐ Waste characteristics ☐ Impact on plant ☐ Locations and discharge types

☐ Other (specify)

Comments: **N/A**

18. Which of the following records are kept at the plant and available to personnel?

☑ Equipment maintenance records ☑ Operational log ☐ Industrial contributor records

☑ Instrumentation records ☑ Sampling and testing records

Comments:

19. List records not normally available to plant personnel and their location:

Comments: **Personnel records are confidential. Located in on-site office**

20. Are the records maintained for the required time period (three or five years)? ☑ Yes ☐ No

Comments:

INSPECTION OVERVIEW AND CONDITION OF TREATMENT UNITS

Kinder Morgan does not maintain any laboratory facilities on-site. Sampling and analysis of their discharge has been contracted to Quality Environmental Solutions, Inc (QES). A review of the August 2009 sample COC and the SWPPP visual observation documentation from QES and the COAs from Lafayette Laboratory indicate all required information is included and that sample holding times and methods are appropriate (see attached).

The inspection revealed that Kinder Morgan's process (hydrostatic tank testing) and storm water holding and discharge facilities were in good condition and operating as designed.

Spill control and containment procedures are in place to address accidental discharges of product. All "process" wastewater and almost all storm water runoff are diverted through an Oil/Water Seperator and settling basin prior to testing and discharge to the James River. The discharge is controlled so if any obvious problems(e.g., oil on surface or excessive turbidity) is observed, discharge to the River will not be initiated.

Some minor Erosion and Sedimentation (E&S) is occurring along the entrance and access roads. These areas discharge to the sedimentation basin. There is also some bare spots on the hillside where the site slopes toward the river. However, these areas very small and their E&S contribution is minor. Any improvements in E&S on the interior of the site will have very little effect on the discharge to the river, but will extend the life and effectiveness of the existing sedimentation basin. The bare spots on the hillside along the path to the river should be watched for evidence of excessive erosion and corrective actions taken if indicated.

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0058378

LABORATORY INSPECTION AND RECORDS REVIEW

Kinder Morgan does not maintain on site any laboratory facilities or analysis equipment used for compliance monitoring. Sampling of their discharge has been contracted to Quality Environmental Solutions, Inc. (QES), 40 Hudson Street, Suite 107, Annapolis MD 21401. Lafayette Laboratory, 500 Ambassador Caffery Parkway, Scott, LA 70583 performs effluent analysis. A review of the August 2009 COCs from QES and the COAs from Lafayette Laboratory indicate all required information is included and that sample holding times and methods are appropriate (see attached).

EFFLUENT FIELD DATA: None Obtained

Flow	ND MGD	**Dissolved Oxygen**	mg/L	**TRC (Contact Tank)**	mg/L
pH	S.U.	**Temperature**	°C	**TRC (Final Effluent)**	mg/L

Was a Sampling Inspection conducted? ☐ Yes (see Sampling Inspection Report) ☑ No

CONDITION OF OUTFALL AND EFFLUENT CHARACTERISTICS:

1. Type of outfall: ☐ Shore based ☑ Submerged Diffuser? ☐ Yes ☑ No
2. Are the outfall and supporting structures in good condition? ☑ Yes ☐ No
3. Final Effluent (evidence of following problems): ☐ Sludge bar ☐ Grease ☐ Turbid effluent ☐ Visible foam ☐ Unusual color ☐ Oil sheen
4. Is there a visible effluent plume in the receiving stream? ☐ Yes ☑ No
5. Receiving stream: James River ☑ No observed problems ☐ Indication of problems (explain below)

   Comments:

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0058378

UNIT PROCESS EVALUATION SUMMARY SHEET

UNIT PROCESS	APPLICABLE	PROBLEMS*	COMMENTS
Sewage Pumping			
Flow Measurement (Influent)	x	none	*estimated*
Screening/Comminution			
Grit Removal			
Oil/Water Separator	x	none	*Serviced "as needed." Routinely checked.*
Flow Equalization			
Ponds/Lagoons	x	none	
Imhoff Tank			
Primary Sedimentation			
Trickling Filter			
Septic Tank and Sand Filter			
Rotating Biological Contactor			
Activated Sludge Aeration			
Biological Nutrient Removal			
Sequencing Batch Reactor			
Secondary Sedimentation			
Flocculation			
Tertiary Sedimentation			
Filtration			
Micro-Screening			
Activated Carbon Adsorption			
Chlorination			
Dechlorination			
Ozonation			
Ultraviolet Disinfection			
Post Aeration			
Flow Measurement (Effluent)	x	none	*estimated*
Land Application (Effluent)			
Plant Outfall	x	none	*Subsurface in James R (no diffuser)*
Sludge Pumping			
Flotation Thickening (DAF)			
Gravity Thickening			
Aerobic Digestion			
Anaerobic Digestion			
Lime Stabilization			
Centrifugation			
Sludge Press			
Vacuum Filtration			
Drying Beds			
Thermal Treatment			
Incineration			
Composting			
Land Application (Sludge)			

* Problem Codes

1. Unit Needs Attention
2. Abnormal Influent/Effluent
3. Evidence of Equipment Failure
4. Unapproved Modification or Temporary Repair
5. Evidence of Process Upset
6. Other (explain in comments)

VA DEQ Wastewater Facility Inspection Report

Permit #	VA0058378

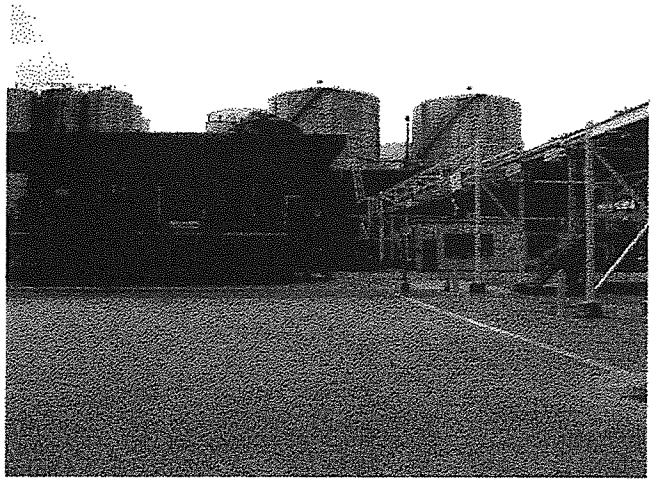
REQUIRED CORRECTIVE ACTIONS:

None

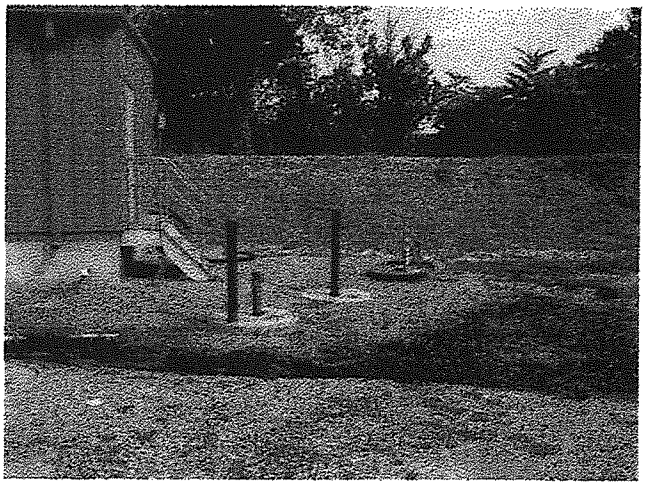
NOTES and COMMENTS:

The site's design and layout (especially the ability to control the basin's discharge) preclude significant negative environmental impact from anything other than significant spills or other catastrophic incidents.

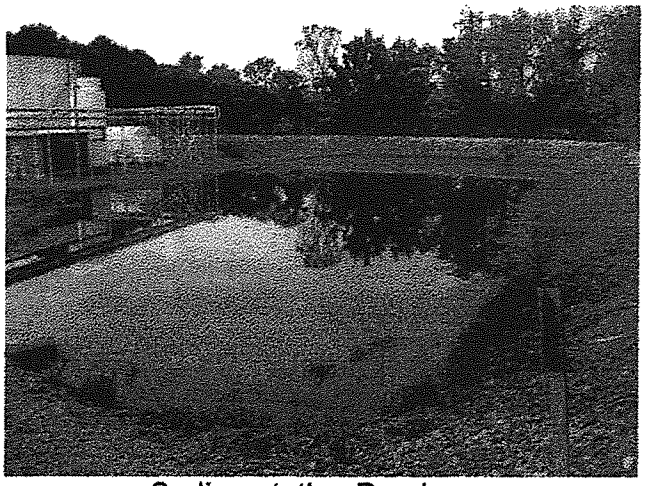
PHOTOGRAPHS



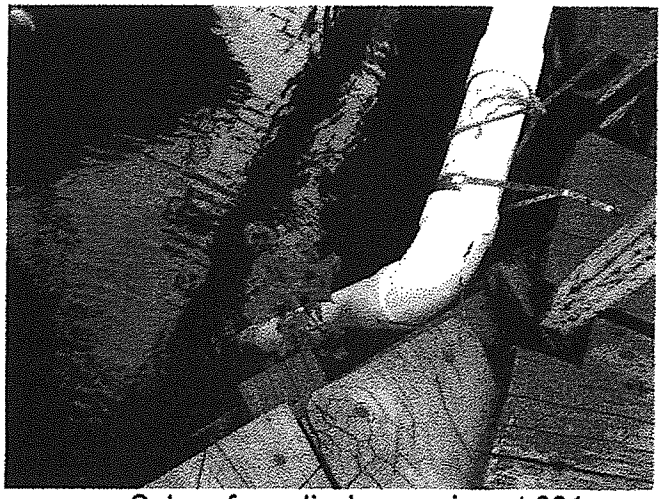
Loading area



Subsurface Oil/Water Seperator



Sedimentation Pond



Subsurface discharge pipe at 001

cc: Water Compliance file

COMMONWEALTH OF VIRGINIA
DEPARTMENT OF ENVIRONMENTAL QUALITY
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
DISCHARGE MONITORING REPORT (DMR)

Industrial Minor 3-Sep-09

PERMITTEE NAME/ADDRESS (INCLUDE FACILITY NAME/LOCATION IF DIFFERENT)

NAME Kinder Morgan Southest Terminals LLC - Richmond 2
ADDRESS 4110 Deepwater Terminal Road
Richmond, VA 23234

FACILITY 4110 Deepwater Terminal Road
LOCATION Richmond, VA 23234

VA0058378	001
Permit Number	Discharge Number

Monitoring Period	
From 08/01/09	To 08/31/09

DEPT OF ENVIRONMENTAL QUALITY
(REGIONAL OFFICE)
Piedmont Regional Office
4949-A Cox Road
Glen Allen, VA 23060
(804) 527-5020

NOTE: READ PERMIT AND GENERAL INSTRUCTIONS BEFORE COMPLETING THIS FORM.

PARAMETER		QUANTITY or LOADING			QUALITY or CONCENTRATION				NO. EX	Sample Frequency	Sample Type
		Average	Maximum	Units	Minimum	Average	Maximum	Units			
001 FLOW	REPORTED	0.21	0.75	MGD	**********	**********	**********		0	1/M	EST
	Permit Requirement	NL	NL	MGD	**********	**********	**********			1/M	EST
002 PH	REPORTED	**********	**********		7.22	**********	7.22	SU	0	1/M	GRAB
	Permit Requirement	**********	**********		6.0	**********	9.0	SU		1/M	GRAB
059 Carbon, Total Organic	REPORTED	**********	**********		**********	**********	6.54	MG/L	0	1/M	GRAB
	Permit Requirement	**********	**********		**********	**********	110	MG/L		1/M	GRAB
257 Petroleum Hydrocarbons, Total Recovered	REPORTED	**********	**********		**********	**********	0.64	MG/L	0	1/M	GRAB
	Permit Requirement	**********	**********		**********	**********	15	MG/L		1/M	GRAB
	REPORTED										
	Permit Requirement										
	REPORTED										
	Permit Requirement										

Additional Permit Requirements Or Comments

BYPASSES AND OVERFLOWS	Occurrences	Total Flow (M G.)	Total BOD5 (K.G.)
	0		

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. Section 1001 and 33 U.S.C. Section 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

Operator In Responsible Charge

Typed or Printed Name	Signature	Certificate No.	Date
Robert McKinley		N/A	9-4-09

Principal Executive Officer or Authorized Agent

Typed or Printed Name	Signature	Telephone	Date

Monthly Observations and Sample Collection - Outfall 001			
Terminal:	Richmond 2, Virginia		DATE REVISED: 07/01/08
Date/Time Arrive On Site:	8/27/09 0940	Date/Time Leave Site:	8/27/09 1100
Project Number:	109-006	QES Associate:	D. JONES
Project Name:	KM Richmond 2	Valve Open Time:	1040
pH Meter Calibration			
pH Meter Working?	Yes DJ	Water Temperature:	24.4°C DJ
Fresh Buffer Solution Used?	Yes DJ	Reading for pH 7.00 Solution:	7.01 DJ
pH Method Used:	Hanna HI 9024	Reading for pH 4.01 Solution:	4.01 DJ
Analyst's Initials:	DJ	pH Sample Time:	1050 DJ
pH Analysis Time:	1050 DJ	Discharge pH reading:	7.22 DJ
On-Site Sample Preparation			
Cooler Condition:		Chain of Custody Number:	304499
Site Compliance Field Observations:			
Was evidence of pollutants entering drainage system observed in the vicinity of:			
Liquid Storage Tanks (Y or N)?	N DJ	Hoppers or Silos (Y or N)?	N DJ
Maintenance Areas (Y or N)?	N DJ	Equipment / Processing Areas (Y or N)?	N DJ
Cleaning areas (Y or N)?	N DJ	Outdoor Stockpile Areas (Y or N)?	N DJ
Fueling Areas (Y or N)?	N DJ	Other Indicators of Storm Water Pollution	
Material Handling Vehicles (Y or N)?	N DJ	Observed (Y or N)?	N DJ
Material and Storage Handling Areas (Y or N)?	N DJ		

Laboratory Sample Collection 304499

Analytical Parameter	Number of Containers	Preservative and Field pH	Time Collected and Initials
TPH-DRO 8015C (Monthly)	One 1-liter amber	None	1054 DJ
TPH-GRO 8015C (Monthly)	Three 40-mL VOAs	HCl (pH <2)	1053 DJ
TOC 5310 (Monthly)	One 4-ounce glass	H_2SO_4 (pH <2)	1052 DJ
TMP/WET (Annually)	Two 1-gallon plastic	None	—
Cooler Temperature Blank	1		

Notes:

Open discharge valve and let run for at least 10 minutes before sample collection

Kinder Morgan Richmond #2 Terminal
Monthly Water Discharge Record
August 2009

NOAA Richmond Airport Rainfall Data

Total (in)	4.04	
Maximum Daily (in)	1.63	08/14/09
No. Rain Days	9	
Average Daily (ft/day)	0.04	

Facility Drainage Area (ft^2)	741,094
Maximum Daily Flow (mgd)	0.75
Average Daily Flow	0.21

Explanation of the Preliminary Monthly Climate Data (F6) Product

These data are preliminary and have not undergone final quality control by the National Climatic Data Center (NCDC). Therefore, these data are subject to revision. Final and certified climate data can be accessed at the NCDC - http://www.ncdc.noaa.gov.

WFO Monthly/Daily Climate Data

000
CXUS51 KAKQ 011011
CF6RIC
PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6)

STATION: RICHMOND VA
MONTH: AUGUST
YEAR: 2009
LATITUDE: 37 30 N
LONGITUDE: 77 20 W

TEMPERATURE IN F:							:PCPN:	SNOW:		WIND			:SUNSHINE:	SKY			:PK WND	
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18
DY	MAX	MIN	AVG	DEP	HDD	CDD	WTR	SNW	12Z DPTH	AVG SPD	MX SPD	2MIN DIR	MIN	PSBL	S-S	WX	SPD	DR
1	89	72	81	3	0	16	0.00	0.0	0	5.4	13	160	M	M	6	1	24	160
2	84	74	79	1	0	14	0.01	0.0	0	8.3	17	240	M	M	9	18	22	250
3	89	71	80	2	0	15	0.00	0.0	0	4.6	13	80	M	M	4	1	24	110
4	93	70	82	4	0	17	0.00	0.0	0	5.7	18	270	M	M	4	18	24	270
5	94	69	82	4	0	17	T	0.0	0	5.2	17	320	M	M	6		25	180
6	79	67	73	-5	0	8	0.33	0.0	0	4.4	16	10	M	M	8	18	20	10
7	85	64	75	-2	0	10	0.00	0.0	0	4.4	12	60	M	M	6	1	16	90
8	88	68	78	1	0	13	0.00	0.0	0	5.7	15	290	M	M	8	1	20	310
9	97	73	85	8	0	20	0.00	0.0	0	7.1	14	270	M	M	3	18	18	280
10	98	75	87	10	0	22	0.00	0.0	0	6.9	15	280	M	M	4		18	280
11	97	75	86	9	0	21	T	0.0	0	5.7	17	310	M	M	6	8	22	300
12	84	74	79	2	0	14	T	0.0	0	5.3	12	340	M	M	8		21	220
13	89	71	80	3	0	15	0.00	0.0	0	6.0	14	30	M	M	9	18	16	70
14	85	70	78	1	0	13	1.63	0.0	0	4.7	17	110	M	M	7	1	22	120
15	89	70	80	3	0	15	0.00	0.0	0	4.1	12	150	M	M	5	1	23	130
16	91	66	79	3	0	14	0.00	0.0	0	2.6	10	130	M	M	5	1	15	150
17	92	70	81	5	0	16	0.00	0.0	0	4.4	13	170	M	M	6		16	200
18	96	73	85	9	0	20	0.00	0.0	0	8.5	20	270	M	M	6		22	270
19	95	74	85	9	0	20	0.03	0.0	0	7.8	26	350	M	M	8	3	33	350
20	94	72	83	7	0	18	0.15	0.0	0	9.4	20	230	M	M	7	8	26	230
21	93	76	85	9	0	20	0.00	0.0	0	10.1	25	190	M	M	7	3	33	190
22	89	70	80	4	0	15	1.56	0.0	0	6.2	30	290	M	M	8	138	64	280
23	87	68	78	3	0	13	0.00	0.0	0	3.2	14	20	M	M	7		23	210
24	87	67	77	2	0	12	0.10	0.0	0	7.8	30	300	M	M	5	13	36	250
25	88	67	78	3	0	13	0.00	0.0	0	4.6	9	40	M	M	2	1	13	90
26	92	69	81	6	0	16	0.00	0.0	0	5.3	15	270	M	M	2	18	20	300
27	91	70	81	6	0	16	0.00	0.0	0	4.4	14	170	M	M	6	18	18	170
28	89	71	80	5	0	15	0.22	0.0	0	4.0	22	140	M	M	9	13	26	140
29	89	71	80	6	0	15	T	0.0	0	4.8	15	310	M	M	7	1	20	270
30	87	71	79	5	0	14	0.00	0.0	0	4.4	12	250	M	M	6		18	210
31	73	62	68	-6	0	3	0.01	0.0	0	7.7	15	20	M	M	9		18	30
SM	2773	2180			0	470	4.04		0.0	178.7			M		193			
AV	89.5	70.3								5.8	FASTST		M	M	6		MAX(MPH)	
								MISC ---->		#	30	290					# 64	280

NOTES:
LAST OF SEVERAL OCCURRENCES

COLUMN 17 PEAK WIND IN M.P.H.

PRELIMINARY LOCAL CLIMATOLOGICAL DATA (WS FORM: F-6) , PAGE 2

STATION: RICHMOND VA
MONTH: AUGUST
YEAR: 2009
LATITUDE: 37 30 N
LONGITUDE: 77 20 W

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

Case Narrative for:

KINDER MORGAN

Certificate of Analysis Number:

09081084

Report To:		Project Name:	109-006
QUALITY ENVIRONMENTAL SOLUTIONS		Site:	KINDER MORGAN RICHMOND II
DON JONES		Site Address:	
40 HUDSON STREET			RICHMOND VA
SUITE 107		PO Number:	
ANNAPOLIS		State:	Virginia
MD		State Cert. No.:	
21401-			
ph: (410) 841-5552	fax:	Date Reported:	9/2/2009

Matrix spike (MS) and matrix spike duplicate (MSD) samples are chosen and tested at random from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data for those samples spiked by the laboratory and may be applicable to other samples of similar matrix from the site. Since the MS and MSD are chosen at random from an analytical batch, the sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group.

The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The Laboratory Control Sample (LCS) and the Method Blank (MB) are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process. If insufficient sample is supplied for MS/MSD, a Laboratory Control Sample (LCS) and a Laboratory Control Sample Duplicate (LCSD) are reported with the analytical batch and serve as the batch quality control (QC).

Results are reported on a Wet Weight Basis unless otherwise noted in the sample unit field as -dry.

The collection of samples using encores, terracores or other field collection devices may result in inconsistent initial sample weights for the parent sample and MS/MSD samples.

The MS/MSD recovery and precision data are calculated based on detected spike concentrations that are adjusted for initial sample weights. As a result of the variability between initial sample weights, the calculated RPD may have increased bias.

Any other exceptions associated with this report will be footnoted in the analytical result page(s) or the quality control summary page(s).

Please do not hesitate to contact us if you have any questions or comments pertaining to this data report. Please reference the above Certificate of Analysis Number.

This report shall not be reproduced except in full, without the written approval of the laboratory. The reported results are only representative of the samples submitted for testing.

SPL, Inc. is pleased to be of service to you. We anticipate working with you in fulfilling all your current and future analytical needs.

C. Thibeaux

Cristina Thibeaux
Project Manager

9/2/2009
Date

Test results meet all requirements of NELAC, unless specified in the narrative.

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

KINDER MORGAN

Certificate of Analysis Number:

09081084

Report To: QUALITY ENVIRONMENTAL SOLUTIONS
DON JONES
40 HUDSON STREET
SUITE 107
ANNAPOLIS
MD
21401-
ph: (410) 841-5552 fax: (410) 266-5588

Fax To:

Project Name: 109-006
Site: KINDER MORGAN RICHMOND II
Site Address:
RICHMOND VA
PO Number:
State: Virginia
State Cert. No.:
Date Reported: 9/2/2009

Client Sample ID	Lab Sample ID	Matrix	Date Collected	Date Received	COC ID	HOLD
OUTFALL 001	09081084-01	Water	8/24/2009 10:52:00 AM	8/26/2009 9:45:00 AM	304499	

Cristina Thibeaux
Project Manager

9/2/2009
Date

Ron Benjamin
Laboratory Director

Tristan Davis
Quality Assurance Officer

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

Client Sample ID: OUTFALL 001 **Collected:** 08/24/2009 10:52 **SPL Sample ID:** 09081084-01

Site: KINDER MORGAN RICHMOND II

Analyses/Method	Result	QUAL	Rep.Limit	Dil. Factor	Date Analyzed	Analyst	Seq. #
DIESEL RANGE ORGANICS BY METHOD 8015C			**MCL**	**SW8015C**	**Units: mg/L**		
Diesel Range Organics (C10-C28)	0.64		0.15	1	08/31/09 15:12	DF	3231987
Surr: o-Terphenyl	125		% 20-153	1	08/31/09 15:12	DF	3231987

Prep Method	Prep Date	Prep Initials	Prep Factor
SW3510C	08/28/2009 9:55	DB	1.00

GASOLINE RANGE ORGANICS			**MCL**	**SW8015C**	**Units: mg/L**		
Gasoline Range Organics (C6-C10)	ND		0.1	1	09/01/09 23:17	SJA	3232449
Surr: 1,4-Difluorobenzene	94.7	%	48-147	1	09/01/09 23:17	SJA	3232449
Surr: 4-Bromofluorobenzene	93.7	%	52-133	1	09/01/09 23:17	SJA	3232449
NPOC AS TOTAL ORGANIC CARBON			**MCL**	**SM5310 B**	**Units: mg/L**		
Organic Carbon,Total	6.54		1	1	08/26/09 20:41	JZ	3225490

Qualifiers:

ND/U - Not Detected at the Reporting Limit
B/V - Analyte detected in the associated Method Blank
* - Surrogate Recovery Outside Advisable QC Limits
J - Estimated Value between MDL and PQL
E - Estimated Value exceeds calibration curve
TNTC - Too numerous to count
>MCL - Result Over Maximum Contamination Limit(MCL)
D - Surrogate Recovery Unreportable due to Dilution
MI - Matrix Interference

Quality Control Documentation

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

Quality Control Report

KINDER MORGAN

109-006

Analysis: Diesel Range Organics by Method 8015C
Method: SW8015C

WorkOrder: 09081084
Lab Batch ID: 82667

Method Blank

RunID: TPHB_090831A-3231982 Units: mg/L
Analysis Date: 08/31/2009 13:19 Analyst: DF
Preparation Date: 08/28/2009 9:55 Prep By: DB Method SW3510C

Samples in Analytical Batch:

Lab Sample ID	Client Sample ID
09081084-01C	OUTFALL 001

Analyte	Result	Rep Limit
Diesel Range Organics (C10-C28)	ND	0.15
Surr: o-Terphenyl	100.8	20-153

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

RunID: TPHB_090831A-3231983 Units: mg/L
Analysis Date: 08/31/2009 13:41 Analyst: DF
Preparation Date: 08/28/2009 9:55 Prep By: DB Method SW3510C

Analyte	LCS Spike Added	LCS Result	LCS Percent Recovery	LCSD Spike Added	LCSD Result	LCSD Percent Recovery	RPD	RPD Limit	Lower Limit	Upper Limit
Diesel Range Organics (C10-C28)	3.00	2.40	79.9	3.00	2.40	79.9	0.1	37	21	102
Surr: o-Terphenyl	0.0500	0.0521	104	0.0500	0.0501	100	3.9	30	20	153

Qualifiers:
ND/U - Not Detected at the Reporting Limit
B/V - Analyte detected in the associated Method Blank
J - Estimated value between MDL and PQL
E - Estimated Value exceeds calibration curve
MI - Matrix Interference
D - Recovery Unreportable due to Dilution
* - Recovery Outside Advisable QC Limits
N/C - Not Calculated - Sample concentration is greater than 4 times the amount of spike added. Control limits do not apply.
TNTC - Too numerous to count

QC results presented on the QC Summary Report have been rounded. RPD and percent recovery values calculated by the SPL LIMS system are derived from QC data prior to the application of rounding rules.

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

Quality Control Report

KINDER MORGAN

109-006

Analysis: Gasoline Range Organics
Method: SW8015C

WorkOrder: 09081084
Lab Batch ID: R214494

Method Blank

RunID: HPCC_090828L-3232443 Units: mg/L
Analysis Date: 09/01/2009 9:03 Analyst: SJA

Samples in Analytical Batch:

Lab Sample ID	Client Sample ID
09081084-01B	OUTFALL 001

Analyte	Result	Rep Limit
Gasoline Range Organics (C6-C10)	ND	0.10
Surr: 1,4-Difluorobenzene	94.0	48-147
Surr: 4-Bromofluorobenzene	92.2	52-133

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

RunID: HPCC_090828L-3232444 Units: mg/L
Analysis Date: 09/01/2009 12:57 Analyst: SJA

Analyte	LCS Spike Added	LCS Result	LCS Percent Recovery	LCSD Spike Added	LCSD Result	LCSD Percent Recovery	RPD	RPD Limit	Lower Limit	Upper Limit
Gasoline Range Organics (C6-C10)	5.00	5.12	102	5.00	5.17	103	1.0	16	73	121
Surr: 1,4-Difluorobenzene	30.0	27.1	90.4	30.0	28.0	93.2	3.1	30	48	147
Surr: 4-Bromofluorobenzene	30.0	30.2	101	30.0	29.2	97.3	3.2	30	52	133

Qualifiers:
ND/U - Not Detected at the Reporting Limit
B/V - Analyte detected in the associated Method Blank
J - Estimated value between MDL and PQL
E - Estimated Value exceeds calibration curve
MI - Matrix Interference
D - Recovery Unreportable due to Dilution
* - Recovery Outside Advisable QC Limits
N/C - Not Calculated - Sample concentration is greater than 4 times the amount of spike added. Control limits do not apply.
TNTC - Too numerous to count

QC results presented on the QC Summary Report have been rounded. RPD and percent recovery values calculated by the SPL LIMS system are derived from QC data prior to the application of rounding rules.

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

Quality Control Report

KINDER MORGAN

109-006

Analysis: NPOC as Total Organic Carbon
Method: SM5310 B

WorkOrder: 09081084
Lab Batch ID: R214084

Method Blank

RunID: TOC_090826B-3225475 Units: mg/L
Analysis Date: 08/26/2009 17:12 Analyst: JZ

Samples in Analytical Batch:

Lab Sample ID	Client Sample ID
09081084-01A	OUTFALL 001

Analyte	Result	Rep Limit
Organic Carbon,Total	ND	1.0

Laboratory Control Sample (LCS)

RunID: TOC_090826B-3225476 Units: mg/L
Analysis Date: 08/26/2009 17:26 Analyst: JZ

Analyte	Spike Added	Result	Percent Recovery	Lower Limit	Upper Limit
Organic Carbon,Total	10.00	9.818	98.18	90	110

Matrix Spike (MS) / Matrix Spike Duplicate (MSD)

Sample Spiked: 09080642-01
RunID: TOC_090826B-3225478 Units: mg/L
Analysis Date: 08/26/2009 17:51 Analyst: JZ

Analyte	Sample Result	MS Spike Added	MS Result	MS % Recovery	MSD Spike Added	MSD Result	MSD % Recovery	RPD	RPD Limit	Low Limit	High Limit
Organic Carbon,Total	ND	10	9.651	96.51	10	11.34	113.4	16.09	20	80	120

Qualifiers:
ND/U - Not Detected at the Reporting Limit
B/V - Analyte detected in the associated Method Blank
J - Estimated value between MDL and PQL
E - Estimated Value exceeds calibration curve
MI - Matrix Interference
D - Recovery Unreportable due to Dilution
* - Recovery Outside Advisable QC Limits
N/C - Not Calculated - Sample concentration is greater than 4 times the amount of spike added. Control limits do not apply.
TNTC - Too numerous to count

QC results presented on the QC Summary Report have been rounded. RPD and percent recovery values calculated by the SPL LIMS system are derived from QC data prior to the application of rounding rules.

Sample Receipt Checklist

And

Chain of Custody

LAFAYETTE LABORATORY
500 AMBASSADOR CAFFERY PARKWAY
SCOTT, LA 70583
(337) 237-4775

Sample Receipt Checklist

Workorder:	09081084	Received By:	COM
Date and Time Received:	8/26/2009 9:45:00 AM	Carrier name:	FedEx-Std 1 Day PM
Temperature:	4°C	Chilled by:	Water Ice

1.	Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
2.	Custody seals intact on shippping container/cooler?	Yes ☑	No ☐	Not Present ☐
3.	Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
4.	Chain of custody present?	Yes ☑	No ☐	
5.	Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
6.	Chain of custody agrees with sample labels?	Yes ☑	No ☐	
7.	Samples in proper container/bottle?	Yes ☑	No ☐	
8.	Sample containers intact?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test?	Yes ☑	No ☐	
10.	All samples received within holding time?	Yes ☑	No ☐	
11.	Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
12.	Water - VOA vials have zero headspace?	Yes ☑	No ☐	VOA Vials Not Present ☐
13.	Water - Preservation checked upon receipt (except VOA*)?	Yes ☑	No ☐	Not Applicable ☐

*VOA Preservation Checked After Sample Analysis

SPL Representative: Contact Date & Time:

Client Name Contacted:

Non Conformance Issues:

Client Instructions:

SPL, Inc.

Analysis Request & Chain of Custody Record

SPL Workorder No. 09081084

page 1 of 1

Client Name: QES for Kinder Morgan
Address: 40 Hudson ST, #107, Annapolis, MD 21401
Phone/Fax: 410.841.1332 410.266.5338
Client Contact: Dan Jones Email: djones@qualityenvironmental.net
Project Name/No.: 109-006
Site Name: Kinder Morgan Richmond #2
Site Location: Richmond, VA
Invoice To: Jill McMillan, Alpharetta GA Ph:

SAMPLE ID	DATE	TIME	comp	grab	matrix (W=water S=soil O=oil SL=sludge X=other)	bottle (P=plastic A=amber glass G=glass V=vial X=other)	size (1=1 liter 4=4oz 40=vial 8=8oz 16=16oz X=other)	pres. (1=HCl 2=HNO3 3=H2SO4 X=other)	Number of Containers	TPC 5310 (1)	TPH-Gas 8015C (3)	TPH-Diesel 8015C (1)							
OUTFALL 001	8/24/09	1052	✓	X	W	G	4	3	1	X									(1)
OUTFALL 001	8/24/09	1053	✓	X	W	V	40	1	3		X								(3)
OUTFALL 001	8/24/09	1054	✓	X	W	A	1	X	1			X							(1)

Client/Consultant Remarks:

Laboratory remarks: CS TPC 8698 0515 5310 (2 of 2) 3.7 SRED 7 (W-1)

Intact? ☑ Y ☐ N
Ice? ☑ Y ☐ N
Temp: 4.0 (4-10)

Requested TAT

Contract ☐ 72hr ☐
24hr ☐ Standard ☒
48hr ☐
Other ☐ _____

Special Reporting Requirements Results: Fax ☐ Email ☒ PDF ☒
Standard QC ☒ Level 3 QC ☐ Level 4 QC ☐ TX TRRP ☐ LA RECAP ☐

Special Detection Limits (specify):

PM review (initial):

1. Relinquished by Sampler: Given to FedEx	date 8/27/09	time 1600	2. Received by: FED Ex
3. Relinquished by: FED Ex	date 8-26-09	time 0800	4. Received by: [signature]
5. Relinquished by: [signature]	date 8-26-09	time 0845	6. Received by Laboratory: [signature]

☐ 8880 Interchange Drive
Houston, TX 77054 (713) 660-0901

☒ 500 Ambassador Caffery Parkway
Scott, LA 70583 (337) 237-4775

☐ 459 Hughes Drive
Traverse City, MI 49686 (231) 947-5777

Attachment No. 6

Effluent Water Quality Data

Discharge Monitoring Report Summary

Permit No	Facility Name	Outfall Number	Due Date	Parameter Code 001 FLOW Quantity Average	Quantity Maximum	002 PH Concentration Minimum	Concentration Maximum	059 CARBON, TOTAL ORG/ Quantity Average	257 PETROLEUM HYDROCARBONS, TOTAL RECOVERABL Concentration Maximum
VA0058378	Kinder Morgan Southeast Terminals LLC - Richmond 2	001	10-OCT-2008	0.23	0.71	7.41	7.41	4.48	0.1
			10-DEC-2008	0.14	0.67	8.27	8.27	4.78	0.1
			10-JAN-2009	0.19	1.21	7.28	7.28	3.66	0.1
			10-FEB-2009	0.09	0.23	8.1	8.1	3.62	0.27
			10-MAR-2009	0.07	0.12	7.68	7.68	4.48	0.25
			10-APR-2009	0.18	0.5	8.62	8.62	5.38	0.33
			10-MAY-2009	0.11	0.27	7.26	7.26	6.79	0.65
			10-JUN-2009	0.12	0.5	7.05	7.05	6.37	0.7
			10-JUL-2009	0.2	0.8	7.51	7.51	5.69	0.19
			10-AUG-2009	0.14	0.36	7.36	7.36	5.08	0.56
			10-SEP-2009	0.21	0.75	7.22	7.22	6.54	0.64
			10-OCT-2009	0.13	0.29	7.5	7.5	5.2	0.5
			10-NOV-2009	0.13	0.38	7.42	7.42	4.4	0.5
			10-DEC-2009	0.34	1.62	7.65	7.65	4.4	0.5
			10-JAN-2010	0.34	0.76	8.4	8.4	2.4	0.5
			10-FEB-2010	0.21	0.57	7.01	7.01	4.4	0.5
			10-MAR-2010	0.14	0.65	7.98	7.98	2	0.5
			10-APR-2010	0.22	0.58	7.45	7.45	3.6	0.5
			10-MAY-2010	0.07	0.76	7.81	7.81	4.7	0.5
			10-JUN-2010	0.04	0.36	7.68	7.68	6.2	1
			10-JUL-2010	0.01	0.19	7.42	7.42	6.5	1
			10-AUG-2010	0.018	0.26	7.89	7.89	8.2	1
			10-SEP-2010	0.06	0.7	6.72	6.72	7.1	1
			10-OCT-2010	2.17	2.17	7.68	7.68	6.3	1
			10-NOV-2010	0.032	0.31	7.24	7.24	7.3	1.8
			10-DEC-2010	0.018	0.39	8.84	8.84	5.2	1
			10-JAN-2011	0.051	0.61	7.95	7.95	1	4.8
			10-FEB-2011	0.037	0.67	7.18	7.18	4.1	1
			10-MAR-2011	0.03	0.36	8.92	8.92	3.8	1
			10-APR-2011	0.06	0.75	7.33	7.33	5.3	1
			10-MAY-2011	0.04	0.42	6.95	6.95	5.8	0.5
			10-JUN-2011	0.06	0.8	7.91	7.91	5.1	1
			10-JUL-2011	0.05	0.5	7.27	7.27	7	1
			10-AUG-2011	0.06	0.8	7.48	7.48	7.9	1
			10-SEP-2011	0.11	2.48	7.09	7.09	6.1	1
			10-OCT-2011	0.17	1.74	6.86	6.86	4.3	1
			10-NOV-2011	0.04	0.67	7.75	7.75	4.4	1
			10-DEC-2011	0.06	1.19	6.42	6.42	1	1
			10-JAN-2012	0.03	0.36	6.99	6.99	23.9	6.1
			10-FEB-2012	0.03	0.32	7.31	7.31	16.9	5.1
			10-MAR-2012	0.05	0.044	8.25	8.25	6.6	0.8
			10-APR-2012	0.04	0.45	7.48	7.48	6.9	1
			10-MAY-2012	0.04	0.74	8.78	8.78	6.6	1
			10-JUN-2012	0.04	0.39	7.93	7.93	7.9	1
			10-JUL-2012	0.06	0.86	8.61	8.61	8.1	1
			10-AUG-2012	0.08	0.84	6.79	6.79	7.6	1
			10-SEP-2012	0.05	0.81	6.71	6.71	8.4	1
			10-OCT-2012	0.06	0.73	6.7	6.7	4.4	1
			10-NOV-2012	0.06	0.73	7.66	7.66	5.3	1
			10-DEC-2012	0.005	0.06	8.91	8.91	4.9	1
			10-JAN-2013	0.04	0.61	8.24	8.28	4.8	1
			Average	0.136490196	0.667529412	NA	NA	5.938627451	1.039019608
			90th percentile	0.21	1.19	8.61	8.61	7.9	1
			10th percentile	0.03	0.26	6.86	6.86	3.62	0.27

VPDES PERMIT RENEWAL APPLICATION
VPDES PERMIT VA0058378
KINDER MORGAN SOUTHEAST TERMINALS, LLC
RICHMOND #2 TERMINAL
EPA Form 3510-2C, Part V

Sample Date	Average Flow (MGD)	pH (S.U.)	Temperature (°C)	BOD (mg/L)	COD (mg/L)	TOC (mg/L)	TSS (mg/L)	Ammonia as N (mg/L)	TPH-DRO (mg/L)	TPH-GRO (mg/L)	O&G 1664A (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Xylenes (ug/L)	Naphthalene (ug/L)
11/20/2012	0.005	8.91	10.2	<60.0	23.3	4.9	4.32	0.137	<0.5	<0.5	<3.69	<1.0	<1.0	<1.0	<2.0	<5.0
10/1/2012	0.06	7.66	18.9			5.3			<0.5	<0.5						
9/10/2012	0.06	6.70	22.5			4.4			<0.5	<0.5						
8/7/2012	0.05	6.71	25.3			8.4			<0.5	<0.5						
7/9/2012	0.08	6.79	28.9			7.6			<0.5	<0.5						
6/15/2012	0.06	8.61	26.1			8.1			<0.5	<0.5						
5/11/2012	0.04	7.93	19.94			7.9			<0.5	<0.5						
4/12/2012	0.04	8.78	13.2			6.6			<0.5	<0.5						
3/22/2012	0.04	7.48	21.6			6.9			<0.5	<0.5						
2/13/2012	0.05	8.25	9.2			6.6			0.8	<0.5						
1/10/2012	0.03	7.31	8.8			16.9			5.1	<0.5						
12/6/2011	0.03	6.99	13.1			23.9			6.1	<0.5						
11/21/2011	0.06	6.42	13.7			<1.0			<0.5	<0.5						
10/11/2011	0.04	7.75	27.3			4.4			<0.5	<0.5						
9/23/2011	0.17	6.86	23.6			4.3			<0.5	<0.5						
8/29/2011	0.11	7.09	24.9			6.1			<0.5	<0.5						
7/8/2011	0.06	7.48	27.7			7.9			<0.5	<0.5						
6/7/2011	0.05	7.27	25.9			7.0			<0.5	<0.5						
5/18/2011	0.06	7.91	24.2			5.1			<0.5	<0.5						
4/21/2011	0.04	6.95	16.9			5.8			<0.5	<0.5						
3/21/2011	0.06	7.33	15.9			5.3			<0.5	<0.5						
2/4/2011	0.03	8.92	6.3			3.8			<0.5	<0.5						
1/11/2011	0.037	7.18	8.3			4.1			<0.5	<0.5						
12/7/2010	0.051	7.95	9.4			4.8			<0.5	<0.5						
11/23/2010	0.018	8.84	15.6			5.2			<0.5	<0.5						
10/15/2010	0.032	7.24	17.9			7.3			1.8	<0.5						
9/30/2010	0.102	7.68	22			6.3			<0.5	<0.5						
8/6/2010	0.06	6.72	28.1			7.1			<0.5	<0.5						
7/14/2010	0.018	7.89	28.7			8.2			<0.5	<0.5						
6/22/2010	0.01	7.42	33.2			6.5			<0.5	<0.5						
5/11/2010	0.04	7.68	21.0			6.2			<0.5	<0.5						
4/28/2010	0.07	7.58	9.1			4.7			<0.5	<0.5						
12/17/2009	0.34	8.4	9.1			2.4			<0.5	<0.5						
11/11/2009	0.34	7.65	11.9			4.4			<0.5	<0.5						
10/21/2009	0.13	7.42	21.2			4.4			<0.5	<0.5						
9/25/2009	0.13	7.5	25.1			5.2			<0.5	<0.5						
8/24/2009	0.21	7.22	24.4			6.54			0.64	0.1						

VPDES PERMIT RENEWAL APPLICATION
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EPA Form 3510-2C, Part V

Sample Date	Average Flow (MGD)	pH (S.U.)	Temperature (°C)	BOD (mg/L)	COD (mg/L)	TOC (mg/L)	TSS (mg/L)	Ammonia as N (mg/L)	TPH-DRO (mg/L)	TPH-GRO (mg/L)	O&G 1664A (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Xylenes (ug/L)	Naphthalene (ug/L)
7/24/2009	0.14	7.36	23.3			5.08			0.56	0.1						
6/8/2009	0.2	7.51	25.1			5.69			0.19	0.1						
5/7/2009	0.12	7.05	25.1			6.37			0.7	0.1						
4/21/2009	0.11	7.26	16.6			6.79			0.65	0.1						
3/16/2009	0.18	8.62	15.61			5.38			0.33	0.1						
2/19/2009	0.07	7.68	13.12			4.48			0.25	0.1						
1/12/2009	0.09	8.1	7.89			3.62			0.27	0.1						
11/18/2008	0.14	8.27	10.01			4.78			0.1	0.1						
7/1/2008	0.19	8.46				6.2			0.1	0.1						
6/23/2008	0.15	6.70	22.89			8.7	38		<0.5	<0.5						
4/4/2008	0.28	7.0	15.5			4.51	<1.0		<0.5	<0.5						
3/20/2008	0.13	7.8	16.1			5.01	6.0		0.19	0.1						
2/22/2008	0.22	7.9	2.8			5.4	148		<0.1	<0.1						
1/9/2008	0.06	8.1	12.2			15.4	91.5		1.5	0.1						
12/18/2007	0.12	7.49	6.11			3.91			0.11	0.1						
Averages	*0.10*	*7.61*	*18.07*			*6.51*	*57.56*		*1.03*	*0.39*						
8/1/2012	Hydrostatic Test - Tank 15						<1					<1	<1	<1	<6	<6

VPDES PERMIT RENEWAL APPLICATION
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KINDER MORGAN SOUTHEAST TERMINALS, LLC
RICHMOND #2 TERMINAL

EPA Form 3510-2C, Line IIB & IIC

Weather Data from Richmond Airport Weather Station (1930 - 2010)

Average Annual Rainfall (inches)	43.58
Average Number of Rain Days (> 0.01 inch)	114
Maximum Daily Rainfall (inches - 8/23/1933)	8.79

Terminal Data

Tank Field Surface Area (square feet)	741,094
Paved Area Surface Area (square feet)	2,500
Assume 1 Hydrostatic Test / Year (MG)	1.37

Terminal Storm-Water Runoff

Average Flow = Average Annual Rainfall * Surface Area * Conversion Factors
Average Annual Flow = (43.58"/yr) (738,594 ft^2) (1'/12") (7.48 gal/ft^3) (1 MG/10^6 gal)
Average Annual Flow = 20.06 MG
Average Daily Flow = 20.06 MG / 114 = **0.18 MGD**
Maximum Daily Flow = Maximum Daily Rainfall * Surface Area * Conversion Factors
Maximum Daily Flow = (8.79"/day) (738,594 ft^2) (1'/12") (7.48 gal/ft^3) (1 MG/10^6 gal)
Maximum Daily Flow = **4.05 MGD**

Loading Rack Storm-Water Runoff

Average Flow = Average Annual Rainfall * Surface Area * Conversion Factors
Average Annual Flow = (43.58"/yr) (2,500 ft^2) (1'/12") (7.48 gal/ft^3) (1 MG/10^6 gal)
Average Annual Flow = 0.07 MG
Average Daily Flow = 0.07 MG / 114 = **0.001 MGD**
Maximum Daily Flow = Maximum Daily Rainfall * Surface Area * Conversion Factors
Maximum Daily Flow = (8.79"/day) (2,500 ft^2) (1'/12") (7.48 gal/ft^3) (1 MG/10^6 gal)
Maximum Daily Flow = **0.01 MGD**

Hydrostatic Test Water

Average of 1.37 MG per year (based on average capacity of the 17 storage tanks with >420,000 gallon capacity with one hyrostatic test/year)
Average Discharge = 1.37 MG / 365 days
Average Discharge = **0.004 MGD**
Maximum Discharge = **0.36 MGD** (250 GPM)

ATTACHMENT A
DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY CRITERIA MONITORING

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL[1]	REPORTING RESULTS	SAMPLE TYPE[2]	SAMPLE FREQUENCY
METALS						
7440-36-0	Antimony, dissolved	(3)	1.4	<0.01 mg/L	G or C	1/5 YR
7440-38-2	Arsenic, dissolved	(3)	1.0	<0.01 mg/L	G or C	1/5 YR
7440-43-9	Cadmium, dissolved	(3)	0.3	<0.001 mg/L	G or C	1/5 YR
16065-83-1	Chromium III, dissolved [8]	(3)	3.6	<0.005 mg/L	G or C	1/5 YR
18540-29-9	Chromium VI, dissolved [6]	(3)	1.6	<0.01 mg/L	G or C	1/5 YR
7440-50-8	Copper, dissolved	(3)	0.50	<0.01 mg/L	G or C	1/5 YR
7439-92-1	Lead, dissolved	(3)	0.50	<0.005 mg/L	G or C	1/5 YR
7439-97-6	Mercury, dissolved	(3)	1.0	<0.0002 mg/L	G or C	1/5 YR
7440-02-0	Nickel, dissolved	(3)	0.94	<0.01 mg/L	G or C	1/5 YR
7782-49-2	Selenium, Total Recoverable	(3)	2.0	<0.01 mg/L	G or C	1/5 YR
7440-22-4	Silver, dissolved	(3)	0.20	<0.005 mg/L	G or C	1/5 YR
7440-28-0	Thallium, dissolved	(4)	(5)	<0.01 mg/L	G or C	1/5 YR
7440-66-6	Zinc, dissolved	(3)	2.0	<0.05 mg/L	G or C	1/5 YR
PESTICIDES/PCB'S						
309-00-2	Aldrin	608	0.05	<0.0476 ug/L	G or C	1/5 YR
57-74-9	Chlordane	608	0.2	<0.0476 ug/L	G or C	1/5 YR
2921-88-2	Chlorpyrifos (synonym = Dursban)	(4)	(5)	<1.43 ug/L	G or C	1/5 YR
72-54-8	DDD	608	0.1	<0.0951 ug/L	G or C	1/5 YR
72-55-9	DDE	608	0.1	<0.0951 ug/L	G or C	1/5 YR
50-29-3	DDT	608	0.1	<0.0951 ug/L	G or C	1/5 YR
8065-48-3	Demeton	(4)	(5)	<2.87 ug/L	G or C	1/5 YR
333-41-5	Diazinon	(4)	(5)	<0.478 ug/L	G or C	1/5 YR
60-57-1	Dieldrin	608	0.1	<0.0951 ug/L	G or C	1/5 YR
959-98-8	Alpha-Endosulfan	608	0.1	<0.0476 ug/L	G or C	1/5 YR
33213-65-9	Beta-Endosulfan	608	0.1	<0.0951 ug/L	G or C	1/5 YR
1031-07-8	Endosulfan Sulfate	608	0.1	<0.0951 ug/L	G or C	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL[1]	REPORTING RESULTS	SAMPLE TYPE[2]	SAMPLE FREQUENCY
72-20-8	Endrin	608	0.1	<0.0951 ug/L	G or C	1/5 YR
7421-93-4	Endrin Aldehyde	(4)	(5)	<0.0951 ug/L	G or C	1/5 YR
86-50-0	Guthion	(4)	(5)	<2.39 ug/L	G or C	1/5 YR
76-44-8	Heptachlor	608	0.05	<0.0476 ug/L	G or C	1/5 YR
1024-57-3	Heptachlor Epoxide	(4)	(5)	<0.0476 ug/L	G or C	1/5 YR
319-84-6	Hexachlorocyclohexane Alpha-BHC	608	(5)	<0.0476 ug/L	G or C	1/5 YR
319-85-7	Hexachlorocyclohexane Beta-BHC	608	(5)	<0.0476 ug/L	G or C	1/5 YR
58-89-9	Hexachlorocyclohexane Gamma-BHC or Lindane	608	(5)	<0.0476 ug/L	G or C	1/5 YR
143-50-0	Kepone	(9)	(5)	<9.43 ug/L	G or C	1/5 YR
121-75-5	Malathion	(4)	(5)	<1.91 ug/L	G or C	1/5 YR
72-43-5	Methoxychlor	(4)	(5)	<0.476 ug/L	G or C	1/5 YR
2385-85-5	Mirex	(4)	(5)	<0.0476 ug/L	G or C	1/5 YR
56-38-2	Parathion	(4)	(5)	<0.956 ug/L	G or C	1/5 YR
1336-36-3	PCB Total	608	7.0	<0.951 ug/L	G or C	1/5 YR
8001-35-2	Toxaphene	608	5.0	<1.90 ug/L	G or C	1/5 YR
BASE NEUTRAL EXTRACTABLES						
83-32-9	Acenaphthene	625	10.0	<9.52 ug/L	G or C	1/5 YR
120-12-7	Anthracene	625	10.0	<9.52 ug/L	G or C	1/5 YR
92-87-5	Benzidine	(4)	(5)	<95.2 ug/L	G or C	1/5 YR
56-55-3	Benzo (a) anthracene	625	10.0	<9.52 ug/L	G or C	1/5 YR
205-99-2	Benzo (b) fluoranthene	625	10.0	<9.52 ug/L	G or C	1/5 YR
207-08-9	Benzo (k) fluoranthene	625	10.0	<9.52 ug/L	G or C	1/5 YR
50-32-8	Benzo (a) pyrene	625	10.0	<9.52 ug/L	G or C	1/5 YR
111-44-4	Bis 2-Chloroethyl Ether	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
108-60-1	Bis 2-Chloroisopropyl Ether	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
85-68-7	Butyl benzyl phthalate	625	10.0	<9.52 ug/L	G or C	1/5 YR
91-58-7	2-Chloronaphthalene	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
218-01-9	Chrysene	625	10.0	<9.52 ug/L	G or C	1/5 YR
53-70-3	Dibenz(a,h)anthracene	625	20.0	<9.52 ug/L	G or C	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL[1]	REPORTING RESULTS	SAMPLE TYPE[2]	SAMPLE FREQUENCY
84-74-2	Dibutyl phthalate (synonym = Di-n-Butyl Phthalate)	625	10.0	<9.52 ug/L	G or C	1/5 YR
95-50-1	1,2-Dichlorobenzene	624	10.0	<9.52 ug/L	G or C	1/5 YR
541-73-1	1,3-Dichlorobenzene	624	10.0	<9.52 ug/L	G or C	1/5 YR
106-46-7	1,4-Dichlorobenzene	624	10.0	<9.52 ug/L	G or C	1/5 YR
91-94-1	3,3-Dichlorobenzidine	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
84-66-2	Diethyl phthalate	625	10.0	<9.52 ug/L	G or C	1/5 YR
117-81-7	Bis-2-ethylhexyl phthalate	625	10.0	<9.52 ug/L	G or C	1/5 YR
131-11-3	Dimethyl phthalate	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
121-14-2	2,4-Dinitrotoluene	625	10.0	<9.52 ug/L	G or C	1/5 YR
122-66-7	1,2-Diphenylhydrazine	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
206-44-0	Fluoranthene	625	10.0	<9.52 ug/L	G or C	1/5 YR
86-73-7	Fluorene	625	10.0	<9.52 ug/L	G or C	1/5 YR
118-74-1	Hexachlorobenzene	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
87-68-3	Hexachlorobutadiene	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
77-47-4	Hexachlorocyclopentadiene	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
67-72-1	Hexachloroethane	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
193-39-5	Indeno(1,2,3-cd)pyrene	625	20.0	<9.52 ug/L	G or C	1/5 YR
78-59-1	Isophorone	625	10.0	<9.52 ug/L	G or C	1/5 YR
98-95-3	Nitrobenzene	625	10.0	<9.52 ug/L	G or C	1/5 YR
62-75-9	N-Nitrosodimethylamine	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
621-64-7	N-Nitrosodi-n-propylamine	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
86-30-6	N-Nitrosodiphenylamine	(4)	(5)	<9.52 ug/L	G or C	1/5 YR
129-00-0	Pyrene	625	10.0	<9.52 ug/L	G or C	1/5 YR
120-82-1	1,2,4-Trichlorobenzene	625	10.0	<9.52 ug/L	G or C	1/5 YR
VOLATILES						
107-02-8	Acrolein	(4)	(5)	<50.0 ug/L	G	1/5 YR
107-13-1	Acrylonitrile	(4)	(5)	<10.0 ug/L	G	1/5 YR
71-43-2	Benzene	624	10.0	<1.0 ug/L	G	1/5 YR
75-25-2	Bromoform	624	10.0	<1.0 ug/L	G	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL (1)	REPORTING RESULTS	SAMPLE TYPE(2)	SAMPLE FREQUENCY
56-23-5	Carbon Tetrachloride	624	10.0	<1.0 ug/L	G	1/5 YR
108-90-7	Chlorobenzene (synonym = monochlorobenzene)	624	50.0	<1.0 ug/L	G	1/5 YR
124-48-1	Chlorodibromomethane	624	10.0	<1.0 ug/L	G	1/5 YR
67-66-3	Chloroform	624	10.0	<1.0 ug/L	G	1/5 YR
75-09-2	Dichloromethane (synonym = methylene chloride)	624	20.0	<5.0 ug/L	G	1/5 YR
75-27-4	Dichlorobromomethane	624	10.0	<1.0 ug/L	G	1/5 YR
107-06-2	1,2-Dichloroethane	624	10.0	<1.0 ug/L	G	1/5 YR
75-35-4	1,1-Dichloroethylene	624	10.0	<1.0 ug/L	G	1/5 YR
156-60-5	1,2-trans-dichloroethylene	(4)	(5)	<1.0 ug/L	G	1/5 YR
78-87-5	1,2-Dichloropropane	(4)	(5)	<1.0 ug/L	G	1/5 YR
542-75-6	1,3-Dichloropropene	(4)	(5)	<1.0 ug/L	G	1/5 YR
100-41-4	Ethylbenzene	624	10.0	<1.0 ug/L	G	1/5 YR
74-83-9	Methyl Bromide	(4)	(5)	<1.0 ug/L	G	1/5 YR
79-34-5	1,1,2,2-Tetrachloroethane	(4)	(5)	<1.0 ug/L	G	1/5 YR
127-18-4	Tetrachloroethylene	624	10.0	<1.0 ug/L	G	1/5 YR
10-88-3	Toluene	624	10.0	<1.0 ug/L	G	1/5 YR
79-00-5	1,1,2-Trichloroethane	(4)	(5)	<1.0 ug/L	G	1/5 YR
79-01-6	Trichloroethylene	624	10.0	<1.0 ug/L	G	1/5 YR
75-01-4	Vinyl Chloride	624	10.0	<1.0 ug/L	G	1/5 YR
ACID EXTRACTABLES (6)						
95-57-8	2-Chlorophenol	625	10.0	<9.52 ug/L	G or C	1/5 YR
120-83-2	2,4 Dichlorophenol	625	10.0	<9.52 ug/L	G or C	1/5 YR
105-67-9	2,4 Dimethylphenol	625	10.0	<9.52 ug/L	G or C	1/5 YR
51-28-5	2,4-Dinitrophenol	(4)	(5)	<23.8 ug/L	G or C	1/5 YR
534-52-1	2-Methyl-4,6-Dinitrophenol	(4)	(5)	<23.8 ug/L	G or C	1/5 YR
25154-52-3	Nonylphenol	(5)	(5)	<4760 ng/L	G or C	1/5 YR
87-86-5	Pentachlorophenol	625	50.0	<9.52 ug/L	G or C	1/5 YR
108-95-2	Phenol	625	10.0	<9.52 ug/L	G or C	1/5 YR
88-06-2	2,4,6-Trichlorophenol	625	10.0	<9.52 ug/L	G or C	1/5 YR

CASRN#	CHEMICAL	EPA ANALYSIS NO.	QUANTIFICATION LEVEL[1]	REPORTING RESULTS	SAMPLE TYPE[2]	SAMPLE FREQUENCY
MISCELLANEOUS						
776-41-7	Ammonia as NH3-N	350.1	200	0.137 mg/L	C	1/5 YR
7782-50-5	Chlorine, Total Residual	(4)	100	0.0 mg/L	G	1/5 YR
57-12-5	Cyanide, Free	(4)	10.0	<0.005 mg/L	G	1/5 YR
N/A	*E. coli / Enterococcus* (N/CML)	(4)	(5)	< 1 mnp / 100 mL	G	1/5 YR
7783-06-4	Hydrogen Sulfide	(5)	(5)	<0.106 mg/L	G	1/5 YR
60-10-5	Tributyltin [7]	NBSR 85-3295	(5)	<0.03 ug/L	G or C	1/5 YR
	Hardness (mg/L as $CaCO_3$)	(4)	(5)	43.5 mg/L	G or C (10)	1/5 YR

Timothy Fox Operations Manager

Name of Principal Exec. Officer or Authorized Agent/Title

Timothy Fox 1/7/10

Signature of Principal Officer or Authorized Agent/Date

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations. See 18 U.S.C. Sec. 1001 and 33 U.S.C. Sec. 1319. (Penalties under these statutes may include fines up to $10,000 and or maximum imprisonment of between 6 months and 5 years.)

FOOTNOTES:

(1) Quantification level (QL) is defined as the lowest concentration used for the calibration of a measurement system when the calibration is in accordance with the procedures published for the required method.

The quantification levels indicated for the metals are actually Specific Target Values developed for this permit. The Specific Target Value is the approximate value that may initiate a wasteload allocation analysis. Target values are not wasteload allocations or effluent limitations. The Specific Target Values are subject to change based on additional information such as hardness data, receiving stream flow, and design flows.

Units for the quantification level are micrograms/liter unless otherwise specified.

Quality control and quality assurance information shall be submitted to document that the required quantification level has been attained.

(2) Sample Type

G = Grab = An individual sample collected in less than 15 minutes. Substances specified with "grab" sample type shall only be collected as grabs. The permittee may analyze multiple grabs and report the average results provided that the individual grab results are also reported. For grab metals samples, the individual samples shall be filtered and preserved immediately upon collection.

C = Composite = A 24-hour **(PW - Revise as required to require same composite duration as BOD_5)** composite unless otherwise specified. The composite shall be a combination of individual samples, taken proportional to flow, obtained at hourly or smaller time intervals. The individual samples may be of equal volume for flows that do not vary by +/- 10 percent over a 24-hour period.

(3) A specific analytical method is not specified; however a target value for each metal has been established. An appropriate method to meet the target value shall be selected from the following list of EPA methods (or any approved method presented in 40 CFR Part 136). If the test result is less than the method QL, a "<[QL]" shall be reported where the actual analytical test QL is substituted for [QL].

Metal	Analytical Method
Antimony	1638; 1639
Arsenic	;1632
Chromium[8]	1639
Cadmium	1637; 1638; 1639; 1640
Chromium VI	1639
Copper	1638; 1640
Lead	1637; 1638; 1640
Mercury	1631
Nickel	1638; 1639; 1640
Selenium	1638; 1639
Silver	1638
Zinc	1638; 1639

(4) Any approved method presented in 40 CFR Part 136.

(5) The QL is at the discretion of the permittee. For any substances addressed in 40 CFR Part 136, the permittee shall use one of the approved methods in 40 CFR Part 136.

(6) Testing for phenols requires continuous extraction.

(7) Analytical Methods: NBSR 85-3295 or DEQ's approved analysis for Tributyltin may also be used [See A Manual for the Analysis of Butyltins in Environmental Systems by the Virginia Institute of Marine Science, dated November 1996].

(8) Both Chromium III and Chromium VI may be measured by the total chromium analysis. If the result of the total chromium analysis is less than or equal to the lesser of the Chromium III or Chromium VI method QL, the results for both Chromium III and Chromium VI can be reported as "<[QL]", where the actual analytical test QL is substituted for [QL].

(9) The lab may use SW846 Method 8270D provided the lab has an Initial Demonstration of Capability, has passed a PT for Kepone, and meets the acceptance criteria for Kepone as given in Method 8270D

(10) The sample type for Hardness (as $CaCO_3$) shall match the sample type selected for Dissolved Metals.

Attachment No. 7

Water Quality/Wasteload Allocation Analysis

FRESHWATER
WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: KinderMorgan SE Terminals #2 Permit No.: VA0058378

Receiving Stream: James River Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information

Mean Hardness (as CaCO3) =	65.2	mg/L
90% Temperature (Annual) =	28.7	deg C
90% Temperature (Wet season) =		deg C
90% Maximum pH =	8	SU
10% Maximum pH =	7.2	SU
Tier Designation (1 or 2) =	1	
Public Water Supply (PWS) Y/N? =	N	
Trout Present Y/N? =	N	
Early Life Stages Present Y/N? =	Y	

Stream Flows

1Q10 (Annual) =	19	MGD
7Q10 (Annual) =	49	MGD
30Q10 (Annual) =	49	MGD
1Q10 (Wet season) =		MGD
30Q10 (Wet season) =		MGD
30Q5 =	49	MGD
Harmonic Mean =	49	MGD

Mixing Information

Annual - 1Q10 Mix =	100	%
- 7Q10 Mix =	100	%
- 30Q10 Mix =	100	%
Wet Season - 1Q10 Mix =		%
- 30Q10 Mix =		%

Effluent Information

Mean Hardness (as CaCO3) =	43.5	mg/L
90% Temp (Annual) =	27.3	deg C
90% Temp (Wet season) =		deg C
90% Maximum pH =	8.61	SU
10% Maximum pH =	6.86	SU
Discharge Flow =	1	MGD

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Acenapthene	0	--	--	na	9.9E+02	--	--	na	5.0E+04	--	--	--	--	--	--	--	--	--	--	na	5.0E+04
Acrolein	0	--	--	na	9.3E+00	--	--	na	4.7E+02	--	--	--	--	--	--	--	--	--	--	na	4.7E+02
Acrylonitrile[c]	0	--	--	na	2.5E+00	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	--	--	na	1.3E+02
Aldrin [c]	0	3.0E+00	--	na	5.0E-04	6.0E+01	--	na	2.5E-02	--	--	--	--	--	--	--	--	6.0E+01	--	na	2.5E-02
Ammonia-N (mg/l) (Yearly)	0	8.15E+00	9.68E-01	na	--	1.63E+02	4.84E+01	na	--	--	--	--	--	--	--	--	--	1.63E+02	4.84E+01	na	--
Ammonia-N (mg/l) (High Flow)	0	2.60E+00	9.04E-01	na	--	2.60E+00	9.04E-01	na	--	--	--	--	--	--	--	--	--	2.60E+00	9.04E-01	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	2.0E+06	--	--	--	--	--	--	--	--	--	--	na	2.0E+06
Antimony	0	--	--	na	6.4E+02	--	--	na	3.2E+04	--	--	--	--	--	--	--	--	--	--	na	3.2E+04
Arsenic	o	3.4E+02	1.5E+02	na	--	6.8E+03	7.5E+03	na	--	--	--	--	--	--	--	--	--	6.8E+03	7.5E+03	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene [c]	0	--	--	na	5.1E+02	--	--	na	2.6E+04	--	--	--	--	--	--	--	--	--	--	na	2.6E+04
Benzidine[c]	0	--	--	na	2.0E-03	--	--	na	1.0E-01	--	--	--	--	--	--	--	--	--	--	na	1.0E-01
Benzo (a) anthracene [c]	0	--	--	na	1.8E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	--	--	na	9.0E+00
Benzo (b) fluoranthene [c]	0	--	--	na	1.8E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	--	--	na	9.0E+00
Benzo (k) fluoranthene [c]	0	--	--	na	1.8E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	--	--	na	9.0E+00
Benzo (a) pyrene [c]	0	--	--	na	1.8E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	--	--	na	9.0E+00
Bis2-Chloroethyl Ether [c]	0	--	--	na	5.3E+00	--	--	na	2.7E+02	--	--	--	--	--	--	--	--	--	--	na	2.7E+02
Bis2-Chloroisopropyl Ether	0	--	--	na	6.5E+04	--	--	na	3.3E+06	--	--	--	--	--	--	--	--	--	--	na	3.3E+06
Bis 2-Ethylhexyl Phthalate [c]	0	--	--	na	2.2E+01	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	--	--	na	1.1E+03
Bromoform [c]	0	--	--	na	1.4E+03	--	--	na	7.0E+04	--	--	--	--	--	--	--	--	--	--	na	7.0E+04
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	9.5E+04	--	--	--	--	--	--	--	--	--	--	na	9.5E+04
Cadmium	0	2.4E+00	8.1E-01	na	--	4.8E+01	4.0E+01	na	--	--	--	--	--	--	--	--	--	4.8E+01	4.0E+01	na	--
Carbon Tetrachloride [c]	0	--	--	na	1.6E+01	--	--	na	8.0E+02	--	--	--	--	--	--	--	--	--	--	na	8.0E+02
Chlordane [c]	0	2.4E+00	4.3E-03	na	8.1E-03	4.8E+01	2.2E-01	na	4.1E-01	--	--	--	--	--	--	--	--	4.8E+01	2.2E-01	na	4.1E-01
Chloride	0	8.6E+05	2.3E+05	na	--	1.7E+07	1.2E+07	na	--	--	--	--	--	--	--	--	--	1.7E+07	1.2E+07	na	--
TRC	0	1.9E+01	1.1E+01	na	--	3.8E+02	5.5E+02	na	--	--	--	--	--	--	--	--	--	3.8E+02	5.5E+02	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	8.0E+04	--	--	--	--	--	--	--	--	--	--	na	8.0E+04

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane[C]	0	--	--	na	1.3E+02	--	--	na	6.5E+03	--	--	--	--	--	--	--	--	--	--	na	6.5E+03
Chloroform	0	--	--	na	1.1E+04	--	--	na	5.5E+05	--	--	--	--	--	--	--	--	--	--	na	5.5E+05
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	8.0E+04	--	--	--	--	--	--	--	--	--	--	na	8.0E+04
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	7.5E+03	--	--	--	--	--	--	--	--	--	--	na	7.5E+03
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	1.7E+00	2.1E+00	na	--	--	--	--	--	--	--	--	--	1.7E+00	2.1E+00	na	--
Chromium III	0	4.0E+02	5.2E+01	na	--	7.9E+03	2.6E+03	na	--	--	--	--	--	--	--	--	--	7.9E+03	2.6E+03	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	3.2E+02	5.5E+02	na	--	--	--	--	--	--	--	--	--	3.2E+02	5.5E+02	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene [C]	0	--	--	na	1.8E-02	--	--	na	9.0E-01	--	--	--	--	--	--	--	--	--	--	na	9.0E-01
Copper	0	8.8E+00	6.2E+00	na	--	1.8E+02	3.1E+02	na	--	--	--	--	--	--	--	--	--	1.8E+02	3.1E+02	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	4.4E+02	2.6E+02	na	8.0E+05	--	--	--	--	--	--	--	--	4.4E+02	2.6E+02	na	8.0E+05
DDD [C]	0	--	--	na	3.1E-03	--	--	na	1.6E-01	--	--	--	--	--	--	--	--	--	--	na	1.6E-01
DDE [C]	0	--	--	na	2.2E-03	--	--	na	1.1E-01	--	--	--	--	--	--	--	--	--	--	na	1.1E-01
DDT [C]	0	1.1E+00	1.0E-03	na	2.2E-03	2.2E+01	5.0E-02	na	1.1E-01	--	--	--	--	--	--	--	--	2.2E+01	5.0E-02	na	1.1E-01
Demeton	0	--	1.0E-01	na	--	--	5.0E+00	na	--	--	--	--	--	--	--	--	--	--	5.0E+00	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	3.4E+00	8.5E+00	na	--	--	--	--	--	--	--	--	--	3.4E+00	8.5E+00	na	--
Dibenz(a,h)anthracene [C]	0	--	--	na	1.8E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	--	--	na	9.0E+00
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	6.5E+04	--	--	--	--	--	--	--	--	--	--	na	6.5E+04
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	4.8E+04	--	--	--	--	--	--	--	--	--	--	na	4.8E+04
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	9.5E+03	--	--	--	--	--	--	--	--	--	--	na	9.5E+03
3,3-Dichlorobenzidine[C]	0	--	--	na	2.8E-01	--	--	na	1.4E+01	--	--	--	--	--	--	--	--	--	--	na	1.4E+01
Dichlorobromomethane [C]	0	--	--	na	1.7E+02	--	--	na	8.5E+03	--	--	--	--	--	--	--	--	--	--	na	8.5E+03
1,2-Dichloroethane [C]	0	--	--	na	3.7E+02	--	--	na	1.9E+04	--	--	--	--	--	--	--	--	--	--	na	1.9E+04
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	3.6E+05	--	--	--	--	--	--	--	--	--	--	na	3.6E+05
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	5.0E+05	--	--	--	--	--	--	--	--	--	--	na	5.0E+05
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	1.5E+04	--	--	--	--	--	--	--	--	--	--	na	1.5E+04
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane[C]	0	--	--	na	1.5E+02	--	--	na	7.5E+03	--	--	--	--	--	--	--	--	--	--	na	7.5E+03
1,3-Dichloropropene [C]	0	--	--	na	2.1E+02	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
Dieldrin [C]	0	2.4E-01	5.6E-02	na	5.4E-04	4.8E+00	2.8E+00	na	2.7E-02	--	--	--	--	--	--	--	--	4.8E+00	2.8E+00	na	2.7E-02
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	2.2E+06	--	--	--	--	--	--	--	--	--	--	na	2.2E+06
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	4.3E+04	--	--	--	--	--	--	--	--	--	--	na	4.3E+04
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	5.5E+07	--	--	--	--	--	--	--	--	--	--	na	5.5E+07
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	2.3E+05	--	--	--	--	--	--	--	--	--	--	na	2.3E+05
2,4 Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	2.7E+05	--	--	--	--	--	--	--	--	--	--	na	2.7E+05
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	1.4E+04	--	--	--	--	--	--	--	--	--	--	na	1.4E+04
2,4-Dinitrotoluene [C]	0	--	--	na	3.4E+01	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	--	--	na	1.7E+03
Dioxin 2,3,7,8-tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	2.6E-06	--	--	--	--	--	--	--	--	--	--	na	2.6E-06
1,2-Diphenylhydrazine[C]	0	--	--	na	2.0E+00	--	--	na	1.0E+02	--	--	--	--	--	--	--	--	--	--	na	1.0E+02
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	4.4E+00	2.8E+00	na	4.5E+03	--	--	--	--	--	--	--	--	4.4E+00	2.8E+00	na	4.5E+03
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	4.4E+00	2.8E+00	na	4.5E+03	--	--	--	--	--	--	--	--	4.4E+00	2.8E+00	na	4.5E+03
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	4.4E+00	2.8E+00	--	--	--	--	--	--	--	--	--	--	4.4E+00	2.8E+00	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	4.5E+03	--	--	--	--	--	--	--	--	--	--	na	4.5E+03
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	1.7E+00	1.8E+00	na	3.0E+00	--	--	--	--	--	--	--	--	1.7E+00	1.8E+00	na	3.0E+00
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	1.5E+01	--	--	--	--	--	--	--	--	--	--	na	1.5E+01

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	1.1E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.1E+05**
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	7.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.0E+03**
Fluorene	0	--	--	na	5.3E+03	--	--	na	2.7E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.7E+05**
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Guthion	0	--	1.0E-02	na	--	--	5.0E-01	na	--	--	--	--	--	--	--	--	--	**--**	**5.0E-01**	**na**	**--**
Heptachlor [c]	0	5.2E-01	3.8E-03	na	7.9E-04	1.0E+01	1.9E-01	na	4.0E-02	--	--	--	--	--	--	--	--	**1.0E+01**	**1.9E-01**	**na**	**4.0E-02**
Heptachlor Epoxide[c]	0	5.2E-01	3.8E-03	na	3.9E-04	1.0E+01	1.9E-01	na	2.0E-02	--	--	--	--	--	--	--	--	**1.0E+01**	**1.9E-01**	**na**	**2.0E-02**
Hexachlorobenzene[c]	0	--	--	na	2.9E-03	--	--	na	1.5E-01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E-01**
Hexachlorobutadiene[c]	0	--	--	na	1.8E+02	--	--	na	9.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.0E+03**
Hexachlorocyclohexane Alpha-BHC[c]	0	--	--	na	4.9E-02	--	--	na	2.5E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.5E+00**
Hexachlorocyclohexane Beta-BHC[c]	0	--	--	na	1.7E-01	--	--	na	8.5E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.5E+00**
Hexachlorocyclohexane Gamma-BHC[c] (Lindane)	0	9.5E-01	na	na	1.8E+00	1.9E+01	--	na	9.0E+01	--	--	--	--	--	--	--	--	**1.9E+01**	**--**	**na**	**9.0E+01**
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	5.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**5.5E+04**
Hexachloroethane[c]	0	--	--	na	3.3E+01	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+03**
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	1.0E+02	na	--	--	--	--	--	--	--	--	--	**--**	**1.0E+02**	**na**	**--**
Indeno (1,2,3-cd) pyrene [c]	0	--	--	na	1.8E-01	--	--	na	9.0E+00	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**9.0E+00**
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Isophorone[c]	0	--	--	na	9.6E+03	--	--	na	4.8E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.8E+05**
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Lead	0	6.8E+01	7.8E+00	na	--	1.4E+03	3.9E+02	na	--	--	--	--	--	--	--	--	--	**1.4E+03**	**3.9E+02**	**na**	**--**
Malathion	0	--	1.0E-01	na	--	--	5.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**5.0E+00**	**na**	**--**
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Mercury	0	1.4E+00	7.7E-01	- -	- -	2.8E+01	3.9E+01	- -	- -	--	--	--	--	--	--	--	--	**2.8E+01**	**3.9E+01**	**- -**	**- -**
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	7.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**7.5E+04**
Methylene Chloride [c]	0	--	--	na	5.9E+03	--	--	na	3.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+05**
Methoxychlor	0	--	3.0E-02	na	--	--	1.5E+00	na	--	--	--	--	--	--	--	--	--	**--**	**1.5E+00**	**na**	**--**
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	**--**	**0.0E+00**	**na**	**--**
Nickel	0	1.3E+02	1.4E+01	na	4.6E+03	2.5E+03	7.0E+02	na	2.3E+05	--	--	--	--	--	--	--	--	**2.5E+03**	**7.0E+02**	**na**	**2.3E+05**
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	3.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.5E+04**
N-Nitrosodimethylamine[c]	0	--	--	na	3.0E+01	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+03**
N-Nitrosodiphenylamine[c]	0	--	--	na	6.0E+01	--	--	na	3.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+03**
N-Nitrosodi-n-propylamine[c]	0	--	--	na	5.1E+00	--	--	na	2.6E+02	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.6E+02**
Nonylphenol	0	2.8E+01	6.6E+00	--	--	5.6E+02	3.3E+02	na	--	--	--	--	--	--	--	--	--	**5.6E+02**	**3.3E+02**	**na**	**--**
Parathion	0	6.5E-02	1.3E-02	na	--	1.3E+00	6.5E-01	na	--	--	--	--	--	--	--	--	--	**1.3E+00**	**6.5E-01**	**na**	**--**
PCB Total[c]	0	--	1.4E-02	na	6.4E-04	--	7.0E-01	na	3.2E-02	--	--	--	--	--	--	--	--	**--**	**7.0E-01**	**na**	**3.2E-02**
Pentachlorophenol [c]	0	1.0E+01	8.1E+00	na	3.0E+01	2.1E+02	4.0E+02	na	1.5E+03	--	--	--	--	--	--	--	--	**2.1E+02**	**4.0E+02**	**na**	**1.5E+03**
Phenol	0	--	--	na	8.6E+05	--	--	na	4.3E+07	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**4.3E+07**
Pyrene	0	--	--	na	4.0E+03	--	--	na	2.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+05**
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**

Parameter	Background	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				**Most Limiting Allocations**			
(ug/l unless noted)	Conc.	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	**Acute**	**Chronic**	**HH (PWS)**	**HH**
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	4.0E+02	2.5E+02	na	2.1E+05	--	--	--	--	--	--	--	--	**4.0E+02**	**2.5E+02**	**na**	**2.1E+05**
Silver	0	1.6E+00	--	na	--	3.2E+01	--	na	--	--	--	--	--	--	--	--	--	**3.2E+01**	**--**	**na**	**--**
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
1,1,2,2-Tetrachloroethane[C]	0	--	--	na	4.0E+01	--	--	na	2.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.0E+03**
Tetrachloroethylene[C]	0	--	--	na	3.3E+01	--	--	na	1.7E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.7E+03**
Thallium	0	--	--	na	4.7E-01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**2.4E+01**
Toluene	0	--	--	na	6.0E+03	--	--	na	3.0E+05	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.0E+05**
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Toxaphene [C]	0	7.3E-01	2.0E-04	na	2.8E-03	1.5E+01	1.0E-02	na	1.4E-01	--	--	--	--	--	--	--	--	**1.5E+01**	**1.0E-02**	**na**	**1.4E-01**
Tributyltin	0	4.6E-01	7.2E-02	na	--	9.2E+00	3.6E+00	na	--	--	--	--	--	--	--	--	--	**9.2E+00**	**3.6E+00**	**na**	**--**
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	3.5E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**3.5E+03**
1,1,2-Trichloroethane[C]	0	--	--	na	1.6E+02	--	--	na	8.0E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**8.0E+03**
Trichloroethylene [C]	0	--	--	na	3.0E+02	--	--	na	1.5E+04	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.5E+04**
2,4,6-Trichlorophenol [C]	0	--	--	na	2.4E+01	--	--	na	1.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+03**
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**--**
Vinyl Chloride[C]	0	--	--	na	2.4E+01	--	--	na	1.2E+03	--	--	--	--	--	--	--	--	**--**	**--**	**na**	**1.2E+03**
Zinc	0	8.0E+01	8.2E+01	na	2.6E+04	1.6E+03	4.1E+03	na	1.3E+06	--	--	--	--	--	--	--	--	**1.6E+03**	**4.1E+03**	**na**	**1.3E+06**

Notes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
2. Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
3. Metals measured as Dissolved, unless specified otherwise
4. "C" indicates a carcinogenic parameter
5. Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
   Antidegradation WLAs are based upon a complete mix.
6. Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
   = (0.1(WQC - background conc.) + background conc.) for human health
7. WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	3.2E+04
Arsenic	2.7E+03
Barium	na
Cadmium	1.9E+01
Chromium III	1.6E+03
Chromium VI	1.3E+02
Copper	7.1E+01
Iron	na
Lead	2.3E+02
Manganese	na
Mercury	1.1E+01
Nickel	4.2E+02
Selenium	1.5E+02
Silver	1.3E+01
Zinc	6.4E+02

Note: do not use QL's lower than the minimum QL's provided in agency guidance

Kinder Morgan Southeast Terminals - Richmond 2
VA0058378
Fact Sheet Attachments

Attachment No. 8

WET Summary Test Results and WETLIM10.xls

WET Summary Test Results

Kinder Morgan Southeast Terminals - Richmond 2
VPDES Permit No. VA0058378
07/14/2008 - 07/13/2013

TEST DATE	PERIOD	TEST TYPE/ORGANISM	LC_{50}	% SURVIVAL	TOXICITY UNITS TUa	NOTES	LAB
11/19/08--11/21/08	AN-2008	Acute *Ceriodaphnia dubia*	>100%	95%	<1.0 TUa	Pass	QES
11/12/09--11/14/09	AN-2009	Acute *Ceriodaphnia dubia*	>100%	100%	<1.0 TUa	Pass	QES
05/12/10--05/14/10	AN-2010	Acute *Ceriodaphnia dubia*	>100%	100%	<1.0 TUa	Pass	CBI
05/19/11--05/21/11	AN-2011	Acute *Ceriodaphnia dubia*	>100%	100%	<1.0 TUa	Pass	CBI
04/13/12–04/15/12	AN-2012	Acute *Ceriodaphnia dubia*	>100%	100%	<1.0 TUa	Pass	CBI

Notes:

- Test Results for Outfall 001 (all samples are 24 hr flow proportional composites)
- %Survival is the percent survival in 100% effluent at the end of the test period.
- Method: *C. dubia*-- EPA 2002.0
- *LC_{50} Endpoint is 16.7% or TU_a 6.0*

ABBREVIATIONS: AN = Annual tests
QES = Quality Environmental Solutions, Inc.
CBI = Coastal Bioanalysts, Inc.

CONTINUED FROM THE FRONT

VII. BIOLOGICAL TOXICITY TESTING DATA

Do you have any knowledge or reason to believe that any biological test for acute or chronic toxicity has been made on any of your discharges or on a receiving water in relation to your discharge within the last 3 years?

☑ YES (*identify the test(s) and describe their purposes below*) ☐ NO (*go to Section VIII*)

Annual Acute Whole Effluent Toxicity testing is completed in accordance with the existing VPDES permit conditions. The 48-hour static acute tests with five test solutions are completed annually utilizing Ceriodaphnia dubia.

12/07 48-hour LC50 for c. dubia was >100%
11/08 48-hour LC50 for c. dubia was >100%
11/09 48-hour LC50 for c. dubia was >100%
05/10 48-hour LC50 for c. dubia was >100%
05/11 48-hour LC50 for c. dubia was >100%
04/12 48-hour LC50 for c. dubia was >100%

VIII. CONTRACT ANALYSIS INFORMATION

Were any of the analyses reported in Item V performed by a contract laboratory or consulting firm?

☑ YES (*list the name, address, and telephone number of, and pollutants analyzed by, each such laboratory or firm below*) ☐ NO (*go to Section IX*)

A. NAME	B. ADDRESS	C. TELEPHONE (*area code & no.*)	D. POLLUTANTS ANALYZED (*list*)
Air Water & Soil Laboratories, Inc.	2109-A North Hamilton Street Richmond, VA 23230	804-358-8295	Permit Analyses Hydrostatic Test Analyses
Coastal Bioanalysts, Inc.	6400 Enterprise Court Gloucester, VA 23061	804-694-8285	Toxicity Testing
TestAmerica Laboratories, Inc.	2960 Foster Creighton Drive Nashville, TN 37204	615-726-0177	Constituents in Parts V-A and V-C
EA Ecotoxicology Laboratory	15 Loveton Circle Baltimore, MD 21152	410-771-4950	Biological Toxicity Testing for 2007-2009
SPL, Inc.	500 Ambassador Caffery Parkway Scott, LZ 70583	337-237-4775	Laboratory Analytical (2008-2010)

IX. CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

A. NAME & OFFICIAL TITLE (*type or print*)	B. PHONE NO. (*area code & no.*)
Andrew B Hartman - Site Ops Manager	866-222-7786 ext. 3774
C. SIGNATURE	**D. DATE SIGNED**
	1/4/13

Spreadsheet for determination of WET test endpoints or WET limits

4		Excel 97			Acute Endpoint/Permit Limit			Use as LC_{50} in Special Condition, as TUa on DMR							
5		Revision Date: 01/10/05													
6		File: WETLIM10.xls			ACUTE	6.00000015	TUa	LC_{50} =	17	% Use as	5.88	TUa			
7		(MIX.EXE required also)													
8					ACUTE WLAa		6	Note: Inform the permittee that if the mean of the data exceeds							
9								this TUa:	1.68584028	a limit may result using WLA.EXE					
10															
11					Chronic Endpoint/Permit Limit			Use as NOEC in Special Condition, as TUc on DMR							
12															
13					CHRONIC	60.0000015	TU_c	NOEC =	2	% Use as	50.00	TU_c			
14					BOTH*	60.0000015	TU_c	NOEC =	2	% Use as	50.00	TU_c			
15	Enter data in the cells with blue type:				AML	60.0000015	TU_c	NOEC =	2	% Use as	50.00	TU_c			
16															
17	Entry Date:		02/13/13		ACUTE WLAa,c		60		Note: Inform the permittee that if the mean						
18	Facility Name:				CHRONIC WLAc		50		of the data exceeds this TUc:			24.6566808			
19	VPDES Number:		VA0058378		* Both means acute expressed as chronic				a limit may result using WLA.EXE						
20	Outfall Number:		1												
21					% Flow to be used from MIX.EXE				Difuser /modeling study?						
22	Plant Flow:		0.21	MGD					Enter Y/N	Y					
23	Acute 1Q10:	NA		MGD	100	%			Acute	20	:1				
24	Chronic 7Q10:	NA		MGD	100	%			Chronic	50	:1				
25															
26	Are data available to calculate CV? (Y/N)				N	(Minimum of 10 data points, same species, needed)					Go to Page 2				
27	Are data available to calculate ACR? (Y/N)				N	(NOEC<LC50, do not use greater/less than data)					Go to Page 3				
28															
29															
30	IWC_a		5	%	Plant flow/plant flow + 1Q10		NOTE: If the IWCa is >33%, specify the								
31	IWC_c		2	%	Plant flow/plant flow + 7Q10		NOAEC = 100% test/endpoint for use								
32															
33	Dilution, acute		20		100/IWCa										
34	Dilution, chronic		50		100/IWCc										
35															
36	WLA_a		6	Instream criterion (0.3 TUa) X's Dilution, acute											
37	WLA_c		50	Instream criterion (1.0 TUc) X's Dilution, chronic											
38	$WLA_{a,c}$		60	ACR X's WLA_a - converts acute WLA to chronic units											
39															
40	ACR -acute/chronic ratio		10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)											
41	CV-Coefficient of variatior		0.6	Default of 0.6 - if data are available, use tables Page 2)											
42	Constants	eA	0.4109447	Default = 0.41											
43		eB	0.6010373	Default = 0.60											
44		eC	2.4334175	Default = 2.43											
45		eD	2.4334175	Default = 2.43 (1 samp)	No. of sample		1	**The Maximum Daily Limit is calculated from the lowest							
46								LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.							
47	$LTA_{a,c}$		24.656682	WLAa,c X's eA											
48	LTA_c		30.051865	WLAc X's eB								Rounded NOEC's		%	
49	MDL** with $LTA_{a,c}$		60.00000147	TU_c	NOEC =	1.666667	(Protects from acute/chronic toxicity)					NOEC =	2	%	
50	MDL** with LTA_c		73.1287342	TU_c	NOEC =	1.367452	(Protects from chronic toxicity)					NOEC =	2	%	
51	AML with lowest LTA		60.00000147	TU_c	NOEC =	1.666667	Lowest LTA X's eD					NOEC =	2		
52															
53	IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a														
54												Rounded LC50's		%	
55	MDL with $LTA_{a,c}$		6.000000147	TU_a	LC50 =	16.666666	%					LC50 =	17	%	
56	MDL with LTA_c		7.31287342	TU_a	LC50 =	13.674515	%					LC50 =	14		
57															
58															

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB

(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

	F	G	H	I	J	K
		Vertebrate			Invertebrate	
		IC_{25} Data			IC_{25} Data	
		or			or	
		LC_{50} Data	LN of data		LC_{50} Data	LN of data
		**********			**********	
	1	0		1	0	
	2			2		
	3			3		
	4			4		
	5			5		
	6			6		
	7			7		
	8			8		
	9			9		
	10			10		
	11			11		
	12			12		
	13			13		
	14			14		
	15			15		
	16			16		
	17			17		
	18			18		
	19			19		
	20			20		
	St Dev	NEED DATA	NEED DATA	St Dev	NEED DAT/	NEED DATA
	Mean	0	0	Mean	0	0
	Variance	0	0.000000	Variance	0	0.000000
	CV	0		CV	0	

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA

ACR for vertebrate data: 0

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3. ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here: NO DATA $\%LC_{50}$

NO DATA TUa

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring % Effluent	Monitoring TUc	Limit % Effluent	Limit TUc
Dilution series based on data mean	4.1	24.65668		
Dilution series to use for limit			2	50
Dilution factor to recommend:	0.2013876		0.1414214	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	20.1	4.97	14.1	7.07
	4.1	24.66	2.0	50.00
	0.8	122.43	0.3	353.55
	0.16	607.95	0.0	2500.00
Extra dilutions if needed	0.03	3018.82	0.0	17677.67
	0.01	14990.08	0.0	125000.00

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Attachment No. 9

NPDES Permit Rating Work Sheet

NPDES PERMIT RATING WORK SHEET

NPDES NO. VA0058378

☐ Regular Addition
☐ DiscretionaryAddition
☐ Score change, but no status change
☐ Deletion

Facility Name: Kinder Morgan SE Terminal, Richmond #2

City: Richmond

Receiving Water: James River

Reach Number: _____

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?
1. Power output 500 MW or greater (not using a cooling pond/lake)
2. A nuclear power plant
3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate

☐ YES; score is 600 (stop here) ☒ NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

☐ YES; score is 700 (stop here)
☒ NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code: _____ Primary SIC Code: 4226 Other SIC Codes: 2951
Industrial Subcategory Code: 1 (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	15	☐ 7.	7	35
☐ 1.	1	5	☐ 4.	4	20	☒ 8.	8	40
☐ 2.	2	10	☐ 5.	5	25	☐ 9.	9	45
			☐ 6.	6	30	☐ 10.	10	50

Code Number Checked: 8

Total Points Factor 1: 40

FACTOR 2: Flow/Stream Flow Volume (*Complete either Section A or Section B; check only one)*

Section A ☐ Wastewater Flow Only Considered

Wastewater Type (See Instructions)		Code	Points
Type I: Flow < 5 MGD	☐	11	0
Flow 5 to 10 MGD	☐	12	10
Flow > 10 to 50 MGD	☐	13	20
Flow > 50 MGD	☐	14	30
Type II: Flow < 1 MGD	☐	21	10
Flow 1 to 5 MGD	☐	22	20
Flow > 5 to 10 MGD	☐	23	30
Flow > 10 MGD	☐	24	50
Type III: Flow < 1 MGD	☐	31	0
Flow 1 to 5 MGD	☐	32	10
Flow > 5 to 10 MGD	☐	33	20
Flow > 10 MGD	☐	34	30

Section B ☐ Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Percent of instream Wastewater Concentration at Receiving Stream Low Flow		Code	Points
Type I/III:	< 10 %	☐	41	0
	10 % to < 50 %	☐	42	10
	> 50 %	☐	43	20
Type II:	< 10 %	☒	51	0
	10 % to <50 %	☐	52	20
	> 50 %	☐	53	30

Code Checked from Section A or B: 51

Total Points Factor 2: 0

FACTOR 3: Conventional Pollutants
(only when limited by the permit)

NPDES NO:

A. Oxygen Demanding Pollutant: (check one) ☐ BOD ☐ COD ☐ Other:_____

			Code	Points
Permit Limits: (check one)	☐	< 100 lbs/day	1	0
	☐	100 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: ____

Points Scored: n/a

B. Total Suspended Solids (TSS)

			Code	Points
Permit Limits: (check one)	☐	< 100 lbs/day	1	0
	☒	100 to 1000 lbs/day	2	5
	☐	> 1000 to 5000 lbs/day	3	15
	☐	> 5000 lbs/day	4	20

Code Checked: 2

Points Scored: 5

C. Nitrogen Pollutant: (check one) ☐ Ammonia ☐ Other: _____

		Nitrogen Equivalent	*Code*	*Points*
Permit Limits: (check one)	☐	< 300 lbs/day	1	0
	☐	300 to 1000 lbs/day	2	5
	☐	> 1000 to 3000 lbs/day	3	15
	☐	> 3000 lbs/day	4	20

Code Checked: ____

Points Scored: n/a

Total Points Factor 3: 5

FACTOR 4: Public Health Impact

Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

☒ YES (If yes, check toxicity potential number below)

☐ NO (If no, go to Factor 5)

Determine the *human health* toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column ☐ check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
☐ No process waste streams	0	0	☐ 3.	3	0	☐ 7.	7	15
☐ 1.	1	0	☐ 4.	4	0	☒ 8.	8	20
☐ 2.	2	0	☐ 5.	5	5	☐ 9.	9	25
			☐ 6.	6	10	☐ 10.	10	30

Code Number Checked: 8

Total Points Factor 4: 20

FACTOR 5: Water Quality Factors

NPDES NO.

A. *Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge:*

		Code	Points
☐	Yes	1	10
☒	No	2	0

B. *Is the receiving water in compliance with applicable water quality standards for pollutants that are water quality limited in the permit?*

		Code	Points
☒	Yes	1	0
☐	No	2	5

C. *Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?*

		Code	Points
☐	Yes	1	10
☒	No	2	0

Code Number Checked: A 2 B 1 C 2

Points Factor 5: A 0 + B 0 + C 0 = 0 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

A. *Base Score: Enter flow code here (from Factor 2):* 51

Enter the multiplication factor that corresponds to the flow code: 0.10

Check appropriate facility HPRI Code (from PCS):

	HPRI#	*Code*	*HPRI Score*
☐	1	1	20
☐	2	2	0
☒	3	3	30
☐	4	4	0
☐	5	5	20

Flow Code	*Multiplication Factor*
11, 31, or 41	0.00
12, 32, or 42	0.05
13, 33, or 43	0.10
14 or 34	0.15
21 or 51	0.10
22 or 52	0.30
23 or 53	0.60
24	1.00

HPRI code checked: 3

Base Score: (HPRI Score) 30 X (Multiplication Factor) .1 = 3 (TOTAL POINTS)

B. *Additional Points* ☐ *NEP Program*
For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

	Code	Points
☒ Yes	1	10
☐ No	2	0

C. *Additional Points* ☐ *Great Lakes Area of Concern*
For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see Instructions)

	Code	Points
☐ Yes	1	10
☒ No	2	0

Code Number Checked: A 3 B 1 C 2

Points Factor 6: A 3 + B 10 + C 0 = 13 TOTAL

SCORE SUMMARY NPDES NO.

Factor	Description	Total Points
1	Toxic Pollutant Potential	40
2	Flows/Streamflow Volume	0
3	Conventional Pollutants	5
4	Public Health Impacts	20
5	Water Quality Factors	0
6	Proximity to Near Coastal Waters	13
	TOTAL (Factors 1 through 6)	78

S1. Is the total score equal to or greater than 80? ☐ Yes (Facility is a major) ☒ No

S2. If the answer to the above questions is no, would you like this facility to be discretionary major?

☒ No

☐ Yes (Add 500 points to the above score and provide reason below:

Reason:

NEW SCORE: _____

OLD SCORE: _____

Virginia Kelly
Permit Reviewer's Name

(804) 527-5048
Phone Number

5 Feb 2008
Date