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October 4, 2006

BY EMAIL AND BY OVERNIGHT DELIVERY

Mr. Gary Yee
California Air Resources Board
Post Office Box 2815
Sacramento, CA 95812

Ms. Laura Yannayon
U.S. Environmental Protection Agency
Region 9, Air Division
Permits Office (Air-3)
75 Hawthorne Street
San Francisco, CA 94105

Re: BHP Billiton Mitigation: Klihyam Source Test Report

Dear Laura and Gary:

As you know, BHP Billiton LNG International ("BHP's") entered into a contract with Sause Brothers, owners of the tug Klihyam, to repower the vessel propulsion engines as mitigation for the emissions from the Cabrillo Port project. BHP previously submitted a report to you both outlining the anticipated emission reductions to be gained from this project. After much discussion over the baseline NOx emission rate it was concluded that the best way to determine the baseline emission rate was to perform a stack test on the vessel. Consistent with the source test protocol previously provided to you both, BHP's contractor (Almega Environmental) performed the stack test on September 9, 2006. The enclosed report outlines the results and provides you with the associated procedures and Quality Assurance documentation.

The Almega report documents a mode weighted emission factor of 11.31 g/bhp-hr. As you will note, this is lower than the emission rate proposed in the report previously submitted to you. When the source test emission factor is employed, the predicted emissions decreases total 97.6 tons of NOx per year. BHP will submit to you separately a revised report outlining the total predicted emission reductions. However, we wanted you to have the source test report as soon as it was available.

Oregon
Washington
California
Utah
Idaho

Please contact me if you have any questions about this report. We would be happy to schedule a conference call with OceanAir Environmental so that you can discuss how the test was completed and how the results figure into the current emissions reduction estimation process.

Sincerely,

Thomas R. Wood

cc: Renee Klimczak
Rick Abel

Attachments: Klihyam Source Test Report

Almega
ENVIRONMENTAL

SOURCE TEST REPORT

Emissions Testing of Two Internal Combustion Engine for NO_X and O_2

Prepared for:

Ocean Air
P.O.Box No.1318
Somis, CA 93066

Equipment Location:

Sause Bros.
1805 Pier D Street
Long Beach, CA

Test Date(s): 09 September 2006

Report Date: 28 September 2006

Project: c-8409, Revision: 00

Prepared by:

Almega Environmental & Technical Services
5251 McFadden Avenue
Huntington Beach, CA 92649

Prepared by: _____
Bikash Sharma, Project Manager

Reviewed by: _____
John Phillips, President

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1.0 EXECUTIVE SUMMARY

Key project information is provided in the summary below. Test results are summarized in Table 1-1.

Customer	Ocean Air P.O.Box No.1318 Somis, CA 93066 Contact: Mr. Mahesh Talwar, tel. (805) 386-1882
Equipment Location	Sause Bros. 1805 Pier D Street Long Beach, CA
Equipment	Internal combustion Engine
Test Objective	Measure emissions of NO_X and O_2 inorder to determine an emission factor for oxides of nitrogen for a tug boat engine powered by two EMD 16-645 engines
Test Requested by	Mr. Mahesh Talwar of Ocean Air
Test Date(s)	09 September 2006
Testing Firm	Almega Environmental & Technical Services 5251 McFadden Avenue Huntington Beach, CA 92649 Contact: Mr. Bikash Sharma, tel (714) 889-4000
Test Personnel	Tim Ta and Robert Summerlin of Almega Environmental & Technical Services
Measurements CEMS: NO_X, O_2 Stack Flow Rate (calculated)	 CARB Method 100 EPA Method 19

Table 1-1. Engine Exhaust Emissions test
PORT ENGINE
Test Date: 9/9/2006
Fuel Type: ULSD
Engine Type: 16-645E6
Engine Rating: H.P. 1950 @ RPM 900
Location: Pier D, Long Beach, CA

A. ENGINE PERFORMANCE DATA	100%	75%	50%	25%
Engine Power (prophp)	1,406	1,049	762	357
Engine power (kw)	1049	783	568	266
Fuel Flow (kg/hr)	274	197	146	71
Intake Air (dry kg/hr)	23847	24937	17197	9324
Exhaust flow (dry kg/hr)	24122	25134	17342	9395
Engine RPM	807	732	658	511
Engine RPM % of Rated	0.90	0.81	0.73	0.57
Engine Load % of Rated	0.72	0.54	0.39	0.18
BSFC (lbs fuel/bhp-hr)	0.430	0.415	0.421	0.441
Gal/hr Prop fuel	86.28	62.04	45.78	22.44
B. GASEOUS EMISSIONS				
NOx (dry ppmv)	441.22	288.16	262.5	190.01
O2 (%)	17.77	18.74	18.59	18.81
C. EXHAUST EMISSIONS ANALYSIS				
Mode Weighting Factors	0.2	0.5	0.15	0.15
Weighted Specific NOx (gms/kw-hr)	4.81	8.19	1.54	0.61

D. RESULTS

Total Mode Weighted NOx	**15.16 gms/kw-hr**	**11.31 gms/bhp-hr**
Cycle weighted H.P.		**974 H.P.**

Table 1-2. Engine Exhaust Emissions test
STARBOARD ENGINE
Test Date: 9/9/2006
Fuel Type: ULSD
Engine Type: 16-645E6
Engine Rating: H.P. 1950 @ RPM 900
Location: Pier D, Long Beach, CA

A. ENGINE PERFORMANCE DATA	100%	75%	50%	25%
Engine Power (prophp)	1,395	1,049	762	357
Engine power (kw)	1041	783	568	266
Fuel Flow (kg/hr)	297	222	166	79
Intake Air (dry kg/hr)	11199	9658	182758	58952
Exhaust flow (dry kg/hr)	11496	9880	182925	59032
Engine RPM	805	732	658	511
Engine RPM % of Rated	0.89	0.81	0.73	0.57
Engine Load % of Rated	0.72	0.54	0.39	0.18
BSFC (lbs fuel/bhp-hr)	0.470	0.466	0.481	0.490
Gal/hr Prop fuel	93.54	69.66	52.26	24.96
B. GASEOUS EMISSIONS				
NOx (dry ppmv)	831.34	708.85	33.48	40.41
O2 (%)	13.78	14.73	20.65	20.53
C. EXHAUST EMISSIONS ANALYSIS				
Mode Weighting Factors	0.2	0.5	0.15	0.15
Weighted Specific NOx (gms/kw-hr)	4.33	7.94	2.08	0.81

D. RESULTS

Total Mode Weighted NOx	**15.17 gms/kw-hr**	**11.31 gms/bhp-hr**
Cycle weighted H.P.		**971 H.P.**

2.0 INTRODUCTION

Almega Environmental & Technical Services (Almega) was retained by Ocean Air Environmental, LLC. to conduct emissions testing a tug boat powered by two EMD 16-645 engines. This tug boat Klihyam is owned by Sause Brothers Ocean Towing Company located at 1805 Pier D Street, Long Beach, CA. The purpose of the test was to determine an emission factor for oxides of nitrogen. The testing was done in accordance with ISO 8178 Emission Test Cycle using the E-3 test as follows:

	Mode 1	Mode 2	Mode 3	Mode 4
Load %	100	75	50	25
RPM %	100	91	80	63
Weighting factor	0.2	0.5	0.15	0.15

Oxides of nitrogen in the exhaust were tested using the CARB Method 100. Almega Environmental is a CARB approved source test company.

2.1 Document Outline

This report is organized as follows. Section 1.0 is a summary of the project and test results. Section 2.0 describes the project, its objectives and approach. Section 3.0 discusses test results. Section 4.0 describes the equipment tested and applicable sampling locations. Section 5.0 describes the sampling and analysis procedures used to conduct the testing. And Section 6.0 describes Quality Assurance and Quality Control activities performed. The Appendices contain test results, calculated data, raw field data, facility process and test data, calibration records, and certification documents.

3.0 TEST RESULTS AND DISCUSSION

The testing was conducted after the arrival of Almega's test personal and set-up of test equipment. The Source was operated by plant personnel during testing activities. No unusual operating conditions were noted during the test periods.

3.1 Test Discussion

Test results were summarized in Table 1-1 and 1-2 and discussed below.

Port Engine:

100 % Load (Mode 1):

- The measured NO_X concentration was 441.22 ppmv on dry basis and NOx emission was 4.81 gms/kw-hr. The measured oxygen concentration at this load was 17.77%.

75% Load (Mode 2):

- The measured NO_X concentration was 288.16 ppmv on dry basis and NOx emission was 8.19 gms/kw-hr. The measured oxygen concentration at this load was 18.74%.

50% Load (Mode 3):

- The measured NO_X concentration was 262.5 ppmv on dry basis and NOx emission was 1.54 gms/kw-hr. The measured oxygen concentration at this load was 18.59%.

25% Load (Mode 4):

- The measured NO_X concentration was 190.01 ppmv on dry basis and NOx emission was 0.61 gms/kw-hr. The measured oxygen concentration at this load was 18.81%.

The total measured NOx emissions (Total mode weighted NOx) for this engine was 15.16gms/kw-hr and 11.31 gms/bhp-hr.

Although engines are rated at 1950 h.p. @ 900 rpm, maximum rpm achieved in the field was only 807. It is possible that full rpm can be achieved when the vessel is towing fully loaded barge at full throttle. Higher load generally result in higher NOx concentration.

Starboard Engine:

100 % Load (Mode 1):

- The measured NO_X concentration was 831.34 ppmv on dry basis and NOx emission was 4.33 gms/kw-hr. The measured oxygen concentration at this load was 13.78%.

75% Load (Mode 2):

- The measured NO_X concentration was 708.85 ppmv on dry basis and NOx emission was 7.94 gms/kw-hr. The measured oxygen concentration at this load was 14.73%.

50% Load (Mode 3):

- The measured NO_X concentration was 33.48 ppmv on dry basis and NOx emission was 2.08 gms/kw-hr. The measured oxygen concentration at this load was 20.65%.

25% Load (Mode 4):

- The measured NO_X concentration was 40.41 ppmv on dry basis and NOx emission was 0.81 gms/kw-hr. The measured oxygen concentration at this load was 20.53%.

The total measured NOx emissions (Total mode weighted NOx) for this engine was 15.17gms/kw-hr and 11.31gms/bhp-hr.

Although engines are rated at 1950 h.p. @ 900 rpm, maximum rpm achieved in the field was only 805. It is possible that full rpm can be achieved when the vessel is towing fully loaded barge at full throttle. Higher load generally result in higher NOx concentration.

Stack gas flow rate was derived from the fuel flow rate using the EPA's F-factor and measures oxygen in the exhaust as specified in EPA's Method 19. RPM was read from the vessel on board tachometer. Fuel flow was determined using A&W fuel flow meter on board vessel that are capable of measuring the supply and return flow rate for each engine. The flow meters are temperature compensated.

4.0 EQUIPMENT AND PROCESS DESCRIPTION

The process and equipment tested are described below.

4.1 Tug Boat Engines Description

Tug Boat Klihyam engines are model EMD 16-645E6, rated at 1950 h.p. at 900 rpm each. Each engine has its own separate exhaust stack. Engines contained California diesel fuel.

4.2 Engine Operating Conditions During Testing

Each engine was operated first at each of the four operating modes of the E-3 test cycle. 100% load and 100% rpm was derived from the full throttle position.

4.3 Sampling Locations

Sample probe was dropped in from the exhaust stack opening. The engines exhaust from the engine room in the lowest deck, the exhaust is located straight up from the upper deck. There is at least 10-15 ft of straight run. Stack diameter is estimated to be 12 inches.

5.0 SAMPLING AND ANALYTICAL PROCEDURES

Test measurements were performed according to sampling and analysis procedures promulgated by the California Air Resources Board (CARB), or US Environmental Protection Agency (EPA). The sampling and analysis procedures used for this test program are summarized below. Any modifications or deviations not addressed herein are discussed in Section 3 of this report.

5.1 CARB Method 100 – Continuous Monitoring of Gaseous Emissions, CEMS
5.2 EPA Method 19 – Stack Gas Volumetric Flow Rate (calculated)

5.1 CARB Method 100 - Continuous Monitoring of Gaseous Emissions, CEMS

In this Method, gaseous components of the stack gas (NO_X, and O_2 are measured continuously according to CARB Method 100 using Almega's mobile continuous emissions monitoring system (CEMS). Figure 5-1 is a schematic of Almega's CEMS.

The CEMS extracts and conditions a representative stack gas sample and analyzes the gas using one or more analytical instruments. Typical CEMS instrumentation is described in Table 5-1. The extraction and conditioning system consists of a stainless steel heated probe, a short heated TFE sample line, a conditioning system, a TFE-diaphragm pump and a TFE transport (sample) line. The sample conditioning system, consisting of water knockout impingers and/or a thermoelectric condenser, removes moisture before the gas is delivered to the analyzers. Sample flow and delivery are controlled using a flow control panel that includes valves, pressure gauges, and flow meters (Rotameters). The flow control panel allows the user to deliver sample gas to any and all instruments. Instrument readings are recorded using a real-time strip chart and an electronic data acquisition system (DAS). Other pertinent data such as calibration gas cylinder numbers and concentrations, test location, dates, times, and operator identification are also recorded on the strip chart and on the field data form.

Sampling includes pretest and post-test calibration and bias checks for each sampling run. Raw concentration data are corrected for sampling system bias according to Method 100 using the following equation:

$$C_{CORR} = C_{MA} \times \frac{(C_i - BIAS_{ZERO})}{(BIAS_{SPAN} - BIAS_{ZERO})}$$

Where:
C_{CORR} = Concentration, corrected for drift and bias
C_i = Average measured concentration (raw value)
$BIAS_{ZERO}$ = Average instrument response during zero bias check
C_{MA} = Certified concentration of applicable span gas
$BIAS_{SPAN}$ = Average instrument response during span bias check

The following QA/QC activities are performed during testing.

- Prior to testing, each individual analyzer is calibrated (adjusted) by introducing zero, hi-span and mid-span gases directly into each analyzer and by making corresponding adjustments.

- Prior to testing, calibration error, linearity and system bias checks are performed on each analyzer. Calibration error and linearity checks are performed by injecting known calibration gases directly to each instrument. System bias checks are performed by injecting calibration gases at the sampling-probe/junction or at the sampling probe tip.

- The system response time for each parameter is determined at the moment when the calibration gas for the bias check reaches 95% of its expected concentration value.

- A Leak Check is conducted before sampling and periodically thereafter to ensure that no leakage occurs in the entire sampling apparatus. The leak check is performed on the vacuum side by sealing the probe tip and increasing vacuum to above 20 inches of mercury. After the vacuum stabilizes, it should hold constantly at about 20 in. Hg On the pressure side, the pressure gauge indicator should drop to zero and flow to each individual Rotameter also should drop to zero to indicate a successful leak check.

- Calibration gases used to span instrumentation conform to EPA Protocol-1. Certified gases are no older than 18 months for stable constituents (e.g. O_2, CO_2, NO_X, CO, SO_2 and THC) and 6 months for unstable constituents (e.g. NO_2). Certificates of analysis for calibration gases are included in the report.

- NO_2-to-NO conversion efficiency (CE) check is performed according to the procedure in Method 100 and the results of the CE check are included in the report.

- In some cases, a non-standard calibration gas value is generated using Almega's STEC "gas divider". If used, the gas divider will be field-certified according to EPA Method 205 "Verification of the Gas Dilution System for Field Instruments Calibration" and the certification data is included in the report.

Figure 5-1. Continuous Emissions Monitoring System

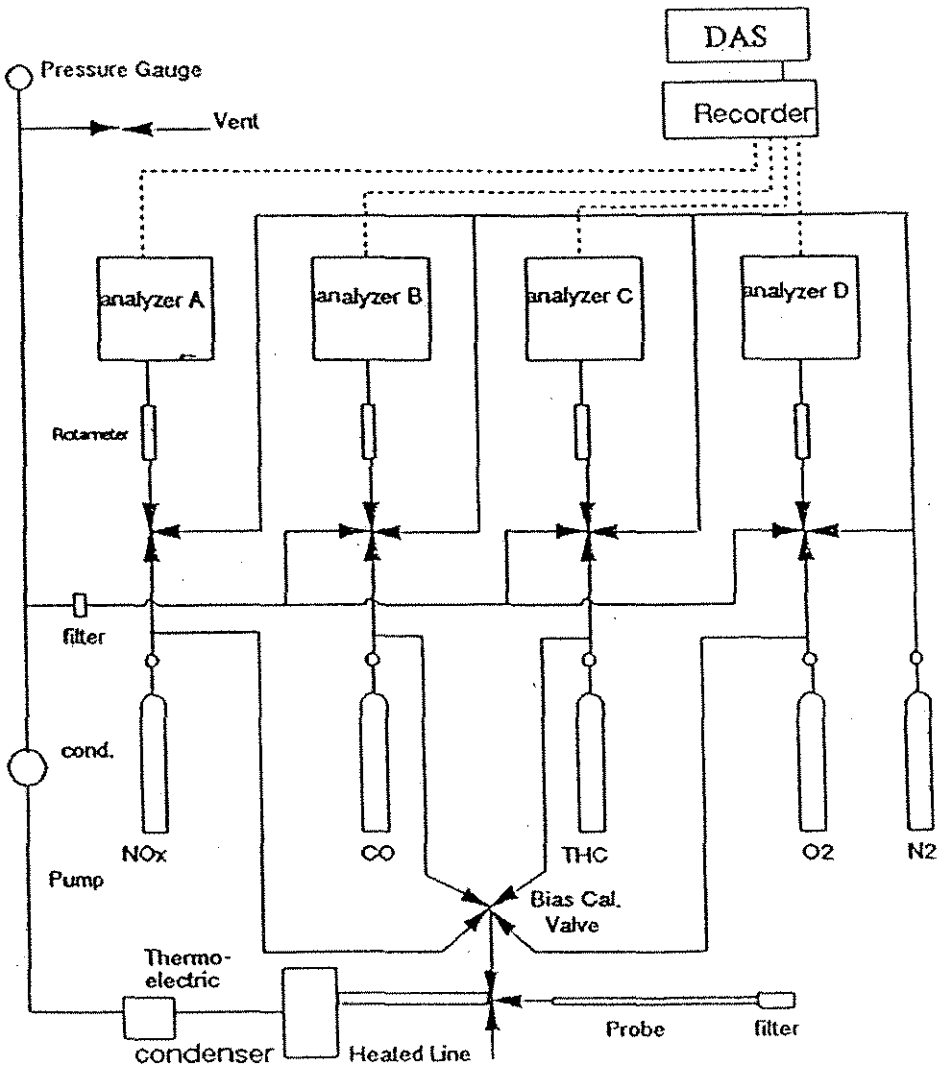


TABLE 5.1. ALMEGA CEMS – EQUIPMENT SPECIFICATIONS

ANALYZERS					
Specification	**O2**	**CO2**	**NOx**	**CO**	**SO2**
Manufacturer	Teledyne	Servomex	Thermo Electron	Thermo Electron	Western Research
Model	326RA	1400B	10A/10S	48/48H	721A2
Analytical Principle	E-Chemical Cell	NDIR	Chemiluminescent	NDIR-GCC	NDUV
Ranges	%: 0-5, -10, -25	%: 0-5, -10, -20	ppmv: 0-2.5, -10, -25, -50, -100, -250, -1,000	ppmv: 0-20, -50, -100, -200, -500, -1k, x10	ppmv: 0-10, -25, -50, -100, -200, -300
Accuracy, % of Full Scale	+/- 1%	+/- 1%	+/- 1%	+/- 1%	+ 0.5%
Repeatability, % of Full Scale	0.5%	0.5%	0.5%	0.5%	0.5%
Sensitivity, % of Full Scale	0.5%	0.5%	0.5%	0.5%	<2% of Range
Zero/Span Drift, % of Full Scale	+/- 1%, in 24 Hrs	+/- 1%, in 24 Hrs	+/- 1%, in 24 Hrs	+/- 1%, in 24 Hrs	-
Response Time	3 Seconds	<2 Seconds	1.7 Seconds	<2.0 Seconds	30 seconds
Linearity, % of Full Scale	< 1%	< 1%	< 1%	< 1%	< 1%
Output	1V DC, 5V DC	0.1V DC, 1V DC	1V DC, 10V DC	1V DC, 10V DC	0-1V DC

OTHER CEMS EQUIPMENT				
Specification	**Sample Conditioner**		**Stripchart Recorder**	
System used	Primary	Back-up	System used	Primary
Manufacturer	Almega	Universal	Manufacturer	Yokogawa
Model	(in-house)	Model 540	Model	Model 2400
Principle	Refrigeration	Refrigeration	Pen Response	3 sec.
Max. Inlet Temperature	300 F	500 F	Input Voltage	user-selectable
Max. Inlet Pressure	50 psi	50 psi	Chart Speed	user-selectable
Max. Flow Rate	10 SCFH	7.0 Lpm	Chart Width	10 inches
Max. Water Concentration	50%	50%	Output	user-selectable
Outlet Dew-Point Temperature	< 37 F	35 F +/- 4 F	No. of Channels	30 user-select. 30 calc'd
Dew-Point Stability		+/- 0.5 F	Colors	10 color, user-selectable

5.2 EPA Method 19 – Stack Gas Volumetric Flow Rate (Calculated)

In this Method, the stack gas volumetric flow rate is stoichiometrically calculated using actual or published fuel gas characteristics and monitored data. The stack gas volumetric flow rate is calculated based on fuel rate, the heating value of the fuel, and the applicable F-factor (per EPA Method 19). The stoichiometric result is corrected for excess air using measured O_2 concentration or other parameter (e.g. CO_2). The equation used to calculate stack gas flow rate follows.

$$DSCFM = Q_f * HV * F_d / 1{,}000{,}000 * 20.9 / (20.9 - O_2)$$

where:

DSCFM	=	Stack gas flow rate, dscfm
Q_f	=	Fuel meter flow rate, cfm
HV	=	Fuel higher heating value, Btu/scf
F_d	=	Fuel dry oxygen F-factor, dscf/MMBtu
O_2	=	Stack gas O_2 content

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

Almega applies stringent quality assurance and quality control (QA/QC) procedures to ensure the validity of measurements for all test methods. The following section discusses general and project-specific QA/QC measures.

6.1 General QA/QC

Generally, Almega's QA/QC procedures follow guidelines from the "Quality Assurance Handbook for Air Pollution Measurement Systems," Volume I through III. And, procedures for pretest preparation and calibration of sampling equipment are followed. Standardized written procedures, calculator programs, and computer spreadsheets are used for test planning, pre-survey, equipment checklist, preliminary calculations, testing, data analysis, and reporting. Pretest equipment preparation and maintenance include organization of the following equipment prior to testing:

- Mobile RM CEM test van: Check fluids, fuel, mechanical conditions, verify operation of CEM instruments, sample lines and sample conditioner prior to the date of the source test.

- Sampling Equipment: Check meter boxes, pitot tubes, manometers and thermocouples to ensure in good working conditions and in proper calibrations. Preclean sampling trains and seal all openings prior to use.

Table 6.1 shows the test equipment calibration schedules. Table 6.2 shows the test equipment maintenance schedules.

6.2 Project-Specific QA/QC

This project included specific QA/QC activities required to validate the test results. These QA/QC activities are based on the test methods discussed in Section 4 and generally acceptable test procedures. Reference Methods used for source testing are promulgated by the California Air Resource Board (CARB), or the US Environmental Protection Agency (EPA). Any deviations from published Methods are approved in advance by the regulatory agency, prior to implementation if possible. Project-specific QA/QC activities and results that may impact test results are discussed in Section 3.

TABLE 6-1. TEST EQUIPMENT CALIBRATION SCHEDULE

Type Of Equipment	**Calibration Period**	**Standard Or Method Of Calibration**
Thermocouples	6 Months (ice, boiling water, hot oil)	Mercury Thermometer, three point calibration
Dry Gas Meters	6 Months	Calibrated Test Meter
Field Barometers	6 Months Check prior to usage	Mercury Barometer
S-Type Pitot	6 Months, check prior to usage	EPA Method 2, Measure physical configuration. Reshape pitot tips or calibrate if configuration does not meet the limits.
Pressure gauges	6 Months	Five-point calibration against manometer
	1 month	Three-point check
Temp. Meters	6 Months	Precision Potentiometer
CEM Systems	Bimonthly, or poor performance	Specified by Manufacture.

TABLE 6-2. TEST EQUIPMENT MAINTENANCE

Equipment	Check For	Correction	Frequency
CEM Systems malfunction, noise, drift, conversion efficiency for NO_X anlzr.	Absence of by the manufacture	As required or depend on performance	Bimonthly
Pumps leakage, flow, proper vacuum	Absence of Replace parts	Inspect, clean, of usage	300 hours
Flow Devices zeroing, obstruction, deformation	Levelling, or re-calibrate	Clean, replace, of usage	300 hours
Calibration Gases Pressure	Expiration date, tank gases	Re-certify, order new testing	2 months and prior to field
Regulators Gauge precision	Malfunction,	Repair or replace	3 months and prior to field testing
Gas Divider precision	Malfunction	Repair or replace	Monthly and before field testing
Condensers temperature	Leakage,	Repair or replace	Monthly and before field testing
Heated lines temperature, cleanliness	Leakage,	Repair, Clean, replace	Monthly and before field testing

APPENDICES

APPENDIX A

GENERAL CALCULATIONS AND FORMULAE

GENERAL CALCULATIONS

Standard conditions: 29.92 in.Hg, 60 °F

Gas Moisture at standard conditions (scf): $V_{WTR} = K2*V_{COND}$
K2 = 0.04707 @ 68 °F, 0.0464 @ 60 °F

Sample volume at standard conditions (scf):
Vmstd =K1*Vmacf*Ym*(Pbar+dH/13.6)/(Tm+460)
K1 = 17.64 @ 68 °F, 17.38 @ 60 °F

Percent of water: $\%H_2O = 100*Vmstd/(Vmstd+Vwtr)$

Dry molecular weight: $M_d = (44*\%CO_2+32*\%O_2+28*(\%N_2+\%CO))/100$

Wet molecular weight: $M_w = M_d*(1-\%H_2O/100)+18*(\%H_2O/100)$

Stack gas pressure (In. Hg): $P_{stk} = P_{bar}+P_{sta}/13.6$

Average velocity head: Ave. dP = $\{SQRT\ (dP)\}^2$

Stack gas velocity (fps): $V = 85.49*C_p*SQRT(dP)*SQRT((T_S+460)/(P_{STK}*M_w))$

Percent of excess air: $\%EXCA = 100*(\%O_2-0.5\%CO)/(0.264(\%N_2-(\%O_2-0.5\%CO)))$

Stack gas flow (scfm): $Q_{STK} = 60(1-\%H_2O/100)*V*A*(528/(T_s+460))*P_{stk}/29.92$

Concentration at 3% O_2: $PPM\ @\ 3\%\ O_2 = PPM_{measured}*17.9/(20.9-\%O_2)$

Emissions lb/MMBtu:
$lb/MMBtu=PPM*10^{-6}*(MW\ lb/lb\text{-}mole)/SV\ Mole*F_d*20.9/(20.9-\%O_2)$

Emissions lb/hr:
$lb/hr = PPM*10^{-6}*((MW\ lb/lb\text{-}mole)/SV)*F_d*FF*(1050\ Btu/scf)*20.9/(20.9-\%O_2)$

CALCULATIONS FOR METHOD 100:

Corrected PPM = $(PPM_{measured}-C_o)*C_{ma}/(C_m-C_o)$

Where: C_o = Average of initial and final bias zeros
C_m = Average of initial and final bias calibrations
C_{ma} = Certified gas value used for the bias calibration.

CALCULATIONS FOR METHOD 100, continued

Calibration Error=	100*(Certified value-Anlzr response)/Anlzr range
Percent Bias=	100*(Direct anlz. response-Bias response)/Anlz. range
System Zero/Span Drifts=	100*(Final-Initial)/Analz. range
Linearity=	100*(Anlz. mid. gas response-Predictive value)/range

Where the Predictive Value for the mid gas is found by a straight line drawn between hi gas and zero gas calibration points which can be calculated from the straight line equation, Y=mx+b where m is the slope of the line and b is the Y-intercept. The calculation is done by a computer spreadsheet for Method 100.1.

DEFINITIONS

A:	Stack cross area, Square feet
Cp:	Pitot coefficient
@h:	Orifice Pressure, In. H2O
MW:	Molecular weight
Md:	Dry molecular weight of flue gas
Mw:	Wet molecular weight of flue gas
Pbar:	Barometric pressure, In. Hg
Psta:	Static Pressure, In. H2O
Pstk:	Stack pressure, In, Hg
P:	Stack differential pressure, In. H2O
Qstk:	Stack gas flow, scfm
Tm:	Meter temperature, F
Ts:	Stack gas temperature, F
Vcond:	Volume of water condensation, ml
Vm:	Meter volume, acf
Vmstd:	Sample gas at standard conditions, scf
Vwtr:	Water vapor volume, scf
Ym:	Meter correction factor
SV:	Specific molar volume, 379.5 dscf/Lb.mole at 60F, or 385.3 dscf/Lb.mole at 68F
FF:	Fuel Flow Rate (SCF/HR)
Fd:	Dry Fuel Factor, for natural gas Fd=8710 Dscf/MMBTU at 68F.

APPENDIX B

APPROVALS AND CERTIFICATIONS

Appendix B1

CARB Testing Approvals

State of California

Air Resources Board

Approved Independent Contractor

Almega Environmental & Technical Services, Incorporated

This is to certify that the company listed above has been approved by the Air Resources Board to conduct compliance testing pursuant to section 91207, title 17, California Code of Regulations, until June 30, 2007, for those test methods listed below:

ARB Source Test Methods

1, 2, 3, 4, 5, 8, 11, 13B, 15

100, CO, CO2, NOx, O2, SO2, THC, 410A, 434

William V. Loscutoff, Chief
Monitoring and Laboratory Division

90 56165

13-1

APPENDIX C

CONTINUOUS MONITORING OF GASEOUS EMISSIONS, CEMS

Appendix C1

CEMS – Results and Calculations

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Bros
City: Long Beach, CA
Source: ICE-Port
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS	Drift-corr.
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span	(Cm)	(Ccorr.)
100% Load	9/9 15:08 15:18	O2	20.9	0.00	21.0	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	17.74	17.77
		nd															
		nd															
		Nox	224	0.00	224.9	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	440.35	441.22

G-1

AETS CEMS Data -- Run-by-Run Basis

	100 % Load-Port			
	Time	O2	CO2	Nox
#	AVG	17.74	0.27	440.35
1	15:08:02	17.86	0.36	421.8
2	15:09:02	18.08	0.35	393.7
3	15:10:02	17.93	0.34	410.1
4	15:11:02	17.91	0.33	416.9
5	15:12:02	17.97	0.32	413.1
6	15:13:02	17.74	0.31	438.4
7	15:16:00	17.81	0.31	429.3
8	15:16:00	17.84	0.29	424.8
9	15:16:02	17.73	0.29	434.8
10	15:17:02	17.75	0.27	440.6
11	15:20:50	17.73	0.27	440.1

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Bros
City: Long Beach, CA
Source: ICE-Port
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS	Drift-corr.
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span	(Cm)	(Ccorr.)
75% Load	9/9	O2	20.9	0.00	21.00	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	18.70	**18.74**
	14:55	nd															
	15:05	nd															
		Nox	224	0.00	224.90	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	287.90	**288.16**

C-3

AETS CEMS Data -- Run-by-Run Basis

	75 % Load-Port			
	Time	O2	CO2	Nox
#	AVG	18.70	0.41	287.90
1	14:55:02	18.66	0.55	281.6
2	14:56:02	18.82	0.55	253
3	14:57:02	18.64	0.53	296.5
4	14:58:02	18.7	0.5	284.9
5	14:59:02	18.57	0.5	301.7
6	15:00:02	18.55	0.47	305.8
7	15:01:02	18.63	0.46	300.2
8	15:02:02	18.42	0.45	322.1
9	15:03:02	18.61	0.43	306.1
10	15:04:02	18.73	0.41	284.1
11	15:05:02	18.66	0.41	291.7

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Bros
City: Long Beach, CA
Source: ICE-Port
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS (Cm)	Drift-corr. (Ccorr.)
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span		
50% Load	9/9	O2	20.9	0.00	21.00	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	18.56	**18.59**
	14:43	nd															
	14:53	nd															
		Nox	224	0.00	224.90	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	262.35	**262.50**

C-5

AETS CEMS Data -- Run-by-Run Basis

	50 % Load-Port			
	Time	O2	CO2	Nox
#	AVG	18.56	0.62	262.35
1	14:43:02	18.55	0.78	260.8
2	14:44:02	18.6	0.77	253.8
3	14:45:02	18.6	0.76	255.4
4	14:46:02	18.76	0.72	235.4
5	14:47:02	18.58	0.71	258.1
6	14:48:02	18.69	0.7	248.0
7	14:49:02	18.62	0.68	252.1
8	14:50:02	18.66	0.66	247.7
9	14:51:02	18.69	0.63	245.6
10	14:52:02	18.58	0.63	254.8
11	14:53:02	18.53	0.6	269.9

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Brothers
City: Pier D, Long Beach, CA
Source: ICE-Port
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS (Cm)	Drift-corr. (Ccorr.)
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span		
1	9/9	O2	20.9	0.00	21.00	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	18.77	18.81
Low	14:25	nd															
25%	14:35	nd															
		Nox	224	0.00	224.90	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	190.15	190.01

C-7

AETS CEMS Data -- Run-by-Run Basis

	25 % Load-Port			
	Time	O2	CO2	Nox
#	AVG	18.77	0.99	190.15
1	14:25:02	18.66	1.27	192.10
2	14:26:02	18.69	1.25	192.40
3	14:27:02	18.73	1.21	189.80
4	14:28:02	18.72	1.17	191.10
5	14:29:02	18.78	1.14	186.10
6	14:30:02	18.80	1.12	184.10
7	14:31:02	18.76	1.08	189.50
8	14:32:02	18.76	1.06	190.20
9	14:33:02	18.81	1.02	189.40
10	14:34:02	18.72	1.01	193.70
11	14:35:02	18.82	0.97	186.60

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Brothers
City: Pier D, Long Beach, CA
Source: ICE-Starboard
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS	Drift-corr.
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span	(Cm)	(Ccorr.)
100% Load	9/9	O2	20.9	0.00	21.0	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	13.81	**13.78**
	16:40	nd															
	16:50	nd															
		Nox	224	0.00	224.9	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	828.90	**831.34**

C-9

AETS CEMS Data -- Run-by-Run Basis

	100 % Load-Starboard			
	Time	O2	CO2	Nox
#	AVG	13.81	0.00	828.90
1	16:40:02	13.74	0	819.1
2	16:41:02	13.38	0	856.1
3	16:42:02	13.41	0	857.8
4	16:43:02	13.4	0	860.4
5	16:44:02	13.57	0	846.9
6	16:45:02	13.66	0.01	845.3
7	16:46:02	13.79	0	830.7
8	16:47:02	13.7	0	838.5
9	16:48:02	13.86	0	829.9
10	16:49:02	13.83	0	825.5
11	16:50:02	13.78	0	832.3

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Brothers
City: Pier D, Long Beach, CA
Source: ICE-Starboard
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS	Drift-corr.
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span	(Cm)	(Ccorr.)
75% Load	9/9	O2	20.9	0.00	21.0	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	14.74	14.73
	16:28	nd															
	16:38	nd															
		Nox	224	0.00	224.9	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	706.90	708.85

AETS CEMS Data -- Run-by-Run Basis

	75 % Load-Starboard			
	Time	O2	CO2	Nox
#	AVG	14.74	0.00	706.90
1	16:28:02	14.87	0	683.5
2	16:29:02	14.72	0	711.6
3	16:30:02	14.81	0	705.7
4	16:31:02	14.84	0	700.3
5	16:32:02	14.87	0	692.5
6	16:33:02	14.89	0	692.5
7	16:34:02	14.85	0.01	695.5
8	16:35:02	14.9	0	688.4
9	16:36:02	14.66	0	715.9
10	16:39:38	14.73	0	713
11	16:39:38	14.75	0	700.8

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Brothers
City: Pier D, Long Beach, CA
Source: ICE-Starboard
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS	Drift-corr.
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span	(Cm)	(Ccorr.)
50% Load	9/9 16:03 16:13	O2	20.9	0.00	21.0	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	20.59	20.65
		nd															
		nd															
		Nox	224	0.00	224.9	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	34.25	33.48

C-18

AETS CEMS Data -- Run-by-Run Basis

	50 % Load-Starboard			
	Time	O2	CO2	Nox
#	AVG	20.59	0.03	34.25
1	16:03:02	20.52	0.04	42.5
2	16:04:02	20.55	0.04	39.8
3	16:05:02	20.56	0.05	37.9
4	16:06:02	20.58	0.02	34.6
5	16:07:02	20.58	0.03	34.4
6	16:08:02	20.59	0.03	34.2
7	16:09:02	20.59	0.03	35
8	16:10:02	20.58	0.02	35.5
9	16:11:02	20.58	0.02	34.4
10	16:12:02	20.58	0.03	35.5
11	16:13:02	20.59	0.02	33

RM CONTINUOUS EMISSIONS MONITORING SYSTEM

Facility: Sause Brothers
City: Pier D, Long Beach, CA
Source: ICE-Starboard
Date: 09/09/2006
Operator: TA / RS

Test Duration: 10 min.

Gas Data		DIR-Cal For:		9/9
Type	F.S.	CERT	zero	Cal
O2	25	20.9	0	21.0
nd	nd			
nd				
Nox	250	224	0	224.9

Run No.	Date Time Start End	Gas Type	Gas Value	RM Direct Calibration Response		System Bias Response				Calibration Drift (%)		System Bias Error (%)				Concentration	
						Initial		Final				Initial		Final		Avg DAS	Drift-corr.
				zero	span	Zero (iZ)	Span (iSP)	Zero (fZ)	Span (fSP)	Zero (Zdr)	Span (Cdr.)	Zero	Span	Zero	Span	(Cm)	(Ccorr.)
25% Load	9/9	O2	20.9	0.00	21.0	0.16	20.87	0.25	20.79	0.4	-0.3	0.6	-0.5	1.0	-0.8	20.46	**20.53**
	15:23	nd															
	15:33	nd															
		Nox	224	0.00	224.9	0	220.3	1.8	227.7	0.7	3.0	0.0	-1.8	0.7	1.1	41.15	**40.41**

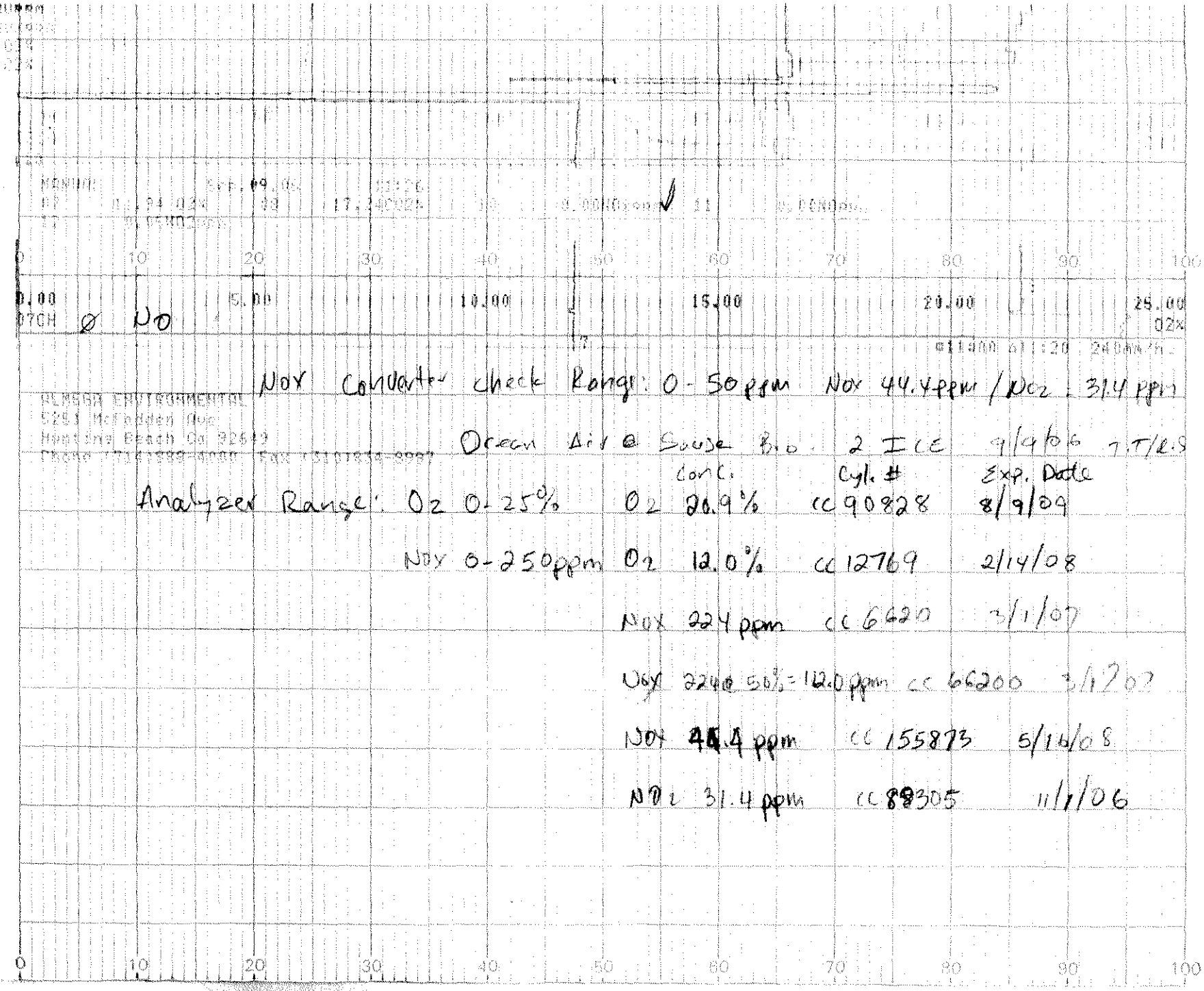
C1-15

AETS CEMS Data -- Run-by-Run Basis

	25 % Load-Starboard			
	Time	O2	CO2	Nox
#	AVG	20.46	0.16	41.15
1	15:23:02	20.54	0.21	31.4
2	15:24:02	20.51	0.21	34.5
3	15:25:02	20.47	0.21	38
4	15:26:02	20.47	0.19	39.4
5	15:27:02	20.49	0.18	36.1
6	15:28:02	20.47	0.19	38.8
7	15:29:02	20.44	0.17	41.3
8	15:30:02	20.49	0.16	36.1
9	15:31:02	20.46	0.16	41.8
10	15:32:02	20.43	0.16	44.5
11	15:33:02	20.49	0.15	37.8

Appendix C2

CEMS – Stripchart

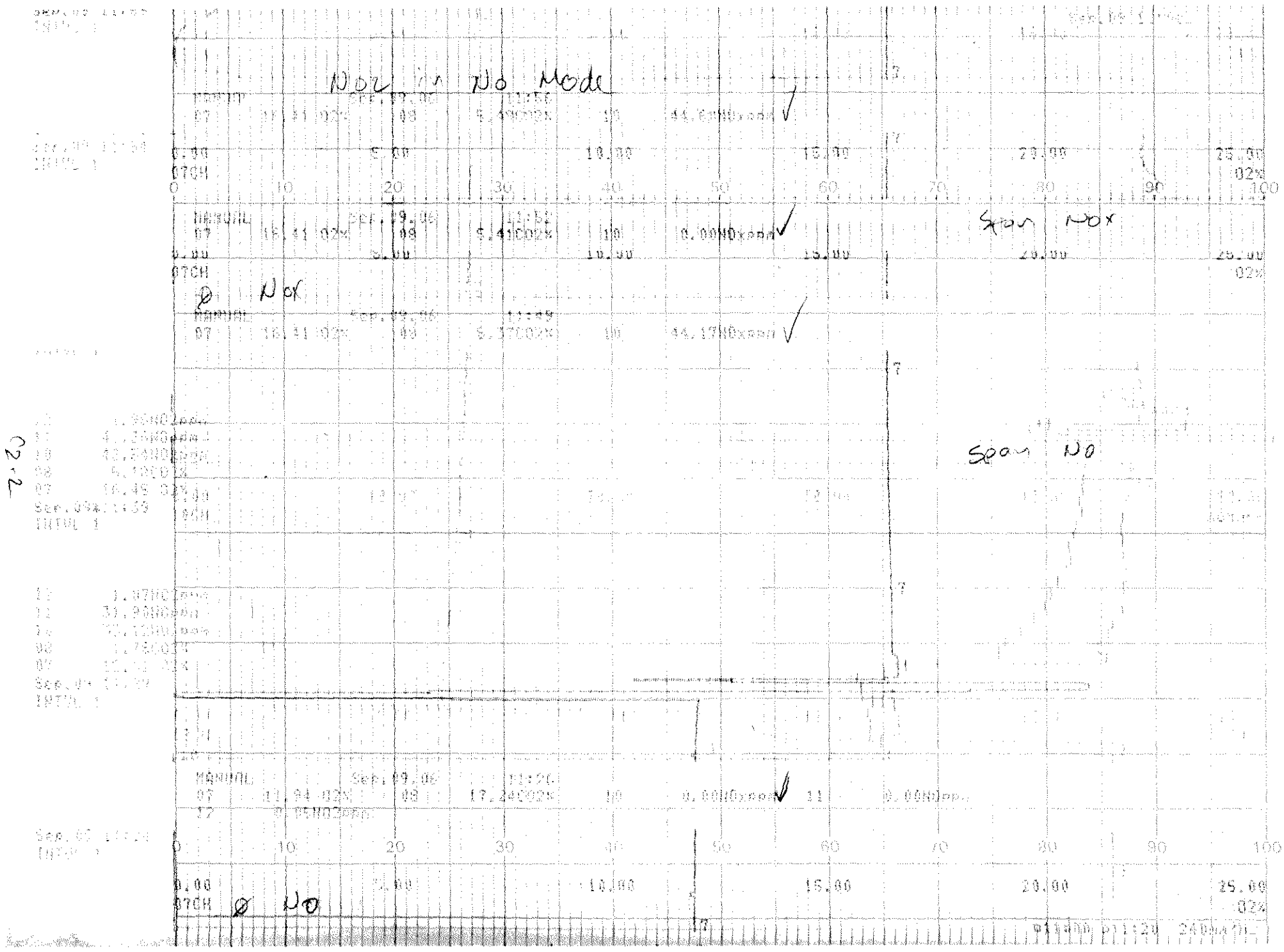


NOx Converter check Range: 0-50 ppm NOx 44.4 ppm / NO2 : 31.4 ppm

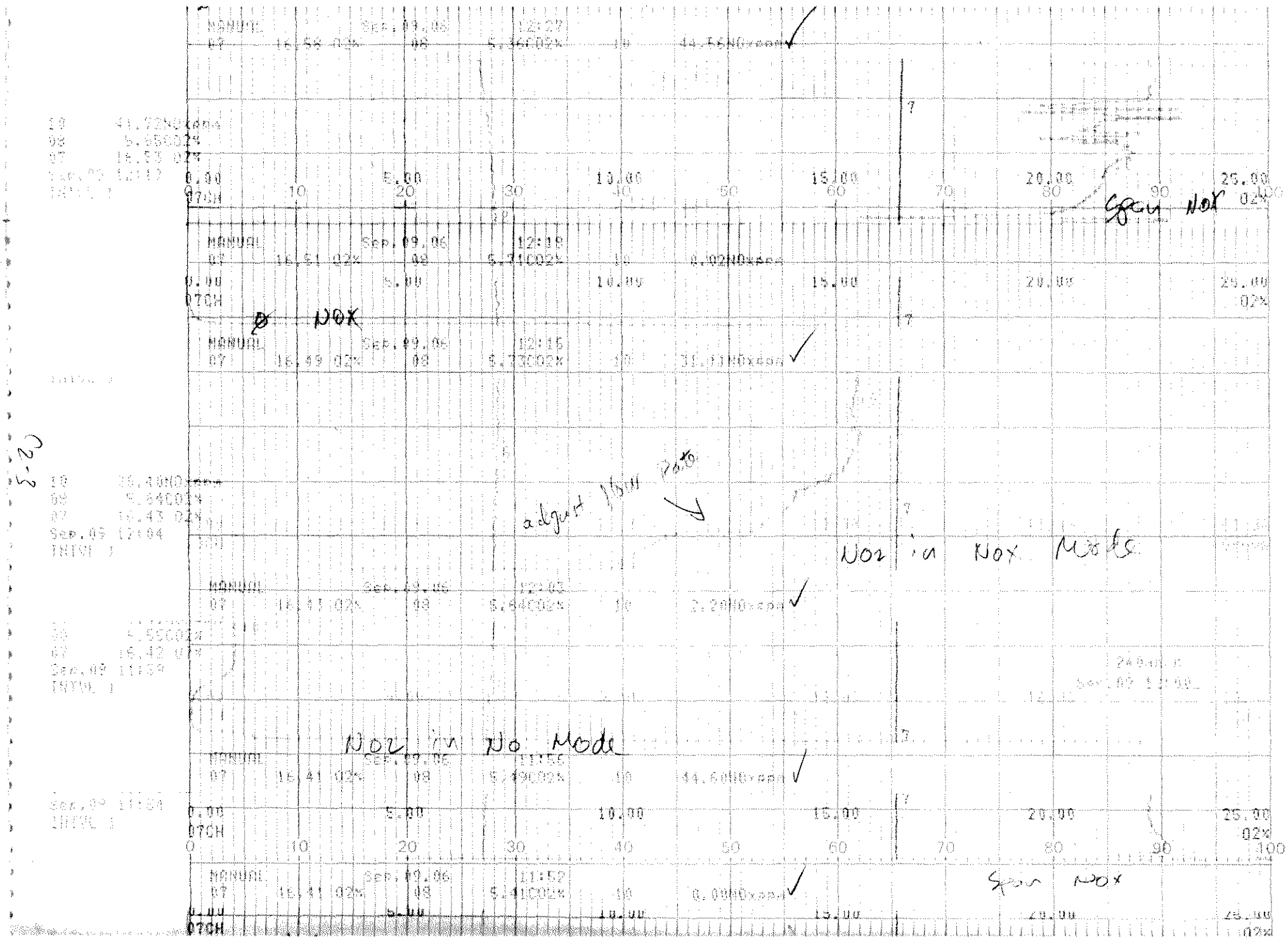
Ocean Air @ Sause B.O. 2 ICE 9/9/06 7.T/2.9

		Conc.	Cyl. #	Exp. Date
Analyzer Range: O2 0-25%	O2	20.9%	CC 90828	8/9/09
NOx 0-250 ppm	O2	12.0%	CC 12769	2/14/08
	NOx	224 ppm	CC 6620	3/1/07
	NOx	224 @ 50% = 112.0 ppm	CC 66200	3/1/07
	NO	44.4 ppm	CC 155873	5/14/08
	NO2	31.4 ppm	CC 88305	11/1/06

C2-1



C2.2


Span NOx
NOx
adjust flow pots
NO2 in NOx Mode
NO2 in NO Mode
Span NOx

C-3

40%

MANUAL Sep.09.06 12:45
07 12.13 02% 08 4.71CO2% 10 54.19NOxppm

02%

60%

MANUAL Sep.09.06 12:45
07 11.53 02% 08 4.75CO2% 10 ****NOxppm

0.00 5.00 10.00 15.00 20.00 25.00
07CH 10 20 30 40 50 60 70 80 90 100 02%

60%

MANUAL Sep.09.06 12:40
07 20.89 02% 08 4.83CO2% 10 ****NOxppm

07CH 02%

100%

MANUAL Sep.09.06 12:38
07 11.97 02% 08 4.84CO2% 10 19.37NOxppm

mid

MANUAL Sep.09.06 12:35
07 20.98 02% 08 4.95CO2% 10 0.00NOxppm

span O2

MANUAL Sep.09.06 12:30
07 0.08 02% 08 5.17CO2% 10 0.00NOxppm

0 O2 Gas Divider check O2 0-25% Range. O2 20.9%, challenge gas 12.0%

MANUAL Sep.09.06 12:27
07 16.58 02% 08 5.36CO2% 10 44.56NOxppm

03 51.72NOxppm
08 5.65CO2%
07 16.53 02%
Sep.09.06 12:19
07CH

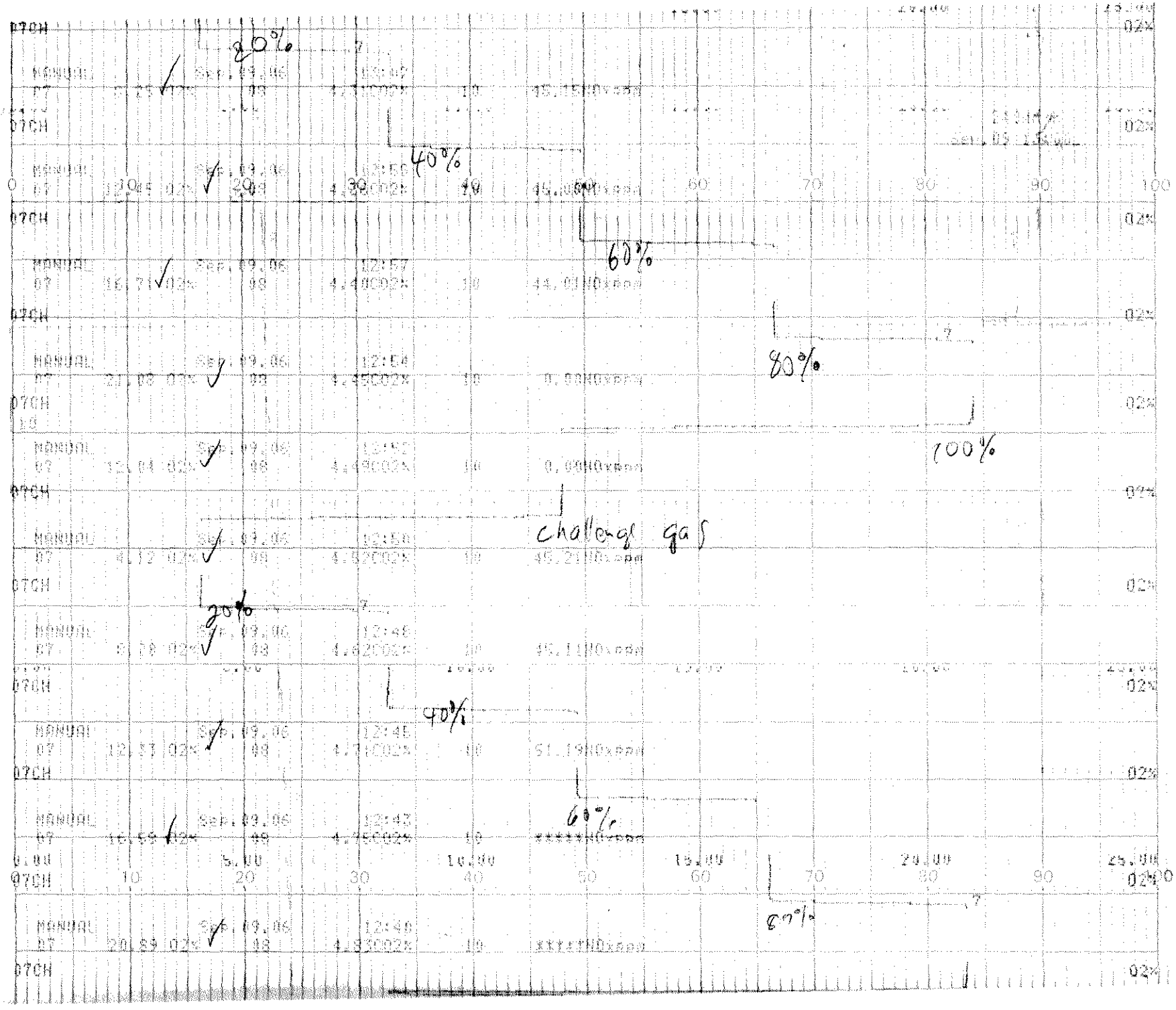
0.00 5.00 10.00 15.00 20.00 25.00
10 20 30 40 50 60 70 80 90 100 02%

span NOx

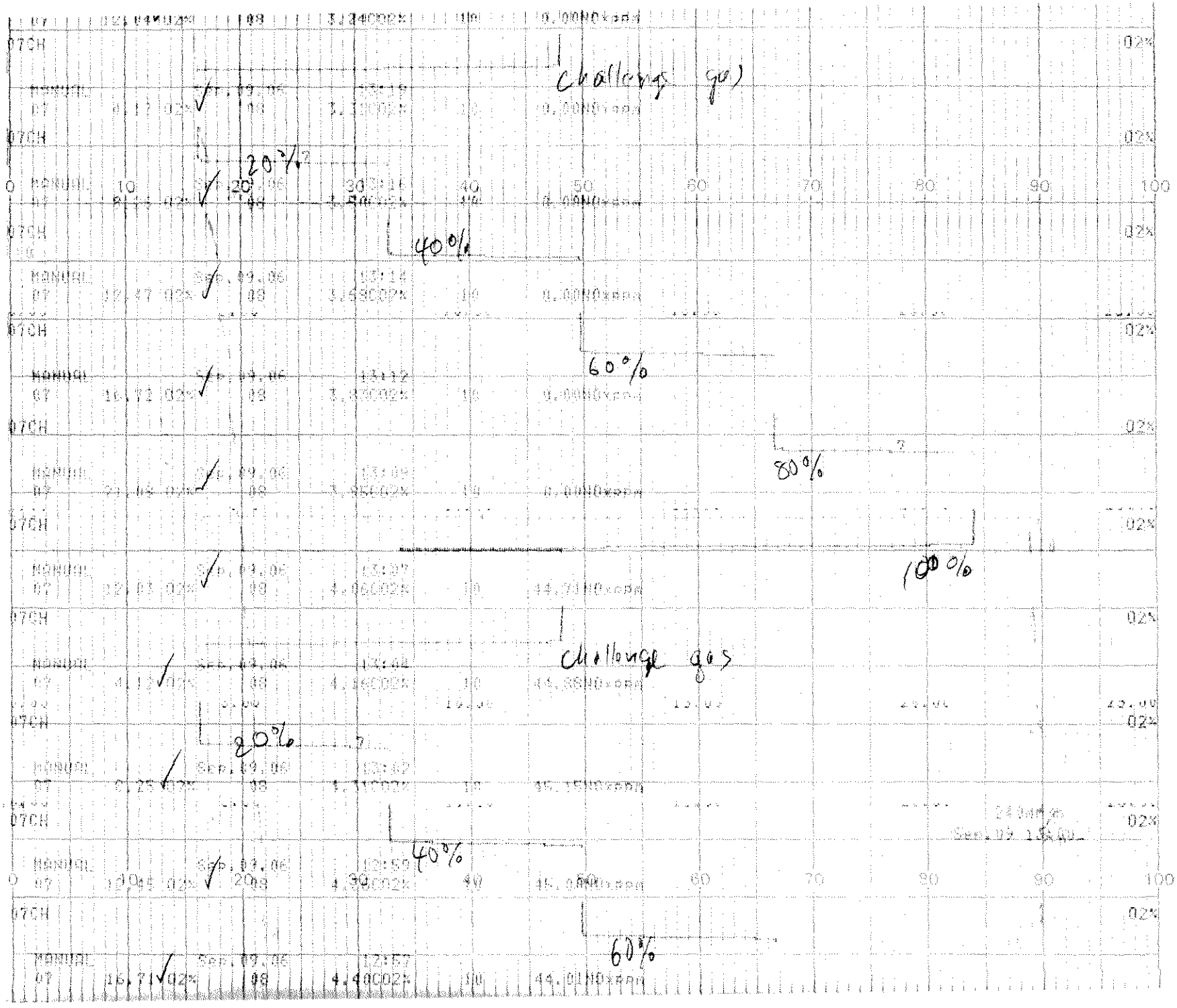
MANUAL Sep.09.06 12:19
07 16.51 02% 08 5.71CO2% 10 0.02NOxppm

0.00 5.00 10.00 15.00 20.00 25.00

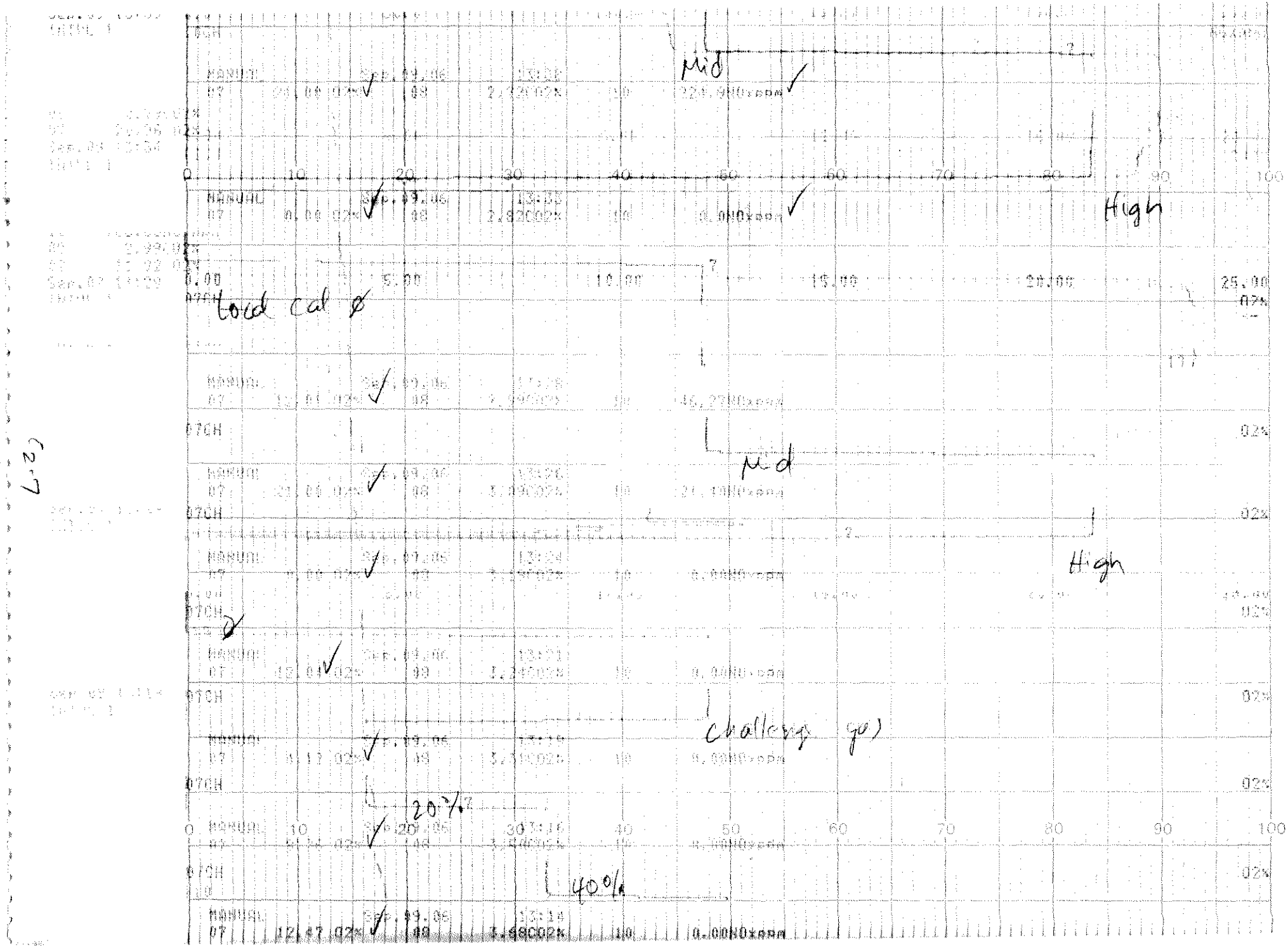
C2-9

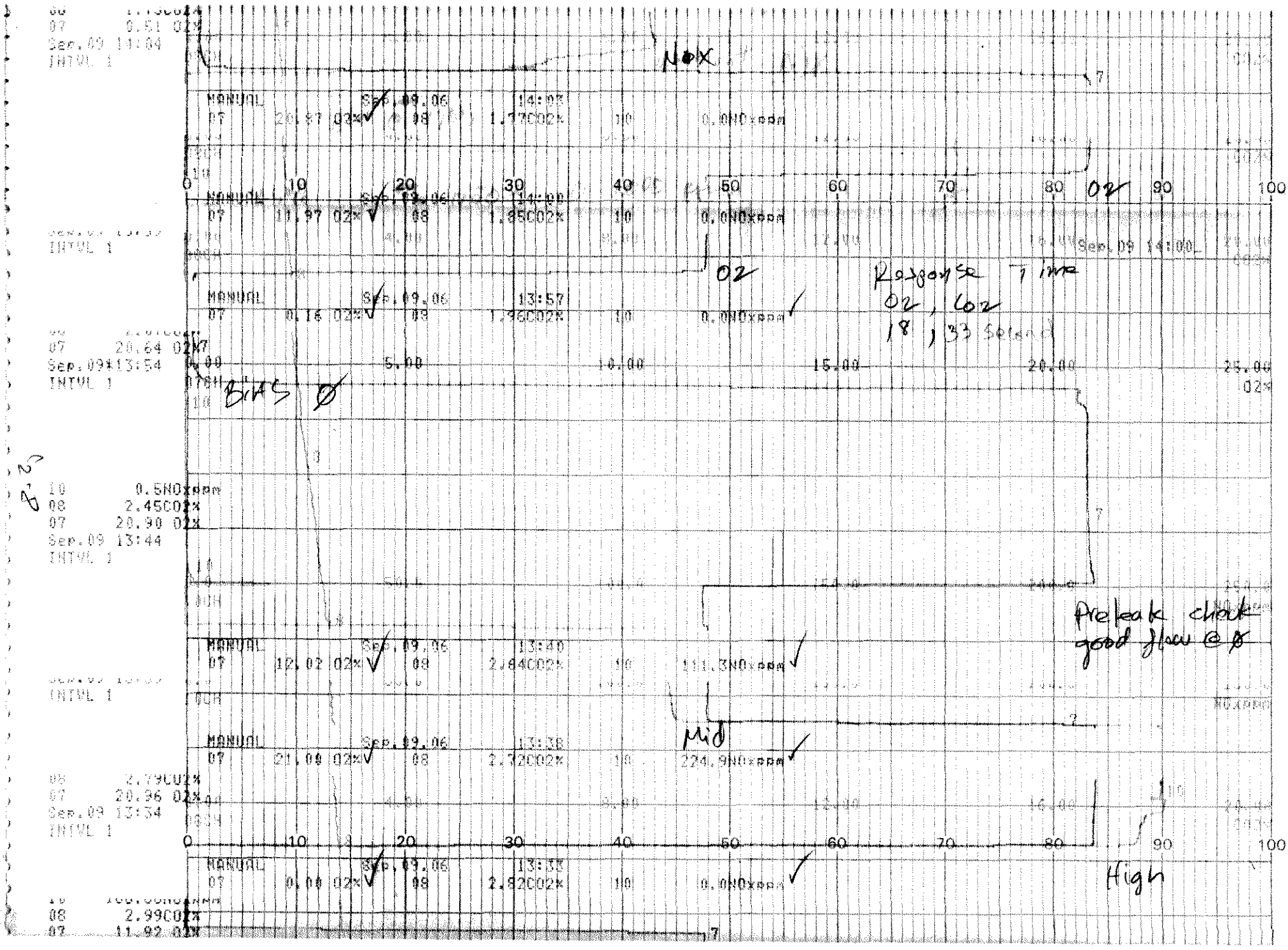

07CH
MANUAL
Sep.09.06
12:57
4.480025
10
44.01NOxppm
12:54
4.450025
0.00NOxppm
12:52
4.190025
12:50
4.020025
45.21NOxppm
12:48
4.020025
45.11NOxppm
12:45
4.710025
51.19NOxppm
12:43
4.750025
12:40
4.930025
80%
60%
40%
20%
100%
challenge gas
0.00
5.00
10.00
15.00
20.00
25.00
10
20
30
40
50
60
70
80
90
100
02%

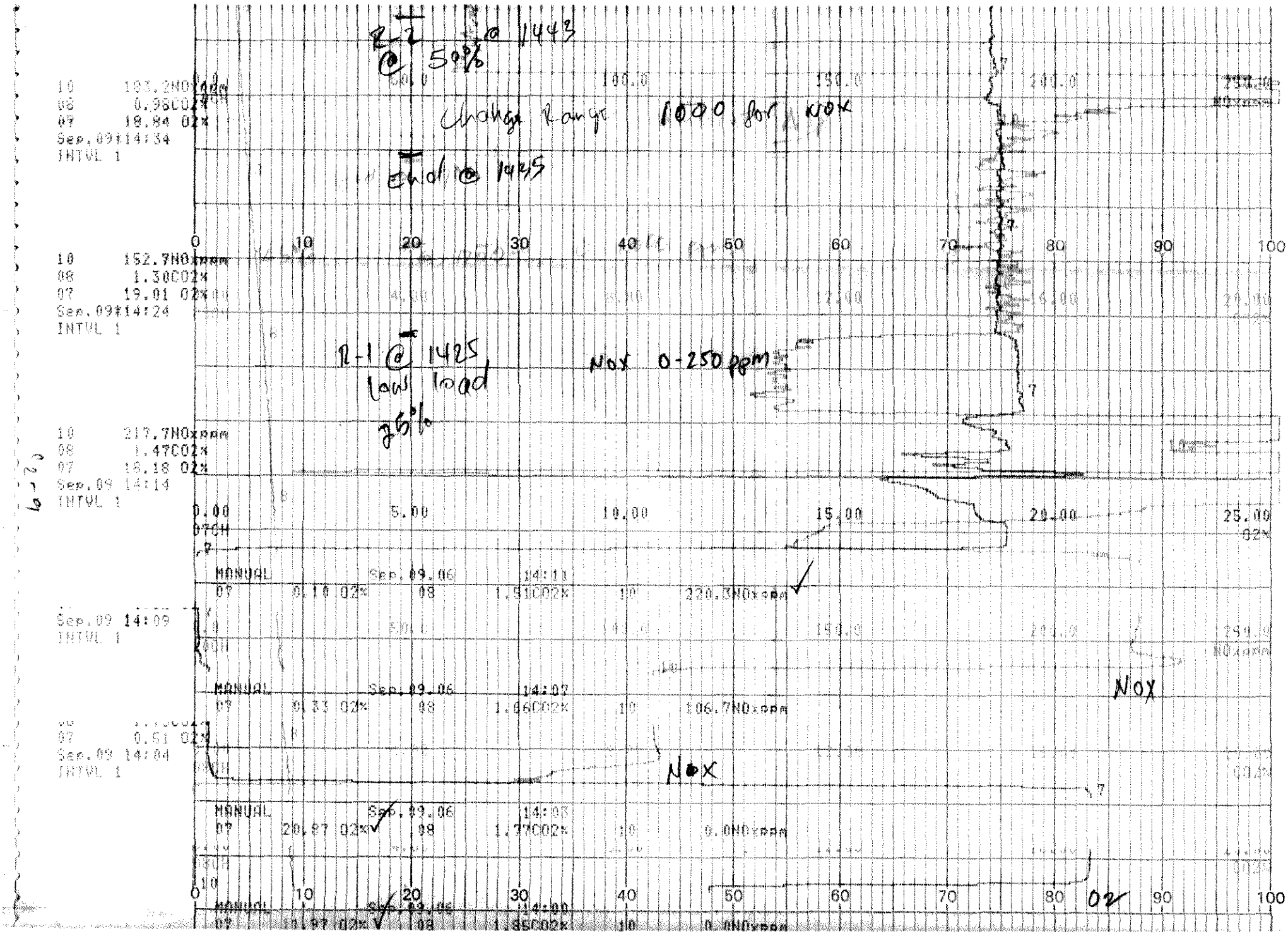
C-5

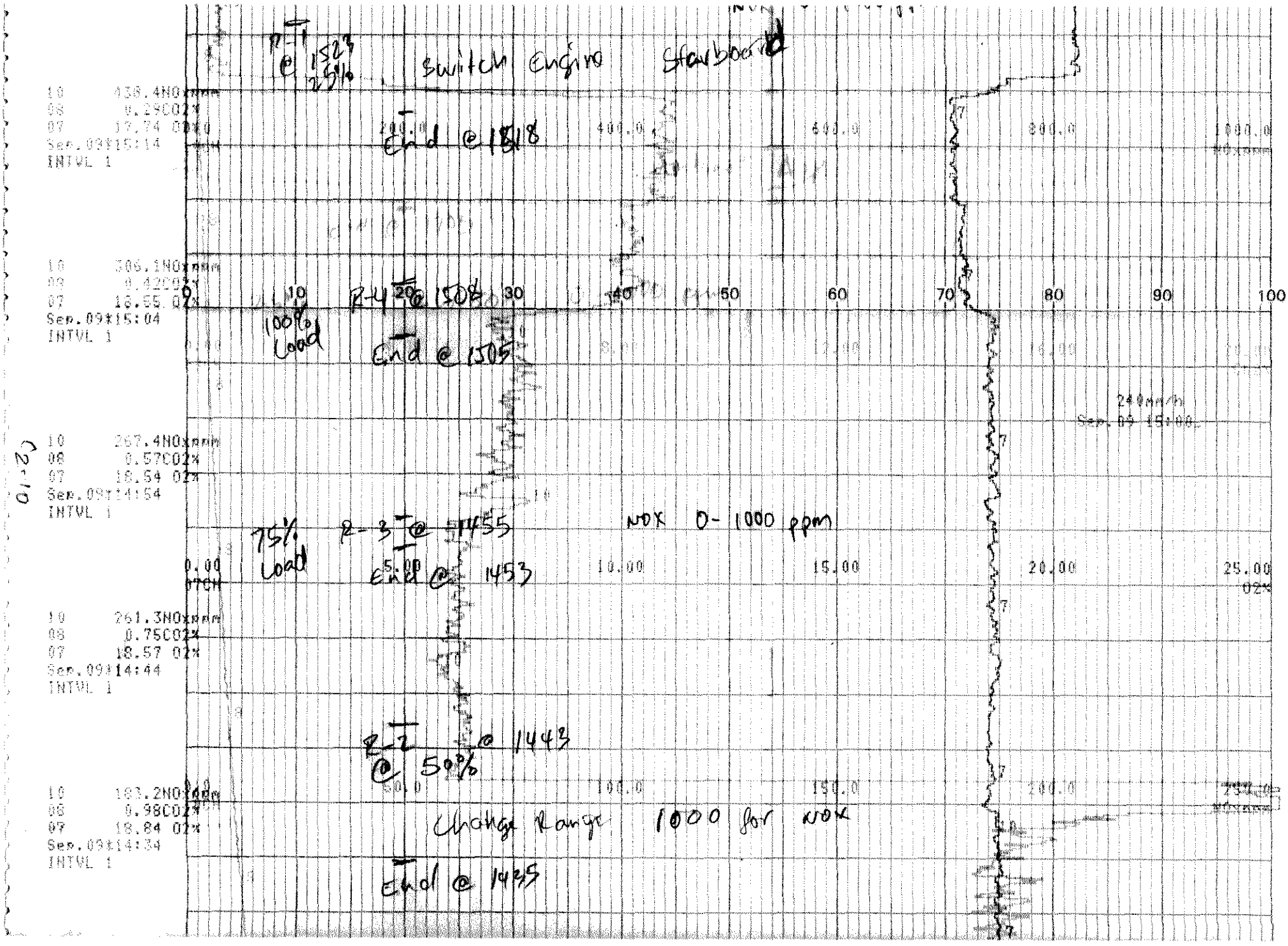

challenge goes
20%
40%
60%
80%
100%
challenge goes
20%
40%
60%
0
10
20
30
40
50
60
70
80
90
100

9-2)

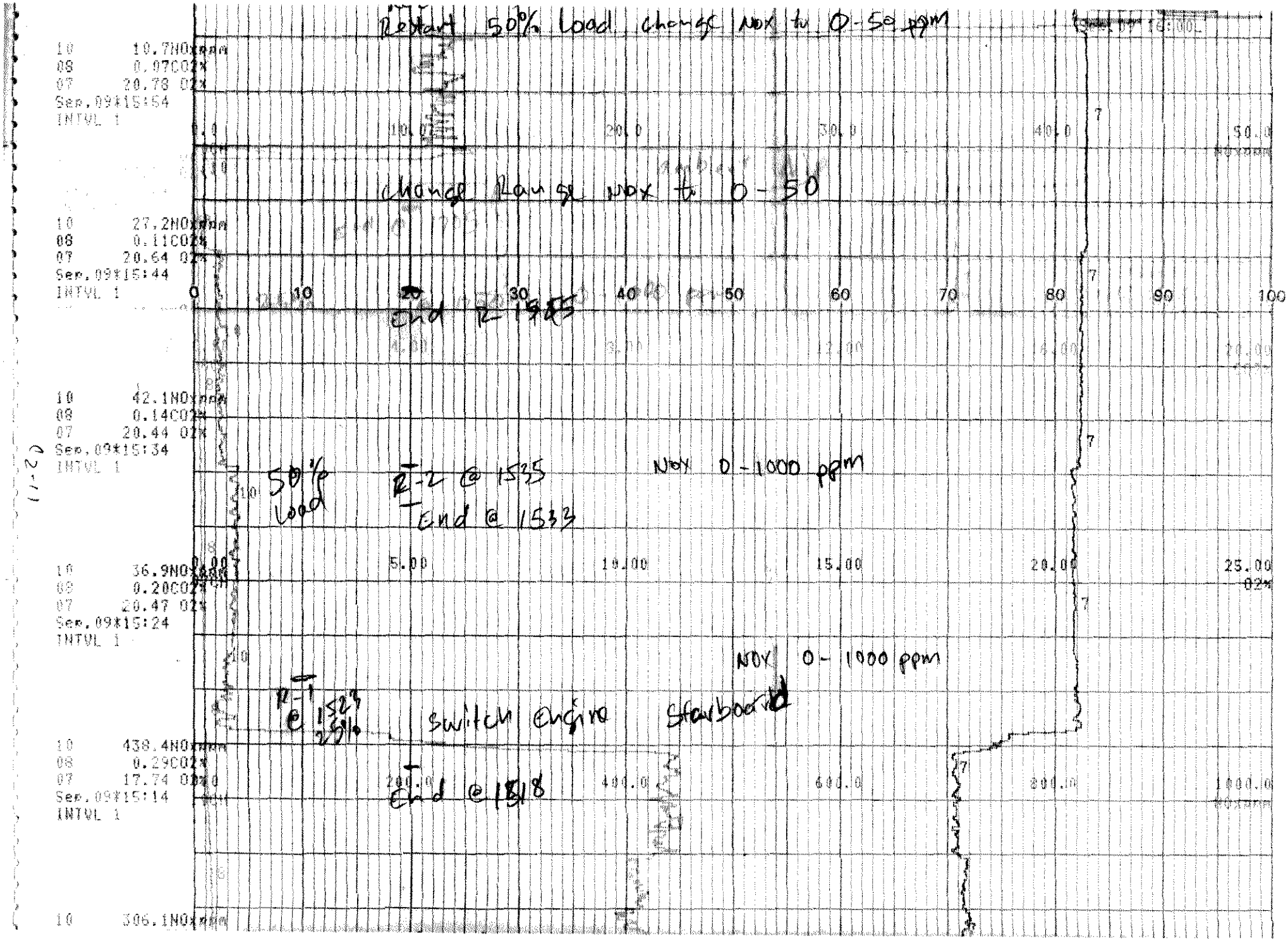

Mid
High
0
10
20
30
40
50
60
70
80
90
100
0.00
5.00
10.00
15.00
20.00
25.00
Mid
High
20%
40%


NOX
O2
Response Time
O2, CO2
18, 33 Seconds
BAS Ø
Prelook check
good flow @ Ø
Mid
High

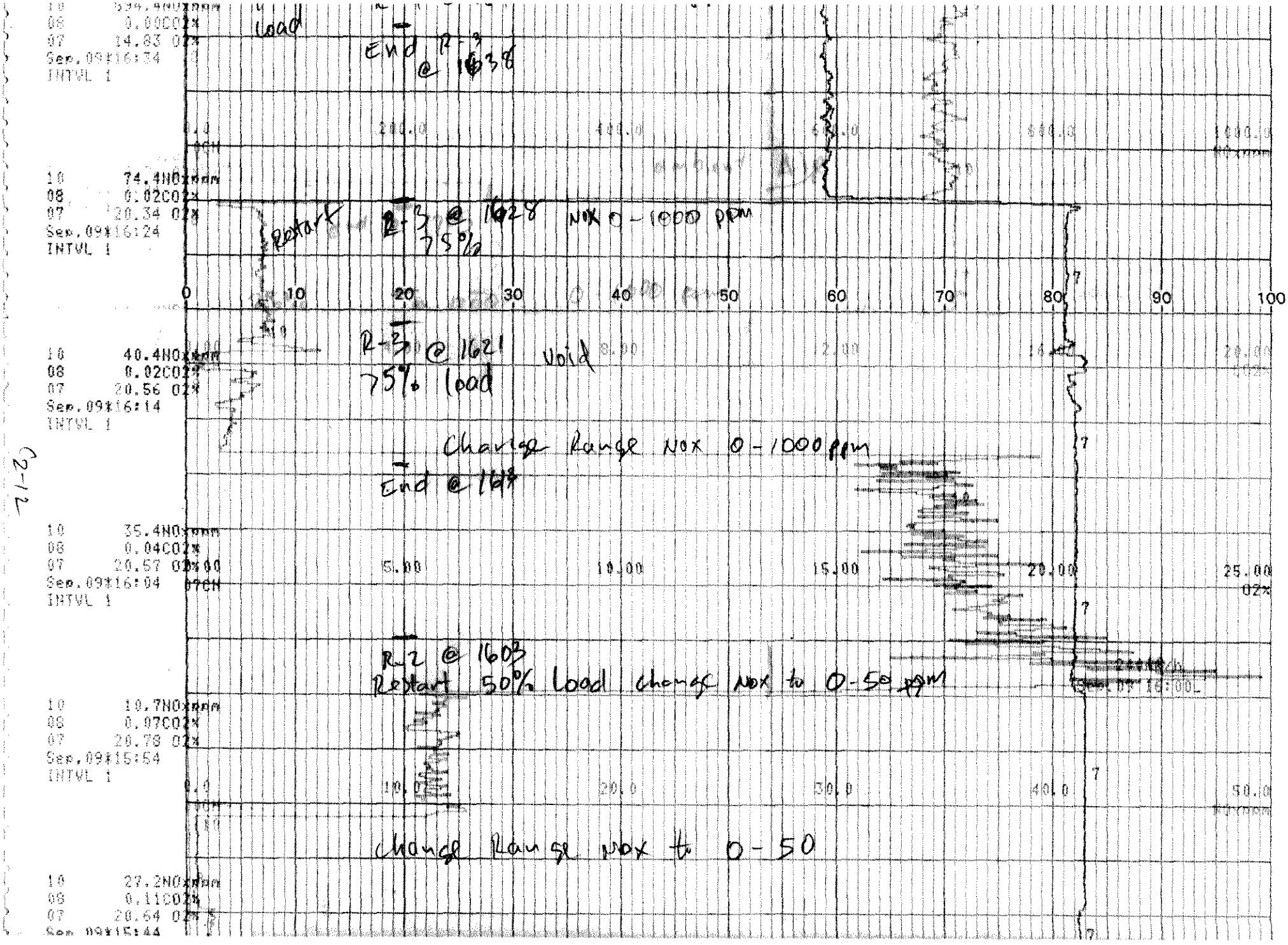

R-2 @ 1443
@ 50%
Change Range 1000 for NOx
End @ 1445
R-1 @ 1425
Low load
75%
NOx 0-250 ppm
NOx
NOx
O2
10 183.2NOxppm
08 0.98CO2%
07 18.84 O2%
Sep.09 14:34
INTVL 1
10 152.7NOxppm
08 1.30CO2%
07 19.01 O2%
Sep.09 14:24
INTVL 1
10 217.7NOxppm
08 1.47CO2%
07 18.18 O2%
Sep.09 14:14
INTVL 1
MANUAL Sep.09.06 14:11
07 0.10 O2% 08 1.51CO2% 10 220.3NOxppm
Sep.09 14:09
INTVL 1
MANUAL Sep.09.06 14:07
07 0.33 O2% 08 1.66CO2% 10 106.7NOxppm
07 0.51 O2%
Sep.09 14:04
INTVL 1
MANUAL Sep.09.06 14:03
07 20.87 O2% 08 1.77CO2% 10 0.0NOxppm
MANUAL Sep.09.06 14:00
07 0.57 O2% 08 1.85CO2% 10 0.0NOxppm


R-1 @ 1523
25%
Switch Engine Starboard
End @ 1518
10 438.4NOxppm
08 0.29CO2%
07 17.74 O2%
Sep.09#15:14
INTVL 1
R-4 @ 1504
100% Load
End @ 1505
10 306.1NOxppm
08 0.42CO2%
07 16.55 O2%
Sep.09#15:04
INTVL 1
240mm/h
Sep.09 15:00
10 267.4NOxppm
08 0.57CO2%
07 18.54 O2%
Sep.09#14:54
INTVL 1
75% Load
R-3 @ 1455
End @ 1453
NOX 0-1000 ppm
10 261.3NOxppm
08 0.75CO2%
07 18.57 O2%
Sep.09#14:44
INTVL 1
R-2 @ 1443
@ 50%
Change Range 1000 for NOX
10 183.2NOxppm
08 0.98CO2%
07 18.84 O2%
Sep.09#14:34
INTVL 1
End @ 1425
10 20 30 40 50 60 70 80 90 100
0.00 5.00 10.00 15.00 20.00 25.00
O2%
0 200.0 400.0 600.0 800.0 1000.0
NOxppm

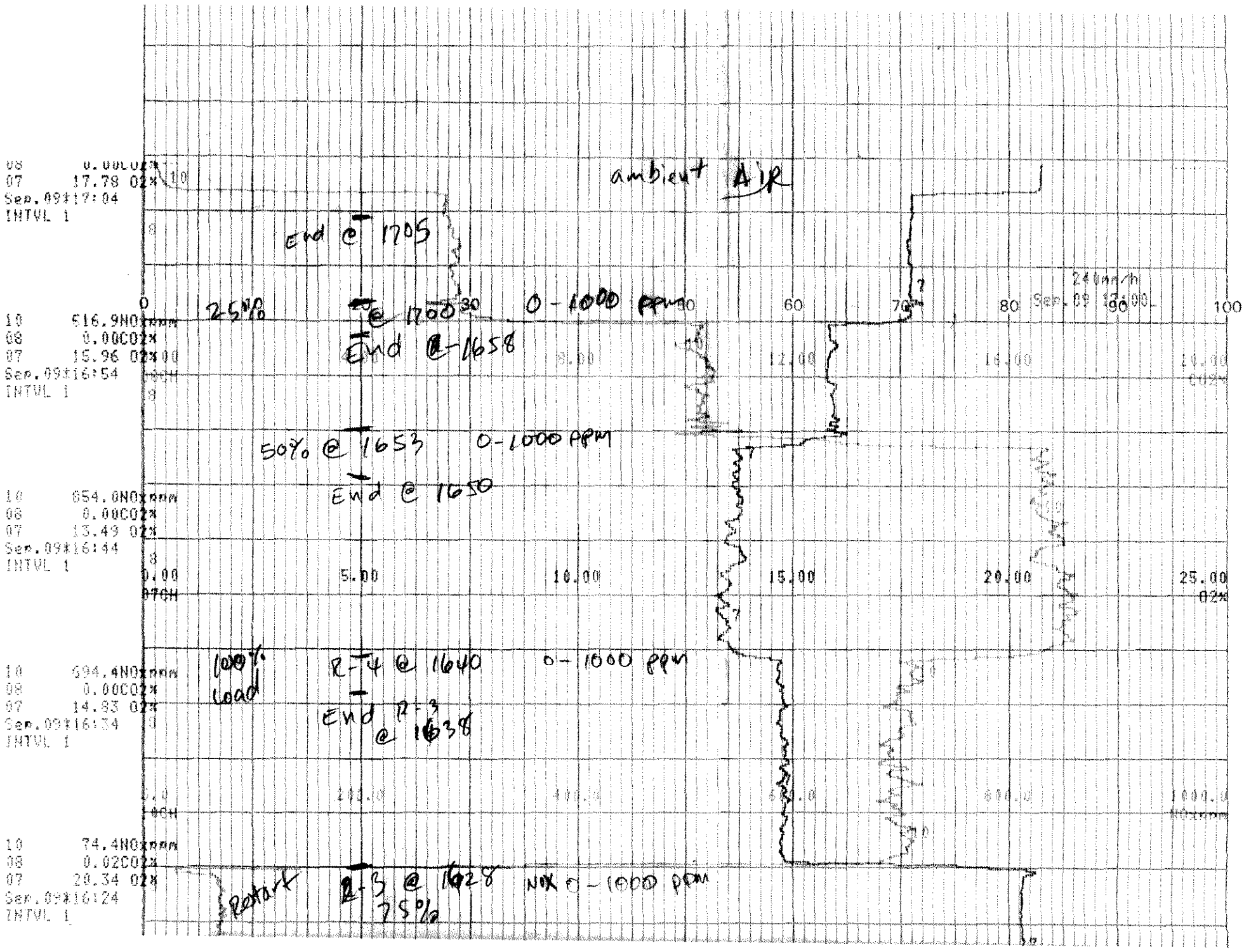
C-10


Restart 50% Load change NOX to 0-50 ppm
10 10.7NOxppm
08 0.07CO2%
07 20.78 O2%
Sep.09*15:54
INTVL 1
change Range NOX to 0-50
10 27.2NOxppm
08 0.11CO2%
07 20.64 O2%
Sep.09*15:44
INTVL 1
End R-1 1545
10 42.1NOxppm
08 0.14CO2%
07 20.44 O2%
Sep.09*15:34
INTVL 1
50% Load
R-2 @ 1535
End @ 1533
NOX 0-1000 ppm
10 36.9NOxppm
08 0.20CO2%
07 20.47 O2%
Sep.09*15:24
INTVL 1
NOX 0-1000 ppm
R-1 @ 1523
switch engine Starboard
10 438.4NOxppm
08 0.29CO2%
07 17.74 O2%
Sep.09*15:14
INTVL 1
End @ 1518
10 306.1NOxppm

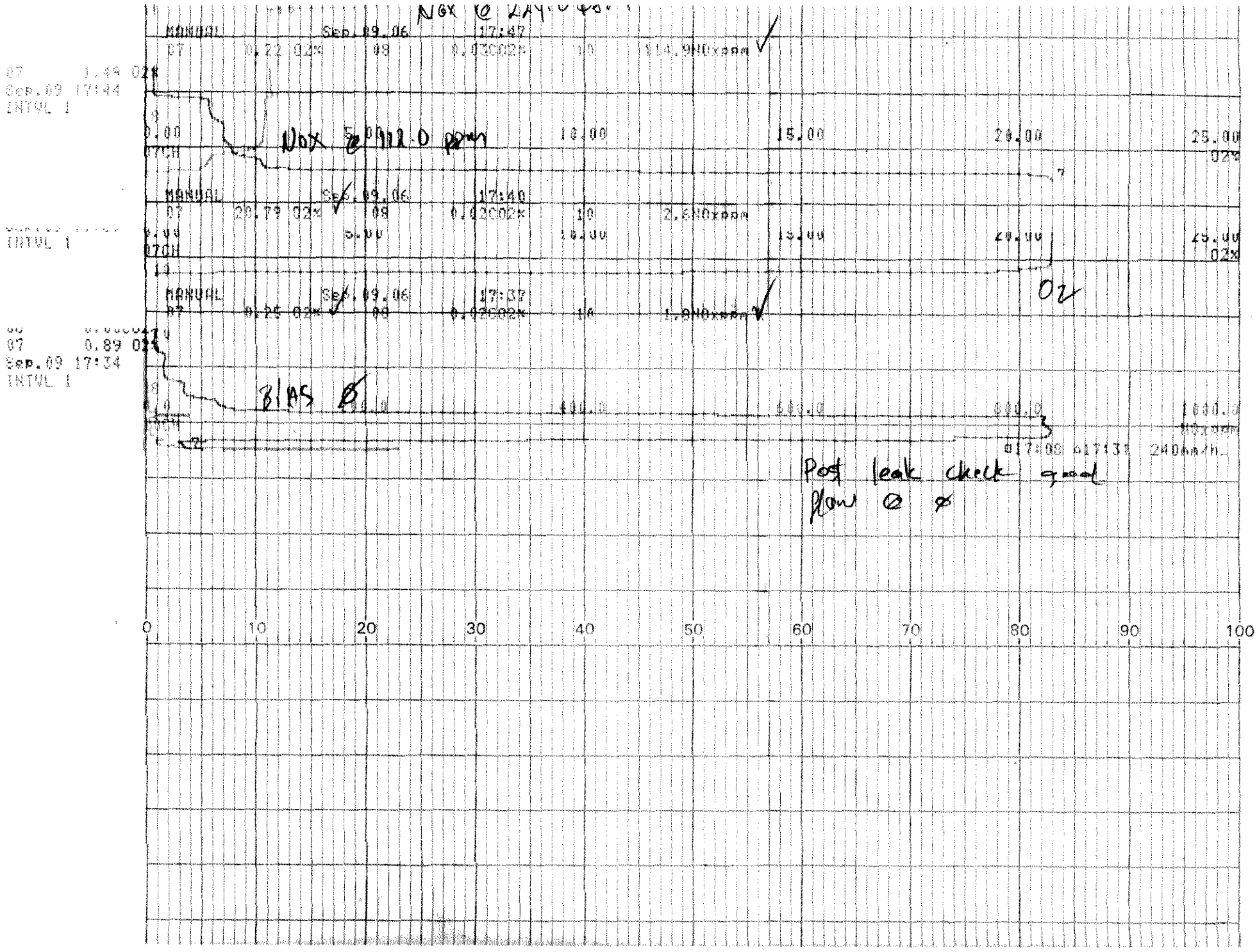
C2-11


10 534.4NOxppm
08 0.00CO2%
07 14.83 O2%
Sep.09*16:34
INTVL 1
Load
End R-3 @ 1638
10 74.4NOxppm
08 0.02CO2%
07 20.34 O2%
Sep.09*16:24
INTVL 1
Restart R-3 @ 1628 NOx 0-1000 ppm
75%
0 10 20 30 40 50 60 70 80 90 100
10 40.4NOxppm
08 0.02CO2%
07 20.56 O2%
Sep.09*16:14
INTVL 1
R-3 @ 1621 Void
75% load
Change Range NOx 0-1000 ppm
End @ 1614
10 35.4NOxppm
08 0.04CO2%
07 20.57 O2%
Sep.09*16:04
INTVL 1
5.00 10.00 15.00 20.00 25.00
O2%
R-2 @ 1603
Restart 50% Load change NOx to 0-50 ppm
10 10.7NOxppm
08 0.07CO2%
07 20.78 O2%
Sep.09*15:54
INTVL 1
10.0 20.0 30.0 40.0 50.0
Change Range NOx to 0-50
10 27.2NOxppm
08 0.11CO2%
07 20.64 O2%
Sep.09*15:44

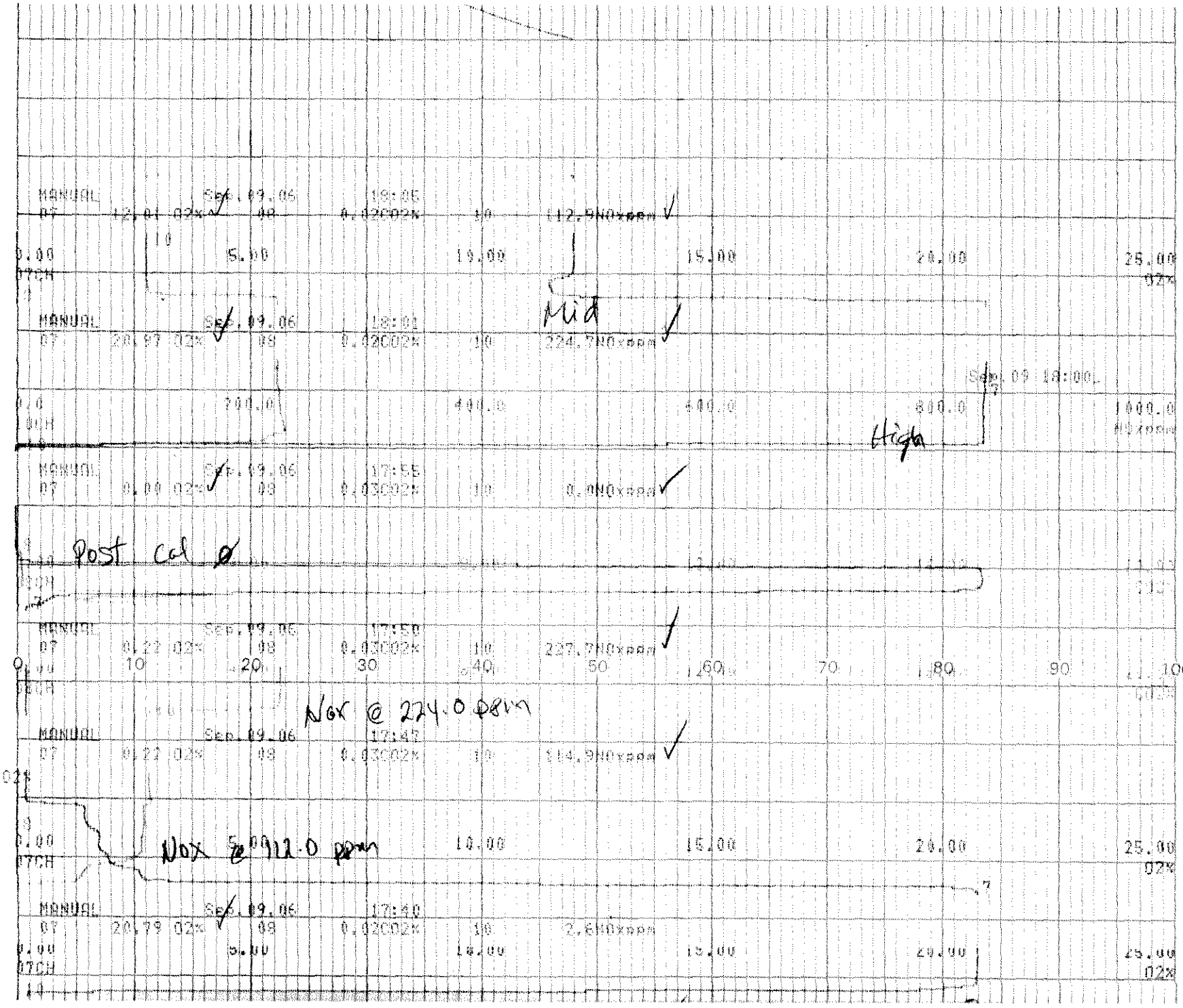
C2-12


08 0.00CO2%
07 17.78 O2%
Sep.09#17:04
INTVL 1
ambient Air
End @ 1705
25% @ 1700 0 - 1000 PPM
End @ 1658
10 516.9NOxppm
08 0.00CO2%
07 15.96 O2%
Sep.09#16:54
INTVL 1
50% @ 1653 0-1000 PPM
End @ 1650
10 654.0NOxppm
08 0.00CO2%
07 13.49 O2%
Sep.09#16:44
INTVL 1
100% Load
R-4 @ 1640 0-1000 PPM
End R-3 @ 1638
10 694.4NOxppm
08 0.00CO2%
07 14.83 O2%
Sep.09#16:34
INTVL 1
Restart
R-3 @ 1628 NOx 0-1000 PPM
75%
10 74.4NOxppm
08 0.02CO2%
07 20.34 O2%
Sep.09#16:24
INTVL 1
240mm/h
Sep. 09 17:00
0.00
5.00
10.00
15.00
20.00
25.00
O2%

C-13


NOx @ 2A4.0 ppm
MANUAL Sep.09.06 17:47
07 0.22 02% 09 0.02002% 10 114.9NOxppm
07 1.49 02%
Sep.09 17:44
INTVL 1
NOx @ 2.0 ppm
MANUAL Sep.09.06 17:40
07 20.79 02% 09 0.02002% 10 2.8NOxppm
INTVL 1
MANUAL Sep.09.06 17:37
07 0.25 02% 09 0.02002% 10 1.9NOxppm
07 0.89 02%
Sep.09 17:34
INTVL 1
BIAS Ø
O2
Post leak check good
flow @ ∞
0 10 20 30 40 50 60 70 80 90 100

C2-14


MANUAL Sep.09.06 19:05
DT 12.01 02% 08 0.02002K 10 112.9NOxppm
INTVL 1
0.00 5.00 10.00 15.00 20.00 25.00
07CH 02%
MANUAL Sep.09.06 18:01
DT 20.97 02% 08 0.02002K 10 224.7NOxppm
Mid
Sep.09 17:59
INTVL 1
Sep.09 18:00
0.0 200.0 400.0 600.0 800.0 1000.0
NOX NOxppm
High
MANUAL Sep.09.06 17:55
DT 0.00 02% 08 0.03002K 10 0.0NOxppm
INTVL 1
Post cal Ø
MANUAL Sep.09.06 17:50
DT 0.22 02% 08 0.03002K 10 237.7NOxppm
INTVL 1
0 10 20 30 40 50 60 70 80 90 100
NOX
NOx @ 224.0 ppm
MANUAL Sep.09.06 17:45
DT 0.22 02% 08 0.03002K 10 114.9NOxppm
DT 1.49 02%
Sep.09 17:44
INTVL 1
0.00 5.00 10.00 15.00 20.00 25.00
07CH 02%
NOx @ 112.0 ppm
MANUAL Sep.09.06 17:40
DT 20.79 02% 08 0.02002K 10 2.8NOxppm
INTVL 1
0.00 5.00 10.00 15.00 20.00 25.00
07CH 02%

C2-15

Appendix C3

CEMS –DAS One-Minute Data

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
1	09/09/06	11:26:07	11.94	17.22	0
2	09/09/06	11:27:07	11.95	17.41	32.88
3	09/09/06	11:28:07	11.97	10.89	32.51
4	09/09/06	11:29:07	11.99	10.51	33.32
5	09/09/06	11:30:07	6.36	4.89	33.12
6	09/09/06	11:31:07	12.8	4.92	32.83
7	09/09/06	11:32:07	16.63	4.94	32.64
8	09/09/06	11:33:07	16.5	4.97	42.48
9	09/09/06	11:34:07	16.5	4.99	42.93
10	09/09/06	11:35:07	16.5	5.05	43.58
11	09/09/06	11:36:07	16.49	5.09	43.7
12	09/09/06	11:37:07	16.48	5.11	43.79
13	09/09/06	11:40:24	16.47	5.15	43.76
14	09/09/06	11:40:24	16.45	5.21	43.6
15	09/09/06	11:40:24	16.45	5.21	43.6
16	09/09/06	11:41:07	16.44	5.21	43.76
17	09/09/06	11:42:07	16.43	5.24	43.87
18	09/09/06	11:43:07	16.42	5.28	43.99
19	09/09/06	11:44:07	16.42	5.28	0
20	09/09/06	11:45:07	16.42	5.31	-99999
21	09/09/06	11:46:07	16.42	5.31	46.53
22	09/09/06	11:47:07	16.41	5.35	44.56
23	09/09/06	11:48:07	16.41	5.33	44.47
24	09/09/06	11:49:07	16.4	5.35	44.34
25	09/09/06	11:50:07	16.41	5.38	43.72
26	09/09/06	11:51:07	16.41	5.41	0.05
27	09/09/06	11:52:07	16.41	5.42	0
28	09/09/06	11:53:07	16.41	5.41	-99999
29	09/09/06	11:54:07	16.41	5.46	45.29
30	09/09/06	11:55:07	16.41	5.47	44.63
31	09/09/06	11:56:07	16.41	5.47	44.52
32	09/09/06	11:57:07	16.41	5.5	3.09
33	09/09/06	11:58:07	16.41	5.52	0.17
34	09/09/06	11:59:07	16.42	5.55	0.24
35	09/09/06	12:00:07	16.42	5.55	0.75
36	09/09/06	12:01:07	16.42	5.58	2.05
37	09/09/06	12:02:07	16.42	5.61	2.21
38	09/09/06	12:03:07	16.42	5.63	2.2
39	09/09/06	12:04:07	16.43	5.63	19.63
40	09/09/06	12:05:07	16.43	5.64	21.1
41	09/09/06	12:06:07	16.44	5.67	22.68
42	09/09/06	12:07:07	16.44	5.67	26.89
43	09/09/06	12:08:07	16.44	5.67	28.16
44	09/09/06	12:09:07	16.46	5.7	29.75
45	09/09/06	12:10:07	16.46	5.72	30.58
46	09/09/06	12:11:07	16.46	5.71	31
47	09/09/06	12:12:07	16.47	5.72	30.84
48	09/09/06	12:13:07	16.47	5.73	30.82
49	09/09/06	12:14:07	16.49	5.73	30.98
50	09/09/06	12:15:07	16.49	5.73	31.11
51	09/09/06	12:18:47	16.5	5.71	0.26
52	09/09/06	12:18:48	16.52	5.69	39.32
53	09/09/06	12:18:48	16.52	5.69	39.32
54	09/09/06	12:19:07	16.52	5.67	41.01
55	09/09/06	12:20:07	16.52	5.67	42.17

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
56	09/09/06	12:21:07	16.53	5.66	42.6
57	09/09/06	12:22:07	16.55	5.61	43.76
58	09/09/06	12:23:07	16.55	5.59	39.65
59	09/09/06	12:24:07	16.56	5.57	42.4
60	09/09/06	12:25:07	16.57	5.54	41.28
61	09/09/06	12:26:07	16.58	5.45	44.71
62	09/09/06	12:27:07	16.58	5.41	44.77
63	09/09/06	12:28:07	4.74	5.32	0
64	09/09/06	12:29:07	0	5.26	0
65	09/09/06	12:30:07	0	5.18	0
66	09/09/06	12:31:07	20.78	5.12	0
67	09/09/06	12:32:07	20.8	5.11	0
68	09/09/06	12:33:07	21.12	5.03	0
69	09/09/06	12:34:07	20.9	5.01	3.61
70	09/09/06	12:35:07	20.92	4.99	0
71	09/09/06	12:36:07	11.84	4.96	38.51
72	09/09/06	12:37:07	11.85	4.91	-99999
73	09/09/06	12:38:07	11.97	4.86	49.22
74	09/09/06	12:39:07	18.9	4.86	50.3
75	09/09/06	12:40:07	20.87	4.84	-99999
76	09/09/06	12:41:07	19.66	4.81	-99999
77	09/09/06	12:42:07	16.58	4.76	-99999
78	09/09/06	12:43:07	16.58	4.77	-99999
79	09/09/06	12:44:07	12.38	4.75	-99999
80	09/09/06	12:45:07	12.33	4.73	-99999
81	09/09/06	12:46:07	9.87	4.69	-99999
82	09/09/06	12:47:07	8.18	4.68	-99999
83	09/09/06	12:48:07	8.21	4.62	45.13
84	09/09/06	12:49:07	4.1	4.57	45.17
85	09/09/06	12:50:07	4.12	4.55	45.18
86	09/09/06	12:51:07	12.01	4.56	45.11
87	09/09/06	12:52:07	12.03	4.51	0
88	09/09/06	12:53:07	19.86	4.48	0
89	09/09/06	12:54:07	21.06	4.47	0
90	09/09/06	12:55:07	17.73	4.43	0
91	09/09/06	12:56:07	16.72	4.4	42.54
92	09/09/06	12:57:07	16.72	4.4	44.02
93	09/09/06	12:58:07	12.45	4.4	44.67
94	09/09/06	12:59:07	12.45	4.36	44.95
95	09/09/06	13:00:07	8.26	4.35	45.28
96	09/09/06	13:01:07	8.25	4.33	45.39
97	09/09/06	13:02:07	8.25	4.31	45.15
98	09/09/06	13:03:07	4.12	4.24	45.29
99	09/09/06	13:04:07	4.12	4.2	45
100	09/09/06	13:05:07	7.1	4.16	44.8
101	09/09/06	13:06:07	12.03	4.12	44.79
102	09/09/06	13:07:07	12.04	4.07	44.69
103	09/09/06	13:08:07	21.08	4.04	44.6
104	09/09/06	13:09:07	21.09	3.98	44.98
105	09/09/06	13:10:07	16.73	3.94	0
106	09/09/06	13:11:07	16.73	3.89	0
107	09/09/06	13:12:07	16.72	3.83	0
108	09/09/06	13:13:07	12.47	3.78	0
109	09/09/06	13:14:07	12.47	3.7	0
110	09/09/06	13:15:07	8.27	3.62	0

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
111	09/09/06	13:16:07	8.27	3.55	0
112	09/09/06	13:17:07	8.26	3.49	0
113	09/09/06	13:18:07	4.12	3.4	0
114	09/09/06	13:19:07	4.12	3.32	0
115	09/09/06	13:20:07	12.03	3.28	0
116	09/09/06	13:21:07	12.04	3.24	0
117	09/09/06	13:22:07	0	3.22	0
118	09/09/06	13:23:07	0	3.19	0
119	09/09/06	13:24:07	0	3.19	0
120	09/09/06	13:25:07	20.99	3.12	25.75
121	09/09/06	13:26:07	21	3.09	21.4
122	09/09/06	13:27:07	12.01	3.07	42.94
123	09/09/06	13:28:07	12.02	3.05	45.19
124	09/09/06	13:32:02	10.19	2.89	0.6
125	09/09/06	13:33:02	0	2.84	0.2
126	09/09/06	13:34:02	0	2.81	0
127	09/09/06	13:35:02	20.96	2.78	220.4
128	09/09/06	13:36:02	20.97	2.76	221.8
129	09/09/06	13:37:02	20.99	2.72	222.8
130	09/09/06	13:38:02	20.99	2.69	225
131	09/09/06	13:39:02	12	2.7	112.3
132	09/09/06	13:40:02	12.01	2.65	111.7
133	09/09/06	13:41:02	12.03	2.64	111.3
134	09/09/06	13:42:02	11.91	2.55	0
135	09/09/06	13:43:02	11.92	2.54	0
136	09/09/06	13:46:48	20.97	2.49	1.3
137	09/09/06	13:46:48	20.85	2.37	0.1
138	09/09/06	13:46:48	20.85	2.37	0.1
139	09/09/06	13:47:02	20.84	2.37	0.1
140	09/09/06	13:48:02	20.83	2.32	0
141	09/09/06	13:49:02	20.83	2.29	0
142	09/09/06	13:50:02	20.83	2.25	0
143	09/09/06	13:51:02	20.82	2.19	0
144	09/09/06	13:52:02	20.81	2.14	0
145	09/09/06	13:53:02	20.83	2.1	0
146	09/09/06	13:54:02	20.59	2.1	0
147	09/09/06	13:55:02	0.48	2.05	0
148	09/09/06	13:56:02	0.18	2	0
149	09/09/06	13:57:02	0.18	1.97	0
150	09/09/06	13:58:02	0.16	1.94	0
151	09/09/06	13:59:02	11.97	1.9	0
152	09/09/06	14:00:02	11.98	1.88	0
153	09/09/06	14:01:02	11.97	1.85	0
154	09/09/06	14:02:02	20.83	1.81	0
155	09/09/06	14:03:02	20.86	1.77	0
156	09/09/06	14:04:02	20.79	1.77	0
157	09/09/06	14:05:02	0.39	1.76	83.1
158	09/09/06	14:06:02	0.31	1.71	108.2
159	09/09/06	14:07:02	0.33	1.67	106.9
160	09/09/06	14:08:02	0.33	1.65	106.5
161	09/09/06	14:09:02	0.13	1.57	227.6
162	09/09/06	14:10:02	0.11	1.56	218.5
163	09/09/06	14:11:02	0.1	1.53	219.9
164	09/09/06	14:12:02	0.14	1.54	212.8
165	09/09/06	14:13:02	18.93	1.5	142.8

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
166	09/09/06	14:14:02	18.39	1.49	189
167	09/09/06	14:15:02	17.99	1.48	234.8
168	09/09/06	14:16:02	16.69	1.46	-99999
169	09/09/06	14:19:47	18.36	1.43	-99999
170	09/09/06	14:19:48	17.9	1.39	-99999
171	09/09/06	14:19:48	17.9	1.39	-99999
172	09/09/06	14:20:02	18.22	1.38	-99999
173	09/09/06	14:21:02	19.2	1.35	139.8
174	09/09/06	14:22:02	19.22	1.33	134.7
175	09/09/06	14:23:02	19.19	1.33	137.8
176	09/09/06	14:24:02	19.12	1.29	143.6
177	09/09/06	14:25:02	18.66	1.27	192.1
178	09/09/06	14:26:02	18.69	1.25	192.4
179	09/09/06	14:27:02	18.73	1.21	189.8
180	09/09/06	14:28:02	18.72	1.17	191.1
181	09/09/06	14:29:02	18.78	1.14	186.1
182	09/09/06	14:30:02	18.8	1.12	184.1
183	09/09/06	14:31:02	18.76	1.08	189.5
184	09/09/06	14:32:02	18.76	1.06	190.2
185	09/09/06	14:33:02	18.81	1.02	189.4
186	09/09/06	14:34:02	18.72	1.01	193.7
187	09/09/06	14:35:02	18.82	0.97	186.6
188	09/09/06	14:36:02	18.77	0.94	194.7
189	09/09/06	14:37:02	18.81	0.94	190.6
190	09/09/06	14:38:02	18.59	0.91	236.9
191	09/09/06	14:39:02	18.6	0.88	247.3
192	09/09/06	14:40:02	18.62	0.87	252.4
193	09/09/06	14:41:02	18.51	0.85	266.6
194	09/09/06	14:42:02	18.57	0.8	258.6
195	09/09/06	14:43:02	18.55	0.78	260.8
196	09/09/06	14:44:02	18.6	0.77	253.8
197	09/09/06	14:45:02	18.6	0.76	255.4
198	09/09/06	14:46:02	18.76	0.72	235.4
199	09/09/06	14:47:02	18.58	0.71	258.1
200	09/09/06	14:48:02	18.69	0.7	248
201	09/09/06	14:49:02	18.62	0.68	252.1
202	09/09/06	14:50:02	18.66	0.66	247.7
203	09/09/06	14:51:02	18.69	0.63	245.6
204	09/09/06	14:52:02	18.58	0.63	254.8
205	09/09/06	14:53:02	18.53	0.6	269.9
206	09/09/06	14:54:02	18.72	0.57	239.6
207	09/09/06	14:55:02	18.66	0.55	281.6
208	09/09/06	14:56:02	18.82	0.55	253
209	09/09/06	14:57:02	18.64	0.53	296.5
210	09/09/06	14:58:02	18.7	0.5	284.9
211	09/09/06	14:59:02	18.57	0.5	301.7
212	09/09/06	15:00:02	18.55	0.47	305.8
213	09/09/06	15:01:02	18.63	0.46	300.2
214	09/09/06	15:02:02	18.42	0.45	322.1
215	09/09/06	15:03:02	18.61	0.43	306.1
216	09/09/06	15:04:02	18.73	0.41	284.1
217	09/09/06	15:05:02	18.66	0.41	291.7
218	09/09/06	15:06:02	18.71	0.38	281.9
219	09/09/06	15:07:02	18	0.38	399.9
220	09/09/06	15:08:02	17.86	0.36	421.8

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
221	09/09/06	15:09:02	18.08	0.35	393.7
222	09/09/06	15:10:02	17.93	0.34	410.1
223	09/09/06	15:11:02	17.91	0.33	416.9
224	09/09/06	15:12:02	17.97	0.32	413.1
225	09/09/06	15:13:02	17.74	0.31	438.4
226	09/09/06	15:16:00	17.81	0.31	429.3
227	09/09/06	15:16:00	17.84	0.29	424.8
228	09/09/06	15:16:02	17.73	0.29	434.8
229	09/09/06	15:17:02	17.75	0.27	440.6
230	09/09/06	15:20:50	17.73	0.27	440.1
231	09/09/06	15:20:51	20.59	0.23	28.8
232	09/09/06	15:20:51	20.59	0.23	28.8
233	09/09/06	15:21:02	20.63	0.23	24.5
234	09/09/06	15:22:02	20.54	0.22	32.7
235	09/09/06	15:23:02	20.54	0.21	31.4
236	09/09/06	15:24:02	20.51	0.21	34.5
237	09/09/06	15:25:02	20.47	0.21	38
238	09/09/06	15:26:02	20.47	0.19	39.4
239	09/09/06	15:27:02	20.49	0.18	36.1
240	09/09/06	15:28:02	20.47	0.19	38.8
241	09/09/06	15:29:02	20.44	0.17	41.3
242	09/09/06	15:30:02	20.49	0.16	36.1
243	09/09/06	15:31:02	20.46	0.16	41.8
244	09/09/06	15:32:02	20.43	0.16	44.5
245	09/09/06	15:33:02	20.49	0.15	37.8
246	09/09/06	15:34:02	20.44	0.14	43.2
247	09/09/06	15:35:02	20.57	0.13	31.4
248	09/09/06	15:36:02	20.63	0.13	26.4
249	09/09/06	15:37:02	20.64	0.12	27.5
250	09/09/06	15:38:02	20.64	0.12	27.5
251	09/09/06	15:39:02	20.63	0.12	26.6
252	09/09/06	15:40:02	20.67	0.12	22.6
253	09/09/06	15:41:02	20.66	0.12	23.7
254	09/09/06	15:42:02	20.67	0.1	23.4
255	09/09/06	15:43:02	20.63	0.1	30.2
256	09/09/06	15:44:02	20.65	0.1	25
257	09/09/06	15:45:02	20.65	0.09	25.8
258	09/09/06	15:46:02	20.66	0.1	24.5
259	09/09/06	15:47:02	20.67	0.09	24.2
260	09/09/06	15:48:02	20.79	0.08	8.8
261	09/09/06	15:49:02	20.76	0.08	12.6
262	09/09/06	15:52:11	20.77	0.1	11.8
263	09/09/06	15:52:11	20.78	0.08	10.4
264	09/09/06	15:52:11	20.78	0.08	10.4
265	09/09/06	15:53:02	20.76	0.08	12.9
266	09/09/06	15:54:02	20.78	0.08	11.3
267	09/09/06	15:57:06	20.78	0.07	11
268	09/09/06	15:57:06	20.78	0.06	11.7
269	09/09/06	15:57:07	20.78	0.06	11.7
270	09/09/06	15:58:02	20.79	0.07	11.1
271	09/09/06	15:59:02	20.79	0.06	11.8
272	09/09/06	16:00:02	20.55	0.05	32.6
273	09/09/06	16:01:02	20.47	0.05	44.8
274	09/09/06	16:02:02	20.55	0.05	39.7
275	09/09/06	16:03:02	20.52	0.04	42.5

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
276	09/09/06	16:04:02	20.55	0.04	39.8
277	09/09/06	16:05:02	20.56	0.05	37.9
278	09/09/06	16:06:02	20.58	0.02	34.6
279	09/09/06	16:07:02	20.58	0.03	34.4
280	09/09/06	16:08:02	20.59	0.03	34.2
281	09/09/06	16:09:02	20.59	0.03	35
282	09/09/06	16:10:02	20.58	0.02	35.5
283	09/09/06	16:11:02	20.58	0.02	34.4
284	09/09/06	16:12:02	20.58	0.03	35.5
285	09/09/06	16:13:02	20.59	0.02	33
286	09/09/06	16:14:02	20.55	0.01	38.8
287	09/09/06	16:15:02	20.53	0.01	47.7
288	09/09/06	16:16:02	20.69	0.02	28.3
289	09/09/06	16:17:02	20.41	0.01	61.7
290	09/09/06	16:18:02	20.55	0	56.3
291	09/09/06	16:19:02	20.72	0.01	19.9
292	09/09/06	16:20:02	20.33	0.02	72.3
293	09/09/06	16:21:02	20.33	0	75.8
294	09/09/06	16:22:02	20.35	0	69
295	09/09/06	16:23:02	20.35	0.01	69.8
296	09/09/06	16:24:02	20.36	0	70.1
297	09/09/06	16:25:02	20.36	0	70.6
298	09/09/06	16:26:02	20.35	0	71.2
299	09/09/06	16:27:02	20.38	0	69.5
300	09/09/06	16:28:02	14.87	0	683.5
301	09/09/06	16:29:02	14.72	0	711.6
302	09/09/06	16:30:02	14.81	0	705.7
303	09/09/06	16:31:02	14.84	0	700.3
304	09/09/06	16:32:02	14.87	0	692.5
305	09/09/06	16:33:02	14.89	0	692.5
306	09/09/06	16:34:02	14.85	0.01	695.5
307	09/09/06	16:35:02	14.9	0	688.4
308	09/09/06	16:36:02	14.66	0	715.9
309	09/09/06	16:39:38	14.73	0	713
310	09/09/06	16:39:38	14.75	0	700.8
311	09/09/06	16:39:39	14.75	0	700.8
312	09/09/06	16:40:02	13.74	0	819.1
313	09/09/06	16:41:02	13.38	0	856.1
314	09/09/06	16:42:02	13.41	0	857.8
315	09/09/06	16:43:02	13.4	0	860.4
316	09/09/06	16:44:02	13.57	0	846.9
317	09/09/06	16:45:02	13.66	0.01	845.3
318	09/09/06	16:46:02	13.79	0	830.7
319	09/09/06	16:47:02	13.7	0	838.5
320	09/09/06	16:48:02	13.86	0	829.9
321	09/09/06	16:49:02	13.83	0	825.5
322	09/09/06	16:50:02	13.78	0	832.3
323	09/09/06	16:51:02	13.71	0	838.7
324	09/09/06	16:52:02	15.23	0	663.2
325	09/09/06	16:53:02	16.08	0	507.8
326	09/09/06	16:54:02	15.99	0	516.7
327	09/09/06	16:55:02	15.97	0	513.7
328	09/09/06	16:56:02	15.85	0	529.2
329	09/09/06	16:57:02	15.91	0	516.1
330	09/09/06	16:58:02	15.91	0	511.8

AETS RAW DAS DATA

S/No.	DATE	TIME	O2%	CO2%	NOXPPM
331	09/09/06	16:59:02	17.51	0	338.4
332	09/09/06	17:00:02	18.05	0	262.9
333	09/09/06	17:01:02	17.78	0	288.6
334	09/09/06	17:02:02	17.81	0	283.7
335	09/09/06	17:03:02	17.75	0	286.8
336	09/09/06	17:04:02	17.77	0	286.2
337	09/09/06	17:05:02	17.82	0	277.7
338	09/09/06	17:06:02	17.81	0	279.6
339	09/09/06	17:07:02	20.76	0	19
340	09/09/06	17:08:02	20.79	0	12.8
341	09/09/06	17:32:38	20.59	0	5
342	09/09/06	17:33:38	1.67	0	3.7
343	09/09/06	17:34:38	0.89	0	2.9
344	09/09/06	17:35:38	0.44	0	2.3
345	09/09/06	17:36:38	0.26	0	2.1
346	09/09/06	17:37:38	0.25	0.03	1.8
347	09/09/06	17:38:38	20.43	0.03	1.8
348	09/09/06	17:39:38	20.78	0.03	2.1
349	09/09/06	17:40:38	20.79	0.02	2.6
350	09/09/06	17:41:38	2.71	0.03	55.5
351	09/09/06	17:42:38	1.98	0.03	100.6
352	09/09/06	17:43:38	1.8	0.03	108.8
353	09/09/06	17:44:38	1.49	0.03	110.7
354	09/09/06	17:45:38	0.23	0.01	116.8
355	09/09/06	17:46:38	0.22	0.03	114.9
356	09/09/06	17:47:38	0.22	0.03	114.9
357	09/09/06	17:48:38	0.22	0.03	226.9
358	09/09/06	17:49:38	0.22	0.03	227.4
359	09/09/06	17:50:38	0.52	0.04	155.8
360	09/09/06	17:51:38	20.75	0.03	6.4
361	09/09/06	17:52:38	20.85	0.03	5.6
362	09/09/06	17:53:38	0.01	0.03	2.9
363	09/09/06	17:54:38	0	0.03	0.4
364	09/09/06	17:55:38	0	0.03	0
365	09/09/06	17:56:38	20.91	0.03	213.5
366	09/09/06	17:57:38	20.91	0.03	229.3
367	09/09/06	17:58:38	20.91	0.02	227.1
368	09/09/06	17:59:38	20.95	0.03	225.2
369	09/09/06	18:00:38	20.96	0.03	224.7
370	09/09/06	18:01:38	12.18	0.03	205.1
371	09/09/06	18:02:38	11.8	0.02	112.9
372	09/09/06	18:03:38	12.01	0.02	112.6
373	09/09/06	18:04:38	12.02	0.02	112.6
374	09/09/06	18:05:38	0	0.03	0.1

Appendix C4

CEMS – QA/QC

RM CALIBRATION DATA

FACILITY: Sause Brothers
CITY: Pier D, Long Beach, CA
UNIT TESTED: ICE
DATE: 9/9/2006
MSTVO: TA / RS

		QA/QC	
		O2	Nox
A	High Span Gas Concentration	20.90	224.00
B	Mid Span Gas Concentration	12.00	112.00
C	Initial Zero Response	0.00	0.00
D	Initial High Span Response	21.00	224.90
E	Initial Mid Span Response	12.02	111.30
F	*Initial System Bias Zero*	0.16	0.00
G	*Initial System Bias Response, Span*	20.87	220.30
H	*Final System Bias Zero*	0.25	1.80
I	*Final System Bias Response, Span*	20.79	227.70
J	Final Zero Response	*0.00*	*0.00*
K	Final High Span Response	*20.97*	*224.70*
L	Final Mid Span Response	*12.01*	*112.90*
M	Analyzer Range	25	250
	Response Time (sec)	18	33
N	***Initial Linearity*** *= {(E-C)-((D-C)xB)/A} x 100/M*	***-0.1***	***-0.5***
O	***Final Linearity*** *= {(L-J)-((K-J)xB)/A} x 100/M*	*-0.1*	*0.2*
P	***Initial RM Cal Error, Zero (%F.S.) =*** *[C/M] x 100*	***0.0***	***0.0***
Q	***Final RM Cal Error, Zero (%F.S.) =*** *[J/M] x 100*	*0.0*	*0.0*
R	***Initial RM Cal Error, Mid (%F.S.) =*** *[(E-B)/M] x 100*	***0.1***	***-0.3***
S	***Final RM Cal Error, Mid (%F.S.) =*** *[(L-B)/M] x 100*	*0.0*	*0.4*
T	***Initial RM Cal Error, High (%F.S.) =*** *[(D-A)/M] x 100*	***0.4***	***0.4***
U	***Final RM Cal Error, High (%F.S.) =*** *[(K-A)/M] x 100*	0.3	0.3
V	***Initial System Bias, Zero (%F.S.) =*** *[(F-C)}/M] x 100*	***0.6***	***0.0***
W	***Final System Bias, Zero (%F.S.) =*** *[(H-J)}/M] x 100*	***1.0***	***0.7***
X	***Initial System Bias, Upper (%F.S.) =*** *[(G-D*)}/M] x 100*	***-0.5***	***-1.8***
Y	***Final System Bias, Upper (%F.S.) =*** *[(I-K**)}/M] x 100*	***-0.7***	***1.2***
	Average NOx Converter Test, (%) - (from stripchart) =		***92.1%***

* D or E, whichever gas was used for bias check
** K or L, whichever gas was used for bias check

C4-1

Facility:	Sause Brothers
City:	Pier D, Long Beach, CA
Source:	ICE
Date:	09/09/2006
Operator:	TA / RS

NO2-to-NO CONVERTER EFFICIENCY CALCULATION

NO2 CONCENTRATION (Co):	31.40
AUDIT GAS WITH NO MODE (C1):	2.20
AUDIT GAS WITH NOx MODE (C2):	31.11

CALCULATIONS:

D1=|C2-C1|=	28.91
D2=|Co-C2|=	**0.29**

% CONVERTER EFFICIENCY: %CE=D1*100/Co= 92.1

Acceptance Criteria*	**(Yes/No)**
D2 < 1 ppm:	yes
% Converter Efficiency > 90% :	yes

STATUS: PASS

* NO2-to-NO Conversion Efficiency must be greater than 90%, OR NO2-response must be within 1 ppmv of expected value.

APPENDIX D

QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

Appendix D1

CEMS Calibration Gas Certificates

Spectra Gases, Inc.

3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER: Almega Environmental
SGI ORDER # : 0094746
ITEM# : 2
P.O.# : verbal-Chris

CYLINDER # : CC-90828
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 590

CERTIFICATION DATE: 8/9/2006
EXPIRATION DATE: 8/9/2009

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Dioxide	8/9/2006	4.55 %	4.55 %	+/- 1%
Oxygen	8/9/2006	20.9 %	20.9 %	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Dioxide	GMIS-1	CC-117398	10.07 %
Oxygen	GMIS-1	CC-133113	22.8 %

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Dioxide	CAI-300	S03001	NDIR	7/10/2006
Oxygen	CAI-300	S03001	PM	7/14/2006

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: JAMES UNTERWALD

DATE: 8/9/2006

Tel: +1 908-252-9300 Fax: +1 908-252-0811
www.spectragases.com

D171

AIR LIQUIDE™

CERTIFICATE OF ANALYSIS

Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC12769

Customer: ALMEGA ENVIRONMENTAL
HUNTINGTON BEACH, CA

P.O. Number:
Item Number:

Shipping Order Number: 19553007
Transfer Number:
Lot Number: SFS93675
Valve: CGA 590
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 14-Feb-06

Expiration Date: 14-Feb-09

COMPONENT	REQUESTED Concentration	ASSAY Concentration			
Oxygen	**12 %**	**12.0**	**±**	**0.1**	**%**
Carbon Dioxide	**9 %**	**9.00**	**±**	**0.10**	**%**
Nitrogen	**Balance**	**Balance**			

Reference Standard Employed For Analysis:

Concentration				Component	Balance	SRM Cyl. No.	NTRM No.	Exp. Date	Sample No.	Type
21.11	±	0.14	%	Oxygen	Nitrogen	CC62828	950808	04/08/06	PA	GMIS
5.006	±	0.026	%	Carbon Dioxide	Nitrogen	CC62828	950808	04/08/06	PA	GMIS

Analysis Information

Component	Oxygen		First Triad Analysis: 2/14/2006			
Analyzer Information			Trial 1	Trial 2	Trial 3	Units
Manufacturer:	Hewlett Packard	Zero	0	0	0	%
Model Number:	5890A	Reference	21.117	21.110	21.085	%
Serial Number:	3336A54620	Candidate	11.997	11.992	11.985	%
MPR Last Calibrated:	02/14/06	Result	11.99	11.99	12.00	%
Analytical Principle:	FID & TCD	Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:		11.99	%

Component	Carbon Dioxide		First Triad Analysis: 2/14/2006			
Analyzer Information			Trial 1	Trial 2	Trial 3	Units
Manufacturer:	Hewlett Packard	Zero	0	0	0	%
Model Number:	5890A	Reference	5.168	5.163	5.168	%
Serial Number:	3336A54620	Candidate	9.296	9.279	9.298	%
MPR Last Calibrated:	02/07/06	Result	9.005	8.997	9.007	%
Analytical Principle:	FID & TCD	Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:		9.003	%

Analyst Signature: Eric Barron

Approved by: Jason Unger

AIR LIQUIDE AMERICA, L.P. Region Office • 8832 Dice Road, Santa Fe Springs, CA 90670-2516
Phone: (562) 945-1383 • Fax: (562) 693-1156

AIR LIQUIDE™

CERTIFICATE OF ANALYSIS

Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC66200

Customer: ALMEGA ENVIRONMENTAL & TECHNICAL SERVICES
HUNTINGTON BEACH, CA
P.O. Number: 300652
Item Number:

Shipping Order Number 15345313
Transfer Number:
Lot Number: SFS77521
Valve: CGA 660
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 1-Mar-05 **Expiration Date: 1-Mar-07**

Component	REQUESTED Concentration	ASSAY Concentration		
Nitric Oxide	**225 ppm**	**224**	**± 4**	**ppm**
NOx		**224**	**ppm**	
Nitrogen	**Balance**	**Balance**		

Reference Standard Employed For Analysis:

Concentration				Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
248	±	3	ppm	Nitric Oxide	Nitrogen	CC179963	SFS63904	11/18/06	QT	GMIS

Analysis Information:

Component	Nitric Oxide		First Triad Analysis 02/22/05					Second Triad Analysis 03/01/05				
Analyzer Information			Trial 1	Trial 2	Trial 3	Units			Trial 4	Trial 5	Trial 6	Units
Manufacturer:	Beckman	Zero	0	0	0	Vdc		Zero	0	0	0	Vdc
Model Number:	951A	Reference	985	984	985	Vdc		Reference	998	999	998	Vdc
Serial Number:	00100508	Candidate	888	889	888	Vdc		Candidate	899	900	899	Vdc
MPR Last Calibrated:	03/01/05	Result	223.6	224.1	223.6	ppm		Result	223.4	223.4	223.4	ppm
Analytical Principle: Chemiluminescent		Evaluation	VALID	VALID	VALID			Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:			223.7	ppm		MEAN ANALYTICAL RESULT:			223.4	ppm

Analyst Signature: Thuan Tran

Approved by: Jason Unger

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AIR LIQUIDE™

CERTIFICATE OF ANALYSIS

Interference-Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section No. 2.2, Procedure . G-1

Cylinder Number: CC155873

Customer: ALMEGA ENVIRONMENTAL
HUNTINGTON BEACH, CA

P.O. Number:
Item Number:

Shipping Order Number 20603248
Transfer Number:
Lot Number: SFS96344
Valve: CGA 660
Cyl. Pressure:* 2000PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Assay Date: 16-May-06

Expiration Date: 16-May-08

Component	REQUESTED Concentration	ASSAY Concentration		
Nitric Oxide	**45 ppm**	**44.4**	**± 0.7**	**ppm**
NOx		**44.4**	**ppm**	
Nitrogen	**Balance**	**Balance**		

Reference Standard Employed For Analysis:

Concentration				Component	Balance	Cyl. No.	SRM or GMIS NTRM No.	Exp. Date	Sample No.	Type
54.4	±	0.6	ppm	Nitric Oxide	Nitrogen	CC196776	SFSF73790	04/15/07	RH	GMIS

Analysis Information:

Component	Nitric Oxide		First Triad Analysis 05/09/06					Second Triad Analysis 05/16/06				
Analyzer Information			Trial 1	Trial 2	Trial 3	Units			Trial 4	Trial 5	Trial 6	Units
Manufacturer:	MKS Instruments	Zero	-0.006	-0.038	-0.013	ppm		Zero	-0.016	0.017	0.031	ppm
Model Number:	2031	Reference	53.993	54.080	54.045	ppm		Reference	54.519	54.441	54.462	ppm
Serial Number:	10387278	Candidate	44.102	44.086	44.099	ppm		Candidate	44.559	44.580	44.567	ppm
MPR Last Calibrated:	04/23/06	Result	44.44	44.35	44.39	ppm		Result	44.47	44.54	44.51	ppm
Analytical Principle:	FTIR	Evaluation	VALID	VALID	VALID			Evaluation	VALID	VALID	VALID	
			MEAN ANALYTICAL RESULT:			44.39	ppm		MEAN ANALYTICAL RESULT:			44.51	ppm

Analyst Signature: _____ Thuan Tran

Approved by: _____ Eric Barron

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Spectra
Spectra Gases, Inc.

3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE # : G1

CUSTOMER:	Almega Environmental	CYLINDER # :	CC-88305
SGI ORDER # :	0088807	CYLINDER PRES:	2000 PSIG
ITEM# :	1	CGA OUTLET:	660
P.O.# :	300978		

CERTIFICATION DATE: 5/1/2006
EXPIRATION DATE: 11/1/2006

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Nitrogen Dioxide	4/24/2006 5/1/2006	31.32 ppm 31.53 ppm	31.4 ppm	+/- 3%

BALANCE Air
PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Nitric Oxide	NTRM-81684	CC-133685	99.5 ppm

INSTRUMENTATION

COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Nitrogen Dioxide	CAI-400-CLD	6L09004	Cheml	4/24/2006

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: FRED PIKULA

DATE: 5/1/2006

Tel: +1 908-252-9300 Fax: +1 908-252-0811
www.spectragases.com

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Appendix D2

Other QA/QC

MASS FLOW DILUTER CHECK

Facility: Sause Brothers
City: Pier D, Long Beach, CA
Source: ICE
Date: 09/09/2006
Operator: TA / RS

Cylinder Gas Data
Full-Span Range: 25
Dilution Gas Value: 20.9
Cylinder No.: CC90828
Challenge Gas Value: 12
Cylinder No.: CC12769

Dilution Ratio	Predicted Response	Run 1		Run 2		Run 3		Average Response	Maximum Deviation (%) **	Average Error (%) *
		Analyzer Response	Percent Error	Analyzer Response	Percent Error	Analyzer Response	Percent Error			
100	**20.90**	20.89	-0.05	21.08	0.86	21.09	0.91	21.02	**0.91**	**0.57**
80	**16.72**	16.58	-0.84	16.71	-0.06	16.72	0.00	16.67	**0.84**	**0.30**
60	**12.54**	12.33	-1.67	12.45	-0.72	12.47	-0.56	12.42	**1.67**	**0.98**
40	**8.36**	8.20	-1.91	8.25	-1.32	8.26	-1.20	8.24	**1.91**	**1.48**
20	**4.18**	4.12	-1.44	4.12	-1.44	4.12	-1.44	4.12	**1.44**	**1.44**
Challenge	**12.00**	12.04	0.33	12.03	0.25	12.04	0.33	12.04	**0.33**	**0.31**
Field Certification Audit Result*:									**PASS**	**PASS**

* Average Error at each concentration level must not exceed 2 percent.
** Deviation from average response at each level must not exceed 2 percent.

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APPENDIX E

FACILITY PROCESS DATA

Data collected by Mike Doherty, Marine Engine Service
Fuel meters installed by Marine Engine Service (A&W electronic fuel flow meters)
RPM read by tug boat's rpm meter
Fuel Used: Commercial ULSD Diesel
Vessel M/V Klihyam, Sause Borthers Ocean Towing Company
Date 9-9-06

Port Engine

RPM	Load %	Fuel Supply gal/hr	Fuel Return gal/hr	Net Consumed gal/hr	Prop H.P.
807	100%	225.3	139.02	86.28	1406
732	75%	214.86	152.82	62.04	1049
658	50%	194.46	148.68	45.78	762
511	25%	150.72	128.28	22.44	357

Starboard

805	100%	235.8	142.26	93.54	1395
732	75%	218.82	149.16	69.66	1049
658	50%	196.14	143.88	52.26	762
511	25%	151.5	126.54	24.96	357