APPENDIX C

AIR QUALITY MONITORING PROGRAM

I. INTRODUCTION

This short-term air monitoring program was conducted in accordance with Hackensack Meadowlands Development Commission (HMDC) requirements as an update to the original Ambient Air Quality Monitoring Report prepared by Greiner, Inc. in September 1984. In accordance with HMDC's request, carbon monoxide levels were measured at three locations in the vicinity of the project site.

The monitoring locations are described in Section II, the methodology is discussed in Section III, the results are presented in Section IV, and air monitoring data and meteorological data are attached following Section IV of this Appendix.

II. MONITORING LOCATIONS

The three monitoring locations were selected on the basis of the closest proximity to the 1984 monitoring locations. The premise of this approach was to compare the 1984 carbon monoxide concentrations to the 1991 levels. A brief description of the monitor locations follows:

Site No. 1 (Sports Complex) - This site is located at the southwest corner of the intersection of Washington Avenue and Paterson Plank Road, approximately one mile from the project site. In 1984, this station was operated by HMDC staff, who monitored ambient carbon monoxide levels at the Meadowlands Sports Complex. HMDC requested that this site be monitored during an event at the sports complex.

Site No. 2 (Empire Blvd. and Washington Ave.) - This site is located at the northeast corner of Empire Boulevard and Washington Avenue, approximately one-half mile from the project site. Greiner's 1984 program monitored carbon monoxide at the southeast corner of this intersection.

Site No. 3 (Commerce Blvd. and Central Blvd.) - This site is located at the northwest corner of Central Boulevard and Commerce Boulevard and is directly north of the Meadowlands Town Center project site and Commerce Boulevard. This location is approximately 200 feet southwest of Greiner's 1984 monitoring site located along Horizon Boulevard.

Newark Bay Study Area
NBSA-00068

Temperature, wind speed, and wind direction data was collected at nearby Teterboro Airport. The locations of the three monitor sites and Teterboro Airport are shown on Figure C.1.

III. METHODOLOGY

HMDC requested that carbon monoxide data be collected during an event at the Sports Complex and for seven consecutive days at the remaining two locations. At Sites Nos. 2 and 3, data was collected Friday, October 11, through Friday, October 18, 1991. At Site No. 1, data was collected Friday, October 11, through Thursday, October 17, 1991 which coincided with a New York Jets football game on Sunday, October 12, 1991.

Carbon monoxide concentrations at the three locations were measured using a Thermo Electron Model 48 Gas Filter Correlation Carbon Monoxide Ambient Analyzer, an Environmental Protection Agency (EPA) reference method, and a Yokogawa Model LR 4100 strip chart recorder. The instruments were initially calibrated by Greiner staff using zero gas, 10.8 parts per million (ppm) and 47.0 ppm carbon monoxide standard, followed by daily zero gas and 10.8 ppm carbon monoxide standard calibration. All calibration standards are traceable to the National Bureau of Standards. The instruments were temporarily housed within existing structures at each site and continuous ambient (outdoor) air samples were collected through a sampling line. The data output of the instruments was continuously recorded onto strip charts. The strip charts were integrated to one-hour average carbon monoxide concentrations.

IV. RESULTS

The EPA ambient air quality standards for carbon monoxide are 35 ppm for a one-hour average and 9 ppm for an eight-hour average. These standards are not to be exceeded more than once per year.

The recorded one-hour and eight-hour average carbon monoxide results follow this section. Hourly temperature, wind direction, and wind speed data is also presented. Table C.1 summarizes the data for each monitoring site.

TETERBORO AIRPORT
TEMPERATURE (°F)

Hour	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91
1	57	48	48	45	46	64	50
2	54	46	46	44	43	64	50
3	54	45	45	42	42	59	50
4	54	43	44	41	42	54	50
5	53	43	44	40	45	52	49
6	54	42	44	40	46	52	49
7	54	43	44	41	47	53	49
8	54	47	45	44	50	53	50
9	57	49	50	48	57	53	50
10	59	51	53	50	58	53	50
11	58	54	56	52	61	54	49
12	56	57	59	53	60	55	48
13	56	58	60	57	63	58	46
14	54	60	62	58	63	58	48
15	54	61	59	59	63	60	49
16	54	60	59	58	62	60	50
17	54	58	57	56	63	59	
18	52	56	55	53	63	57	
19	52	54	53	52	63	55	
20	51	49	52	50	64	54	
21	50	49	50	45	64	53	
22	50	52	48	44	65	51	
23	50	50	47	46	64	50	
24	49	49	46	46	64	50	

As shown in Table C.1, the maximum one-hour average carbon monoxide concentration observed at the three monitoring locations was 4.3 ppm, which does not exceed the standard of 35 ppm. Similarly, the maximum eight-hour average carbon monoxide concentration recorded was 2.7 ppm, which does not exceed the standard of 9 ppm.

Greiner's 1984 carbon monoxide monitoring program detected a maximum one-hour concentration of 8.5 ppm and a maximum eight-hour concentration of 6.6 ppm. Therefore, this short-term air monitoring program does not indicate a localized increase in carbon monoxide in the past seven years.

V. BIBLIOGRAPHY

Ambient Air Quality Monitoring Report for the Empire Tract at the Hackensack Meadowlands District, New Jersey, prepared for Empire, LTD and Leo Kornblath and Associates, Inc., prepared by Greiner Engineering Sciences, Inc., September 1984.

TABLE C.1

CARBON MONOXIDE MONITORING RESULTS SUMMARY
Meadowlands Town Center

Site No. and Name[a]	Sampling Period	One-Hour Average			Eight-Hour Average		
		No. of Observations	Range of Concentrations (ppm)	No. of Exceedances[b]	No. of Observations	Range of Concentrations (ppm)	No. of Exceedances[b]
1 (Sports Complex)	Oct. 11 - 17, 1991	139	<0.1 - 4.3	None	90	<0.1 - 2.7	None
2 (Empire Blvd. and Washington Ave.)	Oct. 11 - 18, 1991	164	<0.1 - 3.8	None	108	<0.1 - 2.6	None
3 (Commerce Blvd. and Central Blvd.)	Oct. 11 - 18, 1991	165	<0.1 - 4.0	None	109	<0.1 - 2.6	None

[a] See Figure 1 for site locations
[b] Ambient air quality standards - one-hour not to exceed 35 ppm
- eight-hour not exceed 9 ppm

Apr-22-04 12:56pm From-NJ Meadowlands Commission 1-201-460-2804 T-850 P 008/014 F-035

AIR MONITORING AND METEOROLOGICAL DATA

SITE NO. 1 (SPORTS COMPLEX)
ONE-HOUR AVERAGE CARBON MONOXIDE (PPM)

Time	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91
1:00		0.2	0.7	<0.1	0.8	<0.1	<0.1
2:00		<0.1	0.9	<0.1	1.3	<0.1	<0.1
3:00		<0.1	0.7	0.1	2.2	<0.1	<0.1
4:00		<0.1	0.4	0.1	2.5	<0.1	<0.1
5:00		<0.1	0.4	1.5	2.5	<0.1	<0.1
6:00		<0.1	0.5	0.4	1.8	<0.1	0.1
7:00		<0.1	0.4	0.2	1.8	<0.1	0.2
8:00		0.4	0.4	0.8	2.8	0.4	0.2
9:00		0.5	0.4	0.3	4.3	0.1	
10:00		<0.1	0.4	<0.1	4.0	0.1	
11:00		<0.1	0.4	<0.1	1.0	<0.1	
12:00		0.4	0.2	<0.1	0.5	0.5	
13:00		0.3	<0.1	<0.1	0.5	0.1	
14:00		0.3	<0.1	<0.1	0.3	0.1	
15:00	0.4	<0.1	<0.1	0.3	0.3	0.1	
16:00	0.5	<0.1	<0.1	0.1	0.4	0.1	
17:00	0.6	0.1	<0.1	0.3	0.4	0.1	
18:00	1.0	0.4	<0.1	0.5	0.3	0.1	
19:00	1.1	0.4	0.2	0.4	0.2	<0.1	
20:00	0.8	0.7	0.8	0.6	0.2	<0.1	
21:00	0.5	0.8	0.6	0.8	0.2	0.1	
22:00	0.4	1.1	<0.1	0.6	0.4	0.2	
23:00	0.4	0.9	<0.1	0.5	<0.1	<0.1	
24:00	0.5	0.7	<0.1	0.2	<0.1	<0.1	

SITE NO. 1 (SPORTS COMPLEX)
EIGHT-HOUR AVERAGE CARBON MONOXIDE (PPM)

Time	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91
		0.1					
8:00		0.1	0.6	0.4	2.0	0.1	<0.1
9:00		0.1	0.5	0.4	2.4	0.1	0.1
10:00		0.1	0.5	0.4	2.7	0.1	
11:00		0.2	0.4	0.4	2.6	0.1	
12:00		0.2	0.4	0.4	2.3	0.1	
13:00		0.2	0.3	0.2	2.1	0.2	
14:00		0.2	0.3	0.1	1.9	0.2	
15:00		0.2	0.2	0.2	1.7	0.2	
16:00		0.2	0.1	1.4	0.1	0.1	
17:00		0.1	0.1	0.1	0.9	0.1	
18:00		0.2	0.1	0.2	0.4	0.1	
19:00		0.2	0.1	0.2	0.4	0.1	
20:00		0.3	0.1	0.3	0.3	0.1	
21:00		0.3	0.2	0.4	0.3	0.1	
22:00	0.7	0.4	0.2	0.5	0.3	0.1	
23:00	0.7	0.6	0.2	0.5	0.3	0.1	
24:00	0.7	0.6	0.2	0.5	0.3	0.1	

SITE NO. 2 (EMPIRE BLVD. AND WASHINGTON AVE.)
ONE-HOUR AVERAGE CARBON MONOXIDE (PPM)

Time	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91	Friday 10/18/91
1:00	0.1	<0.1	0.6	<0.1	0.8	<0.1	0.3	
2:00	<0.1	<0.1	0.4	<0.1	2.5	<0.1	<0.1	
3:00	<0.1	<0.1	0.5	<0.1	2.8	<0.1	<0.1	
4:00	<0.1	<0.1	0.4	<0.1	2.1	<0.1	<0.1	
5:00	<0.1	<0.1	0.2	<0.1	2.0	<0.1	<0.1	
6:00	0.1	<0.1	<0.1	0.1	1.7	<0.1	<0.1	
7:00	0.7	<0.1	0.2	0.2	2.2	<0.1	0.1	
8:00	0.6	<0.1	0.2	0.6	3.2	0.1	0.3	
9:00		<0.1	0.3	0.3	3.8	0.2	0.3	
10:00		0.2	0.2	0.3	3.3	0.1	0.2	
11:00		0.2	0.1	<0.1	0.8	0.1	0.1	
12:00		0.3	0.2	<0.1	0.4	0.2	0.2	
13:00		0.1	<0.1	<0.1	0.5	0.2	0.3	0.3
14:00		0.2	<0.1	<0.1	0.3	0.2	0.3	0.1
15:00		0.3	<0.1	<0.1	0.2	0.2	0.2	0.3
16:00		0.2	<0.1	0.1	0.2	0.2	0.3	0.6
17:00		0.1	<0.1	0.2	0.3	0.2	0.6	0.7
18:00		0.2	<0.1	0.3	0.3	0.4	0.8	1.0
19:00		0.5	0.5	0.3	0.2	0.5	0.5	1.0
20:00		0.7	<0.1	0.4	0.2	0.5	0.3	0.3
21:00		1.1	<0.1	0.4	0.3	0.5	0.2	0.3
22:00		1.5	<0.1	0.5	0.4	0.4	0.1	0.4
23:00		0.8	<0.1	1.0	0.3	0.4	0.1	0.3
24:00		0.6	<0.1	0.5	<0.1	0.5	0.1	<0.1

SITE NO. 2 (EMPIRE BLVD. AND WASHINGTON AVE.)
EIGHT-HOUR AVERAGE CARBON MONOXIDE (PPM)

Time	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91	Friday 10/18/91
8:00	0.2	<0.1	0.3	0.1	2.2	<0.1	0.1	
9:00		<0.1	0.3	0.1	2.5	<0.1	0.1	
10:00		<0.1	0.2	0.2	2.6	0.1	0.1	
11:00		0.1	0.2	0.2	2.4	0.1	0.1	
12:00		0.1	0.2	0.2	2.2	0.1	0.2	
13:00		0.1	0.2	0.2	2.0	0.1	0.2	
14:00		0.1	0.2	0.2	1.6	0.1	0.2	
15:00		0.2	0.1	0.1	1.6	0.2	0.2	
16:00		0.2	0.1	0.1	1.2	0.2	0.2	
17:00		0.2	0.1	0.1	0.8	0.2	0.3	
18:00		0.2	<0.1	0.1	0.4	0.2	0.4	
19:00		0.2	0.1	0.1	0.3	0.3	0.4	
20:00		0.3	0.1	0.2	0.3	0.3	0.4	0.5
21:00		0.4	0.1	0.2	0.3	0.3	0.4	0.5
22:00		0.6	0.1	0.3	0.3	0.4	0.4	0.6
23:00		0.6	0.1	0.4	0.3	0.4	0.4	0.6
24:00		0.7	0.1	0.5	0.3	0.4	0.3	0.5

SITE NO. 3 (COMMERCE BLVD. AND CENTRAL BLVD.)
ONE-HOUR AVERAGE CARBON MONOXIDE (PPM)

Time	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91	Friday 10/18/91
1:00	<0.1	0.2	0.9	<0.1	0.4	<0.1	0.3	
2:00	<0.1	0.2	0.9	<0.1	1.7	<0.1	<0.1	
3:00	<0.1	0.1	0.7	<0.1	3.0	<0.1	<0.1	
4:00	<0.1	0.2	0.6	<0.1	2.3	<0.1	<0.1	
5:00	<0.1	0.2	0.7	<0.1	2.1	<0.1	<0.1	
6:00	0.2	<0.1	0.5	0.2	2.0	<0.1	<0.1	
7:00	0.4	<0.1	0.5	0.2	2.0	0.2	<0.1	
8:00	0.5	0.3	0.5	0.7	3.0	0.4	<0.1	
9:00	0.6	0.3	0.6	0.6	4.0	0.2	0.3	
10:00		0.3	0.5	0.2	2.5	0.3	0.1	
11:00		0.3	0.6	1.0	0.3	0.2	0.1	
12:00		0.3	<0.1	0.7	0.2	0.1	0.1	
13:00		0.2	<0.1	<0.1	0.3	0.2	0.3	0.3
14:00		0.2	<0.1	0.2	0.2	0.1	0.3	0.2
15:00		0.2	<0.1	<0.1	0.1	0.1	0.2	0.3
16:00		0.2	<0.1	<0.1	0.1	<0.1	0.3	0.4
17:00		0.2	<0.1	0.3	0.2	0.2	0.5	0.7
18:00		0.3	<0.1	0.3	0.2	0.3	0.8	1.2
19:00		0.5	<0.1	0.3	0.1	0.4	0.5	1.0
20:00		0.7	0.3	0.6	0.1	0.5	0.2	0.5
21:00		0.8	0.2	0.8	0.3	0.4	0.2	0.4
22:00		1.0	<0.1	0.6	0.4	0.4	0.1	0.5
23:00		1.0	<0.1	0.5	0.2	0.1	<0.1	0.4
24:00		0.9	<0.1	0.4	<0.1	0.3	<0.1	0.2

SITE NO. 3 (COMMERCE BLVD. AND CENTRAL BLVD.)
EIGHT-HOUR AVERAGE CARBON MONOXIDE (PPM)

Time	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91	Friday 10/18/91
8:00	0.1	0.2	0.7	0.1	2.1	0.1	<0.1	
9:00	0.2	0.2	0.7	0.2	2.5	0.1	<0.1	
10:00		0.2	0.6	0.2	2.6	0.1	0.1	
11:00		0.2	0.6	0.4	2.3	0.2	0.1	
12:00		0.2	0.5	0.5	2.0	0.2	0.1	
13:00		0.2	0.4	0.6	1.8	0.2	0.1	
14:00		0.2	0.4	0.5	1.5	0.2	0.2	
15:00		0.3	0.3	0.4	1.3	0.2	0.2	
16:00		0.3	0.2	0.3	1.0	0.2	0.2	
17:00		0.2	0.1	0.3	0.5	0.2	0.2	
18:00		0.2	0.1	0.3	0.2	0.2	0.3	
19:00		0.3	<0.1	0.2	0.2	0.2	0.4	
20:00		0.3	<0.1	0.2	0.2	0.2	0.4	0.6
21:00		0.4	0.1	0.3	0.2	0.3	0.4	0.6
22:00		0.5	0.1	0.4	0.2	0.3	0.4	0.6
23:00		0.6	0.1	0.4	0.2	0.3	0.3	0.6
24:00		0.7	0.1	0.5	0.2	0.3	0.3	0.6

TETERBORO AIRPORT
WIND SPEED (KNOTS)

Hour	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91
1	00	08	00	04	03	07	11
2	00	07	05	05	05	04	10
3	04	05	05	05	03	12	09
4	05	03	05	07	04	11	06
5	06	06	05	05	06	08	07
6	06	03	05	08	04	10	08
7	06	04	07	06	05	10	11
8	08	05	07	10	05	13	12
9	07	05	06	08	05	11	12
10	10	00	03	10	05	12	13
11	09	07	04	07	11	11	15
12	12	08	07	10	09	12	10
13	11	07	08	08	13	08	12
14	08	10	08	06	12	11	14
15	08	10	11	08	13	11	10
16	05	10	10	06	10	12	10
17	05	06	10	05	14	10	
18	06	05	07	05	08	10	
19	08	00	05	00	08	06	
20	05	00	10	00	06	07	
21	00	00	10	00	07	08	
22	07	06	06	00	08	07	
23	06	06	05	05	07	05	
24	06	05	05	08		09	

TETERBORO AIRPORT
WIND DIRECTION (00-36)

Hour	Friday 10/11/91	Saturday 10/12/91	Sunday 10/13/91	Monday 10/14/91	Tuesday 10/15/91	Wednesday 10/16/91	Thursday 10/17/91
1	00	30	00	26	02	17	01
2	00	31	36	29	02	19	01
3	35	25	01	29	01	31	03
4	36	27	01	29	03	32	03
5	36	31	36	30	35	34	36
6	36	32	01	31	36	33	36
7	01	26	01	30	02	34	04
8	02	31	35	30	35	36	36
9	02	25	02	32	34	01	01
10	02	00	02	27	35	36	01
11	36	24	32	23	14	01	02
12	36	30	30	28	14	36	02
13	04	23	30	24	14	01	01
14	36	32	31	23	14	36	01
15	10	26	32	23	14	03	02
16	02	26	32	25	14	03	03
17	30	26	29	22	14	01	
18	02	26	29	16	14	01	
19	31	00	31	18	12	03	
20	34	00	32	00	12	36	
21	00	00	33	00	14	01	
22	30	31	32	00	15	36	
23	26	32	32	00	17	35	
24	28	32	31	02	16	36	