4.0 SAMPLE PROBLEMS

This section contains examples intended to highlight the most important capabilities of STAMINA 2.0 and OPTIMA. The user is encouraged to utilize the examples for understanding and practice.

The problems have input and output formats compatible with the May 1982 version only. The user is cautioned that these formats (especially alpha and shielding) are not applicable to the March 1983 version.

4.1 STAMINA 2.0 EXAMPLE PROBLEMS

The following sample problems are meant to illustrate the use of the STAMINA 2.0 program. Each section contains a discussion of the problem and figures showing a site sketch, the user input file, and the output file or results. The first seen problems all relate to a straight 4-lane section of urban freeway with unchanging traffic conditions. A set of completed coding forms is shown for the first problem. The next problem is identical to Example Problem 2 on pages 59-68 of Report No. FHWA-RD-78-138, "User's Manual: FHWA Level 2 Highway Traffic Noise Prediction Model, STAMINA 1.0.". The last problem depicts the user of STAMINA 2.0 to analyze a noise barrier installed on an elevated structure. A completed set of coding forms is shown for this problem.

4.1.1 FREE FIELD

This problem, shown in Figure 21, illustrates the simplest use of STAMINA 2.0, which utilizes only roadway receiver, and sound propagation data. Completed coding forms illustrate how to code the information shown in Figure 21. Input and output files are shown in Figures 22 and 23.

4.1.2 DEPRESSED FREEWAY

This problem, shown in Figure 24, illustrates how depressing the freeway affects the noise level. The cut is modeled as a barrier, with the top of the cut being the barrier's top (Note that DELZ = 0 since the cut height is fixed). The elevation or Z coordinates of the roadway segment endpoints are 15 feet below the top or the cut. Beams (and/or cuts) with vegetation provide more attenuation that is shown by STAMINA 2.0. The user might wish to compensate by using shielding factors. The value would be 3dBA in this case. Input and output files are shown in Figure 25 and 26.

4.1.3 ELEVATED FREEWAY

As shown in Figure 27, the problem illustrates how elevating the freeway affects the noise level. As with a cut, the fill is modeled as a barrier with its top edge at the top of the fill (DELZ = 0 and P = 0 since the fill height is fixed). Andy excess attenuation due to the ground effects of a soft site is lost as the roadway is elevated; thus, no shielding factors are applied in fill situations. Input and output files are shown in Figures 28 and 29.

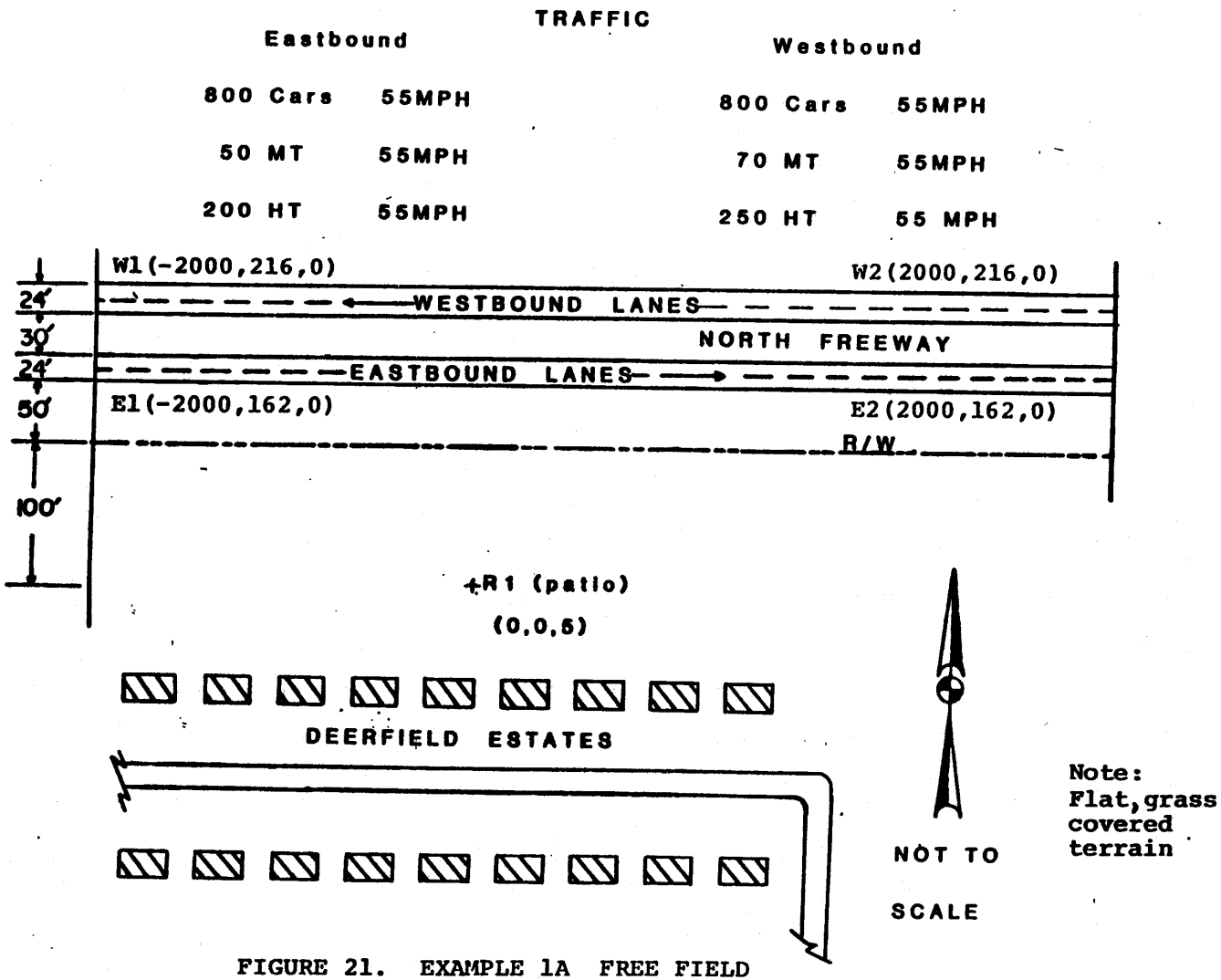

FIGURE 21. EXAMPLE 1A FREE FIELD

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FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

FORM 1 - PROJECT DESCRIPTION

NAME JOHN SMITH
PAGE 1 OF 6
DATE 1 APR 82
PROJECT NORTH FREEWAY

****PLACE A SPACE OR COMMA BETWEEN ITEMS ON SAME LINE WHEN KEYPUNCHING OR ENTERING ITEMS ON TERMINAL****

'OPTIONS' LINE (OPTIONAL)

	METRIC IN?	METRIC OUT?	COMPUTE REFLECTIONS
*			

STAMINA 2.0 ASSUMES INPUT DATA WILL BE IN ENGLISH UNITS, PRINTS OUTPUT DATA IN ENGLISH UNITS, AND DOES NOT COMPUTE REFLECTIONS FROM 'REFLECTIVE' BARRIERS. TO CHANGE ANY OF THOSE ITEMS, CODE AN ASTERISK, THEN A Y FOR YES OR AN N FOR NO FOR ALL ITEMS USING THE FIRST 4 COLUMNS ONLY.

PROBLEM TITLE (MAXIMUM 80 CHARACTERS, ENTER AS ONE LINE)

NORTH FREEWAY

NOTES/SKETCH:

- FREE FIELD
- RECEIVER LOCATED IN BACKYARD PATIO

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FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

FORM 2 - VEHICLE PARAMETERS

NAME SMITH
PAGE 2 OF 6
DATE 1APR82
PROJECT N.F.

13 NUMBER OF VEHICLE TYPES
IF EQUAL TO 3, GO TO FORM 3)

FILL OUT REMAINDER OF FORM WHEN 'NUMBER OF VEHICLE TYPES' EXCEEDS 3

EMISSION LEVEL(EL) VARIABLES- $EL=C0+C1(LOG(SPEED))+0.115(S0)^2$

	SOURCE HEIGHT	C0	C1	S0
6				

'VEH4' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH4' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
7				

'VEH5' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH5' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
8				

'VEH6' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH6' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
9				

'VEH7' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH7' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
10				

'VEH8' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH8' DESCRIPTION (16 CHARACTERS)

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FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

FORM 3 - ROADWAY DATA

NAME SMITH
PAGE 4 OF 6
DATE 1 APR 82
PROJECT N.E

BLOCK CONTROL LINE

~~2 NUMBER OF ROADS~~

NOTES 1. MAXIMUM OF 30 ROADWAYS PERMITTED
2. MAXIMUM OF 15 ENDPOINTS PER ROADWAY
3. USE A SEPARATE SHEET FOR EACH ROADWAY
4. ONLY ENTER BLOCK CONTROL LINE ONCE PER EACH BLOCK OF ROADWAY DATA

ROADWAY TITLE (MAXIMUM OF 60 CHARACTERS. ENTER AS ONE LINE)
WESTBOUND LANES

NO. 2

VEHICLE TYPE	VEHICLES PER HOUR	SPEED
'CARS'	800	55
'MT'	70	55
'HT'	250	55
~~'VEH4'~~		
~~'VEH5'~~		
~~'VEH6'~~		
~~'VEH7'~~		
~~'VEH8'~~		

CROSS OUT IF NOT REQUIRED

'L'/

ENDPOINT ID (MAX 8 CHARAC)	EAST COORDINATE (X)	NORTH COORDINATE (Y)	ELEVATION(Z)	GA*	DO NOT CODE
'W1'	-2000	216	0	0	1
'W2'	2000	216	0	0	2
''					3
''					4
''					5
''					6
''					7
''					8
''					9
''					10
''					11
''					12
''					13
''					14
''					15

'L'/

*GA=GRADE ADJUSTMENT FOR HEAVY TRUCKS - 1=YES, 0=NO

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

FORM 3 - ROADWAY DATA

NAME SMITH
PAGE 4 OF 6
DATE 1 APR 82
PROJECT N.F

BLOCK CONTROL LINE

~~2 NUMBER OF ROADS~~

NOTES 1. MAXIMUM OF 50 ROADWAYS PERMITTED
2. MAXIMUM OF 15 ENDPOINTS PER ROADWAY
3. USE A SEPARATE SHEET FOR EACH ROADWAY
4. ONLY ENTER BLOCK CONTROL LINE ONCE PER EACH BLOCK OF ROADWAY DATA

ROADWAY TITLE (MAXIMUM OF 60 CHARACTERS. ENTER AS ONE LINE)
WESTBOUND LANES

NO. 2

VEHICLE TYPE	VEHICLES PER HOUR	SPEED
'CARS'	800	55
'MT'	70	55
'HT'	250	55
~~'VEH4'~~		
~~'VEH5'~~		
~~'VEH6'~~		
~~'VEH7'~~		
~~'VEH8'~~		

CROSS OUT IF NOT REQUIRED

'L' /

ENDPOINT ID (MAX 8 CHARAC)	EAST COORDINATE (X)	NORTH COORDINATE (Y)	ELEVATION(Z)	GRm	DO NOT CODE
'W1'	-2000	216	0	0	1
'W2'	2000	216	0	0	2
''					3
''					4
''					5
''					6
''					7
''					8
''					9
''					10
''					11
''					12
''					13
''					14
''					15

'L' /

*GRm=GRADE ADJUSTMENT FOR HEAVY TRUCKS - 1=YES, 0=NO

REV/ 3/83

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FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

FORM 5 - RECEIVER DATA

NAME SMITH
PAGE 5 OF 6
DATE 1 APR 82
PROJECT N. F.

BLOCK CONTROL LINE

	NUMBER OF RECEIVERS
5	1

NOTE: 1. MAXIMUM OF 40 RECEIVERS;
2. ENTER BLOCK CONTROL LINE ONLY ONCE FOR RECEIVER DATA
3. ENTER RECEIVER DATA TITLE ONLY ONCE.

RECEIVER DATA TITLE (MAXIMUM OF 80 CHARAC.). ENTER ONCE. ENTER AS 1 LINE

DEERFIELD ESTATES

RECEIVER ID (MAX 8 CHARAC)	EAST COORDINATE (X)	NORTH COORDINATE (Y)	ELEVATION(Z)	DO NOT CODE
R1	0	0	5	1
				2
				3
				4
				5
				6
				7
				8
				9
				0
				1
				2
				3
				4
				5
				6
				7
				8
				9
				0

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

NAME SMITH
PAGE 6 OF 6
DATE 1 APR 82
PROJECT N.F.

FORM 6 — SOUND PROPAGATION DATA

BLOCK CONTROL LINE

	CODE
6	1

NOTES: 1. ENTER CODE ON BLOCK CONTROL LINE: 1=ALPHA VALUES. 2=SHIELDING FACTORS.
2. ENTER BLOCK CONTROL LINE ONCE BEFORE EACH BLOCK OF SOUND PROPAGATION DATA

DATA BLOCK TITLE (ENTER ONCE PER DATA BLOCK. MAX. OF 80 CHARAC.
ALPHA VALUES

ENTER ALPHA VALUES OR SHIELDING FACTORS (IN DBA) FOR ALL RECEIVER—ROADWAY PAIRS

ROADWAY NUMBERS

RECEIVER NUMBER										
1	.5	.5								
2										
3										
4										
5										
6										
7										
8										
9										
10										

7/ 'END OF DATA' LINE. ENTER ONLY ONCE AS LAST LINE IN DATA FILE

```
NORTH FREEWAY
1 3
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 0 0
'E2' 2000 162 0 0
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 0 0
'W2' 2000 216 0 0
'L'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
7/
```

FIGURE 22. EXAMPLE 1A INPUT DATA

```
                STAMINA 2.0/BCR
            FHWA VERSION (MARCH 1982)
          TRAFFIC NOISE PREDICTION MODEL
         DEVELOPED UNDER CONTRACT BY BBN

   (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

 NORTH FREEWAY
 PROGRAM INITIALIZATION PARAMETERS

      HEIGHT      CODE          DESCRIPTION
        0.0         1     RECEIVER HEIGHT ADJUSTMENT
        1.00        2     A-WEIGHTED SOUND LEVEL ONLY
        0.0         3     HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
        8.00        4     HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
        2.30        5     HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

 ROADWAY    1     EASTBOUND LANES

                    VEHICLE TYPE   VEHICLES/HOUR      SPEED
                         CARS            800.          55.
                         HT              200.          55.
                         MT               50.          55.
                     ------------COORDINATES-------------
                          X            Y            Z      GRADE
 E1                    -2000.        162.          0.       0
 E2                     2000.        162.          0.       0

 ROADWAY    2     WESTBOUND LANES

                    VEHICLE TYPE   VEHICLES/HOUR      SPEED
                         CARS            800.          55.
                         HT              250.          55.
                         MT               70.          55.
                     ------------COORDINATES-------------
                          X            Y            Z      GRADE
 W1                    -2000.        216.          0.       0
 W2                     2000.        216.          0.       0
 DEERFIELD ESTATES
                     ------------COORDINATES-------------
                          X            Y            Z
 R1                       0.           0.           5.
   ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 0.5 0.5
   SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 0.0 0.0
 NORTH FREEWAY
 RECEIVER     LEQ(H)   SIG   L10    L50    L90

 R1            71.1    3.6   74.3   69.7   65.1
```

FIGURE 23. EXAMPLE 1A OUTPUT

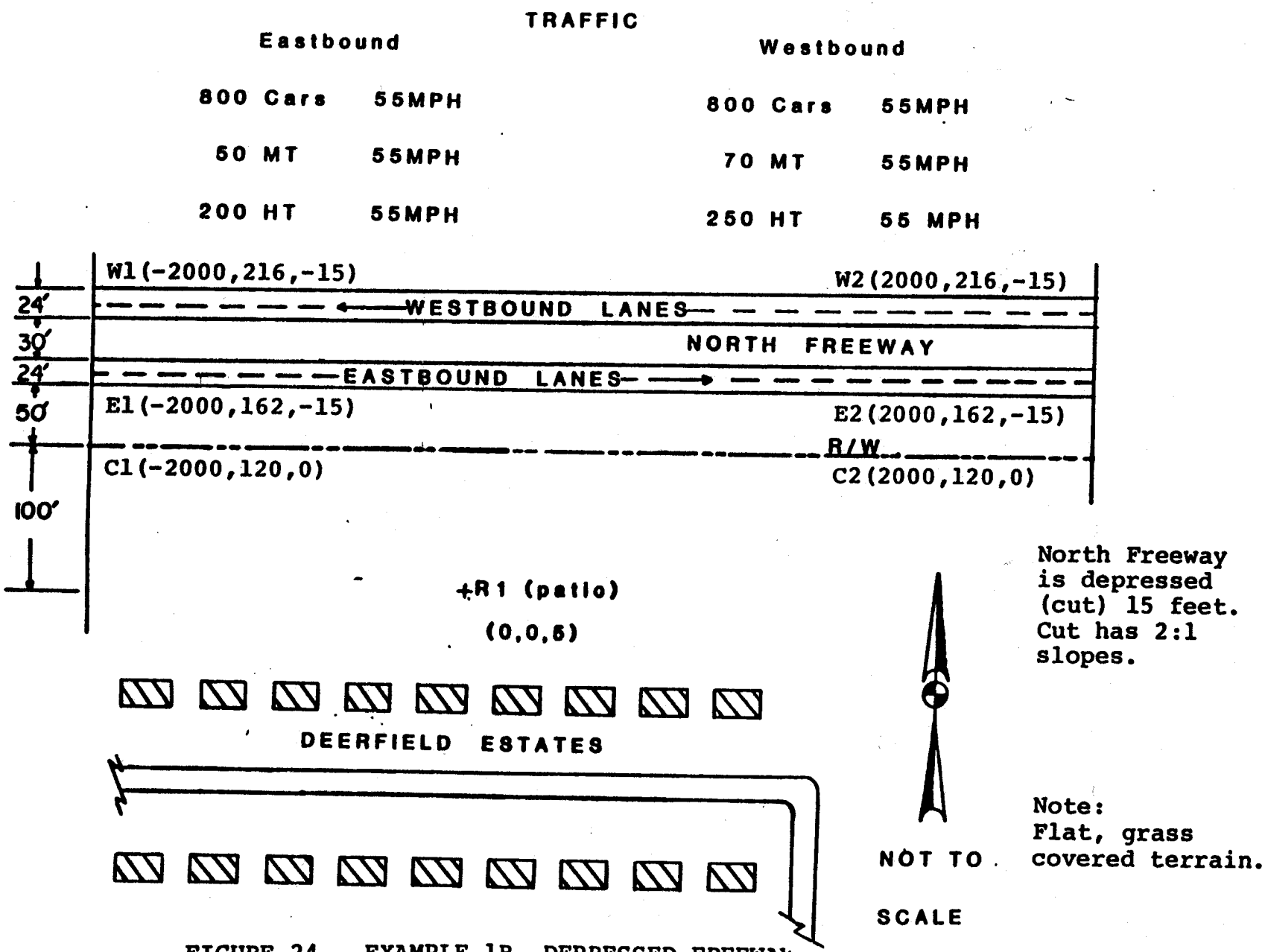


FIGURE 24. EXAMPLE 1B DEPRESSED FREEWAY

```
NORTH FREEWAY
1 3
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 -15 0
'E2' 2000 162 -15 0
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 -15 0
'W2' 2000 216 -15 0
'L'/
3 1
DEPRESSED (CUT) FREEWAY
'C1' -2000 120 0 0 0 0
'C2' 2000 120 0 0
'A'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
6 2
SHIELDING FACTORS
3.0 3.0
7/
```

FIGURE 25. EXAMPLE 1B INPUT DATA

```
              STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

  (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )


NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT       CODE          DESCRIPTION
       0.0          1      RECEIVER HEIGHT ADJUSTMENT
       1.00         2      A-WEIGHTED SOUND LEVEL ONLY
       0.0          3      HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
       8.00         4      HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
       2.30         5      HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)


ROADWAY   1     EASTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                          CARS            800.          55.00
                          HT              200.          55.00
                          MT               50.          55.00
                       ------------COORDINATES-------------
                            X            Y            Z      GRADE
E1                       -2000.00     162.00      -15.00     0
E2                        2000.00     162.00      -15.00     0


ROADWAY   2     WESTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                          CARS            800.          55.00
                          HT              250.          55.00
                          MT               70.          55.00
                       ------------COORDINATES-------------
                            X            Y            Z      GRADE
W1                       -2000.00     216.00      -15.00     0
W2                        2000.00     216.00      -15.00     0
BARRIER   1   TYPE(A)     DEPRESSED (CUT) FREEWAY
                X           Y          Z          ZO        DELZ          P
C1           -2000.0     120.0       0.0        0.0        0.0          0
C2            2000.0     120.0       0.0        0.0
DEERFIELD ESTATES
                       ------------COORDINATES-------------
                            X            Y            Z
R1                         0.0          0.0         5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 3.0 3.0
NORTH FREEWAY
RECEIVER     LEQ(H)   SIG   L10    L50    L90

R1            65.1    5.1   68.6   62.1   55.5
```

FIGURE 26. EXAMPLE 1B OUTPUT

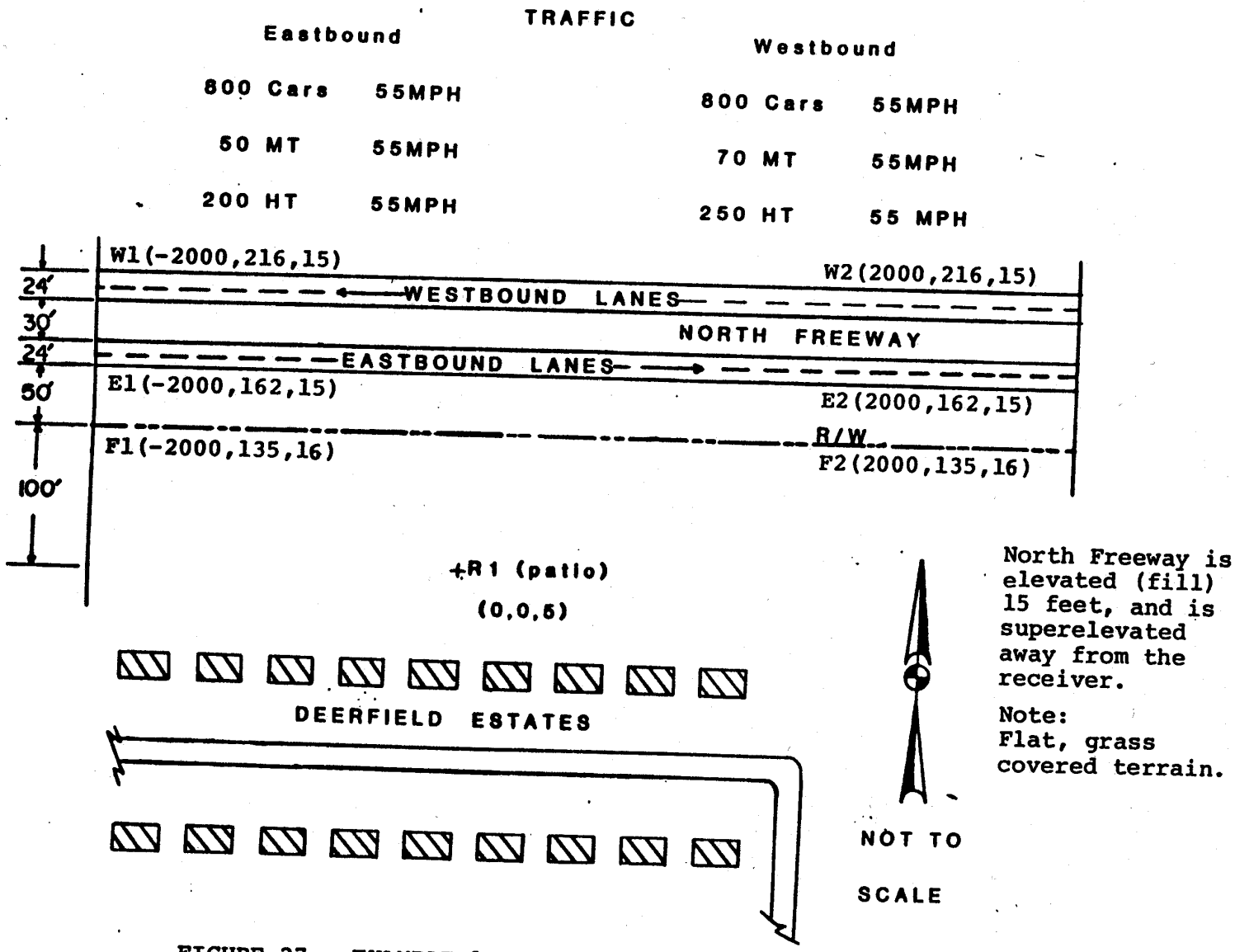


FIGURE 27. EXAMPLE 1C ELEVATED FREEWAY

```
NORTH FREEWAY
1 3
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 15 0
'E2' 2000 162 15 0
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 15 0
'W2' 2000 216 15 0
'L'/
3 1
ELEVATED (FILL) FREEWAY
'F1' -2000 135 16 0 0 0
'F2' 2000 135 16 0
'A'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
6 2
SHIELDING FACTORS
0 0
7/
```

FIGURE 28. EXAMPLE 1C INPUT DATA

```
                STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

   (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

 NORTH FREEWAY
 PROGRAM INITIALIZATION PARAMETERS

      HEIGHT      CODE          DESCRIPTION
        0.0         1     RECEIVER HEIGHT ADJUSTMENT
        1.00        2     A-WEIGHTED SOUND LEVEL ONLY
        0.0         3     HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
        8.00        4     HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
        2.30        5     HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

 ROADWAY   1     EASTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                          CARS            800.          55.
                          HT              200.          55.
                          MT               50.          55.
                     ------------COORDINATES-------------
 E1                        X              Y             Z      GRADE
 E2                     -2000.          162.          15.       0
                         2000.          162.          15.       0

 ROADWAY   2     WESTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                          CARS            800.          55.
                          HT              250.          55.
                          MT               70.          55.
                     ------------COORDINATES-------------
 W1                        X              Y             Z      GRADE
 W2                     -2000.          216.          15.       0
 BARRIER   1   TYPE(A)   2000.          216.          15.       0
                     ELEVATED (FILL) FREEWAY
            ---------COORDINATES----------
                X          Y          Z          ZO        DELZ          P
 F1          -2000.      135.       16.          0.          0.          0
 F2           2000.      135.       16.          0.
 DEERFIELD ESTATES

                     ------------COORDINATES-------------
 R1                        X              Y             Z
                           0.             0.            5.
   ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 0.5 0.5
   SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 0.0 0.0
 NORTH FREEWAY
 RECEIVER     LEQ(H)    SIG    L10    L50    L90

 R1            70.4     3.8    73.6   68.7   63.8
```

FIGURE 29. EXAMPLE 1C OUTPUT

4.1.4 Grade adjustment

Figure 30 shows the freeway with a 7% grade. To account for increased noise from heavy trucks on grades, the user must treat each flow direction must be a separately – that is, each flow direction must be applied only to upgrade segments, and is applied by coding the integer 1 after the z coordinate of the first and last endpoints defining the segment. Downgrade segments have no grade correction applied and are coded with 0 after all endpoints. Input and output files are shown in Figure 31 and 32.

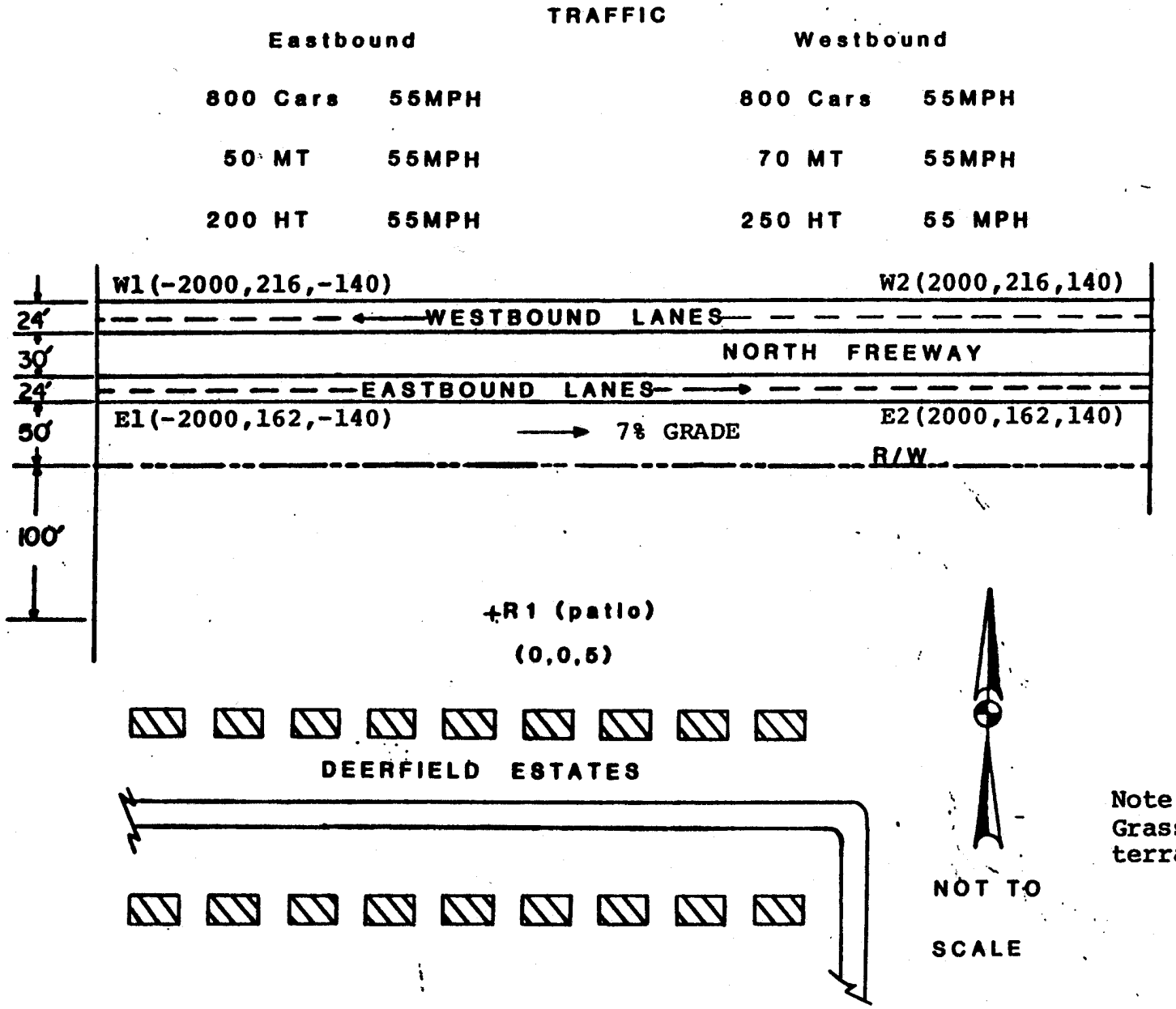
4.1.5 EXTRA VEHICLE TYPE

The problem shown in Figure 33 illustrates how extra vehicle types are added to STAMINA 2.0. The number of vehicle types is coded as 4 (cars, medium trucks, heavy trucks, and the extra vehicle type) on the number of vehicle types line. The extra vehicle source height and emission level coefficients, C_0, C_1, and S_0 and the extra vehicle type's description (name) must then be specified. Traffic data (vehicles per hour and speed) for the extra vehicle type are entered immediately after the flow data for cars, medium trucks, and heavy trucks. Input and output files are shown in Figures 34 and 35.

4.1.6 NOISE WALL

As shown in Figure 36, this problem adds a free-standing noise wall into the noise analysis. Endpoint coordinates and corresponding heights and ground elevation are entered for all barrier segments. Note that DELZ, the incremental height change for the barrier, and P, the number of barrier changes in each direction (up and down), are specified for each barrier, not each barrier segment. Caution: Z – (DELZ X P) z(0), STAMINA 2.0 cannot perturb a barrier height below the ground height. The user is encouraged to fully understand these elements before using the program.

After all coordinates have been entered, the barrier type is entered. Note that 3 dBA should be manually added to noise attenuation when working with an earth berm. This feature is not automatically included in STAMINA 2.0. In special cases, such as shown in section 4.1.2, shielding factors may be used to simulate berm attenuation. Structure barriers are discussed in Section 4.1.9. Input and output files for the sample noise wall problem are shown in figures 37 and 38.



Note:
Grass covered terrain.

FIGURE 30. EXAMPLE 1D GRADE ADJUSTMENT

```
NORTH FREEWAY
1 3
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 -140 1
'E2' 2000 162 140 1
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 -140 0
'W2' 2000 216 140 0
'L'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
7/
```

FIGURE 31. EXAMPLE 1D INPUT DATA

```
                STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

  (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )


NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT       CODE          DESCRIPTION
       0.0          1      RECEIVER HEIGHT ADJUSTMENT
       1.00         2      A-WEIGHTED SOUND LEVEL ONLY
       0.0          3      HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
       8.00         4      HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
       2.30         5      HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)


ROADWAY   1      EASTBOUND LANES

                      VEHICLE TYPE   VEHICLES/HOUR      SPEED
                           CARS            800.          55.00
                           HT              200.          55.00
                           MT               50.          55.00
                        ------------COORDINATES-------------
                              X             Y             Z      GRADE
E1                         -2000.00      162.00      -140.00     1
E2                          2000.00      162.00       140.00     1


ROADWAY   2      WESTBOUND LANES

                      VEHICLE TYPE   VEHICLES/HOUR      SPEED
                           CARS            800.          55.00
                           HT              250.          55.00
                           MT               70.          55.00
                        ------------COORDINATES-------------
                              X             Y             Z      GRADE
W1                         -2000.00      216.00      -140.00     0
W2                          2000.00      216.00       140.00     0
DEERFIELD ESTATES
                        ------------COORDINATES-------------
                              X             Y             Z
R1                            0.0           0.0          5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0 0.0
NORTH FREEWAY
RECEIVER     LEQ(H)   SIG   L10   L50   L90

R1            74.1    4.4   77.5  71.9  66.2
```

FIGURE 32. EXAMPLE 1D OUTPUT

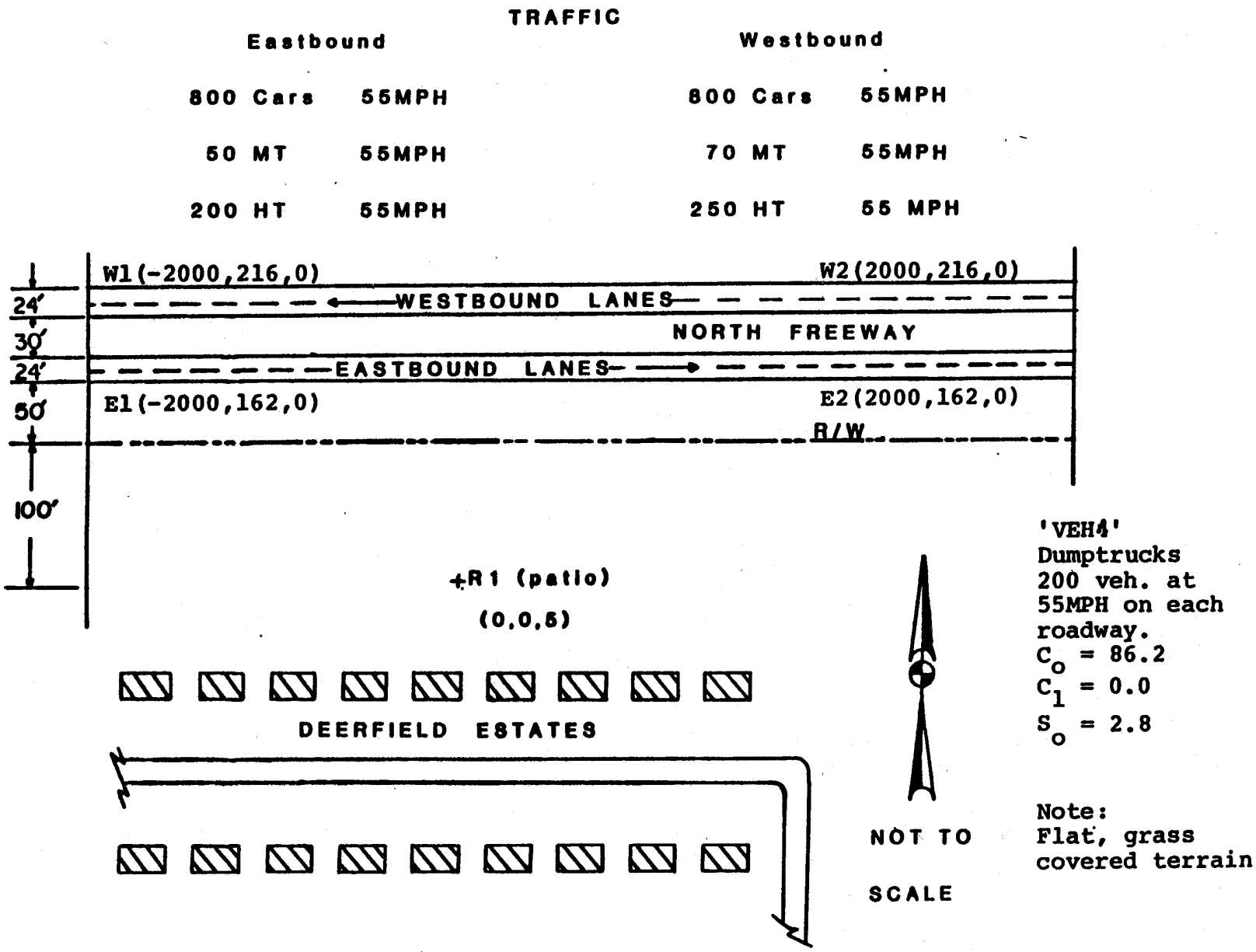


FIGURE 33. EXAMPLE 1E EXTRA VEHICLE TYPE

```
NORTH FREEWAY
1 4
6 8 86.2 0 2.8
DUMPTRUCKS
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'VEH4' 200 55
'L'/
'E1' -2000 162 0 0
'E2' 2000 162 0 0
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'VEH4' 200 55
'L'/
'W1' -2000 216 0 0
'W2' 2000 216 0 0
'L'/

5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
7/
```

FIGURE 34. EXAMPLE 1E INPUT DATA

```
                STAMINA 2.0/BCR
            FHWA VERSION (MARCH 1982)
          TRAFFIC NOISE PREDICTION MODEL
         DEVELOPED UNDER CONTRACT BY BBN

  (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )


NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT       CODE          DESCRIPTION
       0.0          1      RECEIVER HEIGHT ADJUSTMENT
       1.00         2      A-WEIGHTED SOUND LEVEL ONLY
       0.0          3      HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
       8.00         4      HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
       2.30         5      HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)
      8.000         6      HEIGHT ADJUSTMENT FOR TYPE4 VEHICLES (VEH4)
                                                     DUMPTRUCKS
                           CO =      86.20  C1 =       0.0   SO =       2.80


ROADWAY   1      EASTBOUND LANES


                      VEHICLE TYPE   VEHICLES/HOUR     SPEED
                           CARS            800.         55.00
                           HT              200.         55.00
                           MT               50.         55.00
                           VEH4            200.         55.00
                        ------------COORDINATES-------------
                              X            Y            Z      GRADE
E1                         -2000.00     162.00        0.0      0
E2                          2000.00     162.00        0.0      0


ROADWAY   2      WESTBOUND LANES


                      VEHICLE TYPE   VEHICLES/HOUR     SPEED
                           CARS            800.         55.00
                           HT              250.         55.00
                           MT               70.         55.00
                           VEH4            200.         55.00
                        ------------COORDINATES-------------
                              X            Y            Z      GRADE
W1                         -2000.00     216.00        0.0      0
W2                          2000.00     216.00        0.0      0
DEERFIELD ESTATES
                        ------------COORDINATES-------------
                              X            Y            Z
R1                            0.0         0.0         5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0 0.0
NORTH FREEWAY
RECEIVER     LEQ(H)   SIG   L10    L50    L90

R1            73.9    3.0   76.7   72.9   69.0
```

FIGURE 35. EXAMPLE 1E OUTPUT

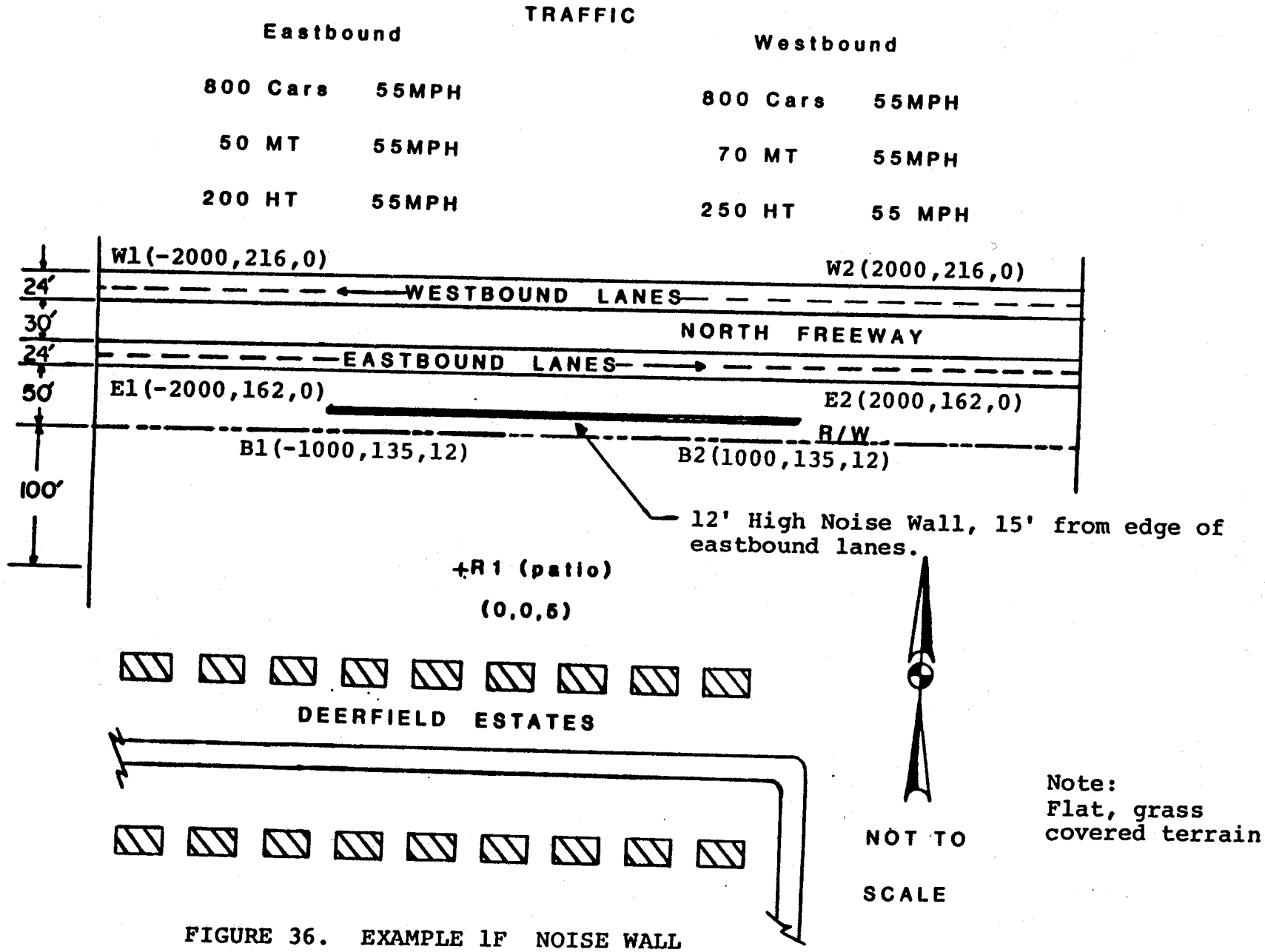
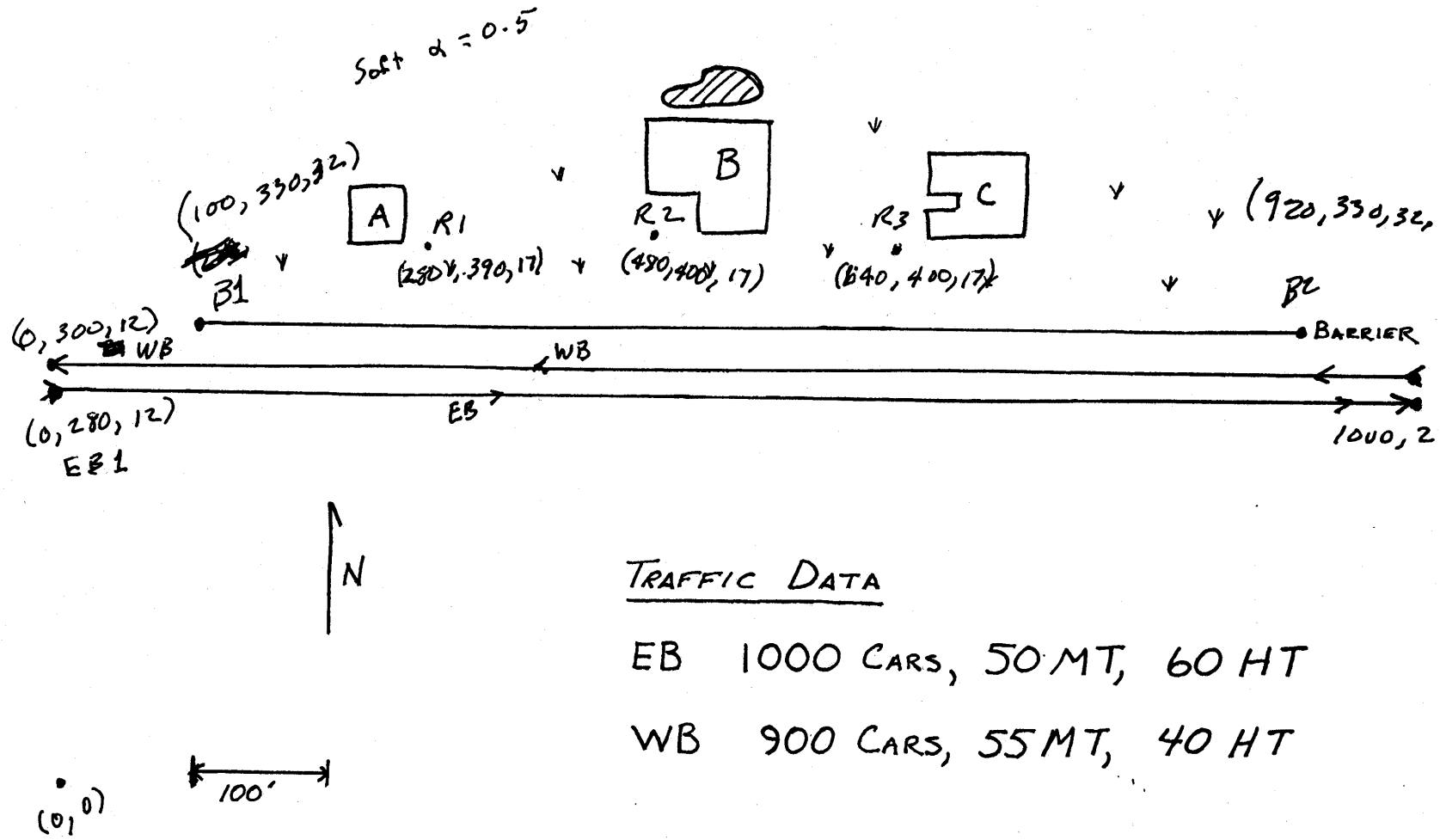


FIGURE 36. EXAMPLE 1F NOISE WALL

```
NORTH FREEWAY
1 3
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 0 0
'E2' 2000 162 0 0
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 0 0
'W2' 2000 216 0 0
'L'/
3 1
NOISE WALL
'B1' -1000 135 12 0 2 3
'B2' 1000 135 12 0
'R'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
7/
```

FIGURE 37. EXAMPLE 1F INPUT DATA

PLAN VIEW - STAMINA ESTATES



TRAFFIC DATA

EB 1000 CARS, 50 MT, 60 HT

WB 900 CARS, 55 MT, 40 HT

"OPTIMA" Noise Barrier Design Program

-- Uses output from "STAMINA 2.0"

- Sound energies passing over each barrier section for each section height for each receiver

-- Interactive program - requests data on:

- Design noise level for each receiver [67] NOISE ABATEMENT CRITERIA
- # of people represented by each receiver [1]
- Material for each barrier section [for COST (calcs only)]

"OPTIMA" Noise Barrier Design Program

-- Computes "effectiveness/cost" ratios for each barrier section for each height

-- Permits quick analysis of changes in individual section heights

- Contribution to total level at each receiver over each segment
- Total Leq with & without barrier at each receiver
- Cost

```
                STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

   (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

 NORTH FREEWAY
 PROGRAM INITIALIZATION PARAMETERS

      HEIGHT      CODE          DESCRIPTION
        0.0         1     RECEIVER HEIGHT ADJUSTMENT
        1.00        2     A-WEIGHTED SOUND LEVEL ONLY
        0.0         3     HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
        8.00        4     HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
        2.30        5     HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

 ROADWAY    1      EASTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                         CARS            800.          55.00
                         HT              200.          55.00
                         MT               50.          55.00
                      ------------COORDINATES-------------
                           X              Y             Z      GRADE
 E1                     -2000.00       162.00         0.0      0
 E2                      2000.00       162.00         0.0      0

 ROADWAY    2      WESTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                         CARS            800.          55.00
                         HT              250.          55.00
                         MT               70.          55.00
                      ------------COORDINATES-------------
                           X              Y             Z      GRADE
 W1                     -2000.00       216.00         0.0      0
 W2                      2000.00       216.00         0.0      0
 BARRIER    1   TYPE(R)    NOISE WALL
                  X          Y          Z          ZO       DELZ          P
 B1            -1000.0     135.0      12.0        0.0        2.0          3
 B2             1000.0     135.0      12.0        0.0
 DEERFIELD ESTATES
                      ------------COORDINATES-------------
                           X              Y             Z
 R1                        0.0            0.0          5.00
   ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 0.5 0.5
   SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 0.0 0.0
 NORTH FREEWAY
 RECEIVER     LEQ(H)    SIG    L10    L50    L90

 R1            66.4     3.1    69.2   65.3   61.3
```

FIGURE 38. EXAMPLE 1F OUTPUT

4.1.7 SHIELDING

This problem shown in Figure 39 illustrates the use of shielding factors to account for excess noise attenuation provided by dense vegetation, berms, rows of buildings, or any object which significantly interferes with the noise propagation. Shielding factors are added for any excess attenuation for each roadway – receiver pair. Input and output files are shown in Figures 40 and 41.

4.2 STAMINA 1.0 MANUAL EXAMPLE PROBLEM 2

This problem, shown in Figures 42 and 43, is identical to Example Problem 2 in the STAMINA 1.0 user's manual. It is included for comparison of the input and output formats of STAMINA 1.0 and STAMINA 2.0. Input and output files are shown in Figures 44 and 45. Note that this problem has English units in and metric units out.

4.3 EXAMPLE PROBLEMS 3 – STRUCTURE – BARRIERS

The following problem shows how STAMINA 2.0 analyzes a noise barrier installed on an elevated structure. The problem has been separated into five cases, each built upon the previous one. This method illustrates the effects of using this STAMINA 2.0 feature.

4.3.1 INDUSTRIAL ROAD ONLY

In this case, the noise level from traffic on a single, two-lane industrial road (Figure 4-6) is calculated. The resulting noise level is 62.1 dBA. Input and output file are shown in Figures 47 and 48.

4.3.2 INDUSTRIAL ROAD AND FREEWAY

In this case, noise from traffic on a four-lane freeway is added (Figure 49). All roadways are on level ground and the receiver is five feet above them. The resulting noise level is 71.7 dBA, an increase of 9.5 dBA over the industrial road only case. Input and output file are shown in Figures 50 and 51.

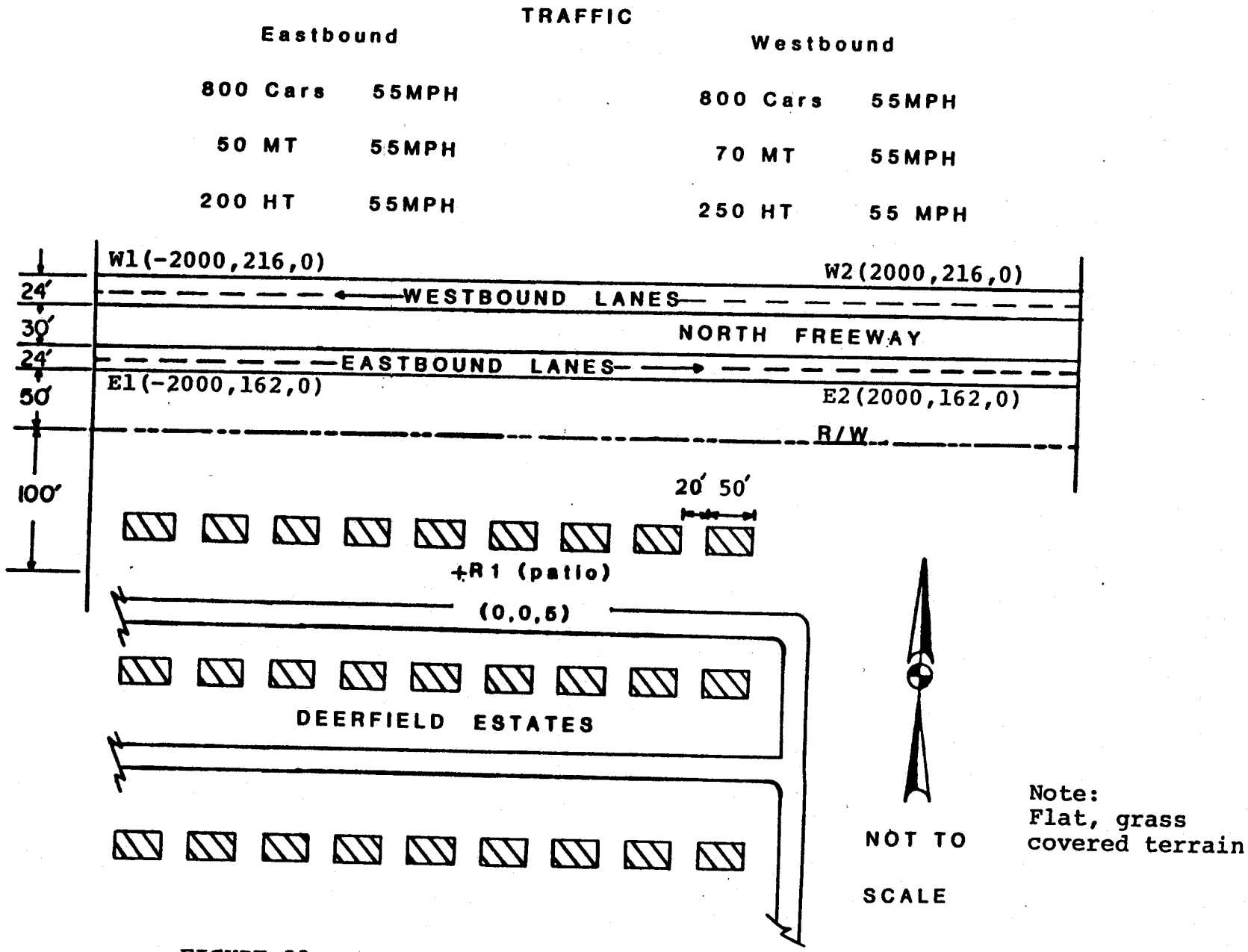


FIGURE 39. EXAMPLE 1G HOUSE SHIELDING

```
NORTH FREEWAY
1 3
2 2
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 0 0
'E2' 2000 162 0 0
'L'/
WESTBOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 0 0
'W2' 2000 216 0 0
'L'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5
6 2
SHIELDING FACTORS - HOUSES
5.0 5.0
7/
```

FIGURE 40. EXAMPLE 1G INPUT DATA

```
                STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

   (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

 NORTH FREEWAY
 PROGRAM INITIALIZATION PARAMETERS

      HEIGHT        CODE          DESCRIPTION
        0.0          1      RECEIVER HEIGHT ADJUSTMENT
        1.00         2      A-WEIGHTED SOUND LEVEL ONLY
        0.0          3      HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
        8.00         4      HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
        2.30         5      HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

 ROADWAY   1      EASTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                         CARS              800.         55.00
                         HT                200.         55.00
                         MT                 50.         55.00
                      ------------COORDINATES-------------
 E1                        X              Y              Z      GRADE
 E2                    -2000.00       162.00           0.0       0
                        2000.00       162.00           0.0       0

 ROADWAY   2      WESTBOUND LANES

                     VEHICLE TYPE   VEHICLES/HOUR      SPEED
                         CARS              800.         55.00
                         HT                250.         55.00
                         MT                 70.         55.00
                      ------------COORDINATES-------------
 W1                        X              Y              Z      GRADE
 W2                    -2000.00       216.00           0.0       0
 DEERFIELD ESTATES      2000.00       216.00           0.0       0

                      ------------COORDINATES-------------
 R1                        X              Y              Z
   ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN          0.0       0.0          5.00

  1 * 0.5 0.5
   SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

  1 * 5.0 5.0
 NORTH FREEWAY
 RECEIVER     LEQ(H)    SIG    L10     L50     L90

 RI            66.1     6.7    69.6    61.0    52.4
```

FIGURE 41. EXAMPLE 1G OUTPUT

Each Lane Carries the Following Traffic:

Automobiles	251 vehicles per hour
Medium Trucks	9 vehicles per hour
Heavy Trucks	26 vehicles per hour

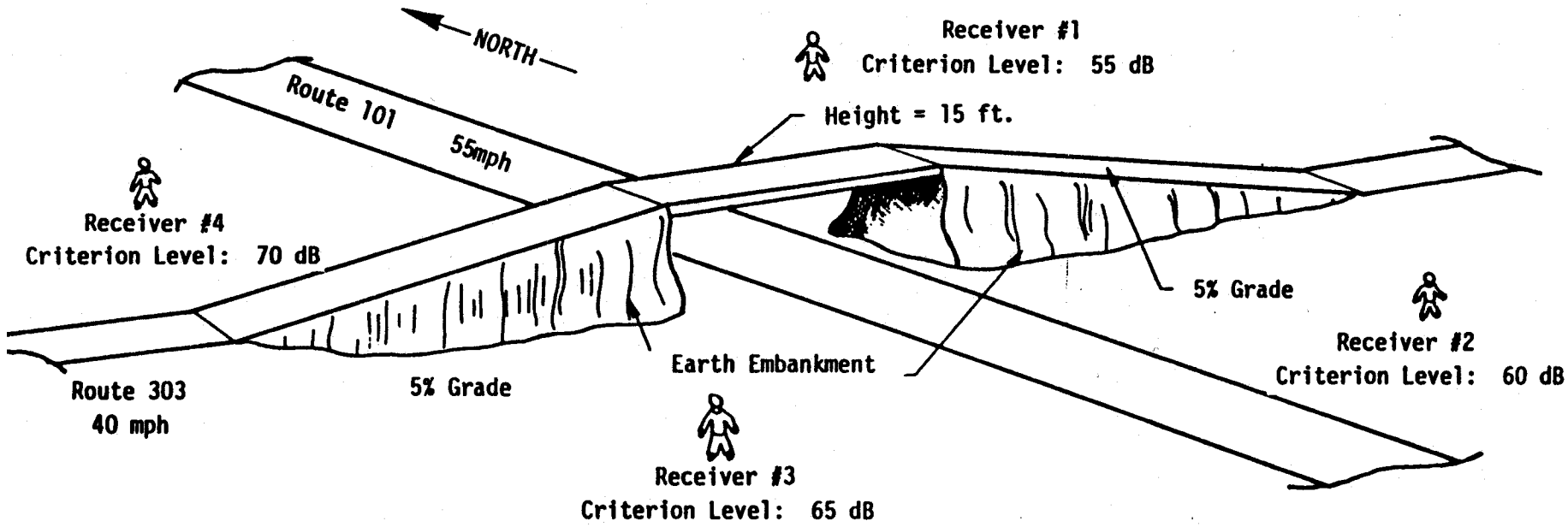


FIGURE 42. EXAMPLE PROBLEM 2

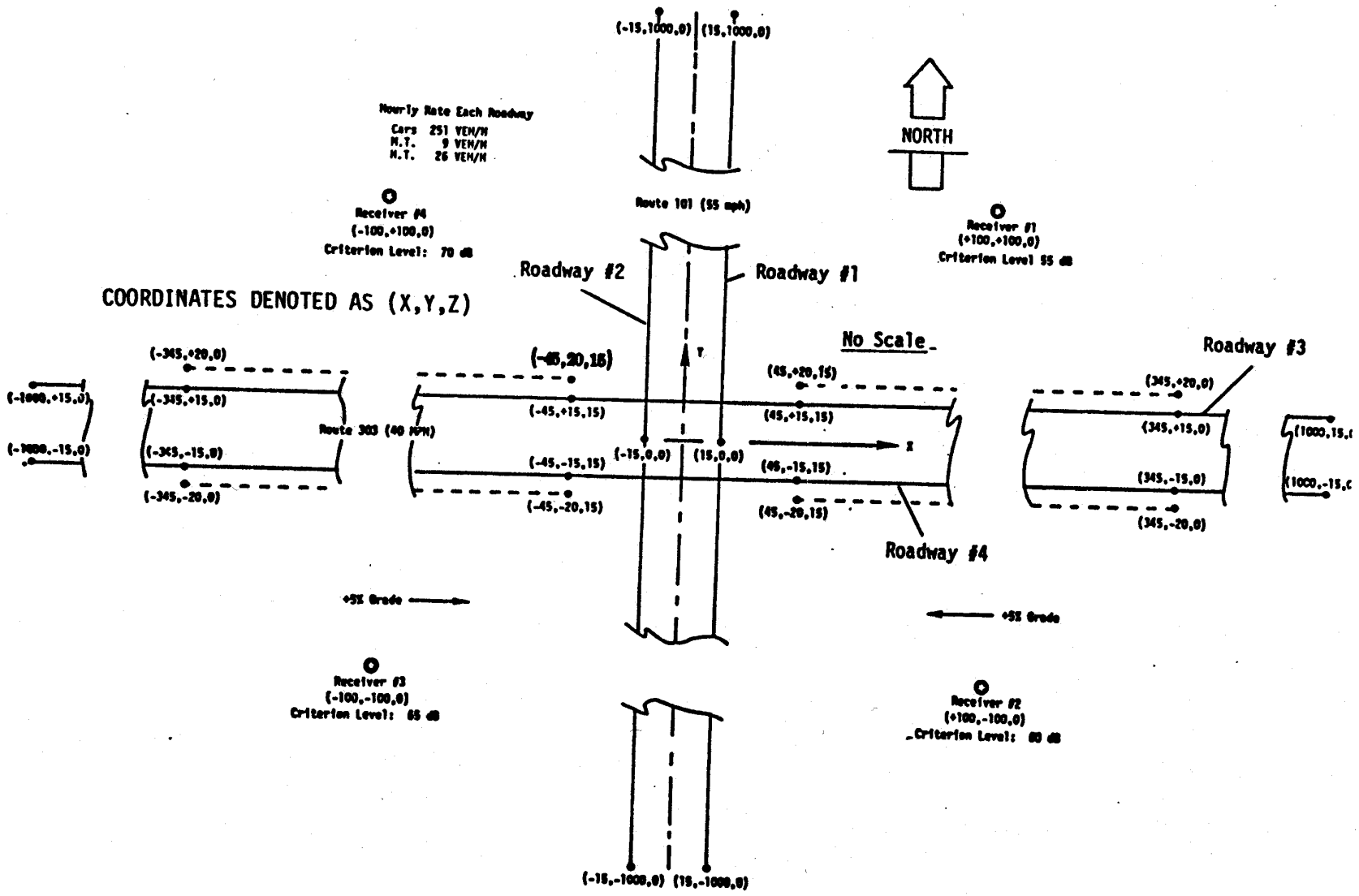


FIGURE 43. ROADWAY, BARRIER, AND RECEIVER COORDINATES

```
*NYN
STAMINA 1.0 EXAMPLE PROBLEM 2
1 3
2 4
ROUTE 101 NORTHBOUND
'CARS' 251 55
'MT' 9 55
'HT' 26 55
'L'/
'N1' 15 1000 0 0
'N2' 15 0 0 0
'N3' 15 -1000 0 0
'L'/
ROUTE 101 SOUTHBOUND
'CARS' 251 55
'MT' 9 55
'HT' 26 55
'L'/
'S1' -15 1000 0 0
'S2' -15 0 0 0
'S3' -15 -1000 0 0
'L'/

ROUTE 303 WESTBOUND
'CARS' 251 40
'MT' 9 40
'HT' 26 40
'L'/
'W1' 1000 15 0 0
'W2' 345 15 0 1
'W3' 45 15 15 1
'W4' -45 15 15 0
'W5' -345 15 0 0
'W6' -1000 15 0 0
'L'/
ROUTE 303 EASTBOUND
'CARS' 251 40
'MT' 9 40
'HT' 26 40
'L'/
'E1' -1000 -15 0 0
'E2' -345 -15 0 1
'E3' -45 -15 15 1
'E4' 45 -15 15 0
'E5' 345 -15 0 0
'E6' 1000 -15 0 0

'L'/
3 4
RAMP ON N.E. SIDE OF ROUTE 303
'NE1' 345 20 0 0 0 0
'NE2' 45 20 15 0
'A'/
RAMP ON N.W. SIDE OF ROUTE 303
'NW1' -45 20 15 0 0 0
'NW2' -345 20 0 0
'A'/
RAMP ON S.E. SIDE OF ROUTE 303
'SE1' 345 -20 0 0 0 0
'SE2' 45 -20 15 0
'A'/
RAMP ON S.W. SIDE OF ROUTE 303
'SW1' -45 -20 15 0 0 0
'SW2' -345 -20 0 0
'A'/
5 4
RECEIVERS IN QUADRANTS OF INTERCHANGE
'NE' 100 100 5
'SE' 100 -100 5
'SW' -100 -100 5

'NW' -100 100 5
6 1
ALPHA VALUES
4*.5
4*.5
4*.5
4*.5
7/
```

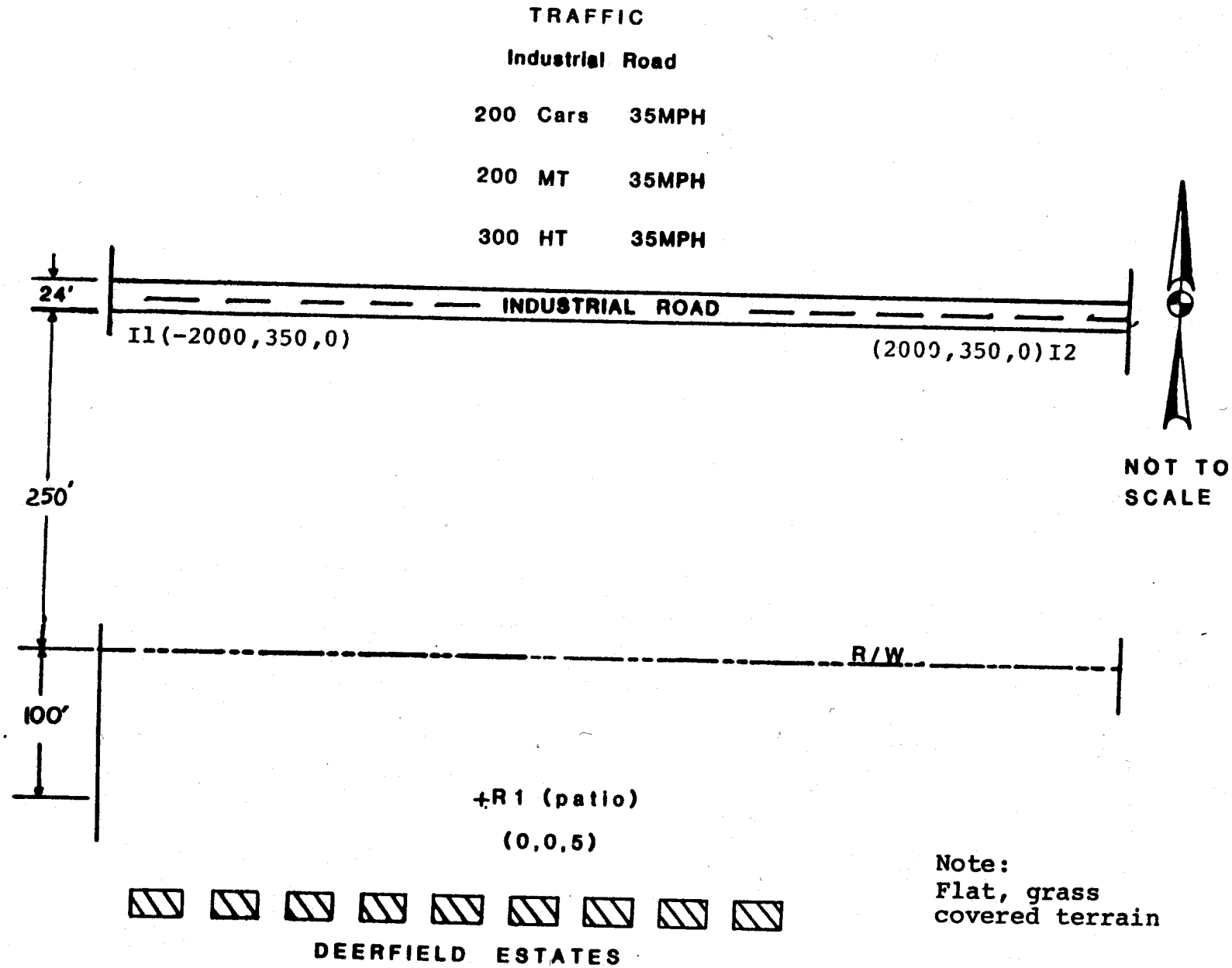
FIGURE 44. EXAMPLE 2 INPUT DATA

```
                STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

   (INPUT UNITS- ENGLISH , OUTPUT UNITS- METRIC   )

STAMINA 1.0 EXAMPLE PROBLEM 2
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT      CODE          DESCRIPTION
       0.0         1     RECEIVER HEIGHT ADJUSTMENT
       1.00        2     A-WEIGHTED SOUND LEVEL ONLY
       0.0         3     HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
       2.44        4     HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
       0.70        5     HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

ROADWAY   1     ROUTE 101 NORTHBOUND

                    VEHICLE TYPE   VEHICLES/HOUR     SPEED
                        CARS            251.         88.51
                        HT               26.         88.51
                        MT                9.         88.51
                   ------------COORDINATES-------------
                          X            Y            Z      GRADE
N1                      4.57       304.80         0.0      0
N2                      4.57         0.0          0.0      0
N3                      4.57      -304.80         0.0      0

ROADWAY   2     ROUTE 101 SOUTHBOUND

                    VEHICLE TYPE   VEHICLES/HOUR     SPEED
                        CARS            251.         88.51
                        HT               26.         88.51
                        MT                9.         88.51
                   ------------COORDINATES-------------
                          X            Y            Z      GRADE
S1                     -4.57       304.80         0.0      0
S2                     -4.57         0.0          0.0      0
S3                     -4.57      -304.80         0.0      0

ROADWAY   3     ROUTE 303 WESTBOUND

                    VEHICLE TYPE   VEHICLES/HOUR     SPEED
                        CARS            251.         64.37
                        HT               26.         64.37
                        MT                9.         64.37
                   ------------COORDINATES-------------
                          X            Y            Z      GRADE
W1                     304.80        4.57         0.0      0
W2                     105.16        4.57         0.0      1
W3                      13.72        4.57         4.57     1
W4                     -13.72        4.57         4.57     0
W5                    -105.16        4.57         0.0      0
W6                    -304.80        4.57         0.0      0
```

FIGURE 45. EXAMPLE 2 OUTPUT

```
ROADWAY    4      ROUTE 303 EASTBOUND

                      VEHICLE TYPE   VEHICLES/HOUR      SPEED
                           CARS            251.          64.37
                           HT               26.          64.37
                           MT                9.          64.37
                        ------------COORDINATES-------------
                              X             Y             Z      GRADE
E1                          -304.80       -4.57         0.0      0
E2                          -105.16       -4.57         0.0      1
E3                           -13.72       -4.57         4.57     1
E4                            13.72       -4.57         4.57     0
E5                           105.16       -4.57         0.0      0
E6                           304.80       -4.57         0.0      0
BARRIER    1    TYPE(A)     RAMP ON N.E. SIDE OF ROUTE 303
                  X           Y           Z          ZO       DELZ          P
NE1             105.2        6.1        0.0         0.0        0.0          0
NE2              13.7        6.1        4.6         0.0
BARRIER    2    TYPE(A)     RAMP ON N.W. SIDE OF ROUTE 303
                  X           Y           Z          ZO       DELZ          P
NW1             -13.7        6.1        4.6         0.0        0.0          0
NW2            -105.2        6.1        0.0         0.0
BARRIER    3    TYPE(A)     RAMP ON S.E. SIDE OF ROUTE 303
                  X           Y           Z          ZO       DELZ          P
SE1             105.2       -6.1        0.0         0.0        0.0          0
SE2              13.7       -6.1        4.6         0.0
BARRIER    4    TYPE(A)     RAMP ON S.W. SIDE OF ROUTE 303
                  X           Y           Z          ZO       DELZ          P
SW1             -13.7       -6.1        4.6         0.0        0.0          0
SW2            -105.2       -6.1        0.0         0.0
RECEIVERS IN QUADRANTS OF INTERCHANGE
                        ------------COORDINATES-------------
                              X             Y             Z
NE                           30.48        30.48         1.52
SE                           30.48       -30.48         1.52
SW                          -30.48       -30.48         1.52
NW                          -30.48        30.48         1.52
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5 0.5 0.5
 2 * 0.5 0.5 0.5 0.5
 3 * 0.5 0.5 0.5 0.5
 4 * 0.5 0.5 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0 0.0 0.0 0.0
 2 * 0.0 0.0 0.0 0.0
 3 * 0.0 0.0 0.0 0.0
 4 * 0.0 0.0 0.0 0.0
STAMINA 1.0 EXAMPLE PROBLEM 2
RECEIVER     LEQ(H)   SIG   L10    L50    L90

NE            68.9    6.4   72.4   64.1   55.9
SE            68.7    6.3   72.2   64.2   56.2
SW            68.9    6.4   72.4   64.1   55.9
NW            68.7    6.3   72.2   64.2   56.2
```

FIGURE 45. con't



Note:
Flat, grass covered terrain

FIGURE 46. EXAMPLE 3A INDUSTRIAL ROAD

```
NORTH FREEWAY
1 3
2 1
INDUSTRIAL ROAD
'CARS' 200 35
'MT' 200 35
'HT' 300 35
'L'/
'I1' -2000 350 0 0
'I2' 2000 350 0 0
'L'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUE
.5
7/
```

FIGURE 47. EXAMPLE 3A INPUT DATA

```
                STAMINA 2.0/BCR
           FHWA VERSION (MARCH 1982)
         TRAFFIC NOISE PREDICTION MODEL
        DEVELOPED UNDER CONTRACT BY BBN

  (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT       CODE          DESCRIPTION
       0.0          1      RECEIVER HEIGHT ADJUSTMENT
       1.00         2      A-WEIGHTED SOUND LEVEL ONLY
       0.0          3      HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
       8.00         4      HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
       2.30         5      HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

ROADWAY   1      INDUSTRIAL ROAD

                      VEHICLE TYPE   VEHICLES/HOUR     SPEED
                           CARS            200.         35.00
                           HT              300.         35.00
                           MT              200.         35.00
                        ------------COORDINATES-------------
                             X            Y            Z      GRADE
I1                        -2000.00     350.00        0.0      0
I2                         2000.00     350.00        0.0      0
DEERFIELD ESTATES
                        ------------COORDINATES-------------
                             X            Y            Z
R1                           0.0          0.0          5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0
NORTH FREEWAY
RECEIVER     LEQ(H)    SIG    L10    L50    L90

R1            62.1     2.8    64.8   61.2   57.6
```

FIGURE 48. EXAMPLE 3A OUTPUT

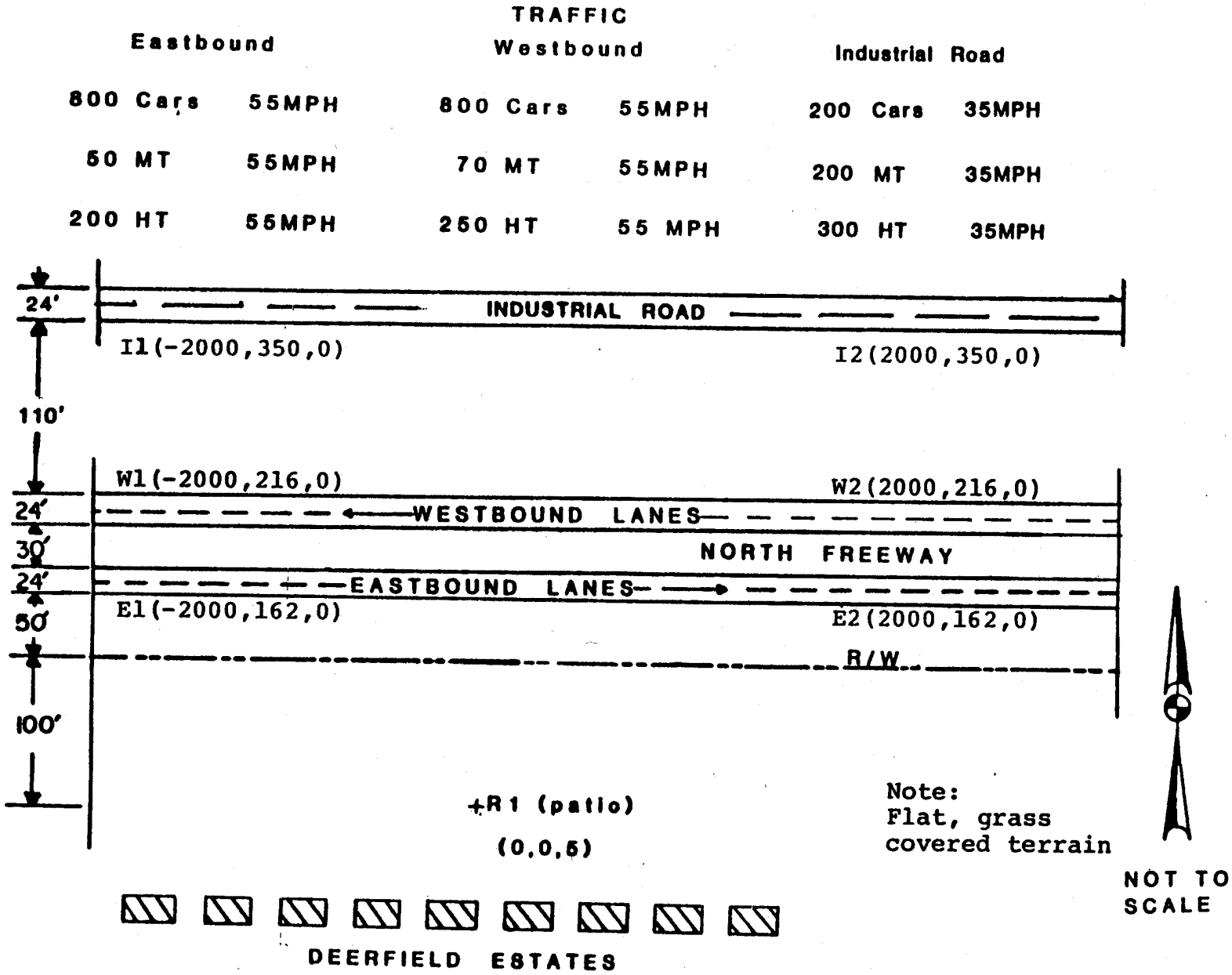


FIGURE 49. EXAMPLE 3B INDUSTRIAL ROAD AND FREEWAY

```
NORTH FREEWAY
1 3
2 3
INDUSTRIAL ROAD
'CARS' 200 35
'MT' 200 35
'HT' 300 35
'L'/
'I1' -2000 350 0 0
'I2' 2000 350 0 0
'L'/
WEST BOUND LANES
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 0 0
'W2' 2000 216 0 0
'L'/
EASTBOUND LANES
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 0 0
'E2' 2000 162 0 0
'L'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
3*.5
7/
```

FIGURE 50. EXAMPLE 3B INPUT DATA

```
STAMINA 2.0/BCR
FHWA VERSION (MARCH 1982)
TRAFFIC NOISE PREDICTION MODEL
DEVELOPED UNDER CONTRACT BY BBN

(INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT      CODE          DESCRIPTION
       0.0         1     RECEIVER HEIGHT ADJUSTMENT
       1.00        2     A-WEIGHTED SOUND LEVEL ONLY
       0.0         3     HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
       8.00        4     HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
       2.30        5     HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

ROADWAY   1     INDUSTRIAL ROAD

                    VEHICLE TYPE   VEHICLES/HOUR     SPEED
                         CARS            200.         35.00
                         HT              300.         35.00
                         MT              200.         35.00
                      ------------COORDINATES-------------
                           X            Y            Z      GRADE
I1                      -2000.00     350.00        0.0      0
I2                       2000.00     350.00        0.0      0

ROADWAY   2     WEST BOUND LANES

                    VEHICLE TYPE   VEHICLES/HOUR     SPEED
                         CARS            800.         55.00
                         HT              250.         55.00
                         MT               70.         55.00
                      ------------COORDINATES-------------
                           X            Y            Z      GRADE
W1                      -2000.00     216.00        0.0      0
W2                       2000.00     216.00        0.0      0

ROADWAY   3     EASTBOUND LANES

                    VEHICLE TYPE   VEHICLES/HOUR     SPEED
                         CARS            800.         55.00
                         HT              200.         55.00
                         MT               50.         55.00
                      ------------COORDINATES-------------
                           X            Y            Z      GRADE
E1                      -2000.00     162.00        0.0      0
E2                       2000.00     162.00        0.0      0
DEERFIELD ESTATES
                      ------------COORDINATES-------------
                           X            Y            Z
R1                         0.0          0.0         5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0 0.0 0.0
NORTH FREEWAY
RECEIVER    LEQ(H)   SIG   L10    L50    L90

R1           71.7    3.3   74.6   70.4   66.2
```

FIGURE 51. EXAMPLE 3B OUTPUT

4.3.3 INDUSTRIAL ROAD AND FREEWAY WITH VIADUCT

In this case, the central portion of the freeway has been elevated on a viaduct (Figure 52). Note that the freeway has been divided into six roadways – three in each direction of travel – rather than two roadways with three segments each. This must be done since a structure barrier can only be specified to apply to entire roadways, not to separate roadways segments. The resulting noise level for this portion of the problem is 71.5 dBA. The difference in noise level between this example and the previous one, is the addition of a barrier, simulating the roadway fill. Input and output files are shown in Figures 52 and 54.

4.3.4 INDUSTRIAL ROAD, FREEWAY WITH VIADUCT, AND REFLECTIVE BARRIER

In this case a 12' high noise barrier constructed at the edge of a ten-feet outside shoulder along the eastbound lanes of the freeway is added (Figure 55). The entire barrier was coded as reflective, and the resulting noise level is 61.0 dBA. The barrier provides a noise reduction of approximately 11 dBA. Input and output files are shown in Figures 56 and 57.

4.3.5 INDUSTRIAL ROAD, FREEWAY WITH VIADUCT, AND STRUCTURAL BARRIER

This case includes the same 12' high noise barrier as in the previous section except that the position of barrier on the viaduct has been coded with an "S" to denote a structure barrier and the roadways affected by the structure barrier have been identified (Figure 58). This feature of STAMINA 2.0 allows noise to pas beneath elevated structures. The resulting noise level is 65.0 dBA – an approximate 4 dBA increase over the reflective barrier case. Input and output files are shown in Figures 59 and 60. A set of completed coding forms is included for the structure barrier problem.

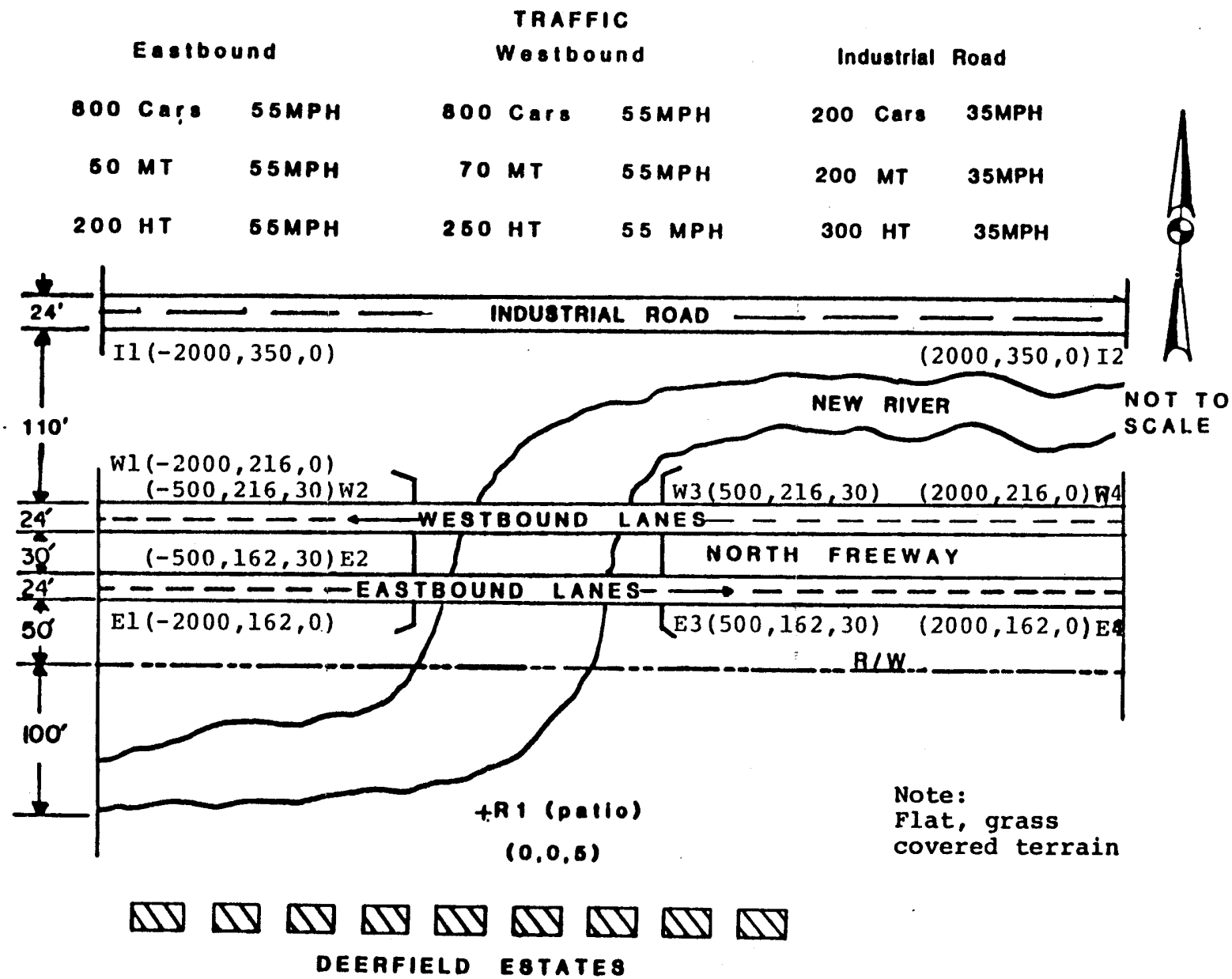


FIGURE 52. EXAMPLE 3C INDUSTRIAL ROAD AND FREEWAY WITH VIADUCT

```
NORTH FREEWAY
1 3
2 7
INDUSTRIAL ROAD
'CARS' 200 35
'MT' 200 35
'HT' 300 35
'L'/
'I1' -2000 350 0 0
'I2' 2000 350 0 0
'L'/
WESTBOUND LANES - W. OF RECEIVER
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 0 0
'W2' -500 216 30 0
'L'/
WESTBOUND LANES - VIADUCT
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W2' -500 216 30 0
'W3' 500 216 30 0
'L'/
WESTBOUND LANES - E. OF RECEIVER
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W3' 500 216 30 0
'W4' 2000 216 0 0
'L'/
EASTBOUND LANES - W. OF RECEIVER
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 0 0
'E2' -500 162 30 0
'L'/
EASTBOUND LANES - VIADUCT
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E2' -500 162 30 0
'E3' 500 162 30 0
'L'/
EASTBOUND LANES - E. OF RECEIVER
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E3' 500 162 30 0
'E4' 2000 162 0 0
'L'/
3 2
WEST APPROACH FILL
'F1' -2000 140 0 0 0 0
'F2' -500 140 30 0
'A'/
EAST APPROACH FILL
'F3' 500 140 30 0 0 0
'F4' 2000 140 0 0
'A'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5 .5 .5 .5 .5 .5
7/
```

FIGURE 53. EXAMPLE 3C INPUT DATA

```
              STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

  (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )


NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT       CODE          DESCRIPTION
       0.0          1     RECEIVER HEIGHT ADJUSTMENT
      1.00          2     A-WEIGHTED SOUND LEVEL ONLY
       0.0          3     HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
      8.00          4     HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
      2.30          5     HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

ROADWAY   1     INDUSTRIAL ROAD

                    VEHICLE TYPE   VEHICLES/HOUR      SPEED
                        CARS            200.          35.00
                        HT              300.          35.00
                        MT              200.          35.00
                   ------------COORDINATES-------------
                         X             Y             Z      GRADE
                    -2000.00       350.00          0.0       0
I1
I2                   2000.00       350.00          0.0       0

ROADWAY   2     WESTBOUND LANES - W. OF RECEIVER

                    VEHICLE TYPE   VEHICLES/HOUR      SPEED
                        CARS            800.          55.00
                        HT              250.          55.00
                        MT               70.          55.00
                   ------------COORDINATES-------------
                         X             Y             Z      GRADE
                    -2000.00       216.00          0.0       0
W1
W2                   -500.00       216.00         30.00      0

ROADWAY   3     WESTBOUND LANES - VIADUCT

                    VEHICLE TYPE   VEHICLES/HOUR      SPEED
                        CARS            800.          55.00
                        HT              250.          55.00
                        MT               70.          55.00
                   ------------COORDINATES-------------
                         X             Y             Z      GRADE
                     -500.00       216.00         30.00      0
W2
W3                    500.00       216.00         30.00      0

ROADWAY   4     WESTBOUND LANES - E. OF RECEIVER

                    VEHICLE TYPE   VEHICLES/HOUR      SPEED
                        CARS            800.          55.00
                        HT              250.          55.00
                        MT               70.          55.00
                   ------------COORDINATES-------------
                         X             Y             Z      GRADE
                     500.00       216.00         30.00      0
W3
W4                   2000.00       216.00          0.0       0
```

FIGURE 54. EXAMPLE 3C OUTPUT

```
ROADWAY    5      EASTBOUND LANES - W. OF RECEIVER

                     VEHICLE TYPE    VEHICLES/HOUR      SPEED
                          CARS            800.          55.00
                          HT              200.          55.00
                          MT               50.          55.00
                      ------------COORDINATES-------------
                            X             Y             Z      GRADE
E1                       -2000.00      162.00         0.0       0
E2                        -500.00      162.00        30.00      0

ROADWAY    6      EASTBOUND LANES - VIADUCT

                     VEHICLE TYPE    VEHICLES/HOUR      SPEED
                          CARS            800.          55.00
                          HT              200.          55.00
                          MT               50.          55.00
                      ------------COORDINATES-------------
                            X             Y             Z      GRADE
E2                        -500.00      162.00        30.00      0
E3                         500.00      162.00        30.00      0

ROADWAY    7      EASTBOUND LANES - E. OF RECEIVER

                     VEHICLE TYPE    VEHICLES/HOUR      SPEED
                          CARS            800.          55.00
                          HT              200.          55.00
                          MT               50.          55.00
                      ------------COORDINATES-------------
                            X             Y             Z      GRADE
E3                         500.00      162.00        30.00      0
E4                        2000.00      162.00         0.0       0
BARRIER    1    TYPE(A)     WEST APPROACH FILL
                X           Y            Z          ZO        DELZ          P
F1            -2000.0     140.0         0.0         0.0        0.0          0
F2             -500.0     140.0        30.0         0.0
BARRIER    2    TYPE(A)     EAST APPROACH FILL
                X           Y            Z          ZO        DELZ          P
F3              500.0     140.0        30.0         0.0        0.0          0
F4             2000.0     140.0         0.0         0.0
DEERFIELD ESTATES
                      ------------COORDINATES-------------
                            X             Y             Z
R1                          0.0           0.0           5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5 0.5 0.5 0.5 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0 0.0 0.0 0.0 0.0 0.0 0.0
NORTH FREEWAY
RECEIVER     LEQ(H)    SIG    L10    L50    L90

R1            71.5     3.3    74.5   70.3   66.1
```

FIGURE 54. con't

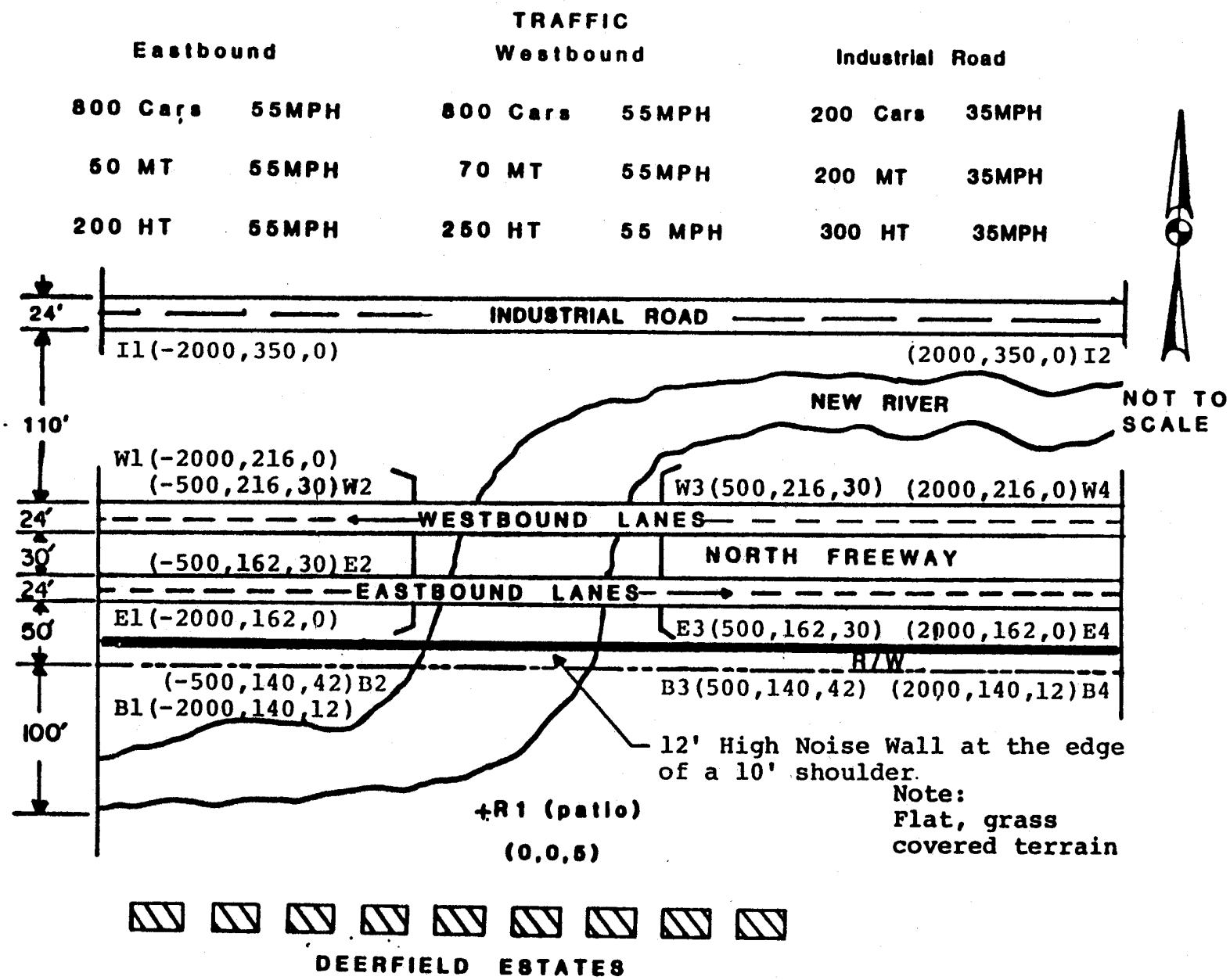


FIGURE 55. EXAMPLE 3D INDUSTRIAL ROAD, FREEWAY WITH VIADUCT, AND REFLECTIVE BARRIER

```
NORTH FREEWAY
1 3
2 7
INDUSTRIAL ROAD
'CARS' 200 35
'MT' 200 35
'HT' 300 35
'L'/
'I1' -2000 350 0 0
'I2' 2000 350 0 0
'L'/
WESTBOUND LANES - W. OF RECEIVER
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W1' -2000 216 0 0
'W2' -500 216 30 0
'L'/
WESTBOUND LANES - VIADUCT
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W2' -500 216 30 0
'W3' 500 216 30 0
'L'/
WESTBOUND LANES - E. OF RECEIVER
'CARS' 800 55
'MT' 70 55
'HT' 250 55
'L'/
'W3' 500 216 30 0
'W4' 2000 216 0 0
'L'/
EASTBOUND LANES - W. OF RECEIVER
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E1' -2000 162 0 0
'E2' -500 162 30 0
'L'/
```

FIGURE 56. EXAMPLE 3D INPUT DATA

```
EASTBOUND LANES - VIADUCT
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E2' -500 162 30 0
'E3' 500 162 30 0
'L'/
EASTBOUND LANES - E. OF RECEIVER
'CARS' 800 55
'MT' 50 55
'HT' 200 55
'L'/
'E3' 500 162 30 0
'E4' 2000 162 0 0
'L'/
3 4
NOISE WALL - W. OF RECEIVER
'B1' -2000 140 12 0 2 3
'B2' -500 140 42 30
'R'/
NOISE WALL - VIADUCT (REFLECTIVE)
'B2' -500 140 42 30 2 3
'B3' 500 140 42 30
'R'/
NOISE WALL - E. OF RECEIVER
'B3' 500 140 42 30 2 3
'B4' 2000 140 12 0
'R'/
GROUND UNDER 12 FT WALL
'F1' -2000 140 0 0 0 0
'F2' -500 140 30 30
'F3' 500 140 30 30
'F4' 2000 140 0 0
'A'/
5 1
DEERFIELD ESTATES
'R1' 0 0 5
6 1
ALPHA VALUES
.5 .5 .5 .5 .5 .5 .5
7/
```

FIGURE 56. con't

```
                STAMINA 2.0/BCR
          FHWA VERSION (MARCH 1982)
        TRAFFIC NOISE PREDICTION MODEL
       DEVELOPED UNDER CONTRACT BY BBN

   (INPUT UNITS- ENGLISH , OUTPUT UNITS- ENGLISH )

NORTH FREEWAY
PROGRAM INITIALIZATION PARAMETERS

     HEIGHT        CODE          DESCRIPTION
       0.0          1      RECEIVER HEIGHT ADJUSTMENT
      1.00          2      A-WEIGHTED SOUND LEVEL ONLY
       0.0          3      HEIGHT ADJUSTMENT FOR PASSENGER CARS (CARS)
      8.00          4      HEIGHT ADJUSTMENT FOR HEAVY TRUCKS   (HT)
      2.30          5      HEIGHT ADJUSTMENT FOR MEDIUM TRUCKS  (MT)

ROADWAY   1      INDUSTRIAL ROAD

                    VEHICLE TYPE    VEHICLES/HOUR      SPEED
                         CARS            200.          35.00
                         HT              300.          35.00
                         MT              200.          35.00
                    ------------COORDINATES-------------
                          X              Y             Z      GRADE
I1                    -2000.00       350.00          0.0       0
I2                     2000.00       350.00          0.0       0

ROADWAY   2      WESTBOUND LANES - W. OF RECEIVER

                    VEHICLE TYPE    VEHICLES/HOUR      SPEED
                         CARS            800.          55.00
                         HT              250.          55.00
                         MT               70.          55.00
                    ------------COORDINATES-------------
                          X              Y             Z      GRADE
W1                    -2000.00       216.00          0.0       0
W2                     -500.00       216.00         30.00      0

ROADWAY   3      WESTBOUND LANES - VIADUCT

                    VEHICLE TYPE    VEHICLES/HOUR      SPEED
                         CARS            800.          55.00
                         HT              250.          55.00
                         MT               70.          55.00
                    ------------COORDINATES-------------
                          X              Y             Z      GRADE
W2                     -500.00       216.00         30.00      0
W3                      500.00       216.00         30.00      0

ROADWAY   4      WESTBOUND LANES - E. OF RECEIVER

                    VEHICLE TYPE    VEHICLES/HOUR      SPEED
                         CARS            800.          55.00
                         HT              250.          55.00
                         MT               70.          55.00
                    ------------COORDINATES-------------
                          X              Y             Z      GRADE
W3                      500.00       216.00         30.00      0
W4                     2000.00       216.00          0.0       0
```

FIGURE 57. EXAMPLE 3D OUTPUT

```
ROADWAY    5      EASTBOUND LANES - W. OF RECEIVER

                      VEHICLE TYPE    VEHICLES/HOUR      SPEED
                           CARS             800.          55.00
                           HT               200.          55.00
                           MT                50.          55.00
                        ------------COORDINATES-------------
                              X            Y            Z      GRADE
E1                        -2000.00     162.00        0.0       0
E2                         -500.00     162.00       30.00      0

ROADWAY    6      EASTBOUND LANES - VIADUCT

                      VEHICLE TYPE    VEHICLES/HOUR      SPEED
                           CARS             800.          55.00
                           HT               200.          55.00
                           MT                50.          55.00
                        ------------COORDINATES-------------
                              X            Y            Z      GRADE
E2                         -500.00     162.00       30.00      0
E3                          500.00     162.00       30.00      0

ROADWAY    7      EASTBOUND LANES - E. OF RECEIVER

                      VEHICLE TYPE    VEHICLES/HOUR      SPEED
                           CARS             800.          55.00
                           HT               200.          55.00
                           MT                50.          55.00
                        ------------COORDINATES-------------
                              X            Y            Z      GRADE
E3                          500.00     162.00       30.00      0
E4                         2000.00     162.00        0.0       0
BARRIER    1   TYPE(R)     NOISE WALL - W. OF RECEIVER
                X           Y           Z          ZO        DELZ          P
B1           -2000.0     140.0       12.0        0.0        2.0          3
B2            -500.0     140.0       42.0       30.0
BARRIER    2   TYPE(R)     NOISE WALL - VIADUCT (REFLECTIVE)
                X           Y           Z          ZO        DELZ          P
B2            -500.0     140.0       42.0       30.0        2.0          3
B3             500.0     140.0       42.0       30.0
BARRIER    3   TYPE(R)     NOISE WALL - E. OF RECEIVER
                X           Y           Z          ZO        DELZ          P
B3             500.0     140.0       42.0       30.0        2.0          3
B4            2000.0     140.0       12.0        0.0
BARRIER    4   TYPE(A)     GROUND UNDER 12 FT WALL
                X           Y           Z          ZO        DELZ          P
F1           -2000.0     140.0        0.0        0.0        0.0          0
F2            -500.0     140.0       30.0       30.0
F3             500.0     140.0       30.0       30.0
F4            2000.0     140.0        0.0        0.0
DEERFIELD ESTATES
                        ------------COORDINATES-------------
                              X            Y            Z
R1                            0.0          0.0         5.00
  ALPHA FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.5 0.5 0.5 0.5 0.5 0.5 0.5
  SHIELDING FACTORS - ROADWAY ACROSS,RECEIVER DOWN

 1 * 0.0 0.0 0.0 0.0 0.0 0.0 0.0
NORTH FREEWAY
RECEIVER     LEQ(H)    SIG    L10    L50    L90

R1            61.0     2.7    63.6   60.1   56.6
```

FIGURE 57. con't

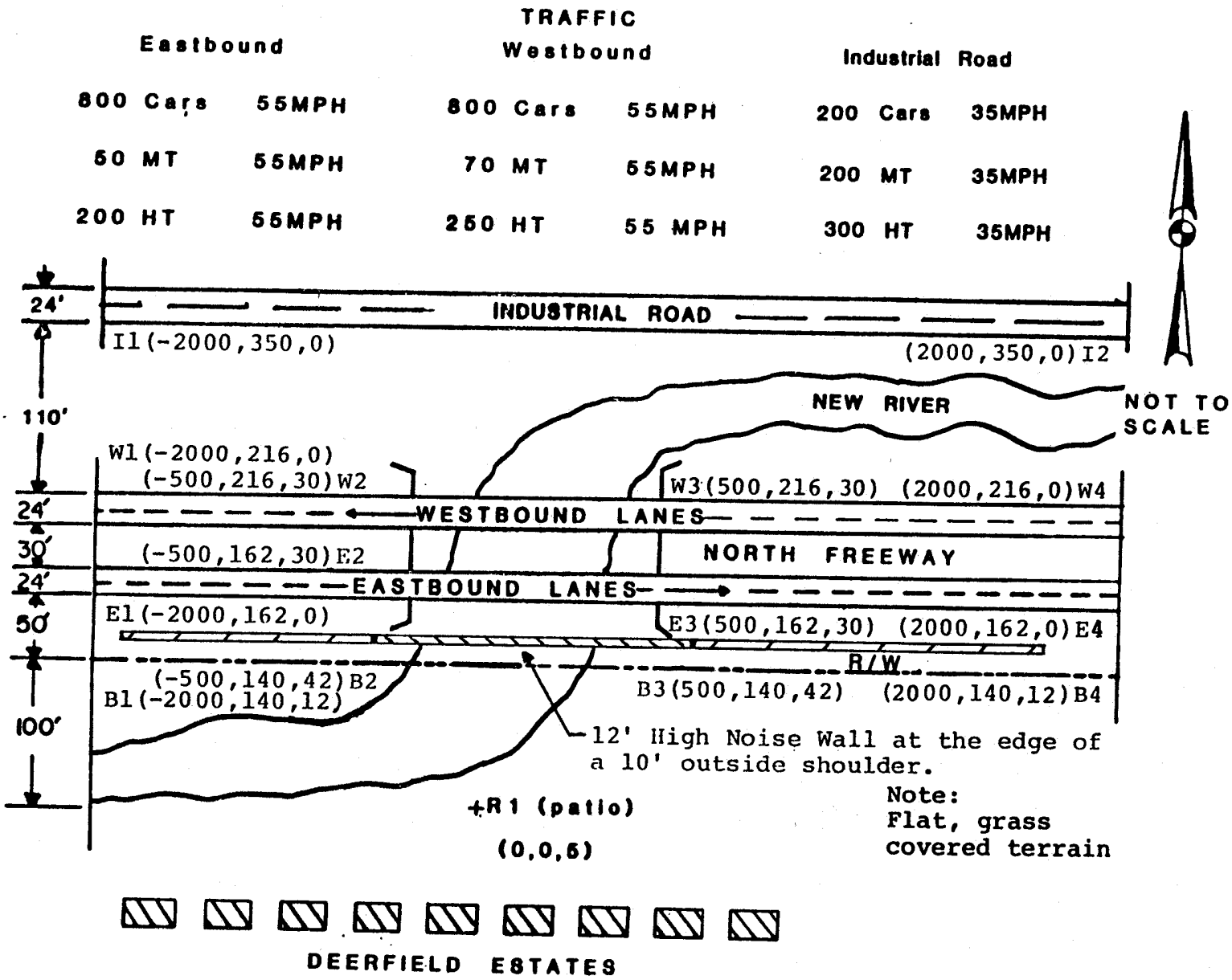


FIGURE 58. EXAMPLE 3E INDUSTRIAL ROAD, FREEWAY WITH VIADUCT, AND STRUCTURE BARRIER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

FORM 1 - PROJECT DESCRIPTION

NAME JOHN SMITH
PAGE 1 OF 16
DATE 15 APR 82
PROJECT NORTH FREEWAY

****PLACE A SPACE OR COMMA BETWEEN ITEMS ON SAME LINE WHEN KEYPUNCHING OR ENTERING ITEMS ON TERMINAL****

'OPTIONS' LINE (OPTIONAL)

	METRIC IN?	METRIC OUT?	COMPUTE REFLECTIONS
*			

STAMINA 2.0 ASSUMES INPUT DATA WILL BE IN ENGLISH UNITS. PRINTS OUTPUT DATA IN ENGLISH UNITS. AND DOES NOT COMPUTE REFLECTIONS FROM 'REFLECTIVE' BARRIERS. TO CHANGE ANY OF THOSE ITEMS, CODE AN ASTERISK. THEN A Y FOR YES OR AN N FOR NO FOR ALL ITEMS USING THE FIRST 4 COLUMNS ONLY.

PROBLEM TITLE (MAXIMUM 80 CHARACTERS. ENTER AS ONE LINE)

NORTH FREEWAY

NOTES/SKETCH:

RECEIVER IN BACKYARD PATIO

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DEMONSTRATION PROJECTS PROGRAM

STAMINA 2.0
FHWA TRAFFIC NOISE
PREDICTION PROGRAM

NAME SMITH
PAGE 2 OF 16
DATE 15 APR 82
PROJECT N.F.

FORM 2 - VEHICLE PARAMETERS

13 NUMBER OF VEHICLE TYPES
IF EQUAL TO 3, GO TO FORM 3)

FILL OUT REMAINDER OF FORM WHEN 'NUMBER OF VEHICLE TYPES' EXCEEDS 3

EMISSION LEVEL(EL) VARIABLES- $EL=C0+C1(LOG(SPEED))+0.115(S0)^2$

	SOURCE HEIGHT	C0	C1	S0
6				

'VEH4' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH4' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
7				

'VEH5' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH5' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
8				

'VEH6' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH6' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
9				

'VEH7' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH7' DESCRIPTION (16 CHARACTERS)

	SOURCE HEIGHT	C0	C1	S0
10				

'VEH8' SOURCE HEIGHT AND EMISSION LEVEL VARIABLES

DESCRIPTION (MAX. OF 16 CHARAC)

'VEH8' DESCRIPTION (16 CHARACTERS)