



**The M77 Glasgow Southern Orbital
DBFO Project**

Pre-Construction

Ambient Noise and Vibration Levels

ATKINS

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May 2003

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1. Introduction

- 1.1 This report compiled by Atkins Noise & Vibration details the findings of ambient environmental noise and vibration surveys prior to the construction works for the M77 Glasgow Southern Orbital DBFO project.
- 1.2 Most of the construction works will be undertaken during daytime, and therefore most of the measurements were taken during the day.
- 1.3 However night-time construction work is expected to take place in the vicinity of 5 sites and therefore night-time levels were also measured at these locations.

2. Methodology

- 2.1 The noise and vibration surveys were carried out at 51 pre-determined monitoring sites with one additional vibration monitoring site identified during the survey.
- 2.2 Each site was given an identity code to link the data in the results tables and the site photographs to the two project location plans titled 'The M77 (Fenwick to Malletsheugh)/Glasgow Southern Orbital DBFO Project Noise Control Stations' drawing numbers 96/006/48 and 096/018/137 respectively.

Noise Monitoring

- 2.3 The noise monitoring was carried out using three Type 1 Integrated sound level meters. These individually met the requirements of BS EN 60651: 2001.
- 2.4 The meters were set to SLOW response with a frequency 'A' weighting and frontal directivity. Noise measurements were made under free field conditions unless otherwise stated. All meters were within calibration.
 - The first meter used was a Bruel & Kjaer 2231, serial number 1735069 with a 1/2" microphone calibrated with a Bruel & Kjaer 4321, serial number 1780754. Calibration due 06/07/03.
 - The second meter used was a Bruel & Kjaer 2231, serial number 1413420 with a 1/2" microphone calibrated with a Bruel & Kjaer 4230, serial number 830438. Calibration due 02/07/03.
 - The third meter used was a CEL 280 serial number 019486 with a 1/2" microphone calibrated with a CEL 284/2, serial number 3/01920229. Calibration due 29/06/03.
- 2.5 Each microphone was set in a horizontal position 2.0m above ground level. Each of the Bruel and Kjaer meters had extension poles and cables fitted to allow the microphone to be set at the required height. The CEL was able to meet the height criterion using a custom tripod.

- 2.6 Metrological conditions were monitored and recorded on the measurement sheets throughout each monitoring period.
- 2.7 The levels were monitored over two non-consecutive 15 minute periods. In instances where the second L_{Aeq} value differed from the first by more than 3dB an additional measurement was taken.

Vibration Monitoring

- 2.8 The vibration monitoring was carried out using Vibrock V801 Digital Seismographs with a transducer set to measure across three axis.
- 2.9 The seismographs were set to TRIGGER response.
- The first meter used was a Vibrock V801, serial number 380 and was calibrated on the 19/02/03.
 - The second meter used was a Vibrock V801, serial number 381 and was calibrated on the 26/02/03.
 - The third meter used was a Vibrock V801, serial number 379 and was calibrated on the 19/07/02.
- 2.10 The transducers were situated on solid surfaces at each location as close to the property as reasonably practicable.
- 2.11 Any events that may have given rise to a trigger event were noted on the measurement sheets (The measurements sheets can be viewed in the appendix).
- 2.12 The levels were monitored over two non-consecutive 15 minute periods.
- 2.13 The additional vibration monitoring site labelled GSO 27 was located on the site of GSO 22 behind the garages on the eastern border of the commercial property.

3. Results

Noise Monitoring

3.1 A summary of the noise survey results for each M77 site can be seen in Table 3.1

Table 3.1 Noise monitoring results for the M77 stations

M77 Noise Monitoring Sites	L_{Aeq} dB
1	50.2
2	71.7
3	66.5
4	54.9
5	62.3
6	61.9
7	66.0
8	63.1
9	54.3
10	50.9
11	69.6
12	71.5
13	52.9
14	77.7
15	54.8
16	72.3
17	76.7
18	60.7
19	65.3
20	57.2
21	49.7

22	50.2
23	61.5
24	67.7
25	54.5

3.2 A summary of the noise survey results for each GSO site can be seen in Table 3.2

Table 3.2 Noise monitoring results for the GSO stations

GSO Noise Monitoring Sites	L _{Aeq} dB
1	50.1
2	52.6
3	52.1
4	48.8
5	48.2
6	44.8
7	40.1
8	39.3
9	43.1
10	56.0
11	51.0
12	54.6
13	55.8
14	40.6
15	50.6
16	49.3
17	44.0
18	49.0

19	52.8
20	56.5
21	60.4
22	62.9
22 Night time	43.5
23	57.5
23 Night time	48.0
24	58.6
24 Night time	47.4
25	63.5
25 Night time	52.4
26	60.8
26 Night time	50.1

Vibration Monitoring

3.3 A summary of the vibration monitoring results for each M77 site can be seen in Table 3.3

Table 2.3 Vibration monitoring results for the M77 stations

M77 Vibration Monitoring Sites	Axis	Peak Velocity (mm/s)	Peak Acceleration (mm/s ²)	Peak Displacement (mm)
1	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
2	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1

3	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
4	X	0.3	< 0.1	< 0.1
	Y	0.2	< 0.1	< 0.1
	Z	0.2	< 0.1	< 0.1
5	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
6	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
7	X	0.7	< 0.1	< 0.1
	Y	1.3	< 0.1	< 0.1
	Z	0.8	< 0.1	< 0.1
8	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
9	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
10	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
11	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1

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12	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
13	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
14	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
15	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
16	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
17	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
18	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
19	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
20	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1

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21	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
22	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
23	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
24	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
25	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1

3.4 A summary of the vibration monitoring results for each GSO site can be seen in Table 3.4

Table 3.3 Vibration results for the GSO stations

GSO Vibration Monitoring Sites	Axis	Peak Velocity (mm/s)	Peak Acceleration (mm/s ²)	Peak Displacement (mm)
1	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
2	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
3	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
4	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
5	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
6	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
7	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
8	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1

	Z	< 0.1	< 0.1	< 0.1
9	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
10	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
11	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
12	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
13	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
14	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
15	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
16	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
17	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1

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	Z	< 0.1	< 0.1	< 0.1
18	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
19	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
20	X	0.8	< 0.1	< 0.1
	Y	0.2	< 0.1	< 0.1
	Z	0.6	< 0.1	< 0.1
21	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
22	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
22 Night time	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
23	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
23 Night time	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
24	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1

	Z	< 0.1	< 0.1	< 0.1
24 Night time	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
25	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
25 Night time	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
26	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
26 Night time	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1
27	X	< 0.1	< 0.1	< 0.1
	Y	< 0.1	< 0.1	< 0.1
	Z	< 0.1	< 0.1	< 0.1

4. Site Photographs

M77 Monitoring Sites

M77 1



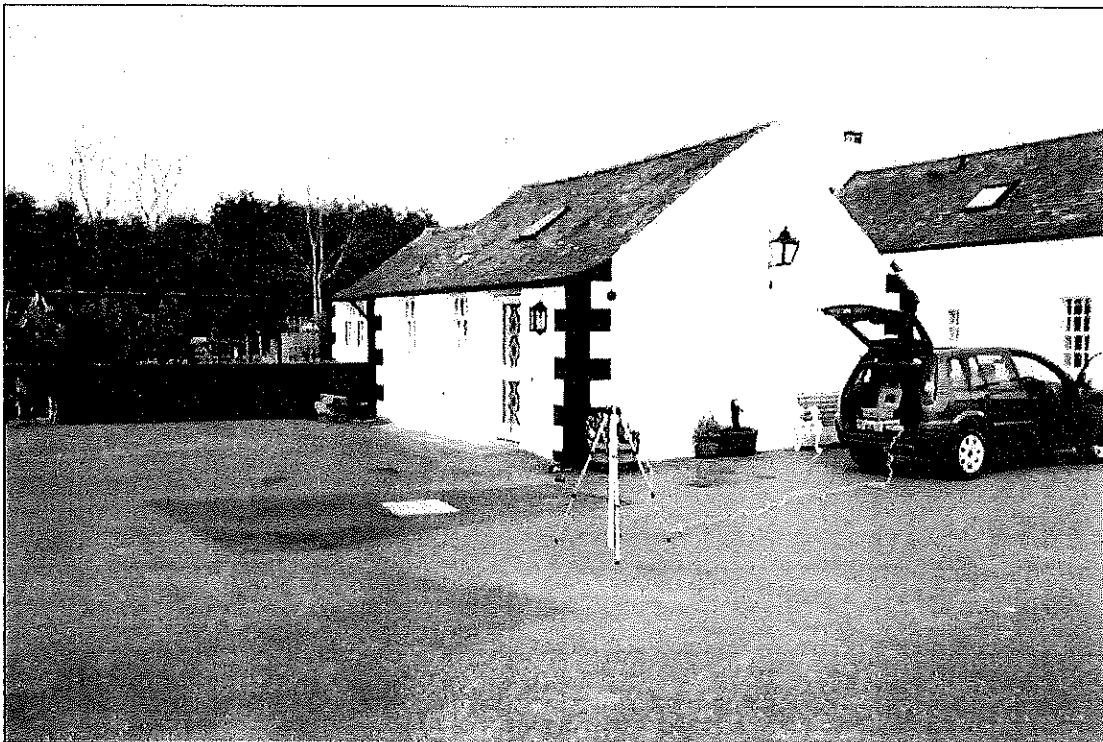
M77 2

No picture available

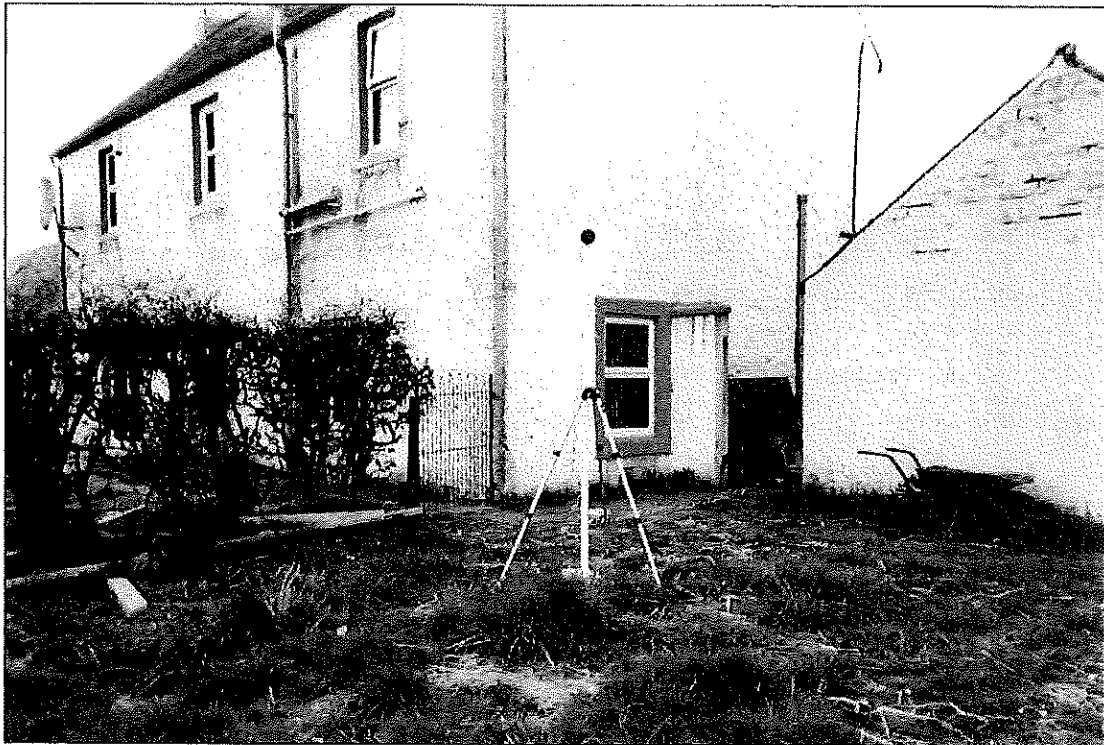
M77 3



M77 4



M77 5



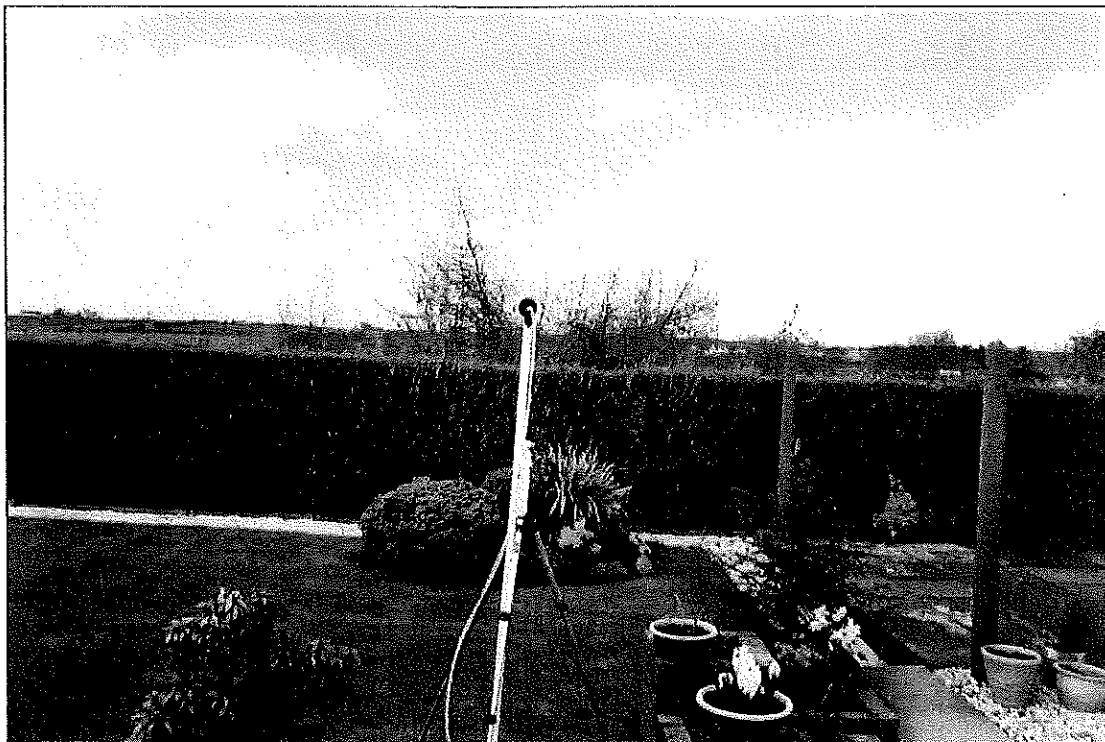
M77 6



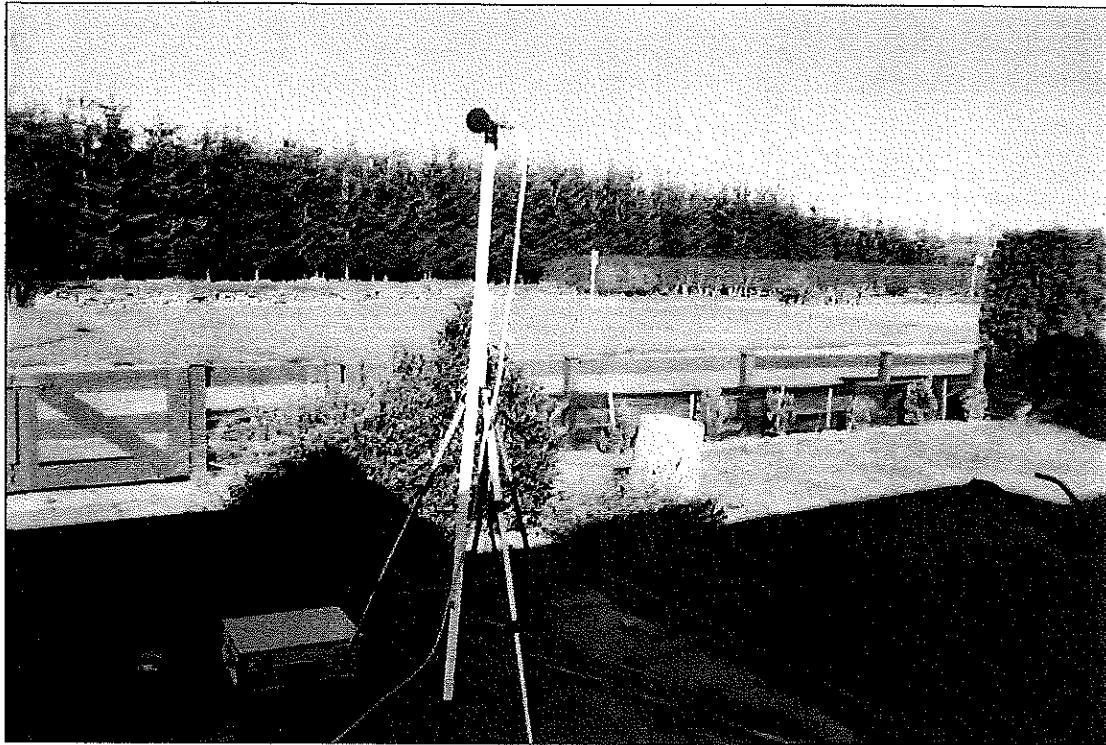
M77 7



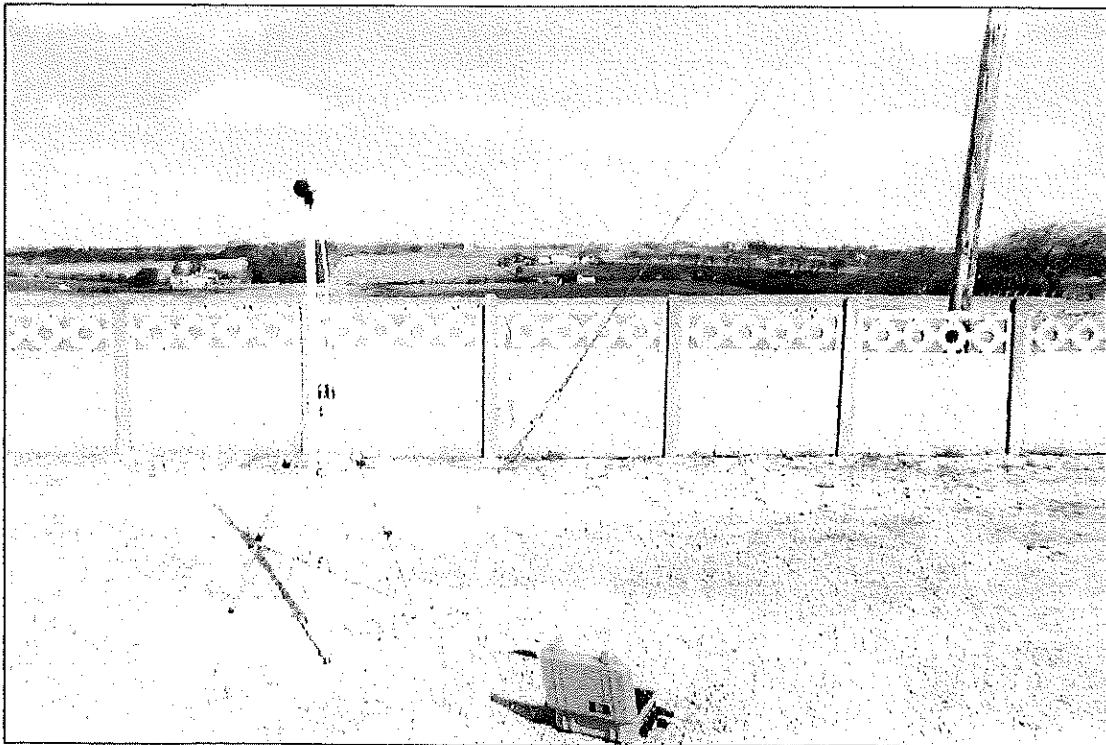
M77 8



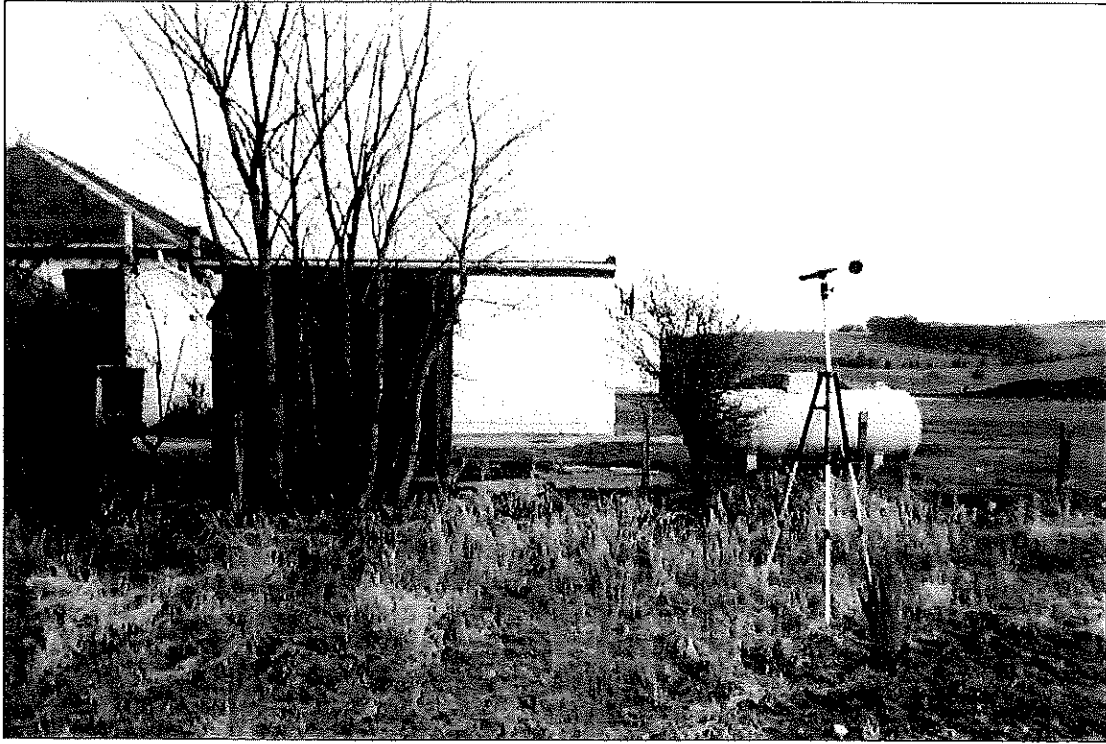
M77 9



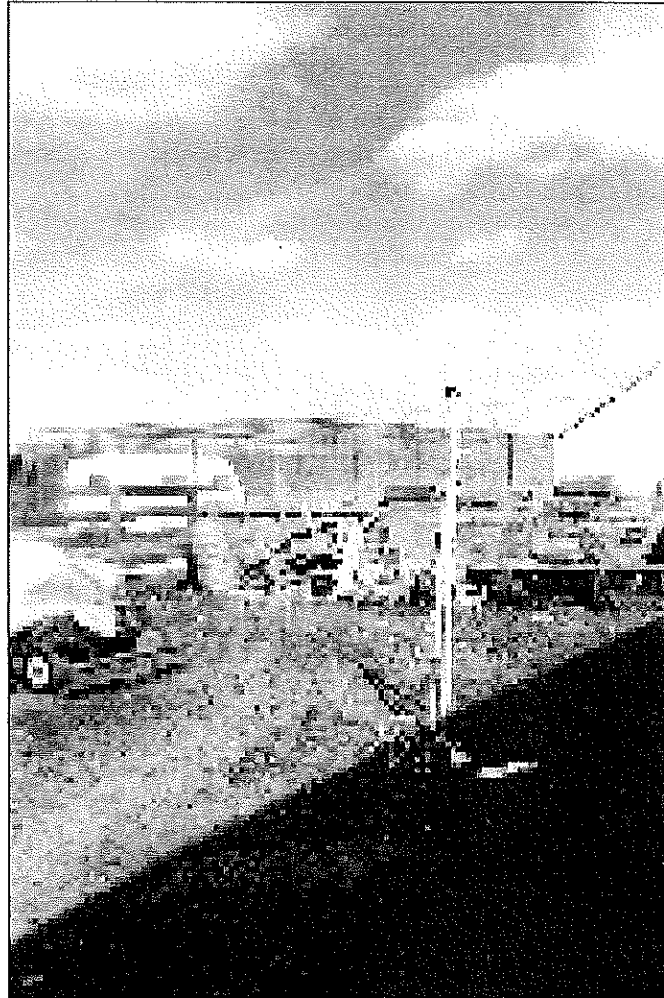
M77 10



M77 11



M77 12



M77 13



M77 14

