REVIEW OF ENVIRONMENTAL FACTORS

McGRATHS HILL FLOOD EVACUATION ROUTE FOR WINDSOR ROAD WORKS BETWEEN CURTIS ROAD, McGRATHS HILL AND SOUTH OF BANDON ROAD, VINEYARD

Prepared by
Environmental Planning Pty Ltd
Telephone (02) 9983 1500
Facsimile (02) 9983 1400
Email envplan@ozemail.com.au
PO Box 390
Pymble, NSW, 2073

for
Sydney Client Services
Roads and Traffic Authority of NSW

March 2001

TABLE OF CONTENTS

Page No.

SECTION A - PRELIMINARIES

1. Introduction 1

2. Proposal Identification 2

3. Proposal Description 5
- 3.1 Location 5
- 3.2 General Features 5
- 3.3 Costs and Timing 7

4. Specialist Studies and Community Involvement 9
- 4.1 Specialist Studies 9
- 4.2 Display of the Proposal 9
- 4.3 Summary of Public Submissions Received 10
- 4.4 Submissions from Public Organisations 10

SECTION B - ENVIRONMENTAL IMPACT ASSESSMENT

5. Strategic Stage 11
- 5.1 General 11
- 5.2 Strategic Justification and Needs Definition 12
- 5.3 Planning and Environmental Background 14

6. Concept Stage 15
- 6.1 Objectives 15
- 6.2 Options 16
- 6.3 Proposal Selection 16
- 6.4 Statutory Planning 17
  - 6.4.1 Zoning 17
  - 6.4.2 State Environmental Planning Policies 18
  - 6.4.3 Regional Environmental Planning Policies 18
  - 6.4.4 Legislation 19
  - 6.4.5 Power to Construct the Proposal 20

7. Detailed Assessment Stage 21
- 7.1 Design Considerations 21
  - 7.1.1 Existing Road 21
  - 7.1.2 Existing and Forecast Traffic 21
  - 7.1.3 Design Parameters 22
  - 7.1.4 Construction Activities 24
  - 7.1.5 Waste Disposal 26
  - 7.1.6 Demand Upon Resources 26
- 7.2 Description of Site and Surroundings 27

7.3 Environmental Impacts 33
7.3.1 Landforms 33
7.3.2 Geology and Soils 33
7.3.3 Climate 34
7.3.4 Landform Stability and Erosion Hazard 34
7.3.5 Air Quality 35
7.3.6 Hydrology and Water Quality 37
7.3.7 Flora and Fauna 40
7.3.8 Landscape and Visual Considerations 41
7.3.9 Socio-economic Considerations 42
7.3.10 Pedestrian and Cyclist Impacts 43
7.3.11 Traffic Impacts 44
7.3.12 European Heritage 45
7.3.13 Aboriginal Heritage 47
7.3.14 Noise and Vibration Effects 47
7.4 Cumulative Environmental Impacts 51
7.5 Ecologically Sustainable Development 52

8. Implementation Stage 54
8.1 Summary of Proposed Safeguards 54
8.2 Implementation Process 59

SECTION C - FINALISATION

9. Summary of Key Issues 60
9.1 Major Beneficial Effects 60
9.2 Major Adverse Effects 60
9.3 Characteristics 60
9.4 The Extent of the Impacts 60
9.5 The Nature of the Impacts 61

10. Consideration of Environmental Factors in Relevant Legislation 61
10.1 NSW *Environmental Planning and Assessment Regulation 2000* Clause 82 Factors 61
10.2 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* Factors 63

11. Declarations 64

References 65

List of Tables

Table 1	Hydraulic Performance of Existing Transverse Drainage	38
Table 2	Hydraulic Performance of Proposed Transverse Drainage	38
Table 3	Existing and Proposed Velocities Downstream of Windsor Road	39
Table 4	Predicted Traffic Noise Levels in Daytime for 2000 and 2012 Using Varying Barrier Heights	48
Table 5	Predicted Traffic Noise Levels in Night Time for 2000 and 2012 Using Varying Barrier Heights	49

List of Figures

Figure 1	Evacuation Routes	3
Figure 2	Location Plan of Proposal	4
Figure 3	Plan, Typical Section and Longitudinal Section of Works Along Windsor Road from Curtis Road, McGraths Hill to South of Bandon Road, Vineyard	8

List of Photographs

Photograph 1	Site 1 on Windsor Road Looking East	28
Photograph 2	Site 2 on Windsor Road Looking South	28
Photograph 3	Site 3 on Windsor Road Looking South	29
Photograph 4	Site 4 on Windsor Road Looking East	29
Photograph 5	Site 5 on Windsor Road Looking East	30
Photograph 6	Site 6 on Windsor Road Looking East	30
Photograph 7	Site 7 on Windsor Road Looking East	31
Photograph 8	Site 8 on Windsor Road Looking East	31
Photograph 9	Site 9 on Windsor Road Looking East to Chapman Road	32
Photograph 10	Site 10 on Windsor Road Looking South	32

Attachments

Attachment 1 *Newsletter No.1 May 2000*

Attachment 2 *Summary of Public Submissions*

Attachment 3 *Responses from Public Organisations*

Attachment 4 *Flora and Fauna Assessment Proposed McGraths Hill Flood Evacuation Route,* November 2000, P. Burcher.

Attachment 5 *Indigenous Heritage Assessment McGraths Hill Flood Evacuation Route Windsor Road McGraths Hill NSW*, September 2000, Bobbie Oakley & Associates Heritage Consultants.

Attachment 6 *Noise and Vibration Impact Assessments for McGraths Hill Flood Evacuation Route on Windsor Road Between Curtis Road and South of Bandon Road,* October 2000, Koikas Acoustics Pty Ltd.

SECTION A - PRELIMINARIES

1. Introduction

In April 1997 the NSW Government established the Hawkesbury-Nepean Flood Management Advisory Committee to prepare a comprehensive strategy for floodplain management to address a serious flood problem in areas of the Hawkesbury-Nepean valley downstream of Warragamba Dam. The Committee presented a report entitled *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* to the Government in November 1997. This adopted strategy complements the NSW Government's actions to construct an auxiliary spillway to eliminate the threat of failure of Warragamba Dam in an extreme flood.

The flood threat to the Hawkesbury-Nepean valley from above the city of Penrith downstream to Spencer has the potential to result in loss of life and significant property damage. Studies indicate that if no action is taken to upgrade existing evacuation routes from their present condition and local flooding occurs, the majority of the flood prone population estimated at 40,000 to 60,000 people, will be isolated and potentially lost if then severe to extreme flooding occurs. This includes the 2500 residents of McGraths Hill in a suburb adjacent to Windsor Road and 1500 associated vehicles.

Having adopted the Hawkesbury-Nepean Flood Management Advisory Committee strategy, the Government established the Hawkesbury-Nepean Floodplain Management Steering Committee to monitor and oversee the Strategy implementation process. It has delegated to the Department of Land and Water Conservation (DLWC) the lead role in implementing the overall Strategy. The DLWC coordinates the program of works and controls the funds provided for implementation of the strategy which includes the following components.

- Government policy initiatives relating to coordinated flood emergency planning, flood forecasting, flood warning and public awareness;
- Best practice floodplain management and planning policies;
- Completion of a comprehensive Regional Floodplain Management Study, from which local Councils can prepare their own floodplain management plans and policies consistent with the merits approach of the Floodplain Development Manual;
- Works and plans to improve road evacuation routes (see Figure 1).

The Roads and Traffic Authority of NSW (RTA) is working in partnership with DLWC to manage the implementation of the road works component of the strategy. The DLWC is also assisted by the State Emergency Service (SES), Department of Community Services and local Councils to implement the strategy.

Implementation of the required road improvements for the Hawkesbury-Nepean Floodplain Management Strategy as detailed in the *Interim Regional Road Upgrade Plan, 2000* will involve expenditure around $45 million to provide effective evacuation routes for flood affected communities under severe flood conditions. It is essential that the existing road infrastructure leading out of the flood inundation areas be upgraded to allow for evacuation of all affected persons to high ground before the evacuation routes become impassable. Evacuation routes, which include Windsor Road, Londonderry Road, Thorley

Street, Castlereagh Road and Richmond Road, will be upgraded to ensure the roads remain open during evacuation periods. Upgrading of the evacuation routes in the flood plain commenced in 1999 with completion of Londonderry Road and Thorley Street in June 2000. A new high level crossing of South Creek (Windsor to Mulgrave) will also be provided. The proposed works includes raising the level of roads in low areas, enlarging culverts and adding additional lanes as necessary to accommodate traffic volumes.

Figure 1 shows the two routes (Windsor Road and a route via Groves Avenue, Railway Road North, Railway Road South, Wallace Road and Hamilton Road) that will be used to evacuate the communities in and around McGraths Hill, in severe or extreme floods. The overall proposal is to upgrade the evacuation routes including Windsor Road to a point where there is sufficient assurance that potential evacuees can be removed from the flooded areas based on the current SES Hawkesbury-Nepean Flood Emergency Plans. As part of the necessary improvements to road evacuation routes for the Hawkesbury-Nepean Floodplain Management Strategy, this proposal is to upgrade Windsor Road between Curtis Road and south of Bandon Road as shown in Figure 2. The proposal is part of an overall upgrade of the evacuation route along Windsor Road from Curtis Road to Annangrove Road.

The proposal, addressed by this Review of Environmental Factors (REF), would provide a secure evacuation route for the McGraths Hill community and improved traffic flow, safety and capacity for travellers along this section of Windsor Road. The RTA and DLWC are the joint proponents and contractors would construct the proposal.

2. Proposal Identification

Name of Proposal:	McGraths Hill Flood Evacuation Route along Windsor Road.
Directorate:	Sydney Client Services.
Local Government Areas:	Hawkesbury City Council on both sides of Windsor Road except Blacktown City Council on the west side of Windsor Road from Bandon Road south.
Construction Program:	State funding.
Plan Registration Number	0184.091.CD.0004 (3 sheets).
Roadloc Co-ordinates:	Start R[0184 201 A1 0.600] Windsor Road. Finish R[0184 201 A1 4.150] Windsor Road.

Figure 1. Evacuation Routes



Figure 2. Location Plan of Proposal



3. Proposal Description

3.1 Location

The proposal is located along approximately 3.5 km of Windsor Road from just north of Curtis Road, McGraths Hill to approximately 500 metres south of Bandon Road, Vineyard in north-western Sydney as shown in Figure 2.

3.2 General Features

The proposal is part of the road evacuation route upgrade component of the Hawkesbury-Nepean Floodplain Management Strategy being implemented by the NSW State Government. The works generally involve widening and raising Windsor Road to at least 13.5 metres Australian Height Datum (AHD) and improving the west to east cross drainage flows with new box culverts, pipes and roadside grass swales at 10 sites between Curtis Road, McGraths Hill and south of Bandon Road, Vineyard. The general features of the proposal for use as a flood evacuation route are as follows. Note that all box culverts would be constructed of reinforced concrete and are size is given in millimetres (mm) width by height.

Site 1 - between Curtis Road and Groves Avenue
Install an additional box culvert (900 mm x 375 mm) under Curtis Road. Remove the existing 0.6 metre diameter pipe under Windsor Road and replace it with a 2400 mm x 600 mm box culvert. Connect the two new culverts with a grassed swale along the west side of the Windsor Road road reserve and partially in private property. Raise the existing Windsor Road level over a length of 200 metres by up to 0.8 metres. Signalise the Windsor Road and Groves Avenue intersection due to increased traffic flows in the area.

Sites 2 and 3 - Groves Avenue to Henry Road
Retain the existing road as the northbound carriageway. Construct approximately 500 metres of new raised southbound carriageway (up to 0.9 metres higher than the existing road). These works would provide a 640 metre section of dual carriageway along Windsor Road separated by a median. At site 2 install two cell box culverts (each 2100 mm x 600 mm) plus a rock mattress downstream of an existing culvert approximately 120 metres south of Groves Avenue. At site 3 install four cell box culverts (each 3600 mm x 600 mm) downstream of an existing culvert approximately 200 metres north of Henry Road. Guard rail would also be installed above the box culverts at Sites 2 and 3.

Site 4 - south of Brennan Dam Road
Install an additional 525 mm diameter pipe culvert adjacent to the existing pipe culvert. There would be no change to road levels at this location which are above the required minimum of 13.5 metres. Night time works would be required at Site 4.

Site 5 - north of Level Crossing Road
Replace the existing pipe culverts with three cell 3300 mm x 900 mm box culverts and raise the existing road level over a length of 100 metres by up to 0.35 metres. Install 750 mm diameter pipe culverts as road side drainage under driveways to carry overflows from the

existing pipe culvert north of Site 5. Construct a grassed swale connecting the road side drainage under driveways to the new multi-cell box culverts. The existing inlet and outlet channel on Windsor Road would also be widened locally. Guardrail would also be installed along both sides of Windsor Road near the multi-cell box culvert. A temporary side track would be formed to carry both lanes of Windsor Road traffic on the west side to enable construction works at Site 5. After completion of the works the fill material for the sidetrack would be removed to either works Sites 2, 3, 7, 8 or 10; the natural surface regraded to natural levels; and the regraded area revegetated.

Site 6 - near Blackwood Road
Replace the existing pipe culvert with a two cell 2100 mm x 450 mm box culverts. There would be no change to road levels at this location which are above the required minimum of 13.5 metres. Night time works would be required at Site 6.

Sites 7 and 8 - between Blackwood Road and Bandon Road
Retain the existing road as the southbound carriageway. Construct approximately 400 metres of new raised northbound carriageway (up to 1.1 metres higher than the existing road). These works would provide a 900 metre section of dual carriageway along Windsor Road separated by a median involving some minor excavation and cut. The road would be constructed to a level of 15.9 metres AHD due to a combination of flow from a relatively large catchment draining to the site and high tailwater levels. At Site 7 extend the existing box culvert and install new 2400 mm x 450 mm box culvert adjacent to the existing culvert. At Site 8 install five new multi-cell box culverts (three 3600 mm x 1200 mm and two 3600 mm x 450 mm) upstream of the existing culvert.

Site 9 - Bandon Road/Chapman Road Intersection
Install a new 750 mm diameter pipe under Windsor Road at the Bandon Road/Chapman Road intersection and signalise the intersection due to increased traffic flows in the area. There would be no change to road levels at this location which are above the required minimum of 13.5 metres AHD.

Site 10 - South of Bandon Road
Install a new 1800 mm x 450 mm box culvert under Windsor Road approximately 350 metres south of Bandon Road. Construct a tie-in section from Bandon Road to the existing three lane section of Windsor Road approximately 500 metres south. These works would allow provision of 3 metre wide right turning lanes approaching the Bandon Road and Chapman Road intersection. There would be no change to road levels at this location which are above the required minimum of 13.5 metres AHD. Night time works would be required at Site 10.

The proposed works at sites 1 to 10 would be contained within the road reserve. No land acquisition or easements would be required for the proposal. The hydraulic capacity of the upgraded culverts and upstream and downstream watercourses would be maintained through the development and implementation of Council's local floodplain management plans and policies as recommended in the Strategy.

Access to private properties would be maintained during construction but for properties adjacent to roadworks, the access may temporarily be of a lower standard. On completion because of the median along the two four lane sections of road, access to properties would be restricted to a left turn in and left turn out onto Windsor Road. The new sections of road would be completed in asphaltic concrete on concrete base pavement.

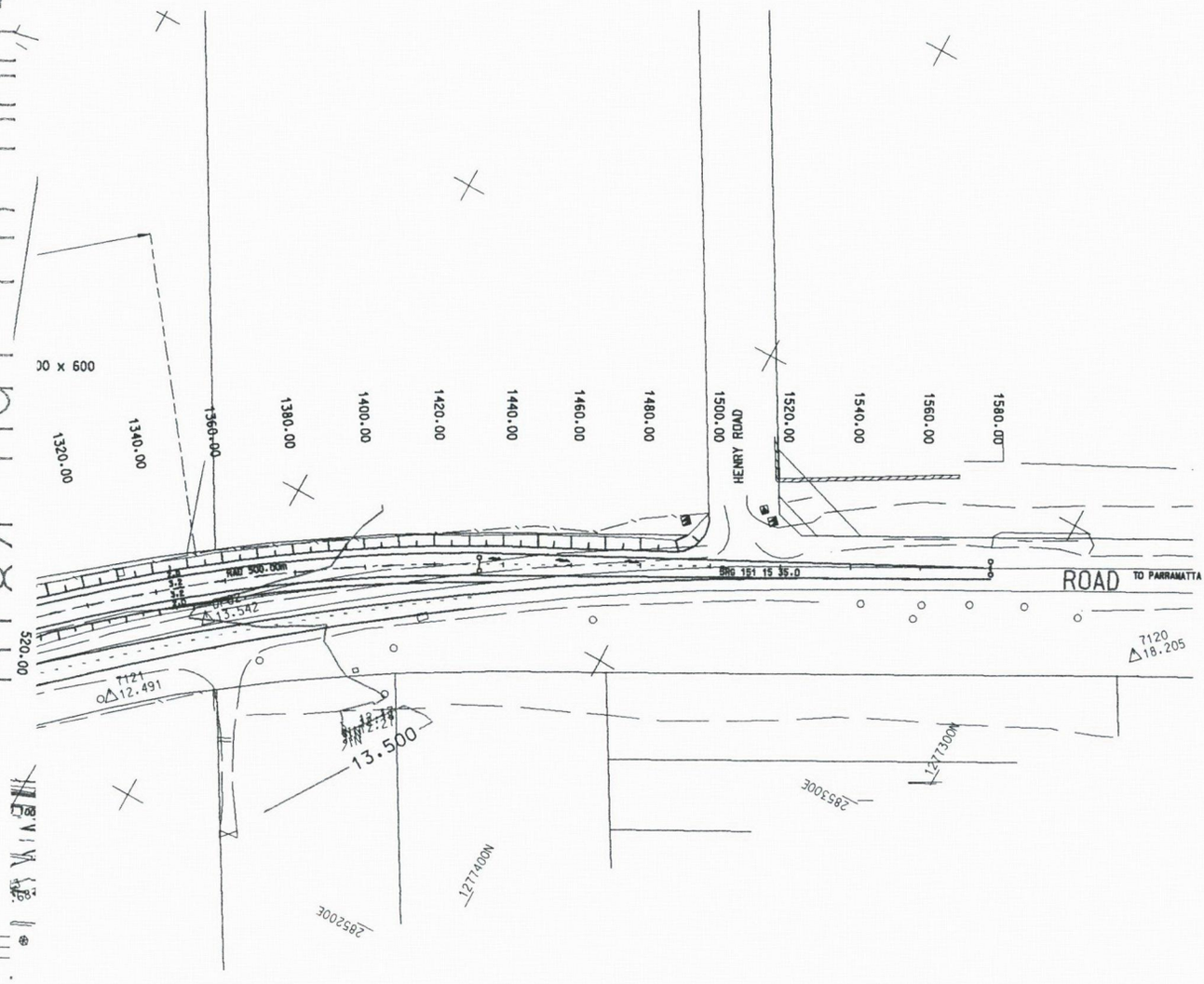
The concept plan, typical cross sections and longitudinal section in Figure 3 show the proposal along the 3.5 km section of Windsor Road and 10 work sites. In summary, the proposal would provide a safe evacuation route for the residents of McGraths Hill by raising Windsor Road for about 2 km, widening the road for about 2.3 km and improving the road side and cross drainage flows. The completed works would provide a minimum road level of 13.5 metres AHD at all sites (except for site 8 to be raised to 15.9 metres AHD) and improved drainage along this section of Windsor Road. The works would allow the residents of McGraths Hill to be evacuated based on the current SES Hawkesbury-Nepean Flood Emergency Plans.

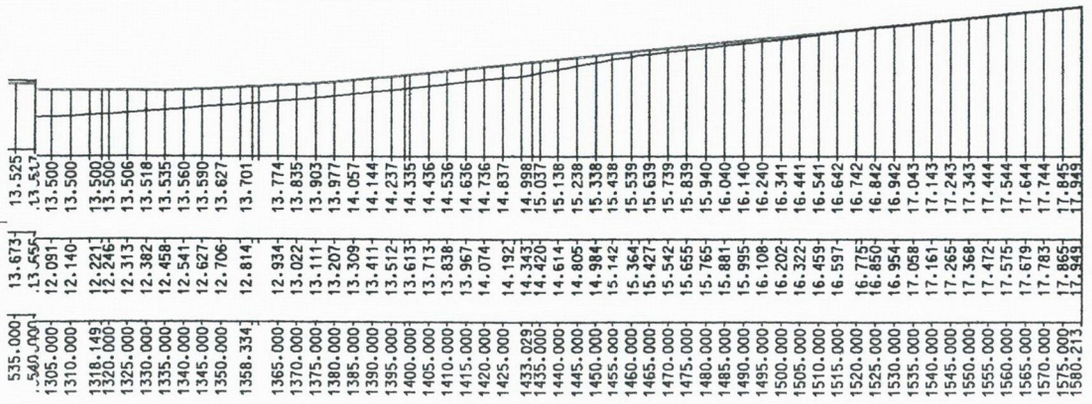
3.3 Costs and Timing

The estimated cost for the concept development, environmental impact assessment, utilities adjustment, detailed design and construction of the proposal is approximately $9 million (in 2001 dollars) including project management and contingencies. Following favourable environmental assessment, determination of the proposal and detailed design it is anticipated that staged construction of the proposal would commence in early 2001 over a period of one year. Completion of the works would be in early 2002.

Figure 3. Plan, Typical Section and Longitudinal Section of Works Along Windsor Road from Curtis Road, McGraths Hill to South of Bandon Road, Vineyard

RTA Plan No. 0184.091.CD.0004 (3 sheets)





535.000	13.673	13.525	
540.000	13.455	13.500	
1305.000	12.091	13.500	
1310.000	12.140	13.500	
1318.149	12.221	13.500	
1320.000	12.246	13.500	
1325.000	12.313	13.506	
1330.000	12.382	13.518	
1335.000	12.458	13.535	
1340.000	12.541	13.560	
1345.000	12.627	13.590	
1350.000	12.706	13.627	
1358.334	12.814	13.701	
1365.000	12.934	13.774	
1370.000	13.022	13.835	
1375.000	13.111	13.903	
1380.000	13.207	13.977	
1385.000	13.309	14.057	
1390.000	13.411	14.144	
1395.000	13.512	14.237	
1400.000	13.613	14.335	
1405.000	13.713	14.436	
1410.000	13.838	14.536	
1415.000	13.967	14.636	
1420.000	14.074	14.736	
1425.000	14.192	14.837	
1433.029	14.343	14.998	
1435.000	14.420	15.037	
1440.000	14.614	15.138	
1445.000	14.805	15.238	
1450.000	14.984	15.338	
1455.000	15.142	15.438	
1460.000	15.364	15.539	
1465.000	15.427	15.639	
1470.000	15.542	15.739	
1475.000	15.655	15.839	
1480.000	15.765	15.940	
1485.000	15.881	16.040	
1490.000	15.995	16.140	
1495.000	16.108	16.240	
1500.000	16.202	16.341	
1505.000	16.322	16.441	
1510.000	16.459	16.541	
1515.000	16.597	16.642	
1520.000	16.775	16.742	
1525.000	16.850	16.842	
1530.000	16.954	16.942	
1535.000	17.058	17.043	
1540.000	17.161	17.143	
1545.000	17.265	17.243	
1550.000	17.368	17.343	
1555.000	17.472	17.444	
1560.000	17.575	17.544	
1565.000	17.679	17.644	
1570.000	17.783	17.744	
1575.000	17.865	17.845	
1580.213	17.949	17.949	

ACCEPTED

NAME S.B. WARRELL

POSITION INFRASTRUCTURE DEVELOPMENT MANAGER

DATE 28/02/01

ROADS AND TRAFFIC AUTHORITY OF N.S.W.

HAWKESBURY COUNCIL AREA

MR 184 WINDSOR ROAD, McGRATHS HILL FLOOD EVACUATION ROUTE

HAWKESBURY-NEPEAN FLOODPLAIN MANAGEMENT STRATEGY

CONCEPT PLAN - SITES 1 to 3

SHEET 1 OF 3 SHEETS

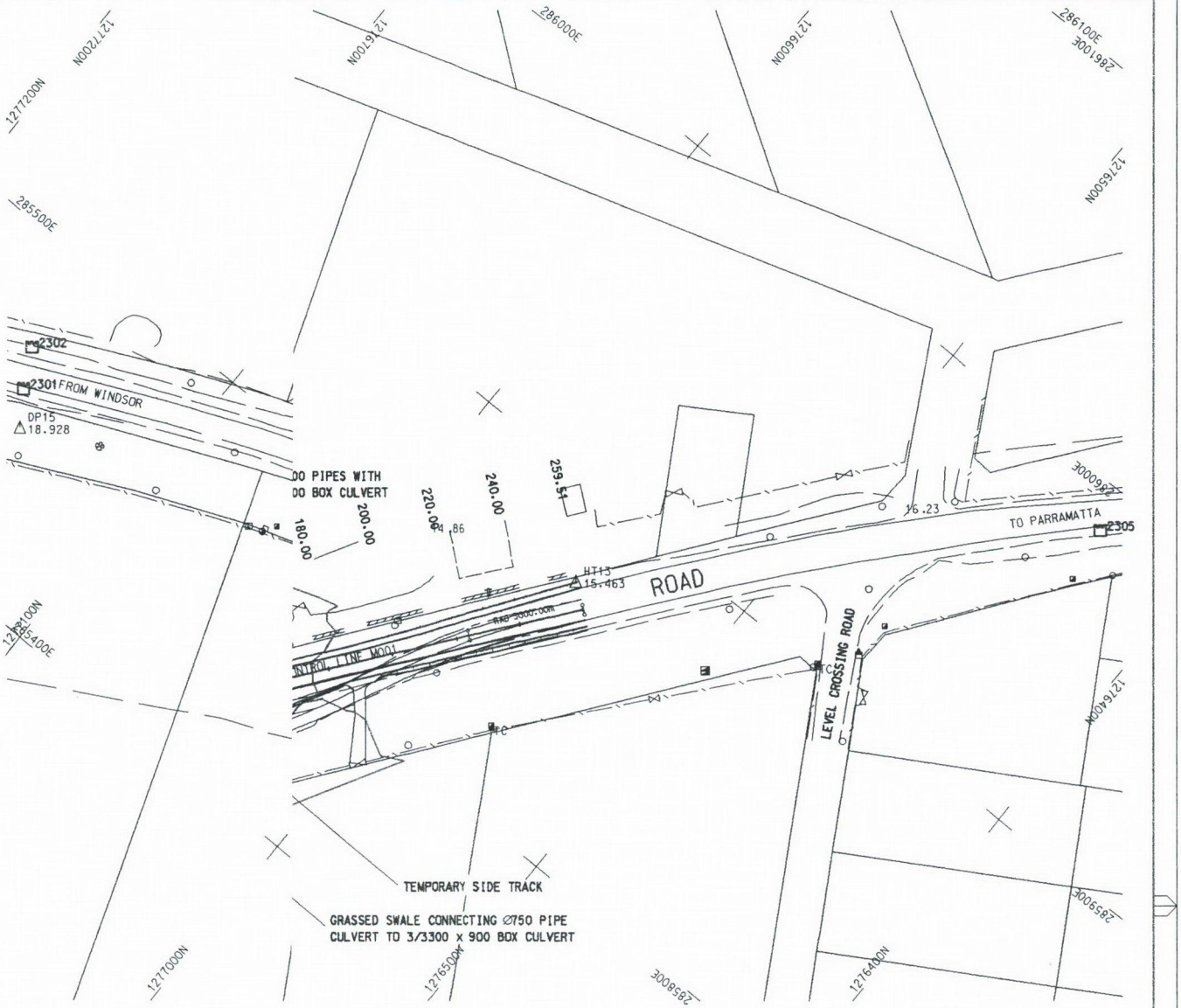
FILE: -

REG No: 0184.091.CD.0003

DRAWN BY CADD

DO NOT AMEND MANUALLY

0184.091.CD.0003



NOTES

1. All existing property

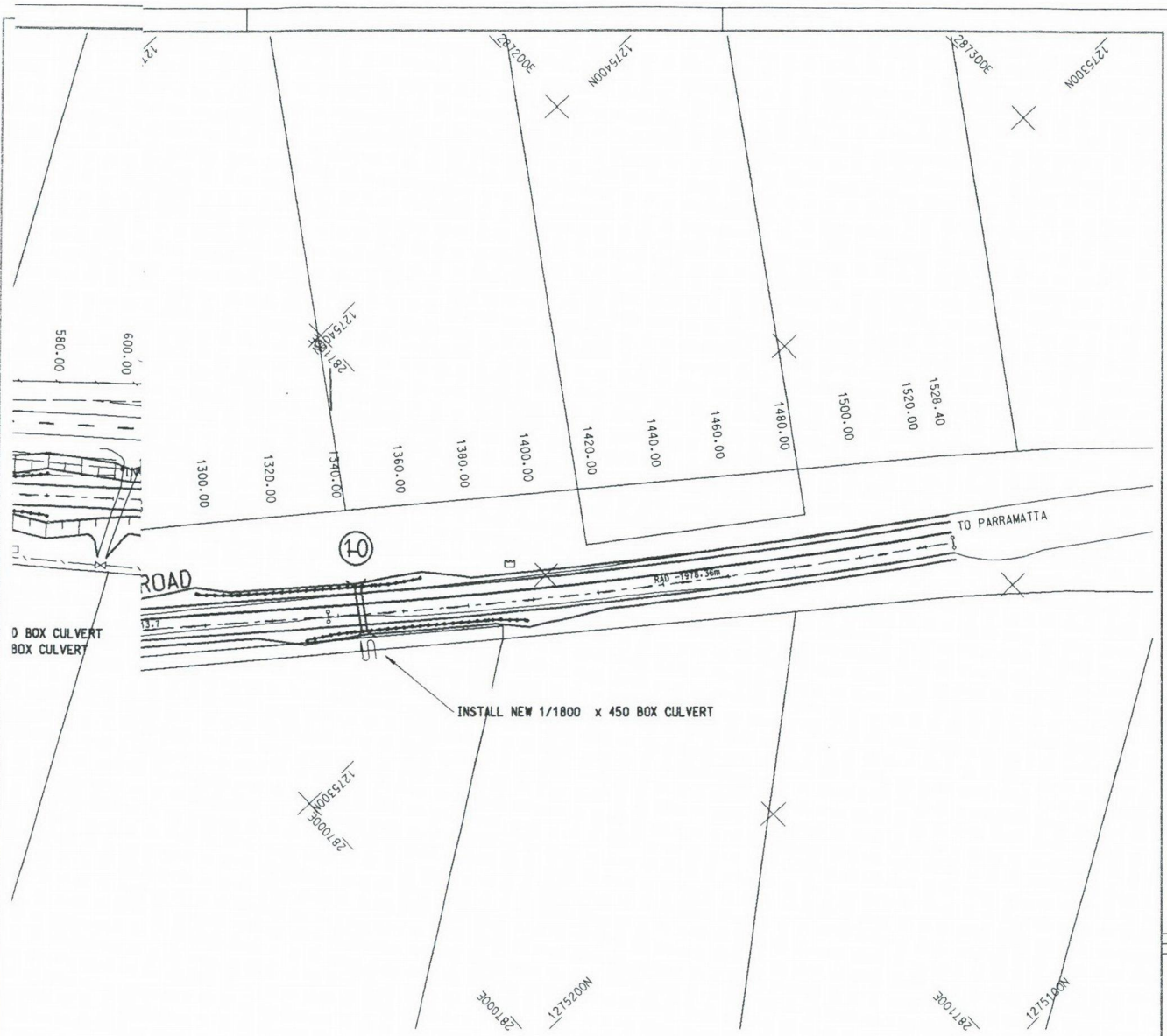
2. Existing drainage cha

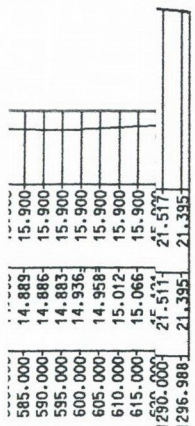
LEGEND

REF Alignment stone an

| | | |

0184.091.CD.0003





Identification

	ROADS AND TRAFFIC AUTHORITY OF N.S.W.	SHEET 3 OF 3 SHEETS
	HAWKESBURY COUNCIL AREA MR 184 WINDSOR ROAD, McGRATHS HILL FLOOD EVACUATION ROUTE HAWKESBURY-NEPEAN FLOODPLAIN MANAGEMENT STRATEGY CONCEPT PLAN - SITES 6 to 10	
	FILE: - REG No: 0184.091.CD.0003	
	DRAWN BY CADD	DO NOT AMEND MANUALLY

01 MAR 2001 09:26:24

4. Specialist Studies and Community Involvement

4.1 Specialist Studies

A range of specialist technical studies has been completed to assist the Advisory Committee in preparing the *Hawkesbury-Nepean Floodplain Management Strategy.* The two studies most relevant to the proposal are:

- *Engineering Studies to Modify Flood Behaviour,* September 1997; and
- *Emergency Response Planning and Traffic Infrastructure,* September 1997.

These studies considered all options to reduce the flood risk faced by the McGraths Hill community during extreme flood events. These studies found the current proposal to be the most practical way of addressing the significant flood risk and preliminary concepts proposed by the Strategy. Further studies were undertaken to assist the Steering Committee in refining the preliminary concept designs recommended in the Strategy. These include:

- *Flood Evacuation Route Optimisation Study,* December 1998; and
- *Local Hydraulics Specification Study, Windsor Road and McGraths Hill Alternative Routes*, December 2000.

Specialist environmental studies completed include European heritage, Aboriginal archaeology and heritage, noise measurements, predicted noise levels and identification of flora and fauna in the area of the proposal. A safety audit has been completed for the concept design and other safety audits would be completed on the detailed design before construction of the proposal, prior to and after opening of the proposal. The findings of the safety audits would be incorporated in the final design.

4.2 Display of the Proposal

The concept design plans were put on public exhibition for three weeks from 19th May 2000 to 9th June 2000, with another week for return of any submissions, at the following locations and times:

Richmond RTA Motor Registry
Shop 5, Rear of 173 Windsor Street
Richmond.
8.30am to 5.00pm Monday to Friday
9.00am to 12.30pm Saturday.

Hawkesbury City Council
George Street
Windsor.
8.30am to 5.00pm Monday to Friday
8.30am to 7.30pm Thursday.

In addition, information sessions were held at Windsor High School on 30th May 2000 and 1st June 2000 to inform the community of the proposal and discuss any issues of concern. A copy of Newsletter No. 1 May 2000 which was available at the two display locations and two information sessions is provided in Attachment 1. Letters were sent on 22nd May 2000 to nearby landowners along Windsor Road describing the proposal and enclosing Newsletter No. 1 and a brochure detailing the *Hawkesbury-Nepean Floodplain Management Strategy*. The NSW State Government Member for Londonderry also issued a media release on the proposal.

4.3 Summary of Public Submissions Received

Attachment 2 provides a summary of the 19 public submissions received by the RTA on the proposal and suggestions. Issues of concern and suggestions from the community ranged over a wide range of topics. The main issues were the need to extend the proposal to 4 lanes or dual carriageway all the way along Windsor Road; suggestions for alternative flood evacuation routes; and concerns about restricted access and turning movements because of the median in the two sections of dual carriageway. A summary of the issues and suggestions from the community is also included in Attachment 2.

4.4 Submissions from Public Organisations

A number of public organisations, utility and service providers with a potential interest in the proposal were consulted and are listed below. Copies of the responses received (indicated by * in the listing) are provided in Attachment 3.

Hawkesbury City Council *
Blacktown City Council *
Department of Land and Water Conservation *
Environment Protection Authority *
Hawkesbury-Nepean Catchment Management Trust *
Telstra
Integral Energy
AGL Gas Companies (NSW) Limited
State Emergency Service
Sydney Water *
Optus Communications Pty Ltd *
Optus Vision Pty Ltd.

The relevant and reasonable requirements of the public organisations, utility and service providers that have been consulted have been addressed in this REF.

SECTION B - ENVIRONMENTAL IMPACT ASSESSMENT

5. Strategic Stage

5.1 General

In recent times the full extent of flood hazards in the Hawkesbury-Nepean Valley has become apparent. Investigations have shown that because of the unusual geography of the valley there are no easy ways of preventing flooding during severe flood events. The narrow gorge north of Wilberforce restricts flow of floodwaters to the sea and has the potential to pond backwater to a great depth in the floodplain areas of McGraths Hill and Windsor. The Hawkesbury River can rise to a level of 26.4 metres AHD at Windsor and McGraths Hill (*Engineering Studies to Modify Flood Behaviour,* September 1997).

Development in the Hawkesbury-Nepean Valley includes many assets and communities that would be adversely affected by flooding as evidenced in the past two hundred years (*Hawkesbury-Nepean River Impacts of Flooding on Communities and Infrastructure*, September 1997).

The Hawkesbury-Nepean Floodplain Management Advisory Committee has addressed the problems of flooding and emergency evacuation in their November 1997 report. Evacuation from the Windsor, Richmond, Londonderry and McGraths Hill areas is considered a high priority.

One of the major constraints for State Emergency Services in the event of a severe flood, is the lack of reliable evacuation routes, which have adequate traffic handling capacity to move large numbers of vehicles under difficult conditions and in a very short time. The existing road network is frequently cut by local flooding and would frustrate any evacuation procedure. The majority of the population at risk (about 60,000 people) would also be isolated by floodwater from the Hawkesbury River at very low levels and potentially lost in severe flooding, if evacuation routes were not upgraded.

A preliminary programme of road improvements was developed by the Hawkesbury-Nepean Advisory Committee, which allows tor the viability of evacuation routes to be phased in across the Hawkesbury-Nepean Valley to increase their effectiveness. The works include a mix of low spot rectification, minor road raising and increased traffic lanes, sufficient to allow evacuation to be completed before roads are ultimately cut by mainstream floodwater. These road upgrading works need to be completed for both existing and future urban development areas.

Following the adoption of the Strategy, the Government convened the Hawkesbury-Nepean Floodplain Management Steering Committee to oversee implementation of the Strategy. The Steering Committee refined the preliminary data and findings of the Advisory Committee into a fully optimised and detailed road upgrade plan (*Interim Regional Road Upgrade Plan*, April 2000).

As part of this process, the condition of the existing road systems were assessed to determine the most suitable evacuation routes and included field surveys and regional planning studies. The traffic dynamics of the evacuation process was also examined across all suitable roads and nominated evacuation routes. Areas where improvements were required to provide safety and to conserve traffic capacity in the system were identified including Windsor Road.

Windsor Road is classified as State Road 184 and serves local, commuter and business traffic and functions as a main road linking major residential growth areas between Rouse Hill and Windsor. Windsor Road has been identified as one of the preferred strategic routes for the evacuation of residents in the McGraths Hill area in the event of a major flood. Parts of Windsor Road are being upgraded in stages by the RTA to meet the need for a suitable flood evacuation route in the area. Windsor Road requires upgrading to ensure that it is a satisfactory evacuation route in the event of a major flood and large local floods. Without the proposal, local communities in the areas in and around McGraths Hill would suffer a loss of life and property damage during times of severe and extreme flooding.

5.2 Strategic Justification and Needs Definition

McGrath's Hill becomes isolated at approximately 12.8 metres AHD when the Hawkesbury River cuts the low point on Windsor Road at Site 1. This corresponds to a frequency of approximately 1 in 10 to 1 in 15 Annual Exceedance Probability (AEP).

During large floods McGrath's Hill becomes an island which progressively shrinks with increasing flood magnitude. A majority of the internal road network and floor levels commence to flood at approximately 14 metres AHD and 16 metres AHD respectively. The entire area would have been submerged by an 1867 type flood event (frequency 1 in 250 AEP) and by several metres in the Probable Maximum Flood event (26.4 metres AHD).

In addition, the *Local Hydraulics Specification Study, Windsor Road and McGrath's Hill Alternative Routes*, December 2000, has shown that the existing road levels and drainage along Windsor Road can also be cut by relatively small floods from local catchments. This would further exacerbate the evacuation problem. For example, Windsor Road is cut by local floods in excess of a 1 or 2 year Average Recurrence Interval (ARI) storm event for sites 1, 2, 3 and 6. These local catchment storms are expected to occur as part of the storm systems that produce the major floods in the Hawkesbury River and require evacuation of McGraths Hill.

Upgrading the Windsor Road and the alternative route via Groves Avenue and adjacent to the railway evacuation routes, is the only viable option to provide sufficient time for the SES to safely evacuate the McGraths Hill community during major flooding.

If no action is taken to upgrade the existing evacuation routes from their present condition, the majority of the 2500 flood prone population in McGraths Hill would be isolated with potential for loss of life if severe flooding occurs. It is considered that there is limited possibility that a majority of these people could be evacuated by other transport means such as boats, helicopters or rail.

Recent studies have shown that a minimum road level of 13.5 metres AHD and culvert amplifications at low points along Windsor Road are required to ensure a safe evacuation of the McGraths Hill community based on the current SES flood emergency plan.

The April 2000 *Interim Regional Road Upgrade Plan* developed essential route requirements for McGraths Hill including upgrading the surface of Windsor Road to secure a minimum evacuation traffic level of 13.5 metres AHD and low points as recommended in local hydraulic specification studies. The December 2000 *Road Evacuation Route Upgrade Strategy, Local Hydraulics Specification Study, Windsor Road & McGraths Hill Alternative Routes* specified the location and size of new culverts at each site and the new levels for the raising of Windsor Road.

In addition, installing the works would require side tracks at some sites to enable continuous traffic flow along Windsor Road during construction. Rather than demolish the side tracks after completion of the culvert and road raising works it would be more cost effective to widen Windsor Road in these areas and provide two sections of dual carriageway. This strategy also fits in with the development of Windsor Road by the RTA as part of the strategic road network.

The main benefit of the proposal would be the provision of a secure evacuation route for the communities in and around McGraths Hill. In addition, the upgrading of Windsor Road associated with the proposal will play an increasingly important role in the main road network in serving the existing and impending residential developments in the surrounding area. Road based transport and local traffic needs will increase dramatically in the Rouse Hill and north-west sector areas with rapid residential development. For example the Sydney Urban Development Program forecasts production of over 10,000 residential lots in the Rouse Hill area in the next five years. Some of this residential development will take place in urban release areas with direct access to Windsor Road. Each of these dwellings is expected to generate approximately 9 daily vehicle trips or 90,000 additional trips a day on the local road network. In addition Baulkham Hills and Blacktown have over 680 hectares of developable employment land for future industrial land uses.

Windsor Road is a key link in the local road and main road network. The proposed upgrade of Windsor Road is essential to meet the future flood evacuation and transport needs of the surrounding residential areas as well as meeting the functions of a main road. The existing two lane road would not meet these future flood evacuation or main road functions with a high probability of flooding and the large expected increases in traffic.

In summary, the proposal for improvements of sections of Windsor Road is essential to cater primarily for future flood evacuation needs and secondly for traffic volumes.

5.3 Planning and Environmental Background

The draft *State Road Network Strategy* was released by the RTA in January 1995 and set out a framework for planning and managing the NSW road network over the next 15 to 25 years. The draft *Strategy* is based on analyses of population growth and distribution, urban growth, economic change, development opportunities, environmental constraints and the total transport needs of passengers and freight - all within a framework of ecologically sustainable development objectives. The main themes of the draft *Strategy* are to facilitate and support State and regional economic development; moderate traffic growth, rather than strive to satisfy unrestrained demand for travel; and progress towards the achievement of ecologically sustainable development objectives. This involves the linkage of major nodes, such as transport interchanges, major land uses and major regional and sub-regional centres. Windsor Road has been identified in the draft *Strategy* as part of the strategic road network for development to serve public transport and freight needs in Sydney.

The RTA's February 1995 *Roadside Environment Strategic Plan* forms part of the commitment expressed in the RTA's Environmental Vision being *a roads and traffic system in harmony with the natural and social environment, while meeting community mobility needs.* In addition the Roadside Environment Policy states *in partnership with local government, other agencies and the community, the RTA will work to improve the management and enhancement of the roadside environment.*

The *Roadside Environment Strategic Plan* has a number of ecological, social and economic functions, environmental factors and environmental management components that would apply to the proposal including:

- maintain the primary economic role of the road as a transport link.
- establishment and maintenance of indigenous vegetation.
- controlling weeds in the road corridor.
- soil conservation during planning, construction and maintenance.
- to protect watercourses and their associated habitats.
- recognising scenic values in roadside corridor management and maintenance.
- consideration of safety issues and roadside corridor management.
- planning and design of roadside structures.
- development of appropriate land uses adjacent to the road corridor which complement roadside values.
- permit limited and appropriate commercial activities within the roadside corridor.
- need for community involvement.
- pollution control and management.
- to provide for public utility services.

6. Concept Stage

6.1 Objectives

Achieving a Hawkesbury-Nepean Floodplain Management Strategy developed a comprehensive strategy for managing the significant flood risks in the Hawkesbury-Nepean valley downstream of Warragamba Dam. Central to this strategy is the realisation that the existing road network in the valley is inadequate from an emergency flood evacuation viewpoint. In response, the strategy identified a preliminary programme of road improvements, which allowed the viability of evacuation routes to be phased in across the Nepean valley.

The *Interim Regional Road Upgrade Plan* refined the preliminary data and findings from the Strategy into a detailed strategy for a regional road upgrade plan. A review of evacuation routes and logistics and a range of regional planning studies including *Flood Evacuation Route Optimisation Study,* and *Local Hydraulics Specification Study, Windsor Road and McGraths Hill Alternative Routes* were undertaken.

The *Flood Evacuation Route Optimisation Study* combined the data on emergency response planning logistics, evacuation statistics, field survey and traffic carrying capacities to achieve the following objectives:

- Identify minimum route elevations required to allow the populations at risk to evacuate prior to the nominated evacuation routes being inundated by backwater flooding;
- Identify optimum elevation of the low points of an evacuation route with respect to economic criteria; and
- Specify route requirements designed to optimise the evacuation function of the designated (both primary and alternative) routes, for example lane requirements, pavement and shoulders, evacuation signage and intersections.

For Windsor Road and the alternative route via Groves Avenue and adjacent to the railway evacuation routes, a minimum level of 13.5 metres AHD is required to meet these objectives.

The objectives of the *Local Hydraulics Specification Study, Windsor Road & McGraths Hill Alternative Routes* is to complement the results from the *Flood Evacuation Route Optimisation Study* and determine the changes to the road levels and associated drainage infrastructure at all low points along both routes to ensure that the evacuation of McGraths Hill would not be compromised by local flooding.

Accordingly the objectives of the proposal are:

- to provide a safe and secure emergency evacuation route for the communities in and around McGraths Hill.
- to minimise the risk of the evacuation routes being cut by local flooding during the evacuation period.
- to improve traffic flow and safety with provision of sections of four lane divided road.
- to achieve community acceptance.
- to satisfy environmental requirements where cost effective and practical.

The above objectives for the proposal are in accord with the draft *State Road Network Strategy* and the RTA's strategy for the area and environmental policy which states *the RTA is committed to using best practical environmental technology, planning and management techniques in all its activities.*

6.2 Options

There are a limited number of options for the arrangement and treatment of the Windsor Road flood evacuation route proposal taking into account the constraints imposed by the existing hydrology of the Hawkesbury-Nepean River, surrounding topography, road alignment and adjacent improvements. Options to reduce the consequences of flooding including modifying flood behaviour (for example, construction of a levee and refuge mound at McGraths Hill, upstream detention storage or increased flood plain storage); modifying flood prone assets; and modifying the response of people to flooding (for example, use of other evacuation routes including the upgrade of Pitt Town Road to link McGraths Hill to Scheyville) were considered in *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* and associated documents. Improving flood evacuation routes including Windsor Road and the alternative route via Groves Avenue and adjacent to the railway was one of the recommended actions. Given the need to provide a secure evacuation route and cater for the large traffic growth expected along Windsor Road in future, the 'do nothing' or 'do minimum' option was not considered acceptable. The environmental impacts of an alternative evacuation route along Groves Avenue and adjacent to the railway line west of the proposal have been considered in other documents.

Alternative transport modes such as upgrading public transport systems are considered in documents such as *Action for Transport 2010 - An Integrated Transport Plan for Sydney* and are beyond the scope of the REF. Use of the nearby railway to Windsor and/or Richmond Air Force Base were not feasible as access to them would be cut off in a major flood.

6.3 Proposal Selection

A number of criteria were used for selection of the proposal including:

- consideration of the requirements in *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* and supporting documents for the proposal.
- minimising costs and maximising benefits.
- reducing potential environmental impacts wherever possible.
- reducing any impact on utilities where possible.
- keeping works as part of or next to existing drainage and within the road reserve wherever possible.

The proposal provides the most suitable and appropriate scheme for a secure flood evacuation route for the communities in and around McGraths Hill. It would be consistent with other sections of Windsor Road and would have environmental impacts no greater than other options. The proposal meets the immediate and recognised needs for a secure flood evacuation route along Windsor Road while considering the strategic information provided in *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* and

supporting documents, the objectives of the proposal, economic and engineering constraints. The proposal can be constructed safely within the road reserve and would meet community, DLWC and RTA objectives. Upgrading Windsor Road as an evacuation route can be justified on strategic, environmental, engineering and community grounds. In addition the proposal is in accordance with some of the principles of ecologically sustainable development.

Having selected a feasible proposal there are also numerous alternatives available with regard to design elements such as materials, roadside furniture, finishes and landscaping. These elements would be refined in the detailed design. The design elements to be selected would be compatible with and match materials in the surrounding roadside and urban environments.

6.4 Statutory Planning

6.4.1 Zoning

Windsor Road lies within the Hawkesbury City Council area on both sides except on the west side from Bandon Road approximately 500 metres south which lies within the Blacktown City Council area. Within the Hawkesbury City Council area Windsor Road is an unzoned arterial road under the provisions of Hawkesbury Local Environmental Plan 1989. However there are a large number of properties on both sides of Windsor Road that are zoned 9(b) Reservation Proposed Road. The objective of the 9(b) zone is to set aside land (being land that the Council or a public authority proposes to acquire) for various proposed roads. Arterial roads and drainage are normally permitted only with development consent in the 9(b) zone.

The western side of Windsor Road south of Bandon Road and the associated road reserve within the Blacktown City Council area are zoned 5(b) (Special Uses - Arterial Road and Arterial Road Widening Zone) under the provisions of Blacktown Local Environmental Plan 1988. The objective of the 5(b) zone is to identify land required for existing or proposed arterial roads, including the widening of existing arterial roads. Roads are permitted without development consent in the Special Uses 5(b) zone. Drains normally require the consent of Blacktown City Council in the Special Uses 5(b) zone.

Land adjoining Windsor Road in both the Blacktown and Hawkesbury City Council areas requires Council and RTA consent for direct access.

The land located on the west side of Windsor Road between Curtis Road and Park Road in the Hawkesbury City Council area is zoned 3(b) Business Special under the Hawkesbury Local Environmental Plan 1989. Vineyard Park located at the intersection of Park Road and Windsor Road is zoned 6(a) Open Space (Existing Recreation). The remainder of the land along Windsor Road within the Hawkesbury City Council area is zoned 1(c) Rural.

Most of the adjoining land located on the western side of Windsor Road south of Bandon Road in the Blacktown City Council area is zoned 1(a) (General Rural) under the Blacktown Local Environmental Plan 1988 except for an area of Special Uses 5(a) zone located on the corner of Bandon Road associated with Vineyard Public School.

6.4.2 State Environmental Planning Policies

The provisions of State Environmental Planning Policy No.4 *Development Without Consent* enables the RTA to construct any road and drainage components of the proposal that are inside the road reserve without the need for consent from either Hawkesbury City Council or Blacktown City Council.

State Environmental Planning Policy No.19 *Bushland in Urban Areas* applies to land in Vineyard Park although no works will take place along Windsor Road affecting any bushland in the park. More detail is provided in Attachment 4.

State Environmental Planning Policy No. 44 *Koala Habitat Protection* applies to land in Hawkesbury City Council area. The land is potential Koala habitat but not core koala habitat under the policy. No Koala plan of management is required. More detail is provided in Attachment 4.

6.4.3 Regional Environmental Planning Policies

The proposal generally meets the general planning considerations, specific planning policies and recommended strategies for water quality, water quantity, cultural heritage, flora and fauna in Sydney Regional Environmental Plan No. 20 *Hawkesbury-Nepean River (No. 2 - 1997)*. The aim of the plan "is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context". Specific items under clause 6 of the plan that need addressing include the following.

Water quality - A soil and water management plan would be prepared by the RTA to cover construction activities. Groundwater and water quality would not be compromised with the proposal. A buffer of native vegetation would be planted along the roadside after completion of the proposed drainage and road works.

Water quantity - The effect of the proposal on the existing hydrological patterns is shown in Tables 1 to 3 in Section 7.3.6. Due to a combination of small catchments draining to the low points and the relatively high downstream Hawkesbury River flood levels, any interference by the proposal would generally be localised and confined to the road reserve.

The proposal would result in an improvement in local drainage efficiency over a wide range of local floods, with a majority of these floods passing under Windsor Road. This would enable a safe evacuation route for the residents of McGraths Hill and also virtually eliminate nuisance flooding along Windsor Road.

Cultural heritage - An Aboriginal site survey has been carried out prior to finalising the proposal and no Aboriginal archaeological sites listed with the NSW National Parks and Wildlife Service Aboriginal Sites Register are located within, or in the vicinity of, the proposed impact areas. One new site comprising two possible Aboriginal scarred trees is located in the vicinity of Site 5. The survey identified Sites 2, 3 and 10 with the potential to contain surface and sub-surface Aboriginal relics. More information is provided in Section 7.3.13 and Attachment 5.

Flora and fauna - Flora and fauna surveys have been carried out to establish the national, regional and locally significant species that are present along the flood evacuation route. More information is provided in Section 7.3.13 and Attachment 4. The RTA would prepare a landscape plan for the proposal including a weed control programme and using locally indigenous species.

Metropolitan strategy - The waste disposal, air and water quality impacts of the proposal have been considered in Sections 7.1.5, 7.3.5 and 7.3.6 respectively.

Consent is normally required from Hawkesbury City Council to fill land greater than 1 metre in depth or 100 square metres in area under Sydney Regional Environmental Plan No. 20. However the provisions of State Environmental Planning Policy No.4 *Development Without Consent* over ride the need for the RTA to obtain consent from either Blacktown or Hawkesbury City Councils.

6.4.4 Legislation

The requirements of the following NSW legislation and associated regulations apply to the proposal and would be complied with.

Fire Brigades Act, 1989
Contaminated Land Management Act, 1997
Dangerous Goods Act, 1975
Environmental Planning and Assessment Act, 1979
Environmentally Hazardous Chemicals Act, 1985
Heritage Act, 1977
Local Government Act, 1993
National Parks and Wildlife Act, 1974
Noxious Weeds Act, 1993
Protection of the Environment Operations Act, 1997
Rivers and Foreshores Improvement Act, 1948
Roads Act, 1993
Soil Conservation Act, 1938
Threatened Species Conservation Act, 1995
Waste Minimisation and Management Act, 1995.

In addition, part of the proposal affects Cumberland Plain Woodland which is listed under the Commonwealth government's *Environment Protection and Biodiversity Conservation Act, 1999* as an endangered ecological community.

6.4.5 Power to Construct the Proposal

Of particular note is the definition of *road work* in the *Roads Act, 1993* which "includes any kind of work, building or structure that is constructed or installed on or in the vicinity of a road for the purpose of facilitating the use of the road as a road...." In turn *carry out road work* " includes carry out any activity in connection with the construction, erection, installation, maintenance, repair, removal or replacement of a road work". The proposal is considered as part of *carrying out road work* and ancillary to the operations of Windsor Road.

Both Blacktown City Council and Hawkesbury City Council have Tree Preservation Orders. Section 88 of the *Roads Act* allows the RTA to remove trees from the road reserve for the purpose of carrying out road works.

7. Detailed Assessment Stage

7.1 Design Considerations

7.1.1 Existing Road

Windsor Road is a main road that generally runs in a north-westerly direction between Parramatta and Windsor in the north-western region of metropolitan Sydney. The existing two lane road serves local, commuter and business traffic including heavy vehicles with increasing traffic generation. The road reserve is of variable width up to 40 metres wide, but generally 20 metres wide, with some land acquisition for road widening along both sides of the road yet to take place by the RTA.

The minimum road levels at each of the sites between Curtis Road and south of Bandon Road are shown in Table 1 in Section 7.3.6. They vary from a minimum of 12.6 metres AHD at Site 5 to in excess of 20.9 metres AHD at Site 10. Three of the sites have levels less than the minimum level of 13.5 metres AHD, being Site 1 (12.86 metres AHD), Site 3 (12.6 metres AHD) and Site 5 (13.1 metres AHD).

The local catchments draining to each of the low points along Windsor Road are shown in Table 3 in Section 7.3.6. They tend to be relatively small and vary from 1.6 hectares at Site 4 to 158 hectares at Site 8. The relatively small catchment areas result in a dominance of short duration storms and quick catchment response. Flooding of the low points along Windsor Road from these local storms is likely to be for short periods of less than 2 hours duration.

The road pavement is dense grade asphalt or flush seal and is in reasonably sound condition. An 80 km/hour speed limit applies along most of the road, except from about 100 metres south of Groves Avenue northwards to Curtis Road were a 60 km/hour speed limit applies. Average traffic speeds are generally near the statutory speed limit. The road has good horizontal and vertical alignments and adequate sight distances.

Traffic control devices along this section of Windsor Road include traffic signs at the unsignalised intersections and no passing lines painted along sections of the road.

There is a bus shelter provided on the east side of the road near Vineyard Public School. Pedestrian and pedal cyclist facilities are sub-standard and the unsealed roadside shoulder presently serves their needs. Mature vegetation generally lines both sides of sections of Windsor Road. Surface drainage is into a series of roadside grass swales located on both sides of the road with culverts and pipes providing cross drainage.

7.1.2 Existing and Forecast Traffic

In 1999 the Annual Average Daily Traffic flow at Vineyard north of Bandon Road was 24,603. Traffic growth along Windsor Road is anticipated to be approximately 5% compound growth per year until at least 2012 due to continuing residential development in the north-west Sydney sector. A feature of the existing traffic flows is that there are predominant weekday morning peak flows for southbound traffic flows towards Sydney

and weekday afternoon peak flows for northbound traffic. However there are relatively heavy traffic flows at all times between 5 am and 7 pm on weekdays. Forecast traffic along Windsor Road is anticipated to be approximately 26,300 Annual Average Daily Traffic in 2002 and 30,800 Annual Average Daily Traffic in 2012.

Approximately 10% of traffic flows along Windsor Road are heavy vehicles. The assessed future heavy vehicle composition of the total traffic flows in 2012 is expected to be similar. There is negligible pedestrian and pedal cyclist activity along Windsor Road at present due to the lack of facilities.

Accident statistics for the 3 year period from 1997 to 1999 show 53 accidents along this section of Windsor Road with 28 injuries and no fatalities.

7.1.3 Design Parameters

The main design criteria for the proposal is to provide Windsor Road with:

- A minimum road level of 13.5 metres AHD to ensure a safe evacuation of the McGraths Hill community based on the current SES flood emergency plans (*Interim Regional Road Upgrade Plan*); and
- To provide road levels and drainage capacity to accommodate a 500 year ARI local flood event in order to minimise the potential for local floods to cut the evacuation route during the evacuation period (*Local Hydraulics Specification Study, Windsor Road and McGraths Hill Alternative Routes).*

In determining the minimum level of 13.5 metres AHD for the Windsor Road and alternative evacuation routes the following criteria were adopted:

- Windsor Road and the alternative routes were both primary evacuation routes;
- Rate of rise in the Hawkesbury River of 0.55 metres/hour from 6 metres AHD at Windsor Bridge;
- Bureau of Meteorology forecasts a flood requiring full evacuation at 6 metres AHD;
- 10 hours for the SES to mobilise and for the SES to warn and mobilise the McGraths Hill community;
- Evacuation (and including 2500 vehicles) commences at 11 metres AHD;
- Evacuation rate of 600 vehicles/hour utilising a single outbound lane;
- Allowance for incoming emergency vehicles; and
- A factor of safety of 2 to allow for uncertainties in the forecasting, warning and evacuation components of the evacuation process.

In determining the recommended drainage option for each location the following design criteria were adopted:

- 0.3 metres freeboard to the highest point on the trafficable lanes during the local catchment 500 year ARI flood event, including flow in table and catch drains that form part of the transverse drainage network. The 500 year ARI flood event water depth would drain to below the road verge.
- No increase in flood levels for the 100 year ARI flood event (in relation to existing conditions) and a minimal increase in flood levels for the 500 year ARI flood event (nominally 0.2 metres).

- Hydraulic analysis using a minimum Hawkesbury River tailwater level of 12.5 metres AHD.
- A minimum cover for pipe culverts of 0.6 metres and 0.3 metres for box culverts.
- A maximum depth of water over the road crest of 0.1 metres (that is maximum depth at any point on the road profile of 0.15 metres) is acceptable where transverse drainage is blocked.

Other design criteria are a design speed of 80 km/hour with a maximum grade of 2.0%, 3.2 metres minimum width for travel lanes and 2 metres width for the road shoulders. All RTA road design criteria would be meet for the proposal. The design criteria would ensure adequate capacity and safety for all vehicles. The existing speed limits of 60 and 80 km/hour would be retained. However reduced speed limits would apply around the construction work sites. The proposal would be designed in detail in accordance with RTA criteria, other specifications including requirements of this document and:

- Roads and Traffic Authority Road Design Guide
- AUSTROADS Guides
- Australian Rainfall and Run-off 1987
- Roads and Traffic Authority Environment Manual
- Australian Standard 1742.3 (for traffic management).

There are no major constraints to the design of the proposal apart from the need to tie in with the existing sections of road and drainage infrastructure and complete the proposal under traffic. Although two sections of road would be upgraded to dual carriageway the RTA has no plans to widen other sections of Windsor Road to 4 lanes for at least 10 years. Some utilities including electricity, water mains, telecommunications and gas services and lines would need adjustment and/or relocation. Land acquisition would not be required for the proposal.

The detailed design would provide for:

- road raising to address minimum evacuation and local drainage requirements.
- economy in construction costs.
- drainage infrastructure to accommodate a 500 year ARI local flood event.
- geometric design including horizontal and vertical alignments generally to 80 km/hour standard.
- import of selected clean fill.
- structural adequacy.
- pavement, pavement area, materials and wearing surface.
- line marking, sign posting, sign structures and lighting.
- adjustments to location of utilities as required.
- implementation of safeguards specified in a Construction Environmental Management Plan[1].

[1] *A Construction Environmental Management Plan is a document prepared to ensure that all environmental requirements of a project arising from environmental impact assessments considered by the Review of Environmental Factors and Decision Report, RTA policies and all relevant legislative requirements are implemented during development of the project.*

7.1.4 Construction Activities

If approval is given to the proposal and following completion of detailed design it would be constructed over a period of 12 months to be ready for traffic in early 2002. The RTA would supervise construction to minimise any delays in traffic along Windsor Road. Three temporary construction compounds would be required between Sites 2 and 3, adjacent to Site 5, and between Sites 8 and 9. They would be located adjacent to the western side of the road reserve on RTA land. The construction compounds would be security fenced and include amenities sheds, portable toilets, plant and equipment storage areas, bunded areas for storage of petroleum, distillate and other chemicals to comply with Environment Protection Authority (EPA) and WorkCover Authority requirements. Any material stockpiles would be located in or adjacent to the road reserve and protected from possible erosion.

Construction equipment expected to be used on-site includes the following mobile plant and equipment as required:

- front end loaders
- excavation plant
- back hoes
- trenching machines
- chain saws
- jack hammers
- dump trucks
- bulldozers
- graders
- vibrating rollers
- concrete agitator trucks
- asphaltic paving machines
- water tankers
- road sweepers
- line marking vehicles
- trucks delivering construction materials
- cranes
- low loader transporters
- light commercial and passenger vehicles.

Construction hours would generally be from 7 am to 6 pm Monday to Friday and 7 am to 1 pm on Saturdays except for night time works required at Sites 4 and 6. From 7 am to 8 am on Saturdays only inaudible work would be allowed at the daytime work sites. Work would not be permitted on Sundays and public holidays unless authorised by the RTA and EPA where required. Night work would be necessary to minimise inconvenience to road users in daytime peak travel times. Any night work would follow the existing procedure used by the RTA Sydney Operations Directorate and endorsed by the EPA with regard to night time road works noise. An estimated 1,000 cubic metres of excavation and 50,000 cubic metres of selected fill material would be required for the proposal.

Construction would follow normal road works procedures including the following general sequence of activities:

- The boundaries of any excavation and fill areas to be cleared at the 10 work sites would be established.
- Temporary site construction compounds would be established as required.
- Temporary erosion, sedimentation and drainage controls would be installed.
- Native vegetation, overburden, concrete and pavement would be removed off-site for recycling.
- Surface preparation by graders would include topsoil being stripped and stockpiled on-site by bulldozers, graders, loaders and trucks.

- Suitable excavated material would be recycled and incorporated in earthworks within the road reserve.
- Unsuitable excavated material would be trucked off-site to a legally operating waste disposal facility.
- All affected utilities, services and signage would be relocated and/or adjusted to suit construction programme requirements.
- Drainage lines would be excavated by backhoe or excavator.
- At construction sites 1, 4, 6, 7, 9 and 10 one half of the road would be excavated, bed levels compacted and sections of cast culvert lowered into place before fixing and backfilling. The same activities would then be completed for the other half of the road. At the other construction sites 2, 3, 5 and 8 the same activities would be completed as one sequence although a temporary side track may be required at site 5.
- Import of select material for fill earthworks would be backfilled and graded.
- Compaction by rollers and vibrating compactors with trimming by graders.
- Batched concrete and asphalt placed on-site by pavers, autograde machines and graders and compacted by rollers.
- Application of asphaltic concrete wearing surface by pavers and rollers.
- Installation of noise attenuation measures.
- Landscaping along the proposal.
- Installation of line marking, guardrail, sign structures, traffic lights and sign posting.
- Site clean up and disposal of all surplus waste materials.
- Opening for traffic.

The RTA would be responsible for the overall implementation of the proposal. Construction would conform to Quality Assurance in accordance with AS/NZS ISO 9001-1994 and RTA specification Part Q *Quality System Requirements*. The safeguards in this REF would be implemented by the RTA and contractor(s) throughout the sequence of activities described above.

No blasting or on-site large scale batching of concrete or asphaltic concrete (for example installation of batch plants) would be permitted. The construction sites would be maintained in a clean and tidy state at all times. Construction equipment would be maintained to meet EPA requirements. No vehicle maintenance would be permitted outside the construction compounds except in emergencies. Cleaning out of batched concrete from agitator trucks and mixing plant would only be permitted in designated areas or off-site at approved facilities.

Construction would be carried out under traffic at sites 2, 3, 5 and 8. Professional and diligent traffic management would be required to construct the proposal and avoid disruption to traffic. Two lanes on Windsor Road would be available for traffic at all times except at the culvert construction sites. Traffic arrangements would be subject to RTA approval. Disruption of access to properties would be minimised and prior arrangement would be made with affected owners in the event of any short term disruption.

7.1.5 Waste Disposal

Any surplus waste material would be disposed of in a legal manner. Construction works would include clearing of introduced and native vegetation from the road reserve. The number of trees to be removed would be the minimum necessary for the safe excavation and construction operations. Trees with limbs overhanging Windsor Road would not be removed unless absolutely necessary for safety reasons. Any overhanging limbs would be cut back where possible. Any suitable vegetation would be provided to community groups as firewood as a first priority and then disposed of at a nearby legally operating recycling facility (for example, the Waste Service NSW depot at Seven Hills) for reuse as mulch. The native vegetation, leaf litter and soil cleared for the construction works would be reused in the landscaping of the disturbed areas. Any exotic vegetation that cannot be mulched or noxious weeds would be disposed of at a nearby legally operating waste disposal site.

Any excavated or excess pavement material and concrete would be incorporated in the earthworks for the proposal as a first priority or transported off-site for recycling. If any contaminated material was encountered it would be disposed of at the direction of the EPA.

All other waste generated during construction (for example, unsuitable spoil, domestic waste and surplus unsuitable construction material) would be removed from the site for disposal at a nearby legally operating waste disposal site. The workforce would use a portable toilet facility located within the construction compounds. No waste would be buried or burnt on-site.

7.1.6 Demand Upon Resources

In addition to labour, plant, equipment and energy inputs the proposal would require concrete, steel, select fill material, pre-fabricated culverts and asphaltic concrete. Any prefabricated construction components, metalwork and signs required would be transported to the site by heavy vehicles. The off-site batched concrete and asphaltic concrete would be sourced from commercial outlets in or near Richmond, Windsor, Riverstone or Baulkham Hills. Import of these resources would mainly involve a number of heavy vehicle loads to be transported along Windsor Road with minor traffic impact. The fill would be sourced from legally operating quarries located in the north-west or western Sydney metropolitan area and/or from legally operating recycled fill suppliers. Actual quantities and number of loads may vary depending on the detail design for the proposal and widening. The proposal would not affect any resources in short supply.

7.2 Description of Site and Surroundings

Windsor Road is located on the metropolitan fringe which is undergoing a rapid transition from rural to urban land uses and in particular low density residential development. Photographs 1 to 10 show the 10 work sites and area of the proposal. The road reserve is variable in width between 20 and 40 metres wide and partially occupied by the existing road pavement area. Adjacent stretches of introduced and mainly native vegetation including mature trees line both sides of the roadside. Windsor Road has a number of utilities in the road reserve. Overhead low voltage and 33kV electricity cables also line both sides of sections of Windsor Road with 66kV electricity cables and towers crossing the road near Site 4 and 8.

The adjacent land uses include rural residential dwellings located as close as 20 metres to the road and a wide range of rural orientated small businesses and industry. These land uses include market gardens, plant nursery, fertiliser manufacturer, farm equipment supplies, motel, various retail outlets (both trading and vacant), petrol filling stations, junk yards, animal studs, poultry farm, kennels, retirement village and Vineyard Public School. The land uses near the north end of the proposal closer to Windsor are more commercial and include fast-food restaurants, automobile parts and a car yard. The section of Windsor Road affected by the proposal provides frontage (most with direct access) to 82 properties in total with 48 properties on the west side and 34 properties on the east side.

The noise environment is dominated by traffic noise from Windsor Road. There has been a high degree of human, physical and chemical disturbance along this section of Windsor Road and adjacent road reserve. Human disturbance is evident from the varied urban and rural land uses and over 200 years of European settlement in the area. Chemical disturbance is likely to include herbicides and pesticides from weed and pest control, hydrocarbons and heavy metals from road runoff. The proposal is located west of the northward flowing Killarney Chain of Ponds catchment, which drains to South Creek and in turn the Hawkesbury-Nepean River.

Photograph 1. Site 1 on Windsor Road Looking East



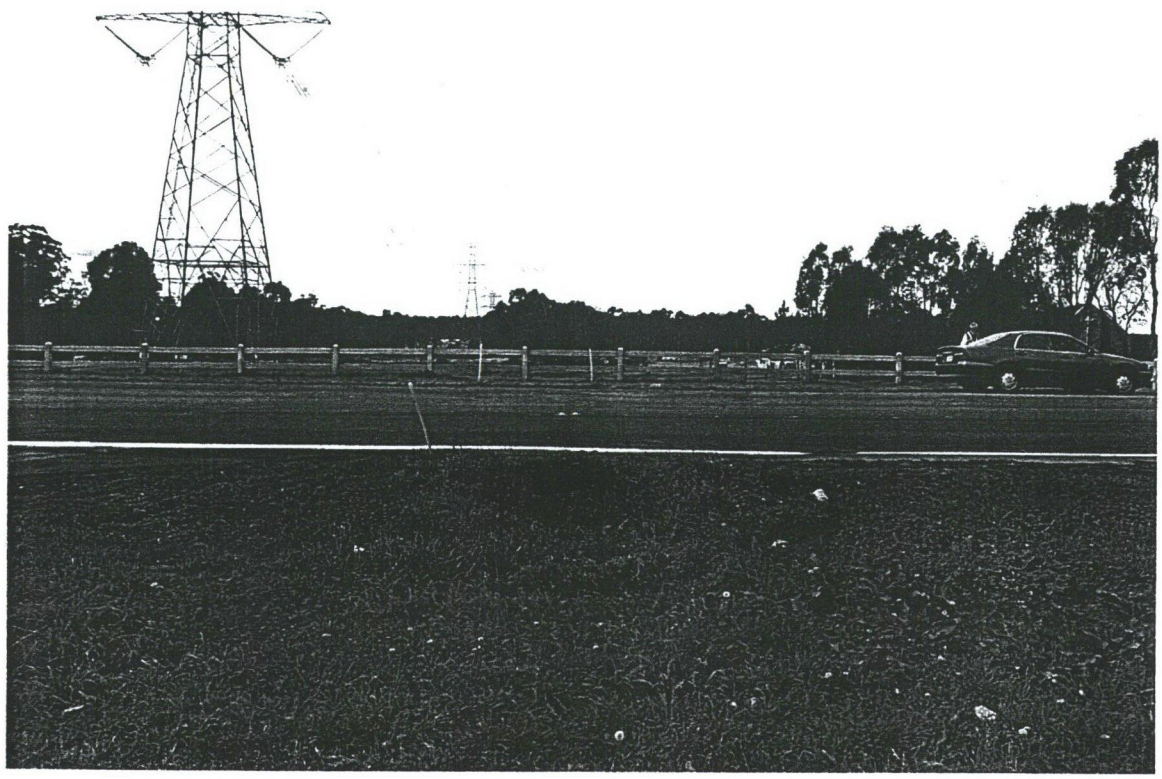
Photograph 2. Site 2 on Windsor Road Looking South



Photograph 3. Site 3 on Windsor Road Looking South



Photograph 4. Site 4 on Windsor Road Looking East



Photograph 5. Site 5 on Windsor Road Looking East



Photograph 6. Site 6 on Windsor Road Looking East



Photograph 7. Site 7 on Windsor Road Looking East



Photograph 8. Site 8 on Windsor Road Looking East



Photograph 9. Site 9 on Windsor Road Looking East to Chapman Road



Photograph 10. Site 10 on Windsor Road Looking South



7.3 Environmental Impacts

7.3.1 Landforms

As expected with a location on a flood plain the topography of Windsor Road is flat to gently sloping with only a 9 metre rise from the north end at Curtis Road to the south end of the proposal over the 3.5 km length. Existing slopes are generally under 2% and this would be maintained with the proposal for drainage. Batters would be relatively flat in the areas of fill with a slope of 4 horizontal to 1 vertical.

Due to the proposal following the existing low and flat relief there would be potential minor adverse environmental impacts with land form during construction requiring appropriate safeguards to be implemented. These safeguards include the protection of earthworks including fill batters during the proposal, landscaping of exposed earthworks areas to avoid erosion and consequent changes to land form.

7.3.2 Geology and Soils

The proposal is located within the Berkshire Park, South Creek and Blacktown soil landscape groupings. The Berkshire Park soil landscape occurs along the majority of this section of Windsor Road except for the southern section around Bandon Road and Vineyard. This soil landscape is characterised by dissected, gently undulating low rises on the Tertiary terraces of the Hawkesbury-Nepean river system. Soils are orange heavy clays and clayey sands with mottled ironstone nodules common. Large silcrete boulders (up to 20 cm) occur in the soils. The soils have a very high wind erosion hazard if cleared. Gully, sheet and rill erosion appears on dissected areas. Other hazards include water logging, impermeable subsoils and low fertility.

The South Creek soil landscape occurs along the Killarney Chain of Ponds and north of Bandon Road and is characterised as being flat with cleared incised channels. The soils have limitations of erosion hazard and frequent flooding.

The Blacktown soil landscape occurs south of Bandon Road. This soil landscape has gently undulating rises and slopes under 5% on Wianamatta Group shales. Soils are shallow to moderately deep hardsetting mottled texture red and brown podzolic contrast soils on crests grading to yellow podzolic soils on lower slopes and drainage lines. Soil limitations are moderately reactive highly plastic subsoil, low fertility and poor drainage.

The soil conditions along Windsor Road within the area of the proposal would require erosion and sedimentation control safeguards during construction.

There are no known occurrences of acid sulfate soil materials or commercial mineral deposits within the area of the proposal or road reserve.

7.3.3 Climate

Climatic factors would generally not constrain construction of the proposal except adverse weather conditions such as heavy rain, localised flooding or very high winds. Heavy and prolonged rainfall would not affect construction of the proposal provided appropriate safeguards to avoid erosion and sedimentation were installed around any excavated, filled or exposed earthworks areas. The proposal would be in the same location or adjacent to the existing road, the operations of which are not constrained by normal climatic factors. It is unlikely that climatic factors would impact on operations of the proposal provided motorists took due care during adverse weather conditions.

7.3.4 Land Form Stability and Erosion Hazard

Components of the physical environment include a combination of flat landform and gentle slopes, some high erosion hazard soils, moderately reactive subsoils, frequent flooding and possible adverse weather conditions leading to potential soil erosion during construction of the proposal. These conditions would require installation of a number of safeguards during construction including selected temporary sedimentation controls such as catch drains, diversion drains and banks, sedimentation basins, geofabric silt fences at the base of all earth works and soil stabilisation measures along the 10 construction sites to be documented in a Soil and Water Management Plan. The controls to prevent potential soil erosion and impacts on local watercourses would include the following:

- provision of silt fences and barriers to prevent sediment laden runoff from leaving the construction areas;
- drainage structures to protect exposed embankment slopes during construction;
- progressive landscaping for all exposed earthworks areas not required for the proposal;
- prevention of erosion on any topsoil stockpiles;
- provision of catch drains or cut-off drains to prevent clean surface runoff entering the construction areas;
- provision of sediment traps near existing drain inlets and catch drains along Windsor Road for the construction sites;
- the provision of scour protection measures at drain and culvert outlets.

During construction of the roadworks, a Soil and Water Management Plan would be implemented referencing the NSW Department of Housing's *Managing Urban Stormwater: Soils and Construction* publication. The Soil and Water Management Plan would detail surface water control, storm water drainage, landscaping, and erosion sediment control measures required during construction to minimise off-site sedimentation impacts. The sedimentation controls would need to be maintained in a functioning condition until all construction activities were completed over the construction period and the site was stabilised. Regular monitoring and maintenance of the sedimentation controls would be required to ensure they perform in a fully functioning condition at all times. The contractor would provide construction drawings that contain a sheet for each of the 10 sites showing the location of permanent and temporary control measures required during construction.

Installation of the selected sedimentation controls and landscaping of exposed earthworks areas would minimise adverse impacts both during construction and operations of the proposal. The moderate climate and growing season in the area would enhance the growth of landscaped areas over time.

7.3.5 Air Quality

Local air quality and neighbourhood amenity could be affected during construction by dusts, construction vehicle emissions and odours and at the operational stage by vehicle emissions. Construction vehicle and dust emissions would be the main source of air pollutants during construction. There would be increases in the local incidence of dusts due to use of heavy plant and machinery. These adverse impacts would be short term and localised at each site. The maximum annual average in dust levels would be the EPA criteria of 4 grams/square metre/month. Dust would be suppressed by dedicated water tankers when required. No blasting would be undertaken at the construction sites. Any odour from construction equipment and activities is not expected to have an adverse environmental impact. All construction vehicles would comply with EPA emission standards and dust emissions from stockpiles, access tracks and construction areas would be minimised by adoption of appropriate dust suppression techniques. These would include:

- covering of loads during transport;
- watering stockpiles;
- watering and stabilising side tracks;
- spraying construction areas to minimise dust emission during grading and dozing operations.

Additional adverse impact on air quality is expected from vehicular sources travelling along Windsor Road during operations due to localised vehicle emissions from the forecast increase in traffic. Although the main pollutants emitted by road traffic of concern to environmental, health and planning organisations are carbon monoxide, nitrogen dioxide, particulates, benzene and lead, improved traffic flows can also have a beneficial effect on emissions. The operations of the proposal would result in the more efficient transport of a greater number of vehicles along Windsor Road including two sections of dual carriageway compared to the existing situation. The greater number of vehicles would run more efficiently with lower emission rates due to less accelerating and decelerating. However as traffic flows increase over the years there would be a reduction in local air quality due to increased volume of emissions.

Sydney's location, topography and size favour the development of poor air quality under certain meteorological conditions. Continuing development particularly in the western part of the Sydney basin has the potential to have serious impacts on air quality and health throughout the region. In the Sydney region motor vehicles are a major source of carbon monoxide, reactive organic compounds, oxides of nitrogen, lead, particulate matter and air toxics such as benzene and diesel soot. The RTA is implementing the *Plan for Reducing Vehicle Emissions* to help reduce greenhouse and other motor vehicle emissions and continues to engage in approaches to encourage the tightening of vehicle emissions standards. Strategies and approaches to reduce vehicle emissions include:

- working with the EPA to implement the State's Motor Vehicle Maintenance Program for lowering emissions;
- making RTA fleet vehicles available to pilot test new technology with potential to reduce vehicle emissions; and
- continuing its role on the Advisory Committee on Vehicle Emissions and Noise to encourage the early implementation of more stringent Australian Design Rules, including the new standard for tightening current light vehicle emission standards.

Greenhouse Issues

Australia is signatory to the *International Framework Convention on Climate Change* (Rio Convention), which commits Australia to programs of monitoring and reporting on greenhouse gas emissions. A target of the Rio Convention is that signatory countries should attempt to reduce greenhouse gas emissions to the levels that applied in 1990. At the 1997 Kyoto meeting the convention agreed that Australia would be allowed to increase their emissions to 5% above the 1990 level by 2012. The convention will reconsider greenhouse gas emissions in mid-2001.

The RTA is committed to ensuring that its environmental goals and policies are consistent with those outlined in the 1992 *Intergovernmental Agreement on the Environment*. This agreement addresses a number of globally important environmental issues including the greenhouse effect. This commitment is facilitated through the RTA's environmental vision which addresses greenhouse gas emissions and also energy consumption.

Approximately 20% of NSW's total carbon dioxide emissions are estimated to come from the transport sector. At a broad level, the RTA has been involved in and implemented several strategic initiatives to address the issue of road transport related greenhouse gas emissions. These are:

National Greenhouse Response Strategy

This strategy was adopted by the Council of Australian Governments in 1992 and aims to contribute to the national commitment to the National Strategy for Ecologically Sustainable Development. The RTA contributed to the development of this strategy and is the NSW representative on the Transport Working Group for the development of a greenhouse gas emissions inventory. With respect to transport, the response strategies include reducing fuel consumption in motorised transport; improving the technical and economic efficiency of operation of the road network and traffic management; and to encourage the use of bicycles. This proposal contributes to these initiatives.

RTA Greenhouse Reduction Plan

The RTA has prepared a plan at a strategic level to address and provide policy in relation to greenhouse gas emissions resulting from its activities. A greenhouse emissions inventory of RTA activities has been carried out and the findings incorporated into the RTA Greenhouse Inventory. In terms of the construction of the proposal it is likely to result in better traffic flow and hence better fuel economy and therefore reduced greenhouse emissions.

7.3.6 Hydrology and Water Quality

The concept drainage for the proposal and widening has been estimated for a minimum road level of 13.5 metres AHD to meet SES evacuation requirements and for a 500 year ARI flood event to minimise the risk of the route being cut by local flooding during the evacuation period. In addition, flows less that the 500 year ARI flood event and all other lesser surface water flows would discharge into the improved roadside sub-surface and cross road drainage for discharge to the existing and proposed grass swales, pipes and culverts alongside and under Windsor Road. The pipe and culvert flows would then discharge into the existing drainage lines located on the east side of Windsor Road and into local waterways including Killarney Chain of Ponds, South Creek and eventually the Hawkesbury-Nepean River. The swales would be graded to capture low flows below Windsor Road. The final size, specifications and location of the sub-surface, cross road, grass swale, pipe and culvert drainage system for the road would be finalised during detailed design.

Hawkesbury City Council would be responsible for maintaining the grass swales. The RTA would be responsible for maintaining the existing and proposed drainage infrastructure along Windsor Road.

The existing and proposed road and drainage infrastructure details and hydraulic performance for the low points along Windsor Road are shown in Tables 1 and 2 respectively. Table 2 shows there would be a minor increase in the upstream 100 and 500 year ARI flood levels due to the proposal (afflux) at Sites 3 and 8. The remainder of the sites would show a large reduction in the upstream flood levels. However, the *Local Hydraulics Specification Study, Windsor Road and McGraths Hill Alternative Routes* indicates that due to the combination of small catchments draining to the low points and the relatively high Hawkesbury River tailwater levels, the minor afflux at Sites 3 and 8 would be localised and generally confined to the immediate vicinity of the road reserve. Hence, the minor afflux would not adversely effect private land or dwellings. The catchment areas of downstream dams on private properties would not be affected by the proposal.

The existing and proposed velocities for a range of local flood events downstream of Windsor Road are shown in Table 3 over. With the exception of Site 2 the changes in velocity due to the proposal over the range of local flood events would be minimal. A rock mattress would need to be installed for a distance 6 metres downstream of the new culverts at Site 2 and within the road reserve to compensate for the increased velocities attributed to the proposal.

Table 1 Hydraulic Performance of Existing Transverse Drainage

Transverse Drainage Location	Existing Road Level (m AHD)	Existing Drainage Structures (No./width x height in mm)	ARI When Windsor Road Overtopped	Upstream Water Level (m AHD)	
				100 year ARI	500 year ARI
Site 1	12.86	600 RCP	2	13.03	13.06
Site 2	13.5	600 RCP	2	13.4	13.5
Site 3	12.59	3/1500 x 450 RCBC with 2/2440 x 570 headwall	1	12.67	12.77
Site 4	18.35	375 RCP	20	18.4	18.42
Site 5	13.14	2/900 RCP	5	13.38	13.47
Site 6	15.3	450 RCP	2	15.42	15.44
Site 7	15.6	2400 x 450 RCBC	100	15.63	15.73
Site 8	15.1	3000 x 900 RCBC	5	15.2	15.26
Site 9	19.98	600 RCP with pit inlet	20	20.05	20.06
Site 10	20.9	375 RCP	5	20.98	21

RCP = Reinforced Concrete Pipe
RCBC = Reinforced Concrete Box Culvert
Source: SMEC Australia and Local Hydraulics Specification Study, Windsor Road and McGraths Hill Alternative Routes.

Table 2 Hydraulic Performance of Proposed Transverse Drainage

Transverse Drainage Location	Proposed Road Level (m AHD)	Proposed Drainage Structures (No./width x height in mm)	Upstream Water Level (m AHD)		Upstream Afflux proposed less existing water levels (m AHD)	
			100 year ARI	500 year ARI	100 year ARI	500 year ARI
Site 1	13.5	2400 x 600 RCBC	12.55	12.83	-0.48	-0.23
Site 2	13.6	2/2100 x 600 RCBC	12.96	13.17	-0.44	-0.33
Site 3	13.5	Existing + 3/2700 x 600 RCBC	12.72	13.03	0.05 *	0.26 #
Site 4	18.35	Existing + 525 RCP	17.81	18.01	-0.59	-0.41
Site 5	13.5	3/3300 x 900 RCBC	12.89	13.17	-0.49	-0.3
Site 6	15.3	2/2100 x 450 RCBC	14.93	15.03	-0.49	-0.41
Site 7	15.6	Existing + 2400 x 450 RCBC	15.3	15.39	-0.33	-0.34
Site 8	15.9	3/3600x1200 RCBC + 2/3600 x 450 RCBC	15.29	15.47	0.09 *	0.21 #
Site 9	19.98	Existing + 750 RCP with 900 x 900 pit inlet	19.65	19.68	-0.4	-0.38
Site 10	20.9	1800x450 RCBC	20.38	20.48	-0.6	-0.52

* Afflux dissipates within 80 metres of road and does not adversely impact on existing development.
# Afflux does not adversely impact on existing development.
RCP = Reinforced Concrete Pipe
RCBC = Reinforced Concrete Box Culvert
Source: SMEC Australia and Local Hydraulics Specification Study, Windsor Road and McGraths Hill Alternative Routes.

Table 3 Existing and Proposed Velocities Downstream of Windsor Road

SITE			EXISTING			PROPOSED		
Catchment Area of Site (hectares)	**ARI Event**	**Peak Discharge** (m^3/s)	**Culvert Exit Velocity** (m/s)	**Average Cross Section Velocity** (m/s)	**Average Channel Velocity** (m/s)	**Culvert Exit Velocity** (m/s)	**Average Cross Section Velocity** (m/s)	**Average Channel Velocity** (m/s)
Site 1 10.9	5 year	0.9	2.9	0.4	0.4	0.9	0.5	0.5
	10 year	1.2	2.9	0.5	0.5	1.0	0.5	0.5
	100 year	2.4	2.2	0.6	0.6	1.7	0.7	0.8
	500 year	3.3	2	0.6	0.7	2.3	0.9	0.9
Site 2 14.9	5 year	1.1	2.49	1.4	1.4	1.9	2.0	2.0
	10 year	1.5	2.49	1.4	1.4	2.1	3.6	3.6
	100 year	3.1	2.49	1.4	1.4	2.6	3.5	3.5
	500 year	4.4	2.49	1.4	1.4	2.8	3.6	3.6
Site 3 44.7	5 year	2.7	1.34	0.2	0.2	0.4	0.2	0.2
	10 year	3.5	1.7	0.3	0.3	0.5	0.2	0.3
	100 year	7.3	1.6	0.5	0.5	1.1	0.3	0.5
	500 year	11.4	0.9	0.6	0.6	1.7	0.5	0.6
Site 4 1.6	5 year	0.18	2.4	0.8	0.8	2.1	0.9	0.9
	10 year	0.23	2.6	0.9	0.9	2.3	1.0	1.0
	100 year	0.5	2.7	1.0	1.0	2.8	1.3	1.3
	500 year	0.6	2.7	1.1	1.1	3.1	1.4	1.4
Site 5 57.9	5 year	3.4	2.57	0.5	0.5	0.4	0.5	0.5
	10 year	4.1	2.6	0.5	0.5	0.5	0.5	0.5
	100 year	9.7	2.6	1.0	1.0	1.1	1.0	1.0
	500 year	15.2	2.5	1.3	1.3	1.7	1.3	1.4
Site 6 8.4	5 year	0.7	2.2	1.6	1.6	0.4	1.6	1.6
	10 year	0.9	2.2	1.7	1.7	0.5	1.7	1.7
	100 year	2	2.2	0.2	0.3	1.0	0.2	0.3
	500 year	2.5	2.2	0.3	0.3	1.3	0.2	0.3
Site 7 8	5 year	0.7	0.8	0.7	0.7	1.2	1.3	1.4
	10 year	0.9	1	0.9	0.9	1.3	1.4	1.4
	100 year	1.9	2.5	1.6	1.6	1.7	1.7	1.7
	500 year	2.5	2.7	2.0	2.0	1.8	1.9	1.9
Site 8 158	5 year	7.4	3.5	1.8	1.8	0.5	1.8	1.8
	10 year	9.6	3.5	2.0	2.0	0.7	2.0	2.0
	100 year	20	2.18	1.0	2.1	1.3	1.0	2.1
	500 year	29.6	1.68	0.6	1.8	1.9	0.6	1.8
Site 9 2	5 year	0.2		0.7	0.7		0.7	0.7
	10 year	0.3		0.7	0.7		0.7	0.7
	100 year	0.6		0.7	0.7		0.8	0.8
	500 year	0.8		0.7	0.7		0.9	0.9
Site 10 3.4	5 year	0.3	2.4	1.6	1.6			-
	10 year	0.4	2.46	1.7	1.7			-
	100 year	0.9	2.2	1.6	1.6	2.8	2.1	2.1
	500 year	1.2	2.1	1.7	1.7	3.0	2.3	2.3

Site 1. Velocities for cross section 15 metres downstream of road.
Site 2 Existing structures include a bypass for events greater than a 2 year ARI.
Site 3 Velocities for cross section 24 metres downstream of road.
Site 5 Velocities for cross section 25 metres downstream of road.
Site 6 Velocities for cross section 5 metres downstream of road.
Site 9 Flow for events greater than 20 year ARI over road not in channel.
Sites 2, 4, 7, 8, and 10 show velocities for cross section just downstream of road.
For all sites tailwater is calculated against normal depth.

Source: SMEC Australia, Supplementary Information, Memorandum to DLWC, 6 November 2000.

There would be increased stormwater flows into the natural and constructed drainage system as a result of more roadspace on Windsor Road. The proposed changes in drainage would not have any adverse impact except for a minor decrease in water quality due to increased leakages of fuel, lubricants, hydraulic fluids, coolants and particulate matter (tyre rubber, brake and clutch linings) being washed off as runoff from increased traffic flows in the future. For the proposal the hydrology and water quality impacts would be similar to the existing situation.

Studies completed by CSIRO for the RTA concluded that road runoff from roads with less than 30,000 vehicles per day (such as Windsor Road) exhibited minimal impact on receiving waters although it is desirable that discharges be kept as clean as possible. Although work on this issue is limited in Australia, the United States of America has undertaken a considerable amount of work and their experience suggests that water quality problems associated with road runoff are primarily related to lead from leaded petrol, zinc from vehicle tyres, and copper from vehicle brakes. Lead levels in leaded petrol have been reduced. Pollutants in water such as lead, zinc and copper often attach to fine particles of dirt and sediments. Control of sediment, especially dispersed clay particles, is the most effective way of reducing pollution by nutrients and heavy metals. Therefore by effectively controlling sedimentation, lead, zinc and copper as well as tyre rubber, dirt and other particles from storm water runoff, water quality in the receiving waters of Killarney Chain of Ponds is not expected to be further affected by the proposal.

Works in relation to sediment control would conform to the system of environment protection licences as required by the EPA in the *Protection of the Environment Operations Act, 1997*. The Soil and Water Management Plan would also address storm water quality controls and include the location of existing natural and constructed drainage channels in relation to the proposed work.

Aquatic ecosystems in Killarney Chain of Ponds are not expected to be adversely affected by the proposal. No water would be drawn from Killarney Chain of Ponds or South Creek for construction purposes.

7.3.7 Flora and Fauna

A general flora and fauna habitat survey of the area around the proposal was carried out by Mr P. Burcher in September 2000. The results of the flora and fauna surveys, impact assessments and recommendations are summarised below and more detail is provided in Attachment 4.

- Two vegetation communities, Shale-Gravel Transition Forest and Cumberland Plain Woodland, occur along the route. Small areas of both communities would be removed by the proposal.
- Cumberland Plain Woodland is listed as an endangered ecological community under the NSW *Threatened Species Conservation Act* and the Commonwealth *Environment Protection and Biodiversity Conservation Act*. However, it is considered that the area to be removed by the proposal will not have a significant effect on this endangered ecological community.

- No threatened flora species were found along the route. However, the Shale-Gravel Transition Forest sections of the route are suitable habitat for two flora species listed as vulnerable at State and Commonwealth levels, *Acacia pubescens* and *Pultenaea parviflora.*
- The route is suitable habitat for the following threatened fauna species; Square-tailed Kite, Swift Parrot, Powerful Owl, Regent Honeyeater, Common Bentwing Bat, Eastern Little Mastiff-bat and Greater Broad-nosed Bat. These species would only use the route as part of very large ranges or on an occasional basis. The proposed road works are unlikely to have a significant effect on these threatened species, or their habitats.
- Neither a Species Impact Statement nor Commonwealth approval is required for the proposed development.
- The proposed development is in accordance with the flora and fauna policy of Sydney Regional Environmental Plan No. 20 *Hawkesbury-Nepean River (No. 2 - 1997),* and the requirements of State Environmental Planning Policy No. 19 *Bushland in Urban Areas* and State Environmental Planning Policy No. 44 *Koala Habitat Protection.*

The proposed development requires the removal of a small area of the endangered ecological community Cumberland Plain Woodland as well as Shale Gravel Transition Forest which is potential habitat for a number of threatened species. Both vegetation types also support a range of non-threatened native flora and fauna species. To compensate for this loss of habitat, it is recommended that the following measures should be undertaken:

- Planting within those parts of the road reserve not required for infrastructure with plant species typical of Cumberland Plain Woodland and Shale Gravel Transition Forest. Generally, Cumberland Plain Woodland species should be planted on crests and upper slopes and Shale Gravel Transition Forest species on lower slopes and depressions. (See Appendix 2 of Attachment 4 for a list of suitable species). If possible, *Acacia pubescens* and *Pultenaea parviflora* should be included in the planting schedule for Shale Gravel Transition Forest areas.
- Stockpiling of any native soil stripped during the works and re-application within the regeneration/landscape areas to aid natural regeneration of locally occurring native plant species.
- The RTA to liaise with Hawkesbury City Council regarding approved removal methods for Prickly Pear that occurs along the route.

In addition, the proposed culverts would allow for the movement of both aquatic and terrestrial fauna under Windsor Road.

7.3.8 Landscape and Visual Considerations

The existing trees currently lining parts of Windsor Road create a positive visual impact and form part of the cultural landscape, which is typically associated with older roads on the metropolitan fringe. Some of these trees and associated undergrowth in the road reserve would be removed during construction of the proposal and replaced with more roadspace. However landscaping of the remaining area of roadside reserve would endeavour to reinforce the former natural landscape of the area. A landscape plan for the proposal would be prepared and implemented by the RTA and/or contractors.

Landscaping techniques would be employed to provide the proposal with recognisable elements, which are in scale with the proposal and the greater landscape, and to improve the amenity of the area through measures that respond to the environment and the user.

Responsible environmental management practices would be used in the design and implementation of the landscape plan including the following.

- maximising environmental resources by retention of existing vegetation and resources wherever possible.
- the reuse of environmental resources such as stockpiling and reuse of site topsoil.
- vegetation removed in construction would be chipped and reused as mulch in landscape works.
- minimising the impact of loss of native vegetation by replacing locally indigenous species in the landscape works.
- where possible trees would be propagated with locally collected seed so as to provide a link with existing trees in the road reserve to conserve the floral diversity of the region.
- a limited amount of median planting is proposed that would be in the form of low shrubs and/or groundcovers to 0.75 metres.
- to maintain clear sight lines and for ease of maintenance, mown grass drainage swales are proposed on both sides of Windsor Road. Other areas would be hydromulched.

Safety and security in the area would be enhanced with the proposal. There would be no loss of privacy, security, sunlight or increased shadowing for residents of nearby dwellings with the proposal. Residents' views of the proposal would be partially screened as the landscaping works matured. The landscaping would also help reduce dirt and dust from traffic.

The surrounding rural residential development, rural orientated small businesses and industry, flat topography and vegetation pattern of the area provides a localised landscape of moderate scenic quality. The proposal would increase the built form of the area with increased roadspace and loss of roadside vegetation. All exposed earthworks areas would be landscaped with appropriate local native shrubs and ground cover which would improve scenic quality for road users, nearby residents and open space users and help integrate the proposal into the adjacent environment. The landscaping would soften this and the construction would partly blend into and become part of the landscape over time. Overall the surrounding landscape character would remain largely intact and similar to the existing road corridor except for the greater built form of the proposal intruding in the landscape.

7.3.9 Socio-economic Considerations

The residents, construction workers and visitors to the rural residential areas and businesses near the proposal would be likely to experience some adverse impacts due to elevated levels of dust, noise, traffic generation and general disruption during the one year construction period. Windsor Road travellers through the area and local residents would be involved in short term inconvenience to travel. Some utilities would require relocation and adjustment during construction with possible minor inconvenience for nearby residents.

There would be no land acquisition, need for easements on properties or property severance as a result of the proposal.

Local access to some dwellings would be affected during and after construction which would be minimised as far as possible. Access to all private properties would be maintained during construction but may temporarily be of a lower standard. On completion of the proposal, because of the median along the two new sections of dual carriageway road, access to some properties would be restricted to a left turn in and left turn out onto Windsor Road (see Section 7.3.11). Some of the local businesses with frontage to the dual carriageway sections may be affected by reduced turnover because of the more restrictive one-way turning movements permitted along Windsor Road and associated longer travel distances. This may be offset to some extent by the increased safety and capacity for travellers along Windsor Road. Windsor Road is a RTA controlled access road and in both the Blacktown and Hawkesbury City Council areas requires Council and RTA consent for direct access.

There would be no significant changes to existing land use apart from the conversion of some road reserve and vegetated land in the road reserve to road space and drainage infrastructure. Economic pursuits in the area would able to be maintained during construction and operations of the proposal but with more restrictive turning movements along Windsor Road.

As a result of the proposal Windsor Road traffic would be closer to and/or appear slightly higher (between 0.35 and 1.1 metres) to the occupants of around 55 rural properties including some businesses. Associated impacts would include a minor loss of visual amenity and privacy, increased noise and air pollution during construction and operations of the proposal.

Socio-economic benefits of the proposal include a safe evacuation route for residents of McGraths Hill in times of major flood; increased safety and capacity along Windsor Road; and improved local amenity with provision of roadside landscaping and drainage infrastructure.

7.3.10 Pedestrian and Cyclist Impacts

During construction the status quo would be maintained for pedestrians and pedal cyclists with a relative lack of facilities for these users provided along Windsor Road. During operation of the proposal there would be improved cyclist safety with provision of a 2 metre wide shoulder on both sides of Windsor Road along the length of the two sections of dual carriageway. Pedestrians would also be able to use the grass swales to be constructed along the roadside at selected locations. Pedestrian crossings would be added at the signalised intersections with Groves Avenue, Bandon Road/Chapman Road. However, for pedestrians and pedal cyclists it may be easier to cross the wider road at the two sections of dual carriageway, as the median could act both as a barrier and pedestrian refuge. The sections of guardrail at Sites 2, 3 and 5 would also act as a partial barrier to pedestrians crossing Windsor Road.

7.3.11 Traffic Impacts

During Construction

The proposal would generate a large number of heavy vehicle movements along Windsor Road during the one year construction period. Approximately 3500 truckloads of imported material would need to be transported to the fill areas at Sites 1, 2, 3, 5, 7, 8 and 10. There would also be additional light and heavy vehicle movements associated with various construction activities. Sites 4, 6 and 10 would be also affected by night time construction works because of the relatively heavy traffic flows and the need to minimise any impacts along Windsor Road. At these sites only one lane of controlled traffic flows would be possible at night time to enable construction works. The temporary side track to be formed on the west side at Site 5 would carry both lanes of Windsor Road traffic.

Construction impacts would have some effect on the operation of traffic flow along the road over the construction period at night time although there would be one lane in operation in each direction through the construction area at most times of the day. Traffic should not experience severe delays for extended periods. However the control of traffic during construction would require the partial closure of a traffic lane at night time, resulting in temporary traffic delays. Where practical these partial closures would be confined to less busy periods at night. This is required to aid in the safety of construction activities and the workforce due to the large volume of traffic travelling along Windsor Road.

Construction activities would require traffic control measures, such as signposting, cones, and traffic control personnel. During construction of the proposal the procedures for the installation and operation of traffic control devices established in AS 1742.3-1996 *Manual of Uniform Traffic Control Devices Part 3: Traffic Control Devices for Works on Roads* and RTA publication *Traffic Control at Work Sites* would be followed wherever possible. Only the minimum practicable length and width of Windsor Road would be affected by construction at any one time to minimise disruption and inconvenience to road users. Construction traffic would be directed wherever possible to use main roads rather than local roads for site access.

Operation of the Road

The two sections of Windsor Road to be provided with dual carriageway with the proposal would restrict access to properties, including some businesses, with frontage to the median to a left turn in and a left turn out of the properties. The median would directly restrict traffic movements for 36 properties in total with 22 properties on the west side and 14 properties on the east side. In addition, those residents in properties with access off onto Windsor Road, such as Industry Road and Groves Avenue, would also have turning movements restricted by the median.

A summary of the works that would impact on traffic flow along Windsor Road during operations includes:

- provision of 4 lanes with two sections of dual carriageway for 1.8 km along the road.
- signalised intersections along the road at Groves Avenue and Bandon Road.
- provision of 3 lanes for 0.5 km south of Bandon Road.

The traffic impacts on residents in the adjacent rural areas and for travellers along Windsor Road resulting from the proposal would be as follows:

- compared to the existing situation greater potential for free flow driving because of the two sections of dual carriageway partially offset by stop/start driving at the signalised intersections at Groves Avenue and Bandon Road.
- greater restrictions on turning movements onto and off the road including a median that would limit "U" turns and increase travel to some local facilities compared to the existing 2 lane undivided road.
- following completion of the proposal residents and visitors to the area and travellers along Windsor Road would have improved access to destinations within and outside the region. The two signalised intersections at Groves Avenue and Bandon Road would also provide improved and safer access to Windsor Road.

7.3.12 European Heritage

The proposal would be constructed within areas already disturbed within the road reserve. There are no items of environmental heritage listed in the Hawkesbury Local Environmental Plan 1989, Blacktown Local Environmental Plan 1998, NSW State Heritage Register and Australian Heritage Commission Register of the National Estate within the proposed works areas. No relics such as disused culverts were evident during various site inspections completed during the specialist studies required for the proposal. However it is possible due to past development in the area that relics greater than 50 years old may be unearthed during construction. If this event occurred then the Heritage Council of NSW would be contacted for advice and/or a permit to remove or destroy the item.

In the RTA heritage register there are 12 known and recorded road alignment stones located along both sides of Windsor Road within the length of works (see Figure 3 for the known locations). The road alignment stones are sandstone blocks with rectangular dimensions of around 240 mm to 360 mm and unknown length (excavated stones are up to 2 metres long) as most have been buried due to past road works. Most of the stones are substantially intact and partially protected by overlying fill although some have damaged top surfaces. As the stones are generally thought to be located in pairs on either side of the road to mark changes in the road alignment there may be at least 4 other stones located along the route. In addition, a displaced road alignment stone is located approximately 200 metres south of Brennan Dam Road on the west side of Windsor Road; however the proposal would not affect this area. The significance of the alignment stones has been assessed as an integral component of the historically significant Windsor Road. They are rare examples of a specific type of road infrastructure constructed in the Colonial period. The known, possible and displaced road alignment stones are relics under the NSW *Heritage Act, 1977.*

The following general recommendations for the future treatment of the alignment stones were considered in a draft report *Historical Archaeological Assessment of Alignment Stones Windsor Road Between Mulgrave and Kellyville, Sydney, NSW* by S. Lavelle for the RTA in September 1997.

- That the road alignment stones should be retained in-situ, and ideally should not be unnecessarily disturbed. The stones should be preserved in their original locations

wherever possible given the context of road safety, upgrading, widening or any other relevant aspect of the normal use and maintenance of the Windsor Road.

- Where individual stones are at risk of further damage, they should be covered by protective fill. Such fill should be free-draining and should not allow water to pond in the vicinity of the stones. If possible a layer of geotextile or similar material should be placed between the top surface of the stone and the covering fill. If future works mean that road levels will be altered, options are:
  - where the road will be higher than present levels, the stones may be filled over;
  - where the road will be lower than present levels, the stones could either be removed or could be excavated and then replaced in the same position but at a lower level (i.e. lift and deepen).
- Piecemeal widening of the Windsor Road corridor, with its obvious consequential impacts on individual items, is undesirable in heritage terms. The general location of much of the present Windsor Road alignment and its surviving Colonial-era structures relate to, and demonstrate, the early ancestry and historic importance of the road. A better option for the longer term future of the Road would be the selection of a separate replacement carriageway if and when the road is to be duplicated in the future (rather than the widening of both sides of the present road formation).
- If the alignment stones are to be retained in-situ, no further permissions (e.g. an Excavation Permit) will be required under the *Heritage Act*.
- If subsequent investigations or works were to indicate that any stones need to be removed then discussions would be required with the NSW Heritage Office concerning the lodgement of an Excavation Permit Application. A copy of this report should be supplied to the NSW Heritage Office Archaeologist.
- If any stones are removed in the future, the location and condition of the stone should be thoroughly documented. Removed stones would also need to be given long term protection and storage in an appropriate and secure repository. This would also be likely to be required under the conditions attached to the Excavation Permit.
- The RTA should consider the appropriate interpretation of the stones to the wider public at a future date. This would be possible through the introduction of low-key signage and/or other material. Given the volume of traffic on Windsor Road, it is suggested that the best location for this type of exercise would be on one of the now abandoned older sections of road formation. A plan for this type of activity could be developed in the future by the RTA in conjunction with the local Council or other interested parties such as local history groups, etc.
- The stone recorded on Inventory Sheet 6 is not in-situ and is in danger of loss or further damage. Consider removal of this stone for safekeeping. *(Note: this stone is within the length of proposed works and has not been removed to date).*

The RTA has also listed the site of old Vineyard Primary School on their Heritage Register. The building was shown in the 1885 survey book of MacKenzie. The site is now part of the Vineyard Public School grounds and would not be affected by the proposed works at Site 9 or 10.

At this stage no items of environmental heritage would be affected by the proposal other than fill that may be placed over unknown locations of road alignment stones. To date no

excavation permits would be required under the *Heritage Act, 1977* unless road alignment stones were unearthed during construction of the proposal.

7.3.13 Aboriginal Heritage

In September 2000 Bobbie Oakley & Associates Heritage Consultants assessed whether the proposal would affect any Aboriginal archaeological sites or relics. The results of the archaeological survey, impact assessments and recommendations are summarised below and more detail is provided in Attachment 5.

- No Aboriginal archaeological sites listed with the NSW National Parks and Wildlife Service Aboriginal Sites Register are located within, or in the vicinity of, the proposed impact areas.
- One new site comprising two possible Aboriginal scarred trees is located outside the study area in the vicinity of the proposed impact area at Site 5.
- The survey identified two areas with the potential to contain Aboriginal relics within study areas Sites 2, 3 and 10.
- Sites 2 and 3 have the potential to contain surface and sub-surface Aboriginal relics and Site 10 has the potential to contain surface Aboriginal relics.

There are no constraints on archaeological grounds to the proposed works at Site 1, 4, 6, 7, 8 and 9. At Sites 2, 3 and 10 a member of the Deerubbin Local Aboriginal Land Council must monitor vegetation clearing and earth works. At Site 5 the two possible Aboriginal scarred trees must be protected from damage during the construction works by:

- marking the trees on the concept plans of the proposed works;
- showing relevant contractors and RTA personnel the location of the trees; and
- constructing a protective barrier around the trees.

If any archaeological sites or relics were found during construction then the NSW National Parks and Wildlife Service and the RTA's Environmental Services Branch, Aboriginal Liaison Officer would be contacted immediately for further advice and action.

7.3.14 Noise and Vibration Effects

The EPA's *Environmental Criteria for Road Traffic Noise* specifies the criteria to be used for redevelopment of arterial roads such as Windsor Road. The road traffic noise criteria for day time from 7am to 10pm is $L_{eq(15\ hours)}$ 60dB(A) and for night time from 10pm to 7am is $L_{eq(9\ hours)}$ 55dB(A). There are also road traffic noise criteria for sensitive land uses such as existing schools with a day time criteria of $L_{eq(1\ hour)}$ 45dB(A) (internal); school playgrounds of $L_{eq(15\ hours)}$ 55dB(A); and active recreation areas $L_{eq(15\ hours)}$ 60dB(A). The EPA's policy states:

> "In all cases the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB. Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulation of in-service vehicles; greater use of public transport; and alternative methods of freight haulage".

Traffic Noise Assessment

An acoustic and vibration assessment was completed by Koikas Acoustics Pty Ltd for the proposal in accordance with the EPA's *Environmental Criteria for Road Traffic Noise* and relevant Australian Standards. A summary of the assessments is provided below and full details are included in Attachment 6. The assessments took into consideration that the maximum statutory travel speed would be retained at 60 and 80 km/hour for the proposal and provided:

- traffic noise measurements in August and September 2000 at three dwellings and Vineyard Public School along Windsor Road.
- calculations of predicted LAeq(15 hours) and LAeq(9 hours) noise levels in 2000 and 2012 for dwellings and internal maximum LAeq 1 hour (0700 to 2200 hours) noise levels for school classrooms using forecast traffic growth along Windsor Road.
- a sensitivity analysis based on noise barrier heights of 2, 3, 4 and 5 metres placed along Windsor Road. This was to facilitate a cost-benefit analysis for which the RTA would then determine whether traffic noise barriers would be erected to meet the EPA's criteria for the proposal.
- an assessment of construction noise.
- an assessment of ground vibration levels.

Traffic noise levels were calculated using a 1988 version of a traffic noise prediction model called the United Kingdom, Department of Transport, Calculation Of Road Traffic Noise amended for Australian conditions. Tables 4 and 5 are summaries of the predicted traffic noise level results for daytime and night time for the three dwellings, Vineyard Public School and active open space at Vineyard Park near the proposal with varying barrier heights in 2000 and ten years after the proposal is ready for traffic in 2012.

Table 4 Predicted Traffic Noise Levels in Daytime for 2000 and 2012 Using Varying Barrier Heights

Predicted Daytime Traffic Noise Levels in Leq dB(A) for Dwellings and School Near the Proposal *(Note 1)*						
Year	**2000**	**2012**	**2012**	**2012**	**2012**	**2012**
Barrier Height	Existing Road	New Road No Barrier	2 metres	3 metres	4 metres	5 metres
281 Windsor Road, Vineyard	68.0	70.8	68.8	62.7	58.4	56.4
452 Windsor Road, Vineyard	61.9	63.3	63.2	57.3	53.8	52.4
472 Windsor Road, Vineyard	68.0	71.2	69.5	64.6	59.6	57.6
Vineyard Public School Classroom *(Note 2)*	46	47	45	39	35	34
Vineyard Public School Playground	66.9	68.8	65.5	62.7	59.1	58
Active Open Space Vineyard Park	66.5	69	66.7	62.9	59.3	58.2

Note 1 2.5 dB(A) was added to the predicted noise levels to allow for facade reflections except for the school playground and Vineyard Park.

Note 2 Vineyard Public School located in Bandon Road was assessed for internal noise levels against the criterion of Leq(1 hour) 45dB(A) internal. The existing portable buildings provide about 19 dB(A) reduction in traffic noise. The maximum recorded Leq 1 hour between 8.30 am and 4.30 pm was 48 dB(A).

Table 5 Predicted Traffic Noise Levels in Night Time for 2000 and 2012 Using Varying Barrier Heights

Predicted Leq (9 hours) in dB(A)Traffic Noise Levels for Dwellings and School Near the Proposal *(Note 1)*						
Year	**2000**	**2012**	**2012**	**2012**	**2012**	**2012**
Barrier Height	Existing Road	New Road No Barrier	2 metres	3 metres	4 metres	5 metres
281 Windsor Road, Vineyard	63.5	66.5	64.8	55.9	53.5	51.5
452 Windsor Road, Vineyard	55.4	56.8	56.7	50.7	47.1	45.7
472 Windsor Road, Vineyard	63.8	66.3	63.4	59.3	53.9	52.4

Note 1 2.5 dB(A) was added to the predicted noise levels to allow for façade reflections.

To meet the EPA policy of $L_{eq(15\ hours)}$ 60dB(A) daytime and $L_{eq(9\ hours)}$ 55dB(A) night time such that noise levels do not increase by more than 2 dB(A) above ambient traffic noise levels in 2012, noise attenuation measures would be required in the form of noise barriers 3 and 4 metres high. The noise attenuation measures could take various forms including wood and concrete panels or a barrier on top of a vegetated mound. Vineyard Public School buildings and playground areas located on Bandon Road and Vineyard Park would also require noise barriers to meet the EPA criteria.

The noise barriers were subject to an economic evaluation in accordance with the RTA's *Economic Analysis Manual*. The results show that the noise attenuation measures are not warranted as the overall calculated average benefit cost ratio for achieving the EPA criteria was 0.9. Although the barriers would be cost effective in sections outside Vineyard Public School and Vineyard Park they are not practical as they would impede floodwaters. However the RTA would continue to monitor the noise levels in the Vineyard Public School classrooms within one year of completion of the proposal.

Alternative mitigation measures were also investigated such as the use of quieter road surfaces (for example, open grade asphaltic concrete) and retrofitting of dwellings to meet EPA criteria with sound attenuating building materials. The calculated average benefit cost ratios for quieter road surfaces and retrofitting of dwellings were also less than 1.

Construction Noise Assessment

Construction noise can cause a variety of problems for residents, such as interference with speech communication, disturbance of work or leisure, disturbance of sleep and possible effects of physical and mental health. The level of disturbance depends on the difference between the intrusive nature of the noise source and the existing background noise level; the distance between the noise source to the receiver; the duration of the noise; and the nature of the noise.

The EPA recognises that construction and demolition operations are typically noisy. The EPA criterion for construction noise for the proposal with a construction period of greater than 26 weeks would be that the $L_{10\ (15\ minutes)}$ levels must not be exceeded by more than 5 dB(A).

EPA construction noise criteria are not always met as in many cases the character of noise emitted from various plant and equipment during construction activities cannot always be shielded by practical means. The construction noise criterion would be exceeded at sites 4, 6 and 10 during night time works when background noise levels are very low around 30 dB(A). The maximum permissible construction noise level for the site would be exceeded at the closest dwellings due to the use of jackhammers, vibratory rollers and other noisy equipment.

Construction activities are expected to exceed the background levels by more than 5 dB(A) over the construction period. A noise barrier at least 1 metre higher than the exhaust stack of any earth moving plant and equipment would need to be erected as close as possible to the plant to ensure the EPA criterion for construction noise is not exceeded. The barrier should be constructed from solid materials capable of attenuating noise levels by at least 20 dB(A) at the 125 Hertz octave band. For those instances where noisy plant and equipment are used it is recommended that they be operated during specific daytime periods corresponding to the highest background noise level periods between 7 am and 6 pm. It is also recommended that residents be warned in advance of noisy construction periods so that they can plan their daily work and leisure periods accordingly.

To minimise construction noise on nearby residents, especially at night time, the following safeguards would be implemented:

- No excessively loud plant and equipment would be used after 10 pm unless essential for the construction works.
- Where practicable only one piece of loud plant and equipment would be used at any one time after 10 pm.
- Residents would be informed in advance of any night time construction works.
- Temporary noise walls would be used at night time work sites where practicable.
- Pile driving or blasting would not be permitted at the work sites.
- Smart reversing alarms would be used on mobile plant and equipment at night time work Sites 4, 6 and 10.
- Access at night time work sites would be one way controlled to limit the number of reversing manoeuvres by mobile plant and equipment fitted with reversing alarms.

Vibration Assessment

In the absence of Australian Standards, British Standard 6472 provides guidance on potential disturbance to persons exposed to building vibration in the frequency range of 8 to 80 Hertz, most applicable to excavation equipment and road traffic. In dwellings, adverse comment may arise during day time as a result of continuous floor vibration levels in the order of 0.3 to 0.6 mm/second. At night time the residential criterion is equivalent to a vertical peak vibration level of 0.2 mm/second. However, significantly higher levels of short term vibration can be tolerated by many people for construction projects.

German Standard DIN 4150 provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The minimum "safe limit" of peak vibration velocity at low frequencies for dwellings is 5 mm/second. Over the frequency range typical vibration in buildings from excavation and construction equipment, the threshold for visible

movement of susceptible building contents (for example, plants and hanging pictures) is approximately 0.5 mm/second.

The potential sources of ground vibration for construction of the proposal are vibratory rollers and bulldozers. The vibration levels from operation of construction plant and equipment should be limited to the levels set out in British Standard 6472 which would be consistent with recommended guidelines set out in Chapter 174 of the EPA's *Environmental Noise Control Manual.*

It is not expected that construction activities would exceed ground vibration level limits. This is primarily due to the type of plant and equipment proposed for use on the project and the distance (generally greater than 20 metres) between the plant and equipment and most dwellings. If normal road construction activities are undertaken then vibration monitoring is not generally required inside the dwellings near the proposal, either before or during construction works. However a survey may be required when heavier construction equipment is proposed for dwellings located closer than 20 metres. Levels of ground vibration caused by a heavy duty (over 7 tonne) vibratory roller operating 20 metres from a dwelling is not likely to exceed the maximum recommended structural damage criterion level. No discomfort to humans or damage to buildings is expected to occur provided all safeguards are implemented during construction. These safeguards would include a limit on any rollers operating within 20 metres of any occupied dwelling and copies of condition surveys being provided to all owners of dwellings with a façade within 20 metres of the construction works.

7.4 Cumulative Environmental Impacts

The cumulative impacts of the proposal would be beneficial in the long term with provision of a safe evacuation route for the residents of McGraths Hill during a major flood in the Hawkesbury River based on the current SES flood emergency plans. Windsor Road would be raised to a minimum road level of 13.5 metres AHD and widened including two sections of dual carriageway. The completed works would provide improved road side and cross drainage along this section of Windsor Road. The capacity, safety, traffic flow and amenity of Windsor Road would be enhanced with the proposal.

Since economic development in the north-west metropolitan region would progress regardless of the construction of the proposal the cumulative impact for the proposal would be relatively minor. The major cumulative benefits of the proposal would be evident in times of flood with prevention of loss of life and some property damage. However, the proposal together with implementation of other components of the *Achieving a Hawkesbury-Nepean Floodplain Management Strategy*, including a nearby high level crossing of South Creek, would contribute towards the safety of the population and enhancement of the road network in the north-west Sydney metropolitan region. In addition the assessed bio-physical impact of the proposal is limited since most of the proposal is on ecologically degraded land and existing roadspace but with retention of most of the existing trees.

Based on the concept design and provided the safeguards are implemented it is considered that the cumulative environmental impacts of the proposal are generally positive and outweigh any adverse impacts.

7.5 Ecologically Sustainable Development

The principles of ecologically sustainable development as detailed in the *Environmental Planning and Assessment Act* and a response in relation to the proposal follow.

(a) The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
There are no known threats of serious or irreversible environmental damage associated with the proposal; hence lack of full scientific certainty has not been used as a reason for postponing any of the proposed safeguard measures outlined in Section 8.1 to prevent environmental degradation. The proposal has followed the precautionary principle by ensuring that the environmental risks associated with the proposal have been considered and that relevant safeguards would be implemented to reduce any uncertainties and to avoid serious or irreversible damage to the environment.

(b) Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
The proposal has been designed for future needs with the raising and widening of Windsor Road to accommodate the safe evacuation of McGraths Hill residents during major flooding in the Hawkesbury River based on the current SES flood emergency plans. The proposal also has the capacity to meet expected traffic growth along Windsor Road for at least the next 10 years. While this does not provide for the next generation, it is highly likely that Windsor Road would be maintained to provide a high level of service to cater for all road users in the foreseeable future. The health, diversity and productivity of the road reserve environment would be maintained for the benefit of future generations provided the safeguards associated with the proposal are implemented.

(c) Conservation of biological diversity and ecological integrity.
The proposal would conserve biological diversity and ecological integrity with a weed control programme, using seed collected from local trees and locally indigenous species in landscaping of the road reserve. Existing vegetation would be retained wherever possible in the roadside. Other safeguards would be implemented to minimise any adverse impacts on soils, water and air quality; flora and fauna; landscape and visual qualities; and the nearby residents.

(d) Improved valuation and pricing of environmental resources.
The cumulative impacts of the proposal, as discussed in Section 7.4, would be beneficial in the long term. However, while prices for natural resources should be set to recover the full social and environmental costs for their use, many environmental values (for example, externalities such as the cost of noise and air pollution) cannot be set in monetary terms. Nevertheless, the proposal and the community would make greater use of the road corridor

and the value using Windsor Road as a flood evacuation route would increase with the proposal. In addition the ultimate disposal of all waste has been considered for the proposal in an ecologically responsible manner.

In summary, the proposal is generally in accord with the principles of ecologically sustainable development. Windsor Road is an integral part of the metropolitan Sydney main road network and the proposal would provide a safe and secure means for the evacuation of people and vehicles during times of major flood than at present. The proposal would provide a sustainable balance between environmental, safety and economic objectives and compliments other components in the *Hawkesbury-Nepean Floodplain Management Strategy* during major flood events.

8. Implementation Stage

8.1 Summary of Proposed Safeguards

There would be some short term, localised and adverse impacts associated with the proposal particularly during construction requiring safeguards. Any adverse impacts of constructing the proposal would be outweighed by the long term beneficial effects of the proposal. In summary the safeguards that would be implemented for the proposal are listed below and would be included in an Environmental Management Plan.

◊ Inconvenience to Windsor Road travellers and nearby residential communities would be minimised through best construction and traffic management practices.

◊ Use of current and best available design criteria to ensure the proposal is correctly constructed, maintained and operated with adequate safety and capacity to meet all reasonable traffic needs for the next 10 years and flood evacuation route needs for the next 100 years.

◊ Implementation of environmental protection requirements of the RTA's Contract Manual and guidelines which includes the following specifications as a minimum:

Part G1 Job Specific Requirements
Part G2 General Requirements
Part G3 Occupational Health and Safety Requirements
Part G36 Environmental Protection Requirements
Part G10 Control of Traffic
Part R1 Erosion and Sedimentation Control (Permanent and Temporary)
Part R11 Stormwater Drainage (General)
Part R13 Drainage Structures
Part R41 Clearing and Grubbing
Part R43 Earthworks (Cut, Fill and Imported Fill)
Part R50 Stabilisation of Earthworks
Part RG92 Batter Protection Treatment
Part RG93 Retaining Structures
Part R162 Vegetation
Part Q7 Quality System.

◊ Other safety audits of the detailed design of the proposal would be completed before construction of the proposal and any findings implemented.

◊ Traffic during construction would be managed in accordance with the requirements of Australian Standard 1742.3 - 1996 *Manual of Uniform Traffic Control Devices Part 3: Traffic Control Devices for Works on Roads* and the RTA publication *Traffic Control at Work Sites*.

◊ Wherever possible two lanes on Windsor Road would be available for traffic at all times.

◊ Traffic arrangements during construction would be subject to RTA approval.

◊ Disruption of access to properties would be minimised and prior arrangements made with affected owners in the event of any short term disruption.

◊ A site meeting between the RTA, Hawkesbury City Council and Better Grow will take place to resolve any future access issues to the Better Grow site.

◊ Construction areas for the proposal would be maintained in a clean and tidy state at all times.

◊ If required, regular road sweeping of the Windsor Road travel lanes adjacent to the construction site works to ensure a clean and safe pavement.

- ◊ Sedimentation potential from construction works requiring installation of selected temporary sedimentation controls (for example, catch drains, diversion drains and banks, sedimentation basins, geofabric silt fences at the base of all earth works and soil stabilisation measures) along and around the construction areas and to be documented in a Soil and Water Management Plan.
- ◊ The Soil and Water Management Plan would also detail surface water control, storm water drainage, landscaping and erosion and sediment control measures required during construction to minimise sedimentation impacts.
- ◊ Regular monitoring and maintenance of the sedimentation controls to ensure they perform in a fully functioning condition at all times.
- ◊ Sediments and pollutants would be removed from temporary sedimentation basins on a regular basis and the contents disposed of in accordance with the requirements of the EPA.
- ◊ Any material stockpiles would be located in or adjacent to the road reserve and protected from possible erosion.
- ◊ Three temporary construction compounds would be located adjacent to the western side of the road reserve on RTA land between Sites 2 and 3, adjacent to Site 5 and between Sites 8 and 9.
- ◊ The construction compounds would be security fenced and lit at night and include amenities sheds, portable toilets, plant and equipment storage areas, bunded areas for storage of petroleum, distillate and other chemicals to comply with EPA and WorkCover Authority requirements.
- ◊ On-site domestic waste and sullage facilities would be provided in the construction compounds.
- ◊ Construction hours would generally be from 7 am to 6 pm Monday to Friday and 7 am to 1 pm on Saturdays except when night time works are required at Sites 4, 6 and 10.
- ◊ From 7 am to 8 am on Saturdays only inaudible work would be allowed.
- ◊ Work would not be permitted on Sundays and public holidays or at night unless authorised by the RTA and EPA where required.
- ◊ Any night work would follow the existing procedure used by the RTA Sydney Operations Directorate and endorsed by the EPA with regard to night time road works.
- ◊ A temporary earth bund would encompass any area where washing out of trucks or containers may occur. This area would be regraded to match surrounding landform and landscaped at completion of construction.
- ◊ Exposed earthworks areas would be stabilised as quickly as possible.
- ◊ Materials transported in trucks travelling on public roads would be covered.
- ◊ Tailgates of all vehicles transporting materials on public roads would be securely fixed, sealed and loads covered.
- ◊ No contaminated material (for example asbestos, environmentally hazardous materials or putrescible waste) would be used in any earthworks.
- ◊ Only clean natural inert fill material such as earth, soil and rock would be used in the sections of road to be raised. Material such as vegetation, building demolition and waste would not be permitted as fill material.
- ◊ Construction work would be regularly monitored and dedicated water carts would suppress dust as required.
- ◊ Any dust fall-out generated by the proposal works would not exceed an annual average of 2 grams/square metre/month above background levels.

- ◊ Any excavated or excess pavement material and concrete would be incorporated in the earthworks for the proposal as a first priority or transported off-site for recycling.
- ◊ No burning or burying of wastes would be permitted on-site.
- ◊ All non-recyclable waste would be disposed of at legally operating waste disposal sites.
- ◊ All internal combustion motors would not be permitted to emit continuous visible smoke for greater than 10 seconds on public lands.
- ◊ No vibratory rollers would be permitted to operate within 20 metres of any occupied dwelling.
- ◊ If the owner agrees a condition survey of all dwellings with a façade within 20 metres of the construction works would be completed by the RTA and a copy provided to the owner before construction commences.
- ◊ A landscape plan would be prepared and implemented by the RTA and/or contractors.
- ◊ Environmental resources would be maximised by retention of existing vegetation and resources where possible.
- ◊ The number of trees to be removed would be the minimum necessary for the safe excavation and construction operations.
- ◊ Site topsoil would be reused on site in landscaping works.
- ◊ Native vegetation removed in construction would be chipped and reused as mulch in landscape works.
- ◊ A weed control programme would be included in the landscape works.
- ◊ Imported fill material will be checked at the source to prevent the spread of any environmental weeds that may be present.
- ◊ Any exotic vegetation, noxious weeds, associated leaf litter and soil cleared for the construction works would not be used in the landscaping of the disturbed areas.
- ◊ Propagules of all noxious weeds would be removed from the construction area for disposal at a legally operating disposal site.
- ◊ Locally indigenous species would be used in the landscape works with plant species typical of Cumberland Plain Woodland and Shale Gravel Transition Forest. Cumberland Plain Woodland species would be planted on crests and upper slopes and Shale Gravel Transition Forest species on lower slopes and depressions. If possible, *Acacia pubescens* and *Pultenaea parviflora* should be included in the planting schedule for Shale Gravel Transition Forest areas.
- ◊ Where possible seed would be collected from local trees and propagated for the landscape works.
- ◊ Any suitable vegetation would be provided to community groups as firewood as a first priority and then disposed of at a nearby legally operating waste disposal site.
- ◊ Trees with limbs overhanging Windsor Road would not be removed unless absolutely necessary for safety or construction reasons. Any overhanging limbs would be cut back where possible.
- ◊ The boundary of the area to be cleared and the native trees to be retained would be clearly delineated and fenced by 'Paraweb' or similar fencing to prevent damage from workers and machinery.
- ◊ Parking of vehicles or storage of materials would not be permitted beneath the canopy of trees to be retained.
- ◊ Exposed earthworks construction areas would be progressively landscaped with native species as soon as possible following completion of construction at each site.

- ◊ The RTA would liaise with Hawkesbury City Council regarding approved removal methods for Prickly Pear that occurs along the route.
- ◊ Landscaped areas would be maintained for at least 12 months with 3 monthly inspections following completion of construction.
- ◊ Utilities and infrastructure would be relocated as required by the providers.
- ◊ Construction equipment would be maintained to meet EPA requirements.
- ◊ No vehicle maintenance would be permitted outside the construction compounds except in emergencies.
- ◊ Mufflers would be fitted to all construction plant and equipment to meet EPA requirements.
- ◊ Heavy vehicle traffic generation during construction would be confined to Windsor Road and other main roads wherever possible.
- ◊ Concrete and asphaltic concrete would be transported from legally operating established batching plants located near the proposal.
- ◊ No batching plant would be permitted on-site.
- ◊ Cleaning out of batched concrete mixing plant would be at approved areas within the road reserve for drying out and incorporation in the earthworks.
- ◊ Construction 'hold points' would be enforced where irreversible environmental damage may occur; major floods, European relics, Aboriginal sites or contaminated material were encountered.
- ◊ At Sites 2, 3 and 10 a member of the Deerubbin Local Aboriginal Land Council would monitor vegetation clearing and earth works.
- ◊ At Site 5 the two possible Aboriginal scarred trees would be protected from damage during the construction works by:
    - marking the trees on the concept plans of the proposed works;
    - showing relevant contractors and RTA personnel the location of the trees; and
    - constructing a protective barrier around the trees.
- ◊ If any Aboriginal archaeological sites or artefacts were found during construction then work would cease within 10 metres of the site and the NSW National Parks and Wildlife Service and RTA's Environmental Services Branch, Aboriginal Liaison Officer would be contacted promptly for further advice and action.
- ◊ If European relics were unearthed during construction then the Heritage Council of NSW would be contacted for advice and/or a permit to remove or destroy the item.
- ◊ The location of the known and possible location of road alignment stones will be marked out by the RTA with painted star pickets and tape before construction commences near the site.
- ◊ The contractor will be advised by the RTA of the historical significance of the road alignment stones with due care to take place during construction.
- ◊ The road alignment stones will be retained in-situ and will not be unnecessarily disturbed during excavation or filling activities.
- ◊ Any fill placed over the road alignment stones will be free-draining and will not allow water to pond in the vicinity of the stones. A layer of geotextile or similar material will be placed between the top surface of the road alignment stones and the covering fill.
- ◊ If construction works uncover additional road alignment stones then work will cease within 10 metres of the site and the RTA's Heritage Survey Coordinator will be contacted promptly for further advice and action.

- ◊ As a minimum the location and condition of any new road alignment stones will be recorded by the RTA's Heritage Survey Coordinator and digital and analogue photographic records documented before any filling over the stone.
- ◊ If subsequent investigations indicated that any stones need to be removed then discussions will be required with the NSW Heritage Office concerning the lodgement of an Excavation Permit Application. Removed stones will also need to be given long term protection and storage in an appropriate and secure RTA repository.
- ◊ The displaced road alignment stone located approximately 200 metres south of Brennan Dam Road on the west side of Windsor Road would be removed by the RTA for safekeeping. This will require an Excavation Permit under the NSW *Heritage Act.*
- ◊ Construction noise would be limited to EPA requirements as far as practicable.
- ◊ No excessively loud plant and equipment would be used after 10 pm unless essential for the construction works.
- ◊ Where practicable only one piece of loud plant and equipment would be used at a work site at any one time after 10 pm.
- ◊ Nearby residents would be informed in advance of any noisy construction periods and night time construction works at least three days in advance.
- ◊ Temporary noise walls would be used at night time work sites where practicable.
- ◊ Pile driving or blasting would not be permitted at the work sites.
- ◊ Smart reversing alarms would be used on mobile plant and equipment at night time work sites 4, 6 and 10.
- ◊ Access at night time work sites would be one way controlled to limit the number of reversing manoeuvres by mobile plant and equipment fitted with reversing alarms.
- ◊ Noisy construction plant and equipment (eg. use of jack hammers and vibrating rollers) would only be used during specific day time periods corresponding to the highest background noise levels between 7 am and 6 pm.
- ◊ For periods where noisy construction activities are likely to take more than 4 weeks, temporary barriers would be erected as close as practically possible to the earth moving plant. Barriers would be at least 1 metre above the exhaust stack of such plant. Barriers should be constructed from solid materials capable of attenuating noise levels by at least 20 dB(A) at the 125 Hertz octave band.
- ◊ The contractor would use the best available techniques not entailing excessive cost with the L10 (15 minutes) level measured at dwellings near Windsor Road not to exceed 5 dB(A) above background noise levels.
- ◊ Traffic noise would be monitored within Vineyard Public School classrooms within one year of commissioning of the proposal to determine whether any installed noise control measures are required.
- ◊ If the actual noise levels in the Vineyard Public School classrooms one year after opening exceed those predicted for the tenth year after opening in 2012, then remedial measures would be undertaken subject to being cost effective and practical.
- ◊ The requirements of all relevant legislation relating to air quality, water quality and noise would be met.
- ◊ All approvals and licences needed to construct the proposal including any air, noise and water pollution licences from the EPA would be obtained.
- ◊ Nearby residents would be informed by letter box drop of the proposal before construction commences.

- ◊ The EPA's Hotline on 131 555 would be informed of any night time construction works and the name of the project or site manager to contact in an emergency.
- ◊ Procedures for monitoring community comments and taking appropriate actions would be implemented.
- ◊ The RTA would obtain agreement with Hawkesbury City Council concerning on-going maintenance of landscaped areas including the grass drainage swales.
- ◊ All the safeguards would be incorporated in a Construction Environmental Management Plan to be prepared by the contractor(s) and/or RTA before construction commences to minimise adverse environmental impacts. The Construction Environmental Management Plan would include provision for hold points where environmental damage may occur, regular reports and audits on the environmental management of the project, details of nonconformances, verification activities and emergency responses.

The above list of safeguards is a minimum for implementation and may not be exhaustive and change as a result of public authorities requirements, changes in legislation, community consultation and detailed design development.

8.2 Implementation Process

The safeguards include all measures that might reasonably be taken to minimise adverse environmental impacts. The safeguards for construction and operation of the proposal would be included in a Construction Environmental Management Plan and contract documents for implementation and monitored to minimise adverse environmental impacts. Construction would commence after the environmental assessment process is complete and tenders have been let, evaluated and awarded. Construction 'hold points' would be enforced where irreversible environmental damage may occur; major floods occur; relics or Aboriginal sites were exposed; or contaminated material was encountered.

The successful tenderer(s) for the construction of the proposal would be required as part of the contract to meet the specifications and safeguards detailed in this REF and RTA Assessment Report. The safeguards include all measures that might reasonably be taken to minimise adverse environmental impacts during construction and operations of the proposal. Specifically all activities must comply with the environmental provisions set out in this REF and RTA Assessment Report for the proposal and project specifications. The collective safeguards would be included in a Construction Environmental Management Plan and/or contractor(s) Construction Environmental Control Plans to be prepared by the contractor before construction commences for acceptance by the RTA for implementation and monitoring. In addition, all activities carried out on site must comply with the relevant provisions of all legislation including regulations relating to construction, operations and maintenance of the project.

SECTION C - FINALISATION

9. Summary of Key Issues

9.1 Major Beneficial Effects

The major beneficial effects of the Windsor Road proposal would be provision of a safe and secure evacuation route for the residents of McGraths Hill with raising of the road to a minimum road level of 13.5 metres AHD and widening of the road including two sections of dual carriageway. The completed works would provide improved road side and cross drainage infrastructure for major floods along this section of Windsor Road. The capacity, safety, traffic flow and amenity of Windsor Road would also be enhanced with the road works and landscaping. Other benefits of the proposal include:

- enhanced accessibility to the main road network and north-western Sydney region;
- improved safety, level of service and traffic flow for travellers along the proposal;
- reduced number of accidents and travel times;
- reduced conflicting traffic movements through traffic segregation along the divided carriageway and signalised intersections at Groves Avenue and Bandon Road.

9.2 Major Adverse Effects

The major adverse effects of the proposal include delays to motorists along Windsor Road during construction, removal of some native vegetation from the road reserve and restricted access for properties with frontage to the two sections of dual carriageway. Local residents would also have increased levels of noise, dusts, vibration, traffic generation and general disruption to daily activities during construction. Noise levels would increase and air quality would decline with increased traffic flows in future. There would be also a medium term loss of visual amenity for some nearby residents until landscaped areas matured. Other adverse effects of the proposal include any visual impact of the raised and widened road, additional road surface, drainage infrastructure, signs and markings to maintain.

9.3 Characteristics

The characteristics of the proposal would be similar to the nearby three and four lane sections of Old Windsor Road south of Sunnyholt Road with increased safety, capacity and better landscaping. The proposal would be of modern design and similar appearance to the upgraded sections of Old Windsor Road south of Sunnyholt Road. The interactions between the proposal and the affected roadside environment would be localised except for Windsor Road travellers inconvenienced during construction.

9.4 The Extent of the Impacts

The impacts during construction would be medium-term over the 12 month period, adverse and localised except for the inconvenience caused to Windsor Road travellers. The main construction impacts include construction noise, dusts under windy conditions, loss of

introduced and native vegetation, disruption to traffic and traffic generation. The extent of the positive impacts during operations would be long-term, beneficial and cumulative on a regional scale and include a safe evacuation route in times of major flood, improved accessibility to the north-west Sydney metropolitan area, improved safety, better traffic flow and level of service along the landscaped Windsor Road proposal. It is considered the long-term local and regional benefits of the proposal outweigh the medium-term localised and acceptable environmental impacts, provided the safeguards are implemented.

9.5 The Nature of the Impacts

Based on construction experience of similar projects the level of confidence in the prediction of environmental impacts is relatively high. It is anticipated that the affected environment would have the resilience to cope with the predicted environmental impacts. With the safeguards implemented during construction it is considered the environmental impacts are manageable although irreversible after completion of the works.

Construction and operations of the proposal would comply with all relevant standards, plans, policies and legislation. The extent of public interest in the proposal is likely to be moderate due to the increasing number of Windsor Road travellers. The environmental impacts are likely to be acceptable to the public with implementation of the safeguards.

10. Consideration of Environmental Factors in Relevant Legislation

10.1 NSW *Environmental Planning and Assessment Regulation 2000* Clause 82 Factors

In assessing the impact of the proposal under Part 5 of the *Environmental Planning and Assessment Act, 1979* the following Clause 82 factors in the *Environmental Planning and Assessment Regulation, 2000* for consideration of likely impact of an activity on the environment are summarised.

(a) any environmental impact on a community;
There would be adverse and beneficial environmental impacts on the adjacent communities during construction and operations of the proposal.

(b) any transformation of a locality;
There would be a long term transformation of approximately 3.5 hectares of vegetated road reserve to pavement area, drainage infrastructure and roadside landscaped area, which would change the views and appearance in the locality.

(c) any environmental impact on the ecosystems of the locality;
There would be minor environmental impact on local ecosystems due to the modified nature and managed land uses in the locality.

(d) any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality;

There would be no known reduction in the scientific or other environmental quality or value of the locality due to the proposal except for removal of some Cumberland Plain Woodland remnants. There would be a reduction in the aesthetic quality of the locality with construction of the proposal, increased signage and traffic control measures creating a larger and more visible road presence.

(e) any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations;

There would be no known adverse impacts on a locality, place or building of significance for present or future generations provided the European and indigenous heritage safeguards are implemented.

(f) any impact on the habitat of any protected or endangered fauna (within the meaning of the National Parks and Wildlife Act 1974);

With respect to the above Act, Section 5A of the *Environmental Planning and Assessment Act, 1979*, and Commonwealth government's *Environment Protection and Biodiversity Conservation Act, 1999* there would be no threat to any protected or endangered fauna, provided the flora and fauna safeguards are implemented.

(g) any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air;

No known endangering of any species as a consequence of the proposal is anticipated.

(h) any long-term effects on the environment;

There would be long term effects on the environment including the visual impact of the proposal and a decline in local noise and air quality with increasing traffic flows along Windsor Road.

(i) any degradation of the quality of the environment;

No degradation of the quality of the environment would occur except for loss in acoustic and visual amenity for residents and visitors to the nearby areas due to construction and operations of the proposal and increased traffic flows in future.

(j) any risk to the safety of the environment;

There would be increased risks to the safety of the environment during construction associated with increased potential for traffic accidents along Windsor Road. Appropriate construction and traffic management safeguards would be implemented to minimise these risks.

(k) any reduction in the range of beneficial uses of the environment;

There would be no change to any beneficial use of the environment apart from the approximately 3.5 hectares of vegetated road reserve changing to road works area.

(l) any pollution of the environment;

Additional pollution would be generated by the proposal including increased air and noise emissions from increased traffic flows along Windsor Road in future.

(m) any environmental problems associated with the disposal of waste;

All generated wastes except introduced vegetation would be recycled as a first priority, otherwise contained and removed from the construction site for safe disposal at a legally operating waste disposal site according to statutory requirements. Any contaminated material would be disposed of according to EPA requirements. No environmental problems are anticipated with the disposal of waste.

(n) any increased demands on resources (natural or otherwise) that are, or are likely to become in short supply;

No increased demands would be made on the use of resources which are, or are likely to become in short supply.

(o) any cumulative environmental effect with other existing or likely future activities;

The cumulative environmental effects of the proposal together with construction of other components of the *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* in the area would positively contribute towards a safe flood evacuation route for McGraths Hill residents and development of the road network in the north-west Sydney metropolitan region. Appropriate safeguards would need to be implemented to reduce the extent and nature of any adverse environmental impacts.

10.2 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* Factors

In assessing the impact of the proposal for the purposes of the Commonwealth government's *Environment Protection and Biodiversity Conservation Act, 1999* the following factors are summarised.

(a) Any environmental impact on a World heritage property?

There would be no environmental impact on any World heritage property.

(b) Any environmental impact on wetlands of international importance?

There would be no environmental impact on any wetland of international importance.

(c) Any environmental impact on Commonwealth listed threatened species and ecological communities?

There would be no significant environmental impact on any Commonwealth listed threatened species or ecological community including the remnant of Cumberland Plain Woodland.

(d) Any environmental impact on Commonwealth listed migratory species?

There would be no impact on Commonwealth listed migratory species.

(e) Does any part of the proposal involve a nuclear action?

No part of the proposal involves a nuclear action.

(f) Any environmental impact on a Commonwealth marine area?

There would be no environmental impact on any Commonwealth marine area.

(g) Any impact on Commonwealth land?

There would be no environmental impact on any Commonwealth land.

11. Declarations

This Review of Environmental Factors provides a true and fair review of the proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal, and all factors listed in Clause 82 of the *Environmental Planning and Assessment Regulation, 2000.*

Signed : B.R. Adcock Date: 12th March 2001.
Environmental Planning Pty Ltd.

Signed : R Blackmore Date: 16 March 2001.
Project Manager,
RTA Sydney Client Services,
Roads and Traffic Authority of NSW.

Signed : Date: 21 March 2001.
for Project Manager,
Hawkesbury-Nepean Floodplain Management Strategy,
Department of Land and Water Conservation.

References

Acid Sulfate Soil Risk 1:25,000 Wilberforce Map, 1997, Department of Land and Water Conservation.

Hawkesbury-Nepean Flood Management Advisory Committee, Achieving A Hawkesbury-Nepean Floodplain Management Strategy, November 1997.

Action for Transport 2010 - An Integrated Transport Plan for Sydney, Department of Transport, 1999.

Environmental Criteria for Road Traffic Noise, May 1999, Environment Protection Authority.

Hawkesbury-Nepean Flood Management Advisory Committee, Hawkesbury-Nepean River Impacts of Flooding on Communities and Infrastructure, September 1997.

Hawkesbury-Nepean Flood Management Advisory Committee, Emergency Response Planning and Traffic Infrastructure, September 1997.

Hawkesbury-Nepean Flood Management Advisory Committee, Hawkesbury-Nepean Flood Management Strategy, Engineering Studies to Modify Flood Behaviour, September 1997.

Hawkesbury-Nepean Flood Management Advisory Committee, Hawkesbury-Nepean Floodplain Management Strategy, Land Use Planning and Development Control Measures, October 1997.

Hawkesbury-Nepean Flood Management Advisory Committee, Supplementary Report, July 1998.

Hawkesbury-Nepean Flood Management Advisory Committee, Flood Evacuation Route Optimisation Study, December 1998.

Hawkesbury-Nepean Floodplain Management Strategy, Interim Regional Road Upgrade Plan, April 2000.

Hawkesbury-Nepean Floodplain Management Strategy, Road Evacuation Route Upgrade Strategy, Local Hydraulics Specification Study, Windsor Road & McGraths Hill Alternative Routes, December 2000, SMEC Australia Pty Ltd.

Historical Archaeological Assessment of Alignment Stones Windsor Road Between Mulgrave and Kellyville, Sydney, NSW, S. Lavelle, September 1997.

Potential and Known European Heritage Sites Along Windsor Road, Between Bandon and Curtis Roads, Vineyard, August 2000, RTA.

Soil Landscapes of the Penrith 1:100,000 Map Sheet, Bannerman S and Hazelton P, 1990, Soil Conservation Service of NSW, Sydney.

South Creek Flood Evacuation Route, Environmental Overview, November 1999.

State Emergency Service, Hawkesbury-Nepean Flood Emergency State Plan, Hawkesbury City Local Flood Plan, February 1993.
(*Note – this document is currently under review as part of the implementation of the Hawkesbury-Nepean Floodplain Management Strategy*).

Supplementary Information, Memorandum to DLWC, 6 November 2000, SMEC Australia.

ATTACHMENT 1

Newsletter No. 1 May 2000

HAVE YOUR SAY

McGRATHS HILL FLOOD EVACUATION ROUTE

Newsletter No 1, May 2000

WHAT IS THIS BROCHURE ABOUT?

The Department of Land and Water Conservation (DLWC) and the Roads and Traffic Authority (RTA) are planning upgrading works on Windsor Road between Curtis Road and Bandon Road to provide an evacuation route for the local community in the event of severe floods.

The objective of this brochure is to advise you of the proposed works so that your comments can be taken into account before the works are committed. The brochure describes the upgrading works and associated temporary works required while work is undertaken and invites your comments on the attached form.

Your concerns will be carefully considered to ensure that the impact of the works on the community are minimised.

BACKGROUND

In recent times the full extent of flood hazards in the Hawkesbury-Nepean Valley has become apparent.

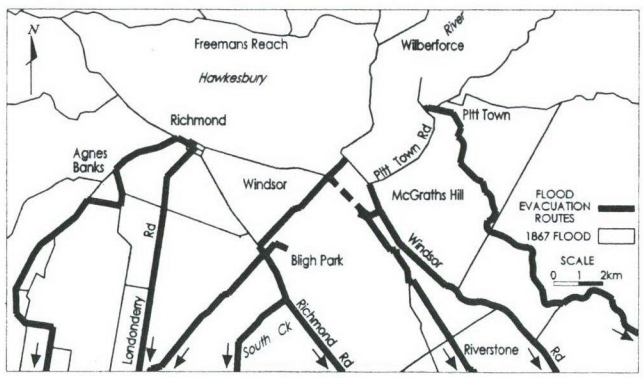
Investigations have shown that because of the unusual geography of the valley, there are no easy ways to prevent flooding during severe flooding events. The narrow gorge north of Wilberforce restricts the flow of flood waters to the sea and has the potential to pond backwater to a great depth in the flood plain areas of Richmond and Windsor.

FLOOD MANAGEMENT STRATEGY

The NSW State Government has responded to the problem and in 1997 formed the community based Hawkesbury-Nepean Flood Management Advisory Committee to undertake investigations and make recommendations to the Government regarding management of the flood risks. The Committee completed its report and submitted it to the Government in November 1997. The report entitled 'Achieving a Hawkesbury-Nepean Floodplain Management Strategy' was exhibited in June 1998. A supplementary report in July 1998 responded to community submissions.

The recommendations for implementing the Strategy are grouped together under the following headings:

- Works and plans to improve road evacuation routes (see map below);



- Government policy initiatives relating to coordinated flood emergency planning, flood forecasting, flood warning and public awareness;
- Best practice floodplain management and planning policies;
- Completion of a comprehensive Regional Floodplain Management Study, from which local Councils can prepare their own floodplain management plans and policies consistent with the merits approach of the Floodplain Development Manual.

The Government has made a commitment to funding the recommendations estimated to cost $58.3 million over a five year period.

LAND & WATER CONSERVATION

DoCS
NSW Department of Community Services

STATE EMERGENCY SERVICE NEW SOUTH WALES

RTA

ATTACHMENT 2

Summary of Public Submissions

19 submissions were received by the RTA as a result of the public display and letters sent to nearby property owners. The submissions have been summarised below with a response. Note that the public display did not include Sites 9 and 10, which have been added to the proposal to tie in with the existing two northbound lanes approximately 500 metres south of Bandon Road.

No.	Name & Locality	Issues Raised in Submission	Response
1.	K. & V. Sultana, Vineyard	• Will existing road be raised at Sites 7 and 8?	• Between Sites 7 and 8 approximately 900 metres of a new raised northbound carriageway (up to 1.1 metres higher than the existing road) will be constructed.
		• Residents between Sites 5 and 6 will have difficulty getting onto Windsor Road - traffic lights are needed.	• A two lane road will be retained between Sites 5 and 6. Traffic lights will not be installed.
		• Build a new raised road from Garfield Road to Windsor.	• Beyond the scope of the proposed works.
		• In wet weather Windsor Road between Bandon Road and Boundary Road floods and it should be raised as well.	• Beyond the scope of the proposed works. This issue has been addressed as part of the Strategy and subsequent studies with upgrade options recommended in *Hawkesbury-Nepean Floodplain Management Strategy, Road Evacuation Route Upgrade Strategy, Local Hydraulics Specification Study, Windsor Road & McGraths Hill Alternative Routes.*
2.	G. & S. Banks, Berrilee	• Access between Sites 7 and 8 will be left in and left out? Will there be a roundabout or U turn bay?	• A section of dual carriageway will be constructed between Sites 7 and 8 restricting access to left turn in and left turn out of properties. There will be no roundabout or U turn bay.
		• Where can we safely turn with our heavy vehicles without travelling too far?	• Heavy vehicles will need to turn into Blackwood Road or use the new signalised intersection at Bandon Road.
3.	T. Preuss, McGraths Hill	• Traffic chaos with 2 and 4 lane sections in the space of 2 or 3 km followed by a 90 degree deviation.	• Noted, the primary objective of the proposal is to provide a flood evacuation route rather than upgrade Windsor Road.
		• Evacuation route should be a continuous free flowing roadway.	• Yes, SES and other authorities will provide controlled traffic flows.
		• Improve traffic flow rather than alter it.	• Traffic flow will be improved with two sections of dual carriageway.
4.	Better Grow, Vineyard	• Access for heavy vehicles required for their site between Groves Avenue and Henry Road.	• A section of dual carriageway constructed between Groves Avenue and Henry Road will restrict access to Better Grow vehicles to left turn in and left turn out of their site.
		• Even if Industry Road was extended there would not be enough room for B-Doubles.	• There are no proposed roads shown on Hawkesbury Local Environmental Plan 1989 to extend Industry Road.

No.	Name & Locality	Issues Raised in Submission	Response
4. cont.		• A roundabout would not decrease traffic flow and would allow a safer entry and exit from their site. • If any works require private property then landowners need to be contacted. • A site meeting between Council and Better Grow must take place.	• No roundabout is proposed near their site and it would not be appropriate for private access. • No private property acquisition is required for the proposal. • A site meeting between the RTA, Council and Better Grow will take place.
5.	R. & H. Moller, Oakville	• Raise Windsor Road across the McGraths Hill flats into Windsor and Richmond Road between Windsor and RAAF Base.	• *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a second crossing for the evacuation of Windsor.
6.	J. Sultana, Vineyard	• Proposal is best for road users. • Need four lanes from Groves Road to Bandon Road.	• Noted. • Traffic flow will be improved with two sections of dual carriageway (4 lanes) between Groves Road and Bandon Road. 4 lanes along the length of Windsor Road is beyond the scope of the proposal.
7.	N. Sultana, Vineyard	• Proposal is best for everyone. • Need four lanes from Groves Road to Bandon Road.	• Noted. • Traffic flow will be improved with two sections of dual carriageway (4 lanes) between Groves Road and Bandon Road. 4 lanes along the length of Windsor Road is beyond the scope of the proposal.
8.	P. Smith, McGraths Hill	• Concerned about destruction of bushland and established native trees along Windsor Road.	• Some bushland and native trees will be lost with the proposal but compensated for with locally indigenous flora species according to a landscape plan.
9.	Anonymous	• Short section of divided road is not practical as traffic will bank up into single lanes. • Clean out creeks so that water flows properly. • Project is impractical - put it further towards Windsor and raise entire area. • Fix Windsor Road.	• Proposal will provided for forecast traffic flows for at least the next 10 years. 4 lanes along the length of Windsor Road is beyond the scope of the proposal. • Creek channels within the road reserve will be maintained by the RTA. • *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a second crossing for the evacuation of Windsor. • Traffic flow will be improved along Windsor Road with two sections of dual carriageway and signalised intersections at Groves Avenue and Bandon Road.
10.	M. Maglic, Oakville	• Raise Wolseley Road to above flood level. • In 1961-1964 at Site 5 flood waters were over 0.35 m.	• *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a second crossing for the evacuation of Windsor. • The proposal will provide a safe evacuation route for a major flood event based on the current SES flood emergency plans.
11.	J. & C. Vella, Freemans Reach	• Concerned there will be heavy traffic delays.	• Traffic flow will be improved along Windsor Road with two sections of dual carriageway and signalised intersections at Groves Avenue and Bandon Road.

No.	Name & Locality	Issues Raised in Submission	Response
11. cont.		• Raise either Windsor or Richmond Bridge for evacuation. • Build it sooner than 2001.	• *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a second crossing for the evacuation of Windsor. This proposal is for the evacuation of McGraths Hill residents. • Proposal will be complete by 2002.
12.	V. Parrella, Hornsby	• Access to property between Site 8 and Bandon Road will be restricted by raised road. • Access to property will be restricted by left turn in and out only and concerned at safety with 80 km/hour speed limit and guardrail. • How far do I travel towards Windsor before turning around towards Castle Hill?	• Access to property will be adjusted to accommodate any change in levels. • The two sections of dual carriageway will restrict turns to left turn in and out only. Guardrail is proposed at Sites 7 and 8 near the property but not across any access. • The maximum distance to turn around would be approximately 900 metres.
13.	B. Smith, McGraths Hill	• Endorse proposal for local evacuation and road travellers. • Widen the whole of Windsor Road as only a small amount will be dual lane.	• Noted. • The primary objective of the proposal is to provide a flood evacuation route rather than upgrade Windsor Road.
14.	R. Campbell McGraths Hill	• What happened to the flyover of 4 lanes from McGraths Hill to Wilberforce over the flood areas in 1969? • Pitt Town Road and the bridge over McKenzie Creek needs to be raised to 17 metres so cars can pass the flood. • New road needs to go from McGraths Hill to Wilberforce and The Putty Road over the flood areas as it was in 1969.	• *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a different strategy for evacuation of the area. • Proposals were considered by the Advisory Committee; an upgrade of Pitt Town Road was further considered by the Steering Committee. It was agreed to upgrade Windsor Road based on social, economic and environmental grounds. • Beyond the scope of the proposal and *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a different strategy for evacuation of the area.
15.	I. Craft, McGraths Hill	• The road works at Sites 1, 2 and 3 with a small rise in levels will not significantly change the flood egress from McGraths Hill or alter the buffer for evacuation. • Proposal does not solve traffic problems with congestion at Pitt Town Road and Macquarie Street. • Short sections of dual lanes compound the problems when merging with traffic. • Proposal should cover flood evacuation and traffic flow as one project. • Need a bypass road from Parks Road direct to Forbes Street/Richmond Road with connection at high level to McGraths Hill and South Windsor at least 16 metres AHD.	• The proposal will provided a safe evacuation route for McGraths Hill residents in a major flood based on the current SES flood emergency plan for McGraths Hill. • Beyond the scope of the proposal. • Noted, but road design will provide for safe merging movements. • The primary objective of the proposal is to provide a flood evacuation route rather than upgrade Windsor Road. • Beyond the scope of the proposal and *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a similar proposal for a second crossing of South Creek.

No.	Name & Locality	Issues Raised in Submission	Response
16.	B. Bassett, Kurrajong	• Dual carriageway needs to be created along the full length of the flood evacuation route at the same time and from Garfield Road to Windsor.	• The primary objective of the proposal is to provide a flood evacuation route rather than upgrade Windsor Road. Two sections of dual carriageway totalling 1.8 km will be provided plus 0.5 km of 3 lane road.
17.	J. Lane, McGraths Hill	• Concerned at blocking traffic access to McGraths Hill and Windsor for commuters to city. • Don't close any lanes on Windsor Road. • Limit night road works to 12 - 3 am.	• Access along Windsor Road will be improved for city commuters with proposal. • During construction some lane closures will occur for short periods. • Night time road works may extent to the whole night at Sites 4, 6 and 10.
18.	E. Fraser, McGraths Hill	• Businesses will be affected. • Lack of concern to entrances to businesses on Windsor Road. • Put the new road bridge over South Creek and the flats where Windsor Road is.	• Access to some businesses will be restricted to left turn in and out along the two sections of dual carriageway. • Entrances to businesses will be adjusted for the new levels. • *Achieving a Hawkesbury-Nepean Floodplain Management Strategy* has recommended a second crossing for the evacuation of Windsor.
19.	G. Banks, Berrilee	• Access between Sites 7 and 8 will be left in and left out? Will there be a roundabout or U turn bay? • Where can we safely turn with our heavy vehicles without travelling too far?	• A section of dual carriageway will be constructed between Sites 7 and 8 restricting access to left turn in and left turn out of properties. There will be no roundabout or U turn bay. • Heavy vehicles will need to turn into Blackwood Road or use the new signalised intersection at Bandon Road.

ATTACHMENT 3

Responses from Public Organisations

Hawkesbury City Council

Our Ref: GR110/006Pt02

3 October 2000

366 George Street
(PO Box 146)
Windsor NSW 2756
Phone: 02 4560 4444
Facsimile: 02 4560 4400
DX: 8601 Windsor

The Director
Environmental Planning Pty Ltd
P O Box 390
PYMBLE NSW 2073

Dear Mr Adcock

Review of Environmental Factors for McGraths Hill Flood Evacuation Route on Windsor Road between Curtis Road and South of Bandon Road

Reference is made to your letter of 21st August 2000 concerning this proposed Review of Environmental Factors (REF). Please accept my apologies for the delay in answering but I understand the circumstances have been explained to you.

In reference to the plans you have enclosed with the letter, it would appear that there are three issues that would need to be addressed in the REF. These are:

1. **The intersection at Groves Avenue, Windsor Road.**

   As you are no doubt aware, an environmental impact statement is currently being prepared for the flood evacuation route across South Creek. It is understood that although the evacuation route will travel along Railway Road South, if the northern option were adopted, arterial traffic would join Windsor Road via Groves Avenue for the medium term. It would therefore seem essential that any intersection works proposed on this project contemplate this role for Groves Avenue as an arterial road link to what would become the Windsor By-Pass. Although the plans show a left-hand turn laid on to Groves Avenue and its intersection controlled by lights, it is considered the issue of this road's role as an arterial road for the medium term should be discussed in the REF and, in particular, to ensure this intersection treatment is not incompatible with that role.

2. **Extension of Four-Lane Road.**

   Sheet 3 of the three sheets provided shows works to the east of Bandon Road terminating at chainage 1528.40, however, the four-lane part of Windsor Road reconstruction ends around chainage around 1160. It would seem that the extension of four lanes to the longer chainage would be appropriate to ensure the ability of increased traffic of the road. It is appreciated however that the primary purpose of this plan is a flood evacuation route and some economies of scale must be achieved to carry out relative minor extensions that will serve arterial purposes as well.

Where people make the difference.

All communications to be addressed to the General Manager
P.O. Box 146, Windsor NSW 2756
Hours: Monday to Friday 8.30am - 5.00pm Thursday 8.30am - 7.30pm

3. Curtis Road Intersection

The proposed treatment of the Curtis Road/Windsor Road intersection provides for a protected right-turn bay for traffic travelling Windsor Road to turn right into Curtis Road, however, there is no protected right-turn exit lane for traffic from Curtis Road onto Windsor Road. Given the configuration of the laneways, that is the merging of the north bound traffic just east of this intersection and the merging of the east bound traffic just west of this intersection, that a protected exit lane or seagull crossing may be a more appropriate treatment for this intersection.

Thank you for the opportunity to comment on these quite significant road improvement proposals. Council officers are always willing to provide further input into design issues as they arise.

Yours faithfully

Malcolm Ryan
Director, Environment and Development

Direct Line : 4560 4540

Blacktown City Council
Growing with Pride

RECEIVED 12/9/00

8 September 2000

Environmental Planning Pty Ltd
P O Box 390
PYMBLE NSW 2073

Attention: Mr Bruce Adcock

Dear Sir,

Re: Review of Environmental Factors for McGraths Hill Flood Evacuation Route on Windsor Road

Reference is made to your correspondence dated 21 August 2000, wherein you request Council's requirements for inclusion in the Review of Environmental Factors (REF) for the proposed Windsor Road upgrade at McGraths Hill.

It is noted that the majority of work is proposed in Hawkesbury Local Government Area. That part of Windsor Road within Blacktown's boundaries is proposed to be retained as a 2 lane southbound carriageway with 900 metres of a new raised northbound carriageway to be constructed on the Baulkham Hills side.

Clause 82 of the Environmental Planning and Assessment Regulation 1994 nominates factors that must be taken into account concerning the impact of an activity on the environment. In addition to these factors, Council has identified a number of specific detailed environmental issues which it would like to see addressed in the REF, including the following:-

(a) A full description of the project;
(b) A statement of the objectives of the project;
(c) A full description of the existing environment likely to be affected by the project;
(d) Identification and analysis of the likely environmental interactions between the project and the environment;
(e) An analysis of the likely environmental impacts or consequences of carrying out the project;
(f) Justification of the project in terms of environmental, economic and social considerations;

G:\Dept\Drs\Let\09DJDS1305.wpd

Council Chambers • 62 Flushcombe Road • Blacktown NSW 2148
Telephone: (02) 9839 6000 • **Facsimile:** (02) 9831-1961 • DX 8117 Blacktown
Email: council@blacktown.nsw.gov.au • **Website:** www.blacktown.nsw.gov.au
All correspondence to: The General Manager • PO Box 63 • Blacktown NSW 2148

(g) Measures to be taken in conjunction with the project to protect the environment and an assessment of the likely effectiveness of these measures;
(h) Any feasible alternatives to the proposed project together with reasons for choosing any said alternative;
(i) Any consequences of not constructing the project;
(j) The identification and analysis of the likely environmental impacts generated by the traffic as a result of the project;
(k) The identification and analysis of the likely environmental impacts during construction of the project, e.g. noise, nuisance, etc.
(l) The identification and analysis of the likely social, cultural and economic impacts of the project;
(m) Statutory provisions;
(n) Accessibility/Traffic, in particular the ability of the upgraded section of roadway including intersections, to cope with existing and projected future traffic volumes;
(o) Pedestrian and Bicycle facilities;
(p) Acoustical assessment;
(q) Flora and Fauna, including any threatened species;
(r) Potential Amenity Impacts;
(s) Archaeological Survey (Aboriginal and European);
(t) Water Quality (during and after construction);
(u) Floodplain Management and impact of the project on hydrology of the floodplain;
(v) Potential Environmental Impacts during construction of the project;
(w) Determination of potential environmental impacts and appropriate measures.

In the preparation of the REF, it is considered appropriate that a programme of community consultation be undertaken, to enable any potential issues of concern to be addressed in the REF. It is also suggested that all utility service authorities be consulted in the preparation of the REF.

In addition to the above, it is considered that 2 eastbound lanes should be provided for the length of the reconstruction to improve traffic flow efficiency and safety. Council is also concerned that the reconstruction of Bandon Road limits movements to the west to a single lane and provides insufficient manoeuvring area for heavy vehicles.

Thank you for the opportunity to contribute to the preparation of the REF. If you have any queries regarding the above, please telephone the contact person indicated below.

Yours faithfully,
IAN REYNOLDS
GENERAL MANAGER

Per: DG

Your contact for this matter is: Ms Martina Keenan
Phone: 9839 6000
File No.: 152-42-11/8, 00-48676C

Your Ref:
Our Ref: ERM00667

8 September 2000

RECEIVED 12/9/00

LAND & WATER CONSERVATION

Director
Environmental planning Pty Ltd
PO Box 390
PYMBLE NSW 2073

Attention: Bruce Adcock

Dear Sir,

Re: REF Requirements.
McGraths Hill Flood Evacuation Route,
Windsor Road between Curtis Road and Bandon Road

Thank you for your letter dated 21 August 2000, seeking this Departments comments and requirements for the above-proposed REF. The information supplied in this letter relate to the Departments standard EIS requirements which are applicable for your situation.

The Department of Land and Water Conservation (DLWC) is responsible for managing the soil, water and vegetation resources in New South Wales.
The vision of the Department is to facilitate *clean, healthy and productive catchments for the twenty-first century*. As part of this vision, the Department advocates the principles of ecologically sustainable development, and intra and intergenerational equity.

The Departments comments are broad in nature to cover a variety of circumstances. Some of these comments may not be fully relevant to your proposal.

As part of the preparation of the EIS you will need to demonstrate how this proposal will meet the requirements of the various Acts and Policies within this letter.

Rivers and Foreshores Improvement Act (1948).

The Department is responsible for administering the Rivers and Foreshores Improvement (R&FI) Act (1948).
If there is any creek, drain, channel (artificial or natural), depression, etc. which conveys water, or there is a foreshore, a Part 3A Permit may be required from the Department under the Act to:

(1) **Excavate** or remove material from the bank, shore or bed of any stream, estuary or lake, or land that is not more than 40 metres from the top of the bank or shore of protected waters (measured horizontally from the top of the bank or shore). "**Protected waters**" as defined under section 22A of the Act means a river, lake into or from which a river flows, coastal lake or lagoon (including any permanent or temporary channel between a coastal lake or lagoon and the sea).

(2) **Build erosion control works** and other **structures** in a river, estuary or lake.

(3) **Place any fill material** in a river, estuary or lake.

When assessing developments that require a Part 3A permit under the R&FI Act, the Department will consider whether the proposal is consistent with State Government policy, including the NSW State Rivers and Estuaries Policy. A condition of consent to a Part 3A permit may include the establishment of a native vegetation riparian zone along a "river". The Department is unlikely to issue a Part 3A Permit for works that degrade watercourses and their environment.

It is the Departments aim that an adequate native vegetation riparian zone be kept or established on either side of any "river" or wetland area. A minimum native vegetation riparian zone of 20 meters, from the top of the bank is generally required, however a greater width may be required, depending upon the site and the surrounding area.

On-line or in-stream water quality structures such as water quality ponds, trash racks and gross pollutant traps (GPT's) are strongly discouraged, as they will affect the continuity and corridor function of streams and result in the loss of riparian vegetation and habitat.

The channelisation, piping and/or relocation of streams and the construction of on-line or in-stream structures and culverts for stream road crossings are also strongly discouraged. Developments that propose such actions must have the necessary approval of DLWC and are unlikely to receive support

Works that are undertaken by Public Authorities (not including business ventures such as state-owned corporations or commercial undertakings), or works on Crown Land, do not require a 3A permit prior to commencing works. However, all works undertaken still need to comply with Government policy, and if it is deemed that they could degrade the protected lands of the watercourse, the Department can require works to cease and issue a remedial notice to repair any damage.

Please note that the definition of a "river" in the Rivers and Foreshores Improvement Act is different to the definition in the Water Act and must be considered separately.

The proponent is advised to contact a 3A permit Resource Officer, at the Parramatta or Penrith Offices, to discuss Part 3A matters and possible inspection.

NSW State Rivers and Estuaries Policy - General.

The NSW Government has a policy to encourage sustainable development of the natural resources of the State's rivers, estuaries, wetlands and adjacent riverine plains. This is to reduce and where possible halt;

- declining water quality,
- loss of riparian vegetation,
- damage to river banks and channels,
- loss of biodiversity, and
- declining natural flood mitigation;

and to encourage projects and activities which will restore the quality of the river and estuarine systems such as;

- rehabilitating remnant habitats,
- re-establishing vegetation buffer zones adjacent to streams and wetlands,
- restoring wetland areas,
- rehabilitating of estuarine foreshores, and
- ensuring adequate streamflows to maintain aquatic and wetland habitats.

This includes ensuring the construction of any wetland or detention structure off-line, so as not to degrade the functions of that natural resource.

NSW Wetlands Policy - General

The NSW Government has a policy to encourage projects and activities, which will restore the quality of the States wetlands. The following principles will be applied in reviewing any proposal,

- Water regimes needed to maintain or restore the physical, chemical and biological processes of wetlands will have formal recognition in water allocation and management plans.
- Land use and management practices that maintain or rehabilitate wetland habitats and processes will be encouraged.
- New developments will require allowances for suitable water distribution to and from wetlands.
- Water entering natural wetlands will be of sufficient quality so as not to degrade the wetlands.
- The construction of purpose-built wetlands on the site of viable natural ones will be discouraged.
- Natural wetlands should not be destroyed, but when social or economic imperatives require it, compensation through the rehabilitation or construction of a wetland will be required.
- Degraded wetlands and their habitats and processes will be actively rehabilitated as far as is practical.
- Wetlands of regional or national significance will be conserved, and
- The adoption of a stewardship ethos and co-operative action between land and water owners and managers, government authorities, non-government agencies and the general community is necessary for effective wetland management.

Surface Water License Issues

The Department is responsible for administering the Water Act (1912), which is for the managing and regulating the use of surface water resources. Water extraction is governed by the Water Administration Act (1986). A bill is presently before Parliament called the Water Management Bill, which will consolidate these and other existing Acts. The new legislation is designed to provide better ways for the equitable distribution of water with an emphasis on environmental protection. Therefore any proposal that may take several years to be implemented may be impacted by changes to the new legislation.

Surface water Licences are issued for authorised works which:-

- Are connected with or which affect the quantity or use of water in a "river" or "lake". A "river" is defined as:- any 3rd or higher order watercourse, as shown on topographic maps.
  any "permanent" flowing stream irrespective of stream order.

Please note that the definition of a "river" in the Water Act is different to the definition in the Rivers and Foreshores Improvement Act and must be considered separately.

- Capture rainfall runoff, and are located on hillsides, gullies or minor non-permanent watercourses. (refer to the Farm Dams Policy below).

Authorised works can include one or a number (or variations on these structures) of the following:-

*	Pumps	*	Regulators	*	Off river storage
*	Pipes	*	Channels	*	Turkeys nest storage
*	Dams	*	Drains	*	Floodplain harvesting storages
*	Weirs	*	Cuttings	*	Tailwater storages
*	Locks	*	Excavations	*	Retentions basins
*	Barrages	*	Training banks		

A licence is issued for a particular purpose and can include one or a combination of the following:

a. General

* Irrigation
* Stock supply
* Domestic supply
* Town water supply
* Conservation of water
* Recreation
* Horticulture (*citrus, nuts, grapes)*
* Pisciculture (*fish farming)*
* Aquaculture *(crustaceans)*
* Soil conservation
* Augmentation of a watercourse
* Prevention of inundation
* Experimental/research purposes
* Drainage
* Changing the course of a watercourse
* Recirculation
* Farming purposes (*dairy, washing/preparing produce for market etc. See also processing produce under Industrial*).
* Firefighting
* Regulation of flow
* The capacity of the dam is greater than 7.0 megalitres. Dams less than 7.0 megalitres and for stock and domestic purposes only, form part of a riparian right and are not required to be licensed. However these dams will require a Part 3A Permit under the R&FI Act.

b. Industrial/Commercial

* Power generation
* Mining
* Industrial-sand and gravel
* Hotel
* Caravan park
* Intensive breeding (feedlot)
* Processing produce *(eg. poultry, fruit vegetables etc).*
* Industrial
* Abattoir
* Cannery
* Motel
* Boarding house
* Dust suppression

Details of the proposal are required, including design, layout, pumping and storage capacities, volumes of water to be used, all associated earthworks and infrastructure works etc. Also to be included are environmental impact management reports such as fauna and flora reports, geotechnical reports for salinity or acid sulfate soils etc. The EIS will need to demonstrate the commercial, environmental benefits and sustainability of the proposal.

The licensing process includes advertising which the consent body must undertake. Licenses are generally issued for 5 years.

There will be separate fees, including an application fee and other charges based on the capacity of the work, the purpose, the volumetric allocation or the area to be irrigated. Surface water licenses are also subject to annual charges as determined by IPART. The license must be obtained before any licensable works can be constructed.

Floodplain Management - General

Any development on flood prone land should be considered in accordance with the NSW Government's Flood Policy (1984) as set out in the Floodplain Development Manual (1986). These principles are further explained in the Government's draft Floodplain Management Manual (1999). The primary objective of the State Government's Flood Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers, and to reduce the private and public losses resulting from all levels of potential flooding. As outlined in the Manual the Policy is merits based, in which the impacts of flooding are balanced against planning, social, environmental and economic issues. The consent authority needs to check that all considerations in the Manual are adequately addressed in making decisions.

The management of flood prone land is primarily the responsibility of local government. The State Government provides technical assistance and, in association with the Federal Government, financial assistance for flood related studies, mitigation works etc.

In assessing any development proposal, consideration needs to be given, where appropriate, to the potential impacts of flooding on the proposed development; the impact of the proposed development on flood behaviour both upstream and downstream of the site; and the possible impacts of flooding on residents and other users of the floodplain. Particular attention should also be given to availability of safe access and egress from the site in times of flood. In this regard, the full range of potential flood events, up to the probable maximum flood (PMF) should be considered.

Impacts from development in isolation can be small. However, when considered in combination with other future development the impact might be significant. It is therefore prudent to assess the cumulative impacts of all likely development. A floodplain management study is an effective way of assessing these cumulative impacts.

Under the Government's Flood Policy, the determination of the acceptability of any afflux arising from proposed development should be merits based and would normally be a matter for the relevant consent authority. However, it should be noted that in some communities an afflux as small as 10 mm has needed to be addressed by way of providing some compensatory flood mitigation.

It is understood that the Department is closely involved in relation to this aspect of the proposal, and that the issues are being addressed to the satisfaction of the Department.

NSW Biodiversity Strategy

The NSW Government has a strategy for protecting the native biodiversity of NSW and for maintaining ecological processes and systems. The following principles will be applied in reviewing any proposal;

- Ensuring.that the proposal does not decrease native biodiversity of either individual species or communities of the site or area.
- Ensuring that the proposal is not part of any threatening process to the native biodiversity of the site or area.
- Determining if the proponent has been guided by the precautionary principle to show careful evaluation to avoid, wherever possible, serious or irreversible damage to native biodiversity, through an assessment of risk-weighted consequences of various options.

Crown Land Matters - General

Matters the proponent needs to consider when undertaking development adjoining Crown land include;

- Overland flows, including stormwater should not be concentrated or diverted from their natural flowline.
- Roofwater shall not be discharged directly onto Crown land.
- The velocity and volume of stormwater flows to Crown land must be no greater than those before the proposed development.
- Any stormwater control structure must be designed and constructed in accordance with, *Managing urban Stormwater, Soils and Construction.* NSW Dept of Housing, 3 Ed. (1998).
- Any excavation or fill is to be contained entirely on the proponents' property and shall not jeopardise the longevity of any vegetation on Crown land. Where fill is proposed adjoining the common boundary it shall be properly drained and retained or battered back and revegetated to prevent the escape of any material onto Crown land.
- Access to any part of the proponents property is not to be over Crown Land. Should the proponent wish to construct a Crown road, permission in writing must first be obtained from the Department.

- Any fire reduction zone that is required by a development, that adjoins Crown land is to be completely within that development boundary.
- Any other matters that may adversely impact upon the Crown land.

Crown Land- Major Public Authority Projects

Where Crown lands or Crown reserves are considered to be needed, as part of a major project, the land should be acquired using the provisions of the **Land Acquisition (Just Terms Compensation) Act 1991.**
Where tunnelling or deep excavation are to be undertaken as part of the project, a close examination of all the titles of the lands affected by the proposal is required. The titles for lands in some instances are restricted in depth. The lands below this depth restriction are considered to be Crown lands and as such compensation for the acquisition of these lands are payable.

Soil Conservation Act (1938)

The Soil Conservation Act (1938) and amendments provides for the conservation of soil and farm water resources and for the mitigation of erosion within NSW. Any land use activity that disturbs a vegetative ground cover creates an erosion hazard, which requires measures to minimise environmental degradation.

In relation to soil erosion, sedimentation and land degradation in general the Department advises that the Environmental Impact Statement (EIS) should address at least, but not be limited to the following issues:-

⇒ topography
⇒ landform
⇒ soil type
⇒ soil erodibility
⇒ site capability
⇒ potential for salinity problems.
⇒ acid sulfate and potential acid sulfate soils
⇒ vegetation management
⇒ erosion and sediment control strategy including techniques

Saline Soils

All developments occurring on the soils derived from the shales on the Cumberland Plain and other known areas of saline soil risk, have a high potential to be adversely impacted upon be a rising saline ground water table. Any development which clears vegetation, (particularly trees), and developments that are in the lower parts of the local landscape could cause a salinity impact, either on the site or off the site, and may not occur for several years after the development.

There are three factors to the development of salinity in an area. These are the salts that are contained within the vertical profile (whether topsoil, subsoil or bedrock); a shallow groundwater table (that will allow mobilisation of salts within the soil or bedrock) or, a shallow saline groundwater table.
In order to ascertain the presence of these factors it is recommended as a minimum:

1. Soil testing be undertaken at least every 500-1000m^2 and samples should be taken of the top 15cm, 15-30cm, 30-50cm, 50 -75cm and 75cm to 1m. If there is a salt crust anywhere on the site, a separate sample of the top 2cm should be undertaken. The location of sampling should ensure that the site is adequately represented in the results.

Note that when electrical conductivity is tested for the soil samples, the results should ensure that conversion factors allowing for the texture of the soil have been taken into account. A raw reading for electrical conductivity with no corrections for texture will give an incorrect and misleading result.

2. Water samples should be taken from piezometers and measure for electrical conductivity. Note that the position of groundwater relative to the ground surface is very important as a shallow watertable (<3m) will affect surface conditions. This may change over time (especially during and after rainfall events) so that a data recorder may be necessary unless frequent recordings can be taken manually.

It is strongly recommended that an electromagnetic induction survey be undertaken of the entire site to determine areas at risk. Proposed development(s) can then be undertaken with reference to this information especially in terms of future drainage, stormwater retention, open space and zoning requirements.

Please note that conditions are subject to change over time whether or not development is undertaken, and that the results of the above tests do not provide any guarantee that salinity will not become a land management issue in the future.
These impacts need to be considered, and remediation strategies developed to minimise the potential impacts. If your site occurs in these soils or locations, then you are advised to seek more site specific advice from Ms Susan Hayward, Regional Salinity Awareness Officer, phone contact 4722 1188

Erosion and Sediment control Plan

An integrated site development plan needs to be prepared, incorporating an Erosion and Sediment Control Plan, for the EIS. This plan shall cover the life of the proposed site extension, rehabilitation and closure, and ensure that the site land is stabilised to standards of the *Managing Urban Stormwater, Soils and Construction.* NSW Dept of Housing,, 1998, 3 Ed, and Consent Authority (which ever is the greater). The plan at the EIS stage should be detailed enough to enable any reviewer to determine that the concepts for control are sound and practical. The sizes and location of control works should be according to design and the accepted policies, and the revegetation/ landscape plan will enhance the native vegetation biodiversity of the site. It is expected that the following detail will be made available upon request, if required. This same detail is what will be required before the Construction Certificate stage.

- ⇒ Soils investigation to determine erosion and sediment control design
- ⇒ Details on proposed erosion control practices
- ⇒ Details on proposed sediment and pollution control practices
- ⇒ Discharge calculations for diversionary works
- ⇒ Design specifications for banks and sediment basins
- ⇒ Detailed rehabilitation practices including selection of tree, shrub and cover crop species and implementation method
- ⇒ Maintenance and monitoring program for sediment and pollution control structures
- ⇒ Assessment of off-site impacts for surface flow from the development
- ⇒ Rehabilitation proposal for existing erosion on or adjacent to the site
- ⇒ Plans at suitable scale and with diagrams and notation clearly displayed
- ⇒ Details of development works for sequence and staging
- ⇒ Location of critical areas (water bodies, drainage lines, unstable slopes, rock outcrops, hard cover areas, flood plains and wet areas).
- ⇒ Location of all earthworks including roads, areas of cut and fill or land regrading
- ⇒ Diversion of uncontaminated up-site runoff areas to be disturbed
- ⇒ Existing and final contours
- ⇒ Revegetation program

Vegetation - Cumberland Plains areas.

All developments occurring on the soils derived from the shales on the Cumberland Plain should not remove or harm native vegetation from the site. This is before checking whether the vegetation is the Endangered Ecological Community called the Cumberland Plain Woodland, and the appropriate authority issued by the National Parks and Wildlife Service.

Vegetation other Endangered Ecological Communities

If there is any native vegetation upon the proposed development site\s, the proponent must check that there is no other Endangered Ecological Communities. There have been several recently listed, and an up to date listing, details of potential location, and description should be obtained from National Parks and Wildlife.

Vegetation - Native vegetation establishment near native vegetation areas.

The Department recommends that developments integrate an endemic native revegetation program. This is to minimise or prevent potential environmental weeds spreading into any existing nearby native vegetation areas and to minimise the fragmentation of any native vegetation by the development.

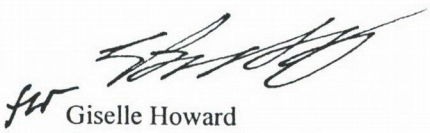
Vegetation - Native plant enhancement.

The Department recommends that developments, where applicable, integrate a bush regeneration program within the development. This is to minimise the on and off-site environmental weed invasion potential and enhance any native vegetation.

Works should enhance, or at least not further disrupt corridor functions for flora and fauna movement. This should be assisted by the larger box culverts proposed to be installed, and can also be assisted by ensuring revegetation with local native species, especially on areas adjoining existing bushland and watercourses. Also, seed should be collected from any native plants to be destroyed, and the plants mulched for respreading on disturbed areas.

I trust the above comments will be useful in the preparation of the EIS. The Department will require three full copies of the EIS to be sent to Greg Brady, Environmental Review Co-ordinator, at the address supplied. Should you have any questions please contact Greg Brady on (02) 9895 7441.

Yours sincerely,



fw Giselle Howard
Resource Planning Manager
Sydney/South Coast Region

Our Ref: ERM001030
Your Ref:

7 February 2001

LAND & WATER CONSERVATION

Project Manager
Environmental Planning Pty Ltd
PO Box 390
PYMBLE NSW 2073

Dear Sir/Madam,

Re: REF, McGraths Hill Flood Evacuation Route for Windsor road works, between Curtis Road, McGraths hill and south of Bandon Road, Vineyard

Thank you for the opportunity of reviewing the REF for the above proposal. The Department apologies for not getting comment to you at an earlier date.
The documents supplied have been reviewed and the sites inspected. The following comments are provided to assist with progressing planning of the project.

Rivers and Foreshores Improvement Act 1948 (R&FI)

The works are located on a number of minor watercourses that drain to Killarney Chain of Ponds. No permits are currently required for the works (under Part 3A of the R&FI) as they are being undertaken by a Public Authority, however all works should be undertaken in accordance with the aims of the NSW State Rivers and Estuaries Policy.
Specifically it is recommended that the drainage designs consider ways in which the ecological functions of the riparian corridors may be maintained and enhanced, including at some sites the use of open based box culverts that provide a range of crossing options for both aquatic and terrestrial fauna.
.If works are to be continuing into the following year within 40 metres of these watercourses a permit may be required due to expected changes to legislation. It is recommended that the proponent check with the Department at that time.

Native Vegetation Conservation Act 1997 (NVCA)

Within the Hawkesbury and Blacktown LGA's the NVCA applies only to areas of State Protected Land. The subject site contains no areas of State Protected Land, and therefore no approval is required under the NVCA for the clearing of native vegetation.

A staged revegetation program will be required to minimise the area and duration of soils exposed on site. Long term revegetation of the site should be planned to enhance native vegetation biodiversity, to maintain and enhance native vegetation corridors, and should therefore be based on the use of native plant species of local provenance. Note that the collection of native seed and propagation of seedlings can take in excess of twelve months. This should be factored into the planning process to ensure plant material is available when required. Failure to plan ahead for revegetation is a very common problem on infrastructure development projects.

It is hoped that the above comments are helpful in progressing planning for the site. Please contact the undersigned for further input as required.

Department of Land and Water Conservation Sydney / South Coast Region
Sydney Metropolitan Office Level 9, 2-10 Wentworth Street Parramatta 2150 P.O. Box 3935 Parramatta 2124
Telephone: (02) 9895 7715 Facsimile: (02) 9895 7255

I trust the above comments are useful. Could you please direct any questions or correspondence to Greg Brady, Environmental Review Co-ordinator, phone contact (02) 9895 7441.

Yours sincerely,

for Giselle Howard
Manager Resource Planning
Sydney/South Coast Region

Our Reference : SR110
Contact : Rob Pearson 9995 6837

RECEIVED 12/9/00

NSW EPA

Sydney Regions

Mr Bruce Adcock
Environmental Planning Pty Ltd
PO Box 390
PYMBLE NSW 2073

Dear Mr Adcock

McGraths Hill Flood Evacuation Route-Review of Environmental Factors

I refer to your letter of the 21 August 2000, seeking comments from the Environment Protection Authority (EPA) on the proposal to upgrade Windsor Road so as to provide a flood evacuation route for the local community at McGraths Hill. The comments are sought to assist in preparation of a Review of Environmental Factors (REF) for the project.

From the information submitted, it is not clear as to whether the project comes within the schedule to Protection of the Environment Protection (PoEO) Act, 1997. This needs clarification and assessment as to whether the project is a scheduled activity and needs to be subject of an Environment Protection Licence.

In addition, I note that it is intended to carry out night work on the project. Wherever possible, any night work that may cause offensive noise at residences or other noise sensitive receptors should be avoided. Night work may be avoided by making the appropriate approaches to the Transport Management Centre (TMC) to seek approval for daytime lane closures to enable the work to be conducted within reasonable hours.

If night work is unavoidable as a result of TMC decisions on daytime lane closures, the Roads and Traffic Authority (RTA) practice guideline for road works conducted outside normal working hours should apply.

Notwithstanding the above, I have attached the following standard comments for environment protection issues to be addressed in preparation of the REF for road projects.

If you have any queries in relation to the matter, please do not hesitate to contact Rob Pearson on 9995 6837.

Yours sincerely,

P. Finlay 7/9/00

Penny Finlay
Principal Officer, Sydney Planning
For Director–General

Environment Protection Authority
PO Box 668 Parramatta NSW 2124 Australia
Level 7 79 George Street Parramatta NSW 2150
Telephone 61 2 9995 6800
Facsimile 61 2 9995 6900
www.epa.nsw.gov.au

STANDARD ENVIRONMENT PROTECTION ISSUES TO BE ADDRESSED IN THE PREPARATION OF A REVIEW OF ENVIRONMENTAL FACTORS (REF) FOR ROAD WORKS

The document is intended only as a general guide. For minor proposals the issues outlined may be too extensive and for major proposals, or for proposals in sensitive locations or over waters, the issues outlined below may not be exhaustive.

For proposals which do not require an EPA licence, the RTA will determine (under Part V of the Environmental Planning and Assessment Act, 1979) whether the works should proceed and what environment protection measures are required. In these cases, the RTA and its contractors will need to ensure the project is managed according to environmental best practice using recognised environment protection procedures.

Where there are any queries, particularly related to large scale works or for works in sensitive environments, the project should be discussed with the EPA.

GENERAL COMMENTS

The EPA considers that a REF should provide an overall environment protection perspective. Issues, which should be addressed, include:

- the impact of the proposal on the existing road system, traffic congestion, public transport and induced traffic;
- the impact of the works on, and opportunities to improve, pedestrian and cycleway facilities;
- the environmental and cost savings possible by adopting energy efficiency measures. Energy efficiency targets are encouraged at the REF stage;
- the implications of the project on air quality both locally and regionally,
- the control of air emissions during construction,
- the management of both construction and operational noise and vibration impacts,
- the impact of the project on water quality both during construction and operation and the measures that need to be implemented to mitigate the impacts,
- the issue of waste generation and disposal,
- the issue of land contamination and acid sulfate soils and
- the possible cumulative environmental impacts and proposals to manage these cumulative impacts.

The Department of Urban Affairs and Planning (DUAP) *"EIS Guideline for Roads and Related Facilities"* (September 1996) is a useful background document and in particular section 6E: Specific requirements for an EIS – The Environmental Issues.

SPECIFIC COMMENTS.

Noise and Vibration Issues

The primary objectives are the control of intrusive noise and the maintenance of residential amenity. The assessment of likely impacts and discussion of mitigation measures should address both the construction and operational phases of the project. An assessment of the impacts of intrusive noise and the likely frequency of such events should be included in the REF.

The EPA's Environmental Noise Control Manual (ENCM) and the Environmental Criteria for Road Traffic Noise are the relevant guidelines for construction noise and operational noise respectively.

Baseline information should be provided for all properties likely to be affected in order to allow evaluation of the projected noise and vibration impacts of the proposal. This could include one week of valid noise data. Noise descriptors of LA_{90} (background noise levels), LA_{10} and LA_{eq}

(equivalent continuous noise level) should be used and collected in a manner that is not affected by rain or winds greater that 5 m/s.

Following are points taken from the ENCM relevant to the construction phase:

- Guidelines for construction noise take into account the fact that these activities are transient and that noise from construction activities is often difficult to limit even with good control measures. EPA target noise levels are:
- background + 20dB(A) for periods less than 4 weeks
- background + 10dB(A) for periods between 4 and 26 weeks
- background + 5dB(A) for periods greater than 26 weeks
- A noise management plan should consider aspects such as: timing of noisy activities; selection of "quiet" equipment; use of noise barriers; scheduling of noisy activities to ensure that they are completed in the shortest period possible; and communication strategies with residents etc. Such a plan should cover issues identified in DUAP's Guideline under Noise and Vibration (a)-(d).
- Recommended construction hours are:
  - Monday to Friday, 7am to 6pm
  - Saturday, 8am to 1pm.
  - No work on Sundays or Public Holidays

  Where these hours may need to be varied details should be provided of when and why, and how work would be managed to minimise impacts.
- Details of the potential noise and vibration impacts from construction activities, including noise from construction machinery, eg drilling, digging. Third octave band sound power levels for the construction equipment. Vibration guidelines can be found in Chapter 174 of the ENCM and should be applied as appropriate.
- Details of any proposed noise-monitoring program to demonstrate compliance;
- Details of truck movements, how road traffic will be managed during the construction phase, any necessary parking facilities etc
- The type of road surface to be used should be included.

The REF needs to address the traffic noise impact of the operational phase of the road and indicate the measures needed to ensure compliance with the EPA's Environmental Criteria for Road Traffic Noise.

Acid Sulfate Soils & Land Contamination

The Department of Land and Water Conservation (DWLC) Acid Sulfate Soil Probability Maps should be used to indicate whether the proposed excavation areas could contain Acid Sulfate Soils.

It is recommended that the proponent conduct a preliminary assessment in accordance with the 1998 New South Wales Acid Sulfate Soils Management Advisory Committee publication, *Acid Sulfate Soils – Assessment Guidelines*. This preliminary assessment should determine whether acid sulfate soils are present and if the proposed works are likely to disturb these soils.

If acid sulfate soils are likely to be disturbed by the works, an appropriate Acid Sulfate Soil Management Plan may be required. Relevant guidelines are outlined in the 1998 New South Wales Acid Sulfate Soils Management Advisory Committee publication, *Acid Sulfate Soils – Management Guidelines*.

Any contaminated land identified, needs to be assessed and managed in accordance with EPA approved quidelines and within the provisions of the Contaminated Land Management Act 1997.

Air Quality Issues

Air quality issues that should be considered in the REF for the construction works include:

- emissions of dust generated by activities such as earthmoving, excavation, loading and vehicle traffic (particularly from unsealed roads and surfaces), wind erosion from exposed surfaces and stockpiles etc;
- assessment of the impact of exhaust emissions from vehicles and other motorised equipment being operated on-site;

An air quality management plan (AQMP) should be developed for the site to describe proposed mitigation measures and safeguards to control dust generation and to minimise impact on nearby receptors.

Mitigation measures and safeguards referred to in the REF should include:

- properly maintained equipment, designed and operated to control the emission of smoke, dust, fume and other objectionable material into the atmosphere;
- spraying of earthworks, roads and other surfaces as necessary with water or other suitable liquids and the provision of dust suppression equipment;
- all working areas, access roads and disturbed areas to be stabilised as soon as practicable to minimise the generation of wind blown dust;
- staging of clearing works to minimise the generation of wind blown dust;
- proposed public consultation program to inform nearby residences of impending activities likely to generate significant quantities of dust and particulate matter;
- proposals for the resolution of air complaints and details of a complaints handling and recording system;

Dust is a major issue during the construction phase. For sites that contain contaminated materials, dust management controls are even more critical. A dust management plan should be prepared for potentially dusty developments or developments that contain contaminated material. This should include: identification of sensitive receptors (eg. residences, schools, nursing homes, hospitals); prediction of dust fall-out and dust concentrations using appropriate air dispersion modelling with the assumed "worst case scenario"; proposed mitigation measures and safeguards to minimise impacts; and details of any proposed public consultation program to inform nearby residents when particularly dusty activities are proposed.

In relation to the operation phase information should be included on the projected changes in traffic volume and traffic type on the proposed road and the adjacent road network and likely changes to the existing air quality at various locations along the proposed route.

Water Issues

The REF should identify, describe and assess the potential impacts of the development on water quality and the aquatic environment both during construction and operational phases, and describe the measures to avoid or minimise these impacts. Water quality management and protection should be in accordance with the local authority's stormwater management plan for the catchment.

An integrated soil and water management plan should be developed to prevent an increase in pollutant loads being exported from the site during construction. The following documents will assist in the development of the plan:

- Managing Urban Stormwater: Treatment Techniques (EPA 1997)
- Managing Urban Stormwater: Soils and Construction (Landcom and the Department of Housing)

Relevant issues for consideration include:

- the potential for water pollutants to be generated,
- measures to be taken to collect, store and treat stormwater, wash down water, wheel wash water etc, prior to any discharge from the site, options for water re-use on the site should be considered,
- materials storage areas, ponds or beds for slurry or other materials,
- management methods to ensure that earthworks do not export sediment,
- measures to prevent litter entering water courses eg; trash racks, and details of permanent gross pollutant traps or other water pollution control devices proposed for the operational stage,
- proposed controls for refuelling facilities during construction eg, oil separators, emergency absorbent booms or pillows,
- identification and mapping of the extent and nature of any site contamination including detailed measures proposed to deal with any contamination in accordance with ANZECC publication "Guidelines for the Assessment and Management of Contaminated sites 1992",
- identification of any significant effects on hydrological conditions and appropriate hydrological studies,
- monitoring proposals, and
- consideration of the impact of the proposal on upstream and downstream flooding taking into account any existing flood plain management plans. Where warranted a flooding contingency plan should be prepared and submitted to DLWC, relevant councils, and Sydney Water (as appropriate).

Hazards Issues

Consider the need for a Hazard and Emergency Management Plan. If warranted it should be consistent with Local Emergency Management Plans and should address handling, transport and storage of hazardous materials including spill requirements and fire water management during construction and operation of the road.

Waste and Spoil Management

Waste Management

The REF should determine and classify in accordance with EPA guidelines the types of spoil material generated and the different disposal strategies for each material. 'Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes (EPA 1999). Waste management principles, starting with minimisation should be applied to each stage of the project's development, including the concept design and construction stages.

If large quantities of spoil material are likely, the REF should determine and classify the types of spoil material in accordance with EPA Guidelines. The reuse/disposal strategies for each material should be included and if reuse on site is impractical, use in other projects is the preferred strategy.

If tree removal is unavoidable, the trees should preferably be chipped on site, and used for landscaping on adjacent areas. Alternatively, cleared timber may be sent to commercial processors or offered to the public. No trees should be bulldozed, burned in the open, or sent to landfills. Other green wastes should be sent for reprocessing, either directly to commercial composters or to transfer stations.

Suppliers of construction materials should be required to reduce unnecessary packaging or to use durable reusable packaging, pallets, crates and drums. Where packaging materials cannot be reused, recycling options should be thoroughly investigated.

Wastes should be source separated and sent to recycling outlets. Recycling facilities should be made available to site staff operating from temporary officers near the road or on the road corridor.

Spoil Management

Management of any contaminated soils should be included in an Environmental Management Plan. The REF should fully investigate the cost of treatment and disposal prior to commencement of works so that adequate resources are allocated to this task and should pay particular attention to:

- re-use on site;
- investigation of re-use on other sites and developments;
- recycling for use in the construction industry (contaminated spoil material will require special measures.);
- the quantity of spoil material likely to be generated;
- proposed strategies for the handling, stockpiling reuse /recycling and disposal of spoil;
- the need to maximise reuse of spoil material in the construction industry (no landfill disposal)
- identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material; and
- designation of truck routes for transport of spoil and proposed times of truck activity.

Flora and Fauna

The REF should include a detailed assessment of the likely ecological impact of the proposal on both terrestrial and aquatic communities and individual species. Remnant and regenerated vegetative communities should be identified and assessed for their value as habitat and wildlife corridors surveyed for rare or endangered flora and fauna species. For detailed advice, the EPA recommends contacting the National Parks and Wildlife Service.

For detailed advice, contact the NPWS, but in general the following issues should be used:

- maximise retention of remnant native vegetation
- utilise local seedstock for planting wherever possible
- maximise linkages between areas of biodiversity value
- refer to the "Green Web" vegetation corridors
- rehabilitate sites when work is complete
- retail topsoil for later reuse

Environmental Management Plan (EMP)

The EPA recommends the preparation of an environmental management plan to guide environmental performance during the project. The EMP should address environmental awareness and skills training for all workers, including contractors, working on the project and in addition to the issues listed above it should also include the following important components:

- appropriate mitigation measures to ensure that operations do not cause unacceptable pollution, cause an unacceptable risk to public health or impact on the amenity of surrounding residents:
- clearly defined and appropriate environmental objectives, referring to relevant guidelines and standards;
- adequate environmental monitoring and reporting programs to ensure that performance is assessed against environmental objectives; and
- clear and appropriate contingency strategies.

Hawkesbury Nepean
CATCHMENT MANAGEMENT TRUST

14 September 2000

RECEIVED 19/9/00

Mr Bruce Adcock
Director
Environmental Planning Pty Ltd
PO Box 390
PYMBLE NSW 2073

Contact: Brian Walters
Our Ref: u:\BWalters\Sub\McGrathsFloodEvac.doc

Dear Mr Adcock

Review of Environmental Factors for McGraths Hill Flood Evacuation Route

The Trust is pleased to provide the following comments regarding the proposed Review of Environmental Factors (REF) for the preferred flood evacuation route for McGraths Hill (your letter of 28 August 2000).

It is understood that:

- Studies carried out by the Roads and Traffic Authority (RTA) have indicated that a high level evacuation route to the east is required so that evacuation of the Windsor/McGraths Hill urban areas conforms to the recommendation of the Hawkesbury-Nepean Floodplain Management Strategy.
- The proposed upgrading of Windsor Road to provide flood evacuation will link with the proposed evacuation route across the lower South Creek floodplain which is the subject of a separate Environmental Impact Statement.

Linkage with the South Creek Crossing

As you are aware, peak hour traffic along Windsor Road between Vineyard and Windsor is very heavy and traffic congestion is common. It seems likely that action to improve traffic flow will be necessary in the short term.

An option being considered for the South Creek crossing is an arterial road to the north of the railway line linking into the McGraths Hill evacuation route at Groves Avenue. In the event that this northern route is selected , it is likely that major roadworks will be needed on the McGraths Hill - Vineyard section of Windsor Road in the near future to enable it to perform an arterial road function. The Trust therefore requests that roadworks proposed for the McGraths Hill evacuation route be compatible with the future upgrading of Windsor Road generally.

Sydney Regional Environmental Plan No.20

The REF should address the relevant provisions of Sydney REP 20, particularly the specific planning policies and recommended strategies set out in clause 6. The

Hawkesbury-Nepean Catchment Management Trust, 68 Mileham St, (PO Box 556), Windsor NSW 2756
Tel: (02) 4577 4243 Fax (02) 4577 4236

Healing the Hawkesbury - Nepean Together

proposed REF should demonstrate how these provisions have been addressed with particular attention being given to the following:

- **Clause 6 (3); Water quality** - An erosion and sediment control plan should be prepared to cover both construction and operational conditions.
- **Clause 6 (4) Water quantity** - The Trust's policy is to maintain as far as possible the existing hydrological patterns. The REF should address any likely interference with present flow patterns caused by the road modifications.
- **Clause 6 (5); Cultural heritage** – An Aboriginal site survey should be carried out prior to finalising the design of the road modifications.
- **Clause 6 (6); Flora and fauna** – Although the habitat in the vicinity of the proposed roadworks has been extensively modified, flora and fauna surveys should be carried out to establish whether regionally or locally significant species are present.
- **Landscaping** - The REF should provide details of any proposed landscaping of the road verges. Information provided should include:
  - Plant species proposed – these should be species indigenous to the local area.
  - Weed control, particularly the prevention of spread of environmental weeds that may be present in imported fill material.

Yours faithfully

PETER DAVEY
Chief Executive Officer

Healing the Hawkesbury - Nepean Together

Sydney
WATER

Official Supplier to Australian Swimming

S:\doy\44593111.doc

11 September, 2000

Officer: Danny O'Meley
Tel: 0247 205 211
Fax: 0247 314 896

Ref: 445931 FA

Environmental Planning Pty Ltd
P.O. Box 390
PYMBLE
NSW 2073

RECEIVED 14/9/00

Attention: Mr. Bruce Adcock

Dear Sir,

Re: Review of Environmental Factors for McGraths Hill Flood Evacuation Route on Windsor Road between Curtis Road and South of Bandon Road.
Your Reference: Concept Plan 0184.091.CD.0004

Reference is made to your letter of 21/8/2000 received by Urban Development 5/9/2000. Sydney Water has water infrastructure along and across Windsor Road at the above location. These mains are detailed on the enclosed plans.

The mains may be affected, to some degree, by any proposed changes to carriageway width / road levels and consequently may require adjustment due to the proposal. If affected, the watermains will require adjustment out of the carriageway to footway locations and/or adjustment to standard depth by re-laying. Watermains crossing major roads need to be re-laid as "maintenance free" as per the required standard. The mains in side streets may also require adjustment to suit any new intersection designs.

Investigations have also shown that a new 300mm watermain will need to be laid along Windsor Road to allow for future development. Provision should be made to accommodate this future watermain within footway areas of the new road design.

Sewer mains in this area are under the control of Hawkesbury City Council. You will need to consult Council on this matter.

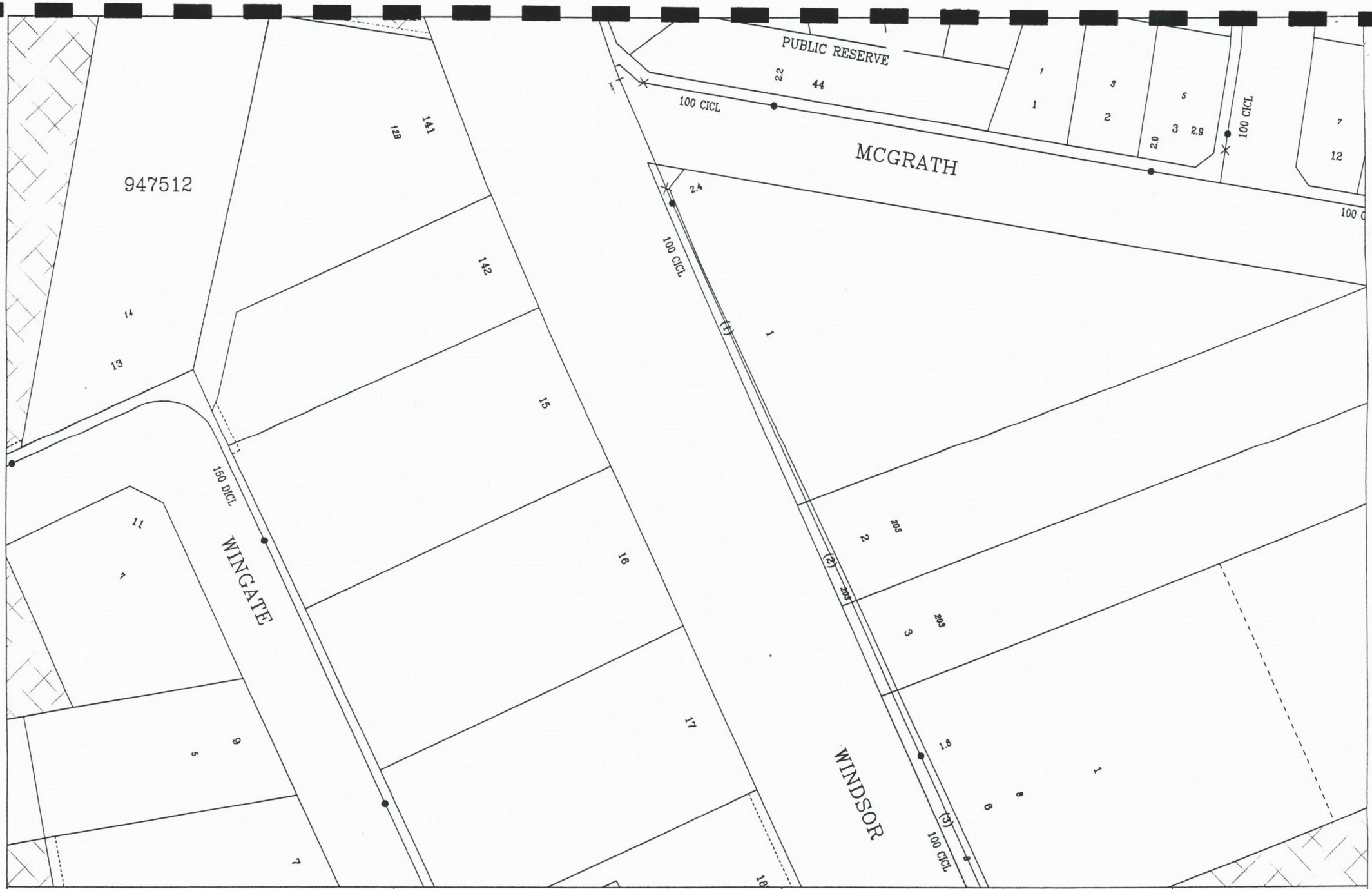
Only general comments can be made at this stage. If more information is required, a full set of road design plans (including cross sections) should be submitted to the Corporation when they become available.

Please contact the writer on the above phone number should you wish to discuss this matter further.

Yours faithfully

Danny O'Meley
Developer Activity Officer
Penrith Commercial Centre
P.O. Box 736,
Penrith NSW 2751

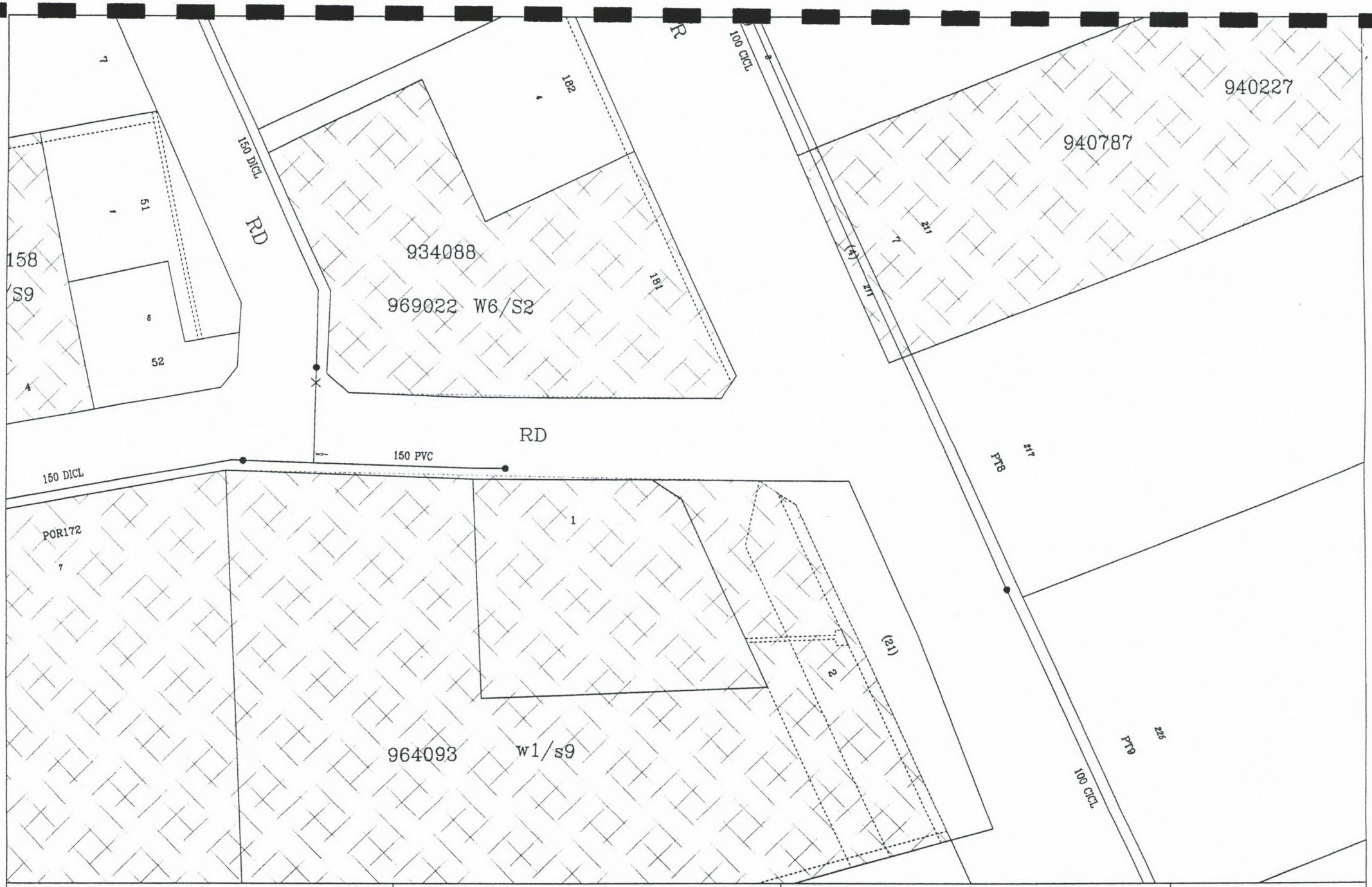
Enc.



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 284707 1278378

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 284753 1278187

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 284883 1278001

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

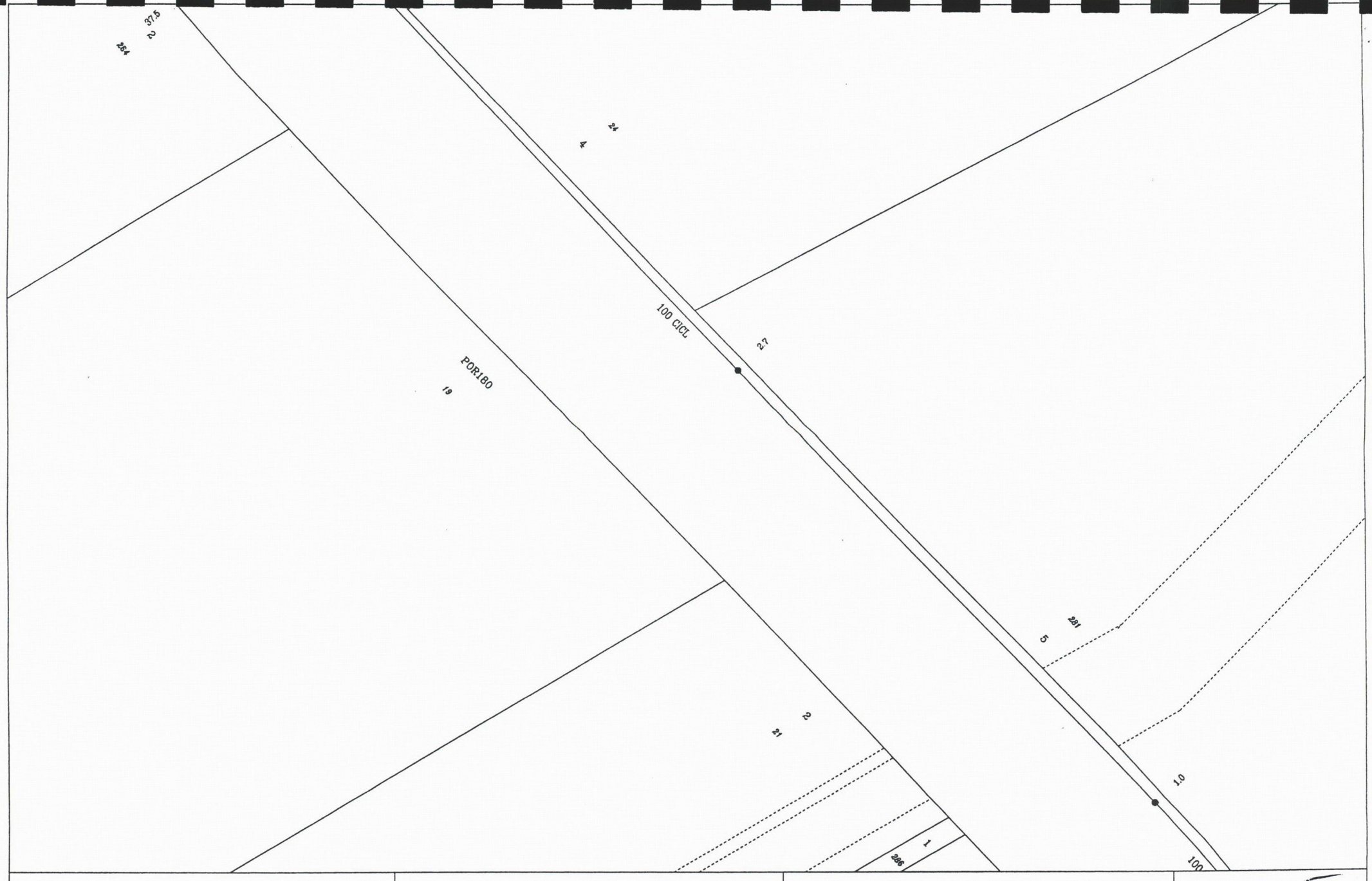
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 284967 1277817

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 285119 1277647

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 285289 1277463

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

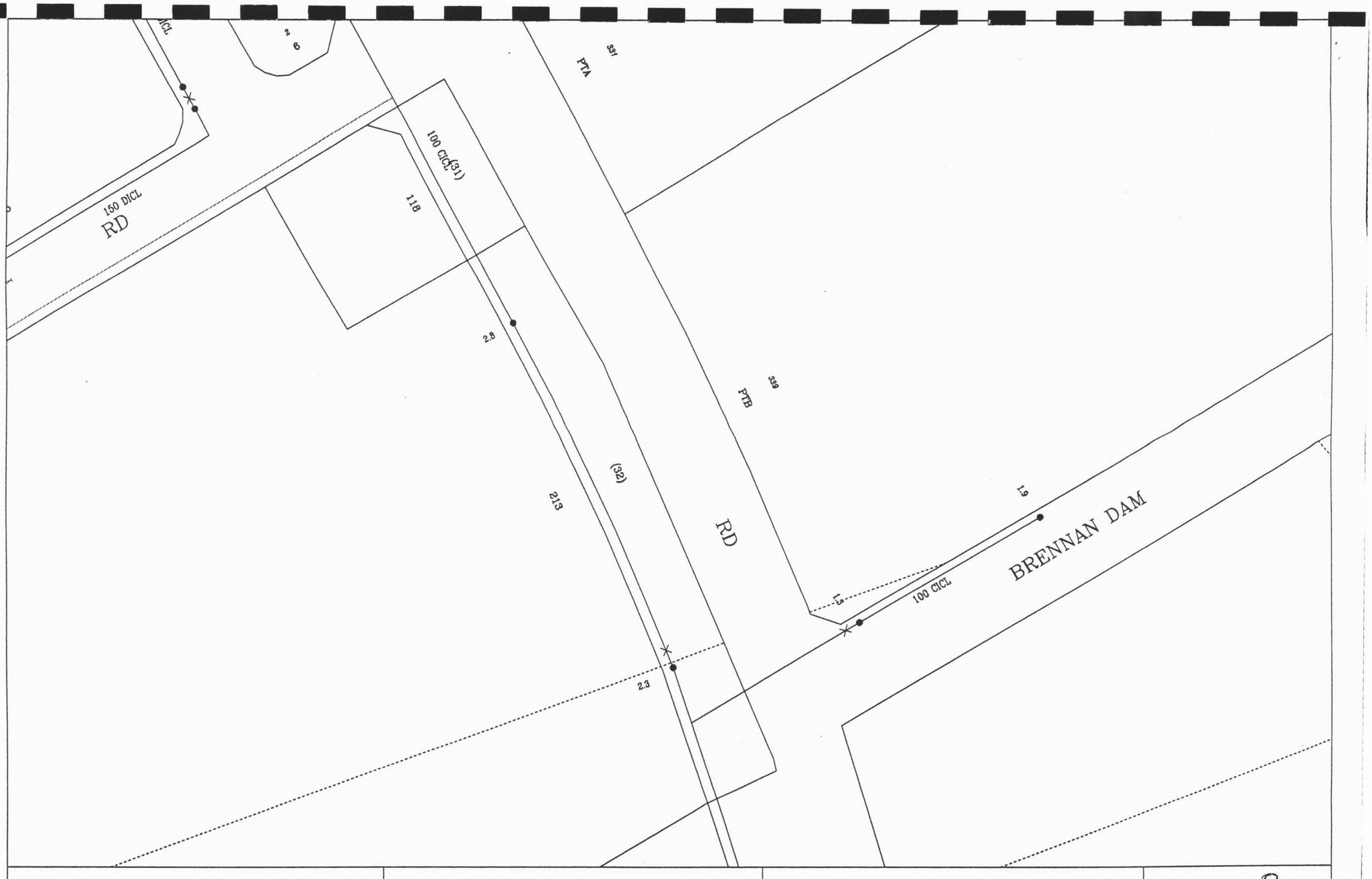
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



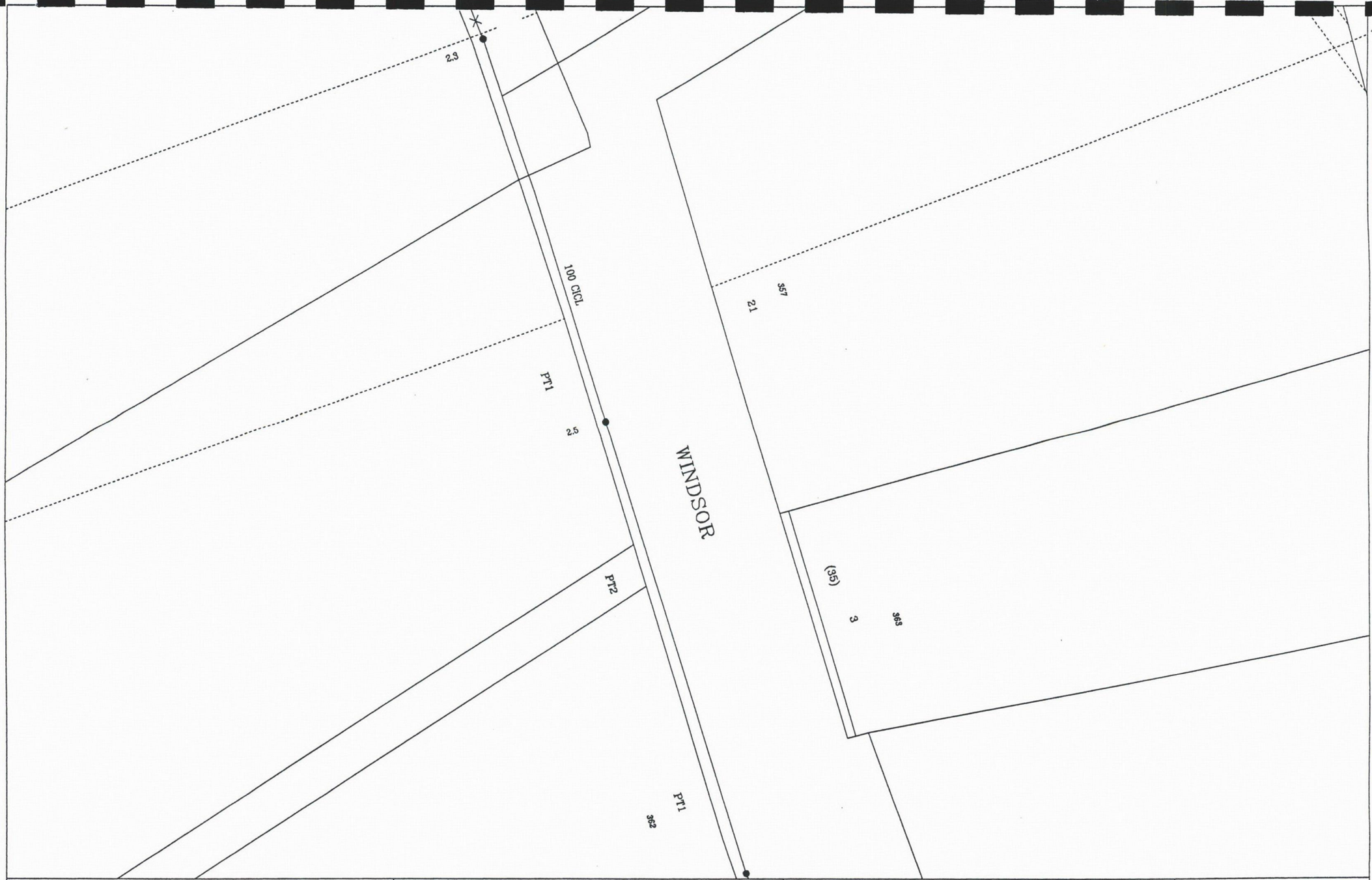
plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 285382 1277281

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



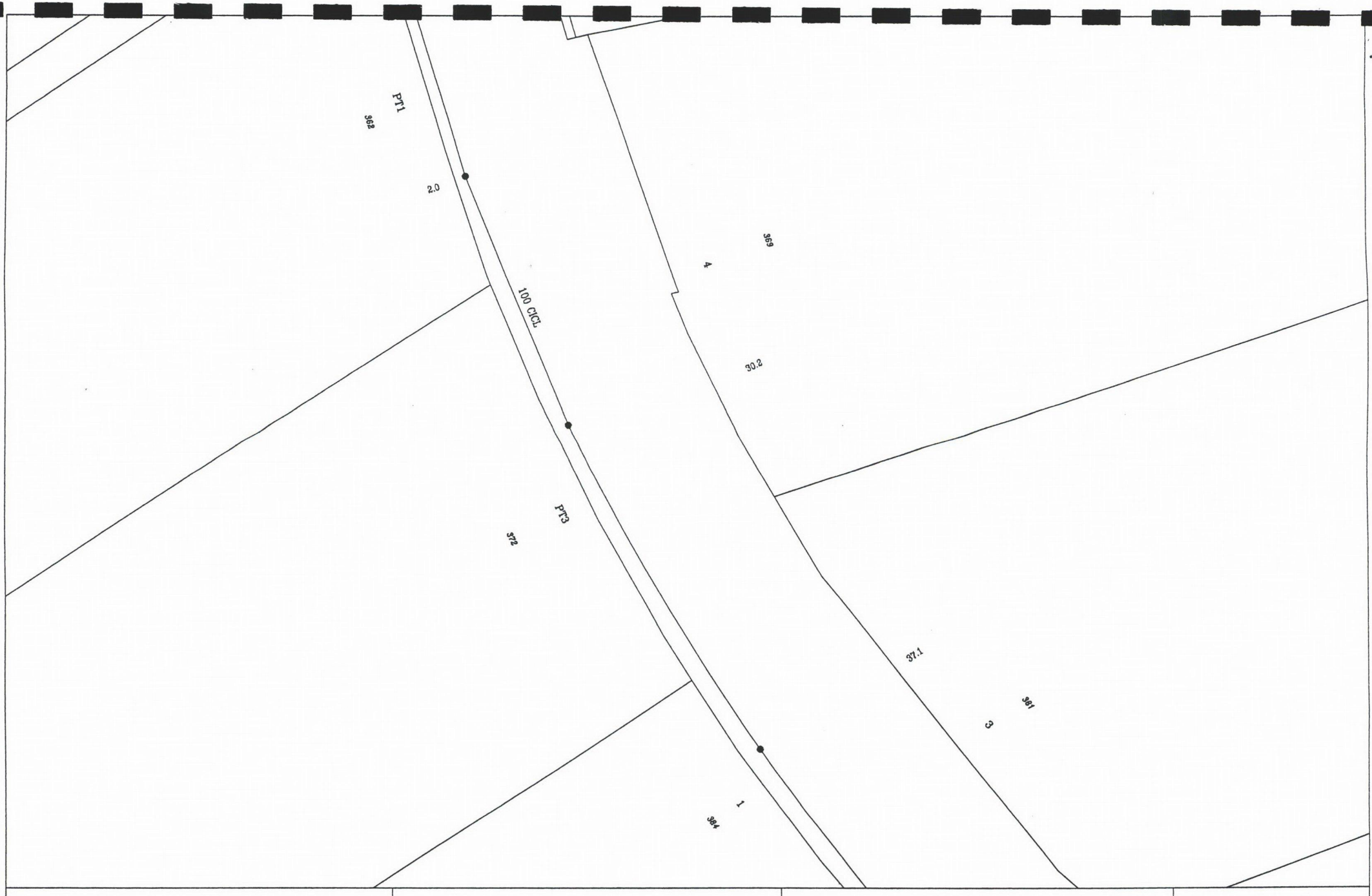
plot_menu_field 1 plot_menu_field 2 ISG Zone 56/1 (m) Central Co-ord: 285471 1277124	Produced By: Danny Leslie O'Meley Date of Production: 11/09/2000 Scale: 1:1165	Copyright Reserved Sydney Water 2000 No warranty is given that this is complete or accurate. SYDNEY WATER CORPORATION	8 Page Number



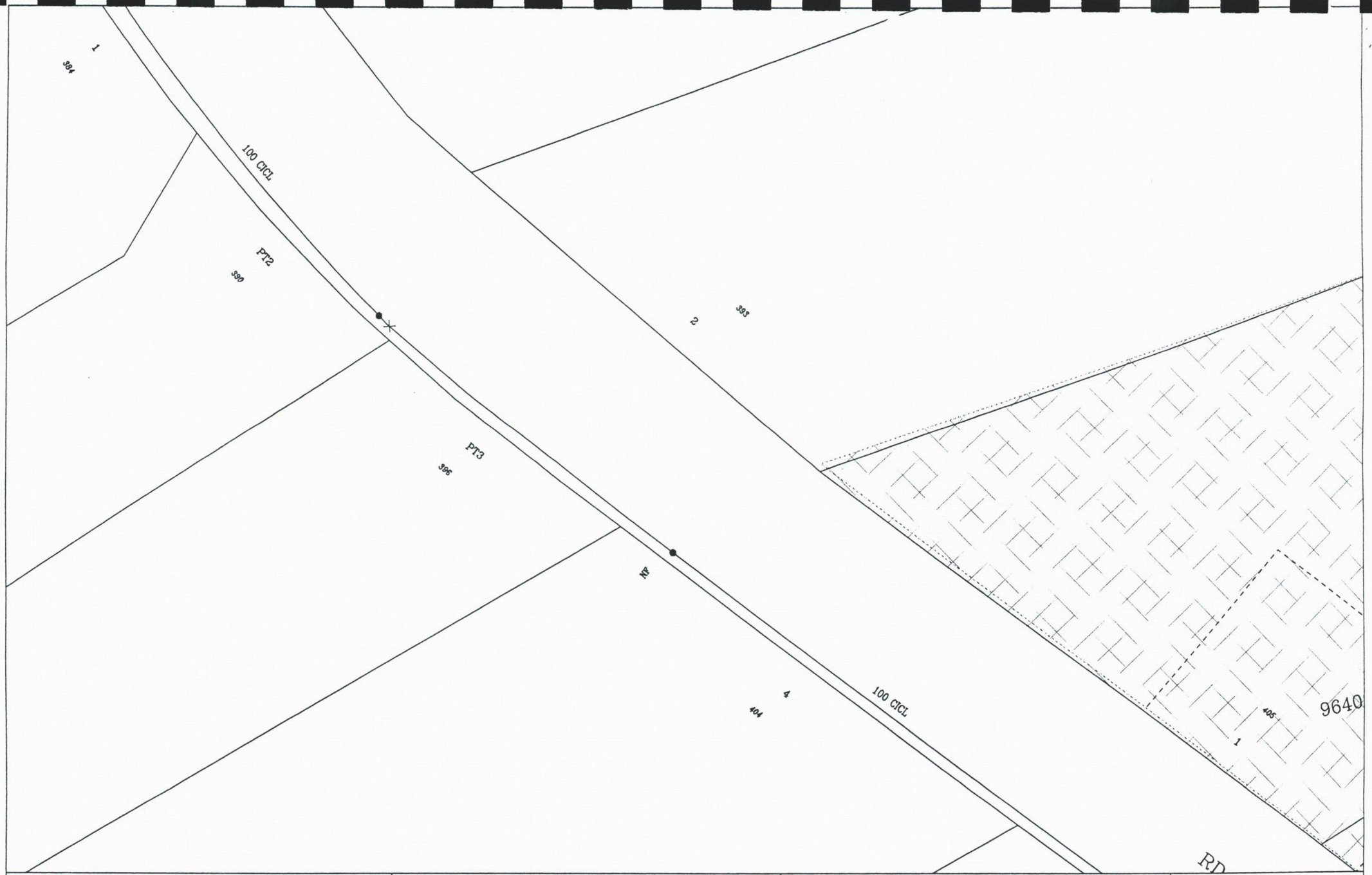
plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 285521 1276973

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



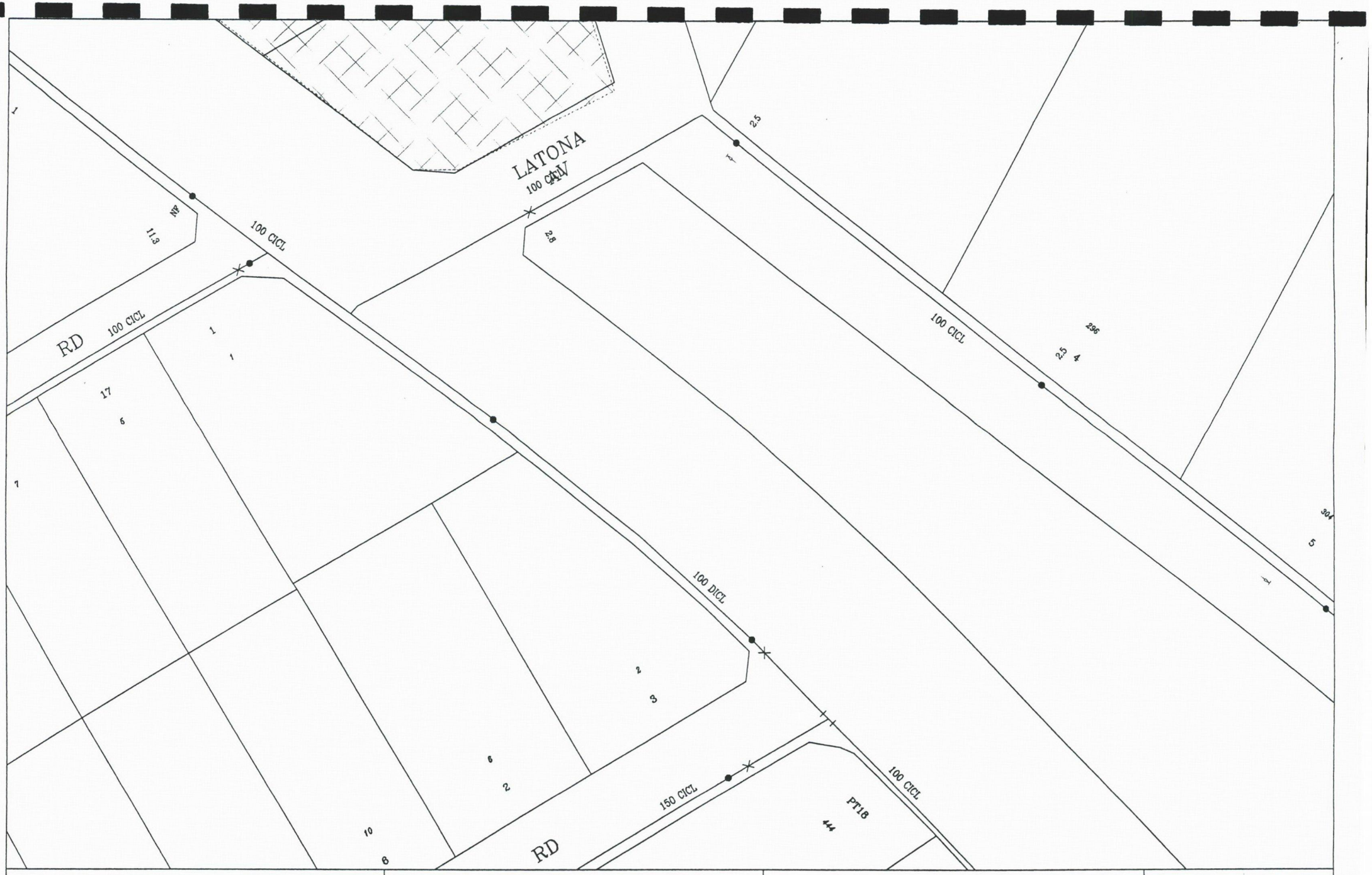
plot_menu_field 1 plot_menu_field 2 ISG Zone 56/1 (m) Central Co-ord: 285588 1276805	Produced By: Danny Leslie O'Meley Date of Production: 11/09/2000 Scale: 1:1165	Copyright Reserved Sydney Water 2000 No warranty is given that this is complete or accurate. SYDNEY WATER CORPORATION	10 Page Number



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 285743 1276628

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

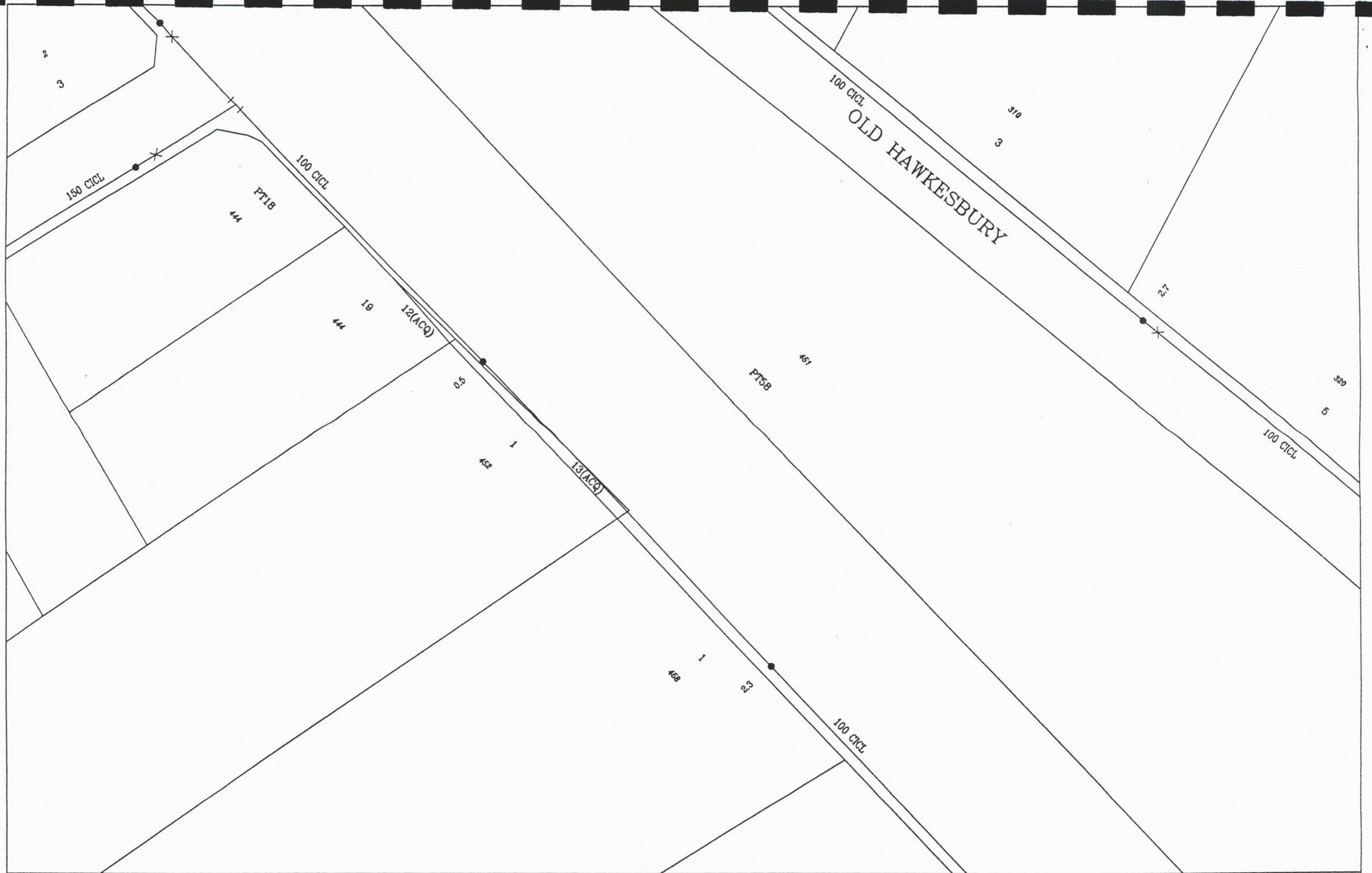
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286015 1276421

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

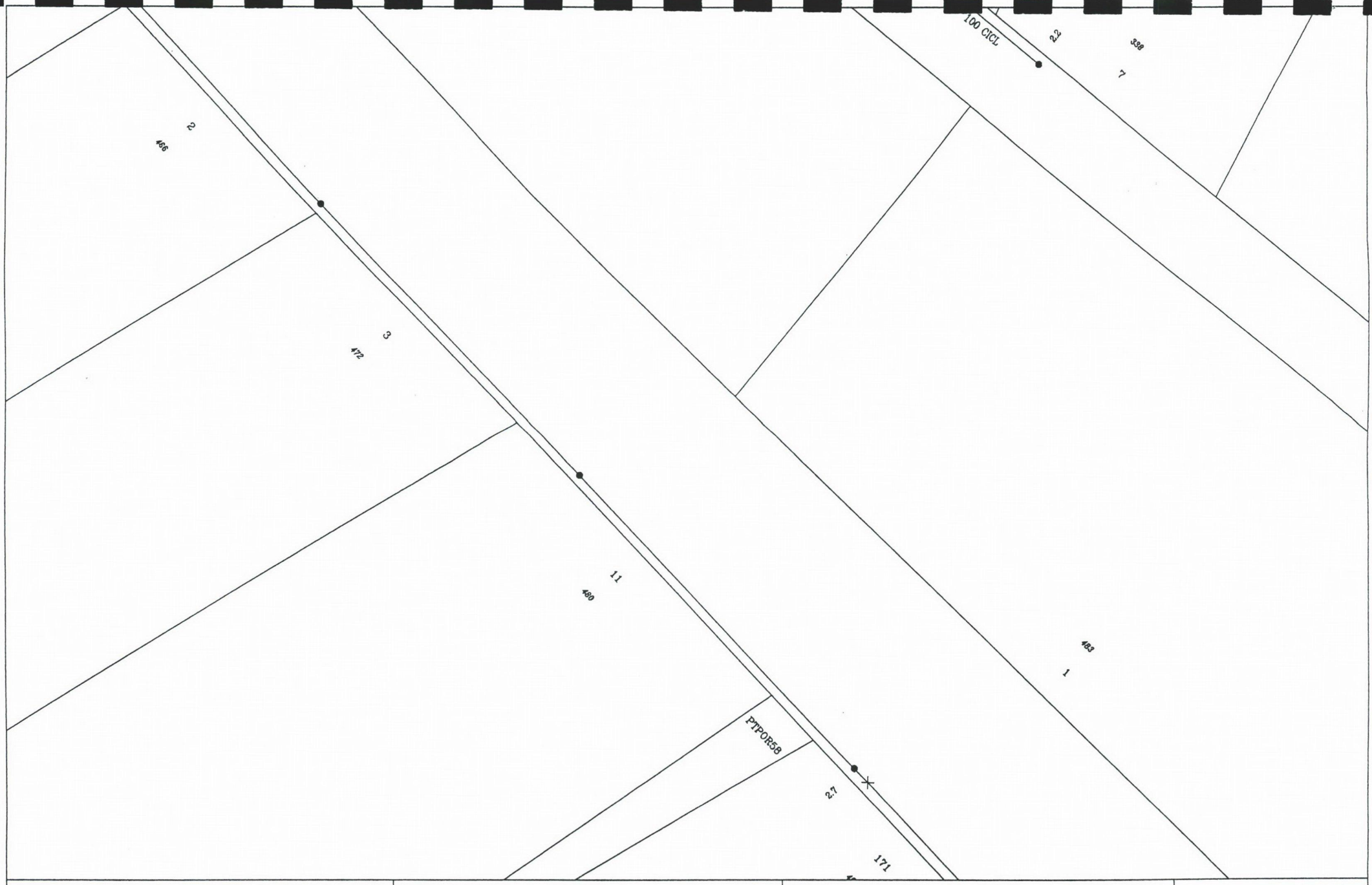
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286162 1276274

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

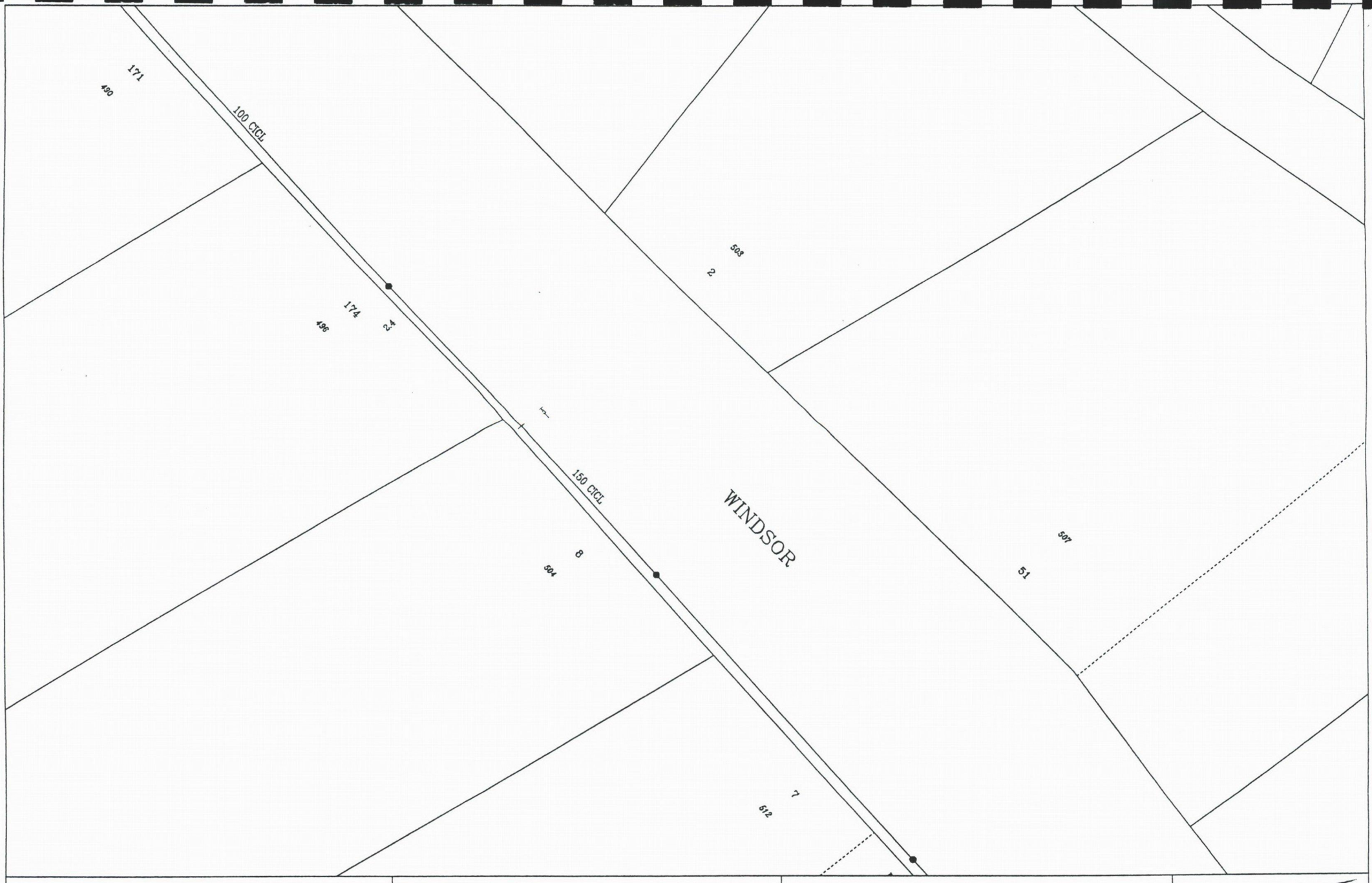
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286335 1276093

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

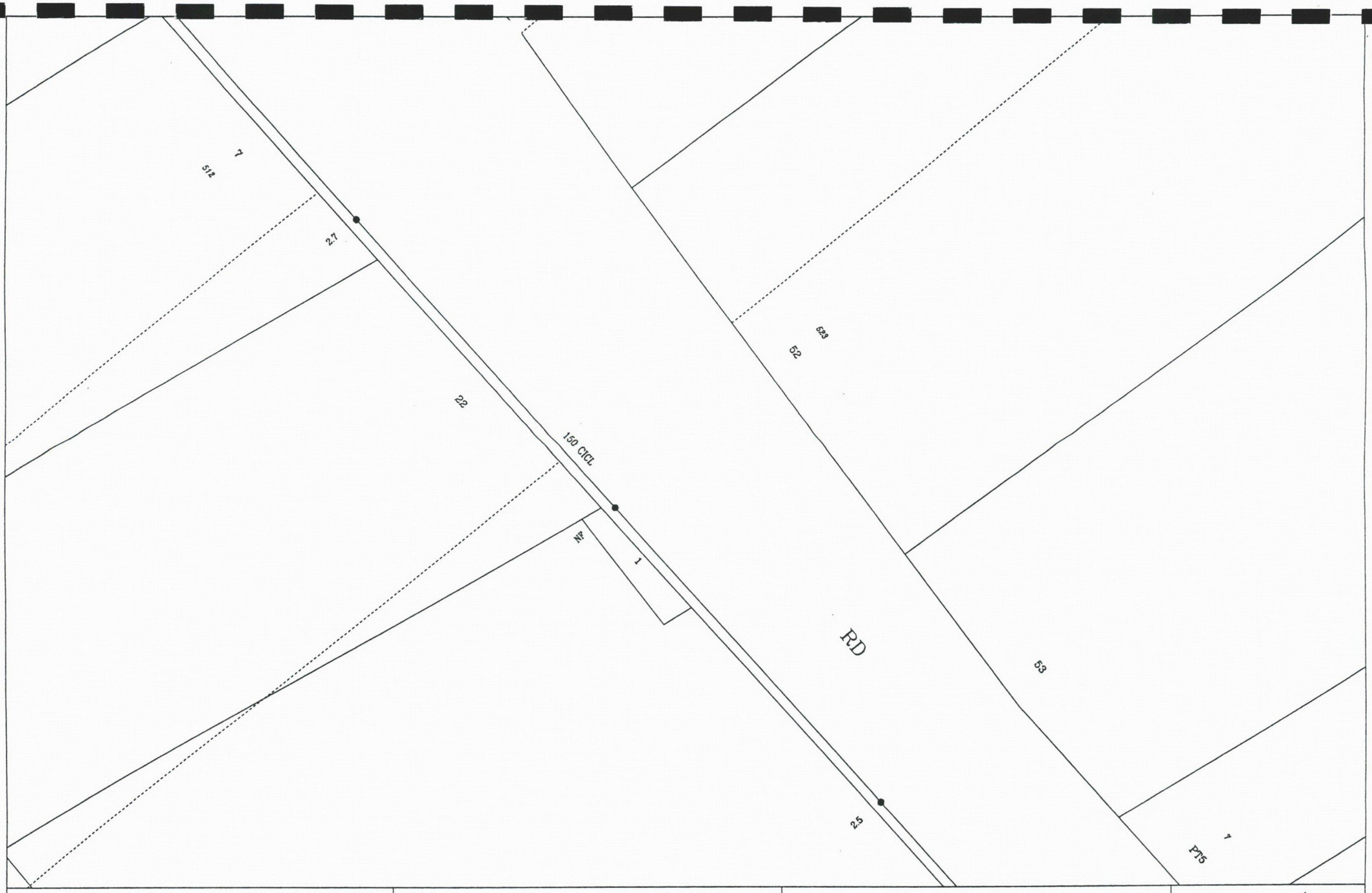
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286513 1275906

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

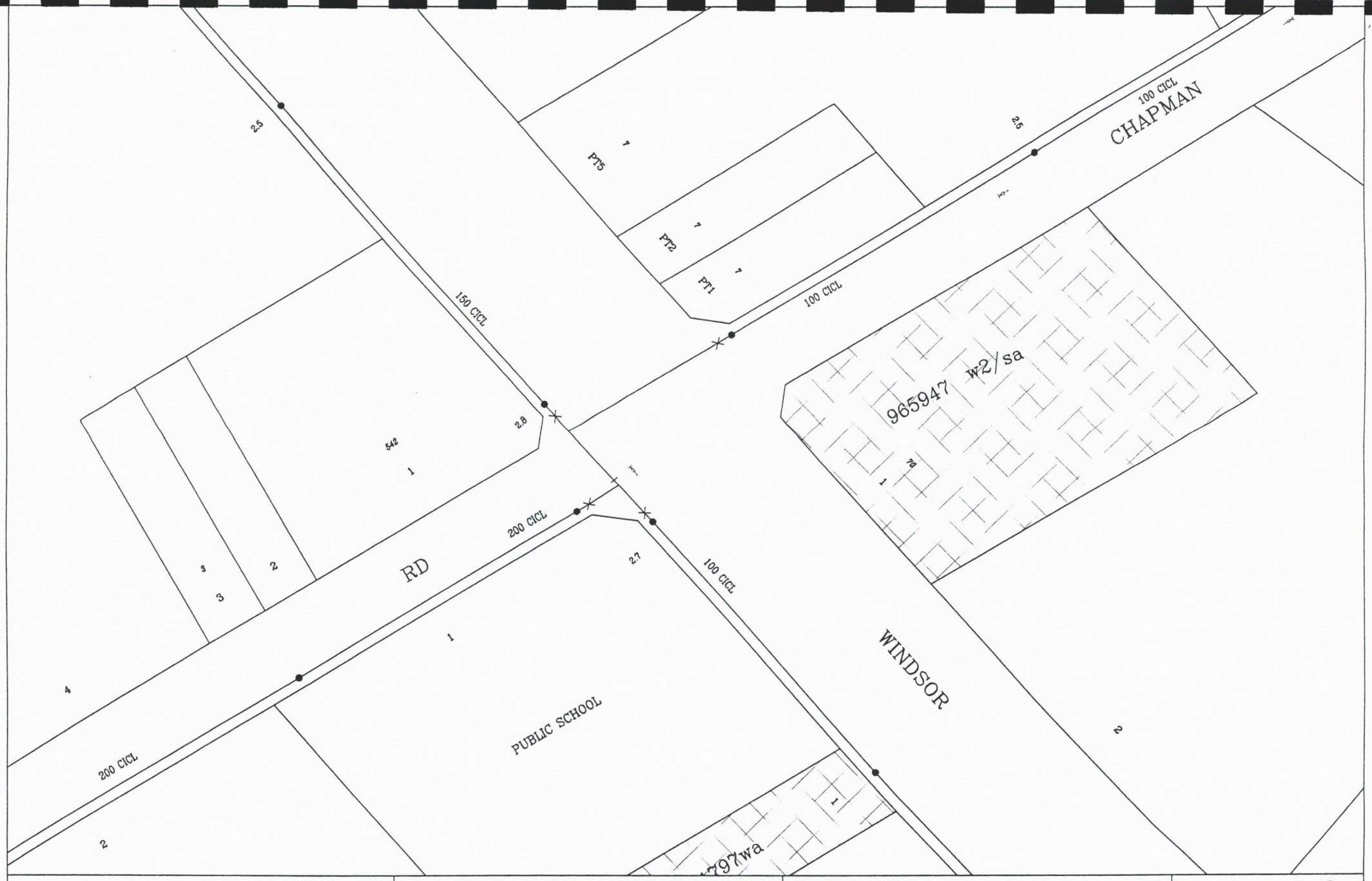
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286646 1275750

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

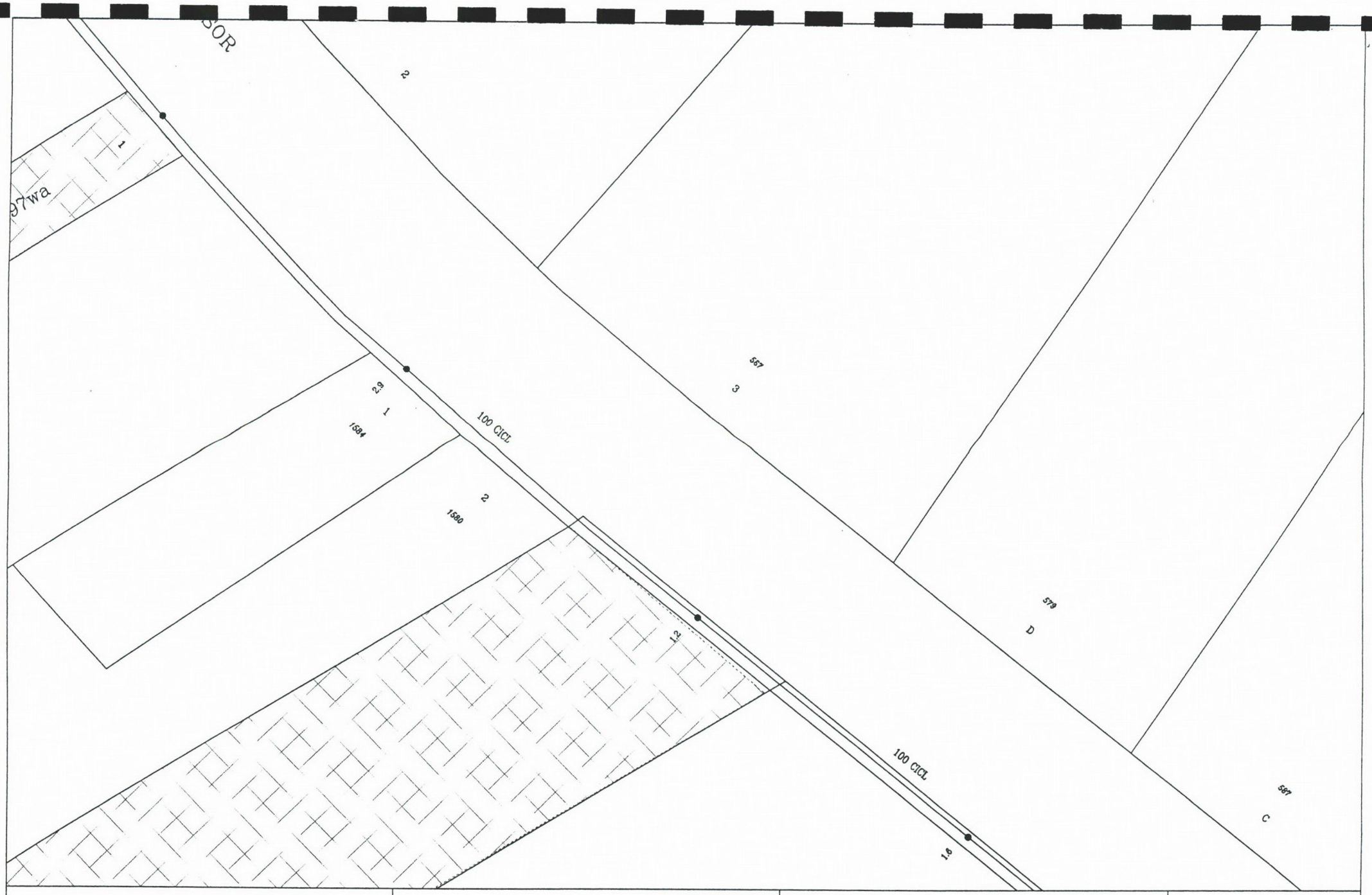
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286790 1275587

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

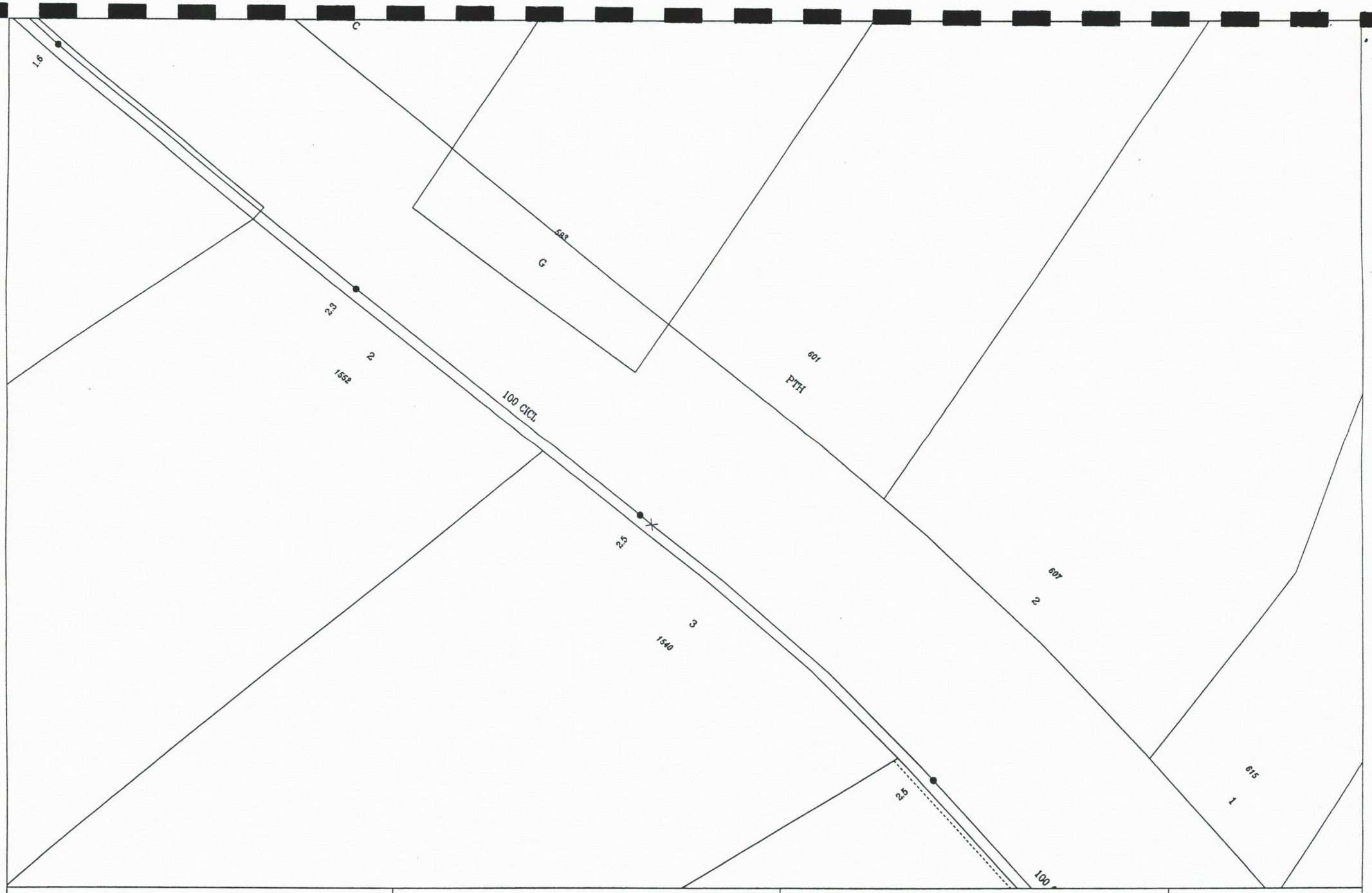
Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



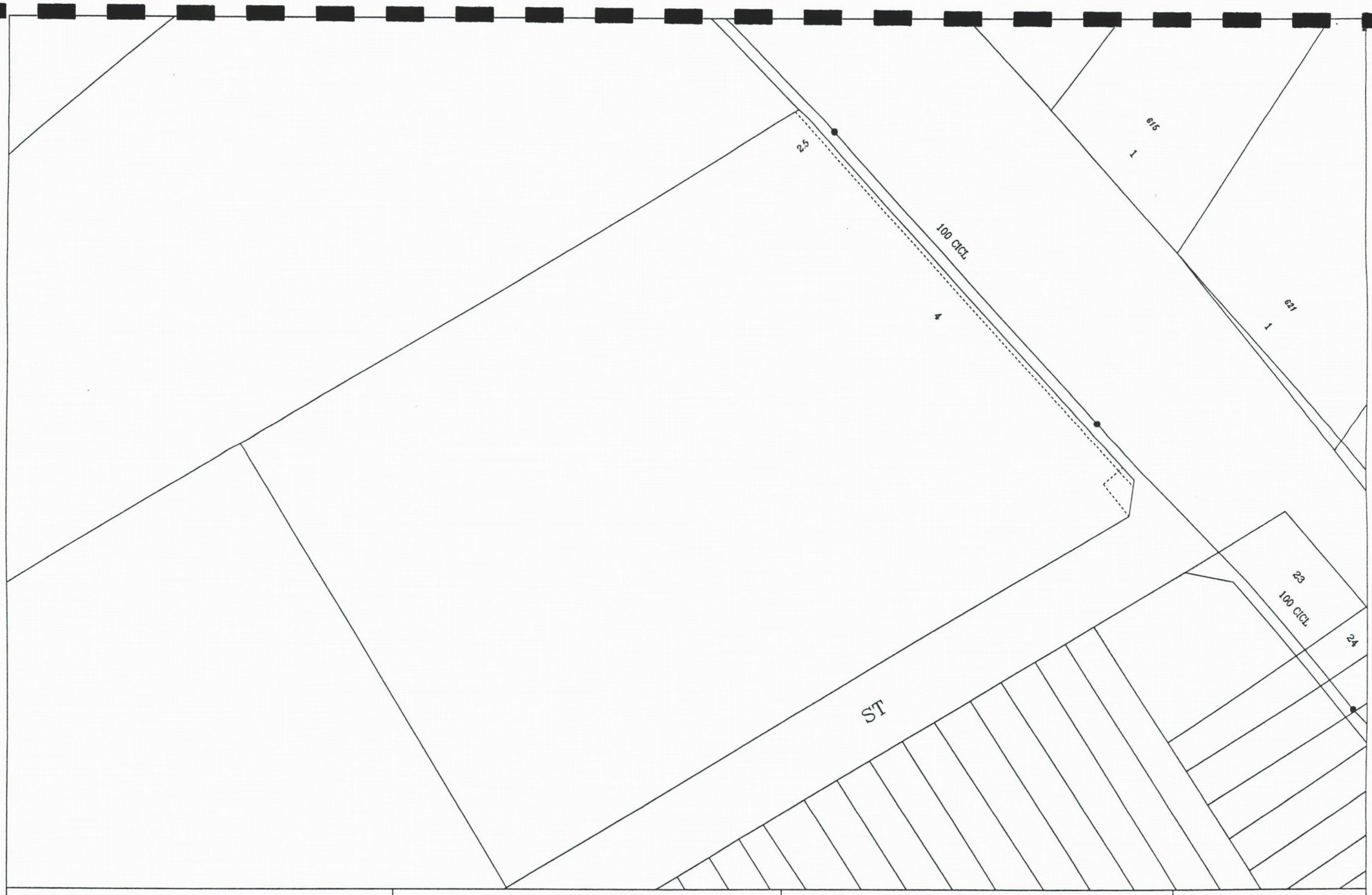
plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 286962 1275427

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION



plot_menu_field 1 plot_menu_field 2 ISG Zone 56/1 (m) Central Co-ord: 287181 1275238	Produced By: Danny Leslie O'Meley Date of Production: 11/09/2000 Scale: 1:1165	Copyright Reserved Sydney Water 2000 No warranty is given that this is complete or accurate. SYDNEY WATER CORPORATION	19 Page Number



plot_menu_field 1
plot_menu_field 2
ISG Zone 56/1 (m) Central Co-ord: 287205 1275083

Produced By: Danny Leslie O'Meley
Date of Production: 11/09/2000
Scale: 1:1165

Copyright Reserved Sydney Water 2000
No warranty is given that this is complete or accurate.
SYDNEY WATER CORPORATION

OPTUS
communications

Asset Analysis Centre

65 Epsom Road
Rosebery NSW 2018

Ph: 1800 505 777
Fax: 1300 307 035

To: BRUCE ADCOCK **Fax:** 0 02 99831400

Company: ENVIRONMENTAL PLANNITY PTY LTD **Pages:** *(including this sheet)* 1

Date: 1/9/2000

Underground Asset Location Reply

Dear Sir/Madam,

With reference to your enquiry of **1/9/00**

- Address of location **MCGRATHS HILL FLOOD EVACUATION ROUTE**
  WINDSOR ROAD BTWN CURTIS ROAD & BANDON ROAD

  NSW
- Optus asset location No. **COMMS1060512**
- One Call System No. **N/A**
- Customer No. **N/A**

After referring to Optus existing asset plans, Optus find that within the vicinity of the proposed works:

- **there are no existing Optus assets.**

We thank you for your enquiry and appreciate your continued use of the local One Call Service and/or tus Asset Analysis Service.

If you require further information please contact Optus on **1800 505 777**.

This reply relates only to the location indicated above and is valid for 14 days from the date of this reply. Where additional works are planned that have not been specified within this acknowledgment, Optus require that an additional location request be submitted. In the case of no additional location request being submitted, Optus will hold the relevant party responsible for any damage to Optus plant and all expenses incurred by Optus as a result of asset damage.

CABLE & WIRELESS

Cable & Wireless Optus Limited
ACN 052 833 208

IMPORTANT: *This fax may be confidential and privileged. Unauthorised use is prohibited. If you have it in error, please notify us and shred this document. Thank you.*

ATTACHMENT 4

Flora and Fauna Assessment
Proposed McGraths Hill Flood Evacuation Route

November 2000, P. Burcher

Flora and Fauna Assessment

Proposed McGraths Hill Flood Evacuation Route

November 2000

AES

Environmental Consultancy

Principal: Paul Burcher (B.App.Sc.)
24 Alberta Avenue, Cowan. 2081
Phone and Fax: (02) 9456 3853
email: pburcher@ozemail.com.au
ABN: 75 407 030 097

Table of Contents

1. Introduction and Recommendations 1
2. Methodology 2
  2.1 Vegetation 2
  2.2 Fauna 2
3. Flora 3
  3.1 Vegetation Description 3
  3.2 Conservation Significance of the Vegetation 4
  3.3 Threatened Flora Species 6
  3.4 Noxious Weeds 7
4. Fauna 7
  4.1 Fauna Habitat 7
  4.2 Threatened Fauna Species 7
5. Impacts of the Proposed Development 8
  5.1 *Threatened Species Conservation Act* - 8 Part Tests 8
    5.1.1 Endangered Ecological Community - Cumberland Plain Woodland 8
    5.1.2 Threatened Species 10
      5.1.2.1 *Pultenaea parviflora* 10
      5.1.2.2 *Acacia pubescens* 11
      5.1.2.3 Square-tailed Kite 12
      5.1.2.4 Swift Parrot 13
      5.1.2.5 Powerful Owl 14
      5.1.2.6 Regent Honeyeater 16
      5.1.2.7 Common Bentwing Bat 17
      5.1.2.8 Greater Broad-nosed Bat 18
      5.2.2.9 Eastern Little Mastiff-bat 19
  5.2 Commonwealth *Environment Protection and Biodiversity Conservation Act* . 20
    5.2.1 Endangered Ecological Community - Cumberland Plain Woodland 20
    5.2.2 Endangered Species 21
      5.2.2.1 Swift Parrot 21
      5.2.2.2 Regent Honeyeater 22
    5.2.3 Vulnerable Species 23
      5.2.3.1 *Pultenaea parviflora* 24
      5.2.3.2 *Acacia pubescens* 25
  5.3 Sydney Regional Environmental Plan No. 20 26
  5.4 State Environmental Planning Policy No. 19 - Bushland in Urban Areas 27
  5.5 SEPP 44 - Koala Habitat Protection 27
6. Impact Mitigation 28
References 29
Appendix 1 Plant Species List 30
Appendix 2 Plant Species Suitable for Landscaping/Rehabilitation 32

Figure 1 Distribution of Vegetation Communities along the Route 5

1. Introduction and Recommendations

A fauna and flora assessment was undertaken of the proposed McGraths Hill Flood Evacuation Route ("the route"). The aim of this assessment is:

- to determine whether the proposed development is likely to cause a "significant effect on threatened species, populations or ecological communities or their habitats[1]", based on the eight factors listed in Section 5A of the NSW *Environmental Planning and Assessment Act*.
- to determine whether Commonwealth approval is required based on criteria in the Commonwealth *Environment Protection and Biodiversity Conservation Act.*
- impacts in relation to Sydney Regional Environmental Plan No. 20.
- impacts in relation to State Environmental Planning Policy No. 19 - Bushland in Urban Areas.
- impacts in relation to State Environmental Planning Policy No.44 – Koala Habitat Protection

The main findings of the assessment are as follows.

- Two vegetation communities occur along the route. These are Shale-Gravel Transition Forest and Cumberland Plain Woodland. Cumberland Plain Woodland is listed as an Endangered Ecological Community under the NSW *Threatened Species Conservation Act* and the Commonwealth *Environment Protection and Biodiversity Conservation Act*.
- A small amount of Cumberland Plain Woodland will be removed by the proposed road works. However, it is considered that this will not have a significant effect on this endangered ecological community.
- No threatened flora species were found along the route. However, the Shale-Gravel Transition Forest sections of the route are suitable habitat for two flora species listed as threatened[2] at State and Commonwealth levels, *Acacia pubescens* and *Pultenaea parviflora.*
- The route is suitable habitat for the following threatened fauna species; Square-tailed Kite (*Lophoinctinia isura*), Swift Parrot (*Lathamus discolor*), Powerful Owl (*Ninox strenua*), Regent Honeyeater (*Xanthomyza phrygia*), Common Bentwing Bat (*Miniopterus schreibersii*), Eastern Little Mastiff-bat (*Mormopterus norfolcensis*) and Greater Broad-nosed Bat (*Scoteanax rueppellii*). These species would only use the route as part of very large ranges or on an occasional basis. The proposed road works are unlikely to have a significant effect on these threatened species, or their habitats.
- Neither a Species Impact Statement nor Commonwealth approval are required for the proposed development.
- The proposed works will not affect Bushland within open space adjacent to the Route.
- The land along the route is not core Koala habitat as defined by SEPP 44. Therefore, a management plan in respect of Koalas is not required.

---

1 i.e. species, populations or ecological communities listed on Schedules 1 and 2 of the *Threatened Species Conservation Act* (1995). The Swift Parrot and Regent Honeyeater are also listed as endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act.*

2 Both species are listed as vulnerable under the EPBC Act. *Pultenaea parviflora* is listed as endangered under the TSC Act

- The proposed development is in accordance with the flora and fauna policy of Sydney Regional Environmental Plan No. 20.

2. Methodology

Fieldwork was undertaken on 12/9/2000 and 11/10/2000 using the following methods.

2.1 Vegetation

The vegetation of the route is described based on the dominant tree species and the height and cover of the tree layer following Specht (1970). The remnant bushland was surveyed for plant species by walking transects of the accessible areas. Plants not readily identified in the field were collected for identification using standard texts. Checks were made against the Schedules 1 and 2 of the *Threatened Species Conservation Act*, Briggs and Leigh (1995) and James et al (1999) for species of conservation significance.

2.2 Fauna

The vegetation community descriptions were used to describe the different fauna habitats that occur along the route. The habitat surrounding the route was also investigated to gain an appreciation of the relative importance of the habitat that occurs along the route.

Notes were made of specific sources of native fauna food and shelter, such as dense shrubs, flowering trees, tree hollows and rock outcrops. The presence, or lack, of particular fauna habitat requirements was noted to enable predictions of species that would be likely to utilise the route.

A search was made for indirect evidence of mammal presence such as droppings, burrows, tracks, diggings and bones. Habitat types and the degree of disturbance were assessed to enable predictions of mammal species presence. Due to the absence of hollow-bearing trees within the area to be developed, it was considered superfluous to undertake spotlighting and insectivorous bat surveys.

A reptile search was undertaken along the route. This involved looking under rocks, bark, fallen timber and leaf litter, with particular attention given to rock outcrop areas. Debris found near moist habitats was checked for the presence of frogs and the type of moist habitats present were noted to allow predictions of frog species likely to occur.

A search was undertaken for the threatened Large Land Snail (*Meridolum corneovirens*) by looking under debris and around the bases of trees.

3. Flora

3.1 Vegetation Description

Much of the route is cleared of natural vegetation and consists of pasture grass or bare ground. However, some areas of natural vegetation remain. These are described in a north-south sequence.

Between chainage 660 and chainage 740 there is Forest Red Gum (*Eucalyptus tereticornis*) with Grey Box (*E.moluccana*) 10-15 metres tall with lower Paperbark (*Melaleuca decora*) and introduced grasses such as Kikuyu (*Penniseteum clandestinum*) and Paspalum (*Paspalum dilatatum*).

Further south between chainage on the eastern side of the road 940 to 1020 there is open forest/woodland of Forest Red Gum and Grey Box with some Broad-leaved Ironbark to 17 metres tall. *Melaleuca decora* to 4 metres tall forms dense patches in some places. Below this is a sparse to mid-dense shrub layer of Blackthorn and Pill Flower (*Helichrysum diosmifolium*) to 2 metres. Although there are some patches of African Love Grass (*Eragrostis curvula*), native species are well represented in the groundcover layer. Common species are Flax Lily (*Dianella longifolia*), Burr-daisy (*Calotis cuneifolia*), Kangaroo Grass (*Themeda australis*) and Three-awn Spear Grass (*Aristida vagans*).

Between chainage 1020 and 1180 the canopy trees are still present. However, there is no understorey. Groundcover is either absent or consists of mown lawn.

Between chainage 1180 and 1380 the vegetation is similar to that between chainage 940 to 1020.

Between chainage 1380 and Henry Road is lower regrowth of Forest Red Gum and Grey Box. African Love Grass is the dominant groundcover, though some native species persist.

Just west of Site 8 there are a number of remnant Forest Red Gums, Grey Boxes and Narrow-leaved Ironbarks (*E.crebra*) to 17 metres. By the creek there is also a small stand of Parramatta Green Wattle (*Acacia parramattensis*). South of the creek between chainage 540 and 600 is another stand of Grey Box with some Forest Red Gums and Broad-leaved Ironbarks. South of the driveway at chainage 600 is a small stand of Forest Red Gum and *Melaleuca decora* to 5-7 metres tall.

South of Chapman Road between chainages 1060 and 1260 is low regrowth 4-8 metres tall of Forest Red Gum, Grey Box and Narrow-leaved Ironbark. There is patchy growth of Blackthorn to 1 metre. The groundcover is composed of a mixture of native and introduced species with African Love Grass and Three-awn Spear Grass being the dominant species.

On the west side of the road at chainage 126 are two Forest Red Gums about 10 metres tall and diameters at breast height of about 80 cm. Both of these are leaning over the existing road. The more southerly one has bracket fungi, which will considerably lessen its life expectancy.

Culverts along the route are vegetated with dense growth of Cumbungi (*Typha orientalis*).

3.2 Conservation Significance of the Vegetation

Table 1 presents a summary of native vegetation communities along the route and Figure 1 indicates their distribution. This does not include those areas unable to regenerate naturally.

Table 1 Native Vegetation Communities

Chainage of Route	Vegetation Community[3]
660 - 740	Shale-Gravel Transition Forest
940 - 1020	Shale-Gravel Transition Forest
1180 - 1380	Shale-Gravel Transition Forest
1060 - 1260	Shale Plains Woodland (Cumberland Plain Woodland)

Cumberland Plain Woodland has been listed as an endangered ecological community under the auspices of the NSW *Threatened Species Conservation Act* and the Commonwealth *Environment Protection and Biodiversity Conservation Act*. This is because the distribution of the community has been substantially reduced and what remains is subject to a variety of threatening factors including residential development and invasion by exotic plants. Over its entire distribution there is now estimated to be a total area of 10,833 hectares of high quality remnants of Cumberland Plain Woodland. This represents 8.83% of what is estimated to have existed prior to European settlement (NPWS, 2000).

It is estimated that 36.52% of the pre-European distribution of Shale-Gravel Transition Forest remains. It is not currently listed as an endangered ecological community.

The remainder of the vegetation along the route is pasture grass, isolated trees or groups of trees with no understorey or groundcover vegetation. Some of these areas may have previously been Cumberland Plain Woodland. However, they no longer qualify as Cumberland Plain Woodland under the definition in the final determination of the Scientific Committee. The determination states:

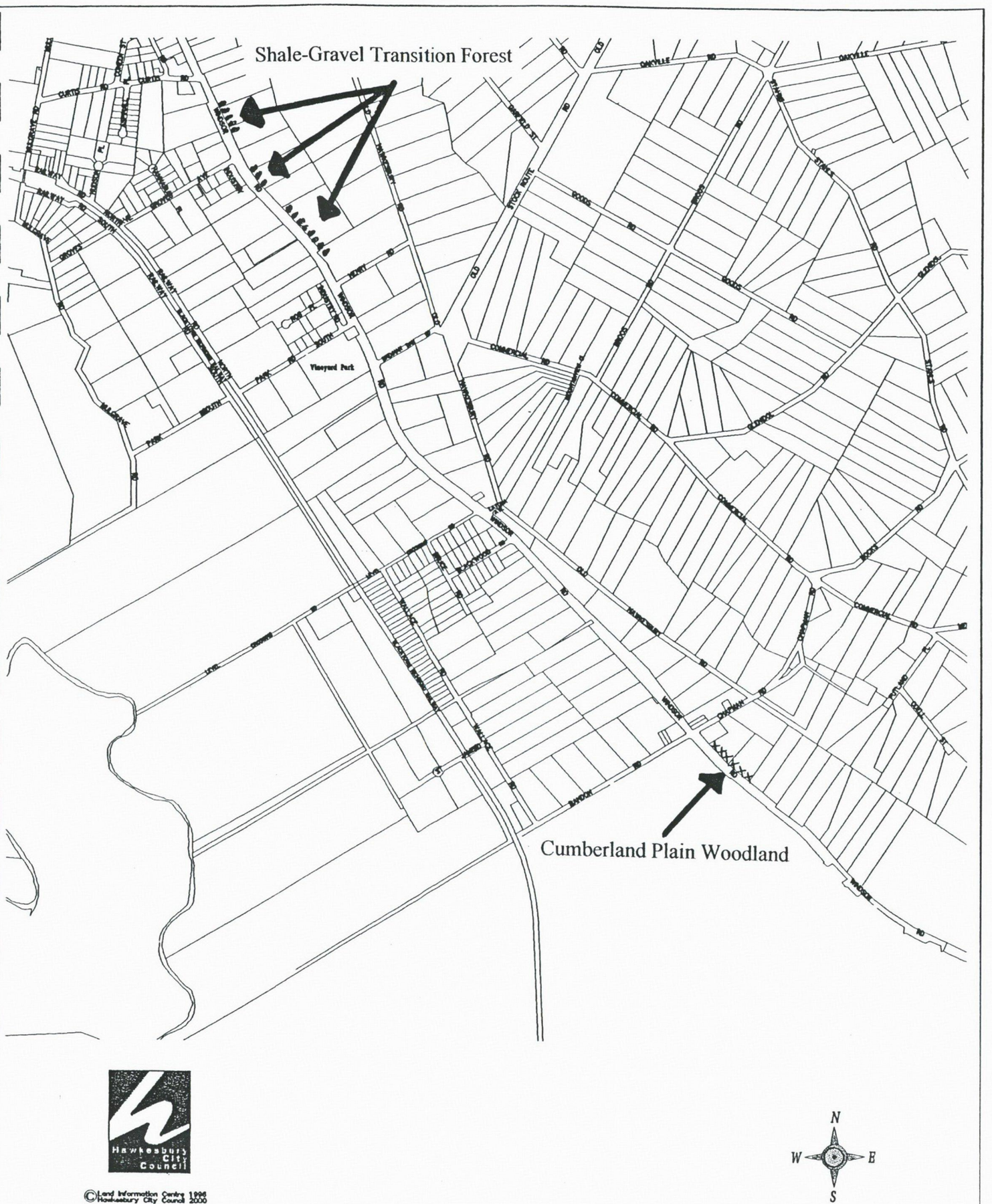
"The understorey is generally grassy to herbaceous with patches of shrubs, or if disturbed, contains components of indigenous native species sufficient to re-establish the characteristic native understorey."

"The Cumberland Plain Woodland includes regrowth which is likely to achieve a near natural structure or is a seral stage towards that structure."

Apart from chainage 1060 to 1260, the vegetation along the route has an understorey dominated by dense cover of introduced species. There is not a sufficient component of native species to allow re-establishment of the characteristic understorey. Nor is the vegetation regrowth, which is likely to achieve a near natural structure.

[3] Following NPWS 2000.

Figure 1 Distribution of Vegetation Communities along the Route



Hawkesbury City Council

©Land Information Centre 1998
Hawkesbury City Council 2000

Scale 1 : 20000

Recent Mapping by NPWS

The NSW National Parks and Wildlife Service undertook mapping of remnant native vegetation in western Sydney in 1998 and 1999 (NPWS, 2000). This was mainly based on aerial photograph interpretation. Map 14 (Baulkham Hills LGA northern section and Hawkesbury LGA eastern section) includes the whole route.

Vegetation communities mapped along the route were Shale Gravel Transition Forest and Shale Plains Woodland. Shale Plains Woodland is a variant of Cumberland Plain Woodland dominated by Grey Box and Forest Red Gum. Shale Gravel Transition Forest is dominated by Broad-leaved Ironbark and *Melaleuca decora*, though Grey Box and Forest Red Gum may also be present. The two communities grade into each other where the underling shale gives way to gravel.

NPWS classifies the vegetation on the eastern side of the road between just south of Groves Road to Henry Road as Shale Gravel Transition Forest TX/TXR. TX signifies that there is some crown cover over agricultural land. Consequently it is considered to be of lower quality than remnants with an intact understorey and groundcover. TXR signifies that there is some crown cover over rural-residential land and is similarly considered to be of lower quality. Field investigation showed that parts of this section of the route and adjoining land should be mapped as Shale Gravel Transition Forest "A" as the patch size (including that on adjoining land) is greater than 0.5 hectares and crown cover is greater than 10%.

The mapping also shows the vegetation between chainage 1060 and 1260 to be Shale Plains Woodland "TXR". As this is part of larger intact patch it should have been mapped as Shale Plains Woodland "A".

Apart from these discrepancies mapping by NPWS (2000) broadly agrees with the findings of this field survey.

3.3 Threatened Flora Species

No threatened flora species were located during the survey. Table 2 indicates the threatened flora species that have been recorded within five kilometres of the route in the past twenty years (Source: NPWS database).

Table 2 Locally Occurring Threatened Flora Species

Species	Habitat*
Acacia gordonii	Found on Hawkesbury sandstone based soils
Acacia pubescens	Open Forest on gravely clay soils
Dillwynia tenuifolia	Castlereagh Woodlands on sandy to clayey soils
Pultenaea parviflora	Western Cumberland Plain on sandy to clay soils
Persoonia nutans	Castlereagh Woodlands on sandy to clayey soils

* based on Benson and McDougall, 1996 and Fairley, 1989.

From Table 2, it can be concluded that the Shale-Gravel Transition Forest sections of the route are suitable habitat for *Acacia pubescens*.

3.4 Noxious Weeds

One species listed as a noxious weed occurs along the route. This is Prickly Pear (*Opuntia stricta*) which is coded W4f. The *Noxious Weeds Act* requires that species designated as W4f shall not be sold, propagated or knowingly distributed. The occupier must implement biological control or other control program directed by the Local Government Authority.

4. Fauna

4.1 Fauna Habitat

A broad description of the fauna habitat is provided by the vegetation community descriptions in Section 3.1. Specific habitat features that may affect the presence of fauna along the route are listed below.

- Most of the route's trees are not old enough to have formed hollows suitable for habitation by arboreal mammals, bats and birds. Only one, a large forest red gum at Site 8 contains such hollows.
- The sparse understorey along most of the route discourages use by small insectivorous birds (eg thornbills) and favours aggressive native and introduced bird species such as Common Myna (*Acridotheres tristis*) and Noisy Miner (*Manorina melanocephala*).
- The route is part of a fragmented and disturbed piece of bushland. Considerable disturbance is produced by vehicular noise due to the busy nature of Windsor Road. Fragmentation and disturbance decrease the diversity and abundance of fauna likely to use the route.
- The route's culverts provides habitat for common frog species. Poor water quality in these creeks precludes their habitation by sensitive species.

4.2 Threatened Fauna Species

Table 3 over indicates the threatened fauna species that have been recorded within five kilometres of the route in the past twenty years (Source: NPWS database; NSW FOC records). From Table 3 it is considered that the threatened fauna species likely to occur along the route are Square-tailed Kite, Powerful Owl, Eastern Little Mastiff-bat, Common Bent-wing Bat and Greater Broad-nosed Bat. In addition to these locally recorded species, the Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Xanthomyza phrygia*) may also occur. These two species may occur during winter due to the presence of Narrow-leaved Ironbark, which is one of their food sources in western Sydney (NPWS, 1997). They may also feed on lerps in other eucalypts along the route.

As the Major Mitchell Cockatoo is a probable aviary escapee outside its normal range (western NSW), it will not be considered in the eight-part tests.

Table 3 Locally Occurring Threatened Fauna Species

Species	Comments
Giant Burrowing Frog *Heleioporus australiacus*	Unusual Cumberland Plain record from Riverstone; unlikely.
Blue-billed Duck *Oxyura australis*	Very rare visitor to farm dams; unlikely.
Square-tailed Kite *Lophoinctinia isura*	Recorded at McGraths Hill and Kenthurst; may occasionally forage in forest/woodland along route.
Major Mitchell Cockatoo *Cacatua leadbeateri*	Probable aviary escapee observed in bushland at Rouse Hill; possible.
Glossy Black-Cockatoo *Calyptorhynchus lathami*	Feeds on she-oaks, which are not present along route; unlikely.
Powerful Owl *Ninox strenua*	Forages in forest and woodland; road kill record along Windsor Road at Second Ponds Creek; possible.
Masked Owl *Tyto novaehollandiae*	Nearby record is from Blue Gum Creek on sandstone; few records from Cumberland Plain; unlikely.
Eastern Little Mastiff-bat *Mormopterus norfolkensis*	Forages at edge of forest, roosts in tree hollows; likely
Common Bent-wing Bat *Miniopterus schreibersii*	Forages over forest; likely
Greater Broad-nosed Bat *Scoteanax rueppellii*	Forages at edge of forest, roosts in tree hollows; likely
Cumberland Land Snail *Meridolum corneovirens*	Not detected during habitat searches.

5. Impacts of the Proposed Development

5.1 Threatened *Species Conservation Act* - 8 Part Tests

The vegetation occurring south of Chapman Road is Cumberland Plain Woodland, which has been listed on Part 3, Schedule 1 of the *Threatened Species Conservation Act* as an Endangered Ecological Community.

This route is also likely to be habitat for nine threatened species: *Acacia pubescens*, *Pultenaea parviflora*, Square-tailed Kite, Swift Parrot, Powerful Owl, Regent Honeyeater, Eastern Little Mastiff-bat, Common Bent-wing Bat and Greater Broad-nosed Bat.

No endangered populations occur along the route.

To make the assessment clearer, the "eight-point test" has been divided into two sections - one dealing with the endangered ecological community; the other with the threatened species.

5.1.1 Endangered Ecological Community - Cumberland Plain Woodland

(a) in the case of threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be significantly compromised,
Not relevant.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised,
Not relevant.

(c) in relation to the regional[4] *distribution of the habitat of an ecological community, whether a significant area of known habitat is to be modified or removed,*
A small area of Cumberland Plain Woodland (approximately 800 m^2) will be removed at the southern section of the route between chainage 1060 and 1260. Given the small amount of Cumberland Plain Woodland to be removed and its quality (i.e. it has a low native species diversity and a considerable disturbance history), it is considered that a significant area of known habitat of the endangered ecological community will not be modified or removed by the proposed development.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for an ecological community,
The area of Cumberland Plain Woodland lost adjoins the road and given its size and location is not a strategic area of Cumberland Plain Woodland in terms of habitat connectivity. There will be no isolation of habitat.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether an ecological community, or its habitat, is adequately represented in conservation reserves (or other similar protected area) in the region,
Cumberland Plain Woodland occurs entirely within the Sydney Basin Biogeographic Region. There is only about 9% of the original (pre-European) distribution of Cumberland Plain Woodland left (NPWS, 2000). The JANIS criteria (JANIS, 1997) for adequate reservation for those communities that are not naturally rare, is that 15% of the original distribution should be protected. By this criterion Cumberland Plain Woodland must be considered inadequately represented in regional conservation reserves.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Clearing for development has been identified as a threat to the survival of Cumberland Plain Woodland (NPWS, 1997). However, the proposal will remove only a very small area of Cumberland Plain Woodland.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution,
On the basis of mapping by NPWS (1997b) Cumberland Plain Woodland is distributed between Landsdowne in the east to Glossodia/Mulgoa in the west; and from Freemans Reach/East Kurrajong in the north to Douglas Park and just south of Picton in the south. Therefore, Cumberland Plain Woodland is not at the limit of its distribution at McGraths Hill.

---

[4] In accordance with the *Threatened Species Conservation Act*, "regional" refers to those areas defined by the CSIRO's Interim Bioregional Assessment. Rouse Hill is within the Sydney Basin Region which stretches from Newcastle to Batemans Bay and west to the Great Dividing Range.

Conclusion
The proposed development is unlikely to significantly affect Cumberland Plain Woodland, or its habitat.

5.1.2 Threatened Species

5.1.2.1 *Pultenaea parviflora*

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
No individuals of this species were found along the route. However, it does occur in Shale-Gravel Transition Forest at nearby Vineyard Park.. Those parts of the route supporting Shale-Gravel Transition Forest are suitable habitat for the species and there is some possibility that it is present in the soil seedbank. Mapping by NPWS (2000) indicates that in comparison to that to be lost by the works substantial area of potential habitat occur locally. Given this, it is considered that the local population will not be placed at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
The amount of habitat to be removed is unlikely to threaten the local population of the species. Therefore at the wider regional scale, it is also unlikely that a significant area of habitat will be removed.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,
Shale-Gravel Transition Forest within the proposed route is potential habitat for the species. The loss of this potential habitat area will be mitigated by rehabilitation of other potential habitat areas within the corridor.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region,
Pultenaea parviflora occurs at Castlereagh Nature Reserve and Windsor Downs Nature Reserve. This representation in conservation reserves is likely to be inadequate to ensure future survival of the species.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Habitat loss is recognised as a threat to the species (Benson & McDougall, 1996).

(h) whether any threatened species, population or ecological community is at the limit of its known distribution
Pultenaea parviflora is restricted to the western Cumberland Plain area. It occurs between Mountain Lagoon in the north, Menai in the south, Bardwell Valley in the east and Woodford in the west (NPWS, 1999). It is near the northern limit of its distribution at McGraths Hill.

Conclusion
The proposed development is unlikely to significantly affect *Acacia pubescens*, or its habitat.

5.1.2.2 *Acacia pubescens*

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
No individuals of this species were found along the route. However, it does occur in Shale-Gravel Transition Forest at nearby Vineyard Park.. Those parts of the route supporting Shale-Gravel Transition Forest are suitable habitat for the species and there is some possibility that it is present in the soil seedbank. Mapping by NPWS (2000) indicates that in comparison to that to be lost by the works substantial area of potential habitat occur locally. Given this, it is considered that the local population will not be placed at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
The amount of habitat to be removed is unlikely to threaten the local population of the species. Therefore at the wider regional scale, it is also unlikely that a significant area of habitat will be removed.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,
Shale-Gravel Transition Forest within the proposed route is potential habitat for the species. The loss of this potential habitat area will be mitigated by rehabilitation of other potential habitat areas within the corridor.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region
Acacia pubescens occurs at four sites within Scheyville National Park (NPWS, 1999). This representation in conservation reserves is likely to be inadequate to ensure future survival of the species.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Habitat loss is recognised as a threat to the species (NPWS, 1999).

(h) whether any threatened species, population or ecological community is at the limit of its known distribution
Acacia pubescens is restricted to the western Sydney/lower Blue Mountains area. It occurs between Mountain Lagoon in the north, Menai in the south, Bardwell Valley in the east and Woodford in the west (NPWS, 1999). It is near the northern limit of its distribution at McGraths Hill.

Conclusion
The proposed development is unlikely to significantly affect *Acacia pubescens*, or its habitat.

5.1.2.3 Square-tailed Kite

(a) in the case of threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be significantly compromised
The "local population" of the Square-tailed Kite consists of one or two individuals, which are summer visitors to the Western Sydney region. The species preys on small birds in the canopy of denser forests and woodlands. Therefore, there is a possibility that it forages in bushland adjacent to Windsor Road.

The proposed development will modify or remove only a small area of what is poor quality potential habitat. It is unlikely the development would place the local population of the Square-tailed Kite at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
No endangered populations occur in the study area.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
The potential habitat for the species represented along the route cannot be considered significant either in terms of its size or quality.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community,
As the species can fly large distances, the proposed development is unlikely to isolate known habitat areas.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
The Square-tailed Kite is not well served by the region's reserves. It appears to favour the higher-nutrient, flatter forests of the Cumberland Plain and Nowra-Jervis Bay regions, rather than the low nutrient, rugged forests and woodlands of the Hawkesbury Sandstone, which are well represented in reserves. Although it has been recorded in some regional reserves (eg Royal National Park), it is considered that regional conservation reserves do not include enough higher-nutrient forest to support the Square-tailed Kite. However, the proposed development will not affect the conservation status of this species.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Habitat loss and modification are generally recognised as threatening processes. The proposed development will result in only a very small amount of loss of poor quality habitat.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution.
The Square-tailed Kite occurs throughout mainland Australia.

Conclusion
The proposed development is unlikely to significantly affect the Square-tailed Kite, or its habitat.

5.1.2.4 Swift Parrot

(a) in the case of threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be significantly compromised
The "local population" of this species is comprised of irregular non-breeding visitors to the western Sydney region. It is reported to feed on flowering Narrow-leaved Ironbark (*Eucalyptus crebra*) in western Sydney (NPWS, 1997a). This eucalypt occurs along the route and is common in the local area. The proposed development will not affect any resources critical to the "local population" and therefore will not place it at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
Habitat for the Swift Parrot is widespread in the region. In relation to that, the amount that may be affected is not significant.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for a threatened species, population or ecological community,
This species is able to travel very long distances (it migrates from Tasmania to as far as Northern NSW). It can, therefore, traverse large areas of unsuitable habitat. Therefore, the loss of some trees over the medium term is unlikely to result in isolation of habitat.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
Most of the records of the Swift Parrot in the region are from Cumberland Plain Woodlands and Sydney Blue Gum Forest - habitats that are not adequately conserved in the region. The loss of habitat within the Sydney Basin region may have contributed to the species decline. However, it is considered the major factor causing decline has been the loss of Tasmanian Blue Gum Forest and Box-Ironbark woodlands on the mainland (Garnett, 1993).

The proposed development will not affect the conservation status of the Swift Parrot.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Habitat modification and removal are generally regarded as threatening processes. As discussed in (a) above, the proposed development will only result in a very small amount of habitat removal/modification.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution.
The Swift Parrot is distributed between Tasmania and northern NSW (Blakers et al, 1984). McGraths Hill does not represent the limit of the species' distribution.

Conclusion
The proposed development is unlikely to significantly affect this species or its habitat.

5.1.2.5 Powerful Owl

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
The Powerful Owl lives solitary or in pairs and has territories in the order of 800-1000 hectares (R. Kavanagh pers comm; Blakers et al, 1984). It favours open forest in deep

gullies as its breeding and foraging habitat though it will venture into more open country in search of prey. Its main prey items are arboreal mammals (possums, gliders, bats) though it will also take birds and ground mammals (Hollands, 1991). It breeds in winter and uses hollows in live eucalypts, often choosing the largest tree in a stand (Debus and Chafer, 1994).

The Powerful Owl is known locally from a road kill specimen found further south where Windsor Road crosses Second Ponds Creek. This individual was probably dispersing from known breeding habitat along Blue Gum Creek at Kenthurst.

The species would not be breeding along the route due to the lack of large hollows in mature trees. It may rarely forage along due to the presence of arboreal mammals. However, the proposed development is unlikely to have any effect on these prey populations and therefore will not place the local population of the Powerful Owl at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
No endangered populations occur in the vicinity

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
This species inhabits open forest and woodland where it preys on arboreal mammals. This habitat type is abundant in the region, and the amount of forest to be modified does not constitute a significant area of habitat.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for a threatened species, population or ecological community,
The species is able to traverse areas much larger than those affected by the proposed development. There is unlikely to be isolation of habitat as a result of the proposal.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
32.4% of the Sydney Basin region is in protected reserves or equivalent tenure (State of the Environment Committee, 1996). Much of this reserve system is open forest and woodland and, therefore, suitable Powerful Owl habitat. The Powerful Owl is known to occur in the following reserves: Marramarra NP (National Park), Berowra Valley Bushland Park, Ku-ring-gai Chase NP, Lane Cove NP, Yengo NP, Garigal NP, Brisbane Waters NP, Royal NP, Muogamarra Nature Reserve, Jervis Bay NP, Morton NP, Blue Mountains NP, Wollemi NP, Cattai National Park (Debus and Chafer, 1994; Morris and Burton,1996).

On the basis of habitat suitability and records for reserves, it is considered that the Powerful Owl is adequately represented in regional nature reserves.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Habitat removal and modification are generally recognised as threatening processes. However, only a very small amount of habitat will be affected.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution
The Powerful Owl is distributed between Mackay (Qld) and the Grampians (Vic). It is not at the limit of its distribution at McGraths Hill.

Conclusion
There is unlikely to be a significant effect on the Powerful Owl, or its habitat.

5.1.2.6 Regent Honeyeater

(a) in the case of threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be significantly compromised
This nomadic species was regularly observed in western Sydney until the 1960s. It is now only sporadically reported and like the Swift Parrot it feeds on flowering Narrow-leaved Ironbark (*Eucalyptus crebra*) (NPWS, 1997a). This eucalypt occurs along the route and is common in the local area. The proposed development will not affect any resources critical to the "local population" and therefore will not place it at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
Habitat for the Regent Honeyeater is not particularly common in the region. However, in relation to the regional distribution of the species habitat, the amount that may be affected is not significant.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for a threatened species, population or ecological community,
The small amount of habitat to be affected would not result in any isolation of habitat.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
Most of the records of the Regent Honeyeater in the region are from Cumberland Plain Woodlands and Swamp Mahogany Forest - habitats that are not adequately conserved

in the region. The loss of these habitats within the Sydney Basin region may have contributed to the species' decline.

The proposed development will not affect the conservation status of the Regent Honeyeater.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Habitat modification and removal are generally regarded as threatening processes. As discussed in (a) above, the proposed development will only result in a very small amount of habitat removal/modification..

(h) whether any threatened species, population or ecological community is at the limit of its known distribution.
The Regent Honeyeater is distributed between Western Victoria and northern NSW (Blakers et al, 1984). McGraths Hill does not represent the limit of the species' distribution.

Conclusion
The proposed development is unlikely to significantly affect the Regent Honeyeater, or its habitat.

5.1.2.7 Common Bentwing Bat

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
This species forages above the canopies of forests. It is likely to forage over the bushland at the edge of Windsor Road. The amount of habitat to be removed would not place the local population at risk of extinction.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
This species habitat is widespread in the region. In relation to that the amount to be removed is not significant.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for a threatened species, population or ecological community,
The Common Bentwing Bat is able traverse large distances (up to 20km in one night) in search of food. Therefore, it must be able to negotiate areas of unsuitable foraging habitat. The proposed development will not result in isolation of habitat.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
The Sydney Basin region contains significant areas of conserved forest and woodland habitat including large tracts of land in the following National Parks: Morton, Kanangra-Boyd, Blue Mountains, Wollemi, Royal, Ku-ring-gai Chase, Marramarra, Dharug. There is no detailed information on population numbers of the two bat species in these reserves. However, it would appear that *habitat* for the Common Bent-wing Bat is adequately conserved by the reserves in the region.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Removal and modification of habitat are generally recognised as threatening processes.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution
The Common Bentwing Bat is distributed along the coast and ranges between Cape York and South-east South Australia (Strahan, 1983).

Conclusion
The proposed development is unlikely to significantly affect this species, or its habitat.

5.1.2.8 Greater Broad-nosed Bat

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
This species may forage in bushland adjoining the route. It is possible that the species could inhabit the large forest red gum at Site No.8 that has tree hollows suitable for this species. The loss of this potential resource will be compensated for by the erection of artificial hollows in retained trees elsewhere within the road reserve.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
The amount of habitat removed is not significant in relation to the regional distribution of the species.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for a threatened species, population or ecological community,
The species is highly mobile. The removal of a small amount of habitat is unlikely to result in isolation of habitat.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
The Sydney Basin region contains significant areas of conserved forest and woodland habitat including large tracts of land in the following National Parks: Morton, Kanangra-Boyd, Blue Mountains, Wollemi, Royal, Ku-ring-gai Chase, Marramarra, Dharug. There is no detailed information on population numbers of the two bat species in these reserves. However, it would appear that *habitat* for the Greater Broad-nosed Bat is adequately conserved by the reserves in the region.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Removal and modification of habitat are generally recognised as threatening processes.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution
The Greater Broad-nosed Bat is distributed between North Queensland and North-east Victoria (Strahan, 1983). It is not at the limit of its known distribution at McGraths Hill.

Conclusion
The proposed development is unlikely to significantly affect the Greater Broad-nosed Bat, or its habitat.

5.2.2.9 Eastern Little Mastiff-bat

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction
Like the Greater Broad-nosed Bat, this species roosts in tree hollows and forages in forests and their edges. The tree hollow at Site 8 is potential roosting habitat for the species. The loss of this potential resource will be compensated for by the erection of artificial hollows in retained trees elsewhere within the road reserve.

(b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised
Not relevant.

(c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed,
The amount of habitat removed is not significant in relation to the regional distribution of the species.

(d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate area of habitat for a threatened species, population or ecological community,
The removal of a small amount of habitat is unlikely to result in isolation of habitat.

(e) whether critical habitat will be affected,
Critical habitat is yet to be defined.

(f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected area) in the region
The Sydney Basin region contains significant areas of conserved forest and woodland habitat including large tracts of land in the following National Parks: Morton, Kanangra-Boyd, Blue Mountains, Wollemi, Royal, Ku-ring-gai Chase, Marramarra, Dharug. There is no detailed information on population numbers of the two bat species in these reserves. However, it would appear that *habitat* for the Eastern Little Mastiff-bat is adequately conserved by the reserves in the region.

(g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process,
Removal and modification of habitat are generally recognised as threatening processes.

(h) whether any threatened species, population or ecological community is at the limit of its known distribution
The Eastern Little Mastiff Bat is distributed along the coast to the east of the Great Dividing Range from Maryborough in Queensland to southern New South Wales. It is not at the limit of its known distribution at McGraths Hill.

Conclusion
The proposed development is unlikely to significantly affect the Eastern Little Mastiff-bat, or its habitat.

5.2 Commonwealth *Environment Protection and Biodiversity Conservation Act*

5.2.1 Endangered Ecological Community - Cumberland Plain Woodland

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered ecological community if it does, will, or is likely to:

- *lead to a long-term adverse effect on an ecological community*
  The proposed route is largely confined to already disturbed land or vegetation that does not qualify as Cumberland Plain Woodland. Only a small area (approximately 800m^2) of Cumberland Plain Woodland will be affected. The loss of this area will not have long-term adverse effect on Cumberland Plain Woodland.

- *or reduce the extent of the community*
  The loss of a small amount of Cumberland Plain Woodland will not significantly reduce the extent of the community.

- *or fragment an occurrence of the community,*
  The proposed route is at the edge of an occurrence of the community that is already fragmented by patches of development in the surrounding area. Development of the route will not compound the fragmentation of the community.

- *or adversely affect habitat critical to the survival of an ecological community,*
  It is unlikely that the patch of Cumberland Plain Woodland within the route is critical to the survival of the community.
- *or modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival,*
  Possible impacts on adjoining Cumberland Plain Woodland will be avoided by the use of standard erosion control measures and specifically designed drainage systems.

- *or result in invasive species that are harmful to the critically endangered or endangered ecological community becoming established in an occurrence of the community*[5],
  The adjoining Cumberland Plain Woodland is already affected by the presence of invasive species (eg African Love Grass). The proposed development will not exacerbate this situation.

- *or interfere with the recovery of an ecological community.*
  The Cumberland Plain Woodland affected is unlikely to be critical to the recovery of the community.

Conclusion
The proposed development is unlikely to have a significant impact on the endangered ecological community Cumberland Plain Woodland.

5.2.2 Endangered Species

Two fauna species likely to occur along the route - Swift Parrot and Regent Honeyeater - are listed as endangered under the *Environment Protection and Biodiversity Conservation Act*. The development therefore must be assessed in relation to criteria pertaining to endangered species. These are discussed below.

5.2.2.1 Swift Parrot

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:
- *lead to a long-term decrease in the size of a population,*
  This migratory species may occasionally inhabit the route. Some Narrow-leaved Ironbarks and other potential foraging resources will be removed by the proposed development. However, given the small amount of habitat affected, its location next to a busy road and the sporadic nature of the species, it is very unlikely the development would lead to a long-term decrease in the size of the population.

[5] Introducing an invasive species into the occurrence may result in that species becoming established. An invasive species may harm a critically endangered or endangered ecological community by direct competition, modification of habitat, or predation.

- *(or) reduce the area of occupancy of the species,*
  The proposed development will only very marginally reduce the area of occupancy of the species.

- *(or) fragment an existing population into two or more populations,*
  There will be not be any modification to a degree where populations are fragmented.

- *(or) adversely affect habitat critical to the survival of a species,*
  The route represents a very small area of potential habitat for the Swift Parrot. It is unlikely to be habitat critical for the survival of the species.

- *(or) disrupt the breeding cycle of a population,*
  The Swift Parrot breeds in Tasmania. Its breeding cycle is unlikely to be affected by the loss of a small amount of potential habitat.

- *(or) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,*
  The proposed development will not affect the species to such a degree where it is likely to decline.

- *(or) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*[6]*,*
  The proposed development will not result in further introduction of invasive species.

- *(or) interfere with the recovery of the species.*
  It is very unlikely that habitat within the route is important to the recovery of the species.

Conclusion
The proposed development is unlikely to have a significant impact on the Swift Parrot.

5.2.2.2 Regent Honeyeater

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- *lead to a long-term decrease in the size of a population,*
  This semi-nomadic species may occasionally inhabit the route. Some Narrow-leaved Ironbarks and other potential foraging resources will be removed by the proposed development. However, given the small amount of habitat affected, its location next to a busy road and the sporadic nature of the species, it is very unlikely the development would lead to a long-term decrease in the size of the population.

[6] Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation

- *(or) reduce the area of occupancy of the species,*
  The proposed development will only very marginally reduce the area of occupancy of the species.

- *(or) fragment an existing population into two or more populations,*
  There will be not be any modification to a degree where populations are fragmented.

- *(or) adversely affect habitat critical to the survival of a species,*
  The route represents a very small area of potential habitat for the Regent Honeyeater. It is unlikely to be habitat critical for the survival of the species.

- *(or) disrupt the breeding cycle of a population,*
  The Regent Honeyeater breeds in two primary locations. These are Bundarra-Baraba, west of Armidale, and the Capertee Valley, north of Lithgow. Breeding has also been reported from the Warrambungles and Mudgee areas (NPWS, 1999). None of these locations are in the vicinity of the route.

- *(or) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,*
  The proposed development will not affect the species to such a degree where it is likely to decline.

- *(or) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*[7]*,*
  The proposed development will not result in further introduction of invasive species.

- *(or) interfere with the recovery of the species.*
  It is very unlikely that habitat within the route is important to the recovery of the species.

Conclusion
The proposed development is unlikely to have a significant impact on the Regent Honeyeater.

5.2.3 Vulnerable Species

The shale-gravel transition forest along the route represents suitable habitat for two vulnerable species, *Pultenaea parviflora* and *Acacia pubescens*. Therefore, the development must be assessed in relation to criteria pertaining to vulnerable species. These are discussed below.

[7] Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation

5.2.3.1 *Pultenaea parviflora*

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- *lead to a long-term decrease in the size of an important population*[8] *of a species, or*

The local population, which occurs in other nearby shale-gravel transition forests, can be considered an important population and parts of the proposed route include suitable habitat for that population. No individuals of the species were found within the area proposed for road widening, though some potential habitat may be affected. It is considered unlikely that the proposed action will lead to a long-term decrease in the size of the population.

- *reduce the area of occupancy of an important population,*

The proposed action will reduce the area of potential occupancy of the population. This will be mitigated by rehabilitation of other potential habitat areas within the corridor.

- *(or) fragment an existing important population into two or more populations,*

The loss of some potential habitat is unlikely to further fragment the local population of the species.

- *(or) adversely affect habitat critical to the survival of a species,*

Given that the small amount of potential habitat affected, it is unlikely that the proposed action will adversely affect habitat critical to the survival of the species.

- *(or) disrupt the breeding cycle of an important population,*

The fact that the species is not apparent above ground indicates that the breeding cycle of the species has been disrupted. Peas (such as the *Pultenaea* genus) generally have long-lived seed and *Pultenaea parviflora* may therefore be present in the soil seedbank. Re-application of stripped topsoil on areas to be landscaped may stimulate any seed present to germinate.

- *(or) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,*

Given that the route is only potential habitat, it is unlikely that the proposed action would lead or significantly contribute to the species' decline.

- *(or) result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat,*

Invasive species have already degraded potential habitat along the route. The proposed action is unlikely to exacerbate this situation.

- *(or) interferes substantially with the recovery of the species.*

The proposed route is unlikely to be important to the recovery of the species.

---

[8] An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

5.2.3.2 *Acacia pubescens*

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- *lead to a long-term decrease in the size of an important population of a species, or*

The local population, which occurs in other nearby shale-gravel transition forests, can be considered an important population and parts of the proposed route include suitable habitat for that population. No individuals of the species were found within the area proposed for road widening, though some potential habitat may be affected. It is considered unlikely that the proposed action will lead to a long-term decrease in the size of the population.

- *reduce the area of occupancy of an important population,*

The proposed action will reduce the area of potential occupancy of the population. This will be mitigated by rehabilitation of other potential habitat areas within the corridor.

- *(or) fragment an existing important population into two or more populations,*

The loss of some potential habitat is unlikely to further fragment the local population of the species.

- *(or) adversely affect habitat critical to the survival of a species,*

Given that the small amount of potential habitat affected, it is unlikely that the proposed action will adversely affect habitat critical to the survival of the species.

- *(or) disrupt the breeding cycle of an important population,*

The fact that the species is not apparent above ground indicates that the breeding cycle of the species has been disrupted. Acacias generally have long-lived seed and *A.pubescens* may therefore be present in the soil seedbank. Re-application of stripped topsoil on areas to be landscaped may stimulate any seed present to germinate.

- *(or) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,*

Given that the route is only potential habitat, it is unlikely that the proposed action would lead or significantly contribute to the species' decline.

- *(or) result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat,*

Invasive species have already degraded potential habitat along the route. The proposed action is unlikely to exacerbate this situation.

- *(or) interferes substantially with the recovery of the species.*

The proposed route is unlikely to be important to the recovery of the species.

5.3 Sydney Regional Environmental Plan No. 20 - Hawkesbury-Nepean River (No. 2 - 1997)

Under this plan the policy in regard to flora and fauna is as follows:
(to) manage flora and fauna communities so that the diversity of species and genetics within the catchment is conserved and enhanced.

Relevant general strategies in this regard are:
(a) *Conserve, and where appropriate, enhance flora and fauna communities, particularly threatened species, populations and ecological communities, aquatic habitats, wetland flora, rare flora and fauna, riverine flora, flora with heritage value, habitats for indigenous and migratory species of fauna, and existing or potential fauna corridors.*
There will be some loss (approximately 800 m^2) of the endangered ecological community Cumberland Plain Woodland and some loss of potential habitat for a number of threatened species. Recommendations in section 6 below will compensate for this loss.

(b) *Locate structures where possible in areas which are already cleared or disturbed instead of clearing or disturbing further land.*
Due to the existing location of important infrastructure and engineering restrictions, it was not possible to avoid removal of bushland. Furthermore, although parts of the proposed development are within bushland, a significant proportion of the bushland is already disturbed.

(c) *minimise adverse environmental impacts, protect existing habitat and where appropriate, restore habitat values by the use of management practices.*
Landscaping and regeneration within other parts of the corridor will restore habitat values lost due to the construction of the flood evacuation route.

(d) *consider the impact on ecological processes such as waste assimilation and nutrient cycling*
There is unlikely to be any impact on such processes.

(e) *consider the range of flora and fauna inhabiting the site of development concerned and the surrounding land, including threatened species and migratory species, and the impact of the proposal on the survival of threatened species, populations and ecological communities, both in the short and long terms*
These factors have been considered under the NSW *Threatened Species Conservation Act* and the Commonwealth *Environment Protection and Biodiversity Conservation Act*. It is considered that there will not be a significant impact on such threatened species or ecological communities.

(f) *consider the need to provide and manage buffers, adequate fire radiation zones and building setbacks from significant flora and fauna.*
Significant flora in the form of Cumberland Plain Woodland will remain adjacent to the southern end of the route. Appropriate landscaping in this area should ensure that further degradation does not occur as a result of he works.

(g) *consider the need to control access to flora and fauna habitat areas.*
The proposed works will have no effect on access to fauna and flora habitat areas.

On the basis of the above discussion it is considered that the policy of Sydney Regional Environmental Plan No. 20 is met by the proposed development.

5.4 State Environmental Planning Policy No. 19 - Bushland in Urban Areas

Part of the route adjoins Vineyard Park, which is zoned as public open space. The western part of this reserve, some 100m from Windsor Road, is bushland as defined by the policy. The vegetation in this bushland is Shale-Gravel Transition Forest and includes a significant population of *Acacia pubescens* and a small population of *Pultenaea parviflora*.

SEPP 19 Clause 9 requires that where a public authority either proposes to carry out development or grant consent in relation to land which adjoins bushland zoned or reserved for public open space purposes, the public authority shall not carry out that development or grant approval or development consent unless it has taken into account:

- *the need to retain any bushland on the land*

There is no bushland within that section of the road reserve fronting Vineyard Park.

- *the effect of the propose development on bushland zoned or reserved for public open space purposes and in particular, on the erosion of soils, the siltation of streams and waterways and the spread of weeds and exotic plants within the bushland*;

No works are proposed for the section of the road reserve fronting Vineyard Park.

- *and any other matter which, in the opinion of the approving or consent authority, are relevant to the protection and preservation of bushland zoned or reserved for public open space purposes.*

No other matters are considered relevant.

5.5 SEPP 44 - Koala Habitat Protection

As Hawkesbury City Council is listed in Schedule 1 of SEPP 44, development controls within the policy are applicable. An assessment of the proposed route was undertaken to ascertain its suitability as koala habitat. The procedures involved in such an assessment are outlined in SEPP 44.

Step 1 Is the land potential koala habitat? - **Yes**

The land is potential koala habitat as more than 15% of the total number of trees present are Forest Red Gum (*Eucalyptus tereticornis*), which is listed on schedule 2 of the policy as a koala feed tree.

Step 2 Is the land core koala habitat - **No**

No koalas, or evidence of the species, were detected along the route during the fauna survey. The nearest koala population is in Maroota State Forest, some 20 kilometres to the north-east.

Therefore, there is no need for a Koala plan of management.

6. Impact Mitigation

The proposed development requires the removal of a small area of the endangered ecological community Cumberland Plain Woodland as well as Shale Gravel Transition Forest which is potential habitat for a number of threatened species. Both vegetation types also support a range of non-threatened native flora and fauna species. To compensate for this loss of habitat, it is recommended that the following measures should be undertaken:

- Planting within those parts of the road reserve not required for infrastructure plant species typical of Cumberland Plain Woodland and Shale Gravel Transition Forest. Generally, Cumberland Plain Woodland species should be planted on crests and upper slopes and Shale Gravel Transition Forest species on lower slopes and depressions. (See Appendix 2 for suitable species). If possible, *Acacia pubescens* and *Pultenaea parviflora* should be included in the planting schedule for Shale Gravel Transition Forest areas. The RTA could liaise with Hawkesbury City Council and the National Parks and Wildlife Service in regard to obtaining propagation material from bushland in nearby Vineyard Park.
- Stockpiling of any native soil stripped during the works and re-application within above-mentioned regeneration/landscape areas. This is to aid natural regeneration of locally occurring native plant species.
- RTA liaises with Hawkesbury City Council regarding approved removal methods for Prickly Pear.

References

Benson, D and McDougall, L. (1996) Ecology of Sydney Plant species Part 4: Dicotyledon family Fabaceae. *Cunninghamia* 4(4).

Blakers, M., Davies, S.J.J.F., and Reilly, P.N.(1984), *The Atlas of Australian Birds* Royal Australasian Ornithologists Union, Melbourne University Press.

Briggs, J.D. and Leigh, J.H., (1995), *Rare or Threatened Australian Plants.* CSIRO Publishing, Collingwood.

Debus S.J.S and Chafer, C.J. (1994) The Powerful Owl Ninox strenua in New South Wales. *Australian Birds* 28 (supplement). pp 21-39.

Garnett, S[ed]. (1993) *Threatened and Extinct Birds of Australia.* RAOU report no 82.

Hollands, D., (1991), *Birds of the Night.* Reed Books, Balgowlah, NSW.

James, T., McDougall, L. and Benson, D.H. (1999) *Rare Bushland Plants of Western Sydney.* Royal Botanic Gardens, Sydney.

JANIS (1997) Comprehensive, *Adequate and Representative Reserve System for Forests in Australia.* Report by the Joint ANZECC/MCFFA National Forest policy Statement Sub-committee.

Morris, A.K. and Burton, A. (1996) 1994 New South Wales Bird Report. *Australian Birds* Vol. 29(4).

NPWS (1997a) *Native Fauna of Western Sydney: Urban Bushland Biodiversity Survey.* NSW National Parks and Wildlife Service, Hurstville.

NPWS (1997b) *Cumberland Plain Woodland Discussion Paper: "Draft for Comment".* NSW National Parks and Wildlife Service Sydney Zone, Hurstville.

NPWS (2000) Interpretation *Guidelines for the Native Vegetation of the Cumberland Plain, Western Sydney.* NSW National Parks and Wildlife Service, Hurstville.

Specht, R.L (1970) Vegetation. In *The Australian Environment* (GW Leeper ed). CSIRO and Melbourne University Press, Melbourne.

Strahan, R., (Ed) (1983), *Complete Book of Australian Mammals*, Cornstalk Publishing, North Ryde.

Appendix 1 Plant Species List

*denotes introduced species

Scientific Name	Common Name
FILICOPSIDA (Ferns)	
ADIANTACEAE	
Cheilanthes sieberi	Mulga Fern
MAGNOLIOPSIDA (Flowering Plants)	
MAGNOLIIDAE (Dicots)	
ACANTHACEAE	
Brunoniella australis	Austral Trumpet
APIACEAE	
Foeniculum vulgare *	Fennel
ASCLEPIADACEAE	
Araujia hortorum *	Moth Plant
ASTERACEAE	
Bidens pilosa *	Cobbler's Pegs
Calotis cuneifolia	Burr-daisy
Conyza sp *	Fleabane
Cyrsium vulgare *	Thistle
Helichrysum diosmifolium	
Senecio madagascariensis *	Fireweed Groundsel
Taraxacum officianale *	dandelion
CACTACEAE	
*Opuntia stricta**	Prickly Pear
CHENOPODICACEAE	
Atriplex prostrata *	
CONVULVULACEAE	
Dichondra repens	Kidney Weed
FABACEAE	
Sub-Family Faboideae	
Bossiaea prostrata	
Daviesia ulicifolia	Bitter-pea
Dillwynia sieberi	Parrot Pea
Glycine clandestina	Love Creeper
G. tabacina	"
Hardenbergia violacea	False sarsaparilla
Vicia sp *	Vetch
Sub-Family Mimosoideae	
Acacia falcata	Sickle Wattle
A.parramattensis	Parramatta Green Wattle
*A.podyariifolia**	Queensland Silver Wattle
LOBELIACEAE	
Pratia purpurascens	White Root
MALVACEAE	
Sida rhombifolia *	Paddy's Lucerne
MYRTACEAE	
Eucalyptus crebra	Narrow-leaved Ironbark
E. fibrosa	Broad-leaved Ironbark
E.moluccana	Grey Box
E.tereticornis	Forest Red Gum
Melaleuca decora	paperbark
OXALIDACEAE	
Oxalis corniculata *	Oxalis
PITTOSPARACEAE	
Bursaria spinosa	Blackthorn
PLANTAGINACEAE	
Plantago lanceolata *	Plantain

Scientific Name	Common Name
POLYGONACEAE	
*Rumex crispus**	Dock
SOLANACEAE	
Solanum nigrum *	Nightshade
VERBENACEAE	
Verbena boniariensis *	Purple-top
LILIIDAE (Monocots)	
ASPARAGACEAE	
*Myrsiphyllum asparagoides**	Florist's Smilax
ASPHODELIACEAE	
Bulbine bulbosa	Golden lily
COMMELINACEAE	
Commelina cyanea	Scurvy Weed
CYPERACEAE	
Cyperus eragrostis *	
JUNCACEAE	
Juncus subsecundus	A Rush
J.usitatus	Common Rush
LOMANDRACEAE	
Lomandra glauca	Iron Grass
L.multiflora	Mat-rush
PHORMIACEAE	
Dianella longifolia	Flax lily
D.prunina	Flax lily
POACEAE	
Aristida vagans	Three-awn Spear Grass
Chloris gayana *	Rhodes Grass
Cynodon dactylon	Couch
Cymbopogon refractus	Barb-wire Grass
Danthonia temior	Wallaby Grass
Eragrostis curvula	African Love Grass
Microlaena stipoides	Weeping Meadow Grass
Paspalum dilatatum *	Paspalum
Setaria sp *	Setaria
Themeda australis	Kangaroo Grass
TYPHACEAE	
Typha orientalis	Cumbungi

Appendix 2 Plant Species Suitable for Landscaping/Rehabilitation

Cumberland Plain Woodland

Trees
Eucalyptus crebra, Eucalyptus eugenioides, Eucalyptus fibrosa, Eucalyptus moluccana, Eucalyptus tereticornis

Small trees/Shrubs
Acacia falcata, Acacia implexa, Acacia parramattensis, Bursaria spinosa, Daviesia ulicifolia Dillwynia sieberi, Helichrysum diosmifolium, Indigofera australis, Melaleuca decora.

Groundcover
Ferns: *Cheilanthes sieberi*
Monocots: *Aristida ramosa, Aristida vagans, Arthropodium milleflorum, Bulbine bulbosa, Commelina cyanea, Cymbopogon refractus, Cyperus gracilis, Dianella longifolia, Dianella revoluta, Dichelachne micrantha, Echinopogon caespitosus, Echinopogon ovatus, Entolasia marginata, Eragrostis leptostachya, Hypoxis hygrometrica, Lepidosperma laterale, Lomandra multiflora, Microlaena stipoides, Oplismenus aemulus, Panicum simile, Themeda australis, Tricoryne elatior,*
Herbs and Twiners: *Asperula conferta, Brunoniella australis, , Dichondra repens, Wahlenbergia gracilis, Hardenbergia violacea, Glycine clandestina, Glycine tabacina, Goodenia hederacea, Hibbertia diffusa, Hypericum gramineum, Pratia purpurascens.*

Shale Grave Transition Forest

Trees
Eucalyptus fibrosa, Eucalyptus moluccana, Eucalyptus tereticornis

Small trees/Shrubs: *Acacia falcata, Acacia parramattensis, Acacia pubescens, Bursaria spinosa, Daviesia ulicifolia, Dillwynia sieberi, Helichrysum diosmifolium, Indigofera australis, Melaleuca decora, Pultenaea parviflora.*

Groundcover: as for Cumberland Plain Woodland

ATTACHMENT 5

Indigenous Heritage Assessment
McGraths Hill Flood Evacuation Route
Windsor Road McGraths Hill NSW

September 2000, Bobbie Oakley & Associates Heritage Consultants.

Indigenous Heritage Assessment
McGraths Hill Flood Evacuation Route
Windsor Road McGraths Hill
NSW

Report to
Environmental Planning Pty Ltd

September 2000

Bobbie Oakley

Bobbie Oakley & Associates Heritage Consultants
91 Great Buckingham Street Redfern 2016 & "Millpost" Nimmitabel 2631
phone & fax 02.64957614 email boakley@ozemail.com.au **ABN 17476991681**

Contents

1. Introduction
1.1 Proposed Works 3
1.2 The Consultancy Brief 4
1.3 Summary Results 4
1.4 Summary of Recommendations 5

2. Aboriginal Participation 5

3. Methodology
3.1 Research 5
3.2 The Survey 6
3.3 Survey Strategy 6

4. Environmental Context
4.1 Location, Geology and Topography 6
4.2 Vegetation 6
4.3 Recent Landuse 7

5. Archaeological Context
5.1 Regional Context 7
5.2 Local Context 8
5.3 Predictions 10

6. Results, Significance Assessment and Discussion
6.1 Effective Survey Coverage 10
6.2 Aboriginal Sites 11
6.2.1 Description of WRSTS 12
6.2 2 Description of Sensitive Areas 13
6.3 Management Requirements 13
6.4 Discussion & Conclusions 14

7. Recommendations 15

Appendix A: RTA Concept Plans

List of Figures

1. Locality Map showing the location of the study area

2. Large scale diagram of the study area

3. Topographic Maps: Wilberforce & Riverstone 1:25k showing locations of recorded Aboriginal sites & the study area.

Photographic Record

1. Section of study area ***Site 1***. Exposure on lower side of road.
2. Section of study area ***Sites 2 & 3*** showing exposure and intensively impacted area adjacent to roadside strawberry farm.
3. Section of study area ***Sites 2 & 3*** showing **SA-1** on lower side of road.
4. Study area ***Site 6*** directly south of Blackwood Road showing location of culvert 6.
5. Study area ***Sites 7 & 8*** between Bandon Road and culvert 8.
6. Study area ***Sites 7 & 8*** between Blackwood Road and culvert 6.
7. Culvert 8 in study area ***Sites 7 & 8***.
8. Telstra installation exposure in study area ***Site 10***.
9. Study area ***Site 10*** showing section of **SA-2**.
10.. Possible Aboriginal scarred tree **WRST-1**.
11. Possible Aboriginal scarred tree **WRST-2**.

Indigenous Heritage Assessment
McGraths Hill Flood Evacuation Route
Windsor Road McGraths Hill NSW

1. Introduction

This report presents the findings of a survey for Aboriginal archaeological sites within the Windsor Road reserve between Curtis Road and Bandon Road, McGraths Hill, NSW (***Figures 1 & 2***).

The archaeological assessment will form part of a Review of Environmental Factors [REF] being prepared by Environmental Planning Pty Ltd, PO Box 390, Pymble 2073. The NSW Roads and Traffic Authority [RTA] commissioned the REF.

1.1 Proposed Works

The Department of Land and Water Conservation (DLWC) and the RTA are planning upgrading works on Windsor Road between Curtis Road and Bandon Road to provide an evacuation route for the local community in the event of severe floods. See ***Figure 2*** for the locations of the proposed impact.

The proposed works are as follows:

Site 1– between Curtis Road and Groves Avenue
Replace the existing pipe culvert with a larger box culvert and raise the existing road level over a length of 160 metres by up to 0.6 metres (***Photograph 1***).

Site 2 & 3– Groves Avenue to Henry Road
Retain existing road as the northbound carriageway. Construct approx. 800 metres of new raised southbound carriageway (up to 0.9 metres higher than existing road). Install new larger box culverts downstream of existing culverts at Sites 2 & 3. This will provide a short section of four lane divided road (***Photographs 2 & 3***).

Site 4—near Brennan Dam Road
Install additional pipe culvert adjacent to existing pipe culvert. No change to road levels.

Site 5– north of Level Crossing Road
Replace the existing pipe culverts with a larger multicell box culvert and raise the existing road level over a length of 100 metres by up to 0.35 metres. Install roadside drainage under driveways to carry overflows from existing pipe culvert north of Site 5.

Site 6- near Blackwood Road
Replace the existing pipe culvert with a larger multicell box culvert. No change to road levels (***Photograph 4***).

Sites 7 & 8 - South of Blackwood Road to Bandon Road
Retain existing road as the southbound carriageway. Construct approx. 900 metres of new raised northbound carriageway (up to 1.1 metres higher than existing road). Install new larger multicell box culverts upstream of existing culverts at Sites 7 and 8. This will provide a short section of four lane divided road. (***Photographs 5, 6 & 7***)

Site 9 at Bandon Road and Windsor Road intersection
Installation of a new pipe under Windsor Road at Bandon Road and signalisation of the intersection.

Site 10 South of Bandon Road
Installation of a new box culvert under Windsor Road approximately 350 metres south of Bandon road and a tie-in from Bandon Road to the existing four lane section of Windsor Road approximately 500 metres south. (***Photographs 8 & 9***)

The proposed works will be generally contained within the road reserve although some easements may be required outside the road reserve to accommodate the project. No land acquisition will be required for the project.

1.2 The Consultancy Brief

The consultant was required to assess whether the proposed upgrading of Windsor Road would affect any Aboriginal archaeological sites or relics. As part of this process the consultant was required to:

- liaise with the RTA's Aboriginal Community Liaison Officer;
- liaise with the Deerubbin Local Aboriginal Land Council [DLALC];
- conduct research at the NSW National Parks and Wildlife Service (NPWS);
- conduct an archaeological survey accompanied by a member of the DLALC to assess the scale and nature of likely impacts of the proposal on indigenous heritage;
- make recommendations on measures to both minimize and reduce any adverse impact on indigenous heritage; and
- prepare a report in accordance with the NPWS report-writing guidelines.

1.3 Summary of Results

- No Aboriginal archaeological sites listed with the NPWS ASR are located within, or in the vicinity of, the proposed impact areas.

- One new site, **Windsor Road Scarred Tree Site [RSTS]**, comprising two possible Aboriginal scarred trees **WRST-1** [Windsor Road Scarred Tree 1] and **WRST-2** [Windsor Road Scarred Tree 2] are located outside the study area, in the vicinity of the proposed impact area at ***Site 5***.

- The survey identified two areas with the potential to contain Aboriginal relics, **SA-1** and **SA-2**, within study areas ***Sites 2 & 3*** and ***Site 10*** respectively.
  [SA-1 has the potential to contain surface and sub-surface Aboriginal relics]
  [SA-2 has the potential to contain surface Aboriginal relics]

1.4 Summary of Recommendations

Site 1

There are no constraints on archaeological grounds to the proposed works at ***Site 1***.

Sites 2 & 3

A member of the DLALC must monitor vegetation clearing and earth works within **SA-1**.

Site 4

There are no constraints on archaeological grounds to the proposed works at ***Site 4***.

Site 5

WRST-1 and **WRST-2** must be protected during the proposed works as outlined in section **6.3 Management Requirements** below.

Site 6

There are no constraints on archaeological grounds to the proposed works at ***Site 6***

Sites 7 & 8

There are no constraints on archaeological grounds to the proposed works at ***Sites 7 & 8***.

Site 9

There are no constraints on archaeological grounds to the proposed works at ***Site 9***.

Site 10

A member of the DLALC must monitor vegetation clearing and earthworks at **SA-2**.

2. Aboriginal Participation

The study area is located within the boundary of the Deerubbin Local Aboriginal Land Council (DLALC). The DLALC was contacted and consulted regarding the proposed development, and a representative of the Land Council was invited to participate in the field survey. Mr Steven Randall participated in the survey.

In addition Ms Suzanne Malligan, the RTA's Aboriginal Liaison Officer, has been consulted regarding the proposed works, and the findings of the study as outlined in this report.

The DLALC and Ms Malligan have been sent a draft copy of the report for comment. A final copy of the report will be forwarded on completion of the study.

3. Methodology

3.1 Research

Research was carried out at the NPWS Aboriginal Sites Register [ASR]. All recorded sites within a 5 kilometre radius of the study area were plotted on to the Riverstone and Wilberforce 1:25k topographic map sheets (***Figure 3***), and relevant archaeological reports and original site cards were consulted.

3.2 The Survey

The survey was conducted on the 4 September 2000 by the consultant and Steven Randall, DLALC.

3.3 Survey Strategy

The survey of the proposed impact areas between Curtis and Bandon Roads was conducted on foot, and all mature trees were inspected for the presence of scars.

The size of the study area was approximately 55,800sq metres comprising:

Site 1	4,000 sq m	(200m long x 2(10m) wide)
Sites 2 & 3	16,000 sq m	(800m long x 20m wide)
Site 4	1,400 sq m	(70m long x 20m wide)
Site 5	4000 sq m	(200m long x 20m wide)
Site 6	400 sq m	(20m long x 20m wide)
Sites 7 & 8	20,000sq m	(1000m long x an average of 20m wide)
Sites 9 & 10	10,000sq m	(500m long x 20m wide)

See ***Figure 2***

4. Environmental Context

4.1 Location, Geology and Topography

The study area is located on the gently undulating Northern Cumberland Plain between McGraths Hill and Vineyard, NSW. It is approximately 3 kilometres to the south and east of Windsor, 2 kilometres to the north of Riverstone, approximately 2 kilometres east of Eastern Creek, approximately 500 metres west of Killarney Chain of Ponds, approximately 1.5 kilometres east of South Creek, and at its northern extent at Curtis Road, approximately 3 km south of the Hawkesbury River at Windsor (***see Figures 2 & 3***).

The underlying bedrock consists of Triassic Ashfield Shale, Liverpool Sub-Group, Wiannamata Shale Group (Packham 1969).

The study area is located on the crest and lower slopes of a low, gently undulating ridge which divides the catchments of Killarney Chain of Ponds to the east and Eastern and South Creeks to the west. These creeks run roughly north-south and flow into the Hawkesbury River several kilometres to the north of the study area. The area contains two minor intermittent tributaries, which flow into Killarney Chain of Ponds.

4.2 Vegetation

With the exception of two sections of the study area within ***Sites 2 & 3***, and ***Site 10***, the area has been cleared of native vegetation and only contains two remnant stands of open woodland containing mature and immature *Eucalyptus moluccana* (grey box), several stands of regrowth *E. moluccana*, and the occasional isolated grey box.

Sites 2 & 3, and ***Site 10*** contain undisturbed remnant grey box woodland with a paperbark understorey, and native grasses (see **Photographs 3 & 9** resp.)

Before European settlement the area would have supported an open woodland containing grey box, forest red gum, rough-barked angophora, and iron barks on the ridge, and a closed grey box woodland with a paperbark understorey on the damper lower slopes adjacent to the Killarney Chain of Ponds alluvial flats.

4.3 Recent Landuse and Disturbance

With the exception of the two undisturbed areas noted in **4.2**, the ground surface within the entire study area been extensively modified by vegetation clearing, road construction, drain and culvert excavation, residential and commercial development, access driveways, grading within the road reserve, and heavy vehicle impact along the unsealed road margins (see ***Photographs 2,4,5,6 & 8***).

Exposures revealed that deposit overlying the shale bedrock was extremely shallow, and in most of the exposures erosion had removed the top soil, exposing the eroding shale bedrock and red/yellow clay. In addition, several exposures resulting from recent bore hole activity and Telstra installation excavations (see ***Photograph 8***), revealed large river cobbles which had been brought to the surface. These exposures were located within **SA-1**, and at study areas ***Site 1 and Sites 7 & 8.***

5. Archaeological Context

5.1 Regional Context – The Cumberland Plain

Archaeological investigations on the Cumberland Plain have recorded more than 650 Aboriginal archaeological sites, and demonstrated that an open campsite at Jamisons Creek was occupied almost continuously from 7000 years ago until well after European settlement (Kohen 1985). However, as Pleistocene dates have been obtained from rock shelter sites in the nearby Blue Mountains, it can be assumed that occupation of the Plain dates to that period.

A relatively recent analysis of 666 sites listed with the NPWS ASR (Jo McDonald CHM Pty Ltd 1997) showed that open camp sites were the most commonly recorded site type (89%). Scarred trees accounted for 2.1%, shelter sites and grinding grooves accounted for 3.6%, and isolated finds and a combination of open/other site types (eg scarred trees) accounted for 3.5% of the recorded sites.

The analysis also found that:

> Open sites were located in all landscapes on the Plain except the shale-sandstone interface areas, and the very high proportion of sites recorded on creekbanks or creekbank combinations was assessed to be more indicative of surface visibility and taphanomic factors, than human distribution of artefacts across the landscape.
>
> Sites located in catchments closer to the Hawkesbury/Nepean contained greater proportions of chert/indurated mudstone than those located further to the east and south.

In addition, investigations by Baker (1996) and by Barton (1996) have demonstrated that many silcrete pieces found on the Cumberland Plain were the result of natural fracturing rather than Aboriginal tool making; and an analysis of silcrete pieces excavated from a site a Plumpton, found that the majority of the artefacts had been 'made' by plough blades (Oakley 1993).

5.2 Local Context

The NPWS ASR lists 71 Aboriginal archaeological sites; all open camp sites, within a 5 kilometre radius of the centre of the study area on Windsor Road.

None of the sites are located within or the vicinity of the study area. The closest site is located approximately 600 metres west of the Level Crossing Road-Windsor Road intersection.

Archaeological studies within and surrounding the local area include those by Dallas (1982), Brayshaw (1986), Byrne (1987), McDonald (1987) Haglund (1983), Smith (1989), Mills (1996 and 1998), Corkill (1992), Barton (1996), Jo McDonald CHM Pty Ltd (1998).

Dallas 1982 found seven stone artefact scatters and four isolated stone artefacts during surveys conduced at Riverstone, Schofields and Quakers Hill for the Land Commission of NSW. The sites fell into two groups: open campsites associated with the small eastern tributaries of Eastern Creek; and stone tool manufacturing and campsites above and alongside Eastern Creek where there was abundant stone and permanent water. The majority of the artefacts were made of silcrete.

Brayshaw 1986 located one artefact scatter (Vineyard 1) and one isolated stone artefact during the survey of a proposed railway branchline between Blacktown and Riverstone, and the proposed electrification of the same line between Riverstone and Richmond. The site was located on a low ridge 90 metres southeast of the headwaters of a tributary to Killarney Chain of Ponds, approximately 600 metres west of the current study area at ***Sites 6, 7 & 8***.

McDonald (1987) as recommended conducted subsequent investigations at Vinyard 1. McDonald conducted five spade probes at the site however as no undisturbed stratified deposit was located, the sub-surface investigation was abandoned. However 260 artefacts were collected at four surface sample areas, most made of silcrete (246), and it was assessed that the site was fairly typical for the area. Other raw materials represented at the site included quartzite, quartz, mudstone and volcanic.

Byrne 1987 conducted a survey on an extensive sand deposit situated between Pitt Town and the Hawkesbury River north of the current study. The survey which examined 50ha of land, found four isolated stone artefacts (2 basalt pebble tools, 1 quartz flake, and 1 indurated mudstone flake) within orchards and a market garden, and it was assessed that given the excellent ground visibility, the artefacts were isolated occurrences and not the remnants of more extensive sites.

Hagland 1983 conducted a survey at the Riverstone Meatworks, to the south west of the current study area. The survey, which covered about 15sq km located nine stone artefact scatters, five isolated stone artefacts, and relocated one previously recorded stone artefact.

Only one of the sites was recorded within the shale hills landform unit. Five of the sites were found in alluvium areas; and three sites were found on the shale hill slopes. The study showed that the sites with the largest areas and most stone artefacts were situated on the banks of creeks and streams, and that away from the creeks there was only sparse archaeological evidence, in the form of isolated artefacts and small sites with only a few artefacts. The majority of the artefacts were made of locally occurring silcrete.

Smith 1989 conducted survey work and site analysis as part of a management study of Aboriginal sites on the Northern Cumberland Plain. The survey recorded 79 open sites and 29 isolated finds, 26 of which are located within 5km of the current study. An analysis of site location indicated location and site densities were closely influenced by the availability of water and the availability of raw materials, and that factors such as topography, natural vegetation, soil types, etc., did not significantly influence site location. Most of the sites analysed by Smith occurred within 50m of permanent water.

However the study by **Jo McDonald CHM Pty Ltd (1997)** noted above, calls into question the site location model proposed by Smith, finding that open camp sites were located in all landscapes on the Plain, except on the shale/sandstone interface. And on the basis of evidence from excavations at an open site West Hoxton, McDonald suggests that sites are more likely to be located more than 50m from a creekline on hillslopes and slightly higher ground (**McDonald 1992**).

Barton 1996 found three stone artefact scatters containing a total of 32 artefacts during a survey of 7.5ha of land in South Windsor adjacent to Rickabys Creek, several kilometres to the southwest of the current study.

Mills 1996 found no Aboriginal archaeological sites during a survey for the RTA along Abbott Road between Old Windsor Road and Seven Hills Road to the south of the current study, however it was recommended that two sensitive areas be monitored during the construction stage of the development.

Mills 1998 found six open campsites, two isolated artefacts and six areas of potential archaeological deposit (PAD) between West Garfield Road and Hamilton Street, Riverstone. The survey concluded the area between William Street and Windsor Road was an area of potentially high archaeological significance and that should the proposed works be conducted, an in depth archaeologically investigation be carried out. Most of the sites and PADs were found on raised creek terrace and floodplain landforms. Only one of the sites and one of the PADs were found on hillslopes.

Corkill 1992 conducted a survey along Windsor Road and Old Windsor Road in Western Sydney to the south of the current study. The survey found eight stone artefact scatters, two isolated stone artefacts, and one possible Aboriginal scarred tree. All the sites were found within 200 metres from a watercourse, and the majority of the stone artefacts were made of red silcrete.

Jo McDonald CHM Pty Ltd 1998 conducted a survey on the Nepean-Hawkesbury floodplain at two properties known as Bona Vista and Fernadell, about 5km north of the current study. The survey located three artefact scatters and one scarred tree.

5.3 Predictions

On the basis the previous studies conducted within the Cumberland Plain region and in the local area, and given the shale bedrock, it is predicted that the study area may contain open campsites, and/or areas with the potential to contain sub-surface archaeological deposits.

Scarred trees may also be present if the area has not been subjected to clearing.

However it must be noted that as the study area is located within the road easement adjacent to a major arterial road within a developed rural residential/commercial area, there is only a low probability that *in situ* relics will be found.

6. Results, Significance Assessment, and Discussion

6.1 Effective Survey Coverage

A total of 55,800 sq metres were surveyed for Aboriginal sites/relics. Exposures accounted for 9,471 sq metres (or 17 % of the study area), and the total amount of the ground surface visible to the survey team was 8,521 sq metres, or 15.3% of the study area.

While the overall archaeological visibility was low due to vegetation cover (grass, remnant bushland, and gravel), the effective survey coverage was variable across the study area: e.g. high at ***Site 6***, and extremely low at ***Site 5***.

Table 1 presents the effective survey coverage data for each survey unit. As the survey was conducted entirely within one landform unit (a low gently undulating ridgeline), the survey units for this study are the proposed impact areas – study areas ***Sites 1-10***.

The effective survey coverage [***ESC***]% was calculated by dividing the total area of visibility in exposures [***VE***] by the total area of the survey unit [***TA***].

$$ESC\% = VE : TA \times 100$$

Table 1

Survey Unit Area Sq metres [TA]	*Total Area Exposures Sq metres*	*Visibility in Exposures Sq metres [VE]*	*Effective Survey Coverage %*	*Number of Sites Non-obtrusive*
1 4,000	100	100	2.5	0
2 & 3 16,000	2,000	1,800	11.25	0
4 1,400	10	10	0.7	0 [2 scarred trees]
5 4,000	1	1	0.025	0
6 400	360	360	90	0
7 & 8 20,000	5,000	4,550	22.75	0
9 & 10 10,000	2,000	1,700	17	0

Discussion

The effective survey results show that the coverage was variable across the study area. However with the exception of survey unit ***Sites 2 & 3***, and survey unit ***Sites 9 & 10***, which contained remnant, probably undisturbed native woodland, the survey results are assessed to be a fairly 'true' reflection of the archaeological resource, as any sites that may have been present within the disturbed areas along Windsor Road would have been destroyed by European impact.

In addition it must be noted that as the effective survey coverage analysis does not take account of the potential for the study area to contain sub-surface sites/relics, such an assessment was also undertaken and is given below.

6.2 Aboriginal Sites

No Aboriginal archaeological sites listed with the NPWS ASR are located within the study area.

The survey found one possible Aboriginal site **WRSTS**, which consists of two scarred trees, **WRST-1** and **WRST-2**, and two areas with the potential to contain Aboriginal

relics, **SA1** and **SA2**.

WRST-1 and **WRST-2** are located outside the boundary of the proposed impact and will not be affected.

6.2.1 Description of WRSTS

AMG: 300250.6275850 **Photographs 10 & 11**

WRSTS consists of two possible Aboriginal scarred trees within three metres of each other. They are located approximately 10 metres east of the Windsor Road bitumen within the road reserve. The trees, which are located on a rise in a stand of box trees, is about 50 metres north of the proposed works at study area Site 5 (between Chainages 40-60), and about 400 metres west of Killarney Chain of Ponds.

The assessment that the scars have an Aboriginal origin is a subjective assessment as there are no visible axe marks and the trees are not large, and therefore may not be old enough. However the shapes of the scars are regular and do not appear to have been caused by the removal of branches or by vehicle collision etc. Therefore, on a scale of probability, it is assessed that there is a moderate probability that they are Aboriginal scarred trees.

WRST-1 contains a scar which may be of Aboriginal origin. The tree is located on a low rise about 50 metres north of the northern bank of a tributary of Killarney Chain of Ponds in study area ***Site 5***, within a stand of grey box trees (***Photograph 10***).

WRST-2 contains a scar which may be of Aboriginal origin. It is located about 3 metres north of WRST-1 (***Photograph 11***).

Scar and tree attributes	*WRST-1*	*WRST-2*
species	grey box	grey box
girth	1.6m	2m
maximum scar length (including regrowth)	93cm	2m
inside scar length (excluding regrowth)	67cm	68cm
maximum scar width (including regrowth)	23cm(estimate)	?
inside scar width (excluding regrowth)	8.2cm	10
maximum depth of regrowth	2cm	10cm
height of inside scar above ground	1m	1m
aspect of scar	northwest	northwest
axe marks	none	none
condition of scar	good	good
condition of tree	good	good
estimated height of tree	c20m	c20m

6.2.2 Description of Sensitive Areas

SA-1, which is located within study area ***Sites 2 & 3***, consists of a narrow strip of remnant grey box woodland within the road reserve, east of Windsor Road, between Henry Road and Groves Avenue (between Chainages 1180—1260 approximately). The woodland appeared undisturbed as it contained a paperbark understorey and native grasses. SA-1, which measures approximately 80 metres x 8 metres contained only one exposure caused by vegetation clearing and disturbance of the ground surface associated with of a bore hole. This disturbance revealed a shallow deposit overlying clay, and several large river cobbles. The sensitivity of this area is based on the assumption that the vegetation is remnant woodland and therefore not disturbed. As such there is a high probability that it contains surface and sub-surface stone artefacts. However, even if the woodland is not remnant but regrowth, this area would still have the potential to contain relics (***Photograph 3***).

SA-2, which is located within study area ***Site 10***, consists of a narrow strip of remnant grey box woodland within the road reserve, east of Windsor Road, about 30 metres south of Bandon Road (between Chainages 1040—1800 approximately). With the exception of a recently cleared track, and an old track, the woodland appeared undisturbed. SA-2, which measured approximately 320 metres x 20 metres contained very little ground surface visibility along the tracks. However an exposure resulting from the recent excavation for Telstra installation, revealed red clay and eroding bedrock, and heavy vehicle use of the road margins adjacent to **SA-2** showed that there is no depth to deposit overlying the bedrock. As with SA-1, the sensitivity of this area is based on the assumption that the vegetation is remnant woodland and therefore not disturbed. As such there is a high probability that it contains surface stone artefacts. There is no potential for **SA-2** to contain sub-surface relics (***Photograph 9***).

6.3 Management Requirements

The two scarred trees are located outside the proposed impact at study area ***Site 5***, however they must be protected from damage during the proposed construction works. The following protective measures should be carried out:

- the trees must be marked on the Concept Plans of the proposed works;
- relevant contractors and RTA personnel must be shown the location of the trees; and
- a protective barrier must be constructed around the trees.

6.4 Discussion & Conclusion

That sites and sensitive areas were found was predicted however they only occur in remnant undisturbed areas within a highly modified road reserve. It is assessed that before European modification the area would have contained sites, probably large campsites and additional scarred trees, as it is suitably located on a narrow rise in the vicinity of major and minor permanent creeks.

The entire area covered by study area ***Site 10*** is assessed to be archaeologically sensitive (**SA-2**), and there is a high probability that surface scatters of stone artefacts and/or isolated stone artefacts are present. However as the deposit overlying the eroding bedrock is very shallow, the probability that sub-surface archaeological deposit is present is assessed to be extremely low.

In addition, it is assessed that a section of study area ***Sites 2 & 3*** (**SA-1**) could contain surface and sub-surface relics, given its proximity to low lying damp land adjacent to Killarny Chain of Ponds.

It is therefore recommended below that a member of the DLALC monitor vegetation clearing and earthworks within **SA-1** and **SA-2**. Sub-surface testing is not recommended for **SA-1** as the vegetation is so dense that it would need clearing .by mechanical means before such investigations could be conducted, thereby reducing the integrity of archaeological deposits which may be present.

The remainder of the study area does not require further investigation or monitoring as there is no potential for the area to contain sub-surface sites, and the integrity of surface sites would have been destroyed by extensive ground surface modification and intensive impact along the Windsor Road margins.

7. Recommendations

The following recommendations are based on:

The requirements of the **National Parks & Wildlife Act (NSW) 1974** (as amended) whereby it is illegal to damage, deface or destroy an Aboriginal relic without first obtaining the written permission of the Director General of the NSW NPWS; and

The findings of the study as documented in this report.

It is recommended that:

1. There are no constraints on archaeological grounds to the proposed works at:
   Site 1, Site 4, Site 5, Site 6, Sites 7&8, and Site 9.

2. Scarred trees **WRST-1** and **WRST-2** north of study area ***Site 4*** must be protected as specified in section **6.3 Management Requirements**.

3. Vegetation clearing and earth works within **SA-1** in study area ***Sites 2 & 3***, and within **SA-2** in study area ***Site 10***, must be monitored by a member of the Deerubbin Local Aboriginal Land Council.

In addition it is recommended that:

4. Should the location(s) of the proposed impact(s) change an archaeologist and a representative of the DLALC must be commissioned to survey the new area(s).

5. Should archaeological relics be found during the proposed works, work must cease and the NPWS contacted to inspect the finds.

6. Three copies of this report are sent to the Archaeologist, Metropolitan Aboriginal Heritage Unit, NPWS Head Office, PO Box 1967, Hurstville, 2220.

7. One copy of this report is sent to the Chairperson of the Deerubbin Local Aboriginal Land Council, PO Box V184, Mt Druitt Village, NSW.

References

Barton H. 1996. Archaeological test excavation for the Quakers Hill Bypass, Quakers Hill, NSW.

Barton, H. 1996. Archaeological Survey at 65 Burfitt Road, Riverstone, NSW.

Brayshaw H. 1986. Archaeological survey associated with modifications to the rail branchline between Blacktown and Richmond, NSW. Report to SRA through Dames & Moore.

Byrne D. 1987. Survey for Aboriginal Archaeological Sites at Lot 7, Johnston Street, Pitt Town, NSW. Report to RA Cole Town Planning Pty Ltd.

Corkill T. 1992. Survey for Aboriginal Archaeological Sites Along Windsor Road and Old Windsor road, Sydney, NSW. Report to Mitchell McCotter & Assoc. Pty Ltd.

Dallas. M. 1982. An Archaeological Survey at Riverstone, Schofields and Quakers Hill, NSW.

Haglund L. 1983. Environmental Investigation Riverstone Meat Company Property. Report to Don Fox Planning Pty Ltd.

Jo McDonald CHM Pty Ltd. 1998. Archaeological Survey of Two Land Parcels Known as Bona Vista and Bernadell at Pitt Town, NSW. Report to Don Fox Planning on behalf of Bona Vista and Fernadell Pty Ltd.

Jo McDonald CHM Pty Ltd. 1999. Archaeological Survey of Proposed Landcom Project 50112, Old Windsor road, Kellyville. Report prepared for John G. Nelson Pty Ltd on behalf of Landcom.

Oakley B. 1993. Test Excavations at Plumpton Park II (PPII) on a Tributary #3 Bells Creek Plumpton Park NSW. Report to Blacktown City Council.

Kohen J. 1985. An Archaeological Survey of Industrial Land in the City of Blacktown. Report to Blacktown City Council.

McDonald J. 1987. Archaeological Investigation of Open Site Vineyard 1 Western Cumberland Plains, NSW. Report to Dames & Moore, Crows Nest.

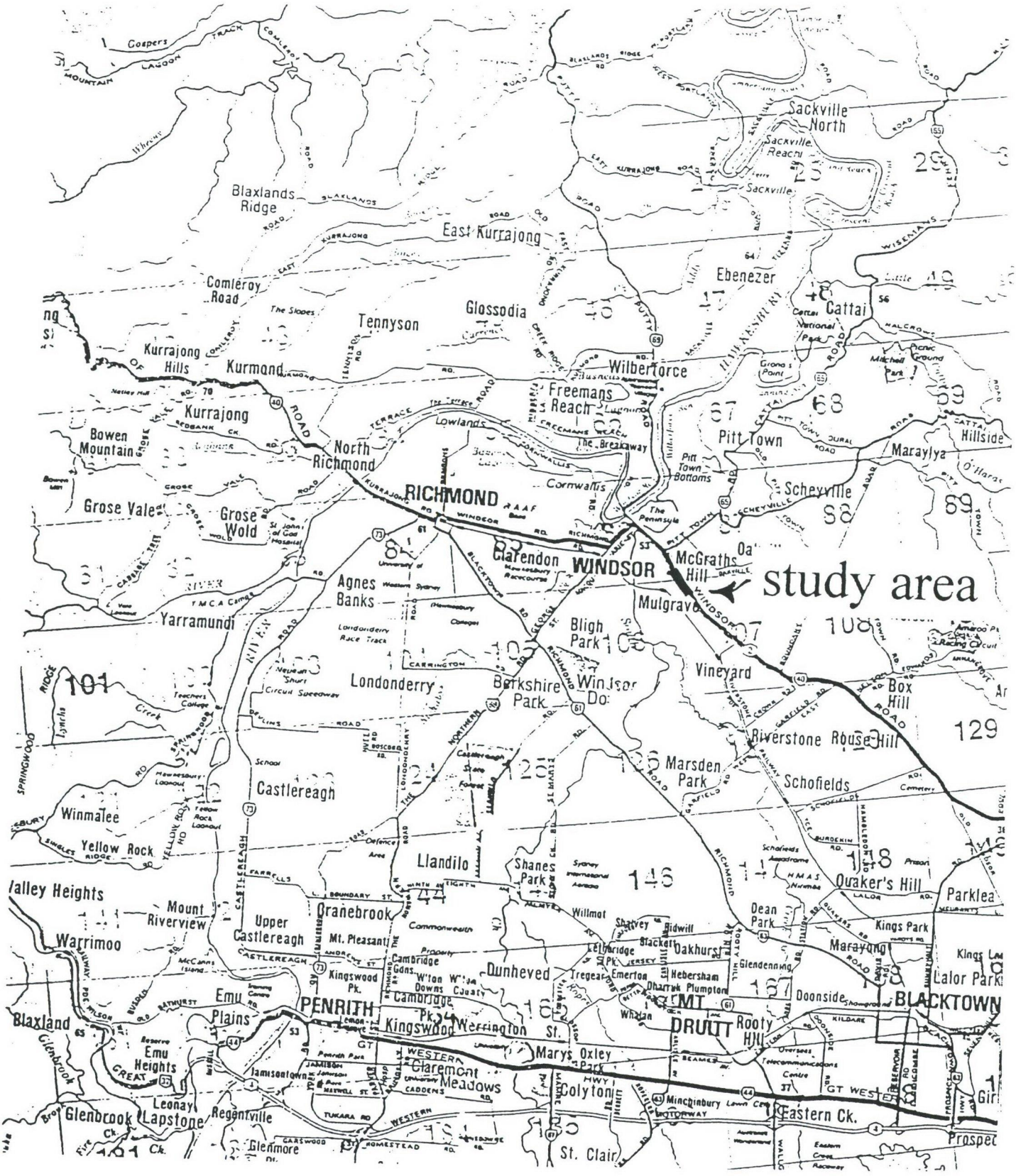
Mills R. 1996. Archaeological Survey of Proposed RTA Reconstruction of Abbott Road between Old Windsor Road and Seven Hills Road. Commissioned for RTA by Sinclair Knight Merz.

Mills R. 1998. An assessment of Aboriginal Heritage within the proposed road easement at Riverstone. Commissioned by the RTA Blacktown Office.

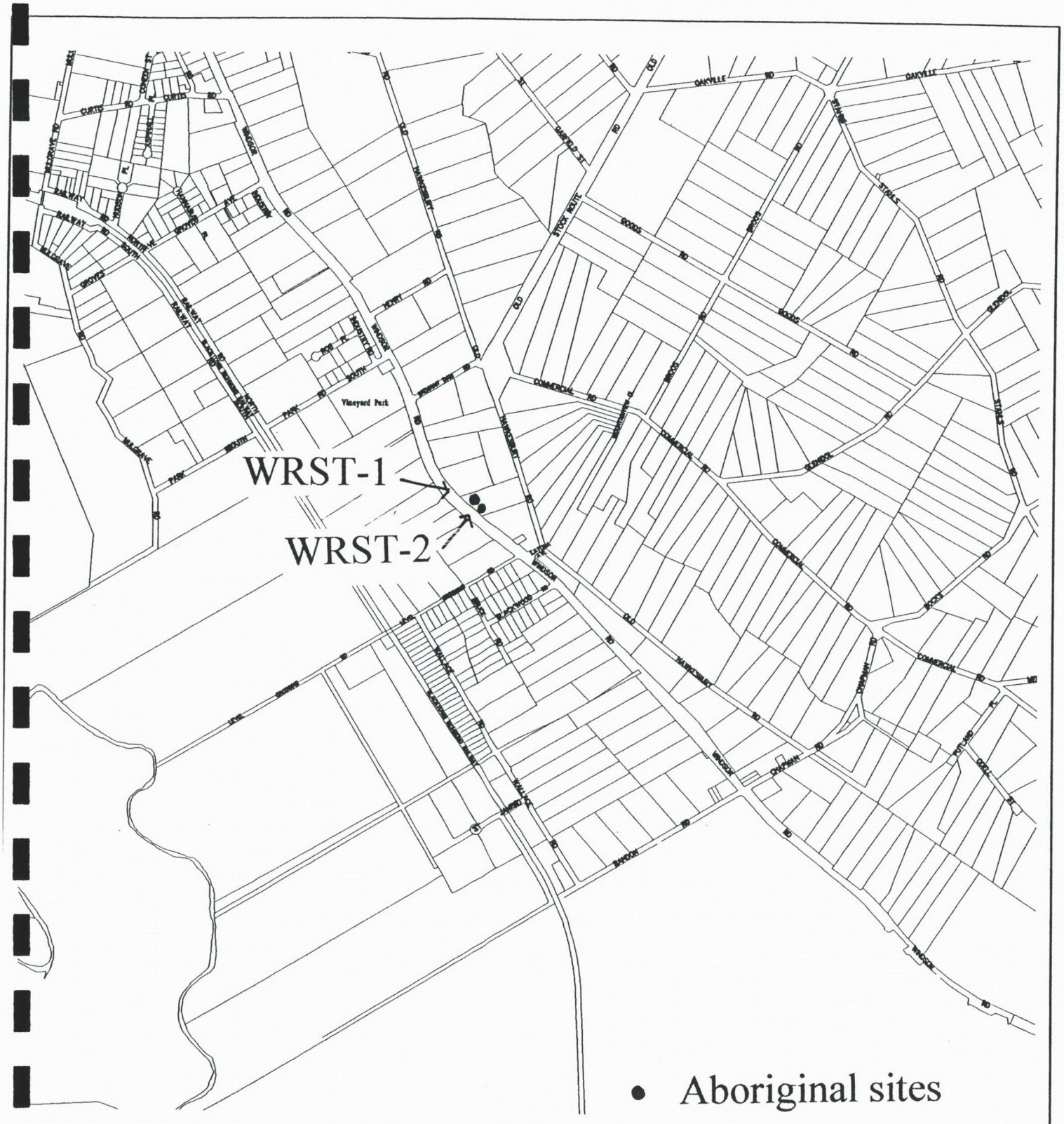
Smith L.1989. Archaeological Site Survey and Analyses of Sites on the Northern Cumberland Plain. Vol 1. Report to NPWS.

FIGURES

Figure One



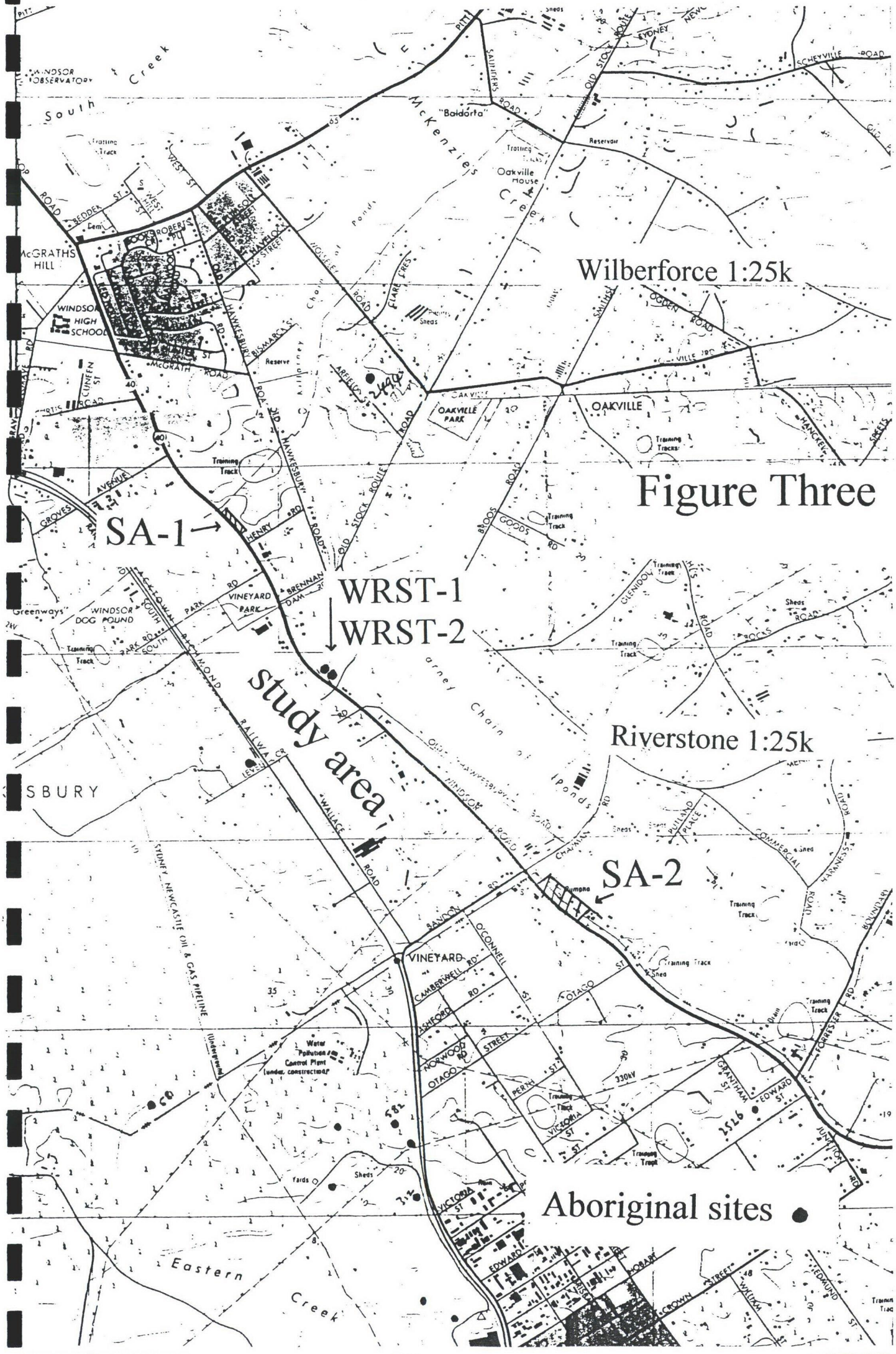
study area
RICHMOND
WINDSOR
PENRITH
BLACKTOWN
MT DRUITT
Sackville North
Blaxlands Ridge
East Kurrajong
Comleroy Road
Tennyson
Glossodia
Ebenezer
Cattai
Kurrajong Hills
Kurmond
Wilberforce
Freemans Reach
Kurrajong
Bowen Mountain
North Richmond
Pitt Town
Maraylya
Hillside
Scheyville
Grose Vale
Grose Wold
Clarendon
McGraths Hill
Agnes Banks
Mulgrave
Yarramundi
Bligh Park
Vineyard
Londonderry
Berkshire Park
Box Hill
Riverstone
Rouse Hill
Marsden Park
Schofields
Castlereagh
Winmalee
Yellow Rock
Llandilo
Shanes Park
Quaker's Hill
Parklea
Mount Riverview
Upper Castlereagh
Cranebrook
Warrimoo
Dean Park
Kings Park
Marayong
Dunheved
Emu Plains
Blaxland
Emu Heights
Kingswood
Werrington
Marys Oxley Park
Colyton
Eastern Ck.
Glenbrook
Lapstone
Regentville
St. Clair
Doonside
Rooty Hill
Lalor Park



Hawkesbury City Council

©Land Information Centre 1998
Hawkesbury City Council 2000

Scale 1 : 20000


Wilberforce 1:25k
Figure Three
SA-1
WRST-1
WRST-2
study area
Riverstone 1:25k
SA-2
Aboriginal sites
OAKVILLE
VINEYARD
McGRATHS HILL
WINDSOR HIGH SCHOOL
WINDSOR DOG POUND
Water Pollution Control Plant (under construction)
Eastern Creek
South Creek
McKenzies Creek
Oakville House
"Baldorta"
Reservoir
Training Track
Sheds
Yards
Rumpna
SYDNEY NEWCASTLE OIL & GAS PIPELINE
OLD STOCK ROUTE
HAWKESBURY ROAD
WINDSOR ROAD
SCHEYVILLE ROAD
OGDEN ROAD
BROOS ROAD
GOODS RD
HENRY RD
BRENNAN DAM
VINEYARD PARK
RICHMOND
WALLACE ROAD
BANDON RD
O'CONNELL ST
CAMBERWELL RD
ASHFORD RD
NORWOOD RD
OTAGO STREET
PERTH ST
VICTORIA ST
EDWARD ST
GRANTHAM ST
FORRESTER RD
COMMERCIAL ROAD
HARNESS ROAD
PUTLAND PLACE
GLENIDOL
ROCKS ROAD
HANCKEY
SAUNDERS ROAD
BEDDEK ST
WEST ST
HAVELOCK STREET
BISMARCK ST
McGRATH ROAD
CLARE CRES
ARFIELD ST
OAKVILLE PARK
GROVES AVENUE
CUNEEN ST
SBURY
Greenways
Water Pollution Control Plant (under construction)
330kV
2526
2494

PHOTOGRAHIC RECORD



1.



2.



3.



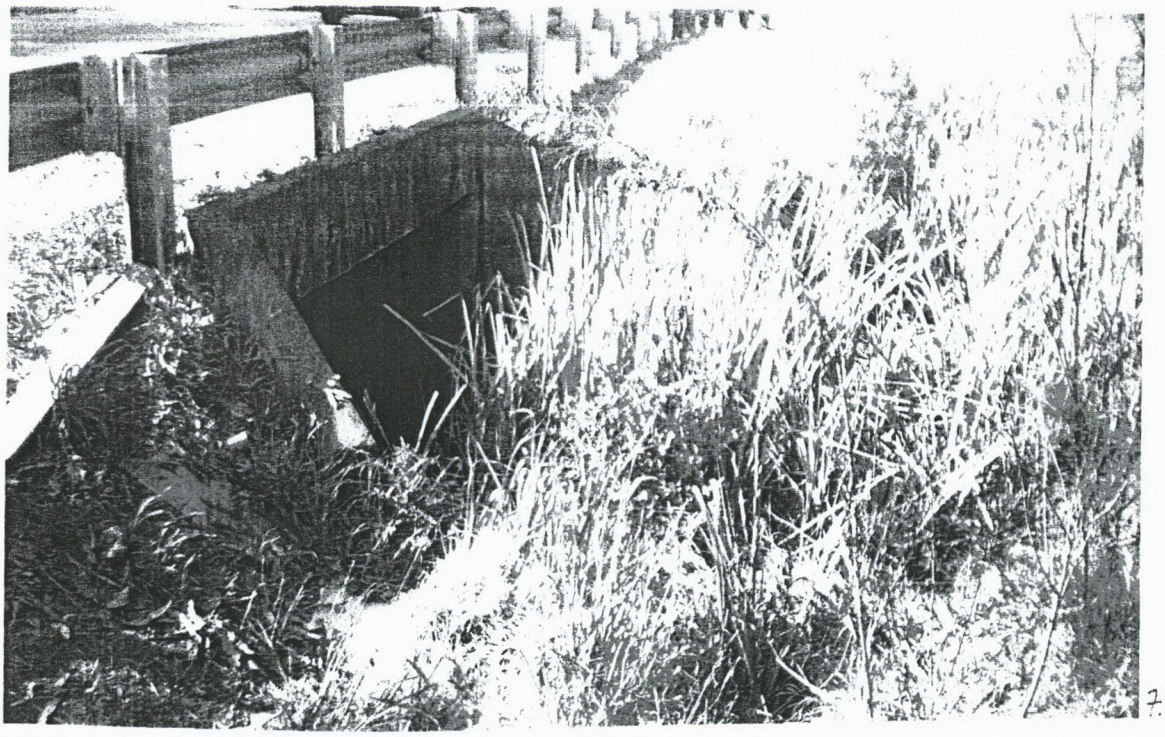
4.



5.



6.



7.



8.

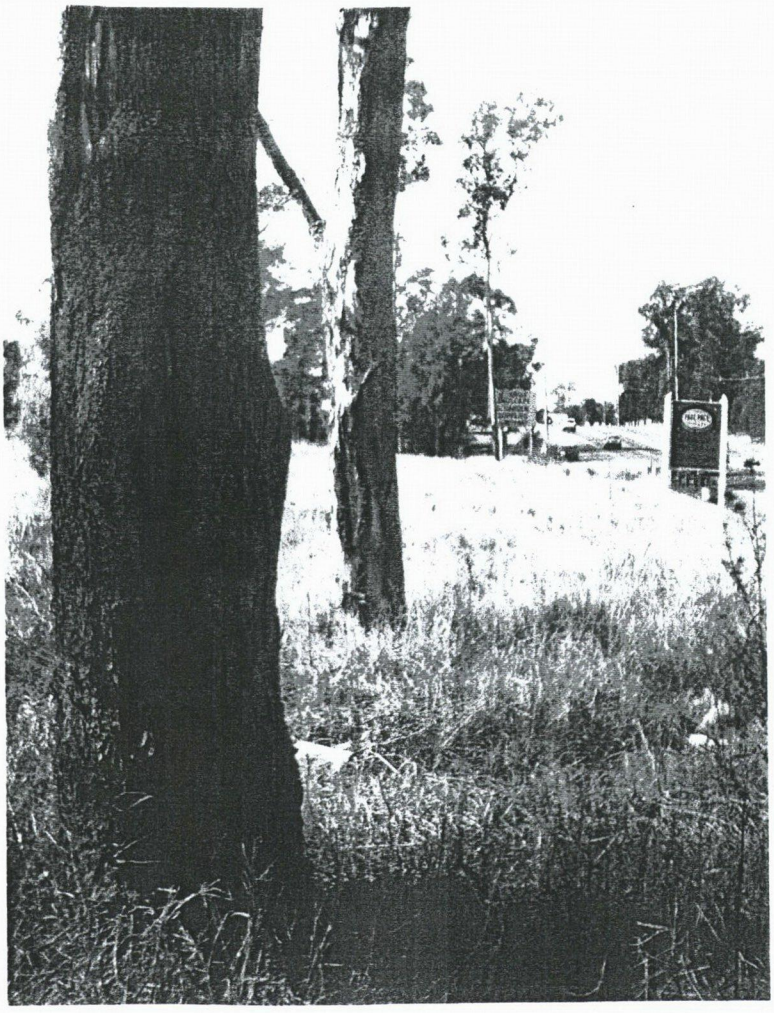


9.



10.

11.



ATTACHMENT 6

Noise and Vibration Impact Assessments for McGraths Hill Flood Evacuation Route on Windsor Road Between Curtis Road and South of Bandon Road

October 2000, Koikas Acoustics Pty Ltd.

KOIKAS ACOUSTICS PTY LTD

CONSULTANTS IN NOISE AND VIBRATION

ACN 058 524 771
ABN 12 058 524 771

MEMBER FIRM OF THE ASSOCIATION OF AUSTRALIAN ACOUSTICAL CONSULTANTS

60 GLENFARNE STREET, BEXLEY NSW 2207 AUSTRALIA

EMAIL : nick_koikas@mail2me.com.au **FAX:** 02 9587 5337 **PH:** 02 9587 9702

NOISE AND VIBRATION IMPACT ASSESSMENTS FOR REVIEW OF ENVIRONMENTAL FACTORS FOR MCGRATHS HILL FLOOD EVACUATION ROUTE ON WINDSOR ROAD BETWEEN CURTIS ROAD AND SOUTH OF BANDON ROAD

PROJECT: **724**

DATE: 13 October 2000

OUR REF: R03100A1.D62

PREPARED FOR: Bruce Adcock
Environmental Planning Pty Ltd
PO Box 390
PYMBLE NSW 2073

PREPARED BY: KOIKAS ACOUSTICS PTY LTD
Member Firm of the Association of Australian Acoustical Consultants

Nicholas G. Koikas
Principal Consultant

CONTENTS

		PAGE
1.0	**INTRODUCTION**	**3**
2.0	**TRAFFIC NOISE CRITERIA**	**4**
3.0	**MEASUREMENT SITES, METHODOLOGY AND INSTRUMENTATION**	**5**
3.1	INTRODUCTION	5
3.2	MEASUREMENT LOCATIONS	5
3.3	INSTRUMENTATION	5
3.4	EXTERNAL / INTERNAL NOISE LEVEL MEASUREMENT METHODOLOGY	6
4.0	**EXISTING TRAFFIC NOISE LEVELS**	**7**
4.1	METEOROLOGICAL CONDITIONS	7
4.2	MEASURED NOISE LEVELS	7
5.0	**TRAFFIC NOISE PREDICTIONS**	**12**
5.1	CORTN PREDICTION MODEL	12
5.2	TRAFFIC DATA USED WITH THE 1988 UK CORTN MODEL	12
5.2.1	Traffic Survey	12
5.2.2	Traffic Data Provided	13
5.2.3	Traffic Volume Trends	13
5.2.4	Percentage of Heavy Vehicles	13
5.2.5	Traffic Speed	13
5.2.6	Road Surface Type	13
5.3	TRAFFIC NOISE PREDICTION RESULTS	14
5.4	DISCUSSION OF CALCULATED TRAFFIC NOISE LEVELS RESULTS	16
6.0	**MITIGATION MEASURES**	**17**
6.1	NOISE BARRIERS	17
6.1.1	Barrier Characteristics	17
6.1.2	Cost Benefit Analysis	17
6.2	QUIETER ROAD SURFACES	20
6.2.1	Use of Open Graded Asphaltic Concrete	20
6.2.2	Cost Benefit Analysis	20
6.3	RETROFITTING DWELLINGS	21
6.3.1	Propagation of Traffic Noise Through Building Envelopes	21
6.3.2	Indoor Criteria Sound Levels	21
6.3.3	Traffic Noise Reduction of Different Types of Building Envelopes	22
6.3.4	Cost Benefit Analysis - Retrofitting	23
7.0	**CONSTRUCTION NOISE ASSESSMENT**	**24**
7.1	CONSTRUCTION NOISE CRITERIA	24
7.2	PROPOSED CONSTRUCTION ACTIVITIES	25
7.3	EXISTING BACKGROUND NOISE LEVELS	25
7.4	SOUND SOURCES	25
7.5	NOISE REDUCTION TECHNIQUES	27
8.0	**CONSTRUCTION VIBRATION ASSESSMENT**	**27**
8.1	PROPAGATION OF GROUND VIBRATIONS	27
8.2	HUMAN DISTURBANCE VIBRATION CRITERIA	28
8.3	BUILDING DAMAGE CRITERIA	29
8.4	CONSTRUCTION VIBRATION LEVELS	30
8.5	SURFACE CRACKS	31
9.0	**CONCLUSIONS**	**31**
9.1	TRAFFIC NOISE	31
9.1.1	Noise Barriers	31
9.1.2	Road Surfaces	32
9.1.3	Retrofitting Dwellings	32
9.1.4	Recommendations	33
9.2	CONSTRUCTION NOISE LEVELS	33
9.3	CONSTRUCTION VIBRATION LEVELS	33

APPENDIX A GLOSSARY OF ACOUSTIC TERMS
APPENDIX B MAP OF THE AREA
APPENDIX C PHOTOGRAPHS OF TRAFFIC NOISE MEASUREMENT SITES
APPENDIX D CALIBRATION CERTIFICATES
APPENDIX E CLIMATE DATA TAKEN CONCURRENT WITH TRAFFIC NOISE SURVEY
APPENDIX F TRAFFIC NOISE SURVEY DATA AND GRAPHS

1.0 INTRODUCTION

A noise and vibration impact assessment has been completed by Koikas Acoustics Pty Ltd on behalf of Environmental Planning Pty Ltd. The study covers the section of Windsor Road between Curtis Road and south of Bandon Road.

The Department of Land and Water Conservation (DLWC) and the Roads and Traffic Authority (RTA) propose to upgrade Windsor Road between Curtis Road and South of Bandon Road to provide an evacuation route for the local community in the event of severe floods.

The works generally involve widening and raising Windsor Road and improving cross drainage with new box culverts, pipes and roadside grass swales at a number of sites. The project is described in more detail in the Newsletter No. 1 May, 2000 entitled *"McGraths Hill Flood Evacuation Route"*, which was prepared by the RTA, and DLWC.

This study has been assessed in accordance with the Environment Protection Authority's *Environmental Criteria for Road Traffic Noise, May 1999* and *Australian Standard 2702-1984 "Acoustics - Methods of Measurement of Road Traffic Noise"*.

The proposal is expected to impact Vineyard Public School and a number of residential properties which are located along Windsor Road. This assessment provides:

- a summary of the existing traffic and background noise levels of the general area;
- a desk top study based on traffic data provided by the Roads and Traffic Authority of predicted traffic flows, and of existing and proposed road alignments;
- predicted traffic noise levels determined for:
  - the year 2002 (used for calibrating the noise level calculation model), and
  - traffic noise levels 10 years after the completion of all road works ie year 2012;
- the height of traffic noise barriers required to achieve the EPA's traffic noise criteria;
- a sensitivity analysis of traffic noise barriers placed along Windsor Road in order to meet the traffic noise criteria noise level limits;
- a benefit cost analysis for noise walls of varying height;
- a discussion of the benefits of using various types of road pavements;
- a discussion of retrofitting dwellings as an alternative to external traffic noise mitigation measures, and
- a construction noise and vibration assessment.

Appendix A consists of a Glossary of Acoustic Terms.

2.0 TRAFFIC NOISE CRITERIA

In May 1999, the EPA released its traffic noise policy entitled "Environmental Criteria for Road Traffic Noise".

The traffic noise descriptor levels, the criteria and Base Noise Level Goals which apply for properties adjacent to existing freeway/arterial road projects are:

- Daytime Goal, 60 dB(A) $L_{eq,\ 15\ hours}$ taken between 07:00 and 22:00 hours;
- Night time Goal, 55 dB(A) $L_{eq,\ 9\ hours}$ taken between 22:00 and 07:00 hours;
- Place of worship, 40 dB(A) (internal) $L_{eq,\ 1\ hour}$ day and night;
- Existing school class rooms, 45 dB(A) (internal) $L_{eq,\ 1\ hour}$ daytime;
- Passive recreation school grounds, 55 dB(A) (external) $L_{eq,\ 15\ hours}$ daytime, and
- Active recreation grounds, 60 dB(A) (external) $L_{Aeq,\ 15\ hours}$ daytime.

We have been advised by the RTA, that the Authority's Policy regarding road upgrades is to consider noise mitigation measures when it can be demonstrated that these measures would be practical and cost effective.

These mitigation measures would apply when the predicted traffic noise levels are greater than the EPA's base noise levels. In this case the base noise levels that apply for residential buildings adjacent to a main arterial road would be 60 dB(A) $L_{Aeq,\ 15\ hours}$ for daytime hours and 55 dB(A) $L_{Aeq,\ 9\ hours}$ for night time hours. Noise barriers would apply whether the predicted traffic noise levels (predicted for 10 years after the completion of all road works) increase by more than 2 dB(A) above the existing measured noise levels or not.

It is noted, whether a road upgrade is proposed or not, traffic noise levels normally increase by more than 2 dB(A) over a 10 year period on some roads as a result of the natural growth of traffic.

3.0 MEASUREMENT SITES, METHODOLOGY AND INSTRUMENTATION

3.1 INTRODUCTION

Field measurements were taken at four representative sites to determine the existing traffic noise levels for the general subject area.

Noise level measurements were taken over seven whole days between late August and early September 2000.

Traffic noise descriptor levels were calculated for all days, and average traffic noise levels were calculated for seven consecutive whole days.

3.2 MEASUREMENT LOCATIONS

Traffic noise level measurements were undertaken at the following seven representative noise sensitive sites in the direction from Windsor to Parramatta:

- Chainage 1000 (Sheet 3 of 3), Vineyard Public School, Windsor Road, Vineyard
- Chainage 240 (Sheet 3 of 3), No. 472 Windsor Road, Vineyard (residential property);
- Chainage 20 (Sheet 3 of 3) No. 452 Windsor Road, Vineyard (residential property), and
- Chainage 1220 (Sheet 1 of 3) No. 281 Windsor Road, Vineyard (residential property).

Appendix B consists of a map of the area showing the location of the measurement stations.

Appendix C provides photographs showing the location of the sound level meters.

3.3 INSTRUMENTATION

Traffic noise measurements were taken with one Type 1 and three Type 2 sound level meters. All noise level measurements were A-frequency and Fast-time weighted. Exceeding Lx and equivalent continuous L_{eq} noise levels were calculated over fifteen minute periods.

Sound level measurements were taken with the following equipment:

- Type 1 Norsonics 116 Integrating Sound Level Meter Serial Number 20244, microphone S/N 15632, preamplifier S/N 19070, and
- Type 2 RT&A sound level meter data loggers S/N 65, S/N 80 and S/N 81.

All noise level meters were field calibrated before and after the measurements with a Rion sound level calibrator NC-73 S/N 10702593. Calibration drifts of less than 0.2 dB(A) were recorded for the Type 1 sound level meters, ± 0.3 dB(A) for the RT&A Type 2 sound level meter data loggers S/N 80 and 81, and + 0.1 dB(A) for the RT&A Type 2 sound level meter data logger S/N 65. All equipment used for taking noise measurements and the field calibrator have been calibrated by a NATA certified laboratory.

Calibration certificates are included in **Appendix D.**

3.4 EXTERNAL NOISE LEVEL MEASUREMENT METHODOLOGY

External traffic noise level measurements were taken with the sound level meter microphone placed 1.2 metres above the ground and 1.0 metre from what was considered to be the most noise sensitive facade at each measurement site.

3.5 INTERNAL TRAFFIC NOISE MEASUREMENTS

Internal traffic noise level measurements could not be taken inside the Vineyard Public School's closest building as these noise measurements would have been affected by people undertaking normal school activities. The internal noise levels were therefore determined by taking traffic noise levels measurements in free field conditions outside the school building and subtracting from these results the traffic noise reduction (TNR) of the builldings envelope. The TNR is determined by taking simultaneous measurements inside and outside the school building. The difference between these results is the TNR. The TNR for the portable building is 19 dB.

All traffic noise survey measurements were taken in 15 minutes consecutive measurement periods. This information was used to calculate the following traffic noise descriptor levels:

- $L_{Aeq,24hours}$ calculated by taking the logarithmic average of each fifteen minute noise level between 00:00 and 24:00 hours;
- $L_{Aeq,15hours}$ calculated by taking the logarithmic average of each fifteen minute noise level between 07:00 and 22:00 hours;
- $L_{Aeq,9hours}$ calculated by taking the logarithmic average of each fifteen minute noise level between 22:00 and 07:00 hours;
- $L_{Aeq,hours}$ calculated by taking the logarithmic average of each fifteen minute noise level between 22:00 and 06:00 hours;
- $L_{Aeq,1\ hour}$ calculated by taking the logarithmic average of four consecutive fifteen minute noise levels between 07:00 and 22:00 hours;
- $L_{A10,18\ hours}$ calculated by taking the arithmetic average of each fifteen minute noise level between 06:00 and 24:00 hours;
- min. $L_{A90,1\ hour}$ the minimum fifteen minute noise level between 07:00 and 18:00 hours, and
- min. $L_{A90,1\ hour}$ the minimum fifteen minute noise level between 18:00 and 07:00 hours.

All measurement methodologies and equipment used comply with the requirements of *Australian Standard 2702-1984 Acoustics - Methods for the Measurement of Road Traffic Noise*, and *Australian Standard 1259.2-1990 Acoustics - Sound Level Meters - Integrating Averaging*, and the measurement methodology recommended in the *EPA's Environmental Criteria for Road Traffic Noise*.

4.0 EXISTING TRAFFIC NOISE LEVELS

4.1 METEOROLOGICAL CONDITIONS

Meteorological conditions during the measurement period were generally fine. As a result, traffic noise levels were not affected.

4.2 MEASURED NOISE LEVELS

Tables 1 to 4 inclusive are summaries of the existing noise level measurement results taken at the four sites. Table 5 provides a summary of the average descriptor levels for all the assessment sites. Table 5 shows that the existing traffic noise levels exceed the EPA Base Noise Level Goals at all measured locations. However, given that the proposal is an upgrading of an existing road, an "increase of up to 2 dB(A) ten years after completion of road works is the appropriate EPA criteria.

Appendix F consists of graphs, data tables and calculated summaries of the traffic noise descriptor levels. The average traffic noise descriptor levels were calculated for all working days not affected by adverse meteorological conditions.

Table 1 External Traffic Noise Levels at 281 Windsor Road, Vineyard (Chainage 1220 - Northern side of Windsor Road)

	NOISE LEVELS [dB(A)]							
Descriptor	Wednesday 30-8-00	Thursday 31-8-00	Friday 1-9-00	Saturday 2-9-00	Sunday 3-9-00	Monday 4-9-00	Tuesday 5-9-00	Average
L_{eq}, 24 hours (0000 -2400)	68.3	67.6	67.7	67.9	65.8	67.7	66.8	**67.4**
L_{eq}, 8 hours (2200-0600)	63.7	62.9	63.4	62.6	62.8	62.9	62.8	**63.0**
L_{eq}, 15 hours (0700-2200)	69.3	68.8	68.7	69.2	67.2	68.8	67.9	**68.6**
L_{eq}, 9 hours (2200-0700)	65.6	64.4	65.2	63.8	63.0	64.8	64.3	**64.4**
L_{10}, 18 hours (0600-2400)	71.9	71.3	71.2	71.5	69.7	71.3	70.5	**71.1**

Table 2 External Traffic Noise Levels at 452 Windsor Road, Vineyard (Chainage 20 - Southern Side of Windsor Road)

	NOISE LEVELS [dB(A)]							
Descriptor	Wednesday 30-8-00	Thursday 31-8-00	Friday 1-9-00	Saturday 2-9-00	Sunday 3-9-00	Monday 4-9-00	Tuesday 5-9-00	Average
L_{eq}, 24 hours (0000 -2400)	61.4	61.1	61.4	60.4	59.0	61.2	61.1	**60.8**
L_{eq}, 8 hours (2200-0600)	57.0	56.7	57.2	55.6	55.6	56.2	57.1	**56.5**
L_{eq}, 15 hours (0700-2200)	62.5	62.2	62.4	61.6	60.3	62.3	62.1	**61.9**
L_{eq}, 9 hours (2200-0700)	58.6	58.4	59.0	56.8	56.1	57.9	58.7	**57.9**
L_{10}, 18 hours (0600-2400)	64.6	64.3	64.5	63.9	62.5	64.5	64.2	**64.1**

Table 3 External Traffic Noise Levels at 472 Windsor Road, Vineyard (Chainage 240 - Southern side of Windsor Road)

	NOISE LEVELS [dB(A)]							
Descriptor	Wednesday 30-8-00	Thursday 31-8-00	Friday 1-9-00	Saturday 2-9-00	Sunday 3-9-00	Monday 4-9-00	Tuesday 5-9-00	Average
L_{eq}, 24 hours (0000 -2400)	68.5	67.5	67.7	67.9	65.8	67.7	66.8	**67.4**
L_{eq}, 8 hours (2200-0600)	65.4	64.0	63.4	62.6	62.8	62.9	62.8	**63.0**
L_{eq}, 15 hours (0700-2200)	69.1	68.4	68.7	69.2	67.2	68.8	67.9	**68.6**
L_{eq}, 9 hours (2200-0700)	67.1	65.6	65.2	63.8	63.0	64.8	64.3	**64.4**
L_{10}, 18 hours (0600-2400)	72.0	71.3	71.2	71.5	69.7	71.3	70.5	**71.1**

Table 4 Traffic Noise Levels at Vineyard Public School (Chainage 1000 - Southern Side of Windsor Road)

	NOISE LEVELS [dB(A)]							
Descriptor	Wednesday 30-8-00	Thursday 31-8-00	Friday 1-9-00	Saturday 2-9-00	Sunday 3-9-00	Monday 4-9-00	Tuesday 5-9-00	Average
L_{eq}, 24 hours (0000 -2400)	63.5	63.3	63.6	62.1	60.9	63.3	63.8	**62.9**
L_{eq}, 8 hours (2200-0600)	59.5	59.0	59.3	57.8	57.7	58.8	58.7	**58.7**
L_{eq}, 15 hours (0700-2200)	64.4	64.4	64.6	63.2	62.2	64.3	65.0	**64.0**
Leq, 9 hours (2200-0700)	61.2	60.6	61.3	58.8	57.9	60.8	60.5	**60.2**
L_{10}, 18 hours (0600-2400)	66.5	66.2	66.4	65.1	64.0	66.3	66.6	**65.9**
Max L_{eq}, 1 hour (0700-2200) - Outdoor	67.8	67.4	67.2	-	-	67.5	66.6	**67.3**
Max L_{eq}, 1 hour (0700-2200) - Indoor	45.3	44.9	44.7	-	-	45.0	47.6	**45.5**

Table 5 Summary of Measured Average Noise Levels

Descriptor	AVERAGE MEASURED TRAFFIC NOISE LEVELS [dB(A)]			
	281 Windsor Road, Vineyard	452 Windsor Road, Vineyard	472 Windsor Road, Vineyard	Vineyard Public School Windsor Road, Vineyard
$L_{eq,\ 24\ hours}$	67.4	60.8	67.6	62.9
$L_{eq,\ 8\ hours}$	63.0	56.5	64.3	58.7
$L_{eq,\ 15\ hours}$	68.6	61.9	68.4	64.0
$L_{eq,\ 9\ hours}$	64.4	57.9	65.7	60.2
$L_{10,\ 18\ hours}$	71.1	64.1	71.3	65.9
Max $L_{eq,\ 8\ hours}$	-	-	-	45.5
$L_{10,\ 18\ h}$-$L_{eq,\ 24\ h}$	3.7	3.3	3.7	3.0
$L_{eq,\ 24\ h}$-$L_{eq,\ 8\ h}$	4.4	4.3	3.3	4.2
$L_{eq,\ 15\ h}$-$L_{eq,\ 9\ h}$	4.2	4.0	2.7	3.8
$L_{eq,\ 15\ h}$-$L_{eq,\ 24\ h}$	1.2	1.1	0.8	1.1
Weekdays (07:00-18:00 hrs) min $L_{90,\ 1\ hour}$	58	54	58	58
Weeknights (18:00-07:00 hrs) min $L_{90,\ 1\ hour}$	36	30	32	-
Saturday (08:00 - 13:00 hrs) min $L_{90,\ 1\ hour}$	66	56	62	-

The figures between the double lines in Table 5 are used for predicting traffic noise levels.

It is noted, that noise level measurements at No. 452 Windsor Road were unusually low compared to the other noise measurement sites located a similar distance from the road. Calibration drifts of this Type 1 sound level meter were noted to be negligible. The ground type between the road and the monitoring site was however quite soft. When the ground type was chosen to represent soft ground, the difference between the calculated and measured traffic noise levels were about 0.6 dB, which in our opinion yields satisfactory correlation. It is also likely, that the awning over the microphone may also have had the effect of reducing traffic noise levels at this site.

5.0 TRAFFIC NOISE PREDICTIONS

5.1 CORTN PREDICTION MODEL

Predicted traffic noise levels were calculated using a traffic noise prediction model called the United Kingdom, Department of Transport, 1988 Version of the Calculation Of Road Traffic Noise (UK DoT 1988 CORTN) method. The UK DoT 1988 CORTN method incorporates all

the procedures and algorithms of the former United Kingdom, Department of Environment (UK DoE) 1975 CORTN method along with the provisions for a wider variety of road surface textures and other amendments. In addition, amendments have been made for Australian road vehicles and road surface conditions. These amendments are outlined in Appendix B of the RTA Environment Manual, Volume 2.

Calculations were undertaken for the year 2012. These calculations considered the source height for light and heavy vehicles. The CORTN model without the Australian amendments was developed for road conditions and traffic noise sources suited for the United Kingdom where for example the exhaust stacks of heavy vehicles are approximately 0.5 metres above the road surface. In Australia, exhaust stacks on heavy vehicles are approximately 3.5 metres above the road level.

Traffic survey data was used to determine the hourly number of light and heavy vehicles for five days (normal working days) which applies for the School, and seven days (full week), which applies for residential properties.

The difference between the $L_{eq,1\ hour}$ and $L_{10,1\ hour}$ traffic noise levels were determined from the traffic noise survey. These differences were used with the CORTN algorithms to calculate the equivalent $L_{eq,\ 15\ hours}$ traffic noise level and $L_{Aeq,\ 9\ hours}$.

The following scenarios were calculated:

i. Year 2000, existing road alignment. This information was used to calibrate the traffic noise prediction model;
ii. Year 2012, new road alignment, no barriers;
iii. Year 2012, new road alignment, with 2 metres high traffic noise barriers;
iv. Year 2012, new road alignment, with 3 metres high traffic noise barriers;
v. Year 2012, new road alignment, with 4 metres high traffic noise barriers, and
vi. Year 2012, new road alignment, with 5 metres high traffic noise barrier.

5.2 TRAFFIC DATA USED WITH THE 1988 UK CORTN MODEL

5.2.1 Traffic Survey

A traffic counting survey from 19th to 25th July 1999 was taken at Station 89.041 Vineyard north of Bandon Road.

Hourly classification of vehicles and the 85 percentile vehicle speeds were not available.

For this assessment, the projected traffic increase was based on 3% compound increase between the years 2000 and 2012.

5.2.2 Percentage of Heavy Vehicles

A traffic study was undertaken by Rhodes Thompson Associates, their report entitled Part A Windsor Road Between Seven Hills Road and Windsor Bridge State Road No. 184 Route Improvements Study for the Roads and Traffic Authority, their Ref 970090 dated November 1997. In this report they refer to the subject length of road to carry approximately 11 % and 10% of heavy vehicles along the south and northbound carriageways. These results were used in our calculation model for daytime hours and approximately 8% and 6% for night time hours.

5.2.3 Traffic Speed

The statutory traffic speed for this section of road is 80 km/hr. All calculation measurements were based on this traffic speed.

5.2.4 Road Surface Type

All traffic noise calculations were based on that dense graded asphaltic concrete (DGAC) would be used along the length of the subject road.

5.3 TRAFFIC NOISE PREDICTION RESULTS

Traffic noise levels were calculated for the same four sites. These calculations were undertaken to:

- Ascertain whether traffic noise levels would increase by more than 2 dB(A) for daytime $L_{Aeq,\ 15\ hours}$ and night time $L_{Aeq,\ 9\ hours}$ for externally monitored sites between the year when measurements were taken in the year 2000 and 10 years after all road upgrades are scheduled to be completed, ie in the year 2012. A similar assessment procedure would also apply for the Vineyard Public School, except that the criteria for this site is based on the maximum $L_{Aeq,\ 1\ hour}$ traffic noise measured inside a classroom between the hours of 07:00 and 22:00 hours;
- Undertake a noise sensitivity analysis of barriers of different heights placed along the common residential, school and road reserve boundaries, and
- Determine the extent of mitigation measures necessary to achieve the EPA's traffic noise criteria along the subject length of road.

A summary of the predicted external $L_{Aeq,15\ hours}$, $L_{Aeq,9\ hours}$ and internal maximum $L_{Aeq,1\ hour}$ traffic noise levels for the years 2000, and 2012 are shown in Tables 8.

Table 8 Existing and Predicted Traffic Noise Levels for the Years 2000 and 2012 - EPA Traffic Noise Criteria

	Measured and Predicted (Based on the CORTN Model) EPA Traffic Noise Level Criteria [dB(A)]																
Description	2000 Measured Traffic Noise Levels	2000 CORTN Predicted Traffic Noise Levels Existing Road Conditions	2000 Existing Height [m] and Type of Boundary Fence	2012 Predicted Noise Level New Road Conditions and Existing Boundary Fences	Predicted Noise Level Increase Between December 2000 and 2012	Does Traffic Noise Increase by more than 2 dB(A) ?	Does it Meet the EPA Criteria ?	2.0 m Noise Barrier		3.0 m Noise Barrier		4.0 m Noise Barrier		5.0 m Noise Barrier		Height of Barrier Required to Meet EPA's Noise Criteria for Leq,15 hr, Leq, 1 hr, & maximum Leq, 1 hr for internal school spaces	Height of Barrier Required to Meet the EPA's Base Noise Criteria for Leq, 15 hrs, Leq,1 hr, & max Leq, 1 hr for internal school spaces
Monitoring Site								Predicted Traffic Noise Level Proposed Road Conditions	Does it Meet the EPA Criteria ?	Predicted Traffic Noise Level Proposed Road Conditions	Does it Meet the EPA Criteria ?	Predicted Traffic Noise Level Proposed Road Conditions	Does it Meet the EPA Criteria ?	Predicted Traffic Noise Level Proposed Road Conditions	Does it Meet the EPA Criteria ?		
Vineyard Public School		**Note 1.**	Acoustically														
Internal (Classroom)			Transparent														
max LAeq, 1 hour	48	46	Fence	48	2	No	Yes	46	Yes	40	Yes	36	Yes	35	Yes	barrier not required	2.5 m
School Grounds		**Note 2.**															
max LAeq, 15 hours	-	66.9		69.4	2.5	Yes	No	67.1	No	63.3	No	59.7	Yes	58.6	Yes	4 m	4 m
No. 472 Windsor Road																	
External																	
daytime LAeq, 15 hours	68.4	68.8	No Fence	71.8	3	Yes	No	69.1	No	65.2	Yes	60.2	Marginal	58.2	Yes	4 m	4 m
night time LAeq, 9 hours	65.7	64.7		66.9	3.2	Yes	No	64	No	59.9	Yes	54.5	Yes	53.0	Yes	4 m	4 m
No. 452 Windsor Road																	
External																	
daytime LAeq, 15 hours	61.9	62.5	No Fence	64.5	2	No	Yes	63.8	Yes	57.9	Yes	54.4	Yes	53.0	Yes	barrier not required	3 m
night time LAeq, 9 hours	57.9	56.0		58.0	2	No	Yes	57.3	Yes	51.3	Yes	47.7	Yes	46.3	Yes	barrier not required	3 m
Vineyard Park		**Note 3.**															
Active Recreation Park	-	67.1	No Fence	69.6	2.5	Yes	No	67.3	No	63.5	No	59.9	Yes	58.8	Yes	4 m	4 m
No. 281 Windsor Road																	
External																	
daytime LAeq, 15 hours	68.6	68.6	No Fence	71.4	2.8	Yes	No	69.4	No	63.3	No	59.0	Yes	57.0	Yes	4 m	4 m
night time LAeq, 9 hours	64.4	64.1		67.1	3.0	Yes	No	65.4	No	56.5	No	54.1	Yes	52.1	Yes	4 m	4 m

5.4 DISCUSSION OF CALCULATED TRAFFIC NOISE LEVEL RESULTS

Note 1.
The results between the measured and predicted traffic noise levels at the school do not correlate well. This is attributed to that the measure of the maximum $L_{eq,1\,hour}$ descriptor level is not a long term average traffic noise level, but dependant on the peak noise emissions from noisy trucks, cars, vehicle horns or other incidental noise emissions from vehicles considered to be non typical of normal traffic flow. The predicted levels are considered to be more typical of free flow traffic. It is also noted, that it is unknown whether noise emissions from school activities may have adversely affected these measurements.
Based on the results in Table 8, most properties will require noise attenuation in order to comply with the EPA's criteria.

Note 2.
The results for school grounds is based on that the receiver point is 10 metres from the proposed new common boundary.

Note 3.
The results for school grounds is based on that the receiver point is 10 metres from the proposed new common boundary.

5.5 EXTENT OF NOISE BARRIERS

Table 9 is a summary of the height and extent of barriers required to meet the EPA's **Base Noise Levels**. The extent and height of barriers to meet the EPA's Base Noise Levels would be warranted only if it can be shown to be cost effective and practical.

It is noted, that the barrier heights required to meet the EPA's traffic noise criteria at the four sites were considered to be representative along the extent of the proposed road upgrades. The information derived from these sites was also used to determine the expected traffic noise impact to the other residential properties, and active recreation grounds.

Table 9 Extent and Height of Barriers Required to Meet the EPA's Traffic Noise Criteria

Description	Chainage (m)	Barrier Height [m]	Barrier Extent Chainage [m]	Length of Barrier [m]
Vineyard Public School - Indoor Space - School Playground	1000 (Sheet 3 of 3) (Sheet 3 of 3)	 2.5 4.0	1140 - 980 + ⅃	160 + ⅃
No'.s 496, 472, 220	(Sheet 3 of 3) 430	4.0	520 - 130	290
No. 452	(Sheet 3 of 3) 20	3.0	90 - 20 + ⅃	70 + ⅃
No. 281	(Sheet 1 of 3) 1220	4.0	1280 - 1170	110
	(Sheet 1 of 3) 870	4.0	940 - 780	160
Vineyard Park	Chainage Unknown (Sheet 2 of 3)	4.0		⅂ + 160 m + ⅃

⅂ and ⅃ denote tapering noise walls that extend at right angles from the major length of barrier

Note: All modelled barrier calculations were based on that the barriers are placed along the proposed boundary line and the road reserve of the affected properties.

For sites where traffic noise levels are expected to decrease, noise barriers were not considered. For these sites, traffic in at least one of the two carriageways is moved further away, and therefore, traffic noise levels would reduce.

6.0 DISCUSSION OF POSSIBLE MITIGATION MEASURES

6.1 NOISE BARRIERS

The location of a barrier between a sound source and a receiver can have a significant shielding effect with regards to the magnitude and the extent of the noise reduction. Three examples which illustrate this are as follows:

(i) if a noise wall is located near a traffic noise source, this would minimise noise diffraction over the barrier and therefore achieve the greatest noise reduction and greatest shadow zone thus providing good noise attenuation to maximum number of sites behind the barrier;

(ii) if a noise wall is located nearer to a receiver point, this would provide less effective noise reduction than for case (i). The effective noise reduction of a barrier reduces as the receiver point distance from the barrier increases. The minimum effective performance of a barrier would occur when the distance between the source and

receiver to the barrier is equal;

(iii) when the distance between the sound source and receiver are equal, the effect of sound diffracting over the barrier is maximised.

6.1.1 Barrier Characteristics

The following barrier characteristics should be considered for selection and construction:

- a timber palling fence would not provide adequate noise reduction unless it is lapped, the gaps between the fence and the ground are sealed with fill, and the palings are at least 30 mm thick;
- all calculations are based on traffic noise barriers are either concrete or timber type reflective barriers;
- there are many different types of barriers that can be used. The RTA's *Noise Barriers and Catalogue of Selection Possibilities*, dated August 1991 should be referred to for more information, and
- the insertion loss of the traffic noise barriers at 125 Hertz should be at least 20 dB(A).

6.1.2 Cost Benefit Analysis

The RTA's Environment Manual Volume 2, Appendix D, entitled Cost Considerations and Economic Evaluation, was used to determine the economic effectiveness of barriers. This analysis considers the cost to the RTA and the community and the change in property value. An economically optimum noise abatement measure would occur for a benefit cost ratio of greater than one. The RTA's cost benefit analysis assumes that property value would increase by 0.9% for every 1 dB(A) noise reduction achieved. Changes in noise level below 47 dB(A) $L_{Aeq,15\ hours}$ is not considered to have an impact on the community.

Based on a Real Estate publication for properties adjacent to the Windsor Road in this area, property values varied between $200,000 to $500,000. This variation takes into account weatherboard, brick veneer, double brick and multi-storey residential housing.
Vineyard Public School's portable building (the most noise sensitive building) has been estimated to cost $200,000.
The cost of Vineyard Park is estimated to be $2,000,000.

The cost of barriers was based on that they are light weight concrete type panels erected upon shielded terrain with a soil shear strength of 100 kPa, the area providing good access, and that the light weight concrete panels are painted with acrylic type paint on both sides. The cost of these barriers vary between $120 / m^2 and $150 / m^2. A summary of costs are provided in Table 10.

Table 10 Cost of Light Weight Concrete Barriers of Various Heights

Barrier Height [metres]	Installed Rate per Lineal metre	Cost of Unpainted Barrier / m^2	Cost of Painted Barrier / m^2
1.8	$245	$136	$149
2.4	$315	$131	$144
2.7	$346	$116	$129
3.0	$412	$114	$127
3.3	$453	$108	$121
3.6	$524	$109	$122
3.9	$605	$112	$125
4.2	$607	$112	$125

The benefit cost analysis for this assessment is based on meeting the EPA's Criteria described in Section 2.0 of this assessment report. Table 11 is a summary describing the number of dwellings adjacent to Windsor Road, Vineyard which are affected by traffic noise, the height and extent of barriers required for each section to meet the EPA criteria, cost of barriers, property value increase and the associated benefit cost ratio.

Table 11 Cost Benefit Analysis to Meet Daytime and Night Time EPA Base Traffic Noise Criteria Minimum Treatment for Various Barrier Heights

Description of Sections Along the Windsor Road, Vineyard	Number of Houses	Barrier Height [m] to Meet the EPA Base Noise Criteria	Length of Barrier [m]	Installed Cost of Barrier [$]	Note 2 Average Noise reduction Achieved [dB(A)]	Note 3 Property Increase due to Barriers [$]	Benefit Cost Ratio
Vineyard Public School - total land $2,000,0000 Vineyard Public School's portable building $200,000	School	4	180	$109,300	10	$180,000	1.6
Residential Properties, Ch. 430, 380,and 220	3	4	290	$176,000	12	$80,100	0.45
Residential Properties, Ch. 20	1	3	90	$37,100	5	$9,000	0.25
Residential Properties, Ch. 1220	2	4	110	$66,400	11	$49,500	0.75
Residential Properties, Ch. 870	1	4	160	$97,100	10	$22,500	0.25
Vineyard Park	Park	4	220	$133,540	10	$180,000	1.3
Total and Average Benefit Cost Ratio	7 houses, School, and Park	Between 3.0 and 4 metres	1050	$619,440 say $620,000	approx. 10	$522,000	0.85

(This cost benefit analysis was based on the average traffic noise level increase between the years 2000 and 2012 and the average traffic noise reduction that would be achieved to meet the EPA's Base Traffic Noise Criteria)

1 Assumes that the traffic noise affected school property has a value of about $2,000,000.
2 Average noise reduction considers both daytime and night time traffic noise level results.
3 Assuming, that the mean cost of housing along Windsor Road, Vineyard is about $250,000.
4 Assumes that Vineyard Park is about $2,000,000.

When light weight concrete panel noise walls are used in order to achieve the EPA's traffic noise criteria the calculated benefit cost ratio would be about **0.85** for the subject length of the road upgrades.

This type of noise mitigation option would only be cost effective for the School and Park properties as the ratio between the property value increase over the cost for the noise barriers would be greater than 1.

6.2 QUIET ROAD SURFACES

6.2.1 Use of Open Graded Asphaltic Concrete

Open graded asphaltic concrete (OGAC) is primarily used on freeways, highways and motorways where the speed limits are over 90 km/hr. Over a period of 12 months, the acoustic performance of OGAC has been found to reduce when motor oil and dust clogs the road surface pores. Windsor Road carries a high percentage of heavy vehicles (~11 %) and the road is designed to operate with a statutory traffic speed of 80 km/hr.

People with normal hearing would perceive a noise level reduction at high frequencies created by the interaction of the tyre/road surface. However, the overall noise reduction would be minimal as there are other noise sources emanating from light and heavy vehicles.

A document entitled "*Contact, Technical Notes 20 from the Department of Main Roads New South Wales*", identifies further mechanisms for the generation of tyre/road noise:

- vertical excitation and radiation of noise from tyre casing;
- tangential excitation as a result of stick and slip action;
- suction and expulsion of air (air pumping and air pocket resonance). This is due to the geometry and porosity of the road surface, and
- aerodynamic action and air turbulence.

Although tyre noise could be reduced by up to 3 dB(A) on this road with the use of OGAC, it would not meet the EPA criteria on its own.

6.2.2 Cost Benefit Analysis - Road Surface

If OGAC was to be used for the entire length of the subject road upgrades between Vineyard Public School and Chapman Road intersection, the average noise reduction achieved would be 3 dB(A) for vehicles travelling at approximately 80 km/hr. There would be a total of about 22 residential properties, one school, and an active recreational space (Vineyard Park) that would benefit from a an average 3 dB(A) noise reduction. This would increase property value by:

0.9% x $250,000 x 22 properties x 3 dB(A) +
0.9% x $2,000,000 (School property) x 3 dB(A) +
0.9% x $2,000,000 x (Park) = $265,000.

The cost for laying 1.8 km of OGAC along Windsor Road, Vineyard is estimated to be about $200/linear metre x 1800 metres x 2 directions x 2 lanes = $1,440,000.

The benefit cost ratio for this type of mitigation measure is = 0.2.

The use of OGAC would not meet the EPA's criteria. Furthermore, OGAC would not be cost

effective nor practical, especially as this surface would require that it is periodically resurfaced.

6.3 RETROFITTING DWELLINGS

6.3.1 Propagation of Traffic Noise Through Building Envelopes

If noise barriers of between 3 to 4 metres in height were erected along the subject road upgrades along Windsor Road in order to meet the EPA's base daytime and night time criteria for outdoor spaces, then a noise reduction of about 10 dB(A) could be achieved. The equivalent maximum indoor noise level reduction that could be achieved would be less, between 5 and 8 dB(A). The reasons for this is as follows:

i. **Diffraction of Sound Over Noise Barriers**
Low frequency sound waves diffract over the top of road side barriers more efficiently compared to high frequency sound waves. Low frequency sound will therefore envelopes the external facades of the buildings;

ii. **Building Resonances**
Most building envelopes provide satisfactory high frequency sound attenuation, but do not provide similar sound reduction for low frequency sound. The reason for this is that the building components have characteristic resonant frequencies occurring at frequencies between 50 and 250 Hertz, ie at these resonant frequencies, sound will radiate through the building envelope more efficiently. Traffic noise contains high levels of low frequency sound, which coincides with the spectral region where resonances occur to buildings. As a result, the low frequency sound waves that have diffracted over the traffic noise barriers and envelope over the building, will radiate through the building.

iii. **Comparative Noise Reduction Outdoors V's Indoors**
When a noise barrier is erected midway between a building and the sound source, a person located outdoors behind the noise barrier would perceive a greater sound reduction of the traffic noise compared to a person located indoors.

A noise barrier primarily provides satisfactory high frequency sound reduction, (tyre noise), the building envelope already provides satisfactory high frequency noise attenuation, and therefore, a person indoors will not perceive a further high frequency sound reduction. Low to middle frequency sound would continue to be transmitted for with and without a barrier due to the mechanism of the low frequency diffraction effects. Although there would be a noise reduction, most of it would be high frequency noise which is due to tyre noise which, is produced and propagates near the ground. The effective barrier height for this type of noise would be much greater compared to other noise sources associated with motor vehicles.

6.3.2 Indoor Criteria Sound Levels

A person with normal hearing can perceive an increase and decrease of 5 dB(A) for an intermittent traffic noise source and a noise increase and decrease of 3 dB(A) for a continuous sounding source. A minimum of 5 dB(A) traffic noise reduction would therefore be required to be achieved indoors for mostly low frequency sound waves.

AS 2107 - 1987

Australian Standard 2107 - 1987 Recommended Design Sound Levels and Reverberation Times For Building Interiors recommend "satisfactory" and "maximum" design sound levels for private houses in inner suburbs.

Table 12 is a summary of recommended design sound levels which would apply for this road traffic noise assessment.

Table 12 Summary of Recommended Indoor Design Sound Levels

	Recommended AS 2107 - 1987 Indoor Design Sound Levels [dB(A)]	
Type of Occupancy / activity	**"Satisfactory"**	**"maximum"**
Recreational Space	35	40
Sleeping Space	30	35
Working Space	35	40
Hospital	30	35
Classrooms	35	40

It is noted, that the above recommended indoor noise levels normally apply for mechanical ventilation noise levels. They have in the past also been applied for traffic noise assessments but for proposed new dwellings.

EPA's Internal Traffic Noise Level Criteria

Page 34, Section C3, point 5 of the EPA's Criteria for Road Traffic Noise states that *"If treatment of the facade is being considered to reduce internal noise levels, it is necessary to include requirements for ventilation. For residential and other proposed developments where the noise level criteria are expressed in terms of external noise levels, it is desirable that internal noise level criteria be 10 dB below the relevant external criteria cited in this document".* For this site, the relevant criteria applies for residential properties adjacent to an existing main arterial road. The internal traffic noise criteria are therefore:

- for night time hours the internal noise level criterion is 45 dB(A) $L_{Aeq,\ 9\ hours}$, and
- for daytime hours the internal noise level criterion is 50 dB(A) $L_{Aeq,\ 15\ hours}$.

This criteria is less stringent but more applicable to existing dwellings.

6.3.3 Traffic Noise Reduction of Different Types of Building Envelopes

Traffic noise level measurements have been taken simultaneously indoors and outdoors with two type 1 SVAN 912AE spectrum analysers in order to ascertain the traffic noise reduction that can be achieved for three different types of residential dwellings, timber, fibro and a double brick walls. Detail results of the measurement results are attached in Appendix G.

Calculations show that both brick veneer and double brick homes could achieve a 7 dB(A) noise reduction when the windows and ceiling/roof systems are retrofitted. A compressed fibrous cement (Fibro) or timber strip type building would require extensive retrofitting to the building's external envelope in order to achieve a similar noise reduction.

The following retrofitting would be required in order to achieve a minimum indoor noise reduction of 7 dB(A) inside a habitable space for double brick and brick veneer homes:

- an additional 6.38 mm thick laminated glazing should be placed at least 100 mm from the existing 3 to 4 mm thick existing glazed windows;

- a layer of insulating batts (100 mm thick, 30 kg/m^3) should be placed between the ceiling joists and a layer of loaded vinyl (minimum of 6 kg/m^2) placed over the top of the insulating batts and ceiling joists, and

- external timber doors should be fitted with perimeter and threshold drop seals.

For timber or fibro homes, the walls should be upgraded to achieve a noise reduction equal to that of a double brick or brick veneer wall. Generally, timber and fibro external wall dwellings would require significant modifications to reduce traffic noise levels by a 7 dB(A) noise reduction.

For timber/fibro type dwellings required to meet the recommended indoor design sound levels of Australian Standard 2107 - 1987, the windows, ceiling/roof system and external walls would require that they be retrofitted and/or replaced with satisfactorily sealing to existing windows, doors, and fitted with additional building materials to the ceiling/roof systems and walls.

When habitable spaces are fitted with good seals along the perimeter of the windows, artificial ventilation would also be required. This would add to the cost of retrofitting.

If the EPA's recommended indoor sound level criteria is considered, this would normally be achieve without any requirement for retrofitting. For example, if the external traffic noise

level is 70 dB(A) facade reflection, the external free field noise level would be 2.5 dB(A) less, ie 67.5 dB(A). Typical dwellings provide about 20 dB(A) traffic noise attenuation, and as a result, the indoor traffic noise level would be 47.5 dB(A). This level is about 2.5 dB(A) less than the recommended indoor traffic noise level for daytime hours adjacent to main arterial roads. Mitigation measures would therefore not be required.

6.3.6 Cost Benefit Analysis - Retrofitting

Based on that there are about 22 residential dwellings that would require some traffic noise attenuation, the following scenario and assumptions were made to determine whether retrofitting would be cost effective:

- the RTA's Interim Traffic Noise Policy procedures for determining cost effectiveness was used;
- the average cost of each of the 22 dwellings excluding any curtilage is estimated to be $150,000;
- most residential dwellings are assumed to be of double brick constructions;
- the average cost for retrofitting each of the 22 residential dwellings would be approximately $22,000. In this case however, there are 22 residential dwellings, and a school portable building;
- the extent of retrofitting would be to achieve at least a 7 dB(A) internal noise reduction on average;
- this would entail upgrading the windows, ceiling/roof system and main entrance doors, and
- every 1 dB(A) internal noise reduction achieved is considered to be two times more beneficial than a 1 dB(A) external noise reduction. This would increase the dwelling value by 1.8% for each 1 dB(A) noise reduction. (A social survey comparing the subjective annoyance perceived by humans outdoors and indoors may be considered in order to quantify more accurately the cost benefit of indoor noise reduction).

Based on the above, when the average internal noise level is reduced by 7 dB(A) due to retrofitting, the dwelling's value would increase by 1.8% x 7 dB(A) x $150,000 = $18,900. This is less than the estimated $22,000 which would be the average cost per dwelling requiring retrofitting. The cost benefit ratio would therefore be less than 1.

Retrofitting the school would not meet the EPA's outdoor traffic noise goals for residential dwellings. Retrofitting would however achieve the EPA's indoor noise goals for school classrooms.

7.0 CONSTRUCTION NOISE ASSESSMENT

Construction noise can cause a variety of problems for residents, such as interference with speech communication, disturbance of work or leisure, disturbance of sleep and possible effects of physical and mental health. The level of noise disturbance depends on the following:

- the difference between the intrusive nature of the noise source and the existing background noise level;
- the distance between the noise source to the receiver;
- the duration of the noisy work, and
- the nature of the noise.

7.1 CONSTRUCTION NOISE CRITERIA

The RTA has adopted the EPA's construction noise criteria. These criteria are as follows:

- for a construction period of 4 weeks or less, the $L_{10,\ 15\ minutes}$ noise level must not exceed the background noise (level during the scheduled daytime hours by more than 20 dB(A);
- for a construction period of between 4 and 26 weeks, the $L_{10,\ 15\ minutes}$ level must not be exceeded by more than 10 dB(A), and
- for a construction period of greater than 26 weeks, the $L_{10,\ 15\ minutes}$ levels must not be exceeded by more than 5 dB(A).

The EPA's time restrictions for construction works are:

- Monday to Friday between 07:00 and 18:00 hours;
- Saturday between 07:00 and 08:00 hours if not audible otherwise
  Between 08:00 and 13:00 hours.

No construction work is permissible on Sundays or Public Holidays.

We have been advised however, that for this project, night time works would be required to be undertaken at three sites for the construction of culverts, Culvert Site 1 (Chainage 650 Sheet 1 of 3), 4 (near Brenan Dam Road), and 6 (near Blackwood Road).

Construction noise criteria is often exceeded as the character of the noise emitted from various plant and equipment during construction activities cannot always be shielded by practical means. For example, earth moving equipment are not normally stationary and the duration of a particular activity may vary between 15 minutes and in some cases by a whole working day.

The EPA recognises that construction and demolition operations are typically noisy.

However, if these activities are of short duration, exceeding noise levels may be accepted provided the adjustments to measured values are met, as discussed in Chapter 82-3 of the EPA's Environmental Noise Control Manual 1994.

7.2 PROPOSED CONSTRUCTION ACTIVITIES

The upgrading of Windsor Road, Vineyard would involve major construction work mostly in the road reserve. Some residents near the construction works are expected to be affected for some periods of time by construction activities. Some residents near the three Culvert sites are likely to be adversely affected by the night time road works.

Typical construction phases for road upgrades undertaken include:

- Earthworks: involving trucks, graders, water cart, backhoe, pad foot roller, compacter and smooth drum roller;
- Drainage: including concrete trucks, backhoe, water cart, kerb/gutter machine and excavator;
- Sub-base and pavement: basically as for earthworks, and
- Guard rail: involving a truck mounted pile hammer.

Trucks travelling to and from construction sites are likely to add to the existing traffic noise that may impact on nearby residences. During peak traffic the impact would appear to be minimal, conversely however, if construction is undertaken during peak hour traffic in order to comply with the EPA's construction criteria levels, this may further adversely impact residents all ready exposed to high traffic noise levels.

7.3 EXISTING BACKGROUND NOISE LEVELS

Measurements of traffic noise were used to determine the ambient background noise level for this area. **Appendix F** shows the daily background noise level trends.

Table 8 contains a summary of the measured minimum repeatable background noise levels found adjacent several sites along the subject road works.

7.4 SOUND SOURCES

Measurements of plant and equipment similar to that expected to be used for the upgrading of Windsor Road have been taken on other RTA construction sites. Table 13 is a summary of 1/1 octave band sound pressure levels of some plant and equipment taken 7 metres from the sound source centre. The summary includes:

- the measured L_{Aeq} 1/1 octave band sound pressure levels (i.e. the continuous equivalent 1/1 octave band sound power levels A-frequency and Fast-time weighted;
- the total L_{Aeq} (i.e. the continuous equivalent A-frequency and Fast-time weighted noise levels), L_{Amax} (i.e. the maximum A-frequency and Fast-time weighted levels); and L_{WA} (i.e. the sound power level, A-frequency and Fast-time weighted levels) of some plant and equipment likely to be used during construction.

Table 13 Noise Level Measurement Results & Calculated Sound Power Levels

Plant And Equipment	1/1 OCTAVE BAND AND TOTAL NOISE LEVELS (Leq taken at 7 metres) [dB(A)]											L_{EQ} Sound Power Level [dB(A)]	L_{MAX} (Taken at 7 metres) [dB(A)]
	32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz	16k Hz	Total		
Cat. 215 Excavator (Impact Hammer)	50	63	75	79	86	93	95	92	84	70	101	126	105
Cat. EL300B Excavator (Impact Hammer)	52	68	74	81	90	89	88	91	81	68	96	121	105
Cat. EL300B Excavator (Exhaust / motor)	33	49	61	72	79	80	80	73	62	51	85	110	90
International 1800 Truck	33	49	52	61	63	72	72	65	59	46	76	101	80
Volvo truck	39	63	59	65	70	72	70	64	56	46	77	101	81
Hind Econo Diesel FF truck	37	47	60	63	69	71	68	64	56	51	75	100	82
Wacker Model VPH70	42	69	73	74	73	72	78	79	78	71	85	110	90
Wacker Werke BS65Y	43	57	62	72	75	75	75	70	66	56	81	106	87
John Deere 670A Grader	43	51	61	66	73	74	75	71	62	48	80	105	86
John Deere JD670 Grader	45	64	70	66	68	71	68	62	53	39	76	101	81
John Deere 12E Grader	38	72	66	69	77	79	78	73	66	56	84	109	89
Ford 9000 Truck	47	52	67	66	67	69	68	67	63	49	76	100	80
Bathyal 194 Roller	55	65	72	69	79	81	83	78	73	61	87	112	90
Ford 555C Front Bucket	49	57	59	60	66	71	69	63	57	46	75	100	91
Ford 555C Front Backhoe	49	57	57	59	68	71	69	63	55	46	74	100	91
Jack Hammer DMR 1240	48	56	69	74	80	85	83	85	82	72	90	115	97
Jack Pick TEX 33E	40	56	66	70	72	71	78	77	75	67	83	108	90
Jack Pick S674	50	63	74	78	88	90	89	91	90	85	97	100	114
Jack Pick S661	49	62	74	82	88	90	83	86	87	81	95	120	112
Jack Hammer S1240	46	63	72	77	83	86	88	87	87	80	94	119	110
Komatsu D75A Bulldozer	46	58	69	72	76	76	74	71	70	63	82	107	90
Caterpillar D9R Bulldozer	47	57	76	76	81	82	83	76	68	56	88	113	93
Compressor Plant	45	60	65	63	55	61	58	51	48	38	70	94	86
Hitachi UH143 Excavator	40	60	66	59	68	71	77	73	65	51	80	105	97
Caterpillar 215 Excavator	39	51	58	63	70	71	71	63	55	43	75	100	92
Concrete Cutting Saw	16	44	46	62	62	66	72	81	79	67	84	109	90
Asphalt Paver, Shuttle Buggy	57	68	78	82	88	87	86	78	68	61	87	112	90

It is noted, that $L_{Aeq,\ 15\ minutes}$ noise levels are expected to be 3 dB(A) less than $L_{10,\ 15\ minutes}$ noise levels. Furthermore, not all plant and equipment would emit noise levels in the same way as those measured and summarised in Table 13. As a consequence, the above figures should be used as a guide only.

Construction noise levels in this case are unlikely to meet the EPA's noise level limits at the boundary of most residential properties. Compliance may be achieved at some residential properties if the duration of construction was for less than 4 weeks, ie the permissible maximum $L_{10,\ 15\ minutes}$ level permissible is 20 dB(A) above the existing ambient background level, and the plant noise is not as loud as some heavy earth moving plant.

Typical construction noise levels are summarised below. These include noisy plant such as Bathyal 194 Rollers and relatively quieter plant such as Compressor Plant:

Distance [m]	Construction Noise Range [dB(A)]
80	48 - 66
150	42 - 60
170	41 - 58
220	39 - 57

Background noise levels are about 30 dB(A), and therefore, could exceed the maximum permissible construction noise levels by between 7 and 16 dB(A) if construction periods are less than 4 weeks.

7.5 NOISE REDUCTION TECHNIQUES

A general expression which could be used to derive the expected construction noise levels is: $$L_P = L_W + 20 \log (r) + 8$$

where L_p is the calculated sound pressure level, Lw is the sound power level of a particular sound source listed in Table 13, and r is the distance between the source and the receiver. This equation normally holds for distances up to 30 metres over flat unimpeded views between single point sources and receiver points.

Noisy plant and equipment should be used between 07:00 and 18:00 hours during weekdays as background noise levels are normally higher than other times during the day. It is recommended, that residents be warned in advance of noisy construction periods so that they can plan their daily work and leisure periods accordingly.

Where construction noise activities are likely to take a long period of time, temporary barriers should be erected as close as practically possible to the earth moving plant and equipment.

The height of temporary barriers should in general be at least one metre above the exhaust stack of earth moving plant. It is not recommended that barriers be erected at the receiver points as these would not provide adequate noise reduction due to diffraction of sound

waves from construction noise sources.

Barriers should be constructed from solid materials capable of attenuating noise levels by at least 20 dB(A) at 125 Hertz octave band. There are many materials available which can be used to attenuate noise. These are discussed in detail in the RTA's Noise Barriers and Catalogue of Selection Possibilities compiled in 1991.

For night time construction, residents may be required to sleep at the rear of their residential premises. Alternative sleeping accommodations may be required if this is not practical.

8.0 CONSTRUCTION VIBRATION ASSESSMENT

8.1 PROPAGATION OF GROUND VIBRATIONS

The potential sources of vibration are bulldozers, vibratory rollers and impact hammers. Damage to a building from ground vibration normally occurs at higher ground vibration levels and therefore, if thresholds for normal discomfort are met, then it is quite likely that damage to buildings from vibrations would also be small.

Excavators fitted with impact hammers, pile drivers, bulldozers and vibratory rollers normally induce high ground vibration levels. Predicting ground vibrations from a source to a receiver is particularly difficult as this depends on various parameters which are often unknown. These include:

- ***Characteristic spectral vibration levels of the source***
  It noted, that the characteristic vibration levels of a source result in different rates of attenuation as a function of distance between the vibrating source and the receiver. For vibrations with higher-frequency component, the rate of attenuation is higher than for lower-frequency vibration sources.

- ***Soil stiffness and composition***
  The soil stiffness and composition can also affect the rate of propagation of ground vibrations. For example, for a constant energy input of vibration, the particle velocity measured on a loose sand fill and on a very stiff silty clay is reported to vary by a factor of 5 to 7, (Construction Vibrations, 1996 by Charles H. Dowding). The effects of soil stiffness on vibratory roller-induced vibrations also affects the amplitude of the vibration amplitude.

- ***Energy transfer rate***
  In addition to the above, there are various types of plant and equipment which transmit energy into the ground as impulsive, reciprocating, rotating and rolling energy. The transfer rate of vibration energy into specific type of ground gives rise to resonant frequencies, whose amplitudes and rate of decay can also vary.

Taking the above factors and the list of equipment specified in Table 13, vibration levels are unlikely to exceed the relevant criteria provided that most heavy plant such as vibratory rollers and impact hammers are not operated closer than 20 m from residential dwellings.

8.2 HUMAN DISTURBANCE VIBRATION CRITERIA

The EPA's ENCM Chapter 174-1 Noise Control Guidelines Vibration in Buildings is used to assess human disturbance inside buildings. Multiplying factors are applied to an acceleration base curve for frequencies between 1 and 80 Hertz. There are different multiplying factors which apply for a particular land use during daytime and night time periods. These multiplying factors also vary if the vibration source is continuous, intermittent or impulsive. The EPA's ENCM stipulates, that the measured acceleration vibration levels are to be taken as an unfiltered time signal in the one-third octave bands between 1 and 80 Hertz. The results of the one-third octave band frequency analysis is then compared to the vibration limits given in the EPA manual. Alternatively, weighted whole-body in the z-axis (W-Bz axis can be obtained and compared to base curves to determine whether compliance has been met).

The recommended maximum permissible root mean square (rms) velocity levels for human comfort can also be determined from "base-curves" given in AS 2670.2-1990. These curves represent magnitudes of approximately equal human response annoyance and complaints about interference with activities.

Australian Standard 2187.2-1993 "Use of Explosives" Appendix J Ground Vibration and Air blast (Informative) recommends the measure of maximum peak velocity [mm/s]. This unit of measure has traditionally been used to measure building damage from blasting, intermittent or continuous ground and structural vibrations, mostly because of the instrumentation that was available to take measurements at the time vibration criteria was gazetted.

Australian Standard 3663-1989 "Acoustics and Mechanical Vibration - Definition of Fundamental Quantities and their Expression as Levels" Section 3.6.1 relates to vibratory velocity in terms of rms, and Australian Standard 2670.2-199'J Part 2: "Continuous and Shock Induced Vibration in Buildings" and ISO 2631-1 also recommend assessing the influence of vibrations as rms values.

In general, the satisfactory magnitudes are related to the minimum adverse comment level by the occupants and not by any other factors, such as short term health hazard and working efficiency. In practically all cases the magnitudes are such that there is no possibility of fatigue or other vibration induced symptoms. Generally, between 10 and 100 Hz, the maximum rms level is 0.4 mm/s after multiplying factors are considered. Between 1 and 10 Hz, the maximum rms level is 2.4 and 0.4 mm/s, respectively. These levels are normally experienced during road construction projects.

In the absence of Australian Standards, British Standard 6472 provides guidance on potentia) disturbance to persons exposed to building vibration in the frequency range of 8

to 80 Hertz, a range most applicable to excavation equipment and road traffic.

During the day, disturbance to persons may occur as a result of continuous floor vibration levels, (between 0.3 to 0.6 mm/s). At night time the residential criterion is equivalent to a vertical peak vibration level of 0.2 mm/second. However, significantly higher levels of short term vibration can be tolerated by many people from construction projects. Construction vibration levels propagated from plant and equipment could be limited to the levels set out in British Standard 6472 which would be consistent with recommended guidelines set out in Chapter 174 of the EPA's Environmental Noise Control Manual.

8.3 BUILDING DAMAGE CRITERIA

For building damage, the German Standard DIN 4150 can be regarded as one of the more informative standards relating to specific safe levels according to type and condition of the building.

The likelihood of damage in dwellings begins to increase for ground vibration levels above 15 mm/s (rms). This level however would be clearly perceptible by humans. Refer to Table 14 which summarises the safe limits for building vibration. In this case, Group 1 and 2 are most relevant.

Table 14 Vibration Safe Limits for Buildings as per German Standard DIN 4150

Group	Type of Structure	Vibration Velocity [mm/s]			
		Frequency Range Measured at Foundation [Hz]			Plane of Floor of Uppermost Storey
		less than 10 Hz	10 to 50 Hz	60 to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and of similar designs	20	20 to 40	40 to 50	40
2	Dwellings & buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration do not correspond to those listed in groups 1 & 2 and are of great intrinsic value (e.g. heritage buildings)	3	3 to 8	8 to 10	8

8.4 CONSTRUCTION VIBRATION LEVELS

Vibration levels are not expected to exceed the EPA's and International Standard's safe

vibration level limits if impact hammers and vibratory rollers are used for distances greater than 20 metres from any habitable dwelling and industrial buildings. Typical vibration levels generated by heavy construction equipment are in Table 15.

Table 15 Vibration Levels

Description	Vibration Levels [mm/s]	Distance [m] from Buildings
heavy trucks passing over normal road surface, measured at the footings of a building	0.01 to 0.2	10 to 20
bulldozers operating 5 metres from the dwelling	1 .0 to 2.0	5
impact hammers	up to 5.0	20

Vibration levels would be below the threshold of possibility of damage to residential dwellings and industrial buildings provided that the vibrating rollers and impact hammers are kept at least 20 metres away from residential buildings. Vibration from machinery and equipment would involve low risk over distance and no damage to the closest dwellings and industrial buildings would be expected if appropriate safeguards are implemented.

8.5 SURFACE CRACKS

It is noted, that surface cracks to buildings would inevitably appear in time with or without ground induced vibrations. Structural stresses in dwellings can develop over time and this is dependent upon the temperature, noise and vibration stresses which the building has been exposed to as well as the resistance of the building materials to physical and chemical effects.

These building stresses arise from various mechanisms such as from:

- heat, moisture, settlement, occupational loads, pre-stressing forces, shrinking, material creep and chemical changes which can cause movements in buildings;
- temperature gradients that occur between outdoor and indoor spaces;
- increase in weight from old porous roof tiles retaining rain water;
- ground movement due to clay shrinkage or swelling after a wet and dry periods;
- earth tremors or quakes.

These stresses are normally released where mechanical permanent deformation can occur such as for cornices, window, ceiling and wall corners. These deformations appear in the form of surface cracks also known as "cosmetic" cracks. Construction activities can be a catalyst for the release of stresses which the building structure builds up over time. This occurs when the vibration energy and the stored structural stress energy is greater than the mechanical energy required to cause permanent structural deformation. Generally, if a

building is in a very unstable state, then it will tend to be more vulnerable to the possibility of damage arising from vibration or any other ground borne disturbances.

Low impact hammers should be use on this road project as most buildings are fairly old and go through large temperature differentials, which therefore can add structural stresses to the building. Heavier impact hammers normally give rise to high levels of low-frequency ground vibration which are potentially more damaging than levels of equal magnitude of high frequency ground vibrations.

The emergence of surface cracks does not imply that the structural integrity of the building is compromised. A condition survey would normally be required prior to the commencement of any construction activities for dwellings and other buildings abutting the Great Western Highway which are less than 20 metres away from construction activities.

9.0 CONCLUSION

9.1 TRAFFIC NOISE

Based on the traffic data provided by the RTA, the results of the traffic noise calculations show that traffic noise levels are expected to increase by more than 2 dB(A) at the Vineyard School playground area, the Vineyard Park and several residential properties. For sections of road where traffic is displaced away, traffic noise levels are expected to decrease. At all other residential sites, there would be a negligible increase in traffic noise adjacent to the road upgrades as the road remains unchanged.

9.1.1 Noise Barriers

Traffic noise barriers between 3 and 4 metres in height would be required to meet the EPA's traffic noise criteria at those sites requiring noise attenuation in order to meet the EPA's base traffic noise criteria.

The calculated average benefit cost ratio for achieving the EPA criteria with noise barriers was found to be 0.85, and therefore, the use of noise barriers would not be cost effective based on the property values used for these calculations.

9.1.2 Road Surfaces

If a quieter road surface is used such as OGAC a reduction of up to 0.3 dB(A) could be achieved. The limiting factor in this case is that tyre noise is only one component of the total traffic noise. Noise emissions from trucks consist of engine, transmission, tyre, wind noise from vehicles, carriage and exhaust stack noise. As a result, truck noise emissions tend to dominate traffic noise levels, particularly during the night time hours and therefore a quieter road surface would not be as effective for reducing traffic noise levels during the evening

hours.

The calculated benefit cost ratio for the use of OGAC was found to be 0.2. Therefore, OGAC would not be effective and practical and is therefore not recommended to be used for traffic noise abatement.

9.1.3 Retrofitting Dwellings

If alternative mitigation measures are considered such as retrofitting dwellings, the EPA's external noise goals would not be met. See EPA ECRTN for criteria.

Retrofitting would however reduce internal noise more effectively than barriers or OGAC could, and therefore may be considered as a preferred alternative particularly for preventing sleep arousal during the evening and early morning hours. The average calculated benefit cost ratio for retrofitting was found to be 0.86, and therefore also not cost effective based on the assumptions discussed in this assessment report.

9.1.4 Recommendations

Based on the calculated benefit cost ratio for alternative mitigation measures including barriers, open graded asphaltic concrete and retrofitting dwellings, barriers would provide the greatest noise reduction performance. If this option was chosen, noise walls could be constructed from a combination of light-weight concrete or other solid panels on the bottom, with the remaining upper section of the noise barriers constructed from clear polycarbonate panels. This type of barrier would provide unimpeded views of the area and provide noise shielding for residents. This type of barrier however would be more costly.

9.2 CONSTRUCTION NOISE LEVELS

It is expected that residential properties in close proximity to the road construction areas are likely to be affected by construction noise. It is therefore recommended that all construction work activities be undertaken as quickly and practically possible to ensure that a minimal disturbance occurs to residents.

All noisy construction activities could be undertaken during the least sensitive time of day. For most sites, this occurs during the morning and afternoon.

It is expected that construction noise levels would exceed background noise levels by as much as 20 dB(A) at some sites, especially during the night time hours (Based on that construction activities at the Culvert sites are for a period less than 4 weeks). If construction periods are for a duration greater than 4 weeks but less than 6 months, criteria levels would be exceeded by a further 10 dB(A). Under those circumstances, the use of temporary noise barriers would be ineffective. All noisy plant and equipment should be fitted with high performance mufflers.

The inconvenience between prolonged construction periods arising from the use of temporary barriers versus shorter construction periods generating higher noise levels need to be considered and discussed with the residents.

9.3 CONSTRUCTION VIBRATION LEVELS

It is unlikely that ground vibration levels would exceed human comfort levels and safe limits for residential dwellings provided that excavators fitted with heavy impact hammers and vibratory rollers are kept at least 20 metres from the closest residential dwelling. All practical and safe practices should be implemented during the construction phase in order to minimise discomfort to people and damage to buildings.

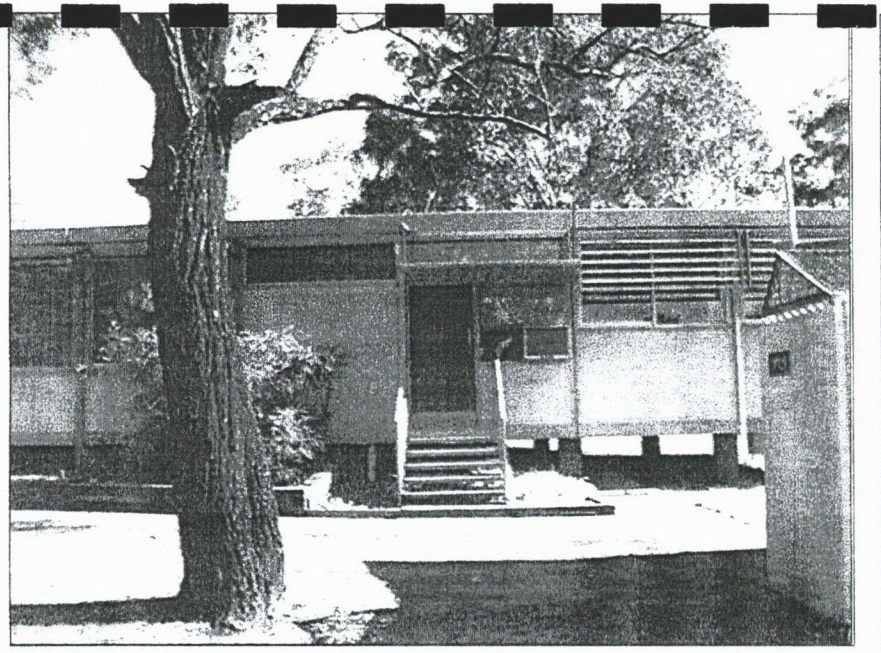


Photo 1 View of sound level located on top of portable building Site 1.

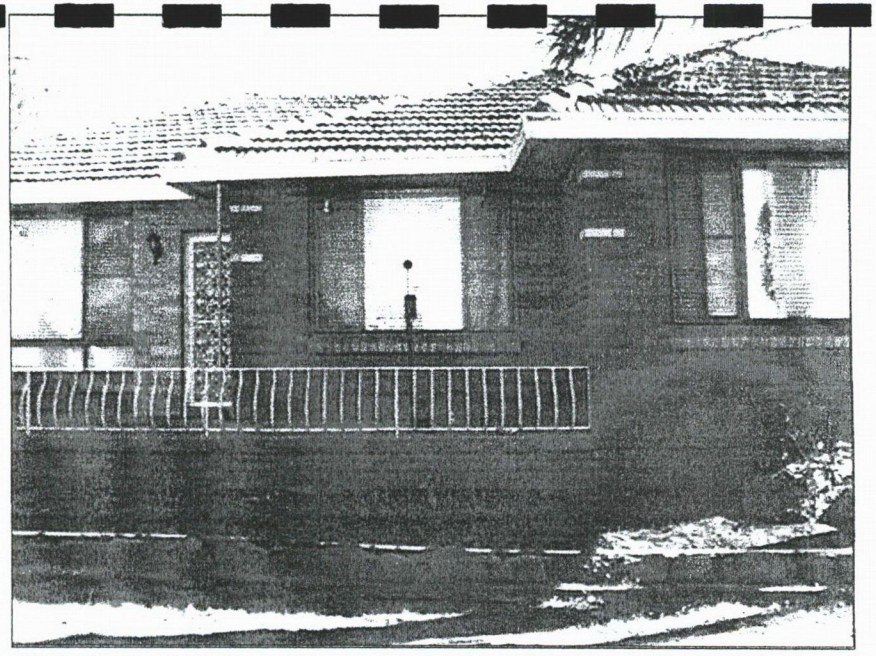


Photo 2 View of sound level meter at No. 472 Windsor Road, Site 2.

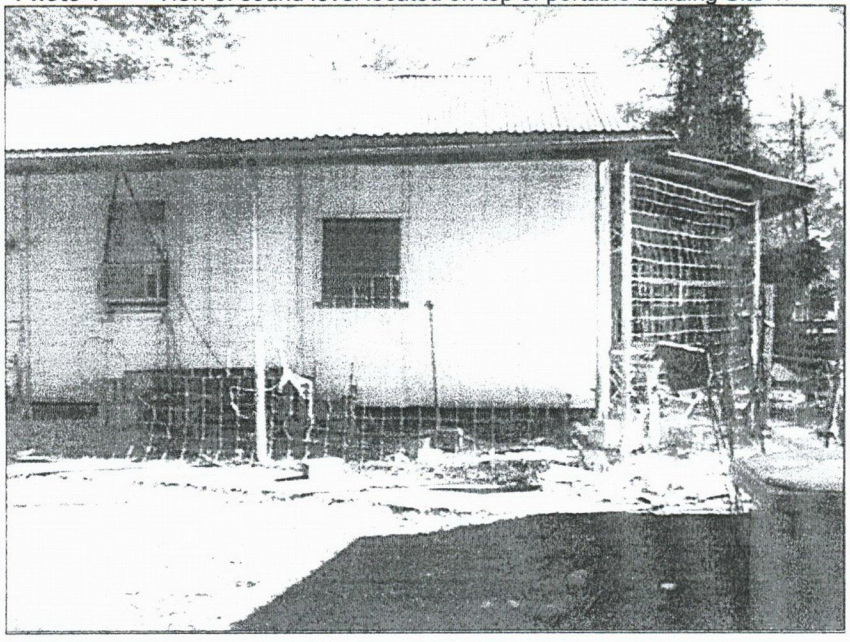


Photo 3 View of sound level meter at No. 452 Windsor Road, Site 3.

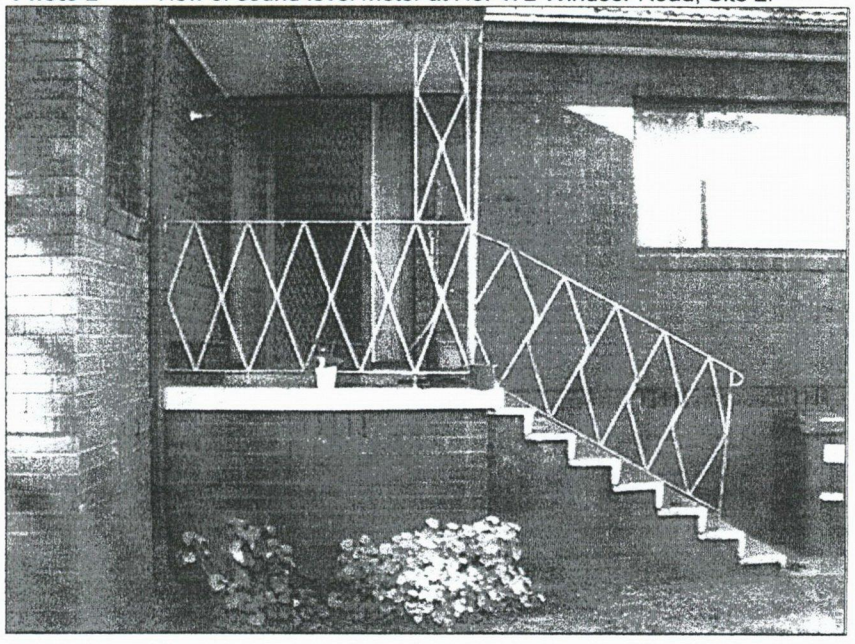


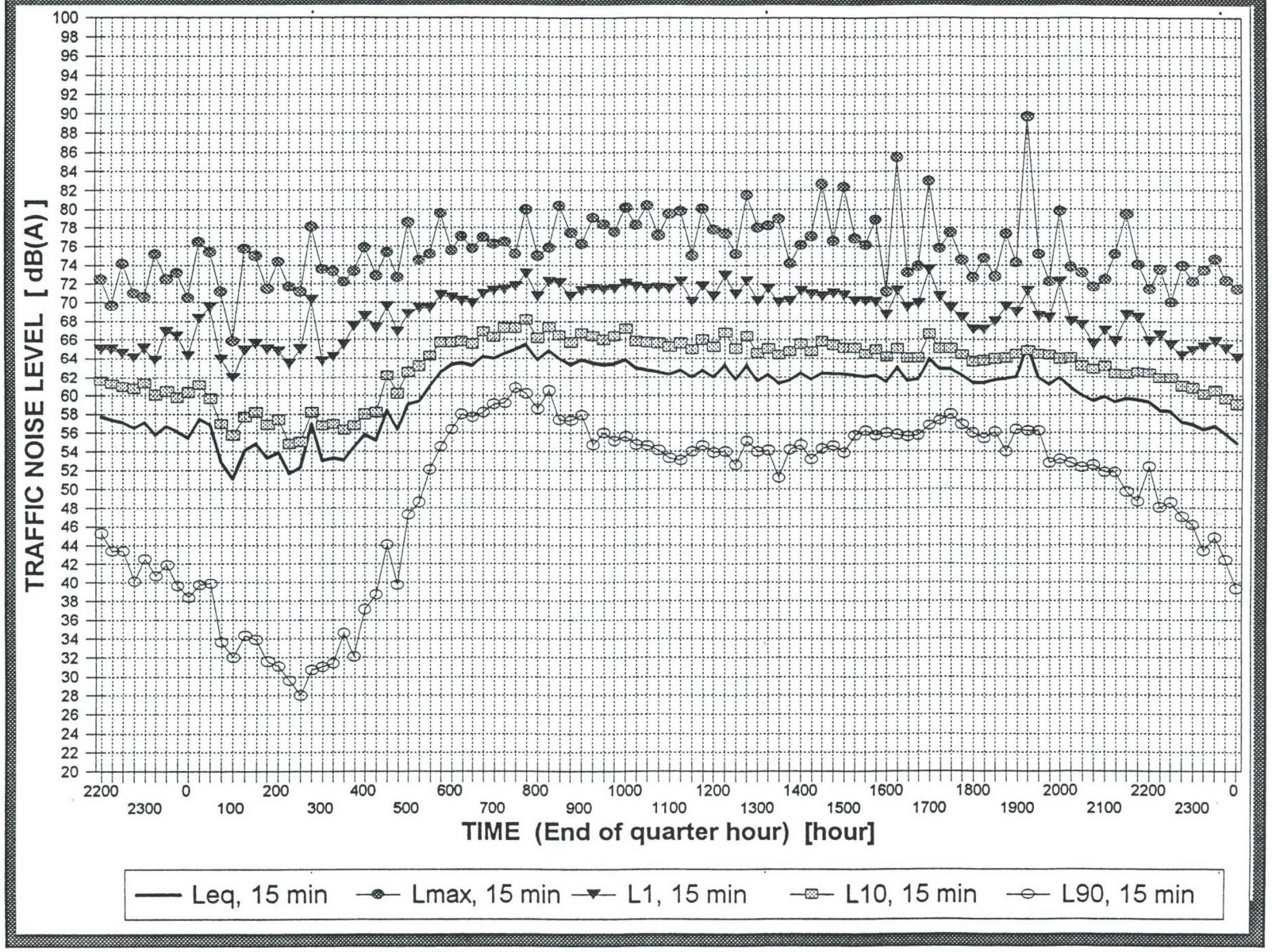
Photo 4 View of sound level meter at No. 281 Windsor Road, Site 4.

452 Windsor Road, Vineyard

DAY 1

Wednesday 30 August 2000

Norsonics 20244



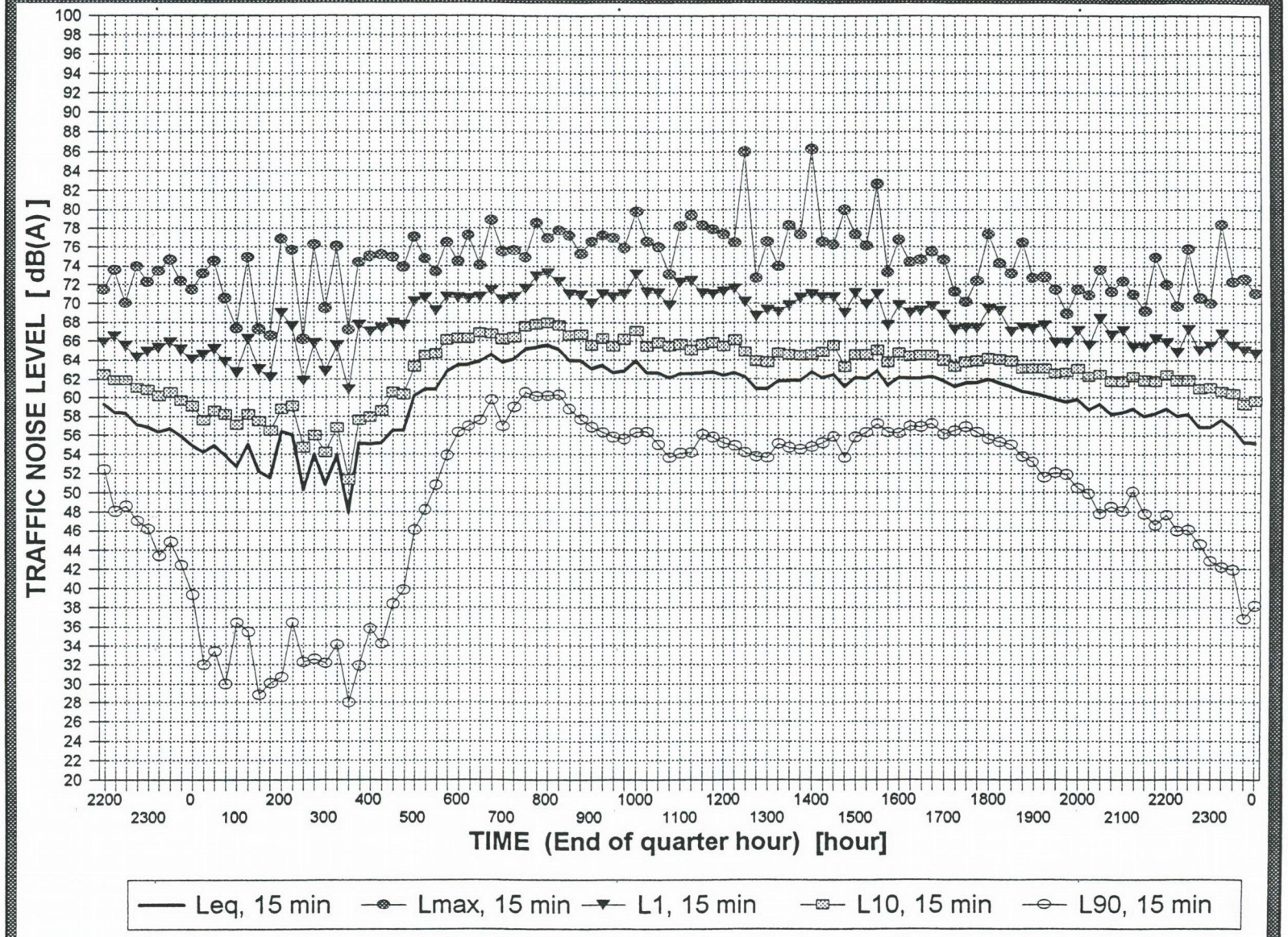
KOIKAS ACOUSTICS PTY LTD

452 Windsor Road, Vineyard

DAY 2

Thursday 31 August 2000

Norsonics 20244



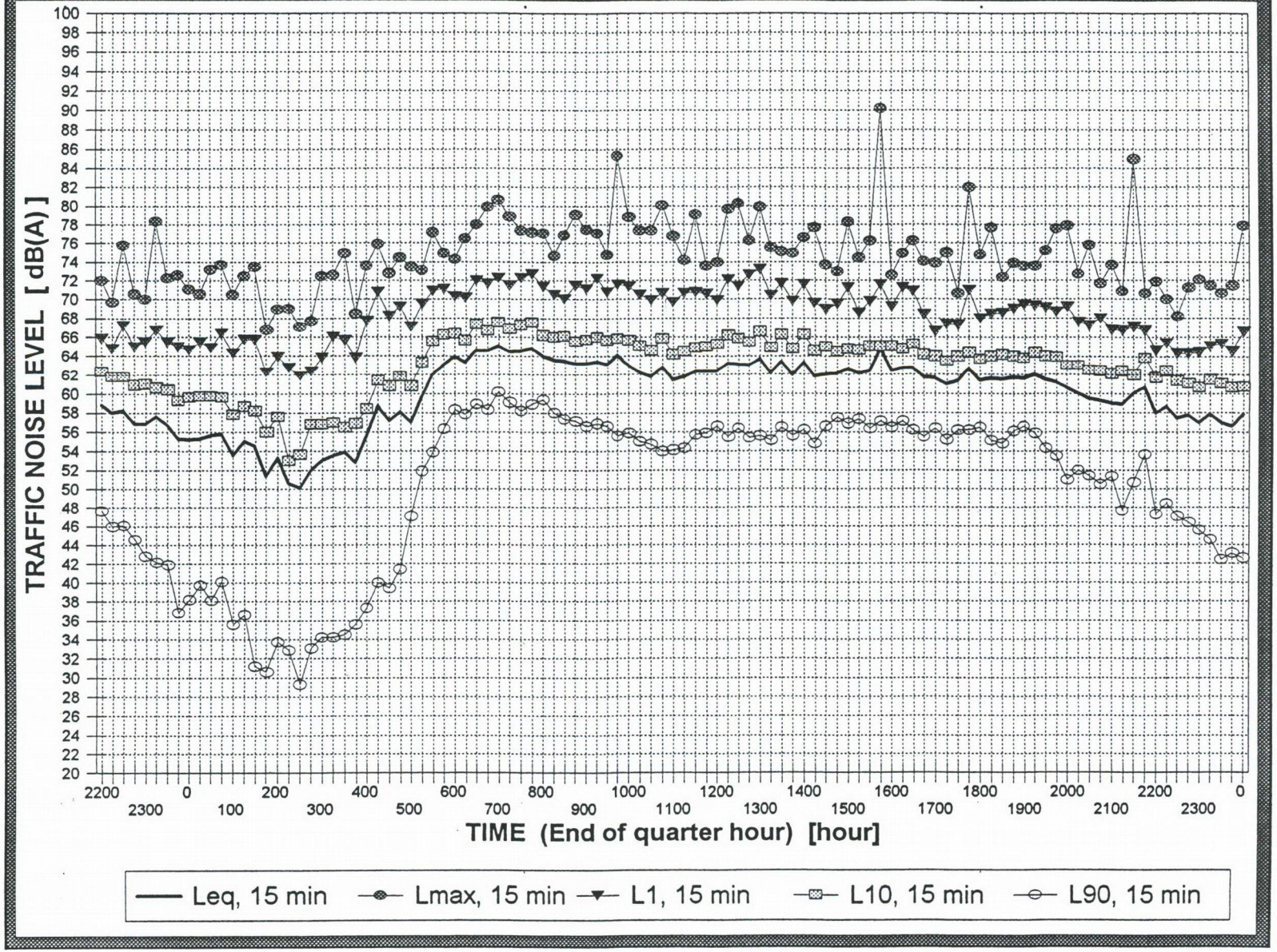
KOIKAS ACOUSTICS PTY LTD

452 Windsor Road, Vineyard

DAY 3

Friday 1 September 2000

Norsonics 20244



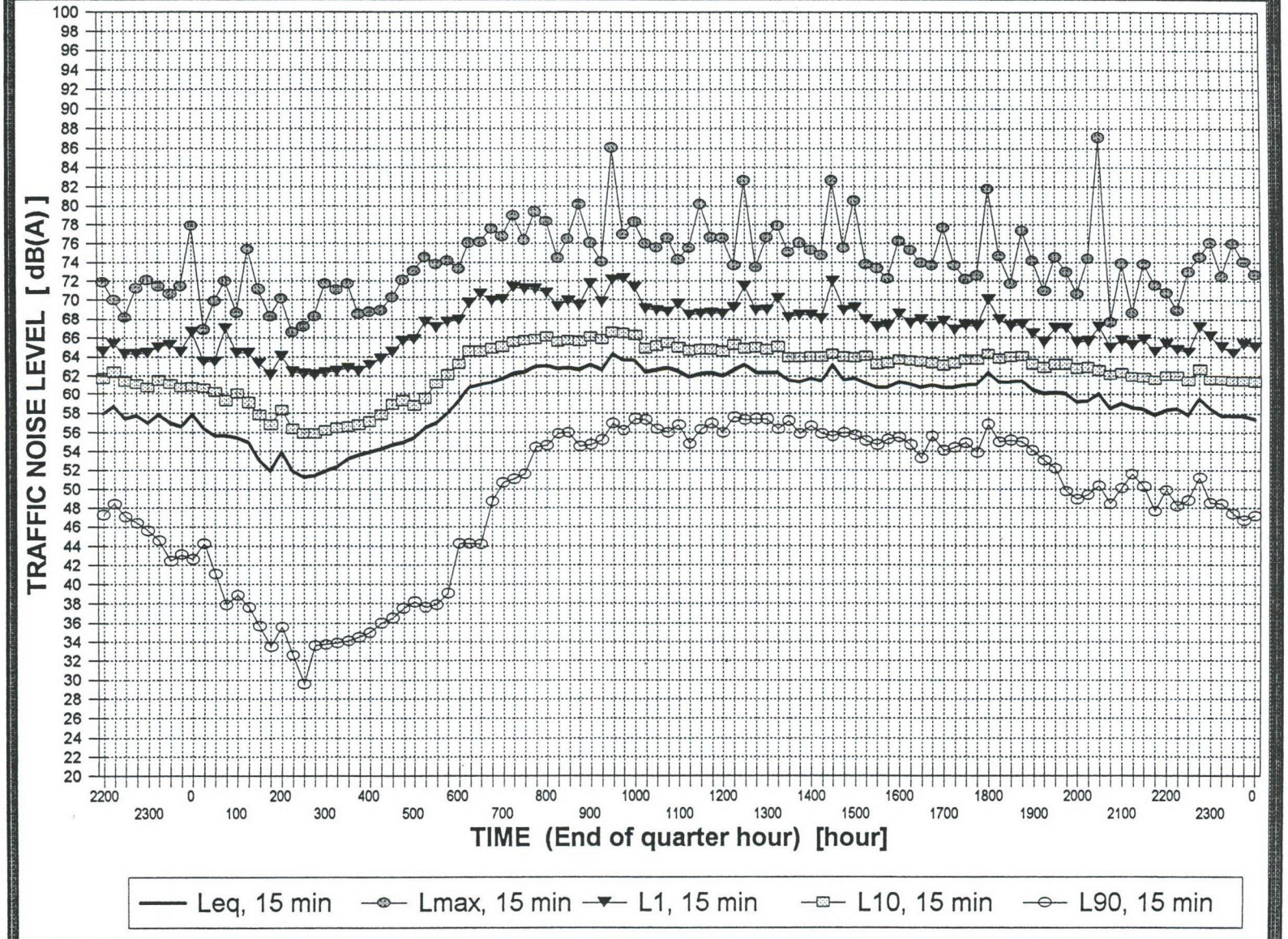
KOIKAS ACOUSTICS PTY LTD

452 Windsor Road, Vineyard

DAY 4

Saturday 2 September 2000

Norsonics 20244

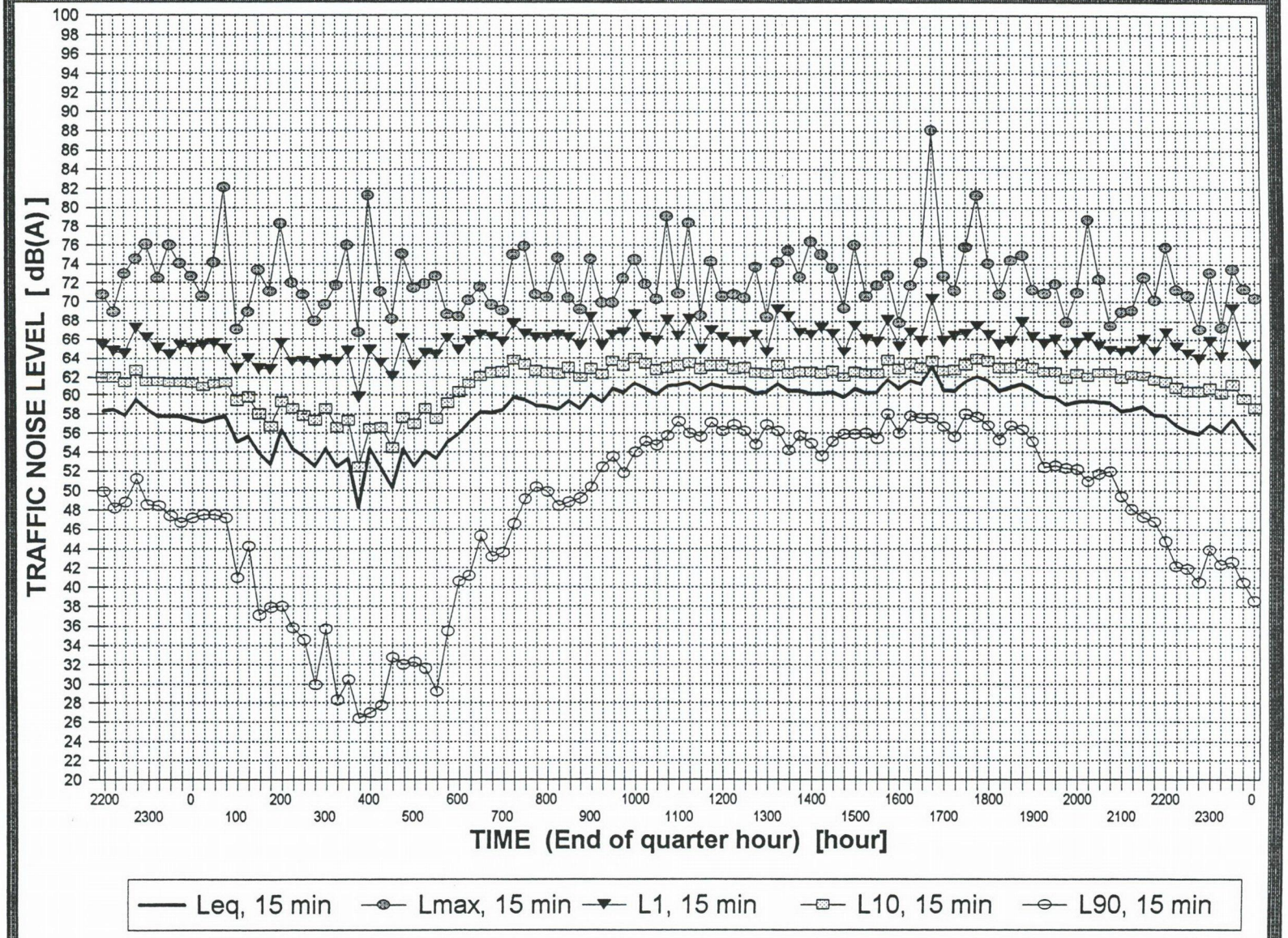


452 Windsor Road, Vineyard

DAY 5

Sunday 3 September 2000

Norsonics 20244



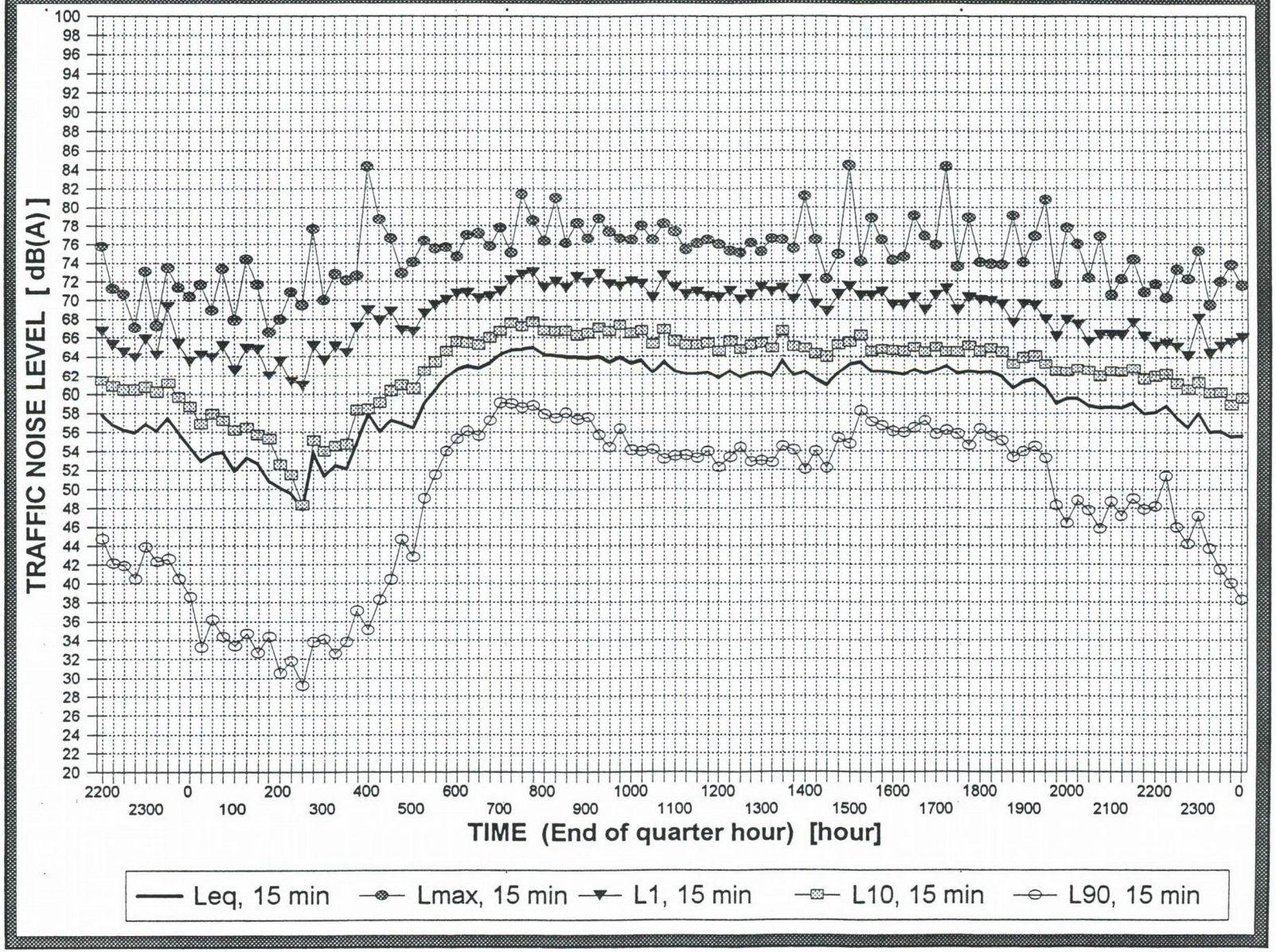
KOIKAS ACOUSTICS PTY LTD

452 Windsor Road, Vineyard

DAY 6

Monday 4 September 2000

Norsonics 20244



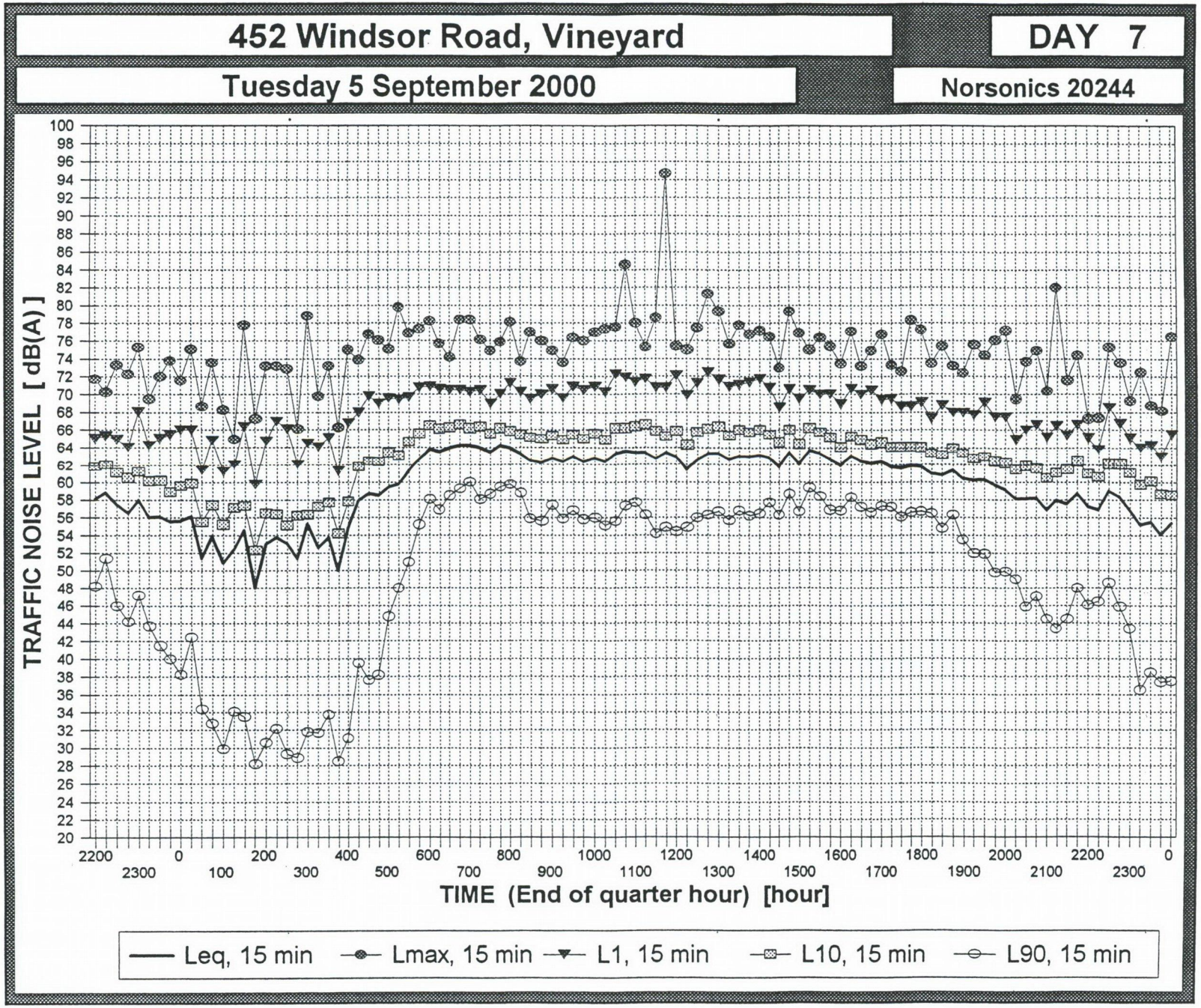
KOIKAS ACOUSTICS PTY LTD

452 Windsor Road, Vineyard

DAY 7

Tuesday 5 September 2000

Norsonics 20244



452 Windsor Road, Vineyard									DAY 1		
Wednesday 30 August 2000									Norsonics 20244		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	829	2215	57.4	69.7	65.0	62.5	61.2	54.7	43.4	35.5	12.3
2000	829	2230	57.1	74.2	64.6	62.2	60.9	54.0	43.4	39.0	17.1
2000	829	2245	56.5	71.0	64.1	62.1	60.7	53.5	40.1	32.4	14.5
2000	829	2300	57.1	70.6	65.1	62.5	61.3	54.1	42.5	35.9	13.5
2000	829	2315	55.7	75.2	63.8	61.3	60.0	50.9	40.7	34.4	19.5
2000	829	2330	56.7	72.5	66.9	62.3	60.4	52.4	41.9	37.2	15.8
2000	829	2345	56.1	73.2	66.4	61.9	59.8	49.7	39.6	33.6	17.1
2000	830	0	55.4	70.5	64.3	61.8	60.3	47.9	38.4	30.7	15.1
2000	830	15	57.5	76.5	68.3	63.2	61.1	50.4	39.7	30.7	19.0
2000	830	30	56.9	75.4	69.5	62.5	59.7	49.7	39.9	34.7	18.5
2000	830	45	52.9	71.2	63.9	59.1	57.0	45.5	33.6	27.2	18.3
2000	830	100	51.1	65.9	62.0	58.6	55.7	42.5	32.0	26.8	14.8
2000	830	115	54.1	75.8	64.9	60.0	57.7	47.3	34.3	26.5	21.7
2000	830	130	54.8	75.0	65.6	60.8	58.2	45.8	33.9	27.0	20.2
2000	830	145	53.3	71.5	65.0	59.7	56.9	42.6	31.6	27.6	18.2
2000	830	200	53.9	74.4	64.8	60.1	57.4	44.0	31.1	28.0	20.5
2000	830	215	51.6	71.7	63.4	57.8	54.8	40.2	29.6	26.3	20.1
2000	830	230	52.3	71.2	65.0	58.5	55.0	42.8	28.0	24.2	18.9
2000	830	245	57.0	78.1	70.3	61.7	58.2	41.5	30.7	25.1	21.1
2000	830	300	53.0	73.6	63.7	59.2	56.8	41.7	31.0	24.5	20.6
2000	830	315	53.3	73.4	64.2	59.4	57.0	44.9	31.4	25.8	20.1
2000	830	330	53.1	72.2	65.5	59.0	56.3	43.6	34.6	29.0	19.1
2000	830	345	54.4	73.4	67.5	60.5	56.8	43.0	32.1	26.7	19.0
2000	830	400	55.8	75.9	68.6	62.1	58.0	44.9	37.1	30.6	20.1
2000	830	415	55.2	72.9	67.3	61.5	58.2	47.3	38.7	31.5	17.7
2000	830	430	58.4	75.4	69.6	64.7	62.2	51.8	44.1	35.8	17.0
2000	830	445	56.3	72.7	66.9	62.4	60.2	50.9	39.7	31.3	16.4
2000	830	500	59.0	78.6	68.8	64.5	62.6	54.6	47.3	41.4	19.6
2000	830	515	59.4	74.6	69.4	65.0	63.2	55.1	48.6	40.2	15.2
2000	830	530	60.9	75.2	69.4	65.8	64.3	58.4	52.1	46.9	14.3
2000	830	545	62.6	79.6	70.8	67.5	65.8	60.7	54.5	49.4	17.0
2000	830	600	63.3	75.6	70.5	67.4	65.8	62.5	56.4	51.9	12.3
2000	830	615	63.5	77.1	70.2	67.4	65.9	62.8	58.0	52.0	13.6
2000	830	630	63.2	75.8	69.9	67.0	65.6	62.3	57.7	52.8	12.6
2000	830	645	64.2	77.0	70.9	68.2	66.9	63.3	58.2	52.1	12.8
2000	830	700	64.0	76.3	71.3	67.7	66.3	63.0	59.1	53.6	12.3
2000	830	715	64.5	76.5	71.4	68.9	67.3	63.2	59.2	53.2	12.0
2000	830	730	65.0	75.2	71.8	69.1	67.3	64.0	60.8	56.0	10.2
2000	830	745	65.5	80.0	73.1	70.0	68.2	64.0	60.2	54.7	14.5
2000	830	800	63.8	75.0	70.7	67.7	66.2	62.9	58.6	50.6	11.2
2000	830	815	64.9	75.9	72.2	69.2	67.4	63.6	60.5	55.6	11.0
2000	830	830	64.0	80.4	72.1	68.1	66.5	62.7	57.4	50.0	16.4
2000	830	845	63.3	77.5	70.7	67.2	65.8	62.3	57.3	51.5	14.2
2000	830	900	63.8	76.3	71.3	68.2	66.7	62.4	57.9	51.8	12.5
2000	830	915	63.5	79.1	71.5	68.2	66.4	61.9	54.7	47.4	15.6
2000	830	930	63.3	78.4	71.4	67.6	66.0	61.9	56.0	43.1	15.1
2000	830	945	63.4	77.6	71.5	68.3	66.4	61.5	55.1	46.5	14.2
2000	830	1000	63.8	80.2	72.0	68.9	67.2	61.7	55.6	48.8	16.4
2000	830	1015	63.0	78.3	71.7	68.0	65.9	60.9	54.7	46.8	15.3
2000	830	1030	62.8	80.4	71.5	67.8	65.8	60.6	54.6	45.5	17.6
2000	830	1045	62.6	77.2	71.6	67.6	65.7	60.3	54.1	43.9	14.6
2000	830	1100	62.3	79.5	71.5	67.4	65.3	59.7	53.3	43.7	17.2
2000	830	1115	62.8	79.8	72.2	67.9	65.7	60.1	53.1	42.6	17.0
2000	830	1130	62.0	75.0	70.1	66.7	65.0	60.4	54.0	45.8	13.0
2000	830	1145	62.8	80.1	71.8	67.8	66.0	60.3	54.6	47.2	17.3
2000	830	1200	62.0	77.8	70.7	67.1	65.3	59.8	53.9	47.2	15.8
2000	830	1215	63.3	77.4	72.9	69.2	66.8	60.2	54.0	46.7	14.1
2000	830	1230	61.7	75.2	70.9	66.9	65.1	59.2	52.6	44.6	13.5
2000	830	1245	63.3	81.5	72.3	69.0	66.4	60.3	55.1	45.9	18.2
2000	830	1300	61.5	78.0	70.2	66.3	64.6	59.2	54.0	47.1	16.5
2000	830	1315	62.3	78.2	71.5	67.1	65.1	59.9	54.1	44.4	15.9
2000	830	1330	61.2	79.0	70.0	66.2	64.4	58.9	51.2	43.7	17.8
2000	830	1345	61.8	74.2	70.2	66.9	64.8	59.4	54.2	46.3	12.6
2000	830	1400	62.5	76.2	71.3	67.7	65.6	60.1	54.7	46.4	13.7
2000	830	1415	61.7	77.1	70.9	66.8	64.8	59.5	53.2	46.7	15.4
2000	830	1430	62.5	82.7	70.7	67.6	65.9	60.1	54.3	47.9	20.2
2000	830	1445	62.4	76.6	71.0	67.5	65.5	60.5	54.6	48.7	14.2
2000	830	1500	62.4	82.4	70.8	67.2	65.2	60.3	53.9	44.2	20.0
2000	830	1515	62.2	76.9	70.2	67.0	65.2	60.5	55.7	46.6	14.7
2000	830	1530	62.0	76.2	70.2	66.4	64.5	60.5	56.2	49.8	14.2
2000	830	1545	62.2	78.9	70.1	66.9	65.0	60.3	55.7	47.1	16.7
2000	830	1600	61.4	71.2	68.7	65.7	64.2	60.2	56.0	50.0	9.8
2000	830	1615	63.1	85.5	71.3	66.9	65.1	60.5	55.8	47.9	22.4
2000	830	1630	61.5	73.2	69.5	65.8	64.1	60.2	55.6	49.7	11.7
2000	830	1645	61.7	73.9	69.9	65.8	64.1	60.5	55.7	50.5	12.2
2000	830	1700	63.9	83.0	73.5	68.5	66.6	61.4	56.8	47.3	19.1
2000	830	1715	62.9	75.8	70.6	66.9	65.1	61.8	57.3	51.7	12.9
2000	830	1730	62.9	77.5	69.4	66.5	65.1	62.0	58.0	50.2	14.6
2000	830	1745	62.2	74.6	68.4	65.3	64.4	61.6	56.9	50.6	12.4
2000	830	1800	61.3	72.7	67.1	64.6	63.7	60.8	56.0	50.2	11.4
2000	830	1815	61.3	74.8	67.1	64.7	63.8	60.8	55.4	49.1	13.5
2000	830	1830	61.6	72.8	68.0	65.2	64.0	60.8	56.1	49.0	11.2
2000	830	1845	61.8	77.4	69.6	65.6	64.1	60.7	54.0	49.2	15.6
2000	830	1900	62.0	74.3	69.0	65.8	64.5	61.0	56.4	50.3	12.3
2000	830	1915	65.4	89.7	71.3	66.4	64.9	61.1	56.2	51.4	24.3
2000	830	1930	61.9	75.2	68.6	65.6	64.5	61.0	56.2	49.8	13.3
2000	830	1945	61.1	72.3	68.4	65.5	64.4	59.6	52.8	41.1	11.2
2000	830	2000	61.9	79.8	72.2	65.5	64.0	59.4	53.2	47.7	17.9
2000	830	2015	60.8	73.8	68.0	65.2	64.1	59.3	52.8	44.5	13.0
2000	830	2030	60.0	73.2	67.6	64.3	63.2	58.3	52.3	46.6	13.2
2000	830	2045	59.4	71.7	65.6	63.9	62.9	57.8	52.6	47.8	12.3
2000	830	2100	59.9	72.5	67.0	64.3	63.2	58.1	51.8	42.9	12.6
2000	830	2115	59.3	75.2	65.9	63.4	62.4	57.8	51.8	47.1	15.9
2000	830	2130	59.7	79.5	68.7	63.5	62.3	57.4	49.7	42.3	19.8
2000	830	2145	59.5	74.1	68.4	64.2	62.6	57.4	48.7	40.0	14.6
2000	830	2200	59.3	71.5	65.9	63.7	62.5	57.8	52.4	41.3	12.2
2000	830	2215	58.4	73.6	66.5	63.6	61.9	55.9	48.1	40.4	15.2
2000	830	2230	58.3	70.1	65.5	62.9	61.9	56.7	48.6	39.5	11.8
2000	830	2245	57.1	74.0	64.3	62.2	61.0	54.8	47.1	38.9	16.9
2000	830	2300	56.9	72.3	64.9	62.2	60.8	54.5	46.2	37.5	15.4
2000	830	2315	56.3	73.5	65.3	61.6	60.1	52.8	43.4	32.9	17.2
2000	830	2330	56.7	74.7	65.9	62.3	60.5	52.9	44.9	39.5	18.0
2000	830	2345	55.9	72.4	65.1	61.8	59.7	51.3	42.4	32.8	16.5
2000	831	0	54.9	71.5	64.1	60.8	59.1	50.1	39.3	27.7	16.6

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	61.4	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	57.0	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	62.5	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	58.6	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	64.6	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	51.2	dB(A)

452 Windsor Road, Vineyard											DAY 2
Thursday 31 August 2000											Norsonics 20244
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	830	2200	59.3	71.5	65.9	63.7	62.5	57.8	52.4	41.3	12.2
2000	830	2215	58.4	73.6	66.5	63.6	61.9	55.9	48.1	40.4	15.2
2000	830	2230	58.3	70.1	65.5	62.9	61.9	56.7	48.6	39.5	11.8
2000	830	2245	57.1	74.0	64.3	62.2	61.0	54.8	47.1	38.9	16.9
2000	830	2300	56.9	72.3	64.9	62.2	60.8	54.5	46.2	37.5	15.4
2000	830	2315	56.3	73.5	65.3	61.6	60.1	52.8	43.4	32.9	17.2
2000	830	2330	56.7	74.7	65.9	62.3	60.5	52.9	44.9	39.5	18.0
2000	830	2345	55.9	72.4	65.1	61.8	59.7	51.3	42.4	32.8	16.5
2000	831	0	54.9	71.5	64.1	60.8	59.1	50.1	39.3	27.7	16.6
2000	831	15	54.2	73.2	64.6	59.7	57.6	47.3	32.0	26.2	19.0
2000	831	30	54.9	74.6	65.2	60.9	58.6	47.6	33.4	28.2	19.7
2000	831	45	53.9	70.6	63.8	60.2	58.2	46.5	30.0	25.1	16.7
2000	831	100	52.7	67.4	62.7	59.4	57.1	47.1	36.4	30.1	14.7
2000	831	115	55.0	74.9	66.2	61.0	58.2	46.6	35.5	29.1	19.9
2000	831	130	52.2	67.3	63.0	59.7	57.5	46.3	28.8	24.2	15.1
2000	831	145	51.5	66.6	62.2	58.9	56.5	40.3	30.1	25.3	15.1
2000	831	200	56.4	76.9	69.0	62.5	58.8	44.5	30.7	24.8	20.5
2000	831	215	56.0	75.7	67.6	62.1	59.1	46.2	36.4	30.4	19.7
2000	831	230	50.3	66.2	61.8	57.7	54.7	38.5	32.3	28.6	15.9
2000	831	245	54.0	76.3	65.8	59.8	56.0	39.9	32.6	26.4	22.3
2000	831	300	50.8	69.5	62.8	57.5	54.2	38.8	32.2	28.4	18.7
2000	831	315	53.9	76.1	65.5	60.2	56.8	41.8	34.1	27.1	22.2
2000	831	330	47.9	67.2	60.8	55.2	51.3	34.2	28.0	24.9	19.3
2000	831	345	55.1	74.4	67.7	61.7	57.6	44.0	31.9	28.2	19.3
2000	831	400	55.0	75.0	67.0	61.5	57.9	44.9	35.8	31.6	20.0
2000	831	415	55.2	75.2	67.4	62.0	58.6	43.5	34.2	28.3	20.0
2000	831	430	56.5	74.9	67.9	62.9	60.5	47.3	38.4	32.3	18.4
2000	831	445	56.5	73.9	67.7	62.6	60.3	49.1	39.8	31.9	17.4
2000	831	500	60.1	77.1	70.2	66.0	63.3	55.6	46.1	37.6	17.0
2000	831	515	60.8	74.8	70.6	66.6	64.5	57.2	48.2	39.9	14.0
2000	831	530	60.8	73.4	69.2	65.9	64.7	57.9	50.8	46.7	12.6
2000	831	545	62.8	76.5	70.7	67.7	66.1	61.1	53.9	49.6	13.7
2000	831	600	63.4	74.5	70.6	67.8	66.3	62.3	56.3	50.4	11.1
2000	831	615	63.5	77.3	70.5	67.8	66.3	62.3	57.0	50.4	13.8
2000	831	630	63.8	74.1	70.7	68.3	66.9	62.6	57.6	48.8	10.3
2000	831	645	64.6	78.9	71.4	68.4	66.8	63.8	59.8	55.0	14.3
2000	831	700	63.7	75.5	70.4	67.3	66.2	63.1	57.0	50.2	11.8
2000	831	715	64.1	75.7	70.7	67.5	66.4	63.4	59.0	52.1	11.6
2000	831	730	65.2	74.9	71.6	68.8	67.6	64.4	60.5	53.0	9.7
2000	831	745	65.4	78.6	72.9	69.6	67.8	64.2	60.1	54.2	13.2
2000	831	800	65.6	77.0	73.2	69.6	68.0	64.4	60.2	52.6	11.4
2000	831	815	65.2	77.8	72.3	69.1	67.7	64.2	60.3	52.8	12.6
2000	831	830	64.0	77.3	71.0	68.1	66.6	62.8	58.8	52.1	13.3
2000	831	845	63.9	75.3	70.9	68.3	66.7	62.8	57.7	51.4	11.4
2000	831	900	63.1	76.6	70.0	67.1	65.6	62.3	56.9	50.1	13.5
2000	831	915	63.4	77.3	71.0	67.9	66.3	62.2	56.3	49.8	13.9
2000	831	930	62.7	77.0	70.7	67.7	65.5	61.0	55.8	46.3	14.3
2000	831	945	62.9	75.9	71.0	67.8	66.2	61.1	55.6	46.7	13.0
2000	831	1000	63.9	79.8	73.1	69.3	67.1	61.2	56.3	47.1	15.9
2000	831	1015	62.7	76.6	71.2	67.1	65.5	60.8	56.4	47.9	13.9
2000	831	1030	62.7	76.0	71.1	67.7	65.9	60.7	55.0	47.1	13.3
2000	831	1045	62.1	73.1	69.8	67.1	65.5	60.4	53.7	48.0	11.0
2000	831	1100	62.6	78.2	72.2	67.8	65.7	60.1	54.1	45.8	15.6
2000	831	1115	62.6	79.4	72.4	67.6	65.1	59.9	54.2	47.4	16.8
2000	831	1130	62.7	78.3	71.1	67.4	65.7	60.8	56.1	49.6	15.6
2000	831	1145	62.8	77.9	71.0	67.9	65.9	60.7	55.8	50.3	15.1
2000	831	1200	62.4	77.4	71.3	67.4	65.5	60.0	55.2	48.3	15.0
2000	831	1215	62.7	76.5	71.6	68.1	66.1	60.2	54.9	46.3	13.8
2000	831	1230	62.2	86.0	70.2	66.7	64.9	60.1	54.2	45.3	23.8
2000	831	1245	60.9	72.7	68.7	65.5	63.9	59.2	53.8	46.3	11.8
2000	831	1300	60.9	76.6	69.3	65.7	63.8	59.1	53.7	46.1	15.7
2000	831	1315	61.7	74.0	69.1	66.5	64.8	60.0	55.1	48.3	12.3
2000	831	1330	61.8	78.3	69.8	66.3	64.6	60.2	54.7	44.2	16.5
2000	831	1345	61.8	77.4	70.6	66.7	64.5	59.8	54.5	45.8	15.6
2000	831	1400	62.8	86.3	71.0	66.9	64.6	60.1	54.8	47.1	23.5
2000	831	1415	62.1	76.6	70.7	67.2	64.9	60.0	55.2	48.8	14.5
2000	831	1430	62.5	76.3	70.7	67.5	65.6	60.6	55.9	49.6	13.8
2000	831	1445	61.1	80.0	69.0	65.1	63.3	59.6	53.7	46.4	18.9
2000	831	1500	62.1	77.4	71.1	66.5	64.6	60.0	55.8	46.5	15.3
2000	831	1515	62.0	76.2	69.9	66.2	64.6	60.6	56.3	50.1	14.2
2000	831	1530	62.9	82.7	71.0	66.8	65.1	60.8	57.2	51.8	19.8
2000	831	1545	61.2	73.3	67.7	64.9	63.8	60.3	56.3	51.6	12.1
2000	831	1600	62.1	76.8	69.8	66.4	64.8	60.8	56.2	50.7	14.7
2000	831	1615	62.0	74.4	69.0	66.1	64.4	61.0	57.0	49.5	12.4
2000	831	1630	62.0	74.7	69.2	66.0	64.5	60.9	56.9	52.1	12.7
2000	831	1645	62.2	75.5	69.7	66.0	64.5	61.1	57.2	50.1	13.3
2000	831	1700	61.7	74.7	68.8	65.9	64.0	60.7	56.1	44.4	13.0
2000	831	1715	61.1	71.3	67.2	64.0	63.3	60.6	56.5	49.7	10.2
2000	831	1730	61.5	70.2	67.4	64.9	63.8	60.9	56.9	50.2	8.7
2000	831	1745	61.5	72.4	67.4	64.9	63.9	60.9	56.3	47.3	10.9
2000	831	1800	61.9	77.4	69.4	65.7	64.2	60.7	55.6	43.9	15.5
2000	831	1815	61.5	74.3	69.2	65.5	64.1	60.2	55.3	47.5	12.8
2000	831	1830	61.1	73.2	67.0	64.9	63.9	60.2	55.0	46.8	12.1
2000	831	1845	60.6	76.5	67.5	64.2	63.1	59.7	53.8	47.5	15.9
2000	831	1900	60.4	72.7	67.3	64.1	63.1	59.5	53.2	43.7	12.3
2000	831	1915	60.1	72.8	67.7	64.4	63.1	58.9	51.6	41.6	12.7
2000	831	1930	59.8	71.5	65.9	63.5	62.6	59.0	52.1	40.2	11.7
2000	831	1945	59.5	68.9	65.9	63.8	62.7	58.5	51.9	42.5	9.4
2000	831	2000	59.8	71.5	67.1	64.2	63.1	58.4	50.5	44.3	11.7
2000	831	2015	58.7	70.9	65.6	63.4	62.2	56.9	49.9	40.5	12.2
2000	831	2030	59.3	73.6	68.4	63.8	62.5	57.0	47.8	38.4	14.3
2000	831	2045	58.2	71.3	66.6	62.8	61.7	56.0	48.5	39.7	13.1
2000	831	2100	58.4	72.4	67.1	63.0	61.7	56.1	48.1	41.1	14.0
2000	831	2115	58.8	71.0	65.4	63.2	62.2	57.2	50.1	44.0	12.2
2000	831	2130	58.0	69.2	65.4	63.0	61.8	55.6	47.8	40.9	11.2
2000	831	2145	58.3	74.9	66.2	62.7	61.7	55.8	46.6	38.0	16.6
2000	831	2200	58.8	72.0	65.9	63.6	62.4	56.6	47.7	41.5	13.2
2000	831	2215	58.0	69.7	64.8	62.9	61.8	56.1	46.0	35.8	11.7
2000	831	2230	58.2	75.8	67.2	63.2	61.8	55.2	46.1	41.6	17.6
2000	831	2245	56.8	70.6	65.0	62.3	60.9	53.9	44.6	35.8	13.8
2000	831	2300	56.8	70.0	65.5	62.4	61.0	52.4	42.8	37.5	13.2
2000	831	2315	57.6	78.4	66.7	62.2	60.6	52.1	42.2	37.0	20.8
2000	831	2330	56.7	72.3	65.5	62.0	60.4	53.5	41.9	35.6	15.6
2000	831	2345	55.3	72.6	65.0	61.3	59.3	48.4	36.8	26.4	17.3

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	**Leq, 24 hours**	between 00:00 and 24:00 hours	**61.1**	dB(A)
Night Time	**Leq, 8 hours**	between 22:00 and 06:00 hours	**56.7**	dB(A)
Daytime	**Leq, 15 hours**	between 07:00 and 22:00 hours	**62.2**	dB(A)
Night Time	**Leq, 9 hours**	between 22:00 and 07:00 hours	**58.4**	dB(A)
Daytime	**L10, 18 hours**	between 06:00 and 24:00 hours	**64.3**	dB(A)
Daytime	**minimum L90, 15 min**	between 07:00 and 18:00 hours	**53.7**	dB(A)

452 Windsor Road, Vineyard — DAY 3

Friday 1 September 2000 — Norsonics 20244

YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	831	2215	58.0	69.7	64.8	62.9	61.8	56.1	46.0	35.8	11.7
2000	831	2230	58.2	75.8	67.2	63.2	61.8	55.2	46.1	41.6	17.6
2000	831	2245	56.8	70.6	65.0	62.3	60.9	53.9	44.6	35.8	13.8
2000	831	2300	56.8	70.0	65.5	62.4	61.0	52.4	42.8	37.5	13.2
2000	831	2315	57.6	78.4	66.7	62.2	60.6	52.1	42.2	37.0	20.8
2000	831	2330	56.7	72.3	65.5	62.0	60.4	53.5	41.9	35.6	15.6
2000	831	2345	55.3	72.6	65.0	61.3	59.3	48.4	36.8	26.4	17.3
2000	901	0	55.2	71.1	64.7	61.8	59.7	48.4	38.2	29.6	15.9
2000	901	15	55.3	70.6	65.5	61.6	59.8	48.1	39.7	32.7	15.3
2000	901	30	55.6	73.2	64.9	61.4	59.8	49.2	38.1	28.6	17.6
2000	901	45	55.8	73.7	66.4	61.9	59.7	49.4	40.1	31.4	17.9
2000	901	100	53.6	70.5	64.3	60.3	57.8	46.3	35.6	29.2	16.9
2000	901	115	55.0	72.5	65.8	61.2	58.7	48.4	36.6	29.0	17.5
2000	901	130	54.5	73.5	65.8	61.1	58.2	43.6	31.2	25.5	19.0
2000	901	145	51.3	66.8	62.3	58.9	56.0	39.7	30.6	27.8	15.5
2000	901	200	53.3	68.9	63.9	60.0	57.6	45.4	33.7	28.7	15.6
2000	901	215	50.6	69.0	62.8	56.9	53.0	41.3	32.9	27.2	18.4
2000	901	230	50.1	67.1	61.9	58.0	53.7	39.0	29.3	25.3	17.0
2000	901	245	52.0	67.7	62.4	58.9	56.8	43.1	33.1	27.2	15.7
2000	901	300	53.0	72.5	63.8	59.6	56.8	44.4	34.2	27.4	19.5
2000	901	315	53.5	72.6	66.0	59.8	57.0	44.5	34.2	29.0	19.1
2000	901	330	53.9	74.9	65.7	60.2	56.5	44.1	34.5	29.4	21.0
2000	901	345	52.8	68.5	63.8	59.7	56.9	46.4	35.6	30.2	15.7
2000	901	400	55.6	73.6	67.7	61.7	58.4	47.7	37.3	31.1	18.0
2000	901	415	58.7	75.9	70.8	65.0	61.4	51.0	40.0	33.0	17.2
2000	901	430	57.1	72.8	68.2	63.4	60.8	51.1	39.4	31.2	15.7
2000	901	445	58.1	74.5	69.2	64.3	61.8	52.4	41.4	35.7	16.4
2000	901	500	57.0	73.5	67.1	62.4	60.8	53.1	47.1	42.9	16.5
2000	901	515	59.8	73.1	69.5	65.2	63.3	56.5	51.9	47.3	13.3
2000	901	530	62.0	77.2	70.9	67.3	65.6	58.9	53.9	50.3	15.2
2000	901	545	63.1	74.9	71.1	68.0	66.3	61.2	56.3	52.0	11.8
2000	901	600	63.9	74.3	70.3	67.6	66.4	63.1	58.3	54.3	10.4
2000	901	615	63.3	76.5	70.2	67.2	65.7	62.4	57.8	52.7	13.2
2000	901	630	64.6	78.0	72.0	69.1	67.4	63.2	58.9	53.9	13.4
2000	901	645	64.5	79.9	71.7	68.1	66.7	63.4	58.3	53.0	15.4
2000	901	700	65.1	80.7	72.3	69.2	67.6	63.9	60.2	53.5	15.6
2000	901	715	64.4	78.9	71.5	68.5	66.9	63.1	59.1	52.7	14.5
2000	901	730	64.5	77.4	72.3	68.9	67.3	63.1	58.2	52.5	12.9
2000	901	745	64.8	77.2	72.7	69.4	67.6	63.4	58.9	53.5	12.4
2000	901	800	64.0	77.1	71.4	67.7	66.2	62.9	59.4	54.9	13.1
2000	901	815	63.6	74.7	70.5	67.4	66.0	62.7	58.0	50.6	11.1
2000	901	830	63.5	76.9	70.1	67.3	66.1	62.5	57.3	49.0	13.4
2000	901	845	63.2	79.1	71.5	67.2	65.6	61.8	57.1	51.1	15.9
2000	901	900	63.2	77.5	71.1	67.7	65.8	61.6	56.6	45.0	14.3
2000	901	915	63.4	77.1	72.2	67.8	66.0	61.7	56.9	48.6	13.7
2000	901	930	63.1	74.8	70.8	67.6	65.7	61.8	56.6	48.7	11.7
2000	901	945	64.1	85.3	71.6	67.9	65.9	61.2	55.6	45.8	21.2
2000	901	1000	63.0	78.8	71.4	67.5	65.7	61.3	55.9	48.5	15.8
2000	901	1015	62.2	77.4	70.5	67.0	65.1	60.3	55.0	47.4	15.2
2000	901	1030	61.7	77.4	69.9	66.2	64.6	60.1	54.7	43.6	15.7
2000	901	1045	62.8	80.1	70.7	67.5	65.9	60.7	54.0	42.5	17.3
2000	901	1100	61.4	76.8	69.7	66.1	64.2	59.9	54.1	46.0	15.4
2000	901	1115	61.7	74.2	70.7	66.5	64.5	59.6	54.3	47.8	12.5
2000	901	1130	62.3	79.1	70.8	66.6	64.9	60.4	55.7	47.7	16.8
2000	901	1145	62.3	73.6	70.6	67.0	65.0	60.7	55.9	48.6	11.3
2000	901	1200	62.4	74.0	69.9	66.9	65.3	61.0	56.6	48.9	11.6
2000	901	1215	63.2	79.7	72.1	68.2	66.2	61.0	55.5	47.7	16.5
2000	901	1230	63.1	80.3	71.4	68.0	65.9	61.2	56.4	50.4	17.2
2000	901	1245	63.0	76.3	72.6	67.5	65.5	61.1	55.4	50.2	13.3
2000	901	1300	63.7	79.9	73.2	69.0	66.6	61.1	55.6	47.3	16.2
2000	901	1315	62.1	75.5	70.4	66.9	64.9	60.2	55.1	46.6	13.4
2000	901	1330	63.4	75.1	71.7	68.1	66.3	61.8	56.5	50.1	11.7
2000	901	1345	61.9	74.9	69.8	66.4	64.8	60.3	55.6	48.4	13.0
2000	901	1400	63.3	76.6	71.6	68.4	66.3	61.2	56.2	47.4	13.3
2000	901	1415	61.8	77.7	69.6	66.3	64.6	60.0	54.8	45.9	15.9
2000	901	1430	62.0	73.7	68.9	66.4	65.0	60.6	56.6	50.5	11.7
2000	901	1445	62.1	73.0	69.5	66.2	64.5	61.0	57.5	48.6	10.9
2000	901	1500	62.6	78.3	71.3	66.8	64.8	60.6	56.9	48.6	15.7
2000	901	1515	62.1	74.5	68.6	65.8	64.7	61.2	57.3	51.0	12.4
2000	901	1530	62.4	76.3	69.8	66.8	65.1	61.1	56.4	48.4	13.9
2000	901	1545	64.9	90.2	71.6	66.9	65.1	61.2	57.1	50.8	25.3
2000	901	1600	62.4	72.6	69.2	66.5	65.1	61.3	56.5	49.7	10.2
2000	901	1615	62.7	74.9	71.3	66.9	64.8	61.2	57.1	50.4	12.2
2000	901	1630	62.7	76.3	70.9	66.8	65.3	61.3	56.2	44.0	13.6
2000	901	1645	61.7	74.1	68.4	65.4	64.2	60.9	55.5	45.6	12.4
2000	901	1700	61.6	73.9	66.6	64.9	64.0	61.1	56.4	49.5	12.3
2000	901	1715	61.0	75.0	67.4	64.6	63.5	60.1	55.2	43.6	14.0
2000	901	1730	61.4	70.7	67.3	64.9	64.0	60.7	56.2	47.4	9.3
2000	901	1745	62.6	82.0	71.0	65.9	64.4	61.1	56.2	49.6	19.4
2000	901	1800	61.4	74.8	68.0	64.8	63.7	60.6	56.5	50.6	13.4
2000	901	1815	61.6	77.7	68.5	65.3	64.0	60.6	55.1	48.6	16.1
2000	901	1830	61.5	72.4	68.6	65.8	64.2	60.4	54.8	45.5	10.9
2000	901	1845	61.7	73.9	69.0	65.3	64.0	60.8	56.1	48.7	12.2
2000	901	1900	61.6	73.6	69.4	64.9	63.8	60.6	56.6	51.5	12.0
2000	901	1915	62.0	73.6	69.3	65.6	64.4	61.1	55.9	49.0	11.6
2000	901	1930	61.5	75.2	69.1	65.0	64.0	60.6	54.3	46.4	13.7
2000	901	1945	61.2	77.6	68.7	65.2	63.9	59.9	53.5	46.2	16.4
2000	901	2000	60.6	77.9	69.2	64.2	63.0	59.0	51.0	42.5	17.3
2000	901	2015	60.0	72.7	67.6	63.9	63.0	58.6	52.0	41.3	12.7
2000	901	2030	59.5	75.8	67.2	63.8	62.5	57.8	51.4	44.8	16.3
2000	901	2045	59.3	71.7	68.0	63.7	62.4	57.5	50.5	43.6	12.4
2000	901	2100	59.0	73.7	66.8	63.4	62.1	57.1	51.3	44.2	14.7
2000	901	2115	58.9	70.9	66.7	63.8	62.4	57.1	47.7	37.3	12.0
2000	901	2130	60.0	85.0	67.1	63.0	62.0	57.0	50.7	43.2	25.0
2000	901	2145	60.7	70.7	66.7	64.8	63.8	59.6	53.7	46.8	10.0
2000	901	2200	57.9	71.9	64.6	62.7	61.7	55.9	47.3	40.1	14.0
2000	901	2215	58.7	70.0	65.4	63.4	62.4	57.0	48.4	38.8	11.3
2000	901	2230	57.4	68.2	64.3	62.4	61.4	55.2	47.1	41.4	10.8
2000	901	2245	57.7	71.3	64.3	62.3	61.1	56.2	46.4	40.1	13.6
2000	901	2300	57.0	72.1	64.4	61.9	60.7	54.8	45.6	37.5	15.1
2000	901	2315	57.8	71.5	65.0	62.8	61.5	55.3	44.6	38.6	13.7
2000	901	2330	57.0	70.7	65.3	62.4	61.1	54.0	42.4	36.6	13.7
2000	901	2345	56.6	71.5	64.5	62.0	60.7	53.5	43.1	36.7	14.9
2000	902	0	57.8	77.9	66.6	62.0	60.8	52.2	42.6	34.8	20.1

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	61.4	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	57.2	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	62.4	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	59.0	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	64.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	54.0	dB(A)

452 Windsor Road, Vineyard									DAY 4		
Saturday 2 September 2000									Norsonics 20244		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	901	2215	58.7	70.0	65.4	63.4	62.4	57.0	48.4	38.8	11.3
2000	901	2230	57.4	68.2	64.3	62.4	61.4	55.2	47.1	41.4	10.8
2000	901	2245	57.7	71.3	64.3	62.3	61.1	56.2	46.4	40.1	13.6
2000	901	2300	57.0	72.1	64.4	61.9	60.7	54.8	45.6	37.5	15.1
2000	901	2315	57.8	71.5	65.0	62.8	61.5	55.3	44.6	38.6	13.7
2000	901	2330	57.0	70.7	65.3	62.4	61.1	54.0	42.4	36.6	13.7
2000	901	2345	56.6	71.5	64.5	62.0	60.7	53.5	43.1	36.7	14.9
2000	902	0	57.8	77.9	66.6	62.0	60.8	52.2	42.6	34.8	20.1
2000	902	15	56.4	66.9	63.5	61.9	60.6	53.9	44.3	39.2	10.5
2000	902	30	55.6	69.9	63.5	61.6	60.2	51.6	41.1	35.2	14.3
2000	902	45	55.6	72.0	67.0	61.7	59.3	48.5	37.9	33.0	16.4
2000	902	100	55.4	68.7	64.4	61.7	60.0	50.5	38.9	32.6	13.3
2000	902	115	54.9	75.4	64.4	60.8	59.1	48.0	37.6	32.7	20.5
2000	902	130	53.1	71.2	63.3	60.0	57.8	44.5	35.7	30.5	18.1
2000	902	145	51.9	68.3	62.1	59.3	56.8	41.4	33.5	26.4	16.4
2000	902	200	53.9	70.2	64.1	60.4	58.3	45.4	35.6	29.6	16.3
2000	902	215	51.9	66.6	62.4	58.9	56.4	43.1	32.6	23.3	14.7
2000	902	230	51.2	67.2	62.2	58.5	55.9	39.7	29.6	24.8	16.0
2000	902	245	51.4	68.3	62.1	58.4	55.9	42.4	33.6	25.0	16.9
2000	902	300	51.9	71.8	62.3	59.0	56.2	43.1	33.7	26.0	19.9
2000	902	315	52.3	71.1	62.5	59.3	56.5	43.5	33.9	27.2	18.8
2000	902	330	53.2	71.8	62.8	59.6	56.6	43.8	34.1	27.5	18.6
2000	902	345	53.6	68.6	62.5	58.8	56.8	44.0	34.5	28.2	15.0
2000	902	400	53.9	68.8	63.1	58.9	57.1	44.2	35.0	28.2	14.9
2000	902	415	54.2	68.9	63.8	58.9	57.8	44.8	36.0	28.9	14.7
2000	902	430	54.6	70.3	64.5	59.6	58.9	46.3	36.5	30.2	15.7
2000	902	445	54.9	72.1	65.7	60.2	59.3	46.9	37.5	31.2	17.2
2000	902	500	55.4	73.1	65.9	61.5	58.8	50.1	38.2	30.2	17.7
2000	902	515	56.5	74.6	67.7	62.4	59.5	50.9	37.6	33.8	18.1
2000	902	530	57.0	73.8	67.1	63.4	61.1	50.7	37.9	30.8	16.8
2000	902	545	58.0	74.2	67.7	64.2	62.1	52.8	39.1	31.8	16.2
2000	902	600	59.3	73.3	67.9	64.9	63.2	56.4	44.3	33.9	14.0
2000	902	615	60.6	76.1	69.7	66.5	64.6	56.7	44.3	35.7	15.5
2000	902	630	61.0	76.2	70.7	66.4	64.6	57.4	44.2	35.3	15.2
2000	902	645	61.3	77.6	69.9	66.4	64.9	58.7	48.7	42.4	16.3
2000	902	700	61.7	76.8	70.1	66.7	65.1	59.3	50.7	39.0	15.1
2000	902	715	62.2	79.0	71.4	67.4	65.6	59.4	51.1	44.0	16.8
2000	902	730	62.4	76.4	71.2	67.5	65.8	60.0	51.6	45.1	14.0
2000	902	745	62.9	79.4	71.2	67.3	65.9	60.9	54.4	48.1	16.5
2000	902	800	63.0	78.4	70.8	67.5	66.1	61.1	54.6	45.5	15.4
2000	902	815	62.7	74.5	69.3	66.7	65.6	61.7	55.9	44.3	11.8
2000	902	830	62.8	76.5	69.9	67.0	65.8	61.5	56.0	46.4	13.7
2000	902	845	62.6	80.2	69.4	66.8	65.7	61.1	54.5	42.8	17.6
2000	902	900	63.1	76.1	71.8	67.5	66.1	61.3	54.7	42.6	13.0
2000	902	915	62.6	74.1	69.8	67.5	65.9	61.0	55.2	50.0	11.5
2000	902	930	64.3	86.1	72.1	68.4	66.6	62.3	57.0	48.4	21.8
2000	902	945	63.6	77.0	72.3	68.0	66.5	61.9	56.2	49.0	13.4
2000	902	1000	63.6	78.3	71.4	67.8	66.3	62.1	57.4	51.6	14.7
2000	902	1015	62.4	76.0	69.1	66.0	64.9	61.5	57.3	49.6	13.6
2000	902	1030	62.6	75.6	68.9	66.1	65.2	61.8	56.4	43.9	13.0
2000	902	1045	62.8	76.6	68.8	66.5	65.5	61.9	56.0	46.9	13.8
2000	902	1100	62.5	74.3	69.6	66.2	65.0	61.4	56.8	49.9	11.8
2000	902	1115	61.9	75.5	68.5	66.0	64.7	61.0	54.8	46.9	13.6
2000	902	1130	62.2	80.2	68.6	65.9	64.8	61.3	56.3	46.5	18.0
2000	902	1145	62.3	76.7	68.7	65.9	64.8	61.4	57.0	50.5	14.4
2000	902	1200	62.0	76.6	68.6	65.8	64.6	61.1	56.0	50.0	14.6
2000	902	1215	62.6	73.7	69.2	66.5	65.3	61.6	57.6	51.6	11.1
2000	902	1230	63.1	82.7	71.5	66.4	64.9	61.1	57.3	49.1	19.6
2000	902	1245	62.4	73.5	68.9	66.1	65.0	61.6	57.4	51.5	11.1
2000	902	1300	62.3	76.7	69.0	66.0	64.8	61.3	57.4	52.6	14.4
2000	902	1315	62.4	77.9	70.2	66.9	65.1	60.8	56.4	51.4	15.5
2000	902	1330	61.5	75.1	68.2	65.0	63.9	60.5	57.2	53.5	13.6
2000	902	1345	61.3	76.1	68.5	65.1	63.9	60.1	55.9	49.4	14.8
2000	902	1400	61.7	75.3	68.5	65.2	64.0	60.6	56.7	50.5	13.6
2000	902	1415	61.4	74.8	68.1	65.2	64.0	60.4	55.9	49.5	13.4
2000	902	1430	63.1	82.7	72.0	65.9	64.3	60.3	55.6	48.7	19.6
2000	902	1445	61.5	75.5	68.9	65.6	64.0	60.3	56.0	48.5	14.0
2000	902	1500	61.7	80.6	69.2	65.1	63.9	60.4	55.7	46.5	18.9
2000	902	1515	61.1	73.8	68.0	65.5	64.1	59.8	55.1	50.9	12.7
2000	902	1530	60.6	73.4	67.2	64.4	63.2	59.7	54.7	46.8	12.8
2000	902	1545	60.7	72.3	67.3	64.6	63.3	59.8	55.3	48.9	11.6
2000	902	1600	61.3	76.3	68.6	65.0	63.7	60.1	55.5	48.4	15.0
2000	902	1615	61.0	75.3	67.6	64.6	63.6	60.0	54.7	48.2	14.3
2000	902	1630	60.6	74.0	68.0	64.6	63.5	59.4	53.3	46.9	13.4
2000	902	1645	60.9	73.7	67.2	64.3	63.3	60.1	55.6	49.6	12.8
2000	902	1700	60.6	77.7	67.8	64.2	63.1	59.4	54.1	45.1	17.1
2000	902	1715	60.7	73.7	66.9	64.4	63.3	59.8	54.4	46.3	13.0
2000	902	1730	60.9	72.2	67.4	64.7	63.7	59.9	54.9	48.9	11.3
2000	902	1745	61.0	72.6	67.3	64.8	63.7	60.1	53.9	47.0	11.6
2000	902	1800	62.4	81.8	70.1	65.5	64.3	61.0	56.9	50.6	19.4
2000	902	1815	61.2	74.7	68.0	64.8	63.8	60.0	55.0	45.7	13.5
2000	902	1830	61.3	71.8	67.3	65.0	64.0	60.4	55.2	46.3	10.5
2000	902	1845	61.4	77.4	67.5	65.2	64.1	60.3	55.0	47.6	16.0
2000	902	1900	60.4	74.2	66.5	64.1	63.2	59.6	54.1	45.5	13.8
2000	902	1915	60.0	71.0	65.6	63.8	62.9	59.2	53.1	45.4	11.0
2000	902	1930	60.1	74.6	67.1	64.2	63.2	58.9	52.2	43.9	14.5
2000	902	1945	60.0	73.0	67.1	64.3	63.2	58.7	49.8	42.4	13.0
2000	902	2000	59.2	70.7	65.6	63.8	62.8	57.8	48.9	42.3	11.5
2000	902	2015	59.3	74.4	65.7	63.9	62.9	57.7	49.4	41.4	15.1
2000	902	2030	60.0	87.1	67.2	63.9	62.6	57.7	50.4	44.9	27.1
2000	902	2045	58.5	67.7	65.0	63.0	62.1	57.1	48.4	40.0	9.2
2000	902	2100	59.0	73.9	65.8	63.3	62.3	57.4	50.1	40.7	14.9
2000	902	2115	58.6	68.7	65.3	63.2	61.9	57.1	51.6	46.5	10.1
2000	902	2130	58.4	73.8	65.9	63.1	61.8	56.5	50.3	43.2	15.4
2000	902	2145	57.8	71.6	64.6	62.5	61.5	56.0	47.7	42.4	13.8
2000	902	2200	58.3	70.8	65.4	63.2	62.0	56.3	49.9	43.9	12.5
2000	902	2215	58.5	68.9	64.8	63.0	62.0	57.1	48.2	43.2	10.4
2000	902	2230	57.8	73.0	64.5	62.5	61.4	55.8	48.8	43.3	15.2
2000	902	2245	59.5	74.6	67.2	63.8	62.7	57.8	51.2	45.2	15.1
2000	902	2300	58.5	76.1	66.2	62.8	61.5	56.0	48.5	42.8	17.6
2000	902	2315	57.7	72.5	65.1	62.7	61.5	54.9	48.4	42.3	14.8
2000	902	2330	57.7	76.0	64.4	62.5	61.4	55.0	47.4	42.4	18.3
2000	902	2345	57.7	74.1	65.4	62.8	61.4	55.2	46.7	41.4	16.4
2000	903	0	57.4	72.7	65.1	62.7	61.3	54.5	47.2	43.8	15.3

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	**Leq, 24 hours**	between 00:00 and 24:00 hours	**60.4**	dB(A)
Night Time	**Leq, 8 hours**	between 22:00 and 06:00 hours	**55.6**	dB(A)
Daytime	**Leq, 15 hours**	between 07:00 and 22:00 hours	**61.6**	dB(A)
Night Time	**Leq, 9 hours**	between 22:00 and 07:00 hours	**56.8**	dB(A)
Daytime	**L10, 18 hours**	between 06:00 and 24:00 hours	**63.9**	dB(A)
Daytime	**minimum L90, 15 min**	between 07:00 and 18:00 hours	**51.1**	dB(A)

452 Windsor Road, Vineyard											DAY 5
Sunday 3 September 2000											Norsonics 20244
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	902	2215	58.5	68.9	64.8	63.0	62.0	57.1	48.2	43.2	10.4
2000	902	2230	57.8	73.0	64.5	62.5	61.4	55.8	48.8	43.3	15.2
2000	902	2245	59.5	74.6	67.2	63.8	62.7	57.8	51.2	45.2	15.1
2000	902	2300	58.5	76.1	66.2	62.8	61.5	56.0	48.5	42.8	17.6
2000	902	2315	57.7	72.5	65.1	62.7	61.5	54.9	48.4	42.3	14.8
2000	902	2330	57.7	76.0	64.4	62.5	61.4	55.0	47.4	42.4	18.3
2000	902	2345	57.7	74.1	65.4	62.8	61.4	55.2	46.7	41.4	16.4
2000	903	0	57.4	72.7	65.1	62.7	61.3	54.5	47.2	43.8	15.3
2000	903	15	57.1	70.6	65.4	62.3	60.9	54.5	47.5	42.6	13.5
2000	903	30	57.5	74.2	65.6	62.5	61.2	54.9	47.5	38.6	16.7
2000	903	45	57.7	82.2	65.0	62.8	61.4	55.1	47.2	41.6	24.5
2000	903	100	55.0	67.1	62.9	60.8	59.4	52.1	41.0	31.9	12.1
2000	903	115	55.6	68.9	64.0	61.4	59.8	51.6	44.3	39.9	13.3
2000	903	130	53.9	73.4	62.9	59.8	58.0	48.8	37.1	28.6	19.5
2000	903	145	52.7	71.1	62.8	58.8	56.7	47.2	37.9	31.9	18.4
2000	903	200	56.3	78.3	65.6	61.2	59.3	50.1	38.0	33.0	22.0
2000	903	215	54.3	72.0	63.6	60.6	58.6	49.3	35.8	26.9	17.7
2000	903	230	53.5	70.8	63.7	60.1	57.8	45.7	34.6	27.3	17.3
2000	903	245	52.5	68.0	63.4	60.0	57.3	41.0	29.9	25.2	15.5
2000	903	300	54.3	69.7	63.9	60.9	58.6	48.0	35.7	27.4	15.4
2000	903	315	52.4	71.8	63.6	59.4	56.6	41.1	28.3	24.0	19.4
2000	903	330	53.3	76.0	64.8	60.3	57.3	41.2	30.4	22.5	22.7
2000	903	345	48.2	66.8	59.8	55.9	52.4	37.1	26.4	22.6	18.6
2000	903	400	54.3	81.3	64.9	59.0	56.5	37.7	27.0	23.2	27.0
2000	903	415	52.3	71.1	63.5	59.7	56.6	40.0	27.7	23.5	18.8
2000	903	430	50.3	68.2	62.1	58.0	54.4	38.5	32.8	25.8	17.9
2000	903	445	54.3	75.1	66.1	60.8	57.6	41.1	32.0	26.1	20.8
2000	903	500	52.5	71.5	63.2	59.5	57.0	41.7	32.3	23.9	19.0
2000	903	515	54.1	71.9	64.6	60.7	58.6	43.6	31.6	25.3	17.8
2000	903	530	53.3	72.7	64.4	60.1	57.5	41.7	29.2	23.2	19.4
2000	903	545	55.0	68.7	66.1	61.3	59.2	47.4	35.5	26.7	13.7
2000	903	600	55.9	68.5	64.9	61.9	60.3	51.9	40.6	32.0	12.6
2000	903	615	57.1	70.2	65.9	62.7	61.2	53.6	41.2	34.2	13.1
2000	903	630	58.2	71.6	66.5	63.5	62.1	55.5	45.3	37.5	13.4
2000	903	645	58.1	69.7	66.3	64.1	62.5	54.4	43.2	34.3	11.6
2000	903	700	58.4	69.1	65.8	63.8	62.6	55.7	43.6	36.3	10.7
2000	903	715	59.8	75.0	67.7	65.0	63.8	57.0	46.6	35.7	15.2
2000	903	730	59.5	75.9	66.6	64.4	63.3	57.5	49.1	45.3	16.4
2000	903	745	58.9	70.8	66.2	63.9	62.7	56.6	50.4	46.8	11.9
2000	903	800	58.8	70.5	66.2	63.8	62.5	56.5	49.9	44.5	11.7
2000	903	815	58.5	74.7	66.5	63.8	62.4	55.5	48.4	41.1	16.2
2000	903	830	59.4	70.4	66.2	64.3	63.0	57.5	48.8	40.5	11.0
2000	903	845	58.6	69.2	65.4	63.1	62.0	57.2	49.2	43.1	10.6
2000	903	900	60.0	74.6	68.4	64.4	62.9	58.2	50.4	42.5	14.6
2000	903	915	59.3	69.9	65.4	63.3	62.3	58.4	52.4	45.3	10.6
2000	903	930	60.6	69.9	66.5	64.6	63.7	59.7	53.5	46.4	9.3
2000	903	945	60.2	72.5	66.8	64.3	63.2	59.2	51.8	43.8	12.3
2000	903	1000	61.2	74.5	68.7	65.3	64.0	60.1	54.0	42.7	13.3
2000	903	1015	60.6	71.9	66.2	64.2	63.4	59.8	55.1	48.3	11.3
2000	903	1030	60.0	70.3	65.9	63.7	62.8	59.3	54.7	47.5	10.3
2000	903	1045	60.9	79.1	68.1	64.0	63.0	60.1	55.7	49.1	18.2
2000	903	1100	61.0	70.9	66.4	64.0	63.2	60.5	57.2	50.5	9.9
2000	903	1115	61.3	78.4	68.2	64.5	63.5	60.5	56.0	49.6	17.1
2000	903	1130	60.5	68.6	65.0	63.6	62.9	60.2	55.6	49.9	8.1
2000	903	1145	61.1	74.3	67.0	64.2	63.2	60.4	57.1	52.1	13.2
2000	903	1200	60.8	70.6	66.2	64.0	63.2	60.2	56.2	48.7	9.8
2000	903	1215	60.7	70.8	65.8	63.8	62.9	60.2	56.9	51.0	10.1
2000	903	1230	60.7	70.4	65.8	63.8	63.0	60.3	56.2	49.0	9.7
2000	903	1245	60.1	73.7	66.5	63.4	62.5	59.4	54.8	48.5	13.6
2000	903	1300	60.3	68.4	64.7	63.1	62.4	59.8	56.9	52.0	8.1
2000	903	1315	61.1	74.2	69.2	64.4	63.2	60.0	56.2	48.7	13.1
2000	903	1330	60.4	75.4	68.5	63.8	62.4	59.0	54.2	48.2	15.0
2000	903	1345	60.4	72.6	66.7	63.7	62.6	59.7	55.7	50.0	12.2
2000	903	1400	60.1	76.4	66.5	63.9	62.6	59.0	54.9	48.4	16.3
2000	903	1415	60.1	75.0	67.3	63.6	62.4	59.1	53.6	46.8	14.9
2000	903	1430	60.3	73.6	66.6	63.7	62.7	59.4	55.1	47.8	13.3
2000	903	1445	59.8	69.3	64.7	62.8	62.0	59.4	55.9	49.7	9.5
2000	903	1500	60.6	76.0	67.5	63.8	62.6	59.6	55.9	51.1	15.4
2000	903	1515	60.2	70.6	66.0	63.4	62.4	59.6	56.0	47.9	10.4
2000	903	1530	60.3	71.8	65.8	63.2	62.4	59.8	55.4	48.5	11.5
2000	903	1545	61.6	72.8	68.1	65.5	63.8	60.7	58.0	52.3	11.2
2000	903	1600	60.6	67.8	65.3	63.6	62.9	60.4	56.0	51.6	7.2
2000	903	1615	61.5	71.8	66.8	64.3	63.4	61.1	57.8	51.7	10.3
2000	903	1630	61.1	74.2	65.9	63.7	63.0	60.6	57.6	52.9	13.1
2000	903	1645	63.2	88.1	70.3	64.8	63.7	61.0	57.6	46.5	24.9
2000	903	1700	60.5	72.7	65.9	63.8	62.7	59.9	56.7	50.7	12.2
2000	903	1715	60.4	71.2	66.4	63.7	62.8	59.9	55.6	49.7	10.8
2000	903	1730	61.4	75.8	66.6	64.2	63.3	61.0	58.0	50.4	14.4
2000	903	1745	62.0	81.3	67.5	64.7	63.9	61.3	57.7	48.5	19.3
2000	903	1800	61.5	74.1	66.5	64.5	63.7	61.1	56.8	51.6	12.6
2000	903	1815	60.4	70.8	65.5	63.8	63.0	59.8	55.3	48.9	10.4
2000	903	1830	60.8	74.4	65.9	63.9	63.0	60.3	56.8	52.0	13.6
2000	903	1845	61.1	74.9	67.9	64.3	63.3	60.4	56.4	50.9	13.8
2000	903	1900	60.6	71.3	66.3	63.8	63.0	60.0	55.1	46.6	10.7
2000	903	1915	59.9	70.9	65.6	63.6	62.6	59.3	52.4	45.3	11.0
2000	903	1930	59.8	71.9	66.0	63.6	62.6	58.9	52.6	45.6	12.1
2000	903	1945	59.0	67.9	64.4	62.5	61.8	58.3	52.3	42.6	8.9
2000	903	2000	59.3	71.0	65.7	63.4	62.4	58.3	52.2	46.5	11.7
2000	903	2015	59.4	78.7	66.3	62.9	62.0	57.9	51.0	42.7	19.3
2000	903	2030	59.3	72.4	65.4	63.4	62.5	58.2	51.7	45.6	13.1
2000	903	2045	59.2	67.5	64.9	63.3	62.5	58.1	52.0	43.3	8.3
2000	903	2100	58.3	68.9	64.7	62.9	61.8	56.7	49.4	37.8	10.6
2000	903	2115	58.5	69.1	64.9	63.2	62.2	56.7	48.1	40.7	10.6
2000	903	2130	58.8	72.6	66.0	63.2	62.1	56.9	47.3	39.3	13.8
2000	903	2145	57.9	70.2	64.8	62.7	61.6	55.8	46.8	38.5	12.3
2000	903	2200	57.8	75.8	66.7	62.9	61.4	54.8	44.8	37.8	18.0
2000	903	2215	56.8	71.3	65.3	62.4	60.8	53.6	42.2	34.9	14.5
2000	903	2230	56.2	70.7	64.5	61.7	60.4	53.0	41.9	37.6	14.5
2000	903	2245	55.9	67.1	63.9	61.7	60.4	52.2	40.5	33.7	11.2
2000	903	2300	56.9	73.1	65.9	62.3	60.7	52.7	43.9	34.6	16.2
2000	903	2315	56.1	67.3	64.2	61.9	60.2	53.0	42.3	30.9	11.2
2000	903	2330	57.5	73.5	69.3	63.0	61.1	51.7	42.6	37.3	16.0
2000	903	2345	55.9	71.4	65.4	61.7	59.7	51.3	40.5	31.9	15.5
2000	904	0	54.4	70.4	63.5	60.4	58.7	49.4	38.6	30.5	16.0

DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	59.0	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	55.6	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	60.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	56.1	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	62.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	46.6	dB(A)

452 Windsor Road, Vineyard											DAY 6
Monday 4 September 2000										Norsonics 20244	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	903	2215	56.8	71.3	65.3	62.4	60.8	53.6	42.2	34.9	14.5
2000	903	2230	56.2	70.7	64.5	61.7	60.4	53.0	41.9	37.6	14.5
2000	903	2245	55.9	67.1	63.9	61.7	60.4	52.2	40.5	33.7	11.2
2000	903	2300	56.9	73.1	65.9	62.3	60.7	52.7	43.9	34.6	16.2
2000	903	2315	56.1	67.3	64.2	61.9	60.2	53.0	42.3	30.9	11.2
2000	903	2330	57.5	73.5	69.3	63.0	61.1	51.7	42.6	37.3	16.0
2000	903	2345	55.9	71.4	65.4	61.7	59.7	51.3	40.5	31.9	15.5
2000	904	0	54.4	70.4	63.5	60.4	58.7	49.4	38.6	30.5	16.0
2000	904	15	52.9	71.7	64.2	59.6	56.9	44.0	33.3	26.6	18.8
2000	904	30	53.7	68.9	63.9	60.4	57.9	46.3	36.2	29.8	15.2
2000	904	45	53.9	73.4	65.2	60.0	57.2	46.9	34.4	28.5	19.5
2000	904	100	51.9	67.9	62.6	59.0	56.2	43.4	33.4	28.1	16.0
2000	904	115	53.3	74.4	64.9	59.6	56.5	44.0	34.7	29.6	21.1
2000	904	130	52.7	71.7	64.8	58.9	55.7	42.7	32.7	28.3	19.0
2000	904	145	50.9	66.6	62.0	58.1	55.3	42.5	34.4	30.7	15.7
2000	904	200	50.1	68.0	63.5	56.9	52.6	35.7	30.5	27.5	17.9
2000	904	215	49.5	70.9	61.3	55.5	51.5	39.2	31.8	27.3	21.4
2000	904	230	47.9	69.5	60.8	53.7	48.3	35.6	29.2	25.3	21.6
2000	904	245	53.8	77.7	65.2	58.9	55.1	39.7	33.8	29.7	23.9
2000	904	300	51.3	70.0	63.6	57.6	54.0	41.7	34.1	30.6	18.7
2000	904	315	52.5	72.8	65.1	58.0	54.5	41.0	32.6	28.0	20.3
2000	904	330	52.1	72.1	64.4	58.4	54.7	42.2	33.8	27.2	20.0
2000	904	345	54.8	72.6	67.1	61.4	58.3	45.0	37.1	28.1	17.8
2000	904	400	57.9	84.3	68.9	61.5	58.4	44.6	35.1	28.6	26.4
2000	904	415	56.0	78.7	67.8	62.0	59.1	47.3	38.3	31.4	22.7
2000	904	430	57.2	76.7	68.8	63.0	60.3	49.5	40.4	32.9	19.5
2000	904	445	56.9	72.9	66.8	62.9	60.9	51.7	44.7	38.3	16.0
2000	904	500	56.4	74.1	66.6	62.4	60.5	50.9	42.8	37.9	17.7
2000	904	515	59.1	76.4	68.6	64.4	62.5	55.4	49.0	44.1	17.3
2000	904	530	60.4	75.5	69.4	65.2	63.4	57.6	51.5	45.9	15.1
2000	904	545	61.7	75.7	70.0	66.2	64.6	60.0	54.0	49.2	14.0
2000	904	600	62.7	74.7	70.7	67.2	65.6	61.4	55.3	48.6	12.0
2000	904	615	63.0	77.0	70.8	67.1	65.5	61.7	56.1	49.8	14.0
2000	904	630	62.8	77.2	70.2	66.5	65.3	61.8	55.6	49.4	14.4
2000	904	645	63.3	75.8	70.4	67.5	66.0	62.1	57.2	50.3	12.5
2000	904	700	64.2	77.8	71.0	68.3	66.7	63.1	59.1	52.3	13.6
2000	904	715	64.7	75.1	72.1	69.4	67.6	63.2	59.0	52.8	10.4
2000	904	730	64.8	81.4	72.7	69.0	67.2	63.4	58.6	52.0	16.6
2000	904	745	65.0	78.6	73.0	69.6	67.7	63.5	58.8	53.0	13.6
2000	904	800	64.2	76.4	71.4	68.5	66.8	63.1	57.9	51.2	12.2
2000	904	815	64.1	81.0	72.0	68.3	66.7	62.7	57.5	49.5	16.9
2000	904	830	64.0	76.2	71.4	68.5	66.8	62.8	58.1	52.1	12.2
2000	904	845	63.9	78.3	72.5	68.4	66.3	61.9	57.3	51.3	14.4
2000	904	900	63.8	76.7	71.9	68.4	66.5	62.1	57.6	50.9	12.9
2000	904	915	64.0	78.8	72.8	69.5	67.1	61.6	55.7	47.7	14.8
2000	904	930	63.4	77.4	71.8	68.5	66.7	61.2	54.4	47.2	14.0
2000	904	945	63.9	76.7	71.5	69.1	67.4	62.0	56.4	47.7	12.8
2000	904	1000	63.3	76.5	72.0	68.7	66.5	61.1	54.1	46.7	13.2
2000	904	1015	63.6	78.0	71.8	68.6	66.8	61.8	54.0	46.4	14.4
2000	904	1030	62.3	76.5	70.3	67.0	65.4	60.7	54.2	45.7	14.2
2000	904	1045	63.5	78.2	72.6	69.0	66.9	60.9	53.2	45.0	14.7
2000	904	1100	62.5	77.4	71.4	67.8	65.7	60.2	53.5	46.1	14.9
2000	904	1115	62.1	75.4	70.6	66.9	65.3	60.2	53.6	46.0	13.3
2000	904	1130	62.1	76.1	70.9	67.0	65.3	60.0	53.3	46.6	14.0
2000	904	1145	62.3	76.5	70.4	67.5	65.5	60.4	54.0	46.8	14.2
2000	904	1200	61.6	76.0	70.3	66.5	64.6	59.7	52.3	43.1	14.4
2000	904	1215	62.5	75.3	71.0	68.0	65.7	60.4	53.4	46.2	12.8
2000	904	1230	61.7	75.1	70.1	66.7	64.8	59.6	54.4	47.2	13.4
2000	904	1245	62.2	76.2	70.6	67.2	65.3	60.2	52.9	43.0	14.0
2000	904	1300	62.3	75.2	71.4	67.7	65.5	59.8	53.0	44.0	12.9
2000	904	1315	61.8	76.6	70.9	66.8	64.9	59.2	52.8	41.9	14.8
2000	904	1330	63.6	76.5	71.3	68.1	66.7	62.3	54.5	47.7	12.9
2000	904	1345	61.9	75.5	70.1	66.9	65.1	59.8	54.1	45.4	13.6
2000	904	1400	62.4	81.2	72.2	67.3	64.9	58.8	52.1	43.8	18.8
2000	904	1415	61.5	76.5	69.6	66.0	64.3	59.8	54.0	47.5	15.0
2000	904	1430	60.9	72.3	68.8	65.4	64.0	59.5	52.2	38.9	11.4
2000	904	1445	62.2	74.9	70.6	67.4	65.3	60.3	55.4	48.6	12.7
2000	904	1500	63.2	84.5	71.5	67.7	65.6	60.8	54.8	45.7	21.3
2000	904	1515	63.5	74.2	70.5	67.6	66.3	62.2	58.3	47.6	10.7
2000	904	1530	62.4	78.9	70.5	66.2	64.6	60.9	57.1	51.9	16.5
2000	904	1545	62.4	76.5	70.9	66.8	64.8	60.9	56.7	51.2	14.1
2000	904	1600	62.2	74.3	69.5	66.3	64.7	61.1	56.1	49.4	12.1
2000	904	1615	62.0	74.7	69.5	66.0	64.6	60.9	56.0	50.6	12.7
2000	904	1630	62.6	79.1	70.3	66.6	65.0	61.5	56.5	50.6	16.5
2000	904	1645	62.1	76.9	68.9	65.8	64.5	61.2	57.2	52.1	14.8
2000	904	1700	62.5	75.9	70.5	66.6	65.0	61.3	55.8	49.5	13.4
2000	904	1715	63.0	84.3	71.2	66.4	64.5	60.9	56.2	50.0	21.3
2000	904	1730	62.1	73.6	68.9	65.8	64.5	61.3	55.8	49.2	11.5
2000	904	1745	62.4	78.9	70.3	66.5	65.2	60.9	54.6	45.0	16.5
2000	904	1800	62.2	74.1	70.0	66.1	64.6	61.0	56.4	48.9	11.9
2000	904	1815	62.3	73.9	69.9	66.6	64.9	61.2	55.6	46.1	11.6
2000	904	1830	61.8	73.8	69.5	65.7	64.5	60.7	55.1	48.6	12.0
2000	904	1845	60.6	79.1	67.6	64.3	63.2	59.4	53.4	44.2	18.5
2000	904	1900	61.3	74.1	69.6	65.6	63.9	59.8	54.0	47.1	12.8
2000	904	1915	61.5	76.9	69.4	65.6	64.1	60.1	54.5	46.2	15.4
2000	904	1930	60.7	80.8	68.0	64.2	63.2	59.0	53.3	45.4	20.1
2000	904	1945	59.0	71.8	66.1	63.6	62.4	57.3	48.3	40.5	12.8
2000	904	2000	59.5	77.8	67.9	63.6	62.3	56.8	46.4	37.4	18.3
2000	904	2015	59.5	76.0	67.4	64.2	62.7	57.4	48.8	40.0	16.5
2000	904	2030	58.8	72.4	65.6	63.5	62.5	56.8	47.8	41.9	13.6
2000	904	2045	58.6	76.9	66.3	63.0	61.9	56.6	45.8	38.4	18.3
2000	904	2100	58.7	70.6	66.3	63.4	62.4	56.7	48.7	44.6	11.9
2000	904	2115	58.6	72.3	66.3	63.7	62.3	56.2	47.2	38.6	13.7
2000	904	2130	59.1	74.4	67.6	63.9	62.7	56.5	49.0	44.4	15.3
2000	904	2145	57.9	70.9	66.1	62.9	61.6	55.4	47.9	43.7	13.0
2000	904	2200	58.1	71.8	65.1	63.2	61.9	55.8	48.2	40.8	13.7
2000	904	2215	58.8	70.3	65.4	63.0	62.1	57.5	51.4	43.7	11.5
2000	904	2230	57.5	73.3	65.0	62.4	61.1	55.1	46.0	37.6	15.8
2000	904	2245	56.5	72.3	64.1	61.8	60.5	53.7	44.2	38.9	15.8
2000	904	2300	58.0	75.3	68.1	63.1	61.2	54.7	47.2	37.9	17.3
2000	904	2315	56.0	69.5	64.3	61.6	60.1	53.0	43.7	37.4	13.5
2000	904	2330	56.1	72.0	65.1	62.0	60.2	51.8	41.5	35.3	15.9
2000	904	2345	55.5	73.8	65.5	61.1	58.9	50.3	40.0	27.5	18.3
2000	905	0	55.6	71.6	66.0	61.7	59.6	49.3	38.3	30.9	16.0

DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	**Leq, 24 hours**	between 00:00 and 24:00 hours	**61.2**	dB(A)
Night Time	**Leq, 8 hours**	between 22:00 and 06:00 hours	**56.2**	dB(A)
Daytime	**Leq, 15 hours**	between 07:00 and 22:00 hours	**62.3**	dB(A)
Night Time	**Leq, 9 hours**	between 22:00 and 07:00 hours	**57.9**	dB(A)
Daytime	**L10, 18 hours**	between 06:00 and 24:00 hours	**64.5**	dB(A)
Daytime	**minimum L90, 15 min**	between 07:00 and 18:00 hours	**52.1**	dB(A)

452 Windsor Road, Vineyard											DAY 7
Tuesday 5 September 2000										Norsonics 20244	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	904	2215	58.8	70.3	65.4	63.0	62.1	57.5	51.4	43.7	11.5
2000	904	2230	57.5	73.3	65.0	62.4	61.1	55.1	46.0	37.6	15.8
2000	904	2245	56.5	72.3	64.1	61.8	60.5	53.7	44.2	38.9	15.8
2000	904	2300	58.0	75.3	66.1	63.1	61.2	54.7	47.2	37.9	17.3
2000	904	2315	56.0	69.5	64.3	61.6	60.1	53.0	43.7	37.4	13.5
2000	904	2330	56.1	72.0	65.1	62.0	60.2	51.8	41.5	35.3	15.9
2000	904	2345	55.5	73.8	65.5	61.1	58.9	50.3	40.0	27.5	18.3
2000	905	0	55.6	71.6	66.0	61.7	59.6	49.3	38.3	30.9	16.0
2000	905	15	56.1	75.1	66.0	61.7	59.9	51.9	42.4	29.8	19.0
2000	905	30	51.4	68.7	61.4	58.0	55.5	45.1	34.4	28.1	17.3
2000	905	45	53.9	73.6	64.9	59.9	57.4	46.2	32.8	28.0	19.7
2000	905	100	50.9	68.3	61.2	57.3	55.2	44.5	29.9	23.9	17.4
2000	905	115	52.4	65.0	62.1	59.3	57.1	46.3	34.1	25.9	12.6
2000	905	130	54.5	77.8	66.4	59.6	57.3	45.1	33.5	26.4	23.3
2000	905	145	48.0	67.3	59.8	55.2	52.3	35.8	28.2	23.0	19.3
2000	905	200	53.0	73.2	64.8	59.7	56.5	40.9	30.6	25.2	20.2
2000	905	215	53.8	73.2	67.0	59.8	56.4	41.4	32.2	27.5	19.4
2000	905	230	53.1	72.9	66.1	58.7	55.1	41.0	29.3	24.5	19.8
2000	905	245	51.3	66.1	62.1	58.4	56.2	38.7	28.9	23.7	14.8
2000	905	300	55.3	78.8	64.5	58.8	56.3	42.7	31.8	26.1	23.5
2000	905	315	52.6	69.8	64.1	59.9	57.2	40.7	31.7	25.6	17.2
2000	905	330	53.8	73.2	65.2	60.8	57.7	43.0	33.7	26.8	19.4
2000	905	345	50.0	66.3	61.3	57.1	54.2	38.3	28.5	24.4	16.3
2000	905	400	54.8	75.0	66.8	61.7	57.8	40.3	31.1	24.0	20.2
2000	905	415	57.9	73.9	68.0	63.9	61.8	52.6	39.5	30.4	16.0
2000	905	430	58.7	76.8	69.8	65.0	62.5	50.1	37.6	31.3	18.1
2000	905	445	58.5	76.1	69.0	64.3	62.4	52.2	38.2	32.1	17.6
2000	905	500	59.4	75.1	69.6	65.6	63.4	54.2	44.8	37.3	15.7
2000	905	515	59.8	79.8	69.4	65.0	63.1	56.3	48.0	42.1	20.0
2000	905	530	61.2	76.9	69.7	66.1	64.7	58.5	51.0	41.7	15.7
2000	905	545	62.7	77.4	70.8	67.1	65.6	61.0	55.2	49.5	14.7
2000	905	600	63.8	78.2	70.9	67.9	66.5	62.8	58.1	53.2	14.4
2000	905	615	63.5	75.7	70.6	67.3	66.1	62.7	56.9	51.1	12.2
2000	905	630	63.9	74.2	70.5	67.6	66.3	63.3	58.5	50.2	10.3
2000	905	645	64.2	78.4	70.5	67.8	66.6	63.4	59.3	52.0	14.2
2000	905	700	64.2	78.4	70.3	67.4	66.2	63.4	60.0	53.4	14.2
2000	905	715	64.0	76.2	70.5	67.8	66.4	63.3	58.1	50.3	12.2
2000	905	730	63.5	74.9	69.0	66.7	65.6	63.1	58.7	54.2	11.4
2000	905	745	64.2	75.9	70.1	67.3	66.2	63.7	59.5	47.0	11.7
2000	905	800	63.9	78.1	71.3	67.0	65.9	62.8	59.8	51.8	14.2
2000	905	815	63.3	73.7	70.3	67.0	65.5	62.5	58.8	52.6	10.4
2000	905	830	62.5	77.0	69.5	66.5	65.2	61.5	55.9	47.2	14.5
2000	905	845	62.2	76.0	70.0	66.6	65.0	60.9	55.6	51.1	13.8
2000	905	900	62.8	74.9	70.6	66.8	65.4	61.6	57.4	50.5	12.1
2000	905	915	62.3	73.6	69.6	66.2	64.9	61.3	55.9	49.8	11.3
2000	905	930	63.0	76.4	70.9	66.9	65.5	61.9	56.8	47.1	13.4
2000	905	945	62.3	76.0	70.5	66.5	65.0	60.8	55.8	49.0	13.7
2000	905	1000	62.8	77.0	70.9	67.8	65.6	61.1	56.0	50.0	14.2
2000	905	1015	62.3	77.4	70.3	66.6	64.9	60.8	55.1	48.2	15.1
2000	905	1030	63.3	77.6	72.3	68.3	66.2	61.2	55.6	48.5	14.3
2000	905	1045	63.6	84.6	71.9	68.3	66.2	61.5	57.3	50.6	21.0
2000	905	1100	63.4	78.0	71.4	68.4	66.4	61.6	57.7	49.7	14.6
2000	905	1115	63.4	75.3	71.8	68.8	66.6	61.2	56.3	51.2	11.9
2000	905	1130	62.7	78.6	70.8	67.7	65.9	61.0	54.2	45.8	15.9
2000	905	1145	63.4	94.7	70.8	67.1	65.3	60.4	54.9	37.6	31.3
2000	905	1200	62.9	75.4	72.1	68.0	65.9	60.7	54.4	50.2	12.5
2000	905	1215	61.4	75.0	69.9	66.1	64.3	59.6	54.9	49.2	13.6
2000	905	1230	62.5	77.5	71.3	67.6	65.8	60.2	56.0	49.9	15.0
2000	905	1245	63.3	81.3	72.5	68.3	66.1	60.8	56.3	50.7	18.0
2000	905	1300	63.3	79.3	71.7	68.3	66.4	61.3	56.7	51.7	16.0
2000	905	1315	62.6	75.7	70.9	67.2	65.4	60.9	55.7	49.4	13.1
2000	905	1330	63.0	77.8	71.1	67.9	66.0	61.0	56.8	52.2	14.8
2000	905	1345	62.9	76.8	71.4	67.8	65.8	60.9	56.2	51.8	13.9
2000	905	1400	63.1	77.2	71.8	67.8	66.0	61.0	56.5	52.6	14.1
2000	905	1415	62.8	76.5	70.8	67.0	65.5	61.4	57.7	53.4	13.7
2000	905	1430	61.7	73.0	68.6	66.0	64.6	60.3	56.3	50.3	11.3
2000	905	1445	63.4	79.3	70.6	67.7	66.0	62.0	58.7	53.5	15.9
2000	905	1500	62.0	76.9	69.5	66.0	64.4	60.8	56.7	50.0	14.9
2000	905	1515	63.7	75.0	70.5	67.5	66.2	62.6	59.4	54.7	11.3
2000	905	1530	63.3	76.4	70.0	67.2	65.8	62.3	58.4	53.7	13.1
2000	905	1545	62.6	75.4	70.1	66.8	65.2	61.4	56.9	52.3	12.8
2000	905	1600	61.9	73.5	68.9	65.8	64.1	61.0	56.8	51.5	11.6
2000	905	1615	63.0	77.1	70.7	66.9	65.3	61.9	58.3	51.1	14.1
2000	905	1630	62.4	73.2	70.0	66.6	64.9	61.2	57.2	51.7	10.8
2000	905	1645	62.1	74.9	70.5	65.9	64.4	60.9	56.6	51.3	12.8
2000	905	1700	62.3	76.8	69.4	65.9	64.6	61.4	57.3	51.2	14.5
2000	905	1715	61.8	73.3	69.5	65.4	64.1	60.8	57.2	52.9	11.5
2000	905	1730	61.6	72.6	68.7	65.3	64.1	60.8	56.1	50.5	11.0
2000	905	1745	61.9	78.3	68.7	65.3	64.1	60.9	56.6	48.3	16.4
2000	905	1800	61.8	77.3	69.1	65.0	64.0	60.8	56.7	50.3	15.5
2000	905	1815	61.0	73.5	67.3	64.5	63.3	60.3	56.5	50.3	12.5
2000	905	1830	60.8	75.4	68.8	64.5	63.1	59.6	54.8	48.6	14.6
2000	905	1845	61.4	73.2	68.0	65.1	63.9	60.5	56.3	49.7	11.8
2000	905	1900	60.4	72.4	68.0	64.8	63.3	59.1	53.5	45.3	12.0
2000	905	1915	60.2	75.6	67.7	63.9	62.7	59.2	52.0	47.1	15.4
2000	905	1930	60.3	74.4	69.1	64.5	62.9	58.6	51.9	43.3	14.1
2000	905	1945	59.7	76.1	67.5	63.8	62.4	57.8	49.8	40.8	16.4
2000	905	2000	59.2	77.2	67.5	63.4	62.2	57.1	49.9	42.6	18.0
2000	905	2015	58.1	69.5	64.9	62.7	61.5	56.7	49.0	42.6	11.4
2000	905	2030	58.1	73.7	66.0	63.2	61.9	55.5	45.9	39.7	15.6
2000	905	2045	58.2	74.9	66.6	63.0	61.6	55.5	47.1	41.3	16.7
2000	905	2100	56.9	70.4	65.2	61.9	60.5	54.2	44.5	37.2	13.5
2000	905	2115	57.9	82.0	66.5	62.6	61.1	54.3	43.4	35.1	24.1
2000	905	2130	57.5	71.6	65.4	62.9	61.5	54.7	44.5	38.0	14.1
2000	905	2145	58.7	74.4	66.6	63.8	62.4	56.0	48.0	43.5	15.7
2000	905	2200	57.2	67.3	65.1	62.3	61.0	55.1	46.1	37.9	10.1
2000	905	2215	56.9	67.4	63.8	61.8	60.6	55.0	46.5	36.4	10.5
2000	905	2230	59.0	75.3	68.6	63.8	62.1	56.1	48.6	39.8	16.3
2000	905	2245	58.3	73.6	66.8	63.3	62.1	55.2	45.9	36.8	15.3
2000	905	2300	56.9	69.3	65.1	62.5	61.1	53.2	43.4	36.3	12.4
2000	905	2315	55.2	72.5	64.0	61.3	59.8	48.9	36.5	27.5	17.3
2000	905	2330	55.5	68.8	64.3	61.6	60.1	50.8	38.5	32.4	13.3
2000	905	2345	54.1	68.2	62.9	60.8	58.7	49.2	37.4	33.2	14.1
2000	906	0	55.4	76.5	65.5	60.7	58.6	48.5	37.5	28.5	21.1

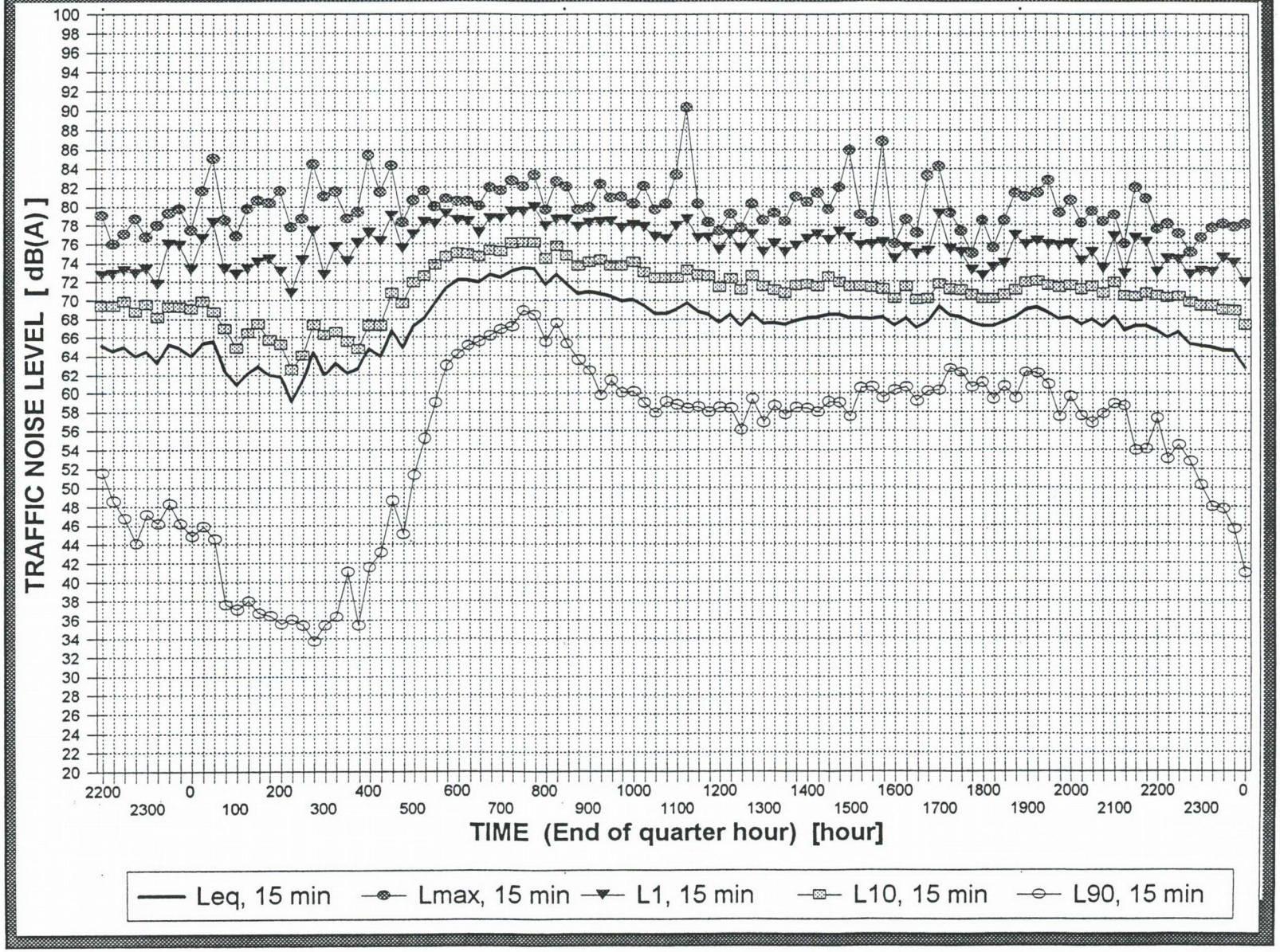
DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	61.1	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	57.1	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	62.1	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	58.7	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	64.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	54.2	dB(A)

472 Windsor Road, Vineyard

DAY 1

Wednesday 30 August 2000

RT&A S/N 65



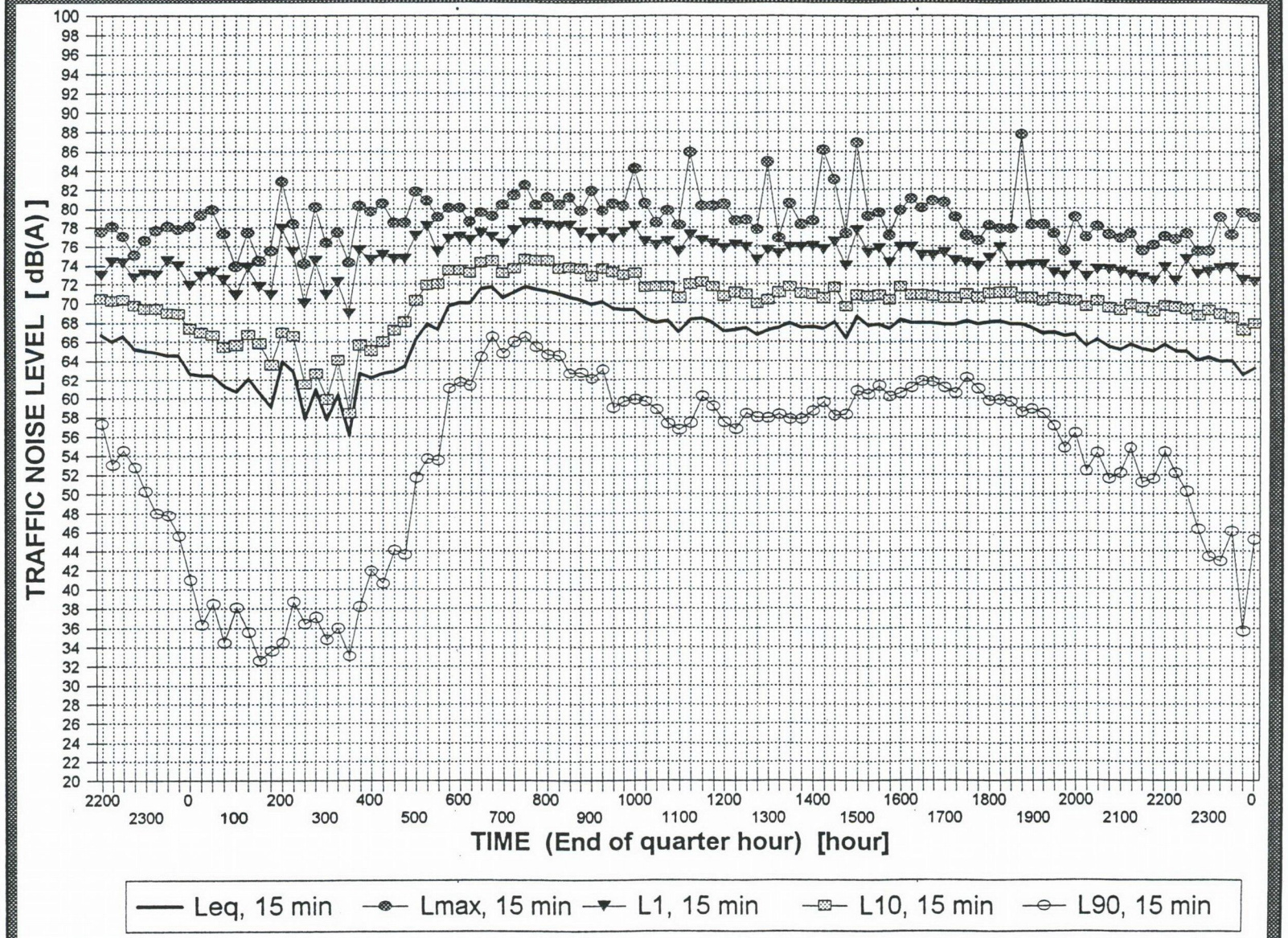
KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard

DAY 2

Thursday 31 August 2000

RT&A S/N 65



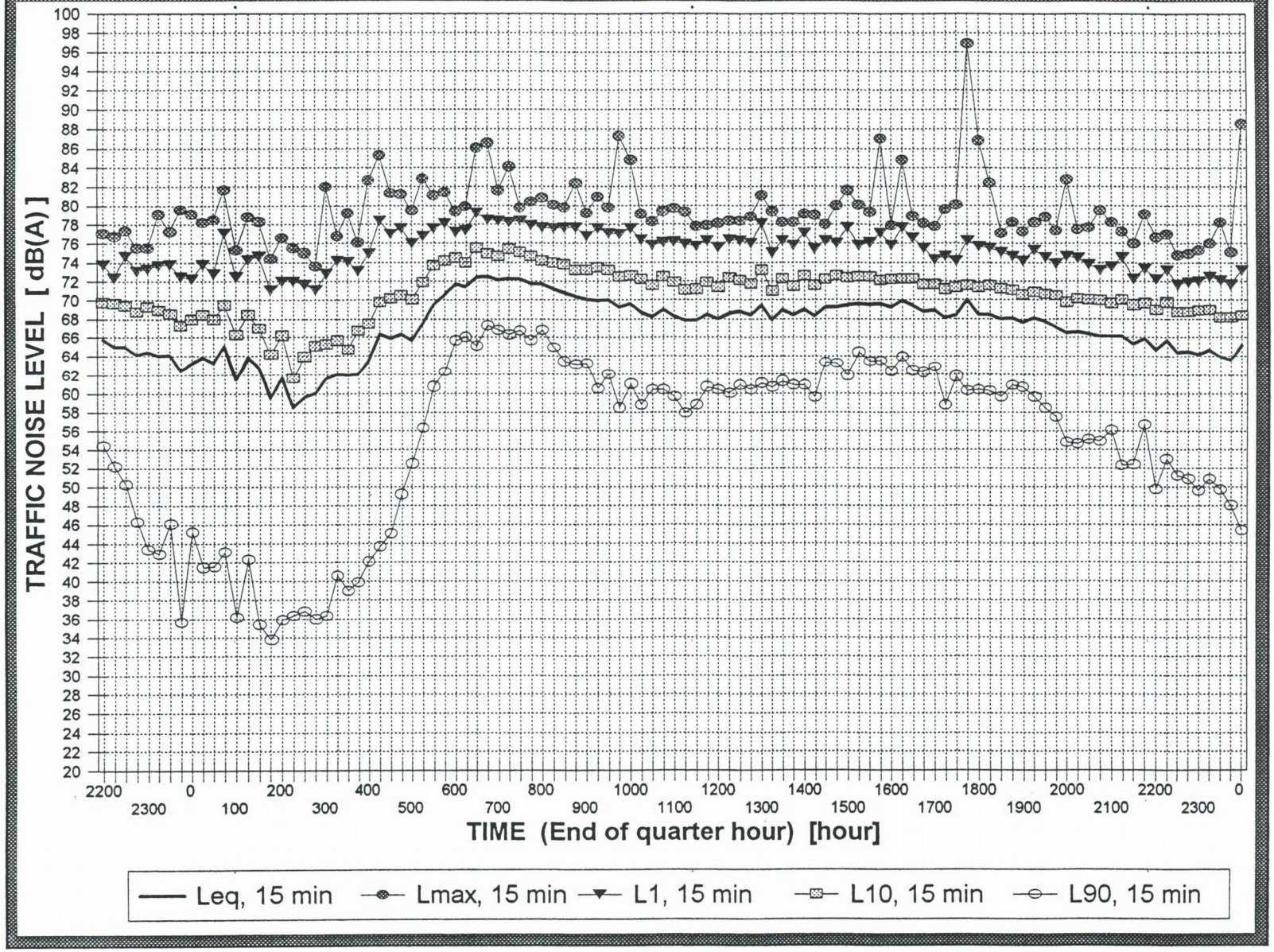
KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard

DAY 3

Friday 1 September 2000

RT&A S/N 65



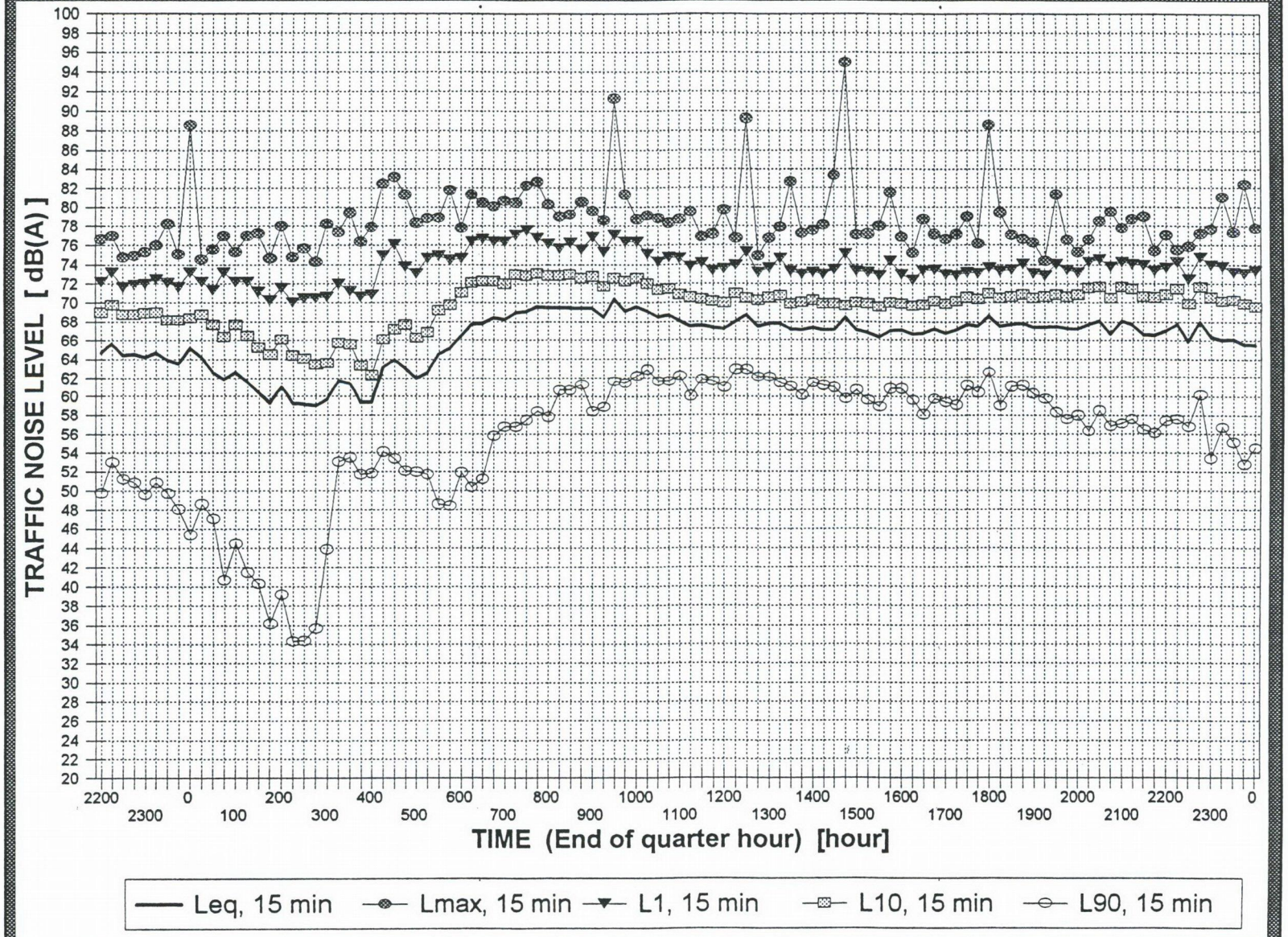
KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard

DAY 4

Saturday 2 September 2000

RT&A S/N 65



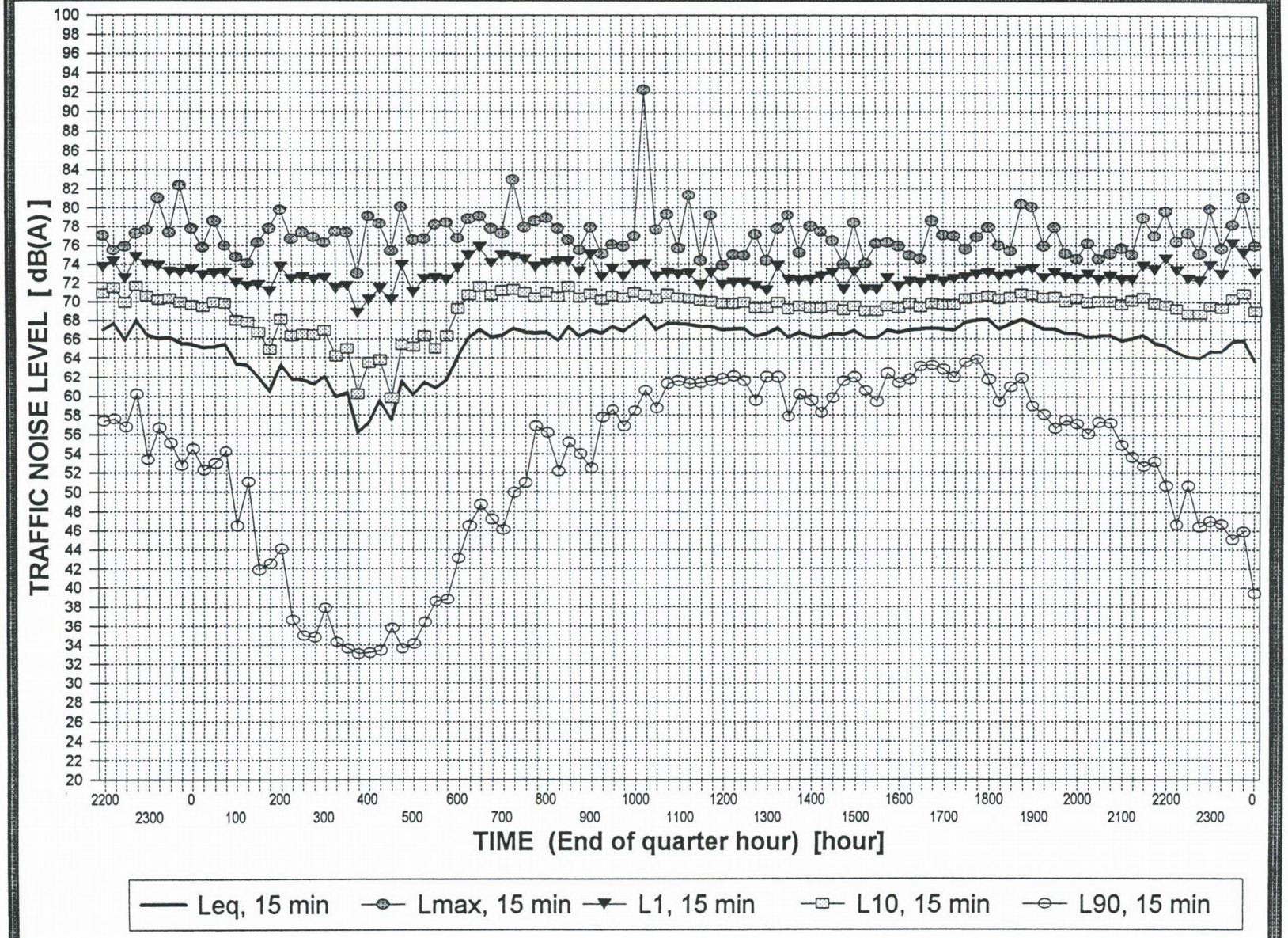
KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard

DAY 5

Sunday 3 September 2000

RT&A S/N 65



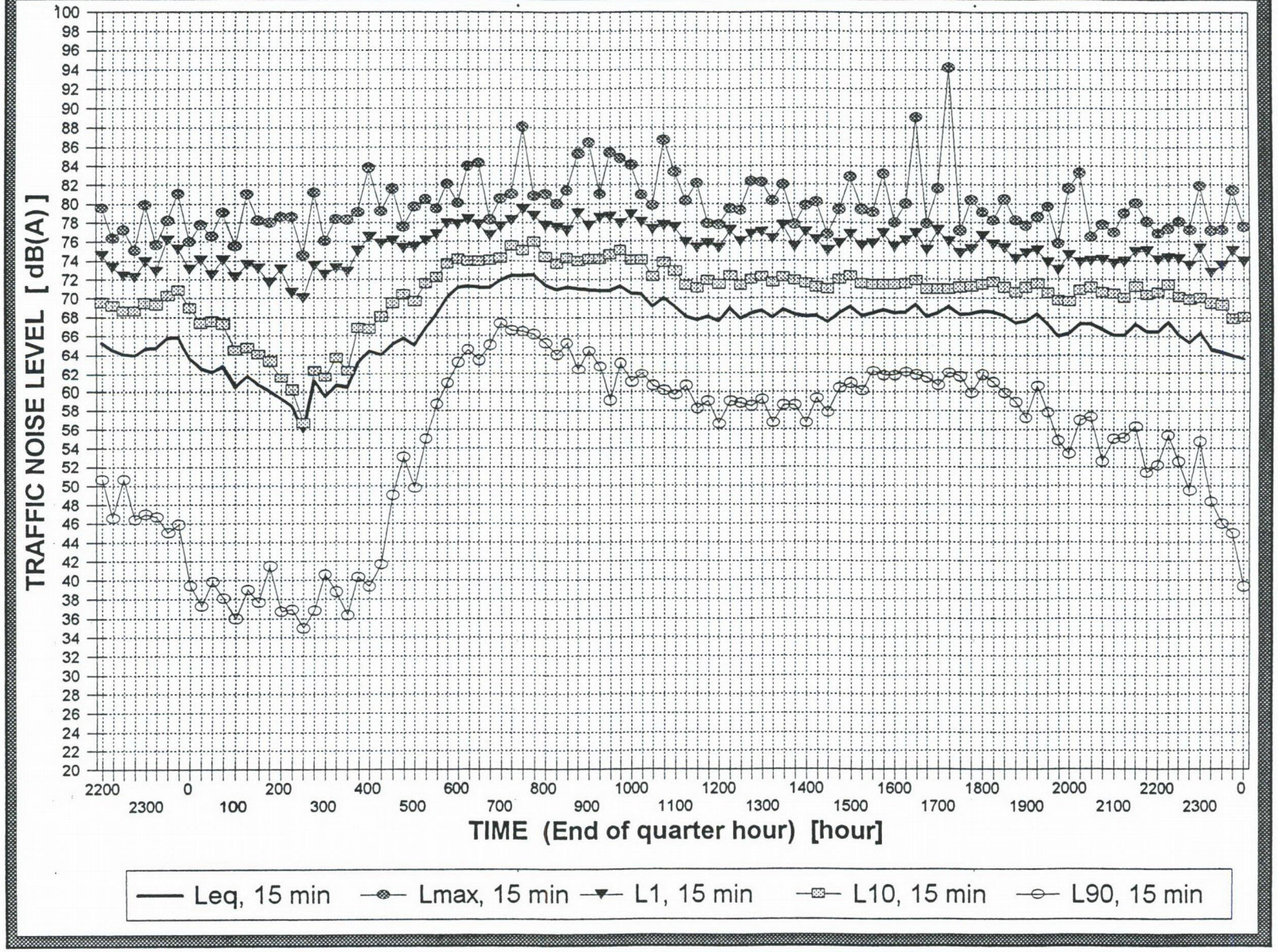
KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard

DAY 6

Monday 4 September 2000

RT&A S/N 65



KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard

DAY 7

Tuesday 5 September 2000

RT&A S/N 65



KOIKAS ACOUSTICS PTY LTD

472 Windsor Road, Vineyard										DAY 1	
Wednesday 30 August 2000									RT&A S/N 65		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	829	2215	64.6	76.0	72.8	70.8	69.4	59.8	48.6	38.0	11.4
2000	829	2230	65.0	77.1	73.2	71.2	69.9	60.3	46.8	38.5	12.1
2000	829	2245	64.0	78.7	72.9	70.2	68.8	58.3	44.1	33.5	14.7
2000	829	2300	64.5	76.8	73.4	71.0	69.6	58.1	47.2	38.1	12.3
2000	829	2315	63.2	78.0	71.8	69.6	68.2	57.9	46.2	38.0	14.8
2000	829	2330	65.3	79.3	76.0	71.4	69.3	60.5	48.3	36.1	14.0
2000	829	2345	64.9	79.8	75.9	71.3	69.3	55.7	46.2	39.7	14.9
2000	830	0	64.0	77.5	73.3	70.7	69.1	57.1	44.9	39.1	13.5
2000	830	15	65.4	81.7	76.6	72.0	69.9	57.5	45.9	40.7	16.3
2000	830	30	65.6	85.1	78.3	71.1	68.8	59.0	44.6	37.3	19.5
2000	830	45	62.5	78.6	73.4	69.5	67.0	50.5	37.6	34.5	16.1
2000	830	100	60.8	76.9	72.8	69.1	64.9	46.1	37.1	35.2	16.1
2000	830	115	62.2	79.8	73.4	69.4	66.5	53.3	38.0	31.9	17.6
2000	830	130	62.9	80.7	74.1	69.8	67.5	49.5	36.7	32.2	17.8
2000	830	145	62.0	80.4	74.4	68.7	65.8	48.1	36.4	34.0	18.4
2000	830	200	61.7	81.7	73.1	68.1	65.3	49.3	35.6	33.2	20.0
2000	830	215	59.1	77.8	70.8	66.0	62.6	46.3	36.1	34.5	18.7
2000	830	230	61.3	78.7	74.3	68.3	64.1	49.8	35.4	33.5	17.4
2000	830	245	64.4	84.5	77.4	70.5	67.4	50.1	33.7	31.8	20.1
2000	830	300	62.0	81.1	72.7	69.2	66.3	48.7	35.4	32.5	19.1
2000	830	315	63.2	81.6	75.7	69.5	66.6	53.6	36.3	32.7	18.4
2000	830	330	62.2	78.7	74.2	69.8	65.6	51.0	41.1	36.3	16.5
2000	830	345	62.7	79.4	76.1	69.6	64.8	47.5	35.4	33.1	16.7
2000	830	400	64.8	85.4	77.2	71.8	67.3	54.2	41.6	35.3	20.6
2000	830	415	63.9	81.5	76.3	70.6	67.3	55.6	43.1	36.2	17.6
2000	830	430	66.7	84.3	79.0	73.6	70.8	58.6	48.6	41.1	17.6
2000	830	445	64.9	78.3	75.5	72.1	69.7	58.4	45.1	37.6	13.4
2000	830	500	67.2	80.7	77.0	73.6	71.9	61.6	51.3	45.1	13.5
2000	830	515	68.1	81.7	78.3	74.4	72.6	63.0	55.2	46.8	13.6
2000	830	530	69.7	80.0	78.1	75.3	73.8	66.5	59.0	49.6	10.3
2000	830	545	71.3	80.8	79.2	76.5	74.7	69.7	63.0	56.5	9.5
2000	830	600	72.1	80.6	78.5	76.2	75.0	71.6	64.2	56.7	8.5
2000	830	615	72.1	80.6	78.4	76.2	74.9	71.5	65.2	58.5	8.5
2000	830	630	71.9	80.1	77.2	75.6	74.7	71.7	65.6	54.7	8.2
2000	830	645	72.7	82.0	78.7	76.3	75.3	72.4	66.2	60.7	9.3
2000	830	700	72.4	81.7	78.7	76.2	75.2	71.8	66.9	57.8	9.3
2000	830	715	73.1	82.8	79.4	77.5	76.1	72.3	67.2	62.5	9.7
2000	830	730	73.5	82.2	79.5	77.8	76.2	72.8	68.9	63.5	8.7
2000	830	745	73.4	83.4	80.0	77.6	76.2	72.6	68.5	62.0	10.0
2000	830	800	71.7	79.7	77.9	75.7	74.5	71.1	65.6	58.8	8.0
2000	830	815	72.8	82.7	78.6	77.1	75.8	72.0	67.6	61.9	9.9
2000	830	830	71.8	82.1	78.6	76.2	74.8	70.9	65.4	56.6	10.3
2000	830	845	70.7	79.7	77.8	75.1	73.7	69.9	63.6	58.5	9.0
2000	830	900	70.9	79.9	78.2	75.6	74.1	69.8	62.5	56.2	9.0
2000	830	915	70.7	82.4	78.3	75.7	74.3	69.2	59.8	52.2	11.7
2000	830	930	70.4	80.9	78.4	75.4	73.7	69.0	61.3	54.1	10.5
2000	830	945	69.9	81.0	77.7	75.2	73.7	68.4	60.0	50.7	11.1
2000	830	1000	70.1	80.3	78.0	75.7	74.1	68.3	60.1	52.7	10.2
2000	830	1015	69.4	82.2	77.8	74.8	73.0	67.6	59.0	50.3	12.8
2000	830	1030	68.6	79.7	76.8	74.1	72.4	66.6	57.9	49.2	11.1
2000	830	1045	68.6	80.3	76.5	74.2	72.4	66.7	59.1	49.1	11.7
2000	830	1100	69.0	83.4	77.9	74.5	72.4	66.8	58.8	50.0	14.4
2000	830	1115	69.7	90.3	78.6	74.8	73.2	67.0	58.4	47.6	20.6
2000	830	1130	68.8	80.3	76.6	74.3	72.7	67.0	58.6	49.8	11.5
2000	830	1145	68.5	78.3	76.7	74.6	72.6	66.2	58.0	46.8	9.8
2000	830	1200	67.6	77.4	75.3	73.1	71.4	65.7	58.5	49.2	9.8
2000	830	1215	68.5	79.2	77.0	74.5	72.3	66.2	58.4	47.2	10.7
2000	830	1230	67.3	77.7	75.5	73.1	71.1	65.2	56.1	47.4	10.4
2000	830	1245	68.6	80.3	77.0	74.2	72.6	66.2	59.4	52.2	11.7
2000	830	1300	67.5	78.5	75.1	73.1	71.5	65.6	56.9	48.2	11.0
2000	830	1315	67.6	79.3	76.0	73.3	71.1	65.4	58.7	49.1	11.7
2000	830	1330	67.4	78.4	75.1	72.6	70.8	65.6	57.7	51.3	11.0
2000	830	1345	67.8	81.0	75.8	73.5	71.6	65.8	58.5	50.7	13.2
2000	830	1400	68.1	80.5	76.5	73.7	71.7	65.8	58.4	47.6	12.4
2000	830	1415	68.2	81.4	77.0	73.6	71.5	66.1	58.0	50.6	13.2
2000	830	1430	68.5	79.7	76.4	73.9	72.5	66.6	59.1	53.1	11.2
2000	830	1445	68.5	82.0	77.3	73.9	71.9	66.4	59.0	49.7	13.5
2000	830	1500	68.1	85.9	76.7	73.4	71.5	66.2	57.5	46.5	17.8
2000	830	1515	68.1	79.1	75.8	73.4	71.5	66.4	60.5	49.5	11.0
2000	830	1530	68.0	78.3	75.9	73.5	71.4	66.4	60.6	51.2	10.3
2000	830	1545	68.2	86.8	76.1	73.1	71.2	66.4	59.5	51.9	18.6
2000	830	1600	67.3	76.0	74.4	72.2	70.2	66.1	60.3	48.7	8.7
2000	830	1615	68.1	78.6	75.6	73.1	71.5	66.6	60.6	51.9	10.5
2000	830	1630	67.0	77.2	74.9	71.9	70.1	65.8	59.2	52.1	10.2
2000	830	1645	67.7	83.3	75.2	71.8	70.2	66.3	60.2	52.5	15.6
2000	830	1700	69.3	84.2	79.2	73.8	71.8	67.4	60.3	49.0	14.9
2000	830	1715	68.4	79.3	75.4	72.5	71.2	67.5	62.7	52.6	10.9
2000	830	1730	68.2	77.4	75.1	72.3	71.1	67.4	62.2	53.1	9.2
2000	830	1745	67.6	75.0	73.2	71.4	70.6	67.0	60.6	53.2	7.4
2000	830	1800	67.2	78.5	72.6	71.0	70.2	66.4	61.1	55.1	11.3
2000	830	1815	67.2	75.6	73.5	71.0	70.2	66.7	59.4	51.9	8.4
2000	830	1830	67.7	78.5	73.9	71.6	70.6	67.0	60.7	55.9	10.8
2000	830	1845	68.2	81.4	76.9	72.3	71.1	66.8	59.5	54.7	13.2
2000	830	1900	69.0	81.0	75.9	73.3	71.9	67.9	62.2	56.8	12.0
2000	830	1915	69.2	81.4	76.3	73.1	72.0	68.4	62.1	55.9	12.2
2000	830	1930	68.7	82.8	75.9	72.7	71.6	67.9	60.9	50.2	14.1
2000	830	1945	68.0	79.3	75.8	72.4	71.4	66.6	57.5	48.1	11.3
2000	830	2000	68.2	80.7	76.0	72.7	71.6	66.6	59.7	49.8	12.5
2000	830	2015	67.4	78.2	74.2	72.2	71.2	65.5	57.6	48.7	10.8
2000	830	2030	68.0	79.5	75.1	72.5	71.5	66.6	56.9	48.6	11.5
2000	830	2045	67.1	78.4	73.4	71.8	70.8	65.8	57.8	43.7	11.3
2000	830	2100	68.3	79.1	76.8	73.0	71.9	66.2	58.9	48.0	10.8
2000	830	2115	66.8	76.0	72.8	71.4	70.5	65.6	58.7	50.1	9.2
2000	830	2130	67.2	82.0	76.6	71.8	70.4	65.0	54.0	44.2	14.8
2000	830	2145	67.2	80.8	76.2	72.2	70.8	64.8	54.1	42.6	13.6
2000	830	2200	66.7	77.6	73.0	71.4	70.5	65.1	57.3	50.9	10.9
2000	830	2215	66.0	78.1	74.4	71.5	70.3	63.1	53.1	44.8	12.1
2000	830	2230	66.6	77.1	74.3	71.5	70.4	64.8	54.5	46.0	10.5
2000	830	2245	65.3	75.1	72.7	71.0	69.8	62.6	52.8	45.1	9.8
2000	830	2300	65.1	76.7	73.1	71.0	69.4	61.8	50.3	38.3	11.6
2000	830	2315	64.9	77.7	73.0	70.9	69.4	61.5	48.0	35.6	12.8
2000	830	2330	64.6	78.1	74.5	70.9	69.0	59.5	47.8	42.1	13.5
2000	830	2345	64.6	77.8	74.0	70.8	68.9	59.9	45.6	40.3	13.2
2000	831	0	62.7	78.1	71.9	69.3	67.4	56.4	41.0	33.6	15.4

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	68.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	65.4	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	69.1	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	67.1	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	72.0	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.1	dB(A)

472 Windsor Road, Vineyard — DAY 2

Thursday 31 August 2000 — RT&A S/N 65

YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	830	2200	66.7	77.6	73.0	71.4	70.5	65.1	57.3	50.9	10.9
2000	830	2215	66.0	78.1	74.4	71.5	70.3	63.1	53.1	44.8	12.1
2000	830	2230	66.6	77.1	74.3	71.5	70.4	64.8	54.5	46.0	10.5
2000	830	2245	65.3	75.1	72.7	71.0	69.8	62.6	52.8	45.1	9.8
2000	830	2300	65.1	76.7	73.1	71.0	69.4	61.8	50.3	38.3	11.6
2000	830	2315	64.9	77.7	73.0	70.9	69.4	61.5	48.0	35.6	12.8
2000	830	2330	64.6	78.1	74.5	70.9	69.0	59.5	47.8	42.1	13.5
2000	830	2345	64.6	77.8	74.0	70.8	68.9	59.9	45.6	40.3	13.2
2000	831	0	62.7	78.1	71.9	69.3	67.4	56.4	41.0	33.6	15.4
2000	831	15	62.5	79.3	72.9	68.8	67.0	51.6	36.3	34.0	16.8
2000	831	30	62.5	79.9	73.3	69.2	66.7	52.5	38.5	32.8	17.4
2000	831	45	61.3	77.4	72.5	68.7	65.5	51.1	34.5	31.6	16.1
2000	831	100	60.6	73.9	70.9	68.0	65.7	51.6	38.1	32.4	13.3
2000	831	115	62.1	77.5	73.8	69.5	66.8	48.2	35.6	32.0	15.4
2000	831	130	60.5	74.5	71.8	68.8	65.9	40.7	32.6	30.8	14.0
2000	831	145	59.1	75.5	70.9	66.8	63.6	46.6	33.6	31.7	16.4
2000	831	200	63.9	82.9	77.9	70.0	67.0	47.9	34.5	32.0	19.0
2000	831	215	62.9	78.4	75.4	69.9	66.6	50.2	38.7	35.2	15.5
2000	831	230	57.8	74.2	70.0	65.9	61.5	45.1	36.4	31.6	16.4
2000	831	245	60.9	80.2	74.5	67.4	62.7	46.5	37.1	34.9	19.3
2000	831	300	57.7	76.4	70.9	64.4	59.9	43.3	34.8	32.7	18.7
2000	831	315	60.3	77.5	72.2	67.9	64.1	47.3	36.0	32.4	17.2
2000	831	330	56.1	74.3	68.9	63.1	58.4	43.2	33.1	31.3	18.2
2000	831	345	62.7	80.3	75.6	69.7	65.7	50.7	38.2	34.4	17.6
2000	831	400	62.2	79.7	74.6	68.8	65.1	50.5	41.9	37.0	17.5
2000	831	415	62.7	80.6	75.1	70.1	66.0	50.7	40.6	36.7	17.9
2000	831	430	62.9	78.5	74.7	70.4	67.2	54.6	44.1	37.6	15.6
2000	831	445	63.4	78.5	74.7	70.6	68.1	53.5	43.6	36.7	15.1
2000	831	500	66.2	81.8	77.1	72.6	70.3	60.1	51.7	41.2	15.6
2000	831	515	67.9	80.8	78.1	73.8	71.9	63.2	53.7	44.8	12.9
2000	831	530	67.3	79.1	75.4	73.3	72.0	63.5	53.5	47.9	11.8
2000	831	545	69.7	80.1	76.8	74.9	73.5	67.9	61.0	54.7	10.4
2000	831	600	70.1	80.1	77.0	74.9	73.5	69.0	61.7	51.0	10.0
2000	831	615	70.0	78.6	76.7	74.4	73.2	69.4	61.3	52.3	8.6
2000	831	630	71.5	79.6	77.4	75.6	74.3	70.9	64.4	54.6	8.1
2000	831	645	71.7	79.2	77.0	75.4	74.5	71.2	66.5	59.9	7.5
2000	831	700	70.6	80.4	76.3	74.4	73.2	70.2	64.8	57.2	9.8
2000	831	715	71.2	81.4	77.7	74.6	73.7	70.6	66.0	58.9	10.2
2000	831	730	71.8	82.5	78.5	76.0	74.7	70.9	66.5	60.0	10.7
2000	831	745	71.5	80.4	78.5	76.0	74.6	70.6	65.5	52.4	8.9
2000	831	800	71.3	81.2	78.2	76.1	74.6	70.3	64.7	55.8	9.9
2000	831	815	71.0	80.5	78.1	75.4	73.7	70.1	64.6	54.7	9.5
2000	831	830	70.7	81.2	78.2	75.2	73.8	69.6	62.7	54.0	10.5
2000	831	845	70.4	79.8	77.5	75.1	73.7	69.3	62.8	53.6	9.4
2000	831	900	69.9	81.9	76.9	74.2	72.9	69.0	62.1	52.6	12.0
2000	831	915	70.2	79.8	77.5	75.1	73.7	68.9	63.1	54.6	9.6
2000	831	930	69.5	80.6	76.9	75.1	73.3	67.7	59.0	51.8	11.1
2000	831	945	69.3	80.3	77.5	74.7	73.0	67.6	59.7	52.6	11.0
2000	831	1000	69.3	84.2	78.1	74.9	73.2	66.9	59.9	49.5	14.9
2000	831	1015	68.4	80.6	76.5	73.4	71.7	66.9	59.7	52.4	12.2
2000	831	1030	68.0	78.5	76.1	73.4	71.8	66.0	58.8	48.6	10.5
2000	831	1045	68.2	79.8	76.5	73.8	71.8	66.3	57.3	49.8	11.6
2000	831	1100	67.0	78.2	75.4	72.5	70.6	65.2	56.7	50.6	11.2
2000	831	1115	68.3	85.9	77.2	73.8	72.0	65.6	57.4	44.8	17.6
2000	831	1130	68.5	80.3	76.6	74.1	72.2	66.5	60.2	45.8	11.8
2000	831	1145	68.0	80.3	76.3	73.4	71.8	65.7	59.2	52.8	12.3
2000	831	1200	67.1	80.5	75.8	73.0	70.8	64.8	57.5	50.3	13.4
2000	831	1215	67.3	78.7	76.2	73.2	71.2	64.9	56.8	48.7	11.4
2000	831	1230	67.5	78.8	75.9	73.2	71.0	65.4	58.4	51.8	11.3
2000	831	1245	66.7	77.8	74.6	71.7	70.0	65.2	58.0	51.5	11.1
2000	831	1300	67.2	84.9	75.6	72.6	70.4	65.2	57.9	47.9	17.7
2000	831	1315	67.5	76.9	75.2	73.0	71.2	65.7	58.3	50.7	9.4
2000	831	1330	68.0	80.6	75.9	73.4	71.8	66.2	57.8	47.4	12.6
2000	831	1345	67.5	78.3	75.9	73.2	71.1	65.5	57.8	48.2	10.8
2000	831	1400	67.6	78.7	76.0	73.5	71.0	65.6	58.7	49.2	11.1
2000	831	1415	67.4	86.2	75.7	72.8	70.6	65.2	59.6	49.6	18.8
2000	831	1430	68.1	83.1	76.5	73.3	71.7	65.9	58.2	50.5	15.0
2000	831	1445	66.4	77.4	74.0	71.5	69.7	65.0	58.3	51.2	11.0
2000	831	1500	68.7	86.9	77.7	73.0	70.9	66.1	60.8	52.5	18.2
2000	831	1515	67.7	79.2	75.3	72.3	70.8	66.4	60.4	52.9	11.5
2000	831	1530	67.9	79.6	75.8	72.9	70.9	66.6	61.3	55.8	11.7
2000	831	1545	67.4	77.2	74.3	71.5	70.4	66.5	60.2	51.9	9.8
2000	831	1600	68.3	79.8	75.9	73.5	71.8	66.5	60.5	53.4	11.5
2000	831	1615	68.0	81.0	75.9	72.4	70.9	66.9	61.1	54.0	13.0
2000	831	1630	68.0	80.1	75.0	72.6	70.9	66.9	61.8	52.4	12.1
2000	831	1645	68.0	80.8	75.0	72.3	70.8	66.9	61.7	53.2	12.8
2000	831	1700	67.8	80.7	75.3	71.8	70.6	66.7	61.1	52.6	12.9
2000	831	1715	67.8	79.1	74.5	71.6	70.6	67.1	60.5	51.0	11.3
2000	831	1730	68.2	77.2	74.3	72.2	71.0	67.6	62.2	54.8	9.0
2000	831	1745	67.9	76.7	73.9	71.7	70.7	67.5	61.0	52.7	8.8
2000	831	1800	68.1	78.2	74.8	72.3	71.1	67.3	59.8	45.9	10.1
2000	831	1815	68.2	77.9	75.9	72.5	71.2	67.2	59.9	50.6	9.7
2000	831	1830	67.9	77.9	74.0	72.1	71.2	67.1	59.7	51.6	10.0
2000	831	1845	67.9	87.8	74.0	71.8	70.7	66.5	58.6	49.9	19.9
2000	831	1900	67.5	78.3	74.1	71.9	70.7	66.4	58.9	52.1	10.8
2000	831	1915	66.9	78.3	74.1	71.4	70.3	65.7	58.4	48.1	11.4
2000	831	1930	67.0	77.4	73.2	71.5	70.6	65.9	57.1	50.9	10.4
2000	831	1945	66.6	75.5	72.9	71.3	70.4	65.4	54.8	48.3	8.9
2000	831	2000	66.8	79.1	73.9	71.5	70.3	65.6	56.4	50.5	12.3
2000	831	2015	65.6	77.0	72.8	70.9	69.7	63.6	52.4	46.8	11.4
2000	831	2030	66.3	78.1	73.6	71.5	70.3	64.3	54.3	44.8	11.8
2000	831	2045	65.5	77.3	73.6	70.8	69.6	62.8	51.6	43.8	11.8
2000	831	2100	65.2	76.9	73.3	70.4	69.3	62.6	52.2	44.1	11.7
2000	831	2115	65.8	77.4	73.0	71.0	69.9	63.6	54.8	47.4	11.6
2000	831	2130	65.3	75.6	72.7	70.8	69.6	62.9	51.2	39.8	10.3
2000	831	2145	65.0	76.2	72.4	70.3	69.2	62.7	51.6	37.9	11.2
2000	831	2200	65.8	77.1	73.8	71.0	69.8	63.4	54.4	44.3	11.3
2000	831	2215	65.1	76.8	72.4	70.7	69.7	62.0	52.2	45.7	11.7
2000	831	2230	65.0	77.4	74.7	71.0	69.4	60.0	50.3	40.0	12.4
2000	831	2245	64.1	75.5	73.1	70.2	68.8	59.5	46.3	39.0	11.4
2000	831	2300	64.4	75.5	73.3	70.8	69.3	59.2	43.4	36.4	11.1
2000	831	2315	64.0	79.1	73.7	70.5	68.9	57.7	42.9	36.5	15.1
2000	831	2330	64.1	77.3	73.8	70.1	68.6	59.2	46.1	33.7	13.2
2000	831	2345	62.5	79.6	72.5	69.2	67.3	54.9	35.7	31.5	17.1

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	**Leq, 24 hours**	between 00:00 and 24:00 hours	**67.5**	dB(A)
Night Time	**Leq, 8 hours**	between 22:00 and 06:00 hours	**64.0**	dB(A)
Daytime	**Leq, 15 hours**	between 07:00 and 22:00 hours	**68.4**	dB(A)
Night Time	**Leq, 9 hours**	between 22:00 and 07:00 hours	**65.6**	dB(A)
Daytime	**L10, 18 hours**	between 06:00 and 24:00 hours	**71.3**	dB(A)
Daytime	**minimum L90, 15 min**	between 07:00 and 18:00 hours	**56.7**	dB(A)

472 Windsor Road, Vineyard											DAY 3
Friday 1 September 2000										RT&A S/N 65	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	831	2215	65.1	76.8	72.4	70.7	69.7	62.0	52.2	45.7	11.7
2000	831	2230	65.0	77.4	74.7	71.0	69.4	60.0	50.3	40.0	12.4
2000	831	2245	64.1	75.5	73.1	70.2	68.8	59.5	46.3	39.0	11.4
2000	831	2300	64.4	75.5	73.3	70.8	69.3	59.2	43.4	36.4	11.1
2000	831	2315	64.0	79.1	73.7	70.5	68.9	57.7	42.9	36.5	15.1
2000	831	2330	64.1	77.3	73.8	70.1	68.6	59.2	46.1	33.7	13.2
2000	831	2345	62.5	79.6	72.5	69.2	67.3	54.9	35.7	31.5	17.1
2000	901	0	63.2	79.1	72.3	69.6	68.0	57.5	45.2	36.1	15.9
2000	901	15	63.8	78.2	73.8	70.5	68.5	57.2	41.5	33.7	14.4
2000	901	30	63.2	78.5	72.8	69.9	68.0	57.3	41.6	33.9	15.3
2000	901	45	65.1	81.7	77.1	71.7	69.5	55.5	43.1	32.1	16.6
2000	901	100	61.4	75.3	72.5	69.1	66.3	52.6	36.2	33.3	13.9
2000	901	115	63.8	78.8	74.3	71.0	68.5	55.5	42.3	34.2	15.0
2000	901	130	62.8	78.3	74.7	70.0	67.0	48.9	35.4	32.8	15.5
2000	901	145	59.5	74.4	71.1	67.5	64.2	44.9	33.8	32.2	14.9
2000	901	200	61.6	76.6	72.0	68.8	66.2	53.2	35.9	32.2	15.0
2000	901	215	58.5	75.5	72.0	65.3	61.6	46.3	36.3	33.0	17.0
2000	901	230	59.6	75.0	71.7	67.6	63.9	45.2	36.8	34.0	15.4
2000	901	245	60.0	73.6	71.1	67.5	65.1	49.7	36.0	32.0	13.6
2000	901	300	61.5	82.0	72.8	68.4	65.3	49.1	36.3	32.8	20.5
2000	901	315	62.0	76.8	74.2	69.3	65.7	52.8	40.6	33.7	14.8
2000	901	330	61.9	79.2	74.1	68.7	64.7	50.2	39.0	33.6	17.3
2000	901	345	62.0	76.1	73.1	69.6	66.7	53.9	39.9	34.0	14.1
2000	901	400	63.5	82.7	74.9	69.6	67.5	55.5	42.1	36.3	19.2
2000	901	415	66.3	85.3	78.4	73.0	69.8	58.4	43.7	37.2	19.0
2000	901	430	65.9	81.3	77.0	72.9	70.2	59.1	45.1	38.0	15.4
2000	901	445	66.3	81.2	77.6	72.7	70.5	59.5	49.2	43.6	14.9
2000	901	500	65.7	79.5	76.0	72.3	70.1	60.6	52.5	44.5	13.8
2000	901	515	67.5	82.9	76.8	73.4	71.9	63.4	56.3	47.8	15.4
2000	901	530	69.5	81.1	77.6	75.2	73.7	66.4	60.7	51.4	11.6
2000	901	545	70.6	81.4	78.1	76.0	74.2	68.8	62.3	55.9	10.8
2000	901	600	71.7	79.4	77.2	75.5	74.5	71.1	65.7	61.8	7.7
2000	901	615	71.4	79.9	77.4	74.7	74.0	71.1	66.0	60.2	8.5
2000	901	630	72.4	86.1	79.2	76.9	75.5	71.3	65.1	58.9	13.7
2000	901	645	72.5	86.6	78.5	76.0	74.9	71.9	67.3	61.8	14.1
2000	901	700	72.1	81.6	78.4	75.9	74.7	71.6	66.8	61.0	9.5
2000	901	715	72.3	84.1	78.2	76.7	75.4	71.3	66.3	60.4	11.8
2000	901	730	72.2	79.8	78.4	76.4	75.1	71.5	66.7	60.4	7.6
2000	901	745	71.8	80.4	77.9	76.0	74.7	71.2	65.7	59.5	8.6
2000	901	800	71.7	80.8	77.7	75.2	74.2	71.3	66.8	62.6	9.1
2000	901	815	71.2	80.1	77.6	75.2	74.0	70.7	64.9	58.9	8.9
2000	901	830	70.8	79.8	77.7	75.1	73.8	70.0	63.4	54.9	9.0
2000	901	845	70.4	82.4	77.7	74.4	73.2	69.6	63.1	55.5	12.0
2000	901	900	70.1	79.2	76.8	75.1	73.2	69.1	63.2	53.7	9.1
2000	901	915	69.9	80.9	77.6	75.2	73.5	68.3	60.5	51.5	11.0
2000	901	930	70.0	79.8	77.1	74.9	73.2	68.9	62.0	49.7	9.8
2000	901	945	69.2	87.3	77.0	74.3	72.5	67.3	58.5	50.5	18.1
2000	901	1000	69.6	84.8	77.6	74.8	72.6	67.9	61.0	52.3	15.2
2000	901	1015	68.7	79.1	76.4	74.0	72.2	67.1	58.8	51.3	10.4
2000	901	1030	68.2	78.3	75.8	73.0	71.6	66.6	60.4	52.5	10.1
2000	901	1045	68.9	79.4	76.1	73.8	72.5	67.3	60.4	52.4	10.5
2000	901	1100	68.3	79.7	76.2	73.4	71.9	66.6	59.7	54.0	11.4
2000	901	1115	67.8	79.3	75.9	73.3	71.1	66.2	57.9	51.3	11.5
2000	901	1130	67.8	77.8	75.7	73.0	71.2	66.3	58.8	48.9	10.0
2000	901	1145	68.5	77.9	76.3	73.9	71.9	67.0	60.7	52.4	9.4
2000	901	1200	68.0	78.1	75.6	73.0	71.4	66.7	60.4	52.9	10.1
2000	901	1215	68.6	78.4	76.4	74.1	72.4	67.0	60.0	52.7	9.8
2000	901	1230	68.8	78.4	76.3	74.2	72.1	67.5	60.9	53.1	9.6
2000	901	1245	68.4	78.8	76.0	73.8	71.8	67.1	60.4	53.1	10.4
2000	901	1300	69.4	81.1	78.1	74.8	73.2	67.3	61.1	52.5	11.7
2000	901	1315	67.9	79.4	75.0	72.4	71.0	66.8	60.7	53.0	11.5
2000	901	1330	68.9	78.2	76.3	74.0	72.3	67.5	61.3	53.6	9.3
2000	901	1345	68.4	78.2	75.8	73.5	71.5	67.2	60.9	51.8	9.8
2000	901	1400	69.0	79.1	77.1	74.2	72.6	67.5	60.9	52.9	10.1
2000	901	1415	68.3	79.0	75.4	72.7	71.6	67.3	59.6	52.0	10.7
2000	901	1430	69.2	78.0	76.3	73.9	72.2	68.1	63.3	54.3	8.8
2000	901	1445	69.2	80.0	76.0	73.9	72.6	68.0	63.2	50.8	10.8
2000	901	1500	69.4	81.6	77.7	73.9	72.4	67.8	61.9	51.6	12.2
2000	901	1515	69.6	80.1	75.8	73.6	72.5	68.9	64.4	55.6	10.5
2000	901	1530	69.5	79.3	76.1	73.9	72.5	68.5	63.4	53.3	9.8
2000	901	1545	69.6	87.0	77.1	73.8	72.1	68.4	63.5	54.1	17.4
2000	901	1600	69.2	77.9	75.8	73.8	72.2	68.5	62.3	54.5	8.7
2000	901	1615	69.9	84.8	77.7	74.3	72.3	68.6	63.9	55.8	14.9
2000	901	1630	69.4	78.9	76.6	73.7	72.3	68.5	62.4	52.5	9.5
2000	901	1645	68.8	78.1	75.5	72.9	71.7	68.0	62.2	52.5	9.3
2000	901	1700	68.9	77.8	74.3	72.6	71.7	68.5	62.8	53.4	8.9
2000	901	1715	68.1	79.6	74.7	72.2	71.2	67.3	58.8	49.7	11.5
2000	901	1730	68.4	80.1	74.2	72.2	71.4	67.8	61.8	55.2	11.7
2000	901	1745	70.0	96.9	76.3	72.8	71.6	67.9	60.3	48.6	26.9
2000	901	1800	68.5	86.8	75.7	72.5	71.4	67.5	60.4	52.9	18.3
2000	901	1815	68.5	82.4	75.5	72.8	71.6	67.4	60.3	48.6	13.9
2000	901	1830	68.0	77.1	75.1	72.5	71.3	67.1	59.7	53.0	9.1
2000	901	1845	68.1	78.2	74.7	72.2	71.1	67.4	60.9	51.2	10.1
2000	901	1900	67.6	77.3	74.2	71.5	70.6	66.9	60.7	50.0	9.7
2000	901	1915	68.1	78.2	75.3	72.1	70.9	67.5	59.7	51.6	10.1
2000	901	1930	67.7	78.8	74.6	71.8	70.7	66.9	58.5	47.9	11.1
2000	901	1945	67.1	77.4	73.9	71.5	70.5	66.1	57.5	49.2	10.3
2000	901	2000	66.5	82.8	74.7	70.9	69.8	64.9	54.8	46.5	16.3
2000	901	2015	66.6	77.5	74.5	71.3	70.2	65.3	54.6	47.1	10.9
2000	901	2030	66.4	77.7	73.8	71.2	70.1	64.9	55.1	47.2	11.3
2000	901	2045	66.1	79.5	73.2	71.0	70.0	64.4	54.9	48.6	13.4
2000	901	2100	66.1	78.2	73.6	71.0	69.7	64.2	56.1	48.2	12.1
2000	901	2115	66.1	77.3	74.6	71.4	70.1	63.7	52.3	45.0	11.2
2000	901	2130	65.3	76.0	72.3	70.4	69.5	63.1	52.4	44.3	10.7
2000	901	2145	65.9	79.1	73.4	70.8	69.7	63.9	56.7	51.6	13.2
2000	901	2200	64.7	76.7	72.2	70.3	69.0	61.6	49.8	43.2	12.0
2000	901	2215	65.7	77.0	73.2	71.1	69.8	63.3	53.0	45.2	11.3
2000	901	2230	64.4	74.8	71.7	69.8	68.8	61.5	51.2	44.2	10.4
2000	901	2245	64.5	74.9	71.9	70.1	68.8	61.9	50.9	44.1	10.4
2000	901	2300	64.2	75.3	72.0	70.0	68.9	60.5	49.6	41.7	11.1
2000	901	2315	64.7	76.0	72.5	70.2	69.0	62.2	50.9	43.1	11.3
2000	901	2330	63.9	78.2	72.1	69.6	68.2	60.2	49.7	43.1	14.3
2000	901	2345	63.5	75.1	71.7	69.6	68.2	59.3	48.1	38.2	11.6
2000	902	0	65.2	88.6	73.2	69.8	68.4	58.4	45.4	36.5	23.4

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	68.3	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	65.0	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.9	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	66.7	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.7	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.9	dB(A)

472 Windsor Road, Vineyard											DAY 4
Saturday 2 September 2000										RT&A S/N 65	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	901	2215	65.7	77.0	73.2	71.1	69.8	63.3	53.0	45.2	11.3
2000	901	2230	64.4	74.8	71.7	69.8	68.8	61.5	51.2	44.2	10.4
2000	901	2245	64.5	74.9	71.9	70.1	68.8	61.9	50.9	44.1	10.4
2000	901	2300	64.2	75.3	72.0	70.0	68.9	60.5	49.6	41.7	11.1
2000	901	2315	64.7	76.0	72.5	70.2	69.0	62.2	50.9	43.1	11.3
2000	901	2330	63.9	78.2	72.1	69.6	68.2	60.2	49.7	43.1	14.3
2000	901	2345	63.5	75.1	71.7	69.6	68.2	59.3	48.1	38.2	11.6
2000	902	0	65.2	88.6	73.2	69.8	68.4	58.4	45.4	36.5	23.4
2000	902	15	64.2	74.6	72.2	70.1	68.8	60.5	48.6	41.2	10.4
2000	902	30	62.6	75.6	71.4	69.2	67.7	57.3	47.1	39.3	13.0
2000	902	45	61.9	77.0	73.2	68.9	66.4	52.9	40.7	33.9	15.1
2000	902	100	62.6	75.3	72.2	69.5	67.7	55.5	44.5	37.5	12.7
2000	902	115	61.6	77.0	72.2	68.6	66.5	52.8	41.5	33.5	15.4
2000	902	130	60.4	77.3	71.2	67.5	65.3	50.5	40.3	35.0	16.9
2000	902	145	59.3	74.7	70.3	67.1	64.5	48.0	38.2	31.0	15.4
2000	902	200	61.0	78.0	71.6	68.6	66.1	51.1	39.2	33.5	17.0
2000	902	215	59.3	74.8	70.1	67.1	64.4	48.2	34.3	30.6	15.5
2000	902	230	59.2	75.7	70.5	66.9	64.1	48.2	34.4	31.0	16.5
2000	902	245	59.0	74.3	70.5	66.3	63.4	49.0	35.7	32.4	15.3
2000	902	300	59.7	78.2	70.7	66.6	63.6	54.5	43.9	36.3	18.5
2000	902	315	61.7	77.4	72.0	68.2	65.8	56.8	53.1	49.3	15.7
2000	902	330	61.4	79.4	71.3	67.9	65.6	56.3	53.5	50.3	18.0
2000	902	345	59.4	76.4	70.7	66.7	63.3	53.7	51.7	47.8	17.0
2000	902	400	59.4	77.9	70.9	66.2	62.3	53.9	51.8	47.2	18.5
2000	902	415	63.1	82.5	74.9	69.5	66.1	56.2	54.1	51.5	19.4
2000	902	430	63.9	83.2	76.1	70.4	67.2	55.8	53.4	50.8	19.3
2000	902	445	63.0	81.3	73.8	70.1	67.7	55.2	52.1	47.9	18.3
2000	902	500	62.0	78.3	73.1	69.1	66.3	54.5	52.0	49.1	16.3
2000	902	515	62.6	78.8	74.7	69.8	66.9	53.9	51.7	48.6	16.2
2000	902	530	64.5	78.9	74.9	71.5	69.2	55.5	48.6	42.8	14.4
2000	902	545	65.2	81.8	74.5	72.1	69.8	58.2	48.4	41.6	16.6
2000	902	600	66.5	77.8	74.7	72.7	71.1	62.4	51.9	45.8	11.3
2000	902	615	67.7	81.3	76.4	73.7	72.1	63.3	50.4	40.8	13.6
2000	902	630	67.8	80.5	76.7	73.7	72.3	63.7	51.2	37.3	12.7
2000	902	645	68.4	80.1	76.4	73.7	72.3	66.2	55.8	46.1	11.7
2000	902	700	68.2	80.7	76.4	73.3	72.0	66.0	56.8	47.4	12.5
2000	902	715	68.9	80.5	77.1	74.5	73.0	66.4	56.8	49.9	11.6
2000	902	730	69.1	82.3	77.6	74.5	72.9	66.9	57.5	50.0	13.2
2000	902	745	69.6	82.7	76.8	74.3	73.1	67.9	58.4	52.1	13.1
2000	902	800	69.5	80.3	76.2	74.0	72.9	68.5	57.8	48.8	10.8
2000	902	815	69.5	79.0	75.7	73.7	72.9	68.7	60.6	50.3	9.5
2000	902	830	69.5	79.2	76.3	74.0	73.0	68.5	60.6	52.4	9.7
2000	902	845	69.4	80.6	75.6	73.6	72.6	68.6	61.2	50.3	11.2
2000	902	900	69.4	79.6	76.9	74.2	72.8	68.2	58.4	50.3	10.2
2000	902	915	68.5	78.6	75.3	73.0	71.8	67.6	58.9	49.7	10.1
2000	902	930	70.4	91.3	77.1	74.1	72.6	68.5	61.6	51.3	20.9
2000	902	945	69.1	81.3	76.4	73.7	72.3	67.9	61.4	53.8	12.2
2000	902	1000	69.6	78.7	76.4	73.9	72.6	68.7	62.2	50.0	9.1
2000	902	1015	69.1	79.1	75.1	72.9	72.0	68.5	62.9	56.0	10.0
2000	902	1030	68.5	78.8	74.3	72.3	71.4	68.0	61.6	51.8	10.3
2000	902	1045	68.7	78.3	74.8	72.6	71.5	68.3	61.6	52.6	9.6
2000	902	1100	68.1	78.7	74.7	72.0	70.9	67.4	62.2	55.5	10.6
2000	902	1115	67.5	79.5	73.8	71.6	70.6	66.8	60.0	50.8	12.0
2000	902	1130	67.6	76.9	74.2	71.4	70.4	66.9	61.8	53.7	9.3
2000	902	1145	67.4	77.2	73.4	71.1	70.2	66.8	61.6	54.2	9.8
2000	902	1200	67.2	79.7	73.6	71.0	70.0	66.6	60.9	51.4	12.5
2000	902	1215	68.0	76.8	74.0	72.1	71.0	67.3	62.9	57.3	8.8
2000	902	1230	68.7	89.3	75.3	71.6	70.5	67.1	62.9	58.7	20.6
2000	902	1245	67.5	74.9	73.2	71.2	70.3	67.0	62.1	56.3	7.4
2000	902	1300	67.8	76.8	73.7	71.8	70.6	67.0	62.1	56.4	9.0
2000	902	1315	67.8	77.9	74.7	72.2	70.8	66.8	61.4	56.3	10.1
2000	902	1330	67.2	82.7	73.3	71.0	69.9	66.3	61.0	55.5	15.5
2000	902	1345	67.1	77.3	73.0	71.0	70.1	66.5	60.1	52.9	10.2
2000	902	1400	67.4	77.6	73.2	71.2	70.3	66.8	61.4	53.5	10.2
2000	902	1415	67.1	78.1	73.0	70.9	69.9	66.3	61.1	55.4	11.0
2000	902	1430	67.1	83.4	73.5	70.9	69.9	66.1	60.9	55.8	16.3
2000	902	1445	68.4	95.0	75.1	71.1	69.7	66.1	59.8	52.3	26.6
2000	902	1500	67.1	77.1	73.3	70.9	70.0	66.4	60.6	53.2	10.0
2000	902	1515	66.8	77.2	73.2	70.9	69.9	65.8	59.6	53.5	10.4
2000	902	1530	66.3	78.0	72.9	70.7	69.6	65.5	58.9	52.3	11.7
2000	902	1545	67.0	81.5	74.4	71.1	70.0	66.0	60.8	51.8	14.5
2000	902	1600	67.1	76.9	73.0	70.8	69.9	66.5	60.8	54.5	9.8
2000	902	1615	66.6	75.2	72.4	70.7	69.7	66.0	59.6	51.6	8.6
2000	902	1630	66.7	78.7	73.4	70.7	69.8	65.9	58.1	50.4	12.0
2000	902	1645	67.2	77.2	73.5	71.3	70.2	66.4	59.8	54.1	10.0
2000	902	1700	66.7	76.7	73.0	70.8	69.9	65.9	59.4	50.8	10.0
2000	902	1715	67.1	77.2	72.9	71.1	70.2	66.6	59.1	51.4	10.1
2000	902	1730	67.7	79.0	73.2	71.5	70.6	67.1	61.1	52.8	11.3
2000	902	1745	67.5	76.2	73.1	71.3	70.4	67.0	60.4	54.9	8.7
2000	902	1800	68.6	88.6	73.7	71.9	71.0	67.7	62.6	52.2	20.0
2000	902	1815	67.5	79.4	73.3	71.3	70.5	67.0	59.0	52.1	11.9
2000	902	1830	67.7	77.1	73.5	71.5	70.7	67.1	61.0	53.7	9.4
2000	902	1845	67.8	76.7	74.1	71.9	70.9	67.0	61.1	54.3	8.9
2000	902	1900	67.4	76.3	73.1	71.4	70.5	66.8	60.3	52.9	8.9
2000	902	1915	67.4	74.4	72.9	71.5	70.7	66.7	59.8	53.2	7.0
2000	902	1930	67.5	81.3	74.1	72.0	70.9	66.3	58.3	51.0	13.8
2000	902	1945	67.3	76.6	73.5	71.7	70.7	66.4	57.6	50.2	9.3
2000	902	2000	67.2	75.3	73.2	71.8	70.9	66.0	58.0	49.6	8.1
2000	902	2015	67.7	76.6	74.3	72.8	71.6	66.0	56.3	45.0	8.9
2000	902	2030	68.1	78.5	74.6	72.8	71.7	66.8	58.5	43.4	10.4
2000	902	2045	66.6	79.5	73.8	71.8	70.5	64.6	56.9	48.8	12.9
2000	902	2100	68.1	77.8	74.3	72.5	71.7	67.0	57.1	48.8	9.7
2000	902	2115	67.7	78.7	74.1	72.5	71.5	66.2	57.6	51.3	11.0
2000	902	2130	66.6	79.0	74.0	72.0	70.7	64.1	56.5	48.1	12.4
2000	902	2145	66.5	75.4	73.4	71.6	70.6	64.6	56.1	41.7	8.9
2000	902	2200	67.0	77.1	73.7	72.1	70.9	65.0	57.4	51.5	10.1
2000	902	2215	67.7	75.5	74.3	72.8	71.5	66.1	57.6	49.7	7.8
2000	902	2230	65.9	75.9	72.5	70.8	69.9	63.5	56.8	47.2	10.0
2000	902	2245	68.0	77.3	74.8	72.8	71.7	66.5	60.2	51.1	9.3
2000	902	2300	66.4	77.7	74.0	71.8	70.6	63.6	53.4	47.1	11.3
2000	902	2315	66.0	81.0	73.8	71.5	70.2	63.0	56.7	47.4	15.0
2000	902	2330	66.1	77.4	73.2	71.4	70.3	63.5	55.1	49.3	11.3
2000	902	2345	65.6	82.4	73.1	71.2	69.9	62.3	52.8	45.9	16.8
2000	903	0	65.5	77.8	73.4	71.0	69.6	62.8	54.5	47.2	12.3

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	**Leq, 24 hours**	between 00:00 and 24:00 hours	**67.0**	dB(A)
Night Time	**Leq, 8 hours**	between 22:00 and 06:00 hours	**62.9**	dB(A)
Daytime	**Leq, 15 hours**	between 07:00 and 22:00 hours	**68.0**	dB(A)
Night Time	**Leq, 9 hours**	between 22:00 and 07:00 hours	**63.9**	dB(A)
Daytime	**L10, 18 hours**	between 06:00 and 24:00 hours	**71.0**	dB(A)
Daytime	**minimum L90, 15 min**	between 07:00 and 18:00 hours	**56.8**	dB(A)

472 Windsor Road, Vineyard									DAY 5		
Sunday 3 September 2000									RT&A S/N 65		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	902	2215	67.7	75.5	74.3	72.8	71.5	66.1	57.6	49.7	7.8
2000	902	2230	65.9	75.9	72.5	70.8	69.9	63.5	56.8	47.2	10.0
2000	902	2245	68.0	77.3	74.8	72.8	71.7	66.5	60.2	51.1	9.3
2000	902	2300	66.4	77.7	74.0	71.8	70.6	63.6	53.4	47.1	11.3
2000	902	2315	66.0	81.0	73.8	71.5	70.2	63.0	56.7	47.4	15.0
2000	902	2330	66.1	77.4	73.2	71.4	70.3	63.5	55.1	49.3	11.3
2000	902	2345	65.6	82.4	73.1	71.2	69.9	62.3	52.8	45.9	16.8
2000	903	0	65.5	77.8	73.4	71.0	69.6	62.8	54.5	47.2	12.3
2000	903	15	65.1	75.8	72.8	70.7	69.4	62.0	52.3	41.9	10.7
2000	903	30	65.2	78.6	73.0	71.2	69.9	62.5	53.0	42.6	13.4
2000	903	45	65.5	76.0	73.1	71.0	69.8	62.6	54.2	45.1	10.5
2000	903	100	63.4	74.8	72.0	69.8	68.0	59.6	46.5	35.7	11.4
2000	903	115	63.2	74.1	71.7	69.4	67.8	59.2	51.1	45.8	10.9
2000	903	130	61.9	76.3	71.8	68.7	66.7	56.7	41.9	34.8	14.4
2000	903	145	60.5	77.8	71.1	68.0	64.9	54.0	42.5	34.0	17.3
2000	903	200	63.3	79.8	73.7	70.2	68.1	56.0	44.1	36.1	16.5
2000	903	215	61.7	76.7	72.4	68.9	66.3	54.5	36.6	33.6	15.0
2000	903	230	61.6	77.4	72.6	69.1	66.5	50.2	35.0	32.8	15.8
2000	903	245	61.2	76.9	72.3	69.0	66.4	44.9	34.8	32.7	15.7
2000	903	300	62.0	76.3	72.5	69.1	66.9	53.4	37.9	33.3	14.3
2000	903	315	59.9	77.5	71.4	67.4	64.2	45.5	34.3	31.7	17.6
2000	903	330	60.3	77.4	71.7	68.1	65.0	44.5	33.6	31.4	17.1
2000	903	345	56.2	73.0	68.8	64.3	60.2	37.1	33.1	31.3	16.8
2000	903	400	57.2	79.1	70.2	67.8	63.5	41.0	33.2	31.2	21.9
2000	903	415	59.5	78.3	71.4	67.2	63.8	45.8	33.4	31.4	18.8
2000	903	430	57.5	75.4	70.2	65.7	59.8	43.1	35.8	33.0	17.9
2000	903	445	61.5	80.1	73.9	69.0	65.4	43.6	33.6	31.6	18.6
2000	903	500	60.1	76.6	71.0	67.6	65.2	47.6	34.1	31.3	16.5
2000	903	515	61.4	76.7	72.4	69.0	66.3	48.6	36.4	32.0	15.3
2000	903	530	60.8	78.2	72.5	68.8	65.0	48.2	38.6	32.6	17.4
2000	903	545	61.6	78.4	72.3	69.1	66.3	50.9	38.8	33.2	16.8
2000	903	600	64.2	76.8	73.6	71.3	69.2	57.8	43.1	34.4	12.6
2000	903	615	66.1	78.8	74.9	72.1	70.7	62.0	46.5	37.1	12.7
2000	903	630	67.0	79.1	75.8	73.2	71.6	63.6	48.7	38.6	12.1
2000	903	645	66.2	77.8	74.1	72.2	70.7	63.2	47.2	38.5	11.6
2000	903	700	66.4	77.3	74.9	72.5	71.2	62.5	46.1	39.0	10.9
2000	903	715	67.1	83.0	74.8	72.8	71.3	64.8	50.0	38.4	15.9
2000	903	730	66.7	77.9	74.5	72.4	71.0	63.7	51.0	41.5	11.2
2000	903	745	66.6	78.6	73.7	71.7	70.4	64.5	56.9	48.0	12.0
2000	903	800	66.7	78.9	74.1	72.2	71.0	63.8	56.2	48.0	12.2
2000	903	815	65.9	77.8	74.3	71.8	70.5	61.9	52.2	44.0	11.9
2000	903	830	67.3	76.6	74.3	72.7	71.6	64.8	55.2	48.8	9.3
2000	903	845	66.3	75.5	73.2	71.4	70.4	64.3	54.0	47.2	9.2
2000	903	900	66.9	77.9	75.0	72.1	70.8	65.0	52.5	44.3	11.0
2000	903	915	66.6	75.1	72.6	71.0	70.2	65.6	57.8	50.5	8.5
2000	903	930	67.3	76.1	73.5	71.6	70.6	66.3	58.6	50.3	8.8
2000	903	945	66.8	75.9	72.7	71.4	70.4	65.9	56.9	50.2	9.1
2000	903	1000	67.7	77.0	73.9	71.8	71.0	67.1	58.5	48.4	9.3
2000	903	1015	68.5	92.3	74.0	71.7	70.7	67.1	60.6	52.1	23.8
2000	903	1030	67.0	77.7	72.7	71.2	70.3	66.3	58.8	49.6	10.7
2000	903	1045	67.7	79.3	73.1	71.7	70.8	67.1	61.3	50.9	11.6
2000	903	1100	67.6	75.7	72.9	71.1	70.4	67.3	61.6	54.8	8.1
2000	903	1115	67.5	81.3	73.0	71.1	70.3	67.0	61.3	53.8	13.8
2000	903	1130	67.3	74.4	71.8	70.8	70.1	66.9	61.4	54.8	7.1
2000	903	1145	67.3	79.2	73.1	71.0	70.0	66.7	61.6	55.0	11.9
2000	903	1200	67.0	73.9	71.8	70.5	69.8	66.7	61.8	54.3	6.9
2000	903	1215	67.1	75.0	72.0	70.5	69.8	66.7	62.1	55.3	7.9
2000	903	1230	67.1	74.9	72.0	70.7	69.9	66.7	61.6	54.7	7.8
2000	903	1245	66.3	77.2	71.7	70.2	69.3	65.8	59.6	48.0	10.9
2000	903	1300	66.6	74.4	71.2	70.0	69.3	66.4	62.0	53.5	7.8
2000	903	1315	67.2	77.8	73.8	70.9	69.9	66.3	62.0	52.4	10.6
2000	903	1330	66.2	79.2	72.3	70.1	69.2	65.6	57.9	49.6	13.0
2000	903	1345	66.7	75.2	72.2	70.3	69.5	66.3	60.2	48.7	8.5
2000	903	1400	66.3	78.0	72.3	70.2	69.3	65.6	59.6	53.1	11.7
2000	903	1415	66.1	77.5	72.7	70.4	69.3	65.0	58.3	51.7	11.4
2000	903	1430	66.6	76.5	73.1	70.4	69.5	65.9	59.9	49.8	9.9
2000	903	1445	66.5	74.0	71.3	69.9	69.1	66.1	61.6	52.8	7.5
2000	903	1500	66.9	78.4	73.2	70.5	69.5	66.3	62.0	52.2	11.5
2000	903	1515	66.2	74.1	71.3	69.8	69.0	65.9	60.6	51.7	7.9
2000	903	1530	66.1	76.2	71.3	69.8	69.0	65.7	59.5	52.6	10.1
2000	903	1545	67.0	76.3	72.5	70.5	69.5	66.5	62.4	55.7	9.3
2000	903	1600	66.7	75.9	71.6	70.1	69.3	66.4	61.4	52.9	9.2
2000	903	1615	67.0	74.9	72.1	70.5	69.8	66.6	61.8	53.2	7.9
2000	903	1630	67.1	74.6	72.0	70.2	69.4	66.8	63.1	55.5	7.5
2000	903	1645	67.2	78.6	72.4	70.5	69.8	66.9	63.2	55.6	11.4
2000	903	1700	67.1	77.1	72.1	70.6	69.7	66.6	62.8	53.5	10.0
2000	903	1715	67.0	77.0	72.4	70.5	69.7	66.7	62.0	52.6	10.0
2000	903	1730	67.8	75.6	72.6	71.0	70.3	67.6	63.5	54.0	7.8
2000	903	1745	68.0	76.9	72.9	71.2	70.4	67.8	63.9	54.7	8.9
2000	903	1800	68.1	77.9	73.1	71.4	70.6	67.8	61.8	50.1	9.8
2000	903	1815	67.1	76.0	72.7	71.2	70.3	66.4	59.5	49.6	8.9
2000	903	1830	67.6	75.4	72.9	71.3	70.5	67.3	61.0	54.0	7.8
2000	903	1845	68.1	80.4	73.3	71.6	70.9	67.5	61.9	55.5	12.3
2000	903	1900	67.7	80.1	73.5	71.6	70.7	67.2	59.0	50.4	12.4
2000	903	1915	67.1	75.9	72.5	71.2	70.4	66.4	58.1	50.4	8.8
2000	903	1930	67.1	77.9	73.1	71.4	70.5	66.4	56.7	50.1	10.8
2000	903	1945	66.6	75.1	72.6	71.0	70.0	65.6	57.5	46.2	8.5
2000	903	2000	66.6	74.6	72.4	71.1	70.3	65.8	57.1	48.7	8.0
2000	903	2015	66.2	76.2	72.9	70.9	69.9	65.0	56.1	50.0	10.0
2000	903	2030	66.3	74.6	72.3	71.0	70.0	65.1	57.3	49.7	8.3
2000	903	2045	66.4	75.1	72.7	71.0	70.0	65.1	57.2	49.7	8.7
2000	903	2100	65.8	75.7	72.3	70.7	69.7	64.1	54.9	46.6	9.9
2000	903	2115	66.0	75.0	72.3	71.0	70.1	63.7	53.7	47.0	9.0
2000	903	2130	66.4	78.9	73.8	71.5	70.4	64.3	52.7	44.3	12.5
2000	903	2145	65.6	77.0	73.4	71.1	69.8	62.7	53.2	44.7	11.4
2000	903	2200	65.3	79.6	74.6	71.0	69.6	60.8	50.7	42.2	14.3
2000	903	2215	64.6	76.4	73.3	70.5	69.2	60.8	46.6	36.9	11.8
2000	903	2230	64.1	77.3	72.4	69.9	68.7	59.9	50.7	43.1	13.2
2000	903	2245	63.9	75.1	72.2	70.2	68.7	59.4	46.4	38.2	11.2
2000	903	2300	64.7	79.9	73.9	70.9	69.5	59.7	47.0	38.6	15.2
2000	903	2315	64.8	75.7	72.9	70.5	69.3	61.2	46.7	38.9	10.9
2000	903	2330	65.8	78.2	76.2	72.0	70.3	59.6	45.1	37.6	12.4
2000	903	2345	65.9	81.1	75.2	72.8	70.9	59.8	45.9	34.1	15.2
2000	904	0	63.6	76.0	73.1	70.9	69.0	56.2	39.4	33.6	12.4

DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	65.9	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	63.5	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	66.9	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	64.1	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	70.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	50.0	dB(A)

472 Windsor Road, Vineyard											DAY 6
Monday 4 September 2000										RT&A S/N 65	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	903	2215	64.6	76.4	73.3	70.5	69.2	60.8	46.6	36.9	11.8
2000	903	2230	64.1	77.3	72.4	69.9	68.7	59.9	50.7	43.1	13.2
2000	903	2245	63.9	75.1	72.2	70.2	68.7	59.4	46.4	38.2	11.2
2000	903	2300	64.7	79.9	73.9	70.9	69.5	59.7	47.0	38.6	15.2
2000	903	2315	64.8	75.7	72.9	70.5	69.3	61.2	46.7	38.9	10.9
2000	903	2330	65.8	78.2	76.2	72.0	70.3	59.6	45.1	37.6	12.4
2000	903	2345	65.9	81.1	75.2	72.8	70.9	59.8	45.9	34.1	15.2
2000	904	0	63.6	76.0	73.1	70.9	69.0	56.2	39.4	33.6	12.4
2000	904	15	62.6	77.8	74.1	70.1	67.4	50.1	37.3	32.9	15.2
2000	904	30	62.2	76.6	72.5	69.6	67.6	54.1	39.8	34.8	14.4
2000	904	45	62.8	79.1	74.1	69.8	67.3	54.0	38.1	33.4	16.3
2000	904	100	60.4	75.5	72.3	67.9	64.5	50.2	36.0	33.2	15.1
2000	904	115	61.7	81.0	73.6	68.6	64.8	52.2	39.0	33.9	19.3
2000	904	130	60.7	78.2	73.2	67.7	64.1	48.8	37.7	35.5	17.5
2000	904	145	60.0	78.0	71.7	67.8	63.3	51.0	41.5	37.2	18.0
2000	904	200	59.3	78.6	73.1	65.8	61.5	42.4	36.7	35.4	19.3
2000	904	215	58.5	78.6	70.6	64.8	60.2	44.8	36.9	35.1	20.1
2000	904	230	55.8	74.6	70.0	60.3	56.7	40.5	35.0	32.6	18.8
2000	904	245	61.1	81.2	73.5	67.8	62.3	45.7	36.8	33.6	20.1
2000	904	300	59.5	76.1	72.5	66.7	61.6	49.8	40.6	36.4	16.6
2000	904	315	60.6	78.4	73.2	67.2	63.7	49.9	38.8	34.5	17.8
2000	904	330	60.4	78.3	72.8	67.8	62.3	48.5	36.3	33.2	17.9
2000	904	345	63.1	79.1	75.0	70.4	66.9	53.4	40.3	34.6	16.0
2000	904	400	64.4	83.8	76.5	71.2	66.8	51.1	39.3	34.3	19.4
2000	904	415	64.0	79.2	75.8	71.5	68.1	55.9	41.7	37.1	15.2
2000	904	430	65.2	81.6	76.1	71.9	69.5	58.4	49.0	39.2	16.4
2000	904	445	65.8	77.6	75.3	72.4	70.4	61.0	53.1	46.8	11.8
2000	904	500	65.1	79.7	75.4	71.8	69.7	59.4	49.8	42.2	14.6
2000	904	515	66.9	80.5	76.1	73.1	71.6	61.2	55.0	50.8	13.6
2000	904	530	68.3	79.5	76.8	73.8	72.2	65.7	58.7	50.0	11.2
2000	904	545	70.1	82.1	77.9	74.8	73.7	68.3	60.9	56.5	12.0
2000	904	600	71.1	80.1	77.8	75.5	74.2	70.4	63.2	55.9	9.0
2000	904	615	71.3	84.0	78.3	75.2	74.0	70.6	64.6	57.8	12.7
2000	904	630	71.2	84.3	77.8	75.3	74.0	70.7	63.4	58.6	13.1
2000	904	645	71.1	78.3	76.7	75.0	74.1	70.5	65.1	60.3	7.2
2000	904	700	71.9	80.6	77.6	75.4	74.3	71.5	67.4	62.0	8.7
2000	904	715	72.4	81.0	78.2	76.7	75.6	71.7	66.6	60.4	8.6
2000	904	730	72.4	88.1	79.4	76.9	75.1	71.3	66.5	59.0	15.7
2000	904	745	72.5	80.8	78.7	77.2	76.0	71.3	66.2	60.9	8.3
2000	904	800	71.4	81.0	77.7	75.5	74.4	70.7	65.3	56.9	9.6
2000	904	815	70.9	80.0	77.5	75.3	73.7	70.2	64.0	56.8	9.1
2000	904	830	71.2	81.4	77.2	75.4	74.3	70.5	65.3	57.2	10.2
2000	904	845	71.0	85.3	79.0	75.6	74.0	69.5	62.5	55.4	14.3
2000	904	900	70.9	86.5	77.7	75.7	74.2	69.5	64.4	56.7	15.6
2000	904	915	70.8	81.0	78.5	75.8	74.2	69.2	62.8	54.1	10.2
2000	904	930	70.8	85.4	78.6	76.1	74.7	68.8	59.1	50.8	14.6
2000	904	945	71.3	84.8	77.9	76.2	75.1	69.6	63.1	55.9	13.5
2000	904	1000	70.5	84.1	78.8	76.1	74.1	68.3	61.0	50.8	13.6
2000	904	1015	70.4	80.9	78.0	75.6	74.1	68.7	61.9	54.6	10.5
2000	904	1030	69.1	79.8	77.3	74.1	72.3	67.7	60.6	51.8	10.7
2000	904	1045	70.0	86.7	77.7	75.3	73.8	67.7	60.1	53.1	16.7
2000	904	1100	69.1	83.4	77.5	74.4	72.9	67.1	59.7	50.8	14.3
2000	904	1115	68.1	80.3	75.9	73.4	71.4	66.5	60.6	52.5	12.2
2000	904	1130	67.7	82.2	75.3	72.7	71.1	65.9	58.2	52.1	14.5
2000	904	1145	68.1	77.9	75.8	73.4	71.9	66.5	59.0	48.5	9.8
2000	904	1200	67.6	77.8	75.3	73.1	71.5	65.9	56.6	45.6	10.2
2000	904	1215	68.9	79.5	77.2	74.2	72.4	67.4	59.0	50.6	10.6
2000	904	1230	67.9	79.3	76.0	73.3	71.4	66.2	58.8	51.7	11.4
2000	904	1245	68.4	82.4	76.8	73.5	72.0	66.5	58.5	50.3	14.0
2000	904	1300	68.7	82.3	77.0	74.3	72.3	66.8	59.2	47.8	13.6
2000	904	1315	68.0	80.3	76.3	73.6	71.7	65.8	56.7	48.0	12.3
2000	904	1330	68.8	82.0	77.7	74.1	72.2	66.9	58.6	48.9	13.2
2000	904	1345	68.3	77.8	75.4	73.5	71.9	66.9	58.8	45.3	9.5
2000	904	1400	68.1	79.8	77.0	73.5	71.6	66.2	56.7	44.9	11.7
2000	904	1415	68.2	80.2	76.2	73.3	71.2	66.9	59.3	49.0	12.0
2000	904	1430	67.5	76.8	75.0	72.2	71.0	66.2	57.8	50.3	9.3
2000	904	1445	68.5	79.4	75.8	73.7	72.0	67.1	60.4	49.9	10.9
2000	904	1500	69.1	82.9	76.8	74.2	72.4	67.5	60.9	51.3	13.8
2000	904	1515	68.2	79.4	75.6	73.1	71.6	66.9	60.1	52.1	11.2
2000	904	1530	68.5	79.1	75.8	73.1	71.5	67.4	62.2	53.0	10.6
2000	904	1545	68.8	83.2	76.9	73.4	71.5	67.4	61.7	55.2	14.4
2000	904	1600	68.5	78.0	75.4	72.8	71.5	67.7	61.7	54.4	9.5
2000	904	1615	68.6	80.0	76.1	73.0	71.6	67.5	62.1	56.1	11.4
2000	904	1630	69.3	89.1	76.9	73.6	71.9	67.6	61.8	55.8	19.8
2000	904	1645	68.1	77.9	75.1	72.2	71.0	67.3	61.5	53.8	9.8
2000	904	1700	68.5	81.6	77.2	72.6	71.0	67.5	60.7	53.8	13.1
2000	904	1715	69.1	94.2	76.0	72.2	71.0	67.6	62.0	55.9	25.1
2000	904	1730	68.3	77.2	74.8	72.3	71.2	67.7	61.6	48.7	8.9
2000	904	1745	68.4	80.4	75.2	72.4	71.3	67.6	59.9	49.9	12.0
2000	904	1800	68.7	79.1	76.6	72.9	71.5	67.7	61.8	52.6	10.4
2000	904	1815	68.6	78.2	75.7	73.1	71.8	67.7	61.0	52.4	9.6
2000	904	1830	68.2	80.5	75.3	72.2	71.2	67.4	59.9	51.0	12.3
2000	904	1845	67.4	78.2	74.2	71.5	70.7	66.2	58.9	52.7	10.8
2000	904	1900	67.6	77.7	74.8	72.4	71.2	66.5	57.2	48.4	10.1
2000	904	1915	68.4	78.6	75.1	72.8	71.6	67.3	60.6	53.5	10.2
2000	904	1930	67.2	79.7	73.8	71.6	70.6	65.9	57.8	48.6	12.5
2000	904	1945	66.0	75.8	73.0	71.0	69.8	64.6	54.8	46.2	9.8
2000	904	2000	66.3	81.6	74.6	71.0	69.7	64.2	53.4	41.1	15.3
2000	904	2015	67.3	83.3	73.8	72.1	70.9	65.6	57.0	48.6	16.0
2000	904	2030	67.3	76.5	74.0	72.2	71.2	65.5	57.3	49.8	9.2
2000	904	2045	66.7	77.8	74.1	71.9	70.7	64.6	52.6	44.6	11.1
2000	904	2100	66.1	77.0	73.7	71.7	70.5	63.3	55.0	47.0	10.9
2000	904	2115	66.1	79.0	73.9	71.5	70.1	63.6	55.1	42.3	12.9
2000	904	2130	67.3	80.1	74.9	72.4	71.3	65.2	56.3	47.5	12.8
2000	904	2145	66.5	78.1	75.0	71.9	70.4	64.4	51.4	44.8	11.6
2000	904	2200	66.5	76.9	74.1	72.0	70.7	64.2	52.2	39.2	10.4
2000	904	2215	67.5	77.4	74.3	72.6	71.5	65.9	55.4	46.7	9.9
2000	904	2230	66.2	78.1	74.2	71.5	70.2	63.6	52.6	40.2	11.9
2000	904	2245	65.3	77.3	73.5	71.2	69.9	62.0	49.5	39.9	12.0
2000	904	2300	66.4	81.9	75.3	71.8	70.1	63.4	54.7	47.5	15.5
2000	904	2315	64.6	77.2	72.7	70.7	69.5	60.6	48.3	41.9	12.6
2000	904	2330	64.3	77.3	73.5	70.9	69.3	59.0	46.0	36.8	13.0
2000	904	2345	64.0	81.4	75.0	70.1	67.9	58.0	45.0	32.9	17.4
2000	905	0	63.6	77.6	73.9	70.0	68.1	58.4	39.3	32.7	14.0

DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	68.2	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	64.5	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	69.0	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	66.1	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.9	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.6	dB(A)

472 Windsor Road, Vineyard										DAY 7	
Tuesday 5 September 2000									RT&A S/N 65		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	904	2215	67.5	77.4	74.3	72.6	71.5	65.9	55.4	46.7	9.9
2000	904	2230	66.2	78.1	74.2	71.5	70.2	63.6	52.6	40.2	11.9
2000	904	2245	65.3	77.3	73.5	71.2	69.9	62.0	49.5	39.9	12.0
2000	904	2300	66.4	81.9	75.3	71.8	70.1	63.4	54.7	47.5	15.5
2000	904	2315	64.6	77.2	72.7	70.7	69.5	60.6	48.3	41.9	12.6
2000	904	2330	64.3	77.3	73.5	70.9	69.3	59.0	46.0	36.8	13.0
2000	904	2345	64.0	81.4	75.0	70.1	67.9	58.0	45.0	32.9	17.4
2000	905	0	63.6	77.6	73.9	70.0	68.1	58.4	39.3	32.7	14.0
2000	905	15	63.3	78.0	73.7	69.9	67.8	58.2	48.4	37.9	14.7
2000	905	30	60.2	78.2	71.4	67.2	64.5	50.9	37.6	31.7	18.0
2000	905	45	60.3	75.3	71.6	67.8	65.0	49.7	35.6	32.0	15.0
2000	905	100	58.4	75.8	70.1	65.9	62.7	47.7	33.2	31.4	17.4
2000	905	115	60.9	73.7	70.9	68.3	66.1	52.1	36.9	32.1	12.8
2000	905	130	62.0	81.2	74.2	68.1	65.6	50.6	35.4	31.9	19.2
2000	905	145	54.9	72.8	68.2	62.3	57.4	37.5	33.1	31.5	17.9
2000	905	200	60.9	80.6	72.4	67.8	64.5	46.4	33.5	31.5	19.7
2000	905	215	61.9	78.8	74.5	69.3	65.4	44.8	35.6	32.6	16.9
2000	905	230	60.3	78.9	74.0	66.8	62.7	44.4	33.0	30.9	18.6
2000	905	245	58.9	74.8	70.0	67.2	64.4	42.3	32.6	31.3	15.9
2000	905	300	62.0	85.4	71.6	66.7	63.9	46.2	35.5	32.7	23.4
2000	905	315	59.6	76.4	72.3	67.1	62.9	45.2	34.0	32.1	16.8
2000	905	330	62.6	81.4	74.4	69.6	66.4	48.7	36.4	32.8	18.8
2000	905	345	58.5	74.1	70.8	66.2	62.6	41.5	33.3	31.2	15.6
2000	905	400	61.6	79.5	74.2	68.7	64.7	44.0	34.2	31.4	17.9
2000	905	415	64.9	81.3	75.7	71.6	69.6	56.9	42.6	32.8	16.4
2000	905	430	65.2	80.1	76.4	72.5	69.8	54.1	39.4	34.1	14.9
2000	905	445	65.2	78.8	75.6	72.0	69.9	59.1	42.0	33.5	13.6
2000	905	500	67.2	81.2	77.9	73.7	71.9	60.4	48.0	38.8	14.0
2000	905	515	67.0	81.7	76.5	72.7	71.3	63.1	50.2	42.6	14.7
2000	905	530	68.4	80.5	76.7	73.7	72.3	65.8	57.3	48.7	12.1
2000	905	545	69.7	80.2	77.5	74.7	73.2	68.2	60.8	54.9	10.5
2000	905	600	71.1	82.6	77.8	75.2	74.1	70.3	63.5	52.0	11.5
2000	905	615	71.1	80.6	77.3	75.0	74.1	70.5	63.5	53.3	9.5
2000	905	630	71.5	83.3	77.4	75.3	74.2	71.1	65.4	56.3	11.8
2000	905	645	71.4	81.1	76.7	75.0	74.1	71.1	65.2	57.8	9.7
2000	905	700	71.4	83.9	76.6	74.8	74.0	70.8	66.5	59.2	12.5
2000	905	715	71.7	82.8	78.4	75.4	74.4	71.1	65.9	55.2	11.1
2000	905	730	70.8	77.9	75.3	74.0	73.4	70.8	64.5	54.2	7.1
2000	905	745	71.7	81.6	76.6	74.8	73.9	71.5	67.3	55.3	9.9
2000	905	800	71.5	82.0	78.0	75.1	74.1	70.8	65.7	57.8	10.5
2000	905	815	70.7	79.3	76.7	74.9	73.6	70.1	64.6	57.1	8.6
2000	905	830	70.2	80.0	76.8	74.2	73.1	69.6	62.4	50.4	9.8
2000	905	845	69.8	79.6	76.8	74.6	72.9	68.8	62.0	51.9	9.8
2000	905	900	69.7	79.0	76.4	74.4	72.7	68.8	61.6	54.7	9.3
2000	905	915	69.1	78.8	75.7	73.7	72.5	68.0	61.4	51.1	9.7
2000	905	930	69.0	78.4	76.0	73.4	72.0	68.0	61.5	52.9	9.4
2000	905	945	68.5	78.3	75.7	73.5	72.0	67.0	59.1	46.2	9.8
2000	905	1000	69.3	79.6	77.6	74.7	73.0	67.7	60.3	51.3	10.3
2000	905	1015	68.8	78.9	76.9	74.1	72.3	67.1	59.9	53.0	10.1
2000	905	1030	69.2	79.7	77.7	74.4	72.7	67.4	60.0	51.1	10.5
2000	905	1045	69.2	81.5	77.2	74.9	73.1	67.0	60.3	52.4	12.3
2000	905	1100	69.7	80.5	77.4	75.0	73.4	67.8	61.2	52.1	10.8
2000	905	1115	69.6	79.6	77.4	75.4	73.6	67.6	59.7	49.4	10.0
2000	905	1130	68.8	80.4	77.6	74.0	72.5	66.9	57.8	50.1	11.6
2000	905	1145	68.3	86.6	75.9	73.8	72.2	66.3	58.5	50.7	18.3
2000	905	1200	68.1	81.3	76.6	74.1	72.1	65.6	57.8	50.5	13.2
2000	905	1215	67.1	79.8	76.1	72.7	70.7	64.7	58.4	50.0	12.7
2000	905	1230	68.1	80.7	77.3	73.5	71.3	65.9	59.3	54.3	12.6
2000	905	1245	68.7	85.1	76.8	74.2	72.2	65.9	59.7	49.6	16.4
2000	905	1300	68.6	80.8	76.8	74.2	72.4	66.3	59.9	52.9	12.2
2000	905	1315	67.9	79.7	76.3	73.8	71.6	65.7	58.0	52.6	11.8
2000	905	1330	68.5	79.6	76.3	73.9	72.3	66.4	61.0	55.6	11.1
2000	905	1345	68.4	80.5	76.5	73.7	72.0	66.5	60.3	55.5	12.1
2000	905	1400	68.7	79.9	76.6	74.1	72.6	66.6	61.4	53.9	11.2
2000	905	1415	68.5	78.8	75.7	73.6	71.8	67.0	61.9	56.6	10.3
2000	905	1430	67.5	80.0	75.5	72.4	70.9	65.9	59.6	54.1	12.5
2000	905	1445	68.8	78.9	76.2	73.7	71.9	67.3	63.3	57.8	10.1
2000	905	1500	67.6	79.5	74.9	72.4	70.9	66.3	59.4	51.8	11.9
2000	905	1515	69.2	81.2	76.5	73.7	72.3	68.0	63.1	58.0	12.0
2000	905	1530	68.7	78.2	75.4	73.1	71.8	67.6	63.0	58.0	9.5
2000	905	1545	68.4	83.0	75.7	73.2	71.5	67.1	61.4	54.8	14.6
2000	905	1600	68.0	77.3	75.3	72.6	71.2	66.8	61.1	53.9	9.3
2000	905	1615	68.9	86.2	75.6	73.0	71.6	67.5	63.0	57.7	17.3
2000	905	1630	68.0	78.2	75.1	72.2	70.8	67.0	61.4	52.9	10.2
2000	905	1645	68.2	80.3	77.0	72.9	70.9	66.6	61.4	55.8	12.1
2000	905	1700	68.3	80.4	75.3	72.8	71.3	67.5	61.0	57.2	12.1
2000	905	1715	68.1	78.8	75.8	72.4	71.0	66.9	61.0	54.9	10.7
2000	905	1730	67.7	77.2	74.7	71.7	70.6	66.8	60.3	52.9	9.5
2000	905	1745	68.0	80.9	75.1	71.9	70.9	67.3	60.4	50.9	12.9
2000	905	1800	67.8	79.7	74.2	71.9	70.8	66.8	61.2	54.1	11.9
2000	905	1815	67.7	76.6	74.1	72.0	70.9	66.9	60.0	52.2	8.9
2000	905	1830	67.0	77.1	73.7	71.2	70.0	66.1	59.8	52.6	10.1
2000	905	1845	67.7	79.3	75.0	71.7	70.6	66.8	60.2	51.7	11.6
2000	905	1900	67.4	80.5	74.8	72.0	70.8	66.1	56.5	49.8	13.1
2000	905	1915	67.0	82.6	75.0	71.1	69.9	65.7	57.6	49.7	15.6
2000	905	1930	66.8	79.4	74.7	71.6	70.3	65.2	56.9	50.6	12.6
2000	905	1945	66.3	82.3	73.7	70.7	69.7	64.5	53.4	42.6	16.0
2000	905	2000	65.7	77.3	72.8	70.9	69.7	63.5	53.9	49.3	11.6
2000	905	2015	65.2	75.4	72.1	70.3	69.2	63.2	54.0	45.8	10.2
2000	905	2030	64.9	77.4	73.1	70.6	69.2	61.8	50.4	43.2	12.5
2000	905	2045	65.0	80.0	73.8	70.7	69.1	61.6	51.8	42.4	15.0
2000	905	2100	64.0	76.7	72.7	70.0	68.4	59.6	50.2	42.9	12.7
2000	905	2115	65.2	81.6	73.6	70.4	69.2	62.1	51.6	40.9	16.4
2000	905	2130	65.9	76.9	73.7	71.7	70.4	62.5	53.6	46.2	11.0
2000	905	2145	66.3	75.7	73.6	71.6	70.4	64.1	54.6	46.7	9.4
2000	905	2200	66.4	76.0	73.5	71.7	70.4	64.4	55.5	47.6	9.6
2000	905	2215	65.8	76.6	73.4	71.6	70.1	63.3	53.1	40.1	10.8
2000	905	2230	66.9	83.0	76.4	72.1	70.7	63.6	55.6	45.9	16.1
2000	905	2245	66.6	78.8	75.1	72.4	71.0	63.2	48.5	38.4	12.2
2000	905	2300	64.3	75.9	72.8	70.7	69.3	59.4	45.2	37.1	11.6
2000	905	2315	61.6	75.1	71.5	68.9	66.7	53.8	38.8	33.2	13.5
2000	905	2330	62.8	76.5	72.3	69.9	67.9	55.4	44.6	34.6	13.7
2000	905	2345	61.5	74.7	71.7	68.8	66.8	53.3	41.3	36.3	13.2
2000	906	0	63.2	84.7	72.9	69.6	67.4	52.8	41.9	33.8	21.5

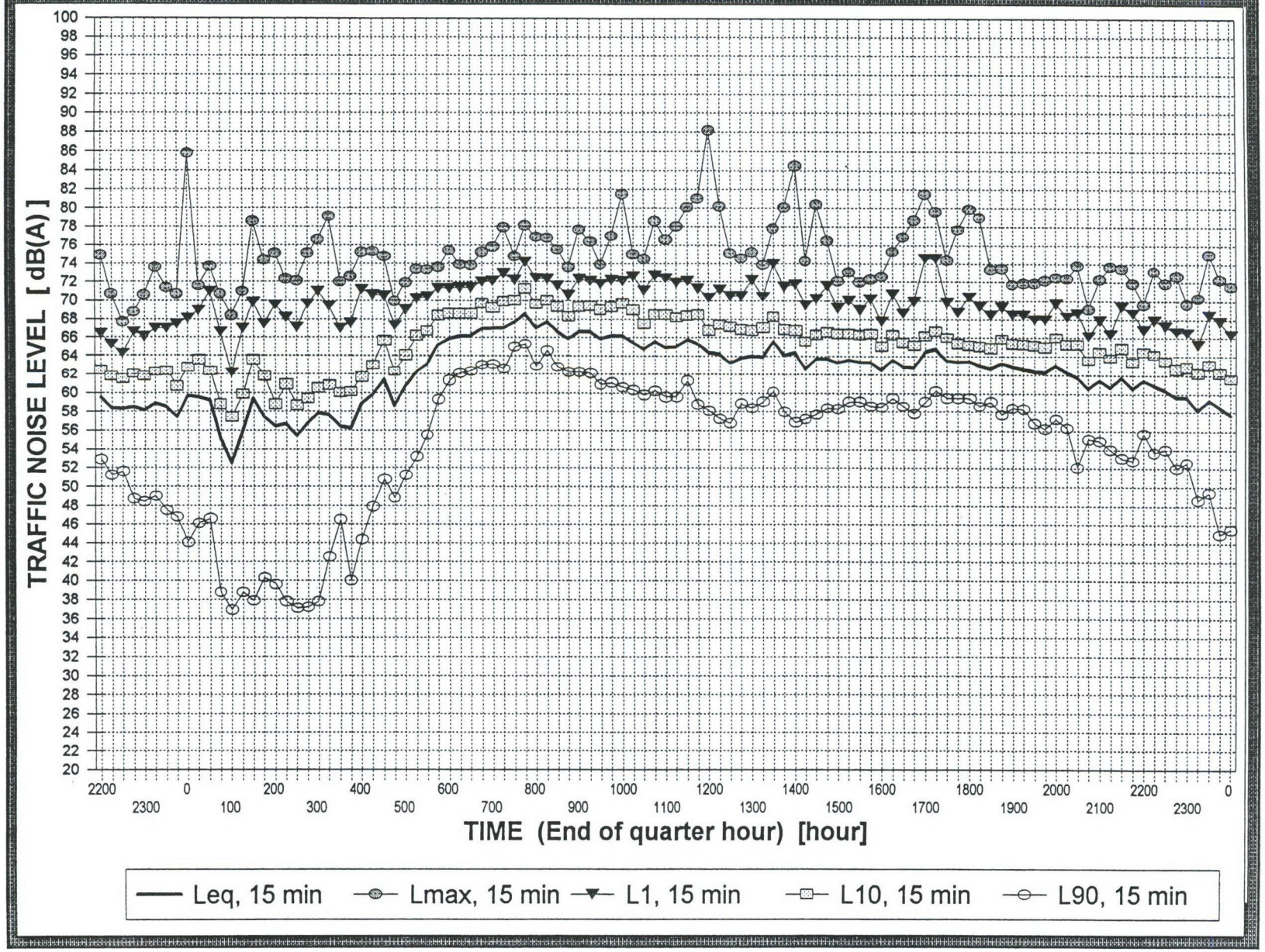
DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.7	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	64.6	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.5	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	66.2	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.4	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.4	dB(A)

Vineyard Public School, Windsor Road, Vineyard

DAY 1

Wednesday 30 August 2000

RT&A S/N 81



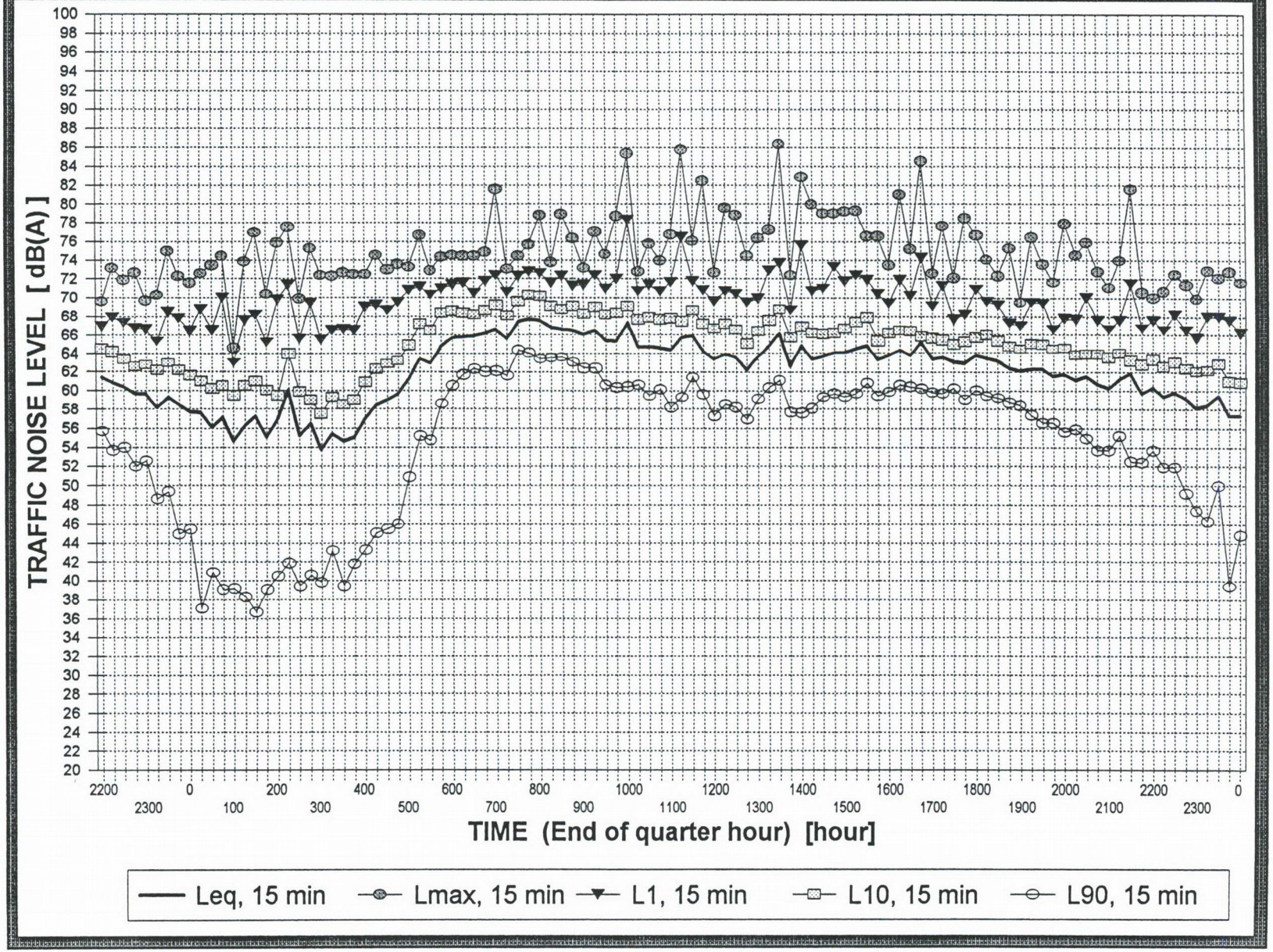
KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard

DAY 2

Thursday 31 August 2000

RT&A S/N 81



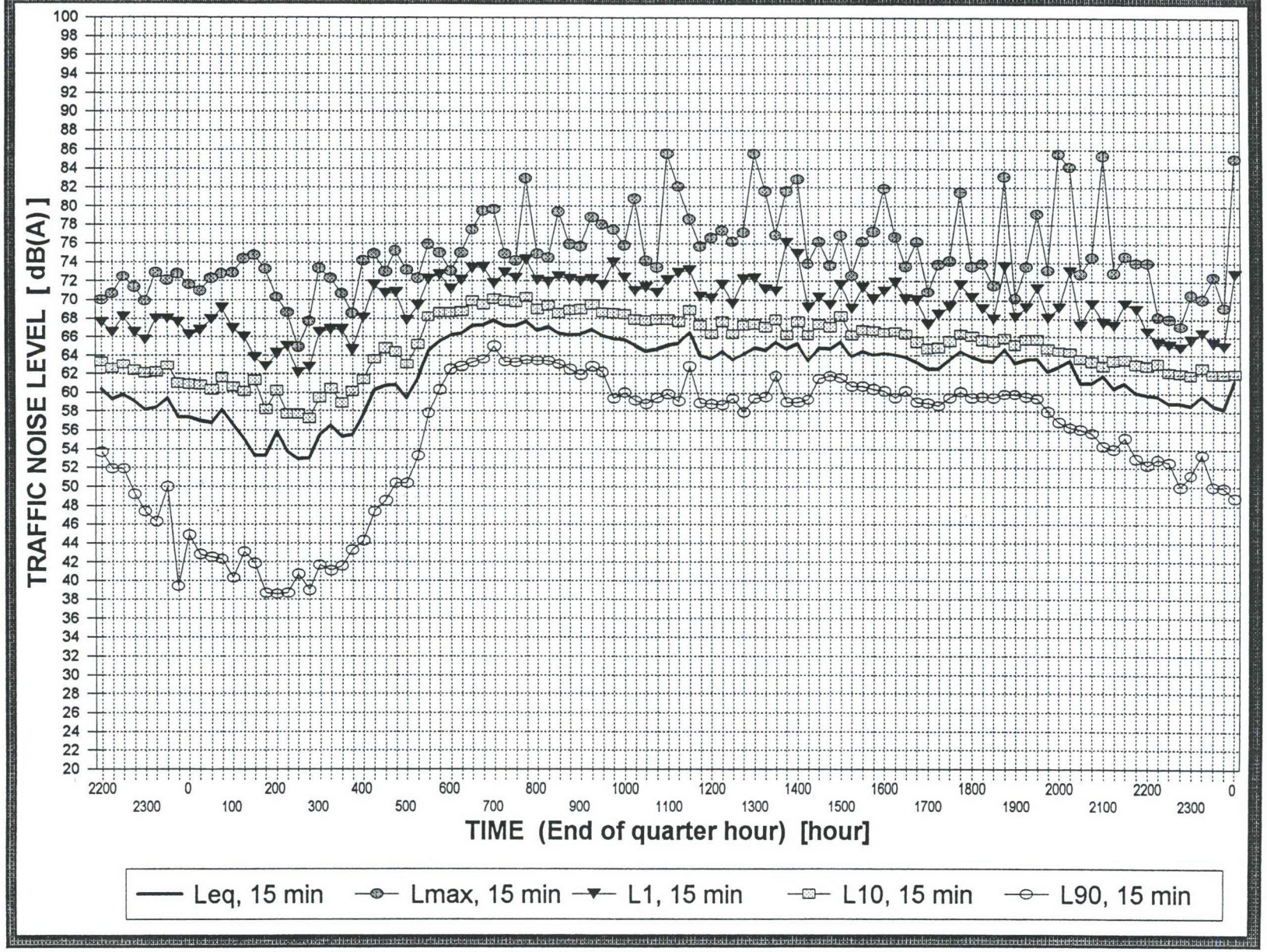
KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard

DAY 3

Friday 1 September 2000

RT&A S/N 81



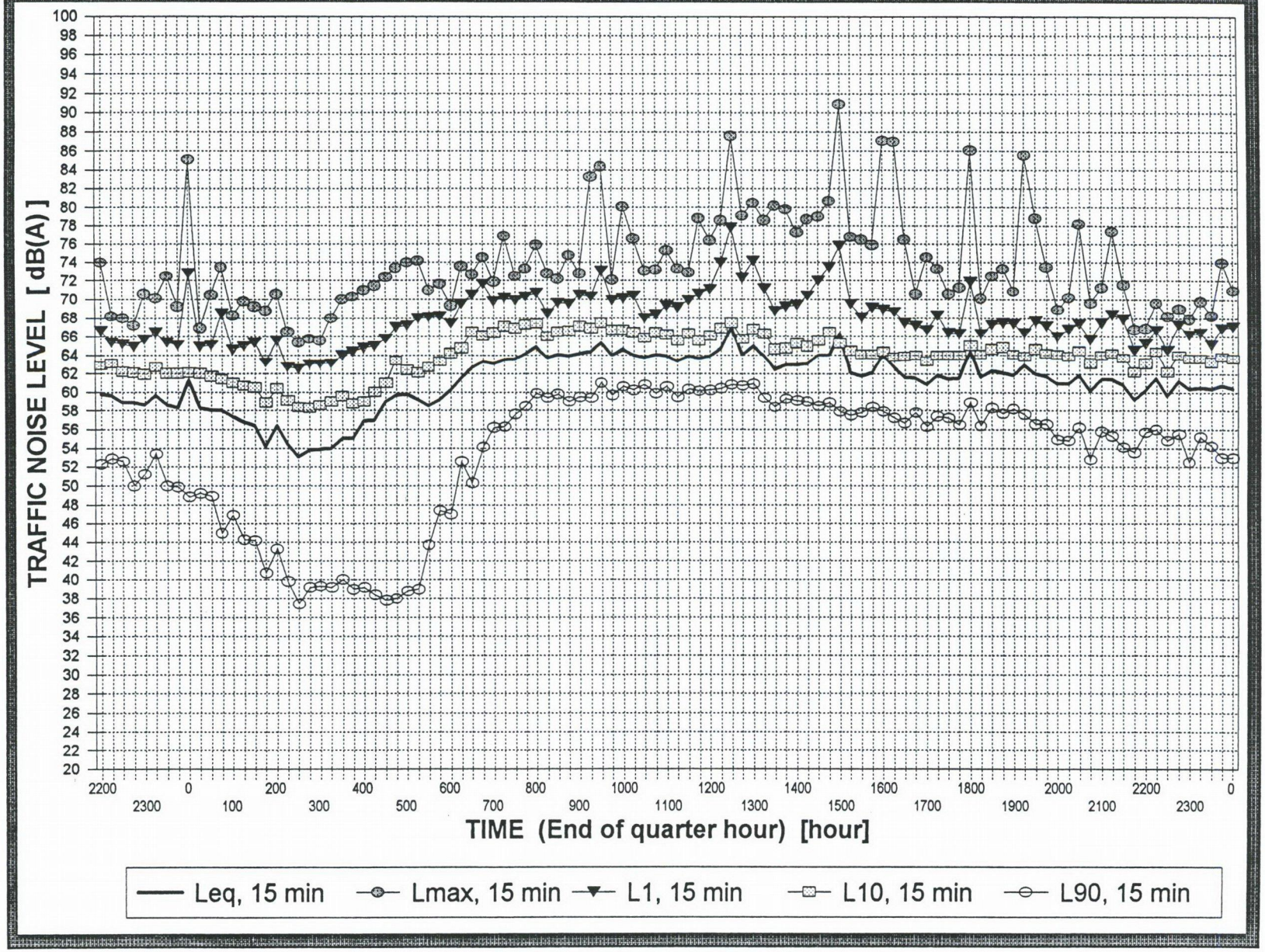
KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard

DAY 4

Saturday 2 September 2000

RT&A S/N 81



KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard

DAY 5

Sunday 3 September 2000

RT&A S/N 81



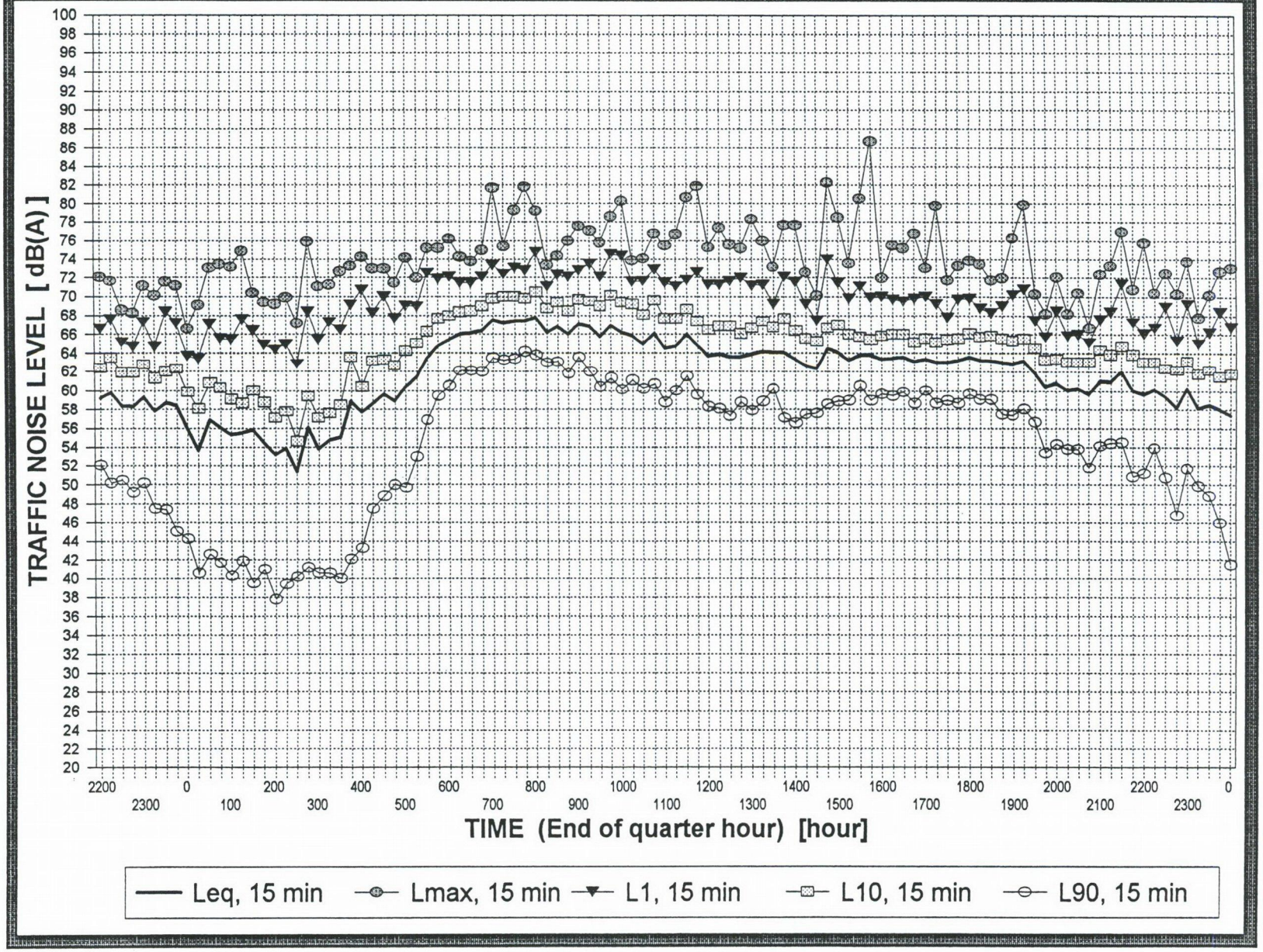
KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard

DAY 6

Monday 4 September 2000

RT&A S/N 81



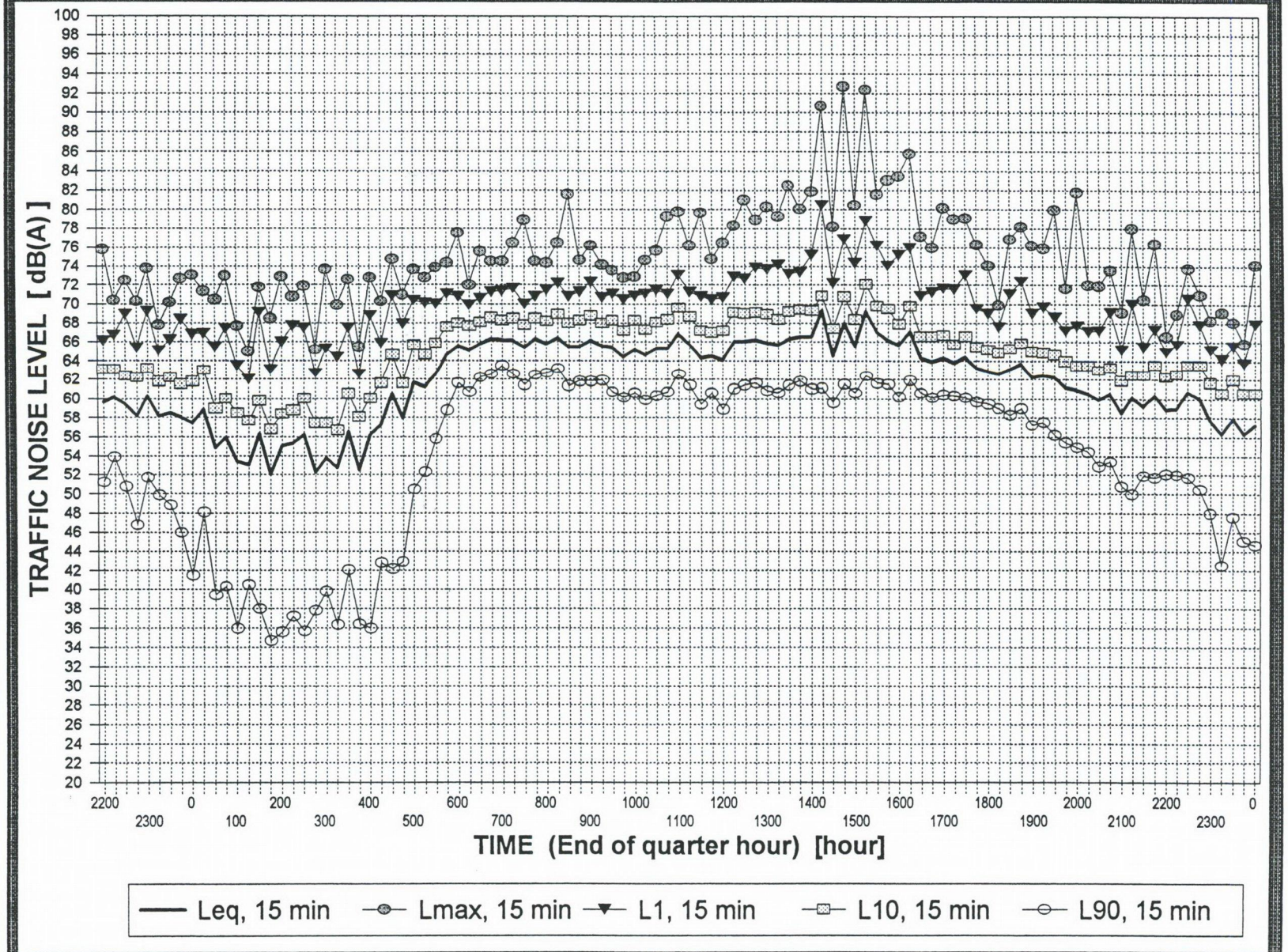
KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard

DAY 7

Tuesday 5 September 2000

RT&A S/N 81



KOIKAS ACOUSTICS PTY LTD

Vineyard Public School, Windsor Road, Vineyard											DAY 1
Wednesday 30 August 2000									RT&A S/N 81		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	829	2215	58.4	70.7	65.3	62.9	61.8	56.9	51.2	44.2	12.3
2000	829	2230	58.3	67.7	64.3	62.3	61.5	57.4	51.6	44.7	9.4
2000	829	2245	58.5	68.8	66.6	63.5	62.1	56.9	48.7	40.8	10.3
2000	829	2300	58.1	70.6	66.1	63.2	61.8	55.8	48.4	38.7	12.5
2000	829	2315	58.9	73.6	67.0	63.8	62.3	56.6	49.0	40.1	14.7
2000	829	2330	58.5	71.4	67.0	64.0	62.4	56.2	47.5	39.5	12.9
2000	829	2345	57.4	70.7	67.5	63.6	60.7	54.3	46.8	41.1	13.3
2000	830	0	59.7	85.8	68.1	64.8	62.8	53.9	44.1	39.0	26.1
2000	830	15	59.5	71.6	68.9	66.0	63.6	55.0	46.1	42.4	12.1
2000	830	30	59.2	73.7	71.0	64.9	62.4	54.2	46.6	38.8	14.5
2000	830	45	55.1	70.7	66.6	61.5	58.8	48.8	38.8	36.6	15.6
2000	830	100	52.5	68.4	62.2	59.2	57.4	46.6	36.9	35.0	15.9
2000	830	115	56.0	71.0	67.0	61.7	59.9	50.0	38.8	35.3	15.0
2000	830	130	59.4	78.6	69.8	65.9	63.6	52.6	37.9	35.6	19.2
2000	830	145	57.4	74.4	67.5	64.1	61.8	52.1	40.3	37.0	17.0
2000	830	200	56.4	75.1	69.5	62.9	58.8	46.2	39.6	37.3	18.7
2000	830	215	56.7	72.3	68.2	64.0	60.9	45.2	37.8	35.3	15.6
2000	830	230	55.4	72.1	67.1	61.5	58.7	48.3	37.1	34.6	16.7
2000	830	245	56.8	75.1	69.6	63.0	59.4	48.3	37.2	34.2	18.3
2000	830	300	57.8	76.6	71.0	64.3	60.5	47.8	37.8	35.4	18.8
2000	830	315	57.6	79.1	69.4	64.1	60.8	50.4	42.5	36.5	21.5
2000	830	330	56.4	72.0	67.0	62.6	60.0	51.4	46.5	42.3	15.6
2000	830	345	56.2	72.6	67.6	62.6	60.1	49.4	40.0	37.9	16.4
2000	830	400	58.9	75.2	71.2	65.3	61.7	51.6	44.4	38.3	16.3
2000	830	415	59.8	75.3	70.6	66.2	63.0	54.9	47.9	43.0	15.5
2000	830	430	61.4	74.8	70.5	67.7	65.7	58.0	50.8	44.1	13.4
2000	830	445	58.6	69.9	67.3	63.9	62.3	56.1	48.8	42.5	11.3
2000	830	500	60.7	71.9	69.0	65.8	64.1	58.8	51.2	43.7	11.2
2000	830	515	62.2	73.4	70.2	67.8	66.2	59.8	53.2	48.2	11.2
2000	830	530	63.1	73.3	70.4	68.0	66.7	61.5	55.5	50.1	10.2
2000	830	545	65.2	73.6	71.3	69.4	68.4	64.3	59.3	54.0	8.4
2000	830	600	65.9	75.4	71.3	69.6	68.6	65.3	61.3	56.6	9.5
2000	830	615	66.1	73.9	71.4	69.7	68.6	65.7	62.1	53.8	7.8
2000	830	630	66.2	73.8	71.4	69.7	68.6	65.8	62.3	58.7	7.6
2000	830	645	66.9	75.2	72.0	70.6	69.7	66.3	63.0	58.5	8.3
2000	830	700	67.0	75.8	72.1	70.3	69.2	66.8	63.1	58.1	8.8
2000	830	715	67.0	77.9	72.9	71.0	69.9	66.1	62.6	58.8	10.9
2000	830	730	67.7	74.8	72.2	70.9	70.0	67.1	65.0	61.9	7.1
2000	830	745	68.6	78.1	74.2	72.3	71.3	67.7	65.3	61.8	9.5
2000	830	800	67.0	76.9	72.4	70.7	69.6	66.5	62.9	57.8	9.9
2000	830	815	67.7	76.8	72.3	70.6	70.0	67.2	64.6	62.3	9.1
2000	830	830	66.6	75.5	71.6	70.1	69.3	66.0	62.8	58.8	8.9
2000	830	845	65.9	73.6	70.6	69.1	68.3	65.7	62.2	58.1	7.7
2000	830	900	66.6	77.7	72.3	70.4	69.3	65.9	62.2	56.3	11.1
2000	830	915	66.6	76.4	72.1	70.3	69.4	66.0	62.1	56.6	9.8
2000	830	930	65.9	73.9	71.8	70.2	69.0	64.9	60.9	55.3	8.0
2000	830	945	66.2	77.0	72.2	70.4	69.3	65.3	61.1	54.6	10.8
2000	830	1000	66.2	81.5	72.1	70.6	69.7	64.8	60.6	54.6	15.3
2000	830	1015	65.5	75.0	72.6	70.8	69.0	63.9	60.3	55.4	9.5
2000	830	1030	64.7	74.5	71.1	68.7	67.5	63.9	59.8	54.5	9.8
2000	830	1045	65.6	78.6	72.7	69.9	68.5	64.5	60.2	54.1	13.0
2000	830	1100	64.9	76.6	72.4	70.1	68.5	63.1	59.6	54.9	11.7
2000	830	1115	65.0	78.0	71.9	69.3	68.2	63.7	59.6	49.9	13.0
2000	830	1130	65.8	80.1	72.1	69.5	68.4	64.9	61.3	56.3	14.3
2000	830	1145	65.3	81.0	71.3	69.4	68.5	63.7	58.8	53.0	15.7
2000	830	1200	64.4	88.2	70.3	68.1	66.8	62.4	58.1	52.2	23.8
2000	830	1215	64.2	80.2	71.2	68.7	67.4	62.6	57.2	48.5	16.0
2000	830	1230	63.2	75.1	70.5	68.4	67.2	61.3	56.8	47.8	11.9
2000	830	1245	63.8	74.6	70.5	68.3	66.9	62.4	58.9	49.8	10.8
2000	830	1300	64.0	75.2	72.2	68.1	66.8	62.6	58.4	52.8	11.2
2000	830	1315	63.9	73.9	70.4	68.3	67.1	62.8	59.1	51.3	10.0
2000	830	1330	65.6	77.8	74.0	69.4	68.3	64.2	60.1	52.0	12.2
2000	830	1345	64.1	80.1	71.5	68.3	66.9	62.5	58.0	47.5	16.0
2000	830	1400	64.4	84.5	71.8	68.2	66.8	62.0	56.9	51.9	20.1
2000	830	1415	62.5	74.3	69.5	66.7	65.6	61.3	57.2	51.5	11.8
2000	830	1430	63.7	80.4	70.2	67.4	66.3	62.4	57.7	50.8	16.7
2000	830	1445	63.7	76.5	71.6	68.0	66.6	62.2	58.4	51.1	12.8
2000	830	1500	63.2	72.1	69.2	67.6	66.4	62.0	58.3	52.5	8.9
2000	830	1515	63.6	73.1	70.0	67.7	66.4	62.4	59.1	53.8	9.5
2000	830	1530	63.3	72.0	69.0	67.2	66.3	62.3	59.1	53.7	8.7
2000	830	1545	63.3	72.3	70.2	67.7	66.4	62.1	58.6	50.2	9.0
2000	830	1600	62.4	72.6	67.8	66.0	65.1	61.8	58.5	53.9	10.2
2000	830	1615	63.6	75.3	70.7	67.6	66.3	62.5	59.5	56.0	11.7
2000	830	1630	62.8	76.9	68.7	66.8	65.5	61.8	58.6	53.1	14.1
2000	830	1645	62.7	78.7	69.9	66.7	65.2	61.7	57.8	51.5	16.0
2000	830	1700	64.5	81.5	74.6	68.5	66.2	62.5	59.1	53.2	17.0
2000	830	1715	64.8	79.6	74.6	68.4	66.7	63.0	60.2	56.5	14.8
2000	830	1730	63.5	74.4	69.8	67.5	66.0	62.6	59.5	53.6	10.9
2000	830	1745	63.3	77.7	68.8	66.4	65.4	62.5	59.5	55.0	14.4
2000	830	1800	63.4	79.9	70.4	66.2	65.2	62.2	59.5	55.3	16.5
2000	830	1815	62.9	79.0	69.4	65.9	65.1	62.1	58.6	50.8	16.1
2000	830	1830	62.6	73.4	68.5	65.8	64.9	62.1	59.1	53.9	10.8
2000	830	1845	63.1	73.5	69.3	67.0	65.9	62.5	57.7	52.4	10.4
2000	830	1900	62.8	71.8	68.5	66.7	65.4	62.3	58.4	51.6	9.0
2000	830	1915	62.5	71.9	68.5	66.8	65.3	62.2	58.3	51.8	9.4
2000	830	1930	62.3	71.9	68.0	65.9	65.2	62.8	56.8	49.4	9.6
2000	830	1945	62.2	72.2	68.0	65.9	65.0	61.6	56.2	48.9	10.0
2000	830	2000	62.9	72.5	69.7	67.4	66.0	61.9	57.2	50.8	9.6
2000	830	2015	62.2	72.4	68.3	66.3	65.3	61.4	56.3	50.5	10.2
2000	830	2030	61.7	73.8	68.7	66.3	65.3	60.4	52.1	42.7	12.1
2000	830	2045	60.5	69.1	66.2	64.4	63.5	60.0	55.1	48.4	8.6
2000	830	2100	61.4	72.3	67.9	65.6	64.5	60.2	54.9	42.9	10.9
2000	830	2115	60.6	73.7	66.4	64.8	63.8	59.4	54.0	43.5	13.1
2000	830	2130	61.7	73.5	69.4	66.0	64.9	60.7	53.1	45.4	11.8
2000	830	2145	60.5	71.9	68.7	64.9	63.3	59.2	52.8	42.9	11.4
2000	830	2200	61.4	69.6	66.9	65.4	64.5	60.7	55.7	47.4	8.2
2000	830	2215	60.8	73.2	67.9	65.4	64.2	59.2	53.7	47.0	12.4
2000	830	2230	60.3	71.9	67.3	64.5	63.4	59.1	54.0	48.2	11.6
2000	830	2245	59.6	72.7	66.7	63.6	62.6	58.6	52.0	45.1	13.1
2000	830	2300	59.6	69.7	66.6	64.3	62.8	58.4	52.6	42.1	10.1
2000	830	2315	58.1	70.3	65.3	63.4	62.2	56.3	48.6	42.6	12.2
2000	830	2330	59.3	75.0	68.5	64.7	63.0	56.5	49.4	42.4	15.7
2000	830	2345	58.5	72.3	67.8	63.5	62.2	55.9	45.0	40.1	13.8
2000	831	0	57.7	71.6	66.4	63.2	61.6	55.2	45.5	39.7	13.9

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	67.8	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	49.3	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	63.5	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	59.5	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	64.4	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	61.2	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	66.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.8	dB(A)

Vineyard Public School, Windsor Road, Vineyard									DAY 2		
Thursday 31 August 2000									RT&A S/N 81		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	830	2200	61.4	69.6	66.9	65.4	64.5	60.7	55.7	47.4	8.2
2000	830	2215	60.8	73.2	67.9	65.4	64.2	59.2	53.7	47.0	12.4
2000	830	2230	60.3	71.9	67.3	64.5	63.4	59.1	54.0	48.2	11.6
2000	830	2245	59.6	72.7	66.7	63.6	62.6	58.6	52.0	45.1	13.1
2000	830	2300	59.6	69.7	66.6	64.3	62.8	58.4	52.6	42.1	10.1
2000	830	2315	58.1	70.3	65.3	63.4	62.2	56.3	48.6	42.6	12.2
2000	830	2330	59.3	75.0	68.5	64.7	63.0	56.5	49.4	42.4	15.7
2000	830	2345	58.5	72.3	67.8	63.5	62.2	55.9	45.0	40.1	13.8
2000	831	0	57.7	71.6	66.4	63.2	61.6	55.2	45.5	39.7	13.9
2000	831	15	57.6	72.6	68.8	63.3	61.0	52.7	37.1	34.0	15.0
2000	831	30	56.1	73.5	66.5	61.8	60.2	49.7	40.9	36.0	17.4
2000	831	45	57.1	74.5	70.0	62.4	60.5	47.6	39.1	35.9	17.4
2000	831	100	54.6	64.6	63.0	61.2	59.5	50.6	39.2	36.3	10.0
2000	831	115	56.3	73.9	67.6	63.3	60.5	46.9	38.3	35.2	17.6
2000	831	130	57.2	77.0	68.2	63.5	61.0	48.7	36.7	33.5	19.8
2000	831	145	55.0	70.4	65.2	61.9	60.0	47.9	39.1	35.2	15.4
2000	831	200	57.0	75.9	69.8	62.9	59.5	44.9	40.5	38.0	18.9
2000	831	215	60.0	77.6	71.4	67.4	64.0	51.4	41.9	37.9	17.6
2000	831	230	55.2	69.9	65.6	61.9	59.9	48.7	39.4	35.5	14.7
2000	831	245	56.5	75.3	69.4	62.8	59.0	47.1	40.6	37.1	18.8
2000	831	300	53.7	72.4	65.5	59.8	57.5	47.0	39.8	37.7	18.7
2000	831	315	55.4	72.3	66.5	61.4	59.3	48.5	43.2	40.3	16.9
2000	831	330	54.6	72.7	66.6	61.0	58.5	45.9	39.4	37.3	18.1
2000	831	345	55.0	72.5	66.5	62.0	59.0	45.8	41.8	37.9	17.5
2000	831	400	57.0	72.5	69.0	63.8	60.9	48.0	43.3	39.3	15.5
2000	831	415	58.4	74.6	69.2	65.3	62.3	50.7	45.1	41.2	16.2
2000	831	430	59.0	73.0	68.7	65.1	62.9	55.2	45.5	41.2	14.0
2000	831	445	59.6	73.6	69.5	65.5	63.2	56.1	46.0	39.6	14.0
2000	831	500	61.2	73.3	70.8	67.2	64.9	58.0	50.9	43.2	12.1
2000	831	515	63.4	76.7	71.2	69.1	67.2	61.2	55.2	43.5	13.3
2000	831	530	62.9	72.9	70.3	68.0	66.5	61.3	54.7	47.8	10.0
2000	831	545	64.8	74.4	71.0	69.4	68.4	63.5	58.6	54.1	9.6
2000	831	600	65.7	74.6	71.4	69.7	68.6	65.0	60.5	56.2	8.9
2000	831	615	65.8	74.5	71.6	69.6	68.4	65.2	61.7	56.4	8.7
2000	831	630	65.9	74.5	70.5	69.0	68.2	65.7	62.3	55.2	8.6
2000	831	645	66.2	74.9	71.8	69.7	68.7	65.6	62.0	57.2	8.7
2000	831	700	66.6	81.6	72.4	70.2	69.2	65.9	62.1	56.3	15.0
2000	831	715	65.6	73.1	70.6	69.0	68.1	65.3	61.6	55.9	7.5
2000	831	730	67.4	74.5	72.3	70.6	69.6	67.0	64.4	60.1	7.1
2000	831	745	67.7	75.7	72.8	71.3	70.3	67.1	64.1	57.3	8.0
2000	831	800	67.5	78.8	72.6	71.1	70.2	66.8	63.4	57.5	11.3
2000	831	815	66.8	73.8	71.6	69.9	69.1	66.3	63.5	57.1	7.0
2000	831	830	66.6	78.9	72.3	69.6	68.8	66.0	63.6	58.6	12.3
2000	831	845	66.5	76.4	71.3	69.9	69.1	66.1	63.0	58.8	9.9
2000	831	900	66.0	73.2	71.4	69.3	68.3	65.6	62.4	58.7	7.2
2000	831	915	66.5	77.1	72.4	70.2	69.0	65.8	62.4	56.7	10.6
2000	831	930	65.4	74.7	71.0	69.5	68.2	64.8	60.6	56.7	9.3
2000	831	945	65.3	78.7	72.0	69.6	68.4	63.8	60.3	54.8	13.4
2000	831	1000	67.3	85.4	78.3	70.5	69.1	64.6	60.4	55.9	18.1
2000	831	1015	64.7	72.8	70.7	68.7	67.7	63.8	60.6	54.2	8.1
2000	831	1030	64.8	75.8	71.4	69.1	67.9	63.6	59.5	54.4	11.0
2000	831	1045	64.6	74.0	70.7	68.9	67.7	63.4	60.1	56.0	9.4
2000	831	1100	64.4	76.8	71.7	69.1	67.8	62.8	58.2	53.6	12.4
2000	831	1115	65.7	85.8	76.5	69.0	67.5	62.9	59.3	53.5	20.1
2000	831	1130	65.9	76.1	71.8	69.8	68.7	65.0	61.4	55.5	10.2
2000	831	1145	64.3	82.5	70.8	68.2	67.2	63.1	59.6	54.7	18.2
2000	831	1200	63.3	72.7	69.6	67.8	66.7	62.1	57.3	52.5	9.4
2000	831	1215	63.9	79.6	70.7	68.6	67.2	62.3	58.5	52.8	15.7
2000	831	1230	63.5	78.8	70.4	67.8	66.6	62.2	58.2	51.4	15.3
2000	831	1245	62.2	74.5	69.5	66.1	65.1	61.0	57.0	51.8	12.3
2000	831	1300	63.6	76.4	69.9	67.7	66.4	62.6	59.1	52.3	12.8
2000	831	1315	64.9	77.3	72.9	68.9	67.6	63.6	60.3	53.4	12.4
2000	831	1330	66.1	86.4	73.7	70.2	68.8	64.8	61.1	54.7	20.3
2000	831	1345	62.6	72.4	68.7	66.9	65.8	61.6	57.7	51.3	9.8
2000	831	1400	64.9	82.9	75.6	68.6	66.9	61.9	57.6	50.8	18.0
2000	831	1415	63.3	80.0	70.7	67.2	66.2	61.8	58.1	53.9	16.7
2000	831	1430	63.6	79.0	71.0	67.2	66.1	62.4	59.3	54.9	15.4
2000	831	1445	64.1	79.0	73.3	67.8	66.2	62.5	59.7	56.0	14.9
2000	831	1500	64.1	79.2	71.8	68.1	66.7	62.8	59.3	54.2	15.1
2000	831	1515	64.5	79.3	72.4	68.7	67.4	62.9	59.7	55.5	14.8
2000	831	1530	64.9	76.6	71.9	69.4	67.9	63.5	60.8	56.5	11.7
2000	831	1545	63.2	76.6	70.4	66.7	65.4	62.3	59.4	54.1	13.4
2000	831	1600	63.7	73.5	69.4	67.1	66.2	63.0	59.9	55.0	9.8
2000	831	1615	64.4	81.0	71.9	67.9	66.5	63.2	60.6	57.2	16.6
2000	831	1630	63.7	75.2	70.2	67.6	66.4	62.8	60.4	55.4	11.5
2000	831	1645	65.3	84.6	74.3	67.7	65.9	63.0	60.2	55.1	19.3
2000	831	1700	63.3	72.6	69.1	66.7	65.7	62.7	59.8	49.9	9.3
2000	831	1715	63.5	77.7	71.3	67.0	65.5	62.4	59.7	56.3	14.2
2000	831	1730	63.0	72.1	67.7	65.9	65.0	62.7	60.2	53.6	9.1
2000	831	1745	62.9	78.5	68.2	66.2	65.3	62.3	59.0	53.2	15.6
2000	831	1800	63.7	76.7	70.9	67.1	65.8	62.7	60.0	53.5	13.0
2000	831	1815	63.4	74.1	69.6	67.2	66.0	62.7	59.4	53.0	10.7
2000	831	1830	63.1	72.3	69.2	66.4	65.4	62.6	59.2	53.6	9.2
2000	831	1845	62.4	75.3	67.3	65.7	64.8	61.8	58.7	55.2	12.9
2000	831	1900	62.1	69.5	67.0	65.6	64.5	61.6	58.4	54.3	7.4
2000	831	1915	62.3	76.5	69.5	66.1	65.1	61.3	57.4	51.9	14.2
2000	831	1930	62.3	73.6	69.4	66.2	65.0	61.5	56.6	48.0	11.3
2000	831	1945	61.5	71.7	66.6	65.3	64.5	60.8	56.6	51.5	10.2
2000	831	2000	61.7	77.9	67.8	65.6	64.6	60.9	55.6	51.0	16.2
2000	831	2015	61.1	74.6	67.7	64.9	63.8	60.2	55.9	47.8	13.5
2000	831	2030	61.5	75.9	70.0	65.2	63.9	60.1	54.9	48.5	14.4
2000	831	2045	60.7	72.8	67.6	65.5	63.9	59.5	53.7	46.1	12.1
2000	831	2100	60.2	71.1	66.6	64.6	63.5	58.9	53.7	47.1	10.9
2000	831	2115	61.2	74.0	67.6	65.1	64.0	60.3	55.2	48.9	12.8
2000	831	2130	61.8	81.6	71.5	64.5	63.2	59.0	52.5	46.8	19.8
2000	831	2145	59.7	70.6	66.7	63.6	62.8	58.8	52.4	45.9	10.9
2000	831	2200	60.3	70.0	67.6	64.3	63.3	59.3	53.7	46.7	9.7
2000	831	2215	59.3	70.7	66.5	63.9	62.6	58.1	51.9	43.3	11.4
2000	831	2230	59.8	72.5	68.2	65.2	63.0	58.2	51.9	45.9	12.7
2000	831	2245	59.1	71.4	66.5	63.4	62.4	57.7	49.2	38.4	12.3
2000	831	2300	58.1	69.9	65.7	63.5	62.1	55.8	47.4	37.8	11.8
2000	831	2315	58.4	72.9	68.0	64.0	62.2	55.1	46.3	39.6	14.5
2000	831	2330	59.4	72.1	68.0	64.4	62.9	57.3	50.0	38.9	12.7
2000	831	2345	57.3	72.8	67.6	62.7	61.0	53.3	39.4	34.4	15.5

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	67.4	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	48.9	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	63.3	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	59.0	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	64.4	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	60.6	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	66.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.0	dB(A)

Vineyard Public School, Windsor Road, Vineyard — DAY 3

Friday 1 September 2000 — RT&A S/N 81

YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	831	2215	59.3	70.7	66.5	63.9	62.6	58.1	51.9	43.3	11.4
2000	831	2230	59.8	72.5	68.2	65.2	63.0	58.2	51.9	45.9	12.7
2000	831	2245	59.1	71.4	66.5	63.4	62.4	57.7	49.2	38.4	12.3
2000	831	2300	58.1	69.9	65.7	63.5	62.1	55.8	47.4	37.8	11.8
2000	831	2315	58.4	72.9	68.0	64.0	62.2	55.1	46.3	39.6	14.5
2000	831	2330	59.4	72.1	68.0	64.4	62.9	57.3	50.0	38.9	12.7
2000	831	2345	57.3	72.8	67.6	62.7	61.0	53.3	39.4	34.4	15.5
2000	901	0	57.3	71.7	66.2	62.1	60.9	54.8	44.9	39.5	14.4
2000	901	15	57.0	71.0	66.7	62.8	60.8	52.5	42.8	35.9	14.0
2000	901	30	56.8	72.3	67.9	61.8	60.3	53.1	42.5	37.0	15.5
2000	901	45	58.1	72.8	69.1	63.6	61.6	53.8	42.3	36.1	14.7
2000	901	100	56.6	72.9	66.9	63.6	60.6	50.6	40.3	36.5	16.3
2000	901	115	55.0	74.4	66.0	62.4	60.1	50.0	43.1	37.5	19.4
2000	901	130	53.3	74.8	63.8	64.4	61.3	51.2	41.9	36.4	21.5
2000	901	145	53.3	73.3	62.8	59.8	58.2	47.1	38.7	34.8	20.0
2000	901	200	55.8	70.3	64.2	61.7	60.2	51.9	38.6	35.6	14.5
2000	901	215	53.7	68.7	65.0	61.0	57.7	46.0	38.7	35.3	15.0
2000	901	230	52.9	64.9	62.1	59.8	57.7	47.8	40.7	38.0	12.0
2000	901	245	53.0	67.7	62.7	59.3	57.2	48.4	39.0	36.6	14.7
2000	901	300	55.5	73.4	66.5	61.7	59.5	48.5	41.7	37.4	17.9
2000	901	315	56.5	72.3	66.8	63.0	60.4	51.3	41.1	37.0	15.8
2000	901	330	55.3	70.7	66.8	62.3	58.9	49.0	41.6	38.4	15.4
2000	901	345	55.5	68.6	64.6	62.0	60.1	51.2	43.3	38.9	13.1
2000	901	400	57.6	74.2	68.1	63.9	61.4	52.6	44.3	38.3	16.6
2000	901	415	60.2	74.9	71.6	67.2	63.6	54.9	47.4	40.2	14.7
2000	901	430	60.7	73.0	70.7	67.4	64.8	57.4	48.5	42.8	12.3
2000	901	445	60.8	75.2	70.8	66.5	64.4	57.2	50.4	44.9	14.4
2000	901	500	59.4	73.2	67.8	64.8	63.0	56.8	50.4	46.0	13.8
2000	901	515	61.5	72.3	69.4	66.9	65.2	59.5	53.3	49.4	10.8
2000	901	530	64.5	75.9	72.2	69.5	68.2	62.4	57.8	53.5	11.4
2000	901	545	65.5	75.0	72.7	70.5	68.7	64.0	60.3	56.3	9.5
2000	901	600	66.2	73.1	71.2	69.6	68.7	65.8	62.5	58.1	6.9
2000	901	615	66.4	75.0	72.1	69.8	68.8	65.9	62.8	57.9	8.6
2000	901	630	67.2	77.5	73.4	70.8	69.9	66.2	63.2	59.4	10.3
2000	901	645	67.3	79.5	73.5	70.9	69.5	66.5	63.6	59.9	12.2
2000	901	700	67.8	79.7	71.8	70.8	70.1	67.3	65.0	62.0	11.9
2000	901	715	67.2	74.9	72.9	70.9	69.9	66.5	63.3	57.8	7.7
2000	901	730	67.2	74.2	72.3	70.8	69.8	66.6	63.2	56.2	7.0
2000	901	745	67.7	83.0	74.3	71.4	70.3	66.8	63.5	59.8	15.3
2000	901	800	66.7	74.9	72.1	69.9	69.0	66.3	63.4	59.0	8.2
2000	901	815	67.1	74.5	71.9	70.2	69.4	66.9	63.4	59.5	7.4
2000	901	830	66.4	79.4	72.5	69.8	68.6	65.6	63.0	58.6	13.0
2000	901	845	66.2	75.9	72.2	70.0	68.9	65.4	62.5	57.6	9.7
2000	901	900	66.3	75.7	72.0	70.0	69.0	65.8	61.9	54.2	9.4
2000	901	915	66.8	78.8	72.2	70.4	69.5	66.1	62.8	53.9	12.0
2000	901	930	66.1	78.0	71.6	69.6	68.7	65.5	62.2	55.5	11.9
2000	901	945	65.8	77.5	74.0	70.0	68.6	64.5	59.4	50.9	11.7
2000	901	1000	65.7	75.8	72.4	69.8	68.5	64.8	60.0	53.3	10.1
2000	901	1015	65.1	80.8	71.0	69.1	67.9	63.5	59.2	52.0	15.7
2000	901	1030	64.5	74.2	71.4	68.9	67.8	63.3	58.8	52.6	9.7
2000	901	1045	64.7	73.5	70.8	68.8	67.9	63.8	59.5	51.2	8.8
2000	901	1100	65.1	85.6	72.1	69.0	67.9	63.9	59.9	53.5	20.5
2000	901	1115	65.3	82.1	72.9	69.1	67.7	63.7	59.1	51.1	16.8
2000	901	1130	66.5	78.6	73.2	70.2	68.9	65.5	62.8	58.6	12.1
2000	901	1145	64.0	75.7	70.4	68.4	67.3	62.8	58.9	52.9	11.7
2000	901	1200	63.6	76.6	70.2	68.0	66.3	62.5	58.8	52.3	13.0
2000	901	1215	64.5	77.4	71.7	69.2	67.7	63.1	58.7	50.4	12.9
2000	901	1230	63.5	76.2	69.6	67.6	66.3	62.5	59.4	56.0	12.7
2000	901	1245	64.2	77.2	72.2	68.8	67.3	62.6	57.9	49.7	13.0
2000	901	1300	64.9	85.6	72.3	68.9	67.4	63.0	59.4	49.9	20.7
2000	901	1315	64.6	81.6	71.2	68.3	67.1	63.2	59.6	54.3	17.0
2000	901	1330	65.4	76.9	71.0	69.0	67.9	64.7	61.8	56.3	11.5
2000	901	1345	64.8	81.6	76.1	67.3	66.2	62.4	59.0	51.0	16.8
2000	901	1400	65.3	82.9	74.9	69.0	67.7	63.1	59.0	50.9	17.6
2000	901	1415	63.4	73.9	69.2	67.4	66.2	62.5	59.3	53.6	10.5
2000	901	1430	64.9	76.2	70.3	68.3	67.4	64.3	61.5	53.6	11.3
2000	901	1445	64.8	73.7	69.5	67.9	67.1	64.4	61.8	57.6	8.9
2000	901	1500	65.5	76.9	71.7	69.6	68.3	64.5	61.6	57.2	11.4
2000	901	1515	63.9	72.6	69.1	67.2	66.2	63.5	60.7	56.1	8.7
2000	901	1530	64.5	76.2	71.4	68.1	66.8	63.5	60.7	55.7	11.7
2000	901	1545	64.1	77.3	70.1	68.1	66.7	63.3	60.4	54.4	13.2
2000	901	1600	64.3	81.9	71.0	68.0	66.5	63.2	60.2	54.6	17.6
2000	901	1615	64.1	76.7	71.9	67.9	66.6	63.2	59.5	51.6	12.6
2000	901	1630	63.8	73.6	70.1	67.5	66.3	63.1	60.2	55.0	9.8
2000	901	1645	63.2	76.2	70.0	66.6	65.5	62.6	59.0	53.8	13.0
2000	901	1700	62.6	70.9	67.4	65.6	64.8	62.5	58.9	53.0	8.3
2000	901	1715	62.6	73.8	68.5	65.8	64.9	62.2	58.6	49.0	11.2
2000	901	1730	63.5	74.2	69.3	66.7	65.6	63.1	59.5	51.2	10.7
2000	901	1745	64.5	81.5	71.7	67.6	66.3	63.5	60.1	54.2	17.0
2000	901	1800	63.8	73.6	70.3	67.1	66.1	63.2	59.5	54.2	9.8
2000	901	1815	63.4	73.9	69.1	66.5	65.7	63.0	59.6	51.1	10.5
2000	901	1830	63.3	71.6	68.0	66.3	65.6	62.9	59.5	53.2	8.3
2000	901	1845	64.8	83.2	73.6	67.2	65.9	63.0	59.9	54.5	18.4
2000	901	1900	63.1	70.2	68.2	66.3	65.2	62.8	59.9	54.0	7.1
2000	901	1915	63.5	73.6	69.2	67.0	65.8	63.0	59.6	55.0	10.1
2000	901	1930	63.6	79.2	71.3	67.4	65.8	62.6	59.4	51.2	15.6
2000	901	1945	62.3	73.2	68.1	65.8	64.8	61.7	58.0	53.5	10.9
2000	901	2000	62.8	85.6	69.2	65.6	64.5	61.1	56.9	49.5	22.8
2000	901	2015	63.4	84.2	73.1	65.5	64.4	61.0	56.3	50.0	20.8
2000	901	2030	61.0	72.8	67.3	64.6	63.6	60.1	56.1	50.0	11.8
2000	901	2045	61.0	74.6	69.6	64.3	63.3	60.0	55.7	48.6	13.6
2000	901	2100	61.8	85.4	67.6	64.0	62.9	59.1	54.3	49.0	23.6
2000	901	2115	60.5	72.9	67.3	64.7	63.4	59.6	54.0	46.9	12.4
2000	901	2130	61.0	74.7	69.6	64.3	63.5	59.8	55.2	49.7	13.7
2000	901	2145	60.0	74.0	69.0	64.0	63.0	58.0	53.0	49.0	14.0
2000	901	2200	59.8	74.0	66.6	63.8	62.9	58.8	52.3	45.0	14.2
2000	901	2215	59.6	68.2	65.4	63.9	63.1	58.8	52.9	47.5	8.6
2000	901	2230	58.9	68.0	65.2	63.4	62.2	58.0	52.6	45.1	9.1
2000	901	2245	58.9	67.2	64.9	63.1	62.1	58.2	50.0	42.4	8.3
2000	901	2300	58.6	70.6	65.7	63.0	61.9	57.5	51.2	46.5	12.0
2000	901	2315	59.7	70.1	66.4	63.7	62.7	59.0	53.4	45.7	10.4
2000	901	2330	58.6	72.5	65.4	63.1	62.0	57.1	50.0	42.3	13.9
2000	901	2345	58.3	69.2	65.1	63.1	62.0	56.9	49.9	43.0	10.9
2000	902	0	61.3	85.1	72.8	64.1	62.1	56.9	48.8	43.3	23.8

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	67.2	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	48.7	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	63.6	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	59.3	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	64.6	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	61.3	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	66.4	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.9	dB(A)

Vineyard Public School, Windsor Road, Vineyard											DAY 4
Saturday 2 September 2000									RT&A S/N 81		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	901	2215	59.6	68.2	65.4	63.9	63.1	58.8	52.9	47.5	8.6
2000	901	2230	58.9	68.0	65.2	63.4	62.2	58.0	52.6	45.1	9.1
2000	901	2245	58.9	67.2	64.9	63.1	62.1	58.2	50.0	42.4	8.3
2000	901	2300	58.6	70.6	65.7	63.0	61.9	57.5	51.2	46.5	12.0
2000	901	2315	59.7	70.1	66.4	63.7	62.7	59.0	53.4	45.7	10.4
2000	901	2330	58.6	72.5	65.4	63.1	62.0	57.1	50.0	42.3	13.9
2000	901	2345	58.3	69.2	65.1	63.1	62.0	56.9	49.9	43.0	10.9
2000	902	0	61.3	85.1	72.8	64.1	62.1	56.9	48.8	43.3	23.8
2000	902	15	58.3	66.9	64.9	63.1	62.0	57.0	49.2	45.1	8.6
2000	902	30	58.0	70.5	65.1	62.9	61.7	56.2	48.9	42.2	12.5
2000	902	45	58.0	73.5	68.5	64.5	61.4	53.9	45.0	38.9	15.5
2000	902	100	57.3	68.3	64.6	62.3	61.0	55.6	46.9	39.1	11.0
2000	902	115	56.8	69.8	65.0	61.7	60.7	54.6	44.3	38.1	13.0
2000	902	130	56.4	69.2	65.4	62.4	60.5	52.3	44.2	39.1	12.8
2000	902	145	54.1	68.8	63.2	60.3	58.9	49.1	40.7	36.6	14.7
2000	902	200	56.4	70.6	65.6	61.9	60.4	53.1	43.3	37.5	14.2
2000	902	215	54.4	66.5	62.7	60.6	59.1	49.9	39.8	36.0	12.1
2000	902	230	53.1	65.4	62.5	60.3	58.4	46.0	37.4	35.6	12.3
2000	902	245	53.8	65.8	63.0	60.2	58.3	49.0	39.2	34.8	12.0
2000	902	300	53.9	65.6	63.0	60.0	58.6	51.9	39.3	38.6	11.7
2000	902	315	54.0	68.0	63.1	60.1	59.0	52.9	39.2	38.9	14.0
2000	902	330	55.0	70.0	64.0	60.3	59.6	54.9	40.0	39.0	15.0
2000	902	345	55.0	70.3	64.4	60.8	58.8	51.8	39.0	38.6	15.3
2000	902	400	56.9	71.0	64.8	61.5	59.0	49.2	39.2	38.2	14.1
2000	902	415	57.0	71.5	65.0	62.9	60.0	55.6	38.4	38.0	14.5
2000	902	430	59.0	72.4	65.8	64.0	61.0	55.6	37.8	38.5	13.4
2000	902	445	59.7	73.4	67.0	64.4	63.4	56.6	38.0	39.0	13.7
2000	902	500	59.8	74.0	67.2	64.2	62.4	57.8	38.8	39.4	14.2
2000	902	515	59.2	74.2	68.0	63.6	62.1	58.0	39.0	39.9	15.0
2000	902	530	58.5	71.0	66.1	64.7	62.7	54.7	43.7	40.0	12.5
2000	902	545	59.2	71.7	68.2	64.9	63.3	56.5	47.4	40.2	12.5
2000	902	600	60.2	69.3	67.4	65.4	64.2	58.9	47.0	42.6	9.1
2000	902	615	61.5	73.6	69.5	66.1	64.8	60.0	52.6	45.1	12.1
2000	902	630	62.6	72.7	70.5	68.3	66.5	60.3	50.3	43.8	10.1
2000	902	645	63.3	74.6	71.7	67.8	66.1	61.9	54.1	47.6	11.3
2000	902	700	63.0	71.9	69.8	67.5	66.4	61.9	56.2	50.8	8.9
2000	902	715	63.5	76.9	70.2	68.2	67.1	62.0	56.3	45.5	13.4
2000	902	730	63.6	72.5	69.9	68.0	66.9	62.5	57.6	52.9	8.9
2000	902	745	64.2	73.3	70.3	68.2	67.3	63.3	58.5	51.2	9.1
2000	902	800	64.9	75.9	70.7	68.6	67.4	64.4	59.9	54.4	11.0
2000	902	815	63.7	72.8	68.5	66.7	66.0	63.5	59.4	55.3	9.1
2000	902	830	64.1	72.2	69.6	67.6	66.5	63.6	59.8	54.2	8.1
2000	902	845	63.9	74.8	69.5	67.7	66.6	63.3	59.0	53.0	10.9
2000	902	900	64.2	72.8	70.5	68.5	67.1	63.4	59.5	52.5	8.6
2000	902	915	64.4	83.3	70.3	68.0	66.9	63.2	59.4	50.1	18.9
2000	902	930	65.3	84.4	73.1	68.6	67.5	63.8	61.0	51.4	19.1
2000	902	945	64.0	72.1	69.9	67.9	66.7	63.3	59.7	52.7	8.1
2000	902	1000	64.6	80.1	70.1	67.9	66.7	63.7	60.6	54.9	15.5
2000	902	1015	64.0	76.6	70.4	67.7	66.4	63.4	60.2	55.4	12.6
2000	902	1030	63.7	73.1	68.0	66.6	65.9	63.4	60.8	53.9	9.4
2000	902	1045	64.1	73.2	68.4	67.1	66.4	63.9	59.9	52.3	9.1
2000	902	1100	63.9	75.3	69.3	67.2	66.2	63.5	60.6	55.9	11.4
2000	902	1115	63.3	73.3	69.1	66.6	65.6	62.7	59.5	49.6	10.0
2000	902	1130	63.9	72.9	69.9	67.5	66.3	63.3	60.3	52.8	9.0
2000	902	1145	63.6	78.8	70.6	66.8	65.6	62.9	60.1	52.7	15.2
2000	902	1200	63.9	76.4	71.1	67.5	66.1	63.0	60.2	55.7	12.5
2000	902	1215	64.8	78.6	74.0	68.5	66.9	63.3	60.4	56.0	13.8
2000	902	1230	66.9	87.6	77.8	69.6	67.5	63.4	60.8	55.9	20.7
2000	902	1245	64.1	79.1	72.3	67.1	65.8	63.1	60.7	55.8	15.0
2000	902	1300	65.0	80.5	74.2	68.6	66.8	63.6	60.9	56.4	15.5
2000	902	1315	63.9	78.6	71.2	68.1	66.3	62.8	59.4	55.2	14.7
2000	902	1330	62.4	80.2	68.8	65.8	64.7	61.7	58.4	52.9	17.8
2000	902	1345	62.9	79.8	69.2	65.8	64.8	61.9	59.3	55.8	16.9
2000	902	1400	62.9	77.3	69.4	66.6	65.3	62.1	59.1	52.3	14.4
2000	902	1415	63.0	78.7	70.4	66.3	65.0	62.1	59.0	54.3	15.7
2000	902	1430	64.0	79.0	72.0	67.6	65.6	62.1	58.5	54.2	15.0
2000	902	1445	64.1	80.7	73.5	69.2	66.5	62.1	58.9	53.4	16.6
2000	902	1500	66.3	90.9	75.8	67.2	65.3	61.5	57.9	53.2	24.6
2000	902	1515	62.1	76.8	69.5	65.7	64.5	61.0	57.5	51.8	14.7
2000	902	1530	61.7	76.5	68.1	64.9	64.1	61.0	57.8	50.4	14.8
2000	902	1545	62.1	75.9	69.1	65.1	64.1	61.2	58.4	52.9	13.8
2000	902	1600	63.9	87.1	68.9	65.6	64.4	61.3	57.9	52.1	23.2
2000	902	1615	62.7	87.0	68.7	64.7	63.8	61.1	57.2	51.5	24.3
2000	902	1630	61.6	76.5	67.5	64.7	63.9	60.8	56.7	50.9	14.9
2000	902	1645	61.5	70.6	67.2	65.2	64.0	61.0	57.8	53.5	9.1
2000	902	1700	60.8	74.6	66.7	64.3	63.3	60.3	56.3	50.2	13.8
2000	902	1715	61.8	73.3	68.3	65.3	64.0	61.1	57.4	50.8	11.5
2000	902	1730	61.4	70.6	66.4	64.7	64.0	60.9	57.2	50.7	9.2
2000	902	1745	61.5	71.3	66.3	64.7	64.0	61.2	56.5	51.4	9.8
2000	902	1800	64.4	86.1	71.9	66.3	65.1	62.2	58.9	53.9	21.7
2000	902	1815	61.6	70.1	66.3	64.8	64.1	61.5	56.4	49.2	8.5
2000	902	1830	62.3	72.5	67.3	65.5	64.7	62.0	58.3	52.4	10.2
2000	902	1845	62.1	73.3	67.5	65.7	64.9	61.5	57.7	50.3	11.2
2000	902	1900	61.8	70.9	67.4	65.0	64.1	61.4	58.2	53.2	9.1
2000	902	1915	62.9	85.6	66.4	64.6	63.9	61.1	57.6	52.2	22.7
2000	902	1930	62.0	78.8	67.7	65.8	64.7	60.7	56.6	47.6	16.8
2000	902	1945	61.7	73.5	67.2	65.2	64.2	61.2	56.6	50.8	11.8
2000	902	2000	60.9	68.9	66.0	64.8	64.1	60.3	54.9	47.9	8.0
2000	902	2015	60.9	70.2	66.8	64.8	63.9	60.2	54.8	48.3	9.3
2000	902	2030	61.8	78.2	67.4	65.4	64.5	60.9	56.2	48.1	16.4
2000	902	2045	60.1	69.6	65.7	63.9	63.1	59.6	52.8	45.7	9.5
2000	902	2100	61.4	71.3	67.5	64.9	64.0	60.9	55.8	50.9	9.9
2000	902	2115	61.4	77.4	68.4	65.0	64.2	60.1	55.3	48.4	16.0
2000	902	2130	60.8	71.6	67.9	65.0	63.7	59.8	54.1	45.6	10.8
2000	902	2145	59.2	66.8	64.6	63.1	62.2	58.6	53.6	46.8	7.6
2000	902	2200	60.2	66.9	65.3	64.0	63.1	59.4	55.7	51.4	6.7
2000	902	2215	61.5	69.6	66.7	65.1	64.4	61.0	56.0	50.3	8.1
2000	902	2230	59.6	68.2	64.6	63.1	62.2	59.1	54.8	48.1	8.6
2000	902	2245	61.2	69.0	67.3	64.9	64.0	60.7	55.5	50.9	7.8
2000	902	2300	60.3	67.9	66.2	64.6	63.6	59.5	52.5	47.5	7.6
2000	902	2315	60.5	69.8	66.4	64.7	63.6	59.4	55.2	48.2	9.3
2000	902	2330	60.3	68.3	65.2	63.9	63.2	60.0	54.2	47.8	8.0
2000	902	2345	60.7	74.0	66.9	64.6	63.8	59.5	53.0	47.8	13.3
2000	903	0	60.4	71.0	67.1	64.4	63.6	59.4	53.0	47.1	10.6

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	65.3	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	46.8	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	62.1	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	57.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	63.2	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	58.8	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	65.1	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.3	dB(A)

Vineyard Public School, Windsor Road, Vineyard — DAY 5

Sunday 3 September 2000 — RT&A S/N 81

YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	902	2215	61.5	69.6	66.7	65.1	64.4	61.0	56.0	50.3	8.1
2000	902	2230	59.6	68.2	64.6	63.1	62.2	59.1	54.8	48.1	8.6
2000	902	2245	61.2	69.0	67.3	64.9	64.0	60.7	55.5	50.9	7.8
2000	902	2300	60.3	67.9	66.2	64.6	63.6	59.5	52.5	47.5	7.6
2000	902	2315	60.5	69.8	66.4	64.7	63.6	59.4	55.2	48.2	9.3
2000	902	2330	60.3	68.3	65.2	63.9	63.2	60.0	54.2	47.8	8.0
2000	902	2345	60.7	74.0	66.9	64.6	63.8	59.5	53.0	47.8	13.3
2000	903	0	60.4	71.0	67.1	64.4	63.6	59.4	53.0	47.1	10.6
2000	903	15	59.8	69.8	66.3	64.0	63.1	59.0	51.9	43.5	10.0
2000	903	30	60.0	70.0	66.0	64.0	63.0	60.2	53.5	44.7	10.0
2000	903	45	59.7	70.8	65.7	64.1	63.1	58.7	52.7	47.7	11.1
2000	903	100	58.2	69.0	65.2	63.3	62.2	56.2	48.5	39.3	10.8
2000	903	115	57.8	65.2	63.8	62.4	61.5	56.6	50.0	41.9	7.4
2000	903	130	55.5	66.7	63.1	61.2	59.7	53.3	43.2	38.6	11.2
2000	903	145	54.5	67.1	63.9	60.5	58.6	51.0	42.9	38.7	12.6
2000	903	200	57.3	71.0	66.6	62.9	61.4	54.2	44.6	39.7	13.7
2000	903	215	56.5	69.7	65.2	62.4	60.9	53.2	40.5	37.2	13.2
2000	903	230	55.1	69.7	65.3	61.5	59.4	49.9	39.6	37.7	14.6
2000	903	245	53.9	69.0	64.2	60.6	58.3	47.8	39.4	35.7	15.1
2000	903	300	55.1	70.5	63.8	61.4	59.8	49.6	39.6	36.4	15.4
2000	903	315	54.2	67.4	64.0	60.8	59.0	47.6	39.6	35.6	13.2
2000	903	330	53.6	66.3	63.1	60.3	58.7	47.2	37.7	35.0	12.7
2000	903	345	50.3	69.1	60.8	56.5	53.9	45.2	36.6	34.6	18.8
2000	903	400	55.9	79.3	65.9	60.5	57.5	47.6	38.6	35.1	23.4
2000	903	415	53.0	65.5	62.5	60.0	58.2	45.6	38.6	36.1	12.5
2000	903	430	53.4	66.8	63.4	60.4	58.7	46.8	39.7	36.3	13.4
2000	903	445	55.9	73.2	66.4	62.4	60.2	47.0	38.0	35.3	17.3
2000	903	500	54.1	71.5	64.5	60.6	58.7	47.4	37.4	35.8	17.4
2000	903	515	55.8	71.2	67.0	61.7	59.9	50.4	40.5	35.9	15.4
2000	903	530	55.3	70.2	65.1	61.7	60.1	49.7	43.1	37.6	14.9
2000	903	545	55.3	68.3	63.9	61.2	59.7	51.4	43.0	38.4	13.0
2000	903	600	57.3	67.7	65.5	62.8	61.2	54.8	46.5	40.3	10.4
2000	903	615	57.6	69.6	65.9	62.8	61.5	55.0	49.9	43.5	12.0
2000	903	630	58.8	70.0	66.3	63.9	62.5	56.9	49.4	43.2	11.2
2000	903	645	59.2	70.2	66.0	64.3	63.3	57.3	49.1	42.4	11.0
2000	903	700	58.2	67.6	64.9	63.2	62.0	56.6	47.2	41.9	9.4
2000	903	715	59.5	69.1	66.2	64.8	63.5	57.7	49.3	42.4	9.6
2000	903	730	60.6	70.2	67.9	65.7	64.4	59.0	50.3	43.2	9.6
2000	903	745	61.9	73.6	68.9	66.0	64.8	60.9	55.2	45.6	11.7
2000	903	800	62.1	76.8	69.6	66.5	65.1	60.9	55.5	48.7	14.7
2000	903	815	61.0	68.6	67.0	65.5	64.4	59.9	53.9	46.6	7.6
2000	903	830	62.2	72.7	68.0	65.9	65.0	61.6	56.4	52.1	10.5
2000	903	845	61.8	69.9	67.5	65.7	64.8	60.9	56.7	52.4	8.1
2000	903	900	62.7	71.4	69.3	67.0	65.8	61.9	56.9	48.7	8.7
2000	903	915	63.0	81.5	68.4	66.0	65.2	62.1	58.0	52.2	18.5
2000	903	930	63.1	70.4	68.0	66.6	65.7	62.6	58.2	48.0	7.3
2000	903	945	62.5	73.5	67.4	66.1	65.3	62.0	57.3	51.0	11.0
2000	903	1000	63.6	76.4	69.5	66.9	66.0	62.9	59.2	53.9	12.8
2000	903	1015	63.1	72.6	67.5	66.1	65.4	62.9	59.1	53.0	9.5
2000	903	1030	63.0	73.2	68.0	65.9	65.3	62.7	59.5	52.6	10.2
2000	903	1045	62.7	72.7	66.9	65.4	64.9	62.4	59.1	50.7	10.0
2000	903	1100	63.7	81.1	68.1	65.8	65.2	63.3	61.1	57.3	17.4
2000	903	1115	63.9	77.7	70.9	67.3	65.9	63.3	60.5	54.1	13.8
2000	903	1130	63.0	77.7	70.2	65.8	64.9	62.2	59.3	54.4	14.7
2000	903	1145	63.7	80.8	71.8	66.5	65.2	62.5	60.0	57.0	17.1
2000	903	1200	63.2	78.8	71.8	66.0	64.9	62.2	59.6	54.9	15.6
2000	903	1215	64.0	82.2	73.1	66.4	65.0	62.1	58.6	54.0	18.2
2000	903	1230	62.3	75.2	69.6	65.0	64.1	61.7	59.1	54.2	12.9
2000	903	1245	62.6	78.6	71.6	65.6	64.2	61.4	58.1	53.5	16.0
2000	903	1300	62.1	75.0	68.4	65.3	64.1	61.5	58.3	52.9	12.9
2000	903	1315	62.2	77.0	68.3	65.5	64.3	61.4	58.5	53.1	14.8
2000	903	1330	61.5	78.6	67.1	64.3	63.6	60.5	57.8	52.5	17.1
2000	903	1345	61.7	73.0	67.5	64.6	63.7	61.4	58.6	50.8	11.3
2000	903	1400	60.9	68.8	66.1	64.2	63.2	60.6	57.3	50.7	7.9
2000	903	1415	61.2	71.5	67.5	64.1	63.4	60.8	57.3	49.1	10.3
2000	903	1430	61.6	70.7	67.4	65.1	64.0	61.1	57.8	51.7	9.1
2000	903	1445	61.5	73.7	67.2	64.6	63.4	61.0	58.5	51.4	12.2
2000	903	1500	62.0	73.0	68.4	65.7	64.2	61.3	58.0	54.3	11.0
2000	903	1515	62.6	79.8	69.8	65.7	64.1	61.7	59.4	51.6	17.2
2000	903	1530	62.5	77.7	71.3	65.8	64.4	61.4	58.2	53.7	15.2
2000	903	1545	62.8	79.3	68.4	65.9	64.8	61.9	59.8	55.6	16.5
2000	903	1600	62.5	75.7	68.8	65.1	64.4	61.9	59.7	54.2	13.2
2000	903	1615	63.6	79.5	71.9	66.9	65.2	62.2	59.6	55.0	15.9
2000	903	1630	62.3	81.1	67.4	64.8	64.0	61.9	59.8	55.8	18.8
2000	903	1645	62.5	70.1	66.9	65.3	64.4	62.2	59.8	55.3	7.6
2000	903	1700	62.2	73.5	67.6	65.1	64.0	61.8	59.6	56.4	11.3
2000	903	1715	61.8	70.4	66.1	64.4	63.8	61.6	59.0	53.2	8.6
2000	903	1730	62.7	83.4	66.9	64.6	64.1	62.4	60.2	54.5	20.7
2000	903	1745	63.1	74.7	68.6	66.2	65.2	62.6	60.4	57.0	11.6
2000	903	1800	63.0	72.0	68.0	65.7	65.0	62.7	59.8	54.3	9.0
2000	903	1815	62.4	75.9	69.0	65.4	64.6	61.9	58.2	52.8	13.5
2000	903	1830	62.2	69.4	66.1	64.8	64.3	62.0	58.9	52.5	7.2
2000	903	1845	63.2	80.8	69.4	66.0	65.1	62.5	59.0	52.3	17.6
2000	903	1900	62.8	72.8	68.2	66.0	65.1	62.5	58.8	51.1	10.0
2000	903	1915	62.0	69.6	66.6	65.2	64.5	61.7	57.5	49.6	7.6
2000	903	1930	62.0	71.1	68.3	66.0	65.0	61.3	55.2	50.9	9.1
2000	903	1945	62.0	92.6	66.6	64.5	63.8	60.8	57.2	48.4	30.6
2000	903	2000	61.5	75.1	67.5	65.2	64.4	60.6	56.2	50.0	13.6
2000	903	2015	60.9	70.7	66.5	64.7	63.7	60.2	55.7	47.3	9.8
2000	903	2030	60.8	68.1	65.9	64.7	63.7	60.2	55.9	51.1	7.3
2000	903	2045	61.2	74.2	66.4	64.9	64.0	60.6	56.1	50.5	13.0
2000	903	2100	60.3	74.7	65.6	64.0	63.2	59.5	54.5	48.7	14.4
2000	903	2115	60.4	68.0	66.1	64.5	63.5	59.7	53.4	48.6	7.6
2000	903	2130	60.6	71.6	68.4	64.9	63.6	59.2	52.2	45.1	11.0
2000	903	2145	60.2	70.0	66.3	64.3	63.4	59.2	54.0	44.9	9.8
2000	903	2200	59.2	72.1	66.6	63.4	62.4	58.0	52.1	42.8	12.9
2000	903	2215	59.8	71.7	67.6	64.9	63.5	58.2	50.2	43.5	11.9
2000	903	2230	58.4	68.6	65.2	62.9	61.9	56.9	50.5	44.7	10.2
2000	903	2245	58.3	68.3	64.7	62.9	61.9	57.3	49.2	43.7	10.0
2000	903	2300	59.3	71.2	67.3	64.3	62.8	57.5	50.2	43.9	11.9
2000	903	2315	57.8	70.1	64.7	62.4	61.3	56.5	47.5	38.1	12.3
2000	903	2330	58.7	71.6	68.4	64.0	62.0	56.4	47.4	39.3	12.9
2000	903	2345	58.4	71.2	67.2	64.0	62.3	55.8	45.1	39.1	12.8
2000	904	0	55.9	66.6	63.7	61.3	59.9	53.7	44.3	37.6	10.7

DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	63.6	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	45.1	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	60.9	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	57.7	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	62.2	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	57.9	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	64.0	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	49.3	dB(A)

Vineyard Public School, Windsor Road, Vineyard — DAY 6

Monday 4 September 2000 — RT&A S/N 81

YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	903	2215	59.8	71.7	67.6	64.9	63.5	58.2	50.2	43.5	11.9
2000	903	2230	58.4	68.6	65.2	62.9	61.9	56.9	50.5	44.7	10.2
2000	903	2245	58.3	68.3	64.7	62.9	61.9	57.3	49.2	43.7	10.0
2000	903	2300	59.3	71.2	67.3	64.3	62.8	57.5	50.2	43.9	11.9
2000	903	2315	57.8	70.1	64.7	62.4	61.3	56.5	47.5	38.1	12.3
2000	903	2330	58.7	71.6	68.4	64.0	62.0	56.4	47.4	39.3	12.9
2000	903	2345	58.4	71.2	67.2	64.0	62.3	55.8	45.1	39.1	12.8
2000	904	0	55.9	66.6	63.7	61.3	59.9	53.7	44.3	37.6	10.7
2000	904	15	53.6	69.1	63.4	59.8	58.1	49.1	40.6	36.5	15.5
2000	904	30	56.9	73.1	67.1	62.5	60.8	52.7	42.6	36.8	16.2
2000	904	45	56.1	73.5	65.6	62.5	60.3	50.6	41.7	38.2	17.4
2000	904	100	55.3	73.2	65.5	61.5	59.1	50.3	40.3	36.4	17.9
2000	904	115	55.5	74.9	67.6	61.3	58.7	49.0	41.9	37.5	19.4
2000	904	130	55.8	70.4	66.4	62.4	60.0	50.3	39.5	34.2	14.6
2000	904	145	54.4	69.4	64.9	61.1	58.8	49.5	41.0	34.5	15.0
2000	904	200	53.2	69.2	64.4	60.5	57.1	46.0	37.8	34.8	16.0
2000	904	215	53.9	69.9	65.0	60.3	57.8	47.0	39.4	36.2	16.0
2000	904	230	51.3	67.2	62.9	57.9	54.6	45.5	40.2	38.0	15.9
2000	904	245	56.1	75.9	68.4	62.0	59.4	48.9	41.2	38.0	19.8
2000	904	300	53.8	71.1	65.5	59.4	57.1	48.4	40.6	36.0	17.3
2000	904	315	54.7	71.3	67.3	61.0	57.6	47.0	40.6	37.5	16.6
2000	904	330	55.0	72.7	66.5	61.7	58.5	48.2	40.0	37.3	17.7
2000	904	345	58.9	73.3	69.1	66.2	63.6	53.2	42.1	37.2	14.4
2000	904	400	57.7	74.3	70.7	63.4	60.4	49.5	43.3	40.2	16.6
2000	904	415	58.6	73.0	68.3	65.1	63.2	53.7	47.5	42.6	14.4
2000	904	430	59.6	73.0	70.0	65.4	63.3	55.0	48.8	43.7	13.4
2000	904	445	58.9	71.5	67.7	64.1	62.7	56.3	50.0	45.7	12.6
2000	904	500	60.4	74.2	69.0	66.1	64.3	57.4	49.7	44.8	13.8
2000	904	515	61.4	72.0	68.9	66.4	65.1	59.8	53.0	48.7	10.6
2000	904	530	63.5	75.2	72.5	67.9	66.3	61.8	56.9	51.1	11.7
2000	904	545	64.8	75.2	71.9	69.3	67.7	63.5	59.5	55.2	10.4
2000	904	600	65.5	76.2	72.1	69.1	68.0	64.9	60.5	55.2	10.7
2000	904	615	66.0	74.3	71.5	69.5	68.4	65.4	62.1	56.6	8.3
2000	904	630	66.1	73.8	71.5	69.7	68.5	65.7	62.1	57.6	7.7
2000	904	645	66.4	75.0	72.1	70.0	69.0	65.8	62.0	56.6	8.6
2000	904	700	67.5	81.7	73.4	70.7	69.8	66.9	63.5	58.4	14.2
2000	904	715	67.2	75.4	72.4	71.2	70.0	66.5	63.3	59.1	8.2
2000	904	730	67.4	79.3	73.1	71.1	70.0	66.6	63.4	58.9	11.9
2000	904	745	67.4	81.8	72.8	70.8	69.8	66.8	64.2	60.8	14.4
2000	904	800	67.8	79.2	74.8	71.7	70.5	66.9	63.8	56.3	11.4
2000	904	815	66.2	73.4	71.1	69.7	68.8	65.7	63.0	57.4	7.2
2000	904	830	66.8	74.4	72.3	70.3	69.4	66.1	63.1	57.2	7.6
2000	904	845	66.0	76.0	72.1	69.5	68.5	65.4	61.8	55.7	10.0
2000	904	900	67.1	77.6	72.8	70.9	69.7	66.2	63.6	55.4	10.5
2000	904	915	66.8	77.1	73.5	70.8	69.5	65.8	62.0	54.9	10.3
2000	904	930	65.8	75.8	72.1	70.0	69.0	64.7	60.4	51.9	10.0
2000	904	945	66.9	78.6	74.6	71.2	70.1	65.5	61.3	54.8	11.7
2000	904	1000	66.2	80.3	74.4	70.7	69.4	64.4	60.1	50.3	14.1
2000	904	1015	65.9	73.9	71.6	70.1	69.2	64.8	61.1	53.6	8.0
2000	904	1030	65.0	74.1	71.7	69.1	68.1	64.0	60.2	53.5	9.1
2000	904	1045	66.1	76.8	72.9	70.7	69.6	64.5	60.7	55.8	10.7
2000	904	1100	64.5	75.5	71.5	68.9	67.7	63.4	58.8	49.8	11.0
2000	904	1115	64.8	76.7	71.1	68.8	67.7	63.8	60.0	53.2	11.9
2000	904	1130	66.0	80.7	71.8	69.8	68.7	65.1	61.5	56.3	14.7
2000	904	1145	64.9	81.9	72.6	68.8	67.4	63.4	59.6	55.5	17.0
2000	904	1200	63.7	75.3	71.3	67.8	66.5	62.6	58.3	49.6	11.6
2000	904	1215	63.9	77.4	71.3	68.1	66.9	62.5	58.1	49.8	13.5
2000	904	1230	63.6	75.6	71.7	68.5	66.9	62.0	57.3	52.6	12.0
2000	904	1245	63.6	75.2	72.0	67.6	66.1	62.1	58.8	54.0	11.6
2000	904	1300	63.9	78.3	71.2	68.0	66.7	62.8	57.9	50.4	14.4
2000	904	1315	64.2	76.0	71.3	68.6	67.4	62.8	58.9	52.0	11.8
2000	904	1330	64.1	73.2	69.2	67.7	66.8	63.4	60.2	53.0	9.1
2000	904	1345	64.1	77.7	72.1	69.1	67.7	62.0	57.1	49.3	13.6
2000	904	1400	63.4	77.7	71.8	68.1	66.4	61.9	56.6	48.8	14.3
2000	904	1415	62.7	72.6	69.2	66.8	65.6	61.8	57.5	51.6	9.9
2000	904	1430	62.3	70.1	67.5	66.0	65.3	61.6	57.6	51.4	7.8
2000	904	1445	64.5	82.3	74.0	68.0	66.7	62.5	58.6	52.1	17.8
2000	904	1500	64.1	78.5	71.5	68.3	67.0	62.8	58.9	53.4	14.4
2000	904	1515	63.3	73.6	69.8	67.5	66.0	62.5	59.0	54.0	10.3
2000	904	1530	63.8	80.6	71.1	66.9	65.8	63.1	60.5	53.9	16.8
2000	904	1545	63.8	86.7	69.9	66.7	65.5	62.2	59.0	54.8	22.9
2000	904	1600	63.4	72.0	70.0	67.0	65.9	62.7	59.7	54.1	8.6
2000	904	1615	63.5	75.5	69.7	67.0	66.0	62.7	59.5	55.6	12.0
2000	904	1630	63.6	75.2	69.5	67.2	66.0	63.0	59.9	53.4	11.6
2000	904	1645	63.1	76.8	69.8	66.4	65.2	62.3	58.7	51.0	13.7
2000	904	1700	63.4	73.1	70.0	66.8	65.6	62.6	60.0	56.2	9.7
2000	904	1715	63.0	79.8	69.2	66.2	65.2	62.2	58.7	54.5	16.8
2000	904	1730	63.0	71.8	67.8	66.3	65.5	62.6	59.0	50.1	8.8
2000	904	1745	63.2	73.3	69.7	66.8	65.6	62.7	58.7	51.5	10.1
2000	904	1800	63.6	73.9	69.8	67.1	66.1	63.0	59.7	55.6	10.3
2000	904	1815	63.3	73.5	68.8	66.9	65.8	62.8	59.1	53.1	10.2
2000	904	1830	63.2	71.8	68.3	66.8	65.9	62.5	59.1	53.4	8.6
2000	904	1845	63.0	72.0	69.0	67.0	65.6	61.6	57.5	51.7	9.0
2000	904	1900	62.9	76.3	70.2	66.9	65.4	61.8	57.4	50.2	13.4
2000	904	1915	63.2	79.9	70.8	67.0	65.6	61.9	58.1	48.6	16.7
2000	904	1930	61.8	70.3	67.5	65.9	64.6	61.2	56.7	51.6	8.5
2000	904	1945	60.4	68.2	65.8	64.1	63.3	60.1	53.4	46.0	7.8
2000	904	2000	60.8	72.1	68.5	64.9	63.4	59.8	54.3	46.5	11.3
2000	904	2015	60.0	68.2	65.9	64.1	63.1	58.8	53.8	47.7	8.2
2000	904	2030	60.2	70.4	66.0	64.0	63.1	59.6	53.8	46.3	10.2
2000	904	2045	59.6	66.7	65.2	63.9	63.1	58.7	51.8	42.3	7.1
2000	904	2100	61.0	72.4	67.6	65.6	64.4	59.7	54.1	46.8	11.4
2000	904	2115	60.9	73.3	68.4	65.2	63.9	59.4	54.4	48.0	12.4
2000	904	2130	62.0	77.0	71.4	66.8	64.8	60.1	54.5	42.9	15.0
2000	904	2145	60.0	70.8	67.3	65.1	63.9	58.1	50.9	44.0	10.8
2000	904	2200	59.6	75.8	66.1	64.3	63.1	58.2	51.2	40.0	16.2
2000	904	2215	60.1	70.4	66.7	64.2	63.1	59.1	53.9	47.7	10.3
2000	904	2230	59.4	72.5	68.9	64.1	62.4	57.6	50.8	43.7	13.1
2000	904	2245	58.2	70.3	65.4	63.4	62.2	56.4	46.8	38.5	12.1
2000	904	2300	60.2	73.8	69.2	65.1	63.2	58.2	51.7	41.6	13.6
2000	904	2315	58.1	67.8	65.1	62.9	61.8	56.7	49.9	44.0	9.7
2000	904	2330	58.5	70.2	66.2	63.4	62.2	56.8	48.8	44.1	11.7
2000	904	2345	58.0	72.7	68.4	63.6	61.5	54.3	46.0	38.7	14.7
2000	905	0	57.4	73.1	66.8	63.3	61.8	53.3	41.5	38.9	15.7

DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	67.5	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	49.0	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	63.3	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	58.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	64.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	60.8	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	66.3	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.6	dB(A)

Vineyard Public School, Windsor Road, Vineyard											DAY 7
Tuesday 5 September 2000									RT&A S/N 81		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	904	2215	60.1	70.4	66.7	64.2	63.1	59.1	53.9	47.7	10.3
2000	904	2230	59.4	72.5	68.9	64.1	62.4	57.6	50.8	43.7	13.1
2000	904	2245	58.2	70.3	65.4	63.4	62.2	56.4	46.8	38.5	12.1
2000	904	2300	60.2	73.8	69.2	65.1	63.2	58.2	51.7	41.6	13.6
2000	904	2315	58.1	67.8	65.1	62.9	61.8	56.7	49.9	44.0	9.7
2000	904	2330	58.5	70.2	66.2	63.4	62.2	56.8	48.8	44.1	11.7
2000	904	2345	58.0	72.7	68.4	63.6	61.5	54.3	46.0	38.7	14.7
2000	905	0	57.4	73.1	66.8	63.3	61.8	53.3	41.5	38.9	15.7
2000	905	15	58.9	71.4	66.9	64.6	63.0	56.0	48.1	41.9	12.5
2000	905	30	54.8	70.5	65.5	60.8	59.0	49.6	39.4	35.3	15.7
2000	905	45	55.9	73.0	67.4	62.5	60.0	47.8	40.3	35.9	17.1
2000	905	100	53.4	67.7	63.5	60.4	58.5	44.7	36.0	34.2	14.3
2000	905	115	53.0	65.0	62.0	59.4	57.7	48.8	40.5	35.9	12.0
2000	905	130	56.3	71.8	69.1	62.6	59.8	47.2	38.0	34.5	15.5
2000	905	145	52.0	68.5	63.1	59.6	56.8	41.4	34.7	33.4	16.5
2000	905	200	55.0	72.9	66.0	61.3	58.4	45.6	35.6	33.8	17.9
2000	905	215	55.3	70.8	67.7	62.1	58.8	44.7	37.2	34.8	15.5
2000	905	230	56.2	71.9	67.5	63.1	60.0	46.6	35.7	34.1	15.7
2000	905	245	52.2	65.2	62.7	59.7	57.4	43.0	37.8	35.2	13.0
2000	905	300	53.8	73.7	65.3	59.7	57.4	47.3	39.8	36.0	19.9
2000	905	315	52.7	69.9	64.4	59.6	56.7	41.9	36.3	34.6	17.2
2000	905	330	56.5	72.6	67.5	62.9	60.5	50.5	42.1	37.3	16.1
2000	905	345	52.5	65.5	62.6	60.2	58.1	44.3	36.4	34.0	13.0
2000	905	400	56.2	72.8	68.8	63.0	60.0	46.8	36.0	33.8	16.6
2000	905	415	57.2	70.3	65.9	63.3	61.6	53.3	42.8	35.0	13.1
2000	905	430	60.5	74.8	70.9	67.0	64.7	53.5	42.2	37.5	14.3
2000	905	445	57.9	71.0	67.9	63.3	61.6	53.8	42.9	36.5	13.1
2000	905	500	61.6	73.7	70.4	67.4	65.7	58.4	50.5	43.0	12.1
2000	905	515	61.2	72.8	70.1	67.0	64.7	58.9	52.3	45.7	11.6
2000	905	530	62.6	73.9	70.0	67.4	65.9	61.2	55.8	49.4	11.3
2000	905	545	64.6	74.4	71.1	69.2	67.6	63.7	58.8	53.5	9.8
2000	905	600	65.6	77.6	70.8	68.9	68.0	65.1	61.6	56.5	12.0
2000	905	615	65.1	72.0	69.9	68.4	67.7	64.9	60.7	54.9	6.9
2000	905	630	65.8	75.6	70.6	68.8	68.1	65.4	62.2	54.8	9.8
2000	905	645	66.3	74.6	71.3	69.6	68.6	65.9	62.6	56.5	8.3
2000	905	700	66.2	74.6	71.4	69.5	68.3	65.8	63.5	60.6	8.4
2000	905	715	66.1	76.5	71.7	69.7	68.5	65.7	62.6	56.7	10.4
2000	905	730	65.4	78.9	70.0	68.7	67.8	65.1	61.4	53.7	13.5
2000	905	745	66.3	74.6	70.8	69.3	68.5	66.1	62.5	55.5	8.3
2000	905	800	65.8	74.4	71.5	69.0	68.2	65.3	62.7	55.3	8.6
2000	905	815	66.4	76.5	72.2	69.9	68.9	65.7	63.2	56.9	10.1
2000	905	830	65.5	81.6	70.8	68.8	68.0	64.9	61.3	56.7	16.1
2000	905	845	65.5	74.7	71.3	69.5	68.3	64.7	61.8	56.5	9.2
2000	905	900	66.1	76.2	72.3	69.8	68.8	65.4	61.8	55.7	10.1
2000	905	915	65.6	74.2	70.7	68.9	68.0	65.2	61.9	53.5	8.6
2000	905	930	65.4	73.6	71.1	69.3	68.3	64.6	60.7	52.9	8.2
2000	905	945	64.4	72.8	70.5	68.4	67.2	63.6	60.1	56.3	8.4
2000	905	1000	65.2	72.9	70.9	69.4	68.3	64.4	60.6	54.3	7.7
2000	905	1015	64.6	74.7	71.1	69.0	67.3	63.5	59.9	55.9	10.1
2000	905	1030	65.3	75.7	71.5	69.2	68.1	64.4	60.3	54.3	10.4
2000	905	1045	65.3	79.3	71.1	69.3	68.4	64.3	60.7	55.0	14.0
2000	905	1100	66.8	79.8	73.1	70.6	69.6	65.8	62.6	58.2	13.0
2000	905	1115	65.8	76.2	71.3	69.5	68.7	65.1	61.4	54.1	10.4
2000	905	1130	64.3	79.7	70.8	68.4	67.2	63.2	59.4	53.0	15.4
2000	905	1145	64.5	74.8	70.5	68.2	67.0	63.8	60.6	56.9	10.3
2000	905	1200	64.1	76.5	70.7	68.3	67.2	62.8	58.9	53.1	12.4
2000	905	1215	66.0	78.3	72.9	70.3	69.1	64.8	61.0	56.7	12.3
2000	905	1230	66.0	81.0	72.7	70.4	69.0	64.8	61.4	56.6	15.0
2000	905	1245	66.2	78.9	73.9	70.5	69.1	64.8	61.8	57.0	12.7
2000	905	1300	65.9	80.3	73.7	70.3	68.9	64.3	60.8	55.7	14.4
2000	905	1315	65.7	79.3	74.2	70.4	68.4	63.9	60.6	56.6	13.6
2000	905	1330	66.3	82.5	73.2	70.5	69.2	65.0	61.4	55.0	16.2
2000	905	1345	66.5	80.1	73.4	70.7	69.4	65.2	61.8	57.2	13.6
2000	905	1400	66.5	81.9	75.2	71.0	69.3	64.7	61.0	55.8	15.4
2000	905	1415	69.3	90.7	80.5	73.6	70.9	65.1	61.1	56.0	21.4
2000	905	1430	64.5	78.2	72.2	68.8	67.4	63.0	59.6	54.6	13.7
2000	905	1445	68.0	92.7	76.9	73.1	70.8	65.4	61.5	56.9	24.7
2000	905	1500	65.6	80.5	74.4	69.9	68.4	63.7	60.6	57.2	14.9
2000	905	1515	69.2	92.4	78.8	74.7	72.1	65.6	62.4	58.9	23.2
2000	905	1530	67.0	81.6	76.2	72.2	69.8	64.8	61.6	56.7	14.6
2000	905	1545	66.2	83.1	74.1	71.1	69.5	64.3	61.5	56.5	16.9
2000	905	1600	65.7	83.5	75.2	69.7	67.9	63.6	60.2	55.5	17.8
2000	905	1615	67.1	85.8	76.0	71.7	69.8	64.7	61.9	58.2	18.7
2000	905	1630	64.3	77.2	70.9	67.9	66.6	63.2	60.6	57.1	12.9
2000	905	1645	63.9	76.0	71.3	67.7	66.6	62.8	60.1	56.7	12.1
2000	905	1700	64.3	80.2	71.7	68.0	66.7	63.1	60.4	56.1	15.9
2000	905	1715	63.8	79.0	71.6	67.2	65.8	62.7	60.3	56.9	15.2
2000	905	1730	64.4	79.1	73.1	68.5	66.6	62.9	60.1	54.2	14.7
2000	905	1745	63.3	76.3	69.5	66.6	65.5	62.7	59.7	54.7	13.0
2000	905	1800	62.9	74.1	69.0	66.4	65.2	62.1	59.5	55.4	11.2
2000	905	1815	62.6	69.9	67.6	65.6	64.9	62.3	59.0	53.1	7.3
2000	905	1830	63.1	76.9	71.1	66.8	65.3	61.8	58.3	51.5	13.8
2000	905	1845	63.7	78.2	72.4	67.4	65.9	62.5	59.0	55.2	14.5
2000	905	1900	62.2	76.2	69.0	66.1	65.0	61.2	57.2	51.8	14.0
2000	905	1915	62.4	75.9	69.7	66.7	64.9	61.2	57.5	53.3	13.5
2000	905	1930	62.2	80.0	68.6	65.9	64.7	61.3	56.2	49.5	17.8
2000	905	1945	61.2	71.7	67.2	64.9	64.0	60.6	55.4	49.2	10.5
2000	905	2000	60.9	81.8	67.7	64.6	63.5	59.7	54.9	48.3	20.9
2000	905	2015	60.5	72.0	67.1	64.6	63.5	59.4	54.4	48.6	11.5
2000	905	2030	59.9	71.9	67.2	64.8	63.0	58.8	52.9	46.0	12.0
2000	905	2045	60.5	73.6	69.1	64.6	63.3	59.1	53.4	46.0	13.1
2000	905	2100	58.5	69.1	65.2	63.2	61.9	57.4	50.8	46.1	10.6
2000	905	2115	60.1	78.0	70.0	64.5	62.5	58.1	50.0	43.8	17.9
2000	905	2130	59.2	70.5	65.5	63.4	62.5	58.1	51.9	43.5	11.3
2000	905	2145	60.3	76.4	67.3	64.8	63.6	59.2	51.7	44.5	16.1
2000	905	2200	58.9	66.6	65.0	63.4	62.3	57.9	52.1	46.4	7.7
2000	905	2215	59.0	68.9	65.8	63.9	62.6	57.5	52.0	44.0	9.9
2000	905	2230	60.7	73.8	70.6	65.2	63.6	58.5	51.7	44.4	13.1
2000	905	2245	60.0	71.0	67.8	64.8	63.6	58.3	50.5	43.0	11.0
2000	905	2300	57.7	68.3	65.2	62.9	61.7	55.3	48.0	39.6	10.6
2000	905	2315	56.3	69.1	64.2	61.7	60.6	52.4	42.5	36.2	12.8
2000	905	2330	57.9	68.1	65.6	63.2	62.0	55.9	47.6	41.5	10.2
2000	905	2345	56.3	65.9	63.8	61.6	60.6	53.9	45.1	39.5	9.6
2000	906	0	57.2	74.2	67.9	62.2	60.6	53.4	44.7	36.1	17.0

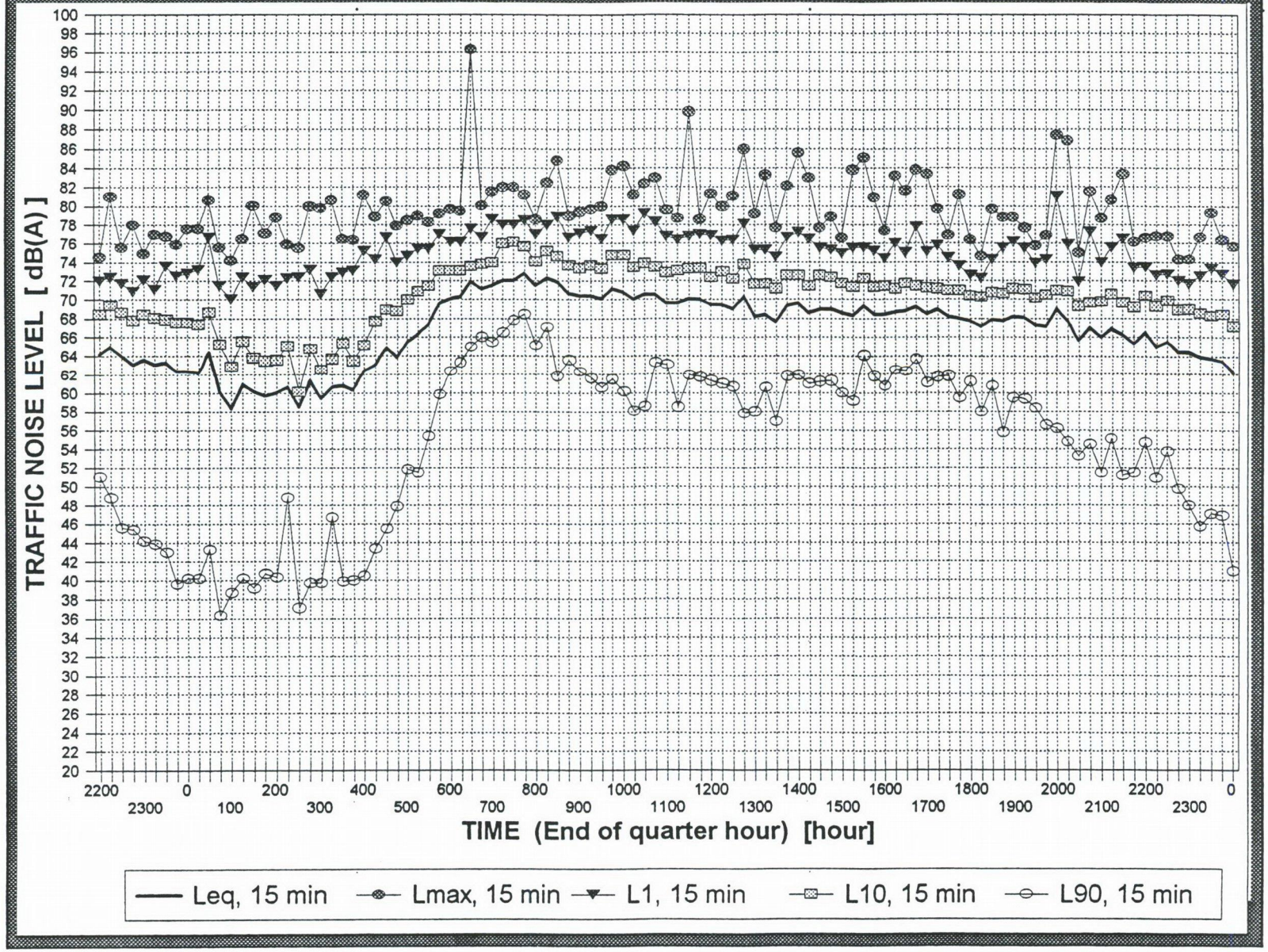
DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Daytime	max Leq, 1 hour outdo	between 07:00 and 22:00 hours	67.6	dB(A)
Daytime	max Leq, 1 hour indoor	between 07:00 and 22:00 hours	49.1	dB(A)
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	63.8	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	58.7	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	65.0	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	60.5	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	66.6	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	58.9	dB(A)

281 Windsor Road, Vineyard

DAY 1

Wednesday 30 August 2000

RT&A S/N 80



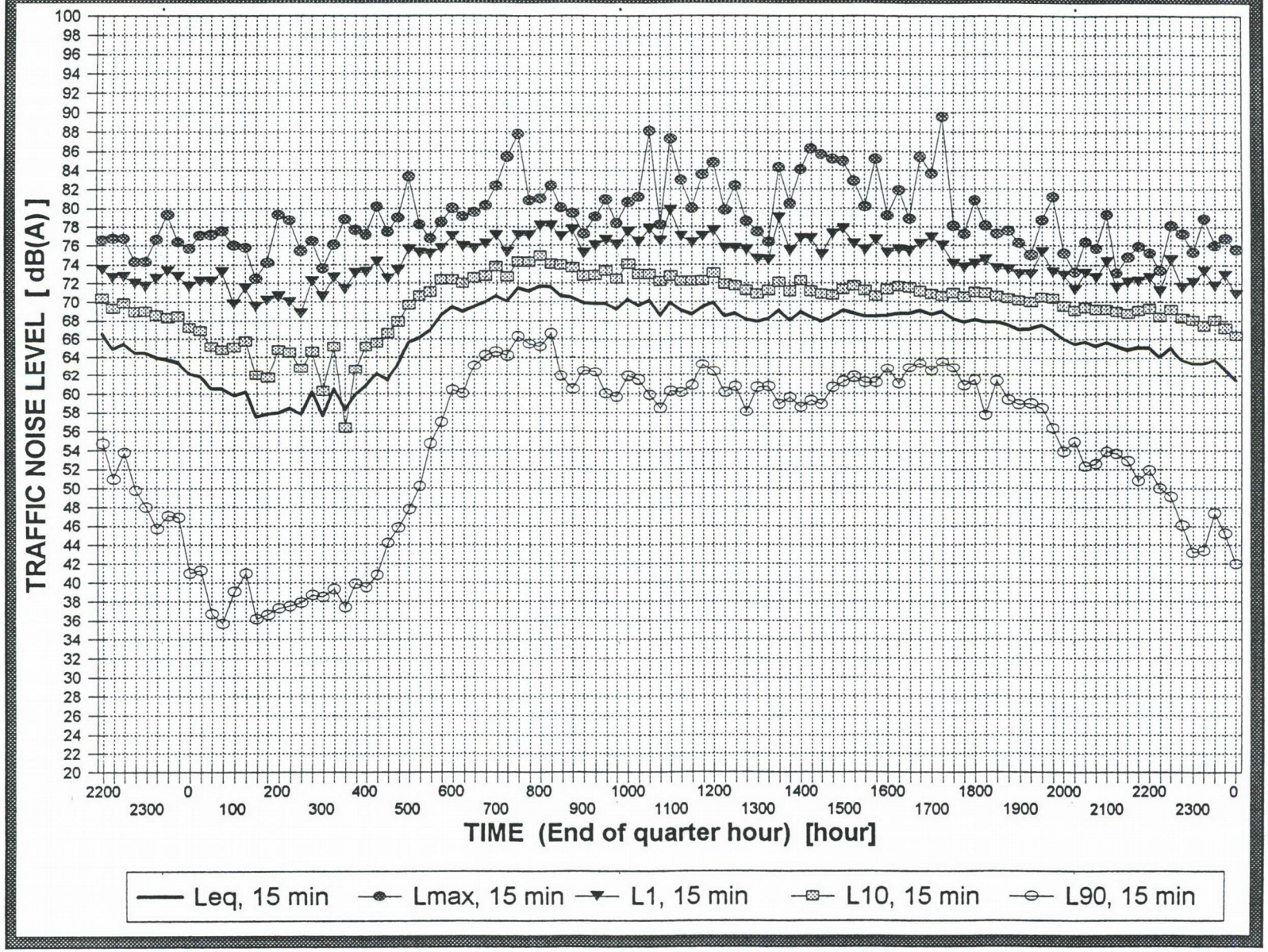
KOIKAS ACOUSTICS PTY LTD

281 Windsor Road, Vineyard

DAY 2

Thursday 31 August 2000

RT&A S/N 80



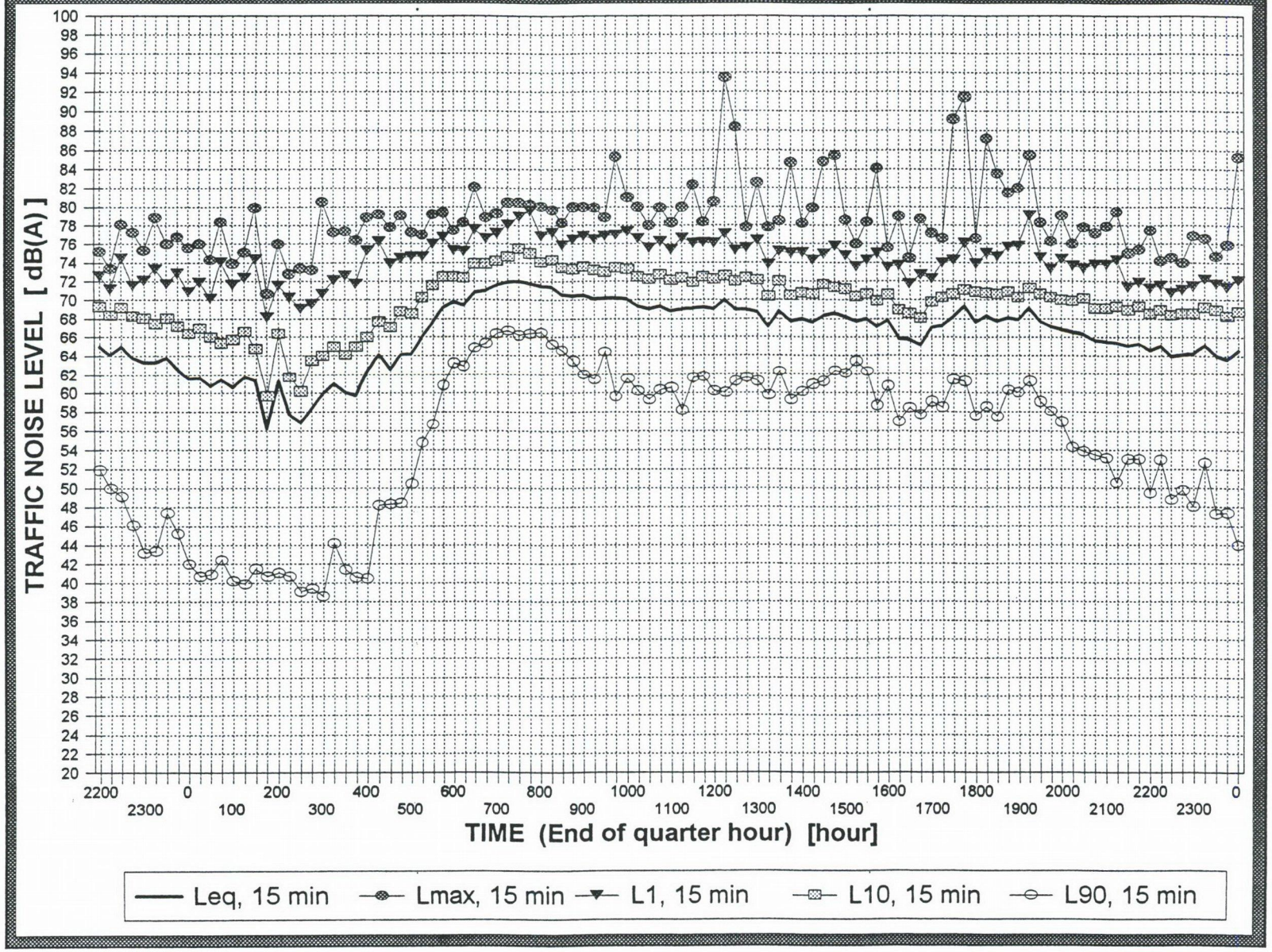
KOIKAS ACOUSTICS PTY LTD

281 Windsor Road, Vineyard

DAY 3

Friday 1 September 2000

RT&A S/N 80



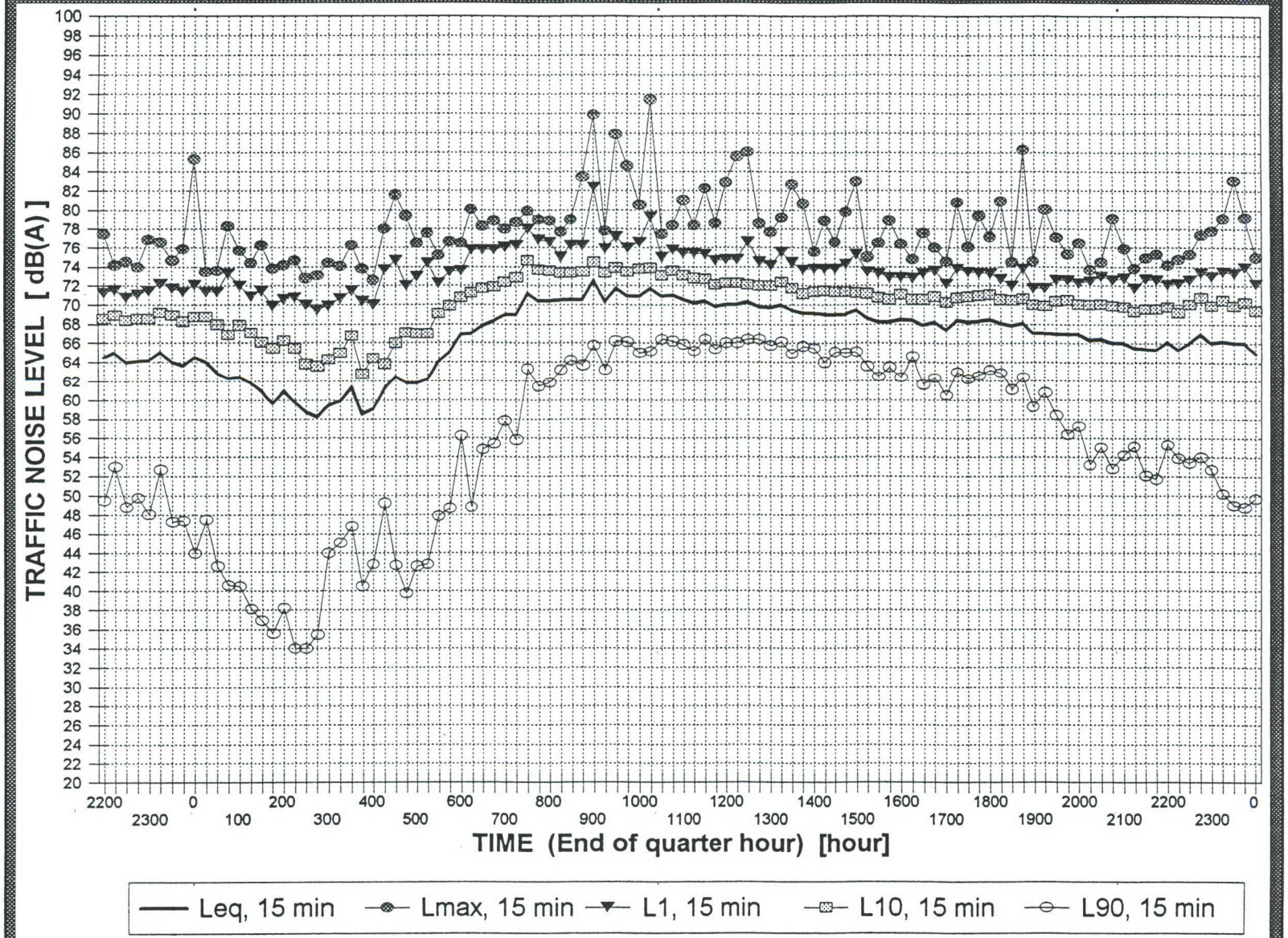
KOIKAS ACOUSTICS PTY LTD

281 Windsor Road, Vineyard

DAY 4

Saturday 2 September 2000

RT&A S/N 80



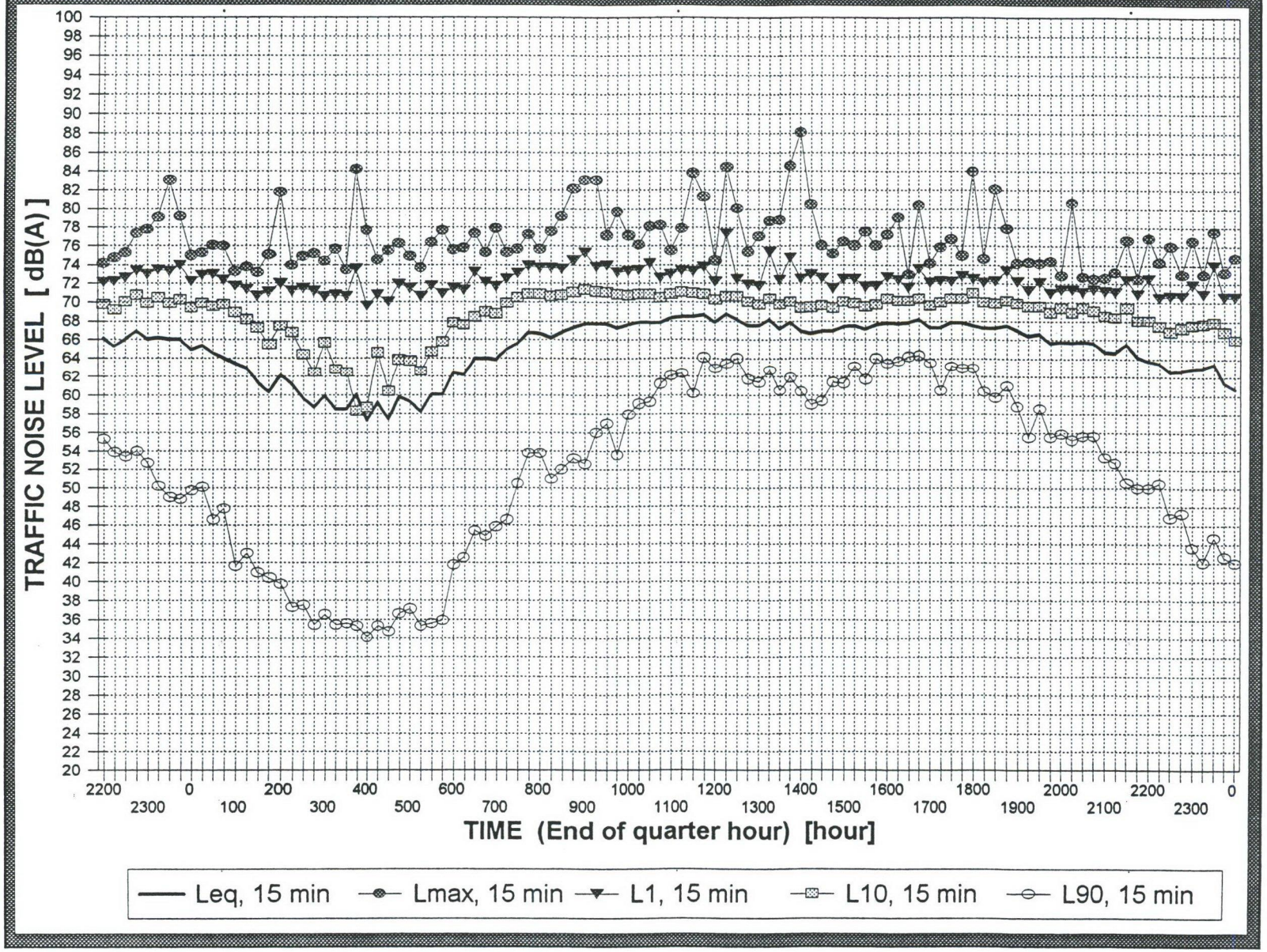
KOIKAS ACOUSTICS PTY LTD

281 Windsor Road, Vineyard

DAY 5

Sunday 3 September 2000

RT&A S/N 80



KOIKAS ACOUSTICS PTY LTD

281 Windsor Road, Vineyard

DAY 6

Monday 4 September 2000

RT&A S/N 80



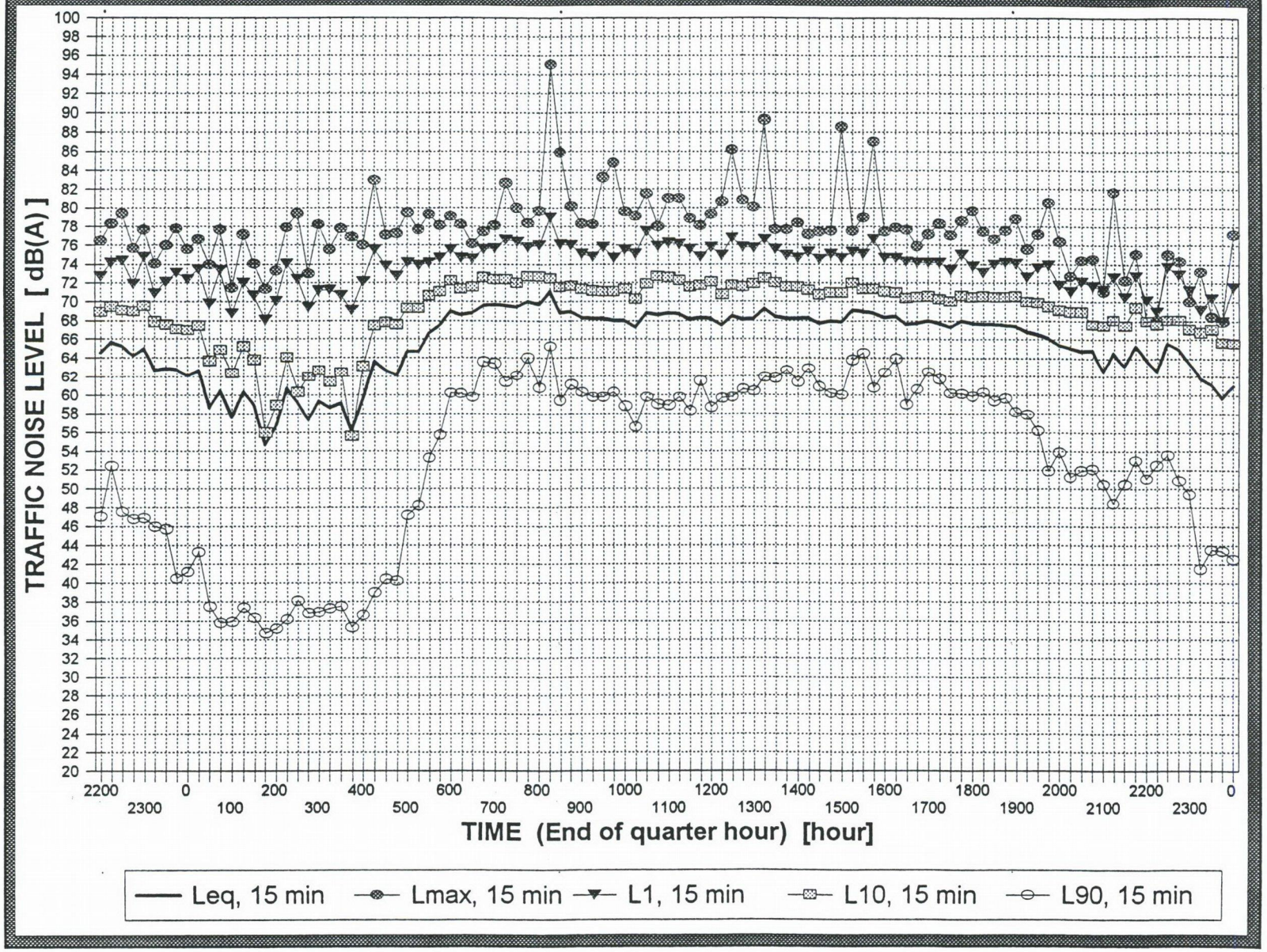
KOIKAS ACOUSTICS PTY LTD

281 Windsor Road, Vineyard

DAY 7

Tuesday 5 September 2000

RT&A S/N 80



281 Windsor Road, Vineyard											DAY 1
Wednesday 30 August 2000										RT&A S/N 80	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	829	2215	65.0	81.0	72.4	70.5	69.4	61.8	48.8	40.4	16.0
2000	829	2230	64.0	75.6	71.8	69.7	68.7	59.4	45.6	40.2	11.6
2000	829	2245	63.1	78.0	70.9	69.0	67.8	57.5	45.4	40.1	14.9
2000	829	2300	63.6	74.9	72.1	69.9	68.5	58.1	44.2	35.8	11.3
2000	829	2315	63.1	77.0	71.1	69.3	68.1	56.3	43.9	40.4	13.9
2000	829	2330	63.3	76.8	73.6	69.6	67.9	55.7	43.0	36.9	13.5
2000	829	2345	62.4	75.9	72.5	69.4	67.6	53.2	39.6	34.9	13.5
2000	830	0	62.4	77.6	72.8	69.4	67.6	53.4	40.2	36.6	15.2
2000	830	15	62.2	77.6	73.2	69.4	67.4	49.8	40.2	36.3	15.4
2000	830	30	64.4	80.7	76.7	71.2	68.7	52.6	43.3	36.9	16.3
2000	830	45	60.1	75.6	71.5	67.6	65.3	44.7	36.3	34.4	15.5
2000	830	100	58.3	74.2	70.1	66.8	62.9	46.4	38.7	35.4	15.9
2000	830	115	60.9	76.5	72.4	68.3	65.6	48.9	40.2	36.6	15.6
2000	830	130	60.2	80.1	71.4	66.8	63.8	44.9	39.2	37.5	19.9
2000	830	145	59.7	77.1	72.1	67.2	63.5	47.6	40.7	37.4	17.4
2000	830	200	60.0	78.8	71.5	67.3	63.6	49.6	40.3	36.5	18.8
2000	830	215	60.6	75.9	72.3	68.3	65.1	52.3	48.8	42.8	15.3
2000	830	230	58.5	75.5	72.4	65.6	60.1	44.5	37.1	35.6	17.0
2000	830	245	61.3	80.0	73.2	68.1	64.8	50.7	39.7	37.0	18.7
2000	830	300	59.4	79.8	70.6	66.5	62.6	47.4	39.7	37.0	20.4
2000	830	315	60.6	80.7	72.4	67.5	63.7	49.2	46.7	44.1	20.1
2000	830	330	60.8	76.5	72.9	68.8	65.4	50.1	39.9	37.7	15.7
2000	830	345	60.3	76.4	73.1	68.3	63.5	46.7	40.0	37.8	16.1
2000	830	400	62.4	81.2	75.2	68.6	65.2	50.0	40.5	37.8	18.8
2000	830	415	63.1	78.9	74.3	70.4	67.7	52.9	43.4	40.6	15.8
2000	830	430	64.9	80.6	76.7	72.0	68.9	55.5	45.5	42.1	15.7
2000	830	445	63.8	77.9	74.0	70.7	68.8	56.7	47.9	40.7	14.1
2000	830	500	65.5	78.5	74.7	71.5	70.0	60.9	51.8	43.4	13.0
2000	830	515	66.3	79.0	75.4	72.5	70.9	61.0	51.5	46.4	12.7
2000	830	530	67.4	78.3	75.4	73.0	71.5	64.6	55.4	49.1	10.9
2000	830	545	69.6	79.2	77.0	74.8	73.1	68.3	59.9	52.2	9.6
2000	830	600	70.1	79.7	76.2	74.2	73.1	69.6	62.4	56.2	9.6
2000	830	615	70.3	79.5	76.2	74.2	73.1	69.9	63.3	58.3	9.2
2000	830	630	71.9	96.3	77.6	74.8	73.6	70.3	65.0	54.7	24.4
2000	830	645	71.1	80.1	76.7	74.8	73.8	70.5	66.0	60.1	9.0
2000	830	700	71.5	81.5	78.6	75.2	74.0	70.8	65.5	58.1	10.0
2000	830	715	72.0	82.0	78.0	78.4	76.0	71.6	66.5	59.0	10.0
2000	830	730	72.0	82.0	78.0	78.5	76.2	72.0	67.8	60.0	10.0
2000	830	745	72.8	81.2	78.5	76.7	75.7	72.1	68.5	61.9	8.4
2000	830	800	71.5	78.6	77.0	75.0	74.1	71.2	65.2	56.1	7.1
2000	830	815	72.3	82.5	78.0	76.3	75.2	71.6	67.1	55.7	10.2
2000	830	830	71.9	84.8	78.9	76.1	74.7	71.3	61.8	52.4	12.9
2000	830	845	70.7	79.0	76.7	74.6	73.7	70.3	63.6	51.7	8.3
2000	830	900	70.4	79.4	77.1	74.8	73.4	69.7	62.3	51.7	9.0
2000	830	915	70.4	79.7	77.4	75.1	73.7	69.4	61.6	50.1	9.3
2000	830	930	70.1	80.0	76.5	74.7	73.3	69.5	60.6	49.9	9.9
2000	830	945	71.2	83.8	78.6	76.3	74.8	69.5	61.5	53.0	12.6
2000	830	1000	70.8	84.2	78.6	76.2	74.8	68.9	60.2	51.9	13.4
2000	830	1015	70.0	81.2	77.4	75.2	73.5	68.5	58.1	47.1	11.2
2000	830	1030	70.6	82.4	79.2	75.6	73.9	69.2	58.6	46.9	11.8
2000	830	1045	70.5	83.0	78.3	74.8	73.5	69.3	63.3	54.7	12.5
2000	830	1100	69.6	79.6	76.8	74.2	72.9	68.5	63.1	51.9	10.0
2000	830	1115	69.6	78.7	76.4	74.4	73.1	68.8	58.5	51.6	9.1
2000	830	1130	70.1	80.8	76.8	74.6	73.3	68.7	61.9	50.3	10.7
2000	830	1145	70.0	78.6	77.0	75.0	73.4	68.9	61.7	51.3	8.6
2000	830	1200	69.4	81.3	76.9	73.9	72.4	68.2	61.3	53.9	11.9
2000	830	1215	69.4	80.0	76.3	74.3	73.0	68.0	61.0	53.3	10.6
2000	830	1230	69.0	81.1	76.4	73.7	72.2	68.0	60.7	50.0	12.1
2000	830	1245	70.3	86.0	78.1	75.2	73.8	68.4	57.8	50.1	15.7
2000	830	1300	68.2	79.2	75.3	72.9	71.7	67.2	58.0	47.1	11.0
2000	830	1315	68.4	83.3	75.3	73.2	71.7	67.2	60.6	48.3	14.9
2000	830	1330	67.6	77.7	74.6	72.2	71.2	66.5	57.0	47.5	10.1
2000	830	1345	69.3	82.1	76.7	74.5	72.6	67.7	61.8	54.0	12.8
2000	830	1400	69.6	85.6	77.2	74.5	72.6	67.7	61.9	53.9	16.0
2000	830	1415	68.6	83.0	76.5	73.3	71.5	67.3	61.0	50.7	14.4
2000	830	1430	68.9	77.7	75.5	73.8	72.6	67.6	61.2	51.7	8.8
2000	830	1445	69.0	78.9	75.3	73.4	72.4	68.2	61.3	52.2	9.9
2000	830	1500	68.6	76.6	74.9	73.0	71.8	67.8	60.0	50.8	8.0
2000	830	1515	68.3	83.8	75.5	72.4	71.4	67.2	59.2	47.5	15.5
2000	830	1530	69.3	85.1	75.6	73.4	72.3	68.4	64.1	54.2	15.8
2000	830	1545	68.5	80.9	75.2	72.7	71.4	67.7	61.8	50.3	12.4
2000	830	1600	68.4	77.4	74.4	72.6	71.5	67.8	60.8	50.1	9.0
2000	830	1615	68.7	83.2	76.0	72.9	71.2	67.6	62.5	52.0	14.5
2000	830	1630	68.8	81.6	75.0	73.3	71.8	68.0	62.3	52.0	12.8
2000	830	1645	69.2	83.8	77.8	73.8	71.5	67.9	63.7	52.7	14.6
2000	830	1700	68.5	83.4	75.1	72.4	71.3	67.9	61.1	53.7	14.9
2000	830	1715	68.9	79.7	75.8	72.5	71.2	68.4	61.7	53.9	10.8
2000	830	1730	68.2	76.9	74.5	72.2	71.0	67.7	61.8	53.9	8.7
2000	830	1745	68.0	81.2	73.6	72.0	71.0	67.6	59.5	49.8	13.2
2000	830	1800	67.7	76.4	72.6	71.1	70.4	67.5	61.2	52.7	8.7
2000	830	1815	67.1	74.7	72.3	71.1	70.3	66.8	58.0	49.1	7.6
2000	830	1830	67.9	79.7	74.3	71.8	70.8	67.1	60.8	54.2	11.8
2000	830	1845	67.7	78.8	75.5	71.7	70.7	67.0	55.8	46.0	11.1
2000	830	1900	68.2	78.8	76.2	72.2	71.2	67.5	59.5	49.1	10.6
2000	830	1915	68.1	77.7	75.5	72.8	71.1	67.2	59.4	48.1	9.6
2000	830	1930	67.3	75.8	73.9	71.0	70.2	66.9	58.4	51.9	8.5
2000	830	1945	67.1	76.9	74.3	71.6	70.5	65.9	56.6	46.2	9.8
2000	830	2000	69.0	87.4	81.0	73.7	71.0	65.9	56.2	48.1	18.4
2000	830	2015	67.7	86.8	75.9	72.5	70.9	65.7	54.8	46.8	19.1
2000	830	2030	65.7	75.0	71.9	70.2	69.3	64.7	53.3	43.2	9.3
2000	830	2045	67.0	81.5	77.3	71.4	69.7	64.6	54.5	47.5	14.5
2000	830	2100	66.0	78.7	74.0	71.2	69.8	64.1	51.5	42.7	12.7
2000	830	2115	66.9	80.7	75.6	71.6	70.6	65.0	55.1	47.9	13.8
2000	830	2130	66.3	83.4	76.5	70.9	69.7	64.0	51.2	44.2	17.1
2000	830	2145	65.3	76.2	73.4	70.4	69.2	63.0	51.5	41.3	10.9
2000	830	2200	66.5	76.6	73.5	71.5	70.4	64.8	54.7	46.0	10.1
2000	830	2215	64.9	76.8	72.6	70.9	69.3	61.5	51.0	42.0	11.9
2000	830	2230	65.5	76.8	72.7	70.9	69.9	62.8	53.8	45.5	11.3
2000	830	2245	64.4	74.3	72.0	70.3	68.9	60.9	49.8	40.6	9.9
2000	830	2300	64.4	74.3	71.7	70.1	69.0	61.0	48.0	40.9	9.9
2000	830	2315	63.9	76.7	72.5	69.8	68.6	59.1	45.7	36.5	12.8
2000	830	2330	63.7	79.3	73.3	70.3	68.3	57.3	47.1	40.8	15.6
2000	830	2345	63.4	76.4	72.7	70.2	68.5	57.0	46.9	41.0	13.0
2000	831	0	62.1	75.7	71.7	69.0	67.2	53.4	41.0	36.4	13.6

DAY 1	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	68.3	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	63.7	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	69.3	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	65.6	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.9	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.0	dB(A)

281 Windsor Road, Vineyard											DAY 2
Thursday 31 August 2000									RT&A S/N 80		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	830	2200	66.5	76.6	73.5	71.5	70.4	64.8	54.7	46.0	10.1
2000	830	2215	64.9	76.8	72.6	70.9	69.3	61.5	51.0	42.0	11.9
2000	830	2230	65.5	76.8	72.7	70.9	69.9	62.8	53.8	45.5	11.3
2000	830	2245	64.4	74.3	72.0	70.3	68.9	60.9	49.8	40.6	9.9
2000	830	2300	64.4	74.3	71.7	70.1	69.0	61.0	48.0	40.9	9.9
2000	830	2315	63.9	76.7	72.5	69.8	68.6	59.1	45.7	36.5	12.8
2000	830	2330	63.7	79.3	73.3	70.3	68.3	57.3	47.1	40.8	15.6
2000	830	2345	63.4	76.4	72.7	70.2	68.5	57.0	46.9	41.0	13.0
2000	831	0	62.1	75.7	71.7	69.0	67.2	53.4	41.0	36.4	13.6
2000	831	15	61.7	77.1	72.2	68.8	66.9	50.6	41.3	37.3	15.4
2000	831	30	60.5	77.2	72.2	68.1	65.2	46.8	36.7	34.3	16.7
2000	831	45	60.5	77.6	73.2	68.5	64.8	43.5	35.7	33.7	17.1
2000	831	100	59.8	76.0	69.8	67.3	65.1	47.5	39.1	36.2	16.2
2000	831	115	60.2	75.8	71.5	68.1	65.8	48.6	41.0	36.5	15.6
2000	831	130	57.5	72.5	69.5	66.5	62.0	42.8	36.2	34.6	15.0
2000	831	145	57.8	74.2	70.2	65.8	61.7	42.0	36.6	35.2	16.4
2000	831	200	58.0	79.3	70.6	67.7	64.8	50.8	37.3	35.6	21.3
2000	831	215	58.5	78.7	70.0	69.5	64.5	52.7	37.5	37.7	20.2
2000	831	230	57.8	75.4	68.8	65.9	62.8	45.8	37.9	36.0	17.6
2000	831	245	60.2	76.5	72.2	67.6	64.6	46.8	38.7	36.7	16.3
2000	831	300	57.6	73.6	70.6	65.9	60.3	41.4	38.5	36.3	16.0
2000	831	315	60.5	76.1	72.6	68.1	65.2	46.7	39.3	37.4	15.6
2000	831	330	58.3	78.8	71.4	64.1	56.4	39.4	37.4	35.9	20.5
2000	831	345	59.9	77.7	73.1	67.4	62.7	46.2	39.9	37.7	17.8
2000	831	400	60.9	77.2	73.2	68.0	65.2	49.0	39.5	37.0	16.3
2000	831	415	62.1	80.2	74.3	69.4	65.6	48.7	40.8	38.8	18.1
2000	831	430	61.4	77.5	72.5	69.4	66.6	50.9	44.2	40.6	16.1
2000	831	445	63.3	79.0	73.4	70.3	67.9	55.6	45.8	42.3	15.7
2000	831	500	65.7	83.4	75.6	71.7	69.7	59.4	47.8	42.1	17.7
2000	831	515	66.1	78.2	75.2	72.4	70.7	61.1	50.2	43.8	12.1
2000	831	530	66.9	76.8	75.1	72.6	71.1	64.0	54.7	47.5	9.9
2000	831	545	68.6	78.5	75.7	73.8	72.4	67.2	57.0	49.1	9.9
2000	831	600	69.4	80.0	77.0	73.8	72.4	68.4	60.4	54.5	10.6
2000	831	615	68.9	79.1	75.9	73.3	72.0	68.0	60.0	51.4	10.2
2000	831	630	69.5	79.6	75.7	73.8	72.6	68.8	63.1	52.3	10.1
2000	831	645	70.0	80.3	76.2	74.0	72.8	69.4	64.2	55.4	10.3
2000	831	700	70.7	82.4	77.1	75.0	73.8	69.8	64.6	57.5	11.7
2000	831	715	70.1	85.4	75.3	73.5	72.7	69.7	64.2	55.7	15.3
2000	831	730	71.5	87.8	77.1	75.6	74.3	70.8	66.3	56.2	16.3
2000	831	745	71.2	80.8	77.1	75.6	74.3	70.3	65.5	55.7	9.6
2000	831	800	71.7	81.0	78.1	76.2	74.9	70.8	65.2	54.0	9.3
2000	831	815	71.6	82.4	78.1	75.1	74.1	71.0	66.6	52.2	10.8
2000	831	830	70.7	80.1	77.0	75.2	74.0	70.0	61.9	51.0	9.4
2000	831	845	70.5	79.5	77.7	75.1	73.7	69.6	60.5	51.1	9.0
2000	831	900	69.9	77.3	75.2	73.6	72.8	69.5	62.5	51.6	7.4
2000	831	915	69.8	79.1	76.0	74.2	72.9	69.0	62.3	52.7	9.3
2000	831	930	69.8	80.9	76.6	74.9	73.4	68.7	60.0	53.1	11.1
2000	831	945	69.2	78.4	76.1	73.8	72.5	68.3	59.7	50.0	9.2
2000	831	1000	70.3	80.7	77.5	75.3	74.1	68.8	61.9	54.1	10.4
2000	831	1015	69.6	81.2	76.4	74.5	73.0	68.5	61.5	53.2	11.6
2000	831	1030	70.2	88.1	77.8	74.5	73.0	68.3	59.9	52.3	17.9
2000	831	1045	68.6	78.2	76.5	73.9	72.2	67.0	58.5	53.0	9.6
2000	831	1100	69.9	87.3	79.8	74.5	72.8	67.5	60.3	54.3	17.4
2000	831	1115	69.1	83.0	77.0	74.0	72.2	67.4	60.1	51.0	13.9
2000	831	1130	68.7	80.0	76.3	74.0	72.2	67.2	60.9	53.2	11.3
2000	831	1145	69.4	83.6	77.0	73.8	72.3	68.2	63.2	53.5	14.2
2000	831	1200	69.9	84.8	77.6	74.9	73.1	68.1	62.4	57.7	14.9
2000	831	1215	68.5	79.8	75.7	73.5	71.9	67.2	60.1	50.2	11.3
2000	831	1230	68.8	82.4	75.7	73.1	71.8	67.8	60.8	48.4	13.6
2000	831	1245	68.1	78.6	75.5	72.5	71.3	67.1	58.1	48.3	10.5
2000	831	1300	67.9	77.5	74.6	72.0	70.9	67.1	60.7	50.3	9.6
2000	831	1315	68.2	76.4	74.5	72.5	71.3	67.4	60.8	51.0	8.2
2000	831	1330	69.1	84.3	79.0	73.8	72.1	66.9	58.9	50.9	15.2
2000	831	1345	68.0	80.5	75.4	73.1	71.2	66.6	59.6	52.0	12.5
2000	831	1400	68.9	84.1	76.8	74.0	72.3	67.0	58.6	48.1	15.2
2000	831	1415	68.4	86.3	76.8	73.2	71.2	66.8	59.3	49.6	17.9
2000	831	1430	67.9	85.7	75.0	72.5	70.9	66.9	58.9	50.2	17.8
2000	831	1445	68.5	85.2	77.3	72.1	70.8	67.0	60.7	51.1	16.7
2000	831	1500	69.1	85.0	77.8	73.2	71.4	67.5	61.3	53.2	15.9
2000	831	1515	68.8	82.9	76.2	73.2	71.8	67.8	61.8	52.7	14.1
2000	831	1530	68.5	80.2	75.5	72.5	71.3	67.7	61.2	53.6	11.7
2000	831	1545	68.5	85.2	76.6	72.3	70.7	67.2	61.2	53.8	16.7
2000	831	1600	68.6	79.2	75.2	72.6	71.4	67.8	62.7	54.7	10.6
2000	831	1615	68.8	81.9	75.6	73.0	71.7	68.0	61.1	50.1	13.1
2000	831	1630	68.8	78.9	75.4	72.9	71.6	68.1	62.8	53.0	10.1
2000	831	1645	69.1	85.4	76.2	72.6	71.2	68.1	63.3	52.6	16.3
2000	831	1700	68.7	83.7	76.9	72.0	70.9	67.7	62.5	52.5	15.0
2000	831	1715	69.0	89.6	76.0	71.9	70.7	67.8	63.5	53.7	20.6
2000	831	1730	68.2	78.1	74.1	72.0	71.0	67.6	62.8	55.3	9.9
2000	831	1745	67.8	77.3	73.7	71.3	70.6	67.5	60.9	53.2	9.5
2000	831	1800	68.1	80.8	74.1	72.1	71.1	67.2	61.5	54.2	12.7
2000	831	1815	67.8	78.1	74.5	72.0	71.0	67.1	57.7	49.5	10.3
2000	831	1830	67.8	77.3	73.6	71.7	70.7	67.4	61.4	50.3	9.5
2000	831	1845	67.5	77.6	73.5	71.3	70.4	67.1	59.4	47.1	10.1
2000	831	1900	67.0	76.3	73.0	71.0	70.2	66.4	58.9	49.1	9.3
2000	831	1915	67.1	75.0	73.0	70.9	70.0	66.7	59.0	51.4	7.9
2000	831	1930	67.5	78.7	75.3	71.6	70.5	66.5	58.5	49.0	11.2
2000	831	1945	66.9	81.2	73.2	71.4	70.4	65.7	56.4	48.6	14.3
2000	831	2000	66.0	75.2	72.9	70.7	69.6	64.5	53.9	47.2	9.2
2000	831	2015	65.4	73.2	71.4	70.0	69.1	64.3	54.9	45.1	7.8
2000	831	2030	65.7	76.4	73.1	70.6	69.4	64.1	52.3	42.8	10.7
2000	831	2045	65.2	75.7	72.6	70.3	69.2	63.6	52.6	45.0	10.5
2000	831	2100	65.6	79.3	74.3	70.4	69.2	63.7	53.9	47.0	13.7
2000	831	2115	65.2	73.1	71.6	69.8	69.0	64.1	53.7	47.9	7.9
2000	831	2130	64.8	74.8	72.1	70.1	68.8	62.8	52.9	47.6	10.0
2000	831	2145	65.1	75.9	72.2	70.1	69.1	63.4	50.8	43.2	10.8
2000	831	2200	65.0	75.2	72.6	70.5	69.3	62.4	51.9	45.7	10.2
2000	831	2215	64.1	73.4	71.2	69.5	68.4	61.1	50.0	43.9	9.3
2000	831	2230	65.0	78.1	74.5	70.8	69.2	60.8	49.1	42.3	13.1
2000	831	2245	63.7	77.3	71.6	69.5	68.3	59.3	46.1	38.9	13.6
2000	831	2300	63.2	75.3	72.1	69.4	68.1	57.4	43.2	38.8	12.1
2000	831	2315	63.2	78.9	73.3	69.2	67.5	55.9	43.4	36.7	15.7
2000	831	2330	63.7	76.0	71.8	69.4	68.1	60.2	47.4	39.6	12.3
2000	831	2345	62.6	76.8	72.9	69.2	67.2	55.3	45.2	38.9	14.2

DAY 2	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.6	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	62.9	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.8	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	64.4	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.3	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	58.1	dB(A)

281 Windsor Road, Vineyard											DAY 3
Friday 1 September 2000									RT&A S/N 80		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	831	2215	64.1	73.4	71.2	69.5	68.4	61.1	50.0	43.9	9.3
2000	831	2230	65.0	78.1	74.5	70.8	69.2	60.8	49.1	42.3	13.1
2000	831	2245	63.7	77.3	71.6	69.5	68.3	59.3	46.1	38.9	13.6
2000	831	2300	63.2	75.3	72.1	69.4	68.1	57.4	43.2	38.8	12.1
2000	831	2315	63.2	78.9	73.3	69.2	67.5	55.9	43.4	36.7	15.7
2000	831	2330	63.7	76.0	71.8	69.4	68.1	60.2	47.4	39.6	12.3
2000	831	2345	62.6	76.8	72.9	69.2	67.2	55.3	45.2	38.9	14.2
2000	901	0	61.5	75.6	70.9	67.9	66.4	54.3	42.0	37.1	14.1
2000	901	15	61.6	76.0	71.9	68.8	67.0	52.0	40.7	37.4	14.4
2000	901	30	60.6	74.3	70.2	68.0	66.0	50.9	40.9	36.6	13.7
2000	901	45	61.4	78.4	74.1	67.6	65.4	50.5	42.4	37.8	17.0
2000	901	100	60.5	73.9	71.7	68.6	65.8	48.8	40.2	36.9	13.4
2000	901	115	61.7	75.1	72.4	69.2	66.6	50.4	39.9	36.6	13.4
2000	901	130	61.3	79.9	74.4	67.7	64.8	49.1	41.5	39.6	18.6
2000	901	145	56.2	70.7	68.2	64.1	59.7	48.0	40.7	38.1	14.5
2000	901	200	61.2	76.0	71.6	68.6	66.4	51.6	41.1	38.9	14.8
2000	901	215	57.7	72.8	70.3	65.4	61.7	44.9	40.7	39.0	15.1
2000	901	230	56.9	73.4	69.1	65.4	60.1	43.0	39.1	37.8	16.5
2000	901	245	58.3	73.2	69.6	66.2	63.5	47.5	39.4	37.1	14.9
2000	901	300	59.9	80.6	70.7	66.9	64.0	46.9	38.6	36.1	20.7
2000	901	315	60.9	77.3	72.1	68.2	65.0	51.3	44.2	40.2	16.4
2000	901	330	60.0	77.4	72.6	67.5	64.1	48.3	41.4	39.7	17.4
2000	901	345	59.7	76.4	71.8	67.7	65.0	46.8	40.6	38.6	16.7
2000	901	400	62.4	78.9	75.3	68.7	66.0	51.0	40.5	37.3	16.5
2000	901	415	64.1	79.2	76.3	71.8	67.7	55.1	48.2	39.0	15.1
2000	901	430	62.6	77.8	73.9	69.6	67.1	54.4	48.3	42.9	15.2
2000	901	445	64.1	79.1	74.5	70.5	68.8	57.2	48.4	46.4	15.0
2000	901	500	64.2	77.3	74.7	70.2	68.6	58.6	50.5	44.6	13.1
2000	901	515	66.0	77.0	74.7	72.0	70.3	62.1	54.8	48.5	11.0
2000	901	530	67.6	79.2	76.0	73.5	71.6	64.7	56.7	51.2	11.6
2000	901	545	69.2	79.4	76.8	74.2	72.5	68.0	60.8	54.9	10.2
2000	901	600	69.8	77.5	75.3	73.5	72.5	69.6	63.2	56.0	7.7
2000	901	615	69.4	78.3	75.2	73.3	72.4	68.8	62.9	57.3	8.9
2000	901	630	70.8	82.1	77.6	75.1	73.9	69.9	64.9	58.1	11.3
2000	901	645	71.0	78.9	76.6	74.8	73.9	70.5	65.4	58.0	7.9
2000	901	700	71.6	79.3	77.2	75.4	74.2	71.1	66.4	58.2	7.7
2000	901	715	71.9	80.5	78.1	76.0	74.7	71.2	66.7	58.2	8.6
2000	901	730	72.0	80.5	79.0	77.6	75.5	71.1	66.2	59.5	8.5
2000	901	745	71.8	80.3	79.6	76.2	75.0	71.1	66.4	57.9	8.5
2000	901	800	71.5	80.1	76.9	74.9	74.1	71.1	66.5	58.5	8.6
2000	901	815	71.4	79.7	77.3	75.6	74.3	70.7	65.3	56.4	8.3
2000	901	830	70.6	78.3	75.9	74.4	73.5	70.3	64.6	53.9	7.7
2000	901	845	70.4	80.0	76.5	74.4	73.3	69.7	63.4	53.4	9.6
2000	901	900	70.5	80.0	76.9	75.1	73.6	69.7	62.0	51.8	9.5
2000	901	915	70.1	79.9	76.5	74.7	73.2	69.4	61.4	47.8	9.8
2000	901	930	70.2	78.9	76.9	74.6	73.0	69.4	64.4	54.7	8.7
2000	901	945	70.2	85.3	77.0	75.1	73.5	68.8	59.6	49.2	15.1
2000	901	1000	70.1	81.0	77.4	75.3	73.3	68.9	61.5	49.8	10.9
2000	901	1015	69.3	80.0	76.6	73.9	72.5	68.2	60.2	49.7	10.7
2000	901	1030	69.0	78.0	75.6	73.7	72.2	68.2	59.3	47.7	9.0
2000	901	1045	69.3	79.9	76.3	74.0	72.7	68.1	60.3	48.5	10.6
2000	901	1100	68.8	78.3	75.4	73.4	72.1	67.8	60.5	51.8	9.5
2000	901	1115	69.0	80.0	76.7	73.7	72.4	67.7	58.2	51.6	11.0
2000	901	1130	69.1	82.4	76.1	73.6	71.9	68.2	61.6	51.6	13.3
2000	901	1145	69.2	78.4	76.2	74.0	72.5	68.0	61.7	51.7	9.2
2000	901	1200	69.0	80.6	76.1	73.7	72.2	67.9	60.2	50.6	11.6
2000	901	1215	70.0	93.5	77.1	74.2	72.6	68.1	60.0	49.1	23.5
2000	901	1230	68.9	88.4	75.3	73.4	72.0	67.1	61.2	50.6	19.5
2000	901	1245	68.9	77.8	75.6	73.5	72.4	67.6	61.6	48.6	8.9
2000	901	1300	68.7	82.6	76.4	73.8	72.1	67.2	61.2	50.6	13.9
2000	901	1315	67.1	77.8	73.8	71.8	70.4	66.0	59.8	45.8	10.7
2000	901	1330	68.8	78.5	75.2	73.2	72.0	67.8	62.3	49.2	9.7
2000	901	1345	67.7	84.7	75.0	72.1	70.5	66.2	59.3	49.2	17.0
2000	901	1400	68.0	78.2	75.1	72.6	70.8	67.2	60.1	47.4	10.2
2000	901	1415	67.6	79.9	74.3	72.1	70.7	66.7	60.9	50.5	12.3
2000	901	1430	68.3	84.8	74.9	72.8	71.7	67.3	61.2	50.5	16.5
2000	901	1445	68.6	85.5	75.8	72.9	71.4	67.6	62.4	53.1	16.9
2000	901	1500	68.2	78.6	74.8	72.4	71.2	67.3	62.1	46.6	10.4
2000	901	1515	67.7	76.0	73.6	71.6	70.4	67.0	63.4	52.4	8.3
2000	901	1530	68.0	78.4	74.3	72.0	70.7	67.2	62.3	50.5	10.4
2000	901	1545	67.1	84.1	75.0	71.5	69.9	66.0	58.7	52.8	17.0
2000	901	1600	67.8	75.6	73.5	71.6	70.6	67.4	60.7	53.5	7.8
2000	901	1615	65.9	79.0	73.7	70.4	68.9	64.9	57.0	51.7	13.1
2000	901	1630	65.8	74.5	71.8	69.4	68.6	65.5	58.4	51.3	8.7
2000	901	1645	65.2	78.7	72.7	69.0	68.1	64.4	57.7	51.8	13.5
2000	901	1700	67.0	77.2	72.3	70.7	69.8	66.6	59.1	50.7	10.2
2000	901	1715	67.2	76.6	74.0	71.3	70.3	66.6	58.5	47.8	9.4
2000	901	1730	68.2	89.2	74.3	71.8	70.7	67.4	61.4	50.0	21.0
2000	901	1745	69.3	91.5	76.1	72.4	71.1	67.6	61.2	48.3	22.2
2000	901	1800	67.6	76.6	73.9	71.8	70.9	66.9	57.6	46.1	9.0
2000	901	1815	68.3	87.2	75.0	72.3	70.8	67.2	58.6	48.8	18.9
2000	901	1830	67.7	83.6	74.7	71.7	70.7	66.9	57.5	47.8	15.9
2000	901	1845	68.1	81.5	75.7	72.3	70.9	67.2	60.3	47.5	13.4
2000	901	1900	67.9	82.0	75.8	71.9	70.3	67.0	60.0	50.1	14.1
2000	901	1915	69.1	85.5	79.1	73.2	71.3	67.6	61.2	48.6	16.4
2000	901	1930	67.7	78.3	74.6	71.5	70.7	67.0	59.1	46.8	10.6
2000	901	1945	67.1	76.3	73.3	71.3	70.3	66.5	58.1	48.5	9.2
2000	901	2000	66.8	79.1	74.4	71.1	70.0	65.7	57.0	48.1	12.3
2000	901	2015	66.5	76.0	73.7	71.0	69.9	65.7	54.3	45.0	9.5
2000	901	2030	66.3	77.8	73.4	71.1	70.2	64.8	53.9	46.1	11.5
2000	901	2045	65.7	77.2	73.8	70.2	69.1	64.3	53.5	46.7	11.5
2000	901	2100	65.5	77.9	73.8	70.3	69.1	63.9	53.2	44.4	12.4
2000	901	2115	65.4	79.5	74.3	70.6	69.3	62.8	50.6	44.6	14.1
2000	901	2130	65.0	75.0	71.4	69.8	68.9	63.7	53.1	45.0	10.0
2000	901	2145	65.3	75.4	71.9	70.2	69.3	63.4	53.1	47.2	10.1
2000	901	2200	64.5	77.5	71.3	69.5	68.6	61.8	49.5	41.6	13.0
2000	901	2215	65.0	74.2	71.6	70.0	68.9	63.5	53.0	46.5	9.2
2000	901	2230	63.9	74.6	70.8	69.4	68.4	61.1	48.8	41.7	10.7
2000	901	2245	64.1	74.0	71.1	69.6	68.6	60.6	49.8	41.8	9.9
2000	901	2300	64.2	76.9	71.5	69.7	68.6	60.8	48.1	39.4	12.7
2000	901	2315	65.1	76.6	72.2	70.3	69.2	62.9	52.7	45.1	11.5
2000	901	2330	64.0	74.7	71.8	70.0	68.9	58.7	47.3	41.0	10.7
2000	901	2345	63.6	75.9	71.4	69.6	68.3	58.0	47.4	38.3	12.3
2000	902	0	64.5	85.3	72.1	70.0	68.8	59.0	44.0	38.5	20.8

DAY 3	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.7	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	63.4	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.7	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	65.2	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.2	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	57.0	dB(A)

281 Windsor Road, Vineyard									DAY 4		
Saturday 2 September 2000									RT&A S/N 80		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	901	2215	65.0	74.2	71.6	70.0	68.9	63.5	53.0	46.5	9.2
2000	901	2230	63.9	74.6	70.8	69.4	68.4	61.1	48.8	41.7	10.7
2000	901	2245	64.1	74.0	71.1	69.6	68.6	60.6	49.8	41.8	9.9
2000	901	2300	64.2	76.9	71.5	69.7	68.6	60.8	48.1	39.4	12.7
2000	901	2315	65.1	76.6	72.2	70.3	69.2	62.9	52.7	45.1	11.5
2000	901	2330	64.0	74.7	71.8	70.0	68.9	58.7	47.3	41.0	10.7
2000	901	2345	63.6	75.9	71.4	69.6	68.3	58.0	47.4	38.3	12.3
2000	902	0	64.5	85.3	72.1	70.0	68.8	59.0	44.0	38.5	20.8
2000	902	15	64.0	73.5	71.4	69.9	68.8	60.1	47.5	41.1	9.5
2000	902	30	62.9	73.6	71.4	69.5	68.0	56.2	42.6	36.3	10.7
2000	902	45	62.3	78.3	73.3	69.0	66.9	52.6	40.6	34.3	16.0
2000	902	100	62.5	75.7	72.0	69.6	67.9	54.3	40.5	35.5	13.2
2000	902	115	61.7	74.4	70.9	68.6	67.1	52.6	38.1	34.6	12.7
2000	902	130	60.9	76.3	71.5	68.7	66.1	48.9	36.9	34.2	15.4
2000	902	145	59.6	73.8	69.9	67.3	65.5	48.9	35.6	32.9	14.2
2000	902	200	60.9	74.2	70.6	68.3	66.3	51.7	38.2	33.0	13.3
2000	902	215	59.8	74.7	70.8	67.6	65.5	46.9	34.0	31.7	14.9
2000	902	230	58.7	72.8	70.0	66.7	63.8	46.3	34.0	32.7	14.1
2000	902	245	58.2	73.1	69.5	66.4	63.6	43.2	35.4	33.1	14.9
2000	902	300	59.4	74.4	69.9	67.0	64.3	52.0	44.0	39.5	15.0
2000	902	315	59.9	74.1	70.7	67.4	65.0	52.8	45.1	39.8	14.2
2000	902	330	61.3	76.3	71.5	68.9	66.8	53.2	46.8	40.8	15.0
2000	902	345	58.5	73.8	70.4	67.1	62.8	48.2	40.5	36.4	15.3
2000	902	400	59.0	72.6	70.0	67.2	64.4	49.2	42.8	40.6	13.6
2000	902	415	61.1	78.0	73.7	68.2	63.8	52.3	49.2	46.9	16.9
2000	902	430	62.5	81.6	74.7	69.3	66.0	50.9	42.7	38.6	19.1
2000	902	445	61.8	79.4	72.0	69.0	67.1	51.4	39.7	37.8	17.6
2000	902	500	61.7	76.5	73.0	69.4	67.0	51.7	42.6	39.5	14.8
2000	902	515	62.2	77.6	74.4	69.5	67.0	50.0	42.8	41.5	15.4
2000	902	530	64.0	75.2	72.3	70.5	69.1	58.3	47.9	42.5	11.2
2000	902	545	65.1	76.7	73.5	71.4	69.9	60.0	48.7	40.9	11.6
2000	902	600	66.9	76.5	73.6	71.8	70.8	65.3	56.2	42.9	9.6
2000	902	615	67.0	80.1	75.8	72.7	71.3	63.0	48.8	38.6	13.1
2000	902	630	67.8	78.3	75.8	73.0	71.8	65.3	54.8	42.4	10.5
2000	902	645	68.3	78.9	75.8	73.1	71.9	67.2	55.4	43.5	10.6
2000	902	700	68.9	78.0	76.1	73.5	72.4	67.6	57.8	48.4	9.1
2000	902	715	68.9	78.7	76.3	74.2	72.9	67.2	55.8	47.5	9.8
2000	902	730	71.2	79.9	78.0	76.0	74.7	70.1	63.3	50.3	8.7
2000	902	745	70.4	79.0	76.9	74.7	73.7	69.6	61.4	54.7	8.6
2000	902	800	70.4	78.9	76.6	74.4	73.6	69.9	61.8	53.5	8.5
2000	902	815	70.5	77.7	75.0	74.0	73.4	70.3	63.2	55.8	7.2
2000	902	830	70.6	79.0	76.3	74.2	73.4	70.3	64.2	57.6	8.4
2000	902	845	70.5	83.5	76.3	74.3	73.5	69.9	63.7	57.9	13.0
2000	902	900	72.5	89.9	82.4	76.1	74.5	70.8	65.8	58.1	17.4
2000	902	915	70.3	77.8	75.9	74.2	73.4	69.7	63.2	54.2	7.5
2000	902	930	71.7	87.9	77.2	74.8	73.9	70.9	66.2	55.6	16.2
2000	902	945	70.9	84.6	76.0	74.4	73.5	70.4	66.1	56.4	13.7
2000	902	1000	70.9	80.6	76.6	74.6	73.8	70.4	65.0	55.8	9.7
2000	902	1015	71.7	91.5	79.3	75.0	73.9	70.6	65.2	47.9	19.8
2000	902	1030	70.9	77.5	75.0	73.7	73.1	70.8	66.4	57.9	6.6
2000	902	1045	71.0	78.4	75.8	74.2	73.6	70.8	66.2	57.3	7.4
2000	902	1100	70.6	81.0	75.4	74.0	73.1	70.3	65.9	54.5	10.4
2000	902	1115	70.2	78.4	75.4	73.5	72.8	69.9	65.2	57.3	8.2
2000	902	1130	70.4	82.3	75.3	73.4	72.7	70.1	66.4	54.9	11.9
2000	902	1145	69.8	78.6	74.7	72.8	72.1	69.5	65.4	59.2	8.8
2000	902	1200	70.0	82.9	74.8	73.1	72.3	69.7	66.0	58.0	12.9
2000	902	1215	70.0	85.6	74.8	73.1	72.3	69.7	66.0	57.2	15.6
2000	902	1230	70.3	86.1	76.7	73.1	72.1	69.5	66.4	58.0	15.8
2000	902	1245	69.8	78.6	74.6	72.8	72.0	69.7	66.4	58.3	8.8
2000	902	1300	69.7	77.7	74.2	72.8	72.0	69.5	65.8	59.3	8.0
2000	902	1315	70.0	79.2	75.6	73.7	72.4	69.5	66.1	57.8	9.2
2000	902	1330	69.4	82.7	74.5	72.6	71.8	69.1	64.9	56.8	13.3
2000	902	1345	69.1	80.7	73.7	71.9	71.2	68.9	65.7	59.5	11.6
2000	902	1400	69.1	75.6	73.8	72.1	71.4	68.9	65.5	59.5	6.5
2000	902	1415	69.0	78.9	73.8	72.2	71.5	68.7	64.0	57.6	9.9
2000	902	1430	68.9	76.6	73.8	72.1	71.4	68.5	65.1	58.1	7.7
2000	902	1445	69.0	79.8	74.3	72.3	71.4	68.5	65.0	60.2	10.8
2000	902	1500	69.4	83.0	75.3	72.2	71.3	68.8	65.1	58.7	13.6
2000	902	1515	68.6	75.0	73.5	72.0	71.2	68.3	63.6	55.8	6.4
2000	902	1530	68.2	76.5	73.3	71.4	70.8	68.0	62.5	55.8	8.3
2000	902	1545	68.2	78.9	72.9	71.4	70.6	68.0	63.5	55.8	10.7
2000	902	1600	68.5	76.4	72.9	71.8	71.1	68.4	62.4	53.5	7.9
2000	902	1615	68.4	74.8	72.8	71.4	70.6	68.2	64.6	57.9	6.4
2000	902	1630	67.9	77.6	73.3	71.4	70.6	67.5	61.6	55.3	9.7
2000	902	1645	68.2	76.0	73.6	71.6	70.9	67.9	62.3	50.9	7.8
2000	902	1700	67.4	74.6	72.2	71.0	70.3	67.1	60.5	51.4	7.2
2000	902	1715	68.4	80.8	73.8	71.6	70.8	68.1	63.0	54.9	12.4
2000	902	1730	68.2	76.1	73.5	71.8	70.9	67.7	62.2	54.6	7.9
2000	902	1745	68.3	79.4	73.4	71.8	71.0	67.9	62.6	50.4	11.1
2000	902	1800	68.5	77.2	73.3	71.8	71.1	68.3	63.2	51.3	8.7
2000	902	1815	68.1	80.9	72.7	71.3	70.6	67.8	62.9	55.0	12.8
2000	902	1830	67.8	74.5	72.0	71.1	70.5	67.7	61.1	52.9	6.7
2000	902	1845	68.1	86.3	73.8	71.3	70.7	67.7	62.4	53.8	18.2
2000	902	1900	67.0	74.6	71.8	70.6	70.0	66.8	59.3	48.6	7.6
2000	902	1915	67.0	80.1	71.8	70.5	69.9	66.6	60.8	53.4	13.1
2000	902	1930	66.9	77.1	72.6	71.4	70.4	66.1	58.4	45.9	10.2
2000	902	1945	66.9	75.3	72.6	71.3	70.5	65.9	56.4	46.9	8.4
2000	902	2000	66.9	76.5	72.3	70.8	70.1	66.4	57.2	46.8	9.6
2000	902	2015	66.3	73.7	72.5	71.0	70.0	65.3	53.2	44.2	7.4
2000	902	2030	66.4	74.5	73.0	71.2	70.1	65.1	55.0	47.2	8.1
2000	902	2045	66.0	79.1	72.6	71.0	69.9	64.4	52.8	43.9	13.1
2000	902	2100	66.0	75.9	72.8	70.9	69.8	64.6	54.2	43.5	9.9
2000	902	2115	65.5	73.8	71.8	70.2	69.3	64.2	55.1	46.4	8.3
2000	902	2130	65.4	74.9	72.7	70.7	69.6	63.1	52.1	44.0	9.5
2000	902	2145	65.3	75.3	72.6	70.7	69.6	62.9	51.7	45.7	10.0
2000	902	2200	66.1	74.2	72.1	70.7	69.8	64.8	55.3	46.6	8.1
2000	902	2215	65.3	74.8	72.2	70.2	69.2	63.3	53.9	45.9	9.5
2000	902	2230	66.0	75.3	72.6	71.1	70.1	63.7	53.4	45.3	9.3
2000	902	2245	66.9	77.4	73.4	71.8	70.8	65.8	54.0	45.9	10.5
2000	902	2300	66.0	77.8	73.0	71.0	69.9	63.7	52.7	45.3	11.8
2000	902	2315	66.2	79.1	73.5	71.6	70.5	62.8	50.2	42.8	12.9
2000	902	2330	66.0	83.1	73.3	71.1	69.9	63.0	49.0	41.8	17.1
2000	902	2345	66.0	79.2	74.0	71.6	70.3	62.5	48.8	40.5	13.2
2000	903	0	64.9	75.0	72.2	70.5	69.4	61.5	49.7	44.2	10.1

DAY 4	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.9	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	62.6	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	69.2	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	63.8	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	55.8	dB(A)

281 Windsor Road, Vineyard											DAY 5
Sunday 3 September 2000										RT&A S/N 80	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	902	2215	65.3	74.8	72.2	70.2	69.2	63.3	53.9	45.9	9.5
2000	902	2230	66.0	75.3	72.6	71.1	70.1	63.7	53.4	45.3	9.3
2000	902	2245	66.9	77.4	73.4	71.8	70.8	65.8	54.0	45.9	10.5
2000	902	2300	66.0	77.8	73.0	71.0	69.9	63.7	52.7	45.3	11.8
2000	902	2315	66.2	79.1	73.5	71.6	70.5	62.8	50.2	42.8	12.9
2000	902	2330	66.0	83.1	73.3	71.1	69.9	63.0	49.0	41.8	17.1
2000	902	2345	66.0	79.2	74.0	71.6	70.3	62.5	48.8	40.5	13.2
2000	903	0	64.9	75.0	72.2	70.5	69.4	61.5	49.7	44.2	10.1
2000	903	15	65.4	75.3	72.9	71.1	69.9	62.0	50.1	41.1	9.9
2000	903	30	64.5	76.1	73.0	70.8	69.6	62.1	46.6	39.9	11.6
2000	903	45	64.0	76.0	72.4	71.0	69.8	60.2	47.8	38.9	12.0
2000	903	100	63.4	73.3	71.8	70.3	68.9	56.6	41.7	36.9	9.9
2000	903	115	62.9	73.8	71.4	69.6	68.2	56.3	43.0	36.7	10.9
2000	903	130	61.4	73.2	70.7	69.0	67.3	51.4	41.0	36.7	11.8
2000	903	145	60.3	75.1	71.1	68.0	65.5	50.2	40.4	35.7	14.8
2000	903	200	62.1	81.8	72.0	69.5	67.5	51.2	39.7	35.0	19.7
2000	903	215	61.1	74.0	71.2	69.0	66.8	49.1	37.3	34.1	12.9
2000	903	230	59.6	74.9	71.5	67.7	64.4	45.7	37.5	34.8	15.3
2000	903	245	58.7	75.2	71.2	67.0	62.5	40.9	35.4	34.0	16.5
2000	903	300	59.9	74.4	70.6	67.8	65.7	46.2	36.5	34.0	14.5
2000	903	315	58.5	75.7	70.8	66.5	62.8	40.0	35.4	34.1	17.2
2000	903	330	58.5	73.5	70.6	67.1	62.5	40.7	35.6	34.0	15.0
2000	903	345	60.0	84.2	73.6	63.6	58.3	37.2	35.3	34.0	24.2
2000	903	400	57.2	77.7	69.6	65.2	58.7	37.8	34.1	33.1	20.5
2000	903	415	59.2	74.6	70.8	67.7	64.6	43.2	35.3	34.2	15.4
2000	903	430	57.4	75.5	70.0	65.5	60.4	38.0	34.7	33.0	18.1
2000	903	445	59.8	76.3	71.9	67.6	63.8	44.9	36.6	34.3	16.5
2000	903	500	59.3	74.9	71.5	67.5	63.7	45.9	37.1	33.8	15.6
2000	903	515	58.2	73.7	70.6	66.6	62.6	42.5	35.3	33.9	15.5
2000	903	530	60.0	76.4	71.8	68.3	64.7	44.9	35.6	34.3	16.4
2000	903	545	60.0	77.7	70.9	68.3	65.8	44.5	35.9	33.7	17.7
2000	903	600	62.4	75.6	71.5	69.2	67.8	54.3	41.8	36.4	13.2
2000	903	615	62.1	75.8	71.3	69.2	67.6	53.9	42.5	37.0	13.7
2000	903	630	63.9	77.4	73.2	70.1	68.5	58.0	45.4	38.9	13.5
2000	903	645	64.0	75.3	72.1	70.2	69.0	58.2	44.9	38.8	11.3
2000	903	700	63.8	77.9	71.7	70.0	68.8	57.9	45.8	39.4	14.1
2000	903	715	64.9	75.3	72.5	71.1	69.9	60.1	46.6	38.0	10.4
2000	903	730	65.6	75.7	73.1	71.7	70.5	61.9	50.5	43.5	10.1
2000	903	745	66.7	77.3	73.9	71.9	70.9	64.6	53.8	47.9	10.6
2000	903	800	66.6	75.7	73.7	71.9	70.9	64.4	53.8	46.3	9.1
2000	903	815	66.2	77.6	73.7	71.8	70.7	62.8	51.0	44.9	11.4
2000	903	830	66.7	79.2	73.6	71.9	70.8	64.6	52.0	45.9	12.5
2000	903	845	67.3	82.2	74.5	72.1	71.1	66.1	53.2	45.7	14.9
2000	903	900	67.7	83.1	75.3	72.6	71.4	66.0	52.6	44.4	15.4
2000	903	915	67.7	83.1	73.8	72.2	71.2	66.8	56.0	48.7	15.4
2000	903	930	67.7	77.2	74.0	71.8	71.1	67.0	57.0	49.8	9.5
2000	903	945	67.2	79.7	73.2	71.6	70.9	66.3	53.6	47.5	12.5
2000	903	1000	67.6	77.2	73.4	71.7	70.8	67.0	57.9	51.0	9.6
2000	903	1015	67.9	76.2	73.5	71.7	70.9	67.6	59.1	51.3	8.3
2000	903	1030	67.9	78.1	74.2	71.8	70.9	67.4	59.3	49.3	10.2
2000	903	1045	67.8	78.2	72.6	71.1	70.5	67.4	61.2	51.1	10.4
2000	903	1100	68.3	75.5	73.0	71.5	70.9	68.3	62.1	50.6	7.2
2000	903	1115	68.5	77.9	73.4	71.9	71.1	68.3	62.3	50.6	9.4
2000	903	1130	68.5	83.8	73.3	71.6	71.0	68.2	60.2	50.8	15.3
2000	903	1145	68.7	81.3	73.8	71.8	70.9	68.4	64.1	54.4	12.6
2000	903	1200	67.9	74.5	72.2	71.0	70.3	68.0	62.9	52.4	6.6
2000	903	1215	68.8	84.5	77.4	71.5	70.7	68.0	63.4	53.6	15.7
2000	903	1230	68.2	80.1	72.5	71.4	70.7	67.9	64.0	54.0	11.9
2000	903	1245	67.5	75.4	71.9	70.8	70.1	67.4	61.7	53.1	7.9
2000	903	1300	67.5	77.1	71.8	70.4	69.8	67.5	61.4	49.9	9.6
2000	903	1315	68.2	78.7	75.4	71.7	70.4	67.7	62.7	52.2	10.5
2000	903	1330	67.1	78.8	72.4	70.5	69.8	66.8	60.5	48.4	11.7
2000	903	1345	67.9	84.6	74.8	71.2	70.1	67.1	61.9	51.9	16.7
2000	903	1400	66.9	88.1	72.5	70.3	69.4	66.5	60.4	49.6	21.2
2000	903	1415	66.6	80.5	73.0	70.2	69.5	66.0	59.0	50.4	13.9
2000	903	1430	66.9	76.1	72.6	70.4	69.7	66.6	59.4	49.0	9.2
2000	903	1445	66.9	75.2	71.5	70.0	69.4	66.7	61.4	46.4	8.3
2000	903	1500	67.4	76.5	72.5	70.9	70.1	67.0	61.3	51.6	9.1
2000	903	1515	67.5	76.1	72.5	70.6	69.9	67.3	63.1	52.2	8.6
2000	903	1530	67.1	77.6	71.7	70.2	69.6	67.0	61.7	49.5	10.5
2000	903	1545	67.6	76.1	71.8	70.5	69.8	67.5	64.0	55.7	8.5
2000	903	1600	67.8	77.3	72.7	71.1	70.4	67.6	63.4	53.0	9.5
2000	903	1615	67.7	79.1	72.4	70.9	70.2	67.4	63.7	54.4	11.4
2000	903	1630	67.8	73.0	71.6	70.8	70.2	67.6	64.2	55.7	5.2
2000	903	1645	68.2	80.4	73.6	71.1	70.4	67.6	64.3	53.6	12.2
2000	903	1700	67.3	74.2	72.1	70.4	69.7	67.1	63.5	51.1	6.9
2000	903	1715	67.3	75.9	72.3	70.7	70.0	67.1	60.5	47.4	8.6
2000	903	1730	67.9	76.8	72.2	71.1	70.4	67.7	63.1	53.0	8.9
2000	903	1745	67.8	75.0	72.8	71.1	70.4	67.6	62.9	53.1	7.2
2000	903	1800	67.5	84.0	72.5	72.5	71.0	67.6	62.9	52.6	16.5
2000	903	1815	67.2	74.7	72.1	70.8	70.0	67.0	60.4	53.1	7.5
2000	903	1830	67.2	82.1	72.3	70.7	69.9	66.8	59.8	47.7	14.9
2000	903	1845	67.5	77.9	73.4	71.0	70.2	67.1	61.0	47.2	10.4
2000	903	1900	67.0	74.2	72.2	70.6	69.9	66.8	58.8	45.5	7.2
2000	903	1915	66.4	74.3	71.3	70.2	69.6	66.0	55.5	46.1	7.9
2000	903	1930	66.6	74.2	72.1	70.5	69.6	66.2	58.6	49.0	7.6
2000	903	1945	65.6	74.4	71.0	69.8	68.9	65.2	55.5	48.0	8.8
2000	903	2000	65.8	72.9	71.4	70.1	69.4	65.0	55.9	46.6	7.1
2000	903	2015	65.7	80.7	71.4	69.7	68.9	65.1	55.2	44.8	15.0
2000	903	2030	65.8	72.7	71.1	70.1	69.4	65.2	55.6	46.8	6.9
2000	903	2045	65.6	72.5	71.4	69.9	69.1	65.0	55.6	47.3	6.9
2000	903	2100	64.7	72.6	71.2	69.7	68.6	63.5	53.3	43.9	7.9
2000	903	2115	64.6	73.2	71.1	69.2	68.4	63.5	52.7	45.0	8.6
2000	903	2130	65.5	76.7	72.4	70.4	69.4	64.0	50.6	41.1	11.2
2000	903	2145	64.2	72.5	70.9	69.2	68.1	62.6	50.0	37.3	8.3
2000	903	2200	63.7	76.9	72.5	69.3	68.1	59.6	50.0	45.2	13.2
2000	903	2215	63.4	74.3	70.5	68.4	67.5	60.9	50.5	43.8	10.9
2000	903	2230	62.5	76.0	70.7	68.2	66.9	57.8	46.8	40.0	13.5
2000	903	2245	62.6	73.0	70.7	68.6	67.3	57.4	47.3	40.6	10.4
2000	903	2300	62.8	76.6	71.9	68.9	67.6	56.7	43.6	37.4	13.8
2000	903	2315	62.9	73.0	70.9	69.0	67.7	58.1	42.1	38.3	10.1
2000	903	2330	63.3	77.6	74.0	69.7	67.9	55.8	44.7	40.0	14.3
2000	903	2345	61.4	73.2	70.6	68.6	66.9	53.5	42.6	38.3	11.8
2000	904	0	60.7	74.8	70.6	67.9	66.0	53.5	42.0	39.2	14.1

DAY 5	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	65.8	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	62.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	67.2	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	63.0	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	69.7	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	46.6	dB(A)

281 Windsor Road, Vineyard											DAY 6
Monday 4 September 2000									RT&A S/N 80		
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	903	2215	63.4	74.3	70.5	68.4	67.5	60.9	50.5	43.8	10.9
2000	903	2230	62.5	76.0	70.7	68.2	66.9	57.8	46.8	40.0	13.5
2000	903	2245	62.6	73.0	70.7	68.6	67.3	57.4	47.3	40.6	10.4
2000	903	2300	62.8	76.6	71.9	68.9	67.6	56.7	43.6	37.4	13.8
2000	903	2315	62.9	73.0	70.9	69.0	67.7	58.1	42.1	38.3	10.1
2000	903	2330	63.3	77.6	74.0	69.7	67.9	55.8	44.7	40.0	14.3
2000	903	2345	61.4	73.2	70.6	68.6	66.9	53.5	42.6	38.3	11.8
2000	904	0	60.7	74.8	70.6	67.9	66.0	53.5	42.0	39.2	14.1
2000	904	15	59.8	76.1	71.2	67.6	64.5	48.1	40.8	39.0	16.3
2000	904	30	60.0	73.1	70.6	67.4	65.4	50.7	42.6	38.7	13.1
2000	904	45	60.0	74.6	72.0	67.5	64.7	50.0	41.0	38.5	14.6
2000	904	100	60.2	76.1	70.9	67.9	65.5	51.3	43.3	40.0	15.9
2000	904	115	60.8	81.6	71.9	67.7	64.7	49.4	41.5	39.4	20.8
2000	904	130	58.7	76.3	70.2	65.9	62.7	47.3	40.7	39.5	17.6
2000	904	145	57.5	72.6	69.3	66.3	61.6	44.7	39.1	37.2	15.1
2000	904	200	58.5	74.8	71.6	66.7	59.9	43.7	39.2	37.6	16.3
2000	904	215	56.4	75.9	68.5	63.6	57.2	41.0	39.1	37.9	19.5
2000	904	230	54.8	74.2	68.6	61.0	54.7	41.8	37.8	36.4	19.4
2000	904	245	59.1	75.2	71.3	67.2	63.4	46.4	38.2	36.9	16.1
2000	904	300	58.5	75.1	71.8	66.2	61.6	46.4	40.9	38.8	16.6
2000	904	315	57.4	74.0	70.2	65.1	59.8	45.3	40.6	38.9	16.6
2000	904	330	59.0	77.7	71.1	66.7	61.3	45.9	39.9	38.0	18.7
2000	904	345	60.7	75.6	72.9	68.8	64.9	47.7	41.3	38.6	14.9
2000	904	400	62.1	79.0	75.1	69.1	65.6	49.2	42.8	39.7	16.9
2000	904	415	62.3	77.6	73.9	69.8	67.2	52.4	43.2	38.9	15.3
2000	904	430	63.6	81.4	75.5	70.2	67.9	54.7	48.2	45.8	17.8
2000	904	445	64.2	77.6	74.3	71.0	68.7	57.9	48.8	43.5	13.4
2000	904	500	63.9	77.0	73.3	70.8	68.7	58.2	48.9	41.8	13.1
2000	904	515	66.5	78.4	75.0	72.3	70.9	63.0	53.6	47.4	11.9
2000	904	530	67.4	79.7	75.5	72.4	71.1	65.1	56.9	49.2	12.3
2000	904	545	68.8	78.9	76.0	73.7	72.3	67.4	60.1	54.1	10.1
2000	904	600	69.6	80.1	76.2	73.6	72.6	69.2	61.3	53.4	10.5
2000	904	615	69.8	83.4	76.7	73.7	72.6	69.2	62.2	57.1	13.6
2000	904	630	70.3	77.6	76.2	74.2	73.1	69.7	64.3	58.0	7.3
2000	904	645	70.2	78.2	75.5	74.0	73.0	69.8	64.0	58.5	8.0
2000	904	700	71.4	93.9	77.7	74.6	73.5	70.5	66.0	59.0	22.5
2000	904	715	72.4	88.9	79.0	77.9	76.4	70.6	64.6	58.1	16.5
2000	904	730	72.4	85.0	78.9	76.3	75.0	71.7	67.3	55.3	12.6
2000	904	745	72.1	81.9	78.0	76.3	75.2	71.2	65.9	58.4	9.8
2000	904	800	71.2	81.2	77.3	74.8	73.8	70.9	64.3	54.4	10.0
2000	904	815	71.0	79.5	76.6	75.1	74.0	70.4	64.1	56.7	8.5
2000	904	830	71.1	78.5	76.9	74.9	74.0	70.5	65.4	56.4	7.4
2000	904	845	70.8	80.4	77.7	75.2	73.6	70.0	62.9	53.4	9.6
2000	904	900	70.9	81.2	77.7	75.0	74.0	70.1	64.5	55.7	10.3
2000	904	915	71.0	87.7	79.5	75.8	74.0	69.3	61.6	53.7	16.7
2000	904	930	70.3	79.6	77.4	75.3	74.1	69.1	58.3	49.1	9.3
2000	904	945	70.7	82.5	78.2	75.7	74.1	69.2	61.7	53.2	11.8
2000	904	1000	70.7	82.4	77.4	75.5	74.3	69.3	62.2	49.9	11.7
2000	904	1015	70.6	80.5	77.4	75.3	74.1	69.3	60.6	48.6	9.9
2000	904	1030	70.2	80.7	76.8	75.2	73.9	69.0	60.7	51.7	10.5
2000	904	1045	69.5	80.1	76.4	74.1	73.0	68.2	60.9	49.9	10.6
2000	904	1100	69.2	80.3	77.4	74.7	72.6	67.6	59.4	52.5	11.1
2000	904	1115	69.2	78.2	75.8	73.9	72.5	68.1	61.5	50.7	9.0
2000	904	1130	68.6	82.2	76.6	73.4	71.8	67.1	58.4	51.3	13.6
2000	904	1145	69.5	89.4	76.5	74.2	72.6	67.4	59.2	50.3	19.9
2000	904	1200	69.0	79.8	76.3	74.0	72.5	67.7	59.2	50.0	10.8
2000	904	1215	68.7	78.3	76.4	74.0	72.2	67.6	58.4	49.6	9.6
2000	904	1230	68.3	77.1	75.5	73.2	71.7	67.2	59.5	51.1	8.8
2000	904	1245	68.7	78.7	76.2	73.6	72.1	67.2	60.6	52.1	10.0
2000	904	1300	68.6	82.0	76.6	73.5	72.2	67.2	57.4	48.2	13.4
2000	904	1315	67.7	76.8	74.7	72.8	71.3	66.2	58.6	51.0	9.1
2000	904	1330	68.2	81.1	76.0	72.9	71.6	67.0	56.9	46.7	12.9
2000	904	1345	67.6	77.3	74.9	72.6	70.9	66.5	58.3	45.0	9.7
2000	904	1400	67.0	78.3	74.3	71.7	70.0	65.9	57.6	47.4	11.3
2000	904	1415	67.0	77.8	74.5	71.8	70.5	65.8	57.3	46.0	10.8
2000	904	1430	66.7	81.6	73.9	70.9	69.8	65.6	56.0	49.6	14.9
2000	904	1445	67.9	78.9	74.9	72.6	70.9	66.8	60.5	52.3	11.0
2000	904	1500	68.1	78.5	75.1	73.0	71.2	67.1	60.6	52.1	10.4
2000	904	1515	67.6	76.8	74.3	72.4	70.7	66.6	58.8	48.7	9.2
2000	904	1530	67.6	81.4	74.9	71.7	70.2	66.8	61.3	49.6	13.8
2000	904	1545	67.8	76.9	74.3	71.8	70.6	67.1	61.5	53.4	9.1
2000	904	1600	68.2	76.5	74.2	71.7	70.8	67.7	62.5	53.9	8.3
2000	904	1615	67.9	80.6	74.7	72.1	70.8	67.1	60.4	51.8	12.7
2000	904	1630	68.8	86.8	75.6	72.8	71.4	67.5	62.0	52.9	18.0
2000	904	1645	67.9	77.4	73.9	71.5	70.7	67.3	61.5	54.4	9.5
2000	904	1700	67.9	77.1	74.7	72.1	70.9	67.2	59.8	47.1	9.2
2000	904	1715	68.3	83.8	73.8	71.8	70.8	67.8	60.8	50.9	15.5
2000	904	1730	68.4	77.0	75.2	72.4	71.3	67.7	61.1	52.6	8.6
2000	904	1745	68.3	80.7	74.9	71.8	71.0	67.8	60.4	46.9	12.4
2000	904	1800	68.2	83.2	75.2	72.2	70.8	67.7	60.1	51.6	15.0
2000	904	1815	68.2	77.2	75.1	72.2	71.0	67.5	60.3	49.3	9.0
2000	904	1830	68.8	86.6	75.5	72.3	71.2	67.8	59.7	52.0	19.8
2000	904	1845	66.9	76.8	73.1	70.8	70.0	66.3	57.5	49.6	9.9
2000	904	1900	67.2	76.8	74.0	71.4	70.4	66.3	57.9	49.3	9.6
2000	904	1915	67.0	83.7	73.8	71.3	70.3	65.8	56.2	48.9	16.7
2000	904	1930	66.3	75.0	72.6	70.6	69.7	65.5	56.6	45.4	8.7
2000	904	1945	66.1	76.4	71.9	70.4	69.6	65.3	54.9	45.6	10.3
2000	904	2000	66.2	79.0	73.6	70.7	69.7	64.8	54.4	47.8	12.8
2000	904	2015	66.1	75.2	72.2	70.9	70.0	64.7	53.5	41.4	9.1
2000	904	2030	65.0	74.1	71.5	70.0	68.9	63.6	51.2	40.5	9.1
2000	904	2045	64.7	76.3	72.3	69.8	68.7	62.3	50.1	41.3	11.6
2000	904	2100	65.3	76.9	72.2	70.6	69.4	63.4	51.5	42.4	11.6
2000	904	2115	64.9	76.4	72.2	70.1	69.1	62.6	50.9	42.8	11.5
2000	904	2130	65.8	78.0	73.3	70.6	69.6	63.7	53.2	45.3	12.2
2000	904	2145	64.9	74.6	72.4	70.6	69.5	61.3	49.9	43.5	9.7
2000	904	2200	64.6	76.5	72.7	70.3	68.9	61.2	47.1	40.5	11.9
2000	904	2215	65.7	78.3	74.2	70.4	69.5	63.3	52.4	43.9	12.6
2000	904	2230	65.3	79.4	74.4	70.7	69.1	61.8	47.6	39.0	14.1
2000	904	2245	64.2	75.7	71.9	70.4	69.0	59.9	46.8	40.4	11.5
2000	904	2300	65.0	77.7	74.8	71.1	69.6	59.2	46.9	39.8	12.7
2000	904	2315	62.7	74.1	70.9	69.1	67.9	57.0	46.0	40.4	11.4
2000	904	2330	62.9	76.0	72.1	69.4	67.6	57.7	45.7	38.0	13.1
2000	904	2345	62.8	77.8	73.1	68.9	67.1	56.3	40.5	36.0	15.0
2000	905	0	62.1	75.6	72.4	68.9	67.0	54.3	41.2	37.4	13.5

DAY 6	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	67.7	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	62.9	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	68.8	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	64.8	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	71.3	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.0	dB(A)

281 Windsor Road, Vineyard											DAY 7
Tuesday 5 September 2000										RT&A S/N 80	
YEAR	MoDy	TIME	Leq	Lmax	L1	L5	L10	L50	L90	Lmin	Lmax - Leq
2000	904	2215	65.7	78.3	74.2	70.4	69.5	63.3	52.4	43.9	12.6
2000	904	2230	65.3	79.4	74.4	70.7	69.1	61.8	47.6	39.0	14.1
2000	904	2245	64.2	75.7	71.9	70.4	69.0	59.9	46.8	40.4	11.5
2000	904	2300	65.0	77.7	74.8	71.1	69.6	59.2	46.9	39.8	12.7
2000	904	2315	62.7	74.1	70.9	69.1	67.9	57.0	46.0	40.4	11.4
2000	904	2330	62.9	76.0	72.1	69.4	67.6	57.7	45.7	38.0	13.1
2000	904	2345	62.8	77.8	73.1	68.9	67.1	56.3	40.5	36.0	15.0
2000	905	0	62.1	75.6	72.4	68.9	67.0	54.3	41.2	37.4	13.5
2000	905	15	62.7	76.7	73.5	69.7	67.5	54.9	43.3	38.1	14.0
2000	905	30	58.6	74.0	69.8	66.6	63.7	46.2	37.5	36.0	15.4
2000	905	45	60.4	77.7	73.4	67.6	64.9	44.1	35.8	34.0	17.3
2000	905	100	57.6	71.5	68.8	66.1	62.4	48.0	35.9	33.6	13.9
2000	905	115	60.3	77.2	72.0	67.9	65.3	47.8	37.4	35.2	16.9
2000	905	130	58.9	74.1	70.7	66.8	63.8	43.2	36.3	34.7	15.2
2000	905	145	54.6	71.4	68.1	62.6	58.0	37.2	34.7	33.3	16.8
2000	905	200	56.7	73.3	70.1	64.9	58.9	40.3	35.2	33.5	16.6
2000	905	215	60.7	77.9	74.1	67.9	64.1	44.6	36.2	34.6	17.2
2000	905	230	59.1	79.4	72.4	65.6	60.3	45.9	38.1	35.9	20.3
2000	905	245	57.3	73.0	69.4	65.8	62.0	41.9	36.8	35.5	15.7
2000	905	300	59.3	78.2	71.2	66.0	62.7	44.4	36.9	34.9	18.9
2000	905	315	58.6	75.5	71.3	66.5	61.4	43.5	37.3	35.4	16.9
2000	905	330	59.1	77.8	70.7	66.8	62.5	43.2	37.5	35.8	18.7
2000	905	345	56.1	76.9	69.1	63.8	55.6	37.4	35.3	33.6	20.8
2000	905	400	59.6	76.0	72.1	67.9	63.1	43.2	36.6	33.9	16.4
2000	905	415	63.6	83.0	75.5	69.8	67.5	50.9	39.0	34.7	19.4
2000	905	430	62.7	77.1	73.8	70.3	67.8	50.8	40.4	37.0	14.4
2000	905	445	62.1	77.3	72.7	69.5	67.6	50.5	40.2	36.6	15.2
2000	905	500	64.7	79.5	74.2	71.0	69.3	56.7	47.2	41.6	14.8
2000	905	515	64.7	77.7	73.9	70.6	69.3	58.8	48.2	45.0	13.0
2000	905	530	66.6	79.3	74.2	71.9	70.7	64.0	53.3	43.9	12.7
2000	905	545	67.5	78.1	74.7	72.3	71.1	66.2	55.7	47.8	10.6
2000	905	600	68.9	79.1	75.5	73.3	72.2	68.1	60.2	51.1	10.2
2000	905	615	68.6	78.2	74.7	72.6	71.4	68.3	60.1	49.7	9.6
2000	905	630	68.8	76.2	74.6	72.7	71.6	68.6	59.8	51.7	7.4
2000	905	645	69.6	77.5	75.6	73.8	72.6	68.8	63.6	55.4	7.9
2000	905	700	69.7	78.1	75.7	73.3	72.4	69.3	63.4	52.1	8.4
2000	905	715	69.6	82.7	76.6	73.5	72.4	68.9	61.4	53.4	13.1
2000	905	730	69.4	80.0	76.4	73.1	72.0	69.0	62.1	51.7	10.6
2000	905	745	70.0	78.4	75.8	73.5	72.7	69.6	64.0	53.9	8.4
2000	905	800	69.7	79.7	76.0	74.0	72.7	69.3	60.8	50.4	10.0
2000	905	815	71.1	95.1	79.0	74.1	72.5	69.3	65.3	57.5	24.0
2000	905	830	68.8	85.9	76.1	73.0	71.6	68.0	59.4	50.2	17.1
2000	905	845	68.9	80.2	76.0	73.5	71.7	68.0	61.1	52.5	11.3
2000	905	900	68.3	78.3	75.1	72.8	71.4	67.4	60.3	52.1	10.0
2000	905	915	68.2	78.2	74.8	72.6	71.2	67.4	59.8	51.2	10.0
2000	905	930	68.2	83.3	75.8	72.7	71.1	67.1	59.8	52.1	15.1
2000	905	945	68.0	84.8	74.7	72.6	71.1	67.1	60.3	51.2	16.8
2000	905	1000	68.0	79.6	75.5	73.0	71.4	66.7	58.8	51.9	11.6
2000	905	1015	67.3	79.1	75.1	72.1	70.3	66.0	56.6	50.2	11.8
2000	905	1030	68.8	81.5	77.5	73.8	71.9	66.8	59.8	52.4	12.7
2000	905	1045	68.6	78.0	75.9	74.0	72.7	66.9	59.0	50.1	9.4
2000	905	1100	68.8	81.0	76.3	74.4	72.6	67.3	58.9	52.0	12.2
2000	905	1115	68.7	81.0	76.1	73.8	72.3	67.2	59.8	53.1	12.3
2000	905	1130	68.1	78.9	75.6	73.6	71.6	66.8	58.3	51.5	10.8
2000	905	1145	68.3	78.1	74.8	73.2	71.8	66.9	61.5	54.1	9.8
2000	905	1200	68.2	79.3	75.8	73.8	72.1	66.6	58.7	51.3	11.1
2000	905	1215	67.5	80.7	74.9	72.7	70.8	66.1	59.7	53.4	13.2
2000	905	1230	68.5	86.2	76.8	73.6	71.8	66.4	59.8	53.2	17.7
2000	905	1245	68.1	80.8	75.8	73.3	71.6	66.5	60.6	52.8	12.7
2000	905	1300	68.2	80.1	75.7	73.5	71.9	66.5	60.4	53.7	11.9
2000	905	1315	69.2	89.3	76.6	74.0	72.5	67.0	61.9	56.6	20.1
2000	905	1330	68.4	77.7	75.6	73.7	72.0	67.0	61.8	53.6	9.3
2000	905	1345	68.2	77.7	74.9	72.9	71.6	67.1	62.7	56.5	9.5
2000	905	1400	68.2	78.4	74.7	73.0	71.6	67.0	61.4	54.4	10.2
2000	905	1415	68.3	77.2	75.3	72.7	71.3	67.2	62.9	57.7	8.9
2000	905	1430	67.7	77.5	74.6	72.3	70.8	66.6	60.9	55.3	9.8
2000	905	1445	68.0	77.6	75.1	72.6	71.0	67.0	60.2	55.6	9.6
2000	905	1500	67.9	88.6	74.7	72.5	71.0	66.6	60.0	54.1	20.7
2000	905	1515	69.1	77.6	75.3	73.2	72.0	68.4	63.8	58.1	8.5
2000	905	1530	68.9	79.0	75.1	72.7	71.4	68.2	64.5	58.4	10.1
2000	905	1545	68.8	87.0	76.7	73.0	71.4	67.7	60.8	55.0	18.2
2000	905	1600	68.3	77.5	74.7	72.4	71.1	67.6	62.4	55.5	9.2
2000	905	1615	68.5	77.9	74.7	72.2	71.0	68.0	63.9	55.7	9.4
2000	905	1630	67.6	77.7	74.3	71.6	70.4	66.9	59.0	54.7	10.1
2000	905	1645	67.7	75.9	74.2	72.0	70.5	67.1	60.6	53.1	8.2
2000	905	1700	68.0	77.2	74.2	71.8	70.6	67.4	62.5	53.0	9.2
2000	905	1715	67.7	78.3	74.2	71.5	70.3	67.2	61.7	53.2	10.6
2000	905	1730	67.3	77.1	73.4	71.1	70.1	66.9	60.2	52.8	9.8
2000	905	1745	68.0	78.6	75.0	71.7	70.7	67.5	60.1	52.6	10.6
2000	905	1800	67.7	79.7	73.8	71.6	70.5	67.2	59.9	51.9	12.0
2000	905	1815	67.6	77.5	73.1	71.4	70.6	67.1	60.3	50.9	9.9
2000	905	1830	67.6	76.7	74.0	71.2	70.5	67.3	59.4	51.0	9.1
2000	905	1845	67.5	77.6	74.2	71.9	70.5	66.8	59.7	52.6	10.1
2000	905	1900	67.4	78.8	74.1	71.6	70.6	66.6	58.2	50.4	11.4
2000	905	1915	66.8	75.6	72.6	70.9	70.0	66.4	57.9	51.8	8.8
2000	905	1930	66.5	77.2	73.6	71.1	69.9	65.5	56.2	51.8	10.7
2000	905	1945	66.1	80.6	73.9	70.5	69.5	64.7	51.9	47.1	14.5
2000	905	2000	65.4	76.4	71.8	70.2	69.1	63.9	53.9	46.0	11.0
2000	905	2015	65.0	72.7	71.1	69.9	68.9	63.8	51.2	42.8	7.7
2000	905	2030	64.7	74.4	72.1	70.2	68.9	62.9	51.9	43.8	9.7
2000	905	2045	64.8	74.6	71.7	69.0	67.6	62.9	52.1	44.4	9.8
2000	905	2100	62.5	71.1	71.3	68.9	67.5	60.6	50.5	40.3	8.6
2000	905	2115	64.5	81.7	72.6	69.6	68.1	60.7	48.4	39.2	17.2
2000	905	2130	63.1	72.3	70.5	68.9	67.5	62.1	50.5	42.1	9.2
2000	905	2145	65.3	75.1	72.7	69.8	69.4	63.4	53.0	46.6	9.8
2000	905	2200	63.8	68.0	70.2	69.3	68.0	62.5	51.1	41.0	4.2
2000	905	2215	62.5	68.1	68.9	68.8	67.6	62.4	52.5	39.5	5.6
2000	905	2230	65.6	75.0	73.7	69.8	68.1	62.5	53.6	43.9	9.4
2000	905	2245	64.9	74.3	72.9	70.3	68.1	62.6	50.9	40.9	9.4
2000	905	2300	63.5	70.0	71.2	68.5	67.1	60.6	49.4	40.4	6.5
2000	905	2315	61.8	73.2	69.1	67.3	66.8	55.3	41.5	31.6	11.4
2000	905	2330	61.1	68.5	70.4	68.6	67.1	58.2	43.5	35.5	7.4
2000	905	2345	59.7	67.9	68.0	66.8	65.7	55.6	43.4	36.3	8.2
2000	906	0	61.0	77.2	71.6	66.7	65.6	55.9	42.5	31.6	16.2

DAY 7	DESCRIPTOR	PERIOD	LEVEL	UNIT
Full Day	Leq, 24 hours	between 00:00 and 24:00 hours	66.8	dB(A)
Night Time	Leq, 8 hours	between 22:00 and 06:00 hours	62.8	dB(A)
Daytime	Leq, 15 hours	between 07:00 and 22:00 hours	67.9	dB(A)
Night Time	Leq, 9 hours	between 22:00 and 07:00 hours	64.3	dB(A)
Daytime	L10, 18 hours	between 06:00 and 24:00 hours	70.5	dB(A)
Daytime	minimum L90, 15 min	between 07:00 and 18:00 hours	56.6	dB(A)

REVIEW OF ENVIRONMENTAL FACTORS

CERTIFICATION

PROPOSAL LOCATION
McGraths Hill: Windsor Road, between Curtis Road and Bandon Road

PROPOSAL DESCRIPTION
The Proposal is to create a flood evacuation route along Windsor Road for McGraths Hill residents by widening and raising the road and improving the drainage flows with culverts, pipes and grass swales.

I am of the opinion that the Review of Environmental Factors (REF) addresses the requirements of Clause 82 of the *Environmental Planning & Assessment Regulation, 1994,* and Sections 5A and 111 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act).

This assessment included consideration of the likely significance of impacts generated by the activity and the consequent impacts upon the environment. This was assessed in accordance with the Department of Urban Affairs and Planning's best practice guidelines *Is an EIS Required.*

The impact of the activity on declared critical habitat and any threatened species, populations, ecological communities, or habitats was assessed. No Species Impact Statement (SIS) is required in relation to the *Threatened Species Conservation (TSC) Act, 1995.*

The Proposal has been assessed in accordance with the appropriate Commonwealth legislation and relevant criteria. The activity described in the REF will have no impact on matters of national environmental significance or on Commonwealth land.

As the activity is not likely to have significant environmental impacts, it is determined that an Environmental Impact Statement (EIS) is not required.

The safeguards contained in the REF and the recommendations contained in the assessment report must be incorporated into the Environmental Management Plan (EMP) and any other Pollution Control Plans for the project. All necessary approvals, permits and licences from responsible authorities and their terms and conditions shall be obtained, maintained and complied with for this activity.

M Veysey 26 February 2001

Mike Veysey
General Manager Sydney Client Services
Roads and Traffic Authority

I concur,

Noel Kelly 22/03/01

A/ Axel Tennie
Regional Director, Sydney South Coast Region
Department of Land and Water Conservation

McGRATHS HILL FLOOD EVACUATION ROUTE FOR WINDSOR ROAD WORKS BETWEEN CURTIS ROAD, McGRATHS HILL AND SOUTH OF BANDON ROAD, VINEYARD
REVIEW OF ENVIRONMENTAL FACTORS - ASSESSMENT REPORT

The Review of Environmental Factors (REF) submitted for this proposal has been examined and it is considered that it addresses all the relevant environmental impacts. Clause 82 of the *Environmental Planning & Assessment Regulation 1994,* and Sections 5A and 111 of the *Environmental Planning and Assessment Act, 1979 (EP&A Act),* were the basis of assessing the environmental impacts of the proposal in the REF.

This assessment considered any likely significant environmental impacts of the activity in accordance with the Department of Urban Affairs and Planning's best practice guidelines *Is an EIS Required.*

BACKGROUND

In April 1997 the NSW Government established the Hawkesbury-Nepean Flood Management Advisory Committee to prepare a comprehensive strategy for floodplain management to address a flood problem in areas of the Hawkesbury-Nepean valley downstream of Warragamba Dam. The flood threat to the Hawkesbury-Nepean valley from above the city of Penrith downstream to Spencer has the potential to result in loss of life and significant property damage. The flood prone population is estimated at 40000 to 60000 people and includes 2500 residents of McGraths Hill in a suburb adjacent to Windsor Road and 1500 associated vehicles. As part of the necessary improvements to road evacuation routes for the flood management strategy, this proposal is to upgrade Windsor Road between Curtis Road and south of Bandon Road.

Windsor Road serves local, commuter and business traffic and functions as a main road linking major residential growth areas between Rouse Hill and Windsor. It has been identified as an evacuation route for the residents in the McGraths Hill area in the event of a flood. The work generally involves widening and raising Windsor Road to at least 13.5 metres Australian Height Datum (AHD) and improving the west to east cross drainage flows with new box culverts, pipes and roadside grass swales at 10 sites between Curtis Road, McGraths Hill and south of Bandon Road, Vineyard. This proposal should provide a secure evacuation route for the McGraths Hill community and is also expected to improve traffic flow, safety and capacity for travellers along this section of Windsor Road.

The objectives of this proposal are:

* to provide a safe and secure emergency evacuation route for the communities in and around McGraths Hill;
* to minimise the risk of the evacuation route being cut by local flooding during the evacuation period;
* to improve traffic flow and safety with provision of sections of four lane divided road
* to achieve community acceptance; and
* to satisfy environmental requirements where cost effective and practical.

The main environmental issues that the proposal may impact on include indigenous and non-indigenous heritage, flora and fauna in the area of the proposal, and the impact of noise on surrounding landuses. These issues have been subject to specialist studies within the REF.

The RTA and the Department of Land and Water Conservation (DLWC) are the joint proponents for the proposal, which would be constructed by contractors. The estimated cost for

the concept development, environmental impact assessment, utilities adjustment, detailed design and construction of the proposal is approximately $9 million. Construction of the proposal is anticipated to commence in early 2001 over a period of one year. Completion of the works would be in early 2002.

DISCUSSION

1. Preparation of a Contractor's Environmental Management Plan (CEMP)

A CEMP should be developed incorporating the safeguard measures identified in the REF, any appropriate specification requirements and the safeguard measures identified in this Decision Report.

The CEMP should be forwarded to the Sydney Environmental Services Branch and DLWC for endorsement before any work commences.

2. Erosion and Sedimentation Control Plan

An Erosion and Sedimentation Control Plan should be developed prior to any work commencing, and should be forwarded to Sydney Environmental Services branch for comment.

3. Noise Attenuation and Monitoring

Any construction works that are to be outside normal working hours should conform to the RTA's *Consultation Procedure for Road Works Undertaken Outside Normal Working Hours* guidelines.

Predicted noise levels should be verified 12 months following the completion of the works. If operational noise levels exceed those predicted in the REF, then additional community consultation should take place and an appropriate noise abatement strategy should be devised.

4. Environmental Audit and Surveillance

To ensure that environmental safeguards are met a program that allows for an appropriate level of environmental surveillance should be undertaken.

The nominated RTA Client Services Directorate Environmental Officer is Les McCluskey.

CONCLUSIONS

It is concluded that the environmental impacts of the proposal are unlikely to be significant, and an Environmental Impact Statement is not required.

RECOMMENDATION

It is recommended that the proposal proceed.

Geoff Cahill
Manager, Sydney Environmental Services
Roads and Traffic Authority

for
Arthur Low
Project Manager, Hawkesbury Nepean Floodplain
Management Strategy
Department of Land and Water Conservation

Mike Veysey
General Manager, Sydney Client Services
Roads and Traffic Authority

Axel Tennie
A/Regional Director, Sydney South Coast Region
Department of Land and Water Conservation