

CONTENTS

PART A: SUMMARY

PART B: INTRODUCTION

1	Background	1-1
1.1	The Study and Its Objectives	1-1
1.2	The Interim National Highway and the Missing F3 to Sydney Orbital Link.....	1-3
1.3	The National Highway objectives.....	1-4
1.4	Previous Studies	1-4
1.5	Contents of This Report.....	1-5
2	Approach to the Study	2-1
2.1	Study Process	2-1
2.2	Study Area and Options Development.....	2-2
2.3	Community Consultation.....	2-3
2.4	This Report.....	2-3
2.5	The Way Forward.....	2-3

PART C: THE CURRENT SITUATION

3	Existing Conditions on the interim National Highway Corridor and F3 Freeway	3-1
3.1	Functions and Types of Users of the National Highway	3-1
3.2	Traffic Conditions on the National Highway and on the Surrounding Arterial Road Network	3-3
3.3	Public Transport, Cyclists and Pedestrians	3-7
3.4	Freight Movement in the Corridor	3-11
3.5	Social and Environmental Impacts of National Highway Traffic	3-16

PART D: KEY ISSUES

4	Traffic Growth in the National Highway Corridor	4-1
4.1	Population and Employment Growth	4-1
4.2	Growth in Passenger Transport.....	4-8
4.3	Growth in Road Passengers.....	4-9

4.4	Growth in Road Freight Transport	4-15
5	Demand Management and Sustainability	5-1
5.1	Land Use, Transport and the National Highway	5-1
5.2	Road Pricing and the National Highway	5-2
5.3	Providing the Right Mix of New Infrastructure	5-4
5.4	Recognising Transport's Social Costs	5-5
6	Rail and Public Transport Scenarios	6-1
6.1	The Four Transport Scenarios	6-1
6.2	Rail Freight Outcomes	6-2
6.3	Rail Passenger Outcomes	6-3
6.4	The Public Transport Only Option.....	6-3

PART E: NEED

7	The Need for a New National Highway Link	7-1
7.1	National and State Development Need.....	7-1
7.2	Regional and Local Needs	7-1
7.3	Public Transport's Role	7-2
7.4	Existing and Continuing Future Needs	7-2
8	The National Highway Planning Objectives	8-1
8.1	The Current National Highway Objectives.....	8-1
8.2	Planning Objectives	8-1
8.3	20 Year Planning Horizon	8-2
8.4	Alleviate Poor Travelling Conditions on the National Highway.....	8-2
8.5	Improve Amenity for People Living and Working along Pennant Hills Road	8-3
8.6	Improve Travel Reliability for Inter-Regional Commercial and Freight Transport.....	8-4
8.7	Servicing Future Growth of Road Freight Transport.....	8-4

PART F DEVELOPMENT AND ASSESSMENT OF CORRIDOR TYPES

9	Options Development Process	9-1
9.1	Introduction	9-1
9.2	Land Use Considerations.....	9-3
9.3	Economic and Regional Development.....	9-5

9.4	Urban Design, Landscape and Visual Assessment.....	9-5
9.5	Social and Environmental Effects	9-8
9.6	Engineering Considerations.....	9-12
10	Investigation and Assessment of the Broad Corridor Types	10-1
10.1	Type A, B and C Corridor Options	10-1
10.2	Strategic Assessment of Corridor Types	10-8
10.3	Transport Assessment of Type A, B and C corridors.	10-10
10.4	Social Effects Assessment of Corridor Types A, B and C	10-13
10.5	Environmental Assessment of Corridor Types A, B and C	10-15
10.6	Economic Assessment of Corridor Types A, B and C	10-16
10.7	F3 Capacity Issues.....	10-17
10.8	Conclusions.....	10-18
PART G: DEVELOPMENT & ASSESSMENT OF TYPE A CORRIDOR OPTIONS		
11	Options Development	11-1
11.1	Project Objectives	11-1
11.2	The Purple, Blue, Yellow and Red Options	11-1
11.3	The Base Case Option.....	11-9
12	Type A Options Assessment	12-1
12.1	Assessment Process.....	12-1
12.2	Assessment of Main Effects.....	12-2
12.3	Pair Wise Comparison of Options.....	12-17
12.4	Main Effects by Interest Groups.....	12-19
12.5	Value Management Workshop Outcomes	12-21
12.6	Conclusions.....	12-23
13	Community Consultation	13-1
13.1	Consultation Program	13-1
13.2	Stakeholder Views	13-4

PART H: THE RECOMMENDED TYPE A OPTION

14	The Purple Option Description	14-1
14.1	General Description	14-1
14.2	Interchange and Tunnel Portal Arrangements	14-2
14.3	Tunnel Design and Ventilation	14-10
14.4	Urban Design and Landscape	14-16
14.5	Associated Works as Part of the Project.....	14-21
15	Social and Environmental Effects	15-1
15.1	Land Use and Zoning	15-1
15.2	Terrestrial Ecology	15-2
15.3	Water Quality and Aquatic Ecology	15-4
15.4	Air Quality.....	15-5
15.5	Noise Impacts	15-7
15.6	Heritage.....	15-8
15.7	Social Impacts.....	15-9
15.8	Energy.....	15-11
15.9	Ventilation Stack Issues.....	15-12
15.10	Waste and Resource Management	15-12
16	Traffic and Transport	16-1
16.1	Traffic Volumes	16-1
16.2	Levels of Service of the New Link.....	16-2
16.3	Interchange Operations and Queuing in the Tunnel.....	16-7
16.4	Sensitivity Tests	16-8
16.5	Associated Works not Part of the Project	16-10
16.6	Integrated Transport Improvements.....	16-11
17	Cost Estimates and Economic Justification	17-1
17.1	Indicative Capital and Operating Costs (Dual Two Lane & Dual Three Lane)	17-1
17.2	Toll and No Toll.....	17-1
17.3	Economic Justification.....	17-2
17.4	Method of Delivery	17-3
17.5	Conclusions.....	17-4

18	Purple Option Refinement	18-1
18.1	Varying Tunnel Length	18-1
18.2	Intermediate Access.....	18-1
18.3	Shared Rail Corridor	18-3
18.4	Land Use and Transport Development Opportunities in the Purple Corridor	18-4

PART I: MAIN FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

19	Main Findings and Conclusions	19-1
19.1	Existing Conditions on the interim National Highway	19-1
19.2	Traffic Growth on the National Highway	19-2
19.3	Demand Management and Sustainability	19-2
19.4	Rail Freight and Public Transport Scenarios	19-2
19.5	The Need for a New Link	19-3
19.6	Assessment of Corridor Types A, B and C	19-4
19.7	Assessment of Type A Options.....	19-4
19.8	Key Outcomes from Community Consultation.....	19-4
19.9	Traffic and Transport Findings	19-5
19.10	Cost Estimates and Economic Justification	19-6
19.11	Social and Environmental Effects	19-6
19.12	Purple Option Refinement.....	19-7
20	Recommendations and Way Forward	20-1
20.1	The Preferred Option	20-1
20.2	Way Forward.....	20-1
20.3	F3 Capacity Issues.....	20-2

LIST OF SUPPORTING DOCUMENTS

REPORTS AND RECORDS

Draft Options Development Report (October, 2002)

Value Management Workshop No.1 Record (June, 2002)

Value Management Workshop No.2 Record (September, 2003)

WORKING PAPERS

No. 1: Community Consultation Report (December, 2003)

Appendices: Background Report, July 2003

Newsletters Nos. 1 & 2

No. 2: Engineering Design and Costings Report (March, 2004)

No. 3: Urban Design, Landscape and Visual Assessment Report (December, 2003)

No. 4: Traffic and Transport Studies Report (December, 2003)

No. 5: Social and Environmental Studies Report (March, 2004)

No. 6: Tunnel Investigations Report (December, 2003)

No. 7: Economics and Finance Report (March, 2004)

List of Tables

Table 3-1:	Estimated trips between Central Coast and Sydney in F3 Daily Weekday Traffic Volume (2 way), 2001	3-2
Table 3-2:	Summary of existing traffic volumes on Major Arterials in the Northern Sydney Road Network, 2002	3-4
Table 3-3:	Road Safety Performance Compared with Sydney network (1999 – 2001).....	3-6
Table 3-4:	Existing Corridor Demand, Passenger Flows, 2002	3-9
Table 3-5:	Heavy Commercial Vehicle Proportions of Total Traffic Volumes in the Corridor, July 2003.....	3-14
Table 4-1:	Population and employment forecasts in the study area	4-3
Table 4-2:	The origins and destinations of forecast traffic flows on Pennant Hills Road, the Pacific Highway and Lane Cove road during the morning peak hour in 2021, assuming there is no new F3-Sydney Orbital Link	4-12
Table 4-3:	Predicted Traffic Volumes on the F3 at Hawkesbury River Crossing.....	4-14
Table 10-1:	Indicative number of properties crossed or passed under, wholly or partly, by each of the long list of options.	10-6
Table 10-2:	Indicative construction cost estimates of the preliminary options.	10-7
Table 10-3:	Strategic assessment of the generally best-performing options against new link objectives	10-9
Table 10-4:	Network Travel Costs and Benefits – Comparison of Type A and Type C	10-12
Table 10-5:	Transport assessment results, comparing the effects of Type A, B and C corridors	10-13
Table 10-6:	Summary of Social Effects of Corridor Types	10-14
Table 10-7:	A Summary of Environmental Impacts of Corridor Types	10-16
Table 10-8:	Economic Performance of Types A, B and C Corridors	10-17
Table 12-1:	Strategic Development.....	12-3
Table 12-2:	Traffic and Transport Assessment.....	12-6
Table 12-3:	Urban Design, Landscape and Visual Assessment.....	12-9
Table 12-4:	Overall Rankings of Environmental Effects	12-10
Table 12-5:	Environmental Effects	12-11
Table 12-6:	Social Effects	12-13
Table 12-7:	Overall Ranking of Options According to Engineering Effects	12-15
Table 12-8:	Capital Cost Estimates and Economics Assessment – No Toll Scenario	12-16
Table 12-9:	Capital Cost Estimates and Economics Assessment – Toll Scenario	12-16
Table 12-10:	Summary Ranking of Options.....	12-17

Table 12-11:	Summary of Option Effects by Interest Group	12-20
Table 12-12:	Type A Options – Two Lane – Tolled	12-21
Table 12-13:	Type A Options –Two Lane Un-tolled.....	12-22
Table 15-1:	Purple Route - Estimated Land take by Land Use Zone	15-2
Table 15-2:	Purple Option - Potential Threatened Flora and Fauna Impacts	15-3
Table 15-3:	Endangered Ecological Communities (EECs) and Populations	15-3
Table 15-4:	Summary Assessment of Purple Option – Aquatic and water quality	15-5
Table 15-5:	Purple Option - Predicted peak ground-level concentrations due to stack emissions	15-6
Table 15-6:	Purple Option - Summary of air quality issues.....	15-6
Table 15-7:	Purple Route - Social Impacts	15-10
Table 15-8:	VKT and Calculated Fuel Used, Fuel Mass and CO2 Emissions.....	15-11
Table 16-1	Tunnel Average Daily (AADT) Flows, 2011 and 2021	16-2
Table 16-2	Estimated Tunnel Peak Hour Flows and Levels of Service.....	16-3
Table 16-3	Traffic Volumes (AADT) in Purple Tunnel - Sensitivity Analysis Results	16-9
Table 16-4	Predicted Traffic Volumes on the F3 at Hawkesbury River Crossing.....	16-10
Table 17-1:	Indicative Capital and Operating Costs Summary (\$ million, 2003 prices).....	17-2
Table 17-2:	Results of Road User Costs-Benefit Analysis (2003 prices)	17-4

List of Figures

Figure 1-1:	The National Highway (Cumberland Highway, Pennant Hills Road and F3 Freeway) in the Study Area (Dean Park to Macquarie Park to Kariong).....	1-2
Figure 2-1:	Study Process.....	2-2
Figure 3.1	Existing Traffic Flows on Major Arterials in the Northern Sydney Road Network, 2002.....	3-4
Figure 3.2:	Through Traffic Distribution (Traffic on the F3 with origins/destinations south of the M2 Motorway)	3-7
Figure 3.3	Travel Mode Proportions for Journey to Work.....	3-11
Figure 3.4:	Number of Southbound Heavy Vehicles per hour August 2001	3-13
Figure 3.5:	Number of Northbound Heavy Vehicles per hour August 2001.....	3-13
Figure 3.6:	Origins/Destinations of Trucks on the Interim National Highway.....	3-15
Figure 3.7:	Travel Zones used to assess Truck O/D Distributions	3-16
Figure 4.1:	Land Use Assumptions – Population – Sydney LGA Population & Population Forecast 2001, 2011 & 2021	4-5
Figure 4.2:	Land Use Assumptions – Employment - Sydney LGA Population & Employment Forecast 2001, 2011 & 2021	4-6
Figure 4.3:	Land Use Assumptions – Growth Rates Population & Employment - Sydney LGA Population & Employment Growth Rate 2001, 2011 & 2021.....	4-7
Figure 4.4:	2021 AADT Flows on the Main Arterial Network, assuming investment in the Main North Rail Line	4-10
Figure 4-5:	Traffic Origins and Destinations of morning peak-hour traffic flows on the F3 in 2021	4-13
Figure 4-6	Growth in Non-Bulk Freight Task Compared with GDP Growth, 1971-2000.	4-15
Figure 4-7:	24 hour truck volumes in 2021	4-16
Figure 5-1:	Typology of External Costs of Road Transport.....	5-7
Figure 9.1:	Overview of the study’s processes for developing and assessing corridor options ...	9-2
Figure 9.2:	Overview of the study’s processes for taking account of urban design considerations.....	9-6
Figure 9.3:	Character zone and landform constraints in the study areas	9-7
Figure 10-1:	Broad Corridor Types.....	10-3
Figure 10-3:	The corridor options assessed during the preliminary stages of this study.....	10-4
Figure 10-4:	Typical Average Daily Traffic Relief on the Interim National Highway and arterial roads from Type C	10-12
Figure 11-1:	Feasible route options.....	11-2
Figure 11-2:	The Purple Option Northern Interchange arrangements with the F3 Freeway and Pacific Highway.....	11-3

Figure 11-3:	The Purple and Blue Options Southern Interchange arrangements with the M2 and Pennant Hills Road	11-3
Figure 11-4:	The Blue, Yellow and Red Northern Interchange arrangements with the F3 and Pacific Highway.....	11-5
Figure 11-5:	The Yellow Option Southern Interchange arrangements with the M2 Motorway	11-7
Figure 11-6:	The Red Option Southern Interchange arrangements with the M2 Motorway	11-8
Figure 12.1:	Ranking of Type A Options by Criteria	12-18
Figure 13-1:	Percentage of Submissions Received by Suburb	13-5
Figure 13-2:	Major Issues from Community Consultation	13-6
Figure 13-3:	Percentage of Submissions which Supported a Particular Option	13-8
Figure 14.1:	The Purple Option.....	14-3
Figure 14.2:	Possible Northern Interchange – Base Layout – Purple Option	14-4
Figure 14.3:	Possible Southern Interchange – Purple and Blue Routes – Base Layout	14-5
Figure 14.4:	Typical Tunnel Cross Sections	14-11
Figure 14.5:	Purple Option Plan and Longsection	14-12
Figure 14.6:	Potential Landscape Treatment at F3 Interchange, looking South.....	14-17
Figure 14.7:	Potential Landscape Plan for F3 Intersection	14-18
Figure 14.8:	Potential Landscape Treatments at the Southern M2 Interchange, looking North	14-19
Figure 14.9:	Possible Alignment of Purple Option Adjacent to the Dartford Road Sports Complex at Brickyard Park, Thornleigh	14-20
Figure 14.10:	A Possible Pennant Hills Road/North Rocks Road Intersection layout, part of the Purple Tunnel Scheme	14-21
Figure 14.11:	Possible Typical Treatment of Re-allocating Road Space on Pennant Hills Road	14-23
Figure 16.1	Optimum Toll Value	16-4
Figure 16.2	Daily Toll Revenue 2021	16-5
Figure 16.3	Toll Elasticity	16-6
Figure 16.4	June 2003 Travel Time Survey – Pennant Hills Road & Pacific Hwy.....	16-6
Figure 16.5	New Link Travel Time Survey – 2011 AM Peak	16-7
Figure 16.6	A Possible Pennant Hills Road/North Rocks Road Intersection layout, part of the Purple Tunnel Scheme	16-11
Figure 18.1:	Potential Section through shared rail corridor in cutting	18-4