

5 Highway and Public Transport Infrastructure



5 Highway and Public Transport Infrastructure

5.1 Introduction

The guiding principles behind the preliminary designs of the public transport and highway infrastructure requirements are re-allocation of road-space for public transport, cyclists and pedestrians. The provision of a high quality public transport corridor from the Deep Lane Park & Ride site, via the Sherford and Plymstock developments, to the Plymouth city centre is a key element of the transport strategy for East Plymouth. This was the strong conclusion generated by the Eastern Corridor Study (ECS).

Highway capacity enhancements have been included where they are deemed necessary and appropriate, to ensure that key junctions in the study area and along the High Quality Public Transport Corridors do not become grid-locked. Other highway alterations have been provided, to re-route traffic approaching the city centre from the A374 and A379 away from Embankment Road which currently suffers from environmental problems due to the high traffic volumes.

New junctions in the Plymstock and Sherford areas have been incorporated into the transport strategy to allow traffic from the new developments to access and egress the highway network. This section presents the preliminary designs, and an assessment of their aims, objectives and impacts. The designs have been developed using the do-min model outputs.

Junction designs have been developed based on the most appropriate designs that may already exist. Due to time and modelling constraints, we have not been able to assess a wide range of junction designs for each junction in the study area.

The preliminary designs that have been developed for the required infrastructure alterations have been modelled using the PARAMICS software. This has enabled the designs to evolve as the study has progressed. Whilst it is not possible to generate RFC (Ratio of Flow to Capacity) values using PARAMICS, the key junction designs have been assessed using visual on screen checks during the micro-simulation run-time. In addition we have analysed through flow, strategic journey times and queues at these key junctions. It is recommended that the TRANSYT software is used to check and refine the junction designs and to enable the signal timings to be optimised. Whilst some TRANSYT models were developed during the Plymouth Eastern Corridor Study it has not been possible to utilise these during this study. This has been due to changes in designs from Option 2 (Plymouth ECS), budget and time constraints.

5.2 Public Transport Infrastructure

Plymouth City Centre: West of Laira Bridge

The routing of the public transport corridor to the city centre is central to the proposals. Bus gates, bus priorities and bus lanes have been designed to ensure high quality facilities which will provide reliable running times for public transport services.

Plymstock Quarry and Sherford Developments

The High Quality Public Transport corridor from the Deep Lane Park & Ride to the city centre will pass through the proposed developments of Plymstock Quarry and Sherford New Community. The route through Sherford has been developed by Scott Wilson and consists of on-street running with bus priorities and bus lanes, whilst the route through Plymstock Quarry will run on a dedicated alignment along a disused railway line. The former is not in line with the recommendations of the ECS, and does not represent a truly HQPT route.

A38 Parkway: Manadon – Deep Lane

Where possible, bus priority measures and bus lanes have been incorporated into the designs for these junctions along the A38 trunk road. These designs are described in more detail in sections 5.7 and 5.8.

5.3 Highway Infrastructure

Plymouth City Centre: West of Laira Bridge

The highway designs have been developed to re-route traffic away from existing residential streets in the St Jude's area. There will be a new 'southern' route to the city centre from Laira Bridge and major junction improvements will be required to achieve this. These improvements are being made for environmental reasons, to allow Embankment Road to be used solely for local traffic and the High Quality Public Transport corridor into the city centre.

Plymstock Quarry and Sherford Developments

The majority of the proposals shown for these areas have been developed from designs produced by Scott Wilson and JUBB, the transport consultants for Sherford New Community and Plymstock Quarry developers, respectively.

A38 Parkway: Manadon – Deep Lane

With the exception of Deep Lane these designs have been developed from those produced by Parsons Brinckerhoff for the A38 Parkway study. A revised grade-separated junction has been designed for the Deep Lane junction, this is described in section 5.8.

5.4 Preliminary Design Drawings

A CD to accompany this report has been produced which contains all the preliminary drawings for this study, there are approx. 40 drawings on this CD and the drawings have been numbered as follows:

Options Drawing

Options - Study area showing received drawings from other Transport Consultants. (A0)

Study Area Overview

Drawing No. 1100 – Master Overview showing location of all the infrastructure proposals and the geographical areas of the 'Location Overviews', this drawing is shown as Figure 13.

(A3 and A0 versions of this drawing have been generated)

Location Overviews

Nine location overviews have been generated to show distinct elements of the study area. The geographical location of the 'Junction and Section Layouts' is shown on these A3 drawings:

Drawing No. 1200 – West of Laira Bridge;

Drawing No. 1300 – East of Laira Bridge and Plymstock;

Drawing No. 1400 – Billacombe Road and Elburton Road;

Drawing No. 1500 – Bus Rapid Transit Corridor;

Drawing No. 1600 – Deep Lane;

Drawing No. 1700 – Embankment Road;

Drawing No. 1800 – Forder Valley and Marsh Mills;

Drawing No. 1900 – Manadon Interchange; and

Drawing No. 2000 – Sherford New Community.

Junction and Section Layouts

A3 drawings have been produced showing the preliminary designs for all of the infrastructure proposals:

Drawing No. 1210 – 1260 are detailed drawings for West of Laira Bridge;

Drawing No. 1310 – 1330 are detailed drawings for East of Laira Bridge and Plymstock;

Drawing No. 1410 – 1440 are detailed drawings for Billacombe Road and Elburton Road;

Drawing No. 1510 – 1540 are detailed drawings for Bus Rapid Transit;

Drawing No. 1610 – 1620 are detailed drawings for Deep Lane;

Drawing No. 1710 – 1720 are detailed drawings for Embankment Road;

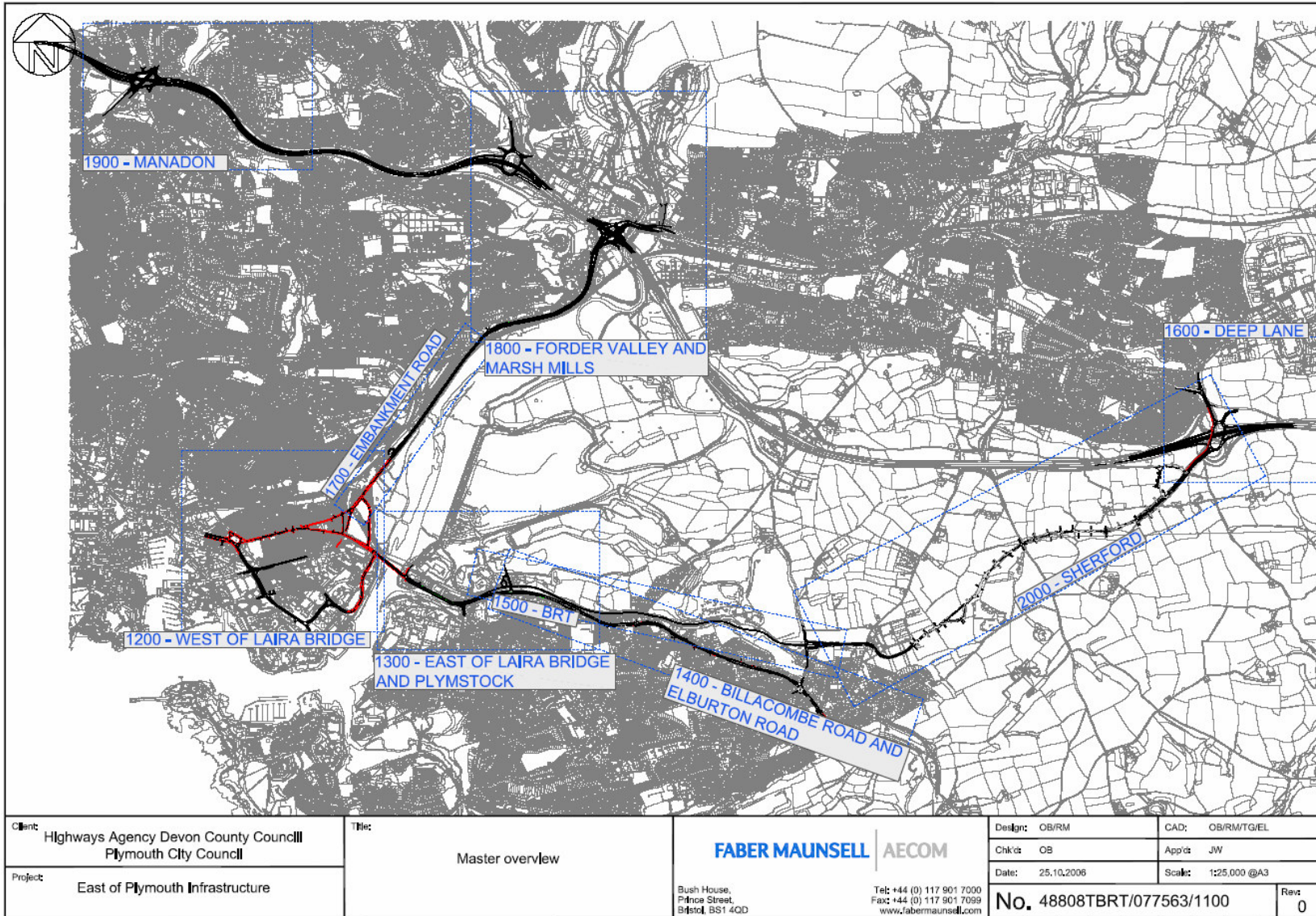
Drawing No. 1810 – 1820 are detailed drawings for Forder Valley and Marsh Mills;

Drawing No. 1910 – 1920 are detailed drawings for Manadon Interchange; and

Drawing No. 2010 – 2040 are detailed drawings for Sherford New Community.

This style of numbering provides a consistent numbering convention for all the drawings.

Figure 11 - Infrastructure Requirements (1100 - Master Overview)



5.5 Summary of the Design Proposals for the West of Laira Bridge

5.5.1 General Background and Description of Site

Location and Topography

The area to the west of Laira Bridge is predominantly urban with some industrial areas, which provides an opportunity to route through traffic away from residential areas. Public transport links are required across Laira Bridge to the east, northward towards Marsh Mills via Embankment Road and westward toward the city centre.

Existing Highway Arrangement

The existing highway consists of local residential roads with several higher quality distributor roads, with some grade separated junctions.

5.5.2 Development of Design

Previous Studies

Faber Maunsell has previously conducted a study examining the area to the west of Laira Bridge, and the previous recommendations have been further developed to produce the proposals illustrated in drawing number 48808TBRT077563/1200.

5.5.3 Proposals

Several alterations to the existing highway network are proposed including:

- the introduction of bus only restrictions in Embankment Road at its junction with Gdynia Way, and in Laira Bridge Road at its junction with Heles Terrace;
- the realignment of Embankment Road and Laira Bridge Road to discourage use by general traffic, including the realignment of the junction of Heles Terrace with Laira Bridge Road to remove eastbound access to Laira Bridge for general traffic;
- the construction of a signalised staggered crossroads in Laira Bridge Road at its junctions with Finnigan Road and Embankment Lane;
- the realignment of Embankment Lane with a signalised junction providing access into the Plymouth Gate development;
- carriageway widening in Finnigan Road to provide two lanes for general traffic in each direction;
- the introduction of bus gates in Plymouth Road to provide southbound bus priority;
- the introduction of a westbound central bus lane and an eastbound nearside bus lane on Laira Bridge;
- the realignment and signalisation of the existing junction of Billacombe Road with The Ride to provide bus priority through the junction;
- the reopening of the old Laira Bridge for use by cyclists and pedestrians;
- the introduction of near side bus lanes in Billacombe Road;
- the construction of an overbridge in Shapters Road at its junction with Barbican Approach and the realignment and signalisation of the existing junction;
- the realignment and signalisation of the existing Shapters Road junction with Clovelly Road;
- the signalisation of the junction of Macadam Road with Shapters Way;
- the construction of a three arm roundabout at the junction of Macadam Road with Oakfield Terrace;
- the removal of the existing roundabout at the junction of Maxwell Road with Oakfield Terrace;
- carriageway widening and signalisation at the junction of Embankment Road with Exeter Street;
- the introduction of nearside a bus lane in Embankment Road on the westbound approach to its junction with Exeter Road; and
- the introduction of nearside bus lanes in Exeter Street.

5.5.4 Aims and Objectives

The above improvements aim to route general traffic away from the St. Jude's area by improving Finnigan Road, Oakfield Terrace, Macadam Road and Shapters Road which will become the primary route for general traffic. The realignment of Embankment Road and Laira Bridge Road aims to reduce community severance.

5.5.5 Passenger Transport Facilities

Bus only measures have been proposed to restrict access for general traffic wishing to travel through the St. Jude's area. Bus priority measures have been introduced at strategic locations in the network to improve bus time reliability and also improve penetration into the St. Jude's area.

5.5.6 Cycle and Pedestrian Facilities

Toucan crossing arrangements have been included at all signalised junctions. Furthermore the proposals will reduce traffic volumes through the residential St. Jude's area which will improve the scope for a safer cycle and pedestrian network.

5.5.7 Design Limitations

Some elements of the proposals may require departures from standards in order to achieve the proposed alignments within the existing highway footprint. This applies to the grade separated junction of Shapwick Road and Gdynia Way, where it may be necessary to provide a sub-standard height clearance. In addition, narrow lanes may be required on Gdynia Way where it passes under Laira Bridge Road.

5.5.8 Land Requirements

Where possible the proposed improvements have been contained within the existing highway footprint. However, some land take will be required, especially within the gas works area, the widening of Finnigan Road and also for the construction of the new Embankment Lane.

5.6 Summary of the Design Proposals for the Sherford and Plymstock Developments

5.6.1 General Background and Description of Site

Site Location and Existing Highway Arrangement

The proposed Sherford and Plymstock developments represent two large residential developments situated to the south of the A38 Parkway between Plympton to the north and Plymstock to the south. Primary access to Sherford will be via the Deep Lane junction from the north and Elburton Road and Billacombe Road to the south, which will also serve the Plymstock development. Elburton Road and Billacombe Road are relatively wide and were originally two-lane carriageways. However, the majority of the length of each road has been reduced to a single lane in each direction with the use of carriageway markings, and only sections of dual carriageway remain. Accesses into the proposed developments and routes through the developments will require alterations to the existing carriageway alignment and some new construction.

5.6.2 Development of Design

Previous Studies

Scott Wilson and Jubb Consulting Engineers have been responsible for developing the highway infrastructure required for the proposed Sherford and Plymstock developments respectively on behalf of the private developers. The proposals from each consultant have been progressed to include Faber Maunsell's aspirations to include a High Quality Public Transport route, which is considered an essential addition in order to provide high quality public transport links to the city centre.

5.6.3 Proposals

Description of the Proposed Highway Alignment

Several alterations to the existing highway network are proposed including:

- the construction of a high quality BRT following the route of a disused railway line which runs parallel to Billacombe Road;
- the construction of a bus interchange at the entrance to the Plymstock development, which will also require the construction of an overbridge to carry the proposed BRT;
- signalisation in Billacombe Road at the entrance to the Plymstock development;
- the realignment and signalisation of the existing roundabout junction of Pomphlett Road with Billacombe Road with bus priority provided through the junction;
- the introduction of nearside bus lanes in Billacombe Road and Elburton Road which will be achieved using existing road-space and with the removal of the existing central reservation;
- the realignment and signalisation of the existing roundabout at the junction of Stanborough Road with Elburton Road;
- the construction of an overbridge to tie in the proposed BRT with the proposed signalised junction in Haye Road at the western limit of the Sherford development; and
- the introduction of bus priority measures in the proposed Sherford Road where possible.

5.6.4 Aims and Objectives

The BRT proposals aim to provide a high quality, fast, reliable and comfortable public transport link to the city centre from the Plymstock and Sherford developments. The proposals also aim to improve the capacity, safety and control of the existing network.

5.6.5 Passenger Transport Facilities

The proposals will provide high quality public transport links as discussed above. There will be a public transport inter-change on the southern fringe of the Plymstock Development the route will then continue eastwards towards Sherford where after Haye Road it will revert to on-street running. The quality of the proposals through Sherford have been taken from the developers drawings, this section of the HQPT will be of a lower standard than the section adjacent to the Plymstock Development.

5.6.6 **Cycle and Pedestrian Facilities**

The proposed BRT route has the potential to provide an extremely high quality cycle link with the city centre, which would be further enhanced with the reopening of the old Laira Bridge for use by cyclists and pedestrians. However issues regarding personal safety for cyclists using the proposed BRT route would have to be addressed. Toucan crossing arrangements have been included at all signalised junctions, to enhance the quality of facilities.

5.6.7 **Design Limitations**

The proposed BRT requires a significant amount of new construction, including the construction of several structures. Each of these will require further investigation to verify buildability. The condition of the old rail bridge at Laira Bridge will also need to be assessed before a decision can be taken whether or not to reopen for use by cyclists and pedestrians. The aspirations to improve public transport links through the Sherford development are restricted by the proposed highway layout as detailed by Scott Wilson.

5.6.8 **Land Requirements**

Additional land take will be required to achieve the recommended BRT alignment. However the majority of the route will be contained within the limits of the existing disused railway line.

5.7 **Summary of the Marsh Mills, Forder Valley and Manadon Junction Designs**

5.7.1 **General Background and Description of Site**

Site Location and Existing Highway Arrangement

The Marsh Mills, Forder Valley and Manadon junctions link the A38 Parkway with Derriford to the north, via the Forder Valley and Tavistock Roads, Plympton to the east via Plymouth Road and Plymouth city centre to the southwest via Plymouth Road and Embankment Road. All three junctions are currently grade separated roundabout junctions with the A38 Parkway the primary route. The roundabout sections of the Forder Valley and Manadon junctions are elevated in a two-bridge arrangement and at the Manadon junction the A386 Tavistock Road is also elevated. The roundabout section of the Marsh Mills junction is at grade with the A38 elevated.

5.7.2 **Development of Design**

Previous Studies

Parsons Brinckerhoff's A38 Parkway study examined the Marsh Mills, Forder Valley and Manadon junctions and proposed various improvements. Two options were presented for the Marsh Mills junction. The first of which involved localised carriageway widening to increase capacity and full signalisation. The second option provided a fully signalised throughabout taking advantage of the fact that the circulatory section of the junction is at grade. A decision has been taken to progress this latter option as it was considered to be the most appropriate long-term solution. Improvements at the Forder Valley and Manadon junctions involved alterations to the A38 slip road arrangements.

5.7.3 **Proposals**

Description of the Proposed Highway Alignment

Several alterations to the existing highway network are therefore proposed including:

- the introduction of a fully signalised four-arm grade separated throughabout junction arrangement with segregated bus lanes on two of the approaches to the Marsh Mills junction to improve bus linkage with the existing park and ride site;
- the signalisation of the Plymouth Road junction with Coypool Road to improve access into the existing Marsh Mills park and ride site as well as the introduction of nearside bus lanes in Plymouth Road;
- the introduction of a southbound nearside bus lane in Forder Valley Road on the approach to the Forder Valley junction; and

- alterations to the existing A38 slip road arrangements at the Manadon and Forder Valley junctions.

5.7.4 Aims and Objectives

The proposals aim to improve access from the A38 Parkway to Derriford to the north, Plympton to the east and Plymouth city centre to the southwest by increasing capacity whilst also improving public transport links. The A38 Devon Expressway must remain available for its strategic function of facilitating the movement of long distance traffic, in particular freight. Measures will be taken to ensure the safe, efficient operation and reliability of journey time of long distance traffic using the A38. Emerging policy TR4 in the draft RSS refers to this issue and would provide a basis for future measures.

5.7.5 Passenger Transport Facilities

Plymouth City Council's strategic public transport network indicates that the Marsh Mills, Forder Valley and Manadon junctions would be used by three bus routes; the Plym Circle, Forder Valley and Sherford North to Derriford routes. The Marsh Mills junction also provides a direct link with the existing Marsh Mills park and ride situated to the northeast of the junction. Therefore bus priority measures at the Marsh Mills junction have been provided across the Marsh Mills junction from northeast to southwest and vice versa. This is by means of segregated bus lanes on the approaches to the junction which will provide a high quality link bypassing general traffic. The northbound nearside bus lane in Plymouth Road will begin by means of a lane gain arrangement to the southwest of the junction. Bus priority measures are also proposed into and out from the Marsh Mills park and ride by means of nearside bus lanes. The options for providing bus priority measures at the Forder Valley and Manadon junctions are limited given the grade separation and complex lane manoeuvres required. The only proposed measures are a nearside bus lane in Forder Valley on the southbound approach to the junction. This will be achieved with the reallocation of carriageway space.

5.7.6 Cycle and Pedestrian Facilities

Cycle and pedestrian facilities are already provided across the Marsh Mills junction, by means of a subway link that passes beneath the A38 flyover and slip lanes on the eastern side of the junction. The expected desire line for cyclists and pedestrians at the Forder Valley junction would be to cross the Forder Valley Road to the north of the junction, where a subway already exists. No additional measures are therefore proposed on either junction.

5.7.7 Design Limitations

The proposed junction layout at Marsh Mills requires a number of approach lanes which could be potentially confusing for motorists. Also the distance between the stop lines are relatively short which will reduce the capacity of the junction. The reallocation of carriageway space in Forder Valley may require some localised carriageway widening.

5.7.8 Land Requirements

The majority of the proposed junction arrangements can be achieved predominately within the existing footprints. However, some minimal land take may be required adjacent to Forder Valley Road in order to achieve a bus lane.

5.8 Summary of the Deep Lane Junction Design

5.8.1 General Background and Description of Site

Site Location and Existing Highway Arrangement

The Deep Lane junction links the A38 Parkway to Chaddlewood and Plympton to the north via Sandy Road and the proposed Sherford development to the south via Deep Lane. The existing junction is a four-arm grade separated half cloverleaf junction with the A38 Parkway the primary route. A single overbridge links Sandy Road to the north and Deep Lane to the south. On and off slips are provided from the A38 Parkway in both directions with two hook arrangements and at grade junctions back onto Sandy Road and Deep Lane.

5.8.2 Development of Design

Previous Studies

Parsons Brinckerhoff's A38 Parkway study examined the Deep Lane junction and proposed three possible options for improvement. The first option involved signalling the existing arrangement. The second option progressed the first option to include the closure of the westbound on-slip and the construction of a second overbridge to allow the dualing of Sandy Road and Deep Lane. The third option involved replacing the existing junction with a conventional two-bridge grade separated roundabout junction. Scott Wilson developed on Parsons Brinckerhoff's second option as part of their brief when developing the Sherford proposals. However, a decision has been taken by Faber Maunsell to progress Parsons Brinckerhoff's third option to construct a new two-bridge grade separated roundabout junction, as it is considered to be the most appropriate long-term solution.

5.8.3 Proposals

Description of the Proposed Highway Alignment

Several alterations to the existing highway network are therefore proposed including:

- the construction of a fully signalised five-arm two-bridge grade separated junction at the Deep Lane junction; this will require two new over bridges;
- an additional arm to provide access for the proposed expansion of the Langage industrial estate to the northeast of the Deep Lane junction;
- the construction of two signalised junctions to the south of the Deep Lane junction to provide access into the proposed park and ride site;
- the construction of a segregated bus lane on the northbound approach to the Deep Lane junction to provide bus priority from the park and ride site; and
- the realignment and signalisation of the existing roundabout junction of Sandy Lane with Ridge Way.

5.8.4 Aims and Objectives

The junction aims to improve access between the A38 Parkway and Plympton and Langage to the north and Sherford to the south, whilst ensuring that public transport is not delayed by the increased traffic volumes generated by the Sherford development. The junction also provides access into the proposed park and ride to the southwest of the junction.

5.8.5 Passenger Transport Facilities

Plymouth City Council's strategic public transport network indicates that the Deep Lane junction would be used by three routes; the Plym Circle, Forder Valley and Sherford North to Derriford routes. The Deep Lane junction also provides a direct link into the proposed park and ride located to the southwest of the junction. Bus priority measures have therefore been provided to link the proposed park and ride to the junction. This is by means of a segregated bus lane from the park and ride to the Deep Lane junction. Also a nearside bus lane has been provided from the junction to the park and ride with a right turn pre signal for buses entering the park and ride. Nearside bus lanes have also been provided on the proposed new link road to Langage. Bus priority measures have not been provided onto or off from the A38 because it is anticipated that the Sherford North to Derriford bus route would be a relatively infrequent service whereas the

links between Langage to the north and Sherford and Plymouth city centre to the south will require a more high quality service that should be promoted.

5.8.6 Cycle and Pedestrian Facilities

It is proposed that toucan crossing arrangements be provided at the signalised roundabout section of the Deep Lane junction and two metre wide shared footway cycleway links would be provided on the nearside of the western overbridge to expand the existing NCN route.

5.8.7 Design Limitations

Construction of the proposed junction arrangement would be extremely challenging with major disruption anticipated during construction. Furthermore, there would be issues regarding tying in levels from the new bridge to the existing bridge on the roundabout section of the junction that would have to be addressed in further detail. The design has assumed that the existing overbridge could be used without any structural alterations. However, it should be noted that the Highways Agency considers that any increase to live load requirements i.e. by converting the structure to carry three lanes, is unlikely to be achieved without significant modifications to the structure. Accordingly, a structural survey of the existing overbridge is required as part of the major scheme business case to determine whether it could be used and the additional cost implications.

The proposed highway alignment falls generally within the existing highway boundary, and large areas of land currently used to accommodate the half cloverleaf arrangement could be returned to pasture or for future development. However, some land take would be required to the north east of the junction to provide the additional arm for the proposed Langage link road.

5.9

Cost Estimates

A summary of the cost estimates is shown in Tables 5.1 – 5.3. Detailed cost estimates for the infrastructure requirements are shown below for each junction and section of the highway and public transport corridors. The junctions and sections can be identified on Figure 12.

The cost estimates include the following elements:

- Traffic Safety and Management;
- General Site Clearance;
- Drainage;
- Earthworks;
- Pavement construction;
- Kerbs, footways and paved areas;
- Traffic signs and road markings;
- Lighting; and
- Structural elements;

The basic Unit Costs and estimates have been taken from SPON'S Civil engineering and Highway Works Price Book 2006: Approximate estimates Section, SPON'S Architects and Builders Price Book 2006 and other recent Faber Maunsell projects. The approximate quantities have been taken from the following Faber Maunsell drawing: East of Plymouth Infrastructure, Master Overview: 48808TBRT077563/1100. In addition the following allowances have been made:

- A general allowance of 10% has been taken for statutory undertakers costs.
- Contract preliminaries have been assumed as 20% of work cost.
- An allowance of 15% has been added for Contingency Items.
- VAT and Fees have not been included in any of the cost estimates.
- In accordance with the Department for Transport, Transport Analysis Guidance (TAG) Oct 2006, Page 28, Table 9: the recommended Optimism Bias Uplift of 44%, has been added.

The consequence of these contingencies, and in particular the optimisation bias, is that the basic construction cost of £88,236,000 is increased to £134,683,819.

Table 5.1: Summary of Cost Estimates for Junctions

Ref	Junction Names	Total Cost
1	Manadon Interchange	£1,406,300
2	Forder Valley	£367,000
3	Marsh Mills	£5,129,600
4	Deep Lane	£27,910,000
5	Sherford / Springfield	£44,200
6	Stanborough Cross	£558,300
7	Stentaway / Colesdown	£252,700
8	Broxton Drive	£3,671,400
9	Pomphlett roundabout	£834,000
10	The Ride	£380,800
11	Finnigan / Embankment Lane	£538,700
12	Laira Bridge Rd	£3,583,700
13	Embankment Lane	£1,118,400
14	Lanhydrock / Embankment Road	£178,300
15	Heles Terrace	£793,100
16	Gdynia way	£207,200
17	Oakfield / Macadam	£1,280,600
18	Clovelley / South Milton	£714,800
19	Gdynia / Barbican	£4,313,600
20	Cattedown Roundabout	£2,119,400

Table 5.2: Summary of cost estimates for Links

Ref	Link Names	Link Total Cost
21	Marsh Mills Approach	£867,300
22	Lanhydrock / Embankment South Bound Approach	£473,600
23	Embankment Lane South Bound Approach	£783,100
24	Embankment Lane - Finnigan / Embankment	£3,657,100
25	Prince Rock	£536,500
26	Laira Bridge Rd	£329,200
27	Gdynia way - Gdynia / Barbican	£114,700
28	Exeter Street - St Andrews Approach	£458,100
29	Clovelley / South Milton - Oakfield / Macadam	£3,643,800
30	Oakfield / Macadam - Finnigan / Embankment	£5,555,900
31	Finnigan / Embankment - The Ride	£683,800
32	The Ride - Pomphlett	£1,602,800
33	Pomphlett - Broxton Drive	£647,900
34	Broxton Drive - Old Rail Line	£10,773,400
35	Broxton Drive - Stentaway / Colesdown	£1,051,500
36	Stentaway / Colesdown - Stanborough Cross	£1,361,700
37	Stanborough Cross - Sherford / Springfield	£17,000
38	Sherford / Springfield North Bound Approach	£14,800
39	Old Rail Line - Deep Lane	Developer funded
40	Plymouth Rd	£262,000

Table 5.3: Summary of costs

Construction Total	£88,236,300
Design Fees (6%)	£5,294,178
Optimism Bias Uplift (+44%)	£41,153,341
Grand Total Cost	£134,683,819

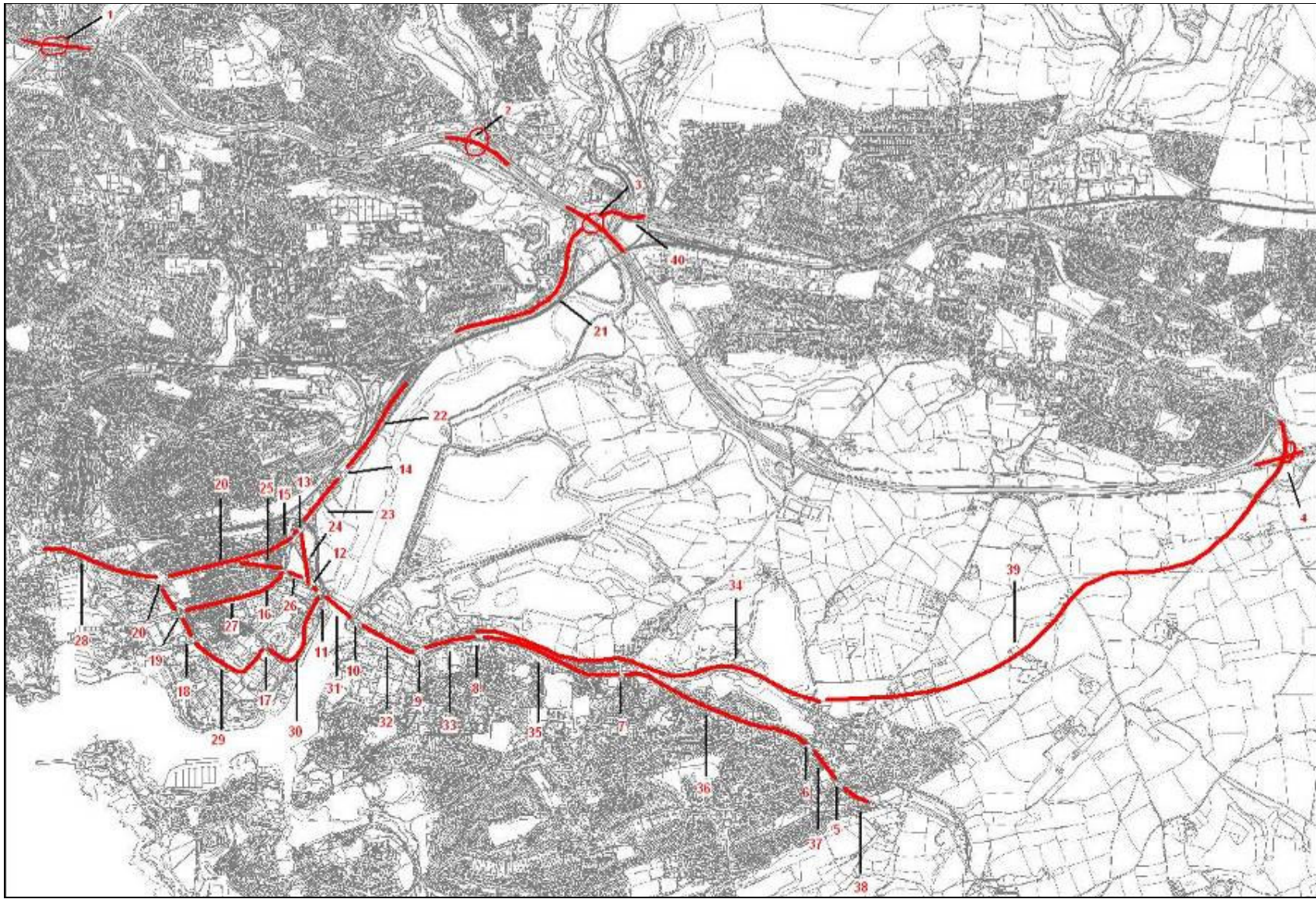
Deep Lane Park & Ride

Cost estimates for the Park & Ride facility at Deep Lane have not been included in the above tables, as there is a commitment from the developer to provide this in Phase 1 of the development. The associated highway improvements at the A38 Deep Lane junction and access into the Park & Ride site from Deep Lane have been included. The Plymouth, South East Cornwall and South West Devon Joint Area Study – Input to the Regional Spatial Strategy (RSS) describes the Deep Lane Park & Ride as follows:

Provision of a transport interchange (including strategic park and ride facilities) on the A38 at Deep Lane, accessible to the proposed HQPT link and road based public transport networks. This cost includes highway access roads and improvements to the A38 Deep Lane junction.

It has not been possible within this study to provide a cost estimate for Deep Lane park and ride. An accurate estimate of the cost of the Deep lane Park & Ride facility would require a detailed topographical survey of the site, proposed layout of the site and proposed interchange facilities.

Figure 12 – Location of Junction and Section Designs



5.10

Area Summary

To assist in the assessment of the infrastructure costs, we present them herein by geographical area, using the following areas:

- West of Laira Bridge
- East of Laira Bridge
- BRT (Plymstock Quarry, Sherford New Community); and
- A38 Parkway.

This section includes highway and public transport infrastructure improvements to the West of Laira Bridge, including Embankment Road north of Embankment Lane (Table 5.4).

Table 5.4: West of Laira Bridge costs

Ref	Location	Cost
11	Finnigan / Embankment	£538,700
12	Laira Bridge Rd	£3,583,700
13	Embankment Lane	£1,118,400
14	Lanhydrock / Embankment	£178,300
15	Hele's Terrace	£793,100
16	Gdynia way	£207,200
17	Oakfield / Macadam	£1,280,600
18	Clovelley / South Milton	£714,800
19	Gdynia / Barbican	£4,313,600
20	Cattedown Roundabout	£2,119,400
22	Lanhydrock / Embankment South Bound Approach	£473,600
23	Embankment Lane South Bound Approach	£783,100
24	Embankment Lane - Finnigan / Embankment	£3,657,100
25	Prince Rock	£536,500
26	Laira Bridge Rd	£329,200
27	Gdynia way - Gdynia / Barbican	£114,700
28	Exeter Street - St Andrews Approach	£458,100
29	Clovelley / South Milton - Oakfield / Macadam	£3,643,800
30	Oakfield / Macadam - Finnigan / Embankment	£5,555,900
Construction Total		£30,399,800
Design Fees (6%)		£1,824,000
Optimism Bias Uplift (+44%)		£14,178,500
Total Cost		£46,402,300

East of Laira Bridge (Billacombe Road and Elburton Road)

This section includes highway and public transport infrastructure improvements to the East of Laira Bridge along Billacombe Road and Elburton Road (Table 5.5).

Table 5.5: East of Laira Bridge costs

Ref	Location	Cost
5	Sherford / Springfield	£44,200
6	Stanborough Cross	£558,300
7	Stentaway / Colesdown	£252,700
8	Broxton Drive	£3,671,400
9	Pomphlett roundabout	£834,000
10	The Ride	£380,800
31	Finnigan / Embankment - The Ride	£683,800
32	The Ride - Pomphlett	£1,602,800
33	Pomphlett - Broxton Drive	£647,900
35	Broxton Drive - Stentaway / Colesdown	£1,051,500
36	Stentaway / Colesdown - Stanborough Cross	£1,361,700
37	Stanborough Cross - Sherford / Springfield	£17,000
38	Sherford / Springfield North Bound Approach	£14,800
Construction Total		£11,120,900
Design Fees (6%)		£667,300
Optimism Bias Uplift (+44%)		£5,186,800
Total Cost		£16,974,900

BRT (Plymstock Quarry and Sherford Developments)

This section includes BRT route through Plymstock Quarry and all highway and public transport infrastructure improvements through Sherford (Table 5.6).

Table 5.6: BRT (Plymstock and Sherford Developments) costs

Ref	Location	Cost
34	Broxton Drive - Old Rail Line	£10,773,400
39	Old Rail Line - Deep Lane	Developer funded
Construction Total		£10,773,400
Design Fees (6%)		£646,404
Optimism Bias Uplift (+44%)		£5,024,713
Total Cost		£16,444,518

A38 Parkway: Manadon – Deep Lane

This section includes highway and public transport infrastructure improvements at Manadon, Forder Valley, Marsh Mills and Deep lane junctions (Table 5.7).

Table 5.7 A38 Parkway costs

Ref	Location	Cost
1	Manadon Interchange	£1,406,300
2	Forder Valley	£367,000
3	Marsh Mills	£5,129,600
4	Deep Lane	£27,910,000
21	Marsh Mills Approach	£867,300
40	Plymouth Rd	£262,000
Construction Total		£35,942,200
Design Fees (6%)		£2,156,532
Optimism Bias Uplift (+44%)		£16,763,442
Total Cost		£54,862,174

6 Implementation of Infrastructure



6 Implementation of Infrastructure

6.1 Outline Contributions for Infrastructure Requirements

A key output of this work is the identification of infrastructure costs attributable to each of the proposed new developments, to assist in obtaining contributions. An outline programme has been developed which defines the implementation of infrastructure requirements relating to the emerging developments. The opening years and phased construction dates for the developments have been used where available to enable the impact of each development to be considered.

A significant level of investment is required to fund the construction of new and improved infrastructure. It is usual for developers to fund the greater proportion of infrastructure enhancements as usually they derive most benefit. In this case however, development is of regional importance and is required to stimulate economic growth, not only in Plymouth but also to transfer it to the far south-west. It is therefore accepted that funding will require contributions from public sources. However, there is currently insufficient information on which the Highway Authorities may decide the appropriate balance between developer and public contributions to infrastructure improvements.

6.2 Contributions Approach

The guiding principle in developing this contributions approach is that High Quality Public Transport services and facilities are essential, and should be available within year one of the developments. The provision of the public transport and highway infrastructure should therefore coincide with the opening year of the proposed developments. This is consistent with the approach and recommendations of the Plymouth Eastern Corridor Study.

Two technical issues which may be addressed within an assessment include the geographical area which may benefit from new or improved infrastructure, and the period in which it is reasonable to expect developers to make contributions. The full benefits in terms of land values and/or economic growth may take more than a decade to be fully realised. It will be reasonable to agree capital contributions towards infrastructure which has already been implemented as long as this is clearly defined in policy and it can be demonstrated that promoters of schemes benefit from the infrastructure. When developing such a system it will be of benefit to liaise with GOSW and the DfT particularly in light of undeveloped government proposals for a planning gain supplement ('land levy') and counter proposals from developers. In summary, the methodology for deriving developer contributions should include:

- a review of relevant national, regional and local planning policy;
- a review of peer authority methodologies;
- an assessment of the likely revenue which can reasonably be assumed from known or expected development;
- an assessment of the degree of certainty associated with each development proposal and likelihood of achieving the expected contribution;
- an assessment of the likely shortfall between total scheme costs and developer contributions and the likelihood of the shortfall being addressed with public funds;
- derivation and testing of a draft methodology for deriving developer contributions;
- consultation with developers; and
- finalise and publish methodology.

Both South Hams and Plymouth LDF Core Strategies state that supplementary planning documents will be published in due course to assist negotiations for planning obligations and agreements. A methodology for deriving developer contributions for infrastructure on the eastern side of Plymouth could be formally included within a supplementary planning document associated with each LDF. We have therefore focused on identifying outline contributions from each of the three main developments, thereby providing a base for ongoing negotiations.

It is also important to note that a minimum of 10% of Major Scheme costs must be secured from non-RFA sources in order to be eligible for the RFA match funding.

6.3 Public Funding

In parallel with deriving the appropriate level of private contributions towards the capital cost of infrastructure and commencing negotiations with developers, it is essential that the local highways authorities begin jointly the process of developing a Major Scheme Bid Business Case. It will be necessary for a MSB Business Case to be submitted in order to achieve programme entry.

It must also be noted that the wider funding process in Plymouth and the South West of England remains relatively fluid, and therefore clear guidance on the potential shortfall has not been possible. The Regional Funding Allocation for Transport identifies that £53m has been outlined for the eastern corridor of Plymouth, including enhancements to the Deep Lane junction. This funding is identified to be available between 2012 and 2016. These figures reflect the outputs of the last RFA refresh panel.

In conclusion, it may be necessary to undertake a two stage process. First, to identify the quantum of funding that may be available through RFA and major scheme process i.e. through the public purse, to fund some improvements in infrastructure. Secondly, the proposed and committed developments that are contributing to the need for infrastructure improvements should either contribute sufficient funds to meet investment needs, or manage travel demand from individual sites to minimise congestion. A bond could be placed on selected developments, whereby additional contributions are called in should development based trips exceed an agreed level. This approach would place the emphasis on the provision of high quality public transport services, as outlined in the Eastern Corridor Study 2006.

6.4 Phasing of Infrastructure Requirements

The guiding principle is that all infrastructure requirements should be in place by 2010, when development will be underway in the eastern corridor. The infrastructure improvements to the east of Laira Bridge should be provided as an initial priority along with improvements to the Marsh Mills and Deep Lane junctions. Furthermore, the provision of a High Quality Public Transport corridor from Deep Lane through to the City Centre should be developed when the first building occurs at Plymstock and Sherford. However, as noted above this is not in line with the RFA prioritisation of investment in the South West. Proposed infrastructure requirements to the west of Laira Bridge should be developed between 2008 and 2010.

It is evident that the ability to achieve this level of investment by or soon after the initial development in the eastern corridor is limited. However, we would strongly support early investment in public transport infrastructure, to ensure that new residents of Sherford and Plymstock Quarry have the full range of transport options available, and traffic levels are managed effectively.

Furthermore, the nature of the modelling suite available for use on this study, and the limited ability to run multiple option assessments, has meant that it has not been possible to calculate detailed phasing and trigger points for investment. The Paramics model, by its nature as a micro-simulation tool, models actual flows within the network, rather than the level of demand that would be evident in an unconstrained network. As such, junction and link based trigger assessments can not be undertaken, and a series of detailed junction by junction assessments would be necessary. This has not been possible within the remit and budget of this present study, and it is recommended that such activities are undertaken on the infrastructure points of greater concern.

The approach taken within this study has therefore been to provide an indicative picture of the impacts of investment in the infrastructure, using a single 2016 do-something model assessment. This time horizon has been selected as it was outlined in the study brief as being the end of the first major phase of development in the eastern corridor. This does not, therefore,

include additional phases of the Sherford and Langage developments, which should be assessed using a 2026 time horizon. The functionality of the Paramics model, and coding requirements, precluded this from being undertaken within this present study. The results from the 2016 do-something modelling are presented in the following sections.

6.5

Do Something Modelled Traffic Flows

The enhancements to the public transport and highway infrastructure identified from the results of the do-min model, has been included in the Do Something model resulting in changes to the strategic flow of traffic. As outlined in section 5, the design process has incorporated 20 junction modifications and 20 link based measures. Many of the designs are worked up from proposals in TA's and previous reports. However, they remain outline designs, and further detailed design and testing is required. The development of these designs and optimisation of the signal timings could significantly alter the flows, journey times and speeds shown in this section of the report. This section presents a brief discussion on the impacts of recommended investment in traffic flows and journey times, as derived from the Do Something model.

Traffic flows at key locations for the 2016 Do Something AM Peak (8.00-9.00) PARAMICS Model are included in Table 6.1. The difference between the do-min and do-something is presented on the right hand side of the table. These are also shown in Figures 13 and 14.

Table 6.1: AM 2016 Do Something Flows

Road Name	Description	08:00 – 09:00 Flow	% Difference from the Do Minimum Scenario
A38	Deep Lane to Marsh Mills (wb)	2320	-12%
	Marsh Mills to Deep Lane (eb)	4150	9%
A374	Marsh Mills to Crabtree (sb)	2640	-13%
	Crabtree to Marsh Mills (nb)	910	-61%
	Crabtree to Lanhydrock Road (sb)	1960	-2%
	Lanhydrock Road to Laira Bridge (sb)	1860	4%
	Lanhydrock Road to Crabtree (nb)	1070	-42%
	Laira Bridge to Lanhydrock Road (nb)	1060	-27%
Billacombe Road	Laira Bridge to Pomphlett Road r/a (eb)	660	-4%
	Pomphlett Road r/a to Laira Bridge (wb)	1930	-14%
Billacombe Road	Pomphlett Road r/a to Stentaway Road r/a (eb)	300	-6%
	Stentaway Road r/a to Pomphlett Road r/a (wb)	1160	15%
Elburton Road	Stentaway Road r/a to Haye Road Junction (eb)	150	-48%
	Haye Road Junction to Stentaway Road r/a (wb)	910	10%
Elburton Road	East of Haye Road Junction EB	380	-36%
	East of Haye Road Junction WB	1040	89%
Sherford Through Route	Westbound	720	29%
	Eastbound	1260	80%
A38	Marsh Mills to Forder Valley (wb)	2330	3%
	Marsh Mills to Forder Valley Slip	1380	-14%
	Forder Valley to Marsh Mills (eb)	1460	7%
	Forder Valley to Marsh Mills Slip	2430	8%
	Marsh Mills to Manadon (wb)	2520	1%
	Manadon to Marsh Mills (eb)	2900	6%

The decrease in flow northbound along the A374 can be attributed to reduced capacity at the Marsh Mills junction; this is also shown in the reduced flow through Marsh Mills from the South. There may be possibility to further optimise the signal timings such that this arm is given greater priority as currently the arms from the A38 east and west show increased flow.

The decreasing flow westbound from Pomphlett Road roundabout to Laira Bridge can be attributed to the delay caused by the west of Laira Bridge Road layout changes, under the Do

minimum the flow across Laira Bridge is not significantly hindered by the signalised junction at Finnegan Road as flows from here are low, under the Do something this delay is increased to give capacity to the main flow from the city centre from Finnegan Road, which are much larger than previous.

Table 6.2: West of Laira Bridge Flows

Location	2016 Do Minimum Flows (8-9)	2016 Do Something Flows (8-9)
Tothill Road nr Cattedown Roundabout(NB)	442	314
Tothill Road nr Cattedown Roundabout(SB)	614	623
Exeter St nr Cattedown Roundabout(WB)	2628	2577
Exeter St nr Cattedown Roundabout(EB)	1201	1054
Embankment Rd between Cattedown Roundabout and Laira Bridge Rd (WB)	787	397
Embankment Rd between Cattedown Roundabout and Laira Bridge Rd (EB)	1382	198
Embankment Road between Laira Bridge Road and Hele's Ter.(WB)	729	100
Embankment Road between Laira Bridge Road and Hele's Ter. (EB)	-	28
Embankment Road between Hele's Terrace and Gdynia Way (WB)	527	15
Embankment Road between Hele's Terrace and Gdynia Way (EB)	1458	24
Shapters Road between Cattedown Roundabout and Barbican Approach junction (NB)	2203	2438
Shapters Road between Cattedown Roundabout and Barbican Approach junction (SB)	-	964
Shapters Road between Barbican Approach junction and Clovelly Road junction (NB)	69	1067
Shapters Road between Barbican Approach junction and Clovelly Road junction (SB)	84	448
Barbican Approach nr junction (WB)	55	360
Barbican Approach nr junction (EB)	116	282
Macadam Road / Shapters Way (NB)	45	1280
Macadam Road / Shapters Way (SB)	181	201
Oakfield Terrace Road nr junction with Maxwell Road(EB).	32	432
Maxwell Road (NB)	61	175
Maxwell Road (SB)	27	1241
Finnegan Road (NB)	102	602
Finnegan Road (SB)	408	1362
Gdynia Way nr Barbican Approach junction (WB)	2401	1407
Gdynia Way nr Barbican Approach junction (EB)	-	617
Gdynia Way nr Embankment Road junction (NB)	-	618
Gdynia Way nr Embankment Road junction (SB)	1204	1580
Laira Bridge Road East of Finnegan's Road junction (WB)	2183	1817
Laira Bridge Road East of Finnegan's Road junction (EB)	718	723
New Road between Finnegan's Road junction and north of Embankment Road/Gdynia Way junction	-	482
New Road between Finnegan's Road junction and north of Embankment Road/Gdynia Way junction	-	206

Figure 13 - 2016 Do Something AM Peak (8.00-9.00) PARAMICS Model Flows (East).

Study Area – Eastern Section

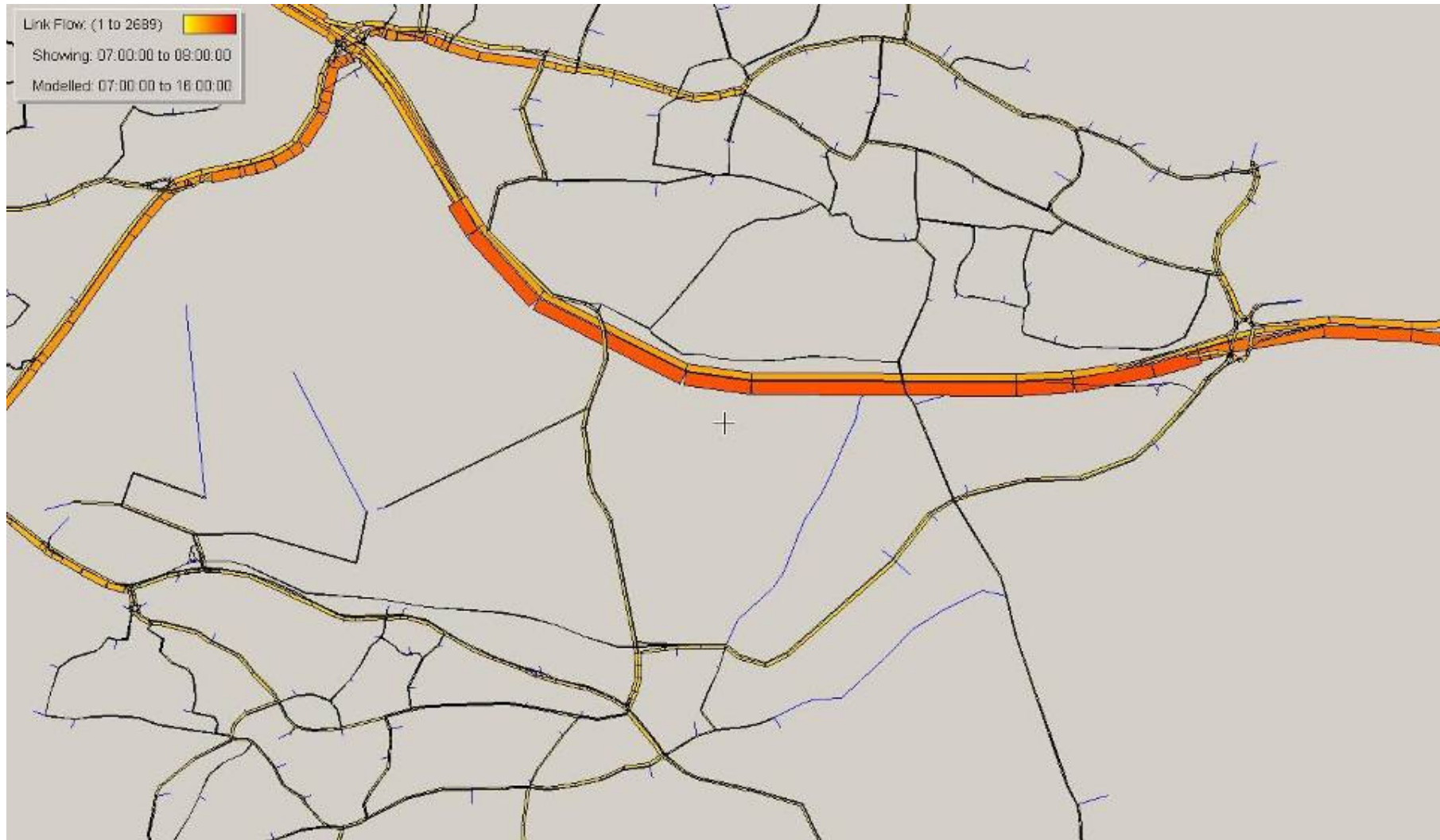
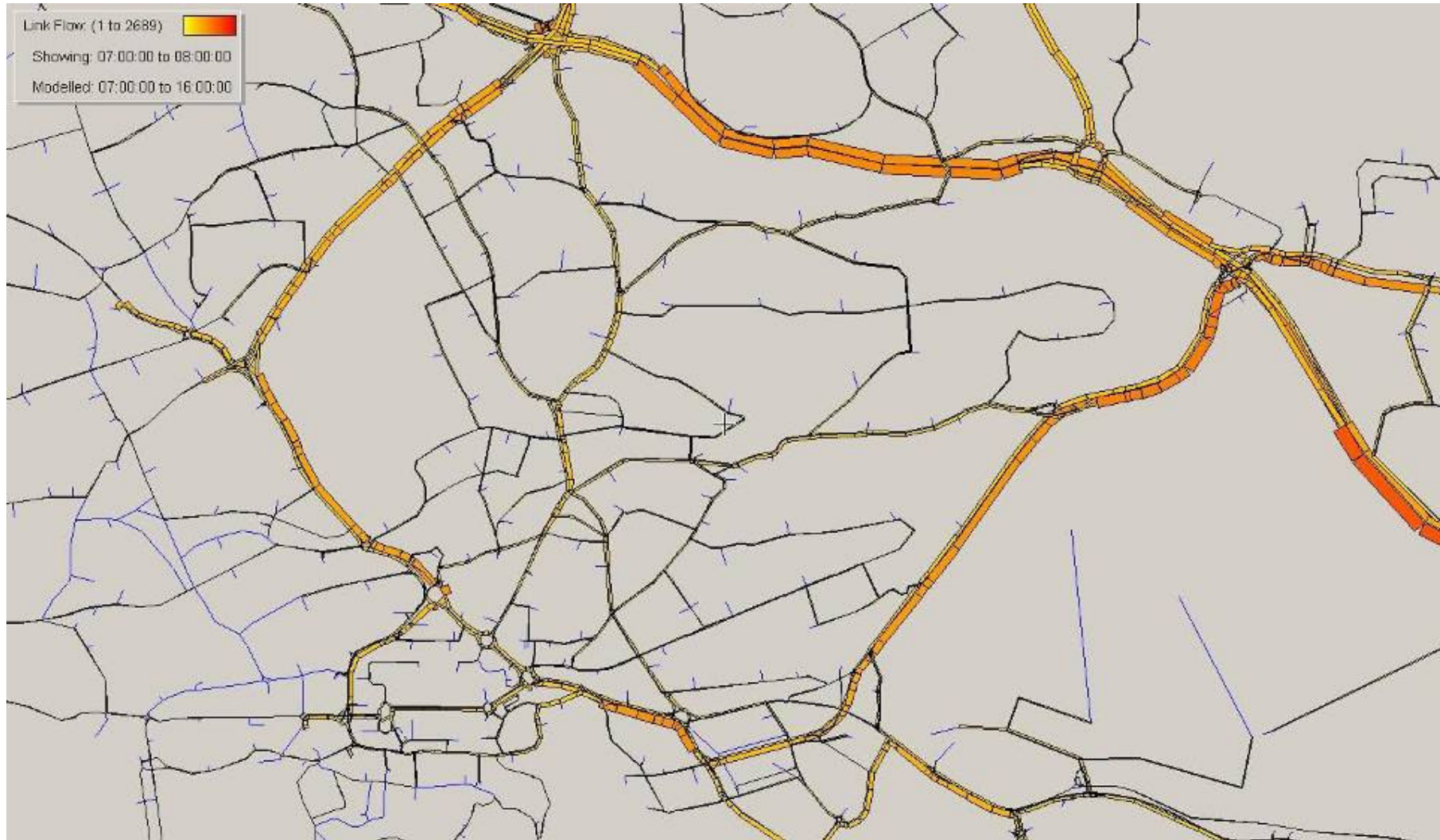


Figure 14 - 2016 Do Something AM Peak (8.00-9.00) PARAMICS Model Flows (West).
Study Area – Western Section



6.5.1 Do Something Strategic Model Analysis

Strategic Model Analysis of Car Journey Times, Trip Distances and Average Speeds for the Do Something AM Peak (8.00-9.00) PARAMICS Model are included in the Table 6.3. The increase in car journey times from Plymstock Quarry, Plymstock West, and Plymstock East can be attributed to reduced car highway capacity at the junctions along the A38 in order to provide bus priority measures.

Table 6.3: AM Car Times, Distances and Speeds

Description	Do Something			Do Minimum
	Journey Time (min)	Distance (Km)	Average Speed (Km/hr)	Journey Time (min)
Deep Lane to				
City Centre	19	14	44	17
Sherford Central to				
City Centre	25	11	26	24
Plymstock Quarry	9	5	35	6
Plymstock E	6	3	32	8
Plymstock W	9	5	29	14
Langage Business Park	6	2	18	7
Plymstock Quarry to				
City Centre	23	6	15	15
Langage Business Park	27	9	20	15
Plymstock West to				
City Centre	22	6	17	17
Langage Business Park	17	7	24	23
Plymstock East to				
City Centre	23	7	19	20
Langage Business Park	16	5	18	20
Langage Business Park				
Sherford	4	2	31	20
Plymstock Quarry	14	7	33	10
Plympton West to				
City Centre	23	8	20	18
Langage Business Park	9	4	26	10

Table 6.4 shows an improvement in the movement of public transport through the network, with journey times on the key route from Deep Lane Park and Ride to the city centre reduced by 4 minutes. The increase in bus journey time from Plymstock East can be attributed to delays within Plymstock, and there may be opportunity to increase the benefit by re-routing services to and from Plymstock to make greater use of the priority measures along the A379.

Table 6.4: AM Bus Journey Times

Do Something	Do-Something JT (min)	Do min	Difference
Deep Lane to			
City Centre via A379	22.3	26.3	-4
Sherford Central to			
City Centre	20.1	24.1	-4
Plymstock Quarry	6.9	11.2	-4.3
Plymstock E	5.8	6.9	-1.1
Plymstock W	10.2	11.3	-1.1
Langage Business Park	6.4	6.9	-0.5
Plymstock Quarry to			
City Centre	13.2	12.9	+0.3
Langage Business Park	12.1	29.9	-7.7
Plymstock West to			
City Centre	17.8	18.4	-1.4
Langage Business Park	22.2	29.9	7.7
Plymstock East to			
City Centre	35.9	30.2	+5.7
Langage Business Park	15.2	25.5	-10.3
Langage Business Park			
Sherford	5.6	6.7	-1.1
Plymstock Quarry	11.4	16.2	-4.8
Plympton West to			
City Centre	28.0	22.9	+5.1

Another important measure of benefits generated by investment in network infrastructure (do-something) is the overall network level journey times. Table 6.5 shows the total car journeys in the do-minimum and do-something scenarios, and the resulting global journey times figures. The increase in global journey time in the Do Something scenario is partly due to the increased number of bus priority measures along major routes. There are also more trips completed in the Do Something Paramics model, which will increase the global journey time.

Table 6.5: Global Network Car Journey Times

	Do Minimum	Do Something
Total Network Trips	30183	35263
Total Network Journey Time (min)	353842	477047

6.5.2 Commentary on modelling results

Many of the schemes included in the Do something include the re-assignment of road space or junction capacity from car to public transport modes. Comparison of the car journey time tables shows a marginal increase in car journey times between the do-min and do-something scenarios. At present, many of the complex junctions included in the do something model are at the preliminary design stage, and detailed optimal signal plans and timings have yet to be determined. The relatively modest increase in car journey times under a sub-optimal signal setup indicates that there may be opportunity to generate benefits for many of the elements of the scheme through more detailed junction optimisation.

Movements to and from Langage Business Park generally show significant journey time reductions. This can be attributed to the revised Deep Lane junction which includes a signalised roundabout with direct access to Langage. However, these revisions mean that traffic from Plympton, which previously had non-signalised access to the A38 no longer has unhindered access. As mentioned above, there may be scope to reduce journey time by further optimisation of the signal timings.

Some of the increase in car journey time for movements into the city centre can be attributed to the realignment of the key routes through the Cattedown area. The new, longer distance route from Laira Bridge to the city centre allows through traffic to be removed from Embankment Road. This will give significant opportunity for environmental enhancements. However, one impact of this longer route is to marginally increase in car journey times.

The schemes included in the do something model incorporate a large number of bus priority measures. These bus lanes, gates and advance signals allow buses to move through the network more quickly, avoiding significant traffic queues. Comparison of the bus journey time tables shows a decrease in journey times along the majority of movements. The only significant increases in journey time occurring on the routes from Plympton and Plymstock East to the city centre. The Plympton to city centre times may be reduced through reduction in queues north of Marsh Mills junction, which hinder buses entering the priority measures. The Plymstock East Bus times have increased because of difficulty getting onto the A379. The journey time benefits along the eastern corridor can be attributed both to the bus lanes and priority junctions along the A379 and over Laira Bridge, and also the revised road layout at Cattedown that provides a virtually 'bus only route' from Laira Bridge to Exeter Street.

6.6

Do Something Infrastructure Assessment

This section presents a summary of the key junctions and link flows relating to the infrastructure investment recommended. The initial tables of flows are supported by a commentary on the results and key conclusions.

Table 6.6: Key Junction Flows – Do Something

Description of Turn		08:00 – 09:00 Flow	% Difference to Do Minimum
Deep Lane	Deep Lane Jn, S Approach	1275	37%
	Deep Lane Jn, W Approach	666	-5%
	Deep Lane Jn, N Approach	1229	1%
	Deep Lane Jn, E Approach	609	-6%
Marsh Mills	Marsh Mills Jn, S Approach	912	-59%
	Marsh Mills Jn, W Approach	2432	8%
	Marsh Mills Jn, N Approach	1784	-25%
	Marsh Mills Jn, E Approach	1705	10%
Forder Valley	Forder Valley Jn, E Approach	1408	-5%
	Forder Valley Jn, E-W Direct Approach	707	-16%
	Forder Valley Jn, W Approach	306	-13%
	Forder Valley Jn, NW Approach	569	59%
	Forder Valley Jn, N Approach	1149	13%
	Forder Valley Jn, NE Approach	421	-15%
Laura Bridge Road, Finnigan Road	Finnigan Road to Jn	570	217%
	Laira Bridge Rd to Jn	30	-96%
	New Link Road to Jn	210	-
	Laira Bridge to Jn	1920	-14%
St Andrews Cross	Embankment Road-Exeter St Jn, S Approach	2437	11%
	Embankment Road-Exeter St Jn, W Approach	1054	-13%
	Embankment Road-Exeter St Jn, N Approach	623	1%
	Embankment Road-Exeter St Jn, E Approach	198	-75%
Gdynia Way, Barbican Approach	Shapter's Road (S) to Jn	1068	1680%
	Barbican's Approach to Jn	305	263%
	Shapter's Road (N) to Jn	964	-
	Gdynia Way to Jn	1407	-41%
East end of Gdynia Way	Embankment Road - Embankment lane Jn N Approach	1594	-10%
	Embankment Road - Embankment lane Jn S Approach (Gdynia Way)	618	-
A379, Pomphlett Road Junction	Billacombe Road - Pomphlett Road Jn W Approach	1291	87%
	Billacombe Road - Pomphlett Road Jn E Approach	662	-45%
	Pomphlett Rd Approach	831	-35%
A379, Broxton Drive Junction	Billacombe Road East	1160	15%
	Billacombe Road West	190	-30%
	Broxton Drive (Plymstock Quarry Access)	520	478%
A379, Stentaway Road Junction?	Billacombe Road to Jn	325	8%
	Colesdown Hill to Jn	84	-1%
	Elburton Road to Jn	1245	14%
	Stentaway Road to Jn	60	-57%

Key Junction Flows (continued) – Do Something

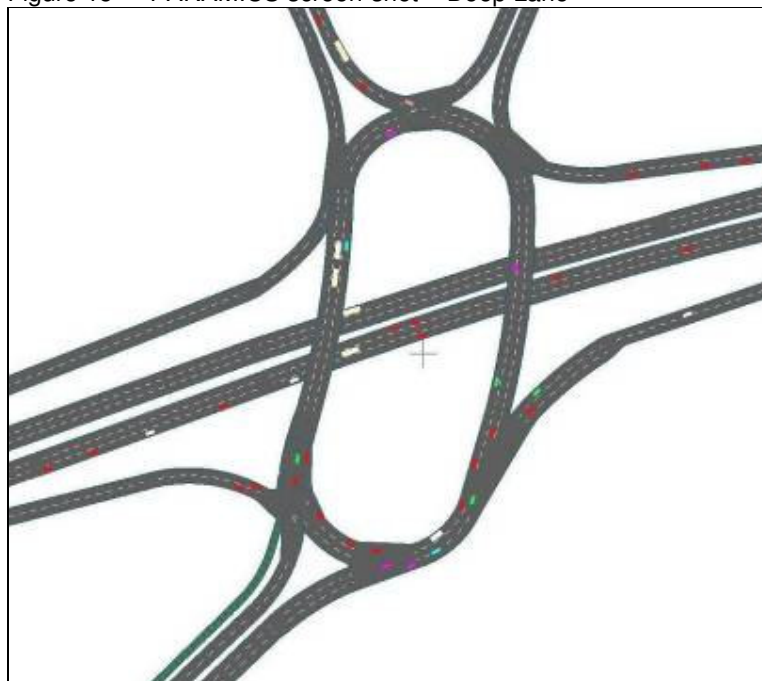
Stanborough Cross	Elburton Road -Haye Rd Jn S Approach	368	27%
	Elburton Road -Haye Rd Jn W Approach	238	-28%
	Elburton Road -Haye Rd Jn N Approach	868	-19%
	Elburton Road -Haye Rd Jn E Approach	1057	93%
A379, Sherford Road Junction	Elburton Road (W) to Jn	383	-35%
	Sherford Road to Jn	136	-16%
	Elburton Road (E) to Jn	616	36%
	Springfield Road to Jn	615	82%
Sherford Southern Access	Haye Road (S) to Sherford Through Route	625	113%
	Haye Road (N) to Sherford Through Route	63	29%
	Sherford Through Route to Haye Road (S)	572	-11%
	Sherford Through Route to Haye Road (N)	18	-87%

6.7 Assessment Commentary

6.7.1 Deep Lane

The junction approach flows show that the revised layout is retaining the capacity from Plympton to the north (changing 1% from the Do Minimum) and significantly increasing capacity from Sherford to the south (+37% from Do Minimum), at the expense of eastbound and westbound movements from the A38 (-6% and -5% respectively).

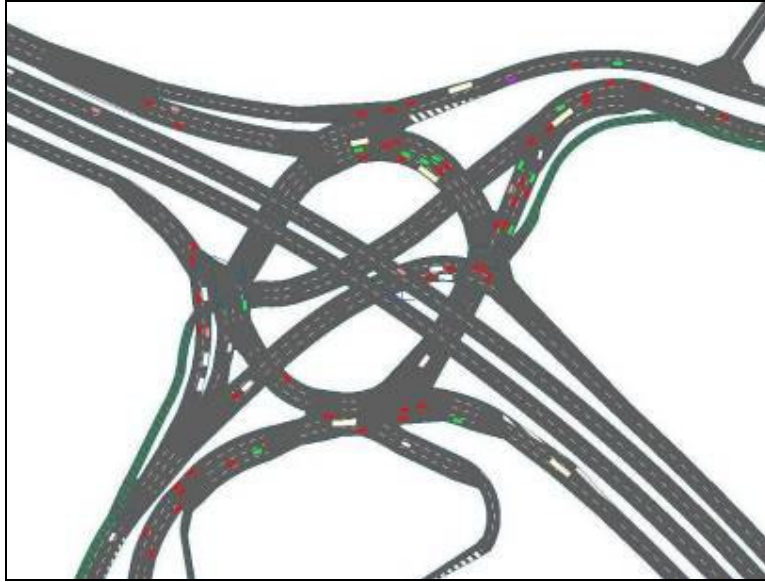
Figure 15 PARAMICS screen-shot – Deep Lane



6.7.2 Marsh Mills

The eastern and western approaches to Marsh Mills have a capacity enhancement of 10% and 8% respectively from the Do Minimum, at the expense of capacity on the other arms. However, the eastern approach is a key movement in the AM peak, and additional optimisation is likely to reduce the impact on the other arms.

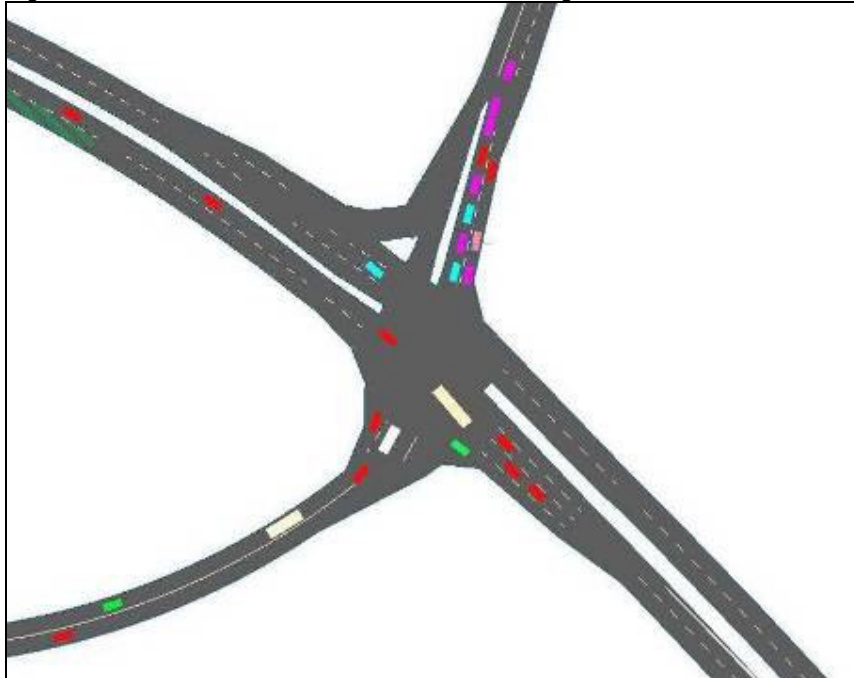
Figure 16 PARAMICS screen-shot – Marsh Mills



6.7.3 Stanborough Cross

The flow from the northern approach (from Sherford) has reduced significantly (-19%), which can be attributed to both the junction capacity and revised route choice from Sherford with more vehicles exiting the development at the Deep Lane junction. The flow from the south (from Plymstock West) has increased (+27%) which may be a response to reduced capacity through Pophlett Road junction. There is also a significant rise in capacity from the east (+97%)

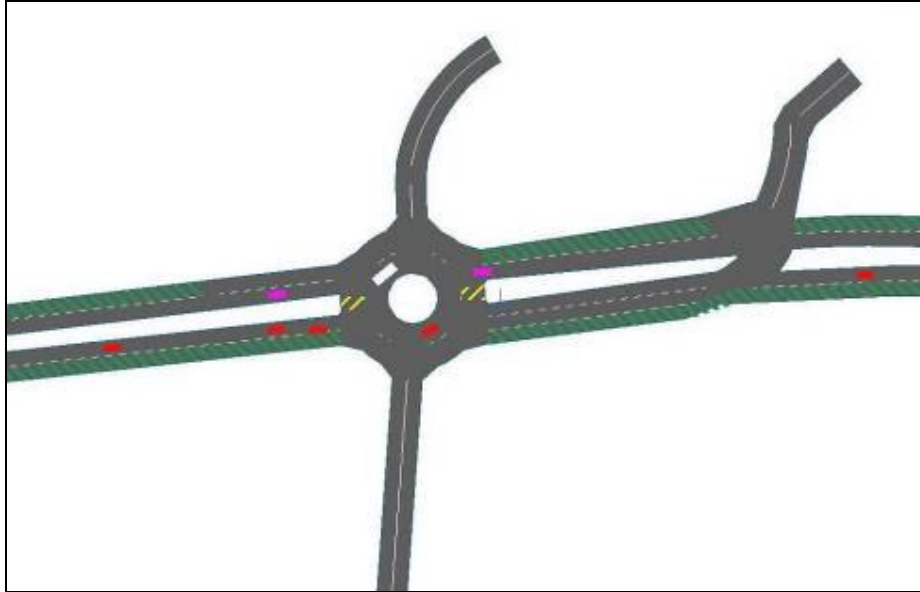
Figure 17 PARAMICS screen-shot – Stanborough Cross



6.7.4 A379, Stentaway Road Junction

The flow both eastbound and westbound along the A379 has increased (8% and 14% respectively over the Do Minimum scenario). There is a reduction in capacity on the southern approach from Stentaway Road (-57%), which although it is a small flow (60 vehicles) is an exit point from Plymstock.

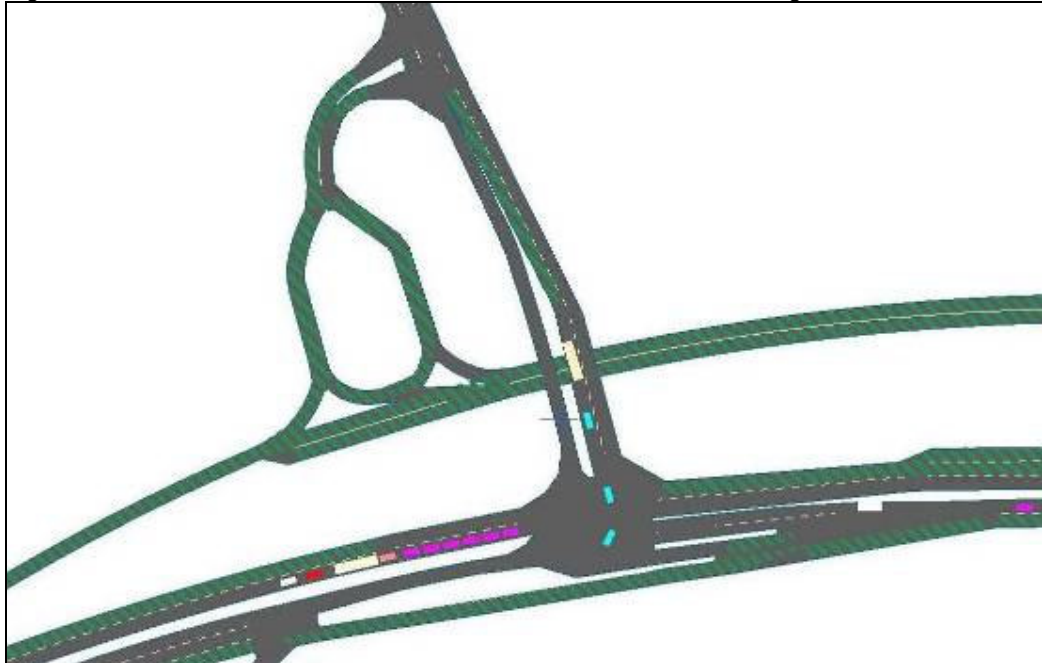
Figure 18 PARAMICS screen-shot – Stentaway Road Junction



6.7.5 A379, Broxton Drive (Plymstock Quarry Access)

The flow through the junction from Plymstock Quarry has increased to 520 vehicles (+478% over Do Minimum) at the expense of the west bound A379 flow (-30%). This indicates that there may be scope to adjust the signal timings to restrict the flow of vehicles exiting the development so that the traffic flow along the A379 is less restricted.

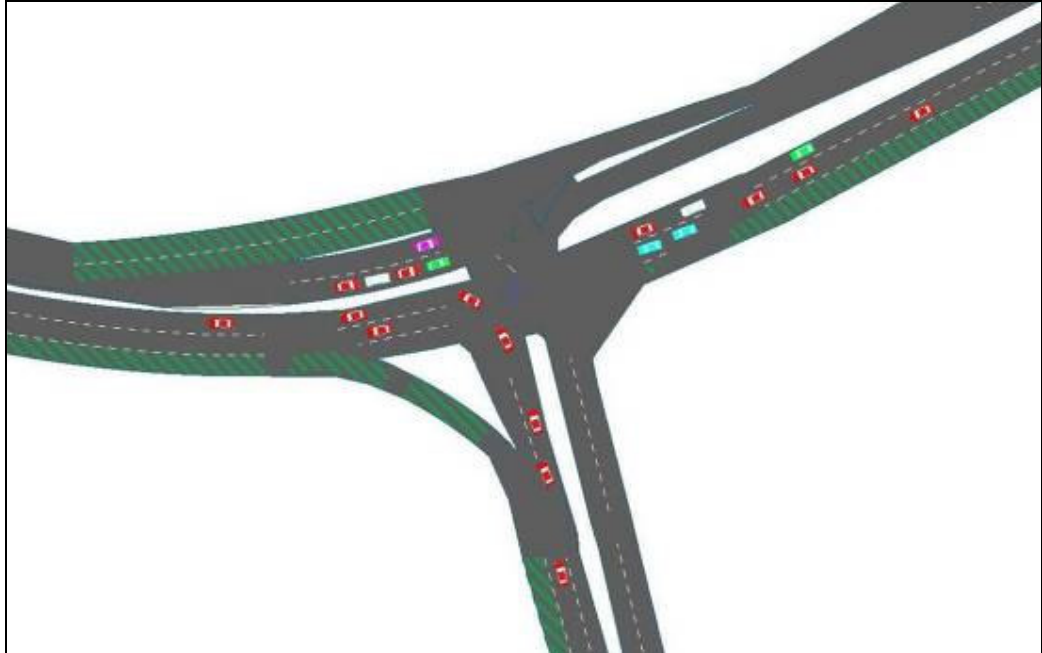
Figure 19 PARAMICS screen-shot – Broxton Drive & BRT Interchange



6.7.6 A379, Pomphlett Road Junction

The flow from the west has increased significantly (+87% from the Do Minimum). This is at the expense of the flow from the east (-45%) and south from Plymstock (-35%). As the eastern and southern approaches are key movements there may be opportunity to enhance the operation of this junction significantly through further optimisation.

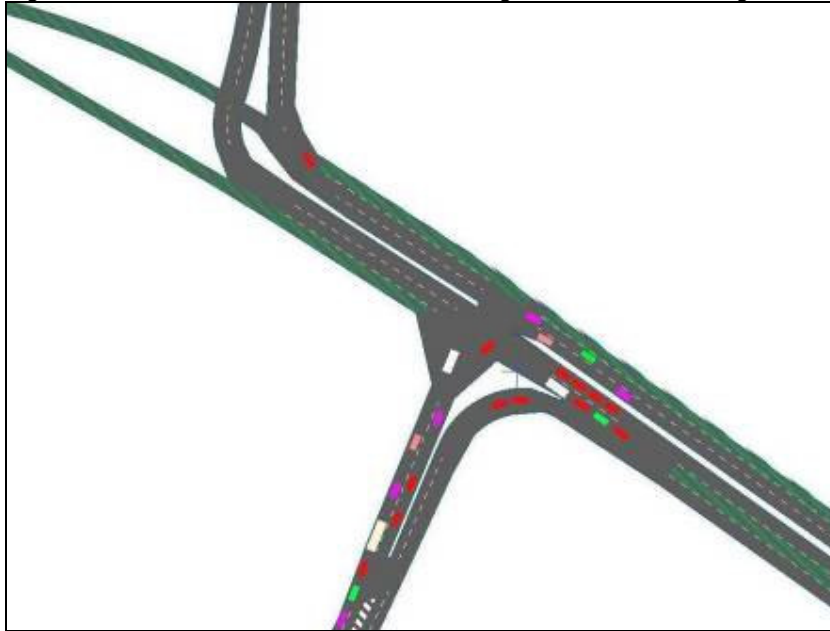
Figure 20 PARAMICS screen-shot – Pophlett Road Junction



6.7.7 Finnigan Road / Laura Bridge Road

The flow across Laura Bridge has decreased (-14% over Do Minimum) this can be attributed to the reduced capacity caused by signalisation of the main flow. The flow along Laura Bridge Road has significantly reduced (-96% over Do Minimum) as this link is now bus only. The flow along Finnigan Road has increased (+217% over Do Minimum) as this is now the main route from the centre.

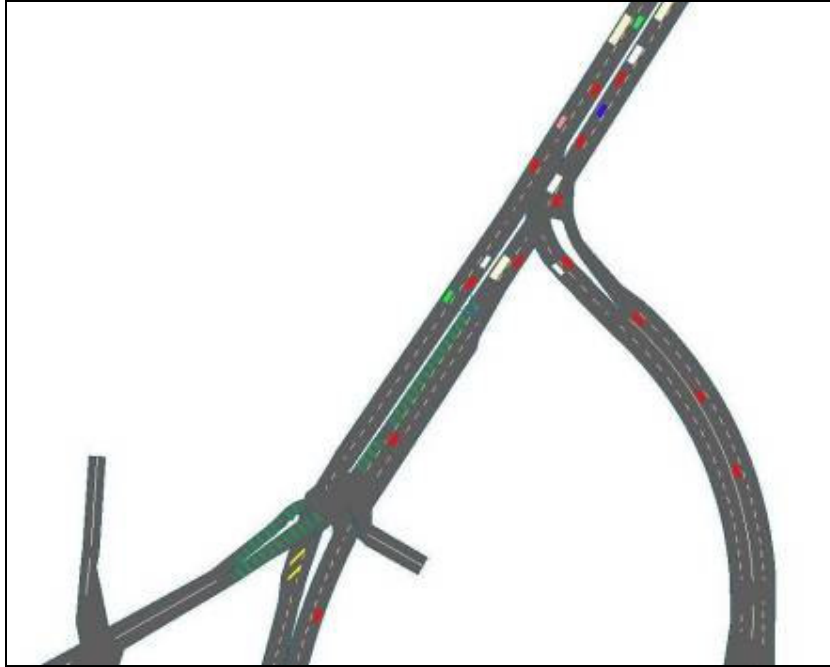
Figure 21 PARAMICS screen-shot – Finnigan Road / Laura Bridge Road



6.7.8 Embankment Rd / Gdynia Way

The approach to Gdynia way from the north shows a marginal decrease flow (-10% from the Do Minimum), partly due to the use of the new link road for eastbound movements. The removal of all vehicles but buses from Embankment Road has allowed this junction to have a simpler signal plan, even though Gdynia Way is now a two-way road.

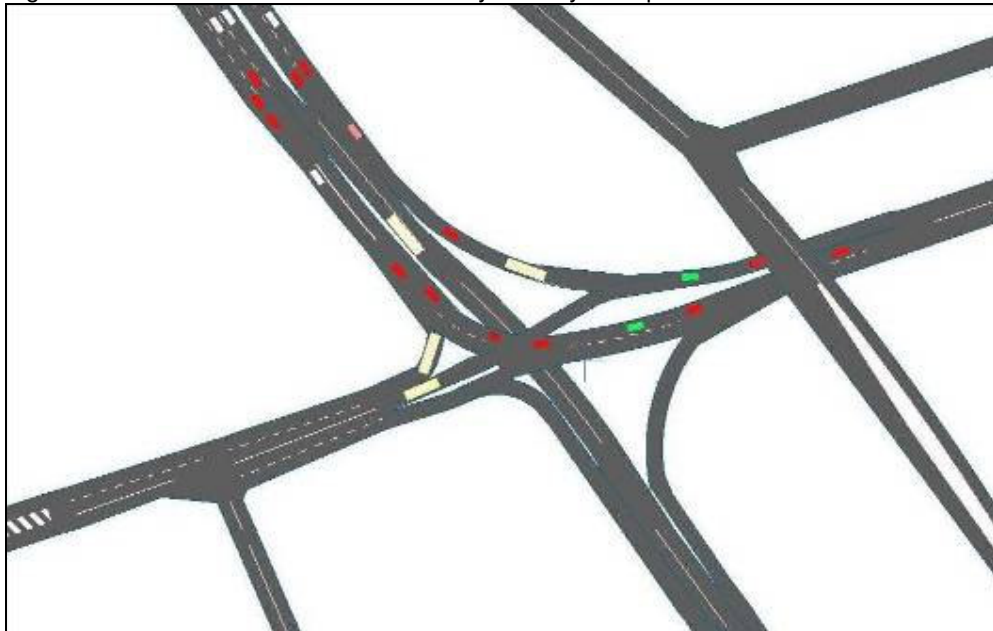
Figure 22 PARAMICS screen-shot – Embankment Road / Gdynia Way



6.7.9 Gdynia Way / Shapters Road Junction

The flow from the southern approach has increased significantly as this is now the main route from the east of Plymouth to the City centre. The flow from Gdynia Way has reduced (-41%) as this arm is no longer carrying the traffic that has come across Laira Bridge. There is no approach from the north in the Do Minimum as Gdynia Way is one-way, and therefore there is no flow comparison for this movement. The capacity from Barbican Approach has increased because there is less opposing traffic from Gdynia Way.

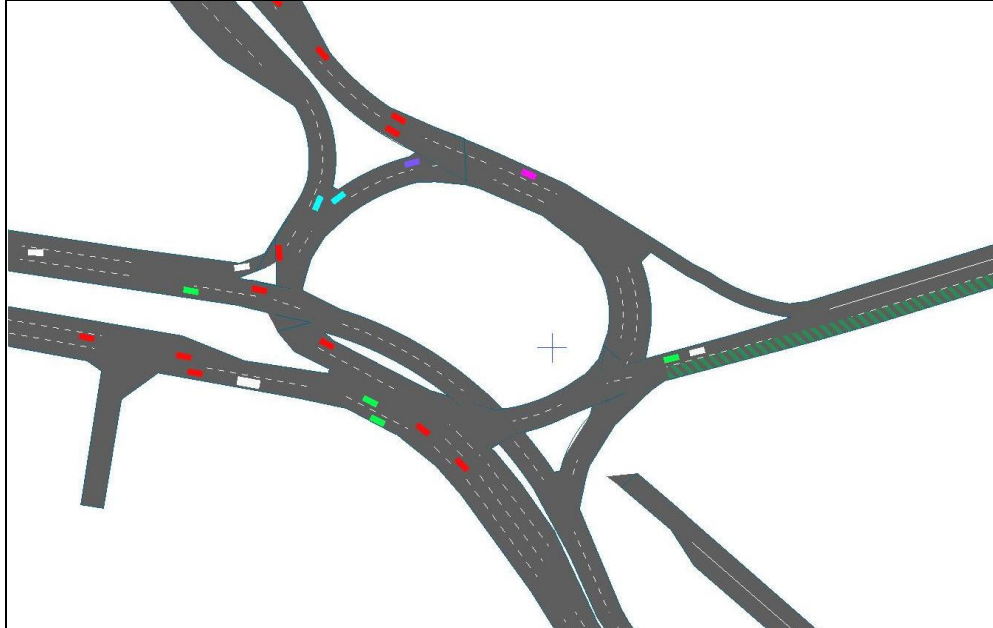
Figure 23 PARAMICS screen-shot – Gdynia Way / Shapters Road



6.7.10 Cattedown Roundabout

The flow through the eastern approach has reduced (-75%) as expected because the through traffic has been removed from Embankment Road. The flow has marginally increased on the northern arm (+1%) and significantly from the southern arm (11%) due to increased capacity of the design.

Figure 24 PARAMICS screen-shot – Cattedown Roundabout



7 Summary and Conclusions



7 Summary and Conclusions

Faber Maunsell was commissioned by Plymouth City Council, Devon County Council and the Highways Agency in August 2006 to undertake the East of Plymouth Development Infrastructure Study. The main aims of this study were to develop a strategy for the public transport and highway infrastructure requirements which will enable sustainable development on the Eastern Corridor and to provide a timetable of delivery for phased implementation of the strategy.

The documents identified in the study brief have been reviewed and summarised, focusing on the larger scale developments of Plymstock Quarry, Sherford New Community and Langage Business Park. The person trip rates have been agreed for these developments and background traffic growth has been defined. This process involved consultation with the relevant consultant for each development.

A PARAMICS micro-simulation traffic model which was developed for the Plymouth Eastern Corridor Study in 2006 and this has been utilised for elements of this study. This included developing a 2006 base model, a 2016 do-minimum model and a 2016 do-something model. The inherent nature of the Paramics model, namely the speed of running and the time required to code infrastructure changes, significantly constrained the number of time horizons and scenarios considered.

The required highway and public transport infrastructure for the proposed developments have been identified, designed and assessed. This has included 20 junction enhancements and re-designs and 20 link based improvements. Where possible, public transport, cyclist and pedestrian facilities have taken precedence over highway capacity enhancements. Overview plans and layout plans have been provided to show the proposed alterations across the study area.

All the highway and public transport infrastructure proposals designed and presented in Section 5 have been included within the PARAMICS model. However, it is recommended that signal optimisation of all the traffic signal timings within the model area is undertaken, to ensure the model is operating as realistically as possible. This work has not been possible within the timescale and budget available.

The key junction designs have been assessed using visual on screen checks during the micro-simulation run-time. In addition we have analysed through flow, strategic journey times and queues at these key junctions which are located across the study area. It is recommended that the TRANSYT software is used to check and refine the junction designs and to enable the signal timings to be optimised. There needs to be a balance in the traffic management of signal timings at the proposed development access points, to allow development traffic to access and egress, whilst maintaining the flow along the main carriage-way.

Detailed cost estimates have been prepared for all the proposed highway and public transport infrastructure. This has included approximately £36,000,000 for work on the four A38 junctions considered within this study (Deep Lane, Marsh Mills, Forder Valley and Manadon). The total estimated investment required within the study area to accommodate future potential traffic levels was £134,700,000. This included a 44% uplift on base costs to account for optimism bias, as specified by present DfT guidance.

The guiding principal used in considering the implementation programme is that high quality public transport services and facilities are essential to successful delivery of the proposed developments. As such, and because of the constraints imposed by the modelling process, a single 2016 future year do-something assessment has been undertaken with all improvements included.

This assessment led to the identification of potential developer contributions, in addition to public funding, to support the introduction of required infrastructure. The approach selected involved the calculation of the weighted percentage of development traffic at each proposed

infrastructure site, excluding those areas to the west of Laira Bridge and Marsh Mills. These areas were excluded because the sites were considered to be outside the area of influence of the three main developments. The outputs identified that Sherford New Community should contribute £47,427,124, Plymstock Quarry £13,192,245 and Langage Business Park £8,510,982. This generates a total of £69,130,351 and a public funding requirement of £65,553,468.

The proposed infrastructure designs, transport modelling and implementation phasing developed for this study can be used to inform the Major Scheme Bid Proposals.

Drawings

Drawing No. 1100 – Master Overview

Drawing No. 1200 – West of Laira Bridge

Drawing No. 1210 – 1260 are detailed drawings for West of Laira Bridge;

Drawing No. 1300 – East of Laira Bridge and Plymstock

Drawing No. 1310 – 1330 are detailed drawings for East of Laira Bridge and Plymstock;

Drawing No. 1400 – Billacombe Road and Elburton Road

Drawing No. 1410 – 1440 are detailed drawings for Billacombe Road and Elburton Road

Drawing No. 1500 – Bus Rapid Transit

Drawing No. 1510 – 1540 are detailed drawings for Bus Rapid Transit

Drawing No. 1600 – Deep Lane

Drawing No. 1610 – 1620 are detailed drawings for Deep Lane

Drawing No. 1700 – Embankment Road

Drawing No. 1710 – 1720 are detailed drawings for Embankment Road

Drawing No. 1800 – Forder Valley and Marsh Mills

Drawing No. 1810 – 1820 are detailed drawings for Forder Valley and Marsh Mills

Drawing No. 1900 – Manadon Interchange

Drawing No. 1910 – 1920 are detailed drawings for Manadon Interchange

Drawing No. 2000 – Sherford New Community

Drawing No. 2010 – 2040 are detailed drawings for Sherford New Community

Appendix A

Detailed Cost Estimates