

**9.0 TRAFFIC IMPACT ASSESSMENT – DOUGALL BAILLIE ASSOCIATES**

## **9.0 TRAFFIC IMPACT ASSESSMENT**

### **9.1 INTRODUCTION**

Patersons of Greenoakhill (Patersons) operate a stone quarry at Dunduff, Kirkmuirhill adjacent to the B7086 Strathaven Road. A one-way access – egress route system is utilised to manage HGV traffic movements between the quarry and the B7086. The access route between the site and the strategic road network utilises the B7086 and the B7078 to reach M74 Junction 8 (A71 / B7078 Canderside Toll) some 4 kilometres north of Blackwood. The route involves the use of Vere Road in Blackwood between the B7086 and the B7078. Traffic calming measures, in the form of chicanes, have been implemented on Vere Road financed by Patersons to control vehicle speeds.

The Dunduff Quarry has considerable reserves and still has a long operational life. There are no operational restrictions on the ability of Patersons to use the existing haul route for the current operation. The quarry can produce between some 600,000 – 800,000 tonnes of material per annum. Currently vehicle operations at Dunduff take place Monday to Friday between 07:00 and 19:00 and on Saturday between 07:00 and 16:00.

As a responsible company, Patersons acknowledge that the HGV traffic generated by Dunduff Quarry has a significant impact on the local environment, especially as it passes through Kirkmuirhill / Blackwood along Vere Road. Patersons are seeking ways of reducing the vehicle movements through Kirkmuirhill / Blackwood. Dunduff Quarry is shown in Regional and Local context in Diagrams 1.1 & 1.2 (Appendix E).

The unclassified route from Boghead to Lesmahagow (Lesmahagow Road – Strathaven Road – Teiglum Road) provides a local link to the M74 Motorway at Junction 10 from Boghead. This route is largely rural in nature and does not have any significant residential frontage development.

Patersons are seeking approval to form a new access route from Dunduff Quarry to the unclassified Lesmahagow Road east of the access to Midtown Farm. The provision of this new access would effectively remove all Dunduff Quarry HGV traffic from Boghead, Kirkmuirhill and Blackwood. The location of the proposed new access is shown in Diagram 1.2 (Appendix E).

It has been predicted by Patersons that approximately 80-85% of HGV Quarry traffic would use the new access to the M74 via Junction 10 and the remaining 15-20% would use the existing one-way access system to travel to/from the west on the B7086.

DBA were appointed by Patersons to prepare a Traffic Impact Analysis (TIA) Report to examine the traffic effects of the new access proposal and establish if network improvements are required to accommodate the level of HGV activity generated by the Quarry on the Lesmahagow Road – Strathaven Road – Teiglum Road route to the M74 at Junction 10. This TIA forms part of the supporting information for the consolidated planning application submitted by Patersons for Dunduff Quarry which also includes the construction of a concrete block making plant within the confines of the Quarry site.

The scoping of this TIA study has been discussed with South Lanarkshire Council Officials, whose comments are incorporated into this report.

### **9.2 PROPOSED NEW ACCESS ARRANGEMENTS**

Dunduff Quarry is situated to the north-west of Lesmahagow and just south of Boghead. The quarry is currently accessed from the B7086 Strathaven Road. The quarry operates a one way in and one way out traffic system from Strathaven Road. Incoming traffic accesses the quarry from the road to the east of Dykehead. Outgoing traffic exits the quarry using the road to the east of Dykecroft.

HGV traffic distribution has been predicted by Patersons based on historical customer information to be 15-20% travelling to/from the west along Strathaven Road with the remaining 80-85% travelling to/from the east. The eastbound traffic then distributes onto the M74 with the majority of traffic destined north to the Central belt. The northbound traffic travels along the B7086 Strathaven Road past Bent Primary School and into Kirkmuirhill. Within Kirkmuirhill the HGV quarry traffic travels north along Vere Road to reach the B7078 to travel north to the M74 at Junction 8.

As part of a consolidated planning application for Dunduff Quarry it is proposed that a new haul road and access to Dunduff Quarry would be provided from the unclassified Lesmahagow Road east of the access to Midtown Farm. The unclassified route from Boghead to Lesmahagow (Lesmahagow Road – Strathaven Road – Teiglum Road) would provide a link to the M74 Motorway at Junction 10.

Junction 10 of the M74 at Lesmahagow includes a direct northbound on-ramp, a direct southbound on-ramp and a direct northbound off-ramp. The southbound off-ramp from the M74 is provided approximately 2km north of Lesmahagow at Junction 9 onto the B7078 to the south of Blackwood.

It is predicted that the greater part of the total quarry HGV traffic that currently travels east onto Strathaven Road (80-85%) would utilise this new access road and the route to M74 Junction 10. The remaining 15-20% would continue to use the existing access to travel to destinations to/from the west via the B7086 to Strathaven.

This proposal would divert 80-85% of HGV quarry traffic away from Boghead, Kirkmuirhill and Blackwood.

Outbound HGV quarry traffic destined for the M74 would leave the quarry via the new access and travel east towards Lesmahagow along the Lesmahagow Road – Strathaven Road – Teiglum Road route to the M74 at Junction 10. At M74 Junction 10 traffic would be able to access the M74 directly in both northbound and southbound directions.

Inbound HGV quarry traffic arriving from the north on the M74 destined for the new access would leave the M74 at Junction 9 and travel south from Junction 9 along the B7078 to Teiglum Road and then follow the Teiglum Road – Strathaven Road – Lesmahagow Road route to the proposed new site access.

An assessment of this proposed new access route is included in Section 9.3.

### **9.3 LESMAHAGOW RD - STRATHAVEN RD – ACCESS ROUTE ASSESSMENT**

The route from the new Quarry access on Lesmahagow Road to the M74 at Junction 10 via Lesmahagow Road, Strathaven Road and Teiglum Road is shown in Diagram 3.1 (Appendix E). Lesmahagow Road has been split into Sections A & B which extends to 0.860 km. Strathaven Road is considered in Section C equivalent to 1.445 km and Teiglum Road is considered in Section D which is 0.375 km long.

At this preliminary stage the assessment of Lesmahagow Road, Strathaven Road and Teiglum Road corridor has been based on Ordnance Survey maps supplemented by observations and local measurements on site. Constraints identified at this stage have been examined in detail in Section 9.4 using a detailed topographical survey base.

It is generally accepted that a road carriageway of 5.5m width permits all vehicles to pass each other with an overall tolerance of 0.5m for the largest vehicles but with ample clearance for all others. In addition a horizontal clearance of approximately 0.5m is required between the road edge and adjacent structures / street furniture. Consequently a minimum road carriageway of 5.5m within a road corridor of 6.5m will be required to accommodate two way heavy goods vehicle (HGV) traffic movements. Even at this width two HGVs would have to pass at slow speeds. A road width of 6.0m (road corridor 7.0m) or greater would be required to permit HGV vehicles to pass unimpeded.

Existing road carriageway and road corridor widths are shown in Diagrams 3.1 & 3.2 (Appendix E). Each road section is considered below.

#### Section A - Lesmahagow Road

The width of the existing road carriageway on this section of Lesmahagow Road varies between 4.5m and 4.8m. The overall width of the road corridor between visible boundaries on site varies between 6.4m and 7.3m. The existing road carriageway is less than the minimum of 5.5m required to accommodate two-way HGV traffic movements. There are locations within this section where there is insufficient width within the overall road corridor to generally widen the road carriageway to 5.5m without land acquisition. It would be possible, however, to locate passing places within the section without land acquisition.

#### Section B - Lesmahagow Road

The width of the existing road carriageway on this section of Lesmahagow Road varies between 5.5m and 6.0m. The overall width of the road corridor between visible boundaries on site varies between 7.6m and 9.5m. The existing road carriageway is greater than or equal to the minimum of 5.5m required to accommodate two-way HGV traffic movements.

The road carriageway at the apex of the existing bend at the junction of Lesmahagow Road and Strathaven Road at 8.7m is insufficient to accommodate the swept path of two heavy goods vehicles. There is a generous verge on the inside of the bend which could be utilised to provide a passing place. Land outwith the road corridor would be required to widen the road and improve the curve radius to accommodate two way traffic movements through the bend.

#### Section C - Strathaven Road

The width of the existing road carriageway on this section of Strathaven Road is greater than 6.0m and therefore exceeds the minimum required to accommodate two-way HGV traffic movements.

#### Section D - Teiglum Road

The width of the existing road carriageway on this section of Teiglum Road is greater than 6.0m and therefore exceeds the minimum required to accommodate two-way HGV traffic movements.

### **9.4 ROAD NETWORK IMPROVEMENTS**

As discussed in Section 3 and shown in Diagram 3.1 (Appendix E) the existing road carriageway on Strathaven Road and Teiglum Road is sufficient to accommodate two way HGV traffic movements. Improvements to the alternative access route between Dunduff Quarry and the M74 would therefore be confined to sections of Lesmahagow Road between the proposed site access and the junction at Strathaven Road.

### Lesmahagow Road / Dunduff Quarry Access Junction

The proposed new Quarry access would be located on Lesmahagow Road to the east of Midtown Farm. The extent of the site frontage onto Lesmahagow Road is shown in Diagrams 3.1 and 3.2 (Appendix E).

The junction layout has been designed to facilitate HGV movements to/from the site access and Lesmahagow Road east of the junction. An indicative layout is shown on DBA Drawing No 09060/SK/01 contained in Appendix D. The swept path of large 4-axle tippers and 16.5 metre maximum legal articulated vehicles negotiating the junction are also shown in DBA Drawing Nos 09060/ATR/01 & 02 contained in Appendix D.

The swept paths show that there is sufficient space to allow exiting vehicles to wait within the Quarry access without impeding vehicles entering the site. Consequently there would not be any unnecessary blocking of through traffic on Lesmahagow Road in the vicinity of the site access junction.

Visibility splays either side of the junction based on an 'x'-distance of 2.5m will be required commensurate with existing traffic speeds on Lesmahagow Road in the vicinity of the junction.

The road is derestricted (60mph max speed limit), however, a speed survey conducted by DBA indicates actual vehicles speeds in the region of 40mph. The appropriate visibility splay for 40mph is 2.5m by 120m. The junction visibility splay is shown in DBA Drawing No 09060/SK/01 (Appendix E) which illustrates that the splay can be provided within land under the control of Patersons and the public road.

### Lesmahagow Road Sections A & B

As noted earlier the existing road carriageway on Section A is less than the minimum of 5.5m required to accommodate two-way HGV traffic movements.

Similarly the existing road carriageway on Section B although greater than the minimum width of 5.5m is less than the recommended minimum of 6.0m required to accommodate unimpeded two-way HGV traffic movements.

Consequently an Improvement Scheme for Lesmahagow Road has been devised based on a system of 4 inter-visible passing places. The scheme is shown in DBA Drawing No 09060/SK/01 (Appendix D).

Passing Place #1, located on the north side of Lesmahagow Road makes use of an existing informal lay-by located some ~90m east of the proposed Quarry access. This passing place is visible from the site access junction.

Passing Place #2, would be constructed on the south side of Lesmahagow Road on the outside of the horizontal curve making use of the existing road verge. The proposed Passing Place would be located some 165m east from Passing Place #1 and 30m west of the access to Blackwoodyett.

Passing Place #3, would be constructed on the north side of Lesmahagow Road making use of the existing road verge. The proposed Passing Place would be located some 150m east from Passing Place #2 and 35m east of the access to Ladehead.

Passing Place #4, would be constructed on the south side of Lesmahagow Road at the crest of a vertical curve making use of the existing road verge. The proposed Passing Place would be located some 108m east of Passing Place #3 and 140m east of the Lesmahagow Road / Strathaven Road junction.

## 9.5 ROAD NETWORK TRAFFIC FLOW DATA

Current operations at Dunduff Quarry produce traffic movements between 07:00 – 19:00 Monday to Friday and 07:00 – 16:00 on a Saturday. It is proposed that the Concrete Block Production plant incorporated in the development proposals will have similar operating times.

Developments of the types under consideration do not have identifiable peak periods of traffic generation. For the purposes of assessing the impact of the development proposal at Lesmahagow traffic flows during the typical weekday morning and evening commuting peak periods have been collected. The combination of existing and generated traffic on the road network will therefore be most onerous during these periods.

### i) Base Traffic Flows

Following preliminary discussions with South Lanarkshire Council, the following junctions were identified for consideration :-

- M74 Junction 10 / Teiglum Road east roundabout junction
- M74 Junction 10 / Teiglum Road west Roundabout junction
- Strathaven Road / Teiglum Road Priority junction

Surveys were undertaken at the above locations on Wednesday 16th December 2009 between 07:30 and 09:30, and between 15:30 and 18:00.

In addition 7-day automatic traffic counts were conducted at the following locations, shown in Diagram 5.1 (Appendix E) on the existing and proposed Quarry access routes :-

- B7078 Carlisle Road, north of Blackwood.
- Vere Road, Kirkmuirhill
- B7086 Strathahven Road, Boghead
- Unclassified Strathaven Road, north of Lesmahagow

The 7-day counts were gathered during the period from Monday 14th to Sunday 20th December 2009.

The ATC counts were classified using the US Department of Transportation Federal Highway Administration (FHWA) classification system Scheme F. This scheme is found to give the most comprehensive breakdown of vehicle type. This classification system is based on the number of axles on each vehicle. An extract showing the classification scheme is included in Appendix A.

The existing highway peak hour identified at the three junctions surveyed was found to lie between 08:15 and 09:15 during the weekday morning peak period and between 16:15 and 17:15 during the weekday evening peak period. The base survey information for both the weekday morning and evening peak hour is shown in Figures 1a and 1b respectively in Appendix B. The average 12 hour weekday traffic flows extracted from the 7-day ATC records are shown in Figure 1 Appendix C.

### ii) Design Years

It is anticipated that the new access to Dunduff Quarry could be operational by 2011 and this has been chosen as the opening design year for the assessment of the development impact. In line with SLC guidance the design of the new site access junction will be assessed for an operational life of 10 years after opening. Projected traffic flows are therefore required for years 2011 and 2021.

The projection of base traffic flows to the relevant design years was carried out using the 'Central' growth prediction obtained from the Department of the Environment, Transport and the Regions publication 'National Road Traffic Forecasts (Great Britain) 1997.'

Growth factors used to project the base survey flows to the chosen design years are shown in Table 5.1.

Year	Index	Factor
2009	1.244	
2011	1.280	1.029
2021	1.460	1.174

**Table 5.1 – NRTF 1997 'Central' Growth Factors**

### iii) Committed Development

SLC Roads indicated that a proposed development at Wellburn Farm should be taken into consideration in the assessment of the revised Dunduff access proposals. The Wellburn Farm development is proposed as a residential development. The accompanying Planning Statement identifies that the Phase 1 development will consist of 18 self build homes, 21 live/work units and a further 17 conventional residential units. The total Phase 1 development content is therefore some 56 homes. It is proposed that the development site, located north of Strathaven Road, Lesmahagow, would be accessed via a new roundabout constructed at the junction of Strathaven Road and Wellburn Avenue. Although further phases are proposed no details of the extent of development are provided.

In traffic terms it is considered that the level of traffic generated by this proposal would be covered in the assessment by the adoption of the NRTF 'Central Growth' factor in the projection of base flows on the network under consideration.

## 9.6 TRAFFIC GENERATION AND DISTRIBUTION

Estimation of the probable vehicle trip attraction by a new development is commonly based on experience and on surveys undertaken at existing similar developments. Details of the HGV trip generation by Dunduff Quarry have been calculated using information provided by Patersons on the annual quantity of extracted material. Similarly the trip generation potential of the proposed block production plant has been based on information provided by Patersons on the maximum capacity of the production facility.

### i) Dunduff Quarry

Dunduff Quarry is currently operational and the proposal would see a re-distribution of the existing traffic on the surrounding road network. Quarry developments do not generally have identifiable peak hour movements as the traffic movements are spread over the course of a working day. For the purposes of assessing the impact of the proposals on the operation of existing junctions at Milton a peak hour traffic generation during the morning and evening peak periods has been undertaken.

Dunduff Quarry has considerable reserves and still has a long operational life. The quarry can produce between 600,000 – 800,000 tonnes of material per annum.

Patersons have advised that the material is transported in two sizes of vehicle. Some 60% of the quarry output is transported in HGVs with a load capacity of 29 tonnes with the remaining 40% transported in vehicles with a load capacity of 20 tonnes. Using this proportion of HGV load capacity it can be calculated that the annual production would require between 24,414 & 32,552 vehicle movements per annum.

Based on historical customer information Patersons have calculated HGV traffic distribution to be 15-20% travelling to/from the west along the B7086 Strathaven Road with the remaining 80-85% travelling to/from the east and then via the M74 north to the Central belt. Consequently only 80-85% of total HGV Quarry traffic would divert use the new access and produce a redistribution of HGV traffic on the local road network. The number of HGV vehicle movements which would be redistributed as a result of the revised access proposals at Dunduff Quarry would range between 20,752 & 27,669 vehicles per annum.

Currently vehicle operations at Dunduff take place Monday to Friday between 07:00 and 19:00 and on Saturday between 07:00 and 16:00 providing a total of 69 operational hours per week. On the basis of 48 operational weeks per year the annual production takes place during 3312 hours per annum.

Taking account of the production and operational statistics described above it has been calculated, as shown in Table 6.1, that the maximum level of HGV trip diversion resulting from the construction of the new quarry access would be 18 trips per hour (9 loads out & 9 empty vehicles in) equivalent to 108 HGV trips in and out during the typical working day, including concrete block making traffic.

The distribution of peak hour HGV traffic movements associated with the Quarry operation on the Lesmahagow Road – Strathaven Road – Teiglum Road corridor is shown in Figures 3a & 3b in Appendix B. The distribution of existing Quarry HGV traffic (12 hour weekday) is shown in Figure 2 in Appendix C. The revised HGV trip distribution incorporating the new Quarry access (12 hour weekday) is shown in Figure 4 also in Appendix C.

## ii) Block Production Plant

Patersons have supplied details of the production capability of the proposed concrete block making plant. The concrete block plant would follow equivalent operational time periods as the quarry.

In order to maximise efficiency Patersons will utilise quarry trucks (returning to Dunduff after delivery of quarry stone) to import relevant production materials for the construction of the concrete blocks. This proposal would reduce the total number of required HGV traffic movements for the combined quarry / block production operation.

Patersons have indicated that the Concrete Block Plant working at maximum capacity would generate 40 movements in and 40 movements out over the course of an average working weekday. This is equivalent to 4 trips In and 4 trips Out each hour. It is proposed that this represents a robust estimate of traffic produced by the concrete block plant considering the potential for reduction from share trips.

The distribution of peak hour HGV traffic movements associated with the Block Production operation on the Lesmahagow Road – Strathaven Road – Teiglum Road corridor is shown in Figures 4a & 4b in Appendix B.

## 9.7 JUNCTION AND NETWORK ANALYSIS

Design year peak hour traffic flows for the weekday morning and evening peak periods were obtained by the methods described in Sections 9.5 and 9.6. Throughout the analysis, these surveyed and projected flows have been used.

The years identified for analysis were base year 2009 and the opening year 2011 including committed and development traffic. SLC Roads also requested that a future assessment year be analysed. This was taken as 2021, which is the year of opening plus 10 years.

The projected traffic volumes including the development proposals for the design years of 2011 and 2021 are shown in Figures 6a&b and 9a&b (Appendix B) for the typical weekday AM and PM peak periods.

The impact of the development proposals on the Lesmahagow Road – Strathaven Road – Teiglum Road corridor are shown in Figures 7a&b. This shows that the percentage increase is significant at the following 3 junctions and consequently a detailed operational assessment of these junctions has been conducted.

1. Lesmahagow Road / Site Access Road priority junction
2. Strathaven Road / Teiglum Road priority junction
3. M74 Junction 10 / Teiglum Road west Roundabout

The generally accepted performance indicator, with regard to traffic capacity at road junctions, is the Ratio of Flow to Capacity (RFC). From input data on junction geometry and design year flows, a ratio of traffic demand to junction capacity is calculated for each movement or approach. A given movement reaches its capacity when the RFC value reaches 1.000, however a figure of 0.850 is commonly adopted as a limiting RFC value in the design of new junctions.

A copy of the analysis files is included on a Disc in Appendix F.

### i) Lesmahagow Road / Site Access Road / (Priority Junction)

The operational assessment of priority controlled junctions is normally undertaken using the approved TRL computer analysis program Picady. This program, however, was developed to deal with new road design where the width of the major road is greater than 6.0m. The width of Lesmahagow Road in the vicinity of the proposed site access junction is of the order of 5.0m and a system of passing places is proposed to accommodate two-way HGV traffic movements. Consequently an operational assessment of the exact parameters of the proposed site access junction can not be produced directly by the Picady analysis program.

The Picady program can, however, also be used to provide a Marginal Analysis in which the effect changes in junction layout parameters on the capacity of giveway movements is appraised. The width of the major road can be included in a Marginal Analysis.

An assessment of the junction operation was conducted using a major road width of 6m. The results are summarised in table 7.1. This assessment indicated that the maximum RFC on the right turn manoeuvre from the Site Access into Lesmahagow Road would be 0.0522 during the typical weekday PM peak hour based on a Demand of 0.48 pcu/min and a calculated capacity of 9.19 pcu/min.

The marginal assessment predicted that the capacity of the minor road right turn would vary by 0.001 pcu/min for a marginal change of 0.1m in the width of the major road. Consequently a major road width of 5m would produce a 0.01 pcu/min reduction in the capacity of the minor road right turn to 9.18 pcu/min. The maximum RFC of the Site Access is therefore predicted to be 0.0523 (0.48/0.918) taking account of the adjustment for the major road width of 5.0m.

The proposed site access junction is therefore predicted to operate well within capacity at peak times.

#### **ii) Strathaven Road / Teiglum Road (Priority Junction)**

Analysis of this existing priority controlled junction was undertaken using the approved TRL computer analysis program Picady. The results are shown in Table 7.2.

The analysis indicates that this junction would operate well within capacity during the typical weekday morning and evening peak periods in the opening year (2011) including all development traffic.

A maximum RFC 0.248, with associated queue of 0.3 vehicles, was predicted to occur on the Teiglum Road approach during the morning peak hour. Similarly during the evening peak hour a maximum RFC of 0.370, with associated queue of 0.5 vehicles, was predicted to occur on the same minor road approach.

The analysis shows that there will be no operational problems at this junction during the morning and evening peak periods.

#### **iii) M74 Junction 10 / Teiglum Road west Roundabout**

Analysis of this existing roundabout junction was undertaken using the approved TRL computer analysis program Arcady. The results are shown in Table 7.3.

The analysis indicates that this junction would operate well within capacity during the typical weekday morning and evening peak periods in the opening year (2011) including all development traffic.

A maximum RFC 0.285, with associated queue of 0.4 vehicles, was predicted to occur on the B7078 (east) approach during the morning peak hour. Similarly during the evening peak hour a maximum RFC of 0.470, with associated queue of 0.9 vehicles, was predicted to occur on the same approach.

The analysis shows that there will be no operational problems at this junction during the morning and evening peak periods.

### **9.8 QUARRY TRAFFIC - DIVERSION EFFECTS**

As part of a consolidated planning application for Dunduff Quarry it is proposed that a new haul road and access to Dunduff Quarry would be provided from the unclassified Lesmahagow Road east of the access to Midtown Farm. The provision of this access would increase traffic flow on the unclassified route from Boghead to Lesmahagow (Lesmahagow Road – Strathaven Road – Teiglum Road) and provide an equivalent reduction on the B7086, B7078 and Vere Road

In order to assess the effects of the diversion of Quarry traffic 7-day ATCs (automated traffic counts) were conducted at locations in Boghead, Kirkmuirhill, Blackwood and Milton.

#### **i) Traffic Flows**

Utilising data from the ATC surveys, 12 hour average weekday traffic flows for all vehicles and HGV were produced for sections of the road network on both existing and proposed access routes to Dunduff Quarry. The existing 2009 traffic volumes are shown in Figure 1 (Appendix C).

As discussed in Section 6 the Average Weekday (12 hour) HGV traffic generation of Dunduff Quarry that would divert to the new access would be approximately 108 one way trips (216 2-way trips) per day based on the peak production capacity. The existing HGV Quarry traffic distribution is shown in Figure 2 (Appendix C) and the future distribution via the new access is shown in Figure 4 (Appendix C).

Revised 2009 traffic predictions for the road network surrounding Dunduff Quarry including the new access are shown in Figure 5 (Appendix C). A comparison of Figure 1 and Figure 5 has been used in Table 8.1 to show the quantum of change in traffic volumes resulting from the provision of the new Quarry Access.

Route	Section	2009 AWD 12hr Total PCU (HGV) Base	2009 AWD (12hr) Total PCU (HGV) Base + Dev	Impact Total (HGV) %
B7078 Carlisle Road	North of Vere Road	5483 (379)	5051 (163)	-7.8% (-56.9%)
Vere Road		2281 (279)	1849 (85)	-18.9% (-69.5%)
B7086 Strathaven Road	Boghead – Vere Road	2134 (249)	1702 (48)	-20.2% (-80.7%)
Strathaven Road	Lesmahagow Rd – Teiglum Rd	656 (28)	1088 (244)	65.8% (771.4%)
Teiglum Road	Strathaven Road – M74	2683 (60)	3115 (276)	16.1% (360%)

**Table 8.1 – Traffic Diversion Effects**

## ii) Impact Significance

According to the guidance in the Design Manual for Roads and Bridges (DMRB) changes in traffic volumes on existing roads of the following magnitude may produce a local change in Air Quality, Noise & Vibration :-

- Daily traffic flow change of 1,000 vehicles AADT or more.
- HGV flow change of 200 AADT or more.
- Traffic flow increase by at least 25% or decrease by 20%.

In order to provide an indication of the significance of the changes in traffic flow the number of properties in bands from the access route centreline have been identified.

Based on Guidance in Volume 11 of the DMRB on Environmental Assessments for simple desktop studies a corridor width of 50m and 200m either side of the road centre line has been adopted. Drawings of the existing and new access route are contained in Appendix E.

Travelling through Boghead, Kirkmuirhill and Blackwood on the existing access route there are approximately 170 properties within 50m and 619 within 200m of the access road corridor. There are also three sensitive receptors on the existing access route. Bent Primary School and St Johns Primary School are within 50m and Blackwood Primary School is within 200m of the access road corridor. It should be noted that the properties immediately adjacent to Vere Road and Carlisle Road face directly onto and have direct frontage access onto the access route refer to drawing no's **09060/SK/03 & 04** (Appendix E).

Following the new access route through Milton to the M74 there are approximately 58 existing properties and another 10 proposed as part of the Wellburn development within 50m of the access road corridor. Similarly there are 269 existing properties and 56 proposed properties within 200m of the proposed access road corridor. There are no sensitive receptors within 200m of the proposed access route. The majority of properties immediately adjacent to Lesmahagow Road – Strathaven Road on this access route do not face or have direct frontage access onto the route.

The provision of the new Dunduff Quarry access will divert ~216 HGV movements per day from the existing B7086 – Vere Road – B7078 access route onto the Lesmahagow Road – Strathaven Road – Teiglum Road corridor. The level of increase in HGV traffic flow is more significant in percentage terms on the Lesmahagow Road – Strathaven Road – Teiglum Road corridor due to the very low existing traffic volume compared to the reduction on Vere Road.

The total number of properties within a 200m zone of influence (619), the number of sensitive receptors (3 Primary Schools) and the level of frontage development (approximately 90 properties) in relation to the existing access route via Vere Road are significantly greater than equivalent figures (269, zero, ~10) for the proposed new access route via Lesmahagow Road.

## 9.9 CONCLUSIONS

Patersons of Greenoakhill (Patersons) operate a stone quarry at Dunduff, Kirkmuirhill adjacent to the B7086 Strathaven Road. The access route between the site and the strategic road network utilises the B7086 and the B7078 to reach M74 at Junction 8 (A71 / B7078 Canderside Toll) some 4 kilometres north of Blackwood. The route involves the use of Vere Road in Blackwood between the B7086 and the B7078.

As part of a consolidated planning application for Dunduff Quarry it is proposed that a new haul road and access to Dunduff Quarry would be provided from the unclassified Lesmahagow Road east of the access to Midtown Farm. The unclassified route from Boghead to Lesmahagow (Lesmahagow Road – Strathaven Road – Teiglum Road) would provide a link to the M74 Motorway at Junction 10. The provision of the new access would divert 80-85% of HGV quarry traffic away from the existing access route via Boghead, Kirkmuirhill and Blackwood onto the Boghead to Lesmahagow route to the M74 at Junction 10.

Dunduff Quarry has considerable reserves and still has a long operational life. The quarry can produce between 600,000 – 800,000 tonnes of material per annum. Taking account of production and operational parameters it has been calculated that the maximum level of HGV trip diversion resulting from the construction of the new quarry access would be 18 trips per hour (9 loads out & 9 empty vehicles in) equivalent to 108 HGV trips in and out during the typical working day.

It is generally accepted that a road carriageway of 5.5m width permits all vehicles to pass each other with an overall tolerance of 0.5m for the largest vehicles but with ample clearance for all others. In addition a horizontal clearance of approximately 0.5m is required between the road edge and adjacent structures / street furniture. Consequently a minimum road carriageway of 5.5m within a road corridor of 6.5m will be required to accommodate two way heavy goods vehicle (HGV) traffic movements. Even at this width two HGVs would have to pass at slow speeds. A road width of 6.0m (road corridor 7.0m) or greater would be required to permit HGV vehicles to pass unimpeded.

The existing road carriageway on Strathaven Road and Teiglum Road is sufficient to accommodate two way HGV traffic movements. Improvements to sections of Lesmahagow Road between the proposed site access and the junction at Strathaven Road would be required to accommodate increased HGV traffic movements. Consequently an Improvement Scheme for Lesmahagow Road has been devised based on a system of 4 inter-visible passing places. The scheme is shown in DBA Drawing No 09060/SK/01 (Appendix D).

A detailed operational assessment of key junctions on the Lesmahagow Road – Strathaven Road – Teiglum Road corridor was conducted. The analysis indicated that all existing junctions studied would operate well within capacity during the typical weekday morning and evening peak periods in the opening year (2011) including all development traffic.

According to guidance in the Design Manual for Roads and Bridges (DMRB) the predicted change in HGV traffic volumes on the existing and proposed access route to Dunduff Quarry may be significant in terms of local Air Quality, Noise & Vibration.

In order to provide an indication of the significance of the changes in traffic flow the number of properties in bands from the access route centreline have been identified. The total number of properties within a 200m zone of influence (619), the number of sensitive receptors (3 Primary Schools) and the level of frontage development (approximately 90 properties) in relation to the existing access route via Vere Road are significantly greater than equivalent figures (269, zero, ~10) for the proposed new access route via Lesmahagow Road.

## **9.10 Appendices, Figures, Diagrams and Drawings**

Material Extracted per annum	15% through Kirkmuirhill	Proportion	Truck size (tonnes)	Trucks
800,000	120,000	0.6	29	2483
		0.4	20	2400
				<u>4883</u>

Mon -Fri	12	hours per day	12
Sat	9	hours per day	9
Hours per week	69		69
Weeks per year	48		48
Hours per annum	3312		3312

Truck Loads in/out = 2.95 (per working hr)  
Truck frequency = 20.35

Material Extracted per annum	15% through Kirkmuirhill	Proportion	Truck size (tonnes)	Trucks
600,000	90,000	0.6	29	1862
		0.4	20	1800
				<u>3662</u>

Mon -Fri	12	hours per day
Sat	9	hours per day
Hours per week	69	
Weeks per year	48	
Hours per annum	3312	

Truck Loads in/out = 2.21 (per working hr)  
Truck frequency = 27.13

**Table 5.1 - Quarry Generation**



Material Extracted per annum	85% through Kirkmuirhill	Proportion	Truck size (tonnes)	Trucks
800,000	680,000	0.6	29	14069
		0.4	20	13600
				<u>27669</u>

Mon -Fri                    12            hours per day  
 Sat                                9            hours per day  
 Hours per week            69  
 Weeks per year            48  
 Hours per annum        3312

Truck Loads in =        8.35  
 Truck Loads out =      8.35  
 Truck Loads in/out =   16.71        (per working hr)

Material Extracted per annum	85% through Kirkmuirhill	Proportion	Truck size (tonnes)	Trucks
600,000	510,000	0.6	29	10552
		0.4	20	10200
				<u>20752</u>

Mon -Fri                    12            hours per day  
 Sat                                9            hours per day  
 Hours per week            69  
 Weeks per year            48  
 Hours per annum        3312

Truck Loads in =        6.27  
 Truck Loads out =      6.27  
 Truck Loads in/out =   12.53        (per working hr)

**Table 6.1 - Quarry Generation**



**Table 7.1 - PICADY 4 Results**  
 Site Access Road / Lesmahagow Road

	Site Access Road		Lesmahagow Road			
	RFC	Queue Veh	Delay mins/Veh	RFC	Queue Veh	Delay mins/Veh
<b>Weekday AM</b>						
Projected 2021 + Generation	0.051	0.1	0.11	0.000	0.0	0.00
<b>Weekday PM</b>						
Projected 2021 + Generation	0.052	0.1	0.11	0.000	0.0	0.00

Notes:

- RFC represent Ratio of Flow to Capacity
- queue lengths are maximum values expressed in numbers of vehicles
- vehicle delays are stated as average delays in minutes per vehicle



**Table 7.2 - PICADY 4 Results**

Teiglum Road / Strathaven Road

	Teiglum Road			Strathaven Road Northbound			Strathaven Road Southbound		
	RFC	Queue Veh	Delay mins/veh	RFC	Queue Veh	Delay mins/veh	RFC	Queue Veh	Delay mins/veh
<b>Weekday AM</b>									
Base 2009	0.178	0.2	0.12	0.149	0.2	0.12	-	-	-
Projected 2011	0.185	0.2	0.12	0.153	0.2	0.12	-	-	-
Projected 2011 + Generation	0.248	0.3	0.14	0.155	0.2	0.12	-	-	-
<b>Weekday PM</b>									
Base 2009	0.300	0.4	0.14	0.110	0.1	0.11	-	-	-
Projected 2011	0.308	0.4	0.15	0.114	0.1	0.11	-	-	-
Projected 2011 + Generation	0.370	0.6	0.16	0.116	0.1	0.11	-	-	-

Notes:

- RFC represent Ratio of Flow to Capacity

- queue lengths are maximum values expressed in numbers of vehicles

- vehicle delays are stated as average delays in minutes per vehicle

**DBA**

**Table 7.3 - ARCADY 4 Results**

Teiglum Road / B7078 / M74 on/off slips

	B7078 (East)			M74 off slip			B7078 (South)			Teiglum Road		
	RFC	Queue Veh	Delay mins/veh	RFC	Queue Veh	Delay mins/veh	RFC	Queue Veh	Delay mins/veh	RFC	Queue Veh	Delay mins/veh
<b>Weekday AM</b>												
Base 2009	0.254	0.3	0.06	0.073	0.1	0.04	0.249	0.3	0.05	0.167	0.2	0.04
Projected 2011	0.262	0.4	0.06	0.076	0.1	0.04	0.258	0.3	0.05	0.172	0.2	0.04
Projected 2011 + Generation	0.285	0.4	0.06	0.077	0.1	0.04	0.261	0.4	0.05	0.190	0.2	0.04
<b>Weekday PM</b>												
Base 2009	0.435	0.8	0.07	0.057	0.1	0.04	0.188	0.2	0.04	0.119	0.1	0.04
Projected 2011	0.448	0.8	0.08	0.060	0.1	0.04	0.194	0.2	0.04	0.122	0.1	0.04
Projected 2011 + Generation	0.470	0.9	0.08	0.061	0.1	0.04	0.196	0.2	0.04	0.140	0.2	0.04

Notes:

- RFC represent Ratio of Flow to Capacity

- queue lengths are maximum values expressed in numbers of vehicles

- vehicle delays are stated as average delays in minutes per vehicle



**APPENDIX A**  
**FHWA Classification**

# Classification Schemes

## Scheme F Classification Scheme (Non-metric)

Scheme F is an attempt to implement the FWHA's visual classification scheme as an axle-based classification scheme. This is one of several interpretations.

Class	Vehicle Type	No. of Axles	Axle spacing in feet				
			Axle 1 to 2	Axle 2 to 3	Axle 3 to 4	Axle 4 to 5	Axle 5 to 6
1	motorcycle	2	<6.0				
2	passenger car	2	6.0 - 10.0				
	car + 1 axle trailer	3	<10.0	10.0 - 18.0			
	car + 2 axle trailer	4	<10.0		<3.5		
3	pickup	2	10.0 - 15.0				
	pickup + 1 axle trailer	3	10.0 - 15.0	10.0 - 18.0			
	pickup + 2 axle trailer	4	10.0 - 15.0		<3.5		
	pickup + 3 axle trailer	5	9.9 - 15.0			<3.5	
4	bus	2	>20.0				
	bus	3	>19.0				
5	single unit truck - dual rear axle	2	14.9 - 20.0			<3.5	
6	3 axle truck	3		<18.0			
7	4 axle truck	4					
8	2S1	3		>18.0			
	2S2	4		>5.0	>3.5		
	3S1	4		<5.0	>10.0		
9	3S2	5		<6.1		3.5 - 8.0	
	5 axle combination	5					
10	6 axle combination	6			3.5 - 5.0		
	3S3	6					
11	2S1-2	5		>6.0			
12	3S1-2	6					>10.0
13	truck	7 or more					

**APPENDIX B**

**Traffic Flow Figures**  
(Typical Weekday Peak Periods)

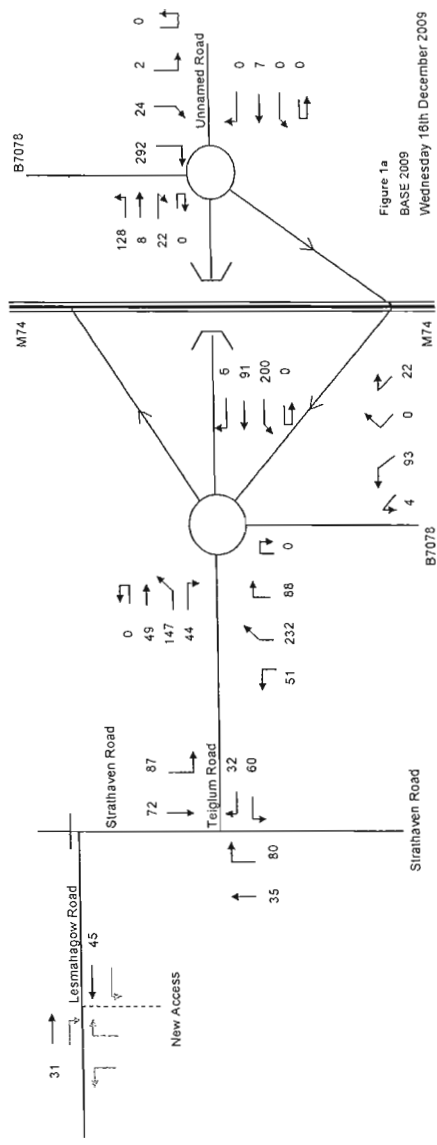


Figure 1a  
 BASE 2009  
 Wednesday 16th December 2009  
 (0815-0915)  
 Peak PCU's  
 DBA

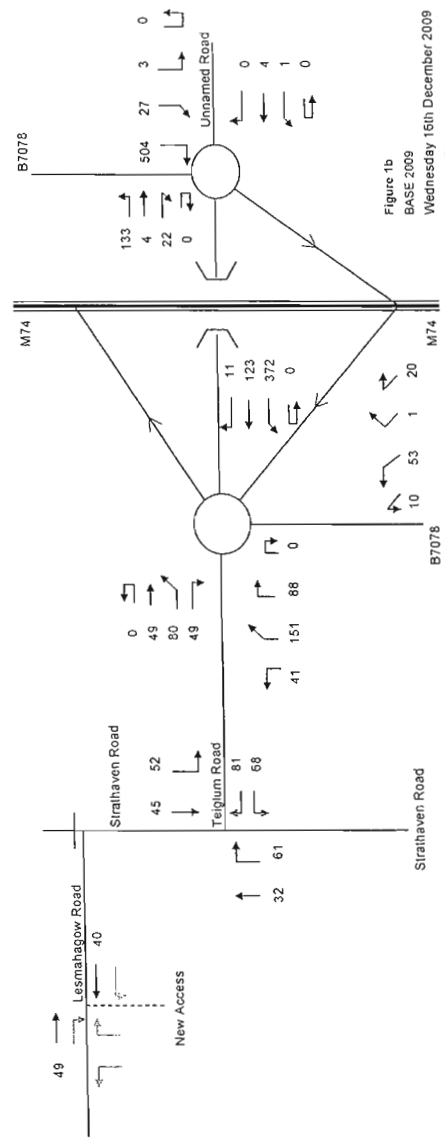
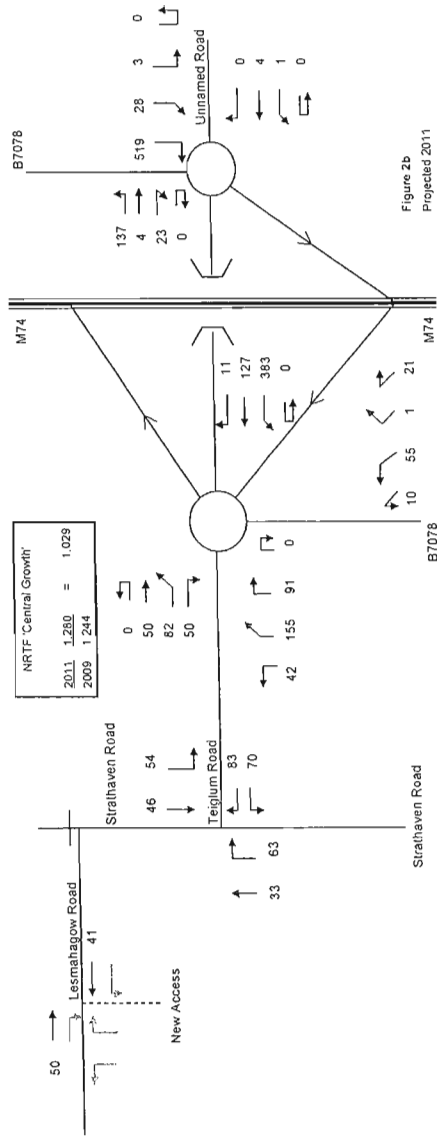
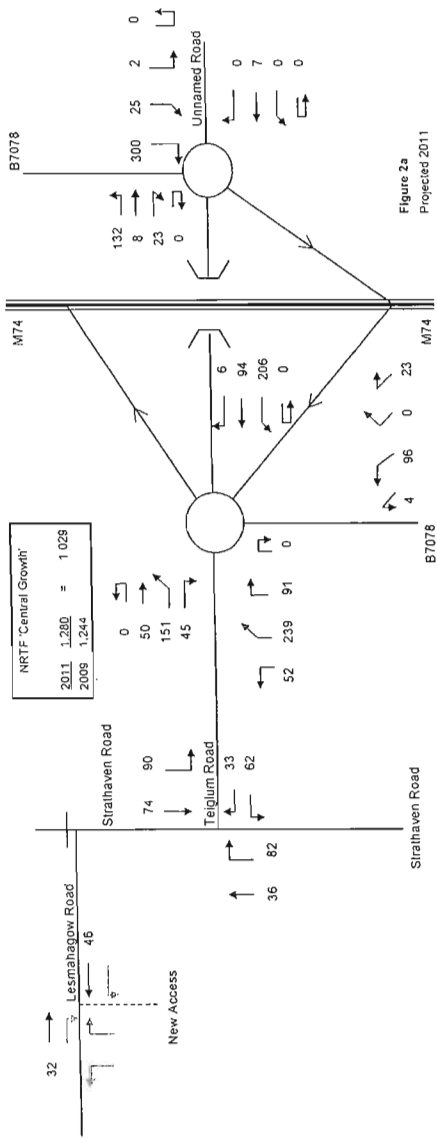


Figure 1b  
 BASE 2009  
 Wednesday 16th December 2009  
 (1715-1815)  
 Peak PCU's  
 DBA



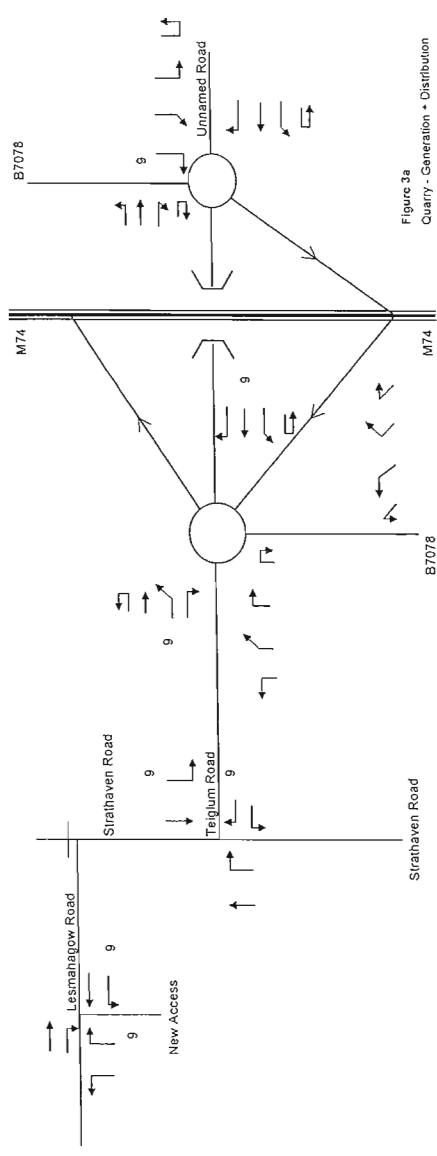


Figure 3a  
 Quarry - Generation + Distribution  
 (0815-0915)  
 HGVs

DBA

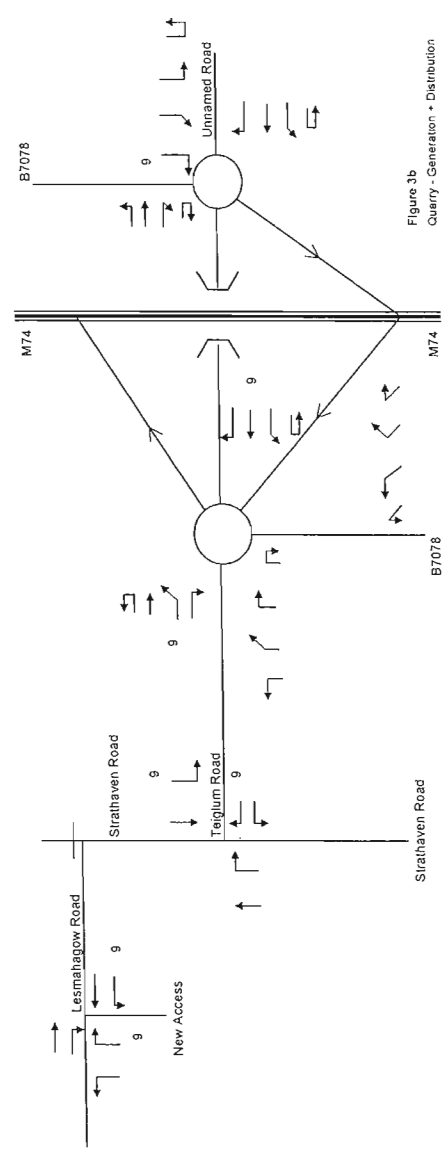


Figure 3b  
 Quarry - Generation + Distribution  
 (1715-1815)  
 HGVs

DBA

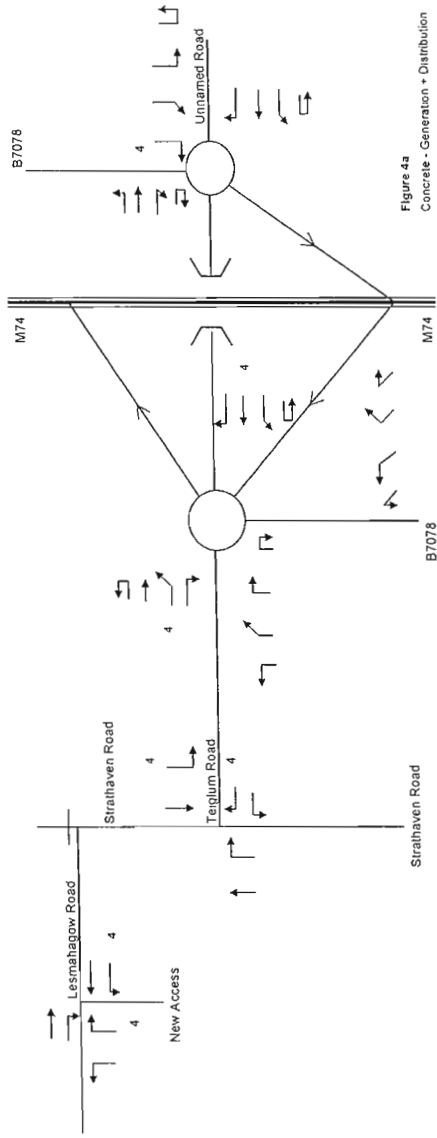


Figure 4a  
Concrete - Generation + Distribution  
(0815-0915)  
HGVs

DBA

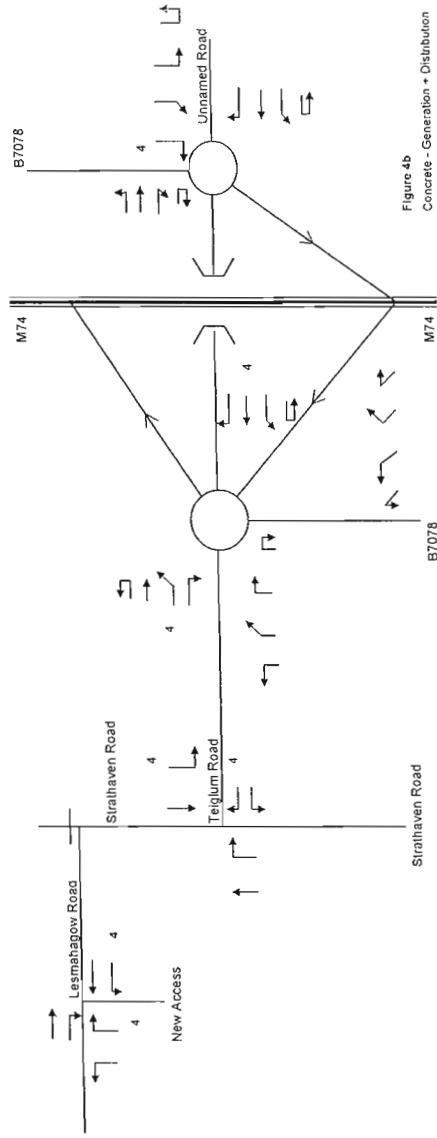


Figure 4b  
Concrete - Generation + Distribution  
(1715-1815)  
HGVs

DBA

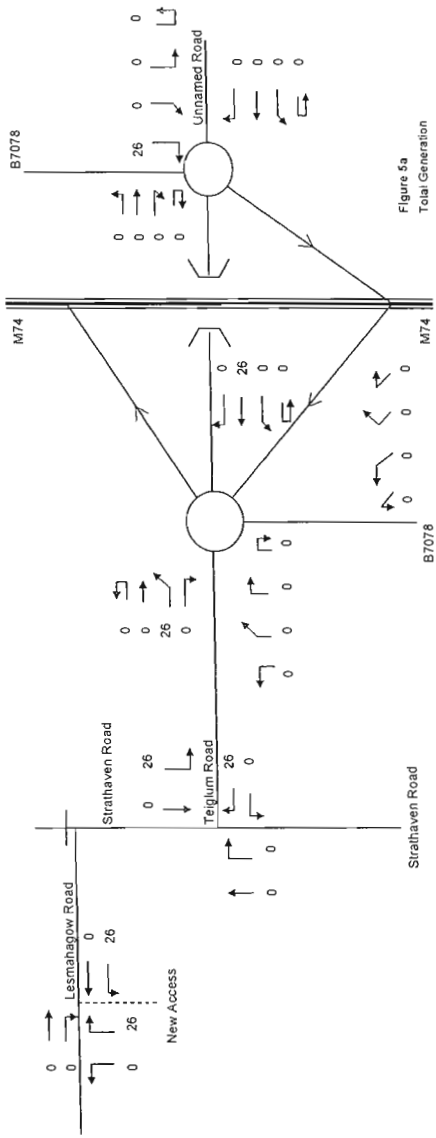


Figure 5a  
Total Generation  
(0815-0915)  
Peak PCU's

D3A

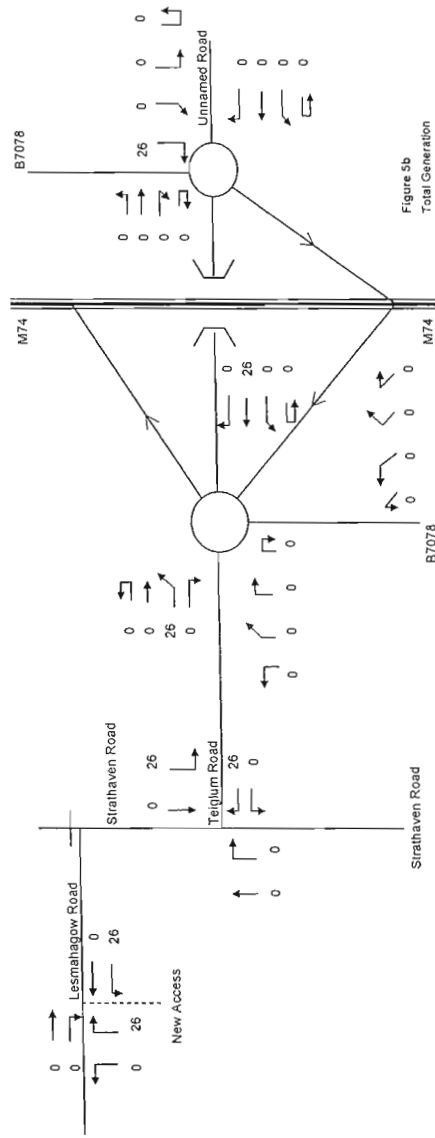


Figure 5b  
Total Generation  
(1715-1815)  
Peak PCU's

D3A

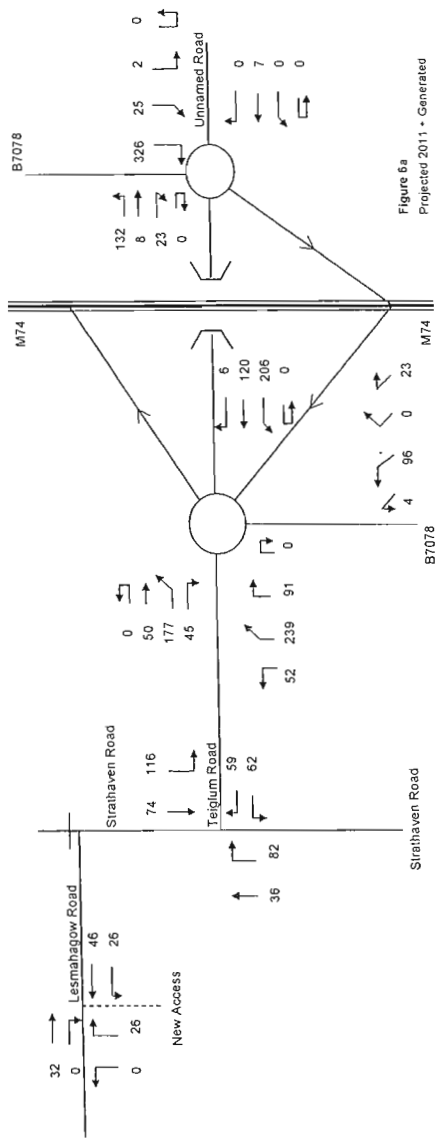


Figure 6a  
Projected 2011 + Generated  
(0815-0915)  
Peak PCU's

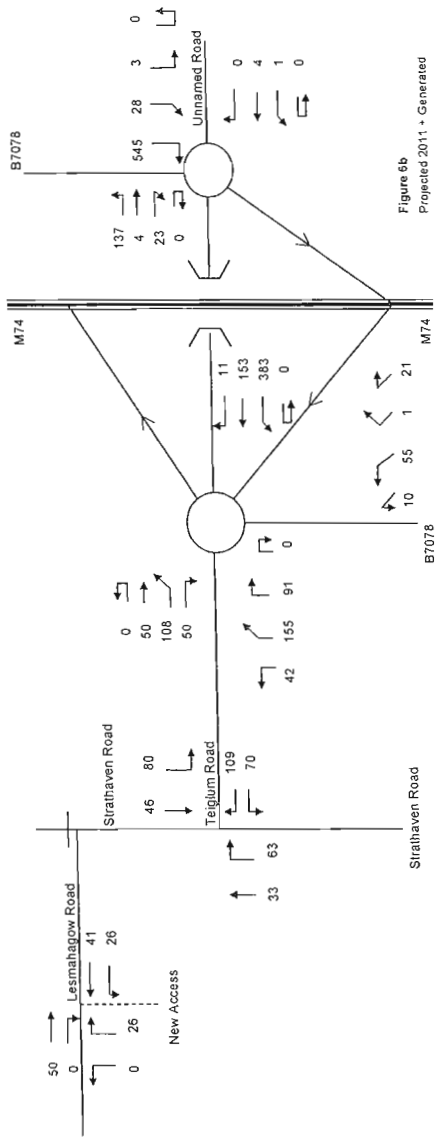


Figure 6b  
Projected 2011 + Generated  
(1715-1815)  
Peak PCU's



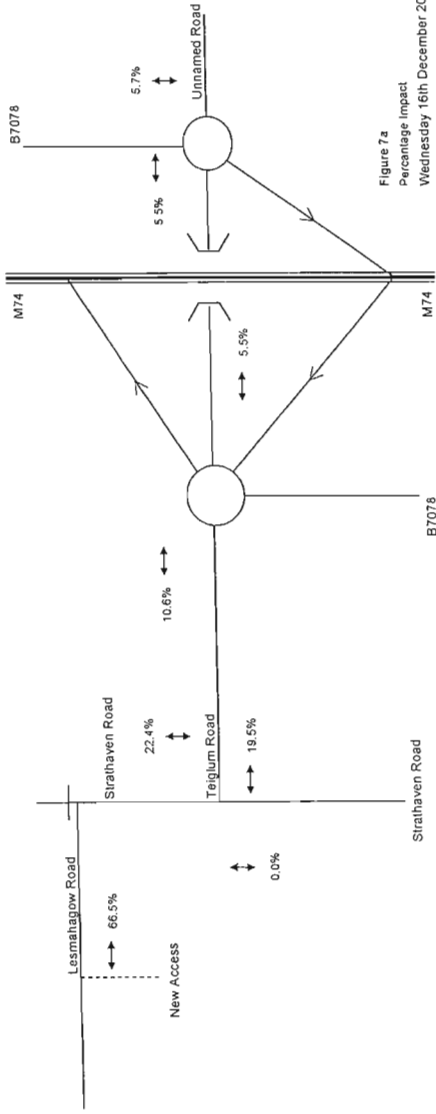


Figure 7a  
Percentage Impact  
Wednesday 16th December 2009  
(0815-0915)  
Peak PCU's  
DCA

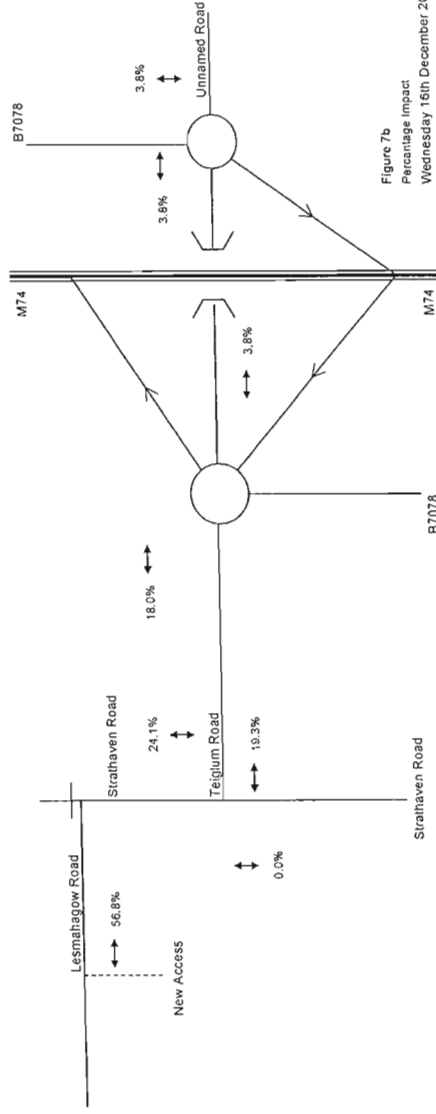


Figure 7b  
Percentage Impact  
Wednesday 16th December 2009  
(1715-1815)  
Peak PCU's  
DCA

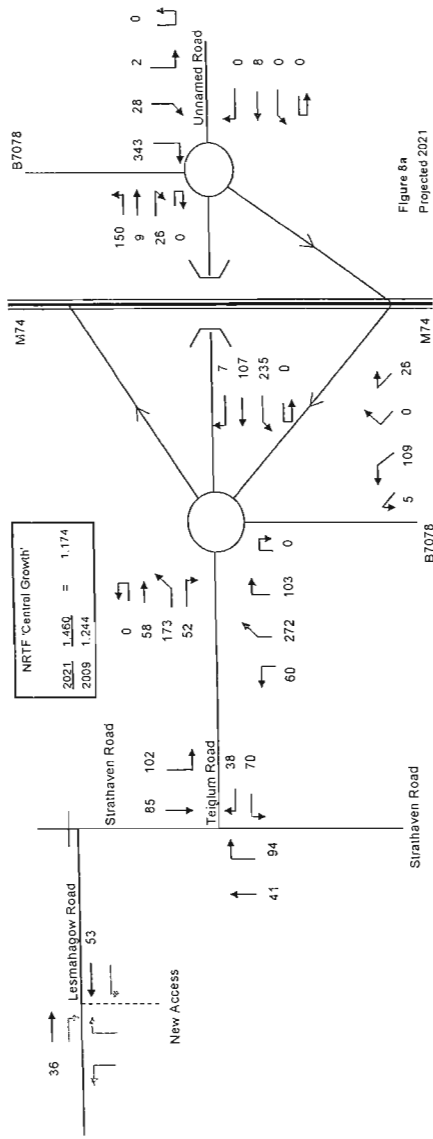


Figure 8a  
Projected 2021  
(0815-0915)  
Peak PCU's  
DCA

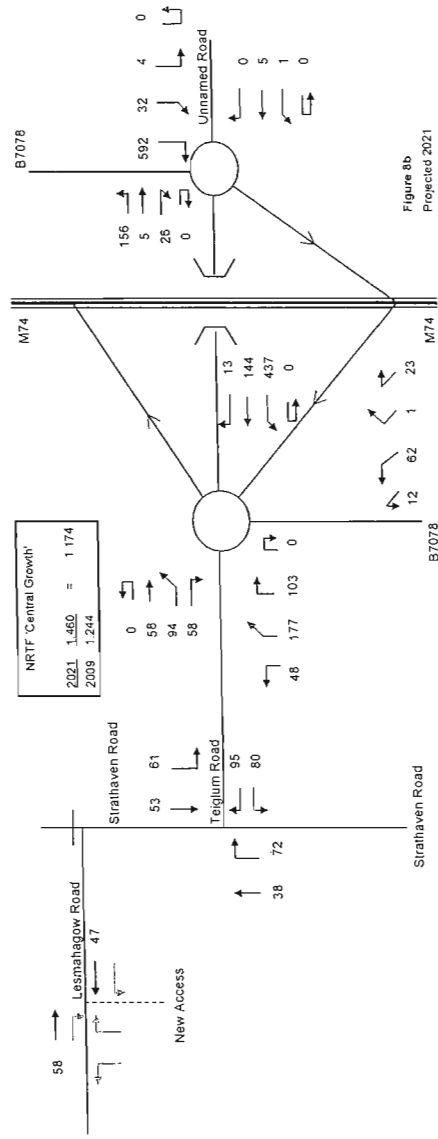


Figure 8b  
Projected 2021  
(1715-1815)  
Peak PCU's  
DCA

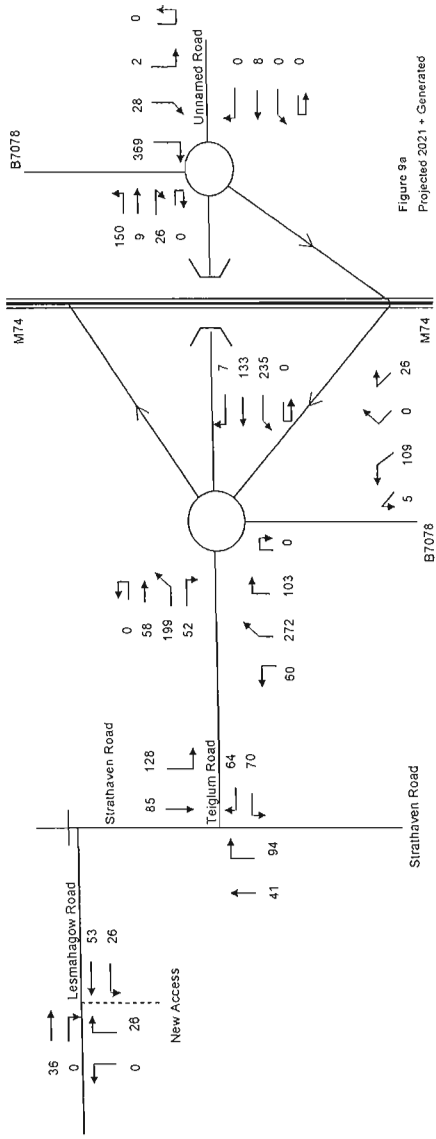


Figure 9a  
Projected 2021 + Generated  
(08/15-09/15)  
Peak PCU's

DBA

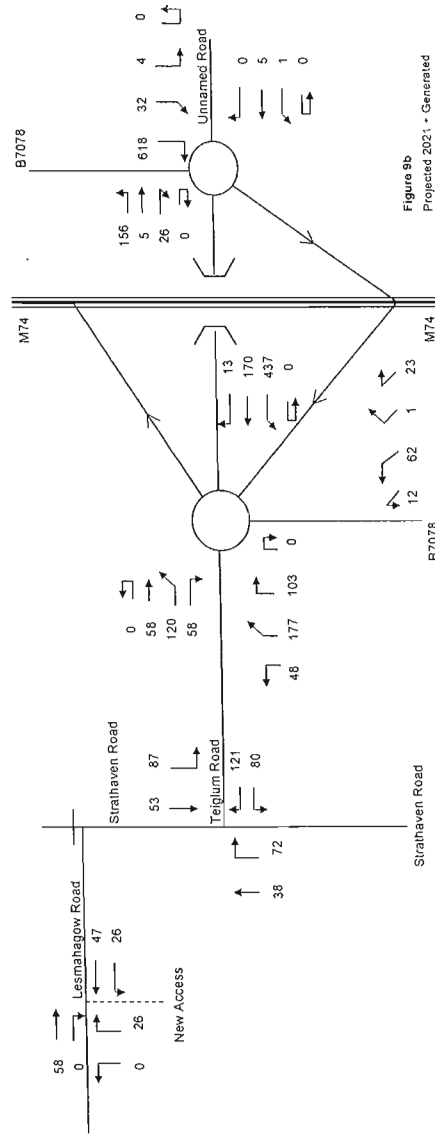


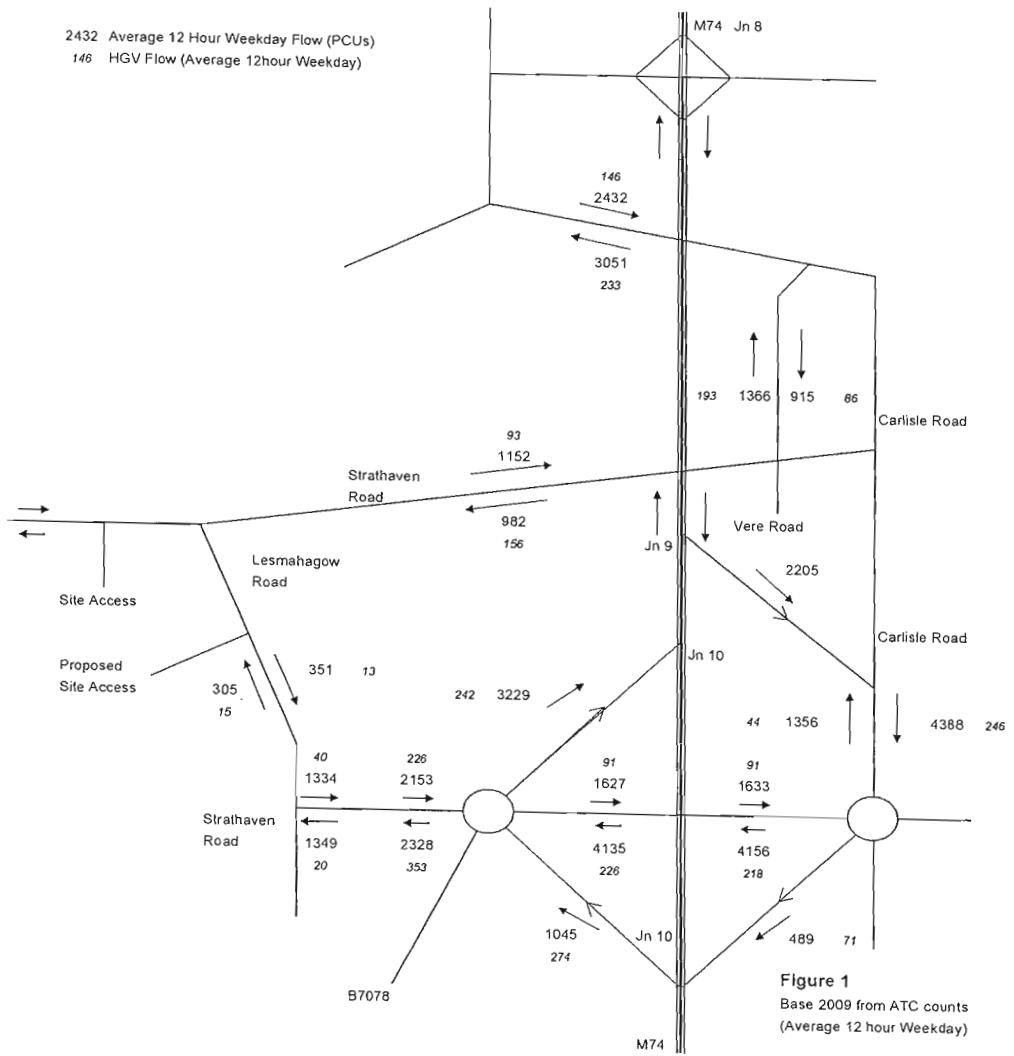
Figure 9b  
Projected 2021 + Generated  
(17/15-18/15)  
Peak PCU's

DBA

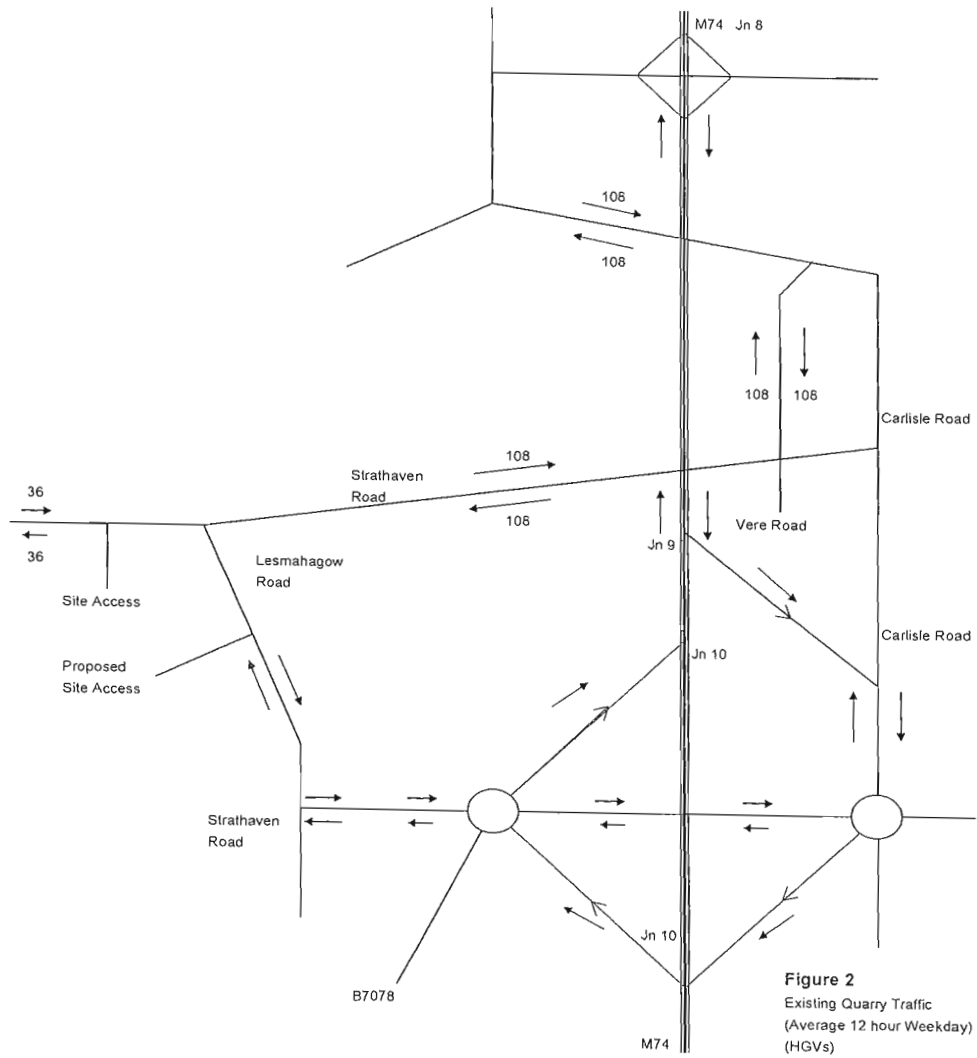
**APPENDIX C**

**Traffic Flow Figures**  
(12 hour Average Weekday)

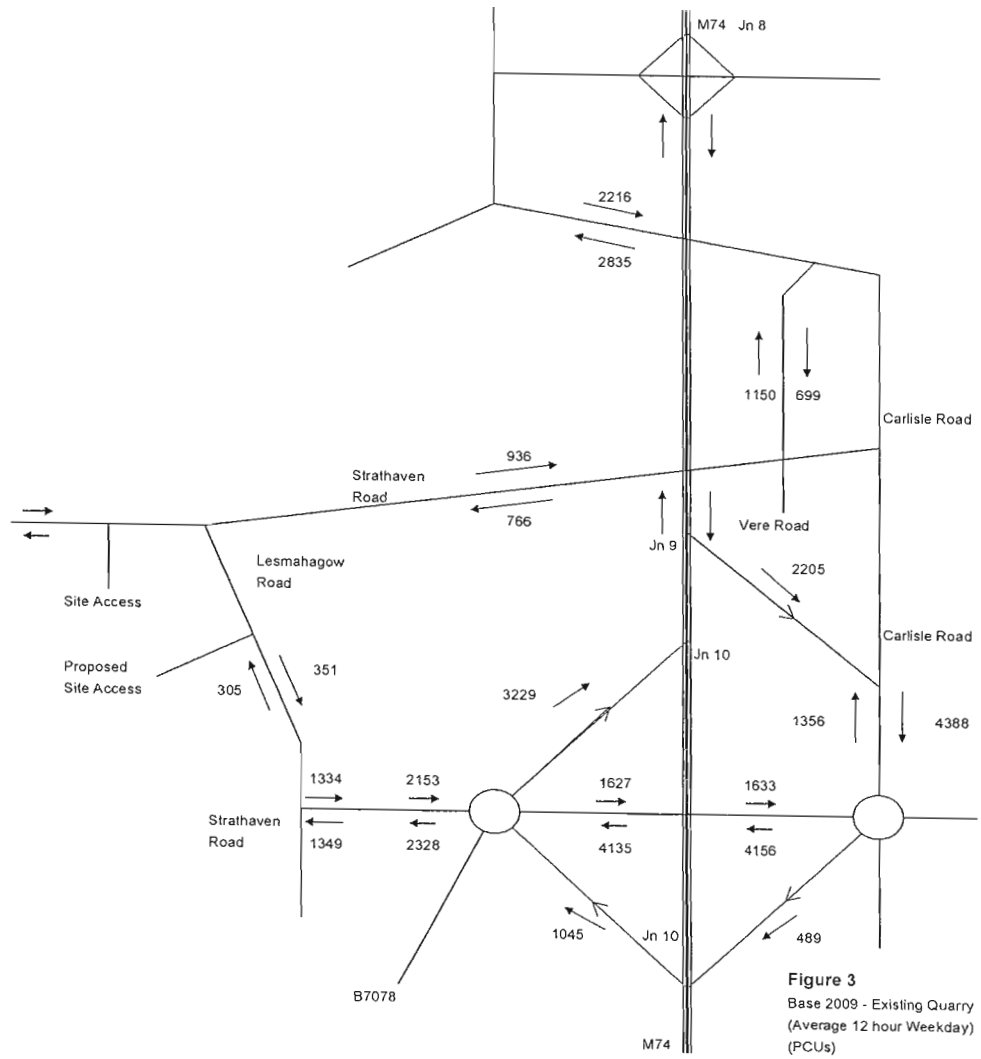
2432 Average 12 Hour Weekday Flow (PCUs)  
 146 HGV Flow (Average 12hour Weekday)



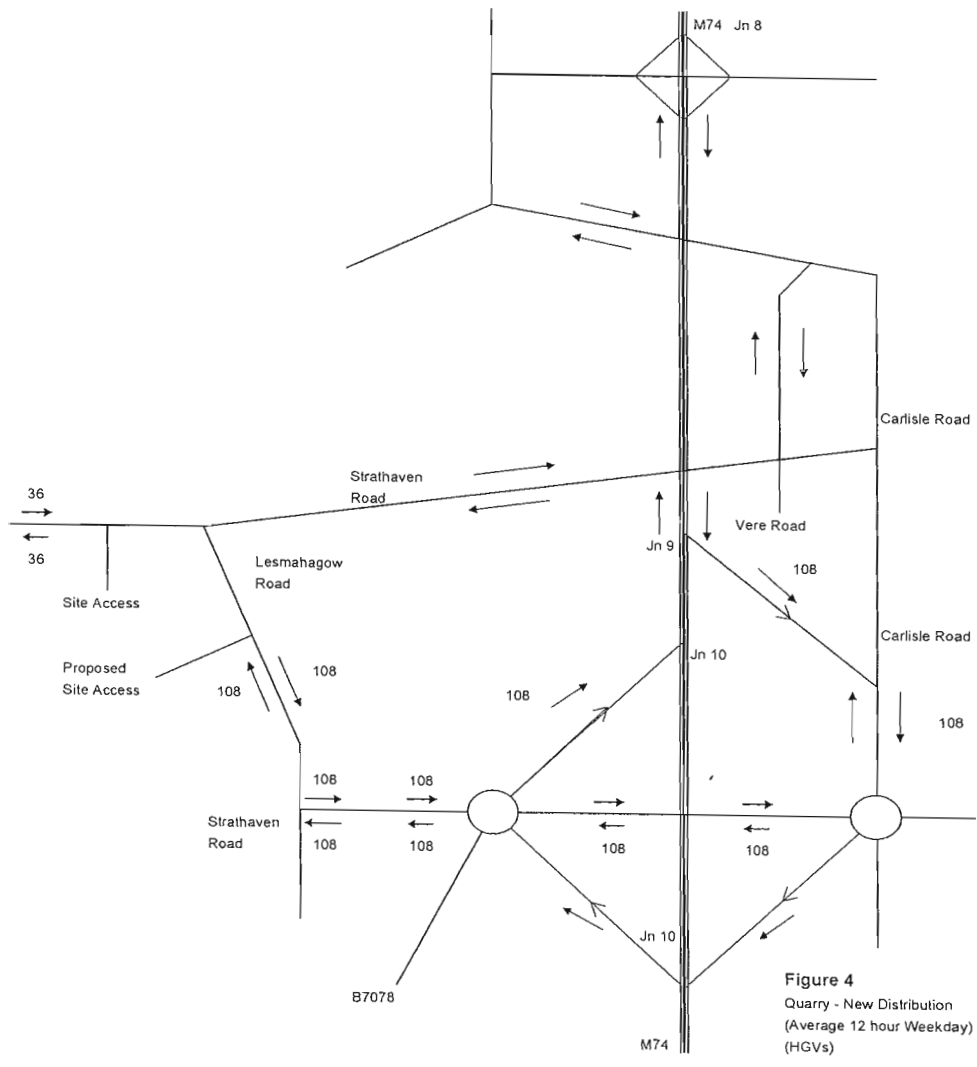
**Figure 1**  
 Base 2009 from ATC counts  
 (Average 12 hour Weekday)



**Figure 2**  
Existing Quarry Traffic  
(Average 12 hour Weekday)  
(HGVs)

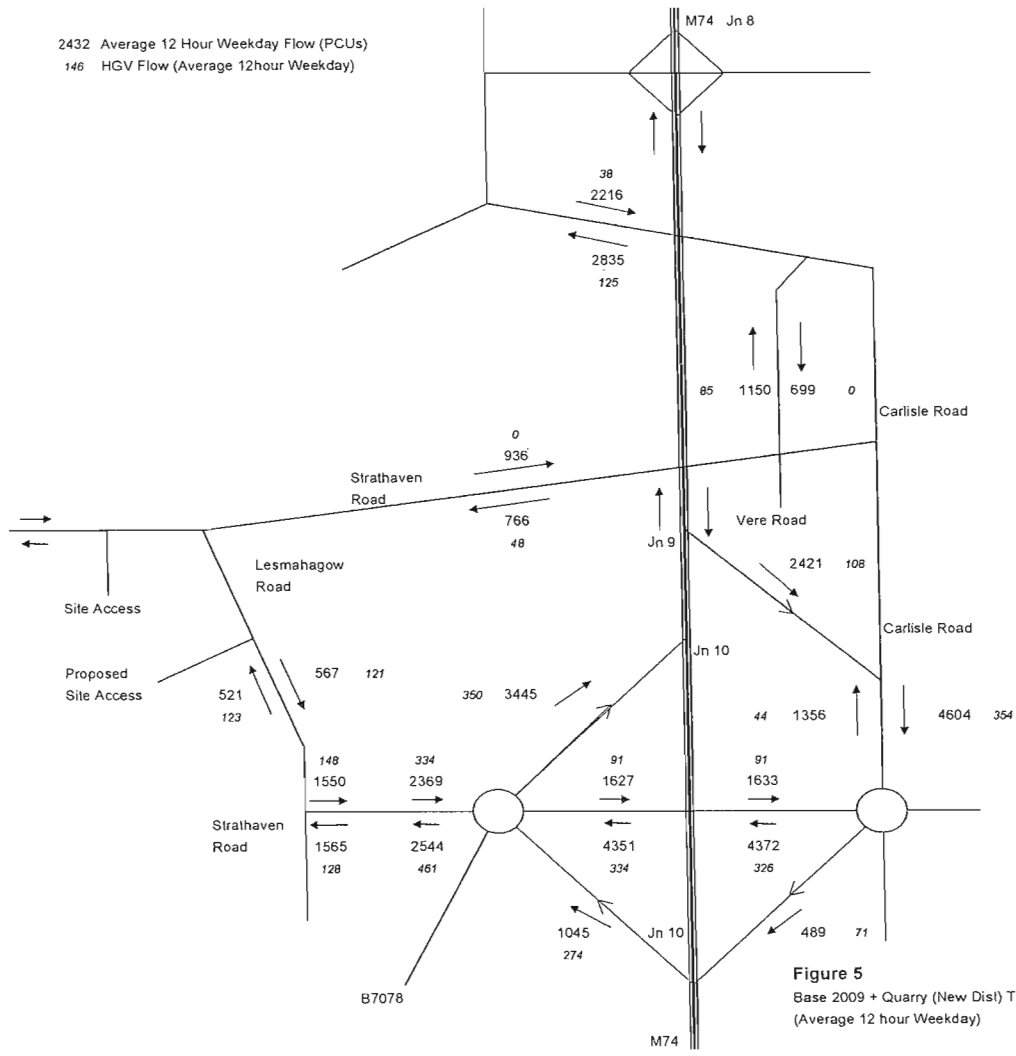


**Figure 3**  
 Base 2009 - Existing Quarry  
 (Average 12 hour Weekday)  
 (PCUs)



**Figure 4**  
 Quarry - New Distribution  
 (Average 12 hour Weekday)  
 (HGVs)

2432 Average 12 Hour Weekday Flow (PCUs)  
 146 HGV Flow (Average 12hour Weekday)



**Figure 5**  
 Base 2009 + Quarry (New Dist) Traffic  
 (Average 12 hour Weekday)

**APPENDIX D**

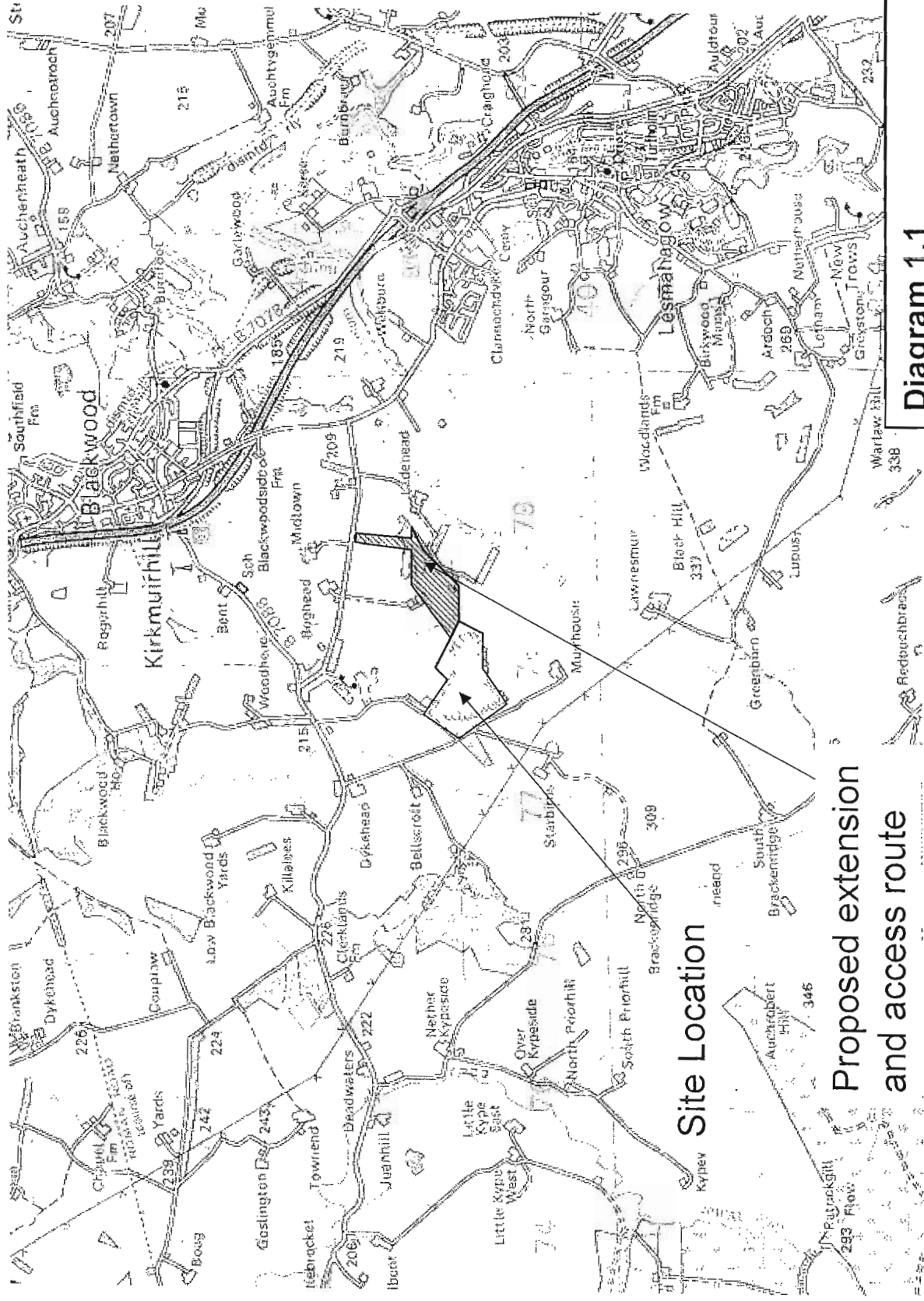
**Lesmahagow Road  
Passing Place Improvement Scheme  
Drawing no. 09060/SK/01**

**Refer to Volume 2**

**APPENDIX E**

**Environmental Impact Diagrams**

**For Diagram 3.1  
Lesmahagow Road – Strathaven Road  
(Sections A,B,C,E & F)  
(Road Carriageway Widths)  
Refer to Volume 2**



Site Location

Proposed extension  
and access route

Diagram 1.1  
Site Location Plan  
Regional Context



Based upon the Ordnance Survey map with the permission of the Controller of H.M. Stationery Office. Crown Copyright Reserved. Licence No. AL 100018007

B.1578

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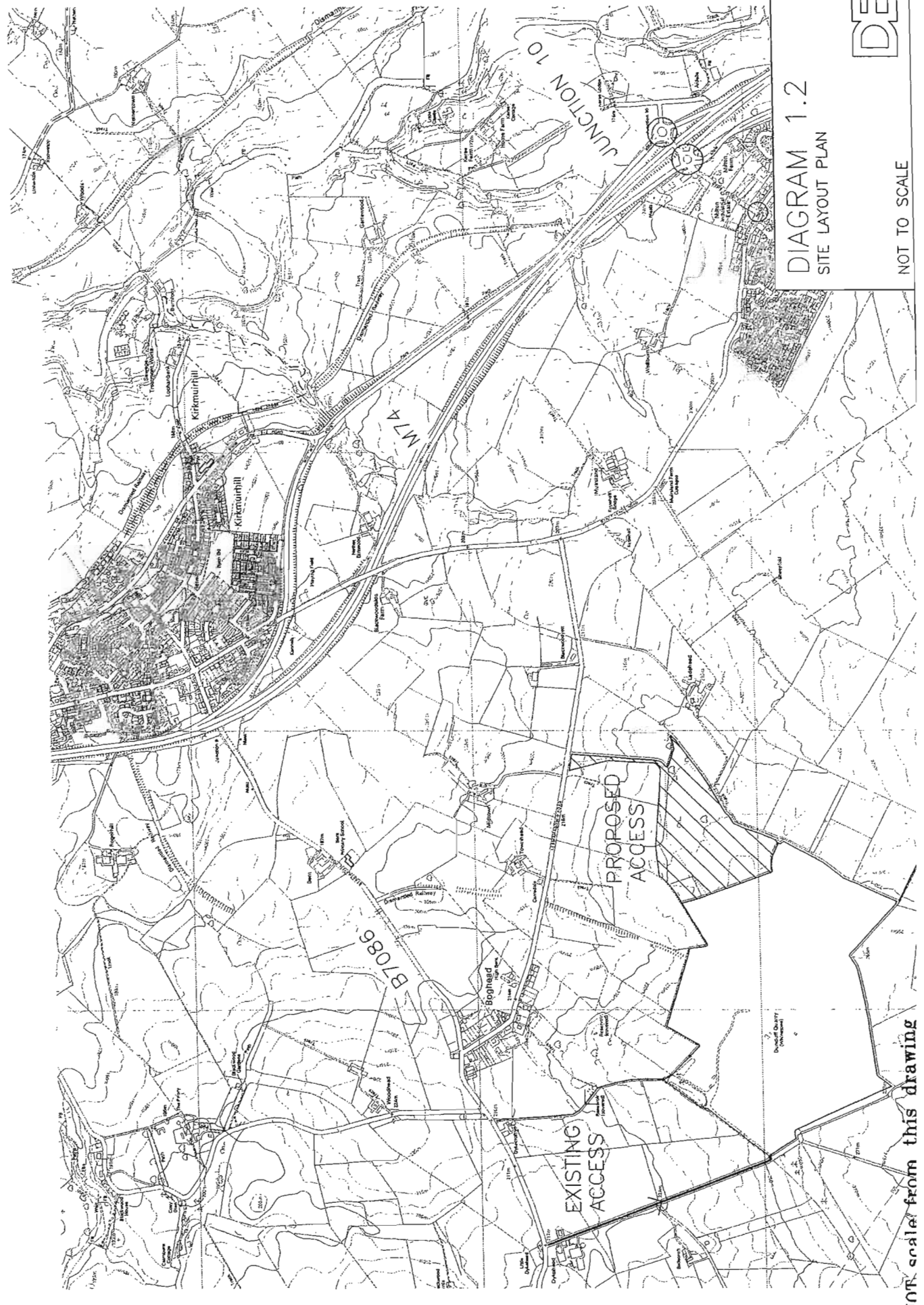


DIAGRAM 1.2  
SITE LAYOUT PLAN



NOT TO SCALE


NO NOT scale from this drawing


Diagram 3.2  
Lesmahagow Road  
(Sections A,B,C&D)  
Road Corridor Widths

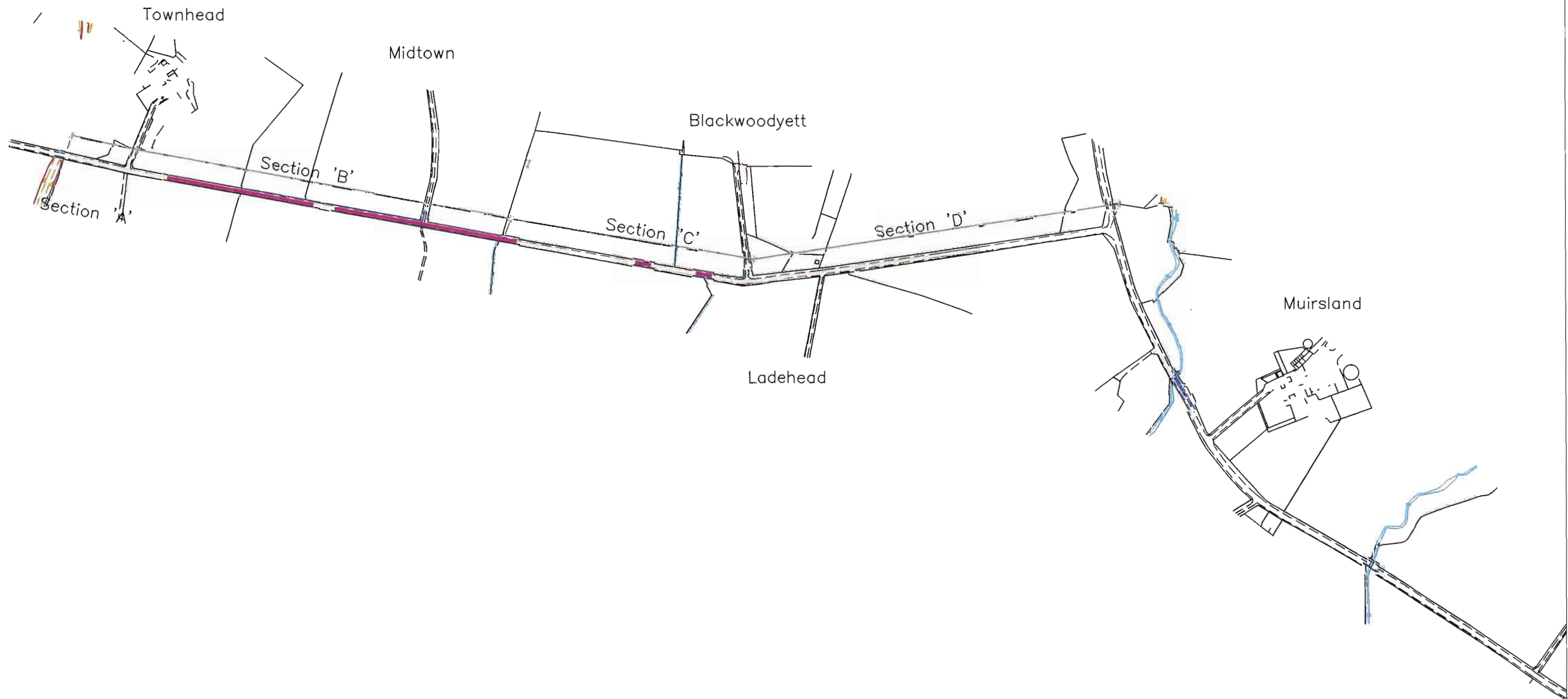
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DBA

Road Corridor Width

 Width < 6.5 metres

 Width > or = 6.5 metres



**Diagram 5.1  
Traffic Counts  
Location Plan**

**DBA**

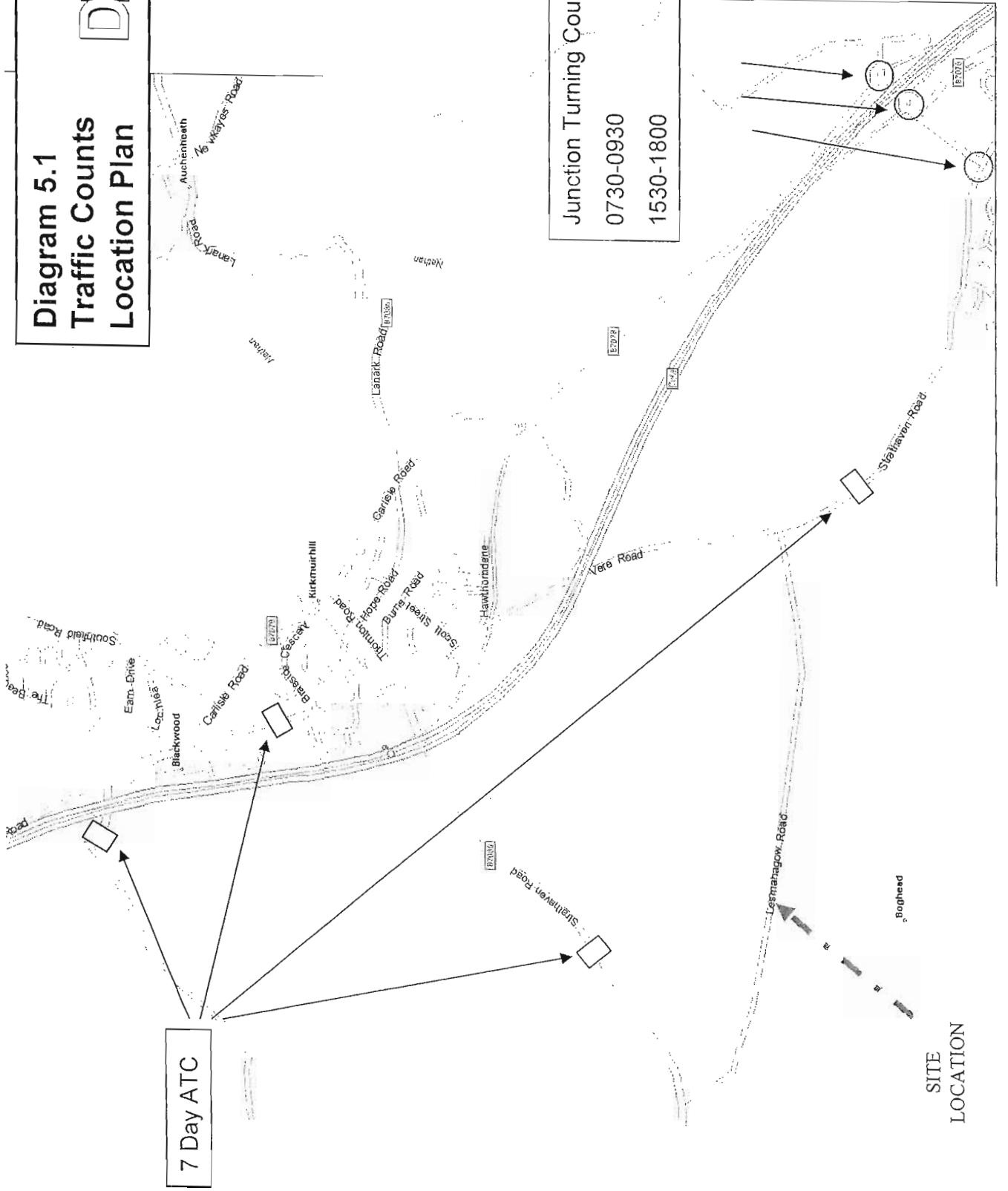
7 Day ATC

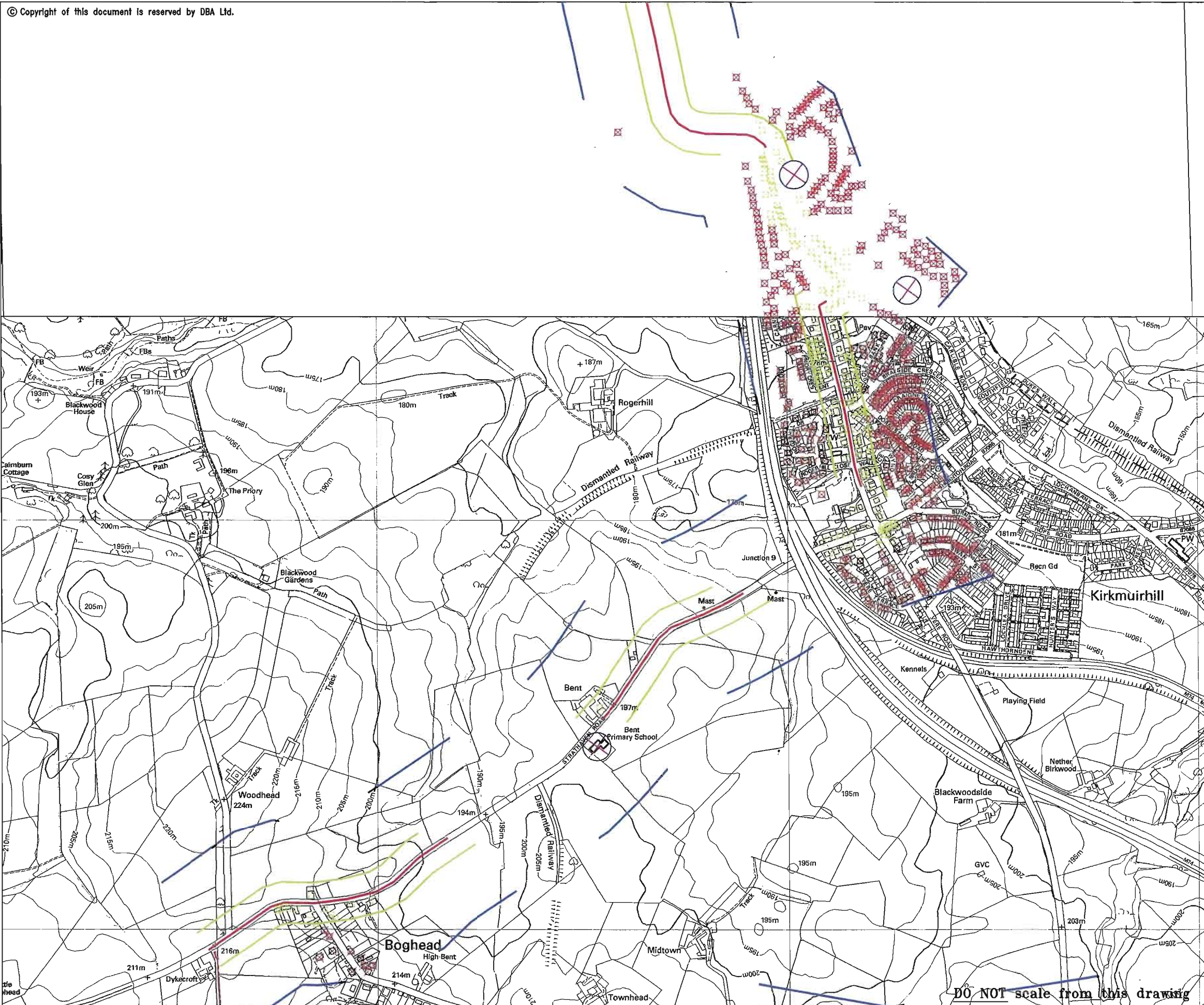
Junction Turning Counts

0730-0930

1530-1800

SITE  
LOCATION





- KEY**
- ⊗ PRIMARY SCHOOL LOCATION
  - ◻ PROPERTIES WITHIN 50m
  - ◻ PROPERTIES BETWEEN 50-200m
  - - - ROUTE CENTRELINE
  - - - 50m CORDON
  - - - 200m CORDON

Rev.	Revision details	By	Checked
		Date	Date

Client  
**PATERSONS OF GREENOAKHILL**

Project  
**DUNDUFF QUARRY**

Drawing Title  
**PROPOSED ACCESS ROUTE  
 PROPERTIES ADJACENT TO  
 ACCESS CORRIDOR**

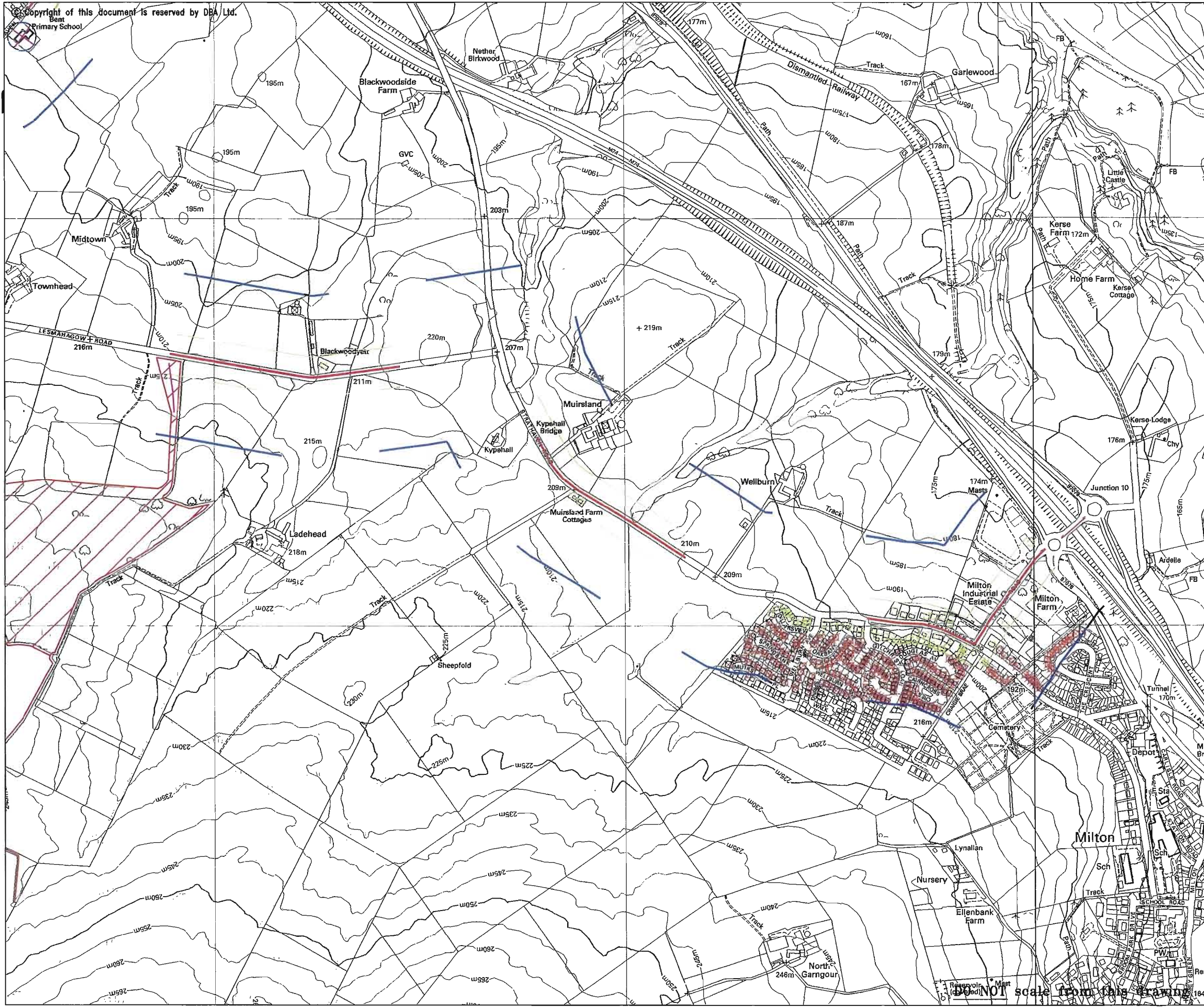
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Date	01.04.10	Date	-.-.
Scale	N.T.S.	Drg. No.	09060/SK/03

**DOUGALL BAILLIE ASSOCIATES**  
 CONSULTING ENGINEERS  
 Civil · Structural · Transportation  
 3 Glenfield Road  
 Kelvin  
 East Kilbride G75 0RA  
 Tel: 01355 266480  
 Fax: 01355 221991



**DO NOT scale from this drawing**

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 Bem Primary School



**KEY**

- PRIMARY SCHOOL LOCATION
- PROPERTIES WITHIN 50m
- PROPERTIES BETWEEN 50-200m
- ROUTE CENTRELINE
- 50m CORDON
- 200m CORDON

Rev.	Revision details	By	Checked
			Date

Client  
 PATERSONS OF GREENOAKHILL

Project  
 DUNDIFF QUARRY

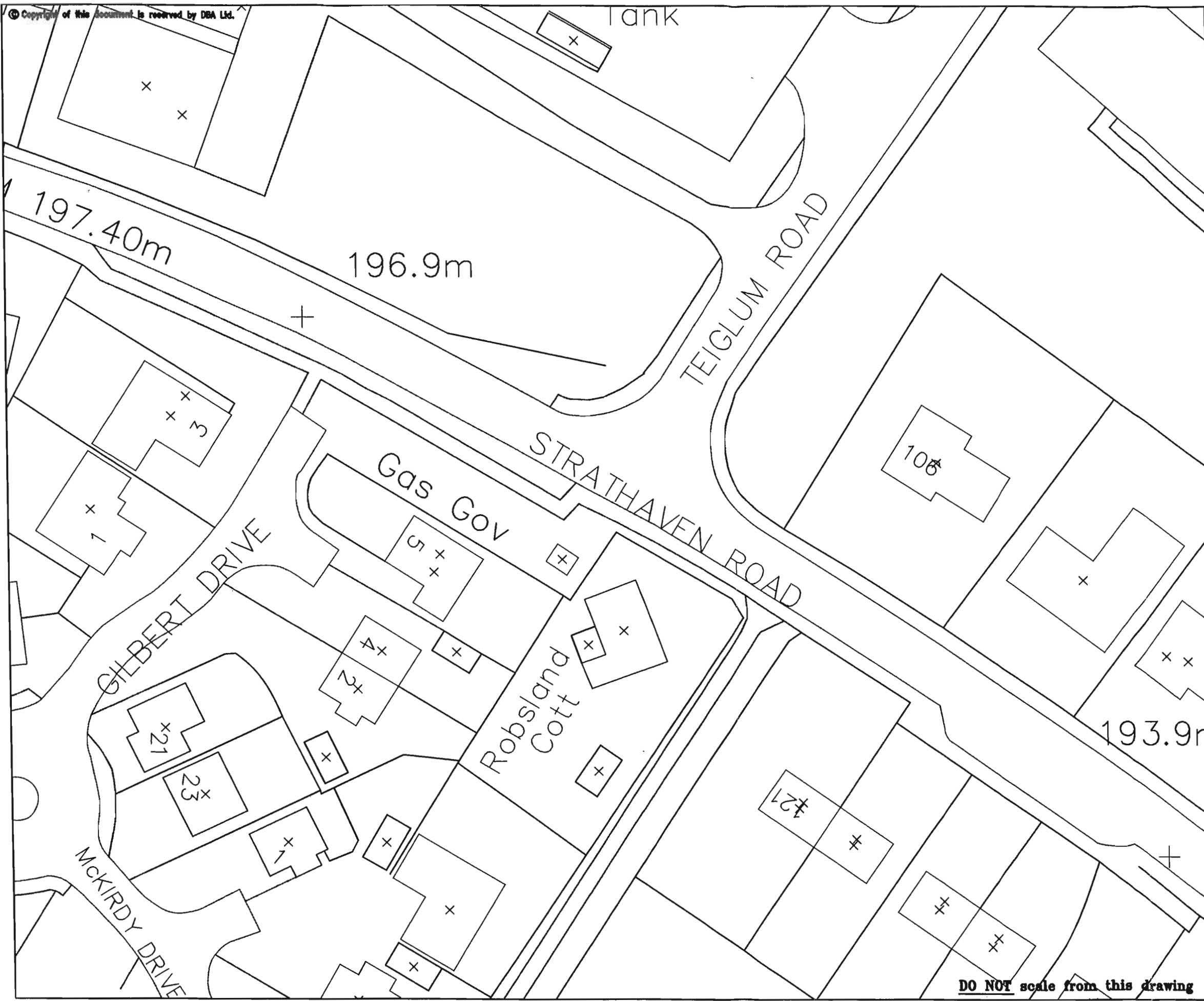
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 PROPOSED ACCESS ROUTE  
 PROPERTIES ADJACENT TO  
 ACCESS CORRIDOR

Drawn	A.H.	Checked	— . — .
Date	01.04.10	Date	— . — .
Scale	N.T.S.	Dwg. No.	09060/SK/04

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Rev.	Revision details	By	Checked
		Date	Date

Client  
**PATERSONS OF GREENOAKHILL**

Project  
**DUNDUFF QUARRY**

Drawing Title  
**TEIGLUM ROAD / STRATHAVEN ROAD PRIORITY JUNCTION**

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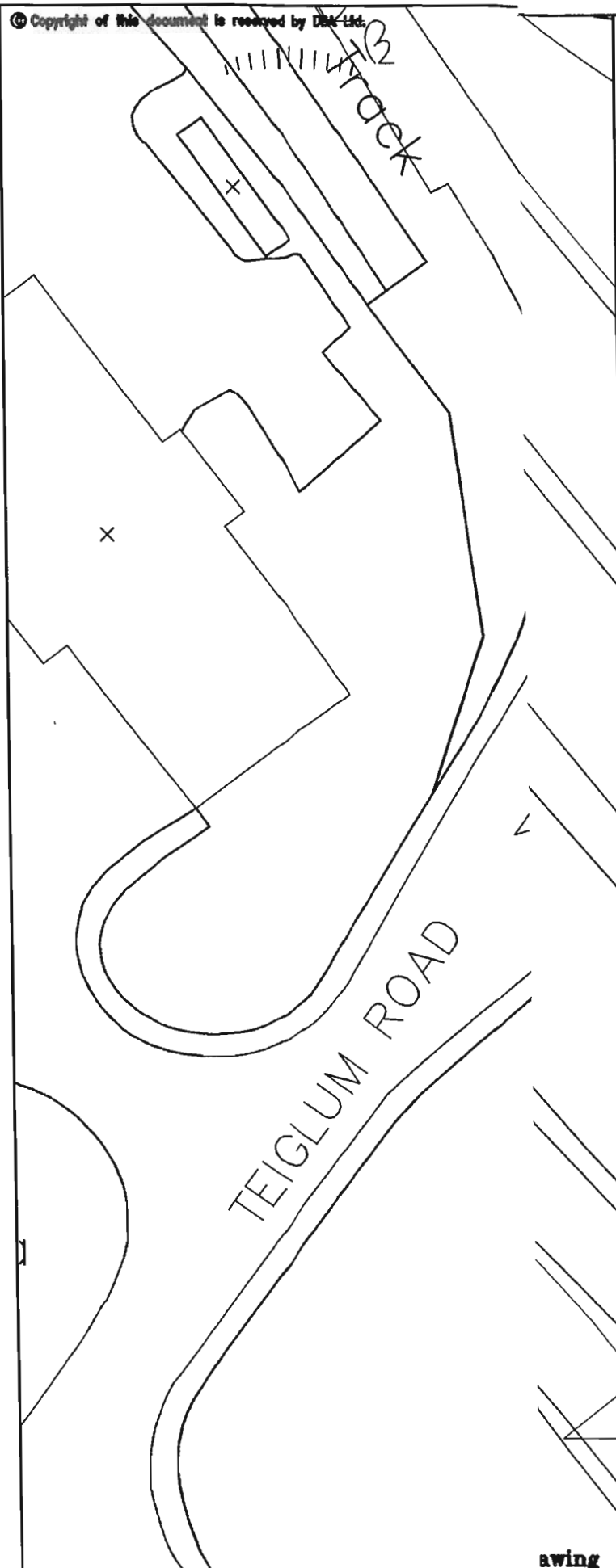
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Rev.	Revision details	By	Checked
		Date	Date

Client  
**PATERSONS OF GREENOAKHILL**

Project  
**DUNDUFF QUARRY**

Drawing Title  
**M74 JUNCTION 10 WEST  
 ROUNDABOUT JUNCTION**

Drawn **A.H.** Checked **-.-. .**

Date **01.04.10** Date **-.-. .**

Scale **1:500@A3** Drg. No. **JUNCTION 3**

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 Civil . Structural . Transportation  
 3 Glenfield Road  
 Kelvin  
 East Kilbride G75 0RA  
 Tel: 01355 266490  
 Fax: 01355 221991

awing



**APPENDIX F**  
**Analysis Files ( Disc)**