

Task 1.5 External Roadside Cordon Survey Processing (Auckland example)

Data Acceptance

The External Cordon Survey (ECS) data was provided in a series of EXCEL spreadsheets; for each of the 16 sites, one of the survey data and one of the count data (tube and manual counts).

The number of records in the final version of the data received from the survey agency is given in Table 1.

Table 1: External Cordon Survey Data Received

Site	Records
1	1,069
2	388
3	500
4	521
5	353
6	824
7	1,261
8	353
9	566
10	556
11	722
12	763
13	500
14	386
15	479
16	457

The data acceptance included some further cleaning of the data and correction of a small number of coding errors. Both the survey agency and the ARC checked the reasonableness of the geocoding.

The minimum information content (MIC) requirements were that interviews would be rejected if they do not contain the following key items:

- Site number;
- Direction of travel;
- Time of interview;
- Vehicle classification;
- Purposes of the trip; and
- Addresses of the trip.
- The information about the reverse trip was excluded if the response was missing or incomplete, but the interview direction information was retained.

All records complied with the MIC with the exception of a few responses to the reverse trip questions, namely Q13-Q16 as shown in Table 2. Hence the reverse trip information for these records is excluded but the interview direction information is retained.

Table 2: External Cordon Survey MIC Check

Site	Reverse Response Missing	Percentage Missing
1	12	1.1%
2	2	0.5%
3	1	0.2%
4	1	0.2%
5	1	0.3%
6	6	0.7%
7	14	1.1%
8	4	1.1%
9	7	1.2%
10	3	0.5%
11	5	0.7%
12	4	0.5%
13	1	0.2%
14	0	0.0%
15	4	0.8%
16	3	0.7%

Hence all records in the data received were accepted, giving a total of 9,698 records.

More generally the following issues of concern were identified:

- Low response rates compared with traffic counts at about half of the sites;
- Variation in responses by time of day that did not correspond with traffic profiles;
- Survey periods shorter than that specified (7am to 7pm), that is beginning after 7am and ending before 7pm;
- Low sample rates for medium/heavy commercial vehicles.

These were documented in three review notes to the survey agency and responses received. The outcome was acceptance of the survey data as provided with acknowledgement that the data deficiencies will result in some compromise to the quality of the matrices produced.

Range and Logic Checks

Checks have been carried on the logic and distributions of responses which were acceptable in all cases.

The traffic and manual count data was also provided in a series of EXCEL spreadsheets, one for each site. This data had already been checked and processed as part of the traffic count processing.

Further checks were carried out including examination of flow profiles at each site, and the data was considered acceptable.

Expansion to Counts

The survey data expansion has been undertaken in three main steps:

- Expansion of the interview data to counts over the survey period, 7am to 7pm (in the survey direction);
- Reversal of the trip data and adjustment to reverse direction counts;
- Expansion to 24 hours.

■ *Survey Period Expansion*

This has been carried out for each site by vehicle class (light non-commercial vehicles, light commercial vehicles and medium/heavy commercial vehicles) and by aggregations of 15 minute time intervals.

The expansion intervals vary by site, vehicle type and time of day depending on the numbers of interviews and the magnitude of the expansion factors. Generally intervals were aggregated to give a minimum sample of 5 interviews in each.

The M/HCV expansion interval for all sites was the full survey period due to the low sampling rate and lack of interviews in many parts of the day.

Two sets of count data were used in the expansion:

- tube traffic counts which separated M/HCVs from other traffic and
- manual counts of the three vehicle classes for part of the survey period (7-9am, 11am–1pm, 4-6pm)

The manual counts were used to split the tube counts into the two light vehicle classes; the AM peak (7am-9am) proportions were used to split the tube counts prior to 7am and the PM peak (4pm-6pm) proportions were used for the period after 6pm.

Table 3 compares the expanded survey data with the corresponding counts for modelled periods

Table 3: Expanded Survey and Counts (Interview Direction)

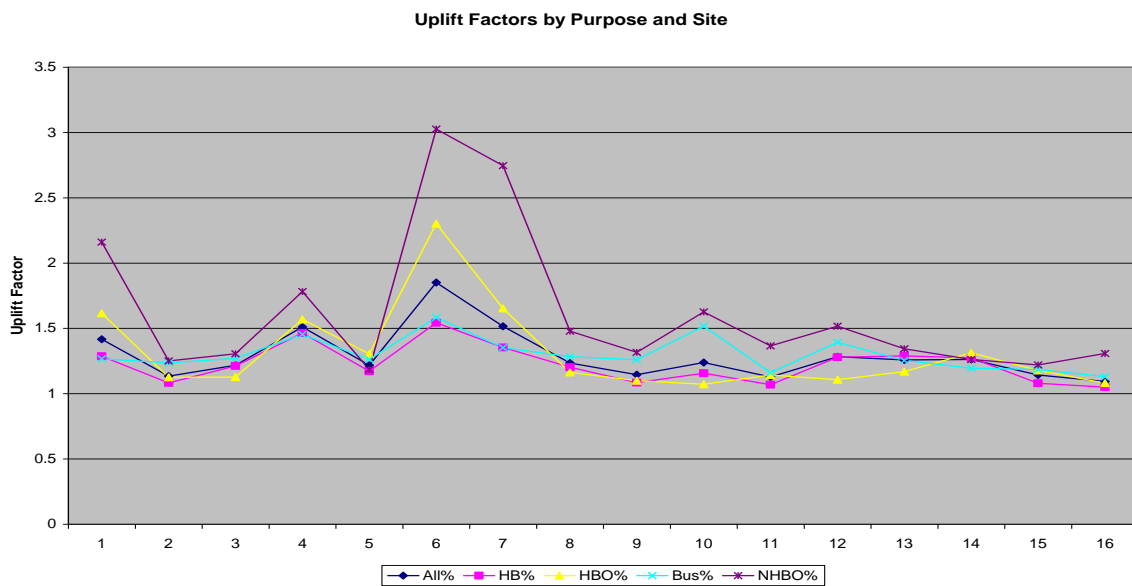
Site	AM Peak		Interpeak		SchoolPeak		PM Peak	
	Survey	Count	Survey	Count	Survey	Count	Survey	Count
1	1069	1008	3254	3400	565	613	1157	1239
2	448	450	600	577	115	120	211	201
3	197	164	617	594	141	167	442	467
4	247	243	848	844	194	207	500	514
5	522	518	855	822	124	185	327	296
6	633	633	2195	2238	543	477	979	978
7	1118	1108	3243	3254	598	614	1418	1406
8	129	135	376	388	77	76	146	130
9	736	720	1369	1275	201	284	470	399
10	797	894	1697	1613	273	294	588	548
11	1041	1093	1356	1313	161	223	587	499
12	1516	1535	1860	1814	511	523	708	714
13	197	186	624	614	224	197	552	592
14	No interviews	232	792	556	114	115	301	302
15	437	428	647	662	139	139	252	247
16	233	228	699	709	143	150	418	389

■ *Trip Reversal*

The expanded interview-direction data was duplicated and reversed (origins, destinations, purposes), and a time of travel allocated based on the start time of the reverse trip and its distance from the survey site. The reversed trips do not match counts due to the incidence of single-direction (irreversible) trips and so need to be factored.

The proportions of single-direction trips by purpose at each site were examined; Figure 1 shows the factors required to account for the single-direction trips. As NHBO trips have higher factors than other purposes across all sites, an uplift factor was applied to this purpose only in the first instance.

Figure 1 Uplift Factors for Reversible Trips



The reversed trips (with the NHBO uplift factors applied) were then expanded by hour to the reverse counts. Table 4 gives the reverse direction expanded survey trips and counts.

Table 4: Expanded Survey and Counts (Reverse Direction)

Site	AM Peak		Interpeak		SchoolPeak		PM Peak	
	Survey	Count	Survey	Count	Survey	Count	Survey	Count
1	866	953	3101	3265	625	671	1431	1475
2	155	183	494	545	166	166	405	405
3	358	384	575	619	113	113	216	216
4	399	442	856	893	135	158	290	290
5	241	268	774	818	189	189	525	534
6	844	710	2573	2387	418	438	785	793
7	1124	1013	3122	3124	676	710	1339	1331
8	55	62	282	296	64	64	147	154
9	343	363	1277	1295	348	348	747	764
10	457	510	1408	1458	329	329	818	831
11	541	541	1062	1128	313	313	966	986
12	687	718	1594	1633	482	508	1227	1248
13	671	681	729	742	133	133	240	240
14	366	386	531	555	135	142	198	198
15	184	184	576	598	171	171	418	418
16	360	372	678	724	137	137	244	249

■ *Expansion to 24 hours*

The data has been expanded from the survey period (7am-7pm) to 24 hours by the ratio of 24-hour to 12-hour counts by direction at each site. This has been done separately for all light vehicles combined and for M/HCVs as the 24-hour count data was available by these two categories. The factors are given in Table 5.

Table 5: 24-hour Expansion Factors

Site	Inbound		Outbound	
	Light Vehicles	MCV/HCV	Light Vehicles	MCV/HCV
1	1.23	1.37	1.21	1.27
2	1.19	1.12	1.18	1.07
3	1.22	1.18	1.19	1.10
4	1.31	1.18	1.23	1.16
5	1.21	1.13	1.19	1.08
6	1.23	1.38	1.23	1.51
7	1.26	1.38	1.25	1.46
8	1.16	1.17	1.14	1.17
9	1.16	1.11	1.16	1.09
10	1.16	1.17	1.19	1.15
11	1.32	1.20	1.24	1.16
12	1.19	1.17	1.20	1.12
13	1.25	1.19	1.24	1.18
14	1.20	1.18	1.19	1.13
15	1.28	1.17	1.25	1.13
16	1.19	1.09	1.20	1.12

Final Database and Verification

- *Double Counting*

When combining the expanded data for all sites, the potential double-counting between the survey sites was identified and a correction factor applied where required. Instances of double-counting theoretically occurred where trips surveyed at one site then passed through another site (without being surveyed).

These movements were tabulated for each site and compared, and then factors of 0.5 applied to each trip.

- *Documentation*

The final processed ECS data was converted from EXCEL to ACCESS and is contained in a single database.

Standard coding common to all surveys was implemented in line with the coding compatibility specifications. These are listed in Table 6.

Table 6– ECS Synthesised Common Codes

Code	Description
PERIOD	Time period
TRIPPURP	Trip purpose
PROD	Trip Direction (Production/Attraction)
MODE1	Mode of first leg of trip
MODE2	Mode of second leg of trip
MODE3	Mode of third leg of trip
MMODE	Main mode of transport for surveyed trip
CARAV	Level of car availability
OZONE	ART3 Zone of origin
DZONE	ART3 Zone of destination

Most of the other survey information has been retained in the final ECS data base to enable further analysis

- *Verification*

Table 7 gives summary statistics from the expanded ECS database.

Table 7 Expanded ECS Data

Period	Trips
AM Peak	16,970
Interpeak	40,384
SchoolPeak	8,573
PM Peak	19,000
Off-Peak	6,753
Trip Purpose	Trips
HBW	19,015
HBE	4,471
HBSH	6,791
HBSO	4,661
HBO	18,989
EB	27,031
NHBO	10,722
Productions / Attractions	Trips
From Home	37,427
To Home	30,448
Non-Home-Based	23,812
Main Mode	Trips
Car Driver	73,337
LCV driver	10,141
Motorcycle driver/ passenger	232
Trucks (MCV and HCV)	7,969
Car Availability	Trips
Missing	1,299
Choice 1 (1 car in household)	58,459
Choice 2 (2 cars in household)	31,922