2016

Report of Roaming Dog Street Survey in Dehradun

Lex Hiby
Consultant, Humane Society International

REPORT OF ROAMING DOG STREET SURVEYS IN DEHRADUN CONDUCTED BY HSI-ASIA IN OCTOBER 2016

Report written by :
Lex Hiby,
Consultant,
Humane Society International

SUMMARY

The 60 wards that comprise the Dehradun municipality were merged into 6 per zones in order to establish a system for monitoring the roaming dog population. One survey route, on average 29.3 km long, was designed within each zone to sample the streets and highways throughout the zone. Four teams, each consisting of a motorcycle driver and observer, recorded the dogs seen as sterilised and unsterilized males and females, lactating females, pups and unknown adults while driving slowly along the route. Poor skin and body conditions (BCS 1 or 2) were recorded as welfare indicators. The surveys were conducted from first light to avoid excessive traffic and repeated to provide estimates of variance in the counts and hence the significance of any observed changes in roaming dog density over time.

Extrapolating the adult dogs recorded during the monitoring surveys via total street length and dividing by an estimated 0.44 detectability gives an estimate of 20,078 total adult roaming dogs. The monitoring surveys estimate an average density of 10.56 adult roaming dogs per km of street in the early morning of which 38.1% are female. On average 4.1% of adult females are spayed and 7.7% lactating. 4.8 % of males are castrated. There are an estimated 3.5 dogs per 100 people.

All the survey routes are provided as a resource for monitoring changes in the roaming dog population. In addition a database is provided to display the monitoring baseline and to upload and display subsequent survey data.

SURVEY TEAM

Dr. Amit Chaudhari, Dr. Shrikant Verma, Dr. Rajesh Pandey and Parvinder

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Pictures were taken during the Dehradun Dog Population survey

INTRODUCTION

The following sections provide results of street surveys carried out at the request of the Dehradun municipality to monitor the density and composition of the Dehradun roaming dog population. By a "roaming dog" we mean any dog that may move freely at times on the city streets or other public areas, such as a "stray", "community dog" or unconfined owned dog.

Results include roaming dog density expressed as the number counted per km of street length, the percentage of females and males that have been sterilised (as evidenced by the presence of an ear notch) and the percentage of females that are lactating (and thus raising a litter of puppies). Dog density per km of street length is quick and easy to monitor and most relevant to the city residents because it determines the number of dogs they will encounter as they move around the city. Breeding activity as evidenced by percentage of females lactating is related to the risk of children being bitten by females responding to a perceived threat to their pups (Reece et al 2013[1]) and to the nuisance of dogs barking and fighting over females in heat. Some residents are distressed by seeing dogs that are in very poor condition or worried about related health risks so dogs that were emaciated or had visible skin conditions were also recorded.

Total abundance within the Dehradun region was estimated by multiplying observed density by total street length and dividing by the average estimated detectability. Mark resight experiments estimate that about half the population of roaming dogs are detected by early morning street surveys. The most recent and extensive set of mark resight experiments conducted earlier this year in Kathmandu estimated detectability at 0.44, which is the value used in this report. Although abundance estimates are useful for planning an intervention we do not recommend they be used for monitoring. Observed density is much easier to monitor and less affected by development and expansion of the city, factors beyond the control of an ABC programme. Furthermore the percentage of females seen on the street surveys that are lactating will be the first aspect of the population to respond to the programme.

ROAMING DOGS DENSITY

Standard routes were designed using Google Maps to run along highways and residential streets. The 60 Dehradun wards were merged into 6 zones and one route, on average 29.3 km long, was designed within each zone. The routes covered 20.6% of the total length of Google Maps streets and highways within the Dehradun region.

[1] Reece, J.F., Chawla, S.K. & Hiby, A.R., 2013. Decline in human dog-bite cases during a street dog sterilisation programme in Jaipur, India. *The Veterinary record*, 172(18), p.473. Available at: http://www.ncbi.nlm.nih.gov/pubmed/23492927

Table 1 - Total street length, route length and survey coverage by zone

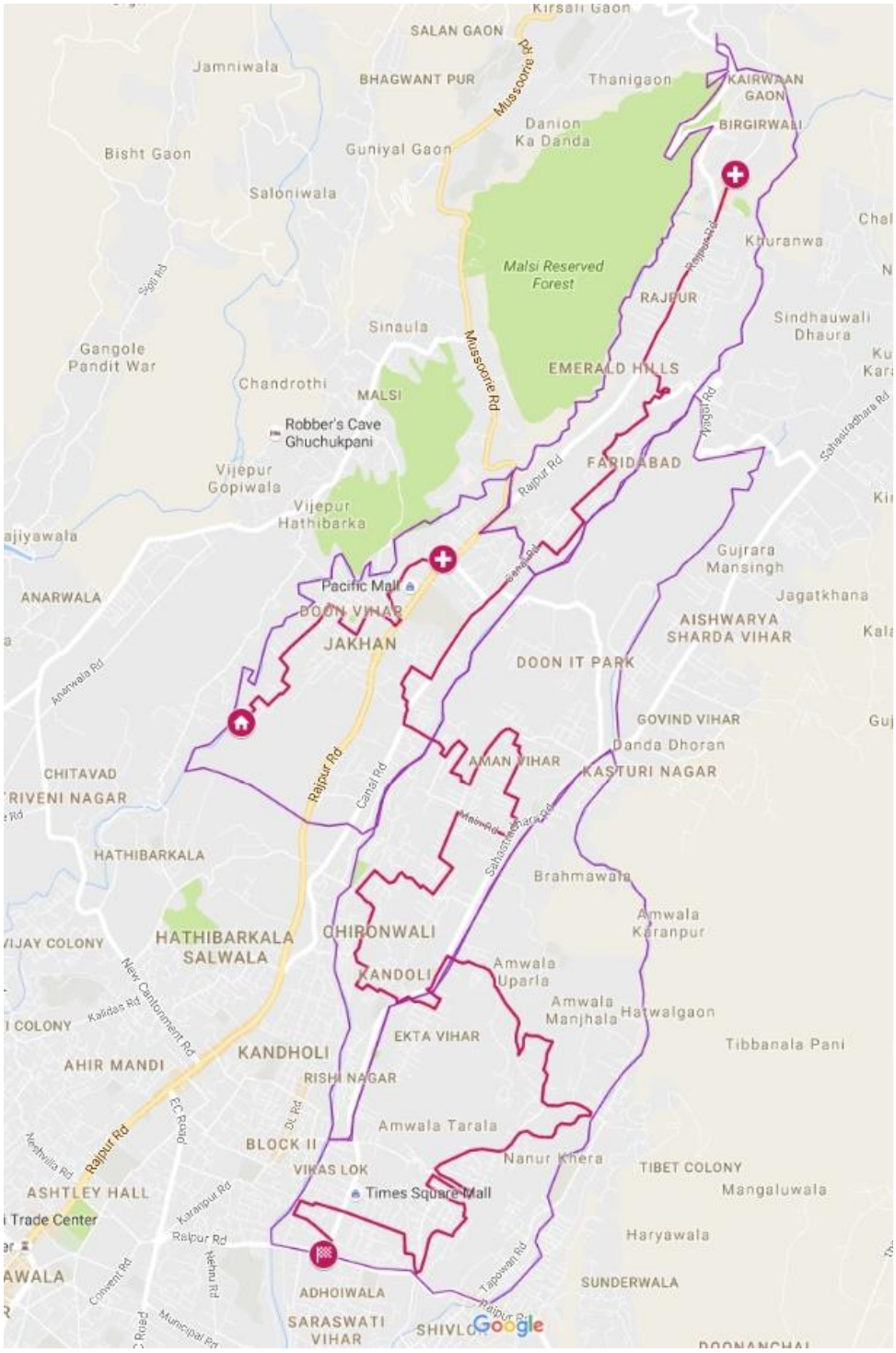
Zone	Route Length	Street length	% coverage
Zone A	19.2	119	16.2
Zone B	33.67	143	23.6
Zone C	33.5	103	32.6
Zone D	35.1	282	12.5
Zone E	32.77	121	27.0
Zone F	21.81	88	24.8

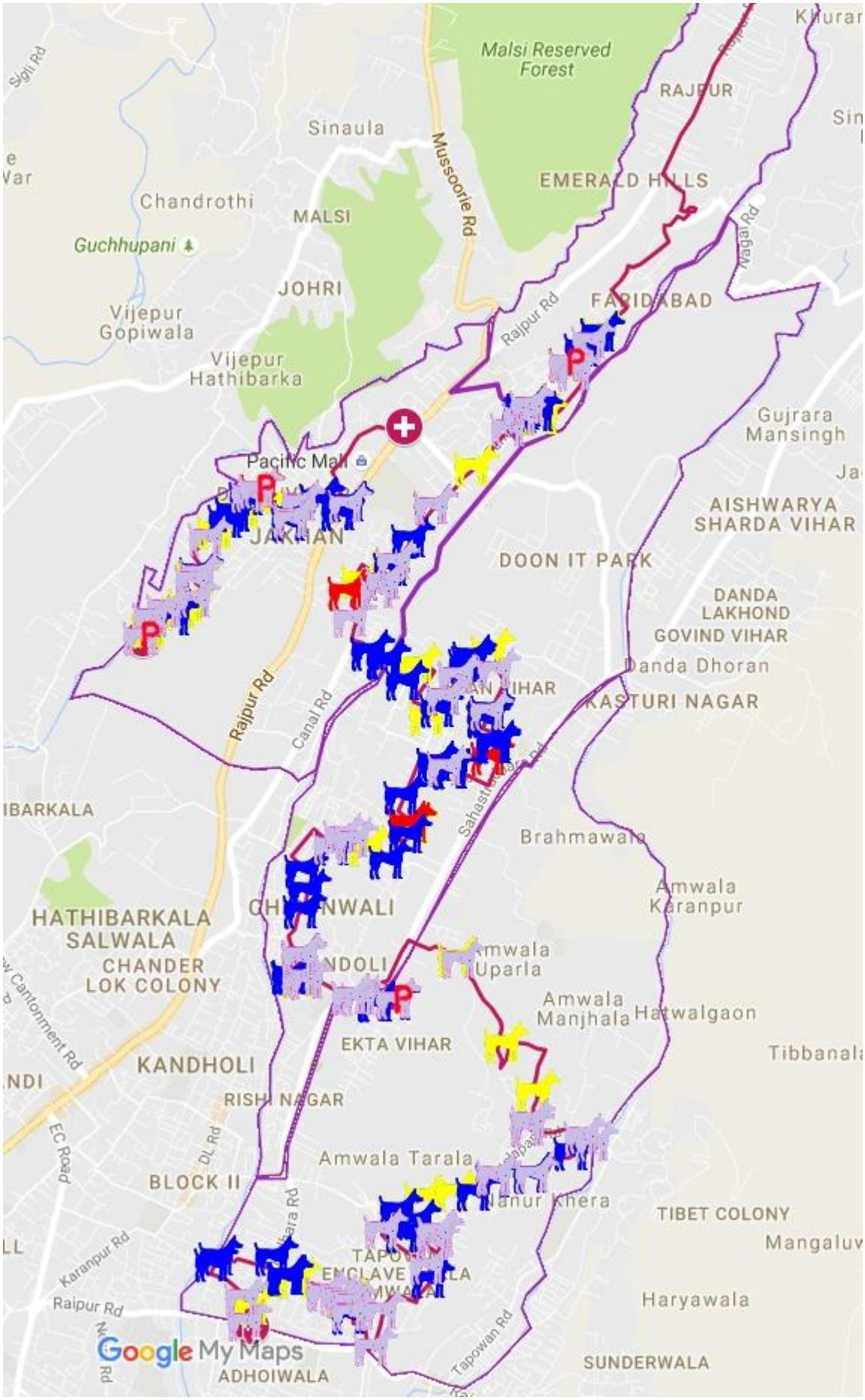
Zone boundaries were superimposed on Google Maps in order to restrict each route to a single zone. The image in figure 1 illustrates the route for Zone A. The route runs from the house icon to the chequered flag. Each route is saved as a kml file that can be loaded into the My Places facility of Google Maps on the PC and then viewed using the Maps application on a smartphone synchronised with that Google account. Any of the routes can therefore be followed at any time in the future by viewing it on a smartphone and navigating to move the location cursor along the route.

To complete the current survey, four teams each consisting of a motorcycle driver and observer followed each route once or twice, recording seven types of dogs seen (Female notched, Female unnotched, Lactating, Male notched, Male unnotched, Unknown adult and Pup) by using the OSMtracker phone application as an event recorder. The phones were GPS-enabled so the exact location of each event was recorded. On completion of the survey the recorded events were exported to a gpx file that was transferred to a PC for upload to a "DogDensity.mdb" Access database. The database includes reports and forms to facilitate upload and provide detailed results. The tracks actually completed during the surveys (as opposed to the pre-planned routes) were generated during the upload and used to adjust the route for any unforeseen obstacles. The 6 saved routes can therefore be followed during future surveys without encountering those problems.

Further details of the recording system are given in the Monitoring section below.

Figure 1 - Survey route for Zone A. The red line shows the route running along streets shown in Google Maps from the house icon to the chequered flag. The purple line shows the boundaries of the wards comprising zone A. The next screenshot shows dogs seen along the route. Green and yellow dog icons show spayed and entire females, red icons show lactating females, black and blue icons show castrated and entire males.




Malsi Reserved Forest
RAJPUR
Sinaula
Mussoorie Rd
EMERALD HILLS
Chandrothi
MALSI
Guchhupani
JOHRI
FARIDABAD
Vijepur Gopiwala
Vijepur Hathibarka
Rajpur Rd
Gujrara Mansingh
Pacific Mall
AISHWARYA SHARDA VIHAR
DOON IT PARK
DANDA LAKHOND
GOVIND VIHAR
Danda Dhoran
KASTURI NAGAR
Canal Rd
Brahmawala
Amwala Karanpur
HATHIBARKALA SALWALA
CHANDER LOK COLONY
Amwala Uparla
Amwala Manjhala
Hatwalgaon
EKTA VIHAR
KANDHOLI
Tibbanala
RISHI NAGAR
Amwala Tarala
BLOCK II
Nanur Khera
TIBET COLONY
Karanpur Rd
Raipur Rd
Haryawala
Tapowan Rd
SUNDERWALA
ADHOIWALA
Google My Maps

The Dehradun ward boundaries were downloaded from http://nagarnigamdehradun.com/wardDetail.aspx and selected wards merged into zones large enough to accommodate survey routes that are long enough to average over local variations in dog density. The following figures 2B to 2F show the extents of zones B to F and the routes they contain

Figure 2B – Black lines show the boundaries of zone B wards, the red line the zone B route

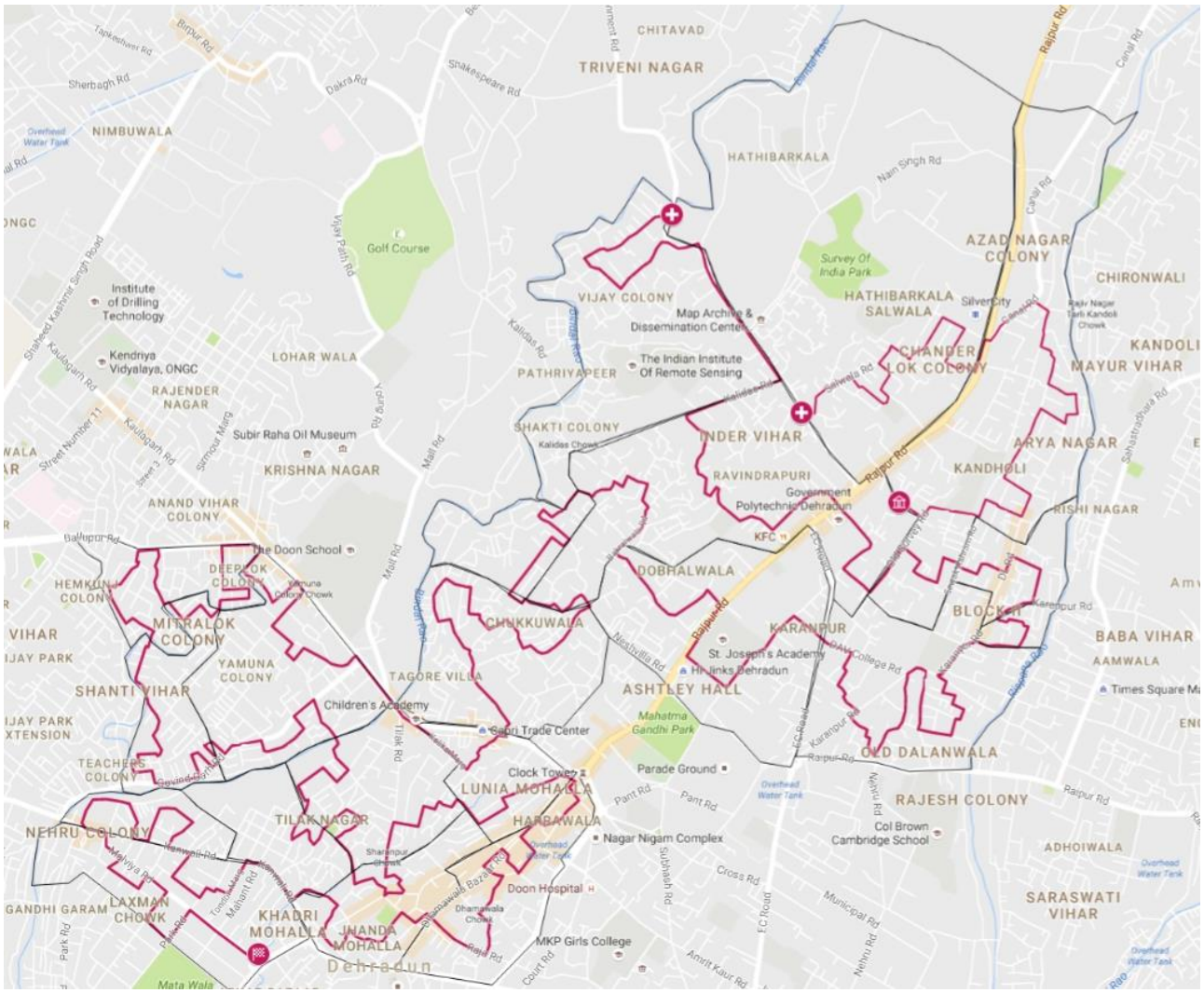


Figure 2C – Black lines show the boundaries of zone C wards, the red line the zone C route

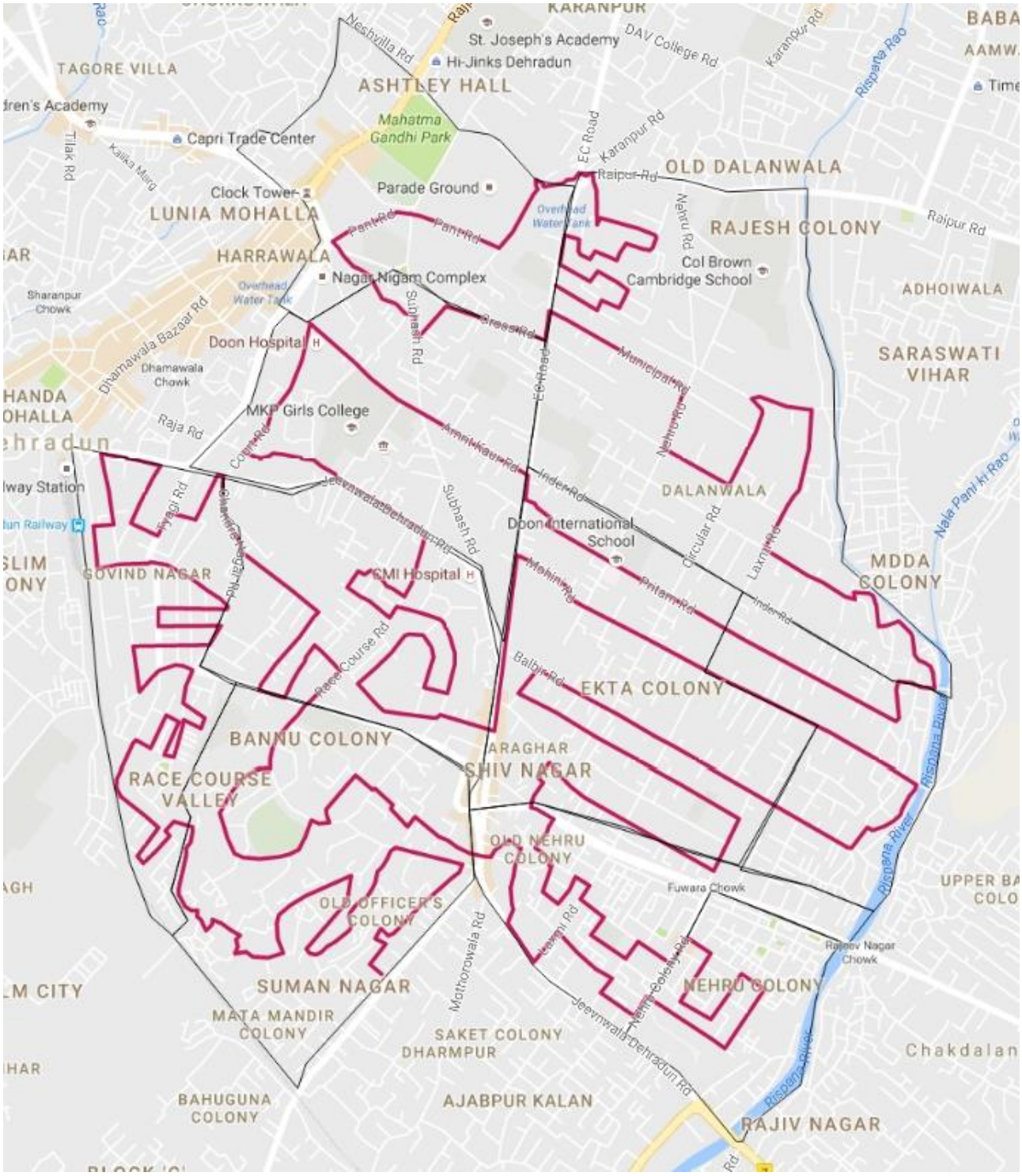


Figure 2D – Black lines show the boundaries of zone B wards, the purple line the zone D route

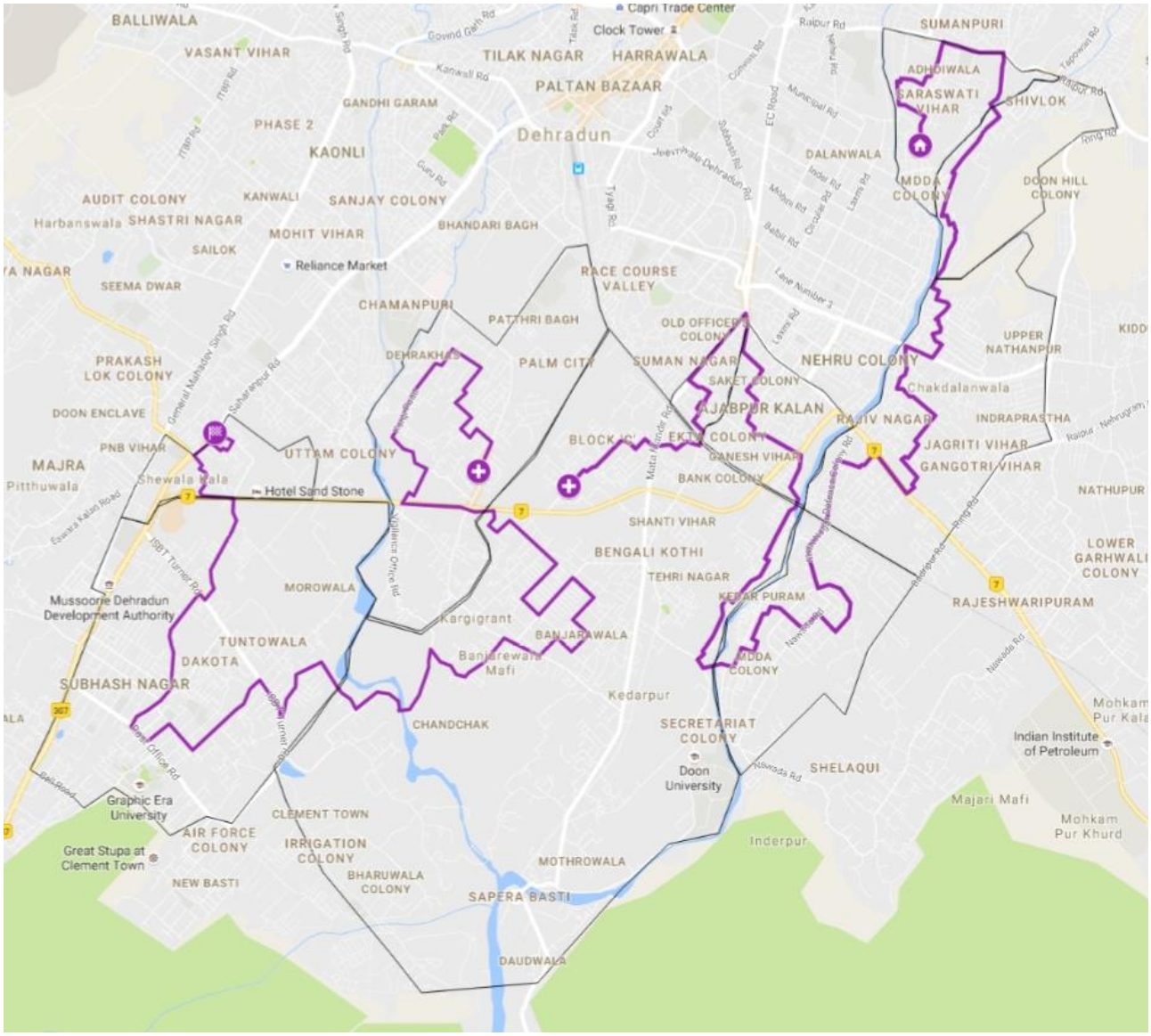


Figure 2E – Black lines show the boundaries of zone E wards, the red line the zone E route

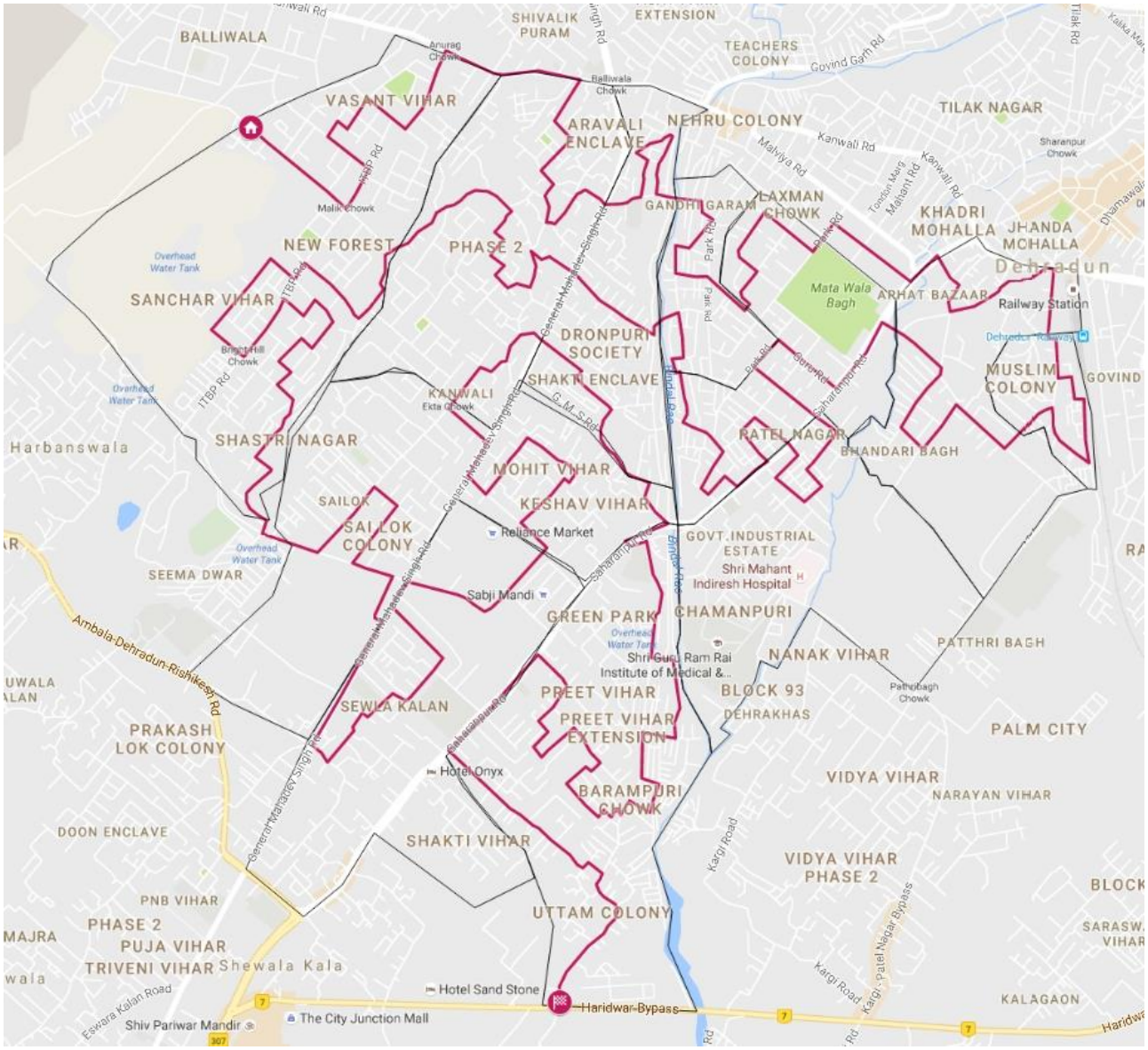


Figure 2F – Black lines show the boundaries of zone F wards, the red line the zone F route

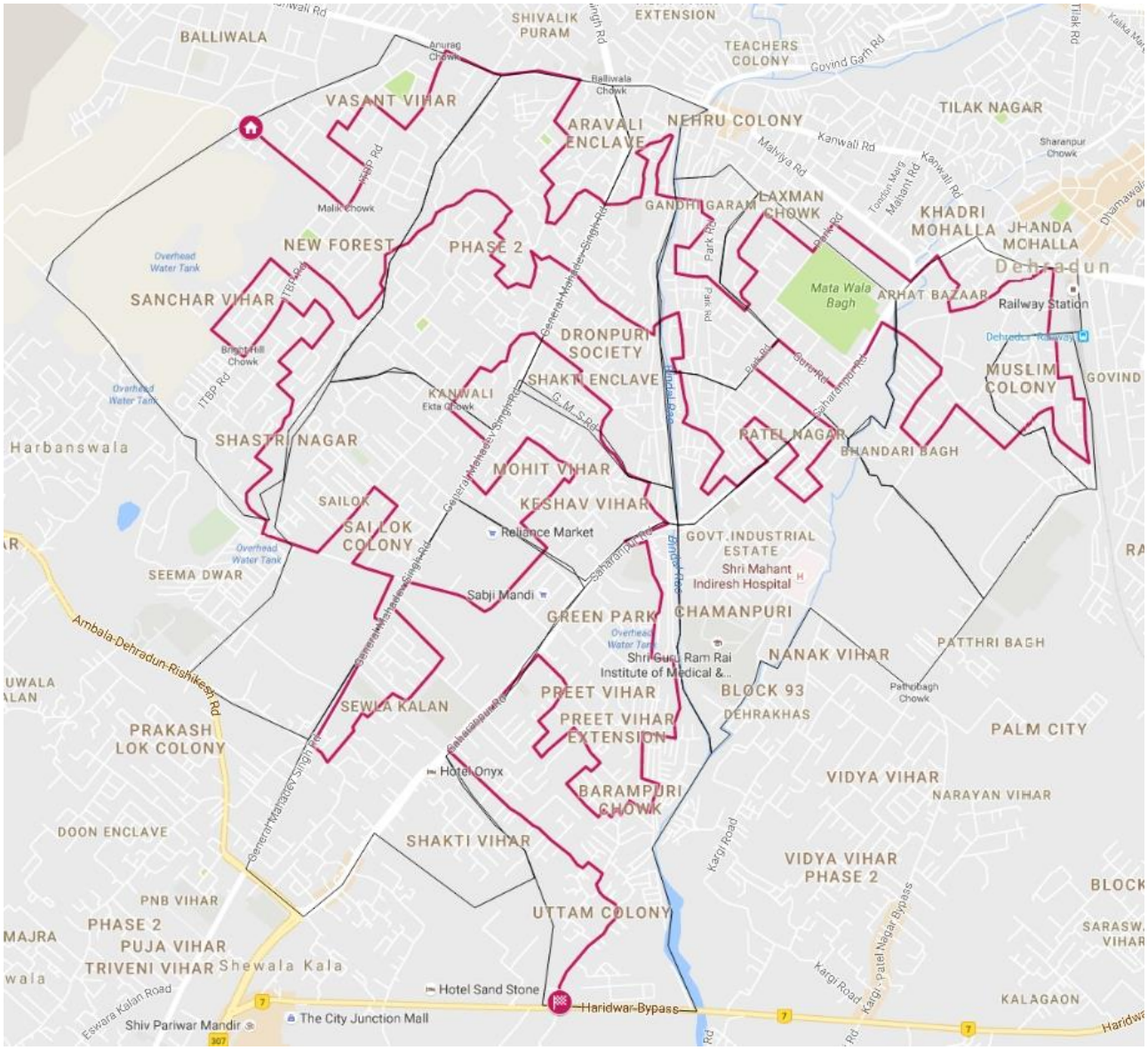


Table 2 shows the count results, extrapolation to total dogs roaming the streets in the early morning and to total population by correcting for detectability. In the second column the average number of dogs counted over the two surveys conducted along each route is expressed as the number of dogs counted per km of street length. The dogs per km is multiplied by the total street length in column three to give the estimated number of dogs on all the streets in the zone at the time of the surveys (column four). The final column estimates the total number of dogs that may roam at any time in each group (the roaming dog abundance) by dividing the number in column four by the estimated probability of 0.44 that a dog that may roam at any time will be on the streets at the time of the surveys ("detectability"). The total roaming estimates summed over the 6 zones is 20,078.

Table 2 - Count results for all zones

Zone	Dogs counted per km	Total street length	Dogs on streets	Total roaming
Zone A	12.6	118.8	1492	3390
Zone B	10.3	143.0	1469	3339
Zone C	7.2	102.8	743	1687
Zone D	9.1	281.8	2562	5822
Zone E	12.8	121.4	1556	3535
Zone F	11.6	87.8	1014	2305

COMPOSITION OF THE ROAMING DOG POPULATION

Table 3 - Composition of dog population observed on the streets.

Zone	% female	% females notched	% females lactating	% males notched	% pups	% emaciated	% skin problem
Zone A	40	1	12	0	3	0.4	1.1
Zone B	36	4	8	2	4	0.3	2.4
Zone C	41	9	6	11	4	4.4	6.7
Zone D	33	2	4	1	4	2.3	4.4
Zone E	41	4	6	2	4	2.9	4.1
Zone F	35	0	8	1	1	0.0	2.7

SPATIAL DISTRIBUTION OF THE ROAMING DOG POPULATION

Zones were found to show only moderate variation in dog density and percentage composition. Zones A and E had the highest roaming dog density, zone E the lowest. The highest percentage of lactating females was found in zone A, the percentage of females ear-notched (spayed) was low in all zones.

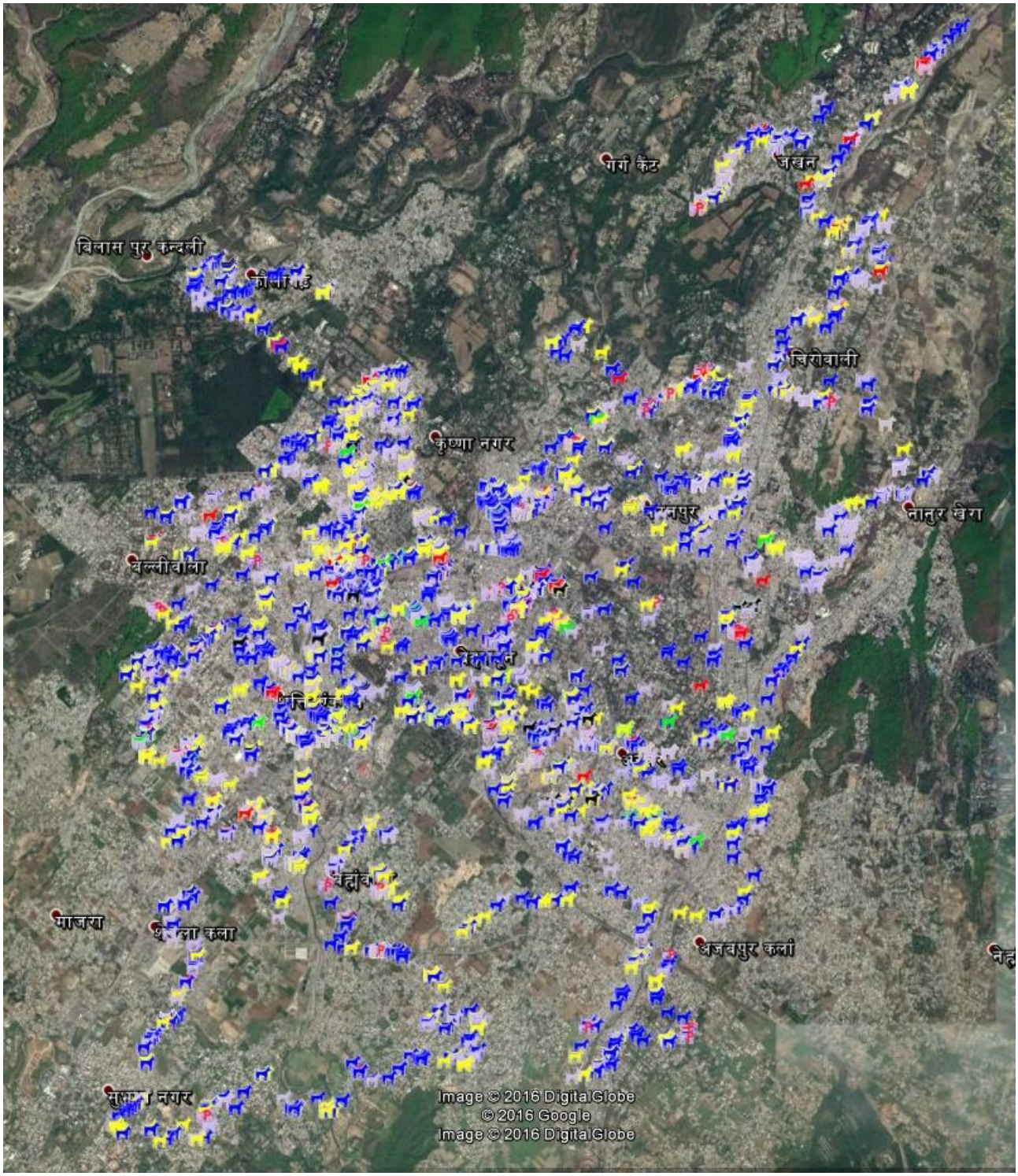
Judging by the generally low percentages of dogs recorded as “emaciated” (Body Condition Score 1 or 2) or requiring treatment for a skin condition welfare was found to be reasonably good, suggesting some level of support from the local population.

Figure 3 illustrates dog density over the Dehradun area. The colour of the icons indicates the dog type seen at that location:

Green = Female notched, Yellow = Female unnotched, Red = Lactating, Black = Male notched, Blue = Male unnotched

Dogs recorded at the same location are shown as a single icon only, however in a live Google Earth display of a kml file generated by the database the separate icons are shown in an expanded pattern.

Figure 3 – GoogleEarth display of dogs seen on surveys of 6 routes in the Dehradun region.



MONITORING

SURVEY CONSISTENCY

The route files provided with this report are a resource that can be used to monitor the population into the future. However for the results to be comparable, it is vital that the same search protocol and, if possible, the same observers are used on each track. On upload of the street counts to the database the driver and observer names and the timing and duration of each survey are recorded. The protocol used during the surveys was kept deliberately simple: all dogs seen from the motorcycle were recorded and those that could not be sexed without getting off the motorcycle to make the dog stand up were recorded as "Unknown adult".

THE POWER TO DETECT CHANGE IN DOG DENSITY

Table 4 illustrates the generally limited amount of variation in the roaming dog counts made on the replicated route surveys:

Table 4 - Replicate route counts.

Zone	Survey number	Route length	Count	Dogs counted per km
Zone A	1	19.2	229	11.93
Zone A	2	19.2	253	13.18
Zone B	3	33.67	278	8.26
Zone B	4	33.67	353	10.48
Zone B	5	33.67	407	12.09
Zone C	6	33.5	219	6.54
Zone C	7	33.5	265	7.91
Zone D	9	35.1	329	9.37
Zone D	8	35.1	309	8.80
Zone E	10	32.77	411	12.54
Zone E	11	32.77	429	13.09
Zone F	12	21.81	242	11.10
Zone F	13	21.81	262	12.01

The total number of dogs counted over the replicate surveys was 3986. The average number counted per km over the 6 zones was 10.56 dogs per km. Taking the square root of the sum of the six within-zone count

variances, to estimate the standard deviation of a total count over all groups, and dividing by that total count, gives a coefficient of variation (CV) of 0.0196 for the estimate of average dogs counted per km.

To estimate the resulting power to detect a change in dog density let $D1$ and $D2$ represent the average dogs counted per km over the same six zones at the same time in two different years. Under the null hypothesis of no change in the population dog density, the absolute difference in the estimates divided by the standard deviation of the difference has the Student's t distribution based on 3 degrees of freedom:

$$\frac{|D1 - D2|}{0.0196 \times (D1 + D2)/2 \times \sqrt{2}} \sim t_3$$

Thus an observed proportional change in mean density can be considered to be significant (at the 95% level) if it exceeds $0.0196 \times \sqrt{2} \times t_{0.05,3}$ or about 9% (e.g. if 5000 were counted in one year then counting 450 fewer over the same routes at the same time in another year would be sufficient to indicate a significant decline in average density).

DISCUSSION

Extrapolating by street length from the street counts and dividing by the detectability estimate provided by the mark/resight experiments gives an estimate of 20,078 dogs roaming on the streets in the Dehradun area.

Thirteen surveys of the six prepared routes were conducted, taking an average of 2 hours 50 minutes each to complete, a total of 37.5 hours for driver and observer. The method is thus efficient as a way to monitor and study the status of the roaming dog population over a large area.

There was generally little day to day variation in counts along the standard routes suggesting that such counts have enough power to detect moderate changes in roaming dog density and other indicators. It is essential use a consistent search protocol, particularly in regard to timing and duration of the surveys. We suspect there is then little difference between observers. However a conservative approach would be to use the same observers to survey the routes they surveyed previously or at least to check for consistency between observers in the number of dogs seen along the same route. Ideally monitoring would be conducted by one or more local NGOs, as in Jaipur where Help In Suffering have monitored dog density along a standard track in the Pink City region since 1998, using largely the same team of observers. Furthermore, as surveying is only possible early in the morning a local NGO might be able to incorporate surveys into their normal work schedule.

In relation to timing, the possibility of seasonality in breeding (as in northern India) should be checked using previous ABC records of pregnancy in females collected for sterilisation. Surveys conducted just prior to the breeding season are more consistent because they include a minimum number of pups, surveys following the peak in breeding are more sensitive to the degree of breeding activity.

Although sterilisation will undoubtedly reduce breeding behaviour as evidenced by lactating females on the streets, it may have little effect on dog density if the pups that would have been produced by the sterilised females have very little chance of surviving to maturity. It is therefore important to also identify and access females whose pups are likely to survive and become part of the roaming dog population.

ADDENDUM

In case estimates of the number of roaming dogs are required by ward the following table lists which zone each ward is in and divides the estimated number of dogs in the zone (Table 2) by the fraction of the zone's total street length in each ward:

Ward No	Zone	Total roaming
Ward 1	Zone A	555
Ward 2	Zone A	1010
Ward 3	Zone A	702
Ward 4	Zone B	332
Ward 5	Zone B	341
Ward 6	Zone B	313
Ward 7	Zone B	214
Ward 8	Zone F	551
Ward 9	Zone B	81
ward 10	Zone B	32
Ward 11	Zone B	221
Ward 12	Zone B	201
Ward 13	Zone B	198
Ward 14	Zone B	65
Ward 15	Zone C	135
Ward 16	Zone C	150
Ward 17	Zone C	160
Ward 18	Zone B	107
Ward 19	Zone B	148
Ward 20	Zone B	90
Ward 21	Zone B	64
Ward 22	Zone B	173
Ward 23	Zone B	149
Ward 24	Zone B	113
Ward 25	Zone C	230
Ward 26	Zone C	114
Ward 27	Zone C	211

Ward No	Zone	Total roaming
Ward 28	Zone A	1123
Ward 29	Zone D	253
Ward 30	Zone D	263
Ward 31	Zone D	844
Ward 32	Zone D	492
Ward 33	Zone C	136
Ward 34	Zone C	189
Ward 35	Zone D	1651
Ward 36	Zone D	265
Ward 37	Zone D	94
Ward 38	Zone C	222
Ward 39	Zone C	138
Ward 40	Zone E	105
Ward 41	Zone E	206
Ward 42	Zone D	670
Ward 43	Zone E	250
Ward 44	Zone E	549
Ward 45	Zone E	338
Ward 46	Zone D	143
Ward 47	Zone D	1147
Ward 48	Zone E	461
Ward 49	Zone E	319
Ward 50	Zone E	417
Ward 51	Zone E	442
Ward 52	Zone F	368
Ward 53	Zone F	591
Ward 54	Zone E	304
Ward 55	Zone E	144
Ward 56	Zone B	204
Ward 57	Zone B	146
Ward 58	Zone B	147
Ward 59	Zone F	325
Ward 60	Zone F	470