



York Regional Police

20-Year Facilities Master Plan

Final Report

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Introduction



Introduction (1)

- August 2012 ORH completed the YRP 20-year Facilities Master Plan.
 - Objective - advise YRP on where new facilities would be required through the period 2012 to 2031 in order to meet growing demand on police services.
- 2016 – The Master Plan is required to be refreshed every 3 years. YRP commissioned ORH to update and extend the Master Plan for a planning horizon through to 2036. This is the Final Report presentation for the review.
- In 2016 ORH also conducted a 10-year facilities and staffing plan for York Region Paramedic Services.

Introduction (2)

- 2016 Objective –
 - Advise YRP on where stations should be based in order to minimize the time spent driving to and from book-on locations to where units patrol.
 - Estimate the future unit requirement based on statistical and projected data.
 - Incorporate modernization practices such as:
 - Sector Policing
 - Demand reduction initiatives.



About ORH

ORH is a management consultancy that uses advanced Operational Research (OR) techniques to support resource planning in the public sector.

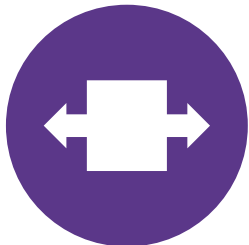
We specialize in solving complex locational planning problems for the emergency services, and we also carry out studies for health authorities, sports bodies and other public sector organizations.

ORH Integrated Approach



Analysis

Our team of analysts uses sophisticated analytical techniques to develop a comprehensive understanding of the relationship between the demands placed on our clients' services, and the utilization of their resources.



Modelling

ORH has developed a suite of powerful, bespoke computer models, based on OR techniques, which are used by our consultants to improve service cost-effectiveness and to inform resource planning.



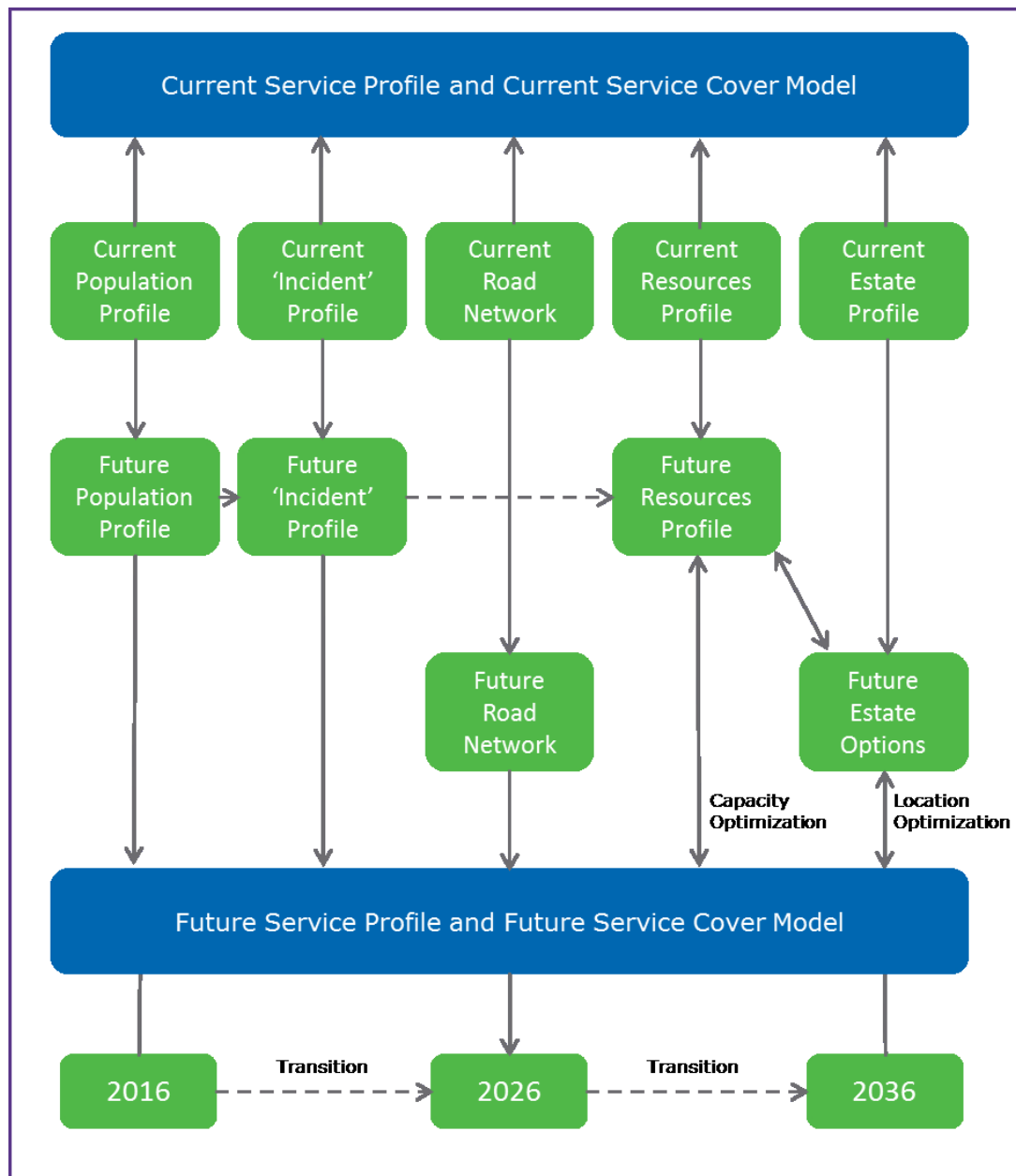
Consultancy

ORH consultants have developed a wealth of public sector experience. The ORH ethos is to keep an open mind, in order to derive optimal solutions adapted to the unique circumstances of the services being provided by the client organization.

Methodology



Broad Methodology



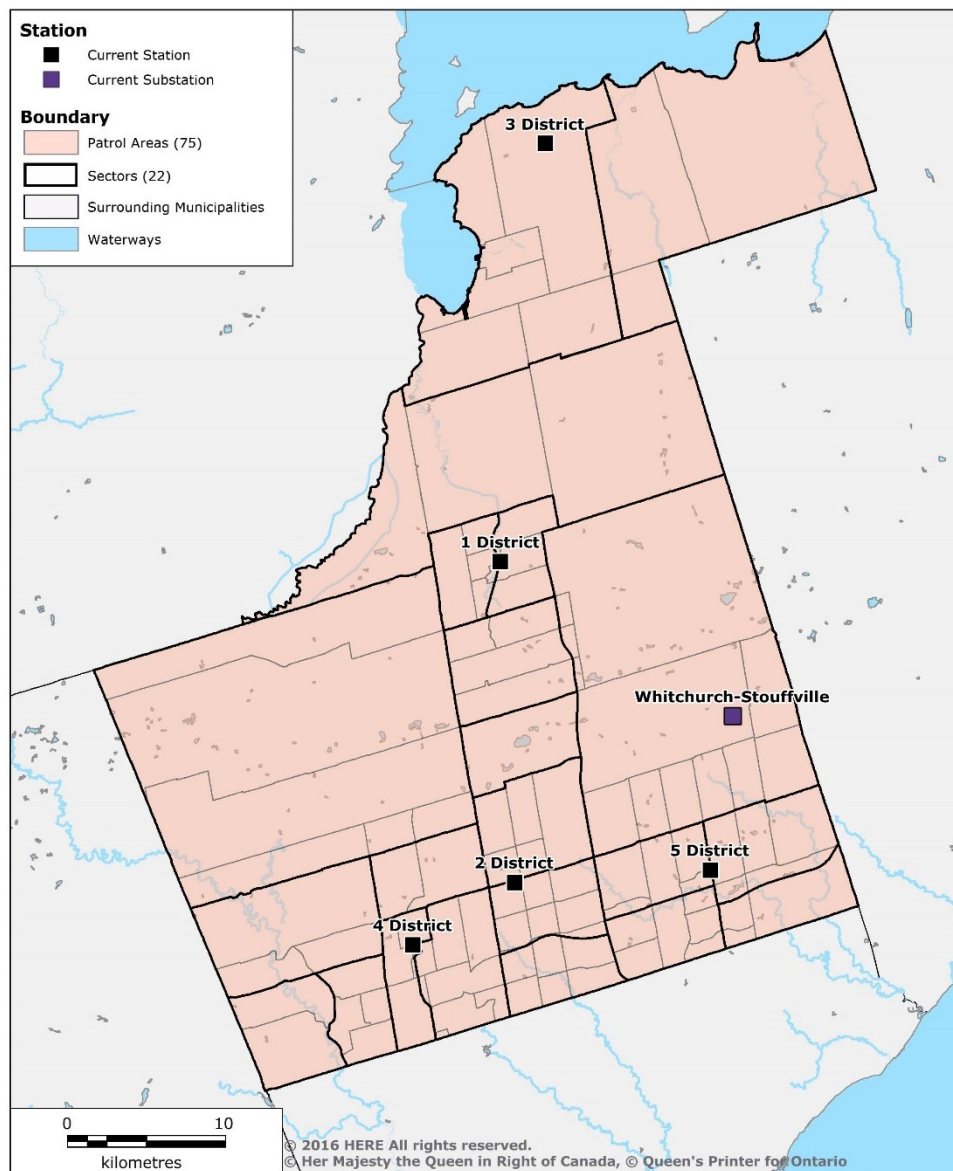
Sector Policing



Introduction

- At the time of the previous review, YRP operated a Patrol Area policing model with the Region divided into 76 patrol areas, one of which covers the southern part of Lake Simcoe.
- As a result of patrol staffing analysis conducted in 2012, the Patrol Innovation Team (PIT) was tasked with reviewing and modernizing the frontline patrol model to address two main issues: the workload imbalance across the districts and inadequate staffing to match workload by time of day.
- The review resulted in the recommendation to group patrol areas into larger sectors, with the aim of:
 - balancing workload;
 - matching staff deployments to workload;
 - enhancing proactive patrol work; and
 - supplementing supervision

Patrol Areas and Proposed Sectors



Minimum Patrol Units by Area

Sector	Patrol Area Model*	Sector Model	Difference
11	4	3	-1
12	3	3	0
13	3	5	2
14	3	2	-1
15	2	3	1
21	6	5	-1
22	6	6	0
23	5	5	0
24	1	2	1
31	4	5	1
32	2	2	0
41	5	6	1
42	3	4	1
43	4	3	-1
44	2	3	1
45	2	2	0
46	2	3	1
51	3	3	0
52	5	4	-1
53	3	4	1
54	4	4	0
55	3	3	0
York Region	75	80	5

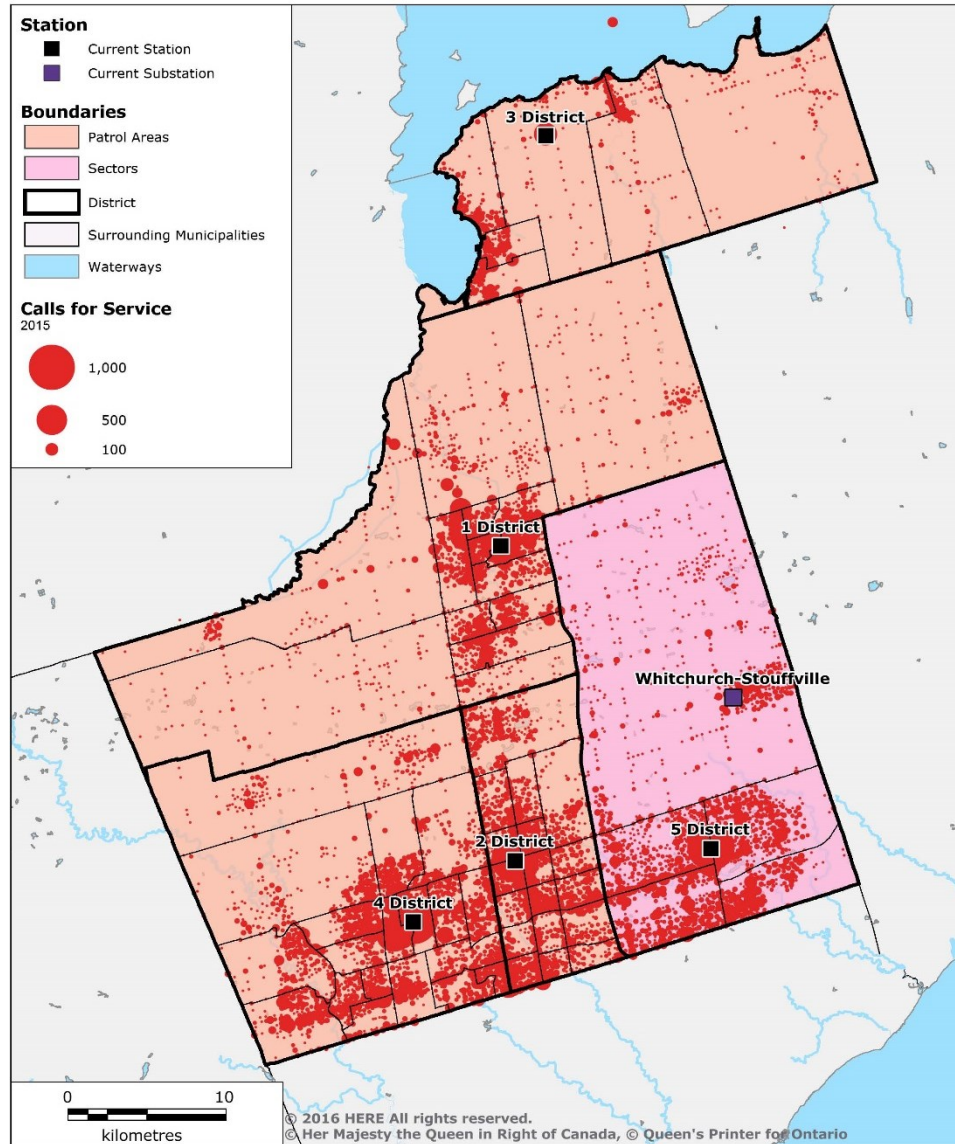
* Excludes Patrol Area 317

Calls for Service Coverage

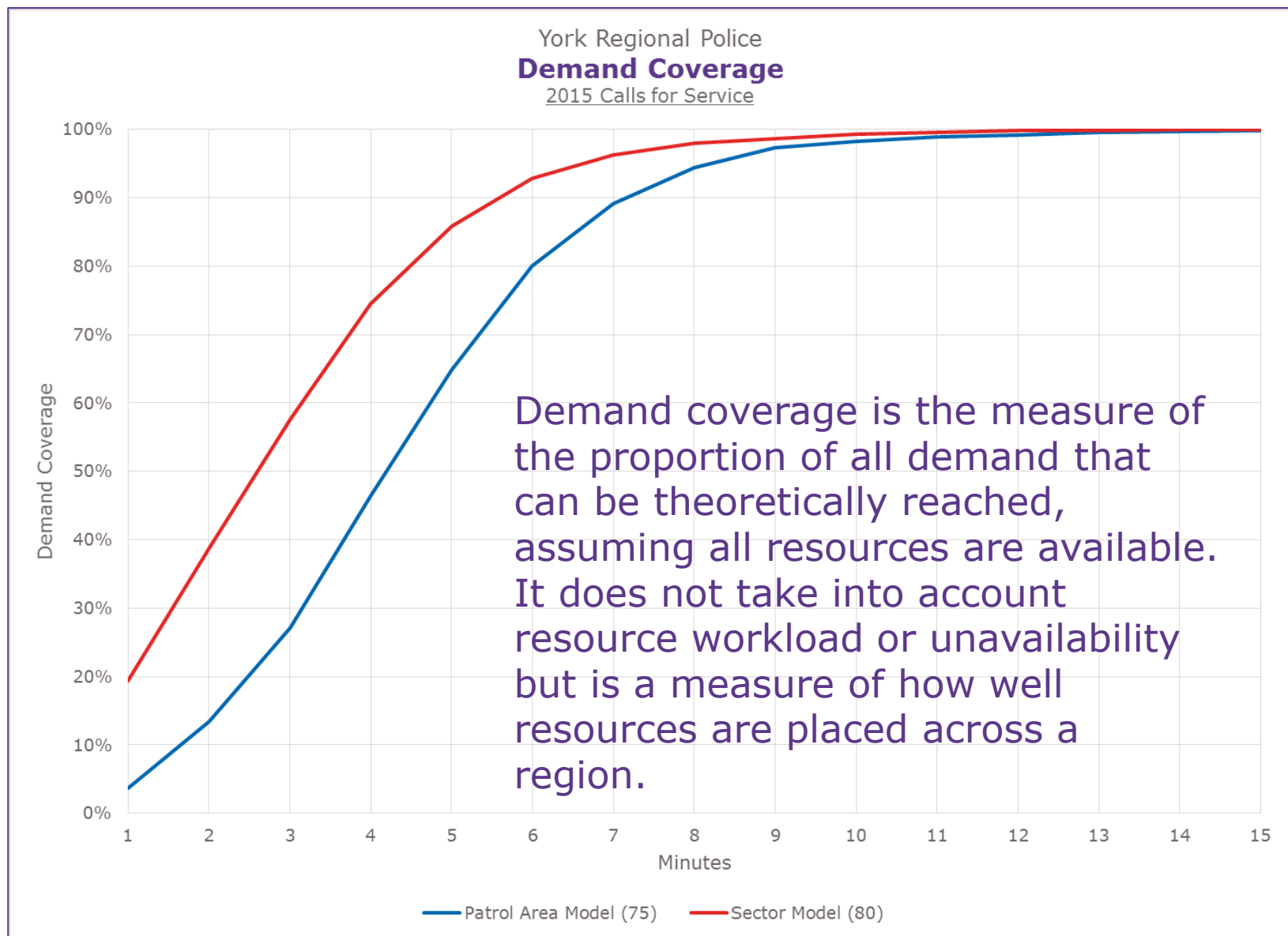
- In the case of patrol areas, if each patrol unit policing its area is responsible for responding to calls within that area, and spends more time in parts of the area where more CFS occur, then an estimate of the range coverage (the travel time to respond to a CFS) and unit workload can be made.
- Moving to the Sector model, the incident-weighted centroid approach can no longer be taken due to multiple units responding within a single sector. Instead, ORH's location optimization model, OGRE (Optimization by Genetic Resource Evolution), was used to identify the optimal locations for each patrol unit within a sector, based on:
 - the PIT-recommended minimum unit levels;
 - the geographical distribution of demand; and
 - unit travel times.

This gives a good indication of where patrol units are likely to spend most of their time in a sector.

Station Configuration, Patrol Boundaries and CFS Distribution



Demand Coverage



Coverage and Workload Summary 2015

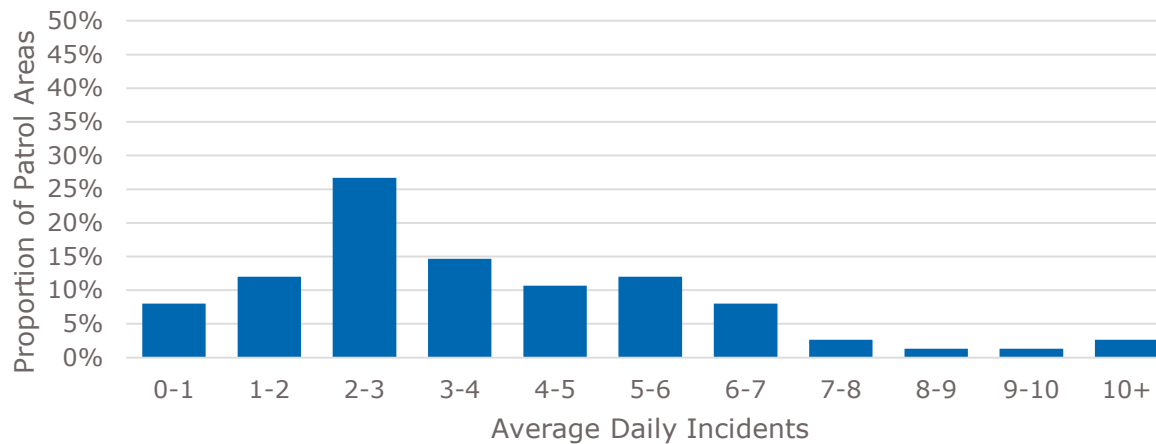
Scenario	Patrol Units	Demand Year	Demand Coverage 90th %ile	Area Workload*		
				Min	Max	Average
Patrol Area Model	75	2015	07:09	0.2	17.2	3.9
Sector Model	80	2015	05:32	2.2	5.4	3.6

* Average Daily Incidents

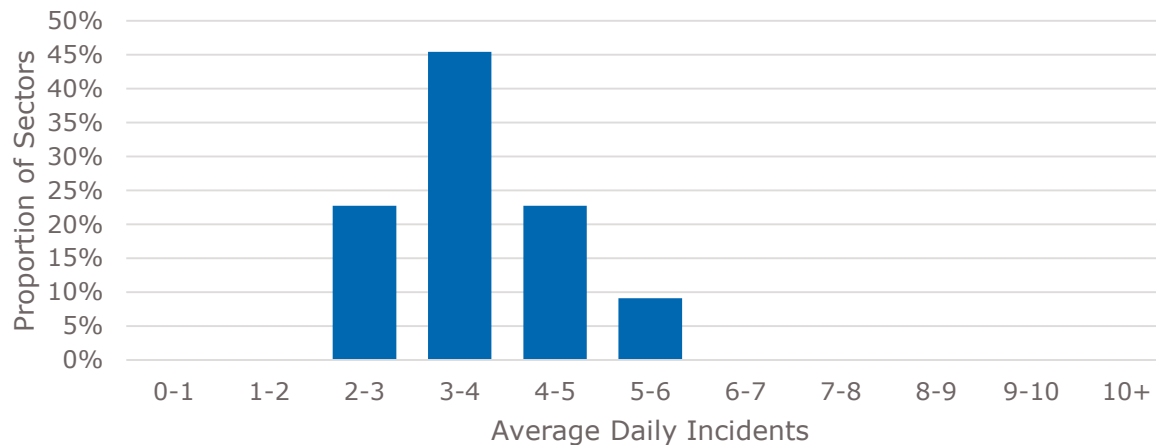
Demand coverage shows improvements of between 1 and 1.5 minutes to response times. This compares to a reduction in reported response times of around 1 minute in 5 District since the trial of Sector Policing started.

Patrol Unit Workload 2015

Patrol Area Model (75) - 2015 Demand



Sector Model (80) - 2015 Demand



Sector Policing Summary

Analysis and modelling has shown that moving to the Sector model for policing should increase incident coverage (and therefore reduce response times) and improve the balance of workload between patrol units.

Future Unit Requirement



Demand Projections

Projected Demand

LTM	Year				
	2015	2021	2026	2031	2036
Aurora	5,300	5,570	5,798	6,029	6,237
East Gwillimbury	3,395	3,726	4,040	4,552	5,109
Georgina	6,765	7,096	7,393	7,704	8,016
King	3,207	3,425	3,609	3,784	3,957
Markham	22,867	23,606	24,308	24,963	25,794
Newmarket	11,025	11,370	11,665	11,946	12,236
Richmond Hill	16,727	17,194	17,613	18,030	18,402
Vaughan	32,195	33,003	33,803	34,783	35,631
Whitchurch-Stouffville	3,959	4,199	4,405	4,541	4,641
York Region	105,440	109,189	112,634	116,333	120,023

Percentage Increase from 2015

LTM	Year				
	2015	2021	2026	2031	2036
Aurora	-	5.1%	9.4%	13.7%	17.7%
East Gwillimbury	-	9.7%	19.0%	34.1%	50.5%
Georgina	-	4.9%	9.3%	13.9%	18.5%
King	-	6.8%	12.5%	18.0%	23.4%
Markham	-	3.2%	6.3%	9.2%	12.8%
Newmarket	-	3.1%	5.8%	8.4%	11.0%
Richmond Hill	-	2.8%	5.3%	7.8%	10.0%
Vaughan	-	2.5%	5.0%	8.0%	10.7%
Whitchurch-Stouffville	-	6.1%	11.3%	14.7%	17.2%
York Region	-	3.6%	6.8%	10.3%	13.8%

Unit Requirements

- An objective was set of dividing officers' time in the following proportions:
 - 30% CFS responses (being responsive)
 - 30% roaming and patrol (being proactive)
 - 30% admin and other duties
 - 10% Community engagement
- The average occupied time of a patrol unit, measured from dispatch time to 'in service time', was 89 minutes in 2015.
- Assuming that this remains unchanged, this would imply that maximum unit workload should not exceed 4.85 incidents per day in 2036.
- Units were therefore added into each sector in 2036 until the average patrol unit workload in that sector fell to below 4.85 incidents per day.

Patrol Unit Workload

Sector	2015	2036	
	Sector Model	Sector Model	ORH 86
11	4.7	5.5	4.5
12	5.0	5.7	4.1
13	3.9	4.5	3.9
14	3.1	4.9	4.2
15	2.6	3.3	3.2
21	2.7	3.1	3.0
22	4.4	4.9	4.2
23	2.9	3.2	3.2
24	3.6	3.9	3.9
31	3.1	3.7	3.7
32	2.2	2.5	2.5
41	4.1	4.7	4.7
42	3.9	4.2	3.7
43	4.6	5.0	4.0
44	3.6	3.9	3.9
45	5.4	6.1	4.3
46	3.3	3.8	3.8
51	3.1	2.8	2.8
52	3.7	3.6	3.6
53	3.1	3.6	3.6
54	4.3	4.7	4.7
55	3.8	4.6	4.3

Min	2.2	2.5	2.5
Max	5.4	6.1	4.7
Average	3.6	4.1	3.9

* Average Daily Incidents per unit

Patrol Units by Response Area

Sector	Sector Model	ORH 86	Difference
11	3	4	1
12	3	4	1
13	5	5	0
14	2	3	1
15	3	3	0
21	5	5	0
22	6	7	1
23	5	5	0
24	2	2	0
31	5	5	0
32	2	2	0
41	6	6	0
42	4	4	0
43	3	4	1
44	3	3	0
45	2	3	1
46	3	3	0
51	3	3	0
52	4	4	0
53	4	4	0
54	4	4	0
55	3	3	0
York Region	80	86	6

Station Location Optimization



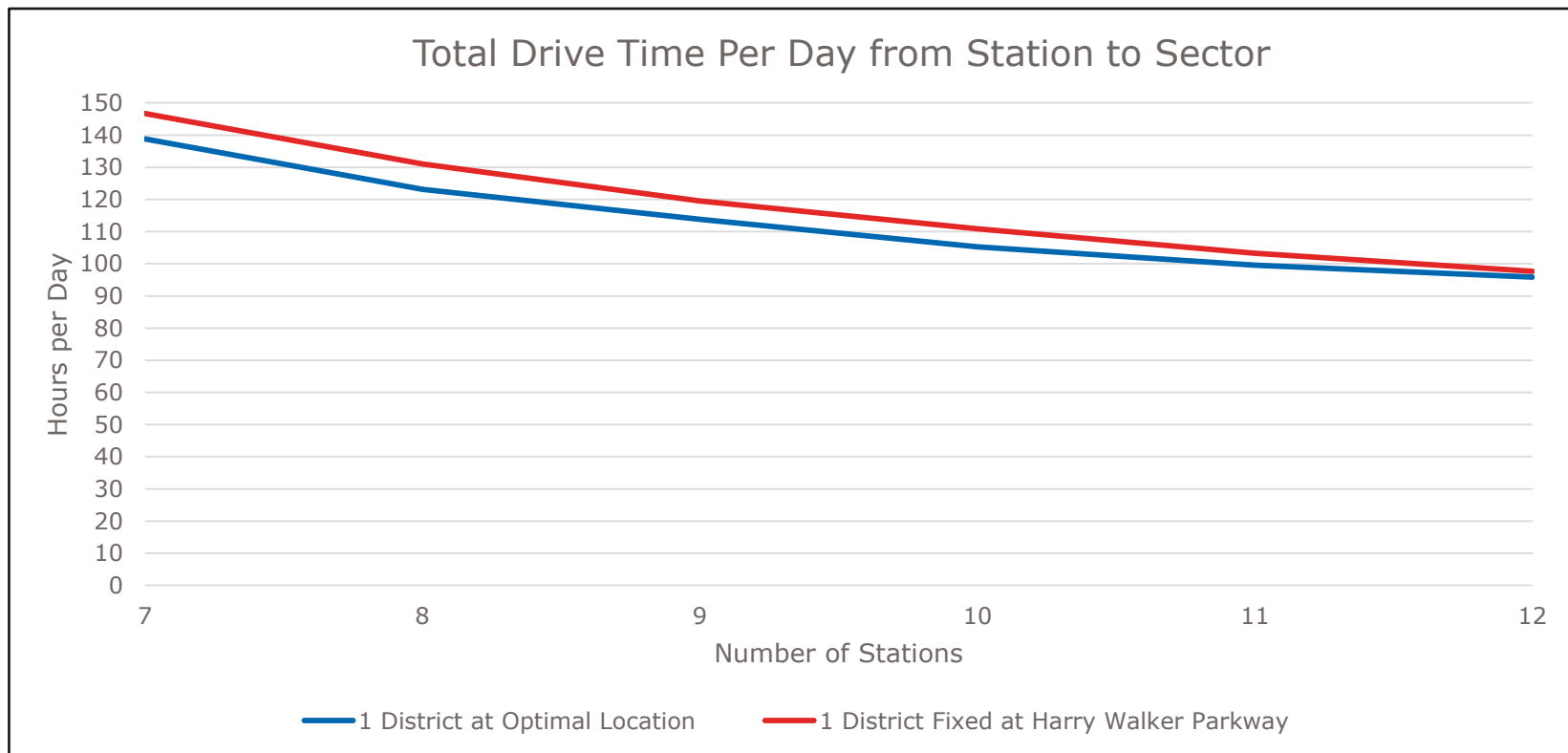
Optimization – Unit Drive Time

- Based on the projected number of patrol units in each sector in 2036, location optimization modelling was undertaken to examine options for 7 through 12 sites from which to deploy patrol cars.
- The aim of the optimization was to minimize the amount of time spent driving to and from book-on sites to locations within each sector.
- Optimization was carried out twice, once fixing the proposed 1 District site at Harry Walker Parkway, and once finding an optimal 1 District location. This found that a site close to the current 1 District location allows for much better access than the Harry Walker Parkway site.

Daily Drive Time from Station to Sector per Shift

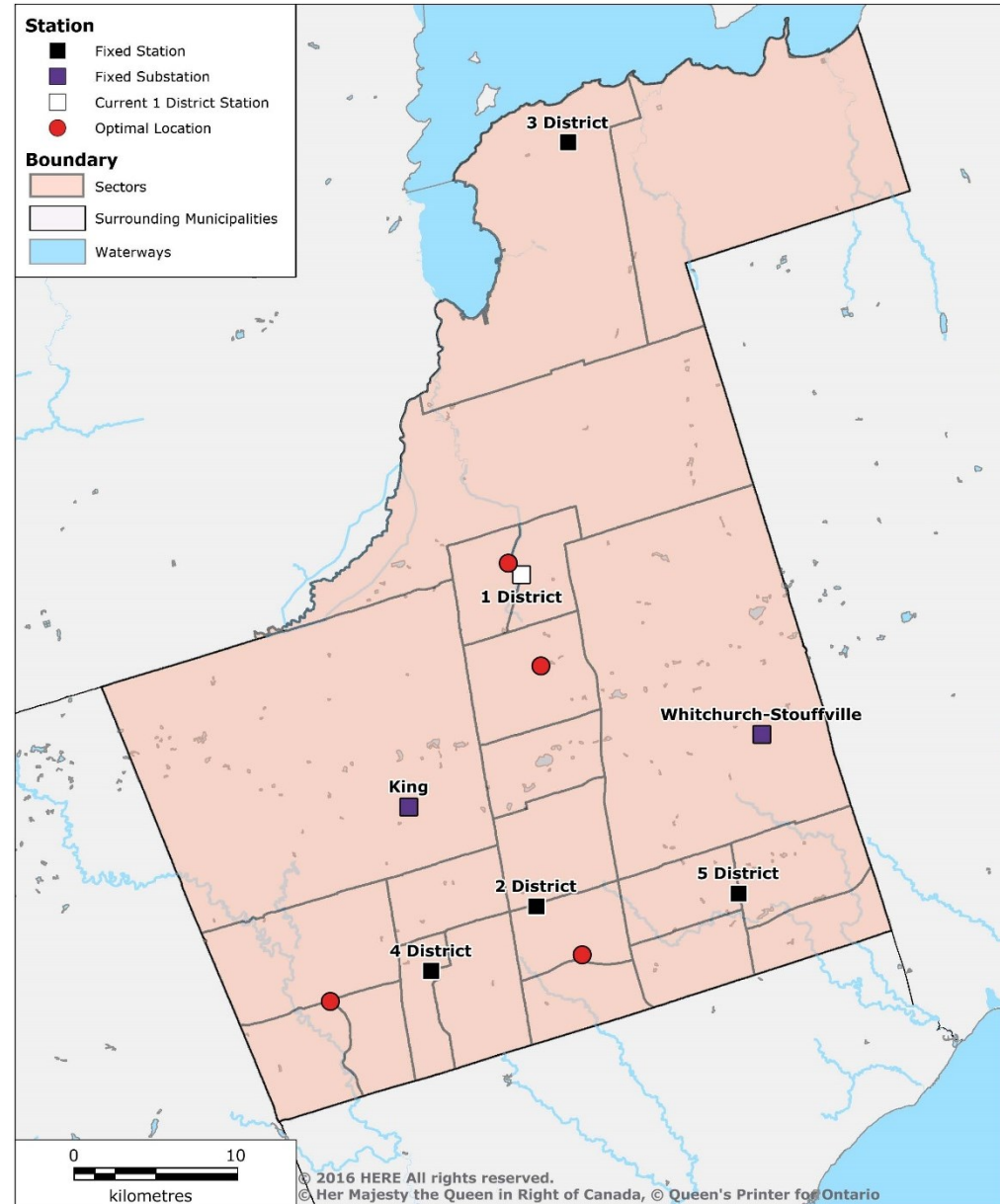
2036 - 86 Patrol Cars Across 22 Sectors - Drive Time in Hours

Scenario	Number of Stations					
	7	8	9	10	11	12
1 District Fixed at Harry Walker Parkway	147	131	119	111	103	98
1 District at Optimal Location	139	123	114	105	100	96



10 Optimal Station Locations

6 Fixed, 4 New



Optimization – Population Access

- The optimization process was repeated, but this time looking to minimize the public drive times from home to their nearest public-facing police facility.
- In addition to the six sites that were fixed for the unit drive time optimization, the marine unit was added as a fixed site.

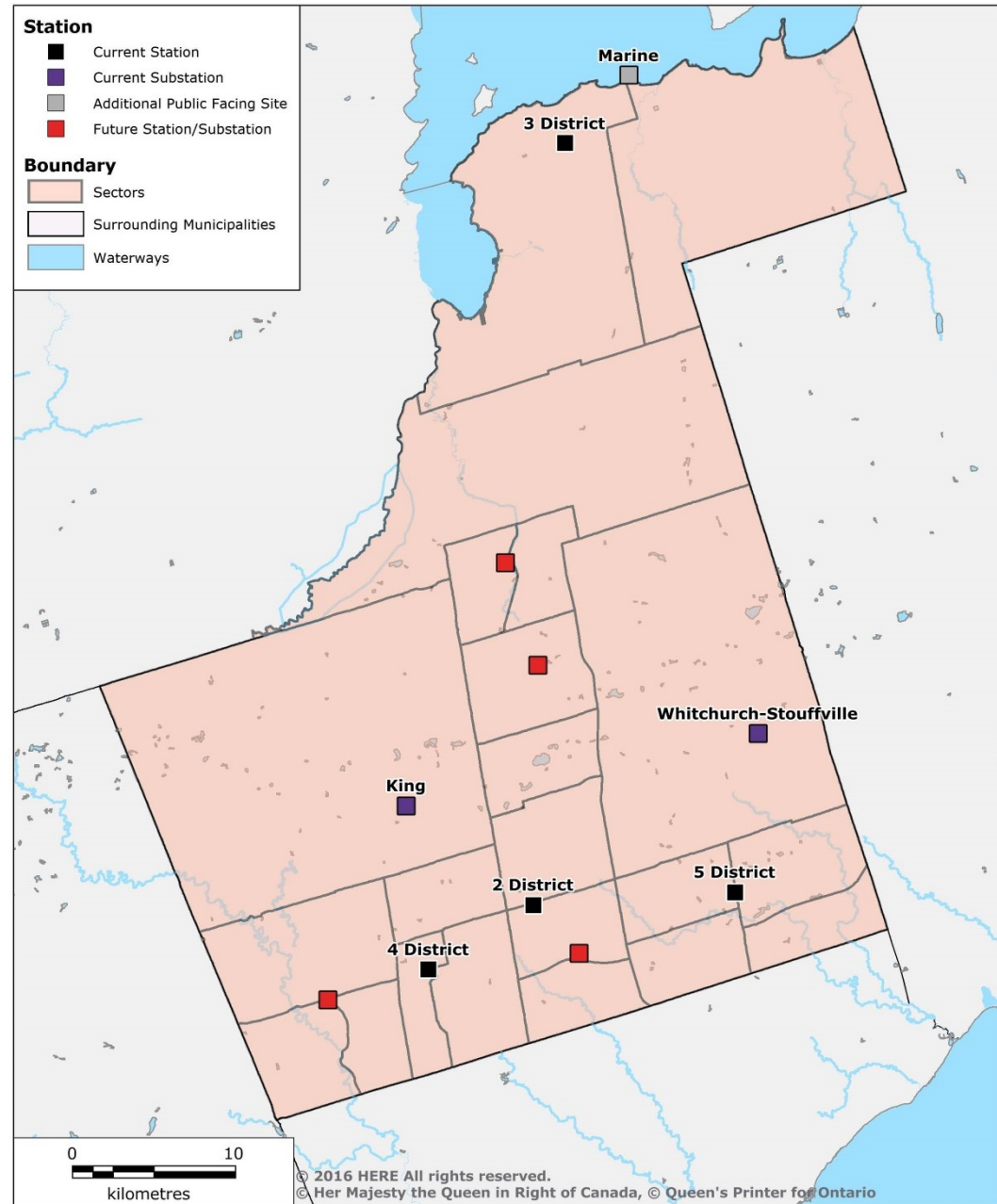
Final Configuration



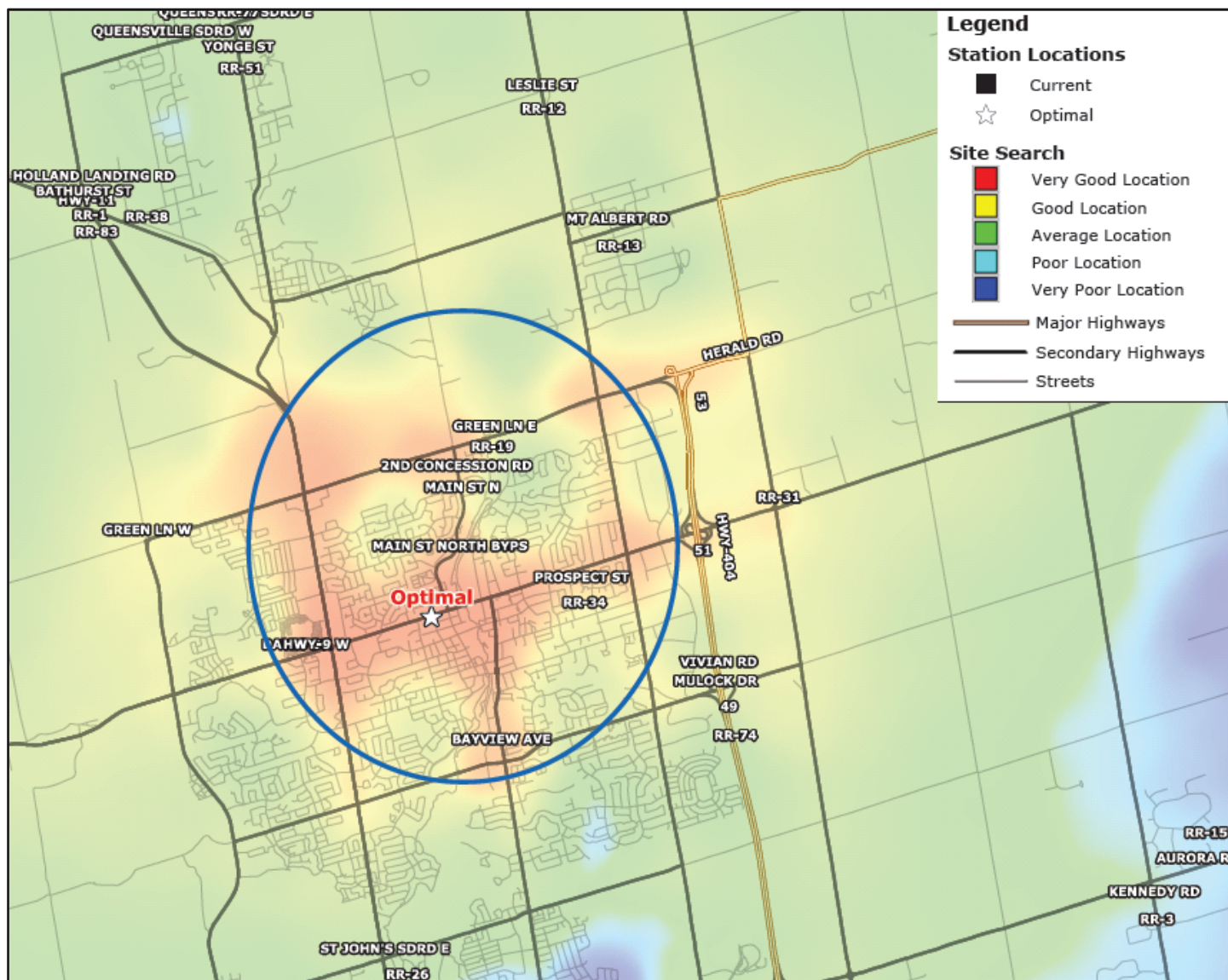
Final Station Configuration

- The results of the two optimizations were compared, with a higher weighting put on the locations to minimize drive time for patrol cars.
- This produced an optimal configuration that was based on the 10-site optimization for unit drive times with the addition of the marine unit for population access.

Final Station Configuration



Newmarket Site Search Map



Legend

Station Locations

- Current (Black square)
- Optimal (Star)

Site Search

- Very Good Location (Red)
- Good Location (Yellow)
- Average Location (Green)
- Poor Location (Light Blue)
- Very Poor Location (Dark Blue)

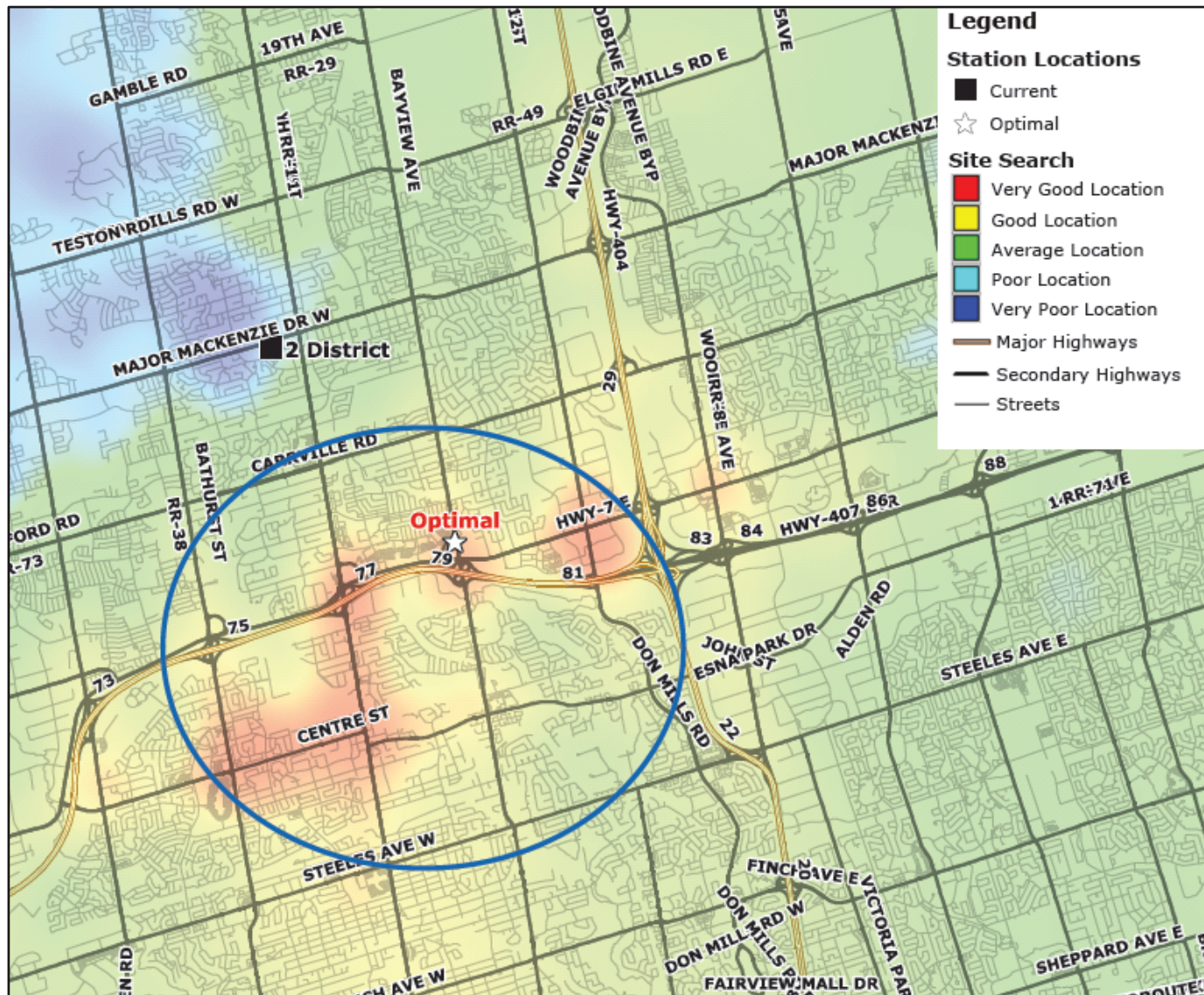
Infrastructure

- Major Highways (Thick brown line)
- Secondary Highways (Thin brown line)
- Streets (Thin grey line)

Map Labels

- 4 District (Black square)
- Major Mackenzie Dr
- Steeles Ave W
- Kipling Ave
- Pine Valley Dr
- Highway 7
- Highway 404
- Highway 407
- Highway 26
- Highway 69
- Highway 65
- Highway 63
- Highway 59
- Highway 55
- Highway 53
- Highway 49
- Highway 45
- Highway 41
- Highway 37
- Highway 35
- Highway 33
- Highway 31
- Highway 29
- Highway 27
- Highway 25
- Highway 23
- Highway 21
- Highway 19
- Highway 17
- Highway 15
- Highway 13
- Highway 11
- Highway 9
- Highway 7
- Highway 5
- Highway 3
- Highway 1

South Richmond Hill Site Search Map





Station Capacities

Assuming that each patrol unit will book-on at the station closest to the location it will be deployed to, by 2036 each of the final 10 sites will have the following number of patrol units operating from them:

- Newmarket (1 District) – 12 (2016 14 cars)
- 2 District – 10 - (2016 18 cars)
- 3 District – 7 - (2016 7 cars)
- 4 District – 11 - (2016 21 cars)
- 5 District – 11 - (2016 17 cars)
- Whitchurch-Stouffville – 3 - (2016 3 cars)
- King – 5
- Aurora – 5
- South Richmond Hill – 16
- Vaughan – 6

Current station capacities and the availability of land will determine whether the sizes for the new locations can be achieved; if not, the reduction in drive times may not be as significant as described earlier.

Considering Alternative 1 District Locations



Considering Alternative 1 District Locations

- While modelling has shown that a new site for 1 District near the current location is preferable to the site on Harry Walker Parkway, the ability to find land here will be difficult.
- Further optimization runs were undertaken to assess how different the optimal solution would be if the site on Harry Walker Parkway, or another site on the corner of Yonge and Green Lane, were used.

Comparing Proposed 1 District Locations

2036 – 10 Optimal Station Locations

1 District Stations	Total Daily Drive Time (hours)	Population Coverage in 15 Minutes
Optimal Location + Aurora	105	96.3%
Harry Walker Parkway + Aurora	111	93.9%
Yonge and Green Lane + Aurora	109	96.6%
Yonge and Green Lane + Prospect Street	113	94.3%

Previous Demand Projection



Previous Demand Projection

- Demand is projected to increase by 13.8% between 2016 and 2036. This compares to a projected increase of 34.5% over 20 years made in the previous review.
- The main reason for the lower projection is that certain modernization initiatives have been put in place by YRP to curb the increase of calls, particularly 'Silent 911' cases and the alarm reduction strategy.
- Modelling was undertaken to assess what the patrol car requirement would have been by 2036 had the demand projections been at the level seen in the previous review.

Additional 2036 Patrol Car Requirement

Sector	Base	ORH 86 (2016 Projection)	ORH 93 (2012 Projection)
11	3	4	4
12	3	4	4
13	5	5	6
14	2	3	3
15	3	3	3
21	5	5	5
22	6	7	8
23	5	5	5
24	2	2	2
31	5	5	6
32	2	2	2
41	6	6	7
42	4	4	5
43	3	4	4
44	3	3	3
45	2	3	3
46	3	3	3
51	3	3	3
52	4	4	4
53	4	4	4
54	4	4	5
55	3	3	4
York Region	80	86	93

Summary



Summary (1)

- Simulation and optimization models were set up for the Region, based on analyzed data and a travel time calibrated road network. It was then possible to examine the travel time and incident coverage impacts of relocating existing stations, or of adding additional sites and units.
- Modelling assessed the impact of introducing the sector-based operational model. The Sector model groups together patrol zones with the aim of:
 - balancing workload between patrol units
 - matching staff deployments to workload
 - enhancing proactive patrol work
 - supplementing supervision
- CFS projections were made, based on combining historical CFS trends with projected population changes. Using this method, the number of dispatched CFS incidents is projected to increase from 105,440 in 2015 to 112,634 in 2026 (+6.8%), and to 120,330 in 2036 (+13.8%).

Summary (2)

- Optimization modelling was undertaken to locate 7 through 11 District stations or sub-stations across the region with the aim of:
 - reducing the drive time for patrol cars to reach the sectors
 - minimizing the distance the public needs to drive to a YRP facility
- By adopting a 10-site configuration, 41 hours and 30 minutes can be saved per day in drive time to and from patrol car base stations to their sectors, compared to the current 6 locations and the proposed 1 District site.

Summary (3)

- Using the 10-site configuration for patrol unit drive time (plus the marine unit) enables 96.3% of the population to drive to a public-facing police facility in 15 minutes. This compares to 82.3% in a configuration with 6 locations and the proposed 1 District site.
- An assessment of a potential site at Yonge and Green Lane was made and modelling showed that, while this is not as good as the optimal location in the centre of Newmarket, it is preferable to the potential site on Harry Walker Parkway.
- The analysis and modelling has shown that by adopting new methods of operating YRP has increased incident coverage (reduced response times) which better balancing workload between patrol units. Demand reduction initiatives have led to a requirement for lower growth in patrol units over the next 20 years.