

Markham East Toronto Rapid Ontario-Electric “I-METRO-E”

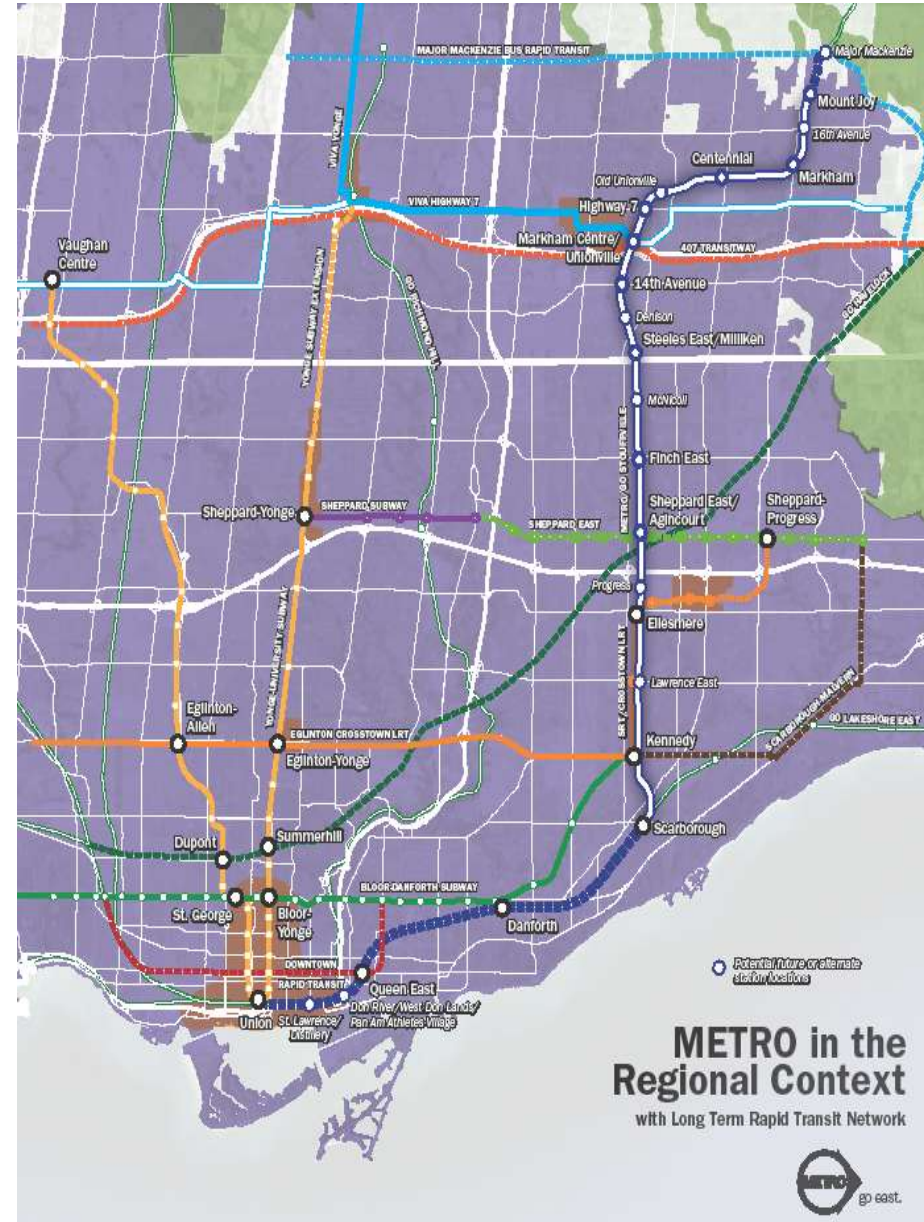


Stouffville GO-Transit Line

Transforming a GO-Line into a
“Rapid Transit I-METRO-E Line”

Transit Dependent Development

Visionary/Author - Jim Jones,
Markham Regional Councillor



I-METRO-E - Stouffville GO-Transit Line Resolution

Notice on Motion: Markham East Toronto Rapid Ontario-Electric All Day Train Service
Moved by: Regional Councillor Jim Jones
Seconded by: Ward V Councillor Colin Campbell

Resolution

WHEREAS the Metrolinx Regional Transportation Plan 2009 (“The Big Move 2020”) identifies full day, 2-way service on the Stouffville line from Mount Joy to Toronto’s Union Station as part of the 15 year plan for Regional Rapid Transit; and

Whereas GO Transit will be undertaking an Environmental Assessment (EA) study on the Stouffville line for future infrastructure improvements in Markham and Toronto to provide for the planned full day, 2-way service, to be operational between Markham Center and Toronto’s Union Station by 2014; and

Whereas Metrolinx in 2013 is reviewing and updating its Regional Big Move 2020 Transportation Plan. The Stouffville Go Line should be considered for electrification in its entirety; and

Whereas during the environmental assessment process for the Stouffville rail corridor, opportunities exist for alternative technologies to be considered. These alternative technologies include MagLev which is currently used in major centers and is extremely quiet, affordable, efficient and fast; and

Whereas smaller, more cost effective diesel-electric multiple unit (DEMU), trains that are used throughout Europe, in use today in Ottawa on their O-Train line, and is currently being implemented between Toronto Pearson Airport and Union Station; and

Whereas consideration should be given to go directly to Electric Train Technology for the Stouffville GO Line; and

Whereas the electric technology will enable more frequent, lower cost service, with a greater number of new stations stops along the route and improve travel time to our transit riders; and

Whereas the electric trains technology could carry a similar or larger number of transit riders than subway service; and

Whereas the Markham East Toronto Rapid Ontario-Electric (I-METRO-E) concept would enable more frequent headways, and more frequent transit stops along this approved north-south rapid transit corridor between Stouffville and Union Station; and

Whereas this north-south corridor will also interconnect with a number of existing and planned east-west transit corridors, including VIVA bus rapid transit, 407 Rail Transitway, Steeles BRT/LRT, Finch BRT/LRT, Sheppard, Eglinton-Crosstown, and Bloor-Danforth Subway, and Lakeshore East GO; and

Whereas the I-METRO-E would stimulate transit dependant development (TDD) and redevelopment along I-METRO-E transit corridor; and

Whereas climate change, global warming, end of oil and gridlock are issues facing all major cities, it is important that all station communities are TDD designed systems to be net zero in energy, waste and emissions and produce the best public realm and quality of life for our citizens; and

Whereas I-METRO-E would reduce automobile dependence, energy consumption and would promote environmental, social and economic sustainability initiatives; and

Whereas Metrolinx has allocated their budget for transit projects for the next five years and revenues from development charges, TIFs, Section 37, HST, taxes, Gas Taxes, increased user fees, improve operating performance are viable and can be leveraged within a Public Private Partnership (P3) model.

NOW THEREFORE BE IT RESOLVED:

That a steering committee co-chaired by Markham Regional Councillor Jim Jones and a member of Toronto Council selected by City of Toronto Council be created. The committee will determine its membership which will include members of Markham, Toronto Council and other municipalities and levels of Government.. This committee will focus on station and rail strategy, TDD, community planning, Government Relationships and Public Private Partnerships; and

That the Steering Committee seek advice from the participating government bodies, agencies and other sources as determined by the committee with respect to terms of reference and funding requirements for comprehensive studies and reports that would be required to pursue the I-METRO-E concept; and

That a working group reporting to the steering committee be formed of representatives from Metrolinx, the City of Toronto, the Region of York, the Town of Markham to review the need and justification of the I-METRO-E concept, and the associated transportation, land use planning and economic development benefits; and

THAT Metrolinx and other government agencies and stakeholders at the Federal, Provincial, Regional and Municipal level be requested to consider the merit and implications of the I-METRO-E concept and Maglev/Electric/DEMU technology on the Stouffville rail line in the context of the current review and update of the Metrolinx Regional Transportation Plan and Metrolinx Environment Assessment Study for the GO’s Stouffville Line; and

That copies of this resolution be forwarded to the Premier of Ontario, the Federal Ministers of Finance, Transportation, Infrastructure and the Provincial Ministers of Finance, Transportation and Infrastructure Ontario, East Toronto and Markham area MPP’s, the City of Toronto, the Mayor and Council members of the City Toronto, the Toronto Transit Commission, Metrolinx, York Region and York Rapid Transit Corporation.

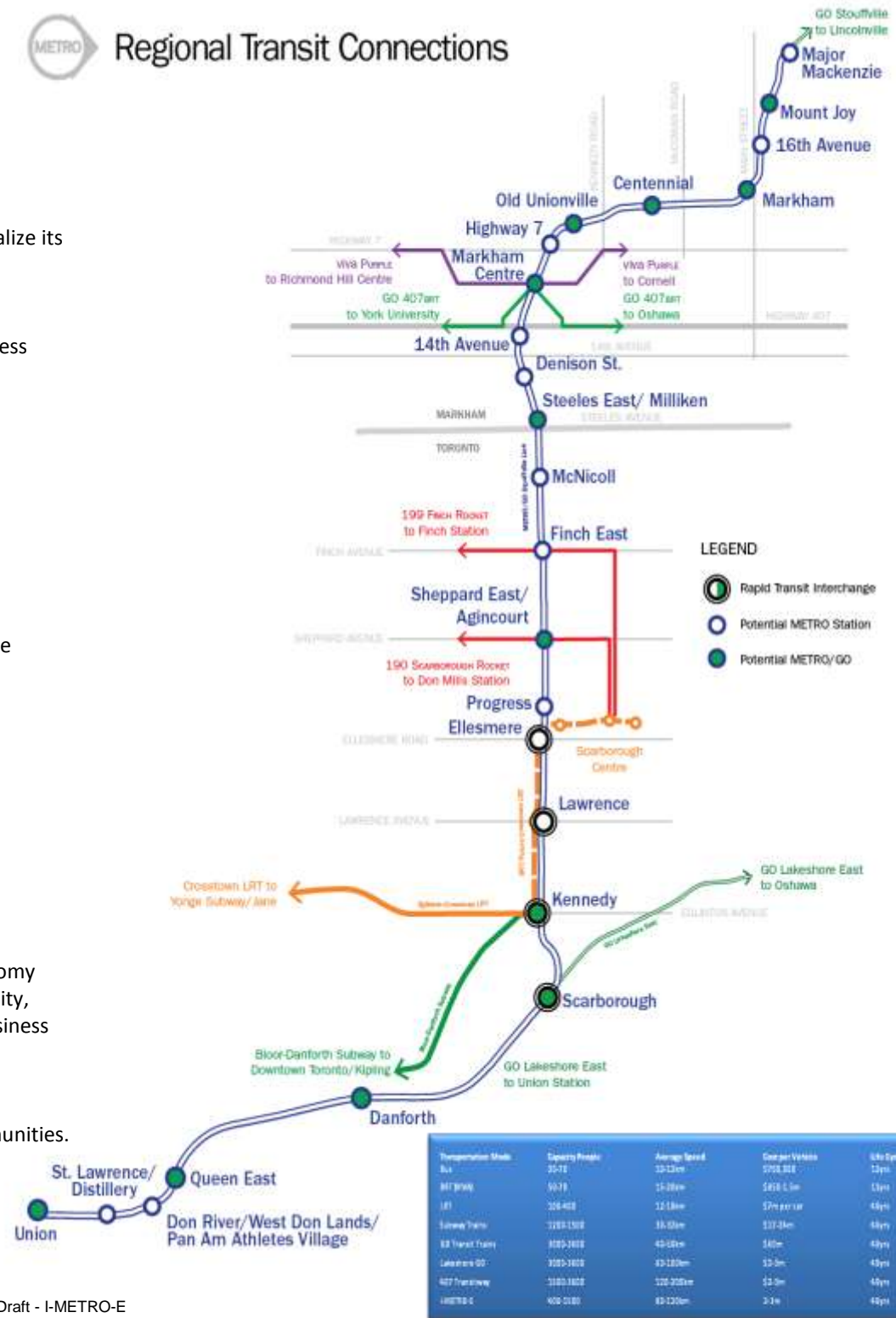
MegaCity Rail Transit Lines

I-METRO-E Imperatives

- Grid up all major bus lines and Rail Lines from Major MacKenize to Union Station
- Buses should never leave their street route
- Go directly to Electric train technology as this line doesn't have freight on it
- Plan Sustainable Transit Dependant Development Communities in the corridor to realize its greatest economic opportunity (Replace GO-Trains with electric trains)
- Plan maximum use of transit infrastructure
- Develop energy, emissions and waste net zero TDD communities
- Focus on the 2,000,000 potential transit riders' mobility, flexibility and competitiveness
- Focus on green and smart technology
- Engineer all the inefficiencies out of the I-METRO-E rail transit system
- Eliminate municipal boundaries and develop a truly integrated grid transit system
- Standardize rail track, train technology, fare collection, intelligent transit systems
- Environmental Assessment should include:
 - ✓ Cost justification and best optimum solutions
 - ✓ New role of the Stouffville GO Line (**I-METRO-E**) Line
 - ✓ Report to a political/citizen steering committee on a regular basis
 - ✓ The design interfaces of all I-METRO-E stations
 - ✓ Elevated track for greater TDD community integration
 - ✓ Elevate the track to eliminate ugly grade separations and maximize land use
 - ✓ Ensure maximum connectivity from end-to-end of the I-METRO-E Line
 - ✓ Train technology to be used
 - ✓ Twinning the tracks
 - ✓ Incorporate all transit automation as possible for an P3 opportunity
 - ✓ E/A Design Documentation – P3 Bidding for financing the I-METRO-E
 - ✓ Eliminate redundancy in track, share when possible, properly mission each transit line through proper transit planning
 - ✓ Eliminate transit turf create the most efficient and versatile/flexible system from operation to meeting ridership requirements
 - ✓ Regular Town hall meetings with subject matter experts
 - ✓ 1st phase of the downtown relief line (est cost is \$5.9 billion)
- Educate the public to change – Creating the Future for a competitive megacity economy
- Financial models based on citizens mobility, connectivity, span of service, predictability, ridership, affordability, flexibility, development opportunity, creative designs and business solutions
- Leave no ecological footprint behind
- communities, rail transit trains and infrastructure must be carbon neutral
- Next 3 Federal & 3 Provincial bldgs should be locate on the I-METRO-E station communities.



Regional Transit Connections



I-METRO-E – Making Transit Useful

Seven Demands and How Transit Serves Them - “Human Transit” by Jarrett Walker

Demand 1: “It takes me where I want to go.”

- ✓ The location of stops and stations determines how close transit service comes to each place that anyone might want to come from or go to.
- ✓ Connectivity is a measure of whether links the place you want to go (your destination) with the place you are now (your origin)

Demand 2: “It takes me when I want to go.”

- ✓ Whether transit runs at all when you need it; the answer to this is the span of service. span of service is indicated by the scheduled time of the first and last trip in each direction.
- ✓ Whether the service runs often enough that you can leave when you really want to go. Frequency is the number of minutes between consecutive trips.

Demand 3: “It is good use of my time.”

- ✓ Includes all the ways of making travel time useful to the passenger. We want travel time to be short.

Demand 4: “It is a good use of my money.”

- ✓ People compare the cost of using transit with the cost of getting somewhere in some other way and this can strongly influence their decision.

Demand 5: “It respects me in the level of safety, comfort, and amenity it provides.”

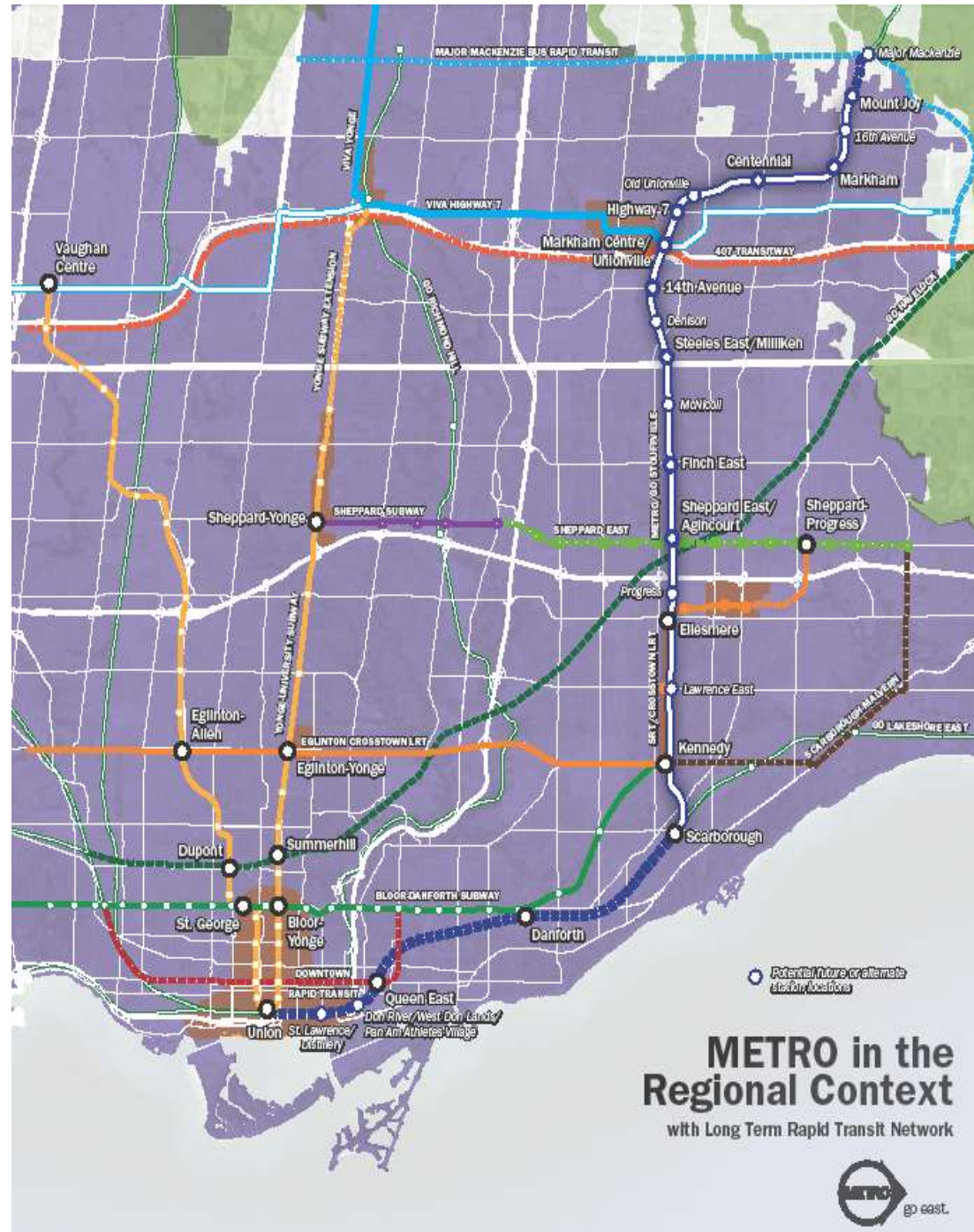
- ✓ Whether the rider feels valued as a customer, as a citizen and as a human being. Shared values unrelated to travel time or cost – such as comfort, cleanliness, courtesy, safety, security and amenities that give value to our time.

Demand 6: “I can trust it.”

- ✓ Our ability to trust operation is called reliability, though frequency is also an important aspect of trust because it reduces our dependence on the reliability of any single transit vehicle.

Demand 7: “It gives me freedom (to change my plans).”

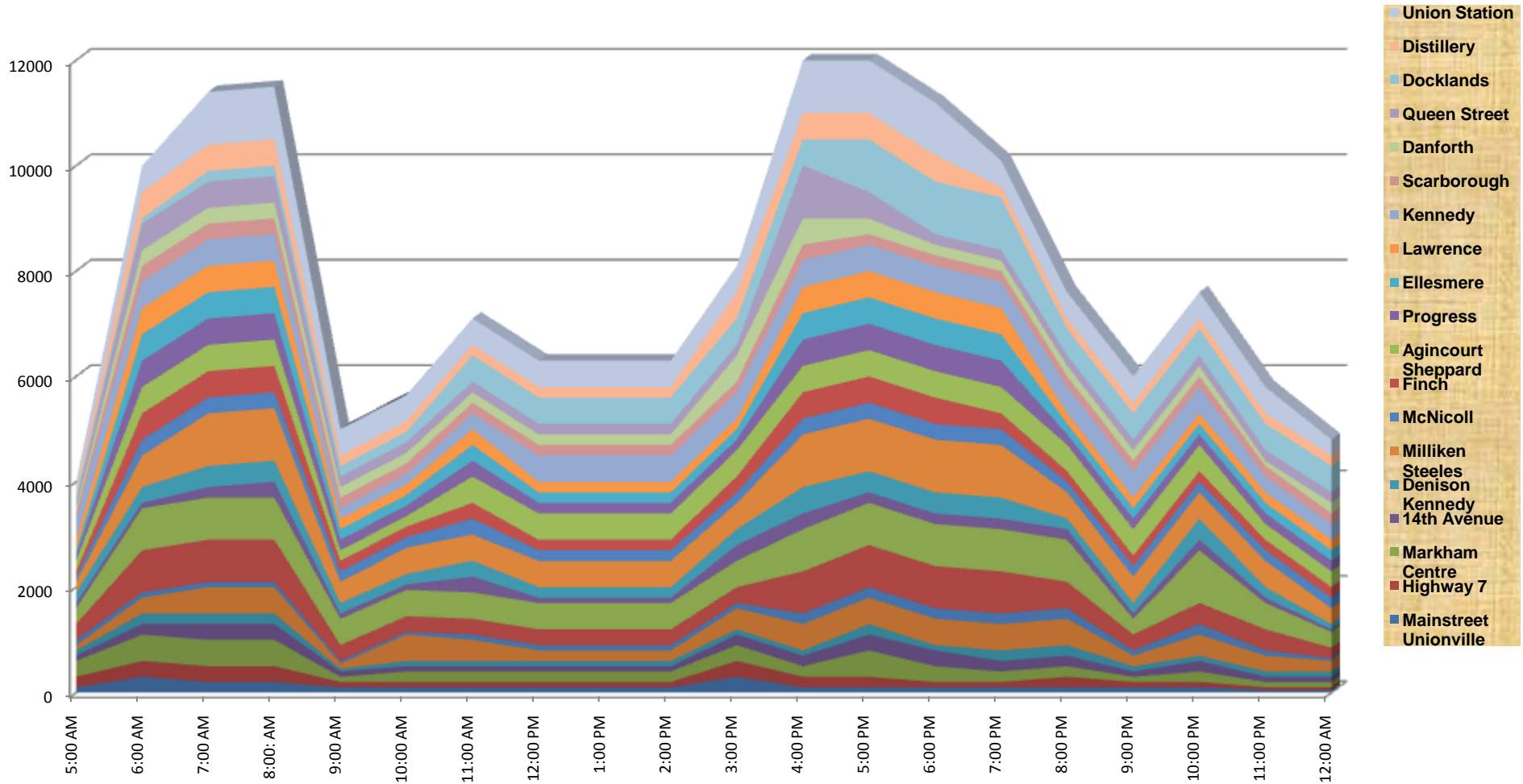
- ✓ Freedom is a crucial sensation, and in most places it is the private car’s crowning virtue. When limited transit schedules interfere with people’s lives – forcing them, for example, to decline a last-minute dinner invitation or cut short the family’s day at the zoo – we see why transit is not the mode of choice for more of the trips we make.
- ✓ The real test of freedom is spontaneity. I can change my plans suddenly? Can I change my plans suddenly? Can I get home if I need to, or go to my child’s school if something came up? Can I simply move freely around my city, following whatever impulse I may feel at the moment?
- ✓ A transit system offers freedom if it offers frequency and span of service (so that there is service whenever you suddenly need it) and a reasonable average speed compared to your alternatives.
- ✓ Must be Legible:
 - 1) simplicity in the design of the networks, so that it’s easy to explain and remember
 - 2) The clarity of the presentation in all the various media



I-METRO-E – Stations – Base First - 2014

Peak First

Think of the peak service as your most fundamental product and of the other times of day as secondary or supplemental product.



Base-First

Think of the pattern of service that runs all the time as your most fundamental product and of the service added on the peak as your supplemental product.

Plan My Trip – From Each Station To Union Station – Using Base Transit Available

<u>Point of Origin-Stouffville</u> <u>Destination-Union Station</u>	<u>GO-Transit Service</u> <u>To Union Station</u> <u>Peak</u>	Est – Base-GO 25 Stations Union Station	BASE Current Systems Mins – 9:00am	<u>I-METRO-E</u> <u>Base/Peak</u> <u>Electric</u>	<u>METROLINX TRANSIT</u> <u>(DEFICIT)</u> <u>SURPLUS</u>
Main Street, Stouffville	63 minutes	96:38 mins	135:00 mins	43:54 mins	(91 minutes)
Major MacKenize		88:38 mins	120:00 mins	37:54 mins	(82 minutes)
Mount Joy	54 minutes	85:12 mins	115:00 mins	38:21 mins	(77 minutes)
16 th Avenue		80:10 mins	112:00 mins	37:15 mins	(74 minutes)
Mainstreet Markham	49 minutes	77:03 mins	105:00 mins	35:51 mins	(69 minutes)
Centennial (McCowan)	44 minutes	72:38 mins	90:00 mins	33:45 mins	(54 minutes)
Main Street Unionville		68:08 mins	85:00 mins	31:35 mins	(53 minutes)
Highway 7		65:00 mins	75:02 mins	30:15 mins	(44 minutes)
Markham Centre	40 minutes	62:02 mins	70:02 mins	29:00 mins	(41 minutes)
14 Avenue		58:56 mins	68:56 mins	27:36 mins	(40 minutes)
Denison Road		55:32 mins	68:00 mins	26:30 mins	(39 minutes)
Milliken (Steeles East)	32 minutes	52:00 mins	69:00 mins	26:00 mins	(43 minutes)
McNicoll		48:50 mins	63:50 mins	23:28 mins	(39 minutes)
Finch		45:32 mins	61:32 mins	22:00 mins	(39 minutes)
Sheppard (Agincourt)		41:26 mins	52:26 mins	20:05 mins	(31 minutes)
Progress		37:56 mins	55:04 mins	18:27 mins	(36 minutes)
Ellesmere		34:56 mins	50:04 mins	17:30 mins	(32 minutes)
Lawrence		30:56 mins	46:86 mins	15:40 mins	(30 minutes)
Kennedy (Eglinton)	19 minutes	26:56 mins	40:04 mins	13::50 mins	(26 minutes)
Scarborough (St Clair)		22:44 mins	26:74 mins	11:52 mins	(14 minutes)
Danforth		15:26 mins	23:26 mins	7:50 mins	(15 minutes)
Queen Street (East)		8:26 mins	20:26 mins	4:00 mins	(16 minutes)
Docklands (Eastern Ave)		5:24 mins	15:24 mins	3:03 mins	(12 minutes)
Distillery District (Front St)		2:00 mins	10:24 mins	2:00 mins	(8 minutes)
Union Station		0:00 mins	0:00 mins	0:00 mins	(0)

Toronto's Downtown Relief Line

Fourth Stage of Construction



Third Stage of Construction



Second Stage of Construction



First Stage of Construction



Stage - 4 \$3,222,709,800 – 15.0 km
km

Stage 3 - \$1,900,729,040 – 5.7 km

Stage 2 \$1,858,028,000 – 5.0 km

Stage 1 \$5,966,929,000

Total Cost for Downtown Relief Line \$12.9 Billion for 38.4 km of Revenue Track



MERGE the Go-Transit and TTC Rail Transit Networks (Excluding Streetcars and slow LRTs) in Backbone Network

Toronto Transit Commission Network

GO-Transit Network



GTA Strategic Architecture Backbone Network

Network Backbone High Order Architecture

1. **Very High Speed** - Quebec City to Windsor – 250-400kms
2. **GTA High Speed** - Transit – Inter-Regional – 100-130kms
 - I. Lakeshore GO ... 100km an hour
 - II. 407 Rail Transitway ... 130 km
3. **Commuter Highest Order** – GO-Transit Line – 40-60 kms
 - I. Peterborough GO
 - II. Stouffville GO – (I-METRO-E)
 - III. Richmond Hill GO
 - IV. Barrie GO
 - V. Bolton GO
 - VI. Georgetown GO
 - VII. Milton GO
 - VIII. GO-Transit - Bus
4. **Urban High Speed Urban** - Subways – 30-32 kms
 - I. Yonge Subway
 - II. Spadina Subway
 - III. Bloor Danforth Subway
 - IV. Sheppard Subway
 - V. Eglinton Crosstown (18-30 kms)
5. **Low - medium Speed** – LRT /BRT– 15-24 km
 - I. Sheppard LRT
 - II. VIVA BRT
 - III. Hurontario LRT
 - IV. Sheppard LRT
6. **Local** - Low
 - I. Streetcar
 - II. Local Bus



High Order High-Speed Transit Backbone Network - Need to Level set on the definition of speed 30 kms and over Federal and Provincial Responsibility

"I-METRO-E"

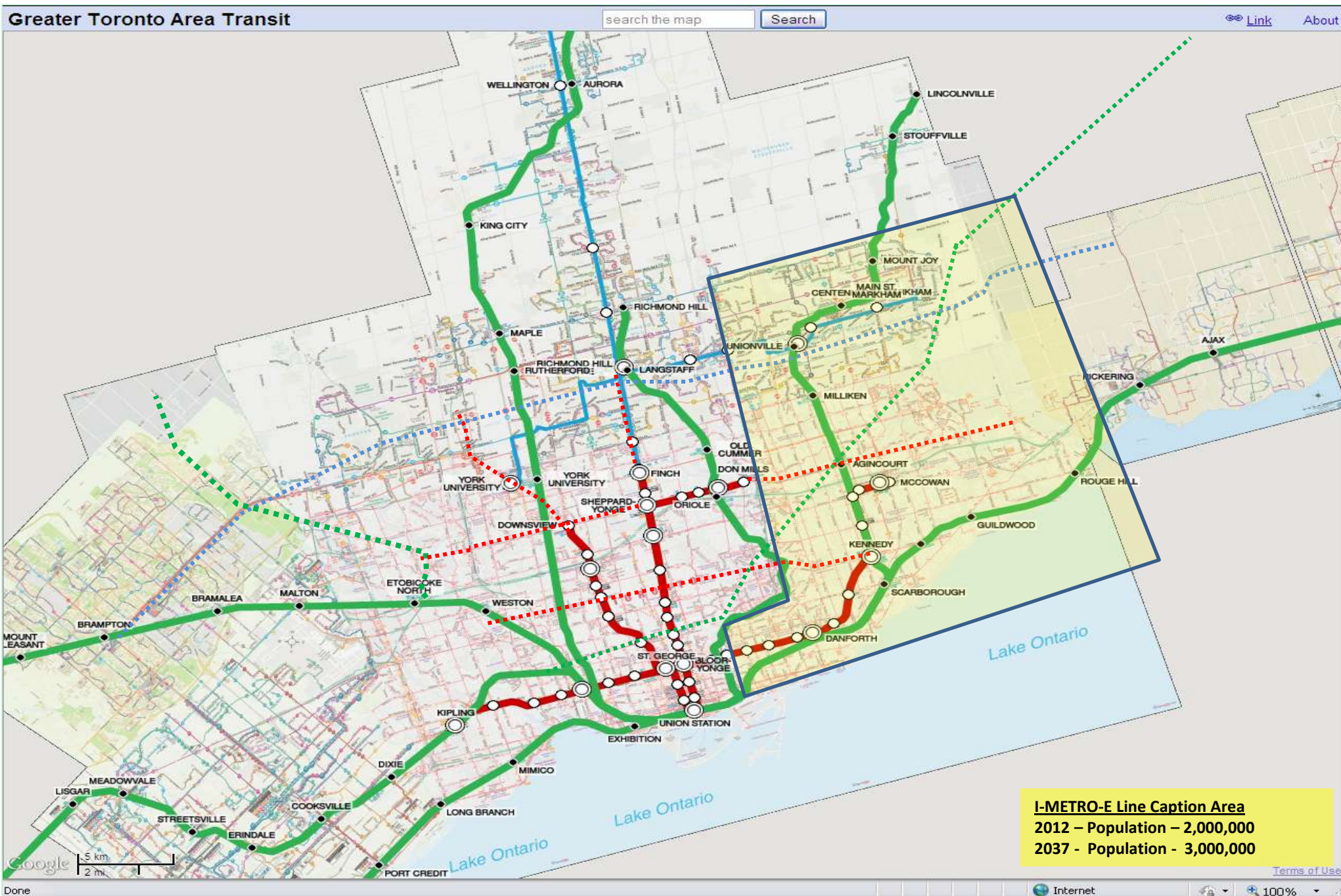
Stouffville GO-Transit Line

Proposed Stations & Timings For I-METRO-E

Stations	DBS (km)	DT(sec)	TBS Min/Sec (incl DT)	Schedule Union Station Stouffville	Schedule Stouffville - Union Station	GO Transit DBS (km)	Schedule GO-Transit Stops-8	Schedule GO-Transit Stops-8
Union Station	0	0	0:00	6:00:00 AM	6:43:54 AM	16.1	7:04:00 AM	7:34:38 AM
Distillery	2.4	30	2:06	6:02:06 AM	6:41:48 AM			7:32:14 AM
Docklands	0.6	30	0:57	6:03:03 AM	6:40:51 AM			7:29:14 AM
Queen East	0.6	30	0:57	6:04:00 AM	6:39:54 AM			7:26:12 AM
Danforth	5	30	3:50	6:07:50 AM	6:36:04 AM			7:19:12 AM
Scarborough	5.3	30	4:02	6:11:52 AM	6:32:02 AM			7:11:54 AM
Kennedy	2.2	30	1:58	6:13:50 AM	6:30:04 AM	6.1	6:45:00 AM	7:07:42 AM
Lawrence East	2	30	1:50	6:15:40 AM	6:28:14 AM			7:03:42 AM
Ellesmere	2	30	1:50	6:17:30 AM	6:26:24 AM			6:59:42 AM
Progress	0.6	30	0:57	6:18:27 AM	6:25:27 AM			6:56:42 AM
Sheppard East	1.5	30	1:38	6:20:05 AM	6:23:49 AM	4.7	6:38:00 AM	6:53:12 AM
Finch East	2.1	30	1:54	6:21:59 AM	6:21:55 AM			6:49:06 AM
McNicoll	1.3	30	1:29	6:23:28 AM	6:20:26 AM			6:45:48 AM
Steeles East	1.3	30	1:29	6:24:57 AM	6:18:57 AM	3.4	6:32:00 AM	6:42:39 AM
Denison Street	1.4	30	1:33	6:26:30 AM	6:17:24 AM			6:39:06 AM
14th Avenue	0.8	30	1:06	6:27:36 AM	6:16:18 AM			6:35:42 AM
Markham Centre	1.2	30	1:24	6:29:00 AM	6:14:54 AM	4.6	6:24:00 AM	6:32:36 AM
Highway 7	1	30	1:15	6:30:15 AM	6:13:39 AM			6:29:36 AM
Old Unionville	1.1	30	1:20	6:31:35 AM	6:12:19 AM			6:26:30 AM
Centennial	2.5	30	2:10	6:33:45 AM	6:10:09 AM	2.4	6:20:00 AM	6:22:00 AM
Mainstreet Markham	2.4	30	2:06	6:35:51 AM	6:08:03 AM	2	6:15:00 AM	6:17:35 AM
16th Avenue	1.2	30	1:24	6:37:15 AM	6:06:39 AM			6:14:24 AM
Mount Joy	0.8	30	1:06	6:38:21 AM	6:05:33 AM	7.4	6:10:00 AM	6:11:24 AM
Major MacKenize	1.4	30	1:33	6:39:54 AM	6:04:00 AM			6:08:00 AM
Stouffville	6	4:00		6:43:54 AM	6:00:00 AM	0	6:00:00 AM	6:00:00 AM



Toronto/GTA – I-METRO-E Sphere of Influence



I-METRO-E

Stouffville GO-Line

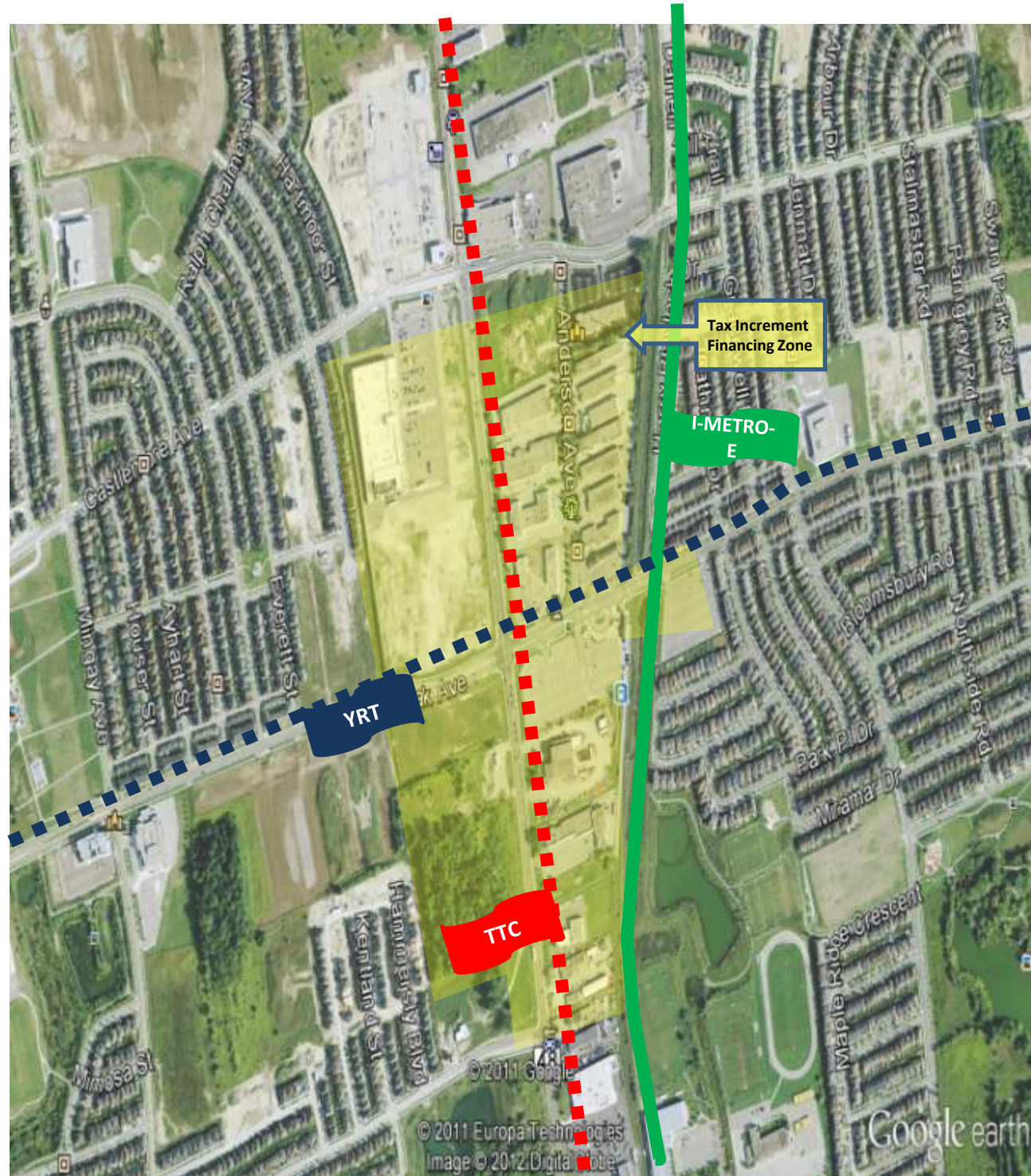
Mount Joy Station

Mount Joy Station Profile - TDD

Land Area	48.47 Hectares	
Population	-	
	2012	30,920 People
	2037	71,695 People
Employment	2012	793 Jobs
	2037	12,791 Jobs



5/2/2012



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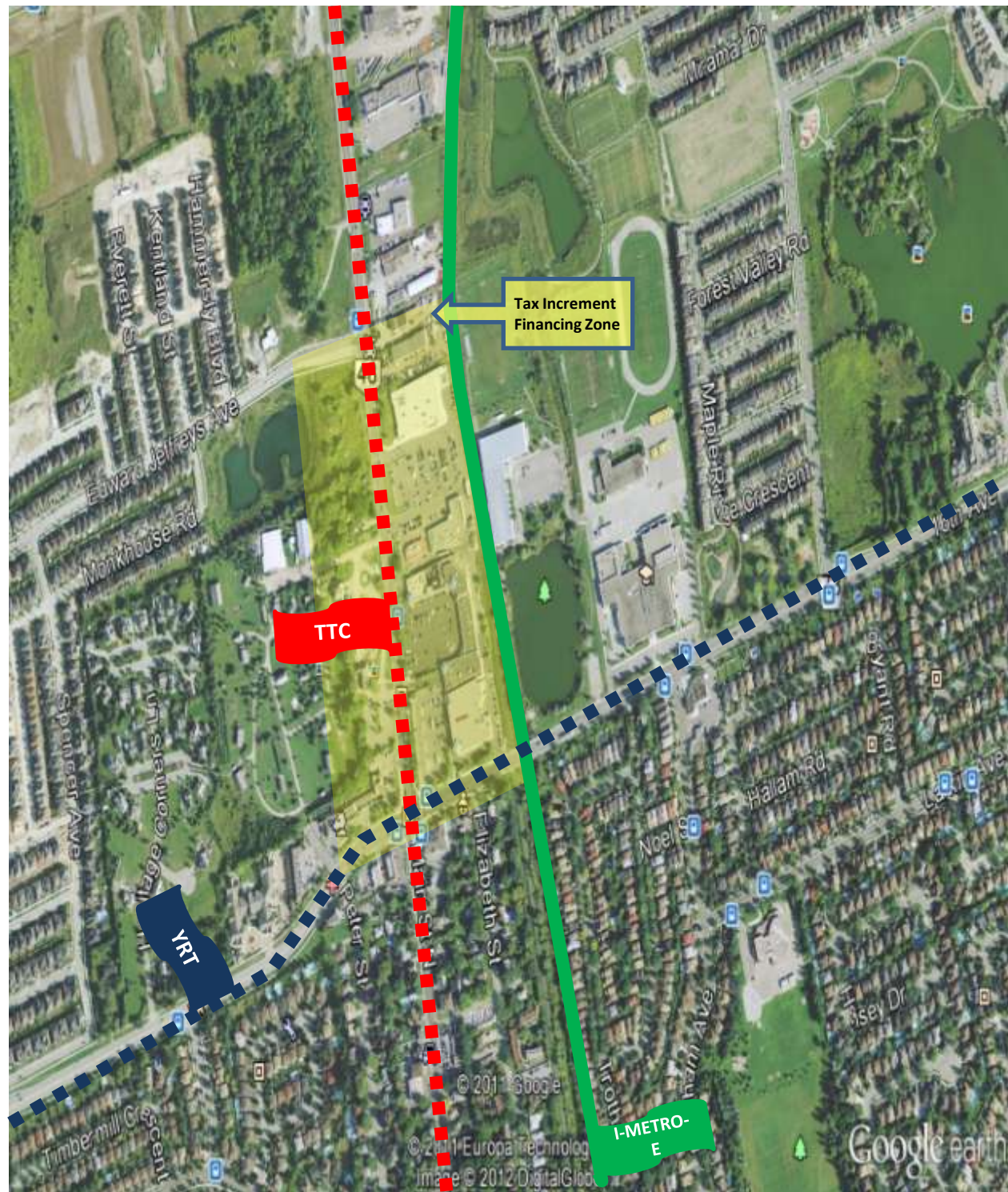
16th Avenue Station

16th Avenue Station Profile - TDD

Land Area	13.22 Hectares	
Population	2012	20,000 People
	2037	23,728 People
Employment	2012	5,525 Jobs
	2037	7,791 Jobs



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Stouffville GO-Line

Mainstreet Markham Station

Mainstreet Markham Station Profile - TDD

Land Area	5.24 Hectares		
Population	-	2012	40,955 People
		2037	47,945 People
Employment	-	2012	1,272 Jobs
		2037	2,541 Jobs



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Stouffville GO-Line

Centennial Station

Centennial Station Profile - TDD

Land Area	106.88 Hectares	
Population	-	2012 2037
		70,699 People 110,309 People
Employment	-	2012 2037
		3,966 Jobs 67,398 Jobs



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Stouffville GO-Line

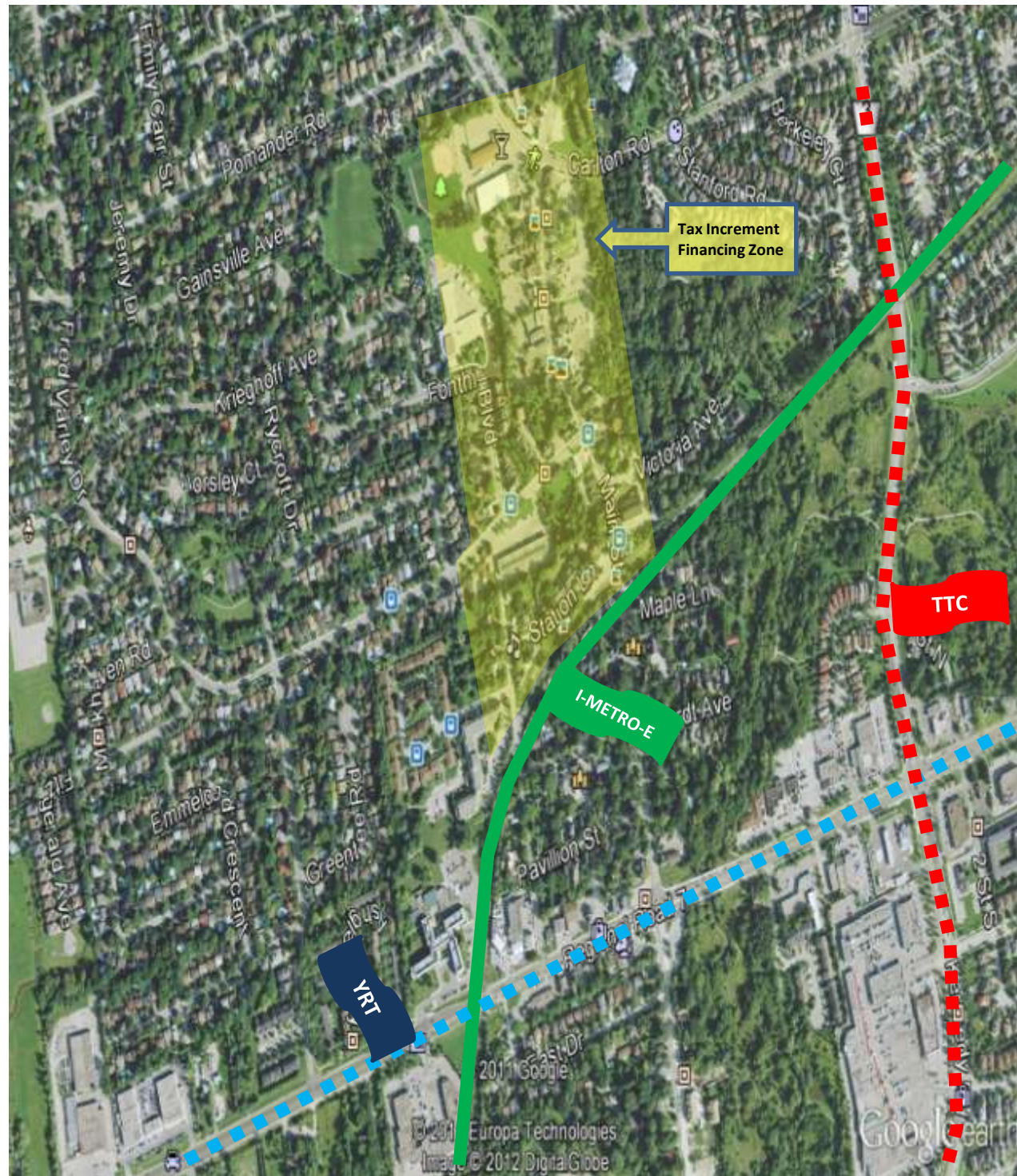
Mainstreet Unionville Station

Mainstreet Unionville Station Profile - TDD

Land Area	20.10 Hectares	
Population	-	2012
		2037
		30,000 People
		39,320 People
Employment	-	2012
		2037
		1,000 Jobs
		2,015 Jobs



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Stouffville GO-Line

Highway 7 Station

Highway 7 Station Profile - TDD

Land Area	75.88 Hectares		
Population	-	2012	64,304 People
		2037	102,749 People
Employment -		2012	2,321 Jobs
		2037	34,037 Jobs



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Stouffville GO-Line

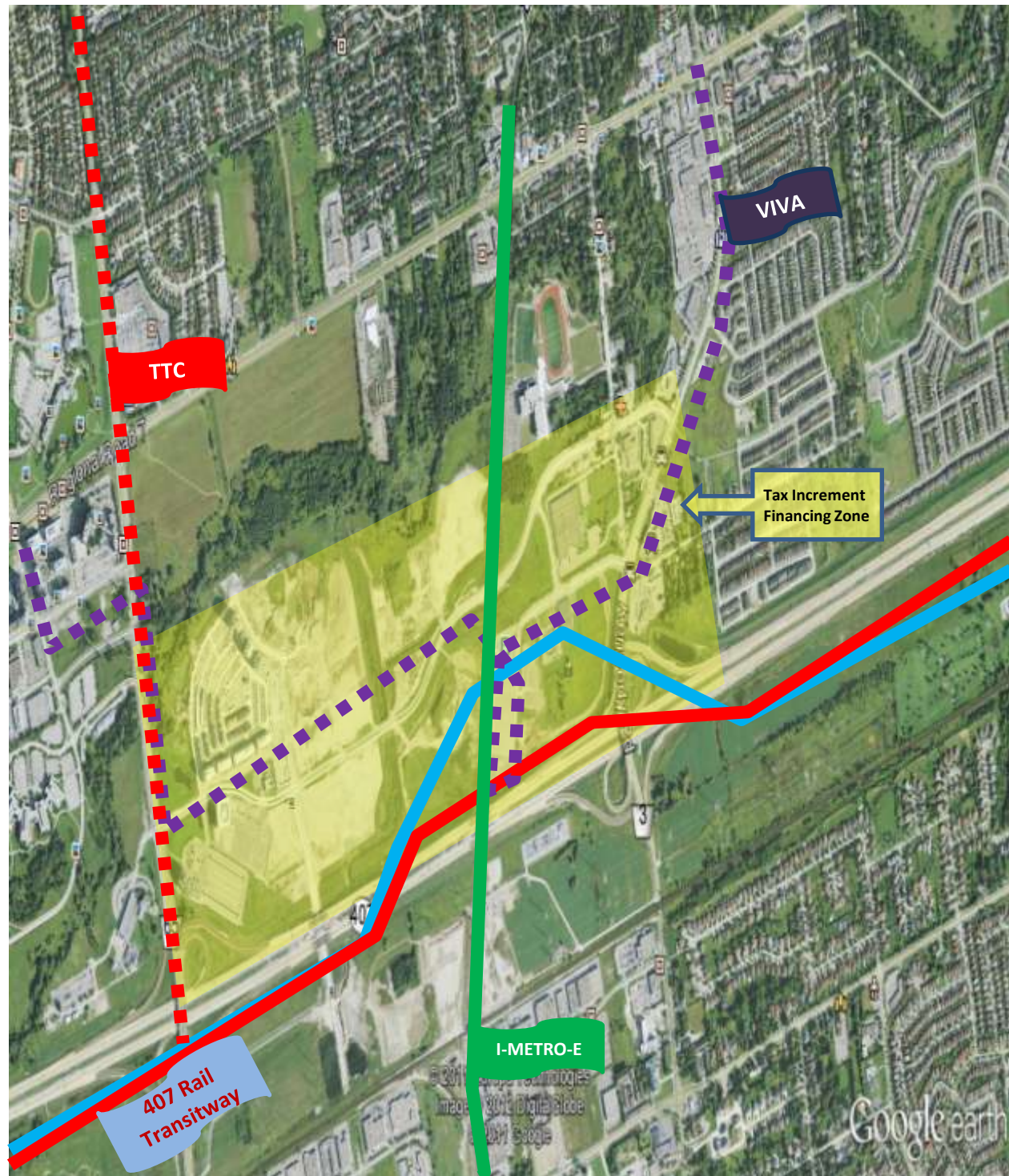
Markham Centre Station

Markham Centre Station Profile - TDD

Land Area	251.05 Hectares		
Population	-	2012	1,162 People
		2037	75,580 People
Employment	-	2012	4,054 Jobs
		2037	77,300 Jobs



5/2/2012



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Stouffville GO-Line

14th Avenue Station

14th Avenue Station Profile - TDD

Land Area	58.15 Hectares		
Population	-	2012	15,614 People
		2037	26,099 People
Employment	-	2012	3,394 Jobs
		2037	32,767 Jobs



5/2/2012



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Stouffville GO-Line

Denison Station

Denison Station Profile - TDD

Land Area	38.83 Hectares		
Population	-	2012	34,601 People
		2037	75,376 People
Employment	-	2012	3,381 Jobs
		2037	20,153 Jobs



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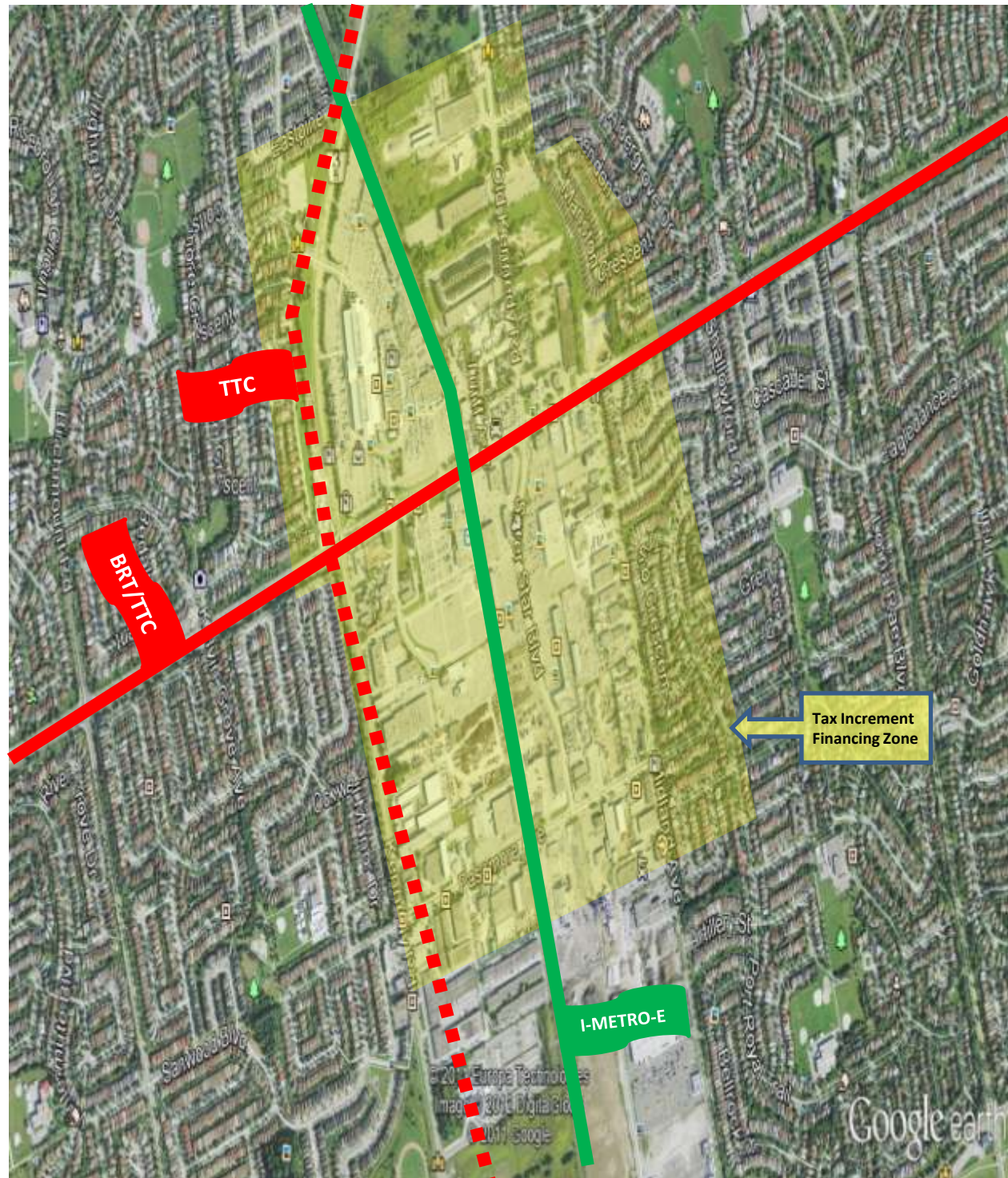
I-METRO-E

Stouffville GO-Line

Steeles Station

Steeles Station Profile - TDD

Land Area	96.51 Hectares		
Population	-	2012	35,322 People
	-	2037	85,562 People
Employment	-	2012	3,520 Jobs
	-	2037	26,753 Jobs



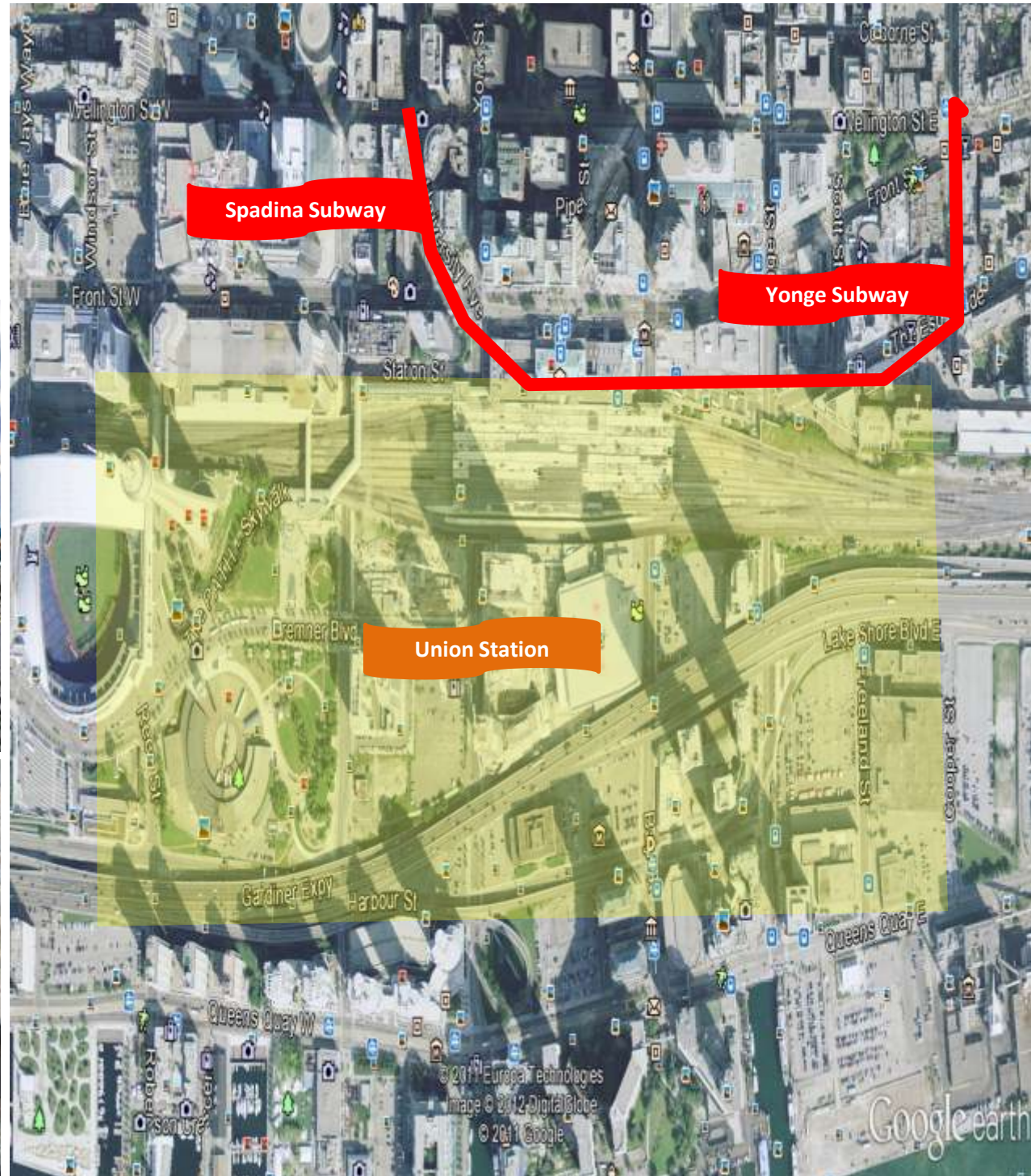
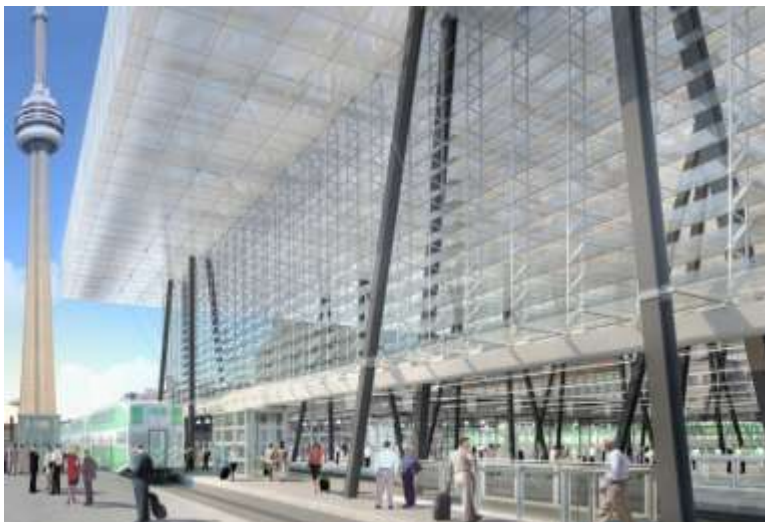
I-METRO-E

Stouffville GO-Line

Union Station

Union Station Profile - TDD

Land Area	61.91 Hectares	
Population	-	
	2012	350,454 People
	2037	373,754 People
Employment	-	
	2012	163,448 Jobs
	2037	391,802 Jobs



I-METRO-E Population and Employment Business Model

Metro Stations	POPULATION						EMPLOYMENT					
	Within 1,000m			Within 4,000m			Within 1,000m			Within 4,000m		
	People 2012	TOD 2037 (units)	People 2037	People 2012	TOD 2037 (Units)	People 2037	Off/Retail (sq. M)	Jobs 2012	Jobs 2037	Off/Retail (sq. M)	Jobs 2012	Jobs 2037
Union Station	35,459	5,000	45,959	350,454	30,000	413,454	46,188	10,000,000	299,914	163,448	15,000,000	544,037
Distillery	15,000	5,000	25,500	157,000	15,000	188,500	2,000	1,000,000	27,373	4,537	3,250,000	86,998
Dockland	3,000	5,000	15,000	10,000	40,000	94,000	3,000	1,500,000	10,000	5,000	11,000,000	40,000
Queen East	5,351	1,000	7,451	52,313	6,500	65,963	1,895	25,000	2,529	6,075	25,000	6,709
Danforth	6,102	5,000	16,602	46,403	10,000	67,403	1,142	100,000	3,679	3,982	250,000	10,325
Scarborough	5,839	5,000	16,339	47,032	10,000	68,032	320	25,000	954	1,283	250,000	7,626
Kennedy	6,474	5,000	16,974	56,777	10,000	77,777	80,077	250,000	86,420	1,849	1,906,504	50,222
Lawrence East	7,000	10,000	28,000	45,000	15,000	76,500	79,950	50,000	81,219	79,950	1,700,000	123,083
Ellesmere	7,770	20,000	49,770	51,575	25,000	104,075	3,219	500,000	15,905	10,230	1,500,000	48,289
Progress	3,500	5,000	14,000	10,000	10,000	31,000	2,000	500,000	14,686	50,000	1,985,329	100,373
Sheppard East	3,489	20,000	45,489	56,892	15,000	88,392	1,373	500,000	14,059	4,080	2,167,000	59,062
Finch East	5,572	3,000	11,872	37,790	5,000	48,290	927	10,000	1,181	2,927	100,000	5,464
McNicoll	5,000	15,000	36,500	21,374	17,500	58,124	1,490	250,000	7,833	3,932	644,120	20,275
Steeles East	5,399	21,000	49,499	35,322	22,000	81,522	1,380	1,000,000	26,753	3,520	1,788,267	48,893
Denison Street	7,232	16,000	40,832	34,601	17,500	71,351	927	250,000	7,270	3,810	644,120	20,153
14th Avenue	1,000	3,000	7,300	15,614	4,500	25,064	1,162	250,000	7,505	3,394	1,000,000	28,767
Markham Centre	5,122	25,000	57,622	15,000	26,000	69,600	1,182	3,000,000	77,300	4,054	7,000,000	181,662
Highway 7	5,255	14,000	34,655	34,304	12,000	59,504	459	250,000	6,802	2,321	1,250,000	34,037
Old Unionville	7,500	1,000	9,600	30,000	2,000	34,200	1,000	10,000	1,254	1,000	40,000	2,015
Centennial	5,497	15,000	36,997	44,304	17,000	80,004	867	2,000,000	35,000	3,966	2,500,000	47,000
Mainstreet Markham	5,788	1,000	7,888	40,955	3,000	47,255	600	25,000	1,234	1,272	50,000	2,541
16th Avenue	2,500	3,000	8,800	20,000	3,600	27,560	10,000	10,000	10,254	5,254	100,000	7,791
Mount Joy	3,360	15,000	34,860	30,920	10,000	51,920	1,240	250,000	7,583	793	472,872	12,791
Major MacKenize	1,372	15,000	32,872	14,480	10,000	35,480	1,000	250,000	7,343	453	644,120	16,796
Stouffville	10,500	1,000	12,600	40,000	20,000	82,000	3,500	250,000	9,843	2,000	709,426	20,000
Total	170,081	234,000	662,981	1,298,110	356,600	2,046,970	246,898	22,255,000	763,895	369,130	55,976,757	1,524,910
Modal Split	17,008		198,894	129,811		614,091	24,690		229,168	36,913		457,473
Assumptions												
PPU	2.10			Modal Split 2012 Office			10%					
Average Sq.M. Per Employee	39.41			Modal Split 2037 Pop			30%					
Modal Split 2012 Pop	10%			Modal Split 2037 Office			30%					

Draft - I-METRO-E

Integrated Sustainable City System Board

Sustainable TDD Station Communities

Cities cover only 1 percent of the Earth’s surface but are home to more than 50% of humanity, consume 75 percent of the available **energy** and emit around 80 percent of all harmful greenhouse gases. It is estimated that roughly 70 percent of the world’s population will live in urban centers by 2050. With urban economic output and energy needs set to soar, cities will have to massively invest in modernizing and expanding their infrastructure, and increasingly tap sustainable and eco-friendly solutions in order to reach their own climate goals..

Energy – Cities – 40% CO2 Emissions

Energy from Waste	Solar, Wind
Deep Geo-Thermal	Energy Storage
Buildings	Lighting
- 40% CO2	

Megacities, or the cities with at least 10 million residents, are inhabited by over 324 million people around the globe today. These cities are the financial centers of their countries, accounting for a major share of the national gross domestic product(GDP).

Transport is the most important of all infrastructure concerns and is the area that citizens believe has the biggest impact on a city’s competitiveness. As the backbone of a city, the transport network needs to keep pace with the needs of the growing urban populace. When it fails to do so, the economy bears the brunt. Cities need to take a leading role in protecting the climate since they are responsible for 80 percent of CO2 emissions. The most effective approaches to reducing emissions are improved insulation of buildings, use of renewable and low-CO2 energy sources, cogeneration of heat and power, and the use of economical electrical appliances and lighting.

Transportation - 30% CO2 Emissions

Electric Trains – Zero Emissions -	Personal People Movers
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Each dollar invested in improved access to **safe water and sanitation** is estimated to produce a return of \$3-34. Investing in sanitation infrastructure also has benefits for the environment. Over 80 percent of sewage in developing countries is discharged today without being treated, thereby polluting rivers, lakes and coastal areas. It is estimated that the total cost in industrial countries of replacing aging water supply and sanitation infrastructure may be as high as \$200 billion per year.

Water & Waste

Waste	Gray Water	Emissions
Drinking	Stormwater	

P3 - The public private partnership model is gaining acceptance as it is realized that P3s are the most effective to handle big infrastructure projects. Government needs to involve the private sector to fund critical infrastructure development in several areas – energy, environment, rail transit, transport and social infrastructure. P3 lending in public infrastructure has increased tremendously over the last 10 years.

Re-Wealth I-METRO-E Corridor is worth \$100s of billions of Economic Opportunity plus an excellent contribution to our people and environment. Plan, Design and build for the ground up around the I-METRO-E Transit Line



Rapid Rail Transit & Transportation
connectivity, predicable, span of service, affordable



Intelligent Buildings & Communities- Net Zero
energy/waste/emissions



Sustainable Cities



Administration & Security, Efficient, cost effective and environmentally competitive



Water & Waste

Oil Rich Abu Dhabi's "Masdar City" - Planning for the End of Oil

Sustainable Buildings | Masdar City

Today only a few buildings in the Middle East even have solar cells. But when it's complete in 2016, Masdar City will boast zero net CO₂ emissions. Narrow alleys and arcades will cool the city naturally.



Oil-Free Future?

The world's first CO₂-neutral city is taking shape in Abu Dhabi. Masdar City is to consume so little energy that local resources will satisfy requirements — without generating net emissions. If the project is successful, urban planners will have a blueprint that could help them prepare for an oil-free future.

Abu Dhabi is tapping into a new source of energy that will never dry up. No, it's not oil — even though around nine percent of the world's known reserves of that valuable resource can be found underneath the desert sand in the emirate. Instead, a project known as Masdar (Arabic for "source") will point the way toward a future without fossil fuels. In February 2008, construction began on Masdar City, a futuristic, environmentally-friendly metropolis, which Abu Dhabi will present to the world in 2016 as living proof that life without fossil fuels can offer plenty of quality.

Some 50,000 people are expected to be living in Masdar City by 2016. The car-free metropolis, to be located between Abu Dhabi City and the emirate's international airport, is a

hugely ambitious project. In fact, plans call for the city to emit zero net CO₂ into the atmosphere. In addition, the city will use solar-thermal plants and photovoltaic facilities, for example, to produce clean energy at peak times above the level actually consumed. Powerful accumulators will then make energy produced during the day available at night. One possibility for such an accumulator is offered by molten salt batteries, which have a very high energy density.

Conventional cities the size of Masdar can emit up to 22 tons of CO₂ per resident per year, which translates into total annual emissions of around 1.1 million tons. Masdar City will get this figure down to zero using state-of-the-art technologies. There are several steps that can

be taken to achieve this ambitious goal. The first is to minimize energy consumption. Here, Masdar City will have to make do with only around 200 megawatts of installed electrical capacity rather than the 800 megawatts that cities of a similar size in its climate zone are accustomed to. Cutting down on the use of fresh water is one way to go about this, as obtaining potable water requires seawater to be desalinated by power-hungry facilities. In general, closed raw material cycles and consistent recycling will keep resource consumption down in the desert metropolis. The city's remaining unavoidable energy needs will then have to be covered by power generated from alternative sources such as wind, the sun, and biofuels made from organic waste.

"We need to fundamentally rethink the ways in which cities can conserve energy and other resources," says Sultan Al Jaber, CEO of the Masdar City Initiative. "This will require extensive use of new technologies and even the creation of new urban development models, which is exactly what we're doing with Masdar City." Jaber believes Masdar City will serve as a model for the urban centers of the future — an important function, given that cities are now growing at a breathtaking rate worldwide.

Effective Building Design. The celebrated architects from Foster + Partners, who are responsible for Masdar City's overall concept, have calculated that energy-efficient city and building designs can reduce the future city's CO₂ emissions by approximately 56 percent. Their current plans call for elongated parks to cut through the city, serving as corridors that channel cool winds into its center. As is the case in traditional desert cities, most streets will be designed as small alleys rather than broad avenues. Like narrow tunnels, these al-

leys will guide the wind between houses, while the latter's arcades will provide additional shade. There are good reasons why desert cities have been built this way for thousands of years. While the temperature in Abu Dhabi feels like more than 70 degrees Celsius in the summer, the various urban architectural improvements will make the temperature in Masdar City feel more like 50 degrees.

The architectural approach being used for Masdar City has won praise from award-winning urban development expert Philipp Rode from the London School of Economics. "What exactly is sustainable ecological urban development?" he asks. "Does it refer to futuristic visions based solely on advanced technology — or is it more like 'back to nature,' where you live

Abu Dhabi will eliminate emissions with efficient buildings, renewable resources, and electric vehicles.

estimates that around half of the city's energy could be generated with photovoltaic systems, with the remainder coming from solar-thermal power plants, solar collectors, waste burning, composting, and wind facilities. Largely forgoing the use of automobiles will also help reduce greenhouse gas emissions, which is why the city will be provided with a tightly woven public transport network of electrically oper-

such as those for low-loss power transmission, innovative lighting, and water treatment, are also being discussed with a view to maximizing energy conservation.

Joachim Kundt, the CEO of Siemens LLC UAE, has lived in Abu Dhabi for many years and is thus familiar with both the challenges and opportunities associated with the emirate. "In extreme climates like those on the Arabian

Peninsula, intelligent building technologies can greatly help conserve energy," he says. "For example, building automation systems that use sensors that recognize when a room is unoccupied and then automatically turn off lights and air conditioning, can significantly cut CO₂ emissions." All of this can also be done — whether in Masdar or anywhere else in the world — without restricting comfort. Suitable technol-



gies are already available (see p. 50), and according to the Intergovernmental Panel on Climate Change (IPCC), consistent use of such technologies could lower CO₂ emissions from buildings by up to 40 percent between now and 2030.

"Masdar City is a model project," says Rode. "It will produce a man-made world that will show us what is technically feasible. The challenge — from both an urban development and technological perspective — will be to transfer the knowledge and experience gained to established urban environments." Abu Dhabi is taking the first step — and it appears that the emirate has realized that its biggest treasure is not to be found under the ground after all.

Andreas Kleinschmidt

I-METRO-E - Integrated Communities - Design Matters

Why Design Matters

The way we perceive our communities is in large part due to the design of the built environment and the degree to which it fosters a livable city. Design choices not only affect our perception of “place” but also the way we use it. While opinions of aesthetics vary from person to person, there are some core design strategies that promote vibrant neighborhoods and livable cities regardless of the chosen style and or aesthetic. Understanding that cities and neighborhoods will approach the design aesthetic of I-METRO-E stations communities differently outlines the system-wide design standards and goals that instill a high level of design quality and consistency throughout the I-METRO-E system .

The design goals of stations and the larger station areas as more than transition spaces, but as vibrant places in themselves. There is a huge opportunity for I-METRO-E to design stations as local landmarks and/or gateways to the cities and neighborhoods that they service. Transit stations move travelers from undefined space through a portal to vibrant city streets. Hence, they provide travelers with their first impression of the city, district, or neighborhood to which they are arriving. It is essential that the stations be visible, attractive, and well-integrated into the urban fabric of the area.

Community Pride & Social Cohesion:

- Boosting civic pride by revitalizing urban heritage
- Enhancing the sense of safety and security
- Delivering better public realm and services
- Returning inaccessible or run down areas and amenities to beneficial public use
- Promoting equality
- Creating well connected, inclusive and accessible new places

Economic Development:

- Producing high returns on investments (good rental returns and enhanced capital values)
- Placing developments above the competition in their local markets
- Reducing management, maintenance, energy and security costs
- Raising confidence in development opportunities and attracting high quality Investments
- Reducing the cost of rectifying urban design mistakes

Human Scale Development

- The scale and size of development should prioritize the pedestrian.
- Development should distinguish and articulate the ground floor to create an attractive, pedestrian-friendly street front.
- Primary streets should have a high level of transparency with frequent windows, doors, and/or openings to break up long blank walls.
- Large buildings should use design techniques to ensure that the massing, height, and scale of the building contribute to a human-scale environment .



I-METRO-E - Integrated Communities - Train Technologies

The Strengths of Electrification - New Economy

Health, Environment and Community

There are no local health or environmental impacts from electric trains. Electric trains receive their power from the grid – they have no emissions and they don't pollute.

Electric Trains can be powered using renewable, green energy such as wind or solar. As our province continues to work towards cleaner, greener energy sources, electric trains will immediately benefit from technological advancements.

Electric trains are more energy efficient. They reduce our carbon footprint and our contributions to global climate change. Electric vehicles are approximately four times more efficient than vehicles using internal combustion engines.

Electric trains are lighter and quieter. They don't disrupt the activities of residents and businesses. Lighter trains also require less energy to operate.

Electric Trains are faster. Electric trains can accelerate much faster than diesel locomotives, permitting many more stops and significant improvement in travel times. Using electric trains will better support the overall transit needs along the I-METRO-E corridor.

Economics

Electric Trains are feasible. Electrification costs \$5 million per kilometer. The cost of electric rolling stock will not differ significantly from that of diesel, and there will be lower maintenance costs because the lighter equipment will cause less wear on infrastructure.

Now is the ideal time for investment. The relative cost of financing, materials and equipment is at an all-time low due to our efforts to stimulate economic recovery. This is an advantage that cannot be expected 15 years from now. Furthermore, pollution increases generate secondary costs to our healthcare system and to our workforce, as well as lifelong impacts on the health of our children. Electrifying the corridor at a later date will mean higher costs and wasted public tax dollars. Given the serious negative impacts and unknown costs of diesel emissions on public health for the next 15-50 years, we cannot afford not to electrify now.

Electric trains stimulate the economy. An investment in electrification of the systems now will stimulate Ontario's electric train, technology and energy industries, creating green jobs. It will position Ontario's industries to capitalize on the move to electric rail that is happening in California and elsewhere in the United States.

Electric Trains will allow for the Transformation of the I-METRO-E corridor into many transit stations, create excellent TDD communities, allow for tremendous economic vitality and gives the transit user flexibility and mobility they never had before.



A study funded by the U.S. Federal Transit Administration found that over the next 25 years, 14.6 million households, which represent one-quarter of all new households, will likely be looking for housing in transit-dependent developments.



I-METRO-E – Why should it be a Public Private Partnership (P3)

P3 Definition:

The main advantage of public private partnerships is the creation of value for money, which is a collection of several factors. The most important value for money-drivers are the transfer of risk, the output based specification, the long-term nature of contracts, the performance measures, the increased competition and the private sector management. Other important advantages of public private partnerships are the quicker delivery of projects, the improved incentives to market forces, the cost efficiencies, the broad support for P3 and the improved cost calculations by the public sectors.

The overall goal of P3 projects is to find solutions to problems in which the advantages of the private sector (such as financial assets, efficient management, propensity to innovative and entrepreneurship) are combined with the advantages of the public sector (such as social and environmental concern). When done right, P3 projects can be a very powerful tools to quickly construct new infrastructure facilities and operate them efficiently.

What is Design, Build, Maintain, Operate, Transfer? - Vancouver's Canada Line



Largest P3 on Rapid Transit at that time In North America

Canada Line is a rapid transit line in the [Metro Vancouver](#) region of [British Columbia, Canada](#). Opened in August 2009, it is the third line in [TransLink's SkyTrain](#) metro network, servicing [Vancouver, Richmond](#), and the [Vancouver International Airport](#). It is coloured turquoise on route maps.

The Canada Line comprises 19.2 kilometers (11.9 mi) of track; the main line goes from Vancouver to Richmond, while a 4 km (2.5 mi) spur line from [Bridgeport Station](#) connects to the airport. Originally scheduled to open on November 30, 2009, it opened fifteen weeks ahead of the original schedule, well in advance of the [2010 Winter Olympics](#) in the following February.

The Canada Line was anticipated to see 100,000 boarding's per day in 2013, and 142,000 boardings per day by 2021, but it has consistently exceeded early targets. Ridership has grown steadily since opening day, with average ridership of 83,000/day in September 2009; 105,000/day in March 2010, and 110,000/day in February 2011. During the 2010 Winter Olympics, the line's ridership increased a further 118 per cent to an average of 228,190 per day over the 17-day event.

Governance of the project was through Canada Line Rapid Transit Inc. (CLCO), formerly RAV Project Management Ltd. (RAVCO, a reflection of the original "Richmond-Airport-Vancouver" name). The line was built by [SNC-Lavalin](#), which will also operate it for 35 years. The Canada Line is operationally independent from SkyTrain's [Expo](#) and [Millennium](#) lines, but is considered part of the SkyTrain network as it is also light metro rapid transit, using fully automated trains on grade-separated guideways.

The Canada Line begins in [Downtown Vancouver](#) at [Waterfront Station](#) (0.0 km) in a cut-and-cover subway tunnel beneath [Granville Street](#). It quickly transitions into twin bored tunnels, heading southwest beneath Granville Street, then curving southeast to follow [Davie Street](#) through [Yaletown](#). The tunnels then dive deeper to pass below [False Creek](#) before rising back up to [Olympic Village Station](#) (2.7km). There, the line transitions back to a cut-and-cover tunnel (which is noted by the tunnel going from being circular to square shaped) heading south under [Cambie Street](#), some portions of which have the two sets of tracks stacked vertically on separate levels. The line finally emerges from the ground just south of 64th Avenue, climbing to an elevated guideway. The Canada Line was built as a [public-private partnership](#). Funding was provided by both government agencies and a private partner, the proponent. As of March 2009, the entire project was expected to cost \$2.054 billion. The premier of BC has furthermore stated that the project is on budget and ahead of schedule. When approved in December 2004 the cost was given as \$1.76 billion.

The public contributions to the budget comes from the following sources:

- [Government of Canada](#): \$450 million
- [Government of British Columbia](#): \$435 million
- [Vancouver Airport](#) Authority: \$300 million
- [TransLink](#): \$334 million
- City of [Vancouver](#): \$ 29 million

The private partner was expected to contribute \$200 million, as well as being responsible for any construction cost overruns. As of November 7, 2009, InTransitBC has invested \$750 million. InTransitBC is a joint venture company owned by SNC-Lavalin, the Investment Management Corporation of BC and the Caisse de Depot, Quebec

I-METRO-E - Integrated Communities - Environmental Assessment Process

Environmental Assessment (work-in-process)

- Determine the best financial solutions - Mitigate the Environment
- Total Open E/A process that involves both municipalities (Toronto and Markham)
- Report to an expert committee including political
- Streamline the environment process
- Townhall meeting including expert witnesses on important topics

Financing Considerations (work-in-process)

- Tax Increment Financing – (TIF)
- Development Charges
- Road Pricing
- Parking Fees
- Taxes
 - Regional Sales Tax
 - Regional Gas Tax
 - Special Payroll Tax
 - Regional Registration Tax
- HST
- Employer Tax
- Road Tolls
- Sin Tax
- Property Tax
- Automobile Registration License Tax
- Driver's License

I-METRO-E

Markham East Toronto Rapid Ontario Express



Transforming a GO-Line into a METRO Line