

Thoughts on Sustainable Urban Development Guidelines

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12 Nov 2020



Traffic Calmer
merging mobility + civility

Direction

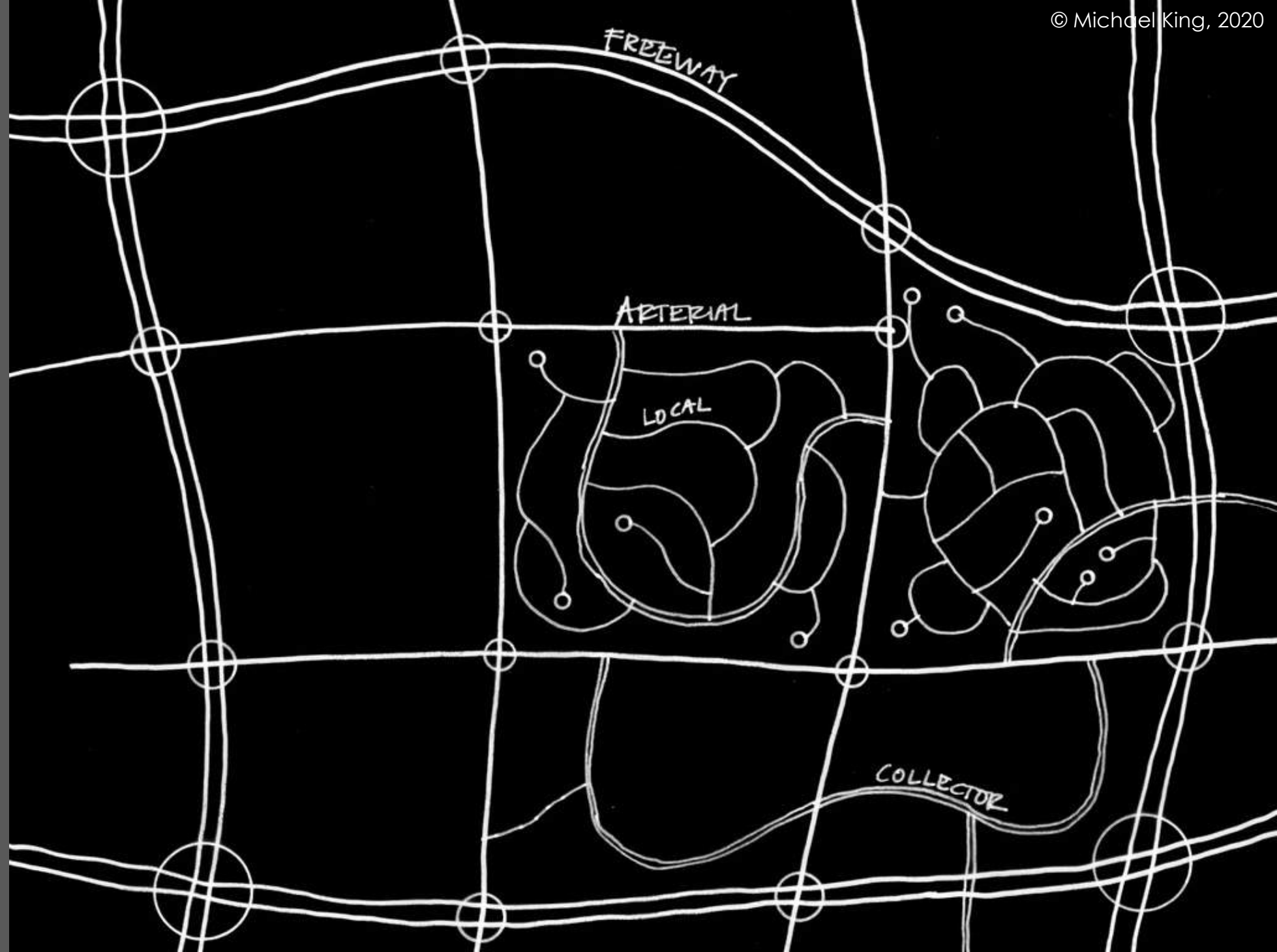
- Develop site/area plans & street layouts based on UN SDG and other principles, specifically:
 - transit-oriented
 - walkable urbanism
 - 15-minute cities
 - neighborhood/community centered
 - respect for natural environments
 - access to parks
 - bicycle connections to trails
 - safety for vulnerable users
 - equity for all
- personal security
- Emulate plans/cities with similar principles.
- Reject organizing areas with a MV-based structure, functional classification and the like, because it privileges drivers. MVs can be accommodated, but are not the basis for the development.

Typical MV-based grid layout based on functional classification

- Limited access highways (freeways) at 1km spacing
- Arterials at 500m spacing
- Collectors at 250m spacing and so on.

To illustrate how arbitrary this layout is, freeways in some places (USA, AUS) are on a 1 mile grid, which is 1.6 km.

Instead of managing traffic, evidence suggests this merely induces driving demand. Build it and they will drive.



Based on UN SDGs, <https://www.un.org/sustainabledevelopment/>

VISIONING

Potential metrics based on UN SDGs

- **5.B** Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women.
 - Streets & transit that appeals to women
 - Personal security
- **6.3** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
 - Sustainable street infrastructure
 - Development patterns that respect nature
 - Recycling bins
- **7.2** By 2030, increase substantially the share of renewable energy in the global energy mix.
 - Solar/wind powered street infrastructure
 - Solar/wind/hydro powered transit
- **9.1** Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.
 - Affordable transit
 - Resilient infrastructure like rain gardens
- **9.A** Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States.
 - Same as 9.1
- **10.3** Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard.
 - NMT & transit is more equitable than MVs
 - 15-minute towns are more equitable because all you have to do is walk

Potential metrics based on UN SDGs

- **11.1** By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums
 - Our plans will ensure access
- **11.2** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons.
 - Our transit (public transport) will ensure access
 - Our streets and transit will be accessible
 - Streets, by definition provide access
 - Connected grids ensure access
 - Complete streets
- **11.3** By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.
 - Our plans will ensure access
- **11.4** Strengthen efforts to protect and safeguard the world's cultural and natural heritage.
 - Our plans will do this
- **11.5** By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.
 - Complete streets
 - Safe system approach (vision zero)
 - Sustainable street infrastructure
- **11.6** By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
 - Our plans will reduce environmental impact of MVs (air pollution, noise pollution, etc.)
- **11.7** By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities.
 - Complete streets
 - Safe system approach (vision zero)
 - Our plans will prioritize vulnerable populations

Potential metrics based on UN SDGs

- **11.A** Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning.
 - Our plans will do this
- **11.B** By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.
 - Our plans will do this
- **11.C** Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.
 - Our plans will do this
- **13.2** Integrate climate change measures into national policies, strategies and planning.
 - Our plans will do this.
- **15.9** By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.
 - Our plans will do this.
- **16.1** Significantly reduce all forms of violence and related death rates everywhere.
 - Safe systems (vision zero)
 - Transit is safer by definition than driving
- **16.3** Promote the rule of law at the national and international levels and ensure equal access to justice for all.
 - Our plans ensure equal access
- **17.9** Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the sustainable development goals, including through North-South, South-South and triangular cooperation.
 - Our approach is progressive and will engender capacity-building.

Other potential metrics

- Ensure 24/7 and short access to daily activities (school, market, park).
- Ensure school-age children can walk/cycle to school independently.
- Ensure children of walking age above are physically protected from MVs.
- Ensure complete streets, safe systems principles, universal access.
- And so on...

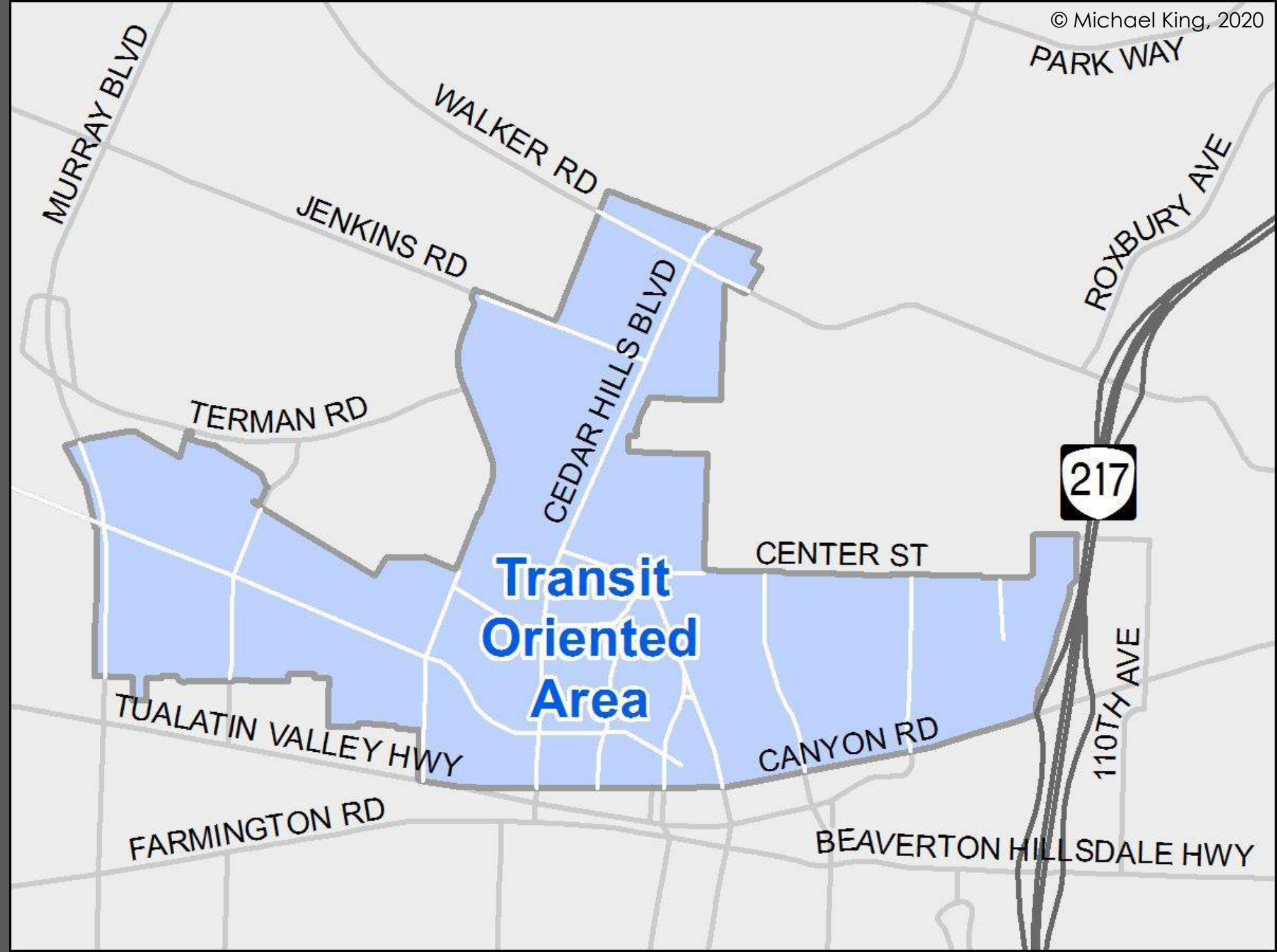
DIAGRAMS

Beaverton OR, USA

© Michael King, 2020

Simple diagram showing relationship of TOD area and highway (217).

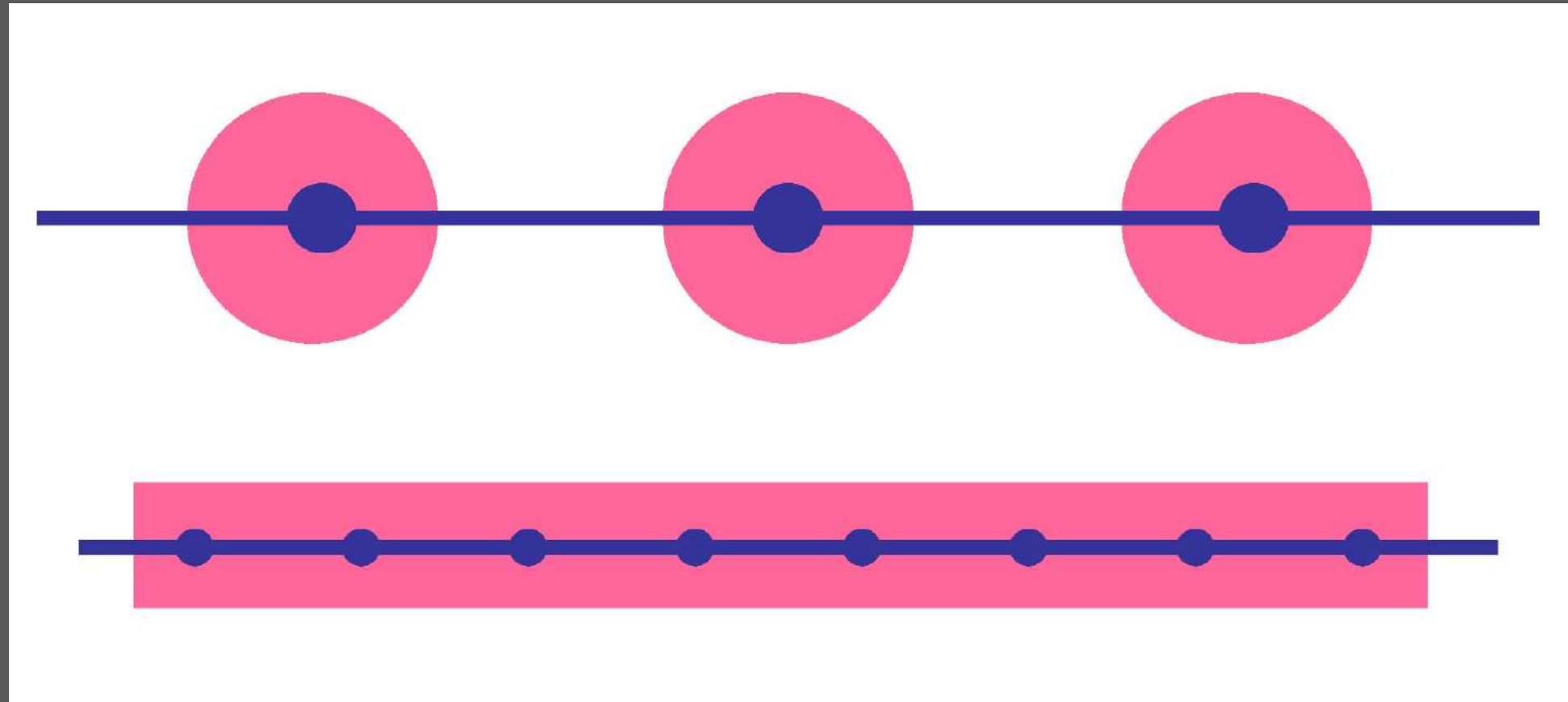
<https://www.beavertonoregon.gov/ImageRepository/Document?documentID=18356>



Development follows transit

Top: Nodal (Metro, express bus) transit. Development around stations.

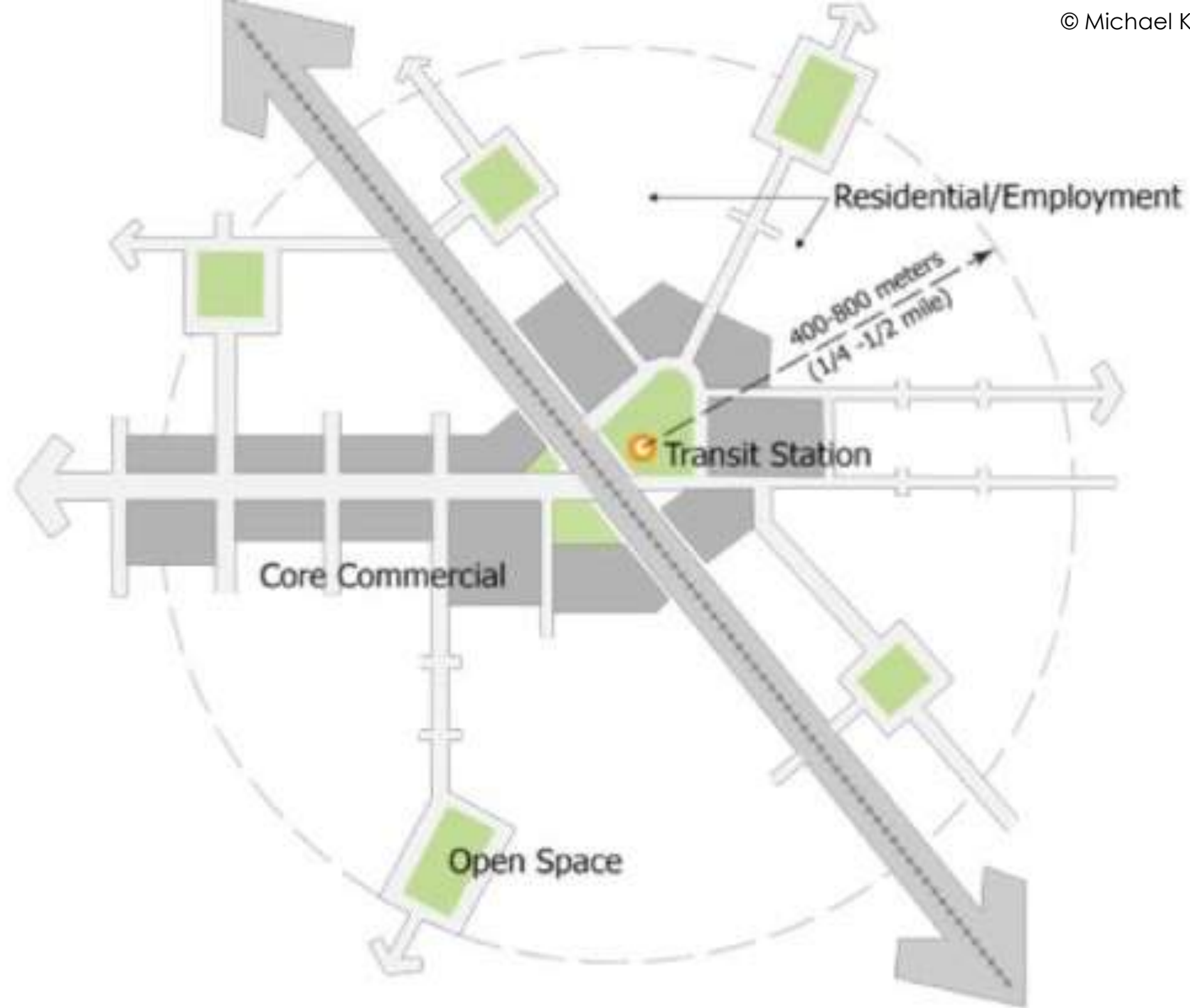
Bottom: Linear (BRT, LRT, local bus) transit. Development along a corridor.



Typical 10-minute neighborhood

At the 10 minute (800m) level, we have a transit station, core commercial and a collection of 5-minute neighborhoods.

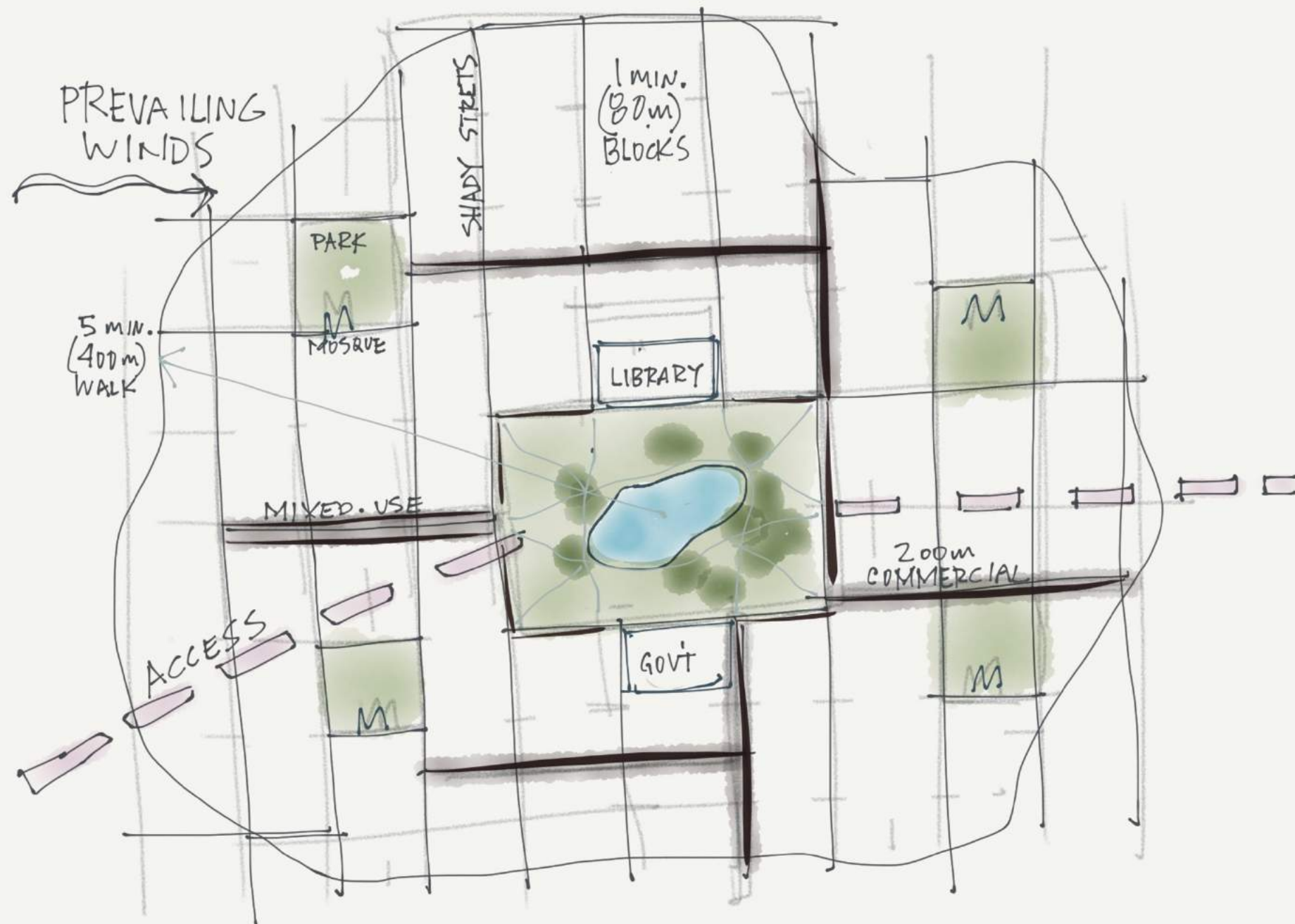
<https://www.pinterest.com/blob:39d-3f4c-49a6-bb17-fbd0ffc84311>



Typical 5-minute neighborhood

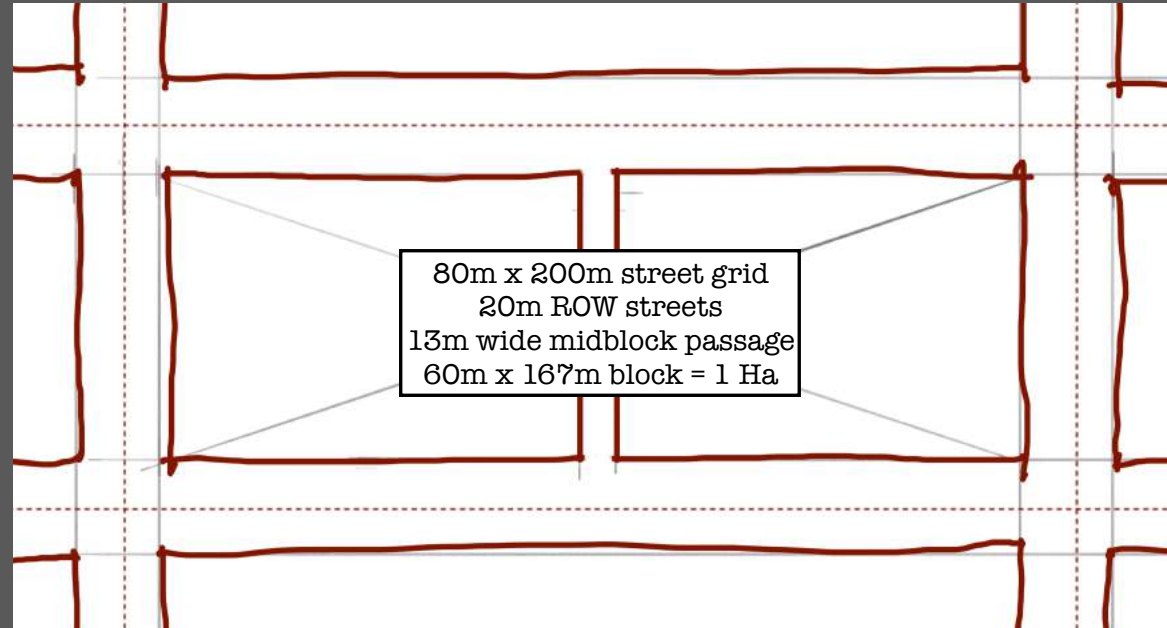
At the local level (400m, 5 min) we want to have a system where people can access everyday services (shops, school, government offices, local transit) within 5 minutes.

At the micro-level (200m) we can have local parks and mosques.



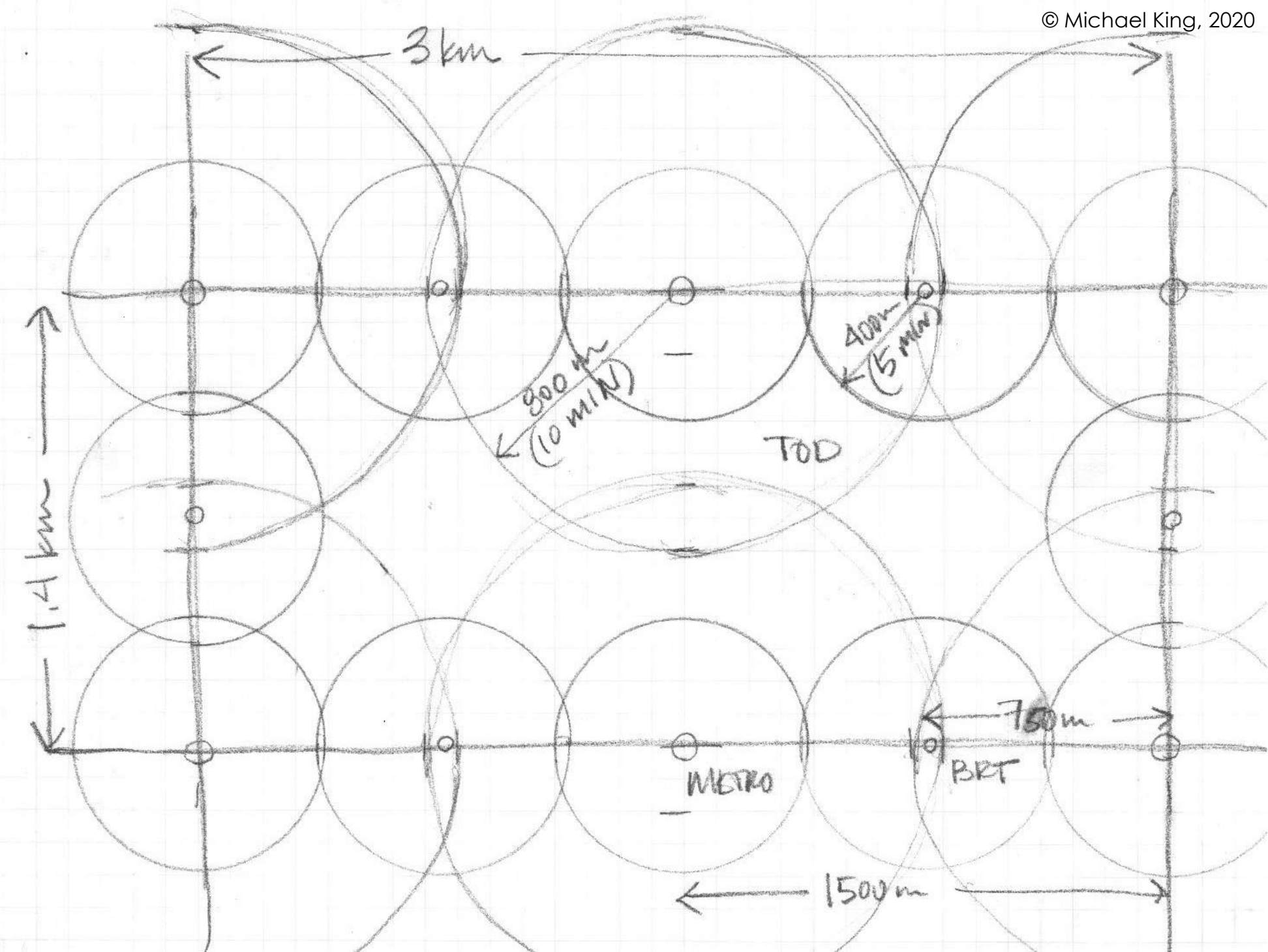
Ideal block size, 80x200m

- 80m is a one minute walk (10 blocks is 800m)
- 200m is an “armature” and a good distance for a commercial street (5 minutes to walk down and back).
- Use an average 20m street right-of-way (ROW). Globally the range of city streets is 10-30m, with 40m boulevards.
- Allow for a 4-13m wide passageway midblock. This can be incorporated into the buildings.
- Resulting developable area is 1 hectare (60m x 167m).



Superblock with transit on exterior roads

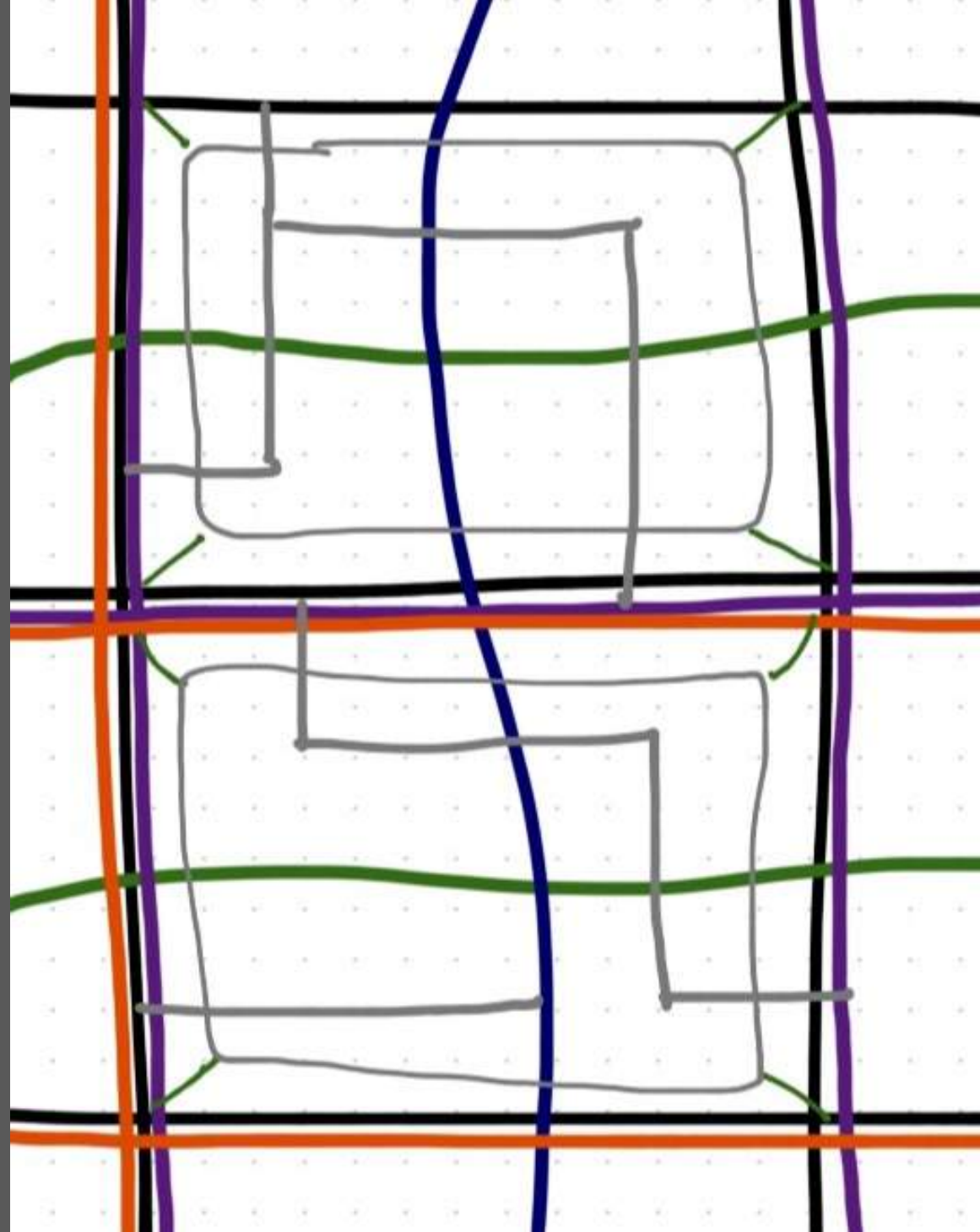
This diagram shows the walking distances to transit (10 min to Metro, 5 min to BRT). Transit is placed on the exterior roads of the superblock. Metro stations are spaced at 1500m and BRT stations are spaced at 750m.



Brampton, Ontario, Canada superbloc diagram

Diagram of a typical superbloc
in Brampton. Size is roughly 1.5
km x 1.5 km.

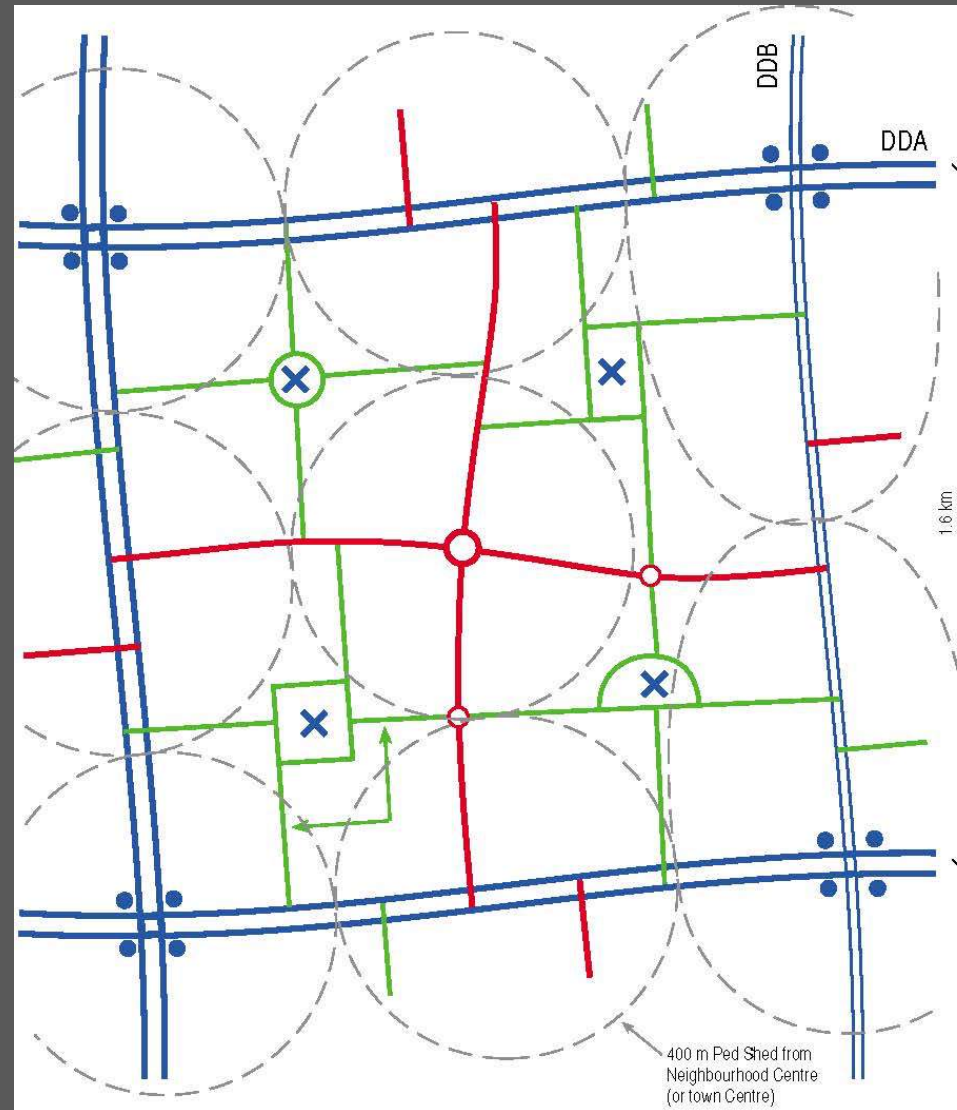
- Red expressways
- Black arterials
- Purple BRT
- Green greenways and paths
- Grey local streets



Western Australia superblock diagram

- 1.6 km superblock (blue)
- Collector on 800m spacing (red)
- Internal roads on 400m spacing (green) with efforts to minimize through traffic
- Ped shed (400m circles) shows walking to neighborhood center, but also to large roads – *confusing!*

<https://www.planning.wa.gov.au/Liveable-neighbourhoods.aspx>



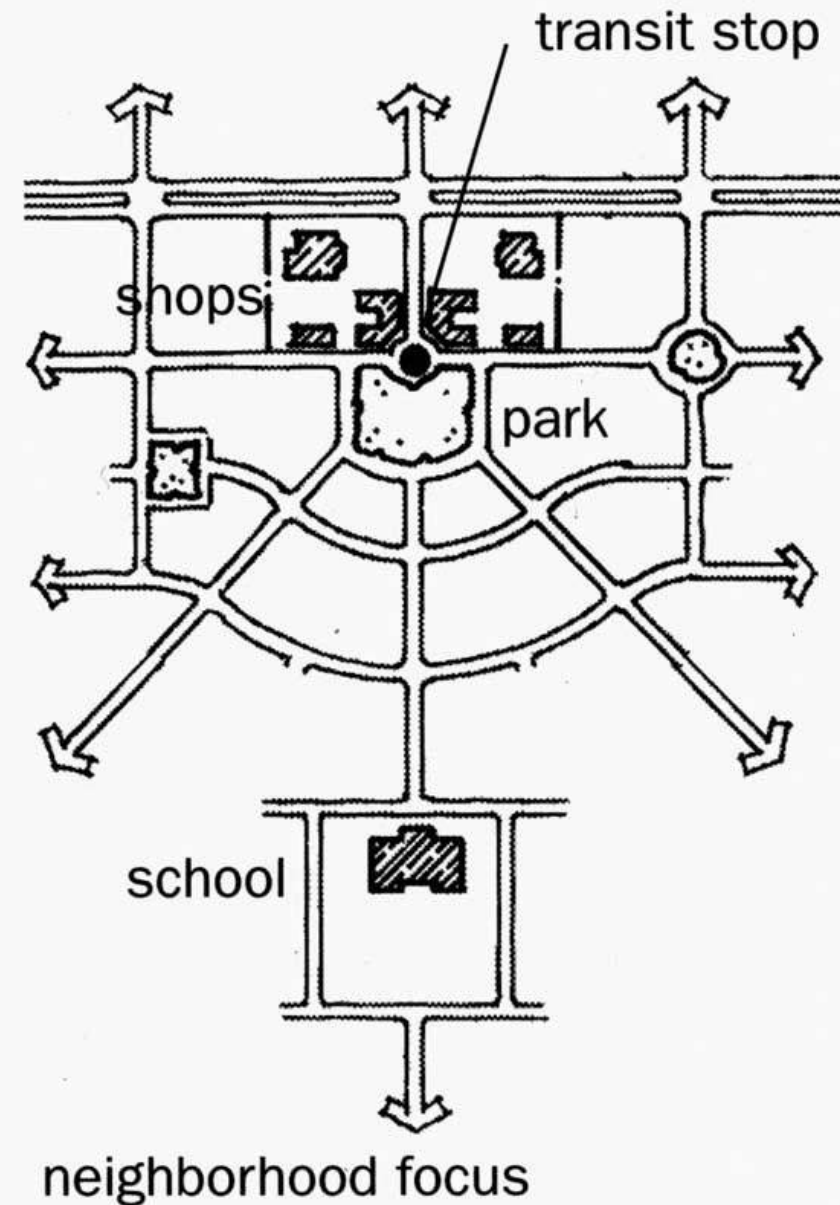
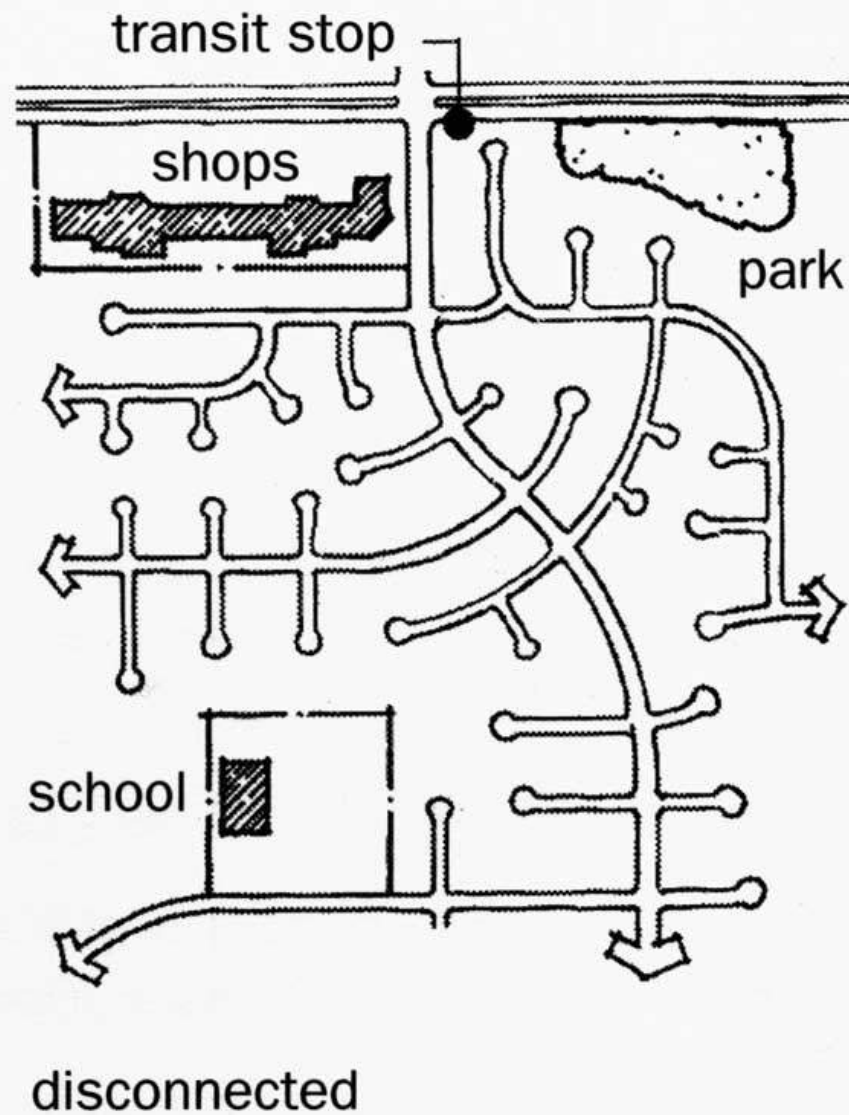
- Signals at Arterial/Arterial intersections.
- Primary roundabouts (10-12 m dia.) at Neighbourhood Connector/Neighbourhood Connector.
- Intermediate roundabouts (10-12 m dia.) at Wider (7.2 m) Access Street/Neighbourhood Connector.
- District Distributor (Integrator Arterial Type A) (DDA).
- District Distributor (Integrator Arterial Type B) (DDB).
- Neighbourhood Connector.
- 7.2 m Access Street (only ones used for traffic management purposes are shown).
- Discontinuity device or street block reorientation to control length of straight (speed control) and to help control rat running.
- Maximum distance to 7.2 m Access Street = 200 m from any property.

Connectivity or not

Diagrams showing the difference between a disconnected set of streets (left) and connected streets (right).

The connected neighborhood provides better internal and external access, quicker walks to transit, and more centralized services (park, shopping).

https://webpages.uidaho.edu/larc301/tod_files/sprawlvsfocus.jpg

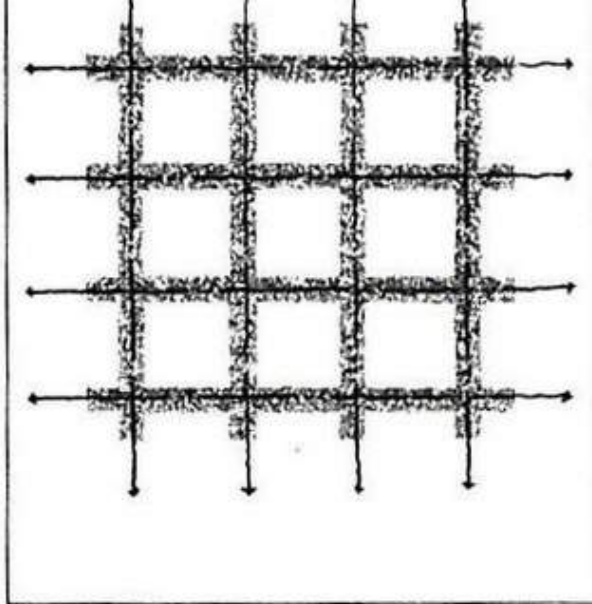


Connectivity diagrams

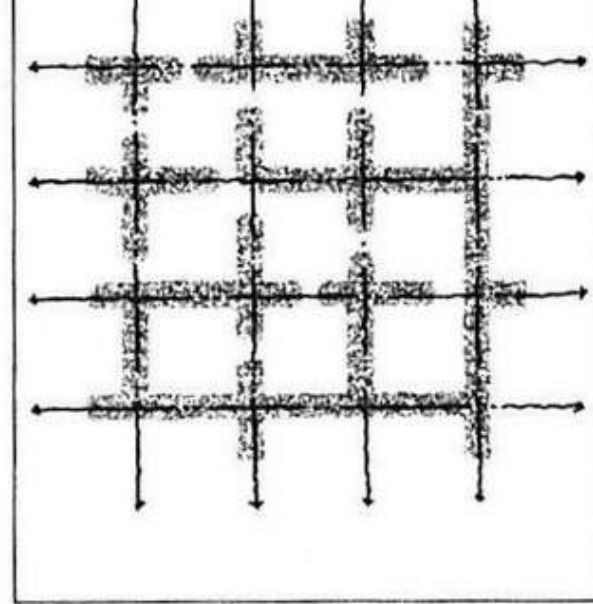
© Michael King, 2020

Diagrams showing ways to increase connectivity in street layout. All connections do not have to be for MVs.

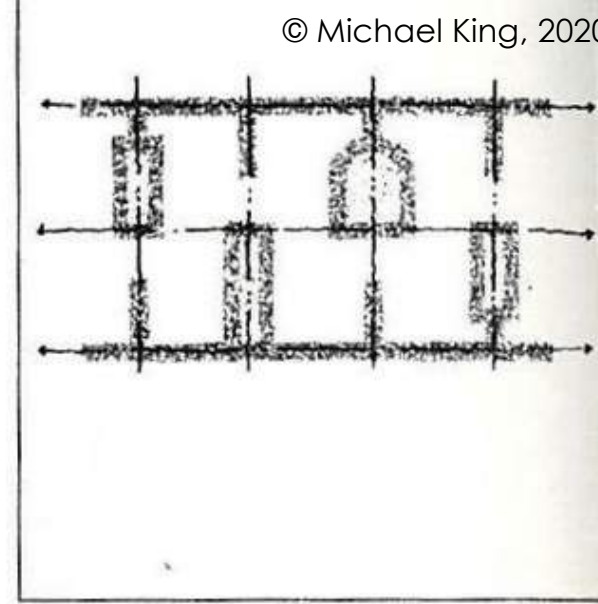
Streets and the Shaping of Towns and Cities, M Southworth & E Ben-Joseph, Island Press, 2003.



Conventional open gridiron

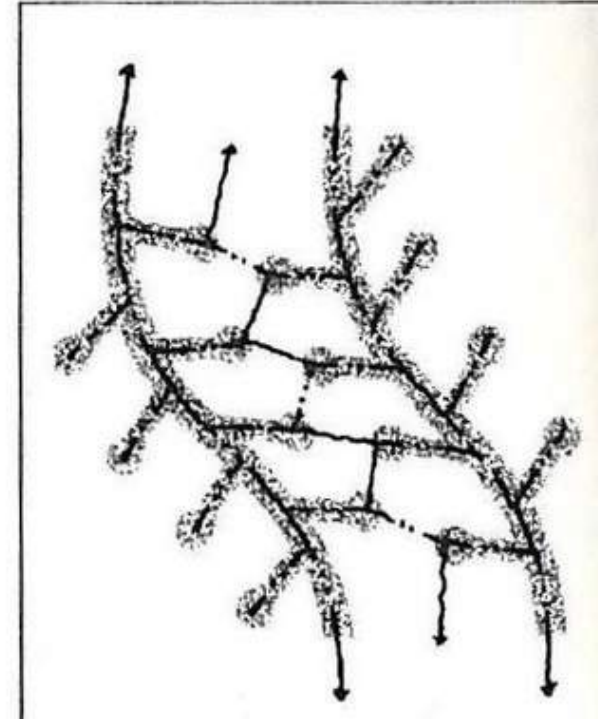
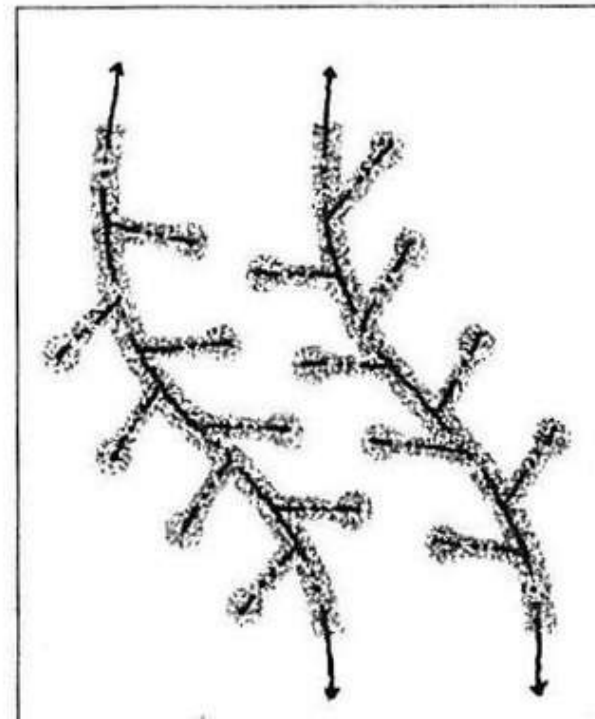


Gridiron with pedestrian connectedness and vehicular disconnectedness



Connected cul-de-sacs and courts with public spaces

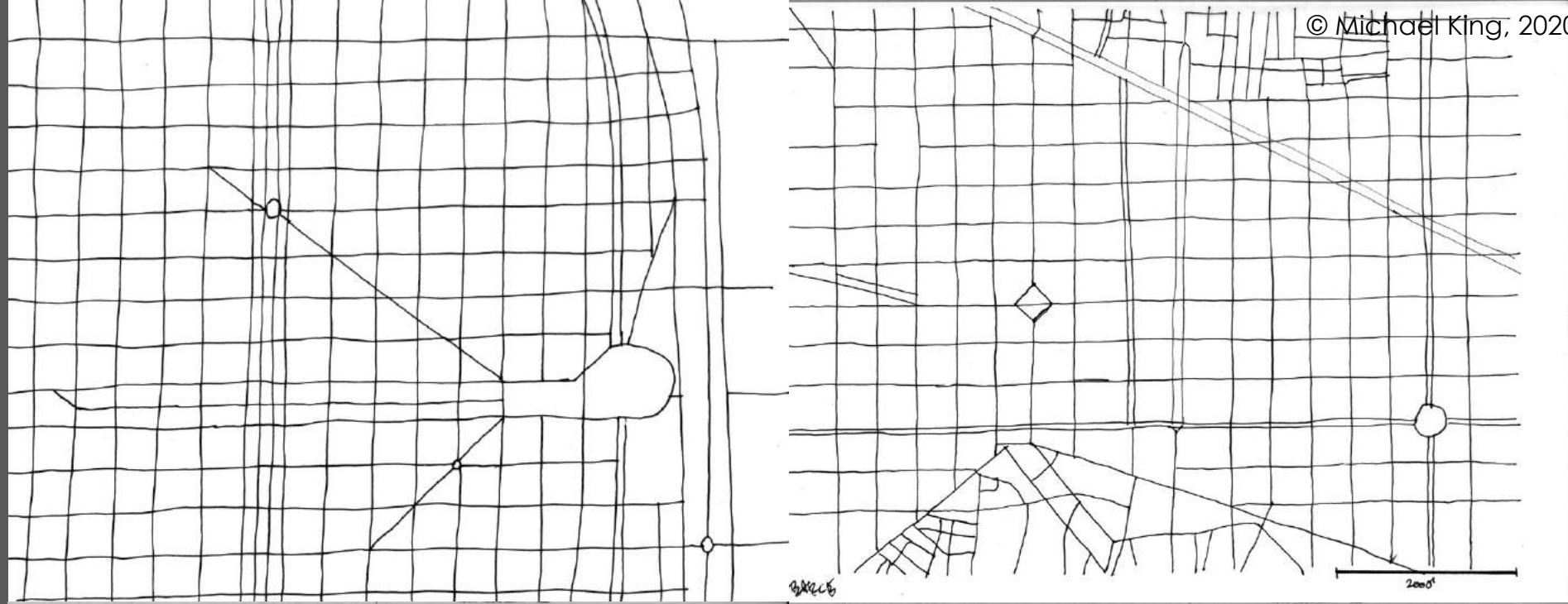
It would be possible to design new residential districts, and to retrofit old ones, to offer the best of both worlds: the interconnected pedestrian network and the limited access vehicular system. By connecting cul-de-sacs and loops with each other and with neighborhood destinations, a walkable neighborhood



Superblock or not

© Michael King, 2020

Diagrams comparing grids of two not superblocks (top: Buenos Aires, Barcelona) with two superblocks (bottom: Chandigarh, Abu Dhabi) at the same scale. Top grids are 100m-120m while bottom is 300-1500m.



Surprisingly, when you include all the local streets, paths and alleys, the total number of streets and intersections are about the same size.

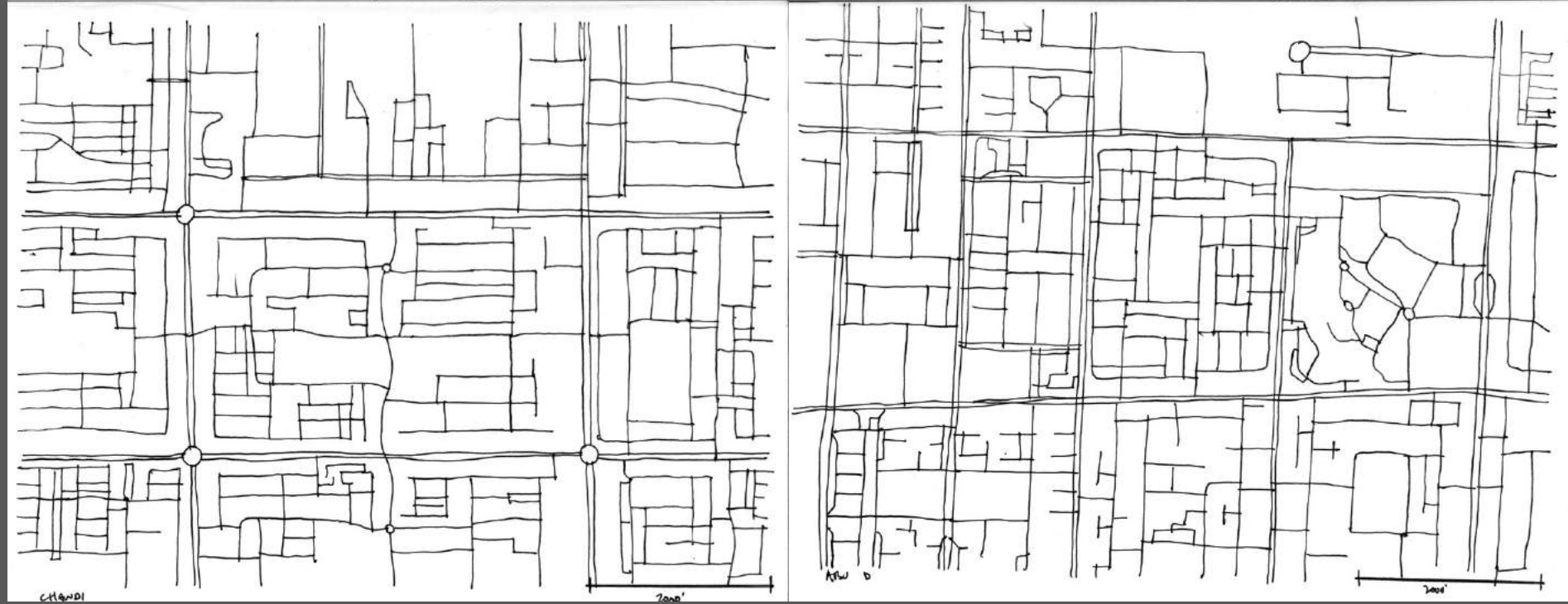
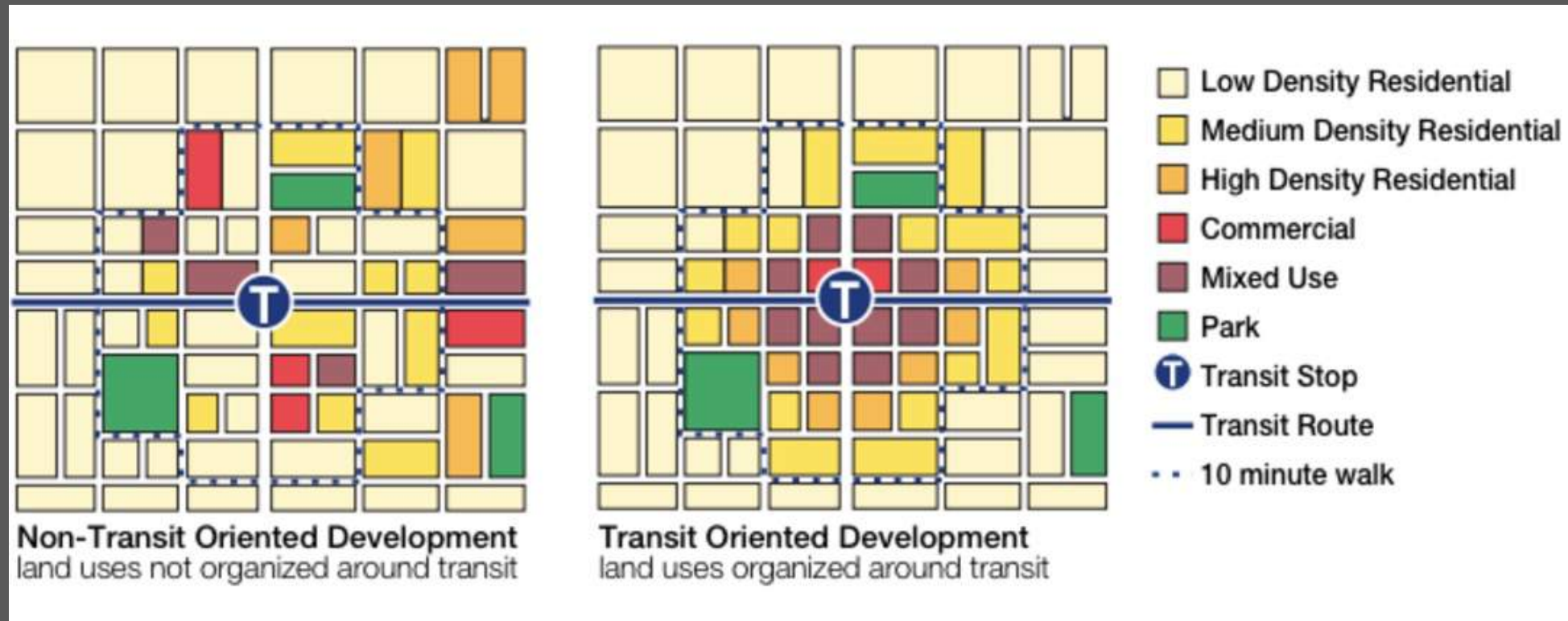


Diagram illustrating that land uses need to be near the transit hub (within a 10 minute walk) for it to be TOD.

https://res.cloudinary.com/saga-city/image/upload/c_crop,h_265,w_671,x_0,y_0/c_scale,w_1080/v1397366821/Screenshot_2013-03-13_at_2.34.33_PM_df1qrn.png

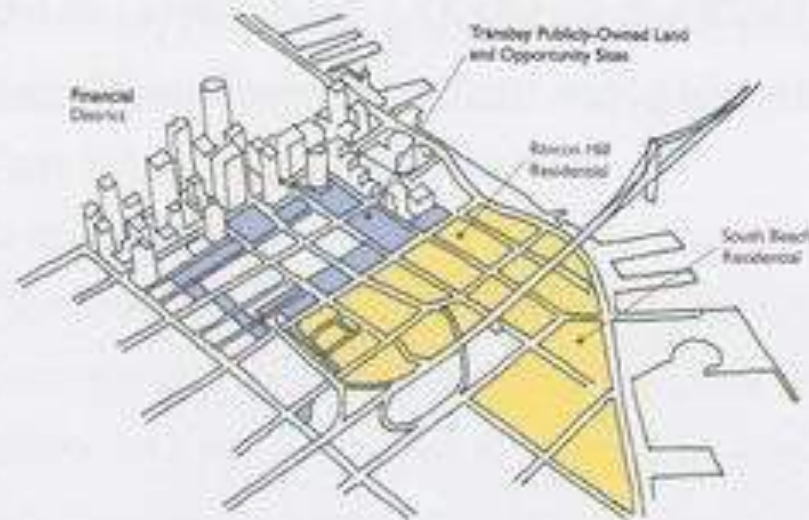


ANALYSES

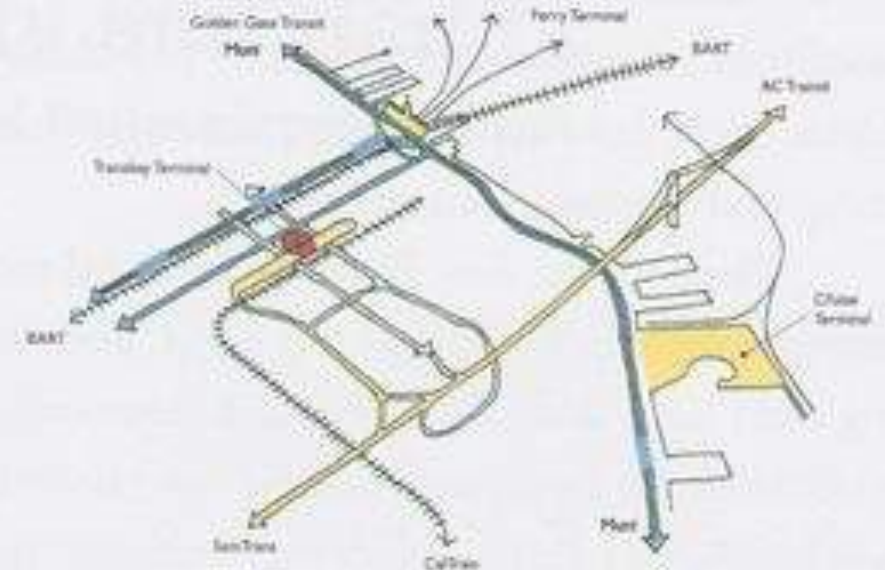
Example of analyzing and understanding a site.

- Context and proximity
- Transit
- Walkways
- Neighborhood open space

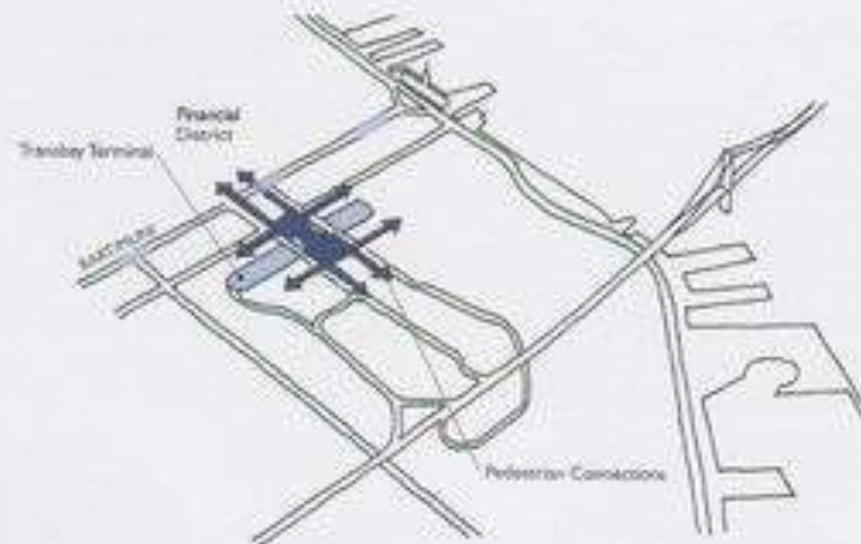
<https://i.pinimg.com/originals/9a/db/b3/9adbb35e676bf05e1b38b70c417f1741.jpg>



Context of the development near the financial district and residential neighborhoods



The highest transit access near the development



Pedestrian connections to the terminal

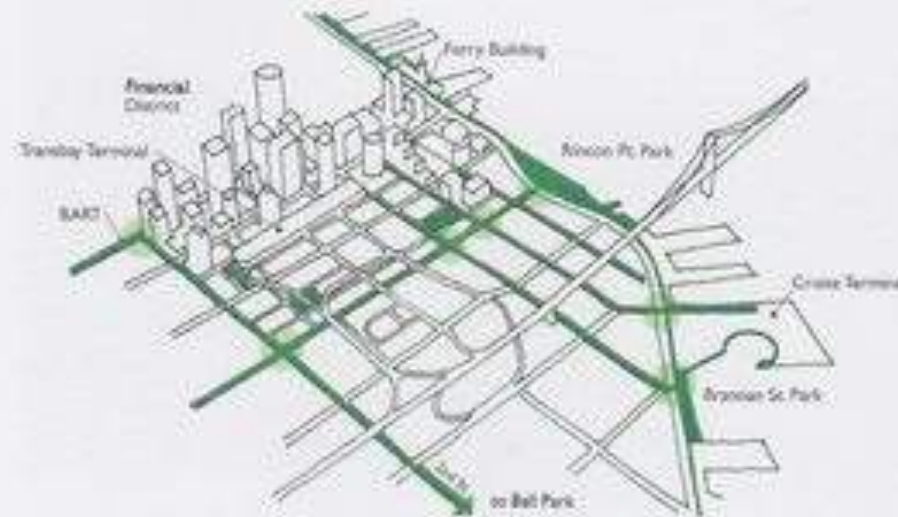


New open spaces in the neighborhood

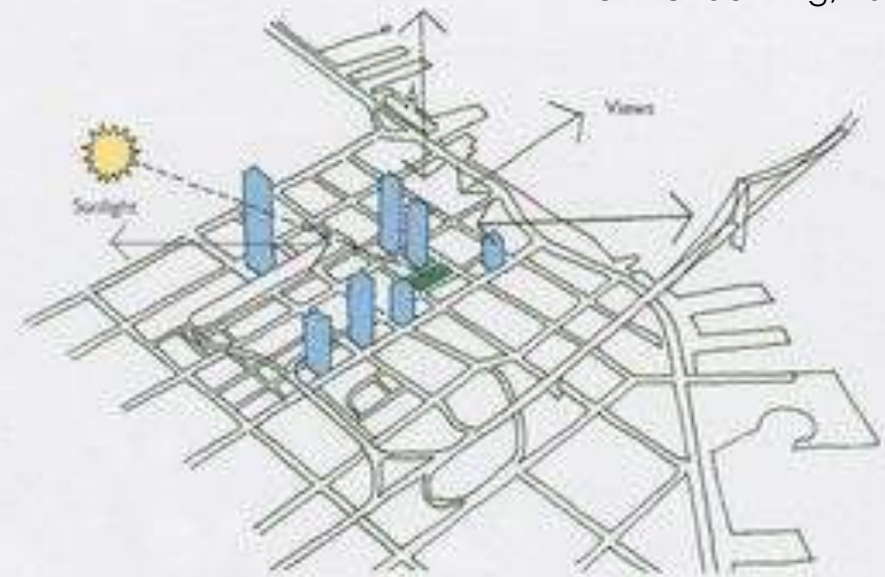
Example of analyzing and understanding a site.

- Open space connections
- Sunlight and views
- Neighborhood center
- Density

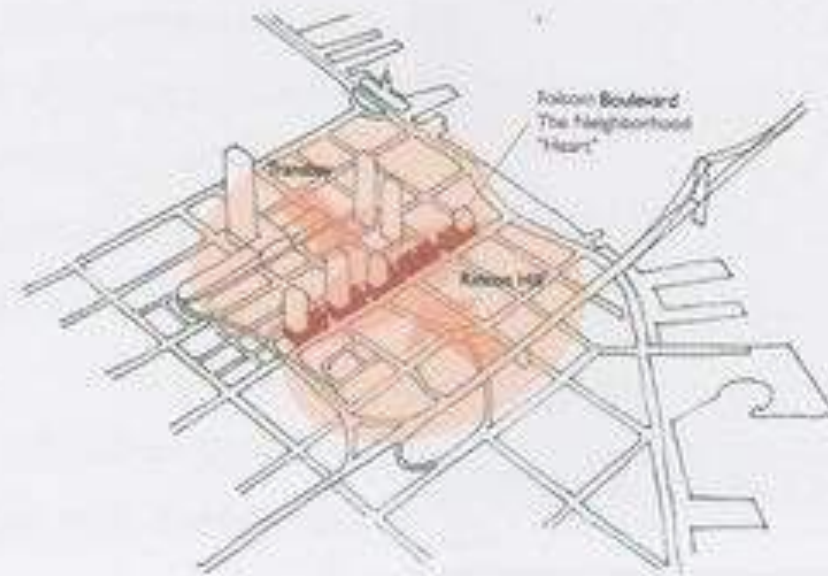
<https://i.pinimg.com/originals/9a/db/b3/9adbb35e676bf05e1b38b70c417f1741.jpg>



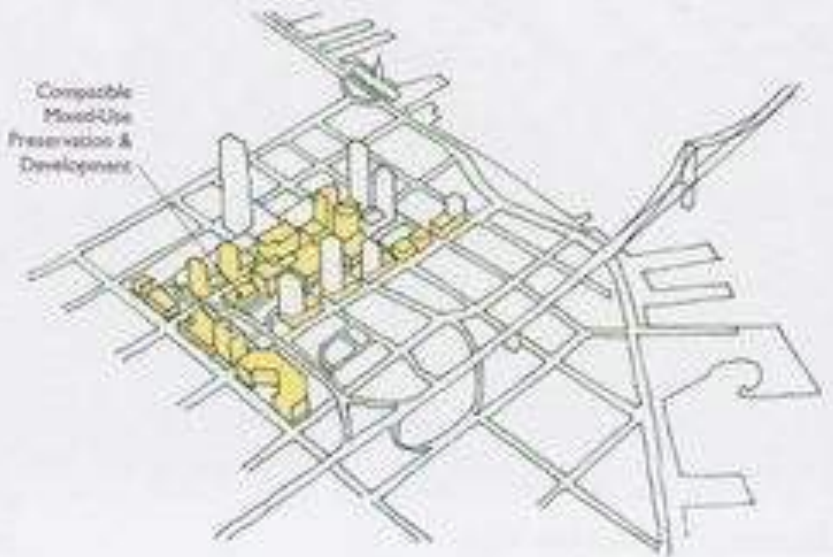
Open-space connections to surrounding areas



Preservation of sunlight and views by wide spacing of towers



Connecting the neighborhood's social heart to the bay shoreline



Existing low-rise context and compatible new infill

Rijeka, Croatia

Example of analyzing and understanding a site.

- Pedestrian network
- MV circulation & parking
- Active retail frontage
- Events
- Land use
- Open space

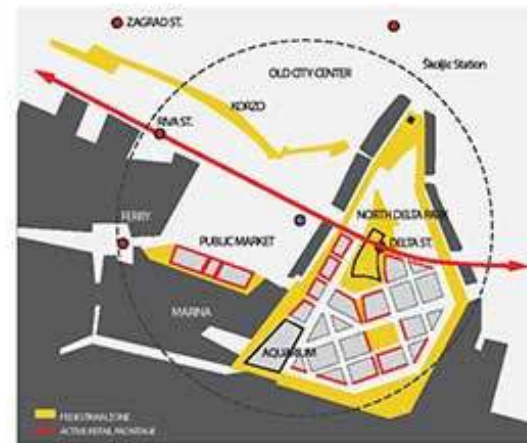
http://www.unitedlab.org/dt/dt_07.jpg



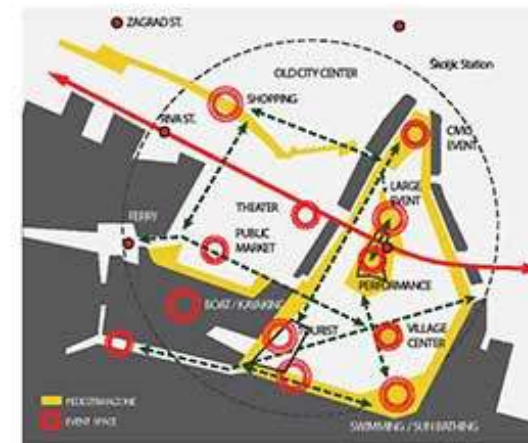
PEDESTRIAN NETWORK



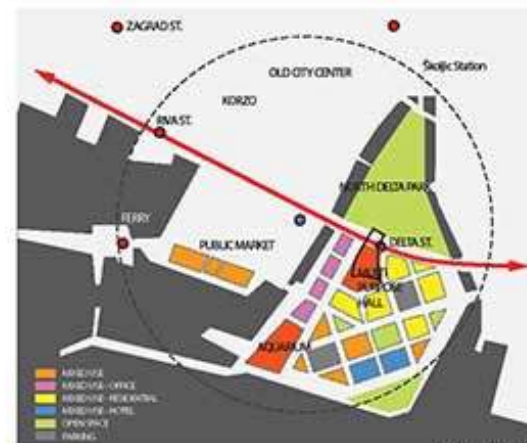
CIRCULATION + PARKING



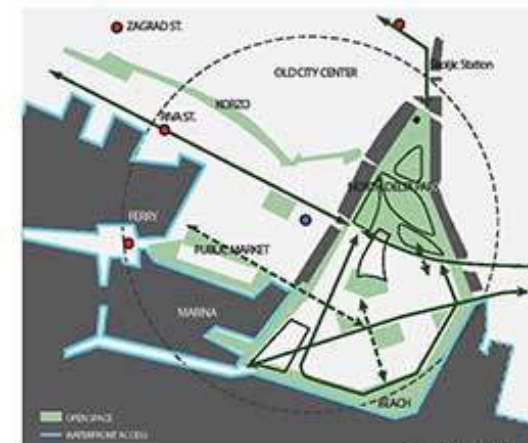
ACTIVE RETAIL FRONTAGE



EVENT / PROGRAM



LAND USE



OPEN SPACE

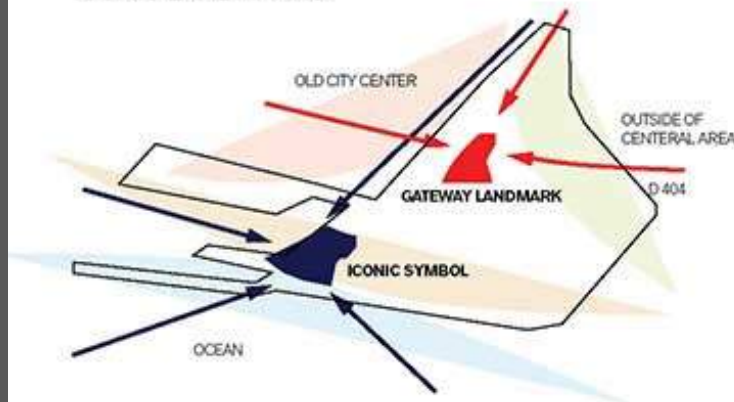
Rijeka, Croatia

Example of analyzing and understanding a site.

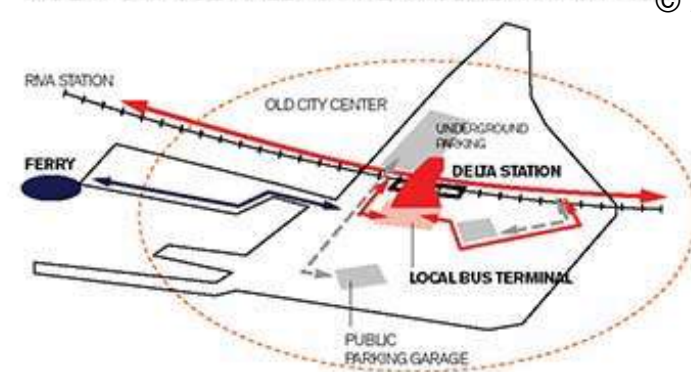
- Iconic landmarks
- Transit connectivity
- City anchors
- Public amenities
- Transit hub
- Parks, beaches, views and other special features

http://www.unitedlab.org/dt/dt_06.jpg

ICONIC LANDMARKS



MULTI PURPOSE HALL AS INTERMODAL TRANSIT HUB



© Michael King, 2020

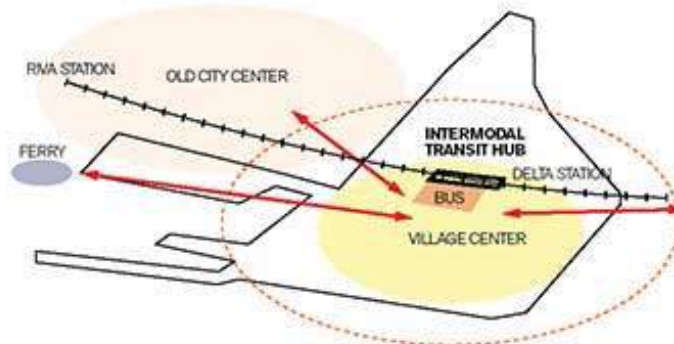
EXTENDED CITY CENTER WITH ANCHORS



PUBLIC AMENITY NETWORK



CENTRAL LOCATION WITH TRANSIT HUB



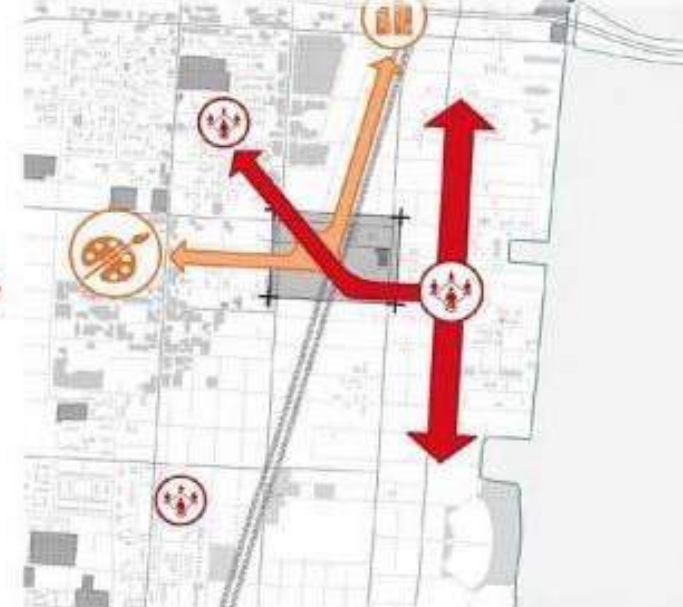
LIVABILITY WITH AMENITIES WITHIN WALKING DISTANCE



CURRENT 01 - Public Space Shortage



STRATEGY 01 - Public Facility



CURRENT 02 - Income Segregation



STRATEGY 02 - Shared Space



Example of analyzing and understanding a site.

- Public space
- Equity

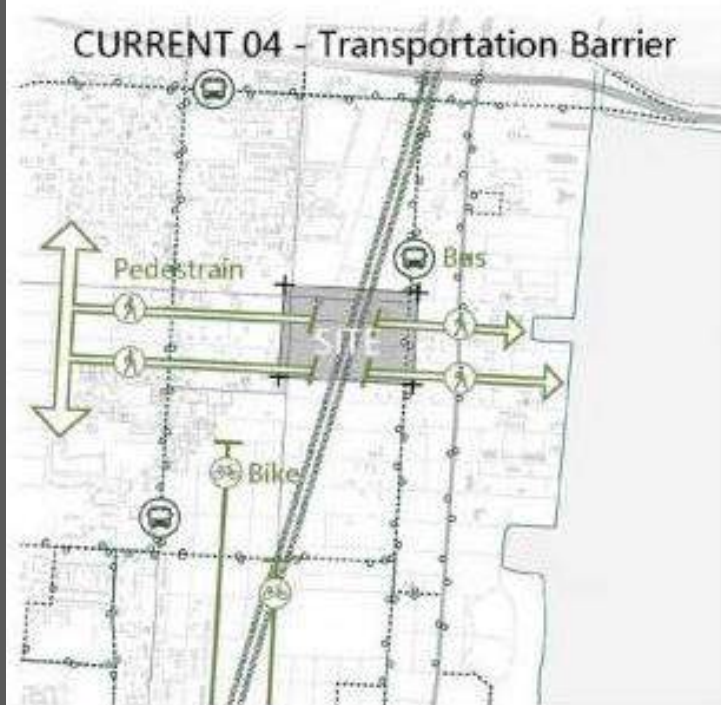
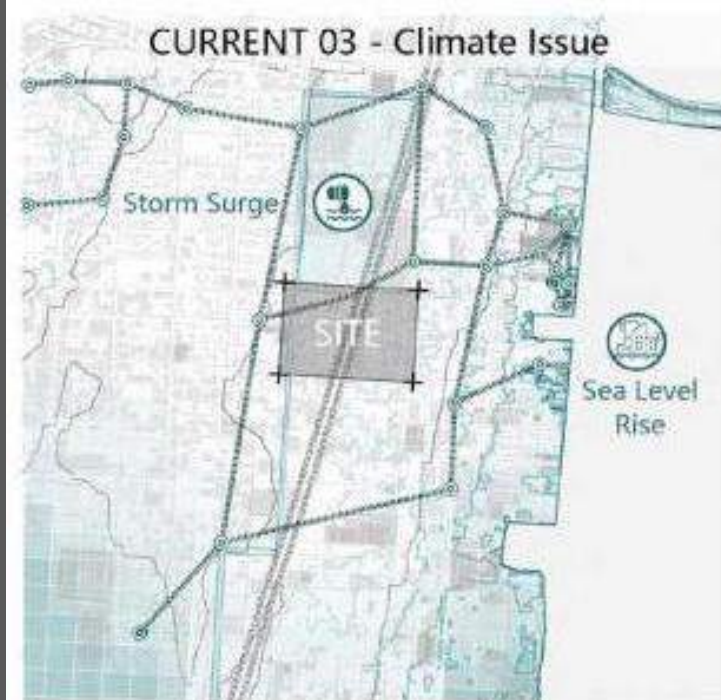
https://image.isu.pub/200219205821-759745b1a1ca4a2ffb9dbd6dd7f13ad9/jpg/page_6.jpg

Miami FL, USA

Example of analyzing and understanding a site.

- Climate
- Mobility

https://image.isu.pub/200219205821-759745b1a1ca4a2ffb9dbd6dd7f13ad9/jpg/page_6.jpg



PEDESTRIAN IMPROVEMENT: OVERALL STRATEGIES

Example of analyzing and understanding a site.

- Walking diagram
- Community facilities (equity)
- Bike lanes and parking
- Streetscape and landscaping

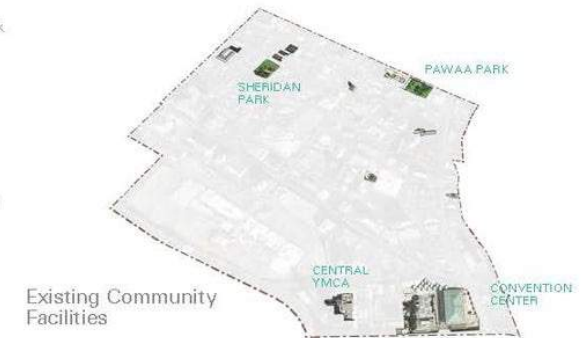
<http://architizer-prod.imgix.net/media/1424193143511AlaMoanaArchitizerA2015Page08.jpg?q=60&auto=format,compress&cs=strip&w=1680>



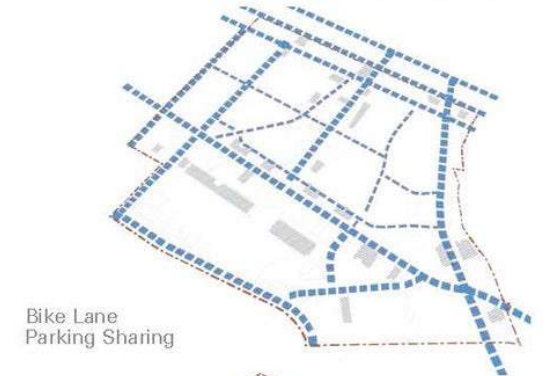
Open spaces include existing neighborhood park improvements, community parks, pocket parks, stream rehabilitation, and a central transit plaza adjacent to the station. These open spaces are connected by streets featuring generous landscaping and a full tree canopy.

PEDESTRIAN IMPROVEMENT DIAGRAM

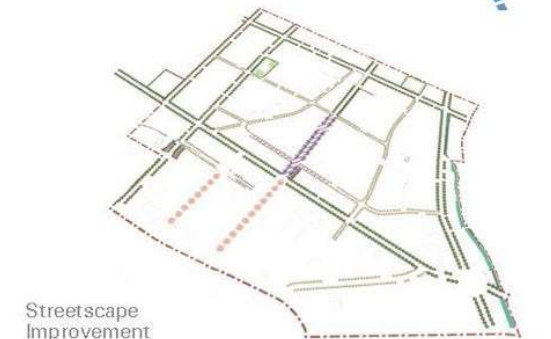
- Proposed Plaza/Park
- Future Decks
Terraces
- Elevated Walkway
- Events-Street
Closure Area
- Mall Passage
- Makiki Stream Trail
- Intersection
Improvement



Existing Community Facilities



Bike Lane
Parking Sharing



Streetscape
Improvement

Ingolstadt, Bavaria, Germany walking diagram

Drawing showing walkways and
paths in the central city of
Ingolstadt, a Bavarian city on the
Danube River.

<https://goo.gl/maps/RVac9XCipEAWd7Yr5>



Heidelberg, Germany school & playground route network

Diagram showing “safe” route for children to walk & cycle to/from schools (blue), parks/playgrounds (green) and churches (red).

- Purple and orange streets are traffic calmed
- Yellow indicates MV traffic is blocked
- Blue circles show where children can cross larger roads safely

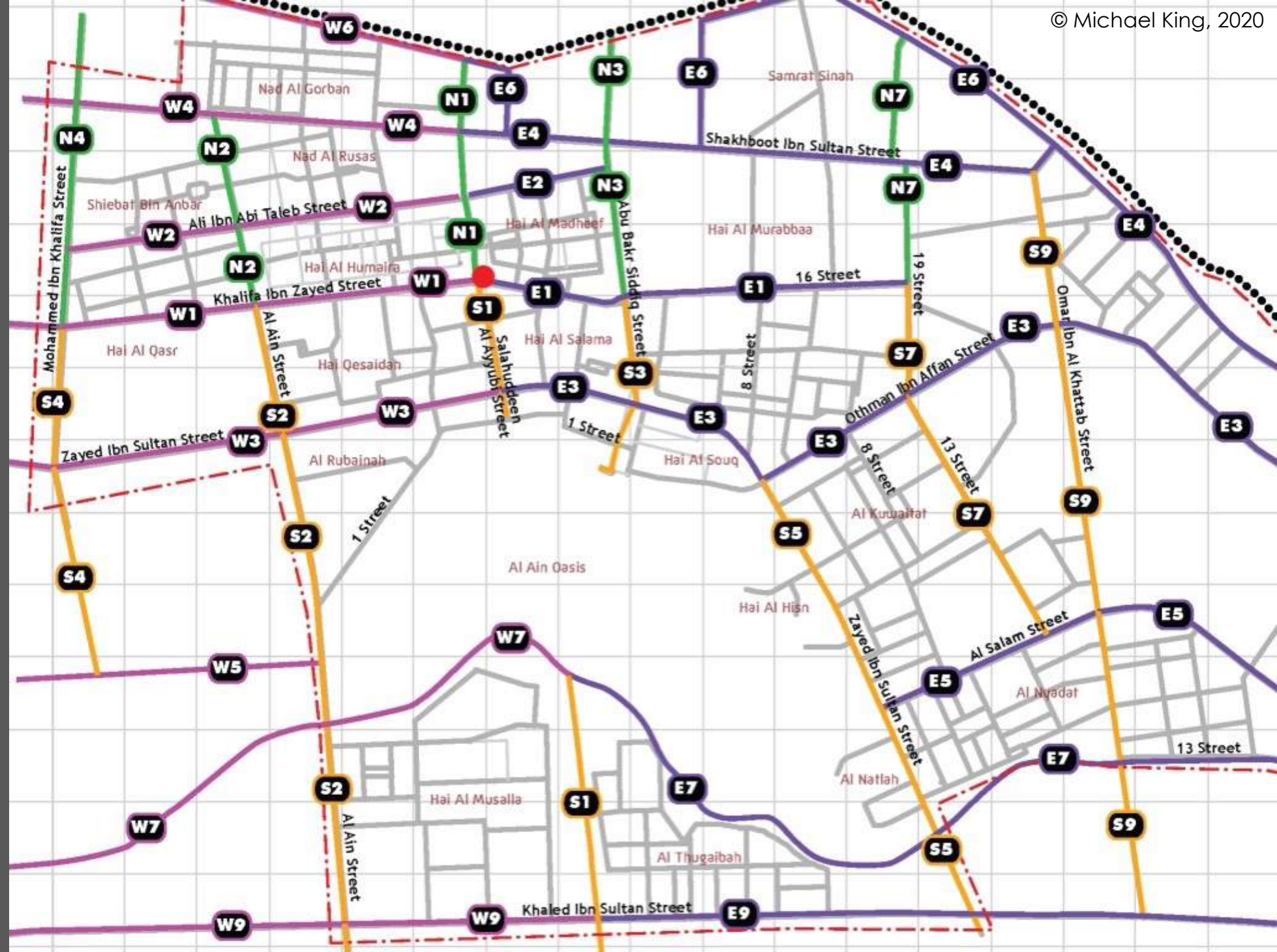
credit unknown.



Al Ain, UAE

© Michael King, 2020

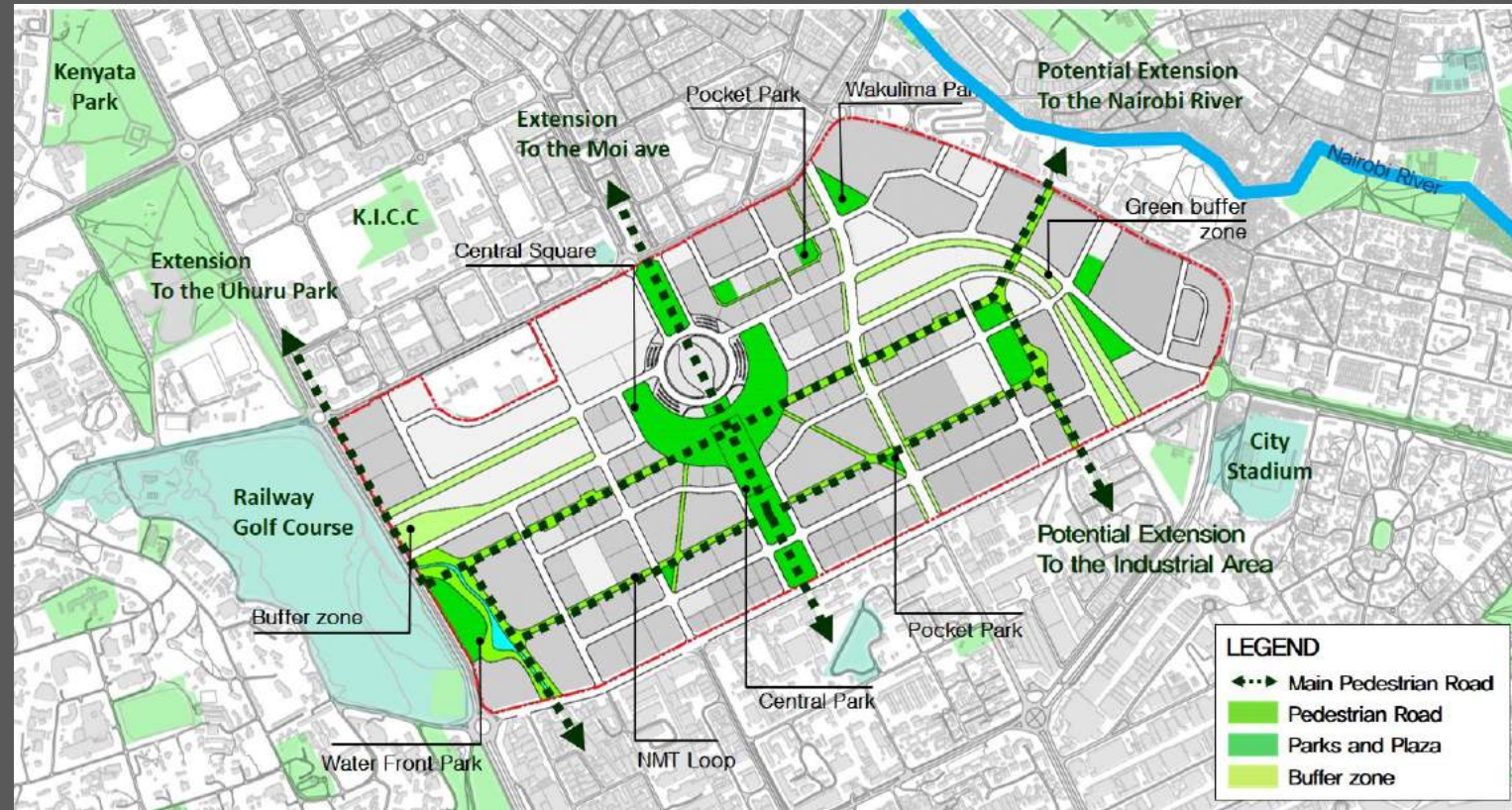
Protected bicycle lane network
(200m spacing)



EXAMPLES

Example of development that is not based on highways and arterials.

<https://danneconsult.com/client/nrc/assets/images/open-space-plan.jpg>



URBAN NODES TOD STRATEGY FOR NAKURU



Bird-eye Render

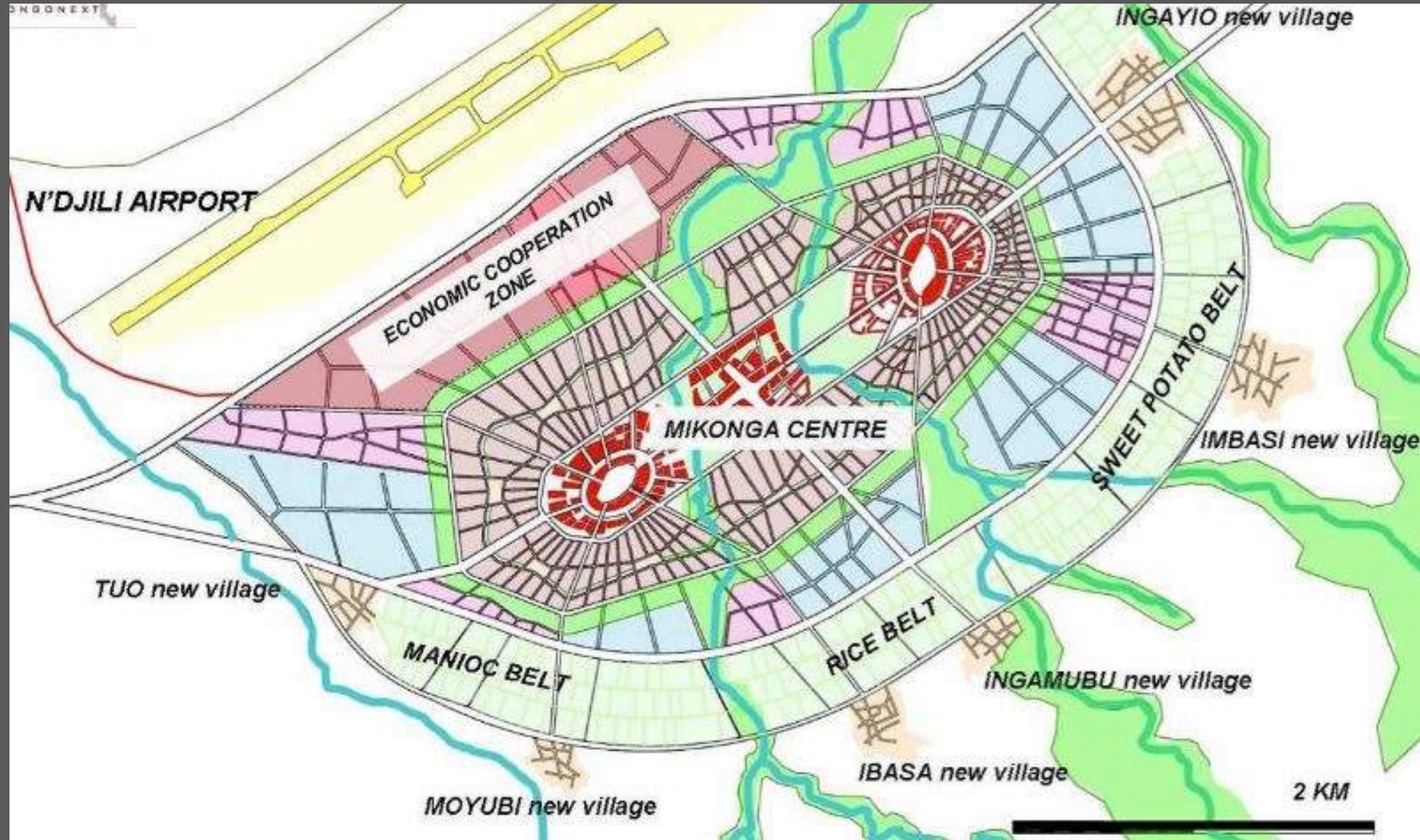
Example of development that is not based on highways and arterials.

<https://www.design.iastate.edu/wp-content/uploads/2016/09/BirdseyeRendering.jpg>

<https://uni.unhabitat.org/global-collaborative-design-competition/>

Example of development that is not based on highways and arterials.

<https://www.citilinks-group.com/wp-content/uploads/2020/02/Kinshasa-tod-urban-mobility-10.jpeg>



Cape Town Belleville, South Africa

Example of development that is not based on highways and arterials. Bus stops are shown in red with catchment areas.

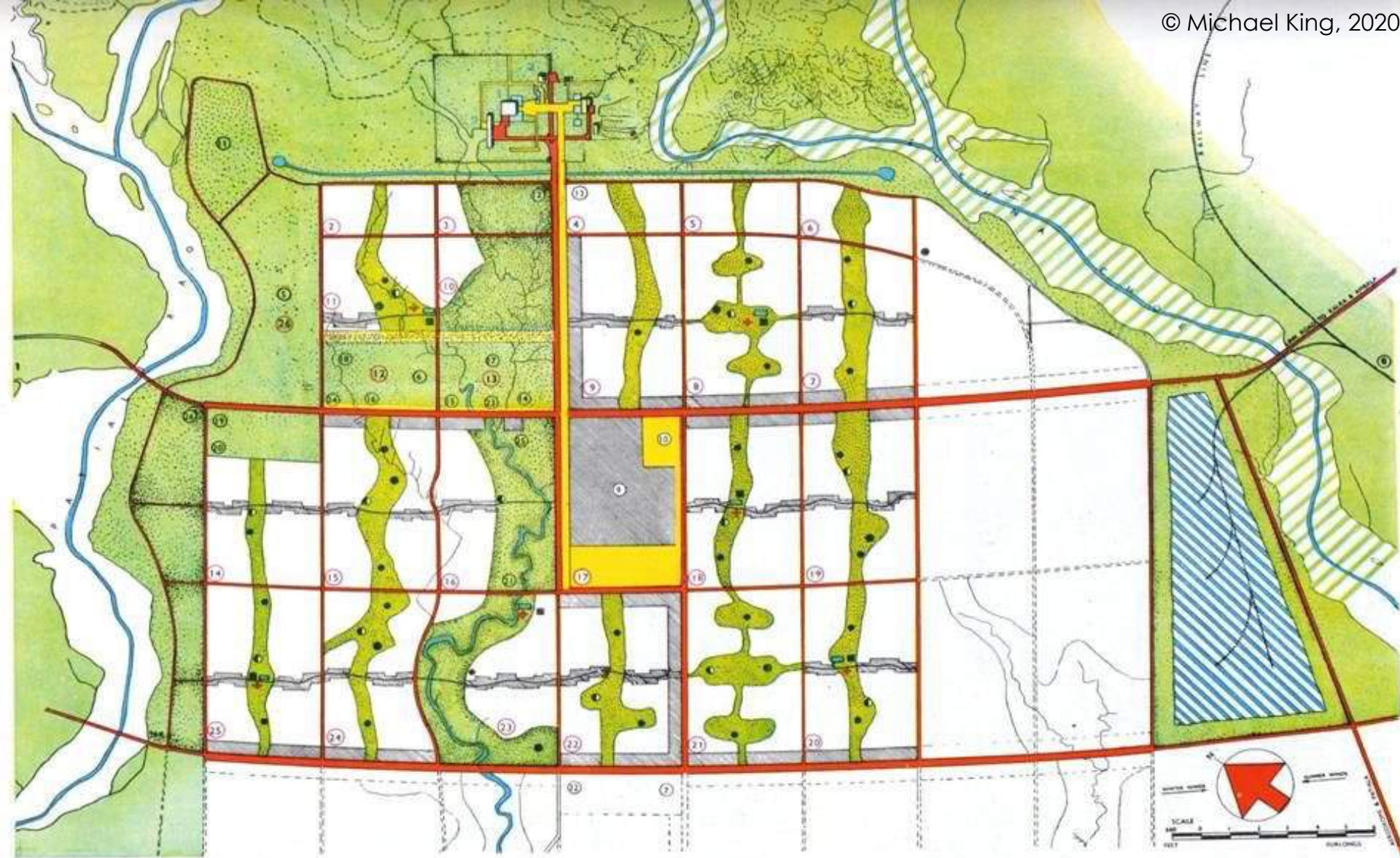
<https://gapp.string.co.za/images/Bellville%20Integrated%20Transport/Bellville-ITLUP2.jpg>



Chandigarh, India superblock and greenway layout

Diagrams showing superblocks of Chandigarh (1m x 1.5m) interspersed with greenways. Yellow is commercial block and corridor. Government offices are at top. Busses ply both the main roads (red) and go through the superblocks.

<https://i.pinimg.com/originals/c4/9f/cf/c49fcfa23e07a4518ddcb48b2dc40644.jpg>



Chandigarh, maggio 1952.
Piano urbanistico definitivo
della prima fase di
realizzazione che comprende
abitazioni e servizi per 150 000
abitanti e il Campidoglio

1 Parlamento
2 Segretariato

3 Campidoglio
4 Corte di giustizia
5 Università
6 Stadio
7 Mercati generali
8 Stazione ferroviaria
9 Centro commerciale
10 Municipio
11 Istituto di ingegneria

12 Residenza del Primo
Ministro
13 Residenza del Capo della
Magistratura
14 Biblioteca
15 Museo
16 Scuola di arti applicate
17 College statale maschile
18 College statale femminile

19 Istituto superiore e ospedale
odontoiatrico
20 Ospedale
21 Maternità
22 Sarai
23 Teatro
24 Istituto Politecnico
25 Croce Rossa
26 Boys Scouts

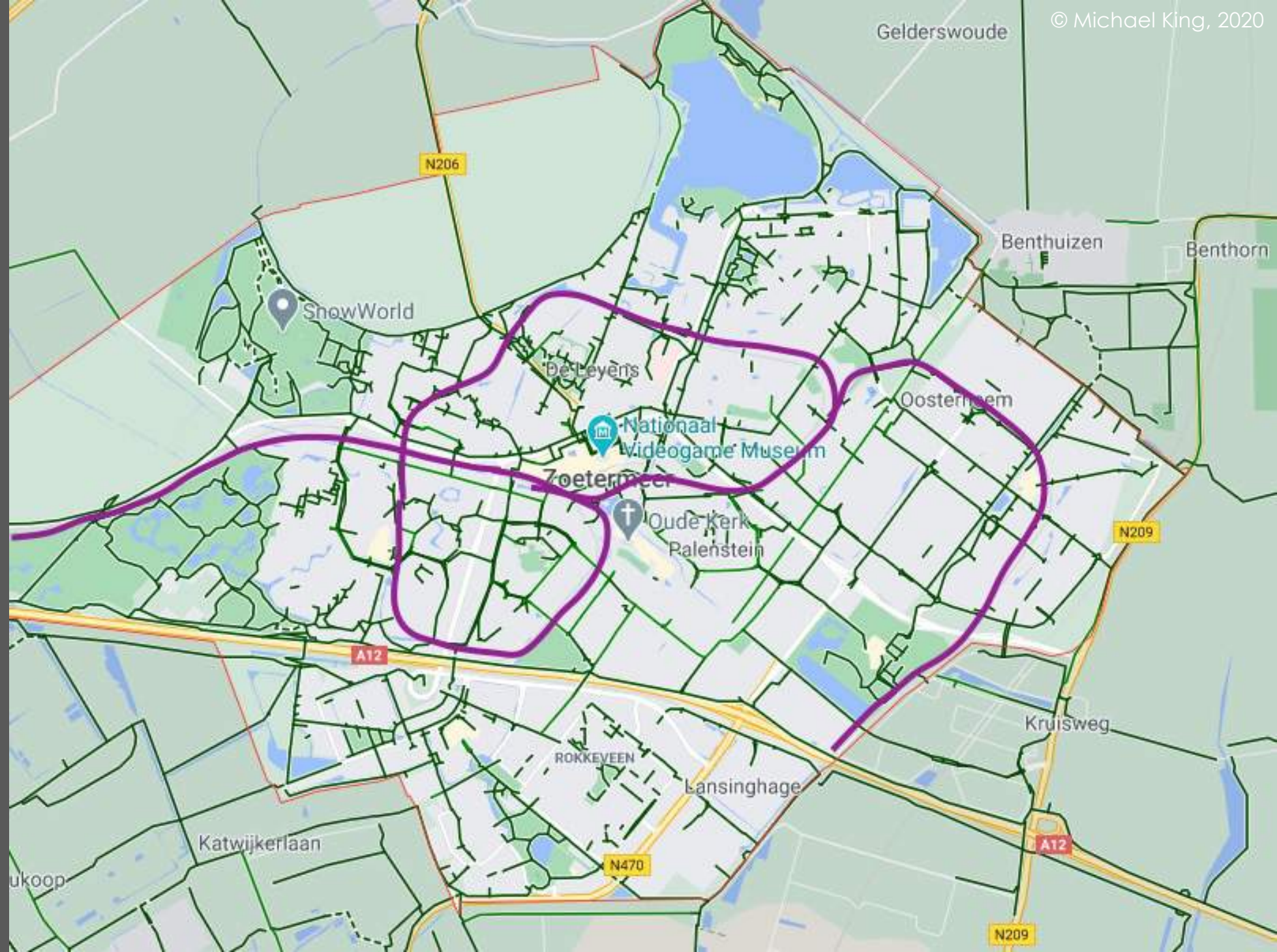
— Vie principali (V2)
— Vie secondarie (V3)
— Strade locali (V5+V6)
— Spazi aperti e parchi
— Affari e commercio
— Zona industriale
— Aree pedonali

● Scuole elementari
● Scuole medie
● Scuole superiori
+ Centri sanitari
■ Centri comunitari
■ Piscine
○ Numeri dei settori
■ Spazi aperti interni

Zoetermeer, Netherlands

Zoetermeer is a suburb of The Hague. It has been developed so that people, especially children, do not have to cross main roads. The cycle network (green) is extensive and there are numerous grade separated crossings. The train (purple) circles throughout the town instead of just stopping at the center.

https://goo.gl/maps/VT784j6JYef_a3Cs38



Bielefeld-Sennestadt, NRW, Germany

- 400 ha (2 km x 2 km), largely residential district for 24,000 people which opened in 1958.
- Commercial development at top left (black)
- 27 km of separated footpaths – a successful example of creating a town where the vehicle traffic is separated from the foot traffic.
- Large green park in the center and a number of cul-de-sacs. Schools, parks, shopping and sports are all accessible via the footpaths.

<https://goo.gl/maps/d4CtRnmRzBS14AhS6>

The Pedestrian and City Traffic, C Hass-Klau, Belhaven Press, 1990.

<https://www.sennestadt-gmbh.de/files/sennestadt-gmbh/handlungsfelder/energetische-stadtsanierung/Bild-Energetische-Stadtsanierung.jpg>

<http://www.newtowninstitute.org/newtowndata/newtown.php?newtownid=860>



Potsdam-Südliche Innenstadt, Germany

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Example of development that is not based on highways and arterials.

<https://goo.gl/maps/bpGXzgsBV FqW24Su6>

<https://wowawest.com/media/pages/case-studies/transit-oriented-community/1895683918-1579158894/00001wowa-transit-oriented-community-1800x1200.jpg>

<https://wowawest.com/en/case-studies/transit-oriented-community>



Harbin-Qunli, Heilongjiang, China

BRT-based TOD district in northern China.

- Main roads designed for BRT.
- Numerous crossings of the main roads (combined with U-turns) linking the pedestrian paths, see inset.
- Density (red) concentrated in top left.
- Greenways and waterways continue through the superblocks.

<https://goo.gl/maps/78bPgWnJnWLMkUB6>



MOBILITY STRUCTURE



5 km² development centered around park (yellow trails) and surrounded by highways and main roads (grey roads).

- Metro station at University Rd
- Skytrain (pink) circumnavigating the park and extending into adjacent developments
- BRT (dashed pink) on perimeter roads and routed onto main street
- Boulevards (large green roads) tracing the park
- Neighborhoods defined by wadis and centered around parks (green squares)
- 80m block units
- Every other street is a path
- Density adjacent to transit



AND NOW THE ADVICE

Methodology

1. Begin with transit, nodal or linear. Concentrate development accordingly.
2. Incorporate and respect natural features (waterways, topography) which can become parks, greenways, blueways, etc.
3. Use ~80m x ~200m blocks.
4. Organize 5, 10 and 15 minute neighborhoods. Distribute facilities accordingly.
5. Connect larger roads to MV network, but not through the development (or at least minimize intrusion).
6. Connect smaller streets throughout development and into other areas.

Resources

- General
 - https://en.wikipedia.org/wiki/Fused_grid
 - <https://www.15minutecity.com>
 - http://pedshed.net/?page_id=130
- Details & research
 - <https://mathis.tamu.edu/block-size-intersection-density/>
 - <https://www.archdaily.com/949094/orthogonal-grids-and-their-variations-in-17-cities-viewed-from-above>
 - <https://www.slideshare.net/TristanWiggill/nmt-infrastructure-bicycle-based-transit-oriented-development>
- Guides & reports
 - <https://www.cnt.org/publications/performance-based-transit-oriented-development-typology-guidebook>
 - <http://uli.org/wp-content/uploads/ULI-Documents/Active-Transportation-and-Real-Estate-The-Next-Frontier.pdf>
 - https://issuu.com/sacpwits/docs/3_international_case_studies
 - https://issuu.com/sacn/docs/1978_sacn_transit_oriented_cities_w
- Examples
 - <http://abstract20122013.gsapp.org/three-peripheries-in-transition-vienna-bordeaux-kumasi/>
 - <https://architizer.com/projects/integrierte-planung-badya-city/>
 - <https://www.as-p.com/projects/project/action-area-plan-for-transit-oriented-development-253/show/>