

*Cycle journey planning,
for cyclists, by cyclists*

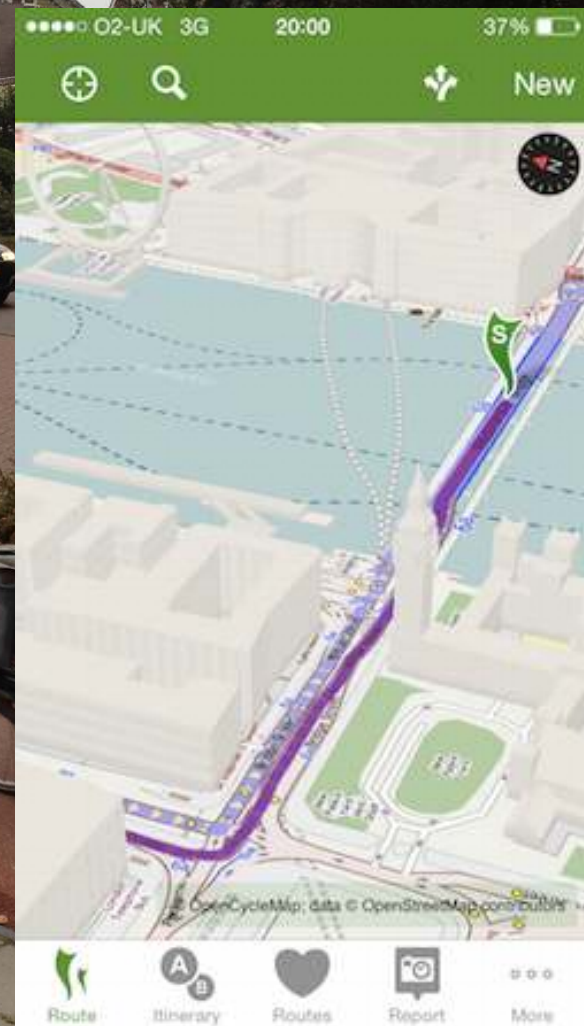


Is the OSM data model creaking?

Slides at: www.cycliststreets.net/blog

About CycleStreets

- UK social enterprise
- OSM user since 2008
- CycleStreets.net
- 3rd-party API users e.g. Citymapper
- 30+ APIs: routing, infra, photos, tracking, etc.



Custom engine

- 3 routing types
- 100s of routing rules
- Infra quality analysis
- Junction/turn analysis
- Detailed elevations
- Route relations



*Cycle journey planning,
for cyclists, by cyclists*





PROBLEM: Compromises from OSM representing spaces as lines.










One conceptual space, but multiple flows

	Foot Path	
---	-----------	--

[Zoom to this](#)

▼ All fields

Name	
Common name (if any)	

Surface		
asphalt		

Width (Metres)		
5		

Structure		
-----------	--	--

Bridge



Two tunnels, as two lines, one unnamed



People trying to do more and more with OSM,
but is the model too basic for the real world?



How do we model this?

▼ All tags (2)



highway	▼	primary	▼		
cycleway	▼	track	▼		
+					



0. Original method c. 2008

▼ All tags (12)



cycleway	▼	track	▼		
foot	▼	no	▼		
highway	▼	cycleway	▼		
lcn	▼	yes	▼		
lit	▼	yes	▼		
name	▼	Hills Road (cycle...	▼		
oneway	▼	yes	▼		
segregated	▼	light	▼		
sidewalk	▼	left	▼		
surface	▼	asphalt	▼		
surface:colour	▼	red	▼		
width	▼		▼		



1. Separate paths approach



In reality you
can cross the
road.

No-one
actually
cycles like
this:



Cycle lanes in bidirectional motor car roads

A lane marked on a portion of a carriageway (UK), roadway or shoulder (USA), designated for cyclist use.

Ref	Context	Photo	OSM	Description
L1a				<p>Cycle lanes on left and right sides of the road.</p> <p>Way A : <code>highway=#[1] + cycleway=lane</code> (recommended)</p> <p>or</p> <p>Way A : <code>highway=#[1] + cycleway:left=lane + cycleway:right=lane</code></p> <p>or</p> <p>Way A : <code>highway=#[1] + cycleway:both=lane</code></p>
L1b				<p>Bidirectional cycle lane on right side of the road.</p> <p>Way A : <code>highway=#[1] + cycleway:right=lane + cycleway:right:oneway=no</code> (recommended)</p> <p>or</p> <p>Way A : <code>highway=#[1] + cycleway=lane</code> (not recommended, as this can't be distinguished from L1a)</p>
L2				<p>Oneway cycle lane on right side of the road only.</p> <p>Way A : <code>highway=#[1] + cycleway:right=lane</code></p> <p>(nb: bikes can use the normal highway on the left side)</p>

Bicycle
page on
wiki –
begins
OK...

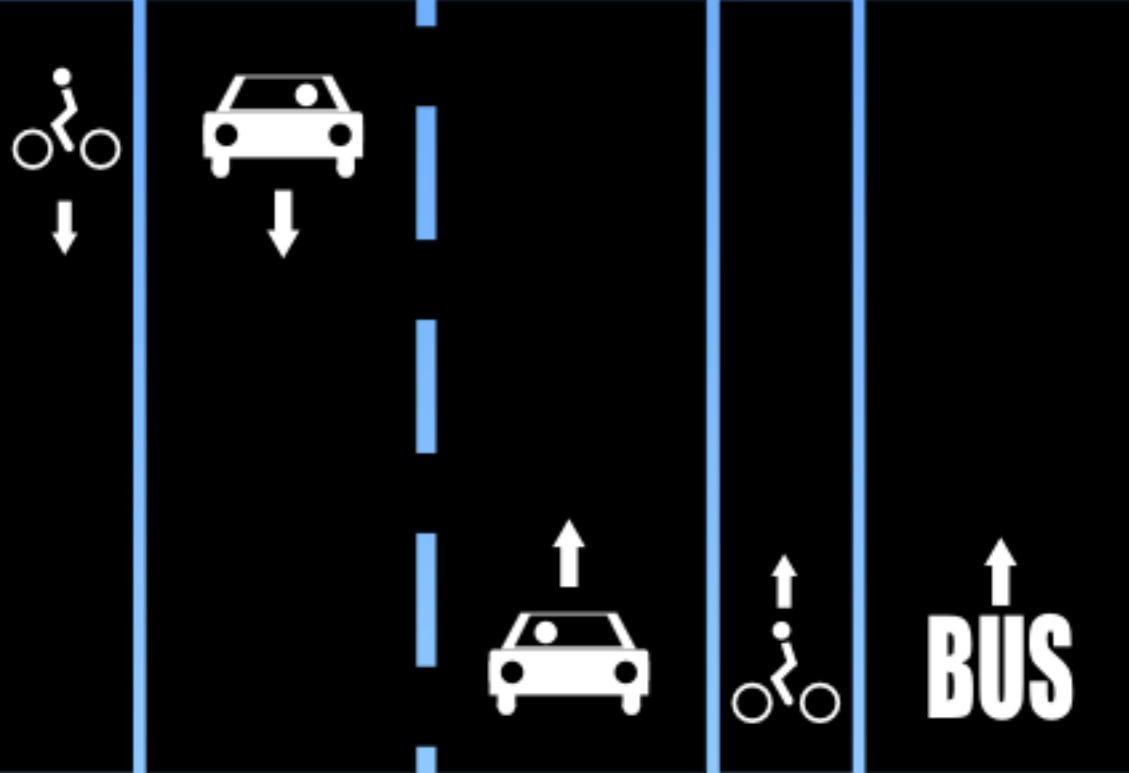
Cycle lanes in oneway motor car roads

Ref	Context	Photo	OSM	Description
M1				<p>Cycle lanes on left and right sides of the oneway road.</p> <p>Way A : <code>highway=#[1] + oneway=yes + cycleway=lane + oneway:bicycle=no</code> (recommended)</p> <p>or</p> <p>Way A : <code>highway=#[1] + oneway=yes + cycleway:left=opposite_lane + cycleway:right=lane</code></p>
M2a				<p>Oneway cycle lane on right side and same direction of the oneway road.</p> <p>Way A : <code>highway=#[1] + oneway=yes + cycleway:right=lane</code> (recommended)</p>

Cycle lanes and bus/taxi lanes

Ref	Context	Photo	OSM	Description
B1				<p>Cycle lanes on left and right sides of the road with a bus/taxi only lane.</p> <p><i>Proposal (no consensus):</i></p> <p>Using the suffix for Lanes:</p> <p>Way A : <code>highway=* + lanes=3 + lanes:forward=2 + access:lanes=*no yes yes no no + bicycle:lanes=*designate</code> <code>taxi:lanes=*no yes yes no designated</code></p> <p><i>Note:</i> the suffix <code>:lanes</code> could be used for all the other examples, but is used usually only in situations where it is not possible to tag the</p>
B2				<p>Cycle lanes on left and right sides of the road after a bus/taxi only lane in right side.</p> <p><i>Proposal (no consensus):</i></p> <p>Way A : <code>highway=*^[1] + lanes=3 + lanes:forward=2 + bicycle:lanes=*no yes yes no designated + taxi:lanes=*no yes yes no designated + lanes:right=1 + lanes:left=1 + lanes:way=lane</code></p>
B3				<p>Cycle lane on left side of the road and a shared cycle lane with a bus/taxi lane in right side.</p> <p><i>Proposal (no consensus):</i></p> <p>Way A : <code>highway=*^[1] + busway:right=lane + cycleway:left=lane + cycleway:right=share_busway</code></p> <p>or</p> <p>Proposed_features/shared_lane</p>
B4				<p>Cycle track shared with a bus/taxi track in right side of the road.</p> <p><i>Proposal (no consensus):</i></p> <p>Way A : <code>highway=service + service=bus + oneway=yes + cycleway:right=share_busway</code></p> <p>Way B :</p> <p><i>assuming for bicycle and buses there is an obligation to use Way A in forward directions (of way A) :</i></p> <p><code>highway=*^[1] + oneway:bus=yes + oneway:bicycle=yes</code></p> <p><i>assuming bicycles may use Way B in both directions :</i></p> <p><code>highway=*^[1]</code></p>
B5				<p>Cycle lane shared with a bus/taxi lane on right side of the road (in some countries only).</p>

... ends up
with more
and more
ridiculous
tagging



Is this
really a
usable
data
model?

Way A : highway=* + lanes=3 + lanes:forward=2 +
access:lanes=*no|yes|yes|no|no +
bicycle:lanes=*designated|yes|yes|designated|yes
+ bus:lanes=*no|yes|yes|no|designated +
taxi:lanes=*no|yes|yes|no|designated

2. Unified street approach

access:lanes=no|no|no|yes|yes|no|no
bicycle:lanes=no|designated|designated|yes|yes|
designated|no
bus:lanes=no|no|no|yes|yes|no|no
cycley:backward=track
cycley:backward:est_width=1.5
cycley:backward:oneway=-1
cycley:backward:segregated=no
cycley:left=stepped
cycley:left:oneway=yes
cycley:left:width=2.1
cycley:right=stepped
cycley:right:oneway=yes
cycley:right:width=2.1
est_width=6
foot:lanes=yes|no|no|no|no|no|yes
highway=primary

lanes=2
lanes:backward=1
lanes:bicycle=3
lanes:foot=2
lanes:forward=1
lcn=no|no|yes|no|no|yes|no
lit=yes
maxspeed=30 mph
name=Hills Road
note=there are cycle lanes in both directions PLUS a
separate cycle track
ref=A1307
source:lit=2011-03-12
surface=asphalt
Surface:color=black|red|black|black|red|black
taxi:lanes=no|no|no|yes|yes|no|no



Problem: Faked geometries to give routability

Ugly. What is this?

Should cyclists get “bear left” twice?





MANDELA
HOUSE

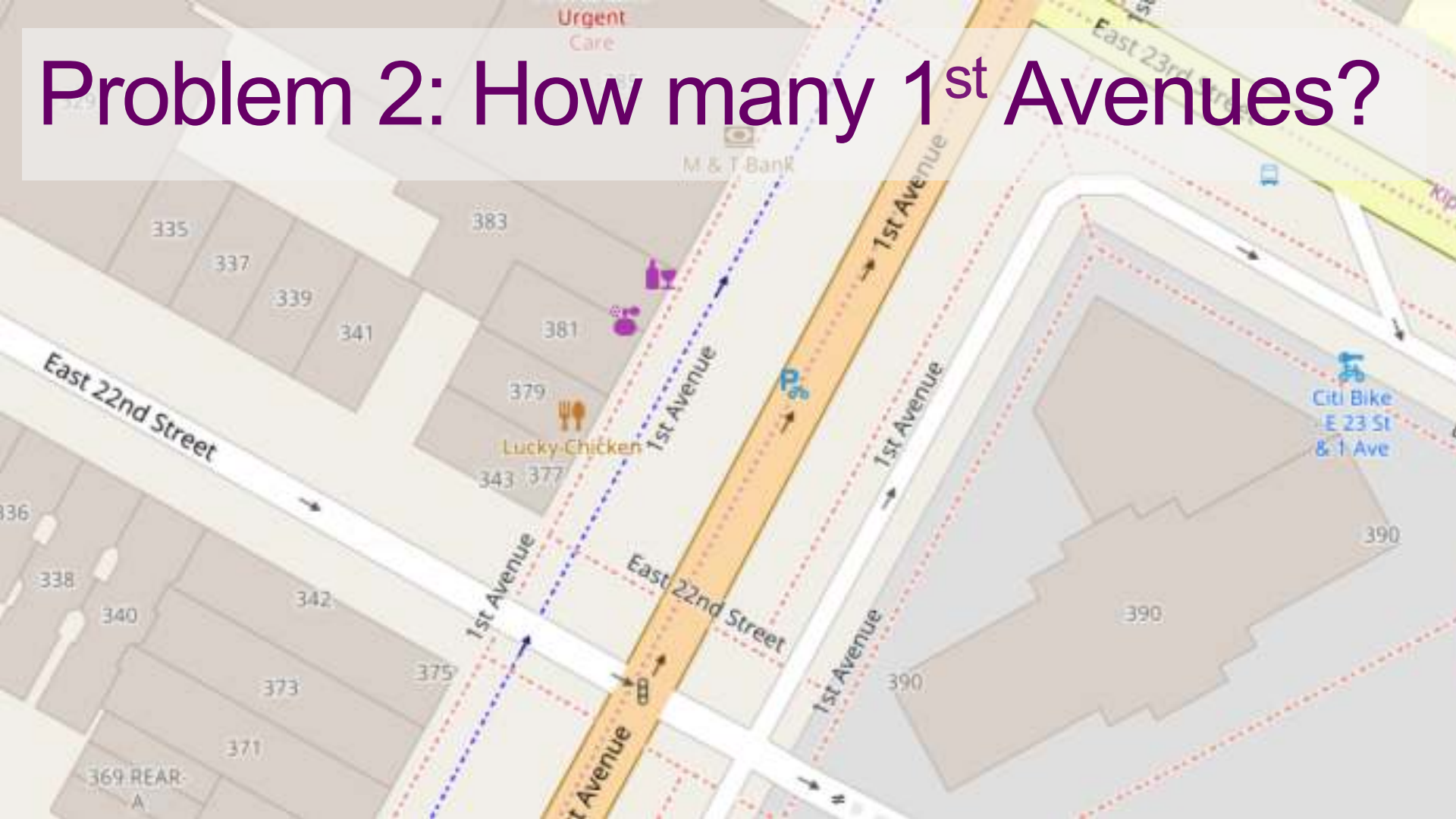
20

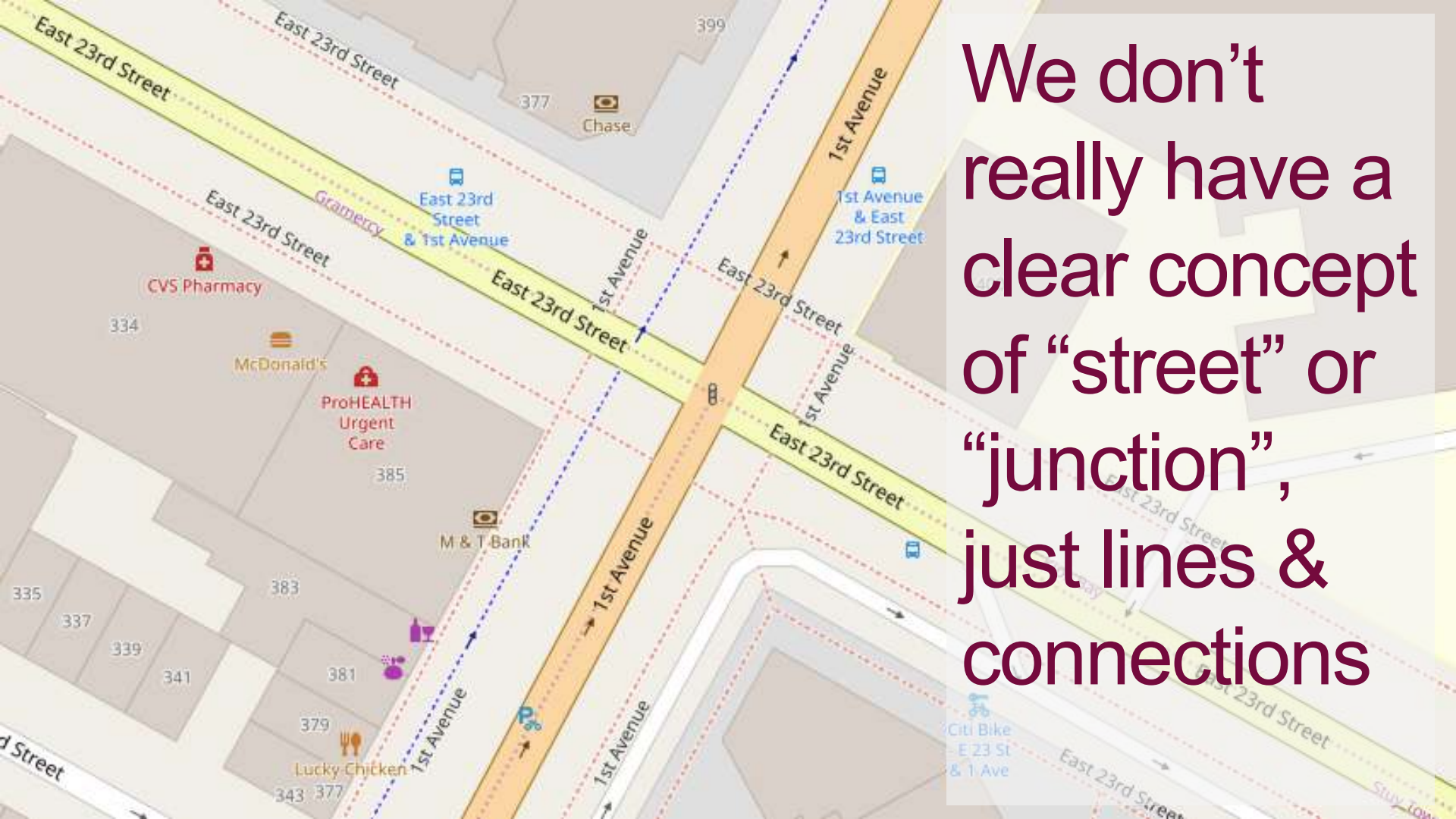
ZONE



WINDY
MOTORCYCLE
SALES

Problem 2: How many 1st Avenues?

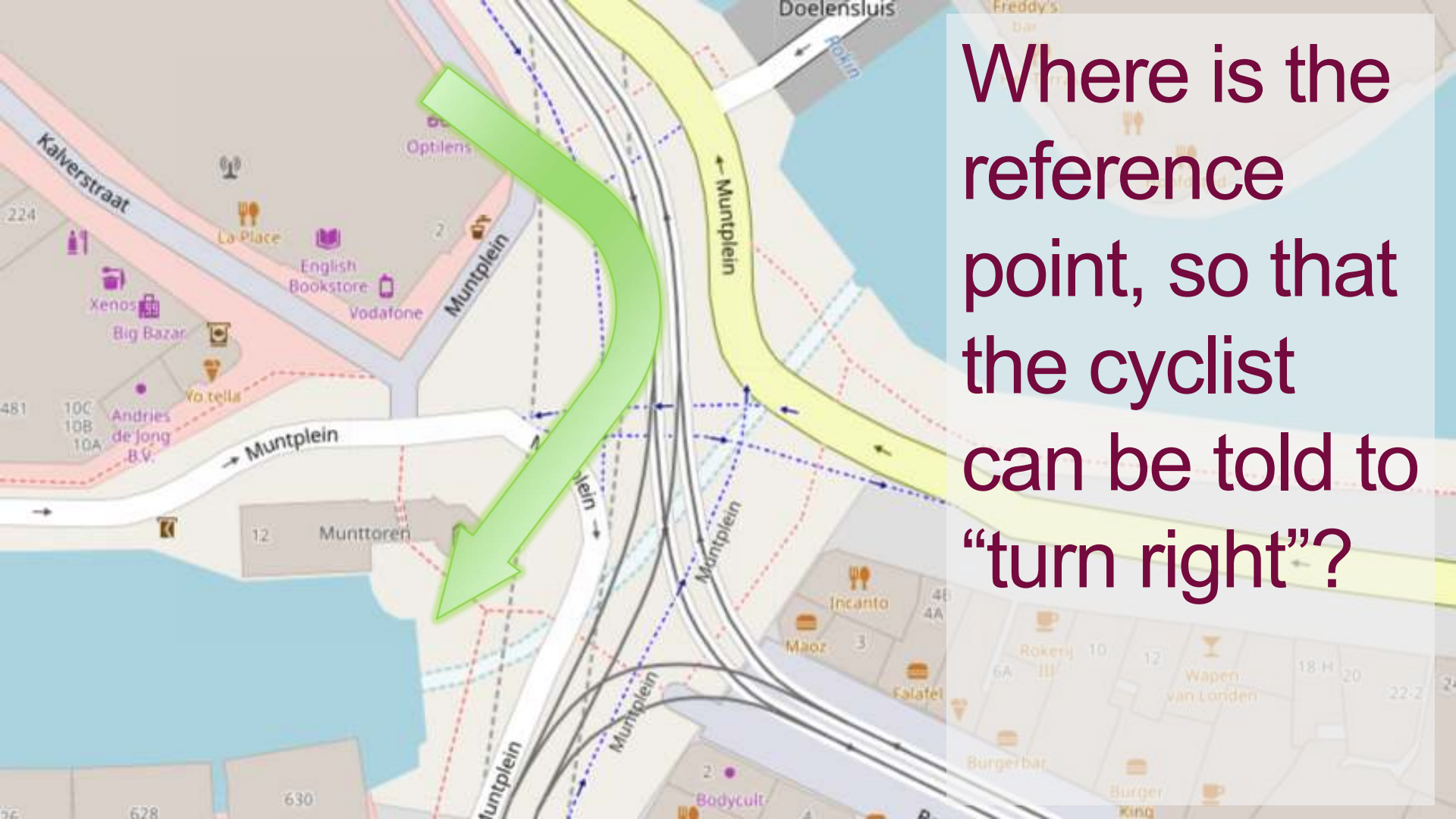




We don't really have a clear concept of "street" or "junction", just lines & connections




We don't really have a semantic concept of "junction", just lines & connections



Where is the reference point, so that the cyclist can be told to “turn right”?

Problem 3: Pedestrian routing poor

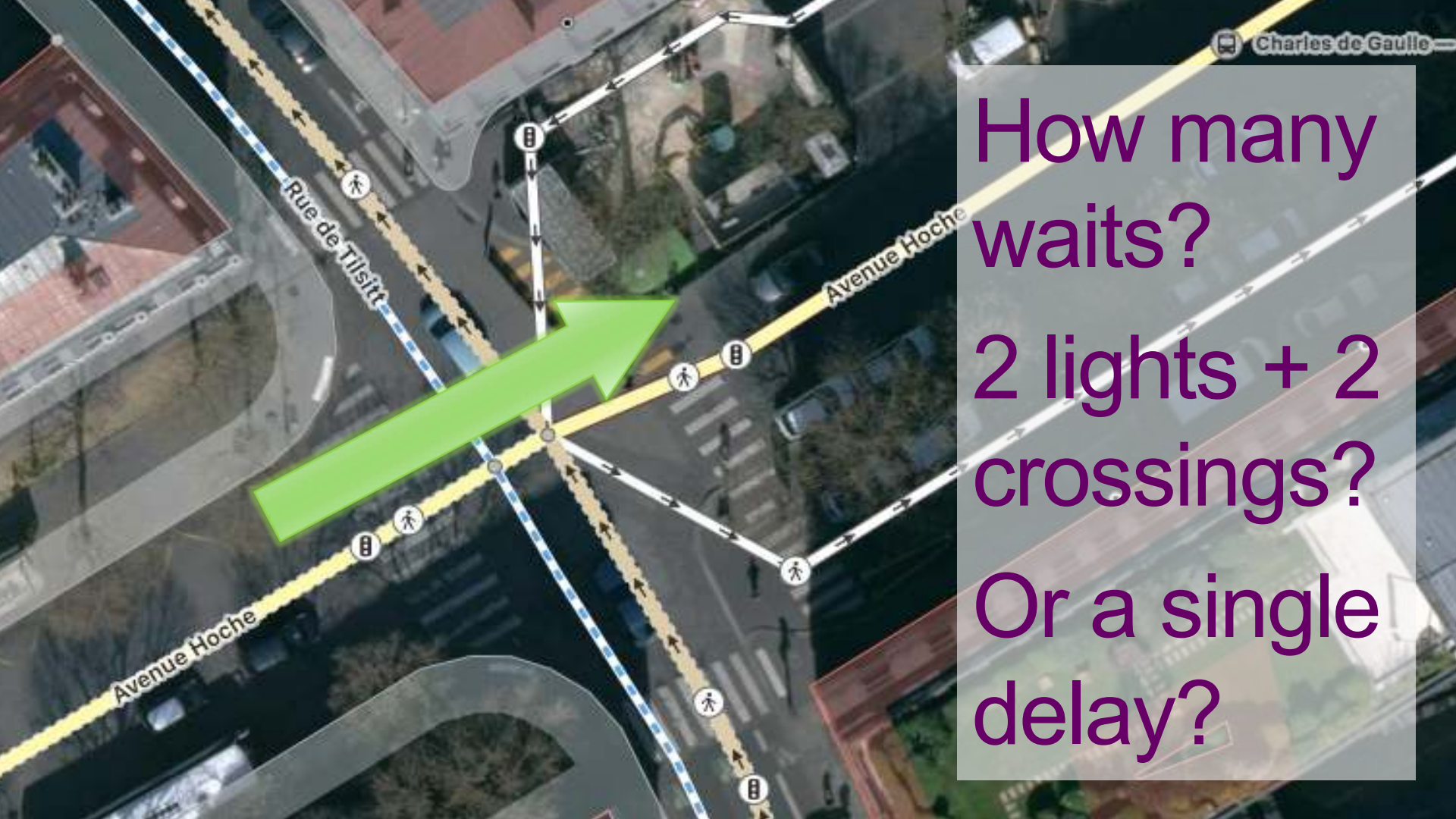


An aerial photograph of a city street intersection. A diagonal road labeled "1st Avenue" runs from the bottom-left towards the top-right. A horizontal road labeled "East 13th Street" runs across the middle. The intersection is marked with a circular sign. The road surface is marked with white arrows and a blue-and-white dashed line. A semi-transparent grey box is overlaid on the right side of the image, containing purple text.

Where should
good walk
routing put the
pedestrian?
Sidewalk next to
road is wrong.

Problem: Can't properly model turns





How many
waits?

2 lights + 2
crossings?

Or a single
delay?

Problem: Junction times unmeasurable



How many lights and crossings actually?



Two delays on E19th NY
– every junction has this problem

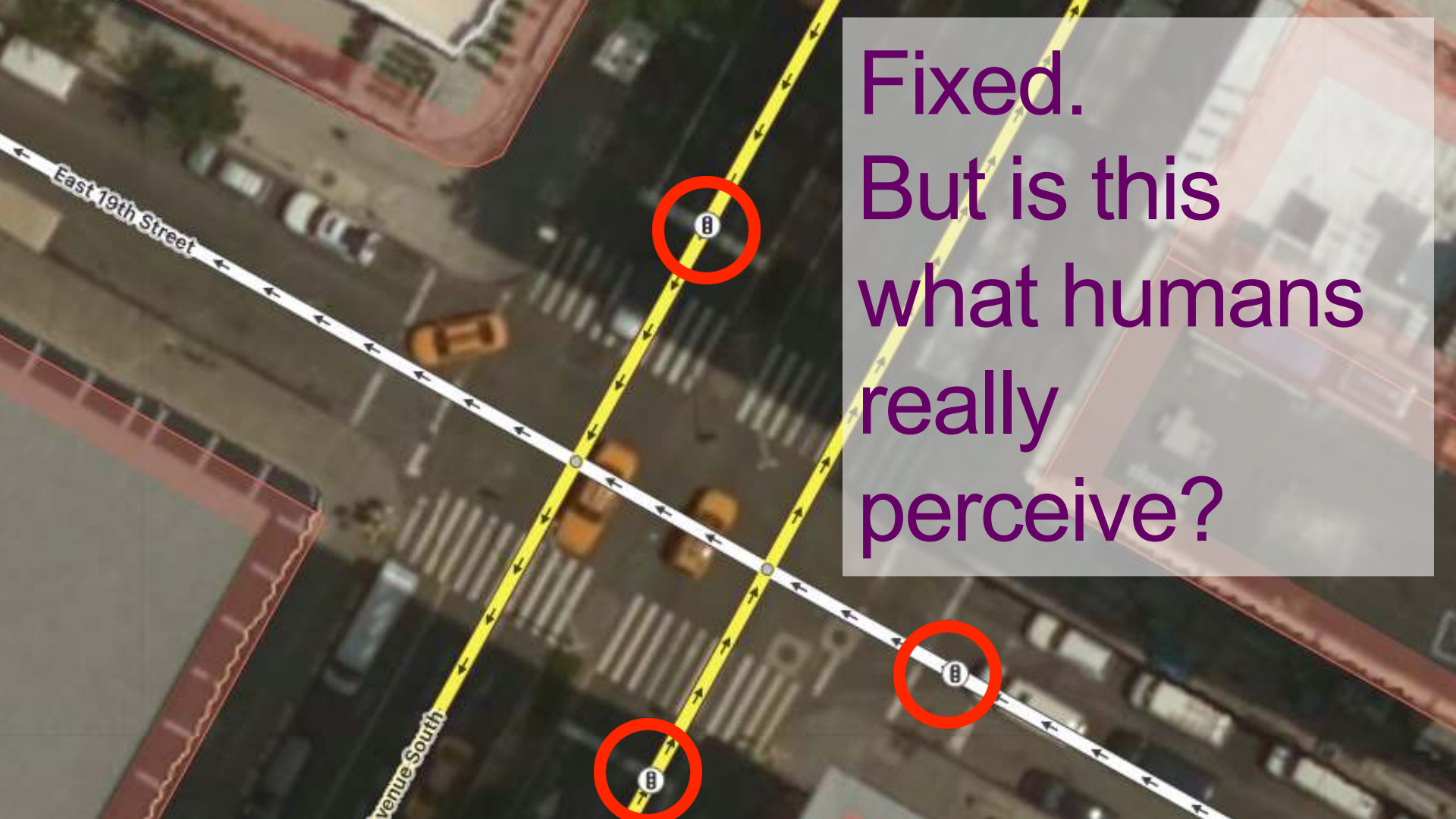


How many traffic lights for the cyclist turning right?



Should we add a fake cycleway purely to bypass the second light?






Fixed.
But is this
what humans
really
perceive?

Problem: No unified “street”
Pedestrian routing - state of the art?

Physical
location vs
routable?



The image shows a technical drawing of a mechanical assembly, possibly a suspension or steering component. It features a central white shaft with several circular joints or bearings. To the left, there is a large, dark brown rectangular component with a small circular feature containing a right-pointing arrow. The drawing is overlaid on a blurred background of a car's interior. A semi-transparent purple box in the upper right corner contains the text 'If routable, then shouldn't it be this?'.

If routable, then shouldn't it be this?

An aerial photograph of a city street grid with a white, dashed-line path overlaid. The path starts from the bottom left, goes up, then right, then up again, and then branches out into a complex, zig-zagging pattern across the city blocks. Brown rectangular shapes represent building footprints. A semi-transparent grey box with purple text is in the upper right. Labels like 'am Way' and 'Close' are visible on the map.

Pedestrians are
the greatest
pythagoreans

Chemisches Institut, Hörsaalgebäude

Problem: Multiple methods (area/point) to represent the same thing

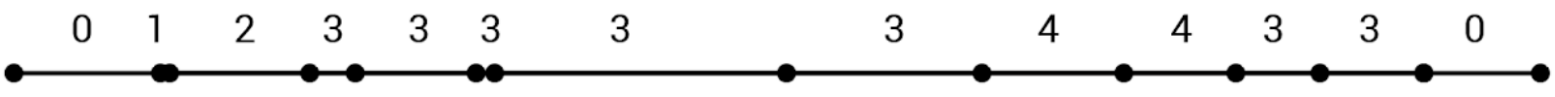


Problem: Kerbside hard to model

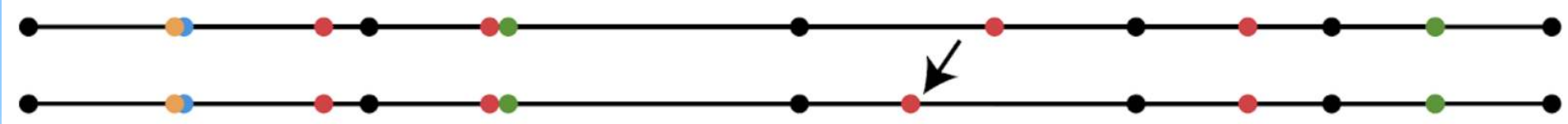
<https://sharedstreets.io/openstreetmap-and-curb-regulations/>



- ← “Inner curb” (e.g. sidewalk)
- ← Actual, physical curb as a barrier
- ← **Where curb regulations apply (i.e. the outer edge of the street)**
- ← Street centerline



Number of restriction levels





Concept of a “Street” (two here)

Verulam Way

An aerial photograph of a city street grid. A network of red lines with arrows and white dashed lines with arrows is overlaid on the map, representing a pathfinding or navigation system. A white solid line also runs through the center. A circular icon with 'db' is visible on the left side. The background shows buildings and greenery.

Tessellation

Pedestrian areas with de-facto routes

Zoom to this

▼ All fields

Name

i

Common name (if any)

+

Surface

🗑️

i

concrete

▼

Lit

🗑️

i

Yes

Width (Metres)

i

Unknown

▼

▲

Structure

i

Bridge





Charles de Gaulle - Étoile

Concept of
“Junction”

Surrounds all
relevant
features,
unifying them



Image: David Earl



Martin Lucas-Smith

www.CycleStreets.net

Twitter: @cyclestreets
info@cyclestreets.net



id:	RWG153099
_type:	cycle_lane_track
On / Off Carriageway:	TRUE
Segregated lane / track:	TRUE
Bi-directional:	TRUE
clt_colour:	NONE



Bikedata
Data to support getting more people cycling.

Collisions

TfL CID 362

Traffic counts

Cycleability ratings

TfL Cycling Infrastructure Database (CID)

TfL's CID is a comprehensive and attribute-rich dataset of all cycle infrastructure throughout London. The data is a snapshot in time ranging between January 2017 and May 2018.

The TfL CID schema is available, as is a GeoJSON API for developers. Raw data

PS London Cycling Infrastructure Database
https://wiki.openstreetmap.org/wiki/TfL_Cycling_Infrastructure_Database