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Accessibility-Based Evaluation of Transportation and Land-Use Planning: From Laboratory to Practice

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Introduction

For decades, transportation planning—and the transportation aspects of land-use planning—have employed metrics and of mobility as the centerpiece of their methodology. Highway level of service is notable among these and is used by both transportation planning (through its "predict-and-provide" approach) and land-use planning (through traffic-impact analysis) to both shape and evaluate development outcomes. Yet these approaches are inconsistent with the core understanding, shared among the transportation professions, that the purpose of transportation is not movement, but access. This notion implies that accessibility, rather than mobility, is the appropriate rubric under which to plan and evaluate transportation.

The centrality of accessibility to transportation has been well understood in the research literature since the 1970s, but accessibility-based planning has been little incorporated into practice. Within this context, project is an investigation into three questions:

1. What has been the impact of mobility-based planning on the planning process and physical outcomes;
2. What are the impediments to a shift to accessibility-based planning; and
3. What are approaches to overcoming those impediments?

Findings

The first question was explored with five case studies of how mobility-based planning plays out in practice. The cases included both land-use and transportation-planning cases, and instances in which mobility-based evaluation was conducted in a formal sense, and a case in which informal mobility-based thinking guided decisionmaking. The cases suggested that the influence of mobility-based planning was more in the way that the framework shapes ideas about desirable transportation and land-use policies than in any direct causal chain going from modeling to implementation. Two cases were selected because of their surprising outcomes; despite the mobility framework under which they operated, they resulted in outcomes not oriented towards improving auto flow. These cases illustrate the uphill battle that urbanist approaches to transportation and land development face when they are evaluated with standard mobility criteria. A shift from mobility- to accessibility-based planning would not automatically alter the nature of transportation and land-development projects that are admissible, but rather could affect problem definitions, the criteria by which projects are evaluated, and ultimately the politics of transportation and land development.

Impediments to the mobility-to-accessibility shift were studied through a series of interviews and focus groups with transportation professionals and decision makers. Impediments ranged from technical challenges to institutional constraints to difficulties in communicating the idea of accessibility.

One approach to overcoming the challenges of communicating is graphical. The report includes a graphical primer designed to communicate accessibility concepts to the planning professional and the layperson. Other approaches including introducing considerations and interests from beyond transportation, including economic and real-estate development, both of which are better attuned to the concept of accessibility than traditional transportation planning. Cities, being a relatively comprehensive and integrated level of government may have a particularly important role to play here, since accessibility inherently spans transportation and land use, realms traditionally institutionally divided from each another.

Recommendations

A shift from mobility- to accessibility based planning in the evaluative models and metrics is compelled by transportation theory, and could alter important aspects of both transportation and land-use planning. Overcoming the impediments to the shift can be assisted by altering evaluation requirements by funding agencies and professional organizations, building coalitions across municipal and metropolitan-level interests, and effectively communicating accessibility concepts.

A companion report (Accessibility-Based Evaluation of Transportation and Land-Use Projects) details new methods for applying accessibility analysis at the level the individual project.

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The concept of highway level-of-service (LOS)[1] and associated mobility metrics including congestion-related delays[2] and prospective value of travel time saved as incorporated in cost-benefit analyses[3] have for decades shaped the practice of transportation planning.[4] Mobility thinking has become so ingrained within the transportation planning profession that many evaluations of transportation projects focus on mobility-related level of service without discussing the rationale behind the level of service measure.

The mobility-centered approach is operationalized in transportation planning's "predict-and-provide" formulation[5] in which planners model travel flows over transportation networks, simulate the impact of future land-use and population change on those flows, and identify opportunities to improve flows through targeted expansion of capacity. In practice, this has often has meant expanding highway links whose forecast volume-to-capacity ratios presage unacceptable degradation in LOS.

This planning approach has been criticized for overestimating the certainty of modeling results,[6] imposing an overly narrow technical rationality on the transportation planning process[7], and neglecting the futility of a strictly supply-based approach to transportation problems.[8] [9] Less common is the critique of the standard transportation paradigm on the basis of its fundamental goal of preserving and expanding mobility, rather than accessibility.[10] This critique argues that planning and evaluation frameworks that are not grounded in the fundamental purpose of transportation threaten to generate perverse transportation outcomes.

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[1] Transportation Research Board (2010). Highway Capacity Manual 2010. Washington, D.C.
[2] Texas Transportation Institute. 2015 Urban Mobility Scorecard. College Station: Texas A&M University.
[3] Laird, James, Chris Nash, and Peter Mackie (2014). Transformational transport infrastructure: cost-benefit analysis challenges The Town Planning Review 85(6):709-730.
[4] Weiner, Edward. (1992) Urban Transportation Planning in the US—A Historical Overview. Washinton, D.C. Office of the Secretary of Transportation. Available at http://ntl.bts.gov/DOCS/UTP.html
[5] Banister, David. (2002) Transport Planning, in David A. Hensher and Kenneth J. Button, Handbook of Transport Strategy, Policy, and Institutions. Bingley, UK: Emerald.
[6] Zhao, Yong and Kara Kockelman (2002). The Propagation of Uncertainty through Travel Demand Models: An Exploratory Analysis. The Annals of Regional Science 36(1):145-163.
[7] Willson, Richard. 2001. "Assessing Communicative Rationality as a Transportation Planning Paradigm." *Transportation* 28: 1-31
[8] Downs, Anthony. (2004) *Still Stuck in Traffic*. Washington, DC: Brookings.
[9] Institute of Transportation Engineers 1989XXXX
[10] Levine, Jonathan, Joe Grengs, Qingyun Shen, and Qing Shen. (2012) "Does Accessibility Require Density or Speed? A Comparison of Fast versus Close in Getting Where you Want to Go in U.S. Metropolitan Areas." *Journal of the American Planning Association* 78(2):157-172.

This view starts from the idea first articulated early in the 20th century[11] that the demand for transportation is largely derived from people's demand to reach their destinations, rather than for the sake of movement per se. Though this view enjoys near-consensus status within the transportation professions, the fields have rarely confronted its implication: metrics of the quality or quantity of movement fail to gauge how well transportation is serving its purpose of accessibility. Moreover, since transportation infrastructure expansion can induce distance-increasing land-use change[12], mobility improvements can translate, in the longer term, into degraded accessibility when increased distances are not compensated for by improved travel speeds.[13]

While this outcome would be undesirable based on the accessibility perspective articulated above, it would be judged a mobility success so long as roadway delays were reduced in the process, because standard metrics of mobility are insensitive to the accessibility outcomes of plans. In this way, the mobility framework, rather than presuming positive accessibility outcomes from mobility improvements, is quite indifferent to accessibility implications.

Aligning transportation planning with transportation's fundamental purpose thus demands a shift from mobility to accessibility as the core framework underpinning the process. In many ways, the shift is underway. Regional planning agencies have begun to evaluate alternative development scenarios on the basis of the accessibility each supports. Transportation plans have begun to use "accessibility and mobility" as the twin goals of transportation planning, though there is little clarity of the distinction between the two (Handy 1997).

Notwithstanding these inroads, this project has found no instances where accessibility analysis actually displaced mobility as the central framework for transportation and land-use planning. Accessibility analyses tend to be carried out at the regional level within the framework of broad visioning exercises, while applied policy guidance on transportation investments and land-use regulatory decisions comes mobility tools such as traffic-impact analysis and level-of-service forecasting.

The transportation professions have been aware of the desirability of accessibility as a normative goal for planning at least since the 1970s[14], and much progress has been made in accessibility research in the intervening decades.[15] Yet the relative lack of progress of accessibility-based evaluation as guidance for applied planning decisions remains little studied. This project seeks to remedy this gap by addressing three questions:

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[11] Bonavia, Michael (1936) The Economics of Transport. London, UK: Nisbet.

[12] Cohen, Harry S. "Expanding metropolitan highways: Implications for air quality and energy use. Appendix B: Review of empirical studies of induced traffic," TRB Special Rep. 245, TRB, Washington, D.C.,1995

[13] Levine et al 2012.

[14] Wachs, M. and T.G. Kumagai. (1973) "Physical Accessibility as a Social Indicator," *Socio- Economic Planning Sciences*, 7(5):437-456.

[15] Geurs, Karst T. and Bert van Wee (2004) Accessibility evaluation of land-use and transport strategies: review and research directions *Journal of Transport Geography* Volume 12(2):127–140

1) What has been the impact of mobility-based evaluation on transportation and land-use planning?
2) What are the obstacles to accessibility-based evaluation?
3) What approaches can overcome those obstacles?

The questions are addressed here through three related sets of investigations: 1) case studies of the use of mobility-based metrics, models, and thinking in applied planning decisions; 2) interviews and focus groups with transportation practitioners and decisionmakers; and 3) a synthesis of the findings of the first two studies, together with a graphical exploration into communication of the accessibility concept. The graphical exploration was predicated on an assumption, validated in the course of the second set of investigations, that challenges in conveying the concept of accessibility would emerge as an obstacle to adoption of accessibility-based evaluation. The graphical techniques, presented in the form of an accessibility "primer" are offered as communication tools to overcome this obstacle.

Obstacles to Accessibility-Based Planning and Evaluation in Practice

Since the 1970s, much research concerning transportation planning has focused on the concept of accessibility, which assesses the ability to reach destinations based on speed of travel and proximity, rather than mobility, which assesses the speed at which one can travel.[16] Mobility-based metrics and evaluation therefore focus on improving the speed at which vehicles can traverse transportation networks. Such analysis neglects the purpose of transportation: to reach destinations.[17] Unlike mobility metrics, accessibility metrics are based on the ability to reach destinations. They evaluate the ability to reach destinations based on location, incorporating both proximity and mobility. Despite widespread agreement in the academic community that accessibility metrics should replace mobility metrics in transportation planning and evaluation, practitioners have yet to adopt accessibility metrics.

This report contains a literature review and a summary of findings from five case studies analyzing the obstacles to adopting accessibility metrics in planning practice. The academic research on the topic focuses on difficulties related to the definition and construction of accessibility metrics, as well as includes a limited amount of material regarding political challenges. Conversely, the case studies reveal a variety political difficulties proponents of accessibility metrics will face in promoting accessibility metrics.

Although most research has focused on the development and impacts of accessibility-based evaluations, many studies address, to varying degrees, the obstacles practitioners face in shifting from mobility to accessibility metrics. Analysis of this body of literature reveals the following three types of obstacles: misunderstanding in practice and disagreement in academic work of the meaning

[16] Levine and Grengs, "Getting There: Putting Accessibility into Practice for Progressive Transportation Planning," *Progressive Planning,* no. 189 (2011): 8.
[17] Ibid.

accessibility, complexity and weaknesses of accessibility models, and political obstacles related to the conflict between regional and local land use planning.

Definition of Accessibility

The first set of barriers concerns the definition of accessibility. Attempts to utilize accessibility in practice have faltered because practitioners elevate mobility to the same level as accessibility and equate accessibility with pro-density concepts like New Urbanism or view accessibility as a means to achieve social justice. Some scholars also define accessibility differently from others, presenting an additional obstacle.

Municipalities and practitioners that use the concept of accessibility in plans and planning documents often place the goal of accessibility on the same level as mobility, demonstrating a misunderstanding of the concept. Levine and Grengs argue this occurrence is an obstacle to accessibility-based planning because it "places on equal footing one means (mobility) with an end (accessibility) while neglecting another important means to that end: proximity."[18] As the concept of accessibility incorporates mobility and proximity, placing mobility on the same level as accessibility demonstrates a misunderstanding of the "transformative power" of the concept.

In an analysis of several regional plans that discuss accessibility, Handy finds a tendency to both equate the goals of mobility and accessibility and use the concepts interchangeably. For example, Sacramento Council of Governments put forth a transportation plan that identified "access and mobility" as its second goal. Despite the fact that the plan accurately defined access "as 'the ability to get somewhere' and mobility as 'the ability to move easily and quickly to get there,'" it did not adequately present the relationship between the two concepts.[19] Moreover, Handy notes that other plans might use the term mobility in their goals, but put forth performance measures or strategies that employ accessibility-based thinking.[20] Like Levine and Grengs, she calls for "a clearer understanding of these concepts and the distinctions between them" in order to successfully "shift toward planning for accessibility."[21] Such misunderstanding of the concept, particularly the conflation with "mobility," creates an obstacle to utilizing accurate accessibility metrics because users will not correctly interpret accessibility metric results if they are as valued as mobility metric results.

Studies have found that practitioners also tend to distort the definition of accessibility by equating it with New Urbanism and compact land use. Levine and Grengs note that equating "the concept of accessibility with new urbanist development approaches [misses] the point that the job of accessibility metrics or measures is to gauge people's ability to reach their destinations, both nearby and far away."[22] Practitioners and activists who equate accessibility with new urbanism therefore limit the

[18] ibid., 9 – 10.
[19] Susan Handy, "Planning for Accessibility: In Theory and In Practice," in *Access to Destinations*, ed. D.M. Levinson and K.J. Krizek (Bingley, United Kingdom: Elsevier Ltd, 2005): 141.
[20] Ibid., 145.
[21] Ibid., 145.
[22] Levine and Grengs, "Getting There," 10.

concept's potential to transform all transportation and land use development, rather than just improve compact, mixed-use development. For example, one study discusses how the transportation infrastructure aligns with the city of Stapleton's new urbanist goals. As the city's plan "was to provide for a 'variety of mobility options beyond the automobile including walking, bus, bicycling, rail transit (along the Smith Road corridor) and the use of telecommunications to substitute for the need for travel' (Stapleton Redevelopment Foundation 1995) with the explicit performance goal of reducing automobile reliance and vehicle miles traveled (or vehicle kilometers traveled)" Marshall argues "the intent was to prioritize accessibility and transit, walking, and biking over mobility and driving."[23] He identifies accessibility with alternative transportation and mobility with driving, when a more accurate description would identify accessibility as an accurate measure for all forms of transportation.

Additionally, studies find that accessibility thinking is often defined overly narrowly, and is sometimes restricted to social justice and equity ends. Rather than understanding accessibility metrics as the theoretically consistent approach to assessing the purpose of transportation, organizations tend to tie accessibility exclusively to their socially oriented goals. For example, "Accessibility Instruments for Planning Practice," assessed the usability of accessibility metrics references this tendency. It notes that the accessibility planning in the UK is directly tied to concerns about social exclusion. In a 2004 report, the Department of Transport established that "the primary purpose of accessibility planning is to promote social inclusion by improving the ability of disadvantaged groups and areas to access the job opportunities and essential public services that they need (DfT 2004, p.19)."[24] While accessibility is an entirely appropriate tool to evaluating social-equity outcomes in transportation, its application is not limited to that context, since accessibility is the service that all societal sectors seek in transportation.

Some scholars argue planners should use accessibility metrics because they more accurately reflect the purpose of transportation: to reach destinations rather than merely to be in motion. Others find particular value in the predictive capacity of the construct. For example, Bertolini writes "[a]s far as soundness is concerned consistency of the measure with the behaviour of households and firms is the central concern."[25] While the positive dimension of accessibility is central to research, the mobility-to-accessibility shift requires a recognition that accessibility is the appropriate normative goal for transportation planning.[26]

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[23] Wesley E. Marshall, "Striving for New Urbanist Transportation in an AASHTO World: Stapleton's Challenges and Opportunities," (paper, The 20th Congress for New Urbanism, West Palm Beach, FL, May, 2012): 4.

[24] Angela Hull, Cecilia Silva and Luca Bertolini, "Accessibility Instruments for Planning Practice," COST Report, page 29 (pdf pg 53).

[25] L. Bertolini, F. le Clercq, and L. Kapoen, "Sustainable accessibility: A conceptual framework to integrate transport and land Use plan-making. Two test-applications in the Netherlands and a reflection on the way forward," *Transport Policy* 12 (2005): 12.

[26] Páeza, Antonio, Darren M. Scott, and Catherine Morency. Measuring accessibility: positive and normative implementations of various accessibility indicators. Journal of Transport Geography Volume 25, November 2012, Pages 141–153

Metrics Construction

The set of second barriers concerns the construction of the metrics. Planners can utilize a number of methods to calculate accessibility, each of which has a differing degree of theoretical soundness, complexity of calculation, and possibility for results. Analysis of the theoretical soundness of the methods and the complexity of the calculation tools reveals trade-offs between accuracy and ease of use and understanding. This presents are barrier to adopting accessibility metrics in practice because practitioners cannot implement one best method. Additionally, most scholars agree that the results of accessibility metrics, no matter the method, are more difficult to communicate to the public than mobility metrics.

Theoretical Soundness

The main methods used to assess accessibility produce results that veer from the theoretical definition of accessibility to varying degrees. As none of the methods perfectly align with the theoretical concept, practitioners need to weigh the theoretical soundness of the methods with the ease of use.

Handy defines the concept of accessibility as "the potential for interaction," "determined by the spatial distribution of potential destinations, the ease of reaching each destination, and the magnitude, quality, and character of activities found there."[27] Measuring accessibility thus entails quantifying a range of aspects including transportation costs, destination preferences, and travel choices. Handy identifies the following three methods for measuring accessibility: cumulative opportunities, gravity-based, and utility-based.[28] The different methods address the aspects of accessibility differently. Cumulative opportunities measurements "emphasize the number of potential destinations or opportunities rather than their distance" from the site.[29] Gravity models weigh both the distance from the site and level of the attraction provided by the opportunity to assess the level of accessibility. Finally, utility measures evaluate "the utility of [one attraction] relative to the utility of all choices."[30] These three measures will therefore produce different results for the same site, as they prioritize different aspects of the accessibility of the site. Handy also discusses the drawbacks of each measure, which include specification and calibration of the measurements and ease of use.[31] The variety of measurements and outcomes presents a barrier to universal adoption of accessibility metrics because practitioners must assess which measure yields the most accurate measurements for their community.

Geurs and van Wee classify the measurement methods differently, identifying four main types of accessibility measurements, and discuss needed theoretical improvements. They classify accessibility measures as infrastructure-, person-, location-, or utility-based and assess each type of measurement for the incorporation of transportation, land use, temporal, and individual components in order to determine their theoretical soundness. They conclude that infrastructure-based measures are the

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[27] Susan Handy and DA Niemeier, "Measuring accessibility: An exploration of issues and alternatives," *Environment and Planning A,* 29 (1997): 1175.
[28] Ibid., 1177.
[29] Ibid., 1177.
[30] Ibid.
[31] Ibid., 1178-81.

easiest to interpret, but "lack the land-use component, and temporal and individual elements."[32] (Infrastructure-based accessibility metrics in the Geurs and van Wee classification are equivalent to mobility metrics here). Location- and utility-based measures include land-use and temporal components, but exclude "individuals' spatial–temporal constraints typically included in person-based accessibility measures."[33] They then identify four theoretical improvements needed for more accurate accessibility measures. The urge incorporating the role of competition in location-based measures, researching the economic benefits utility-based measures, including "and individual's spatial-temporal constraints," and "[linking] daily household activity and travel patterns with long-term land-use changes."[34] Like Handy, Geurs' and Wee's identification of the theoretical advantages and disadvantages of the different methods for measuring accessibility reveal an obstacle to practitioners adopting accessibility metrics. While the location- and utility-based measures are more theoretically sound than the infrastructure-based measures, no one measure captures the entire concept.

Weaknesses of the Tools

Much like the obstacles presented with the theoretical soundness of methods of measuring accessibility, the tools used to calculate accessibility also contain weaknesses that reveal additional barriers. These weaknesses include the inability to provide proof of success for planning goals and the difficulty in obtaining appropriate data.

While some analysts argue for an increased level of realism in accessibility metrics, others find that, as a model, the instrument does not need to replicate reality but rather should "ensure that the accessibility instrument is transparent in its assumptions and logic, and easy to use."[35] This feedback illustrates the tradeoff between realism and ease of use, showing that disagreement about the best method stems from differing opinion about the utility of models. In their literature review of research addressing the subject they found that "instrument developers and users have taken quite a pragmatic approach to defining the measurement of accessibility including balancing the importance of detailed representation of reality against the speed and ease of using the instrument."[36] This conclusion clearly depicts the tradeoff between usability and accuracy. Although this report does not discuss these difficulties in relation to the dominance of mobility metrics, their findings demonstrate how the disagreements concerning the realism of accessibility metrics can impede the shift from mobility to accessibility metrics.

Many studies note that data availability is a universal obstacle to adopting accessibility metrics. In an extensive study of reviewing accessibility measures in the Netherlands, Geurs and van Eck found that space-time models, which incorporate both spatial and temporal components of accessibility,

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[32] Karst T. Geurs and Bert van Wee, "Accessibility evaluation of land-use and transport strategies: Review and research directions," *Journal of Transport Geography,* 12 (2004): 136.
[33] Ibid.
[34] Ibid., 137.
[35] Angela Hull, Cecilia Silva and Luca Bertolini, "Accessibility Instruments for Planning Practice," COST Report, page 250. (pdf pg274)
[36] Ibid., 242. (pdf pg 266)

required more data than activity-based models, which include methods based on distance and attraction measures.[37] In an accessibility assessment of Montreal's transportation plan, Ahmed El-Geneidy also found that data availability is frequently a barrier to utilizing advanced, theoretically sound accessibility measurements.[38] Hull, Silva, and Bertolini's study finds that accessibility instrument developers identified data availability most frequently as the most important institutional barrier to adopting the instruments in practice.

However, they also reference a survey in the United Kingdom finding that "data availability is not a serious obstacle towards detailed accessibility assessments."[39] Furthermore, their study analyzed twenty-two accessibility instruments that largely required readily available network and socioeconomic data. For example, many metrics use transportation travel times and the locations of retail opportunities or housing densities to calculate accessibility. Nevertheless, the above examples demonstrate that researchers face obstacles with data availability, although they do not specify the type of unavailable data. Further research should therefore investigate the specific data barriers planners face when trying to use accessibility metrics.

Communication

The inability to easily interpret and communicate the results of different types of accessibility measures poses another challenge to adopting accessibility metrics in transportation planning practice. Much like the theoretical soundness and accuracy of the measurements, scholars find a trade-off between ease of interpretation and complexity of the models. In assessing academic work and case studies conducted about the usefulness of accessibility measures, Hull, Silva, and Bertolini's study finds that "[i]nterpretability generally appears to be in conflict with usability and because more complex indicators aggregate more information with more sophisticated mathematical methods, thus making them more abstract and less intuitively understandable."[40] Similarly, Geurs and van Wee find that an effective accessibility measure needs to balance ease of interpretation, accuracy of data, and adherence to theoretical criteria.[41] Finally, Susan Handy points to ease of interpretability as a major advantage of cumulative opportunities models, despite the model's lack of sophistication.[42] Difficulty communicating the concept of accessibility, as well as the results of accessibility measurements, creates a challenging obstacle, particularly considering the ease with which stakeholders communicate mobility-based concepts.

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[37] Karst T. Guers and J.R. Ritsema van Eck, *Accessibility Measures: Review and Applications* (Bilthoven, the Netherlands: National Institute of Public Health and the Environment, 2001), 135.
[38] Ahmed El-Geneidy, Assumpta Cerdá, Raphaël Fischler, and Nik Luka, "Evaluating the Impacts of Transportation Plans Using Accessibility Measures," *Canadian Journal of Urban Research,* 20.1 (2011): (proquest pdf pg 3).
[39] Angela Hull, Cecilia Silva and Luca Bertolini, "Accessibility Instruments for Planning Practice," COST Report, page 31. (pdf pg 55).
[40] Angela Hull, Cecilia Silva and Luca Bertolini, "Accessibility Instruments for Planning Practice," COST Report, page 42. (pdf pg 66).
[41] Guers and van Wee, "Accessibility evaluation of land-use and transport strategies," 137.
[42] Handy and Niemeier, "Measuring accessibility: An exploration of issues and alternatives," 1182.

Political Challenges

The third set of barriers concerns political challenges. First, the use of accessibility metrics, which are inherently regional in scope, threatens the land use controls of local governments. Furthermore, the concept of accessibility currently lacks a political constituency that can face the clout of the mobility constituency, a problem common to reform efforts in numerous fields, including education.

Local Land Use Control

Levine and Grengs identify accessibility's incorporation of land use into transportation planning as a politically threatening aspect, as it "will be seen as impinging on local land use regulatory prerogative, something that is zealously guarded by those who are privileged by current arrangements, particularly in the United States."[43] As land use planning is squarely within the power of local municipalities, a shift in transportation planning, which occurs at federal, state, and local levels, that influenced local land uses would be politically contentious. Such conflict is common most regional planning efforts in the United States.

Kathryn Foster addresses these difficulties, arguing "a territorial mismatch between the scale of a regional problem and the scale of a political organization" is the key problem.[44] Although the United States has over 500 regional planning councils dedicated to regional planning issues, they are generally advisory rather than authoritative.[45] However, she also notes that 180 of these regional councils serves as regional Metropolitan Planning Organizations that allocate federal transportation funds. This responsibility could serve as a key to legitimizing accessibility metrics, as these MPOs contain a certain amount of authority regarding transportation decisions. However, as Susan Handy finds in her study of accessibility language in regional transportation plans, many regional organizations misuse the term and fail to incorporate accessibility metrics.[46] Successful implementation would likely require better understanding of accessibility and cooperation for the region's local municipalities, who might resist impingements on their local land use power.

Additionally, municipalities are particularly hesitant to compromise local land use power when they feel threatened by the prospect of high-density development. In an article about regional planning and growth management, Edward Ziegler finds the local NIMBYism ('not in my backyard') dominates conversations about density and growth in rapidly growing regions. Although local municipalities initially support growth, rapid, consistent growth causes attitudes to turn "[ambivalent] as both old and new residents begin to encounter the negative impacts of continued growth and automobile-dependent sprawl. NIMBYism at some point begins to dominate both the public's perception of future growth and

[43] Levine and Grengs, "Getting There," 9-10.
[44] Kathryn Foster, "Policy & Practice: Challenges Ahead for US Regional Governance," *The Town Planning Review*, 81, no. 5 (2010): 490, doi:10.3828/tpr.2010.21.
[45] Ibid., 496.
[46] Susan Handy, "Planning for Accessibility: In Theory and In Practice," 145.

the politics of the local planning and zoning process."[47] He finds that even higher-density zones in such municipalities are still auto- dependent, often "relegated to isolated and residual buffer zones."[48] In *Still Stuck in Traffic: Coping with Peak Hour Congestion,* Anthony Downs also faults NIMBYist attitudes with preventing high-density development.[49] Given the arrangement of local land use control, local attitudes about density tend to prohibit significant high-density development. While accessibility measures are not equated with high-density development, empirical studies find that high-density development can increase accessibility because the benefits of proximity outweigh the loss of mobility.[50] Local NIMBY attitudes about growth and high-density development supported through zoning codes therefore pose an obstacle to the adopting accessibility evaluation.

Finally, the numerous, separate goals of different planning and government bodies also pose a political challenge to adopting accessibility metrics. In Hull, Silva, and Bertolini's study, 39% of the 54 accessibility instrument developers polled identified "separate institutions for urban and transport planning and formal government processes" as a challenge to using accessibility metrics, making this issue the second most frequently mentioned problem, after data availability.[51] This challenge extends beyond the conflict between local and regional planning bodies, illustrating how any two planning departments or government bodies might have conflicting goals.

For example, the relationship between Metropolitan Planning Organization and state level transportation decision makers like State Departments of Transportation and legislative bodies can exhibit conflicting goals, as the state level decision-makers tend to prefer more infrastructure intensive, auto-oriented transportation solutions than those the MPOs support. Benjamin K. Olson argues that the structure of decision-making prevents MPOs from implementing ISTEA and TEA-21 policies that would expand transportation funding focus beyond road building. He finds that "metropolitan transportation decisions continue to be made at the state level and transportation funds for metropolitan areas continue to be spent disproportionately on road-building for outer-ring suburban communities."[52] He also finds that state organizations tend to withhold funds for urbanized areas, prioritizing road-building transportation projects on the fringes of urban centers.

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[47] Edward H. Ziegler, "The case for megapolitan growth management in the twenty-first century: Regional urban planning and sustainable development in the USA," *International Journal of Law in the Built Environment,* 1, no 2 (2009): 111, doi: 10.1108/17561450910974722.

[48] Ibid., 114.

[49] Anthony Downs, Still Stuck in Traffic: Coping with Peak Hour Congestion, (Washington, DC: The Brookings Institute, 2004), 224.

[50] Levine, Jonathan, Joe Grengs, Qingyun Shen, and Qing Shen. (2012) Does Accessibility Require Density or Speed: A Comparison of *Fast* Versus *Close* in Getting Where You Want to Go in U.S. Metropolitan Regions. *Journal of the American Planning Association* 78(2):157-172.

[51] Angela Hull, Cecilia Silva and Luca Bertolini, "Accessibility Instruments for Planning Practice," COST Report, page 230. (pdf pg 254).

[52] Benjamin K. Olson, "The Transportation Equity Act for the 21st Century: The Failure of Metropolitan Planning Organizations to Reform Federal Transportation Policy in Metropolitan Areas," *Transportation Law Journal,* 28, no. 147 (2000): 168.

A study on the capacity of MPOs to implement ISTEA policies also finds that "some SDOTs remain predominantly highway oriented."[53] Furthermore, a similar report by the General Accounting Office indicates that, within the realm of ISTEA policy implementation, State DOTs, regional transit, local governments and MPOs have the most difficulty agreeing on which transportation projects to pursue.[54] The report does not explicitly say that other state agencies prefer road-building projects. However, when read in conjunction with the other cited studies, it becomes clear that state agencies are frequently in conflict with MPOs regarding decisions about infrastructure investment. While the shift to accessibility metrics betters transportation planning, it might not serve the goals of other planning initiatives, including those of infrastructure oriented transportation agencies. Support for accessibility metrics might therefore be difficult to gain among other planners and policy makers.

Lack of Constituency

Additionally, accessibility lacks a strong, expansive constituency like that of mobility, which includes road builders, oil companies, and anyone who benefits from transportation planning revolving around mobility. Though this issue has been little-studied in transportation planning, academic work regarding education reform serves as a useful parallel in illustrating this problem.

Warren, a sociologist who specializes in education and community organizing, argues that successful education reform in urban settings requires a strong political constituency that includes the people most affected by education. He contends that, "a political constituency of parents has to become directly engaged within schools to help build social capital that can increase the capacity of schools to improve."[55] The lack of political opportunity is particularly severe in low-income communities, where the families of school children have few opportunities to change school districts if they are dissatisfied with a school. The schools, in turn, have little pressure to reform. Although the push education reform incorporates a number of social issues not relevant to transforming transportation planning with accessibility, the two movements contain an underlying similarity. Like education reform, the main beneficiaries of transportation planning are the consumers. These consumers, whether the general public or a subset of the general public, have neither a clear voice in the mobility lobby, nor a clear understanding of the benefits of accessibility evaluation. In education reform, Warren finds that political power for school attendees and their families is most successfully built through community organizations. Although this model is more appropriate for education reform, as school issues occur at the community level, than accessibility reform, which will occur across multiple geographic levels, it is useful to learn from other fields addressing lack of constituency.

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[53] U.S. Advisory Commission on Intergovernmental Relations, *MPO Capacity: Improving the Capacity of Metropolitan Planning Organizations to Help Implement National Transportation Policies* (Washington DC: 1995), 45.

[54] United States General Accounting Office, *Urban Transport: Metropolitan Planning Organizations' Efforts to Meet Federal Planning Requirements* (Washington DC: 1996), 22.

[55] Mark R. Warren, "Building a Political Constituency for Urban School Reform," *Urban Education,* 46 (2010): 489, doi: 10.1177/0042085910377441.

Obstacles to Accessibility-Based Evaluation

Although much academic research in transportation planning has investigated the concept accessibility, research considering the specific obstacles to adopting accessibility metrics in transportation practice is relatively sparse. This literature review catalogs academic research conducted on the topic and provides a number of examples from planning practice to illustrate the key findings. Existing literature discusses the issue from three main viewpoints: conflicts with the definition of accessibility, problems with the construction of metrics, and political obstacles to accessibility. The above description of observed obstacles to adopting accessibility metrics is similar to case study research conducted as part of this project. The following summary outlines the trends identified in five case studies that analyzed how mobility-based thinking influences transportation and land use decisions.

Impact of Mobility-Based Planning: Case Studies

To understand the potential for a transformation of the transportation paradigm from a mobility to an accessibility basis, this project first investigated the ways in which mobility-based transportation and land-use planning shapes metropolitan outcomes. Through studies this report illustrates the effects that mobility-based thinking and mobility metrics have on transportation and land use decisions in the United States.

Selection of case studies was guided by the framework presented in Table 1. The project sought both cases of land development and transportation investment, since both are guided at least in part by mobility-based evaluation. The ways in which mobility-based evaluation influences outcomes were assumed to differ, however. In some cases, formal mobility metrics and models were not employed, but the outcome was guided by mobility nonetheless; these are cases based in "Informal Mobility-Based Thinking." Others employed formal models in a more-or-less textbook fashion; these were referred to as "Mainstream Mobility Metrics." Other cases managed to plan for land-use or transportation outcomes not guided by mobility despite the prevalence of mobility-based evaluation; these are referred to as "Mobility Logic Challenged." Candidate cases were developed through searches of national news reports and were were scored on the following scales: decisiveness/illustrative effect (importance of mobility as a factor), timeliness (recent decisions), and well-defined parties and documentation. Cases selected were those with the highest combined scores in each of the cells of Table 1.

	Transportation	Land Use
Mainstream Mobility Metrics	1. Albuquerque, NM	2. Waterbury, CT
Informal Mobility-Based Thinking	N/A	3. Camden County, MO
Mobility Logic Challenged	4. San Francisco, CA	5. Cambridge, MA

Table 1: Case Study Selection Rubric

Paseo del Norte/I-25 Interchange Reconstruction Project, Albuquerque, NM

The purpose of this case study is to demonstrate the effects that mobility-based thinking and mobility metrics had on the decision to reconstruct the Paseo del Norte/I-25 interchange on the north side of Albuquerque, New Mexico. The interchange links I-25, a major north/south route, with Paseo del Norte, a major east/west route in the city. Paseo del Norte is particularly important because it contains one of seven bridges that crosses the Rio Grande to connect to the Westside of Albuquerque and Sandoval County. Furthermore, it has the second highest capacity and traffic volume of all the river

crossings, following I-40, which is directly south of Paseo del Norte.[56] Over the past 15-20 years, Paseo del Norte has served as an important connection between the rapidly growing residential development west of the Rio Grande River and employment and activity along I-25.[57] Therefore, mitigating traffic congestion along Paseo del Norte and at the I-25 interchange is a priority in the region.

The project occurred in two broad iterations: the first considered a $350 million reconstruction plan, and the second considered and implemented a scaled-down $93 million plan. Despite the transition, the project consistently aimed to reduce traffic congestion through enhancing mobility for single-occupancy vehicles. The narrowed scope of the adopted plan emphasizes this goal, as it retained the 'essential' portions of the plan related to commuter traffic flows and took out less important pieces of the plan related to alternative modes of transportation.

Project Development:

Between 2002 and 2011, the City of Albuquerque, the New Mexico Department of Transportation (NMDOT), the Mid-Region Council of Governments (MRCOG), the Federal Highway (FHWA), and various consultants worked together to develop proposals that would reduce traffic congestion in the interchange and along Paseo del Norte. During the first iteration of the project, NMDOT followed a three step process: phase 1A, initial evaluation; 1B, detailed evaluation; and 1C, environmental assessment. An interview with a transportation official confirmed that this is the standard procedure for transportation projects.[58]

The New Mexico Department of Transportation commissioned Wilson & Company to prepare "Phase 1A: Initial Evaluations of Alternatives Report," which presented and preliminarily evaluated different levels of interchange reconstruction.[59] In 2007, after NMDOT hosted a number of public meetings about the project, Wilson Company prepared "Supplemental Phase 1A Initial Evaluation of Alternatives," that recommended which four alternatives NMDOT should evaluate in Phase 1B.[60] Phase 1B analyzed the following aspects of the four alternatives and the no-build alternative: general concept, I-25 interchange, Jefferson intersection, channel arterial, Domingo Baca Arroyo Corridor, bicycle facilities, total estimated cost, right-of-way requirements, constructability advantages, and constructability disadvantages.[61] The phase concluded with a recommendation of two alternatives, Alternative 7 and 13, to move forward to Phase 1C, due to higher performances and lower costs than the other alternatives.[62]

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[56] Wilson and Company, Inc., *Interstate Access Change Request* (Albuquerque, NM, 2013), 8.
[57] *Ibid.*
[58] Anonymous (Tavanaipour Interview).
[59] Wilson and Company, Inc., *Interstate 25 and Paseo del Norte Interchange Project: Transition Report* (Albuquerque, NM, 2013), 2.
[60] Ibid.
[61] Ibid, 3.
[62] Ibid, 3.

In 2010, NMDOT and FHWA conducted Phase 1C and produced a Draft Environmental Impact Statement (DEIS) reviewing Alternative 7, Alternative 16 (a revision of Alternative 13), and the no-build alternative. The Draft and Final Environmental Impact Statement serve to fulfill the National Environmental Policy Act (NEPA) requirements.[63] The Draft compared a number of environmental impacts, including land use, economic effects, air quality impacts, bicycle and pedestrian impacts, and energy impacts.[64] Significantly, the evaluations found that the higher levels of capacity over the no-build alternative would produce more carbon emissions (an air quality measurement) and increased energy consumption. The land use and economic impacts only address the immediate changes occurring in the vicinity of the project, rather than larger regional land use or economic impacts.

In 2011, after the City and NMDOT failed to receive funding, they decided to scale back the project. The City sought proposals for a new design, budgeted around $90 million, which would retain the most essential features of the project.[65] One former politician claimed a politically influential developer played a major role in the budget shift, saying, "we had a project that was languishing, it was too expensive, and now you have someone who had a reason, self-interest to develop their property, to pursue getting this project off the ground."[66] However, there is no definitive documentation to indicate that this developer played a major role in the decision to pursue a cheaper, more feasible alternative. The state ($29.75 million), county ($5 million), and federal ($8.25 million), and the city ($50 million) after holding referendum in November 2012, governments came together to fund the project, and the major stakeholders sought out a design/build team to implement it.

Before securing funding, the city applied for Transportation Investment Generating Economic Recovery (TIGER) grants (Fiscal Years 2011 and 2012) to fund the project. MRCOG conducted an Economic Impact Report, published in November 2011, as part of the Benefit-Cost Analysis required for these applications. The process modeled travel demands statistics, including average speed, average trip time, vehicle miles traveled, vehicle hours of travel, and vehicle hours of delay for the build and no-build alternatives to evaluate 2015, 2025, and 2035 outcomes. Analysis of the outcomes enabled assessment of the economic impacts, including new employment and average annual increases in gross regional product, wages and salaries, and income, of the build alternative over the no-build alternative.[67] The report states that positive economic impacts result from "facilitating a more efficient flow of labor and goods… That is, when the network functions more efficiently, origins and destinations become closer to one another in terms of time and cost."[68]

The final step of the decision-making process required the submission of an Interchange Access Change Request to the FHWA, published in April 2013. FHWA requires this request report under Title 23,

[63] "NEPA Documentation," http://environment.fhwa.dot.gov/projdev/docueis.asp.
[64] Wilson and Company, Inc., *Interstate 25 and Paseo del Norte Interchange Project: Transition Report*, 23-26.
[65] Ibid., 1.
[66] O'Malley Interview, page 7.
[67] Mid-Region Council of Governments, *Economic Impact Report* (Albuquerque, NM: 2011) 3, 5.
[68] Ibid., 1.

USC.[69] The report describes the project impact in relation to the following eight policies: current infrastructure cannot be improved to satisfy the "design year traffic demands" (2035); current transportation system management (ramp metering, mass transit, and HOV facilities) and alternative improvements do not satisfy the need; proposed change does not have a negative impact on safety and operations of the interchange and local streets (extensive specifications included); proposed change connects to a public road, proposed change is "consistent with local and regional land use and transportation plans"; if future changes anticipated, a comprehensive corridor or network study accompanies the request; coordination with future development/land use, in cases where there is an agreement; and proposed change can be included as an alternative in an environmental review.[70] In describing the purpose of the project the report references a Congestion Management Process conducted by MRCOG (2013), which summarizes statistics on the 30 most congested corridors in Albuquerque based on volume-to-capacity ratio, speed differentials, and crash rates. [71] The Congestion Management Process ranks Paseo Del Norte as the 13th overall most congested corridor, specifically noting the high congestion during rush hour, which yields 60-80,000 vehicles per day.

The analyses used LOS (scores A through F) to compare traffic volumes at peak hour in 2035 from the no-build and preferred project.[72] The preferred project exhibited higher LOS ratings than the no-build alternative, ranging between C and F, for freeway, weave junction, or intersection analysis. Two out of twenty four ramp junctions measured receive a score of B, the remaining twenty two receive scores of F, D, or C. The safety analysis reports the number of crashes at various points around the study area during 2007-2009 and 2002-2004, but does not present data on expected decreases in accidents.[73] Finally, the report addresses each applicable policy area. To summarize, the report demonstrates that the existing facility is not adequate for the projected travel demand, previous reviews eliminated bus and HOV improvements due to inadequacy, there are no negative safety impacts, the project was added to the TIP, and the current project has a "smaller environmental footprint" than previous alternatives.[74]

Influence of Mobility Metrics

Throughout the process, the reasoning behind the decision to reconstruct was framed around mobility metrics described above and mobility-based thinking, which led to a solution that enhanced mobility through traffic reduction. The paseoi25 website lists three main goals: traffic congestion relief, safety enhancements, and air quality improvements.[75] Published documents reviewed below about the project and interviews with stakeholders reveal that all the goals depended on successfully reducing

[69] "Stewardship and Oversight Agreement," last modified April 28,2014, http://www.fhwa.dot.gov/nmdiv/stewardship/stewardship02.cfm.
[70] Wilson and Company, Inc., "Interstate Paseo del Norte Interchange Project: Interchange Access Change Request (IACR)," (Albuquerque, NM, 2013), 36.
[71] Mid-Region Council of Governments, A Profile in Congestion (2012): The 30 Most Congested Corridors in Albuquerque Metropolitan Planning Area (Albuquerque, NM: Mid-Region Council of Governments, 2013), pg 9.
[72] Wilson and Company, Inc., IACR, 28.
[73] Ibid., 33, the report also references that these number appeared in Phase 1B report.
[74] Ibid., 36-45.
[75] Paseo/I-25 Interchange Project, New Mexico Department of Transportation, 2.

traffic. Furthermore, as demonstrated in the technical analyses, the project goals did not seriously consider the land use effects, namely increased development of the Westside. These effects were not incorporated into the analysis notwithstanding the fact that MRCOG, a stakeholder, recognizes these effects and conducts other projects and studies that address these issues.[76] However, the following examples from public documents and interviews illustrate the hierarchy of goals, and how the mobility-based analyses reviewed above influenced the formulation of these goals.

Documents published about the project between 2007 and the present indicate that observable traffic congestion has been the primary concern. The purpose statement of the 2007 iteration of the project states, "The purpose of the project is to improve traffic performance and mitigate congestion along I-25 and PDN thereby improving regional mobility and local circulation within the defined project limits. The need for the transportation improvement within the vicinity of and including the PDN/I-25 interchange is evident from congestion that can be observed on a daily basis."[77] In 2008, NMDOT published an Environmental Impact Statement, which stated the need to, "Provide for existing and future traffic demand; reduce congestion; improve local circulation; and, improve regional mobility."[78] The PowerPoint presentations from public meetings about the project in 2012 and 2013 also reflect this priority. The IACR report states, "The need for transportation improvements within the vicinity of and including the I-25/PDN interchange is evident from the congestion observed on a daily basis and documented within the Congestion Management Process (CMP) Document of the Mid-Region Council of Governments (MRCOG)," revealing the relevance of routine documents like the Congestion Management Process, which is federally mandated, to justifying reconstruction projects.[79] The slide stating the purpose and need of the project at a meeting in February 2013 reads, "To improve performance and mitigate congestion along I-25 and Paseo Del Norte there by improving regional mobility. The need for transportation improvements within the vicinity of and including the I-25/Paseo Del Norte interchange is evident from the congestion that can be observed on a daily basis. Safety improvements are also needed."[80] The language in Interstate Access Change Request and the slide almost exactly replicates the language of the 2007 purpose statement, demonstrating that the scope of the project remained constant through the project, despite the change in scale. Furthermore, all of these stated goals reference the observable congestion, implying that a major motivating factor throughout this process is the informal perception of the traffic problem. Although the slide also indicates safety as a goal, interviews with stakeholders reveal that the project was primarily designed for

[76] For example, the "2035 Metropolitan Transportation Plan" discusses the growth trends and the need to pursue alternatives to "building your way out of congestion." http://www.mrcog-nm.gov/transportation/metro-planning/long-range-mtp?id=473:2035mtp&catid=16.

[77] Wilson and Company, Inc., *Interstate 25 and Paseo del Norte Interchange Project: Transition Report,* 6.

[78] J. Don Martinez, Division Administrator, FHWA, NM, "Environmental Impact Statement: Albuquerque, NM."

[79] Wilson and Company, Inc., IACR, 9.

[80] New Mexico Department of Transportation, PowerPoint Presentation from Public Meeting on February 12, 2013, Slide 31.

increased traffic speeds; rather than being inherent to the design, safety enhancements were asserted to flow directly from measures designed to mitigate traffic congestion.

Interviews with proponents and opponents of the project corroborate the language from the published documents, and speak more clearly to the hierarchy of the goals. When asked about the other goals (safety, air quality, and economic impacts), one interviewee, who expressed concern with the scope and potential for success of the project, said, "those generally didn't rise to the surface, the issue was wait time. That was it, people were waiting, chewing up over there, and they didn't want to wait when they were going home."[81] Meanwhile, the current project Design Lead at NMDOT indicated that traffic and safety are the driving forces behind reconstruction.[82] An interview with an NMDOT representative who previously worked in the project clearly described how improving Level of Service and reducing delay directly improves safety, and that safety was, therefore, a partial goal, reliant on traffic reduction.[83] Furthermore, this official discussed how the potential economic impacts of the project also depend on congestion reduction, as they will occur due to less time wasted commuting and transporting goods.[84] His opinion is supported in the Economic Impact Report discussed above.

The website and materials presented at public meetings bolster the goals stated above with statistics gathered from the mobility analyses. For example, regarding congestion, the website uses statistics from the Economic Impact Report, stating, "Potential savings of more than 350,000 hours in travel time annually. Equivalent to more than one hour per person per week or more than 170 person work years in increased work productivity every year."[85] Also, the website cites the crash statistics found in the Phase 1B and Interstate Access Change Request as evidence (470 per year), claiming an accident reduction will occur after the project is completed (despite the fact that this is not stated in the report).[86] Lastly, the website also utilizes the economic information from the Economic Impact Report to boast the positive impacts of the project, such as, "$2.8 billion in net new economic activity from year 2013-2031 for the Albuquerque region; More than 3,000 net new jobs within 20 years; An estimated $2.5 million annual savings in fuel for the region over the next 20 years, supporting a local workforce of approximately 38,000 current jobs (20% of workforce)."[87] The PowerPoint presentations at meetings and much of the printed material about the project references these same statistics, which all demonstrate how NMDOT and the City used the formal mobility analyses for project promotion.

Finally, examination of the features retained from the initial, $350 million project, in the current, scaled back project, demonstrates the extent to which commuter, single occupancy vehicle mobility held priority over other features. On official from NMDOT stated that the current project satisfies the

[81] O'Malley interview pg 6
[82] Smelker interview pg 2
[83] Anonymous (Tavanaiepour interview pg 4).
[84] ibid.
[85] "Purpose and Funding" Paseo/I-25 Interchange Project, last modified 2012, accessed October 24, 2013, http://www.paseoi25.com/about_the_project.aspx.
[86] ibid.
[87] ibid.

"essential elements" of the overall issue, namely the AM/PM commuter traffic between the Westside and downtown Albuquerque, and cut out the pieces that were inessential. According to a segment of the 2011 TIGER grant application publish in the Transition Report, which outlined the shift in the project, "This [new] approach was focused on the high-volume traffic movements through the interchange: traffic on PDN to the west of the interchange and traffic on I-25 to the south of the interchange. The previous PDN/I-25 Interchange Project proposed to improve traffic movements in all directions through the interchange, which required numerous free-flow and fly-over ramps that increase the overall project cost. By reducing the number of ramps, the project cost can be lowered."[88] Furthermore, a local bicycling advocate noted that a bicycle path bridge that would have connected to multi modal paths on the east and west sides of the interstate was removed from the plans, and replaced with highly inadequate bicycle infrastructure (Buntz, 2013).[89] These comments illustrate the project leaders' commitment to the commuter congestion, and lack of concern for alternative approaches to the issue.

Final Decision and Impact:

In conclusion, the final decision to reconstruct the interchange demonstrates a high level of influence from mobility-based thinking. Traffic mitigation, particularly for the benefit of commuters from the Westside of Albuquerque, was a driving force through the entire decision-making process. However, according to one interviewee, the political influence of a Walmart developer also played an important role. Regardless, the official documents, the interviewees' narratives, and the material presented to the public all support the reconstruction based on mobility-based thinking and traffic reduction.

As this project will particularly benefit the people commuting from the Westside of Albuquerque, it will likely encourage (or, at least, not discourage) continued residential growth in this region. As one local architect stated in an email exchange, "The growth of the West Side is a self-fulfilling prophecy. [Paseo del Norte] reached its 20-year capacity in just 6 years due to housing growth on the West Side before and after it was built. PDN acted like steroids for growth 'over there'."[90] This comment raises another important issue: the lifeline of the current reconstruction project. Both representatives from NMDOT discussed the project in terms of 20-year projections, indicating that the travel demand models conducted measured the capacity of the reconstruction system for up to 20 years.[91] A representative from MRCOG also noted that these projections do not take into account other modes of transportation or the impacts of land use on travel demand projections.[92] His comments are significant, as they indicate that professionals involved in transportation decisions that appear to rely entirely on mobility-based influences understand the greater land use implications of these decisions.

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[88] Wilson and Company, Inc., *Interstate 25 and Paseo del Norte Interchange Project: Transition Report,* 18.

[89] Buntz interview pg 3

[90] John Hooker, in email with Arthur Prokosch about Paseo Project, August 2013.

[91] Interviews with hooshang and smelker

[92] Nathan Masek, in email with Alexandra Markiewicz, October 2013.

Regency Place, Waterbury, CT

The denial of the special use permit for Regency Place, a medium density development in Waterbury, Connecticut, demonstrates how Planning Commission can utilize mobility metrics to justify a decision, even if the underlying reason for the decision is based on other concerns. The City of Waterbury officially denied a special use permit for Regency Place, a site owned by Paulmar Associates Limited Partnership, due in part to concerns about traffic congestion and safety. However, the City was particularly concerned about this development because it planned on rezoning the area for low-density during a moratorium that went into effect just after the special use permit application.

This case occurred when Waterbury, a small, quickly growing city about two hours outside of New York, conducted a comprehensive, long overdue planning and zoning revision, after years of financial instability and corruption. In 2007, the city enacted a moratorium on medium and high-density development in order to reassess the zoning code and better plan for the increasing housing demands. At the time of the application, just prior to the moratorium, the Regency Place site was zoned for medium density residential development, but low-density residential zones surrounded it. Paulmar could therefore have expected that the city would rezone the site for low-density development and would need to obtain a special use permit for the proposed development before this change. However, the City denied the special use permit based on nine distinct reasons, five of which involved traffic concerns. Although it is impossible to determine if it would have denied the proposal before the rezoning considerations, it is clear that mobility-based thinking supported a decision that permitted the city to rezone the site as it had planned.

Project Development

In January 2007, Paulmar applied for a joint special use permit and site plan approval and a subdivision plan for its 13.35-acre property on Hamilton Road in Waterbury. The property was adjacent to Route 69, a major route between Waterbury and the neighboring town of Prospect. This case study will focus on the special use permit application, denial, and court case, as the subdivision plan denial did not consider mobility metrics. The special use permit would authorize a proposed development of 171 condominium units in 18 buildings.[93] The proposal planned for two exits and one entrance from the units, both onto Route 69. The northern access point permitted vehicles to exit by making right hand turns to the north towards downtown Waterbury. The southern access point contained two lanes for exiting vehicles, one for right hand turns and one for left hand turns, and one lane for entering vehicles. An hourly transit bus passes along this section of Route 69, running north through downtown Waterbury, on weekdays. However, the traffic related documents for this case do not mention transit as an alternative form of transportation that people living in the proposed community might use.

[93] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 2

Paulmar submitted a traffic impact study as part of the special use permit application, which indicated that the development would have a minimal effect on traffic conditions. The study found a small "change in Level of Service and/or increase in average vehicle delay" at signalized intersections near Interstate 84, a nearby highway, and "very little change in average vehicle delay and no change in Level of Service at each of the State Route 69 intersections with the unsignalized intersections of Hamilton Avenue near the site."[94] However, the study also found that one signalized intersection north of the site "will continue to experience long traffic delays low Levels of Service during the peak hours" but, "the increase in the overall delay and changes in operation of these intersections due to site-generated traffic is considered insignificant."[95] Therefore, the development would minimally impact the intersections surrounding it. Regarding the intersections added for the development, the study found that the southern access "will operate at Level of Service "C" and "D" or better during the weekday morning and weekday afternoon peak hours, respectively."[96] Although the study found minimal negative impacts, the zoning code stipulations concerning traffic presented an obstacle for the special use permit application.

Despite the findings in the traffic impact study, the City Plan Commission unanimously voted to deny the special use permit. It presented nine reasons for its decision based on zoning code requirements, five of which raised traffic concerns.[97] The Commission found that the proposal lacked "adequate vehicular entrances as required by Section 7.46-3," "the south access drive [would] operate below a level of service "C" in violation of Section 7.45-1(f)," and "the "build conditions" [would] cause some traffic movements at the intersection of Rt. 69, Pearl Lake Road and Harper's Ferry Road to degrade below a level of service "C" in violation of Section 7.45-1(f)."[98] The two remaining traffic reasons related to traffic safety, rather than mobility, concerns.

Influence of Mobility Analysis

Paulmar sued the City Plan Commission, arguing that the zoning code's traffic requirements were too vague. However, the court's interpretation of mobility related language in the zoning code supported the Commission's decision. The Court examined the record of the Commission's public meetings concerning the project, finding that "the Commission heard extensively from both the City Planner and the City's Traffic Engineer, and questioned both staff and the applicant regarding this issue."[99] The Court found that the Planning Commission had substantial enough evidence to support the three reasons for denial of the special use permit that concerned mobility impacts, as well as the two reasons that cited traffic safety.

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[94] Frederick P. Clark Associates, Inc., *Traffic Impact & Access Analysis* (Waterbury, CT, 2007): 2.
[95] ibid.
[96] ibid pg 20.
[97] James A. Sequin, letter to Paulmar Associates, L.P., July 19, 2007.
[98] Sequin, letter to Paulmar, July 19, 2007.
[99] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 9

The Court found the reason concerning the Level of Service of the southern access point was supported by the City Planner's testimony at a public hearing about the proposal and the requirements in the zoning code. The City Planner testified that the development's southern access point would operate at insufficient Level of Service, stating, "'the access drive left turn movement or the uphill movement is designed as a design of level service of less than C." (ROR 3f at 36.) He further indicated that "the areas with the red box indicate the deterioration in the level of service from B to C and that is as I understand it a deterioration from the no-build to the build condition.'"[100] The Court then notes to zoning code "Section 7.45-1 requires a level of service of C or above," indicating that the proposal violated this requirement.[101] The Commission therefore had suitable evidence to cite concerns about the LOS of the south access point in its denial of the permit.

The Court also found the Commission had substantial enough evidence to determine that the proposal lacked "adequate vehicular entrances," a requirement of the Section 7.46-3 of the zoning code. The Court cited that the City Planning staff member "did not indicate that he found access ways to be adequate."[102] The judge then argued, "You can't go lower than one [entrance point]. Any argument that the language of the regulation "adequate but not excessive" is vague and is of no consequence as there was only one entrance and that issue was not raised in the pleadings."[103] The Court thus concluded the plaintiff's claim that the zoning requirement for "adequate vehicular entrances" was vague did not stand because the plan only provided one entrance (a bare minimum). Although this reason for denial does not explicitly refer to traffic congestion or mobility, the discussion of the number of vehicular entrances to this development suggest concern about mobility problems arising from an "inadequate" number of entrances.

Finally, the Court found that the Plaintiff could not point to the current low road conditions at a nearby intersection to support his argument that the development will not significantly worsen the already congested intersections. The judge argued, "Any argument that because some of the surrounding road conditions are already below level of service C in violation of regulation 7.45-1(f) is of no help to the applicant. Granted, the applicant cannot change that situation but it does indicate the difficulty with traffic intersections nearby which can only be exacerbated by this application."[104] This argument clearly used mobility-based reasoning; the proposal was denied because it worsened an intersection with a low Level of Service, even though the proposal did not *create* the LOS problem at this intersection. The Court and the Commission thus strictly adhered to the zoning code stipulations in Section 7.45 that the traffic impacts of the proposal cannot contribute to lowering an intersection's LOS below a certain threshold.

The Court also approved of the Commission's two reasons considering traffic safety. Of the nine total reasons cited for denial, the Court concluded that the Commission had substantial enough

[100] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 9
[101] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 9
[102] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 10
[103] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 10
[104] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 10

evidence to support all five reasons related to traffic and one related to aesthetics. The Court did not support the three remaining reasons, which related to utility service, conservation, and soil erosion. Additionally, the court and the Commission considered the neighborhood opposition to the project, which mentioned particular informally based concern about the southern access point.

In sum, the Court maintained the mobility-based approach evident in the Commission's reasons for denial. The zoning requirements, the Commission's review, and the Court's findings all relied on mobility-based thinking to justify denial of the proposal: the zoning code contained regulations that specified threshold impacts and allowed for flexibility in considering "adequate" vehicle accommodations, the Commission cited these regulations in the denial, and the Court upheld the Commission's findings.

Conditional Use Permit, Camden County, MO

Camden County, Missouri sits about half way in between St. Louis and Kansas City. As the county contains a large portion of Lake of the Ozarks, it is a popular summer destination for St. Louis and Kansas City residents.[105] In January 2007, John Karsch of BA Sales, Inc., a land developer, applied for a conditional use permit to develop 180 condominiums on his two adjacent lakefront properties, which were zoned R-1 (3.22 acres, low density residential) and B-2 (7.61 acres, general commercial). After the Planning and Zoning Commission denied Karsch the Conditional Use Permit on February 21, 2007, he appealed the decision to the Board of Adjustments, who held a public hearing on March 28, 2007. The Board of Adjustments denied the appeal. Karsch subsequently sued the Board of Adjustments, but lost at both the trial court and the court of appeals.

Both those who argued for and against the development at the Board of Adjustment's public hearing utilized mobility-based thinking to justify their positions. John Karsch's attorney, Mark Epstein, and two experts presented two such arguments supporting the development. First, Epstein "maintained there would not be much increased traffic flow in the area based on the nature of condominium units and the fact that they are vacant a great deal of the time."[106] Although he argued for the project, his argument rested on the fact that congestion would not likely increase. He also explained that Karsch reduced the number of condominiums to 129 and decided to keep the 3.22 acres zoned as R-1 as "undeveloped green space," thus only building upon the parcel zoned originally as general commercial.[107]

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[105] Data from American Fact Finder indicate that 43% of the housing units are for "seasonal, recreational, or occasional use" (http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1).

[106] *Karsch v Camden County Board of Adjustments*, 302 S.W.3d 754, pdf pg 11(M.O. App. 2010).

[107] Karsch v Camden County, pdf pg 10.

An engineer, a real estate agent, and a real estate appraiser also spoke in favor of the project. The engineer claimed the development of "the Property would not affect the roadway safety of the surrounding area because the roads in that area are "superior" and "much less congested..." than most roads in the lake area and he related that he had reviewed records from the Missouri State Highway Patrol which reported but one traffic accident in the area in the last five years."[108] Furthermore, the real estate appraiser argued, "traffic would not affected in the area on a regular basis" because the typical weekend occupancy rate of condominiums is ""in the 25 percent range at the upper end.""[109] He concluded that the condominiums would therefore "not generate a significant increase in traffic in comparison to other uses," such as general commercial.[110] Both of these arguments rested upon mobility-based thinking, as they simply denied the potential for significant traffic impacts. Lastly, representative from the planning and zoning staff "indicated that the staff had recommended approval of the CUP. However, [he] took no position at the Board hearing "[s]ince the [Planning and Zoning Commission] voted to deny this case by a significant majority, their recommendation by the Administrator is appropriate and would be redundant.""[111] The planning and zoning staff report from the initial hearing in January reveals that the staff was not necessarily supportive of the plan, as "the proposed development seems very dense… By clustering the density to the point the ability to create some limited open space as buffers is possible to the south."[112] However, they recommended approval with various conditions because the zoning ordinance indicates that B-2 districts generally allow this type of conditional use. Like the members of the public and the planning commission, the planning staff had concerns about density.

The arguments presented against the development employed informal mobility-based thinking to convince the Board of Adjustments to deny Karsch's appeal. The documentation from the appeal's court included testimony five of "various local landowners and concerned citizens" who spoke at the Board of Adjustments hearing. Concerns included increased traffic, damage to the roads and infrastructure, increased boat traffic, decreased property values due to increased traffic, loss of lake views, and degradation of neighborhood character. One neighbor claimed, the "development would greatly increase the amount of traffic in the area and would damage the roads. He related, "[h]ow in the world is a 130 condo unit going to help anything as far as lessening congestion of traffic on the roads?""[113] Furthermore, the Board received more than 30 letters expressing concern about the proposed development. Similar to the testimonies, the letters raised issues related to "increased automobile traffic on the roadways; the need for conservation of the trees and shoreline in the area; safety concerns linked to the increase in boat traffic; the interference with the quiet enjoyment of neighboring property due to increased noise, litter, loitering, nuisance and light; the decline in property values; and the effects on the area's infrastructure of another high density condominium

[108] Karsch v Camden County, pdf pg 10.
[109] Karsch v Camden County, pdf pg 10.
[110] Karsch v Camden County, pdf pg 10.
[111] Karsch v Camden County, pdf pg 11.
[112] Camden County Zoning and Planning Commission, "Staff Report" 2007 pg. 2
[113] Karsch v Camden County, pdf pg 11.

development."[114] Following these comments, the Board of Adjustments decided to reject the appeal.

Following the rejection from the Board of Adjustment, Karsch petitioned the decision in the Circuit Court and, upon losing at the trial court, in the Court of Appeals. The legal question addressed was not related to the traffic implications, but rather to the process of the Board of Adjustments hearings. The courts analyzed if the Board of Adjustments was legally able to reject the appeal based on informal comments, in light of Karsch's expert testimonies. The court found that the testimonies against the development were "valid concerns espoused by the very people the condominium project would affect. Further, all of these concerns are contained in the list of reasons set out in section 408.4 of the Code which support the denial of a request for a Conditional Use Permit. There is no merit in Applicant's assertions that the Board's decision was against the weight of the evidence."[115] Despite losing at the courts, Karsch successfully applied to rezone the B-1 property to R-1 low density residential in 2008, two years before the final decision at the Court of Appeals.

It is important to note that the proposed development would not necessarily have increased accessibility due to its high-density. His proposal included one clubhouse, which would likely offer limited amenities. Google Maps reveals that the area surrounding this property contained low-density housing, with few amenities in close proximity. However, there are locations in the region that appear to have an increased density and contain commercial buildings. One could therefore argue that a development such as the one proposed by Karsch could create demand for additional amenities such as small grocery stores or cafes, thus increasing accessibility in the area. Regardless, the significance of the case lies in the use of mobility-based thinking to deny, and defend, the proposal. While Residents and the planning commission could have alternatively argued that the proposal does not increase the accessibility of the area because it does not provide additional amenities, they instead argued the proposed development would increase traffic congestion.

Conclusion

The traffic impact study revealed that the traffic impacts of the proposed development were not particularly severe. Although the proposed development would create some traffic impacts, the developer could have alleviated concerns through redesigning the access points. However, the City Plan Commission denied the application, citing traffic concerns supported by mobility related zoning regulations in three of the nine reasons. The developer brought a claim to court against the city, likely because he could not reapply for a permit due to the moratorium. The court supported the Commission's mobility-based reasoning and strict adherence to the zoning code, approving of all the reasons for denial related to mobility and traffic. Meanwhile, the site was rezoned to low density residential once the City lifted the zoning moratorium. In the end, it is impossible to determine if the Commission used the mobility regulations in the zoning code to support a politically motivated decision that related more to the City's planning initiatives than pure concern for mobility. Nevertheless, the case illustrates how local governments can strictly enforce mobility standards in zoning codes in order to

[114] Karsch v Camden County, pdf pg 12.
[115] Karsch v Camden County, pdf pg 14.

prevent dense development.

Bicycle Plan, San Francisco, CA

The cases against the 2005 and 2009 San Francisco Bicycle Plans illustrates how municipalities must work around environmental regulations in order to successfully challenge mobility-based thinking. In brief, the California Environmental Quality Act (CEQA) categorizes congestion as an adverse environmental impact, thus triggering documentation of traffic impacts of projects that affect congestion. Projects such the San Francisco Bicycle Plan, which increase congestion by restricting the space available for vehicles in favor of bicycles, must frame traffic impacts as negative regardless of positive environmental impacts of improved bicycle infrastructure. In this case, local residents sued the city in 2006 for neglecting to conduct a full environmental impact report on the 2005 Bicycle Plan, as per CEQA requirements. The court mandated the city to conduct the report and placed an injunction on the plan until it was completed. In 2010, after the city created the 2009 Bicycle Plan Final Environmental Impact Report (EIR), which included a full study of the plan's environmental impacts, the court lifted the injunction.[116]

The development of the Bicycle Plan, which would limit the space available for single occupancy vehicles and parking in favor of increased space for bicycles, challenges mobility-based thinking because it eliminated the assumption that automobile travel speed is the most important goal in transportation planning. The Bicycle Plan prioritized bicycle infrastructure, safety, and funding in order to increase the number of bicyclists in the city (San Francisco Planning Department, 2009a: III-1).[117] The city of San Francisco was a fitting place for this type of transportation policy, as "2.5 percent of all San Francisco residents cycle to work, five times the national average of 0.5 percent, and about three times the state average of 0.8 percent" (San Francisco Planning Department, 2009a: IV. B-6-7).[118] Furthermore, a 2003 survey indicates that 22% of Bay Area residents would consider commuting by bicycle (San Francisco Planning Department, 2009a: IV. B-6-7).[119] Throughout the process, the Bicycle Plan also received support from a number of political constituents, including Mayor Newsom, who, after the injunction was placed on the plan, said, "Better, safer bicycling is good for San Franciscans and good for our environment - I remain committed to realizing our goal of a citywide bicycle network, that unites the current patchwork of bike lanes into a unified, comprehensive system."[120] Despite this widespread

[116] Following the lift, the plaintiffs appealed the decision, arguing that the city did not adequately analyze alternatives to the Bicycle Plan, which is required in EIRs. In January 2013, the Court of Appeals of California reversed the decision to lift the injunction, and returned the case to the trial court to give the City directions regarding the Plan.
[117] San Francisco Department of Planning, San Francisco Bicycle Plan Environmental Impact Report, Volume 1 (San Francisco, CA: 2009), III-1 (pdf pg 119). (v1)
[118] ibid., IV. B-6,7 (pg 134-5).
[119] Ibid.
[120] "Mayor Newsom Reaffirms Commitment to City's Bike Plan," *US States News*, November 8, 2006.

support, the potential environmental impacts caused by limiting vehicle mobility slowed the enactment of the plan because it triggered the CEQA requirement to perform an Environmental Impact Report. Furthermore, the use of Level of Service (LOS) metrics to measure the environmental impacts reveals the extent to which innovative challenges to traditional mobility-based thinking must operate within the framework of mobility metrics in order to justify their implementation.

Case Development:

The inclusion of design implementation plans for a bicycle lane network in the 2005 Bicycle Plan prompted the CEQA requirement for environmental review. In 1997, the San Francisco Board of Supervisors published a Bicycle Plan that intended to "provide a comprehensive guide for efforts that will make San Francisco a more 'bicycle-friendly' city."[121] The plan contained the following four objectives: improve bicycle facilities, improve safety, promote bicycling, and increase funding for bicycle projects.[122] In 2002, the Department of Traffic and Policy began to update and expand the Bicycle Plan to include an implementation plan for a network of 60 bicycle lanes. The Department of Traffic and Policy initially formulated the plan as one document, but subsequently separated it into the "Policy Framework," which outlined general policies similar to the 1997 plan, and the "Network Document," which presented plans for near and long term infrastructure. In 2005, the Planning Department reviewed the Bicycle Plan Policy Framework, and determined it was exempt from CEQA requirement for an Environmental Impact Report because it did not propose specific changes to the built environment, as the changes were included in the "Network Document."[123] CEQA permits a General Rule Exemption "where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment."[124] Furthermore, DTP determined that each of the projects in the "Network Document" were exempt from review citing CEQA section 15301(c) and 15304(h), which exempt "minor alterations to streets" and the "creation of bicycle lanes in the existing rights of way."[125] In May 2006, while the plan was in the midst of adoption, the petitioners, Rob Anderson, a local blogger, and Citizens for Adequate Review (CAR), requested an "Order to Show Cause" regarding the decision to treat each project outlined in the Network Document as an independent project, rather than reviewing the project as a whole.

The court examined whether the city had "abused its discretion" in exempting the plan from environmental review. The court ruled that the city must view the plan as a whole, arguing that separating the project into pieces that, on their own, do not have significant environmental impacts, "is akin to trying to avoid review of a timber harvest plan by removing trees one at a time, claiming each

[121] San Francisco Bicycle Plan Environmental Impact Report, III-1 (pdf pg 119).
[122] CAR; Ninety-Nine Percent; Anderson v. City and County of San Francisco, 2006 trial court (Unsure how to cite because this case was never published in a reporter), pdf pg 3.
[123] CAR; Ninety-Nine Percent; Anderson v. City and County of San Francisco, 2006 trial court, pg 5
[124] California Environmental Quality Act (CEQA) Statutes and Guidelines, Article 5, 15061 (Califaep.org 2012). Page 115 (Pdf pg 165).
[125] CAR; Ninety-Nine Percent; Anderson v. City and County of San Francisco, 2006 trial court, pg 7

tree removal to be independent and exempt. At the end of the process the forest would be gone or the entire City streetscape reconfigured without environmental review ever having happened."[126]

Although the case did not specifically pertain to mobility metrics, but rather to the CEQA process, the plaintiff, Rob Anderson, and the court's actions imply mobility based thinking. According to a widely publicized article published in the Wall Street Journal, Anderson brought the suit based upon concerns about mobility. The article states, "Cars always will vastly outnumber bikes, [Anderson] reasons, so allotting more street space to cyclists could cause more traffic jams, more idling and more pollution."[127] While the legal reasoning rested upon details of CEQA exemption requirements, Anderson's motive was based upon concerns about congestion and air quality. Furthermore, the judge also hinted at these concerns when he concluded, "Given the extensive scope of the citywide Bicycle Plan and its potential effects to the streetscape, parking, traffic, and public transit, the Bicycle Plan may have a significant effect on the environment."[128] In reference to CEQA, 'significant' indicates a likely adverse impact.[129] The judge's assumption about the impact on the environment, in relation to the effect on street space, implies that he utilized mobility-based thinking during his consideration.

CEQA Requirements:

CEQA designates traffic as an environmental impact on its face, thus presenting a challenge for the development of innovative transportation projects like the Bicycle Plan that might increase congestion while improving accessibility. CEQA requires preparation of an Environmental Impact Report to "identify the significant effects on the environment of a project, to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided."[130] As noted above, 'significant' indicates negative impacts on the environment.

Although the CEQA Handbook does not list categorically significant impacts, several sections of the guidelines reveal that congestion is automatically assumed a significant impact. For example, in the section about the level of significance of environmental impacts, it notes, "Examples of direct physical changes in the environment are the dust, noise, and traffic of heavy equipment that would result from construction of a sewage treatment plant and possible odors from operation of the plant."[131] While this applies to the construction of a project, rather than the impact of a project itself, the inclusive of "traffic" as a significant direct change demonstrates that congestion is categorized as an adverse effect.

Similarly, state, regional, or area-wide projects require environmental review if they have "potential for causing significant effects on the environment extending beyond the city or county in which the project would be located. Examples of the effects include generating significant amounts of traffic or interfering with the attainment or maintenance of state or national air quality standards."[132] As

[126] CAR; Ninety-Nine Percent; Anderson v. City and County of San Francisco, 2006 trial court, pg 14
[127] Phred Dvorak, "Could Bike Lanes Cause Pollution," *The Wall Street Journal*, August 20, 2008.
[128] CAR; Ninety-Nine Percent; Anderson v. City and County of San Francisco, 2006 trial court pdf pg 19
[129] CEQA Statutes and Guidelines § 21068. Page 7 (Pdf pg 57).
[130] CEQA Statutes and Guidelines § 21002.1.Page 2 (pdf pg 52).
[131] CEQA Statutes and Guidelines, Article 5, 15064. Page 119 (pdf pg 169).
[132] CEQA Statutes and Guidelines, Article 13, 15206. Page 202 (pdf pg 252).

with the examples of significant direct changes, the examples cited as potentially significant for state and regional projects include traffic.

The language about traffic also appears in requirements for exemptions. The guideline concerning the categorical exemption of infill projects notes, “Approval of the project would not result in any significant effects relating to traffic, noise, air quality, or water quality.” Furthermore, the section concerning exceptions to findings for infill residential projects notes, “Nothing in this section relieves a city or county from the requirement to analyze the project's effects on traffic at intersections, or on streets, highways, or freeways, or from making a determination that the project may have a significant effect on traffic.”[133] Both of these qualifications for infill projects limit their exemption based on the traffic impacts the project would impose. Together, these examples show that CEQA categorizes congestion as a significant or potentially environmental impact on its face. Therefore, projects like the San Francisco Bicycle Plan, which might increase congestion for the sake of providing environmentally beneficial alternative means of transportation, must frame their traffic impacts as adverse to the environment.

Lastly, one of the questions on the sample assessment directly speaks to congestion impacts. The question states, “Would the project conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?”[134] Respondents rank the level of impact the project would have, from ‘no impact’ to ‘potentially significant impact.’ Here, the formulation of CEQA indicates that disturbances to Level of Service and other standards are specifically considered.

In fact, CEQA exempts congestion management programs and projects that relieve congestion from environmental review, thus further demonstrating how mobility-based thinking frames the guidelines. The guidelines list “Congestion Management Programs” as statutory exemptions, “pursuant to Government Code Section 65089,” which provides specifications for the preparation of these programs.[135] Statutory exemptions also include projects “for restriping of streets or highways to relieve traffic congestion.”[136]

Influence of Mobility Metrics:

Due to the nature of the EIR, the San Francisco Planning Department used traditional mobility metrics to catalog the environmental impacts of the Bicycle Plan. In the section describing transportation impacts, the report analyzed the program and project level impacts on traffic, transit,

[133] CEQA Statutes and Guidelines, Article 19, 15332, page 234 (pdf pg 284)(and § 21081.2).
[134] CEQA Statutes and Guidelines Appendix G, 268. pdf pg 318
[135] CEQA Statutes and Guidelines Article 18, 15276, page 217 (pdf pg 267). See also: http://law.onecle.com/california/government/65089.html.
[136] CEQA Statutes and Guidelines § 21080.19, page 18. pdf pg 68

parking, pedestrians, and bicycling.[137] At the program level, the report categorized the results of the analysis as no potential impact, less-than-significant, potentially significant, significant, and unavoidable. At the project level, the report evaluated the exiting conditions, existing conditions with the project alternative, 2025 cumulative conditions, and 2025 cumulative condition with the project alternative.[138] The analysis based the 2025 traffic volume forecasts on "San Francisco County Transportation Authority's (SFCTA) travel demand forecasting model (SF-CHAMP Model)."[139] The analysis used constant vehicle traffic volumes for both current and both 2025 scenarios, "since the implementation of the Proposed Project would not result in any new traffic volumes being added to the roadway network."[140] Therefore, the LOS measurements were based on the assumption that the implementation of an improved bicycle network would not reduce the number of vehicles on the road. This analysis illustrates how the nature of the EIR embodied mobility-based thinking, as the metrics do not take into account the potential for improved bicycle infrastructure to influence individual travel decisions.

At the program level, the LOS evaluations of the overall goals and policies, minor improvements, and long-term improvements found several potentially significant and unavoidable impacts. At the policy level, the report found "potential to cause the level of service at an intersection's worst approach, to deteriorate from LOS D or better to LOS E or F with Caltrans signal warrants met; and/or potential to have significant adverse impacts at intersections that operate at LOS E or F under existing conditions."[141] The minor improvements resulted in no significant impacts. However, the long-term improvements, which included "area-specific changes in circulation patterns" and large development projects, contained the following "four potentially significant and unavoidable impacts:" "(a) a potential to increase traffic delays in some areas of the City, (b) a potential to cause a significant adverse impact to intersection levels-of-service; (c) a potential to slow transit vehicle movement in some locations; and (d) a potential to eliminate some curb space, currently used for passenger loading/unloading or commercial loading/unloading. All of these potential impacts were identified as being potentially significant and unavoidable." The use of LOS measurements, therefore, illustrates negative mobility impacts on both single occupancy vehicles and transit.

At the project level, which included analysis of the 60 near-term improvement projects, the report identified a number of potentially significant, significant, and unavoidable impacts.[142] The near-term improvements posed "potential reduction of traffic levels-of-service on some roadway segments and at some intersections, a potential slowing of transit movement in specific locations, and a potential reduction of truck loading spaces in specific locations within the project area."[143] The report details the intersections within the clusters of projects that will have significant or unavoidable impacts based on

[137] San Francisco Bicycle Plan Environmental Impact Report, Volume 1, V.A. 1-1 (pdf Pg 221).
[138] Ibid., V.A. 3-11- 12 (pdf pg 315-316).
[139] Ibid., V.A. 3-13 (pdf pg 317).
[140] Ibid., V.A. 3-14 (pdf pg 316).
[141] Ibid., V.A. 2-6 (pdf pg 240).
[142] Ibid., Volume 2, V.A. 6-2 (pdf pg 604).
[143] Ibid.

the LOS evaluations.

Following the transportation impact analysis, the report utilized the same LOS measurements to detail the Air Quality impacts, finding that the project has potential to decrease air quality because it will decrease space for vehicles. The report analyzes the air quality impacts under the same model as the transportation impacts, which assumes "no change in intersection volume under project conditions" for each time period, current and 2025.[144] Therefore, the report concludes "the reduction of travel lanes at major intersections would increase traffic congestion," yet, based upon their analysis, these increase "CO levels would not exceed the ambient air quality standard and toxic air contaminant emissions would be less than existing at all intersections."[145] Importantly, the report also recognized the potential for the project to reduce the number of automobiles on the road, noting "however, the mode shift from cars to bicycles is not quantifiable, and therefore, the [Green House Gas] analysis does not account for this potential decrease in GHG emissions."[146] The Air Quality analysis demonstrates how the LOS metrics are not suitable for evaluating the potential of the project to induce mode shifts. Therefore, the LOS metrics potentially result in worse impacts for both transportation and air quality than measurements that would incorporate mode shifts.

Following the completion of the 2,000 plus page Bicycle Plan Environmental Impact Report, the court lifted the injunction on the plan, citing that the city had fully complied with CEQA. The report identified and documented the significant and unavoidable impacts of the project based upon LOS metrics. However, CEQA did not require the report to eliminate portions of the project with significant impacts. The court found that the EIR adequately described the project, the project's baseline and existing setting; that it identified and analyzed "the project's significant direct, indirect, and cumulative impacts" on transit, parking, air quality, traffic, and noise; that it "analyzed a reasonable range of alternatives" and mitigation measures; and that the process included appropriate public involvement.[147] As the court found the EIR successfully complied with all the requirements of CEQA, it dismissed the petitioners' arguments and lifted the injunction.

Final Decision and Impact:

The use of LOS metrics directly and indirectly influenced the outcome of both the 2006 trial court case and the formulation of the Final Environmental Impact Report.

The mobility metrics employed in the Final Environmental Impact Report illustrate the extent to which mobility-based thinking influences the perception of the environmental impacts of transportation projects. Like NEPA, CEQA intends to maintain the environmental quality of the environment.[148] To this end, CEQA requires Environmental Impact Reports for projects that are not categorically exempt or fall

[144] Ibid., Volume 3, V.B. 6-22 (pdf pg 46).
[145] ibid.
[146] Ibid, V.B. 6-23 (pdf 47).
[147] CAR v City and County of San Francisco Injunction Lifted (unsure how to cite) pg 13, 20.
[148] CEQA Statutes and Guidelines § 21000, page 1 (pdf pg 51).

within the general rule for exemption. Although the Environmental Impact Report does not require agencies to use LOS to measure traffic and air quality impacts, the guidelines reference LOS in the sample evaluations.

NorthPoint Development, Cambridge, MA

The City of Cambridge approved a special use permit for NorthPoint, a dense, mixed-use, transit-oriented development on a previously industrial site in Cambridge. The site, situated on the east side of Cambridge, is adjacent to a large railway and highway junction. In October 2001, the City of Cambridge Community Development Department completed the "Eastern Cambridge Planning Study," which outlined the state of and recommendations for a section of Cambridge including North Point. The city commissioned the study in an effort to reevaluate zoning and planning in light of increased growth and commercial development. The study committee conducted a full transportation and traffic analysis, finding:

> "…the prospect of considerable new development in specific parts of the study area – North Point, the Volpe Center site, and the Transition Areas – coupled with the trend towards increased car-ownership, has generated growing concern about cumulative impacts to the transportation system and growth of auto traffic within the neighborhoods. The degree to which non-auto mobility can be enhanced and vehicular access and off-street parking controlled play a significant role in determining the scale of these potential impacts."[149]

The study recommended the following transportation changes to accommodate the growth: relocate the Lechmere station of the Green Line to a location closer to North Point, extend to Green Line to reach beyond Cambridge to Somerville, add "pedestrian and bus links from North Point to the Bunker Hill Community College Station [to] provide access to the Orange Line from the study area," and improved bicycle facilities.[150] Furthermore, the study envisioned the North Point area "as a mixed-use neighborhood with housing as a dominant use – a place to live, work, and enjoy a variety of parks and public spaces."[151] As a result of the study's recommendations, the City of Cambridge revised its zoning code to include a Planned Unit Development zone overlaying North Point. The instructions for North Point's Planned Unit Development specifically requested a project that would incorporate residential,

[149] Eastern Cambridge Planning Study Committee, Cambridge Community Development Department, *Eastern Cambridge Planning Study* (City of Cambridge: 2001), 23.
[150] Ibid., 30. much more detailed provided in appendix, etc, but I didn't think I needed to go too far into it since this is not what the case is really about.
[151] Ibid., 38.

commercial, and office uses, as well as consistency with the recommendations outlined in the Eastern Cambridge Planning Study.[152]

In 2003, the City of Cambridge approved a Planned Unit Development proposal submitted by North Point Land Company, which included "approximately 5,500,000 square feet of residential, office, research and development, and retail uses" on 48 acres.[153] In accordance with the zoning code guidelines and the Eastern Cambridge Planning Study, the project was "designed to maximize the use of public transportation and minimize the use of single occupancy vehicles."[154]

Efekta Schools, Inc., a for-profit educational corporation, "conducted educational and travel businesses, including cultural exchange programs, tour programs, language programs, and a business school" from a ten story building in North Point.[155] It sued the city for approving a special use permit, claiming "the North Point project will result in substantial adverse impacts on traffic in the area of its building, negatively affecting employees' commutes and customers' access."[156] Efekta was not successful in court because North Point Land Company adequately addressed traffic issues, using mobility metrics in the Traffic Impact Study conducted as part of the special use permit application, and the zoning code supported this type of development.

Planning Board Project Approval

The North Point Land Company completed an extensive application for the special use permit to build NorthPoint, which included the Traffic Impact Study. The Planning Board's response was supportive of the project, however, it indicated that the Board was concerned with traffic and mobility. Regardless, the response to the application also signified that the board sought alternative solutions, rather than enhanced vehicular mobility, to potential congestion.

Concerns about traffic also played an important role in shaping the guidelines for the Planned Unit Development in the zoning ordinance. In describing the nature of the mixed-use, "self-contained" guidelines for the Planned Unit Development, the Planning Board's response to the application states, "While housing is the preferred dominant use in North Point because of its traffic implications (as reflected in the provisions of the new zoning), the Master Plan accommodates an additional element of

[152] "This Section 13.70 is intended to provide the opportunity to create a new residential neighborhood from an area now primarily industrial in character. Retail and office uses and community services are encouraged as part of that neighborhood to serve the residential community and stimulate activity in the area for extended hours throughout the day. Significant new public open space to serve the residents of the district and the general public is desired. It is also intended that development in the PUD in the North Point Residence District will be generally consistent with the policy objectives set forth in the Eastern Cambridge Plan and guidance provided in the Eastern Cambridge Design Guidelines" (13-33, Zoning Ordinance)

[153] Master Plan Special Permit Amendment, Notice of Decision: Final Development Plan, 2012, pg 2.

[154] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 3

[155] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 4

[156] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 4

commercial development, consistent with the provisions of the Zoning Ordinance."[157] The zoning ordinance specifically set housing as the dominant use in the plan for a mixed-use community, in order to avoid the potential traffic issues resulting from commercial and office development. As a result of the "significant difference in the nature of traffic generated between general office uses and research and development activity," the Planning Board limited "the ratio of those two uses to that [which was] analyzed in the supporting Traffic Study to ensure that the assumptions with regard to traffic generation in the Study will be realized as the project emerges in physical form."[158] Beyond the requiring residential use on 65% of the Gross Floor Area, the Planning Board made further specifications for the ratio of research and development use due to traffic concerns.[159]

The Planning Board outlined several measures for the project in order to assure continual traffic mitigation, thus further demonstrating their concern about traffic mobility. The project proposed to build multiple buildings over a twenty year period, prompting the Board to outline a specific construction plan, which requested, "residential uses will always be a significant component of the mix of uses on the ground at anyone time. For traffic and planning reasons it is important that there not be an imbalance of commercial and residential uses at any time."[160] Furthermore, the Board required yearly monitoring of "the traffic generated and mode splits achieved as buildings are built and occupied" so as to assure "meeting the traffic generation targets that are the basis for approval of the entire Master Plan."[161] The procedures outlined illustrate the Planning Board's concerns about traffic and the methods it used to address these concerns.

Despite the Planning Board's concerns about vehicular traffic, it also discussed public transit's critical role in the success of the project. In the introduction of the response to the application, the Planning Board notes,

> "the traffic generated by the development, while considerable as compared to that generated by any single building alone, is consistent with that to be expected from a development composed of twenty separate buildings. Most importantly, this location offers the opportunity to create an urban district where access to it by residents and employees can be achieved by means other than the single occupancy vehicle."[162]

The tone of this observation suggests that use of public transit and other non-automotive means is a priority for this project. The Planning Board desired a dense residential development, commercial development, and prioritized non-automotive transit for this project. Although its concerns about traffic reveal that it had not completely abandoned mobility-based thinking, these concerns might also simply reflect a reality: this project would increase traffic because people still tend to use cars in this neighborhood. Therefore, notwithstanding the numerous instances of mobility-based thinking, the

[157] Master Plan Special Permit Amendment, Notice of Decision: Final Development Plan, 2012, pg 12.
[158] ibid pg 18
[159] ibid
[160] ibid pg 20
[161] ibid pg 46
[162] ibid 14

parallel emphasis on more accessibility-minded features that expand the commercial, housing, and transportation opportunities available to the neighborhood, such as retail shops, denser housing, and improvements to public transit, reveals the innovative nature of this case.

Court Case, Traffic Impact Study, and the Zoning Code

In 2003, Efekta Schools, Inc. brought a claim against the planning commission's approval of three special use permits for the NorthPoint project due to the traffic impacts of the proposed project. After losing in the trial court, the plaintiff appealed. In 2006, the Court of Appeals found that the city had not arbitrarily issued the special use permits, as the project did not create the "substantial adverse" traffic impacts beyond which the zoning code required a Board to reject an application.[163] The procedure outlined in the zoning ordinance required use of mobility-based metrics to create a Traffic Impact Study. However, the zoning code did not require the planning commission to categorically reject proposals that exceed the traffic standards, thus permitting the commission to exercise considerable discretion with projects that challenge mobility-based thinking.

Efekta Schools argued that the Planning Commission arbitrarily issued the special use permits, as the project would significantly and unreasonably worsen the traffic in the surrounding area. Specifically, Efekta claimed, "the North Point project will result in substantial adverse impacts on traffic in the area of its building, negatively affecting employees' commutes and customers' access."[164] Efekta employed approximately 600 people in the building at that time, of which over 50% commuted by public transit.[165] Efekta did not raise any additional issues about the project to the court, demonstrating that traffic was its priority concern.

The court examined the Traffic Impact Study conducted for the North Point application to determine the extent of the congestion impacts resulting from the project. The Traffic Impact Study analyzed the impacts on trip generation, Level of Service at intersections, residential streets, vehicle queues, and pedestrian service.(cite). The study found the project would generate 2,000 new automobile trips.(cite) Although this exceeded the recommended limit in the zoning ordinance by eight times, the court and planning board recognized that the project combined twenty different projects, due to its large scale. Furthermore, the Traffic Impact Study found that LOS would diminish at five intersections during commuting hours, but service was "expected to improve at least two of those five intersections" due to signal improvements.[166] It also found insignificant impacts to residential streets and moderate vehicle queue impacts on only five intersections, which it expected to mitigate through signal management.[167] Finally, with regards to pedestrian impacts "the project improves pedestrian conditions at more crosswalks than it impacts [negatively]," but also exceeded the threshold at a

[163] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 5
[164] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 4
[165] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 4
[166] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7
[167] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7

number of crosswalks.[168] However, the Traffic Impact Study interestingly classified *any* degradation in pedestrian level of service (PLOS) as exceeding the threshold of "potentially substantial adverse impacts," illustrating the code's commitment to pedestrians.[169] Therefore, although the project exceeded the threshold at many intersections, the board used its discretion to conclude that the project did not contain substantial impacts. (I do not have access to the actual TIS, so I don't know what metrics they used, and cannot speak to how mobility focused it was).

The court determined that the Planning Commission followed the correct procedure to approve the application, since the Zoning Ordinance presented flexible guidelines about traffic. The zoning ordinance stated, "the Planning Board shall grant the special permit only if it finds that the project will have no substantial adverse impact on city traffic within the study area as analyzed in the Traffic Study."[170] First, the court found that, "the board openly recognizes that there will be traffic impacts from a project of this size. It again relies on the voluminous [Traffic Impact Study] to support its conclusion that the traffic impacts will not be severe and do not warrant denial of the special permit."[171] Although the ordinance's directive required the board to "grant the special permit only if it finds that the project will have no substantial adverse impact on city traffic within the study area as analyzed in the Traffic Study," it permitted discretion in identifying adverse impacts.[172] The court found that the ordinance did not require the board to classify any exceeded "potentially substantial" impact as "a substantial adverse impact, "instead, the city chose a more flexible scheme, placing discretion in the planning board."[173] Furthermore, the court concluded,

> "the ordinance requires recognition that the potential for a substantial adverse impact exists where one or more of the criteria are exceeded, but then affords the planning board the discretion to examine the effectiveness of the proposed mitigation and other supplemental information that identify circumstances or actions that will result in a reduction in adverse traffic impacts."[174]

As the zoning ordinance permitted the board to exercise significant discretion concerning the traffic impacts of a project like North Point, Efekta was unable to successfully demonstrate that the board wrongly approved the special use permits. Had the zoning ordinance explicitly directed the board deny project that exceed certain traffic impacts, the board would have had to deny the proposal or require significant changes to the project.

The key to this case therefore was the flexible zoning ordinance, rather than rejection or revision of mobility metrics. In fact, the proposal necessitated mobility metrics for the Traffic Impact Study and, more generally, the ordinance and Planning Unit Development guidelines still framed the

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[168] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7
[169] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7
[170] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 5.
[171] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7
[172] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 5
[173] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7
[174] *Efekta vs City of Cambridge*, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7

project around traffic impacts. Like the San Francisco Bicycle Plan case, where the Bicycle Plan was justified using traditional mobility metrics, the NorthPoint project in part justified approval and implementation based on mobility metrics which found that the project would not significantly increase traffic and would mitigate impacts where possible. Unlike the San Francisco Bicycle Plan, this project more easily navigated the development procedures and faced challengers in court due to Cambridge's flexible zoning code.

Analysis of Cases

Notwithstanding the notable differences among the cases, several commonalities emerge from them: the influence of the public opinion, particularly about traffic congestion and mobility, on transportation and land use decisions; the extent to which varying zoning code and environmental regulations shape the outcome of transportation and land use decisions; the interaction between the courts and municipal zoning codes and decisions; the identification of traffic, rather than lack of access, a the self-evident problem definition; and the sometimes indirect routes by which mobility analyses affect outcomes. These dimensions influence will shape the way accessibility metrics can transition from laboratory to practice. A successful transition from laboratory to practice will likely need to incorporate public education about mobility and accessibility and support in the zoning codes and other regulatory documents.

Public Opinion and Congestion

Public concern about mobility and traffic congestion can inspire projects that spur traffic mitigation. In one case, years of informal concern about traffic congestion in Albuquerque, New Mexico prompted proposals for the reconstruction of an interstate interchange that commuters coming from a rapidly growing neighboring suburb used heavily. Throughout the decisionmaking process, which occurred over almost ten years, the purpose consistently linked the need for the project to *observable* congestion. In 2007, the purpose statement stated, "The need for the transportation improvement within the vicinity of and including the PDN/I-25 interchange is evident from congestion that can be observed on a daily basis."[175] Although the project development required a wide array of formal mobility metrics, the inclusion of this language indicates that the motive was in part related to informal mobility-based thinking.

Additionally, public concern about traffic congestion can prevent projects that increase density (and, in some cases, accessibility). Two cases land use decisions analyzed illustrate this point particularly well. First, the decision to deny a dense development of condominiums in Camden County, Missouri, rested entirely on informal concerns about traffic impacts. Despite evidence illustrating the minimal level of traffic impacts in testimony from the project engineer, a real estate appraiser, and the

[175] Wilson and Company, Inc., Interstate 25 and Paseo del Norte Interchange Project: Transition Report (Albuquerque, NM, 2013), 6.

developer's attorney, the County's Board of Adjustments based its denial on informal testimony from numerous neighbors. One neighbor claimed, the "development would greatly increase the amount of traffic in the area and would damage the roads. He related, "[h]ow in the world is a 130 condo unit going to help anything as far as lessening congestion of traffic on the roads?""[176] Furthermore, the Board received more than 30 letters expressing concern about, "increased automobile traffic on the roadways" and numerous other issues.[177] Similarly, concerns about traffic influenced a decision to deny a special use permit for a medium density development on a site surrounded by single-family residences in Waterbury, Connecticut. While this case incorporated the results of a traffic impact study that used mobility metrics into the decision, testimony from concerned members of the public and planning staff played a significant role. The judge noted,

> "Any fair reading of the transcript of the one public hearing on the application on June 5, 2007 indicates it was all about traffic and the traffic hazards generated by the points of ingress and egress from the subject 171 townhouse development out onto a well traveled state highway, Route 69, right in the middle of a hill… It is of little surprise that the applicant's traffic expert supported the application. That does not mean the commission is bound by it if other evidence or the inherent nature of the access ways is dangerous to traffic."[178]

The judge's statement indicates the importance of public, informal testimony to land use decisions: public opinion could serve as evidence to undermine the results of mainstream mobility metrics.

Zoning Codes and Environmental Regulations

The language and requirements in zoning codes and environmental regulations also play a critical role in shaping the outcome of land-use and transportation decisions, defining the extent to which decisionmakers can pursue projects that depart from traditional mobility-based thinking. Except in the Albuquerque case, the decision in each case relied on direction and requirements outlined in the municipality's zoning code or, in the case of San Francisco, the transportation plan.

Some zoning codes specified the type of development permitted and included restrictions on the development based on projected traffic impacts. Zoning code regulations supported decisions to deny special permits for dense developments Waterbury, Connecticut. The section of the Waterbury zoning code concerning the issue of special use permits prohibited traffic at access points and adjacent intersections to "to degrade below a level of service "C"," and proposals to contain "adequate vehicular entrances."[179] The issue of a special use permit therefore required the traffic impacts of the proposed development to remain below a designated Level of Service, illustrating how directly the zoning code

[176] Karsch v Camden County Board of Adjustments, 302 S.W.3d 754, pdf pg 11(M.O. App. 2010).
[177] Ibid., pdf pg 12.
[178] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 8
[179] Ibid., pdf pg 2-3

employed mobility metrics to limit and shape development. These types of restrictions enable municipalities to deny transportation or land use proposals based on traffic alone.

Conversely, other zoning codes contain less strict criteria, thus permitting development that might create negative traffic impacts. The Cambridge zoning code enabled the dense, mixed-use development at North Point, despite the negative traffic impacts it would create, because it fulfilled the desired outcome for this site. The zoning code states, "Where a Traffic Study is required as set forth in Section 19.24 (3) above the Planning Board shall grant the special permit only if it finds that the project will have no substantial adverse impact on city traffic within the study area as analyzed in the Traffic Study."[180] Like Waterbury, the code enables the city to deny proposals based on traffic impacts; however, unlike Waterbury, the code does not set a specific threshold Level of Service below which the city must deny proposals. Furthermore, the code notes, "In making its findings, however, the Planning Board shall consider the mitigation efforts proposed, their anticipated effectiveness, and other supplemental information that identifies circumstances or actions that will result in a reduction in adverse traffic impacts."[181] While the indicators include change in LOS, increased vehicle volume, and other mobility-based features, the city is permitted to take into account other factors that might lessen the severity of a traffic impact. The flexibility built into this zoning code allows for developments like NorthPoint, that increase the opportunities for work, shopping, and housing in a given area despite creating traffic impacts.

In San Francisco Bicycle Plan case, the required environmental assessment of the effect of the bicycle plan, which challenged traditional mobility-based thinking, relied on mobility-based metrics. In other words, environmental regulations that required mobility metrics influenced the development of a bicycle plan that challenged mobility-based thinking. The California Environmental Quality Act (CEQA) mandates preparation of an Environmental Impact Report to "identify the significant effects on the environment of a project to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided."[182] As traffic was automatically categorized as a significant impact at the time, the EIRs assess the traffic and air quality impacts resulting from traffic using LOS.[183] It is impossible to determine if the proposed bicycle network would have been different if the city did not need to conduct an EIR using LOS. However, one could imagine that the bicycle network could have improved accessibility (even more) if it had been assessed with accessibility metrics.

In sum, the specific requirements of zoning codes and environmental regulations relating to traffic impacts play an important role in land use and transportation decisions. Where zoning codes that includes strict, specific standards about traffic impacts can prohibit dense development, zoning codes with more flexible traffic requirements provide an opportunity for development proposals that

[180] City of Cambridge, *Zoning Ordinance Article 19* (Cambridge, MA: 2013) pdf pg 10.
[181] ibid.
[182] California Environmental Quality Act (CEQA) Statutes and Guidelines, § 21002.1. (Califaep.org 2012). Page 2 (pdf pg 52).
[183] CEQA Statutes and Guidelines, Article 5, 15064. Page 119 (pdf pg 169); CEQA Statutes and Guidelines, Article 13, 15206. Page 202 (pdf pg 252).

challenge traditional mobility. Additionally, environmental regulations, despite their environmental intentions, can further enforce traditional mobility-based thinking at the expense of alternatives.

Role of the Courts

The role of the zoning code and environmental regulation requirements is established and reinforced in court decisions, where there is a deference to municipal decisions, particularly when these decisions fall in line with mobility-based thinking. Except in Albuquerque, all of the cases resulted in a court case regarding the decision. The court deferred to the authority and discretion of the municipality when the case concerned regulations and requirements in the municipality's zoning code. However, in San Francisco, where the case concerned CEQA, the state's Environmental Quality Act, the court ruled against the actions of the city. This pattern suggests that courts are likely to rule in favor of municipalities if a decision only involved local law, but, when a decision considers state law, the law will trump local authority and discretion.

The court ruled in favor of the government entity in Camden County, Missouri and Waterbury, Connecticut, resulting in decisions that prevented dense development. In both cases, the court relied on the planning entities interpretation of the zoning code. In Camden County, the judge found that found that the testimonies against the development were "valid concerns espoused by the very people the condominium project would affect. Further, all of these concerns are contained in the list of reasons set out in section 408.4 of the Code which support the denial of a request for a CUP. There is no merit in Applicant's assertions that the Board's decision was against the weight of the evidence."[184]As discussed above, the judge found that the county code enabled the Zoning Board of Appeals to base its decision on public testimony, despite quantitative evidence supporting the plaintiff. In Waterbury, the judge also ruled in favor of each reason the Planning Commission listed for denial of the special use permit. Two of the reasons related to traffic cited specific LOS thresholds, and were therefore less debatable. However, the third reason pointed to the lack of adequate entrances to the development, which the plaintiff argued was too vague a standard. The judge argued, "You can't go lower than one [entrance point]. Any argument that the language of the regulation "adequate but not excessive" is vague and is of no consequence as there was only one entrance and that issue was not raised in the pleadings."[185] Like Camden, the judge held that the planning entity had authority and substantial enough evidence to deny the proposal.

The court also ruled in favor of the municipality in the Cambridge case, thus sustaining the city's challenge to mobility-based thinking. The court found that the ordinance did not require the board to classify any exceeded "potentially substantial" impact as "a substantial adverse impact, noting "instead, the city chose a more flexible scheme, placing discretion in the planning board."[186] Furthermore, the court concluded,

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[184] Karsch v Camden County Board of Adjustments, 302 S.W.3d 754, pdf pg 14(M.O. App. 2010).
[185] Paulmar v City Plan Commission 2008 WL 2930567 (Conn.Super.)) pdf pg 10.
[186] Efekta vs City of Cambridge, 66 Mass.App.Ct. 1113, 2006 WL 1726173 (Mass.App.Ct.) pdf pg 7.

> "the ordinance requires recognition that the potential for a substantial adverse impact exists where one or more of the criteria are exceeded, but then affords the planning board the discretion to examine the effectiveness of the proposed mitigation and other supplemental information that identify circumstances or actions that will result in a reduction in adverse traffic impacts."[187]

The court could have viewed the results of the Traffic Impact Study, which cataloged numerous negative impacts, as evidence of "adverse" impacts. However, the court interpreted the proceeding in favor of the planning board, relying on its discretion rather than making its own conclusion about the impacts.

Together, these cases demonstrate the deference the court generally has for municipal decisions that involve either support of or departure from traditional mobility-based thinking. However, the court did not defer to the city of San Francisco in the CEQA Bicycle lane case, showing that the court does not exclusively rule in favor of municipalities, particularly since this case involved a state, rather than local, law.

Traffic as a Problem

Most of the above examples demonstrate how, in land use and transportation decisions, traffic, rather than access, is viewed as a problem in need to mitigation. This is the most universal theme among the cases; every case discussed inherently characterized traffic as a problem.

The San Francisco case most directly recorded this view, as CEQA regulations in force at the time considered traffic an automatic negative environmental impact.[188][189] This categorization inherently favored mobility-based planning decisions, because it could prevent projects that decrease mobility but might enhance accessibility. Accessibility-enhancing projects would face the burden of proving that they

[187] Ibid.

[188] CEQA Guidelines 15064, 15206, 15332, and 21081.2

[189] On September 27, 2013, California passed Senate Bill 743, which will change the way CEQA evaluates transportation and land use projects. A memo Viktoriya Wise, Deputy Environmental Review Officer to San Francisco Planning Commission, on November 26, 2013 outlines the impacts Senate Bill 743 will have on current CEQA regulations. As of July 1, 2014 CEQA will no longer utilize Level of Service to measure transportation impacts of development. The memo notes, "Senate Bill 743 requires [the Office of Planning and Research](OPR) to develop revisions to the CEQA Guidelines establishing criteria for determining the significance of transportation impacts of projects within transit priority areas that promote the "…reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses". It also allows OPR to develop alternative metrics outside of transit priority areas. The statute provides that, upon certification and adoption of the revised CEQA Guidelines by the Secretary of the Natural Resources Agency, "automobile delay, as described solely by level of service or similar measures of vehicular capacity or traffic congestion shall not be considered a significant impact on the environment pursuant" to CEQA. In other words, LOS generally shall not be used as a significance threshold under CEQA."

avoided degrading mobility too much, a constraint that limits the potential for accessibility enhancement.

The Cambridge case also considered traffic an automatic problem, despite the concern for decreasing auto dependency and increasing transit use. As noted above, the zoning code restricted special use permits to proposals that did not create traffic beyond a certain threshold ("substantially adverse"). Alternatively, the zoning code could have set the threshold using accessibility language, barring projects that did not increase accessibility. However, the language demonstrates that even Cambridge, who presented the most flexible, mobility-challenging zoning code, still considered traffic as a core problem.

Similarly, the zoning codes and the public opinion surrounding the remainder of the cases reveal the traffic, rather than lack of access, was always considered a problem. While Waterbury's zoning code strictly prohibited special permits for proposals that would degrade traffic flow below a certain level, Albuquerque's project goals focused on the increased speed at which commuters would pass through the interchange. In Camden County, the developer's proposal was denied solely based on the public's concerns about traffic. In each case, the municipality could have utilized accessibility language to describe the nature of a problem the projects mitigated or exacerbated. However, the stakeholders in each case identified mobility as a major problem, focusing on preventing traffic above most other considerations.

Indirect Routes of Influence

Planning research has long been aware of the complicated relationship between formal analysis and decisionmaking.[190] The idea of a linear process under outcomes shown to be the best through models are adopted with technical rationality has been shown to be a mismatch for on-the-ground political reality. Models interact with politics; they are commonly employed to justify politically preferred alternatives ex post facto, and are used to squelch other alternatives.

The cases shown here each demonstrate this principle, in different fashions. Modeling of transportation impacts in the Albuquerque case appeared to come well after the politically preferred alternative was settled upon. Waterbury demonstrated a use of formal mobility analysis to justify a decision that had apparently been made on other grounds, i.e., the desire to rezone the area for low density. Camden County, MO illustrated the principle that mobility thinking can shape political perceptions and priorities quite independently of formal models. And both the San Francisco and Cambridge cases illustrated the burden faced by projects that did not prioritize automotive movement; they needed, one way or the other, to demonstrate that the impact on cars would not be too bad.

The line from reformed planning structures to changed physical outcomes—the mobility to accessibility shift—is indirect and winding. There is no suggestion here that better analysis will lead to better outcomes independently of the complex and multidimensional interventions of politics. The concept

[190] te Brommelstroet, Marco, Peter Pelzer, and Stan Geertman. Forty years after Lee's Requiem: are we beyond the seven sins? Environment and Planning B: Planning and Design 2014, volume 41, pages 381–391

instead is to "make the good easy and the bad difficult"[191]: to tilt the playing field of the political process such that advocates of accessibility-enhancing project find fewer obstacles to doing so. Over the longer run, the hope is for the changed planning frameworks to help shape the political dynamics. Informed about the accessibility purpose of transportation, professionals, decisionmakers, and even the general public may be less inclined to gravitate automatically toward mobility-based problem definitions.

Conclusion

A number of obstacles will need to be overcome in order to insert accessibility into transportation and land use decisions. First, revisions to zoning codes and environmental regulations to include both accessibility-based standards and require accessibility, rather than mobility, metrics could profoundly change the type of land-use and transportation projects pursued. Following this change, court decisions could bolster the shift, as the courts tend support with municipal decisions based on the language in the zoning code and state law. Furthermore, this change would transform the identification of problems; proposal reviewers would point to lack of access rather than traffic as an inherent problem. However, any such shift would need to be predicated on changes in public opinion. Public concern about traffic impacted a number of the cases, demonstrating the power of an unhappy public in these types of decisions. Proponents of accessibility will have a difficult time transforming how localities make land use and transportation decisions as long as a congestion-based problem definition dominates public perceptions of transportation policy.

Obstacles to Accessibility-Based Evaluation and Approaches to Overcoming Them

To explore these issues from a different set of perspectives, this project conducted twelve interviews with thought leaders and practitioners and conducted four focus groups in different areas of the United States (San Francisco, Los Angeles, Ann Arbor, and in Washington D.C. during the Transportation Research Board Conference). The interviews and focus groups, conducted in 2013 1n 2014, were guided by the following questions:

QUESTION 1: What are the ways that people, from the interviews that you conducted, are implementing accessibility? What are the things that they find are working? Where is the perspective taking hold the most from the conversations that have taken place?

QUESTION 2. What are the challenges and options when applying accessibility-based thinking: What are the main challenges that are coming up? How did people view these challenges?

[191] Attributed to Albert Einstein. Pawley, Martin. (1998) Terminal Architecture. London: Reaktion Books. P. 217

QUESTION 3. Opportunities / Actions: What are some suggestions for overcoming obstacles and implementing accessibility metrics?

To protect their privacy, respondents are referred to below by their job descriptions or the focus group in which they participated.

Question 1: Implementation of Accessibility-Based Evaluation

None of the interviewees cited instances in which mobility-based evaluation had been replaced by an accessibility-based counterpart. Instead, accessibility analysis as described in these interactions is used as a descriptive supplement, often at the regional-visioning level, to applied level-of-service and traffic-impact analyses.

Walkscore.com, a metric of pedestrian accessibility (but not accessibility more broadly) was frequently cited. True to its name, walkscore tends to be used as a ranking device, and even an aid in competition. It is offered as individual-level guidance in residential-location choices.

> *Walkscore – It's really reductive to a single number – that means something to people. Leaders want to know what it is for their neighborhood. It might have some flawed assumptions and might oversimplify the issue but it is really easy to access and understand… Walkscore helped people make decisions on where to live.* (Statewide municipal advocate).

Walkscore is seen as a potentially effective marketing device for real-estate developers in a market where pedestrian accessibility is prized:

> *I know it is used a lot in the real estate world, because people want to know the WalkScore of my site, of my potential development and how close. Because people want to be able to walk now, more so in the last few decades.* (Ann Arbor focus group).

Walkscore is sometimes used as in input into investment decisions, e.g., for statewide housing agencies:

> *Personally, not sure if that is that is the right approach but there is certainly a desire by state agencies to see some of these quantitative measures so they can justify investing in one thing over another, WalkScore is often used a proxy but since it is single modal, so it is not necessarily a full accessibility measure.* (Ann Arbor focus group)

The Housing and Transportation Index of the Center for Neighborhood Technology is not an accessibility metric but a related affordability index. It is sometimes used in a similar descriptive fashion to walkscore, but at a regional level:

> *We have used walkscore quite a bit in trying to help community leaders better understand their assets. We have also worked with Center for neighborhood technologies' transportation and affordability index. What I do is conduct asset research for a community to help evaluate the*

area (using CNT and walkscore). So that they can better understand their area and compare it to other communities. (Statewide municipal advocate)

Metropolian Portland OR, through the Greater Portland Pulse projects developed a number of indicators of metropolitan performance, some of them accessibility-related. These serve as a kind of regional report card but are not yet directly linked to decisionmaking on individual land-use or transportation projects:

> *I was part of regional team called Greater Portland Pulse, which was looking at developing indicators for Portland to measure health and activity of the system…Accessibility indicators looked at access to travel options + food + goods + destinations etc. Indicators were developed on proximity to frequent destinations, travel modes, level of walkability.* (University Sustainable Transportation Outreach Professional)

Density, a concept related to but not equivalent to accessibility, is sometimes used as a more readily calculated proxy:

> But, some measure of accessibility, I think, you know what we use maybe as a proxy, is some density measures. Whether—how dense the employment is, or the number of businesses, or the number of people. If you have more of any of those things, then they have more weight to connect in a smaller area. (San Francisco focus group)

Question 2: Obstacles

Interviews were particularly informative with regard to the obstacles to a shift to accessibility-based evaluation and planning. A multidimensional set of obstacles emerged, including technical, institutional, and interest-based impediments. In some cases respondents revealed misconceptions about accessibility that themselves may constitute impediments to a wider use of accessibility-based planning.

Technical

Accessibility metrics, because they integrate both location and speed, are inherently more complicated to develop and communicate than their mobility-oriented counterparts. Technical complexity interacts with institutional complexity as accessibility inherently spans realms and jurisdictions:

> *For most studies that are undertaken, it is very easy to measure things like level of service for them, but for accessibility, all of a sudden you are talking about destinations and all of a sudden you are talking about multiple jurisdictions* (San Francisco focus group)

Concerns were voiced about the insufficiency of current data sources for reliable accessibility-metric calculation:

> *There is a lack of Data and lack of consistency in data.* (Campus sustainable transportation outreach professional)

Others view the problem differently, identifying the labor-intensive nature of accessibility calculation:

> *I don't think there is a lack of data if anything we have too much data with not enough people who know how to synthesize this data and make it useful.* (New mobility industry executive).

In general the simplicity of mobility-based metrics has been key to their longevity and popularity:

> *Whatever measures they are, if they are easy to measure, it will be taken up by decision makers. And I think that's why travel time and VMT and things like that have been so widely used for so many decades because they have been so easy to measure right. Whoever is sitting there has to show me the difference on some number, if it is a nice easy number, I can obtain it and show.* (Ann Arbor focus group)

The simplicity of mobility metrics affects the ease of their communication, not merely their development and use:

> *Speed applies to everybody, but accessibility is unique to every single person.* (Los Angeles focus group)

Institutional

The technical limitations described above may east somewhat with improving data availability and processing capacity and are hardly sufficient to explain the persistence of mobility-based planning and evaluation. Accessibility inherently bridges transportation and land use, yet these realms are governed by entirely separate institutions in the United States and most other countries.

> *Within my department people feel we don't have anything to do with land use. They feel they don't affect it*. *It's a typical silo*. (State department of transportation official A)

> *Messed up planning rules around transportation. Local streetscape is established and maintained by the municipality, which can be very small. Next level is county – they face the spatial challenge. We don't have the right governance structure to the investment scheme.* (Transportation advocate A)

This institutional separation leads to an institutional sense of responsibility for the transportation system per se; the interaction between the transportation and land-use systems is not taken to be anyone's direct responsibility:

> *National Highway Systems: All money goes in maintaining that system and its only 55/60 years old. People think they have to maintain this asset. Thinking is always on alternatives to get funding*. (Transportation advocate A)

The lack of institutional responsibility for the transportation/land-use connection can lead requirements for accessibility-metric development to be viewed little more than unfunded mandates:

> *From the transit perspective, we don't collect that data; it would be the transit agencies that do it. And if we ask them to collect one more piece of information, there's going to be a lot of pushback—they already feel overburdened*. " (Washington, D.C. focus group)

Professional practices, training, and socialization constitute additional institutional constraints. One focus group participant highlighted the centrality of the transportation engineer:

> *But you don't have to scratch very far down the engineering profession to find people who really still believe that moving cars, that cars that are not moving, is a problem. And all this other stuff I believe in is really great, but if the cars aren't moving, that's the problem.* (San Francisco focus group.)

This training often defines the professional realm by transportation modes, a mindset that on respondent found to be a significant constraint on innovation:

> *Everyone is MODAL in his or her mindset. …We limit the way we can look at the situation. What if he asked - How can they better access hospital services? Maybe more solutions will come to mind like Tele medicine, van pool service, etc. We need to think out of transportation Mode mindset and think about the people* (Transportation advocate B)

> *There is a challenge that the three main departments Eco Dev Agency, Land Use Planning and Transportation planning are not working together. Jobs inventory in under the purview of eco dev agency – they know where what types of jobs are. Land use planning folks know where what services are. And transportation-planning folks are planning the Mobility systems. Challenge in getting these bodies to communicate with each other and have Accessibility be a focus in the development.* (Transportation advocate A)

One respondent phrased the institutional constraint in an especially pithy fashion:

> *You only analyze to the level you've been authorized to analyze.* (State department of transportation official)

Transportation planners respond to specific mandates from funding agencies and professional societies; top-down reform from this level would surely go a long way to overcome built-in institutional obstacles.

Power and Interests

A tradition of mobility-oriented planning and evaluation is inherited from decades of practice, yet there are important interests that tend to keep it in place. There is a strong presumption of planning for car drivers, based both on the size and political influence of this class:

> *We design for middle and upper class whose access is never in question. Integrating an equity lens has been difficult. The belief that everyone has a car is an obstacle. People aren't willing to address equity as a transportation challenge.* (Transportation advocate A)

The mobility problem definition tends to be self-reinforcing because of its very ubiquity:

> *Right now, too many good projects are denied because of traffic impact analysis, because it says it's going to cause the intersection to have a bad level of service. That's a terrible metric that a lot of cities are trying to get rid of. I think we are measuring the wrong things. Politics don't even enter into these decisions because of the metrics that are currently in place.* Ann Arbor focus group.

Other respondents noted the economic interests associated with transportation planning and engineering:

> *It (accessibility-based evalution) would conflict with the interests of the car driving groups that support a certain way of life and this might be connected to certain industries like engineering firms (that create roads and bridges), auto companies, etc. that are promoters of a culture of auto-mobility. There are also supporters of suburban culture who are dependent on the automobile due to the lifestyle they have created.* (Transportion researcher)

> *It plays well with DOT to say– it spent so many…dollars to remove congestion. Belief is that if you spend money to expand roads you remove congestion- that's not true. It's good for industry to have such index (TTI urban mobility) to put money into highways… How would highway industry use accessibility to justify money being spent on roads?* (State department of transportation official)

Or most pointedly:

> *What would get directors of state departments of transportation to adopt accessibility-based evaluation? If they became convince that it was a really good way to argue for more money for highway construction*. (State transportation official)

Misconceptions

Some obstacles to the deployment of accessibility-based evaluation come in the form of broadly held misconceptions about the nature of accessibility and its potential role in transportation and land-use planning. One of these views is that accessibility is a service needed by the transportation disadvantaged, while more affluent people with easy auto access need mobility. This view was expressed by one respondent:

> *Accessibility issue is more discussed by social scientists, they are looking at spatial mismatch and how low income populations are not able to have access to job markets in wealthy areas due to*

poor access to public transport. People looking at Social dimensions I feel are more involved with accessibility. (New mobility industry executive B)

Another misconception is the notion that while mobility is readily quantified, accessibility is inherently qualitative:

Metrics for calculations that are done happen only at a later level or at qualitative level. Its not part of city planning review process, nobody gets into that level of detail of how it's connected. It's a very macroscopic view. .. For Mobility, which has largely been car focused, there are metrics like level of service (even for other different modes), congestion, etc. There has been a lot of research that has been done on this, but there is no way to put the qualitative aspects of accessibility to use in a metrics. (Municipal transportation engineer)

QUESTION 3. Opportunities / Actions: What are some suggestions for overcoming obstacles and implementing accessibility metrics?

Several important directions emerged from the interviews and focus groups regarding policy reform and overcoming obstacles to accessibility-based planning and evaluation. One common theme was injecting thinking and influence of realms beyond traditional transportation planning in support of policy reform. For example, current thinking about economic development can support greater use of accessibility-based evaluation in transportation:

Retention of millennial in the area. Tie the fact that millennial like walkable, mixed use areas- accessibility goes up , more people want to stay, improves job creations etc… if you grow smarter- its better from infrastructure stand point and for attracting people. (State department of transportation official).

This idea was echoed by an executive in the new-mobility industry:

Companies always looking for more investment – companies rely a lot on smart/educated people who seem to be drawn by more transit, more subways, etc. Companies are now moving where these infrastructures exist, for example Google and coca-cola moving to downtown Ontario. Some companies are still in the suburbs but even they are demanding better public infrastructure. (New Mobility Executive)

Where the lack institutions integrating transportation and land use constitutes an obstacle to accessibility-based evaluation, one respondent saw an opportunity in the comprehensive functions of municipal government. As least within their territory, cities can embody a comprehensiveness that can be supportive of the mobility-to-accessibility shift:

Start with Cities, they have the most comprehensive control over the three groups (Land use planning, transport planning, eco dev). I am talking mostly in the Michigan context. Look for

governments that have control over three and help them understand the differentiation. They can take these concepts to pragmatic implementation. (Transportation advocate A)

Effective communication was highlighted as key to adoption of accessibility-based planning. One respondent inadvertently highlighted a difficulty with the current system; improvements in accessibility are sometimes reported as degradations in highway level-of-service:

I am impressed by the City of Cambridge that has decided to accept Level of service D for their major arterials. They consciously didn't want level A service as they wanted to discourage cars in their city. (Campus Sustainable Transportation Professional)

Notwithstanding this endorsement, the requirement of appearing to accept a worse level of service would surely constitute an impediment to transportation and land-use policy reform. In this environment, demonstrating an accessibility improvement rather than a level-of-service degradation can be a politically desirable option:

You talk about level of service, and a road has level of service C, no one wants that, they want to be an A, so clearly just because it is defined on an A-E scale is a powerful, popular messaging tool for what it should be: defining what is acceptable versus desirable versus unacceptable and needing to be fixed. The clearer, and simpler, and more sound-bitey the final product can be, the better. (Ann Arbor focus group)

Effective communication of the accessibility concept was seen as vital, with graphical communications being an important tool.

The solution I feel is that you tell them, and you again tell them, you tell them again till it's a part of their consciousness. You tell them graphically, you tell them in an analytical way and even let them experience it in some way. Try to tell in different ways to reinforce the thought. The actual form of communication is a design problem in my mind. Is it a movie, a map, a graphic, etc? (Transportation advocate B)

The following section responds to the importance of effective graphical communications of the concept of accessibility and is oriented both to planning professionals and the general public.

Accessibility or Mobility? A Question of Perspective

ACCESSIBILITY OR MOBILITY?
A QUESTION OF PERSPECTIVE

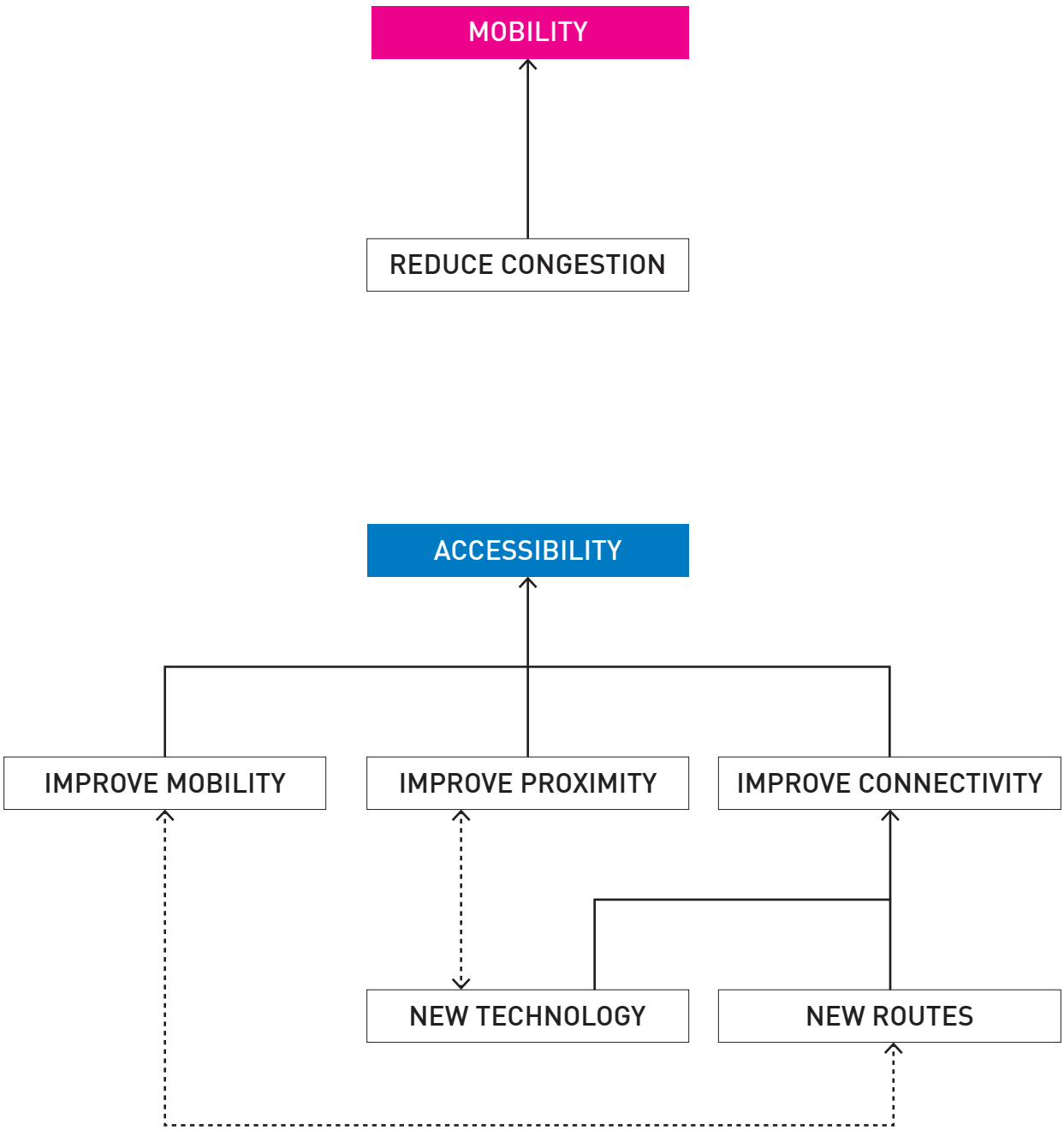
A Graphical Primer on Accessibility, Mobility, and Equity
in the Planning and Production of the Built Environment

Prepared by: Geoffrey Thün and Dan McTavish
Taubman College of Architecture and Urban Planinng at the University of Michigan

Accessibility or Mobility // A Question of Perspective

Mobility, or the ability to move, as a concept, occupies the center of a perspective that dominates much of land-use and transportation planning practice today, specifically when it comes to assessing modifications to existing transportation systems across a range of scales of the built environment. This perspective, writes Levinson, Krizek, and Gillen (2005,1) "aims to reduce average vehicular delays, increase passenger throughput, and in general, keep traffic flowing smoothly and safely." Mobility, in this sense, is seen as an end in itself. Within a mobility-based perspective, land-use and transportation interventions, in the form of physical infrastructures, services, policy, maintenance regimes, public education, policy, or technology, should be utilized in ways that do not negatively affect the mobility of individuals, for example through the increase of congestion, or in ways that improve their mobility, for example through the addition of lanes to decrease congestion. Mobility-based metrics seek to provide a method of quantifiable measurements for land-use and transportation interventions that can be used to evaluate the potential impact of these interventions on mobility.

In 1959 Walter G. Hansen, a Highway Research Engineer with the Bureau of Public Roads, Division of Highway Planning, introduced the concept of accessibility to the planning community in "How Accessibility Shapes Land Use." Accessibility, Hansen writes, is "... defined as the potential of opportunities for interaction." "In general terms," Hansen continues, "accessibility is a measurement


MOBILITY
REDUCE CONGESTION
ACCESSIBILITY
IMPROVE MOBILITY
IMPROVE PROXIMITY
IMPROVE CONNECTIVITY
NEW TECHNOLOGY
NEW ROUTES

of the spatial distribution of activities about a point, adjusted for the ability and the desire of people or firms to overcome spatial separation." (Hansen, 1959) More specifically, accessibility has come to be defined as the ability to reach destinations or opportunities, from a fixed point, such as ones dwelling, to sustain ones life and fulfill basic life needs with an urban environment. (Access to Destinations, 2013) Destinations and opportunities are seen to include places for working, shopping, leisure, education, etc. (Scott and Horner, 2008) Simply put, accessibility, or the ability to access certain things, physical or otherwise, in order to fulfill ones needs and desires, is seen as the ends towards which land-use and transportation should be the means. It is important to note that there is a dialectic relationship between access and mobility, where mobility is part of the equation when addressing accessibility. "The reason for virtually all trips is not the please of motion per se, but to reach destinations. Where destinations are close by, accessibility can be high even if traffic is slow; conversely, where destinations are remotely spread, accessibility can be low even in an environment of rapid travel. The problem is that there is a trade-off relationship between mobility and proximity in producing accessibility." (Levine and Grengs, 2011, 8)

While mobility is part determining accessibility, there does, however, exist a potentially antagonistic relationship between mobility-based and accessibility-based methods of evaluation. Stated another way, while mobility should be seen as part of, and complimentary to, accessibility, the respective means of evaluation, which emerge through each concept, differ greatly. A question then exists, how does one illustrate and explicate the contrasting nature and implications of these two methods of evaluation and

their embed perspectives? The following attempts to make clear the terms, stakes, and priorities of both methods in relation to come land-use and transportation interventions through the deployment of both a mobility-based and an accessibility-based perspective.

Structuring Comparative Scenarios

Through a series of diagrammatic illustrations, drawn at the scale of the city, the community, the city, and the region, various interventions, such as car sharing, addition public transportation service, new zoning regulations, and new types of service provision, are juxtaposed to compare the preoccupations of both respective paradigms of evaluation. This method of representing land-use and transportation interventions resists a tendency within planning discourse to classify certain interventions as exclusively "mobility interventions" or properly "accessibility interventions". For example, bike-lanes are often seen as an "accessibility intervention" because they are not concerned with cars or auto-mobility. Bike-lanes are in fact just an intervention into the system of bicycle transportation and, as such, can be evaluated from both a mobility centric perspective and from an accessibility perspective. From a mobility perspective bike-lanes might increase bicycle mobility while increasing or decreasing auto-mobility, while from an accessibility perspective, partially due to increased mobility, potentially more people are able to to reach more destination and opportunities by bicycle. Pairing these perspectives enables an examination of the ways in which the same format of intervention would be evaluated through both the lens of accessibility and the lens of mobility, towards potentially similar or dissimilar outcomes. At a meta-scale, this is intended to not only help to communicate the significance on outcome of evaluation

means utilized, but also to raise awareness of the broader set of issues impacted by transportation related interventions.

While the above example shows why it is challenging, if not impossible, to classify land-use or transportation interventions as a "mobility intervention" or an "accessibility intervention", there are certain interventions outside of the toolbox of land-use and transportation planners, specifically in the domains of policy, technology, programming and design that significantly affect accessibility, and in some instances directly or indirectly affect mobility while in others the affect on mobility is only tangential or visible at an extremely large scale, if at all. Some of these outlying examples are worth articulating.

The first is the implementation of ubiquitous telecommuting practices. Such a program could only be encouraged within the private sectors through policy or implementation through the public sector, and is thus almost entirely outside of the land-use or transportation planners' control. This, as an intervention, might produce greater accessibility as well as greater mobility due to a decrease in loads and thus congestion. The implementation of telecommuting, at any significant scale, relies on the assumption that there is universal access to the Internet and that all constituents have universal access to the infrastructure, such as a computer, that are required for telecommuting. Similarly, while one might be spatially proximate to a hospital or facility providing preventative care, one might not be able to access that care. Exclusion from the health-care system due to lack of insurance coverage and the establishment of specific coverage-networks which redistribute facilities and

resources based on insurance, greatly limit the ability of people to access health-care. Intervention into how health-care is paid for and who does or does not receive care, while clearly outside of the domain of land-use and transportation planning, drastically affects who has access to spatial destinations to sustain ones life and fulfill basic life needs, and who does not. This form of intervention might never be considered through an exclusively mobility-based perspective, and not accounted for in mobility-based metrics, and therefore might be categorized as an "accessibility intervention" in this context.

The production or design of specific forms of mixed-use development is significantly impacted by the definition of zoning regulations within planning frameworks for municipalities, however, within a specific developer's proposal for a mixed use development, there exists a wide variety of densities and programmatic mixes that, while all meeting the requirement for 'mixed use', would produce radically different outcomes in terms of their impact on accessibility. Further, the specific design of the configuration of such programs (in terms of locational specificity, building typologies, and ease of use) may also have a significant impact on the effective accessibility delivered by a specific programmatic assemblage within the built environment, but these nuanced issues of design are again, beyond the purview of land-use and transportation planning professionals. As a result, it would seem that there is potentially significant value in engaging those professionals and private interests charged with delivering the specificity of built form to urban environments within the discourses surrounding accessibility.

A Graphical Approach

As a collection of illustrations the ambition is to elucidate the often-reductive nature of mobility-based metrics. Accessibility-based metrics, and more importantly accessibility-based thinking, requires us to look at interventions within space in much broader and more complex ways, specifically in how these interventions will be used by, or enable individuals to fulfill their needs and desires. The use of a series of cascading scales shows the ways in which specific interventions affect not only local conditions but also impact large scales of consideration. As such, it is necessary to consider not only what local impacts on accessibility might be produced, but how such an intervention might have system wide impact, either in a positive or negative way. The examples illustrated are diagrammatic and should be understood as such. The outlined scenarios are not exhaustive of all the possible concerns that need to be considered or that are implicated by the implementation of accessibility-based thinking or evaluation. Rather the illustrations act to represented the general principles of accessibility-based thinking in comparison to mobility-based thinking and the necessity to approach question of access through engagement with multiple stakeholders and through multiple disciplines.

Access to Destinations, "About Accessibility," Last modified on Tuesday, 15 October 2013 http://access.umn.edu/about/

Ahmed M. El-Geneidy and David M. Levinson, "Access to Destinations: Development of Accessibility Measures," (Minnesota Department of Transporation Office of Research Services, 2006) Accessed on Thursday, 11 April 2014 http://www.lrrb.org/media/reports/200616.pdf

Joe Grengs, Jonathan Levine, Qing Shen, and Qingyun Shen, "Intermetropolitan Comparison of Transportation Accessibility: Sorting Out Mobility and Proximity in San Francisco and Washington, D.C.," *Journal of Planning Education and Research* 29 (2011) 427 – 443

Susan Handy, "Methodologies for exploring the link between urban form and travel behavior," *Transportation Research Part D* 2 (2011) 151 – 165

- , "Planning for accessibility: In theory and in practice," in *Access to Destinations*, ed. David M. Levinson and Kevin J. Krizek (Bingley: Emerald, 2005)

Susan Handy and Debbie Niemeir, "Measuring accessibility: an exploration of issues and alternative," *Environment and Planning A* 29 (1997) 1175 – 1194

Walter G. Hansen, "How Accessibility Shapes Land Use," *Journal of the American Institute of Planners* 25 (1959) 73 - 76

Jonathan Levine, "Rethinking Accessibility and Job-Housing Balance," *Journal of the American Planning Association* 64 (2007) 133 – 149

Jonathan Levine and Joe Grengs, "Getting There: Putting Accessibility into Practice for Progressive Transportation Planning," *Progressive Planning* 189 (2011) 8 – 11

David Levinson, Kevin J. Krizek, and David Gillen "The Machine for Access," in Access to Destinations, ed. David M. Levinson and Kevin J. Krizek (Bingley: Emerald, 2005)

Darren M Scott and Mark W. Horner, "The role of urban form in shaping access to opportunities," *Journal of Transport and Land Use* 1 (2008) 89 – 119

David Schrank, Bill Eisele and Tim Lomax, Urban Mobility Report 2012, (Texas Transportation Institute, December 2012) Accessed on Monday, 14 April 2014 http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/mobility-report-2012.pdf

Mobility Perspective
Perceived Ends and Means

Increasing Movement & Reducing Congestion
The easy movement of people in motorized vehicles, with focus primarily on automobile, on road networks.

Interchange Improvement
Ramp Configuration, Diverging Diamond Interchanges, Innovative Intersections, Roundabouts, Turn Lanes, Superstreets

New Passenger Modes
Light Rail, Bus Rapid Transit, Underground

New Freight Modes
Freight Rail Improvement, Intermodal Terminals

Additional Capacity
+600 vph

Adding Lanes, Adding Roads, Adding Toll Lanes or Toll Roads, Managed Lanes

Increase Speed Limit
100 mph

New Transportation Services
Car Share, Real-Time Ride Share, Car Pooling, Van Pooling, Pay-to-Drive Off-Peak, Pay-As-You-Drive Insurance

Modifications to Existing Network
Collector-Distibutor Roads, Acceleration/Deceleration Lanes, One-Way Streets, Access Management

Additional Mode Capacity
Bike Lanes, New LRT Lines, Bus Rapid Transit Lanes

New Transportation Modes
Bike Share

New Mode Interchanges
Multi-Modal Hubs, Raised Platforms

- Infrastructure
- Policy
- Services
- Guidelines
- Technology
- Management
- Information + Education

Financial Disincentives

Carbon Tax, Driver's License Surcharge, Fuel Sales Tax, Local Fuel Tax, Vehicle Sales Tax, Vehicle Mileage Fee

Financial Funding Models

Comprehensive Development Agreements, Proposition Bonds, Pass Through Financing, PPP's

Incentive Policies

Trip Reduction Ordinances, State Employee Trip Reduction, Truck Incentives and Use Restriction

Management & Maintenance

Aggressive Incident Clearance, Special Event Traffic Management, Contract Contracting Options

New Institutions & Associations

Transportation Management Associations

Zoning

Density, Activities, Parking Management, Park-and-Ride Lots

Active Traffic Management

Electronic Toll Collection, Reversible Traffic Lanes, Variable Speed Limits, Dynamic Routing, Management Centers

Telecommuting

Accessibility Perspective

Perceived Ends and Means

Fulfilling Basic Social Needs
Meeting and socializing with others, participating in governance, meeting ones spiritual needs

Fulfilling Desires
Special destinations, Movement with no destination, Recreation, Leisure activities

Fulfilling Economic Needs
Employment, Moving Goods

Fulfilling Sustinance Needs
Food, Water, Health

Fulfilling Educational Needs
Primary, Secondary, Post-Secondary Education

Fulfilling Cultural Needs
Libraries, Theaters, Museums

Interchange Improvement
Ramp Configuration, Diverging Diamond Interchanges, Innovative Intersections, Roundabouts, Turn Lanes, Superstreets

New Passenger Modes
Light Rail, Bus Rapid Transit, Underground

New Freight Modes
Freight Rail Improvement, Intermodal Terminals

Additional Capacity
+600 vph

Adding Lanes, Adding Roads, Adding Toll Lanes or Toll Roads, Managed Lanes

Increase Speed Limit
100 mph

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Financial Disincentives

Carbon Tax, Driver's License Surcharge, Fuel Sales Tax, Local Fuel Tax, Vehicle Sales Tax, Vehicle Mileage Fee

Financial Funding Models

Comprehensive Development Agreements, Proposition Bonds, Pass Through Financing, PPP's

Incentive Policies

Trip Reduction Ordinances, State Employee Trip Reduction, Truck Incentives and Use Restriction

Health Care

Opening up where and how one can recieve care

Education

Training programs and skill upgrading to eliminate the spatial mis-match of jobs to skill labor

Business Cluster Initiatives

Establishment of new institutions to train a new labor force and foster new technologies for industry application

Block Low-Road Geographic Policies

Eliminate race to the bottom strategies like tax abatements, locational subsidies, and right-to-work.

Management & Maintenance

Aggressive Incident Clearance, Special Event Traffic Management, Contract Contracting Options

New Institutions & Associations

Transportation Management Associations

Goods & Services Delivery

Groceries, Electronics, Consumer goods

Zoning

Density, Activities, Parking Management, Park-and-Ride Lots

Street Section Planning

Mode Distribution, Walking Conditions, Biking Conditions

Active Traffic Management

Electronic Toll Collection, Reversible Traffic Lanes, Variable Speed Limits, Dynamic Routing, Management Centers

Telecommuting

Social Networking

Replaces the requirement of locational proximity to socialize with peers

Telehealth

Distance Education

Distance Education

E-Business & New Media

Access to media & products firmware, on-demand and on any device

Integrated Payment Systems

RFID, Smart Cards

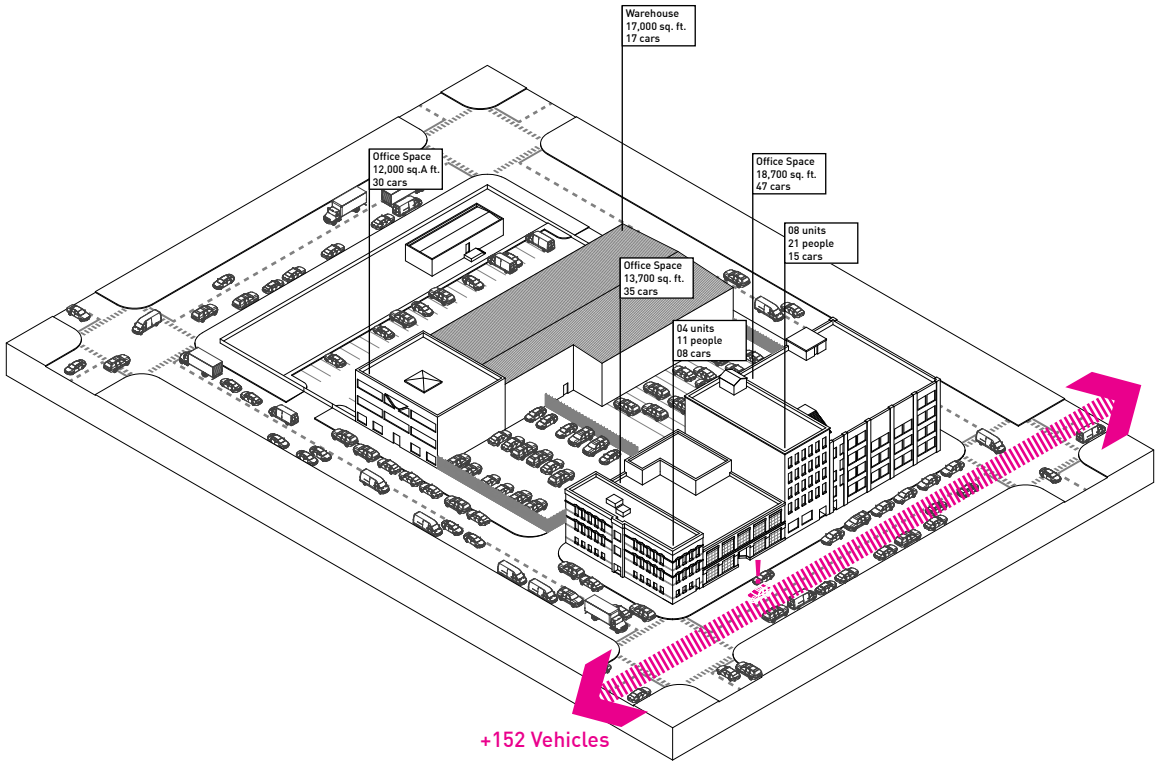
THE BLOCK

1:1,500

The Block // 1:1,500

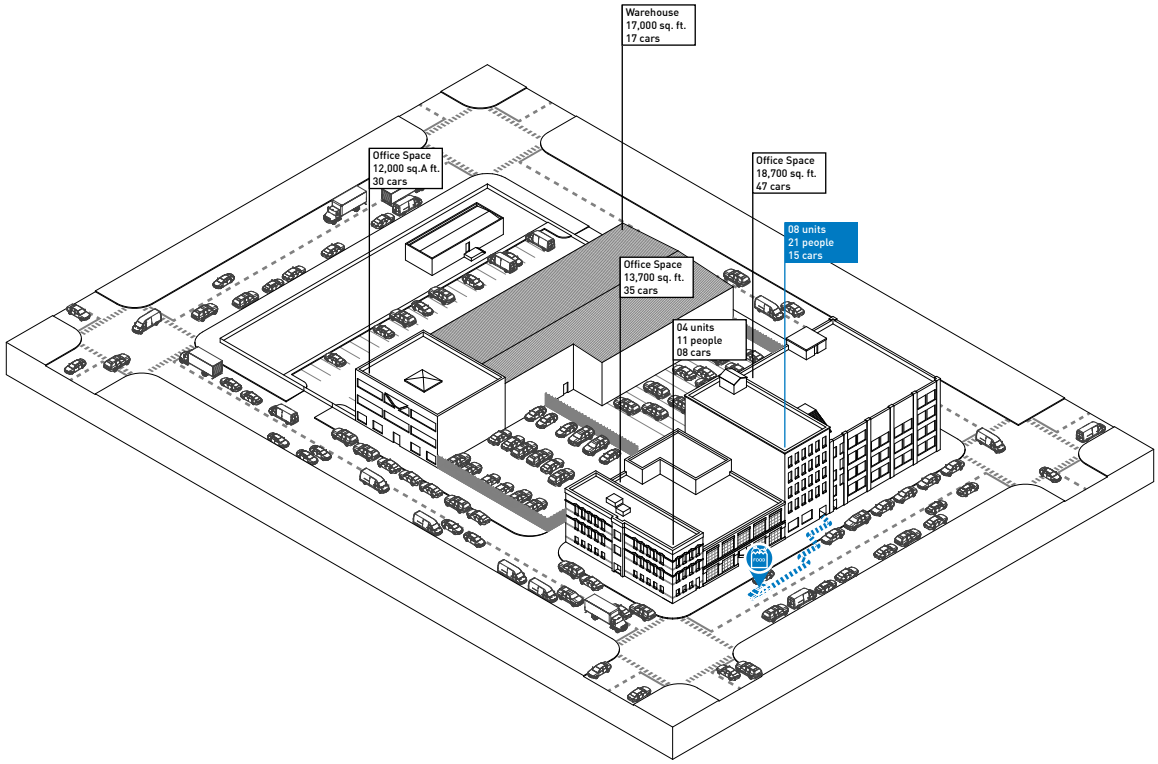
The block scale allows for a tangible and knowable scale through which to describe the principles of accessibility-based thinking relative to mobility-based metrics. The potential impacts of interventions at the scale of the block are assessed in relation to their immediate surroundings, as well as what larger systems and time scales might be implicated requiring further investigations. For example, the introduction of new separated rapid transit, in the form of light-rail, bus-rapid-transit, or subways, will, through a mobility-based perspective, potential reduce congestion on roadways. However, depending on the system implemented, congestions may increase for a period of time through construction or longer, due to the removal of traffic lanes. From an accessibility-based perspective, these decreases in mobility might be offset because more people have the potential to access high quality and high-speed transportation options, allowing them to get to destinations or opportunities that they desire.

Personal Motor Vehicles
Mobility Perspective



Personal motor vehicles increase individual mobility, while also increasing the potential for congestion. The Level of Service of a roadway must be maintained to ensure congestion does not increase and that efficient movement is possible.

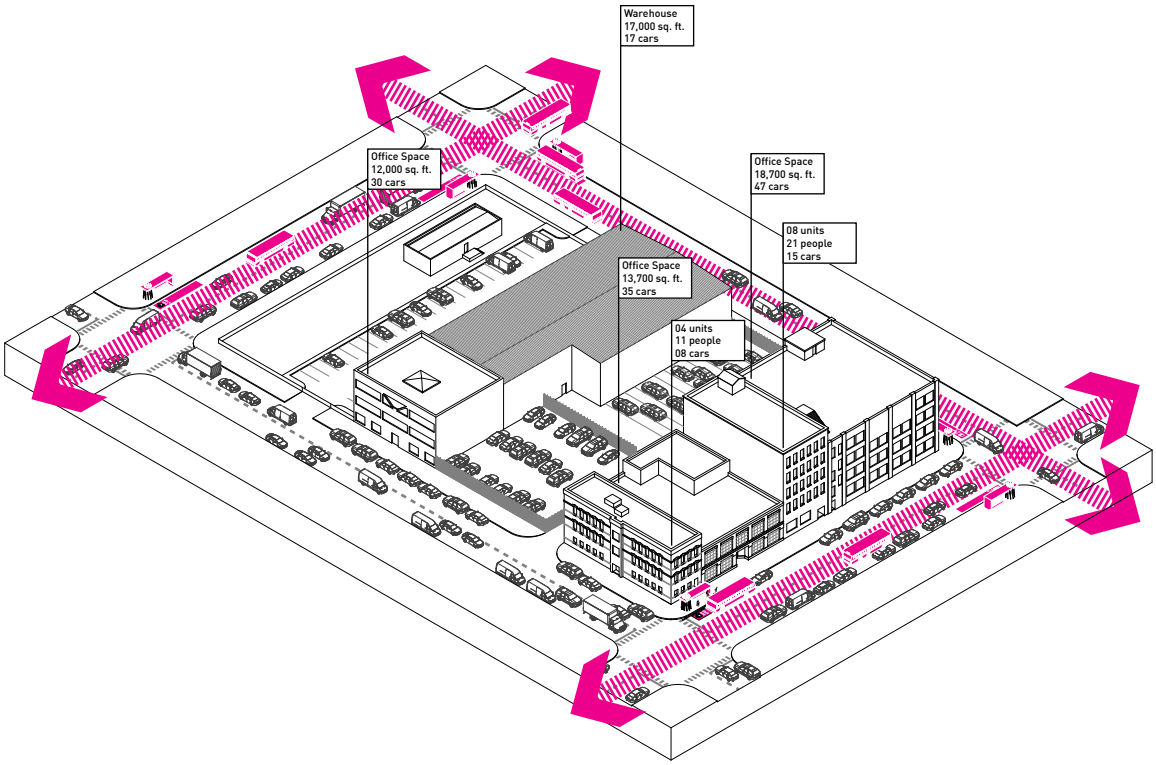
Personal Motor Vehicles
Accessibility Perspective



Personal motor vehicles allow for individuals to access distant opportunities and destinations assuming those individuals have access to personal motor vehicles, through individual ownership or a car sharing service and that the network promotes movement sufficiently, for example is uncongested.

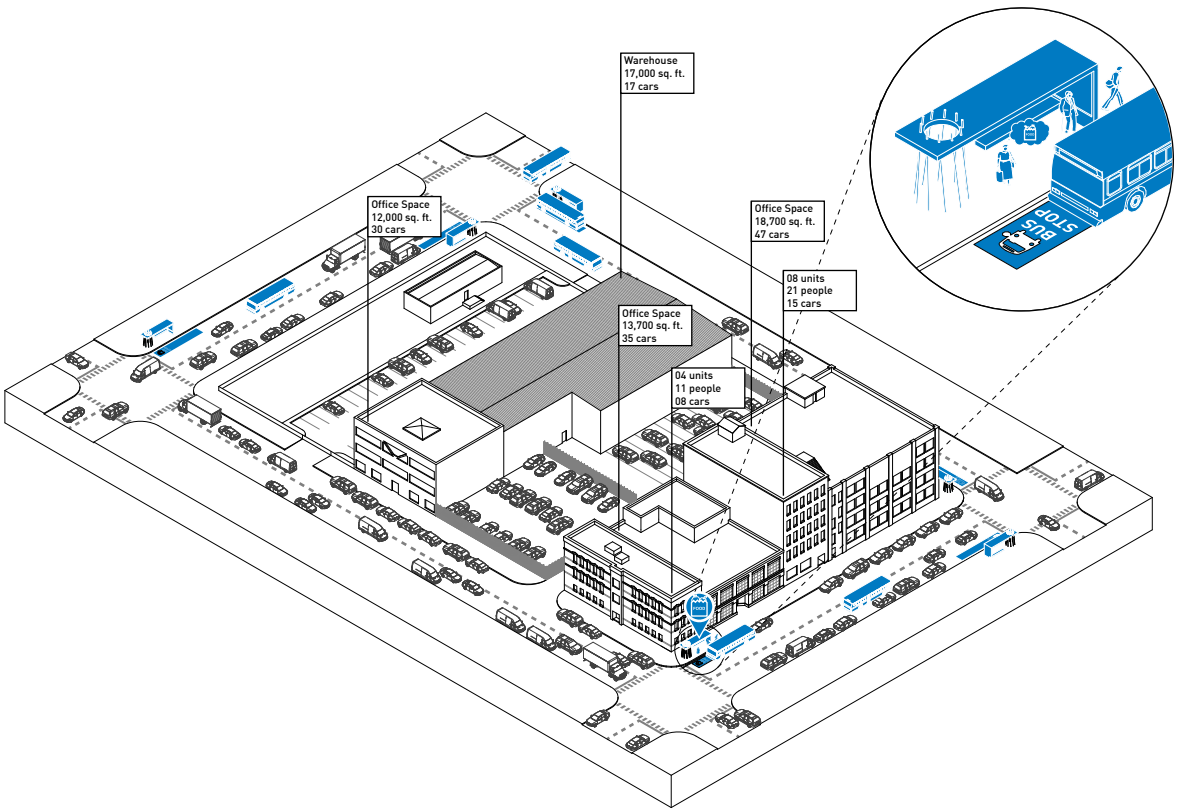
Shared Right-of-Way Transit Routes and Stops

Mobility Perspective



The provision of new or additional transit options on existing roadways has the potential to increase congestion and reduce overall Level-of-Service. Unless it displaces enough people from personal motor vehicles, transit is seen as an additional load and thus a potential impediment to movement.

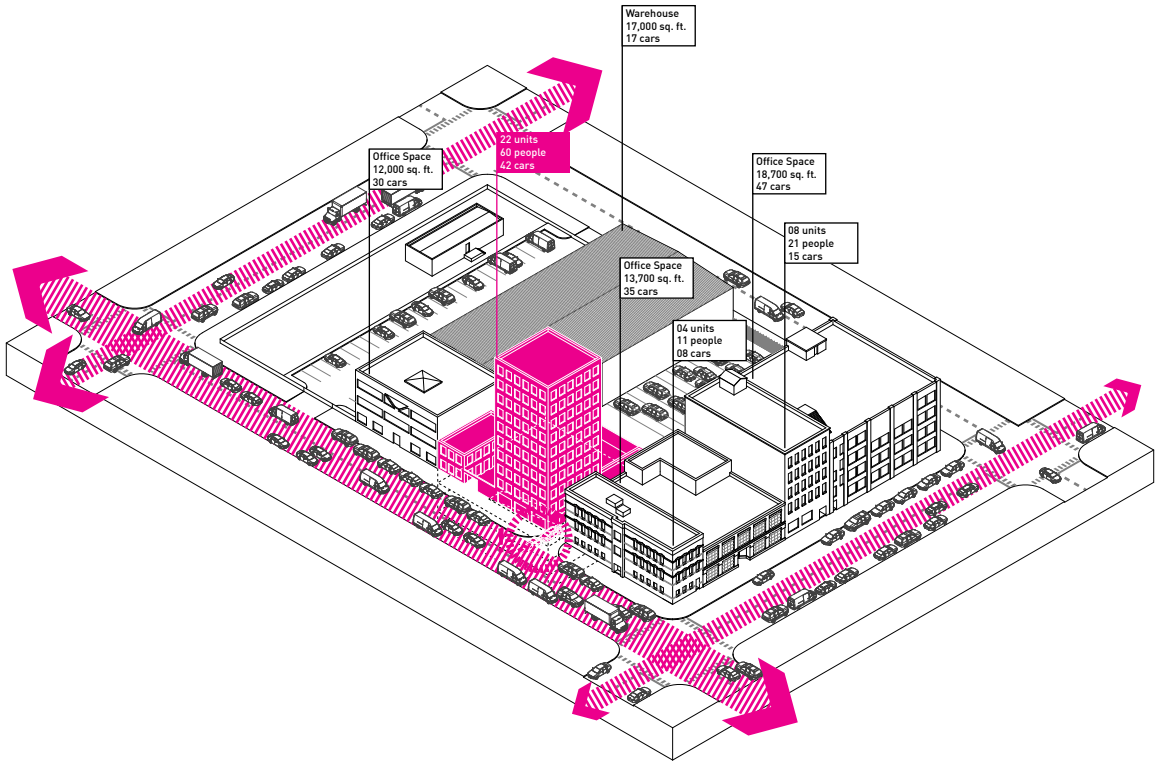
Shared Right-of-Way Transit Routes and Stops
Accessibility Perspective



The provision of new and additional transit options, while possibly decreasing mobility and thus accessibility for those modes which utilize the roadway, creates the potential for those without access to a personal motor vehicle the ability to access destinations and opportunities not immediately proximate.

Mid-Rise Mid-Block Development

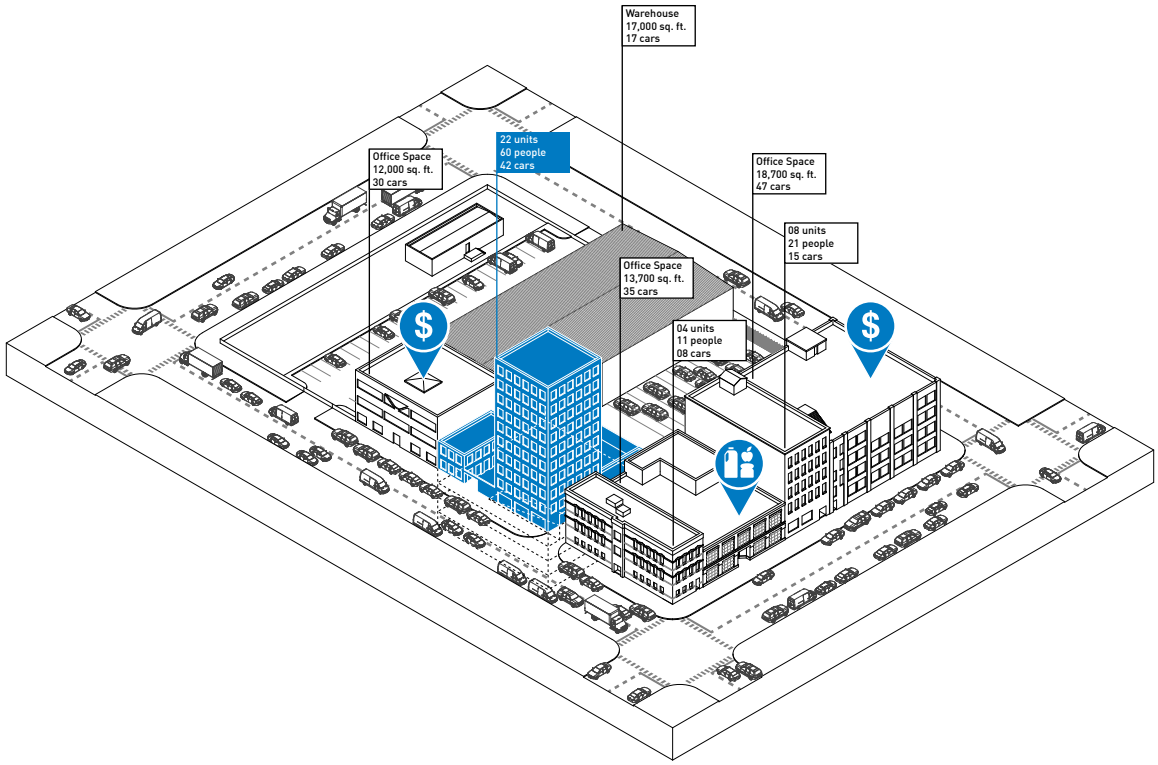
Mobility Perspective



The development of a mid-rise residential building might create a point of congestion where the entry to the underground parking garage meets the road. This would cause a decreased level-of-service due to cars turning into and out of the garage from the adjacent street, as well as increase the load on the surrounding streets.

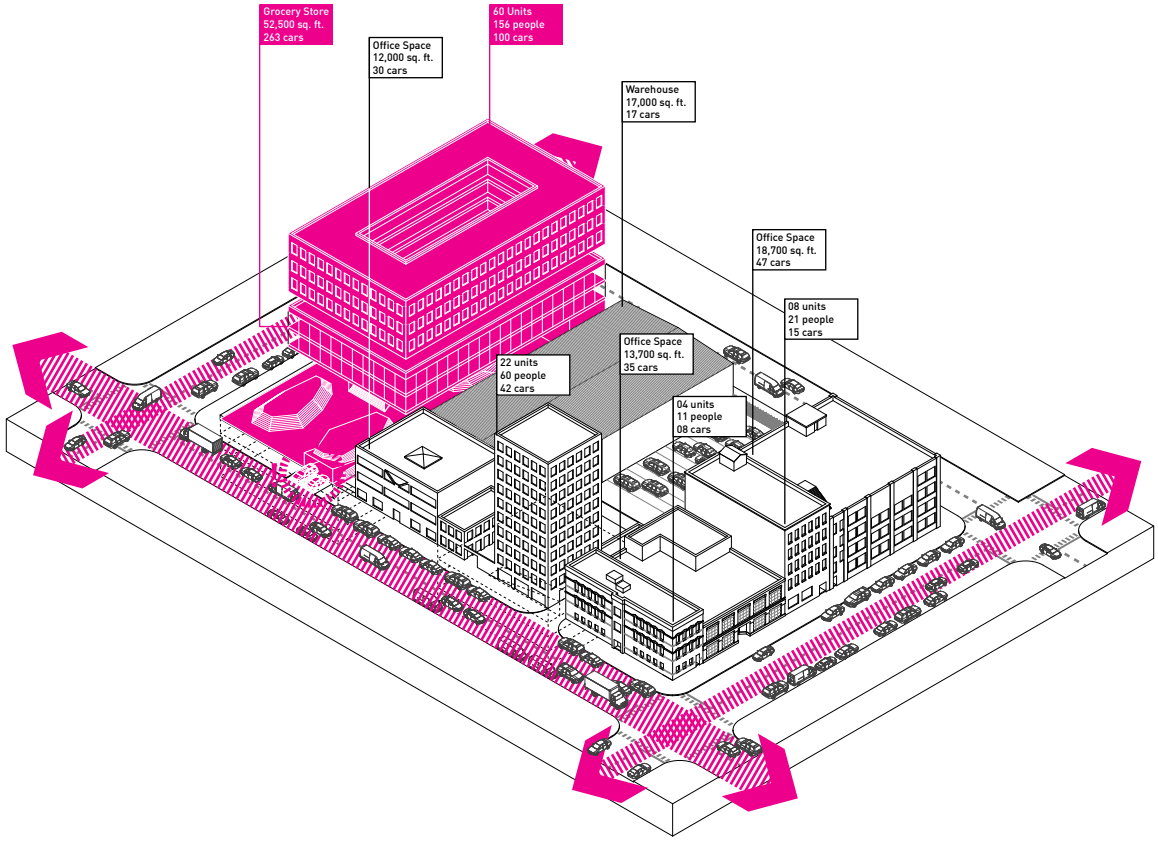
Mid-Rise Mid-Block Development

Accessibility Perspective



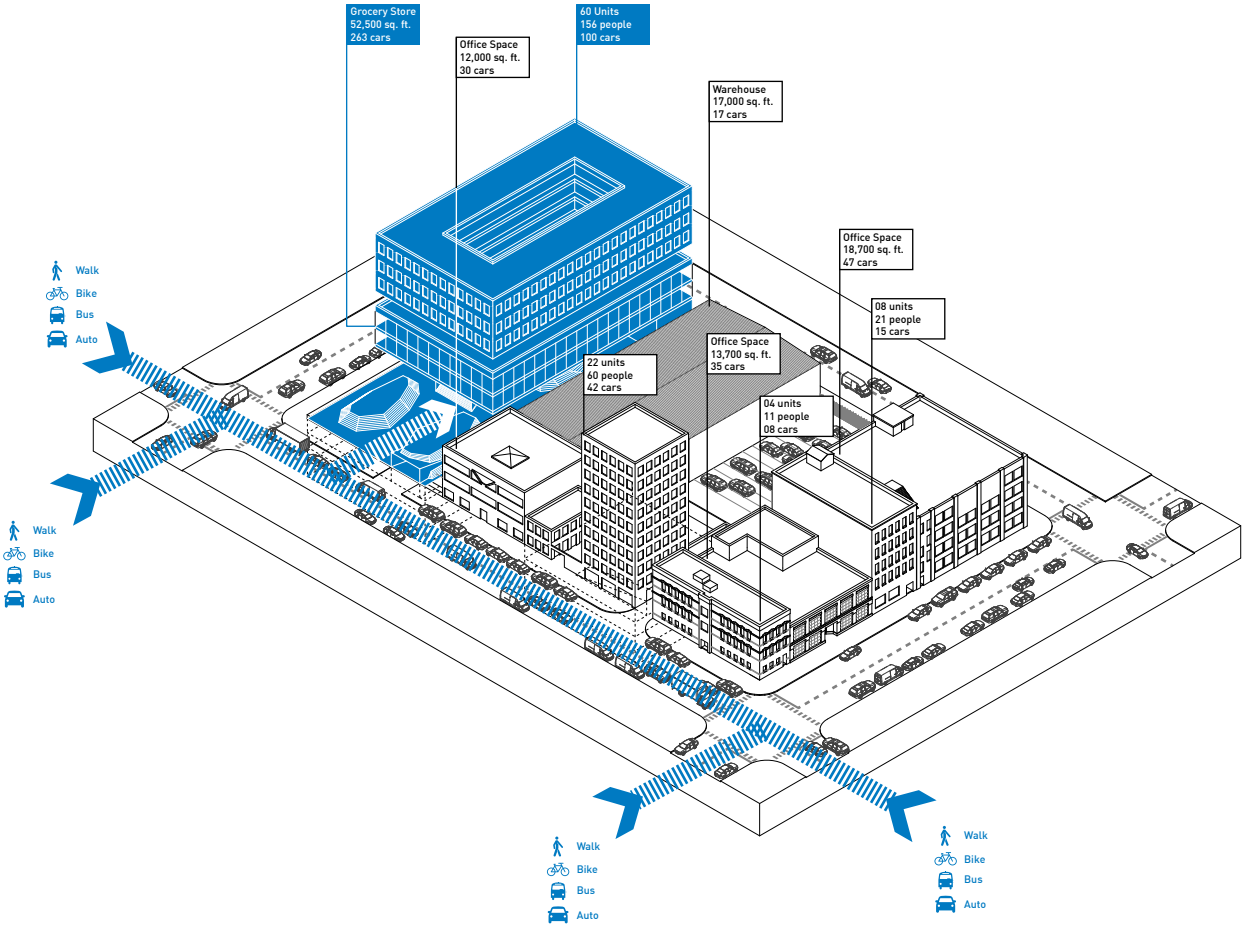
The development of a mid-rise residential building might decrease mobility and thus decrease accessibility. However by increasing proximity through the development of residential housing units adjacent to economic opportunities and services, such as a grocery store, overall accessibility might be increased and leave mobility unchanged.

Large Mixed-Use Development
Mobility Perspective



The development of a large mixed-use project might increase the load on local roadways from the additional residential population, as well as the traffic coming to the project to access a specific destination. The increased load is seen as something that might decrease the level-of-service of the road, thus increasing congestion.

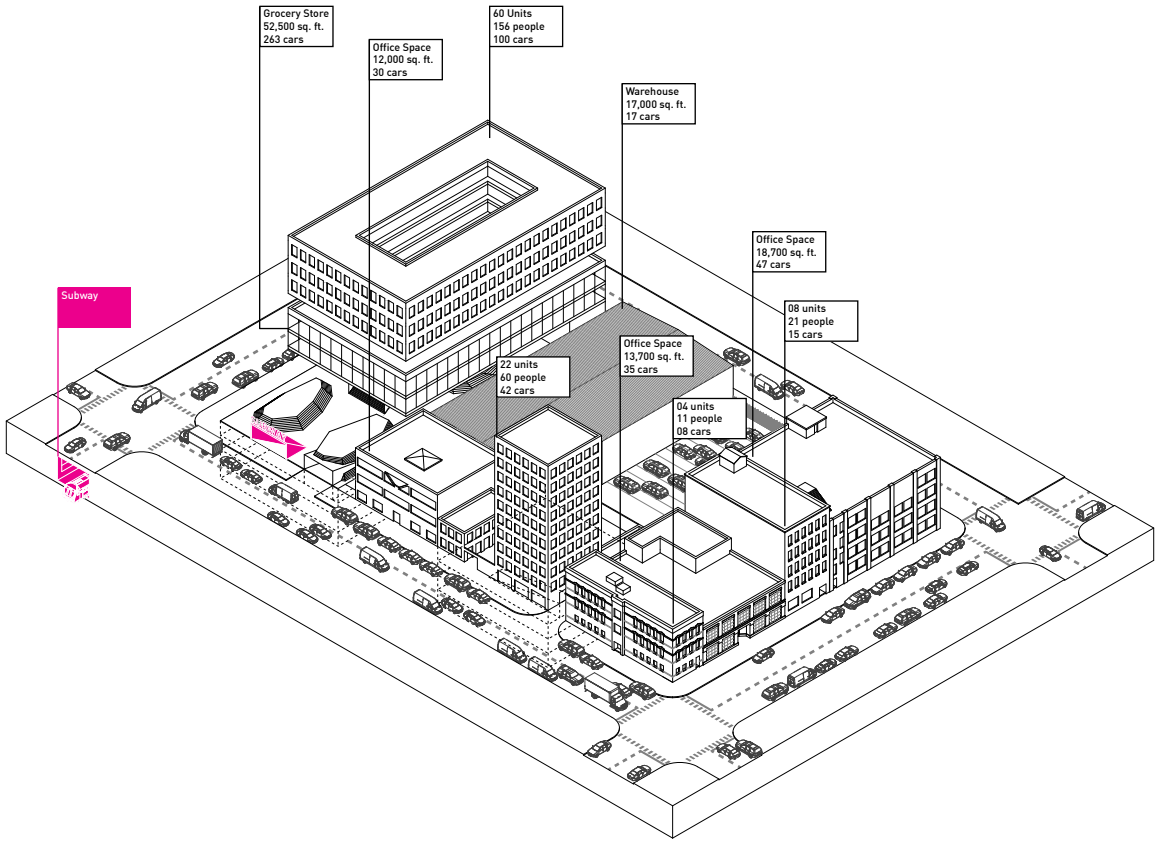
Large Mixed-Use Development
Accessibility Perspective



The development of a large mixed-use project while potentially decreasing mobility of those utilizing roadways, puts those living in the development into immediate proximity to a range of opportunities, inside of the development and outside. It also allows those travelling through a variety of modes the ability to access those destinations and opportunities.

Dedicated Right-of-Way Transit Routes and Stops

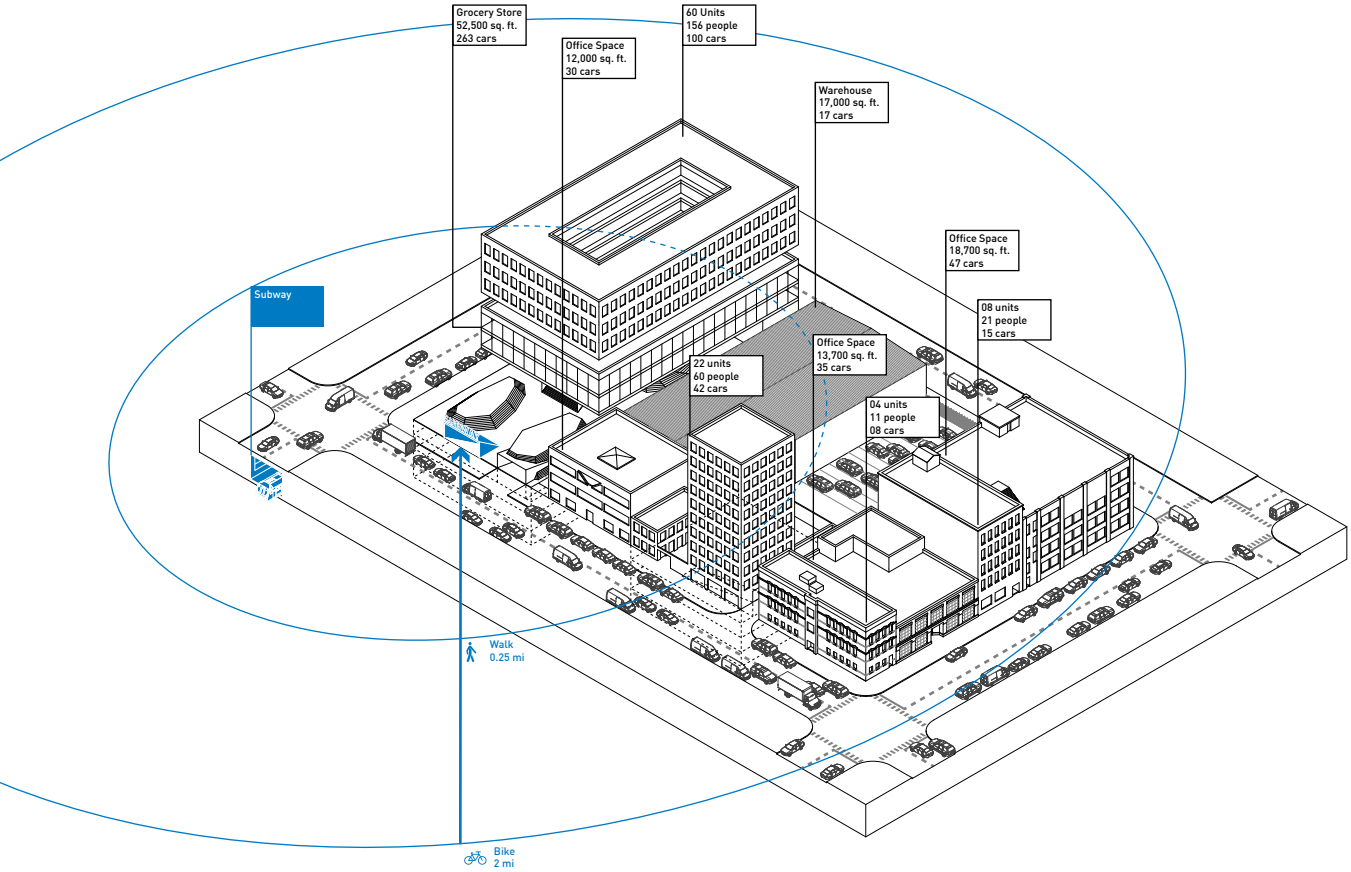
Mobility Perspective



New dedicated right-of-way transit increases mobility specific to a given mode, for example subways, which also increasing mobility through other modes, for example auto-mobility, by possibly taking vehicles off the road. Over a shorter period of time, however, mobility might be decreased for specific modes due to the construction of the right-of-way.

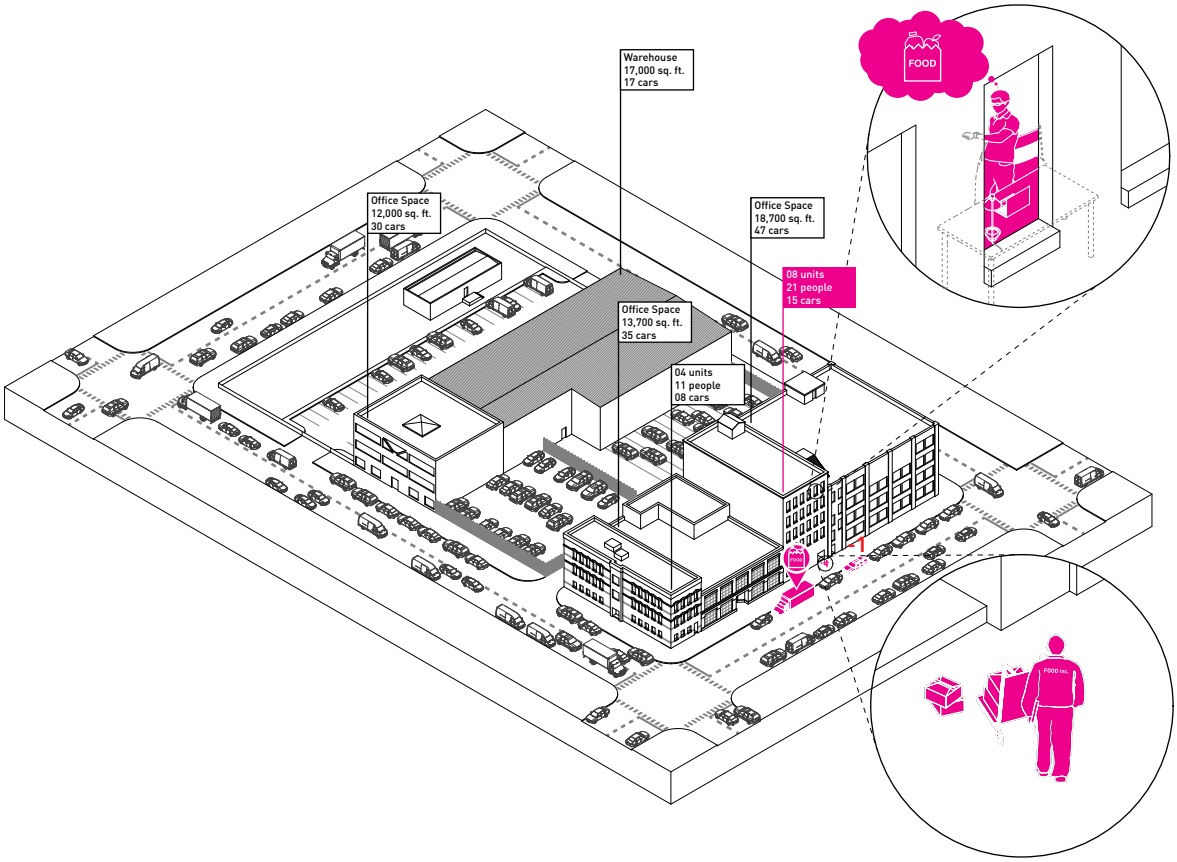
Dedicated Right-of-Way Transit Routes and Stops

Accessibility Perspective



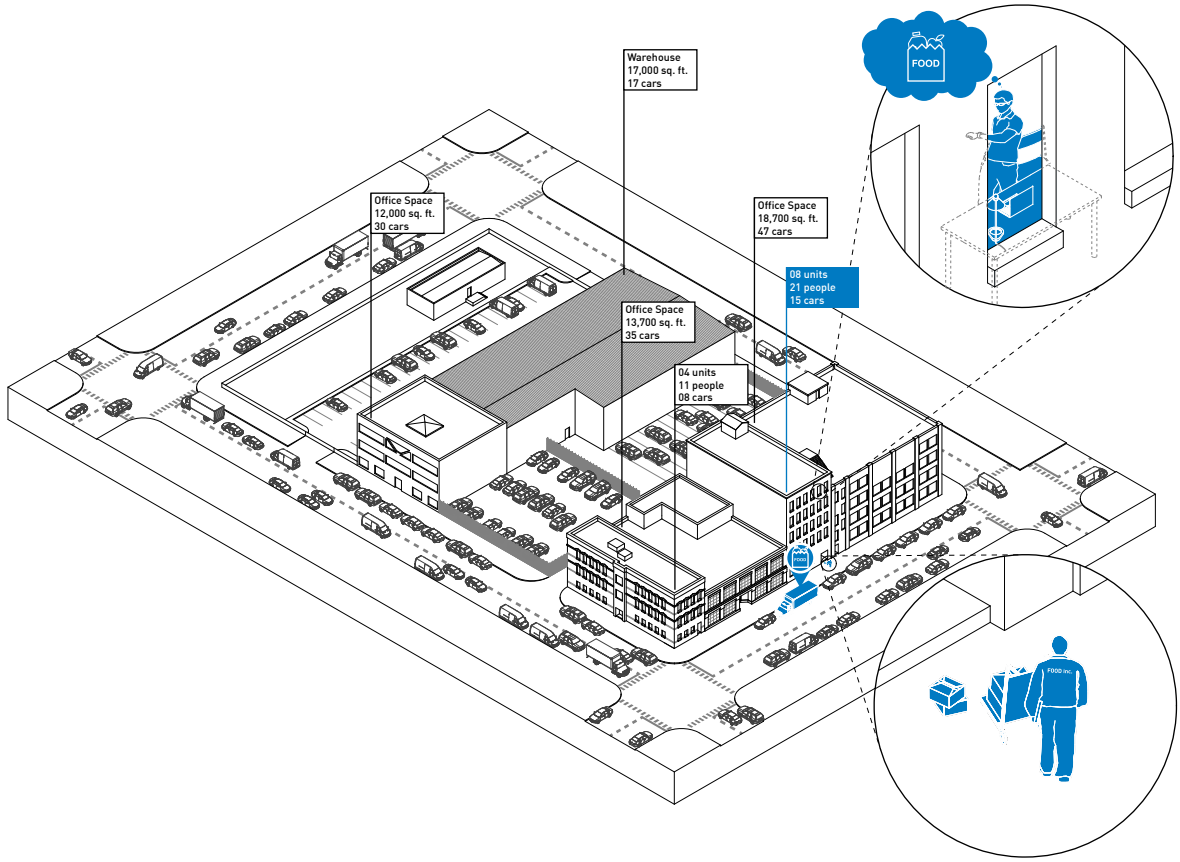
New dedicated right-of-way transit increases accessibility to destinations and opportunities for a wide range of the population who live within a certain distance of its stops. Dedicated right-of-way transit provides high-speed transportation options to access less proximate destinations and opportunities.

Delivery Services
Mobility Perspective



The implementation of new delivery services possibly helps to reduce the number of vehicles on the road, increasing mobility on roadways. However, as more people use delivery services, these services must ensure that increased loads do not negatively affect the time it takes to receive goods.

Delivery Services
Accessibility Perspective



New delivery services put more people into proximity, albeit virtually, to those things which they desire or need, and relies on the movement of others to delivery those goods or services to your physical location. Access to these services presupposes access to some form of interface with these services, for example, through an Internet connection.

THE COMMUNITY

1:15,000

The Community // 1:15,000

The community scale allows for an investigation into a new planned community at the intersection of an established suburb of a major North American city and a regional rail line. The documentation presents how the existing configuration as well as the new proposed community might be viewed from a mobility-based perspective and an accessibility-based perspective. Through this, an understanding of accessibility from a point, as in the case of commuters accessing jobs in distant locations, as well as to a point, in the case of residents of the planned community accessing an adjacent regional business and recreation hub in addition to those using the regional rail to move to this point. While from an accessibility-based perspective these could be seen as increasing access, and potentially increasing or decreasing congestion and thus mobility, a mobility-based perspective would exclusively view these interventions through their impact on traffic mobility.

Motor Vehicle Dominant Development

Mobility Perspective

The form of development prioritizes the circulation of motor vehicles. From a mobility-based perspective, everything is seen to be in good working order as there is no congestion and level-of-service is high. Any additional development should seek to main the current level-of-service.

Motor Vehicle Dominant Development

Accessibility Perspective

From an accessibility-based perspective, the situation has limited accessibility. Accessibility via motor vehicle might be high if what one desires or needs to access is the limited number of opportunities or destinations. Accessibility through other modes, such as biking or walking, is limited and not promoted, especially from regional transit connections.

Mixed-Use Development

Mobility Perspective

The development of a new mixed-use community, which includes potential in demand destinations such as a middle school, a library, and at-grade retail, might increase the load on roadways and decrease the level-of-service. The additional load on the network would be both from within the new community and from outside.

Mixed-Use Development

Accessibility Perspective

The development of a new mixed-use community, while possibility decreasing mobility of motor vehicles, puts a greater number of people in proximity to destinations and opportunities locally such a school, library, and retail, while also putting them in proximity to destinations and opportunities further away through the developments proximity to regional transit.

Regional Business + Recreation Development

Mobility Perspective

The development of a regional business and recreation hub might drastically increase the loads of roadways due to the scale and potential significance of such a development. Roadways might become congested and reduce the level-of-service of the roadways immediately around the development and larger arterial roads.

Regional Business + Recreation Development

Accessibility Perspective

The development of a regional business and recreation hub, while possibly decreasing the mobility of personal motor vehicles, might increase access to those needs and desires fulfilled by potential employment and recreation. Its proximity to regional rapid transit means that these destinations are not only available to those within the community but those that might live near other transit stops.

Telecommuting
Mobility Perspective

Telecommuting potentially decreases loads on roadways from commuters, and thus congestion, maintain or increasing roadway level-of-service. However, increased loads on broadband infrastructure may decrease acceptable Internet speeds depending on the scale of implementation.

Telecommuting
Accessibility Perspective

Telecommuting allows people to access employment opportunities that might not otherwise be available due to a combination of mobility, proximity, and cost. However, this perspective assumes that individuals or households have access to the Internet and the required infrastructure to connect to a broadband network, which might not universally be the case.

THE CITY

1:150,000

The City // 1:150,000

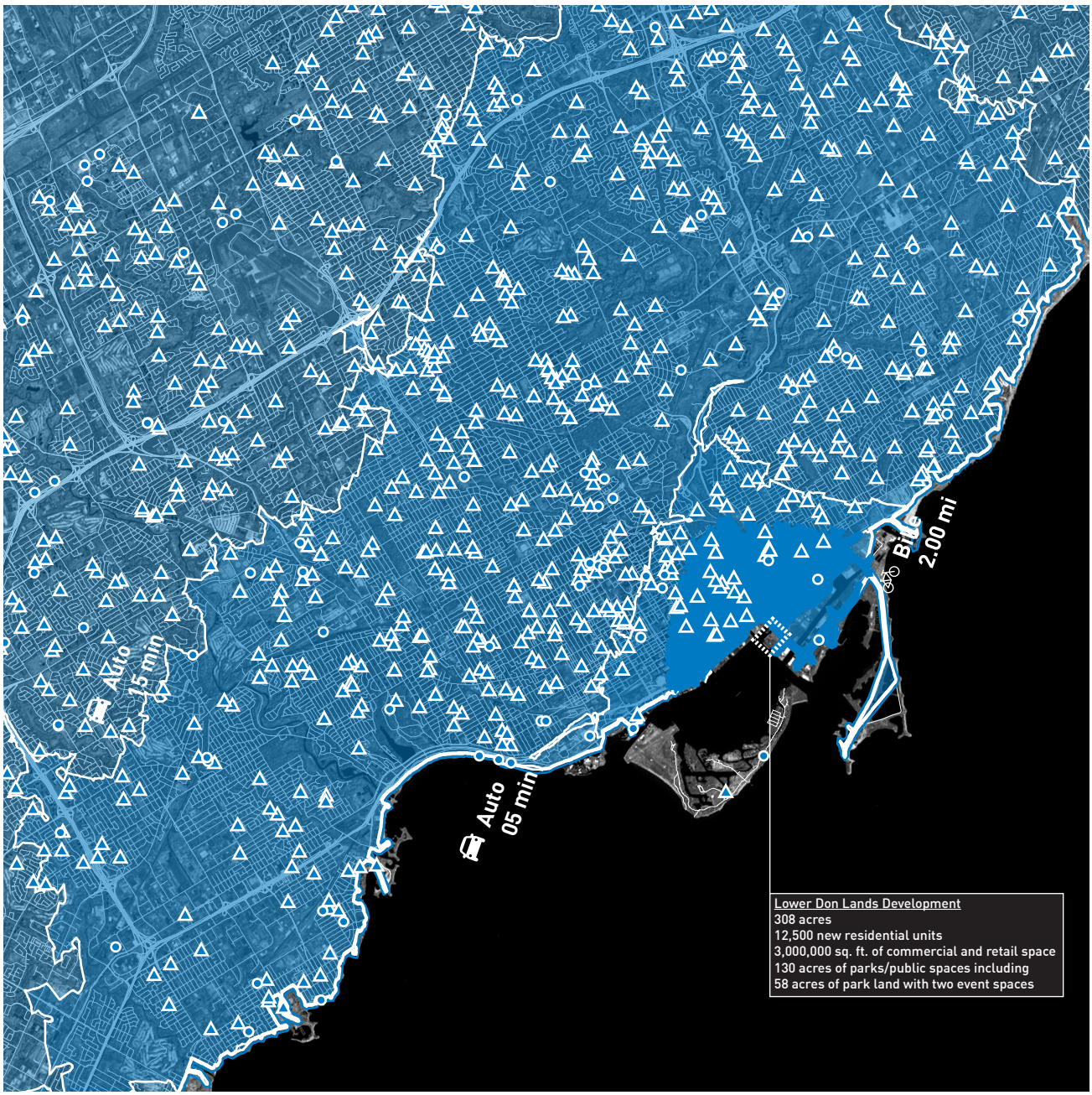
The city-wide impacts of point interventions, as in the case of a new community development, or system wide interventions, such as the coupling of bike share infrastructure and subways stations, are assessed from mobility and accessibility-based perspectives. Similar to the community scale, the impact of transportation interventions, particularly from a mobility-based perspective, are viewed within the mode of the intervention as well as on its potential mobility impacts on other modes. The evaluation through an accessibility-based perspective attempts to understand how interventions might increase accessibility through a multiple modes, either in isolation or through multi-modal configurations.

Mixed-Use Development

Mobility Perspective

The mixed-use redevelopment of a large piece of land within the city has the potential to increase congestion on both local and major roadways and expressways. This congestion would lead to a decrease in level-of-service. Of concern would be increased traffic from within the development and arriving to the development.

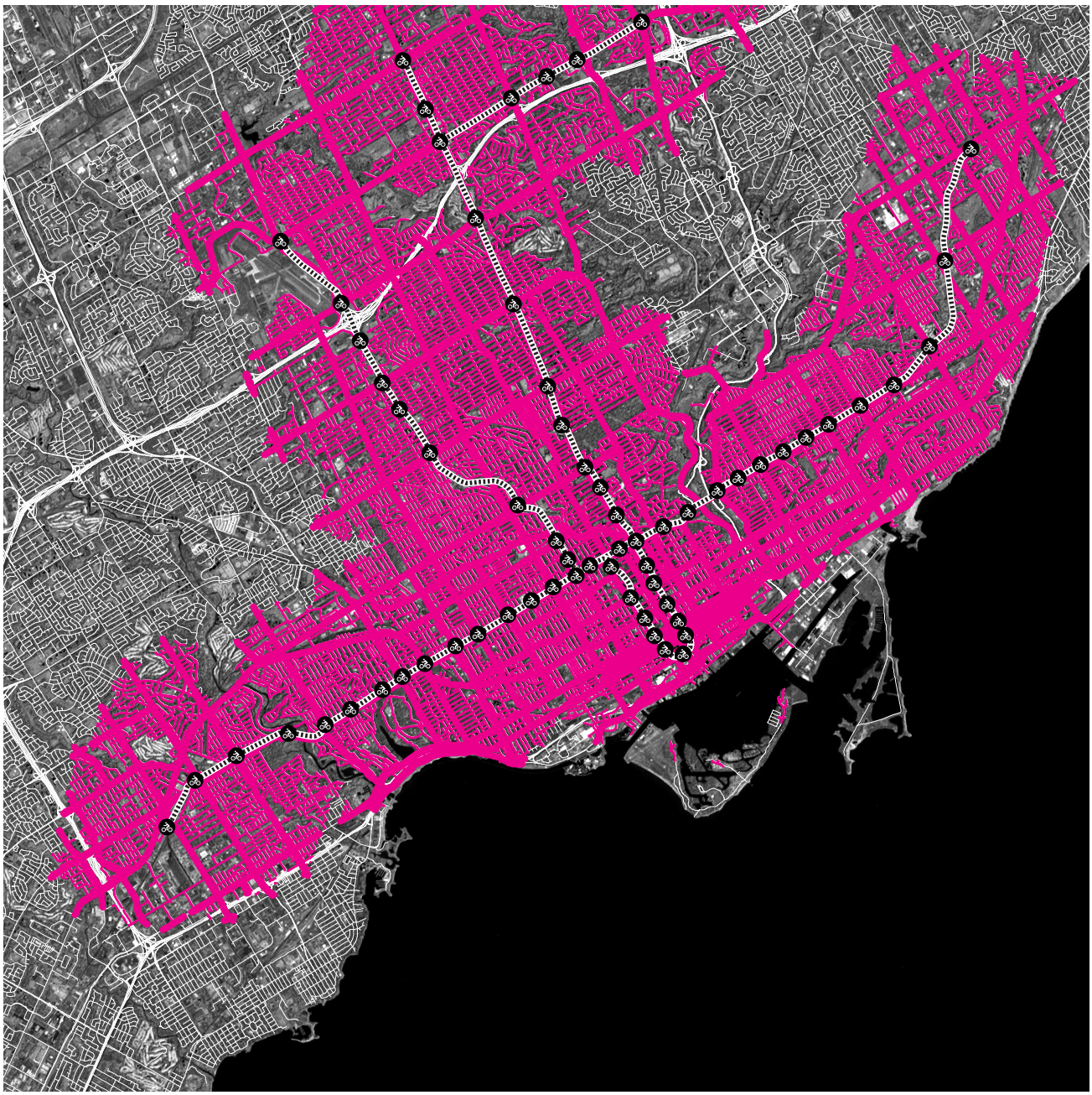
Mixed-Use Development
Accessibility Perspective



The mixed-use redevelopment of a large piece of land within the city, while possibly increasing congestion for motor vehicles, put people into greater proximity to destination and opportunities within the development and in proximity to it. These destinations can be accessed through various modes of transportation. For example thirty schools can be reached within a two-mile bicycle ride.

		5 / 30 min
	30	602/1115
	3	6/101

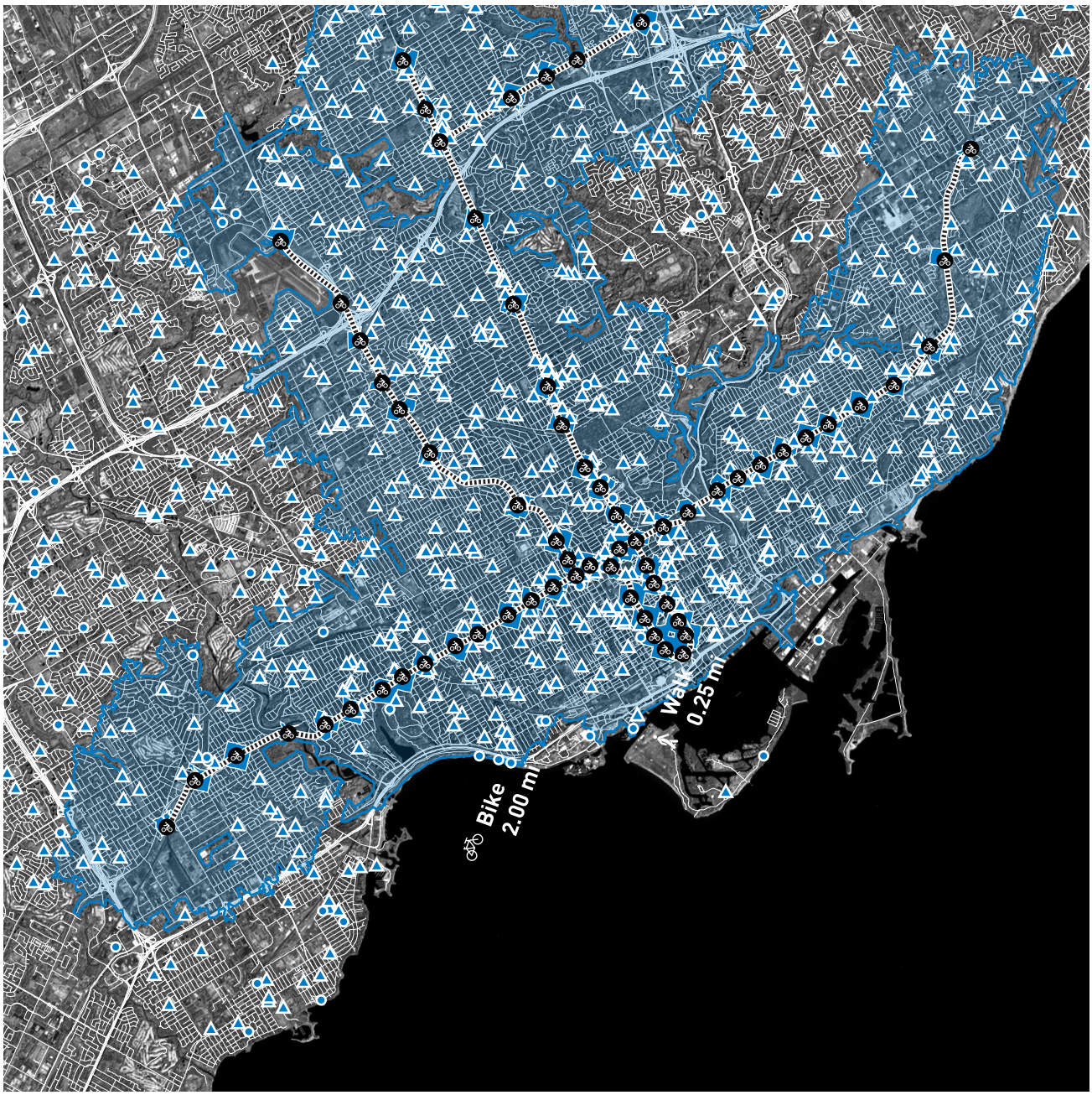
Bike Share System
Mobility Perspective



New bike sharing stations are installed at all rapid transit stations. From a mobility-based perspective this intervention has the potential to increase bicycle loads and thus congestion on roadways, and depending on the configuration of the road, to increase automobile congestion in turn. This congestion would decrease roadway level-of-service.

Bike Share System

Accessibility Perspective



New bike share stations are installed at all rapid transit stations. From an accessibility-based perspective, while possibly limiting mobility of some modes, this intervention might produce better integration of modes, and would allow people to access destinations or opportunities further away from station then would be accessible by walking, in the same amount of time.

	+	+
	64	602
	8	47

THE REGION

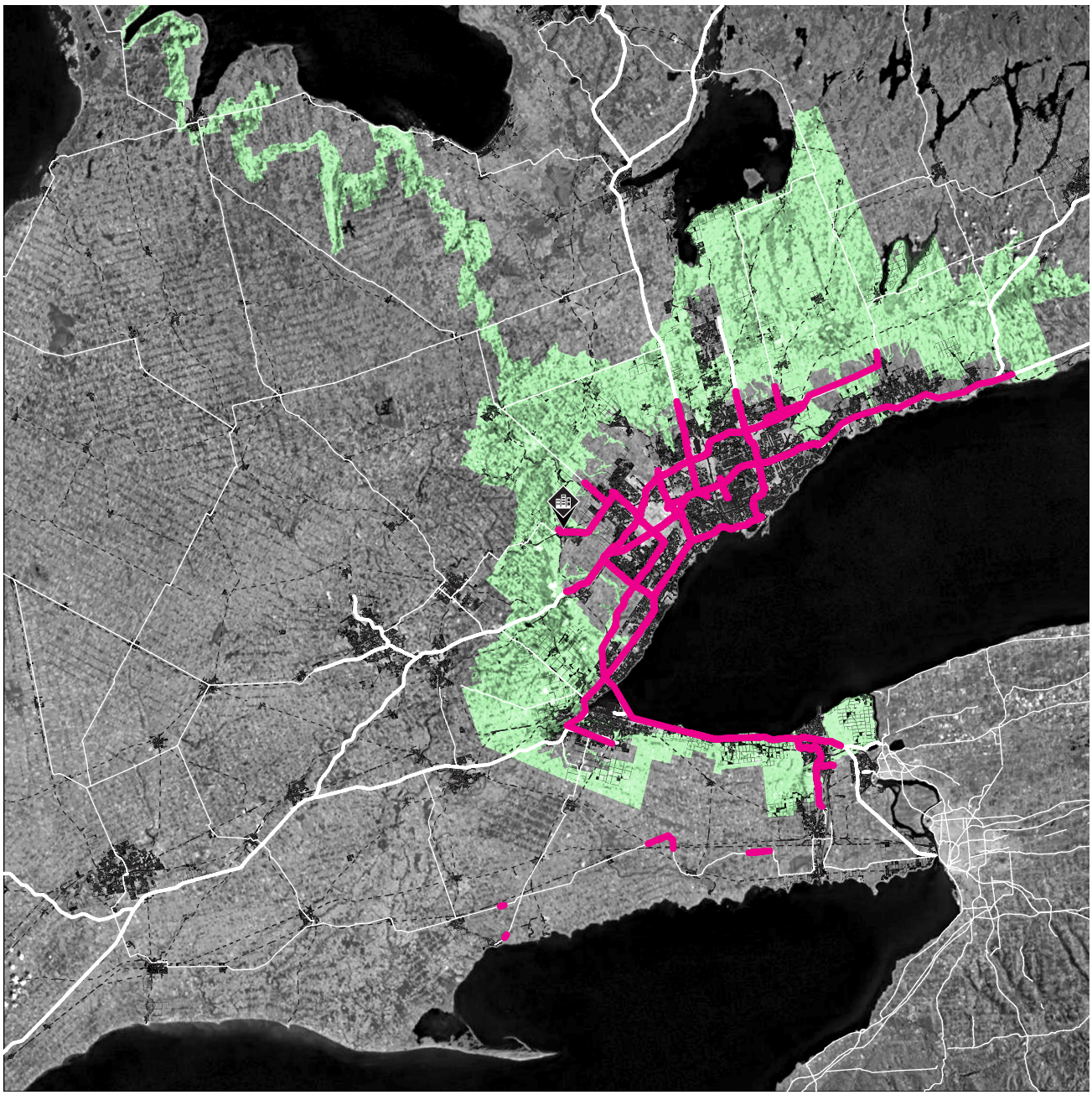
1:1,500,000

The Region // 1:1,500,000

Through the regional scale the impacts of a regional growth boundary, in the form of a green belt, and the development of a new planned community at the intersection of the green belt, a highways system, and a regional rail system, are evaluated and presented. The interventions allow for a mobility and accessibility-based perspectives to be tested at the scale of the region. While there might be positive or negative impacts based on either evaluation method, it is crucial to understand the impacts of interventions across multiple spatial and temporal scales to fully evaluate these impacts. For example, a impacts to congestion of the highway system generated by new populatioons would need to be considered ralative to accessibility produced through the new population deposition - both within and without the community itself. The case of the region makes clear the need to evaluate interventions in a dynamic way.

Regional Growth Boundary

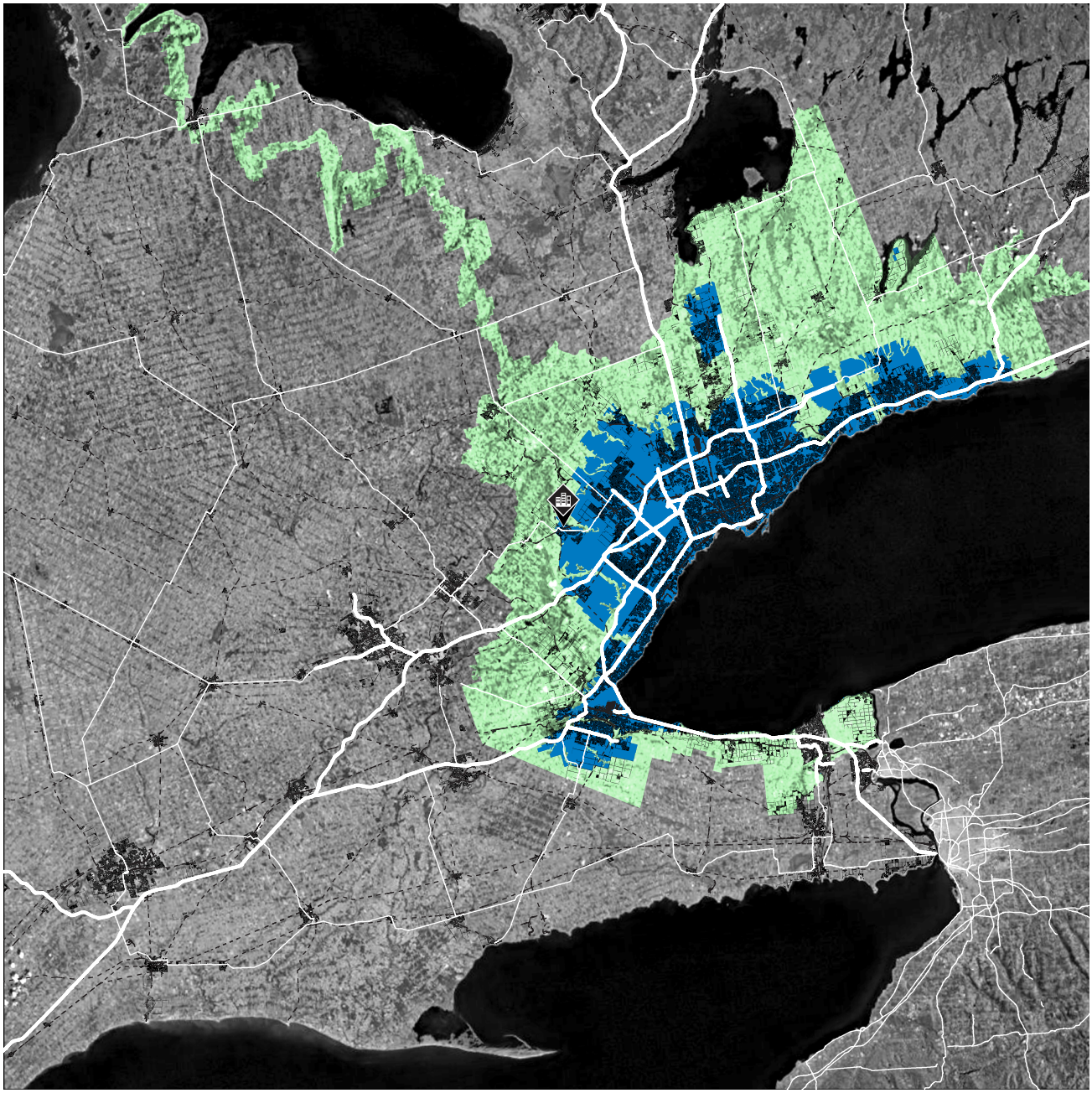
Mobility Perspective



A new regional growth boundary, in the form of a green belt, concentrates growth into one area and thus increases the potentially excessive loading of existing roadways. This excessive loading might increase the likelihood of congestion and decrease the level-of-service of some of the major roads within the growth boundary.

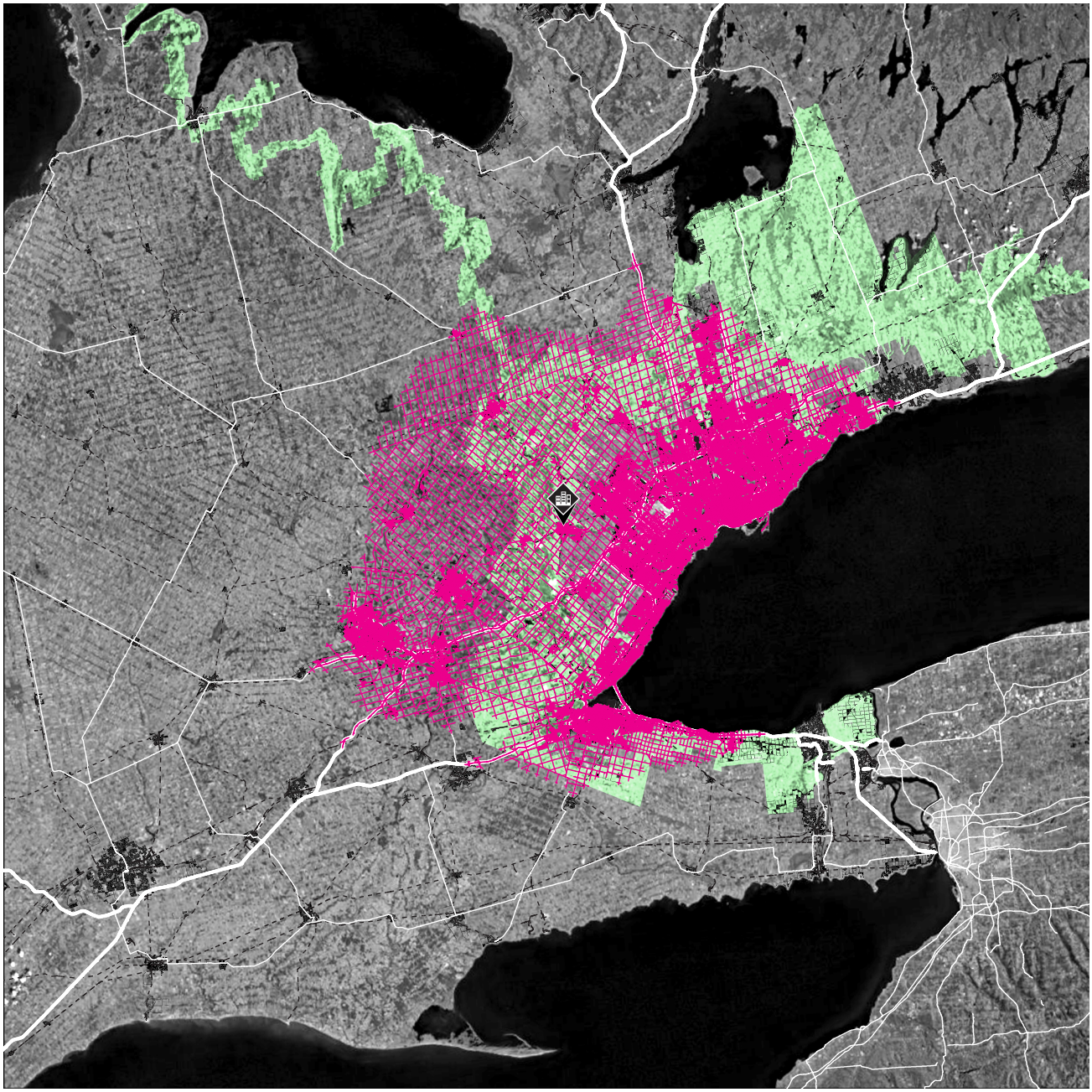
Regional Growth Boundary

Accessibility Perspective



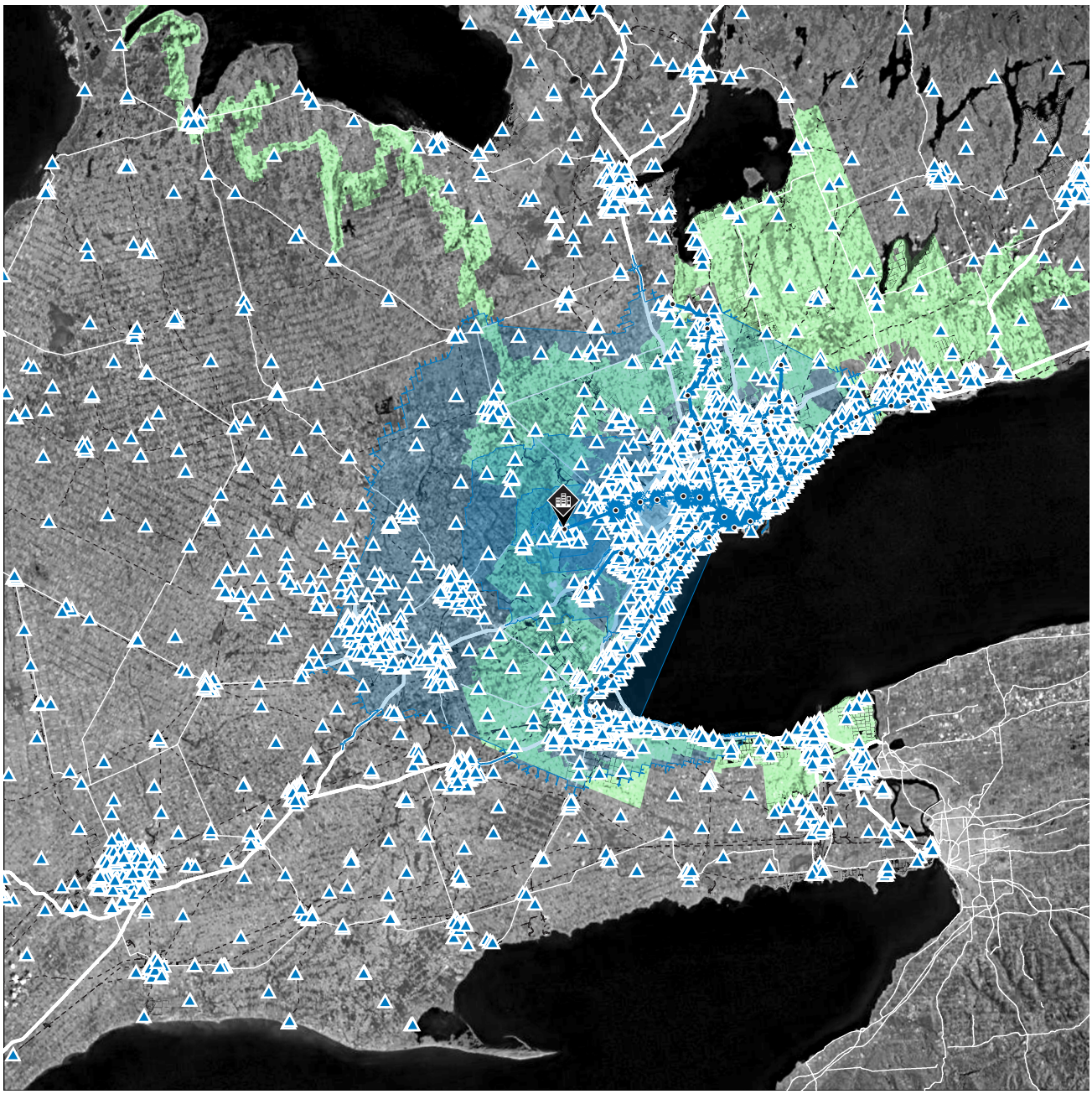
A new regional growth boundary, in the form of a green belt, concentrates growth into one area, and while potentially decreasing mobility, it has the potential to put more people in proximity to those destinations and opportunities that would fulfill their needs or desires.

Mixed-Use Development
Mobility Perspective



The development of a new mixed-used community has the potential to increase loading on existing roadways due to the increase in population. This increased loading might increase congestion and thus decrease the roadways level-of-service. As well, its location next to regional rail might increase rail loading and decrease mobility by rail.

Mixed-Use Development
Accessibility Perspective



The development of a new mixed-use community adjacent to regional rail and major roadways, while possibly decreasing mobility through congestion, connects people to a range of destinations and opportunities through multi-modal connectivity. For example, through a combination of rapid transit and bicycling, one might be able to reach 230 schools.

5 /10/15/30

14/22/70/639

230

Conclusions

The mobility-to-accessibility shift in transportation planning is logically compelled by an understanding of the derived nature of transportation demand, and has been supported in the research literature at least since the 1970s—yet has scarcely made the leap into practice. This study investigated the implications of continued reliance on mobility-based planning, obstacles to the mobility-to-accessibility shift, and approaches to overcoming those obstacles.

Policy reform in this realm will be assisted by three principal approaches: bottom-up, top-down, and outside-in. "Bottom-up" refers to the capacity of planners in local practice to inject accessibility thinking, metrics, and models into day-to-day planning practice. Note that this is not equivalent to planning for multimodalism or mixed-use development, as welcome as these innovations may be. Rather, it is a shifting of the rationale for what constitutes success in transportation. Cases in which urbanist solutions triumphed because they passed muster with mobility-styled analyses are laudable but fail to challenge the evaluative framework that impedes these approaches in so many other cases.

Bottom-up policy reform will benefit from more effective communications of the concept of accessibility, including the graphical approaches demonstrated here, to build general-public support. Yet the bottom-up approach suffers from an inherent limitation. The planner who seeks to analyze decisions in accessibility terms is in effect volunteering for extra duty: the norms of mobility-based analysis remain in place, and, because of lack of mandates, few resources are devoted to accessibility-based analysis. Thus observed instances, while important, need bolstering of a different sort.

"Top-down" reform refers to altering the mandates and norms promulgated by state and federal agencies, funding organizations, and professional societies. These can generate the requirements for accessibility-based planning, provide resources, and, importantly, provide professional legitimacy. This has happened before in the transportation realm. The Institute of Transportation Engineers has published extensively on traffic calming,[192] a move that provided the cover of professional legitimacy to applied transportation professionals seeking to pursue this innovation. Much local transportation planning is driven by mandates, funding, and professional norms of national organizations, and reform in these institutions could help support local practitioners seeking to inject accessibility thinking, metrics, and models into their practice.

"Outside-in" reform is based on bridge-building to realms outside of traditional transportation and land-use planning. Sectors including real estate and economic development are keenly aware of the role of accessibility in shaping outcomes of concerns to them. The medical and public health fields are keenly interested in the ability of patients to reach medical care. The interests of these sectors extend far beyond people's ability to move rapidly to the much more fundamental question of people's ability to reach their destinations and can provide support for the reform of transportation-planning methods.

[192] http://www.ite.org/traffic/