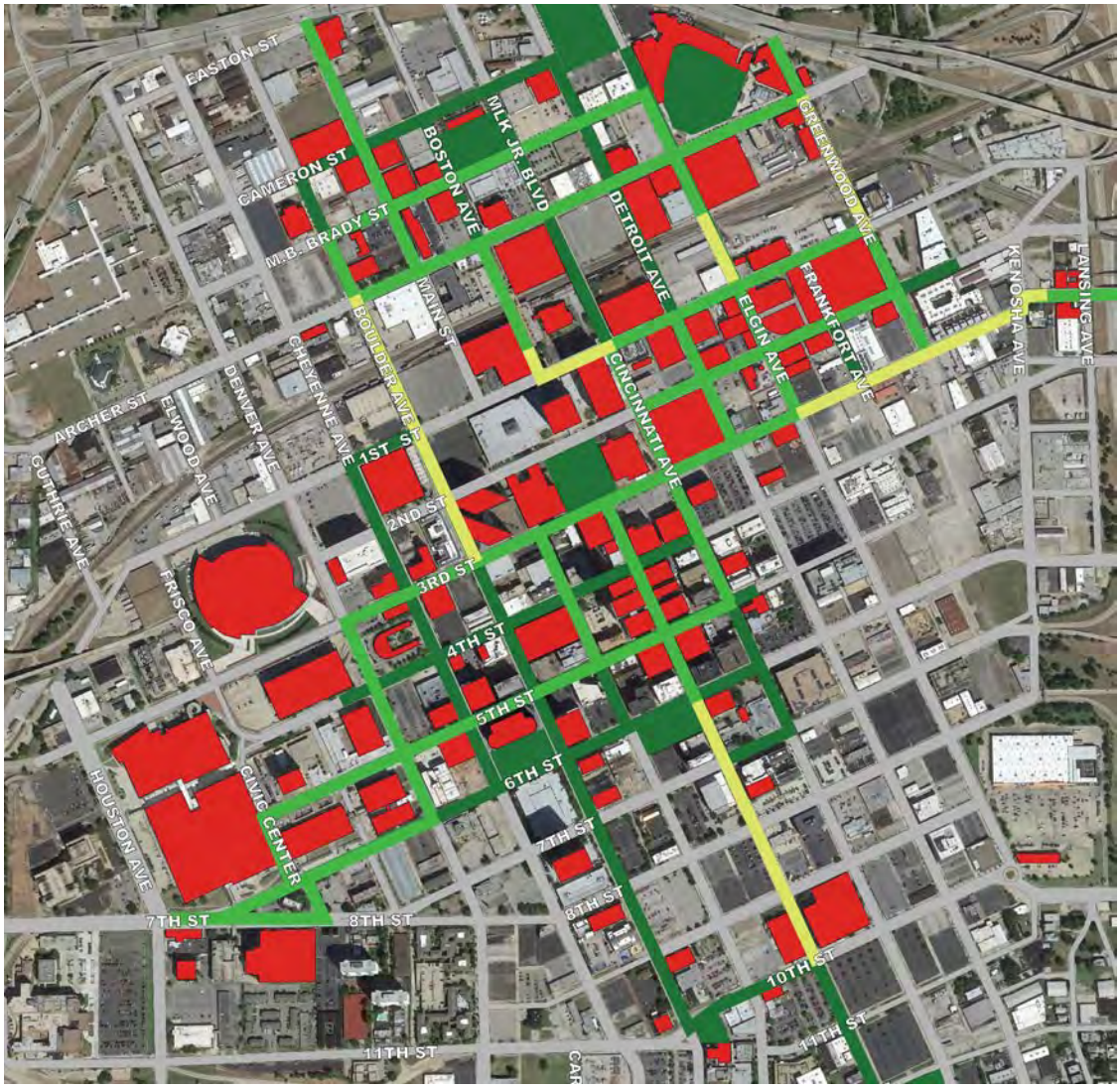
SPECK & ASSOCIATES LLC

NELSON NYGAARD

# TULSA, OKLAHOMA
# DOWNTOWN WALKABILITY ANALYSIS

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SPECK & ASSOCIATES LLC
WITH
Nelson\Nygaard Consulting Associates, Inc.

TULSA, OKLAHOMA
DOWNTOWN WALKABILITY ANALYSIS & RECOMMENDATIONS
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**TECHNICAL APPENDICES (Available upon request)**

# OVERVIEW

## The Purpose of This Document

This is a downtown walkability analysis, not a downtown master plan. It is not comprehensive, and does not try to be visionary. But, like a master plan, it hopes to have a profoundly positive impact on the physical form, economic success, and social vitality of the city. Specifically, this report, and the effort that led to it, it asked this question: ***What changes can be made, in the least time and for the least cost, that will have the largest measurable impact on the amount of walking and biking downtown?***

Downtown Tulsa is the center of a metropolis of more than 400,000 people. Historically a vibrant hub of commercial and political life, it has seen its fortunes shift as a great suburban migration decanted many of its resources to surrounding areas. Now, after several decades of enlightened but limited reinvestment, there is a sense of an upswing. Certain districts are known to be lively at certain times of day, and downtown redevelopment is on the rise. Yet, overall, a sleepy feeling still pervades, and the city's remarkable collection of art deco towers can't help but remind the visitor of a time when the downtown was bustling with the life of an earlier boom.

Happily, there is every reason to believe that downtown Tulsa is poised for a comeback. National trends, to which Tulsa is certainly not immune, show the beginnings of what is understood to be a tremendous shift of populations back to city centers. With 88 percent of the next 100 million American households expected to be childless, and with 77 percent of millennials saying that they want to live in America's urban cores, demand for downtown housing in Tulsa is about to skyrocket—but only if downtown can provide a truly urban lifestyle that distinguishes it from its surrounding suburbs. And central to that lifestyle—its very essence—is walkability. Polling among both millennials and empty nesters indicates a strong preference for mixed-use neighborhoods in which automobile use is an option rather than a universal mandate.

Based on these indicators, the question is not whether people and businesses will be moving downtown, but whether they will be moving to downtown Tulsa. The answer to that question will depend in part on whether Tulsa provides a downtown environment that welcomes and supports walking.

It can be said with some objectivity that there is still much work to be done in this regard. Most streets in downtown Tulsa are engineered to invite driving speeds considerably higher than those posted. One-way roads with the characteristics of freeways rush commuters in and out of downtown. Bicycle facilities are almost nonexistent. Unlike many cities with far less to offer, downtown Tulsa suffers from

traffic patterns and behaviors that almost certainly impede its development of a robust street life.

Acknowledging these circumstances, Tulsa's political and business leaders have asked the question of how their downtown can become more walkable and livable, and—by extension—more safe, healthy, and sustainable. This report attempts to answer that question in a manner that both directs and motivates real change in the short term. Few people will dispute whether its recommendations will lead quickly to more walking, biking, and vitality downtown. Few people will dispute that a more lively downtown will help to create a more successful Tulsa. But many will ask whether this study's proposals are a high priority. It is hoped that the evidence gathered here will make the urgency of this report's proposals clear, and overcome the attachment to business as usual that is generally the greatest impediment to the revitalization of American downtowns.

## Approach

By applying a design strategy centered on walkability, this study asserts and attempts to demonstrate how a series of careful planning interventions can exert a profound influence on the livability and vitality of downtown Tulsa.

This document begins with a discussion of the four components of walkability, describing how most people will only make the choice to walk if that walk simultaneously useful, safe, comfortable, and interesting. Those four criteria are then used as a basis for the recommendations that follow.

These recommendations are organized into six parts, as follows:

Part I, What Causes People to Walk?, goes step by step through the Safe, Useful, Comfortable, and Interesting Walk, describing the factors that contribute or detract from each. Because feelings of pedestrian safety are particularly challenged in Tulsa, that category is further broken down into nine separate sections discussing best practices in downtown safety, addressing everything from one-way vs. two-way travel to the details of street design. Part II, A Safe Walk, then goes on to show how these nine categories of best practices apply specifically in downtown Tulsa, and what changes to street design strategy they mandate.

Part III, Street Reconfigurations, summarizes the revised street design strategy into a kit of parts that is then applied to all streets in the downtown. This process leads to a collection of more than 67 distinct street configurations to be applied in downtown Tulsa, and elsewhere in the city as appropriate. Because these configurations are designed to fit between existing curbs, none of them require any street reconstruction beyond the application of a new topcoat and striping, keeping costs to a minimum.

Part IV, A Useful Walk, gets into detail on the principal factors that determine the usefulness of walking in downtown Tulsa. These include housing supply, the pricing and management of parking, transit service, and wayfinding. Specific recommendations are made for optimizing each of these important factors.

*The study area, appropriately, is downtown Tulsa, as bounded by the Inner Dispersal Loop.*

Part V, a Comfortable and Interesting Walk, introduces the concept of the Street Frontage Quality Assessment, which, along with an Anchors Analysis, determines the "Networks of Walkability": where people can be expected to walk in downtown. These Networks of Walkability—Priority, Primary, and Secondary—allow us to prioritize all the improvements recommended in this Study, because there is little benefit in improving the pedestrian experience along a street that pedestrians rarely use. Additionally, this Part addresses the issues of a downtown zoning overlay, sidewalk dining, and other factors that can impact the comfort and interest of walking in downtown Tulsa.

Finally, Part VI, Setting Priorities, revisits the proposed street reconfigurations in light of Networks of Walkability and, in conjunction with already-budgeted street improvements, suggests a schedule for implementation. It also highlights those aspects of this Study's other recommendations that would seem to merit the greatest attention in the months ahead.

The report ends with appendices that describe the traffic analysis that was completed as a foundation for this effort. Because it is unsafe for streets to have more lanes than needed for traffic, and because one-way networks are less safe than two-way networks, this effort recommends a redesign of the downtown street network that eliminates many unnecessary driving lanes and reverts many one-way streets back to two-way flow. Such a recommendation can only be made responsibly if one has confidence that no intersections will become overburdened by traffic. For that reason, this effort began as a traffic modeling exercise, which is described here.

A final note: this document is designed to function independently, but also to supplement the City's excellent and still vital *Downtown Area Master Plan,* completed in 2010, with which it agrees in almost all respects. In those rare instances when an alternative approach is recommended, it will be noted herein.

## PROLOGUE

The section that follows is a synopsis of the first three chapters of the book *Walkable City: How Downtown Can Save America, One Step at a Time,* (Jeff Speck, NY: Farrar Straus & Giroux, 2012). Full footnotes for all data and quotations can be found in the book. The book's full text is recommended as background reading for those who wish to better understand the theory and experience behind the recommendations in this report.

## THREE ARGUMENTS FOR THE WALKABLE CITY

After several decades arguing for more walkable cities as a designer, this city planner has found that it is more useful to do so as an economist, an epidemiologist, and an environmentalist. What follows is a discussion of why these three groups are all independently fighting for the same thing, which is to redesign our cities around the pedestrian.

### The Economic Argument

Many cities ask the same question: How can we attract corporations, citizens, and especially young, entrepreneurial talent? In some cities, they ask it differently: "How can we keep our children from leaving?"

The obvious answer is that cities need to provide the sort of environment that these people want. Surveys—as if we needed them—show how creative class citizens, especially millennials, vastly favor communities with *street life,* the pedestrian culture that can only come from walkability.

The number of 19-year-olds who have opted out of earning driver's licenses has almost tripled since the late seventies, from 1 in 12 to 1 in 4. This driving trend is only a small part of a larger picture that has less to do with cars and more to do with cities, and specifically with how young professionals today view themselves in relation to the city, especially in comparison to previous generations.

The economist Christopher Leinberger compares the experience of today's young professionals with the previous generation. He notes that most 50-year-olds grew up watching *The Brady Bunch, The Partridge Family, and Happy Days,* shows that idealized the late-mid-20$^{th}$-century suburban standard of low-slung houses on leafy lots, surrounded by more of the same. The millennials in contrast, grew up watching *Seinfeld, Friends,* and, eventually, *Sex and the City.* They matured in a mass culture—of which TV was only one part—that has predisposed them to look favorably upon cities, indeed, to aspire to live in them.

This group represents the biggest population bubble in fifty years. 64 percent of college-educated millennials choose first where they want to live, and only then do

they look for a job. According to surveys, fully 77 percent of them plan to live in America's urban cores.

Meanwhile, the generation raised on *Friends* is not the only major cohort looking for new places to live. There's a larger one: the millennials' parents, the front-end boomers. They are citizens that every city wants—significant personal savings, no schoolkids.

And according to Christopher Leinberger, empty nesters want walkability:

"This group is finding that their suburban houses are too big. . . All those empty rooms have to be heated, cooled, and cleaned, and the unused backyard maintained. Suburban houses can be socially isolating, especially as aging eyes and slower reflexes make driving everywhere less comfortable."

In the 1980s, city planners began hearing from sociologists about something called a NORC (Naturally Occurring Retirement Community). Over the past decade, a growing number of retirees have been abandoning their large-lot houses to resettle in mixed-use urban centers. For many of them, that increased walkability means all the difference between an essentially housebound existence and several decades of continued independence.

Of the 100 million new households expected to take shape between now and 2025, fully 88 million are projected to be childless. This is a dramatic change from 1970, when almost half of all households included children. These new adults-only households won't be concerned about the quality of local schools or the size of their backyards. This fact will favor cities over suburbs, but only those cities that can offer the true urbanism and true walkability that these groups desire.

This growing demand for pedestrian-friendly places is reflected in the runaway success of Walk Score, the website that calculates neighborhood walkability. In this website, which gets millions of hits a day, addresses are ranked in five categories, with a score of 50 needed to cross the *Somewhat Walkable* threshold. 70 points earns a *Very Walkable* ranking, and anything above 90 qualifies as a *Walker's Paradise.* San Francisco's Chinatown earns a 100, while Los Angeles' Mulholland Drive ranks a 9. (Downtown Tulsa earns an 87, good overall, but about average for a mid-sized downtown.)

If Walk Score is so useful in helping people decide where to live, then it can also help us determine how much they value walkability. Now that it has been around for a few years, some resourceful economists have had the opportunity to study the relationship between Walk Score and real estate value, and they have put a price on it: $500 to $3000 *per point.* In a very typical city, Charlotte, North Carolina, the economist Joe Cortright. found that each Walk Score point was worth $2000—that's $200,000 across the full scale.

That is the value that houses get for being walkable. But what about cities themselves? Does being more walkable make a whole city worth more?

In 2007, Joe Cortright, the economist responsible for the Walk Score value study cited above, published a report called "Portland's Green Dividend," in which he asked the question: what does Portland get for being walkable?

To set the stage, it is useful to describe what makes Portland different. Beginning in the 1970s, Portland made a series of decisions that fundamentally altered the way the city was to grow. While most American cities were building more highways, Portland invested in transit and biking. While most cities were reaming out their roadways to speed traffic, Portland implemented a Skinny Streets program. While most American cities were amassing a spare tire of undifferentiated sprawl, Portland instituted an urban growth boundary. These efforts and others like them, over several decades—a blink of the eye in planner time—have changed the way that Portlanders live.

This change is not dramatic—were it not for the roving hordes of bicyclists, it might be invisible—but it is significant. While almost every other American city saw its residents drive farther and farther every year, and spend more and more of their time stuck in traffic, Portland's vehicle miles traveled per person peaked in 1996. Now, compared to other major metropolitan areas, Portlanders on average drive 20 percent less.

According to Cortright, this 20 percent (4 miles per citizen per day) adds up to $1.1 billion of savings each year, which equals fully 1.5 percent of all personal income earned in the region. And that number ignores time not wasted in traffic: peak travel times have actually dropped 11 minutes per day. Cortright calculates this improvement at another $1.5 billion.

What happens to these savings? Portland is reputed to have the most independent bookstores per capita and the most roof racks per capita. These claims are slight exaggerations, but they reflect a documented above-average consumption of recreation of all kinds. Portland has more restaurants per capita than all other large cities except Seattle and San Francisco.

More significantly, whatever they are used for, these savings are considerably more likely to stay local than if spent on driving. Almost 85 percent of money expended on cars and gas leaves the local economy—much of it, of course, bound for the Middle-East. A significant amount of the money saved probably goes into housing, since that is a national tendency: families that spend less on transportation spend more on their homes, which is as local as investments get.

That's the good news about Portland. Meanwhile, what's happened to the rest of the country? While transportation used to absorb only one tenth of a typical family's budget (1960), it now consumes more than one in five dollars spent. The

typical "working-class" family, remarkably, pays more for transportation than for housing.

This circumstance exists because the typical American working family now lives in suburbia, where the practice of "drive-'til-you-qualify" reigns supreme. Families of limited means move further and further away from city centers in order to find housing that is cheap enough to meet bank lending requirements. Unfortunately, in so doing, they often find that driving costs outweigh any savings, and their total household expenses escalate.

No surprise, then, that as gasoline broke $4.00 per gallon and the housing bubble burst, the epicenter of foreclosures occurred at the urban periphery, places that required families to have a fleet of cars in order to participate in society, draining their mortgage carrying capacity. These are the neighborhoods that were not hurt by the housing bubble bursting; they were ruined by it.

This is bad news for Orlando and Phoenix, but it's good news for New York, Chicago, and Portland. But the real Portland story is perhaps not its transportation but something else: young, smart people are moving to Portland in droves. Over the decade of the 1990s, the number of college-educated 25 to 34 year-olds increased 50 percent in the Portland metropolitan area—five times faster than in the nation as a whole.

There is another kind of walkability dividend, aside from resources saved and resources reinvested: resources attracted by being a place where people want to live. The conventional wisdom used to be that creating a strong economy came first, and that increased population and a higher quality of life would follow. The converse now seems more likely: creating a higher quality of life is the first step to attracting new residents and jobs. This is why Chris Leinberger believes that "all the fancy economic development strategies, such as developing a biomedical cluster, an aerospace cluster, or whatever the current economic development 'flavor of the month' might be, do not hold a candle to the power of a great walkable urban place."

## The Epidemiological Argument

On July 9, 2004, three epidemiologists published a book called *Urban Sprawl and Public Health*. Until that day, the main arguments for building walkable cities were principally aesthetic and social. More significantly, almost nobody but the planners was making them. But it turns out that while the planners were shouting into the wilderness about the frustrations, anomie, and sheer waste of suburban sprawl, a small platoon of physicians were quietly doing something much more useful: they were documenting how our built environment was killing us, in at least three different ways: obesity, asthma, and car crashes.

The numbers are compelling. According to the U.S. Centers for Disease Control, fully one-third of American children born after 2000 will become diabetics. For the first time in history, the current generation of youth are expected to live shorter lives than their parents. This is due partly to diet, but partly to planning: the methodical eradication from our communities of *the useful walk* has helped to create the least-active generation in American history.

In any discussion about American health, obesity has to be front and center. In the mid-1970s, only about one in ten Americans was obese, which put us where much of Europe is right now. What has happened in the intervening thirty years is astonishing: by 2007, that rate had risen to one in three, with a second third of the population "clearly overweight." According to the rules of the U.S. military, twenty-five percent of young men and forty percent of young women are too fat to enlist.

Much has been written about the absurdity of the American corn-based diet and its contribution to our national girth. But our body weight is a function of calories in and calories out, and the latest data suggests that diet is actually the smaller factor. One recent study, published in the *British Medical Journal*, called "Gluttony or Sloth?" found that obesity correlated much more strongly with inactivity than with diet. Meanwhile, at the Mayo Clinic, Dr. James Levine put test subjects in motion-detecting underwear, placed them all on the same diet, and then began to stuff them with additional calories. As anticipated, some subjects gained weight while others didn't. Expecting to find a metabolic factor at work, he learned instead that the outcome was entirely attributable to physical activity. The people who got fatter made fewer unconscious motions and, indeed, spent on average two more hours per day sitting down.

Over the past decade, there has been a series of studies that attribute obesity to the automotive lifestyle and, better yet, to the automotive landscape. One study, in San Diego, reported that 60 percent of residents in a "low-walkable" neighborhood were overweight, compared to only 35 percent in a "high-walkable" neighborhood. Another, a six-year analysis of 100,000 Massachusetts residents found that the lowest Body Mass Index averages were located in Boston and its inner ring suburbs, while the highest could be found in the "car-dependent" outer ring surrounding Interstate 495.

Now, let's turn to asthma. About fourteen Americans die each day from asthma attacks. That number does not seem particularly high, but it is three times the rate of 1990. Now, 7 percent of American's suffer from Asthma in some form.

Pollution isn't what it used to be. American smog now comes principally from tailpipes, not factories. It is considerably worse than it was a generation ago, and it is unsurprisingly worst in our most auto-dependent cities, like Los Angeles and Houston. In 2007, Phoenix recorded three full months of days in which it was deemed unhealthy for the general public to leave their homes.

Finally, for most healthy Americans, the greatest threat to that health is car crashes. Most people take the risks of driving for granted, as if they were some inevitable natural phenomenon—but they aren't. While the U.S. suffers 12 traffic fatalities annually per 100,000 population, Germany, with its no-speed-limit Autobahn, has only 7, and Japan rates a 4. New York City beats them all, with a rate of 3. If our entire country shared New York City's traffic statistics, we would prevent more than 24,000 deaths a year.

San Francisco and Portland both compete with New York, with rates below 3 deaths per 100,000 population, respectively. Meanwhile, Tulsa comes in at 14 and Orlando at 20. Clearly, it's not just how much you drive, but where you drive, and more accurately how those places were designed. Older, denser cities have much lower automobile fatality rates than newer, sprawling ones. Ironically, it is the places shaped around automobiles that seem most effective at smashing them into each other.

In search of some good news, we can turn to Dan Buettner, the National Geographic host and bestselling author responsible for *The Blue Zones: Lessons for Living Longer from the People Who've Lived the Longest.* After a tour of the world's longevity hot spots, Buettner takes his readers through the "*Power Nine:* the lessons from the Blue Zones, a cross cultural distillation of the world's best practices in health and longevity." Lesson One is "Move Naturally":

"Longevity all-stars don't run marathons or compete in triathlons; they don't transform themselves into weekend warriors on Saturday morning. Instead, they engage in regular, low-intensity physical activity, often as a part of a daily work routine. Rather than exercising for the sake of exercising, try to make changes to your lifestyle. Ride a bicycle instead of driving. Walk to the store instead of driving. . ."

Like most writers on the subject, Buettner and his sources neglect to discuss how these "lifestyle" choices are inevitably a function of the design of the built environment. They may be powerfully linked to place—the Blue Zones are zones, after all—but there is scant admission that walking to the store is more possible, more enjoyable, and more likely to become habit in some places than in others. It is those places that hold the most promise for the physical and social health of our society.

**The Environmental Argument**

In 2001, Scott Bernstein, at the Center for Neighborhood Technology in inner-city Chicago, produced a set of maps that are still changing the way Americans think about their country. In these maps, remarkably, the red and the green switched places. This reversal, perhaps even more than the health discussion, threatens to make walkability relevant again.

On typical carbon maps, areas with the greatest amounts of carbon output are shown in bright red, and those with the least are shown in green, with areas in between shown in orange and yellow. The hotter the color, the greater the contribution to climate change.

Historically, these maps looked like the night-sky satellite photos of the United States: hot around the cities, cooler in the suburbs, and coolest in the country. Wherever there are lots of people, there is lots of pollution. A typical carbon map, such as that produced in 2002 by the Vulcan Project at Purdue University, sends a very clear signal: countryside good, cities bad.

These maps are well in keeping with the history of the environmental movement in the United States, which has traditionally been anti-city, as has so much American thought. This strain traces its roots back to Thomas Jefferson, who described large cities as "pestilential to the morals, the health, and the liberties of man." Not without a sense of humor, he went on: "When we get piled up upon one another in large cities, as in Europe, we shall become as corrupt as in Europe, and go to eating one another as they do there."

For a long time, these were the only type of carbon map, and there is certainly a logic in looking at pollution from a location-by-location perspective. But this logic was based on an unconsidered assumption, which is that the most meaningful way to measure carbon is by the square mile.

This assumption is false. The best way to measure carbon is per person. Places should be judged not by how much carbon they emit, but by how much carbon they cause us to emit. There are only so many people in the United States at any given time, and they can be encouraged to live where they have the smallest environmental footprint. That place turns out to be the city—the denser the better.

Or, as the economist Ed Glaser puts it: "We are a destructive species, and if you love nature, stay away from it. The best means of protecting the environment is to live in the heart of a city."

No American city performs quite like New York. The average New Yorker consumes roughly one third the electricity of the average Dallas resident, and ultimately generates less than one third the greenhouse gases of the average American. The average resident of Manhattan consumes gasoline "at a rate that the country as a whole hasn't matched since the mid-1920s."

New York is America's densest big city and, not coincidentally, the greenest. But why stop there?: New York consumes half the gasoline of Atlanta. But Toronto cuts that number in half, as does Sydney—and most European cities use only half as much as those places.

This condition exists not because our buildings or cars are less efficient, or our buildings are less green, but because our cities are not as well organized around walking. This point was made clear in a recent EPA study, "Location Efficiency and Building Type—Boiling it Down to BTUs," that compared four factors: drivable vs. walkable ("transit-oriented") location; conventional construction vs. green building; single-family vs. multifamily housing; and conventional vs. hybrid automobiles. The study demonstrated that, while every factor counts, none counts nearly as much as walkability. Specifically, it showed how, in drivable locations, transportation energy use consistently tops household energy use, in some cases by more than 2.4 to 1. As a result, the most green home (with Prius) in sprawl still loses out to the least green home in a walkable neighborhood.

It turns out that trading all of your incandescent light bulbs for energy-savers conserves as much carbon per year as living in a walkable neighborhood does each week. Why, then, is the vast majority of our national conversation on sustainability about the former and not the latter? Witold Rybczynski puts it this way:

Rather than trying to change behavior to reduce carbon emissions, politicians and entrepreneurs have sold greening to the public as a kind of accessorizing. "Keep doing what you're doing," is the message, just add another solar panel, a wind turbine, a bamboo floor, whatever. But a solar-heated house in the suburbs is still a house in the suburbs, and if you have to drive to it—even in a Prius—it's hardly green.

This accessorizing message has been an easy sell in America, where it is considered politically unwise to ask consumers to sacrifice, to alter their quality of life in service of some larger national goal, such as keeping a dozen of our largest cities above sea level. But what if there were a more positive quality-of-life discussion, one that allowed us to satisfy consumer demands that have not been met by a real estate industry centered on suburban sprawl.

The gold standard of quality-of-life rankings is the Mercer Survey, which carefully compares global cities in the ten categories including political stability, economics, social quality, health, education, recreation, housing, and even climate. Its rankings shift slightly from year to year, but the top ten cities always seem to include a number of places where they speak German (Vienna, Zurich, Dusseldorf, etc. ) along with Vancouver, Auckland, and Sydney. These are all places with compact settlement patterns, good transit, and principally walkable neighborhoods. Indeed, there isn't a single auto-oriented city in the top 50. The highest rated American cities in 2010, which don't appear until number 31, are Honolulu, San Francisco, Boston, Chicago, Washington, New York, and Seattle.

Looking at this ranking, the message is clear. America's cities, which are twice as efficient as its suburbs, burn twice the fuel of European, Canadian, and Aussie/Kiwi places. Yet the quality of life in these foreign cities deemed considerably higher.

This is not to say that quality of life is directly related to sustainability, but merely that many Americans, by striving for a better life, might find themselves moving to places that are more like the winners. . . or better yet, might try transforming their cities to resemble the winners. This sort of transformation could include many things, but one of them would certainly be walkability.

Vancouver, always a top contender, proves a useful model. By the mid-20th century, it was fairly indistinguishable from a typical U.S. city. Then, beginning in the late 50s, when most American cities were building highways, planners in Vancouver began advocating for high-rise housing downtown. This strategy, which included stringent measures for green space and transit, really hit its stride in the 1990s, and the change has been profound. Over the past fifteen years, the amount of walking and biking citywide has doubled, from fifteen percent to thirty percent of all trips. Vancouver is not ranked #1 for livability because it is so sustainable; the things that make it sustainable also make it livable.

Quality of life—which includes both health and wealth—may not be a function of our ecological footprint, but the two are deeply interrelated. To wit, if we pollute so much because we are throwing away time, money, and lives on the highway, then both problems would seem to share a single solution, and that solution is to make our cities more walkable.

## PART I. WHAT CAUSES PEOPLE TO WALK?

The pedestrian is a delicate creature. While there are many harsh environments in which people are physically able to walk, there are few in which they actively choose to walk, especially when the option of driving is available. The following four sections describe a hierarchy of conditions that must be met if the average person is going to make that choice. Each is necessary but not alone sufficient. They are:

A safe walk;

A reason to walk;

A comfortable walk; and

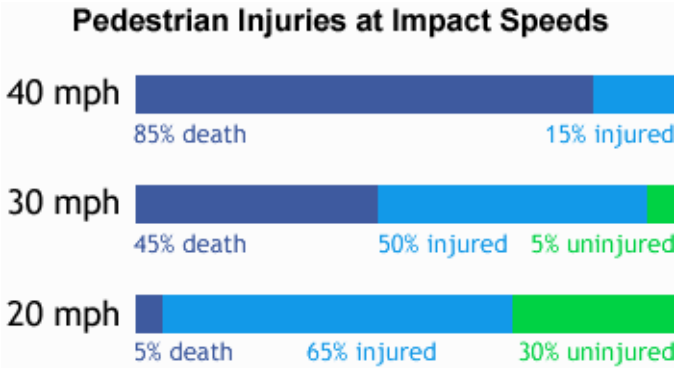
An interesting walk.

Reviewing and understanding these criteria is a prerequisite to properly considering the recommendations made in this report.

**A Safe Walk**

While crime is sometimes a concern, most people who avoid walking do so because the walk feels dangerous due to the very real threat of vehicles moving at high speed near the sidewalk. Statistically, moving automobiles are much more of a dangerous threat to people walking than is crime.

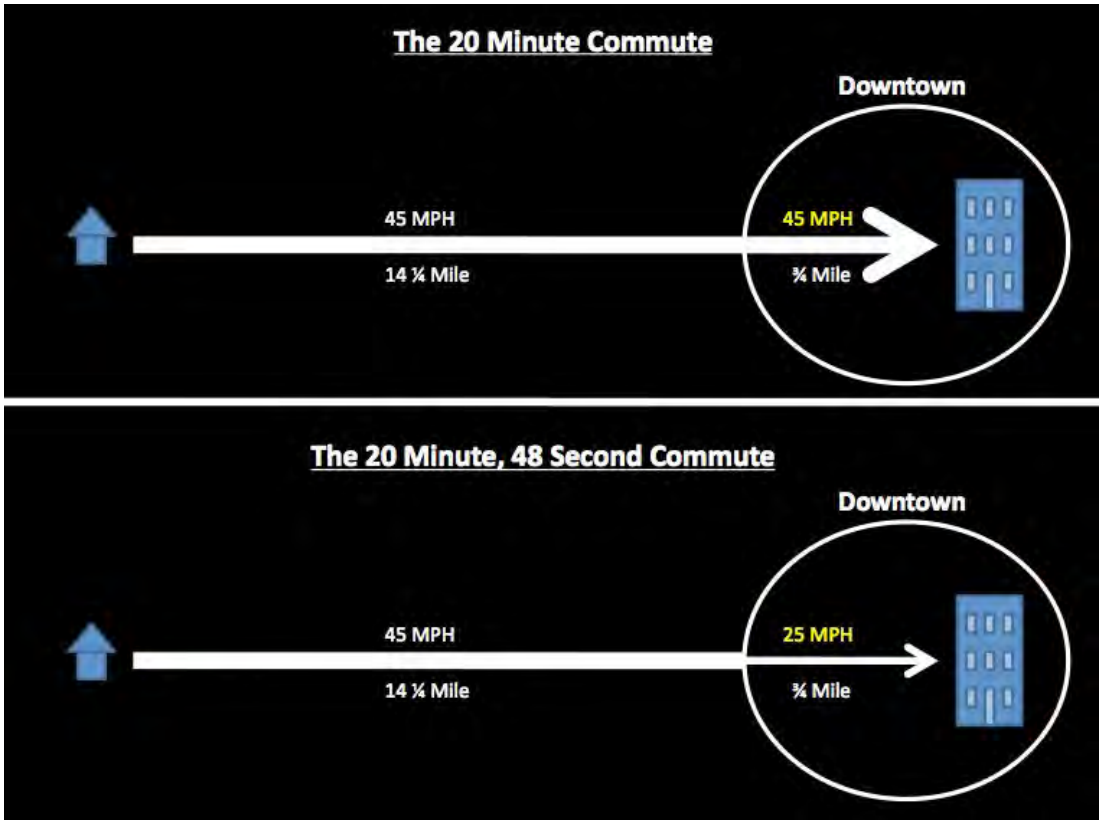
Street life is dramatically impacted by the speed of vehicles. Whether they know it or not, most pedestrians understand in their bones that a person hit by a car traveling at 30 mph is roughly nine times as likely to die than if the car is traveling at 20 mph. Any community that is interested in street life—or human lives—must carefully consider the speed at which it allows cars to drive in places where people are walking.




*Keeping drivers at or below the downtown 25-mph speed limit is essential to pedestrian safety in Tulsa.*

And in most American cities, the place where people are most likely to walk is the downtown. Acknowledging this fact opens up real possibilities, as it allows us to have dramatic impact on walking while impacting driving only minimally. By focusing on vehicle speeds in downtown, we can make walking safer for the most pedestrians with the least amount of driver inconvenience.

The illustration below tries to make this point clear. It shows how the difference between an attractive and a repellant downtown may be less than a minute of drive time. Would most people be willing to spare 48 seconds each day if it meant that their city was a place worth arriving at? Probably.



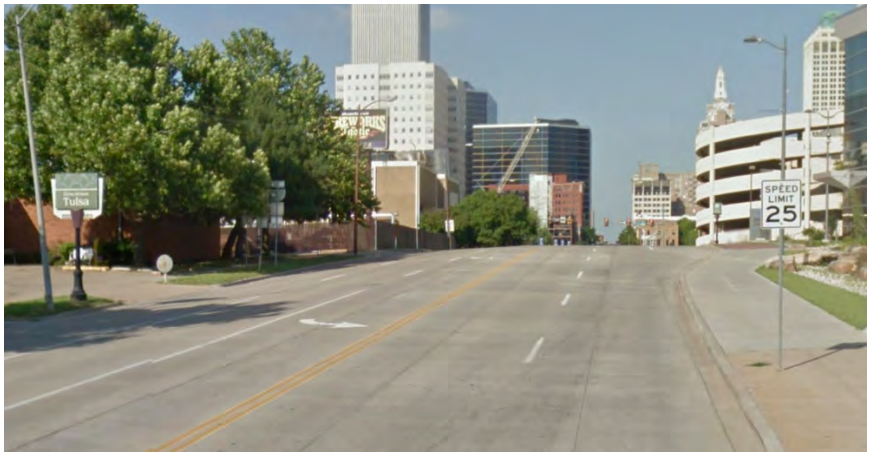

*This diagram describes how a significant change in downtown speeds typically results in a minimal change to commute times.*

This logic explains why a growing number of cities have instituted "20 is Plenty" ordinances in their downtowns, and a few have even settled on 18 mph as the target speed. Wisely, Tulsa already posts a 25 mph speed limit throughout the downtown. But, as discussed, lowering speed limits is only the half of it. The more important step is to engineer the streets for the desired speed, which means outlawing wider lanes and other inducements to speeding.

If the key to making a street safe is to keep automobiles at reasonable speeds—and to protect pedestrians from them—we must address the principal factors that determine driver speed and pedestrian exposure. In Tulsa, there are nine:

1. One-way vs. two-way travel;
2. The number of driving lanes;
3. Lane width;
4. Cycle facilities;
5. On-street parking and street trees;
6. Sidewalk curb cuts;
7. The presence of unwarranted signals;
8. The provision and design of crosswalks, signals, and streetlights; and
9. The presence of swooping geometries.

The understanding of how each of these factors impacts both driver and pedestrian behavior has evolved tremendously over the past few decades. Much of what many traffic engineers were taught in school has been invalidated, and many of the lessons learned are counterintuitive. In the pages that follow, each of these nine criteria is discussed at length, in order that current best practices can direct the redesign of Tulsa's streets. In the subsequent part of this Study, the same nine criteria shall be used to organize a series of specific recommendations for making downtown Tulsa more walkable.




*3rd Street: Posting a 25 mph speed limit has little impact on driver behavior if the street itself invites high speeds.*

### *Interlude: What Traffic Means*

Before analyzing traffic behavior further, it is worth stepping back to address the consequences of increased traffic in American downtowns, because all is not negative. Downtowns need traffic to survive. Indeed, cars, moving slowly, are the lifeblood of the American City. If given a chance, each driver is a potential shopper or diner. However, the rush hour driver is not an ideal shopper. It is clear that many if not most of the people who drive to the downtown in the morning and home at night are simply using city streets as a conduit, without stopping.

This sort of behavior is of course influenced by the nature of the streets that the commuters are on. The more that a street feels like a highway, with multiple lanes in a single direction and timed traffic lights enabling non-stop flow, the less likely a driver is to stop and shop or dine. This factor presents an additional incentive to modify Tulsa's roadways so that they better resemble downtown streets.

It is eye-opening, in this regard, to consider the measure of Level of Service, which traffic planners use, often exclusively, to determine the success of a street network. Level of Service (LOS) rankings run from A to F, with A presumably considered the ideal, and F representing gridlock. Clearly, gridlock must be avoided, but beyond that, we must ask ourselves: what is the target for a healthy downtown? Most experienced engineers understand that a certain amount of congestion is inevitable in city centers, and aim to provide an LOS of C or D downtown.

Now, picture a lively city center. How fast are the cars moving, and how far apart are they? Readers will be surprised to learn that an LOS of D means that cars are roughly eight car-lengths apart[1]. That's one or two cars moving *per block*. It is clear that the LOS system, which was created to grade highways, is the wrong measure for determining the success of a city. Indeed, as the engineer Sam Schwartz also notes, when comparing cities, every 10% increase in traffic delay correlates to a 3.4% increase in per-capita GDP[2].

Fast traffic also depresses property values. Surprisingly, a clear inverse correlation can be found in North American cities between an inner city's land values and that city's investment in roadways. Generally, the more highways a city builds through its downtown, the less valuable that downtown's real estate becomes. (A longer discussion of this history can be found in Speck, *Walkable City*.) While this correlation applies principally to the construction of elevated highways, it is relevant to the construction of surface streets as well, to the degree that those streets invite multiple lanes of brisk travel. Cars speeding past properties make them less attractive, as does large quantities of traffic. And, as documented by Donald

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[1] Sam Schwartz, *Street Smart,* p. 41

[2] Sam Schwartz, *Street Smart*, p. 104

Appleyard in 1981 in *Livable Streets*, the wider and more trafficked a person's street, the less sense of community they are likely to report.

In sum, traffic can be a boon to a downtown and, indeed, downtowns need significant traffic to survive. But the traffic will only benefit the city if it is does not overwhelm the city with its speed. Many of Tulsa's downtown streets already invite speeds which are not beneficial to the city, a circumstance that this Study hopes to correct.

### *1. Avoiding One-Ways*

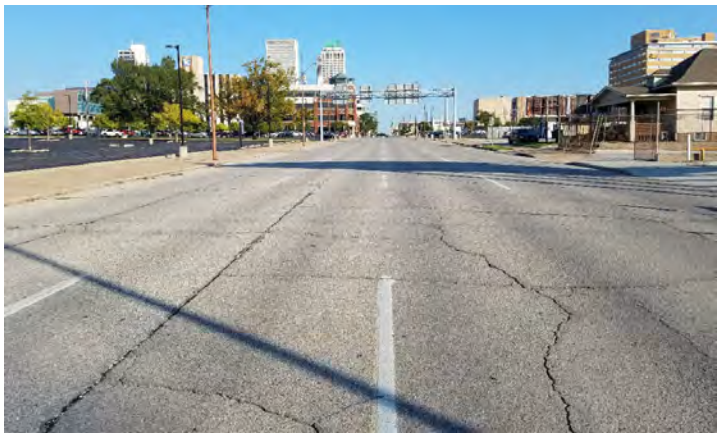
Like in many American cities, Tulsa converted many of its downtown streets to one-way traffic by the late 1950s. This transformation, by eliminating the delay inherent in left turns across traffic and by introducing and allowing for synchronized signals, helped to speed the motion of cars through downtown. Unfortunately, it did so at the expense of pedestrian comfort and business vitality.

Recognizing these disadvantages, the DAM Plan recommends the reversion of all one-way pairs downtown. Thus far, the City has already reverted Boston Avenue (2007) and Main Street (2013) and plans, in short order, to revert Boulder Avenue and Cheyenne Avenue as well.

How One-Ways Work

People driving tend to speed on multiple-lane one-way streets, because there is less friction from opposing traffic, and due to the temptation to jockey from lane to lane. In contrast, when two-way traffic makes passing impossible, the driver is less likely to slip into the "road racer" frame of mind. Also, drivers turning onto one-ways from side streets have learned that, if they hit the gas, they can catch the tail end of the "green wave" of synchronized signals, and avoid waiting at a light. For this reason, setting a low speed limit on the green wave, as is done in Tulsa (17 mph), does not eliminate speeding.

Additionally, people often don't look both ways before turning onto the one-way street, since all traffic is coming from over only one shoulder. This means that people entering the crosswalk from the opposite direction are not seen until a conflict is imminent.



*It is not by accident that people speed on Tulsa's one-way streets. When a street looks like a highway, drivers find it difficult not to drive like they are on a highway.*

And then, of course, there is the danger of the "salmon swimming upstream." Almost everyone has a story about having seen someone drive the wrong way on a

one-way street—something that even occurred with us in the vehicle during our visit—evidence that the system is not intuitive for anyone. This danger is confirmed by data: a recent crash report documents thirty-nine collisions on one-way streets since 2010, with six of those resulting from cars going in the wrong direction.

One-ways also have a history of damaging downtown retail districts, principally because they distribute vitality unevenly, and often in unexpected ways. They have been known to harm stores consigned to the morning path to work, since people do most of their shopping on the evening path home. They can also intimidate out-of-towners, who are afraid of becoming lost, and they frustrate locals, who are annoyed by all the circular motions and additional traffic lights they must pass through to reach their destinations. For example, fully a quarter of trips on 1st Street between Boulder and Cheyenne Avenues appear to be generated by circling necessitated by the one-ways – trips that wouldn't exist in a two-way system.

Learning from the damage wrought by the one-way conversion, dozens of American cities are reverting these streets back to two-way. One such success story, Vancouver, Washington, was famously covered in *Governing* magazine in 2009. Merchants credit a two-way reversion of their one-way main street with the revitalization of a struggling downtown. A similar experience was documented in Savannah, Georgia, where a conversion to one-way traffic on East Broad Street in 1968 resulted in a loss of almost two-thirds of all businesses. When the street was reverted to two-way in 1990, the number of businesses quickly rose by 50 percent. More local experience can be found in downtown Oklahoma City, which has reverted almost all of its one-way grid back to two-way travel over the past five years, the outcome of which will be described ahead.

If downtown is reverted back to its original two-way grid, several things will happen differently. First, the distribution of these drivers among two-way streets, with fewer opportunities for lane-jockeying, will result in a safer environment for all. Second, the more comforting "main street" experience offered to these drivers, and the time spent lingering at intersections, will make them more likely to shop or dine. Experiencing Tulsa as a place, and not just a conduit, they will be more inclined to spend a little time.

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## The Return of the Two-Way Street

Why the double-yellow stripe is making a comeback in downtowns.

BY ALAN EHRENHALT | DECEMBER 2009

16 48 0 1

**Over the past couple of decades, Vancouver, Washington, has spent millions of dollars trying to revitalize its downtown, and especially the area around Main Street that used to be the primary commercial center. Just how much the city has spent isn't easy to determine. But it's been an ambitious program. Vancouver has totally refurbished a downtown park, subsidized condos and apartment buildings overlooking it and built a new downtown Hilton hotel.**

Some of these investments have been successful, but they did next to nothing for Main Street itself. Through most of this decade, the street remained about as dreary as ever. Then, a year ago, the city council tried a new strategy. Rather than wait for the $14 million more in state and federal money it was planning to spend on projects on and around Main Street, it opted for something much simpler. It painted yellow lines in the middle of the road, took down some signs and put up others, and installed some new traffic lights. In other words, it took a one-way street and opened it up to two-way traffic.

The merchants on Main Street had high hopes for this change. But none of them were prepared for what actually happened following the changeover on November 16, 2008. In the midst of a severe recession, Main Street in Vancouver seemed to come back to life almost overnight.

*In 2009, Governing Magazine documented some of the benefits of two-way reversion.*

One issue already raised, the need for servicing, can also be a concern when a two-way reversion eliminates the opportunity to double-park. This was the challenge faced by the City of Lowell, Massachusetts, population 108,000, when the two-way reversion of its downtown streets was proposed five years ago. At that time, it was said that the main retail corridor, Merrimack Street, could not accept eastbound traffic because its second westbound lane was needed for truck deliveries. Eventually, a servicing plan was completed, and in 2015 the full downtown two-way reversion took place—including Merrimack Street. Deliveries now occur in certain designated locations, and the entire transformation came off without a hitch.

Recent Experience

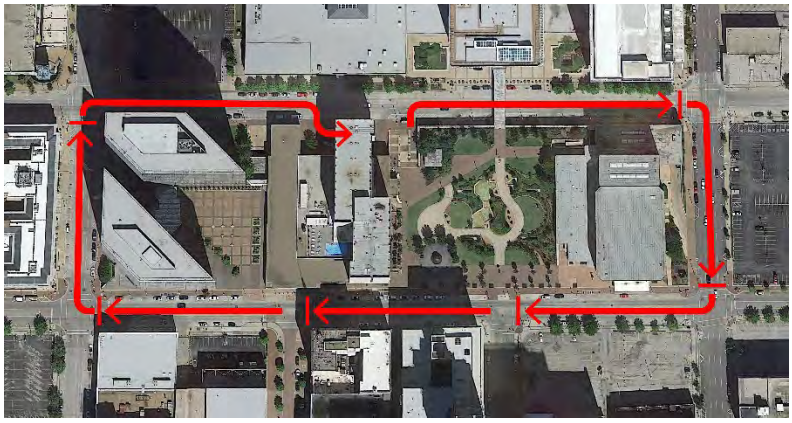
The most recently published report on this topic comes from Louisville, Kentucky, and is outlined in a report titled "One Way to Fix Louisville's Declining Neighborhoods," by Professor John Gilderbloom. This paper covers the experience of two Louisville Streets, Brook and First, that were reverted to two-way traffic a few years ago, and compares them to nearby streets (Second and Third) that remain one-way.

Here are some of the findings: along the reverted streets, a "significant reduction in crime, accidents, and an increase in property values, business profits, and bike and pedestrian traffic." Specifically, Brook Street saw a 36 percent reduction in car crashes and a 39 percent increase in property value. Car crashes on First Street dropped 60 percent. Meanwhile, on one-way Second and Third Streets, car crashes increased an average of 15 percent. And while crime increased 36 percent on Second and Third Streets, it dropped 23 percent on Brook and First.

Revenues to businesses on the converted streets have also risen significantly, with one restaurant doubling its table space. It is likely that the merchants of Tulsa, when presented with this information, might consider it worthwhile to relocate their deliveries in order to achieve a proper two-way street.

Annoyance and Confusion

Conversations with focus groups reveal some interesting stories about the practical difficulties of living with a one-way downtown in Tulsa. For example, it was pointed out that some Hyatt visitors who park overnight at the adjacent lot and then wish to pick up their family and luggage at the front door are faced with a half-mile odyssey involving four turns and five traffic signals, all potentially red.



*The notorious half-mile loop from parking to hotel pickup.*

One also hears stories about the not insignificant number of Tulsa residents who are apparently reluctant to visit downtown because they are intimidated by the one-way system and afraid of getting lost. Particularly for people already fearful of (largely non-existent) crime, the prospect of becoming disoriented and potentially sent the wrong way in an unfamiliar one-way network can be the last straw in keeping them away from downtown entirely.

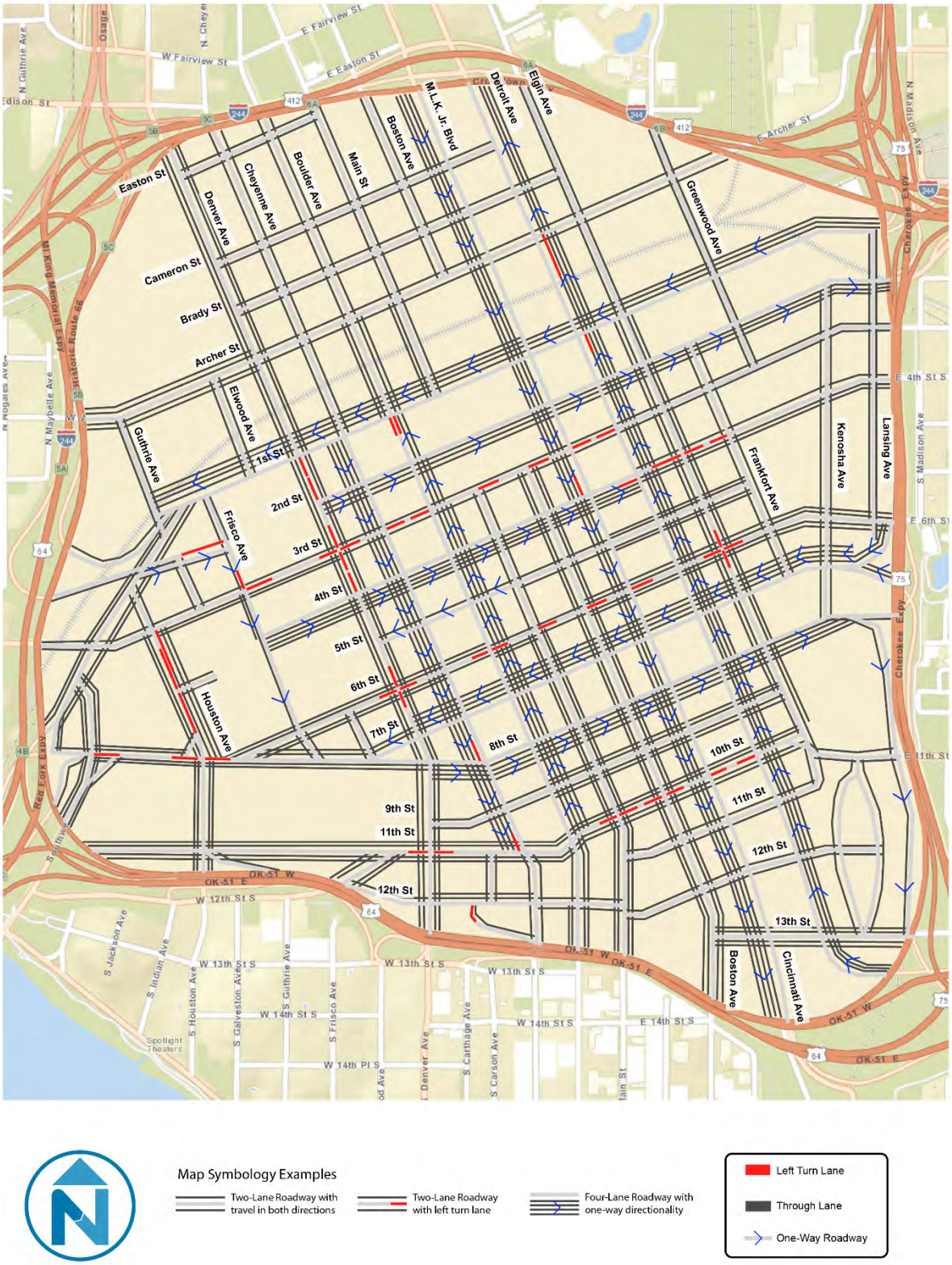
### *2. The Proper Number of Driving Lanes*

The more lanes a street has, the faster traffic tends to go, and the further pedestrians have to cross. Most of Tulsa's downtown streets clearly have more lanes than they need to satisfy the demand upon them, as will be demonstrated ahead. Removing these wasted driving lanes frees up valuable pavement for more valuable uses, such as curb parking and bike lanes.

The Right Size

Determining which lanes are unnecessary, now and into the future, is a central challenge of this effort. The Appendix contains a summary of the traffic analysis that was completed by Nelson\Nygaard to determine the right size of the downtown street network. The first step of that effort was simply to compare the network's current capacity (supply of lanes) to its traffic (demand for lanes). The diagram on the next page shows how many lanes are present on each street in the downtown grid.

## CURRENT LANE SUPPLY

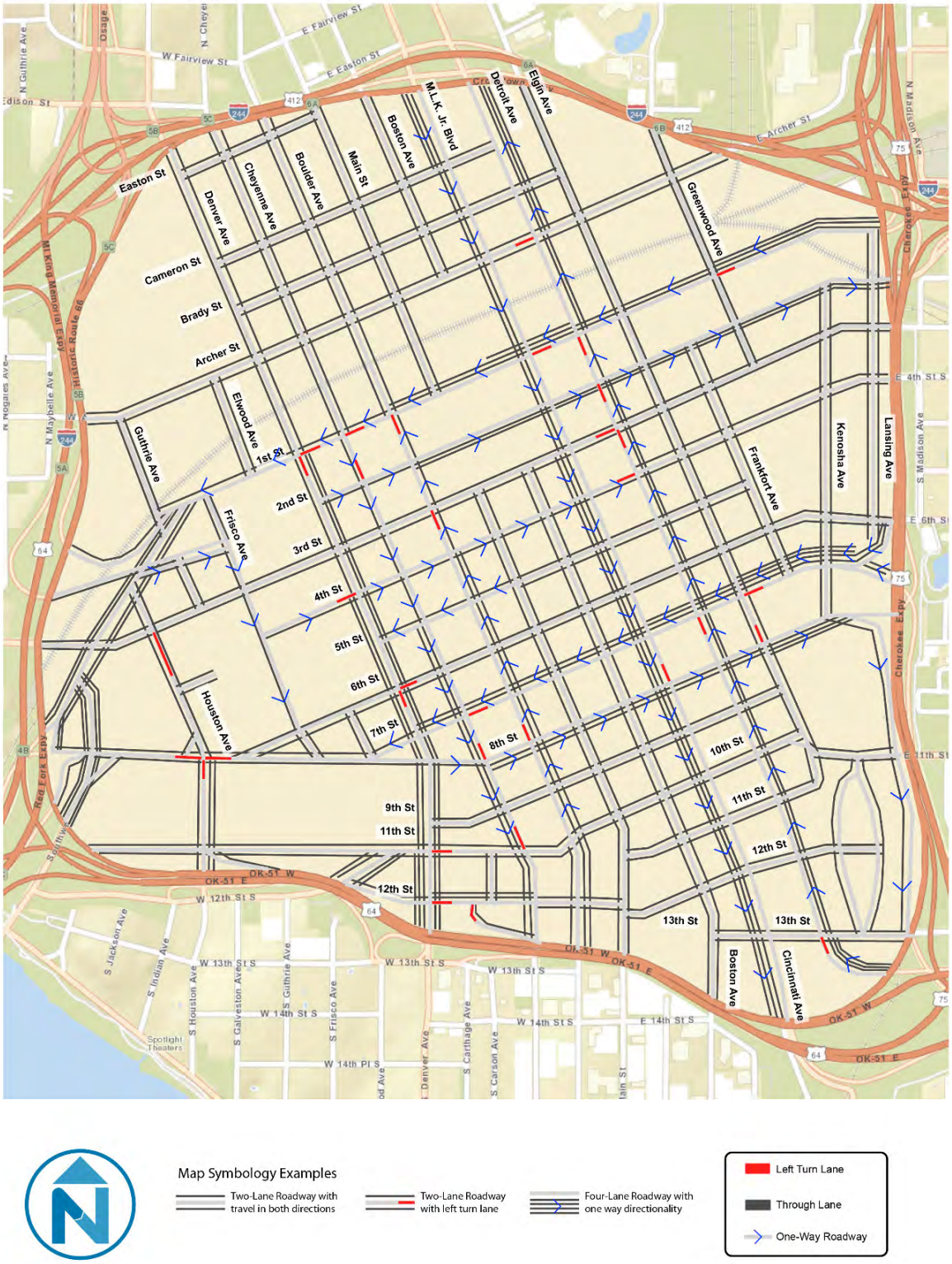



*The current supply of driving lanes in downtown Tulsa.*

Tulsa is a city that does a very good job keeping track of its traffic, and recent traffic counts have been recorded on every downtown street that handles more than a light trickle of vehicles. To be useful in considering rush-hour, traffic counts are measured in number of vehicles per peak hour. Because data varies across the country, so do assumptions about how many vehicles each lane is expected to process, but most engineers use a number between 500 and 800 vehicles per hour. Oklahoma has not established a State standard, but others have. For example, Iowa's is 750 vehicles per lane per hour. In order to be extremely conservative, this Study uses a measure of 500 vehicles per hour. This translates to an average of more than seven seconds between each vehicle passing.

Applying this ratio to Tulsa's current traffic counts results in the diagram on the next page. In this drawing a street with 501 cars at peak hour in a given direction receives a second lane in that direction, and 1,001 cars earns a third lane.

**CURRENT LANE DEMAND**

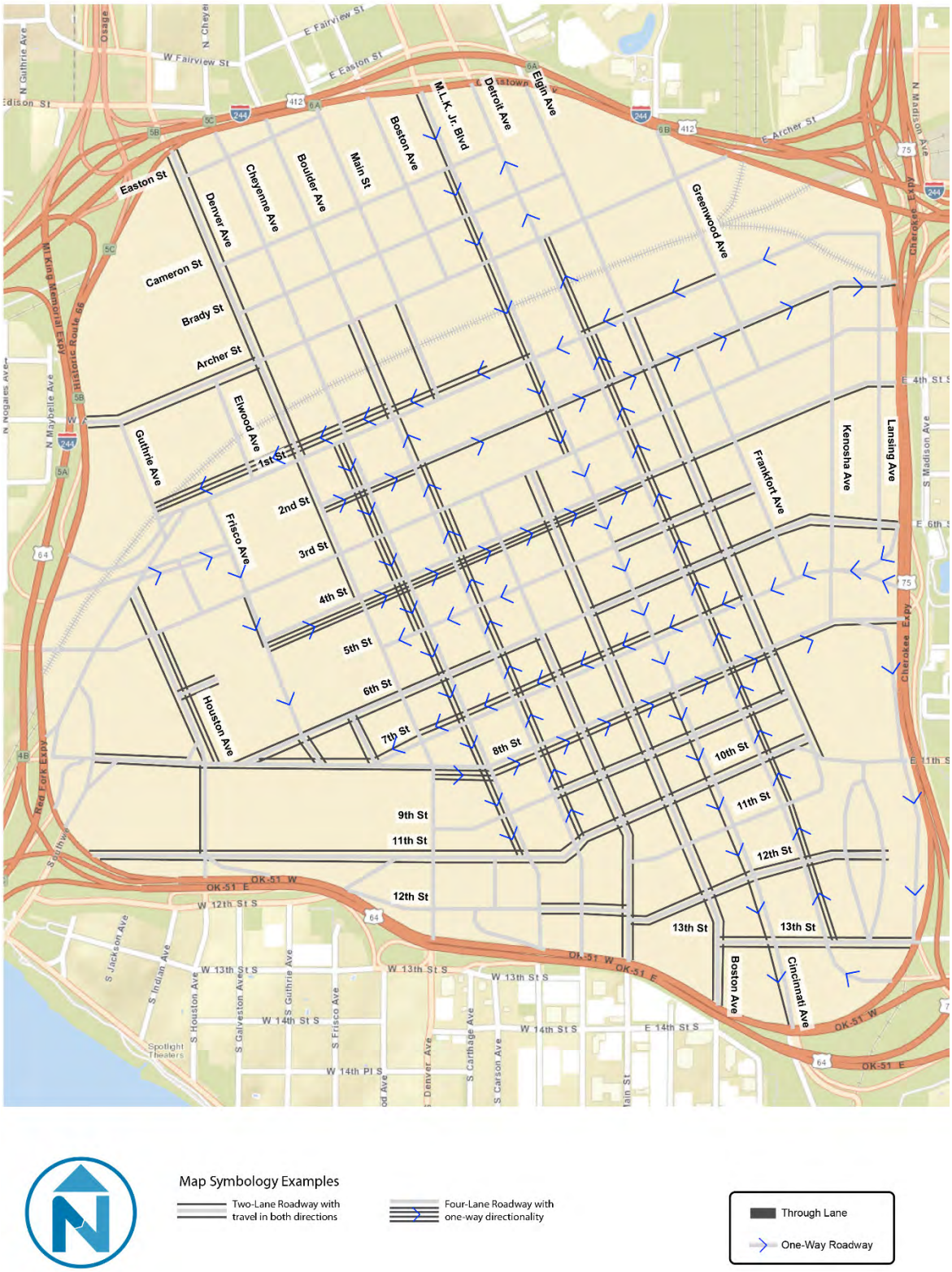



*The current demand for driving lanes in downtown Tulsa.*

As is immediately evident, there is a dramatic difference—indeed a huge disconnection—between the demand for lanes and the supply of lanes in downtown Tulsa. How this came to be is always an interesting discussion, but it is less useful than recognizing the tremendous inducement to speeding that these lanes represent, as well as the resource they can provide for other uses such as parking and cycling.

The wealth of that resource can be seen in the diagram on the next page, which represents the difference between the first two drawings, and the extent of oversupply currently present in downtown. Putting many of these excess lanes to alternative use is one of the main objectives of this study.

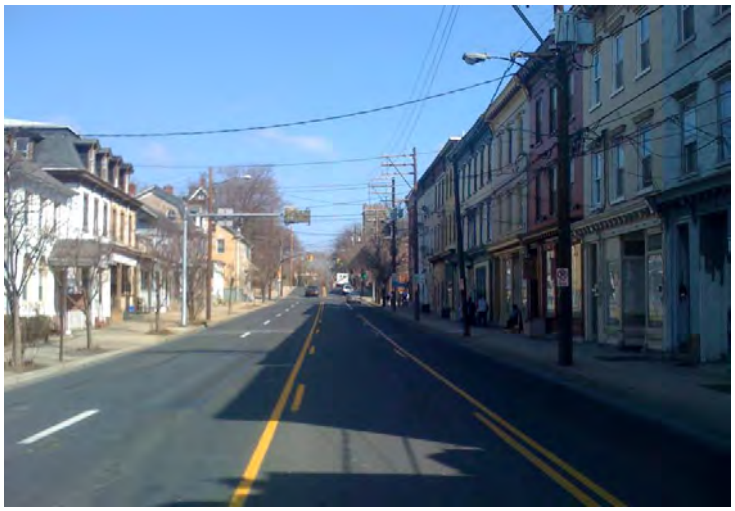
## CURRENT LANE OVERSUPPLY




*The current oversupply of driving lanes in downtown Tulsa.*

Turn Lanes Count Too

Most of the larger two-way streets in downtown Tulsa include left-turn lanes. This is not surprising, as it has become common practice to insert such lanes wherever they will fit, since they increase the efficiency of intersections. But left-turn lanes are by no means the universal approach to intersection design. They should be used only at intersections where congestion is caused by cars turning left; otherwise, they make the street more dangerous for drivers, pedestrians, and cyclists alike.



*In Bethlehem, PA, an unnecessary and overlong turn lane has eliminated a block of curb parking, contributing to the failure of most adjacent businesses.*

When unnecessary left-turn lanes are provided, the extra pavement width encourages speeding, lengthens crossing distances, and takes up roadway that could otherwise be used for on-street parking or bike lanes. For streets where infrequent turning movements fail to justify a turn lane, and none is inserted, the occasional pause that drivers must make for other vehicles turning left is an effective traffic calming device.

When justified, left-turn lanes should be just long enough to hold the number of cars that stack in them in standard rush-hour conditions, and no longer, for the same reason: extra roadway causes speeding.

Unlike left-turn lanes, exclusive right-turn lanes are rarely justified in urban locations where people are likely to be walking, and only make occasional sense where heavy pedestrian activity causes queuing right-hand turners to dramatically impede through-traffic. This is a condition that rarely happens in downtown Tulsa. Because right turns are never opposed by oncoming traffic, adding an exclusive lane for them provides only a limited increase to a street's vehicular capacity, while dramatically undermining pedestrian comfort. This trade-off rarely makes sense in streets meant to encourage multi-modal use.

The Network

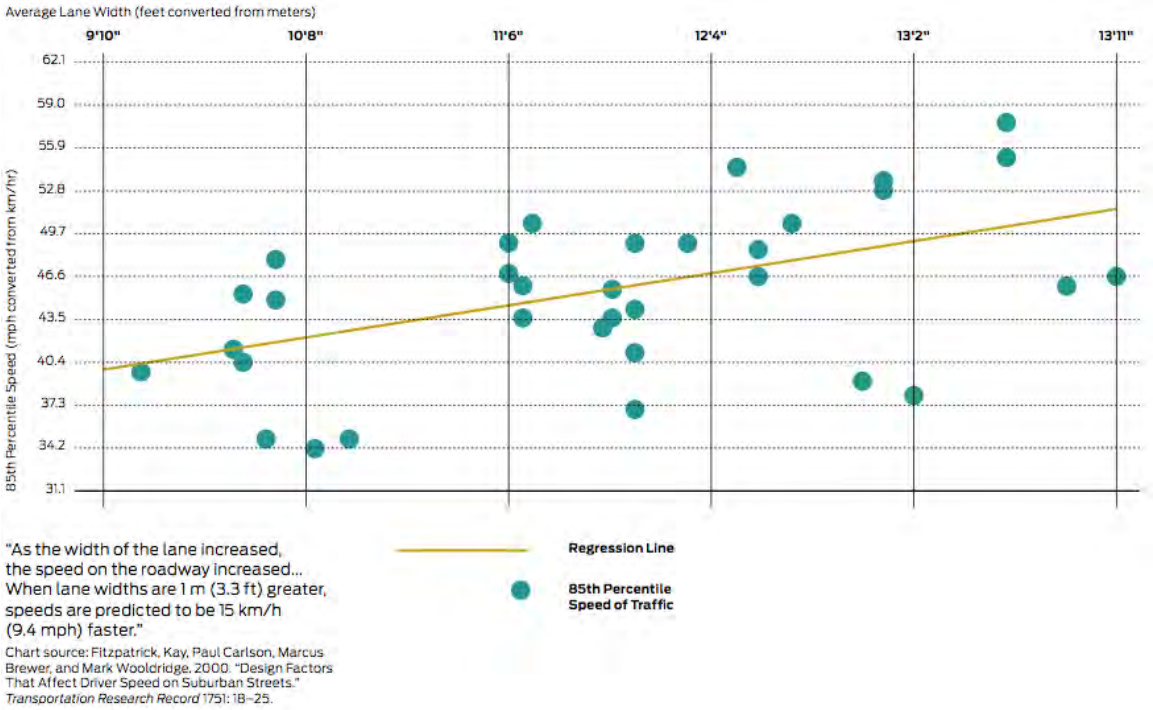
Before moving on, it is useful to bring up one other important factor in considering the provision of lanes, the often overlooked role of the street grid, or *network*. For roughly forty years, the dominant ideology of roadway planning was to eschew street networks in favor of *dendritic* (branching) systems. In such systems, which characterize suburban sprawl, parking lots and cul-de-sacs lead to collectors, which lead to arterials, which lead to highways, and there is typically only one efficient path from any one destination to any other. We now know that these systems present many disadvantages to the traditional network alternative, principal among them their inflexibility. A single engine fire on an arterial can bring an entire community to a halt.

The inflexibility of these dendritic systems has led to a general tendency within the traffic engineering profession to think of networked systems as being considerably less flexible than they truly are. Often, each street is considered individually, with little attention paid to the fact that, within a grid, traffic can easily switch from street to street in response to congestion. Remembering this fact—that each car within a grid is an "intelligent atomic actor" maximizing its utility at every corner—allows us to manipulate networked street systems with much greater freedom than we would have in dendritic sprawl. Gridded streets can and do absorb each other's traffic every day, something we see clearly when one street is narrowed or closed for repairs. The analysis and recommendations that follow take into account that parallel streets are typically available to ease the pressure on busy streets.

### *3. Lanes of Proper Width*

Different-width traffic lanes correspond to different travel speeds. A typical American urban lane is 10 feet wide, which comfortably supports speeds of 35 mph. A typical American highway lane is 12 feet wide, which comfortably supports speeds of 70 mph. Drivers instinctively understand the connection between lane width and driving speed, and speed up when presented with wider lanes, even in urban locations. For this reason, any urban lane width in excess of 10 feet encourages speeds that can increase risk to people walking.

Many streets in downtown Tulsa contain lanes that are 12 feet wide or more, and drivers can be observed approaching highway speeds when using them. It is surprising to learn, then, that the correlation between lane width and driving speed, accident frequency, and accident severity is a very recent discovery of the traffic engineering profession, and contradicts decades of conventional wisdom within that profession. Even today, many traffic engineers will still claim that wider lanes are safer. This understanding is accurate when applied to highways, where most people set their speeds in relation to posted speed limits. But on city streets, most people drive not the posted speed, but the speed which feels comfortable, which is faster when the lanes are wider. Fortunately, a number of recent studies provide ample evidence of the dangers posed by lanes 12 feet wide and wider.

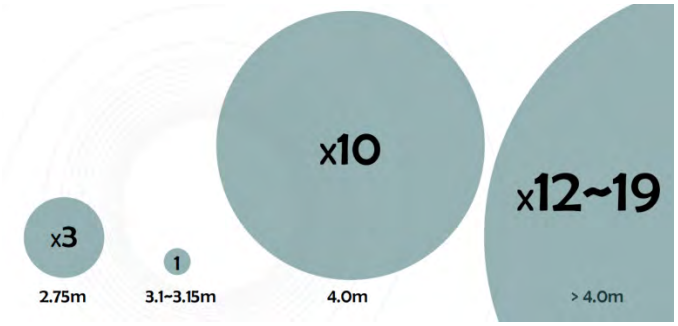



*Studies show that wider travel lanes are correlated with higher vehicle speeds.*

These studies, published by the National Cooperative Highway Research Program and others, demonstrate that urban and suburban 12-foot lanes are clearly

associated with higher speeds and higher crash frequencies than 10-foot lanes[3]. Additionally, a June 2015 report by the Canadian Institute of Transportation Engineers found that lanes wider than 10 feet generate risk for higher crash severity.[4]

Given that 10-foot lanes handle no less traffic than 12-foot lanes[5], there is clearly no justification for 12-foot lanes in urban locations. In acknowledgement of this body of research, numerous organizations and agencies, like NACTO (The National Association of City Transportation Officials), have recently begun to endorse 10 foot lanes for use in urban contexts. NACTO's *Urban Street Design Guide* lists 10 feet as the standard, saying, "Lane widths of 10 feet are appropriate in urban areas and have a positive impact on a street's safety without impacting traffic operations." They add: "Narrower streets help promote slower driving speeds which, in turn reduce the severity of crashes."




*Compared to 10-foot lanes, 12-foot lanes correlate with a dramatically higher degree of crash severity.*
*Source: http://www.tcat.ca/wp-content/uploads/2015/10/Karim.pdf*

This same conclusion was reached by ITE, the Institute of Transportation Engineers. According to the *ITE Traffic Engineering Handbook, 7th Edition,* "Ten feet should be the default width for general purpose lanes at speeds of 45 mph or less." That statement is very telling, as it implies, accurately, that lanes wider than 10 feet encourage speeds greater than 45 mph. And 45 mph is a full 20 mph over the posted speed limit for downtown Tulsa!

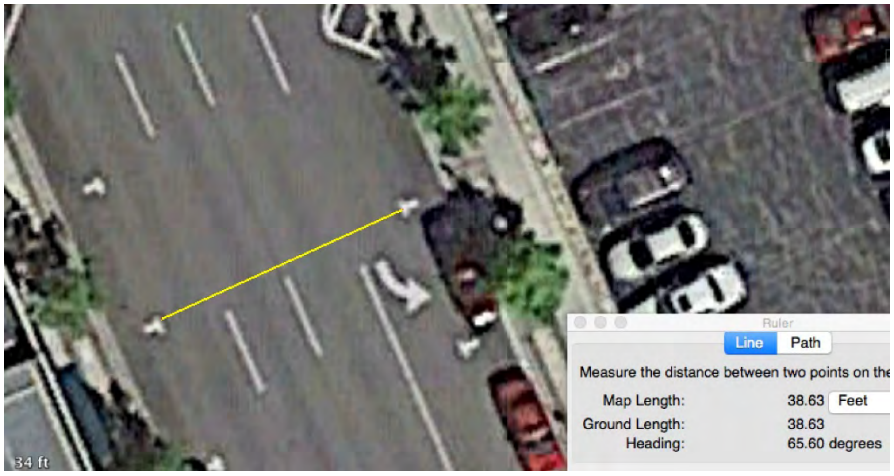
The ultimate argument for this 10-foot-lane standard is Tulsa itself, which already uses 10-foot lanes on many of its streets. About half of the streets in downtown contain four 10-foot lanes side by side. Most of the driving lanes on M.L.K. Jr. Boulevard/Cincinnati Avenue, Detroit Avenue, and Boston Avenue, and Main, 2nd, 4th, 7th, and 8th Streets, are 10 feet wide. In fact, many of these lanes are slightly less

[3] Project 3-72, Relationship of Lane Width to Safety for Urban and Suburban Arterials, NCHRP 330, Effective Utilization of Street Width on Urban Arterials

[4] https://www.researchgate.net/publication/277590178_Narrower_Lanes_Safer_Streets

[5] FDOT Conserve by Bike Program Study, 2007

than 10 feet wide. The picture below shows Cincinnati Avenue holding four lanes in 39 feet. This is the most commonly used street design in all of downtown.




*As shown here on Cincinnati Avenue, many downtown streets already contain lanes 10 feet wide or less.*

No further evidence is needed to establish 10 feet as the ongoing standard for downtown.

### *4. Including Bike Lanes*

Cycling is the largest planning revolution currently underway. . . in only some American cities. The news is full of American cities that have created significant cycling populations by investing in downtown bike networks. Among the reasons to institute such a network is pedestrian safety: bikes help to slow cars down, and new bike lanes are a great way to use up excess road width currently dedicated to oversized driving lanes. When properly designed, bike lanes make streets safer for people who are biking, walking—*and driving.*

Safety—for All

This was the experience when a cycle track (protected two-way bike lane) was introduced on Prospect Park West in Brooklyn, NY. A 3-lane one-way street was converted to 2 lanes, parked cars were pulled 12 feet off the curb, and a cycle track was inserted in the space created. As a result, the number of weekday cyclists tripled, and the percentage of speeders dropped from about 75 percent of all cars to less than 17 percent. Injury crashes to all road users went down by 63 percent from prior years. Interestingly, car volume and travel times stayed almost exactly the same—the typical southbound trip became 5 seconds faster—and there were no negative impacts on streets nearby.


*The insertion of a cycle track on this Brooklyn street dramatically improved safety for all road users without reducing daily car through-put.*

Experience in a large number of cities is making it clear that the key to bicycle safety is the establishment of a large biking population—so that drivers expect to see them—and, in turn, the key to establishing a large biking population is the provision of buffered lanes, broad lanes separated from traffic, ideally by a lane of parked cars. In one study, the insertion of buffered bike lanes in city streets was found generally to reduce injuries to all users (not just bicyclists) by 40 percent. Of course,

buffered lanes need not be inserted everywhere. Often, in smaller cities, the insertion of just one prominent buffered facility can have a tremendous impact on cycling population.

Economic Impacts

Additionally, bike lanes are good for business. A study in Portland, OR, found that customers arriving by bike buy 24 percent more at local businesses than those who drive. And merchants along 9th Avenue in New York City showed a 49 percent increase in retail sales after buffered bike lanes were inserted.

New York has dominated the biking headlines in recent years because of its investment under Mayor Bloomberg in a tremendous amount of cycle infrastructure. But many smaller and less "progressive" cities are making significant cycling investments, with the goals of reducing car dependence, achieving higher mobility at lower cost, and especially attracting young entrepreneurial talent. More than half of the states in the US already have buffered bike lanes as part of larger downtown networks.

Currently, Tulsa has almost no downtown bicycle network to speak of. By contemporary standards, "sharrow" signs placed in driving lanes no longer qualify as bike facilities, principally because they fail to attract cyclists not already bold enough to attack unmarked city streets. In fact, one recent study found that sharrows may actually *increase* safety risk to cyclists.[6] If Tulsa hopes to become a cycling city—one of the objectives of this Study—then it needs to establish a network of marked lanes, mostly buffered, that welcome more timid cyclists throughout the downtown core. This is no small task, but it can be accomplished through a limited number of well-placed facilities.

By necessity, this Study's recommendations will interface with the region's Bicycle and Pedestrian Master Plan as laid out in the GO Plan, which we have reviewed and discussed with its creators. It does not shy away from making recommendations for specific facilities, for two reasons: first, because certain key challenges and opportunities surrounding cycling corridors became quickly apparent during the study; and second, because a central strategy of this effort is to identify excess street pavement that needs to be put to other use lest it encourage speeding.

6 http://www.citylab.com/cityfixer/2016/02/sharrow-safety-bike-infrastructure-lane-chicago/460095/

### *5. Providing Continuous On-Street Parking and Street Trees*

Whether parallel or angled, on-street parking provides a barrier of steel between the roadway and the sidewalk that is necessary if people walking are to feel fully at ease. It also causes people driving to slow down out of concern for possible conflicts with cars parking or pulling out. On-street parking also provides much-needed life to city sidewalks, which are occupied in large part by people walking to and from cars that have been parked a short distance from their destinations.

On-street parking is also essential to successful shopping districts. According to the consultant Robert Gibbs, author of *Urban Retail,* each on-street parking space in a vital shopping area produces between $150,000 and $200,000 in sales.

Many streets in downtown Tulsa lack a significant amount of their potential on-street parking due to driving lanes that are either too wide or too many in number—that is, more than traffic counts would suggest are needed. Some of these streets have no on-street parking at all. On many other streets, parking spaces are missing due to curb cuts and to what appears to be an oversized sight triangle requirement—ensuring that cars can see clearly around (and thus speed around) corners—or for no discernable reason at all.

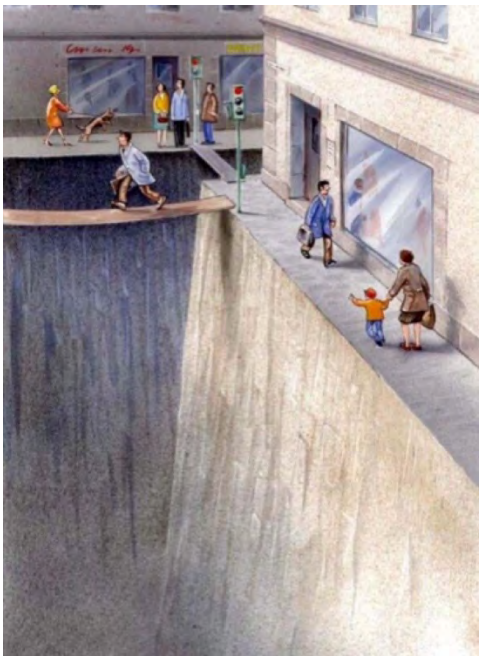
Bringing missing parking back will contribute markedly to the safety and success of downtown. It is in recognition of the value of downtown parking that cities, including Tulsa, regularly invest tens of millions of dollars in parking structures. It is said that one or several new parking garages are needed downtown. Yet there is literally a parking structure's worth of missing curb spaces in downtown Tulsa. This unrealized asset—and the need for safer sidewalks—should compel the city to make an inventory of all the places in the downtown where curb parking has been disallowed, to determine where it can be reinstated. The individual street redesigns that follow discuss some, but not all, of these many locations.

In the context of pedestrian safety, street trees are similar to parked cars in the way that they protect the sidewalks from the moving cars beyond them. They also create a perceptual narrowing of the street that lowers driving speeds. But they only perform this role when they are sturdy, and planted tightly enough to register in drivers' vision.

Recent studies show that, far from posing a hazard to motorists, trees along streets can actually result in fewer injury crashes. One such study, of Orlando's Colonial Drive, found that a section without trees and other vertical objects near the roadway experienced 12 percent more midblock crashes, 45 percent more injurious crashes, and a dramatically higher number of fatal crashes: six vs. zero.

When planting street trees, it is best that arboring species are selected and planted such that the tree canopies will touch once the trees have matured. While a few downtown Tulsa streets have some good trees, most lack adequate tree cover. This

is not surprising given the cost of planting and maintaining them. These costs are easier to justify when one enumerates the many hidden benefits of shade trees, which include the absorption of storm-water, tailpipe emissions, and UV rays; the lowering of urban heat islands and air-conditioning costs; increased income streams to businesses; and dramatically higher real-estate values (and property tax revenue) on tree-lined streets.



*A sidewalk without parked cars or street trees, as imagined by artist Carl Jilg.*

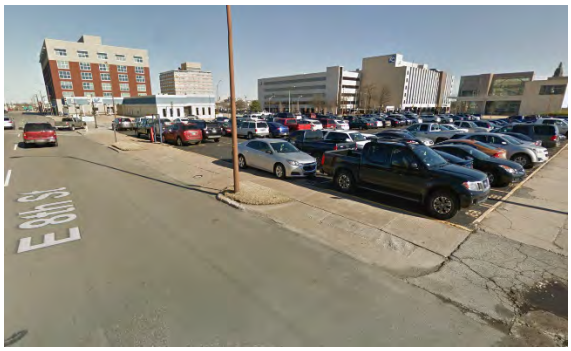
This final item could perhaps provide the motivation necessary for a greater investment in tree planting and maintenance, as the data is compelling. A comprehensive study of the east side of Portland, OR found that an adjacent tree added 3.0 percent to the median sale price of a house, an increase of $8,870. Since there are more houses than street trees, each individual tree was deemed responsible for almost $20,000 in increased real estate value. Extrapolating to the city as a whole, the study's authors found that the presence of healthy street trees likely adds $15.3 million to annual property tax revenues. Meanwhile, the City pays $1.28 million each year for tree planting and maintenance, resulting in a payoff of twelve to one.

This twelve-to-one return on investment ignores all the other benefits provided by street trees including their contribution to pedestrian safety. It is hoped that a similar analysis conducted in Tulsa might be used to mandate an enlarged commitment to street trees.

### *6. Limiting Sidewalk Curb Cuts*

Among the fourteen cities for whom we have completed walkability studies, Tulsa suffers far more than any from a preponderance of curb cuts violating the sidewalk edge. In a city where many alleys are available to provide easy access to properties, such an outcome is surprising, unfortunate, and in need of immediate attention.

A curb cut occurs whenever a driveway crosses a sidewalk. Each curb cut presents a potential danger to people walking and biking who may be hit by a vehicle crossing their path. This danger makes the sidewalk feel less safe and comfortable, a feeling which is reinforced by the tilt of the driveway skirt and the missing curb. Additionally, as noted above, curb cuts eliminate on street parking that would otherwise protect the sidewalk edge, resulting in a visual widening of the street that encourages illegal speeds.




*Sidewalks that are continually violated by curb cuts do not feel safe to walk along.*

This preponderance of curb cuts threatens to derail many of the improvements recommended in this Study, for several reasons:

- Adding curb parking to a street by right-sizing the number and width of driving lanes has little impact if the parking is removed for curb cuts.
- Bike lanes crossed by curb cuts are not as safe as they would be otherwise.
- Cycle tracks, where parked cars protect bike lanes from traffic, are badly interrupted by curb cuts, which replace the parked car with a wide striped buffer zone providing little protection.
- It is more challenging to plant street trees when the sidewalk is regularly interrupted by driveways.

Downtown Tulsa will not become a walkable place until its number of curb cuts is reduced significantly. Ahead, we will propose a specific program towards reaching that goal.

### *7. Replacing Unwarranted Signals with All-Way Stop Signs*

For many years, cities inserted traffic signals at their intersections as a matter of pride, with the understanding that a larger number of signals meant that a place was more modern and cosmopolitan. Recently, that dynamic has begun to change, as concerns about road safety have caused many to question whether signals are the appropriate solution for intersections experiencing moderate traffic. Research now suggests that all-way stop signs, which require motorists to approach each intersection as a negotiation, turn out to be much safer than signals. Unlike with signals, no law-abiding driver ever passes through the intersection at more than a very low speed. There is considerable eye-contact among users. While people driving slow down, they never have to wait for more than a few seconds to pass, and people walking and biking are generally waved through first.

While it would be useful to have more research, the one study on this subject is compelling. It is described in Persaud et. al.: "Crash Reductions related to Traffic Signal Removal in Philadelphia" (1997). This study recounts the 1978 removal of 462 traffic signals due to a 1977 state ruling stating that signals were not warranted on intersections with an annual average daily traffic of less than 9,000 on the major street or less than 2,500 on the minor street. 199 of these signals had adequate data to make it into the study, and 71 non-converted intersections were identified as a control group.

In almost all cases, the signals were replaced by all-way stop signs. The overall reduction in crashes was 24 percent. Severe injury crashes were reduced 62.5 percent overall. Severe pedestrian injury crashes were reduced by 68 percent. While some pedestrians and drivers prefer signalized intersections, this data is too conclusive to ignore. Until a contradicting study is completed, cities should be compelled to conduct an audit of current signalization regimes to determine which signals may be eliminated.

When converting signals to stop signs, cities are faced with the choice of two-way and all-way stops. Clearly, if one street contains tremendously more traffic than the other, a two-way stop makes more sense. However, there is no doubt that all-way stops should be used wherever they do not pose an undue burden, as they are considerably safer. In studying the conversion of two-way stops to 4-way, "the collective results of numerous published studies of such conversions established that crashes are reduced by approximately 40 – 60%, and injury crashes are reduced by 50-80%."[7] Additionally, two-way stops are damaging to walkability, as they essentially require people crossing the faster street to jaywalk. For that reason, it is generally wise to leave signals in place in locations where a four-way stop does not make sense.

[7] Hauer, 1985

One great byproduct of converting signals to stops is money saved: stop signs are much cheaper to install and maintain than signals. This fact is important to keep in mind as one considers the conversion of downtown streets from one-way to two-way. The principal cost of these reversions is signal reorientation. However, while signals are almost always required where multilane one-ways intersect, they are often not required where two-lane two-ways intersect. Moreover, when two-lane two-ways cross at a 4-way stop sign, there is often no need or use for a left-turn lane pockets, and that pavement can be used instead for parking or cycling.

The savings that accrue from replacing signals with stop signs are a factor that advocates for making two-way reversions in a more comprehensive way, rather than piecemeal. It is only when intersecting multilane one-ways are both converted to two-way that signals can be eliminated.

### *8. Providing Proper Crosswalks, Signals, and Lighting*

One does not need to commission a walkability study to understand the need for proper crosswalks at all intersections. Yet, as in many cities, crosswalks in Tulsa are not consistently well marked, and many are not up to the current best-practice standard of striping. Part of a commitment to walkability is ensuring that the annual street-maintenance budget includes funding for bringing crosswalks up to date.

Additionally, street lighting should be provided at all intersections, with additional care and emphasis taken at and near crosswalks. Independent of safety, proper street lighting is also important for pedestrian comfort. While darkness increases danger and fears of crime, an excess of lighting, especially harsh-spectrum lighting from tall fixtures (a.k.a *Scorched Earth Policy*) can also deter walking.

Pushbutton crossing requests are another feature that impacts the pedestrian experience. While they were ostensibly created to assist people walking, they more often then not have the opposite effect. Typically, the introduction of a pushbutton means that, unless they push the button, people walking are not given an ample crossing time. In some cases the walk signal never appears at all unless the button is pushed. Quite often, the pedestrian is frustrated by the impression that the button is ineffective. Little wonder, then, that most walkable cities don't have them.

When pushbuttons are introduced, it is often in conjunction with a multi-phase signal at which pedestrians must wait for all cars to compete their turning motions before given the walk sign. This regime is quite frustrating, as it results in much longer pedestrian wait times and, as a result, more jaywalking. It is pedestrian inconvenience in the name of pedestrian safety, and it ultimately undermines safety, not just through jaywalking, but by reducing the pedestrian population. If people walking have to wait ages at every intersection, many give up and drive instead.

The traditional and proper signalization system for intersections is called a "concurrent regime." Under a concurrent regime, pedestrians receive the walk sign when cars get the green light, and vehicles must wait for pedestrians to clear the crosswalk before turning. This system is extremely convenient for people walking: if they can't cross one leg of an intersection, they can cross the other. The concurrent regime is the reason why it is possible to walk diagonally across Manhattan without ever stopping.

In recent years, one upgrade has been introduced to the concurrent regime, the Lead Pedestrian Interval, or LPI. The LPI gives pedestrians the walk sign a few seconds before the light turns green allowing them to claim the crosswalk before it is encroached by turning vehicles. For crosswalks at which many people are walking, LPIs are the safest and most convenient solution.

### *9. Avoiding Swooping Geometries*

Walkable environments can be characterized by their rectilinear and angled geometries and tight curb radii. Wherever suburban swooping geometries are introduced, cars speed up, and pedestrians feel unsafe. The road network of any urban area should never be shaped around a minimum design speed, but rather should be designed to accommodate the turning motions of only the largest vehicles that will be using it on a daily basis.

Across the U.S., is easy to spot those parts of cities that have been reshaped to meet minimum design speed criteria. In Tulsa, one such area would seem to be the intersection of 10th and 11th Street at Boulder Avenue, where Route 66 has been relocated. Where an historic shift in the street grid has created an irregular intersection, a wide swooping curve has been introduced, including a right-turn slip lane on both sides of the intersection. This area, called Cathedral Square, no longer feels like a square because it has been designed around the turning radius of a car going 40 mph. Pedestrians rarely feel safe or welcome in places designed around highway department criteria, because they inevitably feel more like highways than places.

*Route 66 was improperly allowed to swoop through downtown Tulsa with high-speed geometrics that make Cathedral Square unwelcoming to pedestrians.*

While swoops of this kind are often quite expensive to undo, there are techniques for appropriately narrowing the roadway and eliminating slip lanes that can effectively civilize the traffic and make pedestrian life possible again, as will be covered ahead. The main lesson in this category is for future use: to make a commitment as a city to not allow other similar changes to be perpetrated upon downtown streets.

### *Epilogue: the OKC experience*

It is useful and convenient, when proposing dramatic changes to a city's street network, to have a nearby example of a similar effort that is largely finished. In this case, we can look to downtown Oklahoma City, where Speck & Associates completed one of its first walkability studies almost eight years ago. At that time, *Prevention* magazine had named OKC the "least walkable city in the United States," and city leadership was desperate to make its downtown more safe, healthy, and livable. That study led into Project 180 where, in conjunction with the construction of the Devon Tower, the City decided to invest over $100 million in rebuilding most of the streets in its 40-block central business district.

This effort is now largely complete, and put into play many of the same practices recommended in this Study, including:

- Reverting a half-one-way street network almost entirely to two-way traffic;
- Reducing the number of driving lanes to meet anticipated demand;
- Reducing lane widths to a safer standard, typically 10 feet;
- Doubling the number of on-street parking spaces;
- Introducing an effective network of bike lanes;
- Replacing aging curbs and crosswalks; and
- Planting hundreds of new street trees.

Project 180 differed from this effort in Tulsa in several key ways. First, as noted, its large budget resulted in many improvements being expensively constructed rather than merely striped. Second, it was designed at a time when cycle tracks were not yet common, so none were included in the plan. But otherwise, its recommendations were largely similar to the ones found in this Study, and therefore it is a good model for Tulsa to consider as it weighs this report.

As might have been expected in 2009, the recommendations for reducing the capacity of the street network were met with great skepticism, and were in fact rejected by the City's traffic planning consultants, who eventually had to be overruled for the project to proceed. Most contentious was the project's recommendation that no left-turn lanes be included on any street expected to experience fewer than 10,000 car tips per day. The Public Works department concluded, correctly, that unnecessary left-turn lanes would invite speeding, and supported the recommendation.

According to Laura Story, the OKC Public Works engineer who managed Project 180, the much-feared congestion has not come to pass. She notes that traffic downtown now remains "better than acceptable, even with additional unrelated construction within the original boundaries."

More importantly, downtown OKC has experienced a much-celebrated rebirth. Even through the great recession and the current "oil bust," every year has reportedly brought more housing, shops, and vitality to the heart of the city. It is a different place than it was in 2009, and most people acknowledge that Project 180 played some part in this change.

Because she was such a key figure in Project 180—and is also a licensed engineer—Laura Story was commissioned to write a short memo describing her experience. It is included in Appendix B, along with an article that Jeff Speck wrote about the project, "A 180° Turnaround," published 2011 in *Planning* magazine (Appendix A).

## A Useful Walk

As Jane Jacobs noted, "Almost nobody travels willingly from sameness to sameness. . . even if the physical effort required is trivial." For people to choose to walk, the walk must serve some purpose. In planning terms, that goal is achieved through mixed use. Or, more accurately, placing the proper balance of the greatest number of uses all within walking distance of each other.

An essential step towards achieving better walkability, therefore, is to consider all of the uses present in the heart of your city, and to see which uses are lacking or in short supply. These uses include office, housing, retail, dining, entertainment, hospitality, schools, recreation, worship, and others. The better these uses can be balanced in your downtown, the more walkable it will be. In most downtowns, the use that is most underrepresented is housing.

### *Ample Housing*

Tulsa must attain a larger supply of housing to achieve a proper balance of activities downtown. Bringing more people downtown is already a priority of the City, but there is still a long way to go: the area within the IDL now contains only about 1800 housing units, which represents a density of less than three units per acre. . . the equivalent of low density suburban sprawl.

*The approximate housing density of downtown Tulsa.*

While evening events are important, little does more to create a lively and safe downtown core than the development of downtown housing. Unfortunately, given all the friction associated with in-town development—from tight sites to historic structures to concerned neighbors—it is simply more expensive to build there. This is not a great barrier to creating luxury housing, but there is a very small market for luxury housing in downtown Tulsa; the people most ready to live downtown are

recent college graduates and empty nesters of moderate income, and they seek comfortable apartments at an attainable cost. For that reason, the City must take a more active role in encouraging and enabling the construction of large quantities of inexpensive housing within the IDL.

### *Market-Rate Parking*

Parking provision can contribute to the usefulness of the city in many ways. On-street parking is cherished by merchants, who understand that many people need to be enticed by curb parking in order to shop and dine. Additionally, there exists a perception that the future office success of downtown Tulsa is constrained by its limited parking supply. Fortunately, a tremendous amount of untapped supply lies waiting in the dozens of downtown streets containing driving lanes that are either too wide or too many in number. Making these streets safer for people walking and driving will also make most better for parking.

It is not enough, however, to simply increase parking supply. The price of parking must be carefully set to reflect its value, or the market for parking spaces will not function properly, causing a number of undesirable outcomes. Overpriced parking will result in empty curbs and streets that continue to invite speeding. Underpriced parking will result in overcrowding at curbs and circling traffic. The parking expert Don Shoup, in *The High Cost of Free Parking,* documents how merchants suffer when underpriced parking results in a lack of curb vacancies. A pro-business approach to the hourly pricing of parking downtown suggests some significant changes to the City's current policies and practices, especially with what is regarded as lax enforcement.

### *Useful Transit*

Transit service can play a large role in a downtown's usefulness, as it grants pedestrians access to a much larger proportion of their daily needs and destinations, freeing them from the burden of car ownership. Additionally, downtowns in car-dependent regions like Tulsa can provide transit as a convenience, to allow car owners to drive less, especially in the evenings when they may be out drinking. Such was the intention of The Loop, a downtown circulator which has yet to achieve a critical mass of ridership. It is worth considering how the Loop might be made more effective, particularly as an all-day convenience for those who would rather not dig their car out of a lot.

In Tulsa, most transit service exists to serve those who are not able to own or operate a car—*transit by need.* The current bus service is essential, and can be made more effective through a better integration with other modes of transit, as will be discussed ahead.

### *Wayfinding*

Finally, even the most mixed-use, well-managed, and well-connected downtown will fall short of its potential utility if it is not clearly legible; locals and visitors alike need to be able to find their way in and out of downtown. If arriving by vehicle, they must be directed clearly to key destinations and to public parking. If moving around on foot, they must be directed clearly among prime pedestrian activity centers. Tulsa could perform somewhat better in both of these categories.

## A Comfortable Walk

The need for comfortable walk is perhaps the least intuitive part of this discussion, because it insists that people like to be *spatially contained* by the walls of buildings. Most people enjoy open spaces, long views, and the great outdoors. But people also enjoy—and need—a sense of enclosure to feel comfortable walking.

Evolutionary biologists tell us how all animals simultaneously seek two things: prospect and refuge. The first allows you to see your predators and prey. The second allows you to know that your flanks are protected from attack. That need for refuge, deep in our DNA from millennia of survival, has led us to feel most comfortable in spaces with well defined edges. This issue has been discussed from before the Renaissance, in which it was argued that the ideal street space has a height-to width ratio of 1:1. More recently, it has been suggested that any ratio beyond 1:6 fails to provide people with an adequate sense of enclosure, creating a *sociofugal* space: an environment which people want to flee.

Therefore, in addition to feeling safe from automobiles, humans are not likely to become pedestrians unless they feel enclosed by firm street edges. This is accomplished in several ways:

### *Streets Shaped by Buildings*

The typical way in which cities shape streets is with the edges of buildings that pull up to the sidewalk. These buildings need to be of adequate height so that the 1:6 rule is not violated, ideally approaching 1:1. Gaps between buildings should not be very wide. If a street is intended to be walkable, then no building along it should be allowed to sit behind a parking lot.

### *No Exposed Surface Parking Lots*

Most American cities suffer from the windswept spaces created where historic buildings have been torn down to provide ample surface parking. These parking lots are often the single greatest detriment to pedestrian comfort, and city codes and private land-use practices must be reviewed in order to fundamentally alter the conditions that lead to their proliferation. Among these are the on-site parking requirement, which should ideally be replaced by a regime that treats parking as a public good, provided strategically in the proper locations to encourage more productive land use.

Some streets in the study area contain only one or two parking lots that mar an important and otherwise viable pedestrian trajectory; these lots should be made high-priority development targets. Conveniently, it is not necessary to eliminate such parking lots fully; rather, only the front edge needs to be replaced by a building against the sidewalk. Since 60 feet is the typical thickness of a center-corridor residential building, this typically means that only a single bay of parking must be removed.

### *Street Trees*

Already mentioned under Safety, street trees are also essential to pedestrian comfort in a number of ways. They reduce ambient temperatures in warm weather and reduce the effects of wind on cold days. Trees also improve the sense of enclosure by "necking down" the street space with their canopies. A consistent cover of trees can go a long way towards mitigating the impacts of an otherwise uncomfortable street, but the trees must be substantial. The City's tree list should be reviewed and purged of any species that is merely decorative and/or fails to offer the microclimate impact of a large shade canopy to those who walk.

**An Interesting Walk**

Finally, even if a walk is useful, safe, and comfortable, people will not chose to go on foot unless it is also at least moderately entertaining. There needs to be something interesting to look at.

Humans are among the social primates, and nothing interests us more than other people. The goal of all of the designers who make up the city must be to create urban environments that communicate the presence, or likely presence, of human activity. This is accomplished by placing "eyes on the street," windows and doors that open, and avoiding all forms of blank walls. The stretch of 2nd Street near Tulsa's Performing Arts Center building is a prime example of how designers, for a while, forgot this rule.

As bad as blank walls are the edges of structured parking lots, which must be shielded by a habitable building edge, at least at ground level. Cities that support walkability do not allow any new parking structures to break this rule in their designated walkable corridors. While somewhat wanting in its execution, the thin liner of residential buildings on Boulder Avenue garage demonstrate a good way of doing this. City codes should ensure that all future parking structures have active uses against the sidewalk. Retail use is much more interesting than office or residential use. Moreover, successful retail desires connectivity, so the goal of continuous retail against designated streets needs to inform planning decisions. Tulsa also suffers from many blank walls against sidewalk edges. When those cannot be activated with new openings, there's local precedent for activating façades through artist murals.

A final enemy of pedestrian interest is repetition. The era of the multi-block mega-project is fortunately over, but cities must take pains not to allow any single architectural solution to occupy more than a few hundred feet of sidewalk edge. Boredom is another reason why "almost nobody travels willingly from sameness to sameness," and multi-building developments should be asked to distribute schematic design responsibility to multiple architects (even within the same firm), to avoid a city-as-project outcome. Many hands at work is another way to suggest human activity, especially when the number of humans on the sidewalk is less than ideal.

# PART II. A SAFE WALK

## A Strategy for Street Redesign

The first chapter in Part I described nine factors that influence driver speeds and otherwise determine the safety of a street for all users. These were as follows:

1. One-way vs. two-way travel;
2. The number of driving lanes;
3. Lane width;
4. Cycle facilities;
5. On-street parking and street trees;
6. Sidewalk curb cuts;
7. The presence of unwarranted signals;
8. The provision and design of crosswalks, signals, and streetlights; and
9. The presence of swooping geometries.

Each of these nine discussions offers specific direction on how to make downtown Tulsa safer and more walkable. In this Chapter, we will lay out the changes in street design that are necessary to achieve the ends stated in each of those discussions.

### *1. Avoiding One-Ways in Tulsa*

Whether or not more one-way streets should be restriped to two-way is the biggest and most often asked question regarding traffic patterns in downtown Tulsa. The current half-one-way configuration provides the advantage of allowing drivers to ride a wave of green lights through downtown and to take left turns unimpeded by oncoming traffic. It provides the disadvantages of increasing danger to pedestrians and cyclists, undermining retail viability, lengthening trips, and confusing visitors. Each of these advantages and disadvantages effects different populations, so the choice between solutions is a political one, and will ultimately be made by weighing the interests of drivers passing through downtown against the interests of downtown residents, visitors, and business-owners.


*Currently, about half of the significant downtown streets hold one-way traffic.*

Few people will argue that, in the heart of a city, the desires of commuters just passing through should trump the safety of pedestrians and the success of businesses. However, there are many people who reasonably fear that slowing down traffic might create such congestion that the city fails to function properly, and that all residents and businesses will suffer as a result. While this fear is reasonable, it is not based in fact. The experience of hundreds of cities all across America—including Tulsa when it reverted Boston Avenue and Main Street to two-way—has been consistent: there is not a single record in the extensive annals of urban planning of a city's vitality suffering in any way from a one-way to two-way reversion. To the contrary: there are many reports of business success and a rebirth of street life, but never has the additional traffic friction presented by two-way streets caused a city to perform less well socially or economically.

For that reason, this discussion becomes a simple argument between those who want to get through the downtown as quickly as possible, and those who want a downtown worth arriving at. While only those who prioritize speed over vitality can argue for the former, it must be acknowledged that the "green wave" of traffic flow presents a luxury that many street users enjoy. Worth noting is that two-way streets can still be timed with green waves—inbound in the morning and outbound in the evening—that shorten commuting times. But a more meaningful approach is to acknowledge that the elimination of a green wave does indeed represent a small sacrifice on the part of commuters, one that deserves acknowledgement and thanks. Fortunately, many, if not most, commuters occasionally also walk around the downtown, and, when they do, they can also count themselves among the beneficiaries of a safer and more successful street network.

The one-way pairs in downtown Tulsa are as follows:

- Cheyenne & Boulder Avenues (North-South)
- M.L.K. Jr. Boulevard/Cincinnati Avenue & Detroit Avenues (North-South)
- 1st & 2nd Streets (East-West)
- 4th & (partial) 5th Streets (East-West)
- 7th & 8th Streets (East-West)

The DAM Plan recommends that all of these pairs be reverted to 2-way traffic as do we; it would be a misunderstanding of this Study to suggest that anything less than this is ideal. That said, this Study recommends that this conversion be pursued in two phases, for three reasons: first, because a compete reversion of all the streets above would likely require a budget too large to be identified in the short term (although, were funding found, such a comprehensive reversion is recommended); second, because some reversions are considered easier to achieve than others; third because there is a political logic to preserving one green wave in each direction through downtown; and fourth, because there is a clear logic in support of studying the overall impacts of a partial reversion before completing the full effort. While

evidence gives us confidence in a positive outcome, there is no great harm in proceeding cautiously.


*Were money no object, a complete two-way reversion would have the most positive impact on downtown.*

In conversations with focus groups, it has become clear that the most difficult one-way pairs to convert are M.L.K. Jr. Boulevard/Cincinnati Avenue & Detroit Avenue and 7th & 8th Streets. In contrast, Cheyenne & Boulder Avenues are already slated for reversion, and 1st & 2nd Streets do not seem difficult to revert if that change is kept away from the highway ramps at their ends. 4th Street represents a largely unbalanced half of a one-way pair with 5th Street, which has already been reconstructed to contain only two blocks of light one-way traffic.

Happily, these two blocks of 5th Street are already slated for conversion. 4th Street is difficult to revert to 2-way west of Denver, due to its island intersection at Civic

Center Drive, but reverting its central one-way segment, from Denver to Detroit, would result in more evenly-dispersed traffic throughout the grid. Because of their highway ramps to the east and west, 1st and 2nd Streets should be reverted from Denver to Greenwood, and not beyond. New eastbound traffic on 1st street would be forced to turn north or south at Greenwood, while westbound traffic on 2nd would reach only as far as its termination on Denver at the BOK Center. As already planned, the two-way reversion of Cheyenne and Boulder Avenues would encompass the entirety of their current one-way segments.


*The recommended Phase I reversion comprises Cheyenne and Boulder Avenues and 1st, 2nd, 4th, and 5th Streets.*

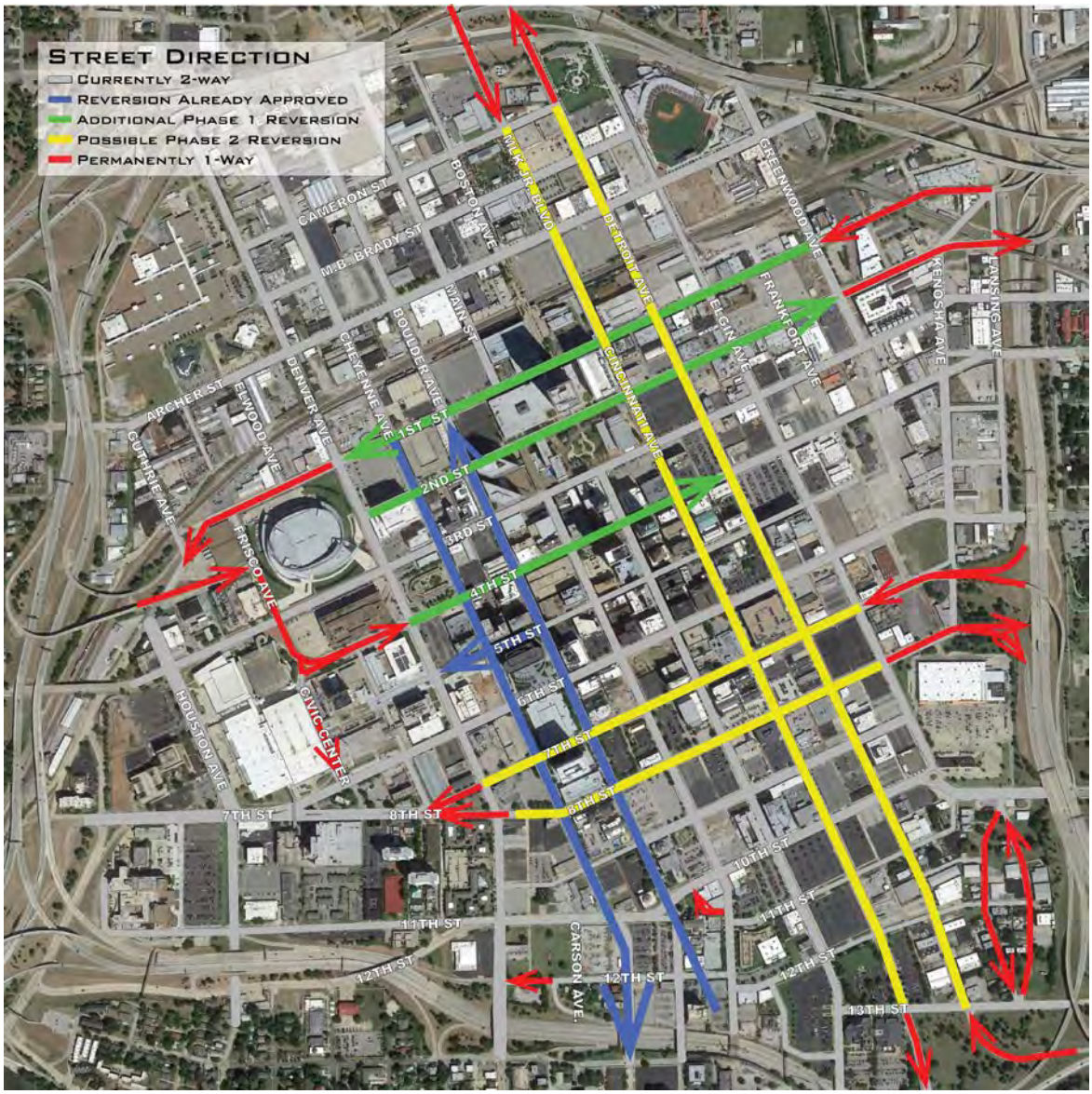
One concern about one-way reversions relates to access to private properties and parking structures whose entries were designed in response to the current one-way layout. There are a number of parking structures that will be approached differently as a result of the two-way reversion, but none would seem to require any

reconstruction to function properly. For example, the garage at the corner of Cincinnati and 4th—which already creates queues of drivers due to its valet-only management—may wish to reverse its interior flow so that cars enter from Cincinnati rather than 4th, but this change requires no construction. Otherwise, only the service ramps that lead off of Cheyenne Avenue under OneOK Plaza present a challenge, but that issue was already resolved in the City's current two-way proposal; if the southbound down- and up-ramps reverse roles and directions, they will present no conflict with two-way traffic on Cheyenne.

One final consideration regarding this partial reversion is timing, which theoretically presents some significant trade-offs. While it may not be possible to budget the entire effort in a single phase, it is usually less expensive to complete the project in one fell swoop, so that street signals at intersecting streets need be reconfigured only once. For example, if Boulder Avenue is reconfigured in 2017 and 1st Street in 2019, then the signal at their intersection would need to reconfigured twice.

However, an interesting condition exists in this case, as all of the intersections between the streets proposed for reversion are also intersections in which traffic signals will no longer be warranted or necessary once reversion is completed. As described ahead in Section 7, once both intersecting streets become two-way, they will function better with all-way-stop control. This circumstance would seem to reinforce the above discussion: if Boulder and 1st, as an example, are reverted in two phases, they will require a signal reconfiguration and then a signal removal. If reverted all at once, the signal can simply be removed.

The reconfiguration of signals is the greatest cost in reverting one-way streets to two-way traffic. As further described in Section 7, the entire Phase I reversion proposed here requires that signals be reconfigured at a total of 14 intersections, with the remainder of signalized intersections becoming all-way stops. The more that reconfigurations can be limited through this signal removal, and through careful phasing, the more affordable this effort can be.




*Tulsa two-way reversion proposal.*

In summary, a comprehensive overview of the proposed two-way reversion strategy is presented above. It must be noted that the many street designs presented in this report, as well as the traffic study conducted by Nelson\Nygaard, are all based on this proposed partial reversion scenario and would require modifications if a different Phase I reversion is selected.

### *2. The Proper Number of Driving Lanes in Tulsa*

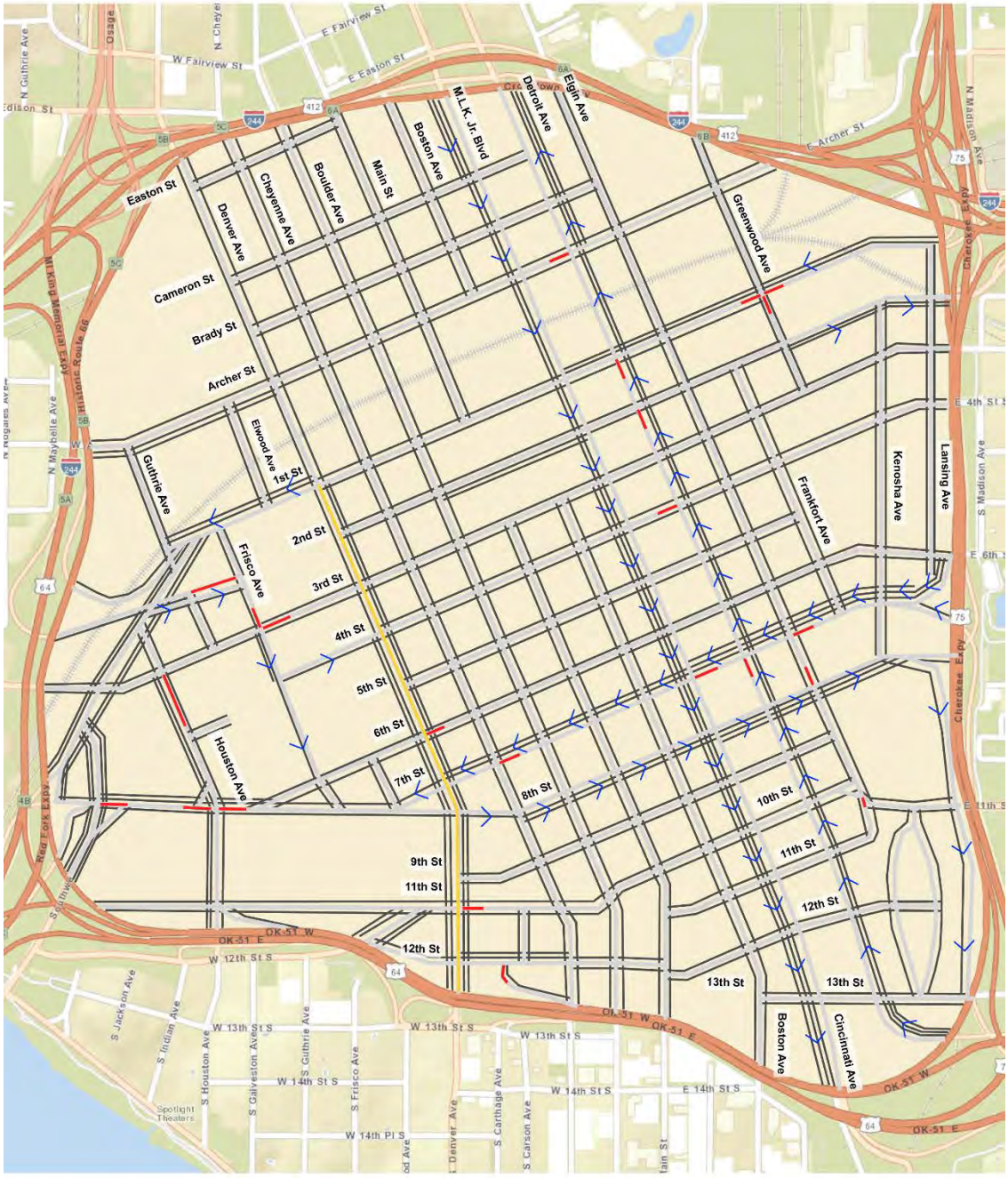
A central effort of this Walkability Study has been a careful analysis of anticipated future traffic downtown. Working with the City, Nelson\Nygaard established reasonable assumptions regarding anticipated future traffic within the network, and then determined how those trips were likely to be redistributed by the partial two-way reversion just discussed. While all such assumptions are merely guesses, it is worth remembering that, in a porous street network, each driver (a.k.a. "intelligent atomic actor") has the opportunity to shift to a parallel path if it sees congestion ahead, and therefore what matters most is the capacity not of each individual street but of the system as a whole.

As discussed, reverting additional streets back to two-way traffic alters the network function in a number of ways that impact traffic flow. One the one hand, it reduces the number of unopposed left turns; one advantage of one-way systems is that drivers can turn left without crossing oncoming traffic. On the other hand, reverting to two-way travel eliminates much of the circling that is needed for people to reach their destinations. In order to be doubly conservative in sizing our proposed street network, the trips saved by eliminating circling were simply not counted.

When one-way streets are reverted back to two-way, there is often a compulsion to insert many new left-turn lanes in fear of the congestion that may result from drivers having to turn across newly-opposing traffic. Here, restraint is needed to avoid an over-wide roadway. There will be certain intersections, where many drivers turn left, where such turn lanes are mandated. Additional turn lanes should be avoided lest they encourage speeding.

More information on the assumptions underlying the traffic analysis can be found in the Appendix. This analysis determined the number of lanes required to hold anticipated traffic in each downtown street subsequent to the two-way reversions proposed in the Study, producing the diagram below. This diagram then became the basis for the redesign of each downtown street.

## ANTICIPATED LANE DEMAND - PARTIAL 2-WAY REVERSION





*The anticipated demand for driving lanes in downtown Tulsa.*

The traffic analysis completed by Nelson\Nygaard has identified those locations where a left hand turn lane is needed to ensure smooth traffic flow on busy streets. However, in right-sizing downtown Tulsa's streets to match this diagram, there is one other important issue to resolve. Trucks sometimes double-park to load and unload on these streets, and the removal of extra lanes can make this act impossible. As streets lose these impromptu loading lanes, the City must work with business owners to identify alternative loading zones within a reasonable distance. One hopes that merchants will be incited to support this effort by the data surrounding two-way conversion and retail success.

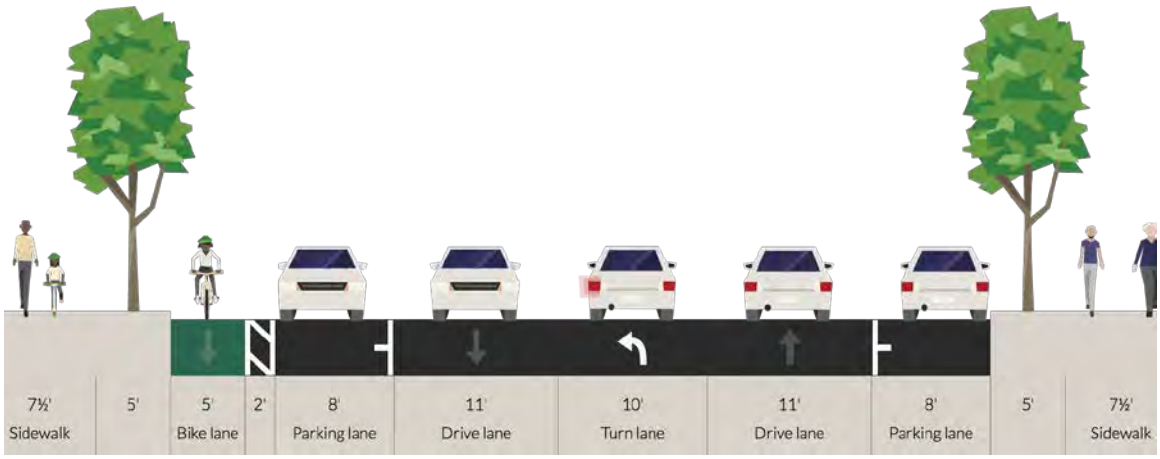
In a few cases, where such a solution seems impossible, it may make sense to introduce a center turn lane, and allow trucks to load from its midblock section. This solution, which can be found in many locations around the U.S., may seem awkward and potentially dangerous, but actually is another factor that causes drivers to proceed more slowly and safely on city streets.


*Center-lane loading already occurs in a number of locations in downtown.*

In recommending the above lane reduction, it is understood that a city cannot restripe all of its downtown streets with the flick of a switch. While much less costly than reconstruction, restriping takes dollars and time. It is essential to establish a priority ranking for such an effort—one of the tasks of this Study—but also to stress that, if a safer and more livable downtown is the goal, then right-sizing as many downtown streets as possible, as quickly as possible, must be a key objective.

### *3. Lanes of Proper Width in Tulsa*

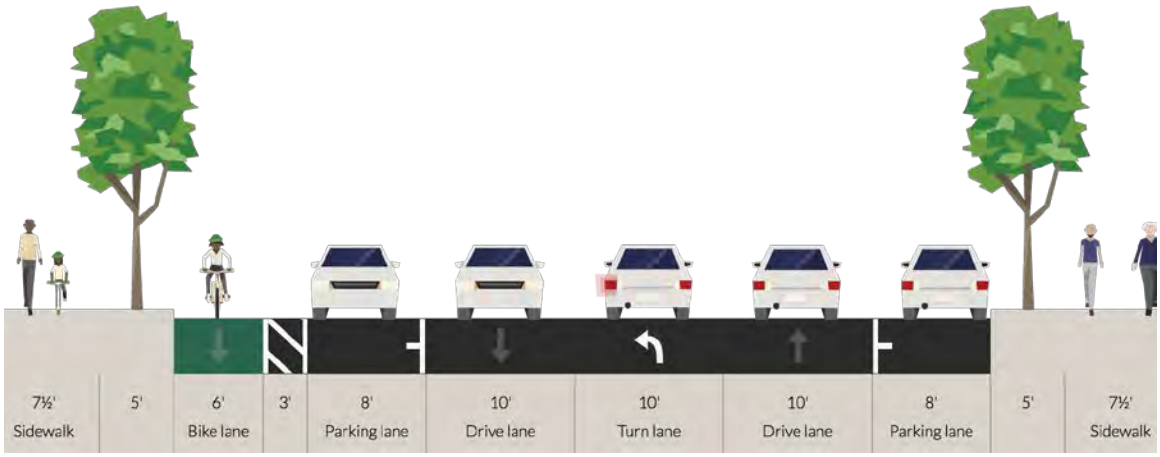
Every standard driving lane in downtown Tulsa that is more than 10 feet wide is a direct invitation to speeding and a threat to pedestrian safety. As already noted, about half of the lanes downtown already meet this 10-foot measure. The rest do not; many downtown street contain lanes that are 11, 12, even 15 feet wide and wider. Like removing extra lanes, replacing these wider lanes with a 10 foot standard creates a tremendous opportunity to reallocate pavement to better use while potentially saving lives.




*The current plan for restriping Boulder Avenue includes 11-foot lanes.*

Reducing these lanes to 10 feet wide, as shown below, results in a street in which fewer drivers are likely to speed. It also replaces a substandard cycle track, in which the car-door buffer is only 2-feet wide, with one that meets best practices.

It is important not to pull any punches here. Placing an 11-foot lane in a street with a 25-mph speed limit is an invitation to breaking the law. For that reason, with certain justified exceptions, all of the street redesigns provided ahead are based on a 10-foot standard.




*A safer and more bike-friendly solution would provide 10-foot lanes.*

<u>But What About Buses?</u>

11-foot lanes are often provided in order to meet the perceived demands of buses. But are they really necessary? In some cases, yes, as we shall explain.

Tulsa Transit buses are 8'-6" wide, plus mirrors. When a bus in a 10-foot lane passes a car in a 10-foot lane, there is no friction. When a bus passes another bus under similar circumstances, some "give" is needed in an adjacent area to allow smooth passage. This squeeze requires the bus to slow down slightly, for a moment that is too short to impact bus schedules, but has a positive impact on the street's safety to all users. Some transit agencies appreciate the value in the traffic-calming value of 10-foot lanes. The administrators of DART, in Des Moines, advocate for 10-foot lanes, reminding us that "every transit ride begins and ends with walking, and without walkable streets we are undermining the opportunities for public transit in the community."[1] However, DART is the exception; most agencies and standards recommend 11-foot bus lanes. Indeed, even NACTO allows for one 11-foot lane on streets that are active transit corridors.

This standard comes, as expected, from the worry that bus mirrors will collide when two buses pass each other on two 10-foot lanes, not knowing whether the adjacent roadway provides additional "give" to allow smooth passage. The real worry, then, is of being constrained to a clear zone 20 feet wide; 22 feet is considered necessary. For that reason, a more sophisticated standard allows 10-foot lanes in locations where there is 22 feet clear or more—in other words, where the street consists of more than two lanes flanked by parking. The presence of a center turn lane, a bike lane, or some other facility that widens the clear zone allows us to avoid the pitfalls of the 20-foot clear. This means that most downtown streets are in a position to handle buses quite adequately in 10-foot lanes—as many already do.

[1] Elisabeth Presutti, CEO, Des Moines Regional Transit Agency

Details

Some exceptions to this standard are needed. For example, it is standard practice to provide wider lanes against angle parking stalls, to allow more freedom of parking motions. As can be evidenced on Mathew B. Brady Street and elsewhere, angle parking is such an effective tool for calming traffic that these lanes do not pose a safety risk unless excessively wide. This Study limits these lanes to 12 feet across, in order to match the outcomes that the City has already provided so successfully on Brady.

Additionally, there are a few locations where a driving lane is proposed to sit right up against a curb, with no parking or bike lanes in between. In these locations, an 11-foot driving lane has been allowed to allay concerns about too tight a squeeze.

Finally, as pertains to driver behavior, a lane is only as narrow as it appears to be. When an unstriped parking lane is not full of cars, it effectively becomes a part of the adjacent driving lane, widening it perceptually by 7 feet or more, encouraging higher speeds. For this reason, it is important that all parking spaces have their outer edges clearly marked, with paint that is not allowed to fade out of sight.

Slow Flow Streets

It must also be noted that streets handling considerably less traffic may make use of a standard that is yet smaller. Across America, many historic and newer neighborhoods contain lower-speed streets with lanes as narrow as 8 feet wide. This "slow-flow" geometry is appropriate for low volume, non-regional streets that do not serve bus routes. A typical slow-flow street contains one or two 7- or 8-foot parking spaces flanking two 8- to 9-foot driving lanes. There are several instances in downtown Tulsa, most prominently the brick-paved section of Main Street, where applying slow-flow geometry would allow the return of much-needed curb parking.

*A new slow-flow street in Virginia contains 8-foot driving lanes and no centerline.*

Centerlines

Typically, slow-flow streets contain no centerline. The absence of a centerline on wider streets has produced positive results as well. On streets with standard-width lanes, one recent study found that removing the centerline from six well-used streets

effectively lowered driving speeds by an average of 7 MPH. It was found that, like wide lanes, centerlines give drivers confidence that they have a clear path, resulting in more speeding.[2]

Based on this recent information, more cities are making the choice to forego centerlines on certain moderately traveled streets, and such an approach is recommended for all two-lane two-way streets within the downtown. It is already the practice on the eastern segments of 11th and 12th Streets. However, to avoid driver confusion, particularly on streets that have been reverted from on-way to two-way traffic, it is advisable to mark the centerline for a short distance at each intersection—for example along the 20 feet of street adjacent to the stop bar—while leaving it unmarked for the remainder of the block.

[2] http://content.tfl.gov.uk/centre-line-removal-trial.pdf

### *4. Including Bike Lanes in Tulsa*

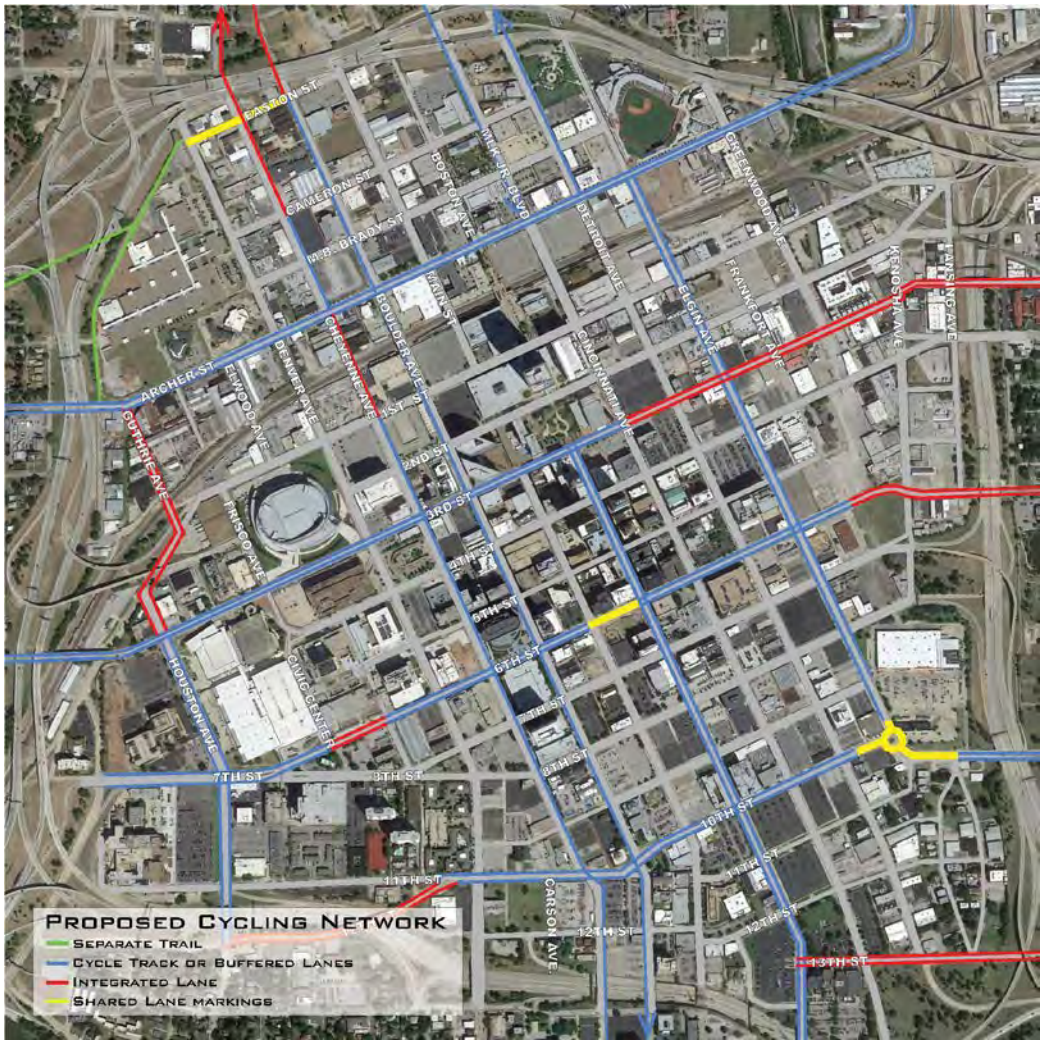
As noted, downtown Tulsa is well behind most American cities in its provision of bicycle infrastructure. If share-the-road markings—which probably do not improve biking population or safety—are not included, then the downtown bike map is largely empty. As seen below, the only facilities present can be found to the northwest, where Archer Street contains two blocks of bike lanes and the Katy Trail arrives behind the jail on a path that feels unsafe due to loitering.


*Downtown Tulsa's bike network is currently negligible.*

The good news is that the City is already taking measures to change this situation dramatically, and this Study provides an opportunity, through its recommended restriping, to create a new downtown bike network that is truly robust and effective.

Designing a cycling network is a complex and iterative task that must weigh many different factors. In making a proposal for downtown Tulsa, we considered the following factors:

- The recommendations of the GO cycling plan currently underway;
- The arrival points of regional bicycle infrastructure at the edges of downtown;
- The likely origins and destinations of cycling trip within the downtown;
- The desire for a sparse network that still reaches within a few blocks of all locations;
- The need for internal connectivity and avoiding dead-ends;
- The availability of excess pavement for reassignment to cycling infrastructure;
- The direction of vehicle travel and its implications on bicyclist safety;
- The opportunities presented by currently-planned resurfacing projects; and
- The desire to give the cyclist a path that is not just expedient, but pleasurable.




*A sparse network of high-quality cycling facilities provides safe access to within a few blocks of all downtown addresses.*

These factors led to the proposed plan presented above. It can be described as follows.

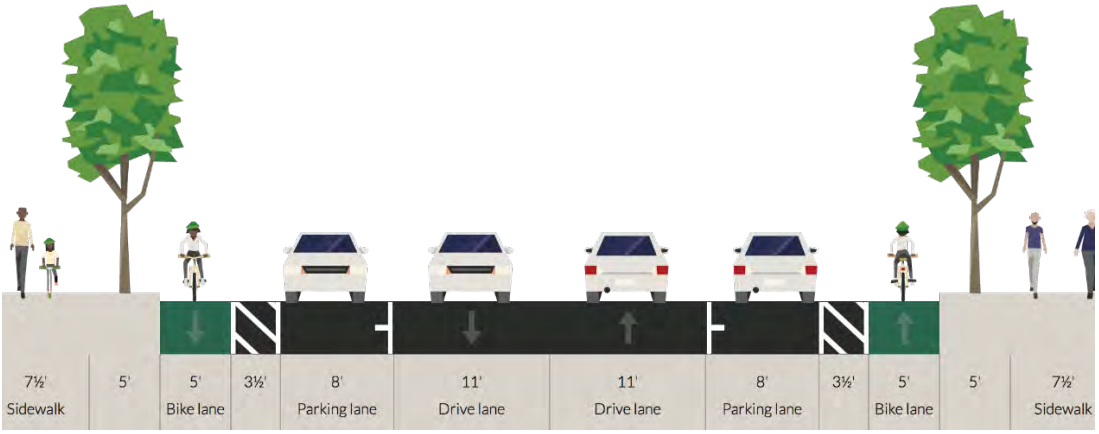
North-South:

- When they are reverted to two-way travel Cheyenne and Boulder Avenues are already slated to receive a bike lane in each direction. This strategy is embraced, but the bike lane is replaced by a cycle track wherever space exists, which is in all locations except in Cheyenne north of 1st Street. This facility covers the western half of the center of downtown.
- North of Archer, M.L.K. Jr. Boulevard and Detroit Avenue are also being restriped to include bike lanes. Properly sizing these streets' travel lanes allows for these lanes to be one-way cycle tracks as well. These lanes are instrumental in bringing students northward toward OSU Tulsa and Langston University, and should be continued safely beyond those anchors. .
- South of Archer, Cincinnati Avenue no longer has enough extra space to include cycling facilities, so the pair of cycle tracks are moved east to Elgin Avenue, a two-way street with ample pavement and lower car volumes. The east-west transfer occurs along Archer Street. This cycle track covers the east side of downtown.
- An additional north-south facility is needed on the far west side to connect the western ends of the planned east-west network. This is achieved by placing bike lanes in Guthrie Avenue, a short segment of Heavy Traffic Way, and along Houston Avenue to 3rd Street. At that location, Houston widens, and its traffic loads suggest that one of its northbound travel lanes can be eliminated beyond the southern edge of downtown. This provides the opportunity for cycle tracks to be located on both flanks of the street all the way south to 12th Street, where they will connect with the cycle track there. These changes require construction of the median between 4th and 7th Streets.
- Finally, a north-south corridor is still needed in the heart of downtown between Cheyenne and Elgin Avenues, which are 5 blocks apart. Midway between them is Boston Avenue, which has the least car traffic and the nicest views in downtown, and also connects directly to Tulsa Community College and its 7,000 in-town students. This facility can eventually reach from 3rd Street past the IDL, where it can continue all the way to 18th Street. The segment of Boston Avenue beyond the IDL should receive a classic 4-to-3 road diet, where its two lanes in each direction are replaced by two bike lanes flanking two driving lanes and a center turn lane.

East-West:

- Just south of the north leg of the IDL, sharrows are placed in slow-speed Easton Street to indicate the link between the Trail and the Cheyenne/Boulder facility.
- With its ample pavement width, low traffic volumes, excellent connections beyond downtown, and its minimal amount of angled parking, Archer Street provides an ideal corridor for a pair of east-west cycle tracks serving the Brady and Greenwood districts.

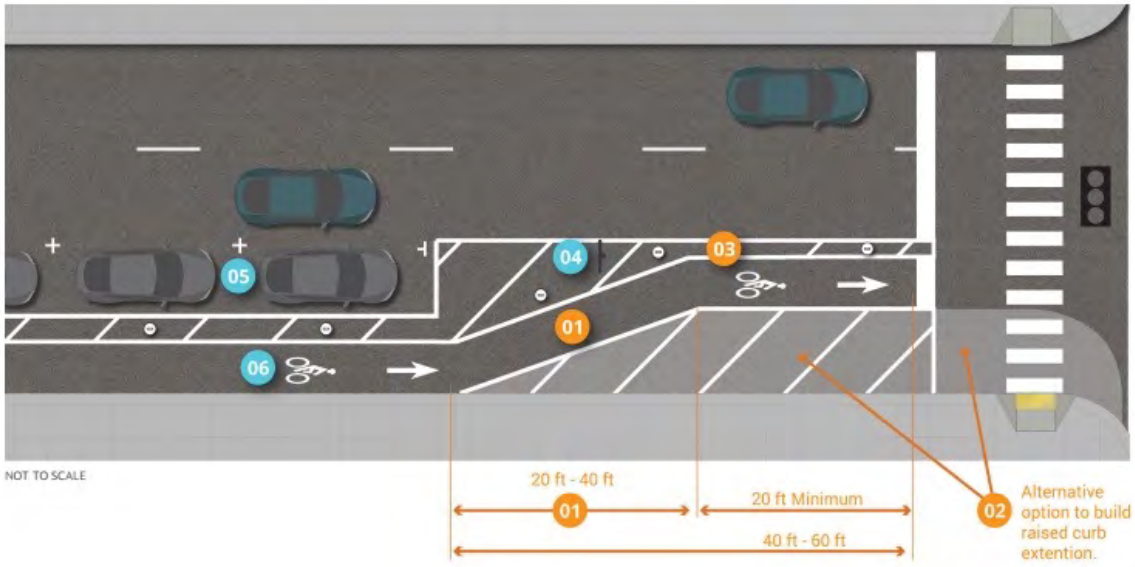
- 3rd Street has most of the same qualities as Archer, and is the first street south of Archer to reach safely beyond to the IDL, including to the Pearl District and the Midland Valley Trail to the East. West of Cincinnati Avenue, it is wide enough to hold two cycle tracks. Further east, they become standard bike lanes.




*This ideal dual-cycle-track condition is proposed for the main segments of Elgin Avenue, Archer St., 3rd, St., and 6th Street.*

- Between 3rd and 10/11th Streets, only 6th Street provides the opportunity for safe passage from east of the IDL all the way to Houston Avenue. Depending on its width, it receives a pair of either cycle tracks or bike lanes. Between Main and Boston Avenues, the introduction of a median requires one block of sharrow markings instead.
- Route 66 is planned to approach downtown from the east on 11th Street with a cycle track, and a cycle track is already funded for 12th Street where it brings Route 66 into the west side of downtown. Between these two, that facility should continue as a cycle track along 10th and 11th Streets. Where 10th and Elgin intersect at the new roundabout, sharrows and careful signage will be needed to announce the merge condition.
- Bike lanes are planned to approach downtown from the east along 13th Street, and these are continued to their terminus on Boston Avenue.

The outcome of the above facilities is a network that amply serves the entire downtown with four principal north-south corridors and four principal east-west corridors. By placing facilities in less than a third of all downtown streets, evenly distributed, it brings cyclists within two blocks of every address within the IDL.




*An illustration of how to angle a bike lane around a curb extension with minimal loss of parking spaces.*
*Source: Federal Highway Administration's Separated Bike Lane Planning and Design Guide, p110.*

One detail to make note of is the slight impediment to curbside bike lanes presented by curb extensions, or "bulb-outs" already present in the downtown. When the curb extends outward into a parking lane in order to shorten crossing distances at intersections, this requires that any new curbside bike lanes flare around that extension. The proper technique for doing so is shown above. Since every curbside parking space has value, it is recommended that a minimal length chamfer zone be provided, such that the full distance from the stop bar to the first parking space be limited to 40 feet.

When transforming a largely non-existent bike network into a complete one, the biggest challenge is funding and the biggest question is prioritization. It is hoped that a dedicated funding source can be identified to accomplish this effort in short order. In that regard, we note that the City of London just committed £770 million (about $1 Billion) to its already healthy cycling infrastructure. If applied per capita, that would translate to about $45 million in Tulsa. The plan proposed here could likely be accomplished for a fraction of that amount.

Absent immediate funding, the desire to complete much of this system in the near future is one key factor that will be used ahead to determine the prioritization of the street redesigns proposed by this Study. Given the large size of the downtown—roughly 16 blocks square—it will be difficult to encourage more cycling until at least two of the north-south and two of the east-west cycle tracks are complete.

This point is worth additional attention. It will be difficult to assess the success of the nascent cycling network until it is large enough to be useful. That is one reason why a major first phase is needed.

On the same token, there will no doubt be many people who argue against the value of a cycling network in Tulsa, where so few people can be seen cycling. Again, it must be stressed that cycling population has shown itself globally to be a function principally of cycling infrastructure. To say that we should not build bike lanes in Tulsa because nobody bikes is like saying we shouldn't build a bridge across a river because no one is walking on the water.

Finally, it is hoped that Tulsa's planned bike share system will consider this plan in determining where to locate its facilities. For example, a bike share station on Boston Avenue at both 3rd and 10th Streets would encourage students to zip downtown for lunch without resorting to driving.

### *5. Providing Continuous On-Street Parking and Street Trees in Tulsa*

Four principal measures are recommended to better protect the sidewalks in downtown Tulsa from moving traffic. They are:

- The restriping of streets to provide more curbside parking;
- The consistent application of limited sight-triangle distances at corners and driveways;
- The proper pricing of curb parking; and
- A requirement for ample shade tree provision along all rebuilt curbs.

Each of these measures is discussed in turn below.

Restriping for Parking

As noted, a principal recommendation of this Study is to right-size all downtown streets to the number of driving lanes demanded by the amount of traffic they handle. Doing so allows much asphalt to be put to better use, and that use is either cycle facilities or curb parking. Cycle facilities were located in the previous section, making use of a certain amount of that resource; all remaining available extra pavement is now available to increase the amount of curb parking downtown.

On some streets, this increase may take the form of adding a lane or two of parallel or angle parking. In others, it may mean turning parallel parking into angle parking. In some it may mean both. The amount of new parking a street can receive will be a simple function of how much extra room it has.

We are fortunate that the City has already pioneered this effort in the reconstruction of certain streets downtown, most notably M.L.K. Jr. Boulevard/Cincinnati Avenue and Mathew B. Brady Street. On Cincinnati, between 4th and 8th Streets, a four lane cross-section with parallel parking was transformed into a three-lane section with parallel parking on one side and back-in angle parking on the other. On Brady Street, a variety of configurations have been introduced depending on the width of the street. These vary from half-parallel half-angle to all-angle, with that angle being either 45° or 60°. All angle parking spaces on Mathew B. Brady Street are head-in rather than back-in.

Because they perform so well in providing parking and calming traffic on Mathew B. Brady Street, it is worth noting the rules implied by Brady Street's various configurations:

- A street 45 feet wide or wider can include angle parking on one side. 18 of those feet are dedicated to the parallel parking lane and its driving lane. 27 feet are dedicated to the angle parking and it's driving lane. This parking is angled at 45° to take less space in this narrow configuration.

- Once 30 feet become available for angle parking plus driving, the 45° angle is allowed to be a more conventional and efficient 60° angle. By this logic, one can see on Brady that 55-foot-wide segments have two sides of 45° angled parking, 60-foot-wide streets have two sides of 60° angled parking, and 58-foot wide streets have one side of each type.

These measurements have been accepted as a standard in this effort and are used as building blocks for many of the street restripings ahead.

The difference between Brady's head-in parking and Cincinnati's back-in parking deserves comment. Many cities across America are now experimenting with back-in parking. The recent tradition has been for angled parking to be nose-to-the-curb although, historically, many Main Streets did it the other way around. Recently, it has been determined that back-in parking is considerably safer than head-in. As a result, dozens of Main Streets nationwide have reintroduced back-in parking—including Austin, Charlotte, Honolulu, Indianapolis, New York, Seattle, Tuscon, and Washington—and accidents are down, especially those involving bikes. Tuscon, for example, averaged about one bicycle/car crash per week before converting from head-in to rear-in parking. Four years into implementation, no such crashes had been reported.


*The City recently restriped Cincinnati Avenue to include back-in angle parking on one side.*

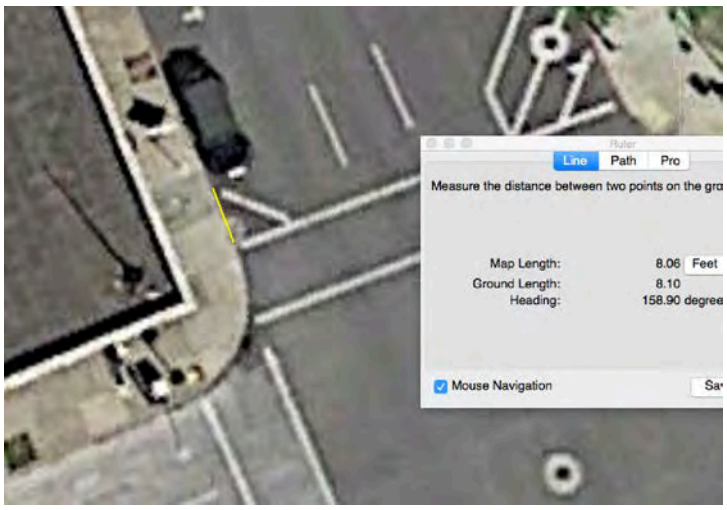
The additional safety comes from the fact that, with back-in parking, the reverse motion is into the curb, while head-in parking requires drivers to back into moving traffic. Back-in parking is also more convenient for loading and unloading, and safer for getting ones children to the curb. The only major problem with back-in parking is that some people don't like it, mostly because they are not used to it. To be fair, it does require more skill to back into a tight parking space than into a wide-open street—but it's still easier than parallel parking.

The City is to be commended for striping back-in parking on Cincinnati Avenue. The majority of mid-sized American cities have not yet summoned the courage to try it. And, unlike other places, like Cedar Rapids, Iowa, there does not seem to have been much significant public backlash against it. In focus groups, there were few complaints. Perhaps Tulsans are just better at backing up their vehicles than people in other cities.

Given the success of the pilot project on Cincinnati, all angle parking recommended in this Study has been shown as back-in. It should be understood that this recommendation is flexible. Downtown, Tulsa has only experimented with back-in parking on one-way streets. Just to the south, however, an installation exists on two-way Riverside Drive. Two-way streets provide more opportunity for driver confusion, and an education program may be needed, including instructional signage, to keep people from cutting across two-way streets to park head-in on the wrong side. There may be locations where back-in parking is not advisable. That said, we would recommend against putting front-in angle parking along any street that attracts a significant number of cyclists, because front-in parking and cycling simply are not a safe combination.

Limited Sight Triangle Distances

The sight triangle requirement deserves special attention in Tulsa, because its inconsistent application has resulted in the loss of many on-street parking spaces. In many locations, parking is not allowed within 20 feet of a crosswalk. In others, a standard of about 8 feet is used, which is more in keeping with what is found in more walkable cities. This 8-foot standard should be applied on all future restripings.




*On a recently restriped segment of Cincinnati Avenue, parallel parking begins 8 feet from the crosswalk, an appropriate standard, as greater distances can encourage speeding around corners.*

A similar concern exists around curb cuts, discussed in more detail below. In this case, the standard seems to have crept upward over time, from just a few feet, to what is now a full 16 feet. Such a large standard is not in keeping with the practice in more walkable cities.

Below are images of a curb cut on 7th Street before and after a recent restriping. An area that was once legal for curb parking has been striped out, to enlarge the sight triangle. Because there are so many driveways downtown, creating wide parking setbacks around them has resulted in many block faces lacking parallel parking entirely. The result is streets that feel wider, inviting speeding, and sidewalks that are unprotected by parked cars.

Because it is counterintuitive, this point needs repeating. Wide sight triangles cause drivers to speed in and out of driveways across sidewalks, endangering pedestrians. They can be expected to reduce safety, not improve it. Unsurprisingly, focus group participants complained of drivers entering driveways quickly and not showing proper respect to people walking. Tighter sight triangles would help cut down on this dangerous practice.


*7th Street, before and after: recent restripings have eliminated on-street parking to the right of a parking lot driveway.*

It is therefore clear that, a new standard needs to be established regarding driveway parking setbacks. In Des Moines, the rule is 2 feet. In New York City, the rule is zero feet. 3 feet would seem to be a reasonable standard, to be applied on all future restripings.

Pricing Curb Parking

Curb parking does not provide its traffic-calming role if it is empty. Whether or not a parking space is used is a function of two factors: price and convenience. If these two factors do not exist in a proper relationship, parking will not be utilized properly. This phenomenon will be discussed at length in the Parking section ahead. For the purposes of this discussion, it must be stressed that, unless inconvenient parking is inexpensive, it will not be used.

Many on-street parking spaces in downtown Tulsa currently go unused most of the time. Many more are likely to be introduced with the implementation of this Study. These spaces, like all downtown spaces, must be priced in a way that reflects their value. Just as some over-subscribed downtown spaces need to cost more, many undersubscribed spaces need to cost less. For some, that cost will be zero.

Many of the changes proposed herein will fail to have the desired effect unless parking spaces are priced to sell. To cite just one important example, a protected bike lane is not protected by parked cars when no cars park.

Planting More Shade Trees

It is encouraging to see that the downtown's newest streetscapes, like new sidewalks built along Detroit Avenue and M.L.K. Jr. Boulevard near the IDL, include steady rows of shade trees. These installations suggest that current regulations and practices demand street trees as part of all new curb repairs downtown. This circumstance should be confirmed and celebrated, and reinforced with a commitment to fund maintenance of all new plantings. If not given dedicated care, most urban trees will not live very long.


*New sidewalks on Detroit, M.L.K., and elsewhere suggest a proper tree-planting standard is in place.*

This experience along new sidewalks contrasts markedly with the typical curb in downtown Tulsa, where it is sometimes difficult to find more than one tree in a row. An effort should be made to return trees to those streets that are missing them, but such an effort needs to be prioritized based upon where people are likely to walk. This Study will offer a list of priority streets where efforts to replenish the urban canopy should be directed first. Given the great expense of creating new tree

pits, all efforts should first focus on replacing missing and damaged trees rather than creating new places for them. Whenever a curb is rebuilt, however, it should be done to the standard shown above, with proper tree pits placed continuously along the sidewalk edge at a spacing not to exceed 30 feet on-center.

When locating trees along Tulsa streets, the City should approach sight triangle requirements with the same skepticism already encouraged above. First, it can be argued that reduced visibility around corners at intersections, far from increasing safety, can instead increase driver confidence and vehicle speeds. Second, it should be noted that tree trunks are narrow and do not obstruct views in a meaningful way. As evidenced in a 2006 study by the Institute of Urban & Regional Development, street trees, if pruned correctly, cause less visibility problems than newspaper racks and on-street parking and can therefore be planted close to intersections, as they do not cause significant sight obstruction.[3] We recommend that, when making a planting plan for new curbs, the fist tree pit at each corner should be located about 10 feet back from the edge of the crosswalk.

*Crepe myrtles, like those planted along Easton Street, provide little shade while crowding adjacent sidewalks.*

A final important note concerns tree species. It is clear that the City's current list of approved street trees includes a number of species that are not properly considered as such. Even full grown, crepe myrtles and other bush-like trees do not provide the shade and sense of protection of a sycamore or oak. The list should be edited to eliminate trees that do not have columnar trunks, proper canopies, and significant height at maturity. Most good street trees grow well over 30 feet tall, with canopies at least 30 feet wide.

[3] "Street Trees and Intersection Safety" http://www.uctc.net/research/papers/768.pdf

### *6. Limiting Sidewalk Curb Cuts in Tulsa*

The physical city is a product of written rules. Somewhere along the line, unlike other cities, Tulsa began to allow property owners unlimited curb access to their properties. While other cities do not allow any curb cuts to alley-accessed lots, Tulsa would appear to allow as many as are desired, including continuously along the full property frontage. The outcome is a downtown in which sidewalks, on-street parking, and potential bike lanes are all undermined significantly.

It is clear how the design of surface parking lots has responded to Tulsa's current curb cut rules. Below can be seen two parking lots on 8th Street. The lot to the left is built surrounding its alley, and requires no additional driveways along the sidewalk. (Despite this fact, it has still taken an extra one, visible to its upper right.) The newer lot, to the right, has ignored its alley entirely, and run all five of its drive aisles directly into the street. Effectively, it has appropriated the street as an aisle for moving between parking bays.


*Old vs. new parking lot design: When a lot is allowed as many curb cuts as it wants, it takes them all.*

While the sidewalk along the left parking lot feels safe to walk on, the curb against the right one does not. While the curb against the left parking lot can potentially hold 12 parked cars, the curb against the right one can hold, at most, 4. Tellingly, these spaces are not striped.

Parking lots like this one to the right can be found throughout the downtown. The already-planned restripings of M.L.K. Jr. Boulevard/Cincinnati Avenue, Detroit Avenue, and Boulder Avenue suffer inordinately from their adherence to redundant and completely unnecessary curb cuts along private properties. While one does not want to delay these efforts, it is frustrating to see streets restriped to

such a compromised outcome, when property owners have not even been asked about the possibility of modifying their street access.

The best approach to this crisis would appear to be a two-step process. First, to stop the bleeding, the City should immediately pass a rule allowing no new curb cuts for properties downtown, with notable limited exceptions for parking structures and other necessary auto-oriented businesses. Any new curb cuts should be limited to 20 feet in width for parking structures, and 10 feet otherwise. Second, particularly in high priority areas—where pedestrian life is desired—the city should create a properly funded program for closing existing curb cuts that are unnecessary or redundant. This effort should begin immediately for streets about to be restriped.

Such a program to close redundant curb cuts would need to be structured in a way that acknowledged the cost to property owners, in time and effort, of closing these access points. Ideally, it would provide the following owner-assistance process:

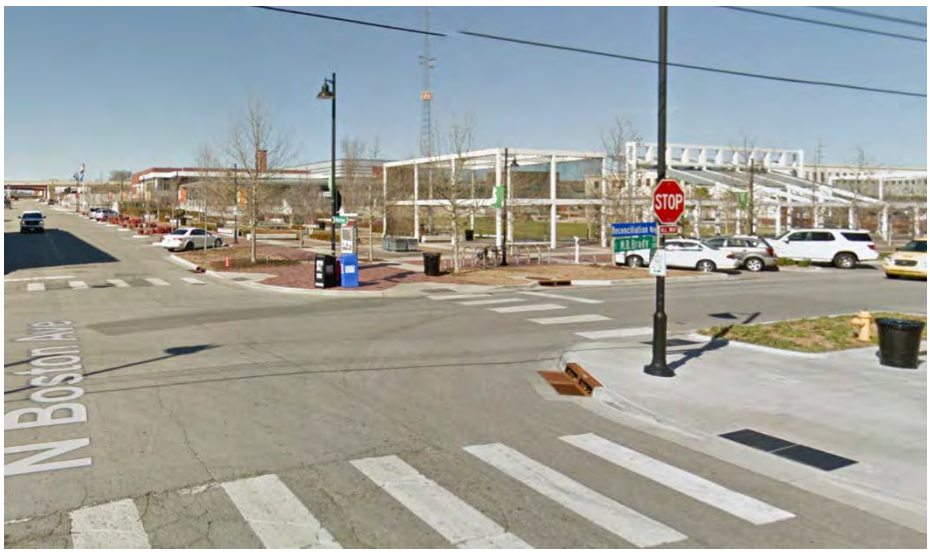
- Property owner notified of upcoming curb replacement. Meeting requested. If owner chooses not to meet, curb will be replaced without owner involvement.
- For cooperating owners, City provides design for reconfiguring owner's property, and executes design with owner's approval.
- In some cases, reconfiguring a property such as a parking lot will result in a net loss of interior parking spaces, representing a foregone revenue to the owner. This anticipated revenue should be calculated according to a standard formula as the net present value of future income, and paid in a lump sum to the owner as a subsidy.

If properly executed, this owner-assistance program can be funded principally from the additional revenue that the city will receive from new curb parking installed along the reconstructed curbs.

The above proposal is is a first attempt at a viable and fair process for replacing curbs in downtown Tulsa. It is not based on best practices, because it is, to our limited knowledge, unprecedented. This fact is not entirely surprising, given how much more acute this problem is in Tulsa than in most other cities.

### *7. Replacing Unwarranted Signals with All-Way Stop Signs in Tulsa*

When street networks are right-sized to meet traffic volumes and one-way streets are reverted to two way traffic, many intersections that were previously not good candidates for all-way stop signs become viable for signal removal. This happens because the greatest challenge to all-way-stop function is having multiple lanes intersecting in multiple directions. When any street approaches an intersection with more than one through-lane, all-way stops become confusing to use, as drivers are not sure who is supposed to take the next turn. At the time of this Study, this condition could be observed at the corner of Cheyenne Avenue and 6th Street, where a temporary stop sign created much confusion among drivers who were sometimes approaching the intersection two at a time from the same direction.




*A successful application of all-way stop function can be seen at Boston Avenue and Mathew B. Brady Street by the Guthrie Green.*

When a four-lane street becomes two-lane, or a multi-lane one-way becomes two-way (with one lane in each direction), all-way stop signs become easy to use.

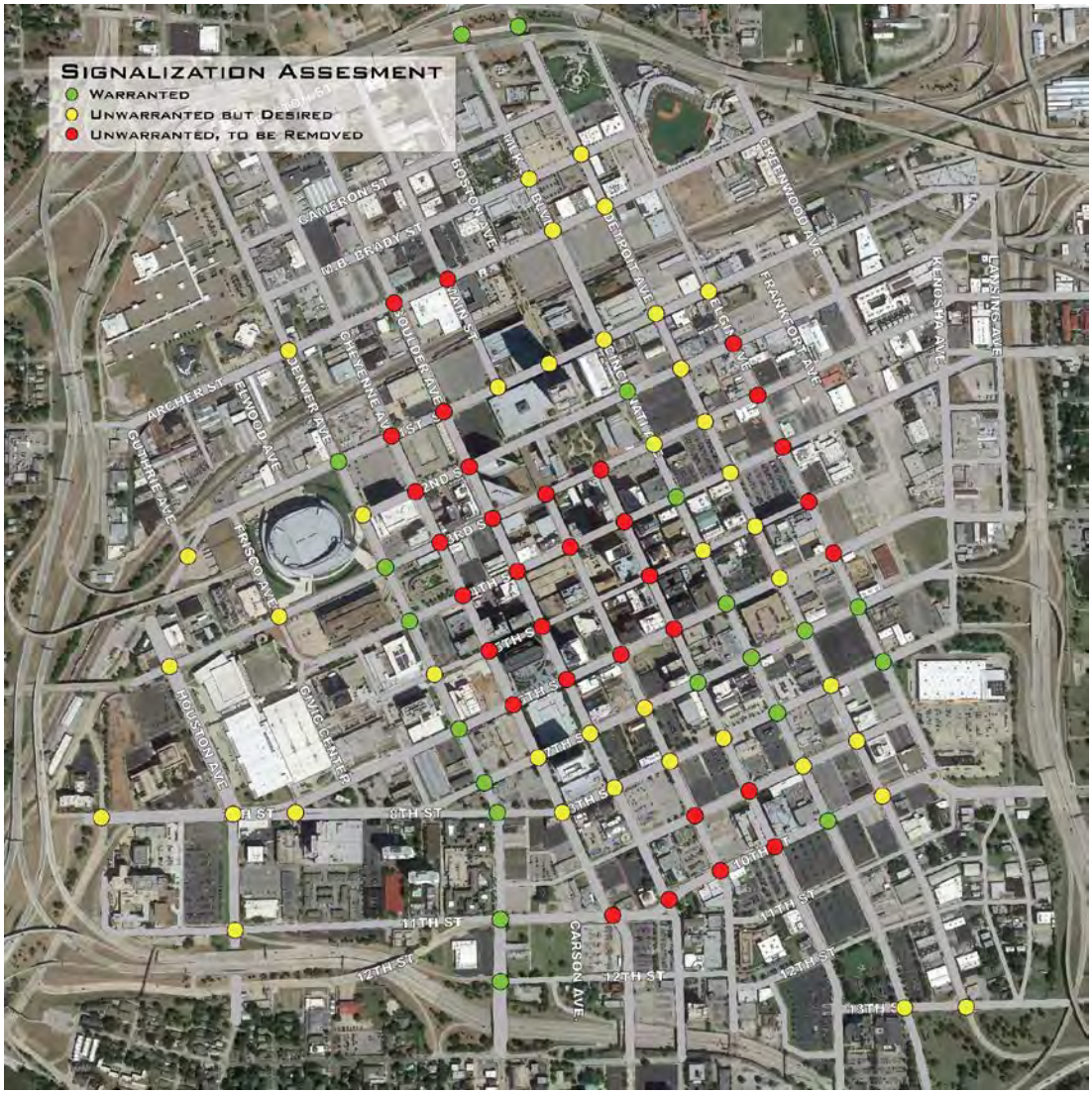
Presuming traffic volumes are not high enough to warrant a signal, signal removal is prudent if the goal is to achieve greater safety. However, there are still some locations where it makes sense to keep signals in place. Most obvious would be along the remaining one-way streets, where a green wave provides drivers with an expedited path through downtown. Next, there are some places where cross traffic is too light to justify an all-way stop, suggesting a two-way stop solution. Since two-way stops are bad for pedestrians, the safer solution would be to keep the existing signal in place.


*Once the system of lanes is right-sized and half-converted to two-way, most downtown signals will no longer qualify for warrants.*

The signalization regime proposed below is based on the street network recommended above, in which most streets see a reduction in lanes and all but two one-way pairs are reverted. A different solution would produce a different proposal. Analyzing this layout, it became evident that most downtown intersections will not handle enough traffic to warrant signals. This analysis, which can be found in the Appendix, applied the guidance of the Manual on Uniform Traffic Control Devices (MUTCD) to eight hour, four hour, and peak hour traffic.

In some states, like Pennsylvania, cities are not allowed to put signals where they are not warranted by volumes. In Oklahoma, doing so is allowed, but often not wise for the reasons discussed. Under the planned reconfiguration, only 20 of the downtown's current supply of 91 signals would remain warranted, as shown above.

However, among the 71 unwarranted signals, there are reasons to keep many of them. 25 of these signals sit on the two one-way pairs of M.L.K. Jr. Boulevard/Cincinnati Avenue & Detroit Avenue and 7th & 8th Streets. Three of them are located at intersections with one dominant direction of travel, where signal removal would result in an undesired two-way or one-way stop condition. Several others were located at intersections planned to have more than one through lane is a given direction, such as on the 5-lane section of Denver Avenue. About ten more were in places where nobody is likely to walk, whatever the conditions. All in all, 39 unwarranted signals were deemed worthy of retention, leaving 32 for which removal seems the proper option.




*Of the many unwarranted signals downtown, justification could be found for keeping more than half.*

The above proposal also keeps all signals in place within a block of the BOK Center, the Cox Business Center, and ONEOK Field, to help drivers negotiate post-event crowds. Other signals can be retained where crowd control is determined to

be a problem, but that decision should be made only in places where a rare event can't be handled by a crossing officer.

While there is some short-term cost to removing the 32 signals shown in red in the above diagram, the long term financial prospects are more than positive. Each signal represents a long-term maintenance burden, and will also need eventual replacement. In this context, the roughly $6,000/intersection cost of signal removal would seem a good investment.

A word is also needed about the driver experience that accompanies the replacement of signals with all-way stops. It is true that, compared to a network of signals, a network of stops signs result in a drive that is interrupted by more pauses. Drivers must reduce their speed to near zero at every controlled intersection. However, these pauses are all quite brief. Never does the driver have to sit and wait for a light to turn from red to green. Such waits at signalized intersections are often 30 seconds long or longer, and, across a network, can add up to a lot of time wasted. As a result, while a trip through a network of stop signs will involve more stops than the same trip through a signalized network, it can often take less time. Surprisingly, more stops can mean a quicker commute.

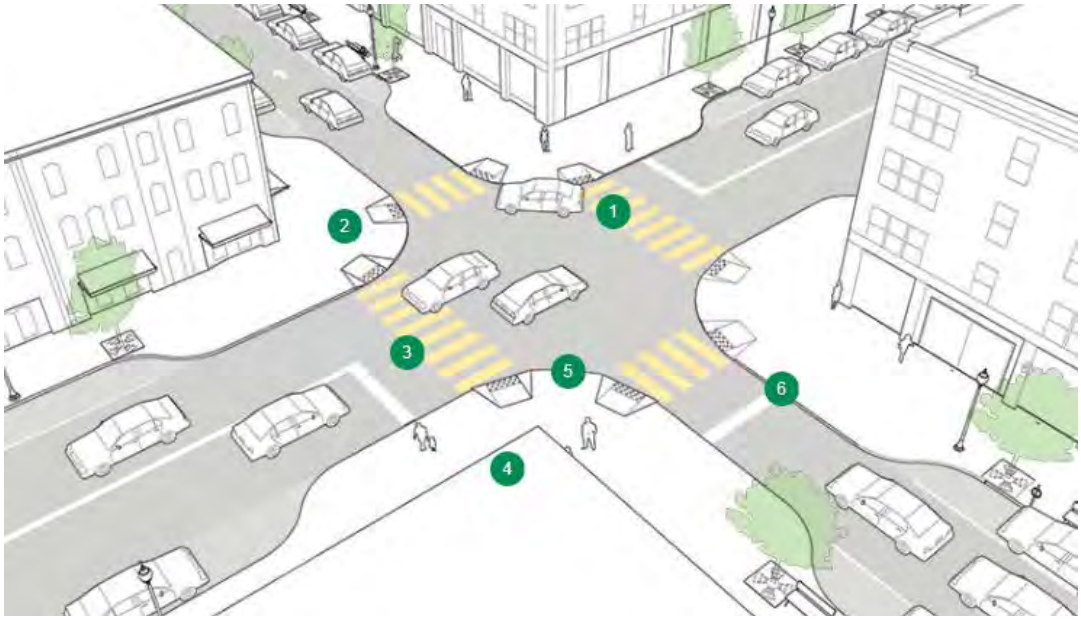
It is clear that removing these 32 signals represents a win-win scenario, in which increased safety is met by reduced public expenditure without lengthening travel times. This Study recommends that, particularly to save funds, the signal removal be done directly in conjunction with the street reconfigurations, without delay. As noted above, these signal removal recommendations stem from the suggested street reconfigurations and may not make sense in their absence.

### *8. Providing Proper Crosswalks, Signals, and Lighting in Tulsa*

Crosswalks

As noted, due to budgetary constraints, crosswalks in Tulsa are not consistently well marked, and are mostly not up to the current best-practice standard of striping. Established and illustrated by the National Association of County Transportation Officials, that standard includes the following (Source: *NACTO Urban Street Design Manual):*

1. Stripe all signalized crossings to reinforce yielding of vehicles turning during a green signal phase. The majority of vehicle–pedestrian incidents involve a driver who is turning.
2. Stripe the crosswalk as wide as or wider than the walkway it connects to. This will ensure that when two groups of people meet in the crosswalk, they can comfortably pass one another. Crosswalks should be aligned as closely as possible with the pedestrian through zone. Inconvenient deviations create an unfriendly pedestrian environment.
3. High-visibility ladder, zebra, and continental crosswalk markings are preferable to standard parallel or dashed pavement markings. These are more visible to approaching vehicles and have been shown to improve yielding behavior.




*The numbers above correspond to the recommendations here.*

4. Accessible curb ramps are required by the Americans with Disabilities Act (ADA) at all crosswalks.
5. Keep crossing distances as short as possible using tight corner radii, curb extensions, and medians. Interim curb extensions may be incorporated using flexible posts and epoxied gravel.

6. An advanced stop bar should be located at least 8 feet in advance of the crosswalk to reinforce yielding to people walking. In cases where bicycles frequently queue in the crosswalk or may benefit from an advanced queue, a bike box should be utilized in place of or in addition to an advanced stop bar. Stop bars should be perpendicular to the travel lane, not parallel to the adjacent street or crosswalk.

With so many crosswalks ready for improvement, the cost would seem too high to launch an downtown-wide restriping effort. One of the tasks of this Study is to create a means for prioritizing tasks of this nature, so that an affordable first phase can be identified. Ahead in this document can be found a designation of the downtown's Priority, Primary, and Secondary Networks of Walkability—the locations where pedestrians are most likely to be found. It is recommended that all crosswalks be brought up to best practices first within the Priority Network, next within the Primary Network, next within the Secondary Network, and only eventually downtown-wide.

Beyond that, however, it is worth considering crosswalks as opportunities for public art. Tulsa is special in the number of skilled graffiti artists that are active in the downtown. It would be lovely to see a competition created, sponsored by a local nonprofit, to create a zone of artistic crosswalks in a particularly lively part of downtown.


*One of many artistic crosswalks recently installed in Madrid, Spain.*

Such an effort would require the active collaboration of the City, and a willingness to accept crosswalks that are not in keeping with established standards. While no studies have yet been completed, impressions among users is that these unusual crosswalks, by attracting the interest of pedestrians and drivers alike, result in more cautious use of the intersection.

Signals

As noted, Tulsa is a downtown with few pushbutton crossing signals, which puts it in the company of America's most walkable places. However, pushbuttons have recently been introduced in a few locations, such as those on Brady Street at M.L.K. Jr. Boulevard and at Detroit Avenue, suggesting a negative trend. These pushbuttons should eventually be removed, and as intersections are modified in downtown, no new pushbutton signals should be added. To be truly walkable, every intersection should always allow pedestrian travel in one direction or the other. If the north-south crosswalk says "Don't Walk," the east-west crosswalk should say "Walk."

This sort of "concurrent" signalization regime demands that drivers who are making turns wait for pedestrians to clear the intersection before attempting to do so. In order to increase the safety of this circumstance, the City should introduce Lead Pedestrian Interval (LPI) devices as feasible. As mentioned in Part I, the LPI gives pedestrians the walk sign a few seconds before the light turns green allowing them to claim the crosswalk before it is encroached by turning vehicles. Such a signal is generally the safest and most convenient solution for people walking. This type of signalization should be implemented whenever a crossing signal is replaced within the Networks of Walkability, and perhaps more aggressively in areas with the highest pedestrian activity.

Lighting

In focus groups, there were not many complaints about the adequacy of lighting within the downtown, with the two exceptions of the convention center area and the Greenwood District. It is recommended that these locations, which sit on the Primary Network of Walkability, be given immediate attention. As an area of shops and restaurants, North Greenwood Avenue should be designated to receive a larger number of smaller, human-scaled streetlights rather than larger high-watt stanchions.

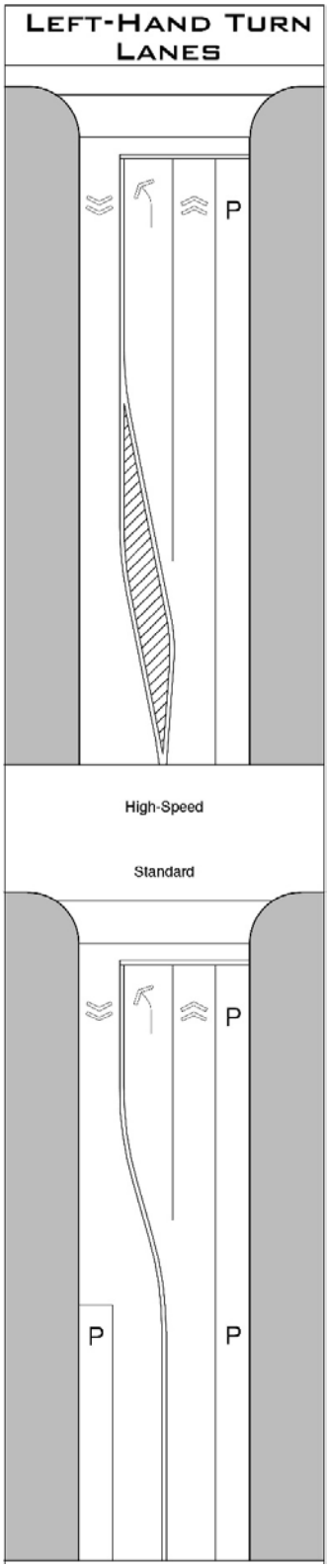
### *9. Avoiding Swooping Geometries in Tulsa*

Left-Turn Lanes

As noted, swooping geometries cause cars to speed up, and make pedestrians feel unsafe. As the introduction of more two-way travel results in the provision of some new left-turn lanes, it is important that the City design these facilities to an urban standard, which does not include a pre-swoop center stripe zone. As illustrated here, this zone tells drivers that that they are on a highway, encouraging higher speeds.

The urban standard results in the area approaching the turn lane taking one of two forms. Either the center lane is maintained straight and striped because it is needed as a loading zone for deliveries, or it disappears and the traveled roadway narrows around it. This latter condition is represented in the drawing, where it can be seen that the narrower roadway beyond the turn-lane taper zone allows for a flank of parallel parking to appear. On streets that already contain two flanks of parallel parking, it can be seen how the narrowing of the travel way could allow one flank to become angled instead. Such midblock transitions introduce a complexity to the street that increases driver caution and can be expected to lower speeds.

*AT RIGHT: Highway-style left-turn lanes encourage speeding and reduce the supply of on-street parking.*



Intersection Turning Paths

One condition that appears in Tulsa that we have not seen elsewhere is the unusual marking of intersections to encourage drivers to take over-wide turns. As pictured below, the striping on some intersections directs drivers to turn not into the immediate, lane, but into the second lane out, encouraging higher speeds.

*Cincinnati and 2nd is one of many locations with second-lane turn markings.*

One focus-group participant located this condition as occurring at the following locations:

- Detroit Avenue at 1st Street;
- Cincinnati Avenue at 1st and 2nd Streets;
- Boulder Avenue at 2nd and 7th Streets;
- Cheyenne Avenue at 1st Street.

There may be other occurrences as well. It would seem that these stripes should be removed at the first opportunity.

One Key Intersection

As discussed earlier, the intersection of Boulder Avenue and Route 66 is a location where high-speed engineering has changed what should be a walkable intersection into something else. This location has all the makings of a nice urban place, but the wide streets, slip lanes, and swooping geometries make that impossible.

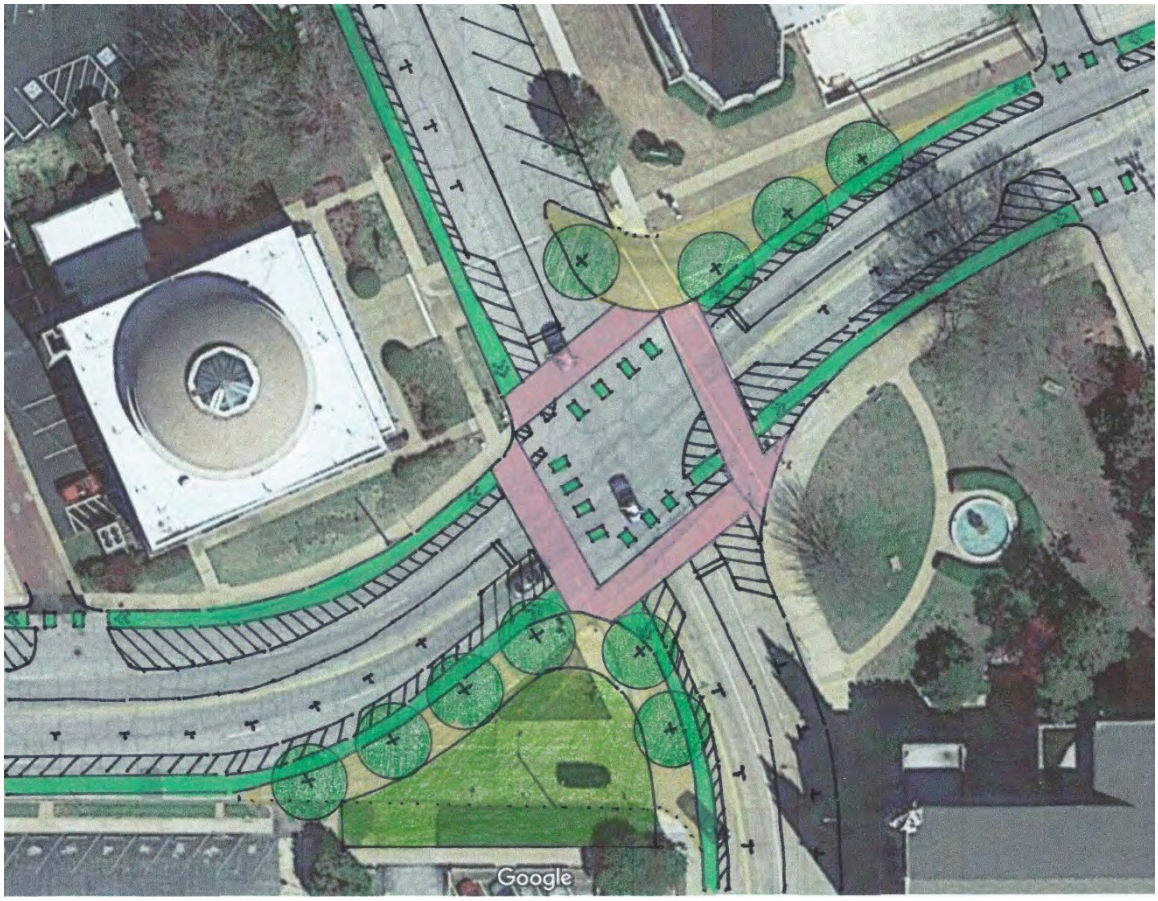

*Current conditions where Boulder Avenue meets Route 66 prioritize vehicle speed over safety.*

A proposed redesign consists of the following steps:

- Reconfigure Boulder as proposed in this Study to include two-lane, two-way travel with a southbound cycle track and curb parking as fits. North of the intersection, there is room for angle parking on one flank and parallel parking on the other. South of the intersection, there is room for parallel parking on both flanks.
- Reconfigure Route 66 as proposed in this Study to include two travel lanes, protected by two cycle tracks and one lane of parallel parking.
- Remove the slip lanes at the northeast and southwest corners with limited new construction.
- Update the crosswalks to the current best practice. Since curbs are being reconstructed, a higher standard of a contrasting material is shown.

- Since we are showing the ideal condition, the two parking lots to the southwest have had their curb cuts closed, since they have alternative access points on other sides.

These changes result in the drawing below. At a limited cost, they would make Cathedral Square a much safer—and more appealing—location.




*The ideal reshaping of the intersection extends the northeast and southwest curbs to embrace the corner. Streets are shown as modified by this Study's recommendations.*

## PART III: STREET RECONFIGURATIONS

### The Kit of Parts

By the reasoning already put forth in this document, almost every street in downtown Tulsa is in need of a redesign. This assessment is presented with an understanding that changes to streets often come slowly and sometimes at considerable expense. But they do come—routine deterioration demands resurfacing, which offers the opportunity to reconfigure—and sometimes a proper understanding of the value of safer streets causes them to come more quickly.

Indeed, in Tulsa's case, there appears to be a mandate for change to be made much faster than has been the case in the past. Plans are already underway to convert three more streets back to two-way traffic, and this Study has been commissioned largely because of a growing sense among concerned parties that the design of its streets may be holding the downtown back from reaching its full potential.

In that vein, this Study has gone to the effort of proposing the reconfiguration of every downtown street that could benefit from change—over 30 in all. Plans for the different segments of these streets, comprising more than 70 distinct designs, are presented ahead. In this context, it is important to recognize that such a comprehensive repaving/restriping effort threatens to be overwhelming, and also, if pursued in a random order, would result in dollars being squandered in locations where their impact would be limited. For that reason, this analysis also includes a Priority Ranking that suggests the most impactful order in which reconfigurations can be accomplished.

Importantly, none of these reconfigurations require the rebuilding of curbs; to save money, ***all curbs are kept in their existing locations.*** The designs ahead were accomplished by following the following five steps:

1. Reverting Cheyenne and Boulder Avenues, and 1st, 2nd, 4th, and 5th Streets to two-way traffic;
2. Providing the number of driving lanes recommended by the traffic analysis;
3. Providing bike facilities where indicated by the cycling plan;
4. Dedicating all remaining unused street space to on-street parking; and
5. Rebalancing cycling and parking as needed to optimize both.

The final step was needed only where the demands of cycling and parking were in conflict, in order to produce the best possible cycling network without unduly limiting convenient parking.

These steps were taken making use of a Kit of Parts that has already been suggested by the above discussion: driving, parking, and cycling lanes that are as large as needed, but rarely larger. It is important that this kit of parts be properly communicated, because it presents a toolkit that the City may use in all areas where

walkability is desired. Moreover, if conditions change, requiring the modification of the street reconfigurations presented in this report, the Kit of Parts allows that work to be done in keeping with the intent, if not the letter, of this document. ***As long as a street contains no more driving lanes than needed, and the Kit of Parts is followed,*** the City can move forward with confidence that streets are being reconfigured in a way that is supportive of a more walkable and bikeable downtown.

***The Kit of Parts is as follows:***

Driving Lanes

Driving lanes shall be 10 feet wide except for these exceptions: on slow flow streets, against angle parking, where they shall be 12 feet wide; and if a 22-foot-clear is not otherwise maintained or when directly against a curb, where they shall be 11 feet wide.

Cycle Lanes

Un-buffered cycle lanes shall be 6 feet wide, unless circumstances require them to be narrower, in which case they shall be no less than 5 feet wide. However, a short stretch of 4-foot lane is acceptable where there is no curb parking and the alternative is a less-safe Sharrow condition. Buffered cycle lanes shall be 5 to 6 feet wide, with 4 feet allowed on limited occasion. When 7 feet is available for cycling, it should be striped as a 4-foot lane with a 3-foot buffer. When 6 feet is available for cycling, it should be striped as a 6 foot cycle lane with no buffer. When 15 feet is available for both curb parking and cycling, it should be striped as a 7-foot parking lane next to a 3-foot buffer next to a 6-foot cycling lane.

Parallel Parking Lanes

Parking lanes shall be 8 feet wide except for these exceptions: against a bike-lane buffer or in other rare occasions when space is at a premium, where they shall be a minimum of 7 feet wide; and when there is additional space in the roadway, where they may be as much as 9 feet wide.

Angled Parking Lanes

Based on existing parking measurements in downtown Tulsa, parking stalls shall be between 15 and 20 feet deep. If more than 17 feet deep, they shall be angled at 60°. Otherwise, they shall be angled at 45°.

In reviewing the full Street Typology that follows, this Kit of Parts should be kept in mind. Any street that does not correspond to the Kit of Parts represents either an error in the design, an error in the communication of the Kit of Parts, or an exception that is justified by special circumstances. Determining which of those three conditions holds is a task to be considered carefully.

**The Downtown Tulsa Street Typology**

For the purposes of this report, 67 new street designs are proposed for downtown Tulsa. This large number is a function of the fact that there are more than 25 different street widths within the study area. Applying the Kit of Parts to these many widths, while creating streets that are one-way or two-way, one to four lanes wide, parallel- and/or angle-parked, and containing some or no bike facilities, results in 67 distinct street designs. Most of these designs are for segments of streets, since many streets change their width, travel volume, or function along their length.

While downtown Tulsa's current repertoire of streets is quite limited and generic, this Typology is fine tuned to the needs and opportunities on each street, block by block. Given the cost of paving a street, and the importance of street design to safety, there is no reason why streets should not be laid out with this much precision. When a bespoke suit costs little more than sackcloth, why not get the suit?

The table that follows lays out the full Typology. It is organized alphabetically by width, and describes the number and width of each street component. The final column indicates for what street(s) each street type is proposed. Please note that these street configurations are based upon the recommended reversion to two-way traffic of Boulder and Cheyenne Avenues and 1st, 2nd, and 4th Streets.

Following the table are all 67 street designs. Below each design is a similar list of where that street is proposed, and from what direction the street section is viewed.

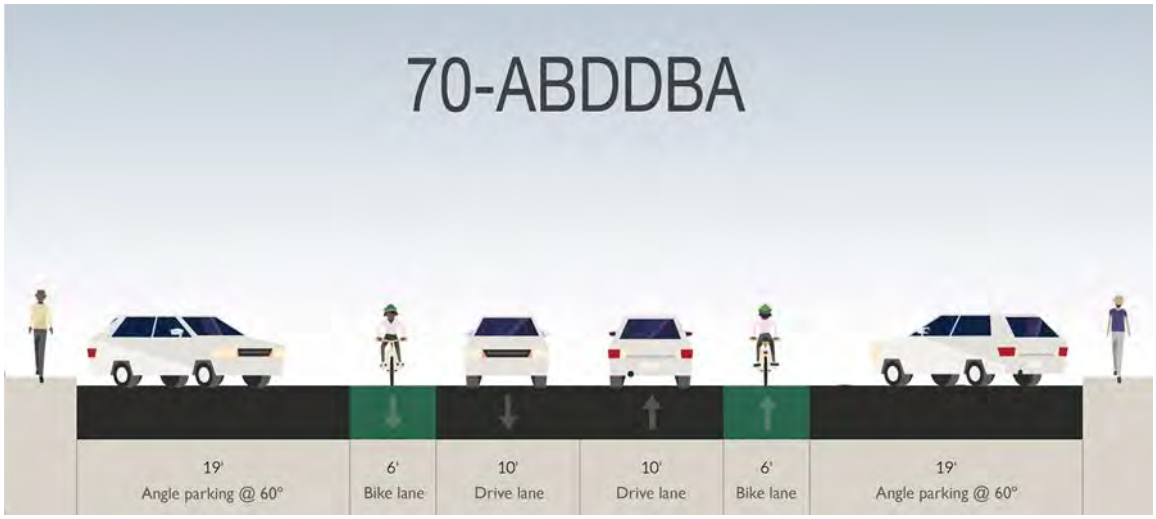
The following two sections, *North-South Streets* and *East-West Streets,* then go on to make recommendations for each downtown street in detail. Current conditions are reviewed, opportunities are discussed, and specific reconfigurations are then described.

It must be stressed that these 67 street designs were not completed under the illusion that they all would be implemented quickly or, indeed ever. It is expected that a good number will be implemented right away. It is hoped that many will be implemented soon. But some will never see the light of day. For example, it would be better that, before 7th and 8th Street are reconfigured to this standard, there is instead a determination to revert those streets to two-way traffic, requiring different designs, to be completed according to the Kit of Parts.

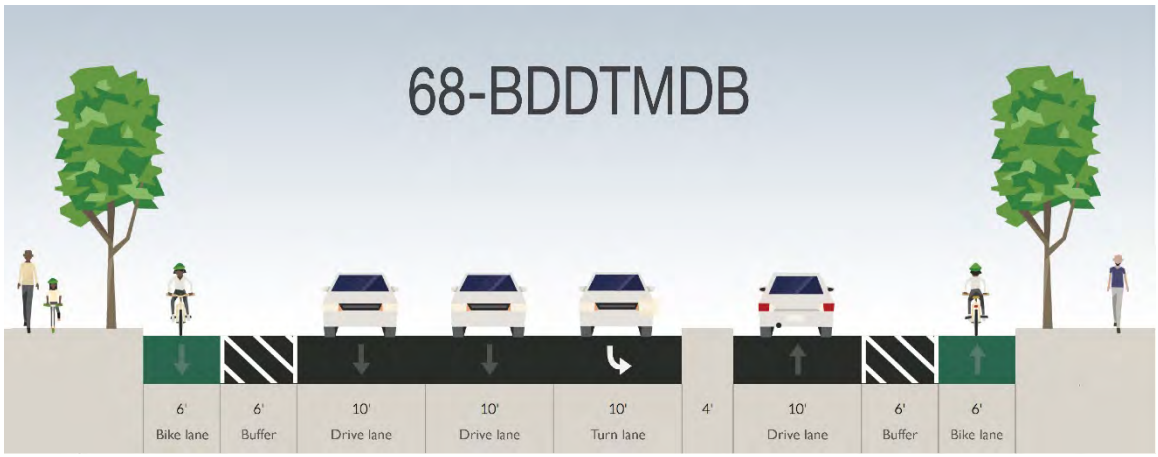
This Typology was completed fully because we wanted the City to have a new standard for any downtown street that it might wish to repave in the years ahead. These reconfigurations are ordered geographically and not by priority, which will be discussed subsequently.

| DOWNTOWN TULSA STREET TYPOLOGY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Page 1 of 2 | | | LANES | | | | PARKING | | | | |
| NAME | CARTPATH | DIRECTION | DRIVING | TURNING | CYCLING | BUFFER | ANGLE | PARALLEL | MEDIAN | LOCATIONS | REPORT PAGES |
| 70-ABDDBA | 70 | 2-way | 2 @ 10 | | 2 @ 6 | | 2 @ 19 | | | 6th | 96, 168 |
| 68-BDDTMDB | 68 | 2-way | 2 @10, 10 | 1 @ 10 | 2 @ 6 | 2 @ 6 | | | | 7th | 96, 170 |
| 67-BDDMDPB | 67 | 2-way | 2 @ 10, 1 @ 12 | | 2 @ 5 | 2 @ 3 | | 1 @ 8 | 1 @ 11 | Houston | 97, 152 |
| 67-BDDMTDB | 67 | 2-way | 3 @ 10 | 1 @ 10 | 2 @ 5 | 1 @ 6, 1 @ 8 | | | 1 @ 3 | Houston | 97, 152 |
| 65-ADDA-1W | 65 | 1-way | 2 @ 12.5 | | | | 2 @ 20 | | | 4th | 98, 164 |
| 61-ADDA-1W | 61 | 1-way | 2 @ 12 | | | | 2 @ 18.5 | | | 4th, Detroit, MLK/Cincinnati | 98, 136, 138, 164 |
| 59-BPDDA-1W | 59 | 1-way | 10, 12 | | 1@ 6 | 1 @ 4 | 1 @ 19 | 1 @ 8 | | MLK | 99, 138 |
| 59-BPDDDP-1W | 59 | 1-way | 3 @ 10 | | 1 @ 6 | 1 @ 7 | | 2 @ 8 | | Detroit, MLK | 99, 136, 138, 139 |
| 58-BPDDPB | 58 | 2-way | 2 @ 11 | | 2 @ 6 | 2 @ 4 | | 2 @ 8 | | 10th | 100, 174 |
| 56-BDDMDB | 56 | 2-way | 2 @ 11, 12 | | 2 @ 6 | 2 @ 3 | | | 1 @ 4 | 6th | 100, 168 |
| 55-(P)DDMDD(P) | 55 | 2-way | 4 @ 11 | | | | | 2 off peak | 1 @ 11 | Denver | 101, 149 |
| 55-ADDA | 55 | 2-way | 2 @ 12 | | | | 2 @ 15.5 | | | Frankfort, Main, Denver, Brady, 1st, 2nd, 5th, 9th, 11th | 101, 133, 142, 143, 149, 155, 159, 161, 165, 166, 173, 176 |
| 55-ADDA-1W | 55 | 1-way | 2 @ 12 | | | | 2 @ 15.5 | | | Detroit, Cincinnati, 1st, 2nd, 7th, 8th | 102, 136, 138, 159, 161, 170, 172 |
| 55-ADDDP | 55 | 2-way | 2 @ 10, 12 | | | | 1 @ 15 | 1 @ 8 | | 1st, 2nd | 102, 159, 161 |
| 55-ADDDP-1W | 55 | 1-way | 2 @ 10, 12 | | | | 1 @ 15 | 1 @ 8 | | Cincinnati, 7th, 8th | 103, 139, 170, 172 |
| 55-ADTDP | 55 | 2-way | 10, 12 | 1 @ 10 | | | 1 @ 15 | 1 @ 8 | | 2nd | 103, 161, 164 |
| 55-BDTDPB | 55 | 2-way | 2 @ 10 | 1 @ 10 | 2 @ 5 | 2 @ 3.5 | | 1 @ 8 | | Elgin | 104, 134 |
| 55-BPDDA | 55 | 2-way | 10, 12 | | 1 @ 5 | 1 @ 3 | 1 @ 17 | 1 @ 8 | | Boulder, Cheyenne | 104, 145, 146 |
| 55-BPDDDB | 55 | 2-way | 3@10 | | 2 @ 5.5 | 2 @ 3 | | 1 @ 8 | | Archer | 105, 157 |
| 55-BPDDPB | 55 | 2-way | 2 @ 11 | | 2 @ 5 | 2 @ 3.5 | | 2 @ 8 | | Elgin, Archer, Boston, 3rd, 6th | 105, 134, 140, 141, 157, 163, 168 |
| 55-BPDTDP | 55 | 2-way | 2 @ 10 | 1 @ 10 | 1 @ 6 | 1 @ 3 | | 2 @ 8 | | Boulder, Cheyenne (Compromise) | 106, 145, 146 |
| 55-PDDTTP | 55 | 2-way | 2 @ 10 | 2 @ 10 | | | | 2 @ 7.5 | | 1st | 106, 159 |
| 55-PTDDA-1W | 55 | 1-way | 10, 12 | 1 @ 10 | | | 1 @ 15 | 1 @ 8 | | Detroit | 107, 136 |
| 54-BDDDDB | 54 | 2-way | 4 @ 10.5 | | 2 @ 6 | | | | | Heavy Traffic Way | 107, 153 |
| 53-ADDP-1W | 53 | 1-way | 10, 14 | | | | 1 @ 20 | 1 @ 9 | | 4th | 108, 164 |
| 53-BDDTDB | 53 | 2-way | 4 @ 10 | | 2 @ 5 | 2 @ 1.5 | | | | 11th | 108, 176 |
| 53-BPDDPB | 53 | 2-way | 2 @ 11 | | 2 @ 5 | 2 @ 3 | | 2 @ 7.5 | | 11th | 109, 176 |
| 51-PBDDA | 51 | 2-way | 10, 12 | | 1 @ 6 | | 1 @ 15 | 1 @ 8 | | Cheyenne | 109, 146 |
| 50-ADDP | 50 | 2-way | 10, 12 | | | | 1 @ 20 | 1 @ 8 | | Greenwood, 4th, 5th | 110, 132, 165, 166 |
| 50-BPDDB | 50 | 2-way | 2 @ 10 | | 2 @ 6 | 2 @ 5 | | 1 @ 8 | | 6th, 10th | 110, 168, 174 |
| 50-BPDDPB | 50 | 2-way | 2 @ 11 | | 2 @ 4 | 2 @ 3 | | 2 @ 7 | | 6th, 10th (Alternative) | 111, 168, 174 |

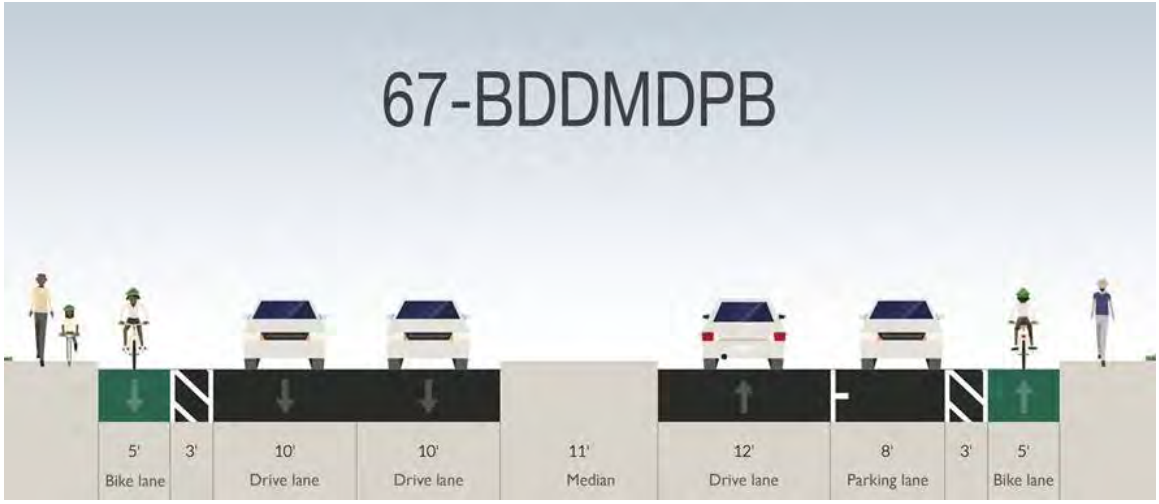
| DOWNTOWN TULSA STREET TYPOLOGY | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Page 2 of 2 | | | LANES | | | | PARKING | | | | |
| NAME | CARTPATH | DIRECTION | DRIVING | TURNING | CYCLING | BUFFER | ANGLE | PARALLEL | MEDIAN | LOCATIONS | REPORT PAGES |
| 50-PDMDP | 50 | 2-way | 14, 13 | | | | | 2 @ 9 | 1 @ 5 | 7th | 111, 170 |
| 50-PDTDP | 50 | 2-way | 2 @ 10 | 1 @ 12 | | | | 2 @ 9 | | Greenwood | 112, 132 |
| 48-ADDP-1W | 48 | 1-way | 10, 12 | | | | 1 @ 18 | 1 @ 8 | | 8th | 112, 172 |
| 48-ADDP | 48 | 2-way | 10, 12 | | | | 1 @ 18 | 1 @ 8 | | Frankfort, 5th, 11th | 113, 133, 154, 166, 176 |
| 48-BDDDB | 48 | 2-way | 3 @ 10 | | 2 @ 6 | 2 @ 3 | | | | Archer | 113, 157 |
| 48-BDTDB | 48 | 2-way | 2 @ 10 | 1 @ 10 | 2 @ 6 | 2 @ 3 | | | | Archer, 12th | 114, 157, 177 |
| 48-BPDDB | 48 | 2-way | 2 @ 10 | | 2 @ 6 | 2 @ 4 | | 1 @ 8 | | Archer, 13th | 114, 157, 179 |
| 48-BPDDP | 48 | 2-way | 2 @ 11 | | 1 @ 6 | 1 @ 4 | | 2 @ 8 | | Cheyenne | 115, 147 |
| 48-PBDDBP | 48 | 2-way | 2 @ 10 | | 2 @ 6 | | | 2 @ 8 | | 3rd, 6th | 115, 163, 168 |
| 48-PDDDP | 48 | 2-way | 3 @ 10 | | | | | 2 @ 9 | | 2nd St. | 116, 161 |
| 46-BPDDB | 46 | 2-way | 2 @ 11 | | 2 @ 5 | 2 @ 3 | | 1 @ 8 | | Archer | 116, 157 |
| 45-ADDP | 45 | 2-way | 10, 12 | | | | 1 @ 15 | 1 @ 8 | | Main, Denver, 4th | 117, 143, 149, 165 |
| 45-ADDP-1W | 45 | 1-way | 10, 12 | | | | 1 @ 15 | 1 @ 8 | | Detroit, 8th | 118, 136, 172 |
| 45-BPDDB | 45 | 2-way | 2 @ 10 | | 2 @ 5.5 | 2 @ 3 | | 1 @ 8 | | Boston | 117, 141 |
| 44-BPDDP | 44 | 2-way | 2 @ 11 | | 1 @ 5 | 1 @ 3 | | 2 @ 7 | | Boulder | 118, 145 |
| 44-PBDDBP | 44 | 2-way | 2 @ 10 | | 2 @ 5 | | | 2 @ 7 | | 3rd, 6th | 119, 163, 168 |
| 43-PBDDP | 43 | 2-way | 2 @ 10 | | 1 @ 6 | | | 8, 9 | | Cheyenne | 119, 146 |
| 42-BDDBP | 42 | 2-way | 2 @ 11 | | 2 @ 6 | | | 1 @ 8 | | 13th | 120, 179 |
| 40-ADD | 40 | 2-way | 10, 12 | | | | 1 @ 18 | | | Main | 120, 142 |
| 40-PDDP | 40 | 2-way | 2 @ 11 | | | | | 2 @ 9 | | 11th | 121, 173, 176 |
| 40-PDDP-1W | 40 | 1-way | 2 @ 11 | | | | | 2 @ 9 | | 1st | 121, 159 |
| 40-PDDT-1W | 40 | 1-way | 2 @ 10 | 1 @ 11 | | | | 1 @ 9 | | 1st | 122, 159 |
| 36-PDDP-1W | 36 | 1-way | 2 @ 11 | | | | | 2 @ 7 | | Frisco, 1st, 8th | 122, 150, 159, 171, 172 |
| 36-PDDP | 36 | 2-way | 2 @ 11 | | | | | 2 @ 7 | | Elwood, Frisco, 5th | 123, 150, 166 |
| 36-BDDB | 36 | 2-way | 2 @ 10 | | 2 @ 5 | 2 @ 3 | | | | Elgin, Guthrie | 123, 134, 151 |
| 35-BDDP | 35 | 2-way | 2 @ 10 | | 1 @ 5 | 1 @ 2 | | 1 @ 8 | | Boulder, Cheyenne | 124, 144, 146 |
| 30-BDD | 30 | 2-way | 11, 10 | | 1 @ 5 | 1 @ 4 | | | | Cheyenne | 124, 146 |
| 30-PDP-1W | 30 | 1-way | 1 @ 12 | | | | | 2 @ 9 | | Kenosha | 125, 130 |
| 30-PDD | 30 | 2-way | 2 @ 11 | | | | | 1 @ 8 | | Frankfort, Carson, 9th, 11th, 12th | 125, 133, 147, 154, 173, 176, 177, 178 |
| 30-PDD-1W | 30 | 1-way | 2 @ 11 | | | | | 1 @ 8 | | 8th | 126, 171 |
| 30-PDDP | 30 | 2-way | 2 @ 8 | | | | | 2 @ 7 | | Main | 126, 143 |
| 28-BDDB | 28 | 2-way | 2 @ 10 | | 2 @ 4 | | | | | Houston | 127, 152 |
| 26-PDP-1W | 26 | 1-way | 1 @ 12 | | | | | 2 @ 7 | | 4th | 127, 165 |
| 26-PDD | 26 | 2-way | 2 @ 9.5 | | | | | 1 @ 7 | | Boston, 12th | 128, 141, 178 |
| 24-PDD | 24 | 2-way | 2 @ 8.5 | | | | | 1 @ 7 | | Main, 5th, 12th | 128, 143, 166, 178 |
| 22-BD-1W | 22 | 1-way | 1 @ 12 | | 1 @6 | 1 @ 4 | | | | 11th | 129, 176 |



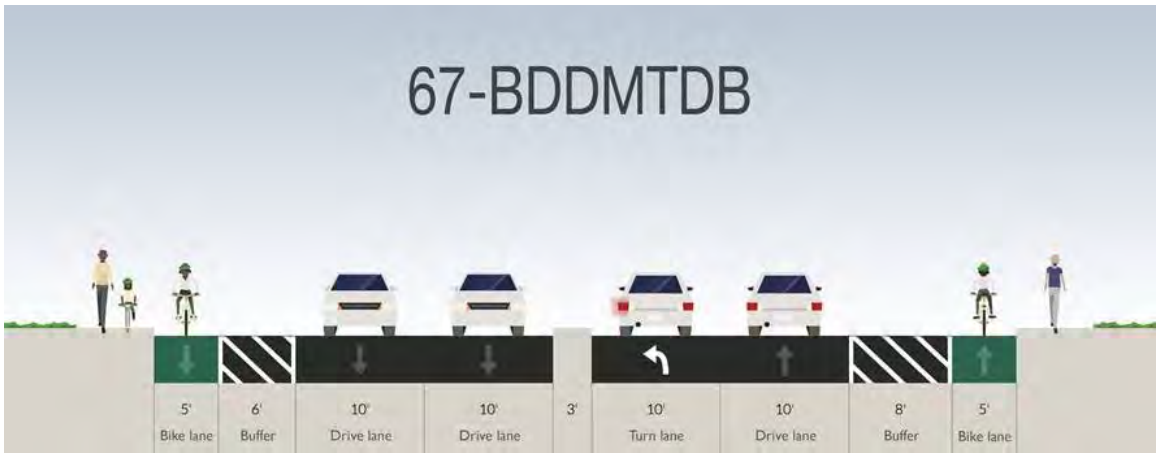

*This cross section is recommended for 6th Street between Civic Center Drive and Elwood Avenue.*




*This cross section is recommended for 7th Street between the IDL and 6th Street, viewed here looking east.*

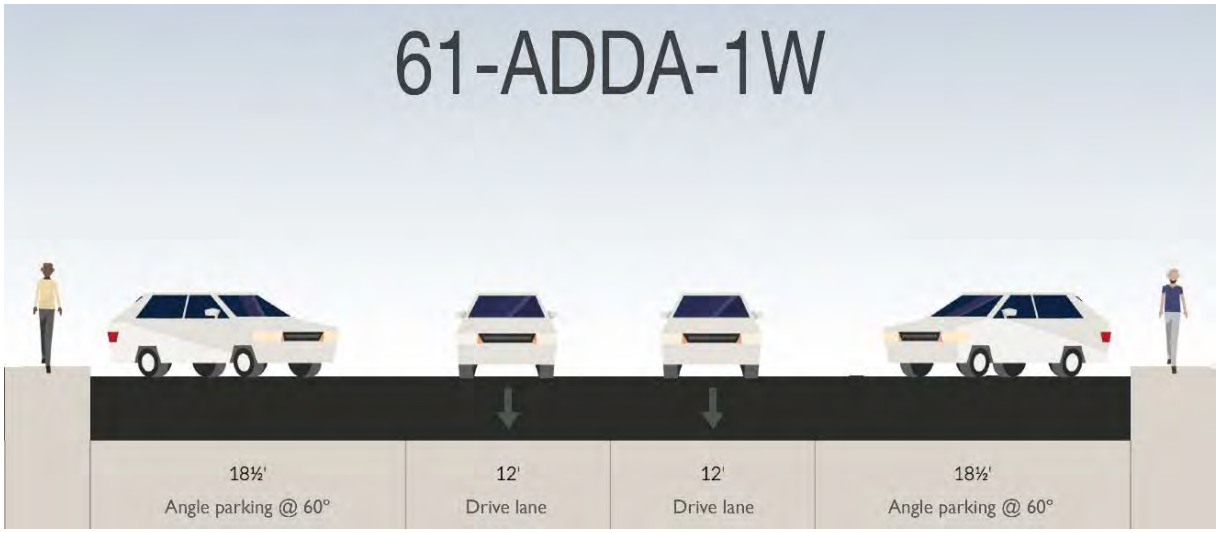



*This cross section is recommended for Houston Avenue between 4th and 7th Streets, viewed here looking north.*



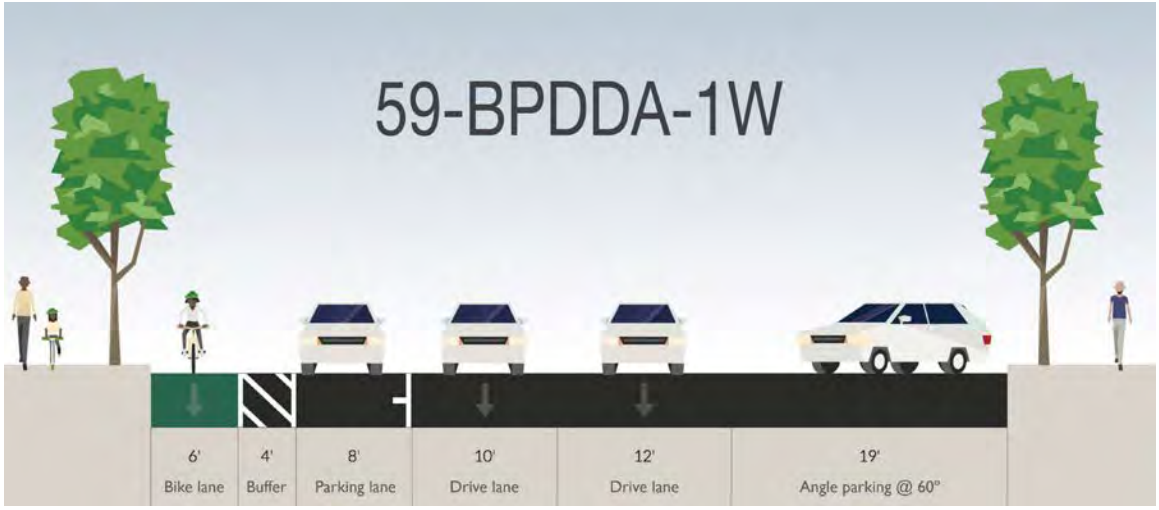

*This cross section is recommended for Houston Avenue between 3rd and 4th Streets, viewed here looking north.*


*This cross section is recommended for the half block of 4th Street west of Civic Center Drive, viewed here looking east.*

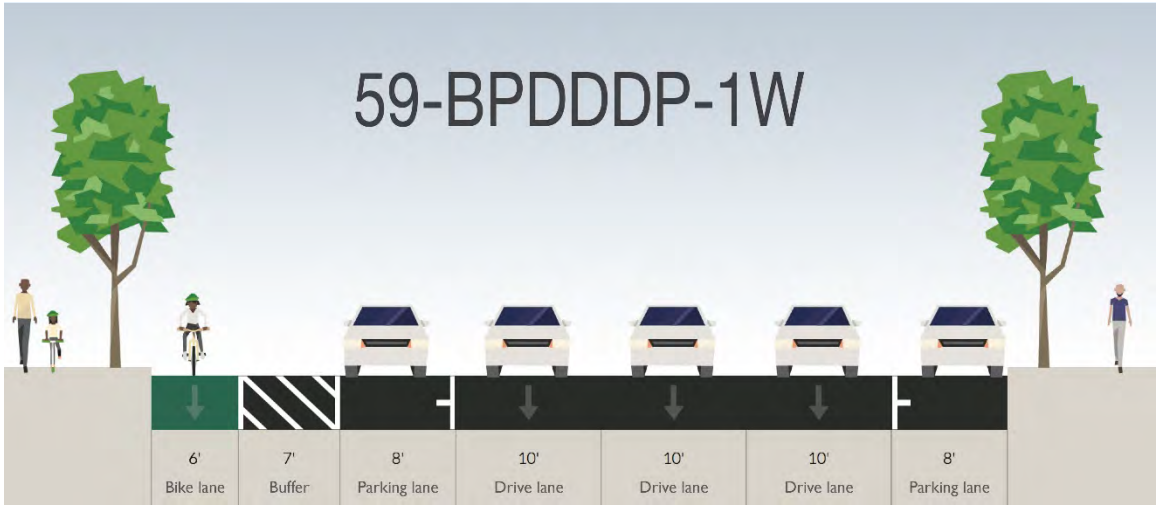



*This cross section is recommended for:*

- *4th Street the half block east of Civic Center Drive, viewed here looking west;*
- *Detroit Avenue between Archer and 1st Streets, viewed here looking south;*
- *M.L.K. Jr. Boulevard / Cincinnati Avenue between Archer and 1st Streets, viewed here looking north.*

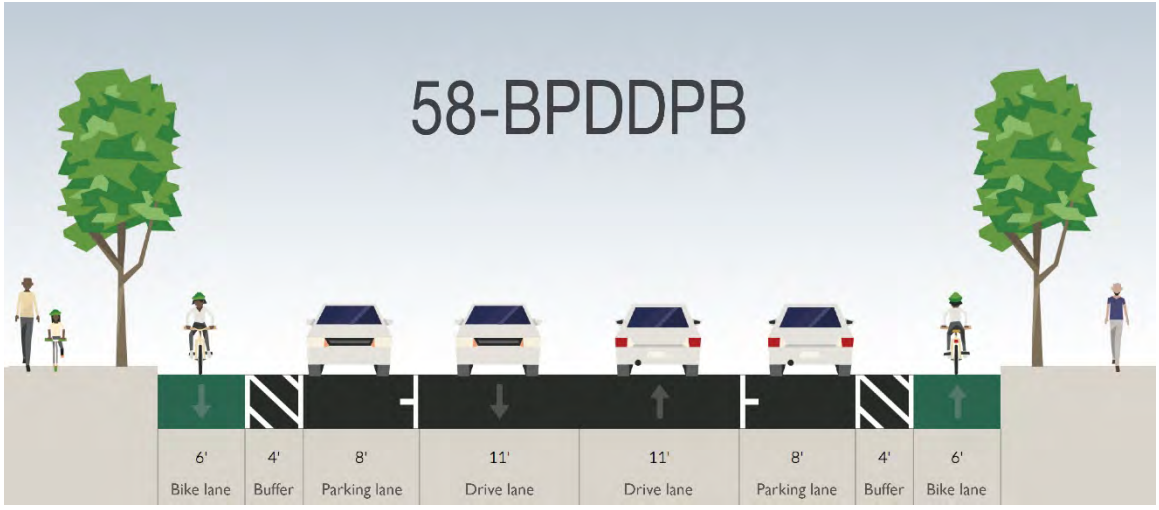



*This cross section is recommended for M.L.K. Jr. Boulevard between Cameron and Archer Streets, viewed here looking south.*

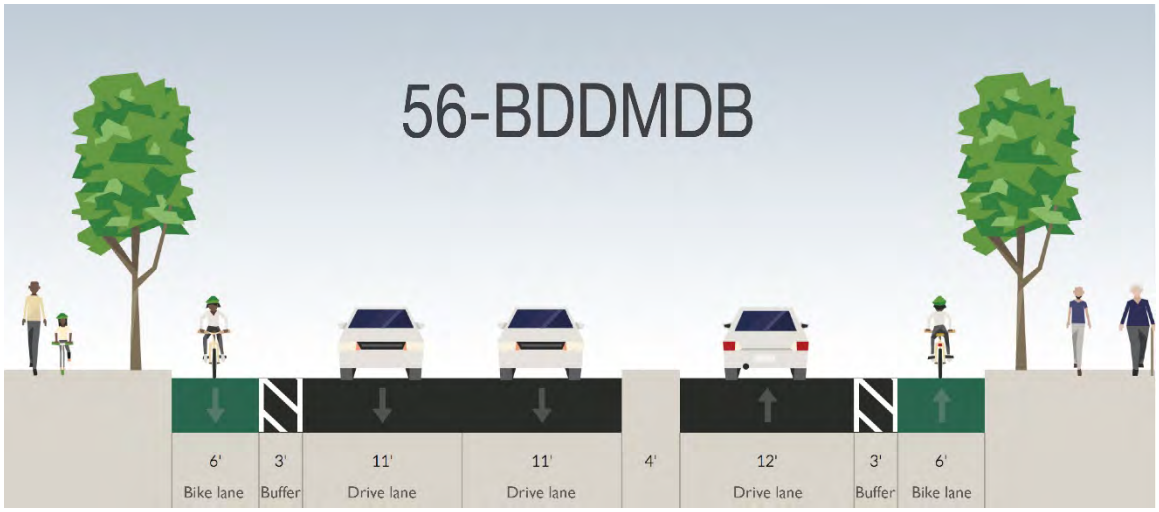



*This cross section is recommended for:*

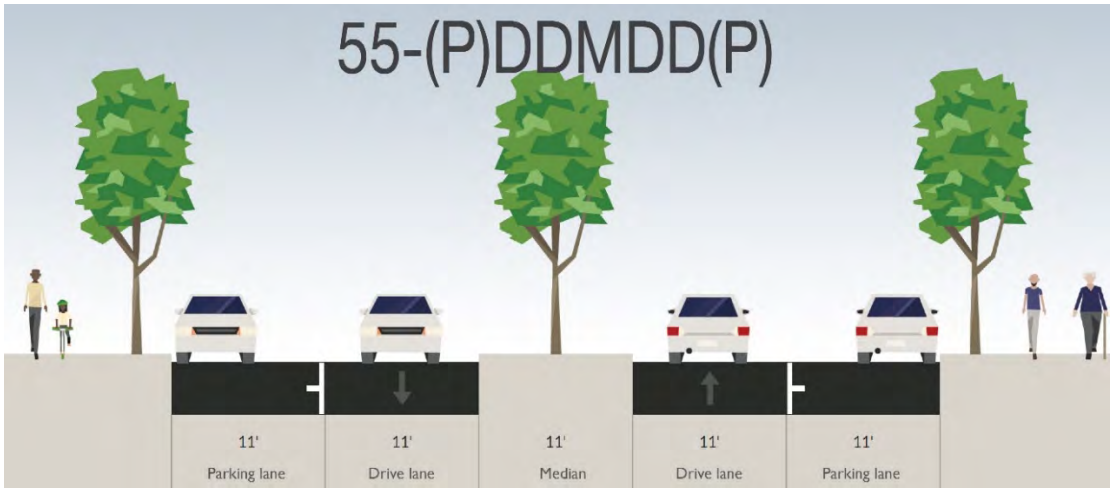
- *Detroit Street between the IDL and Archer Street, viewed here looking south;*
- *M.L.K. Jr. Boulevard between the IDL and Cameron Street, viewed here looking north.*



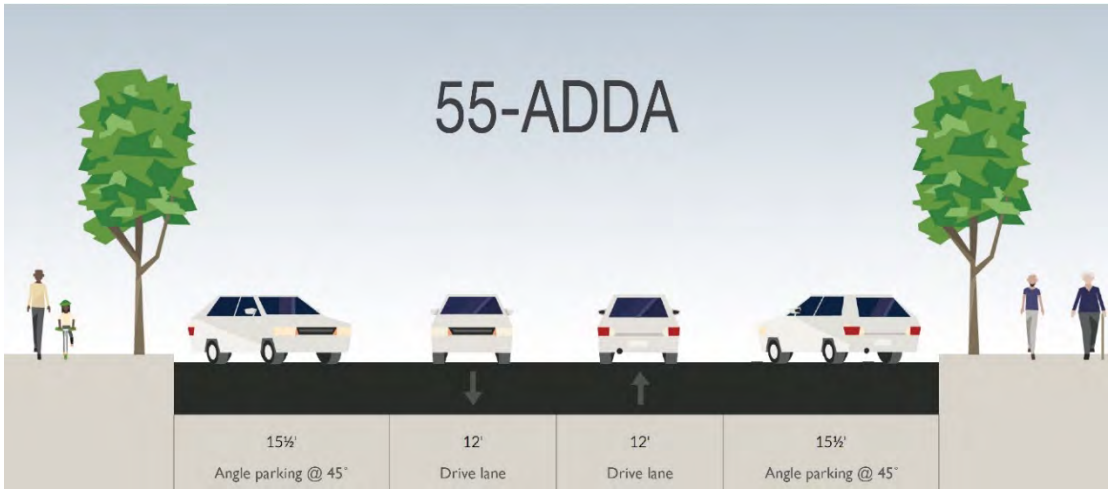

*This cross section is used on 10th Street (between Boulder and Detroit Avenues) where the cartpath widens to 58 feet, allowing for the addition of a second flank of parking to the south side.*




*This cross section is recommended for 6th Street from 7th Street to Civic Center Drive, looking east.*

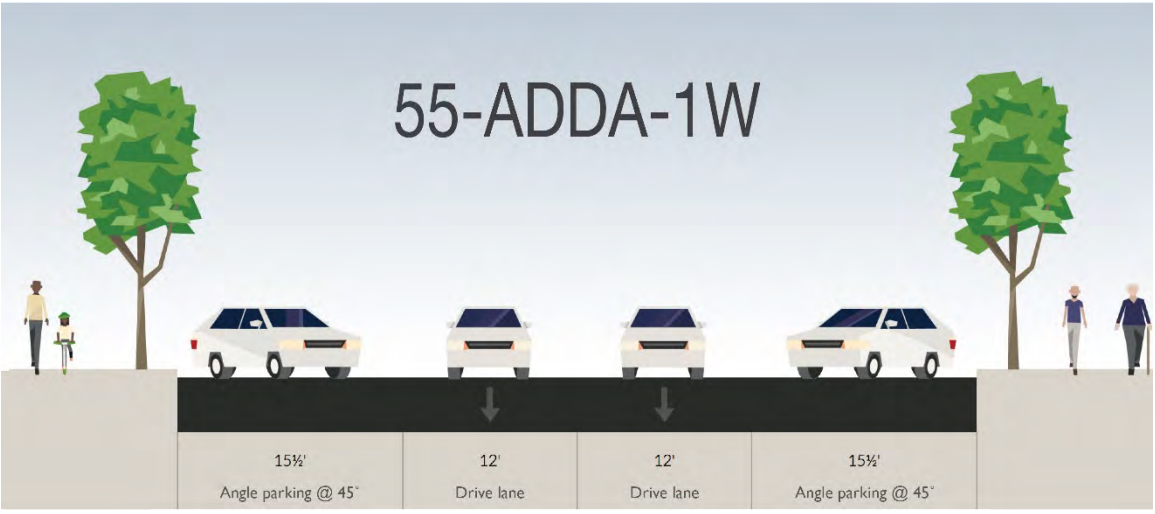



*This cross section is recommended for Denver Avenue between 1st and 7th Streets, viewed here looking north. As the cartpath varies in width between 55 and 57 feet, the median would vary correspondingly between 11 and 13 feet. If a median cannot be built soon, it should be striped in anticipation.*



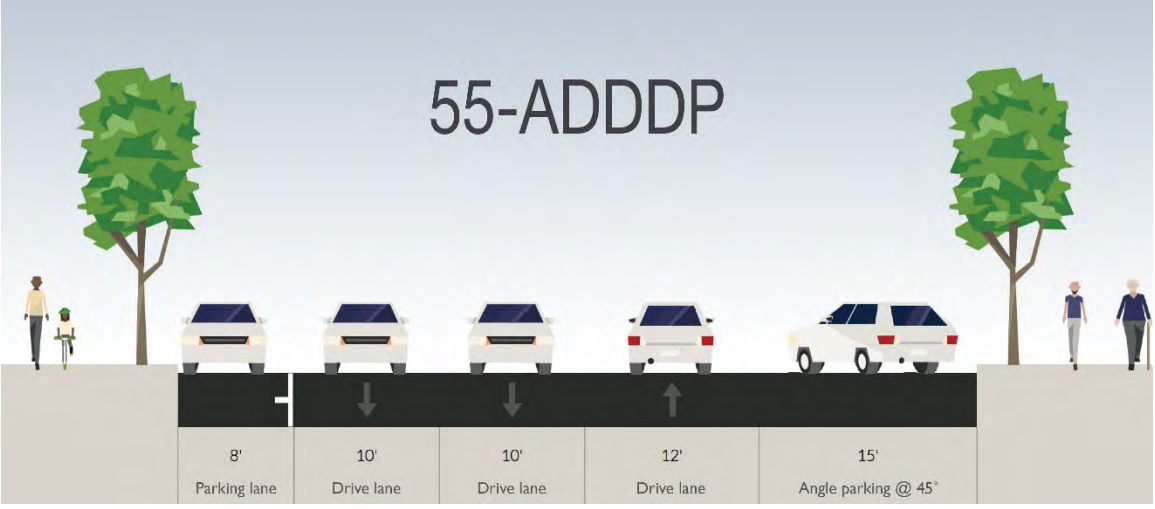

*This cross section is recommended for:*

- *Frankfort Avenue just south of 3rd Street to the mid-block alley;*
- *Main Street between Brady and Archer Streets and between 6th and 10th Streets;*
- *Denver Avenue between Cameron and Archer Streets;*
- *Mathew B. Brady Street between Denver and Cheyenne Avenues;*
- *1st Street between Denver and Cincinnati Avenues;*
- *2nd Street between Denver and Frankfort Avenues; between Frankfort and Greenwood Avenues;*
- *4th Street between Denver and Frankfort Avenues; between Kenosha Avenue and Lansing Avenue south of the triangle;*
- *5th Street between Cincinnati and Elgin Avenues;*
- *9th Street between Boulder and Elgin Avenues;*
- *11th Street between Main Street and Boston Avenue.*



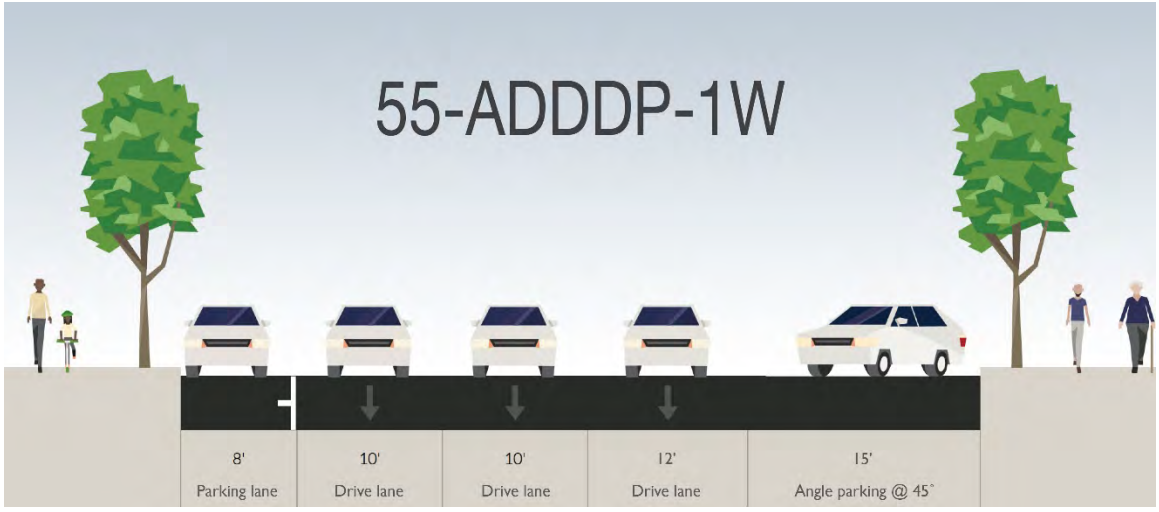

*This cross section is recommended for:*

- *Detroit Avenue between 1st and 12th Streets, viewed here looking south;*
- *Cincinnati Avenue between 1st and 3rd Streets, viewed here looking north;*
- *1st Street between Heavy Traffic Way and Denver Avenue, viewed here looking east;*
- *2nd Street between Greenwood Avenue and the IDL;*
- *7th Street between Boulder and Cincinnati Avenues, viewed here looking east;*
- *8th Street between Main Street and Detroit Avenue, viewed here looking west.*



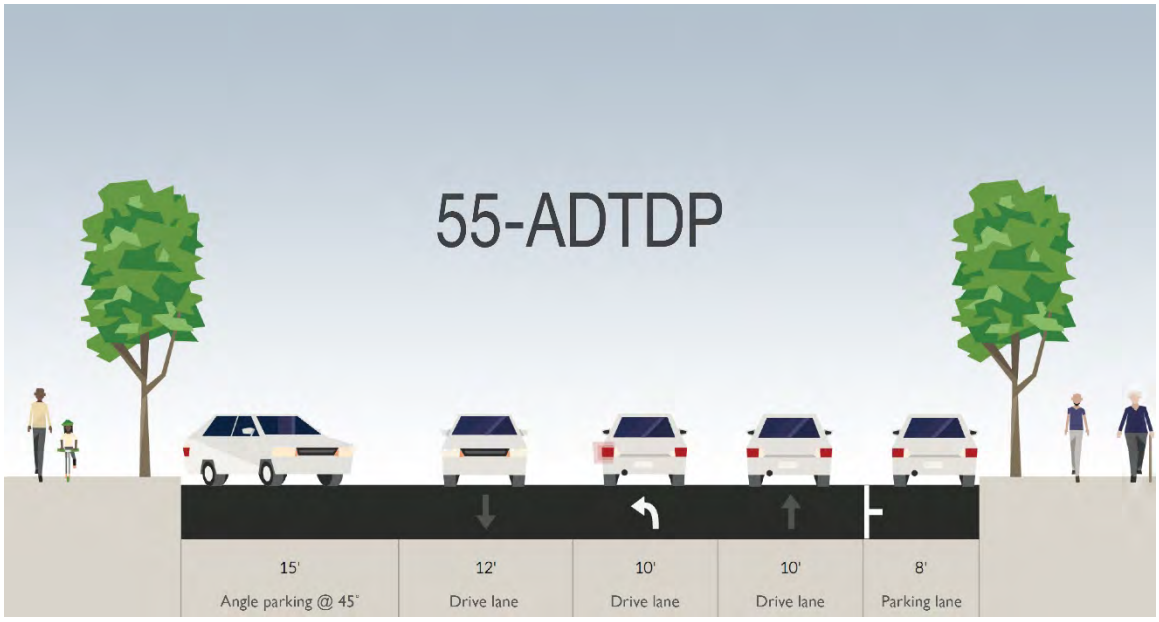

*This cross section is recommended for:*

- *1st Street between Cincinnati and Greenwood Avenues, viewed here looking east;*
- *2nd Street between Boulder and Cincinnati Avenues, viewed here looking west.*

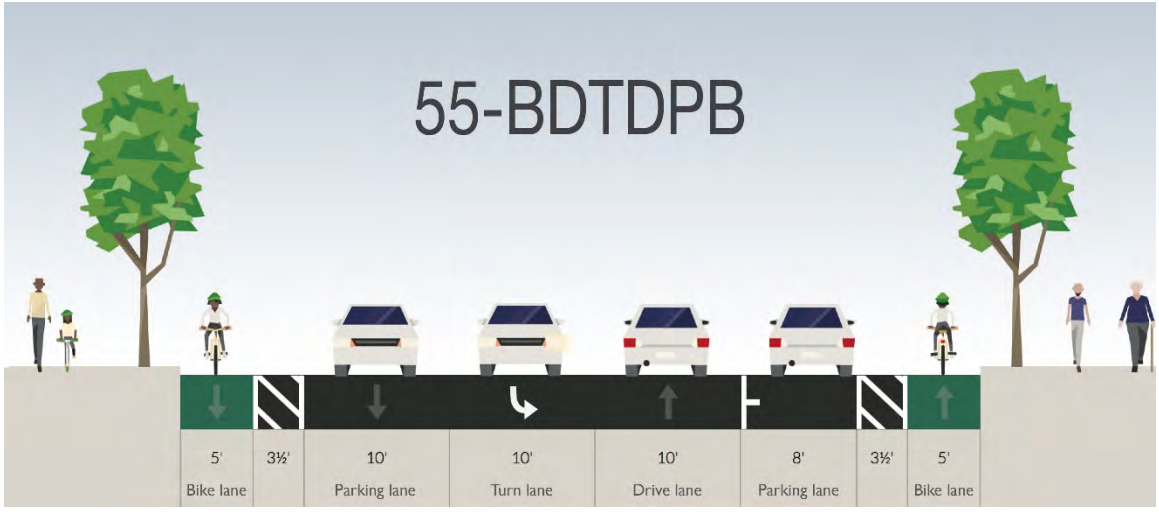



*This cross section is recommended for:*

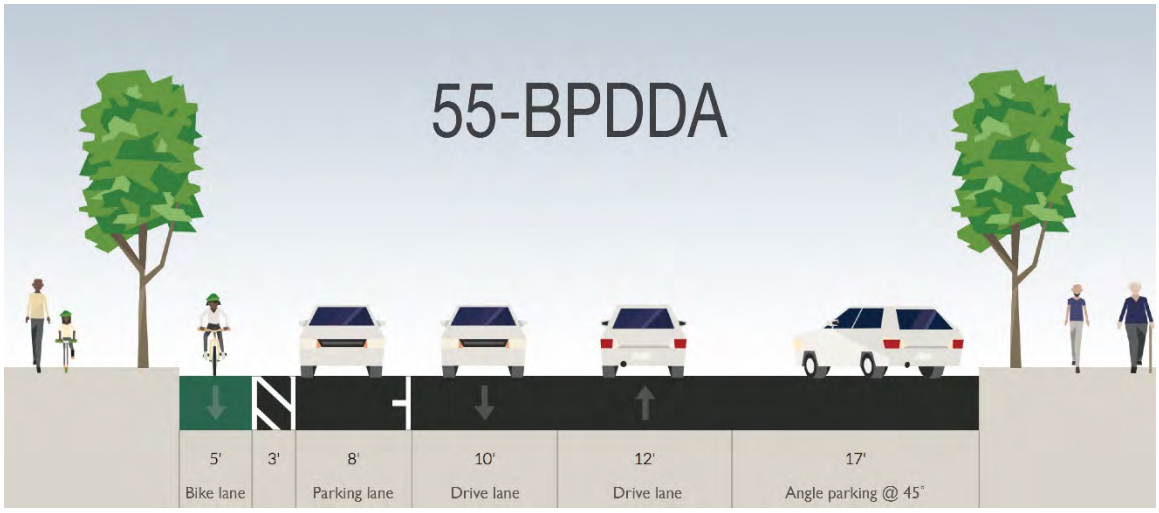
- *Cincinnati Avenue between 3rd and 4th Streets and 8th and 13th Streets, viewed here looking north;*
- *7th Street between Denver and Boulder Avenues, viewed here looking east;*
- *8th Street between Detroit and Kenosha Avenues, viewed here looking west but in mirror image.*




*This cross section is recommended for 2nd Street between Cincinnati and Frankfort Avenues, viewed here looking east.*

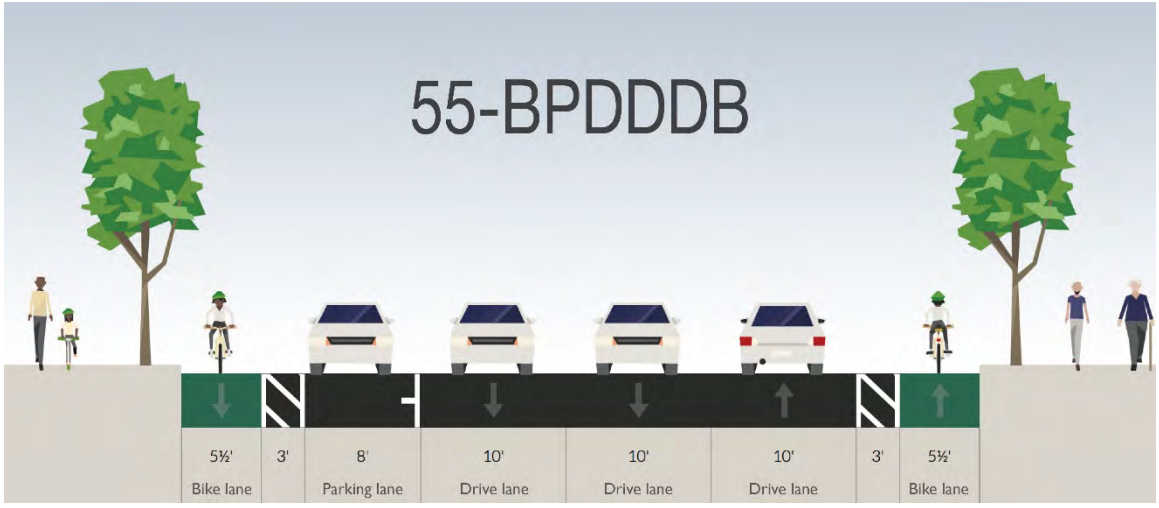



*This cross section is recommended for Elgin Avenue between 7th and 8th Streets, viewed here looking north.*

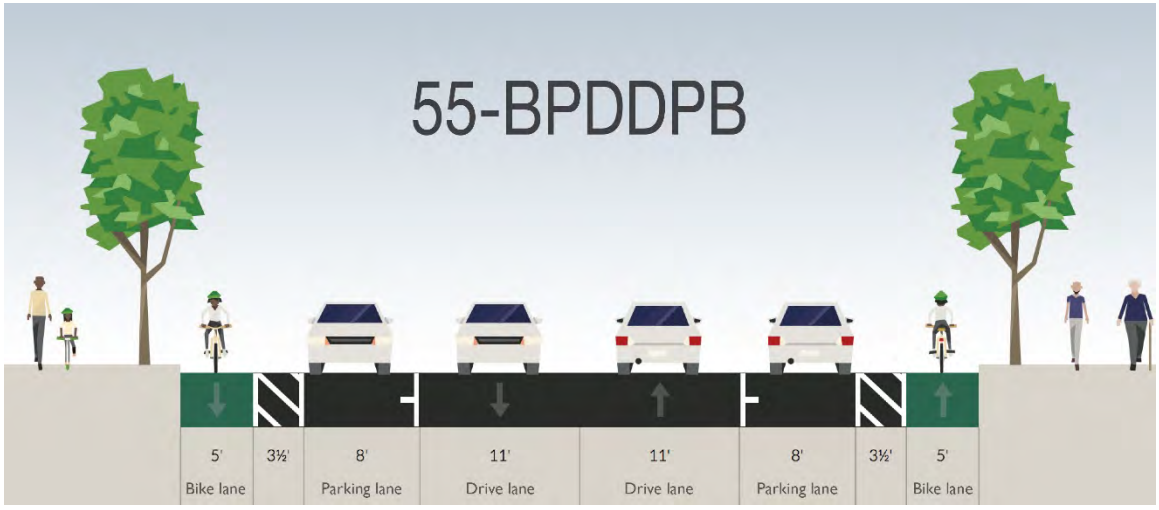



*This cross section is recommended as the preferred alternative for:*

- *Boulder Avenue between Easton and 10th Streets, viewed here looking north;*
- *Cheyenne Avenue between 1st and 11th Streets, viewed here looking south.*

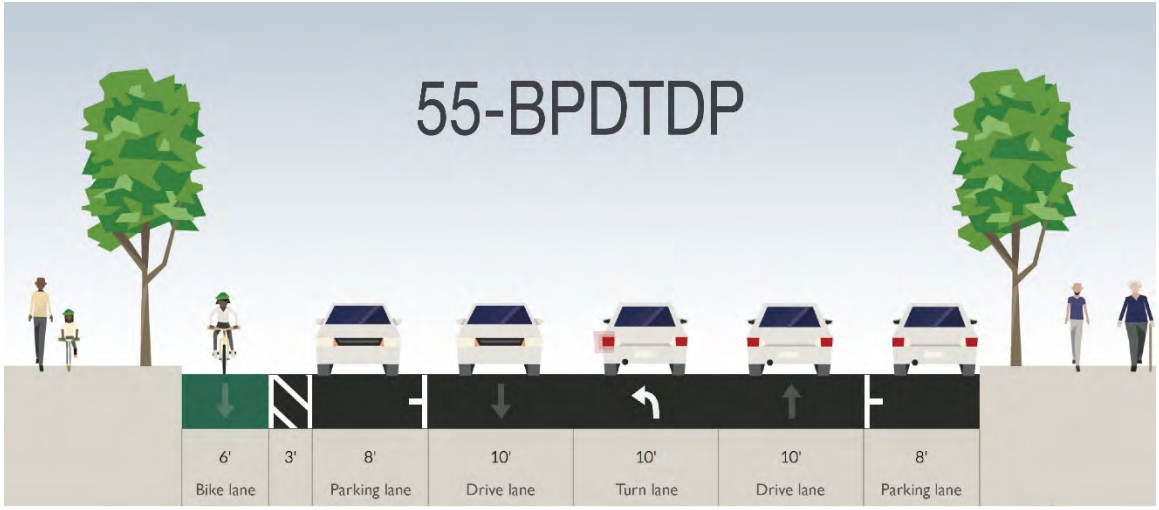



*This cross section is recommended for Archer Street between Guthrie and Elwood Avenues, viewed here looking west.*



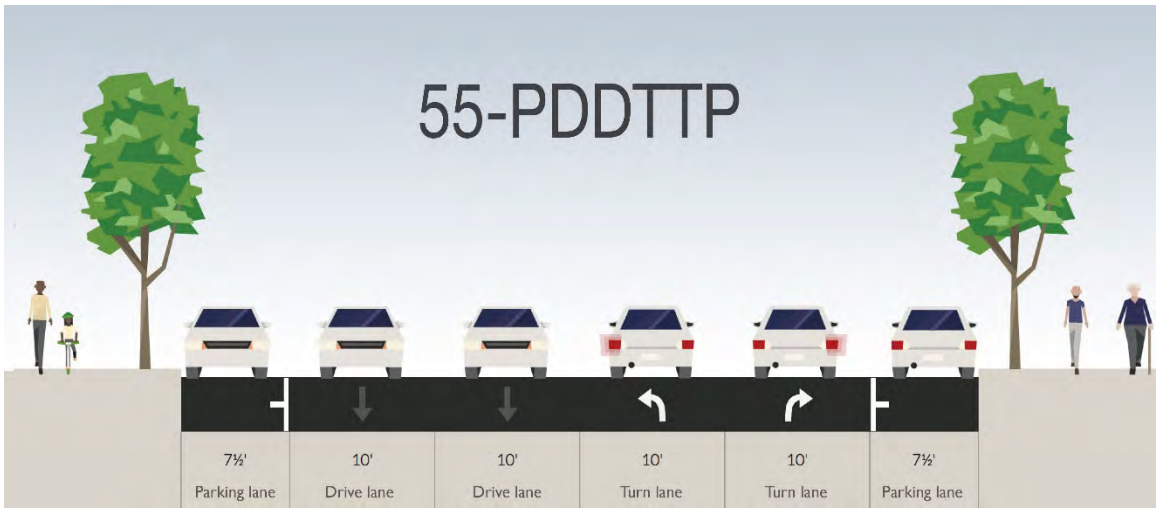

*This cross section is recommended for:*

- *Elgin Avenue between Archer and 7th Streets and between 8th and 10th Streets;*
- *Boston Avenue between 3rd Street to just south of 12th Street;*
- *Archer Street between Cheyenne Avenue and Main Street and between Greenwood Avenue and the IDL;*
- *3rd Street between IDL and Cincinnati Avenue;*
- *6th Street between Denver Avenue and Main Street; between Boston Avenue to halfway between Elgin and Frankfort Avenues.*

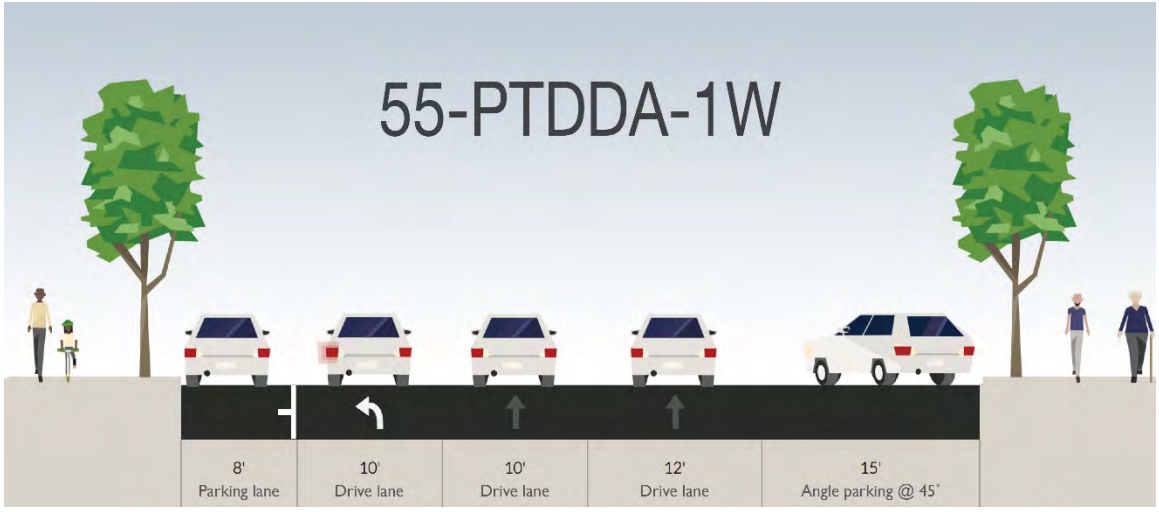



*This cross section is recommended as the compromise alternative for:*

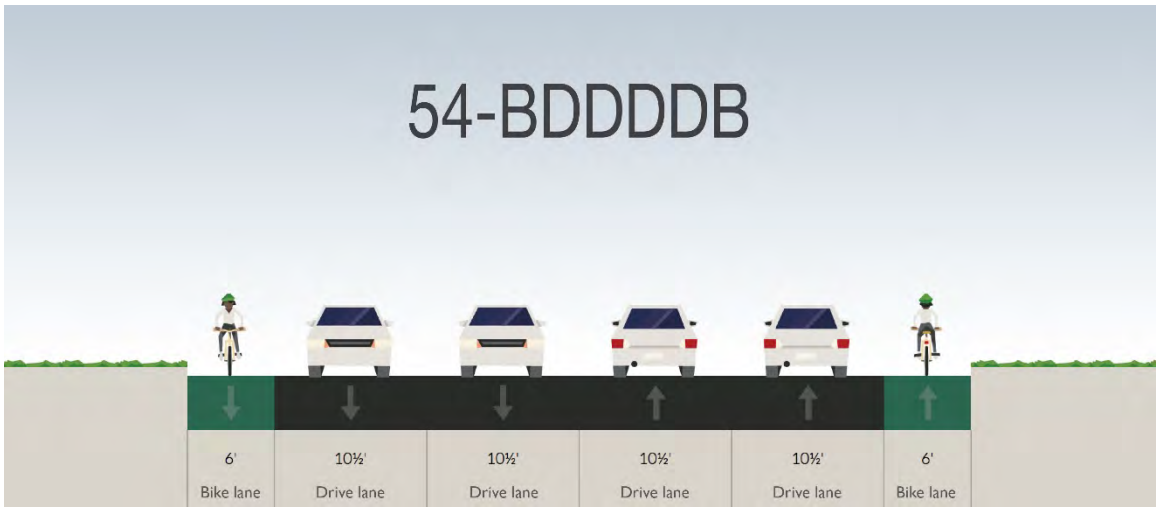
- *Boulder Avenue between Cameron and 10th Streets, viewed here looking north;*
- *Cheyenne Avenue between 1st and 11th Streets, viewed here looking south.*




*This cross section is recommended for 1st Street between Cincinnati and Greenwood Avenues, viewed here looking east.*

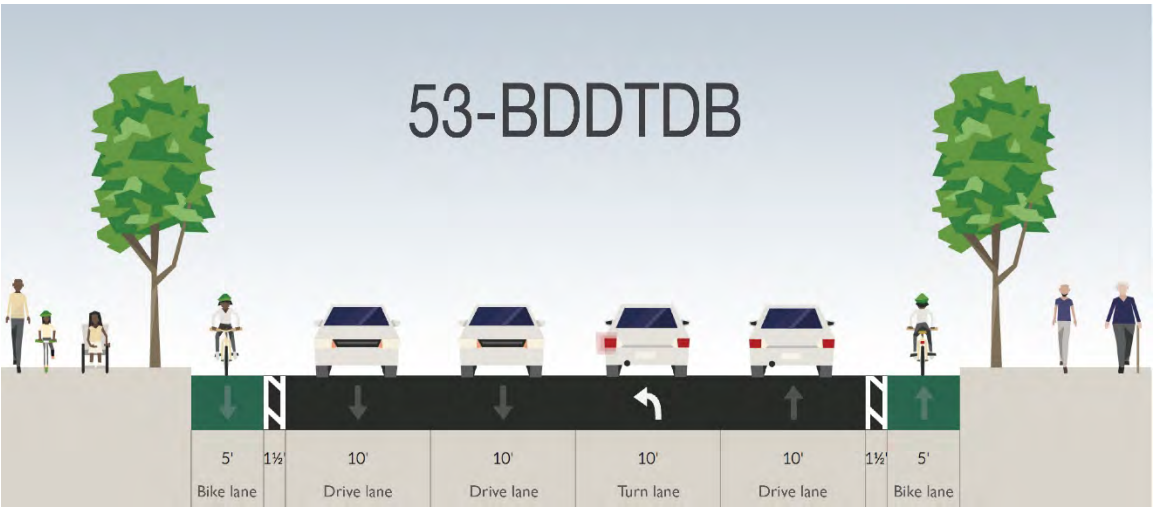



*This cross section is recommended for Detroit Avenue just south of 1st, 2nd, and 7th Streets, viewed here looking north.*

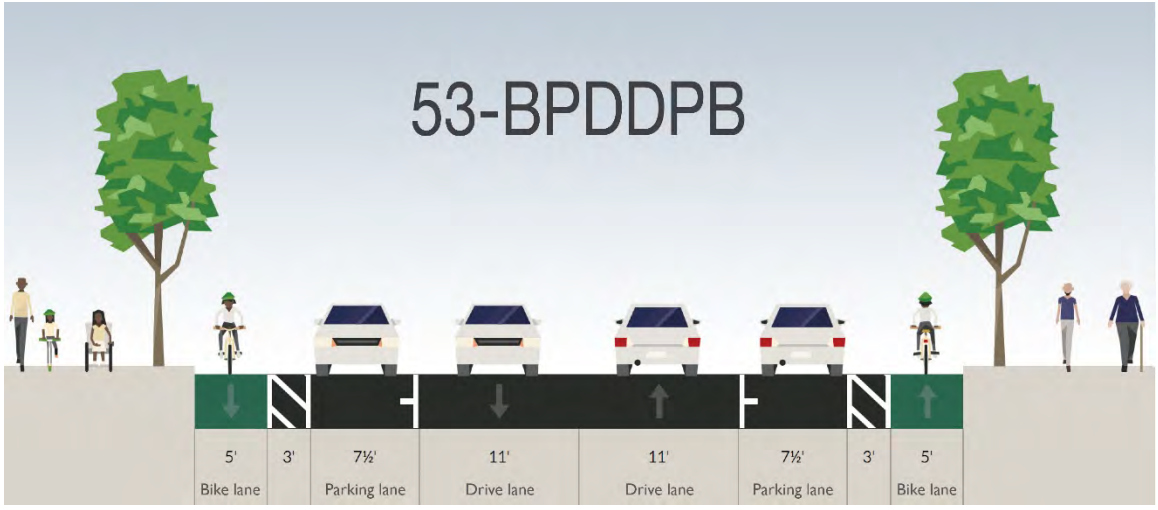



*This cross section is recommended for Heavy Traffic Way between Lawton Avenue and Houston Avenue.*

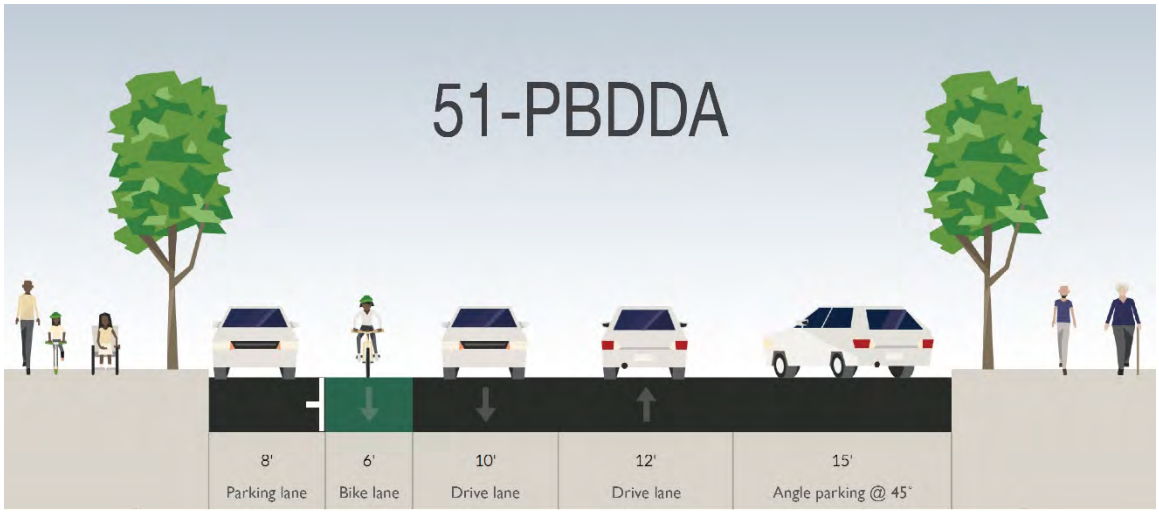

*This cross section is recommended for the half block of 4th Street west of Denver Avenue, viewed here looking east.*



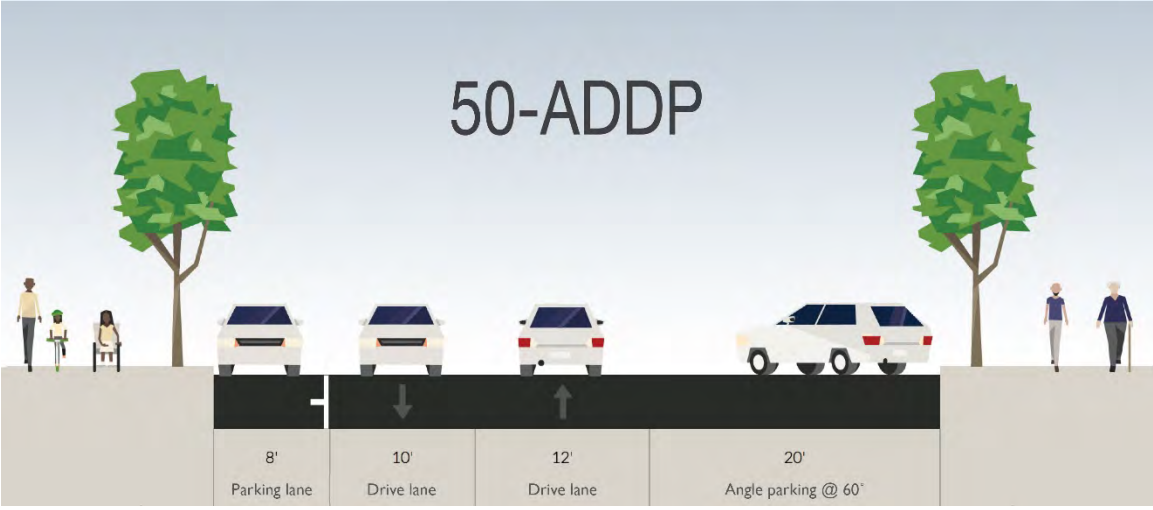

*This cross section is recommended for 11th Street between the 12th Street triangle and Denver Avenue, viewed here looking east.*




*This cross section is recommended for 11th Street between Denver and Boulder Avenues.*

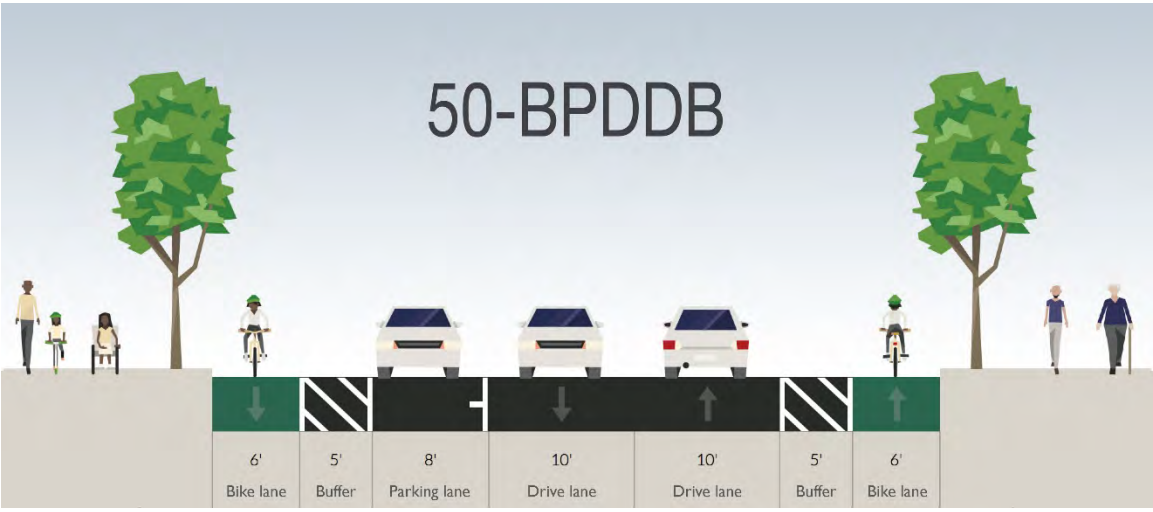



*This cross section is recommended for Cheyenne Avenue between the railroad tracks and 1st Street, viewed here looking south.*



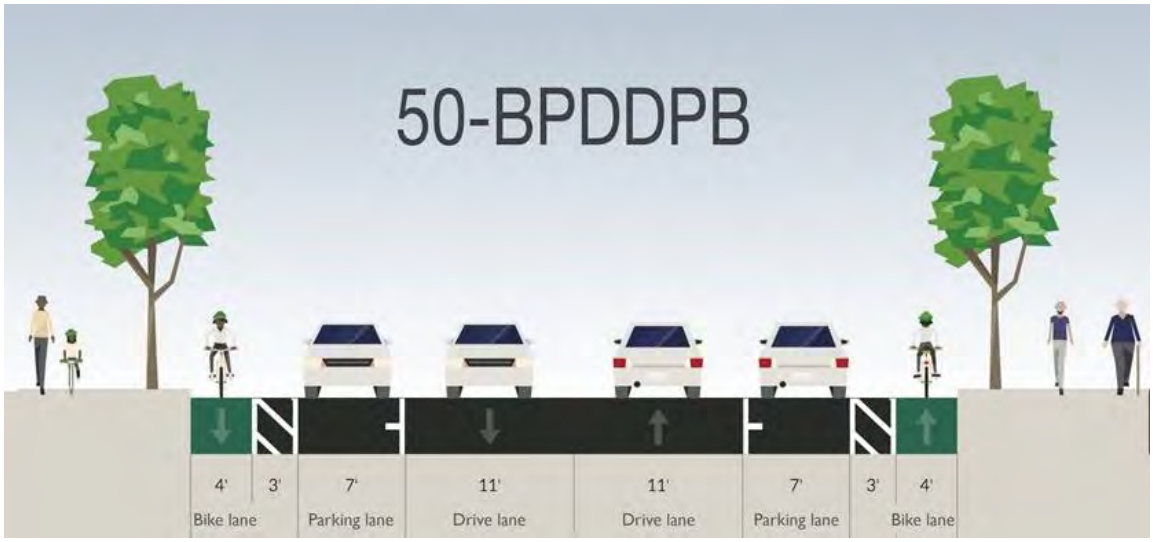

*This cross section is recommended for:*

- *Greenwood Avenue between Archer and 1st Streets and between 2nd and 3rd Streets, viewed here looking south;*
- *4th Street between Kenosha and Lansing Avenues, viewed here looking east;*
- *5th Street mid-block between Elgin and Frankfort Avenues.*



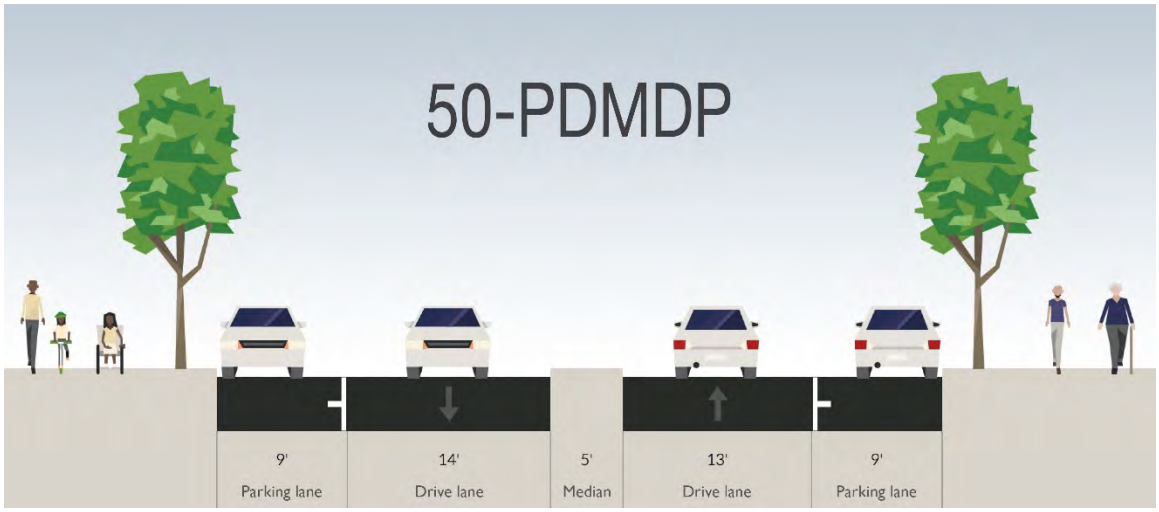

*This cross section is recommended for:*

- *6th Street between Elwood and Boulder Avenues, viewed here looking east;*
- *10th Street between Boulder and Detroit Avenues, viewed here looking west.*

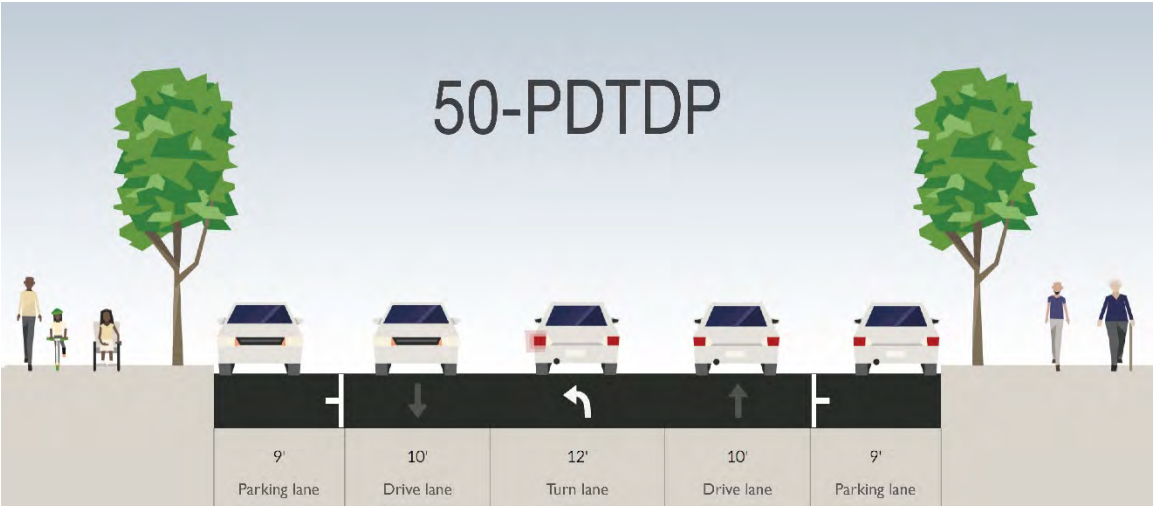



*This cross section is recommended for:*

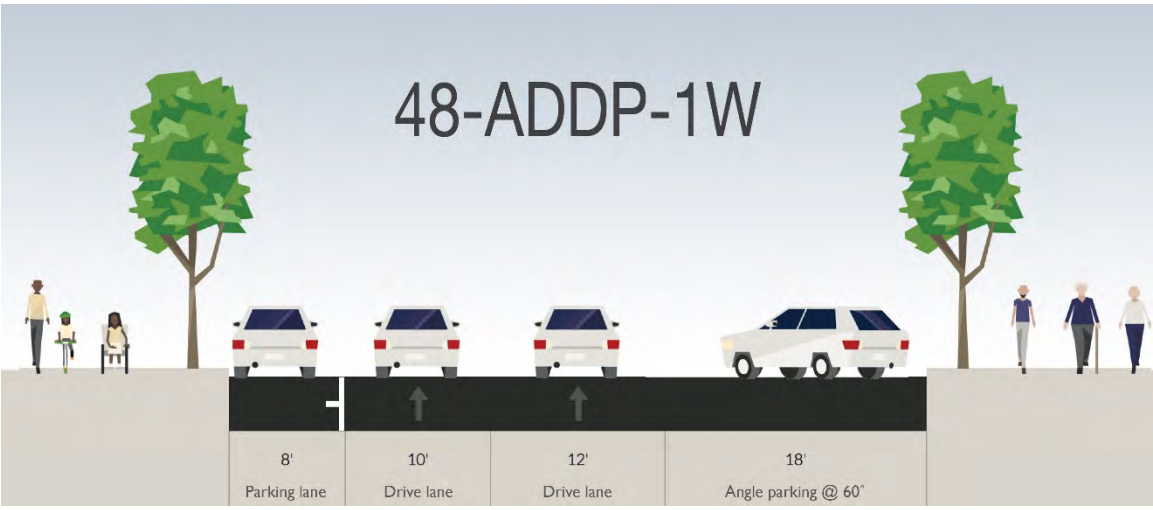
- *6th Street mid-block between Elgin and Frankfort Avenues;*
- *10th Street between Boulder and Detroit Avenues.*



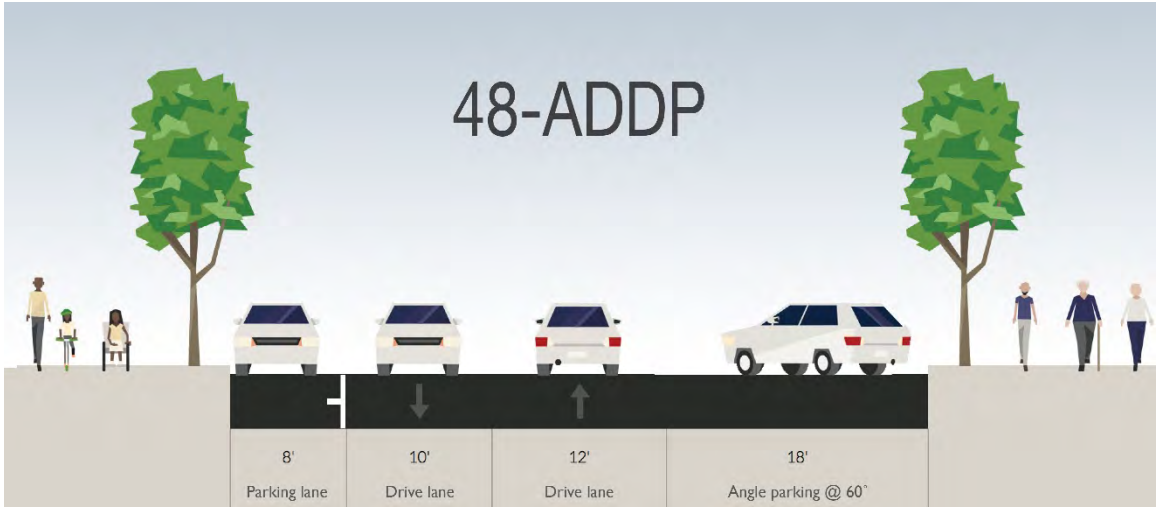

*This cross section is recommended for 7th Street between 6th Street and Elwood Avenue.*




*This cross section is recommended for Greenwood Avenue between 1st and 2nd Streets, viewed here looking south.*

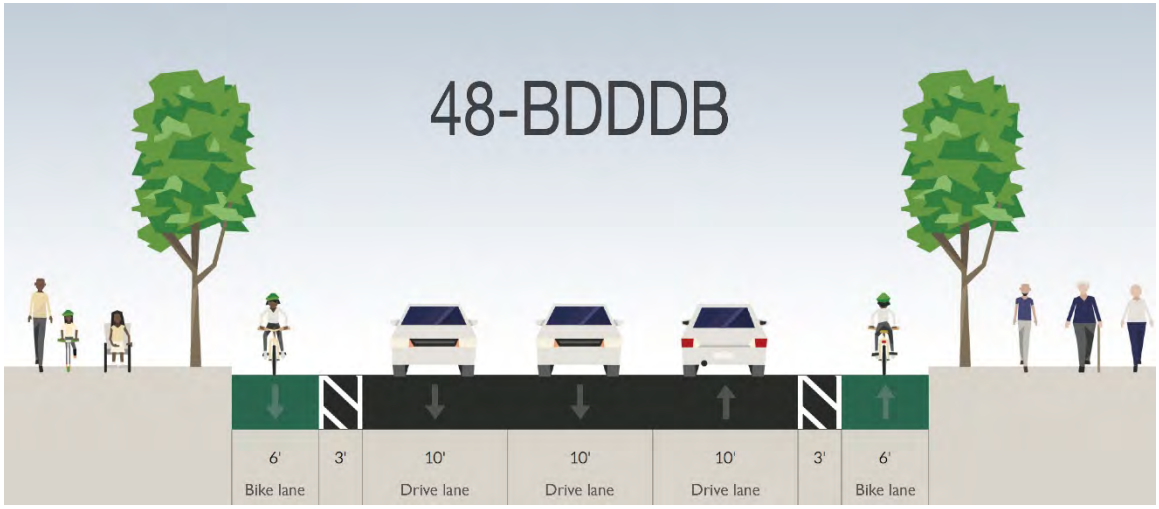



*This cross section is recommended for 8th Street between Denver and Boulder Avenues, viewed here looking east.*

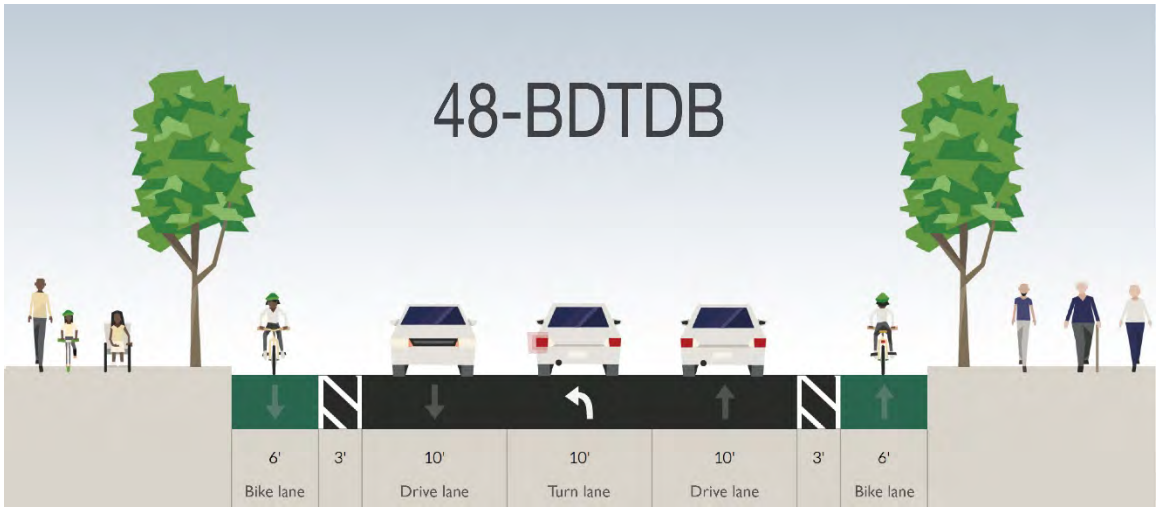



*This cross section is recommended for:*

- *Frankfort Avenue between 2nd and 4th Streets, viewed here looking south;*
- *5th Street between Boston and Cincinnati Avenues, viewed here looking west;*
- *11th Street between Main Street and Boston Avenue, viewed here looking west.*

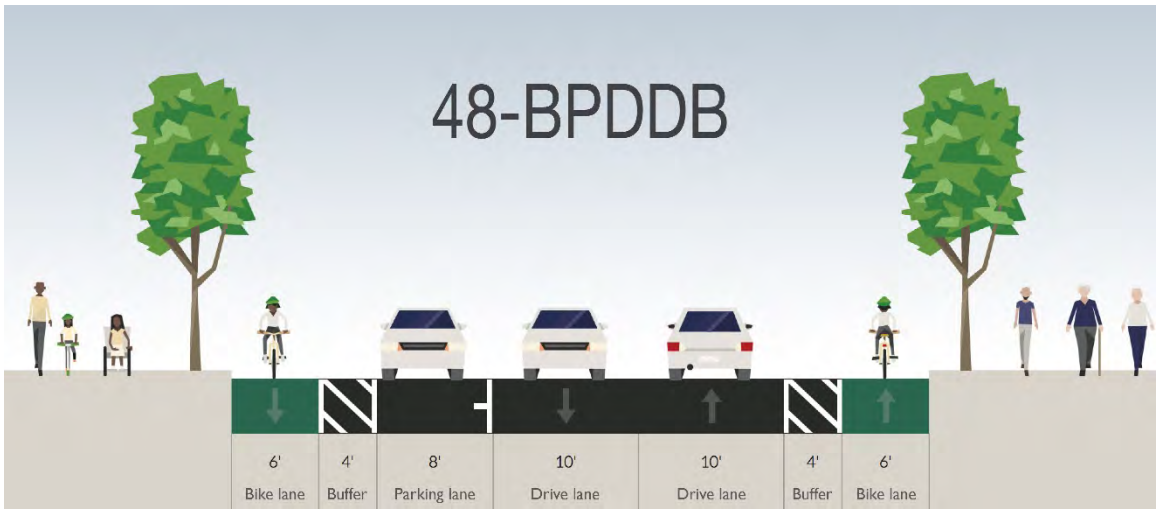



*This cross section is recommended for Archer Street between Elwood and Denver Avenues, viewed here looking west.*



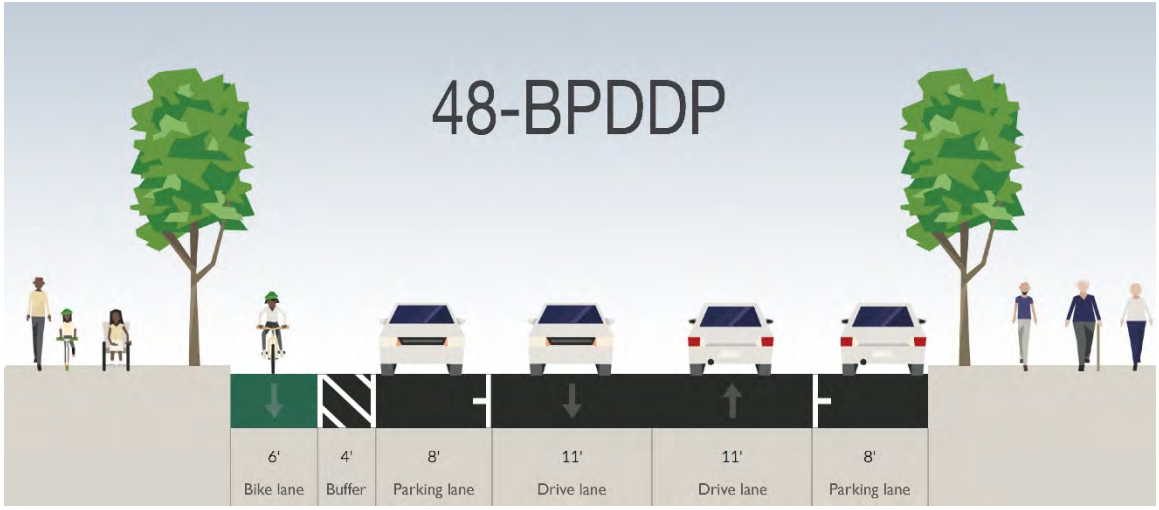

*This cross section is recommended for:*

- *Archer Street between M.L.K. Jr. Boulevard and Detroit Avenue, viewed here looking east;*
- *12th Street between Southwest Boulevard and the 11th Street Triangle, viewed here looking east.*

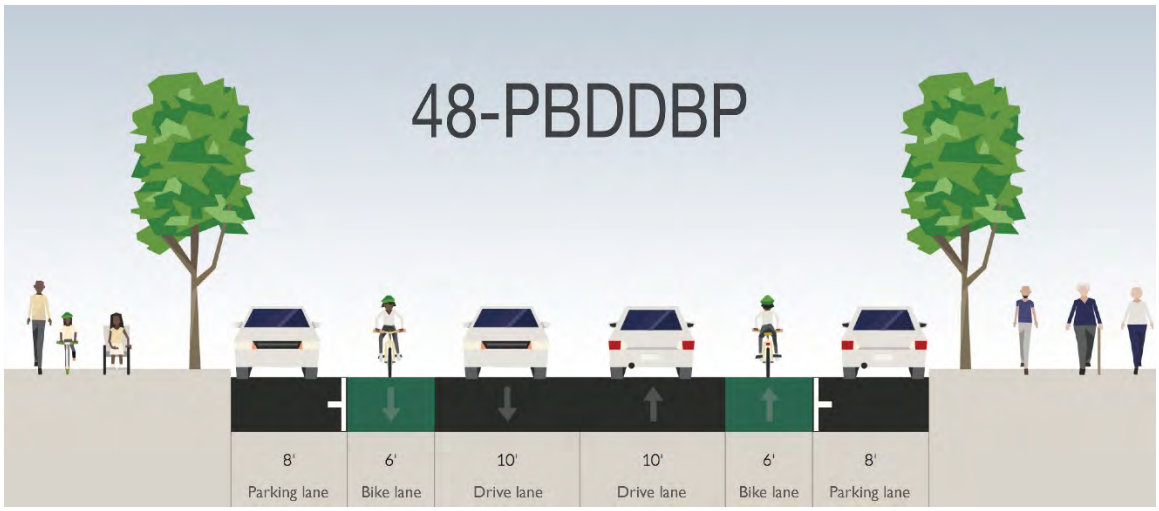



*This cross section is recommended for:*

- *Archer Street between Denver and Cheyenne Avenues and between Main Street and Boston Avenue and between Detroit and Greenwood Avenues, viewed here looking east;*
- *13th Street between Cincinnati Avenue and the IDL, viewed here looking east.*

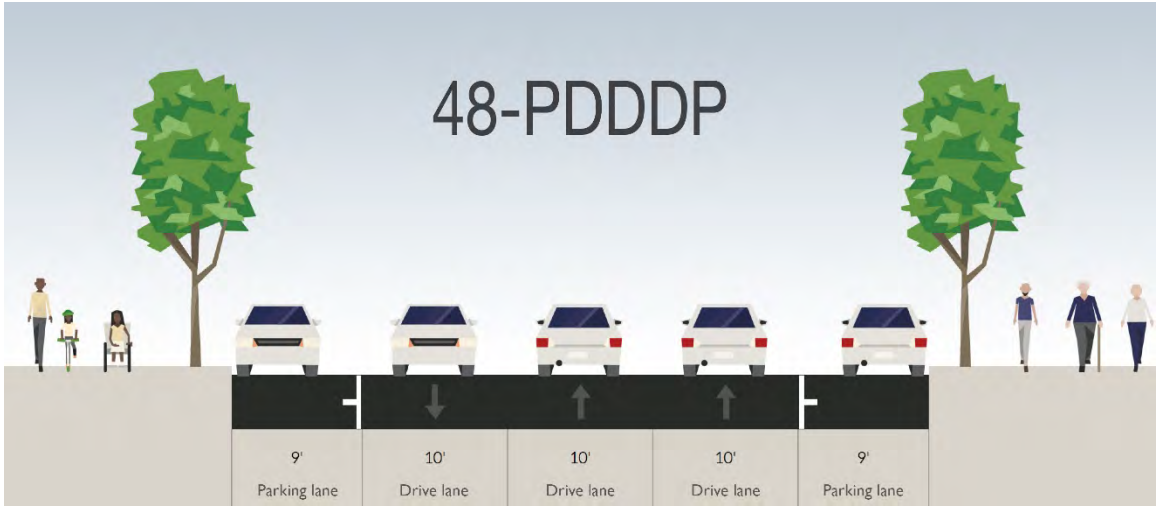



*This cross section is recommended for Cheyenne Avenue between 11th Street and the IDL, viewed here looking south.*

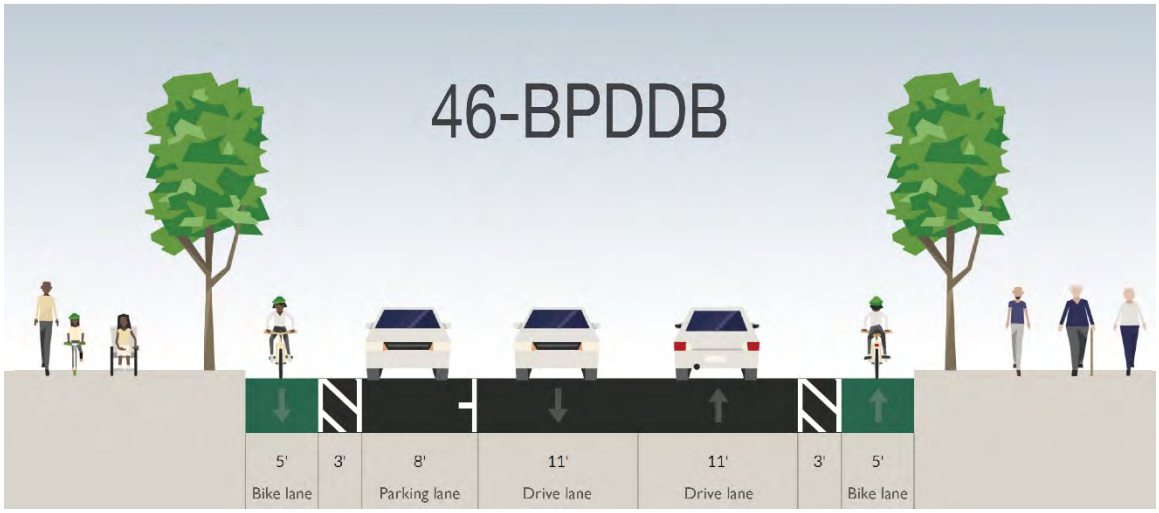



*This cross section is recommended for:*

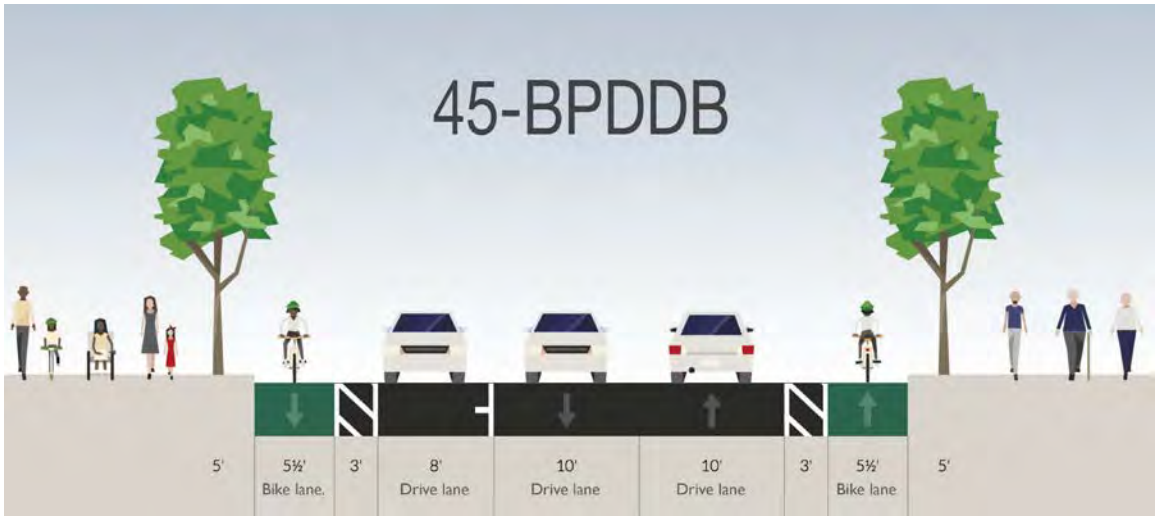
- *3rd Street between Lansing and Madison Avenues;*
- *6th Street between Frankfort Avenue and the IDL.*



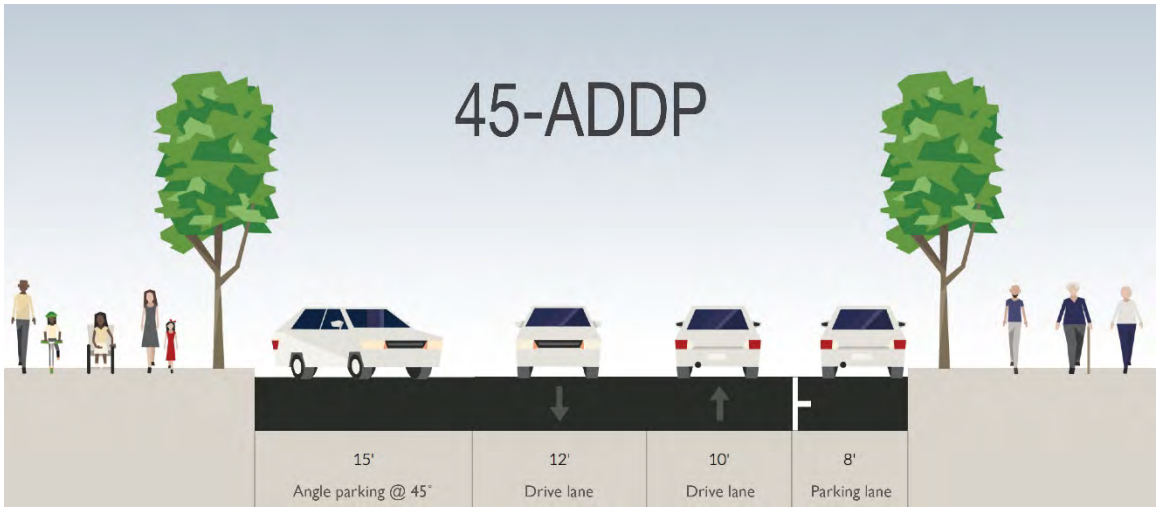

*This cross section is recommended for 2nd Street between Boulder and Cincinnati Avenues, viewed here looking east.*




*This cross section is recommended for Archer Street between Boston Avenue and M.L.K. Jr. Boulevard, viewed here looking east.*

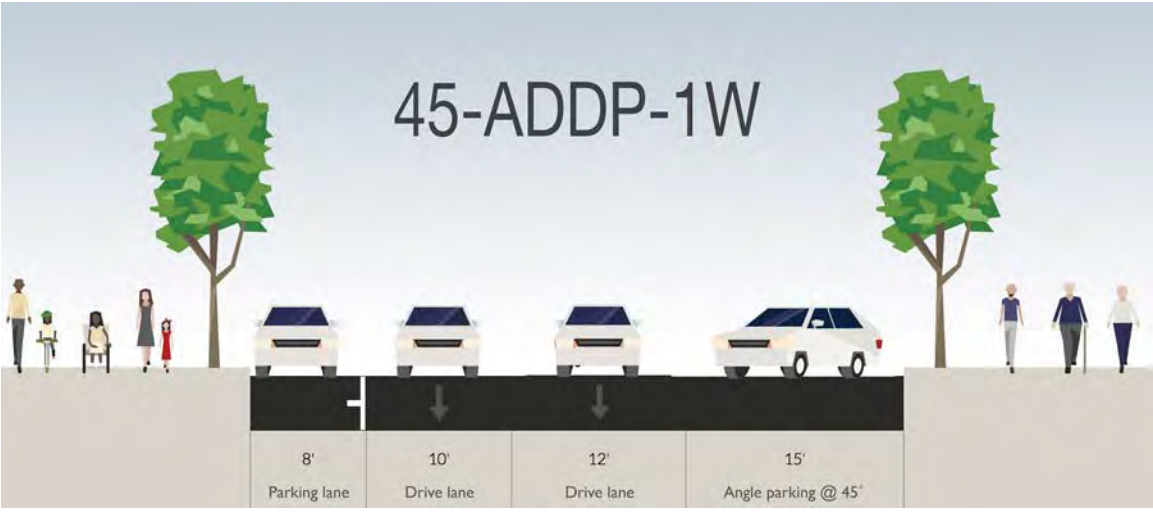



*This cross section is recommended for Boston Avenue from the curve south of 12th Street to the IDL, viewed here looking north.*



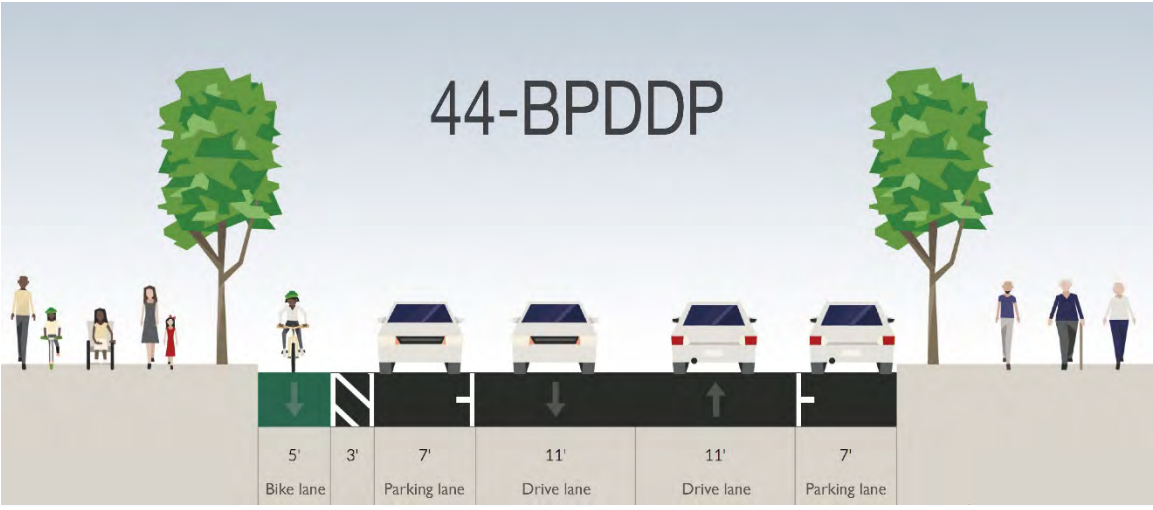

*This cross section is recommended for:*

- *Main Street between 10th Street and the IDL, viewed here looking north;*
- *Denver Avenue between Easton and Cameron Streets, viewed here looking north;*
- *4th Street between Frankfort and Kenosha Avenues, viewed here looking west.*

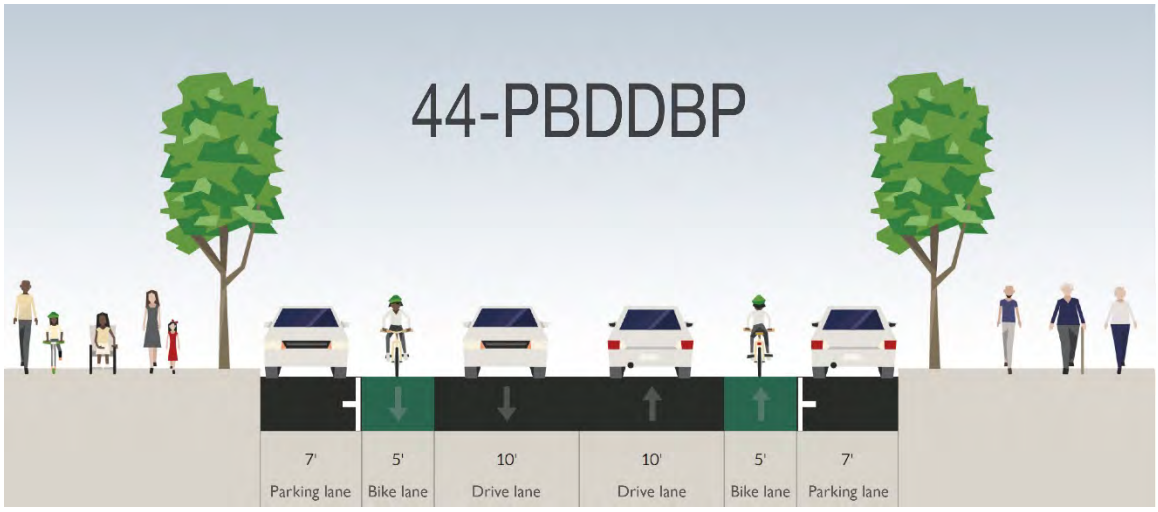



*This cross section is recommended for:*

- *Detroit Avenue between 12th and 13th Streets, viewed here looking south;*
- *8th Street between Elwood and Denver Avenues, viewed here looking west.*

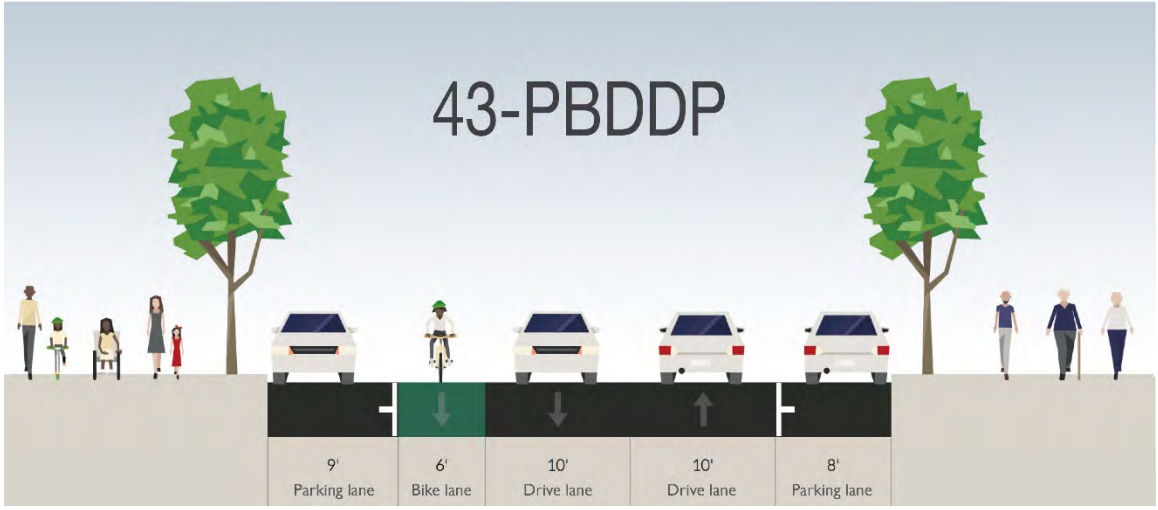



*This cross section is recommended for Boulder Avenue between 10th Street and the IDL, viewed here looking north.*

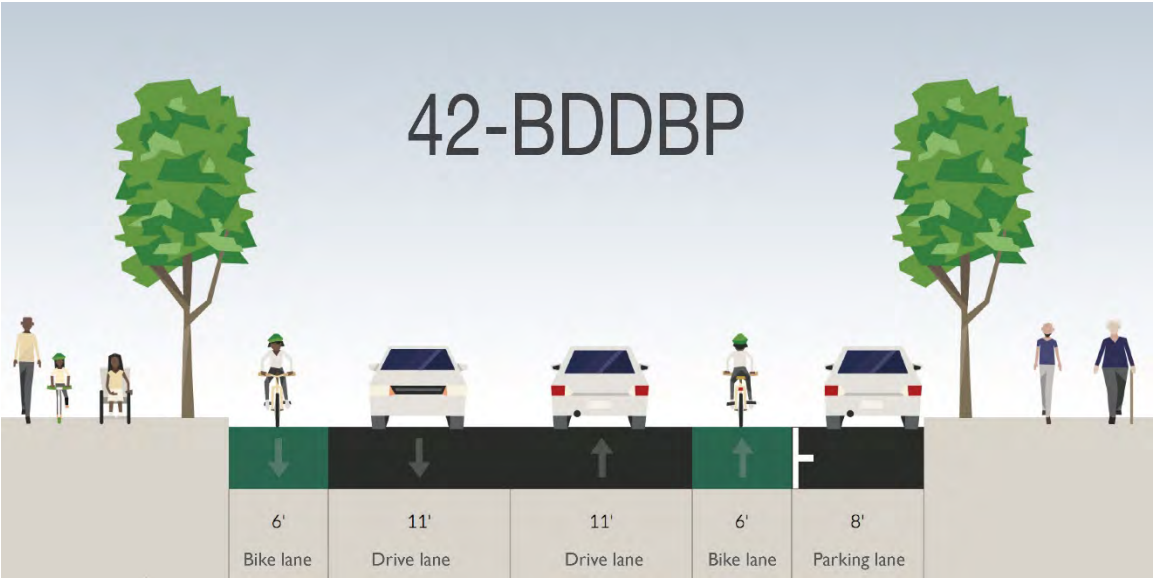



*This cross section is recommended for:*

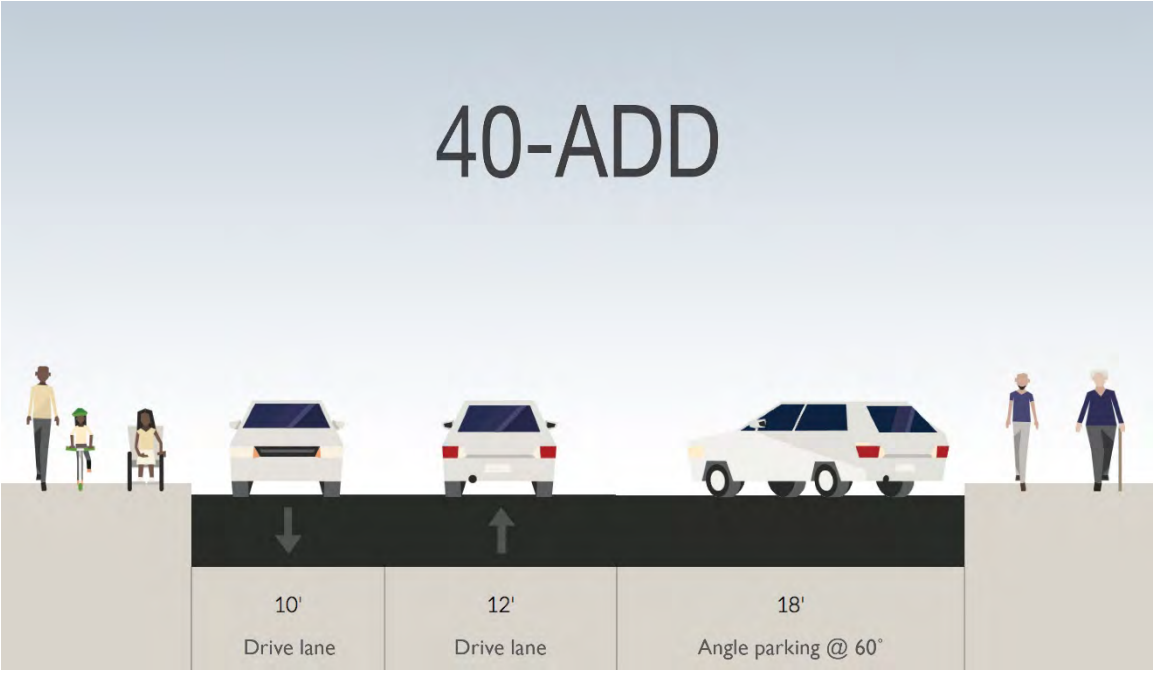
- *3rd Street between Cincinnati and Lansing Avenues;*
- *6th Street between Frankfort Avenue and the IDL.*



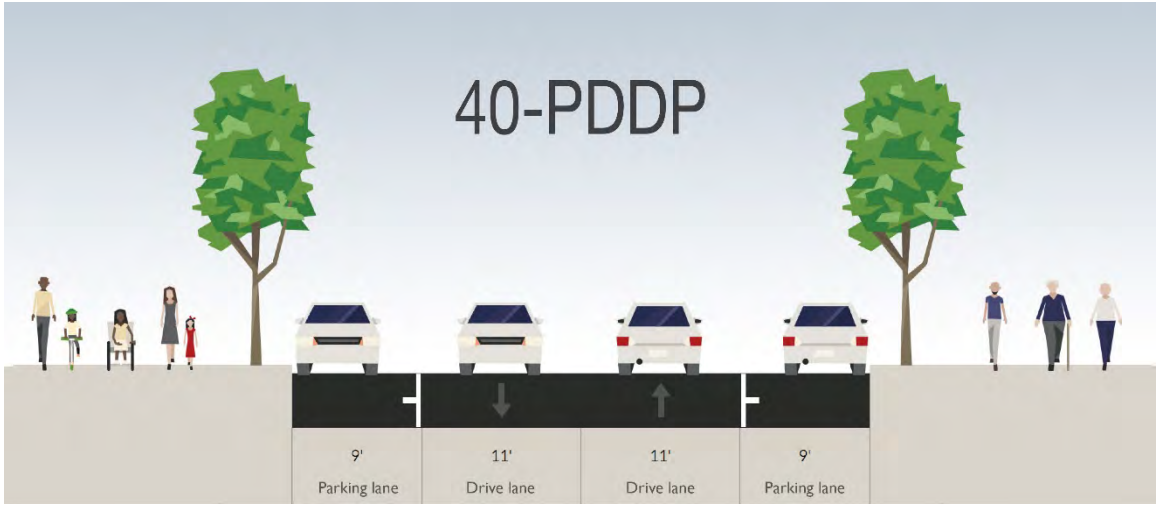

*This cross section is recommended for Cheyenne Avenue between the IDL and Cameron Street, viewed here looking south.*



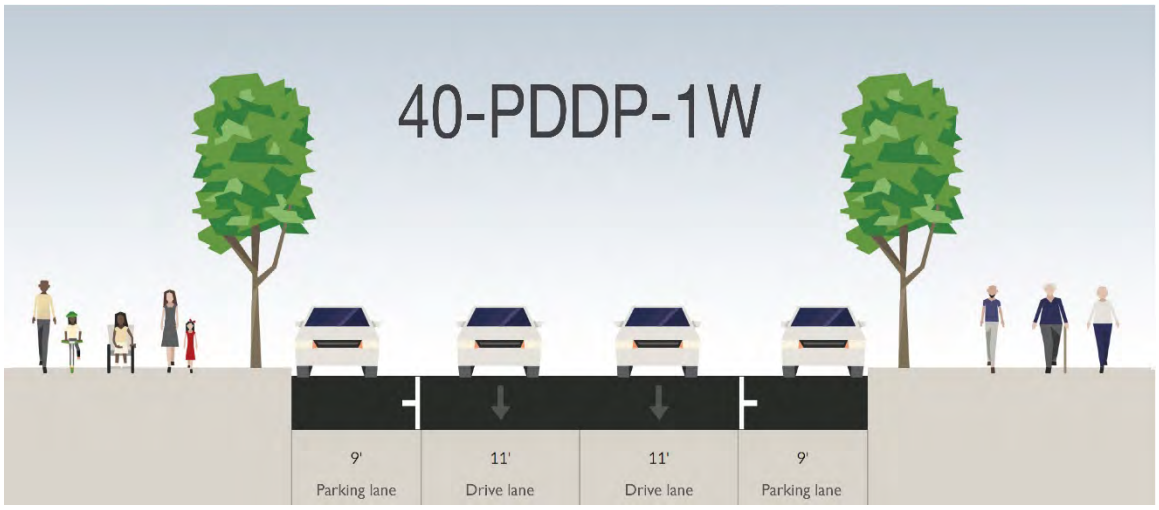

*This cross section is recommended for 13th Street between Boston and Cincinnati Avenues, viewed here looking east.*



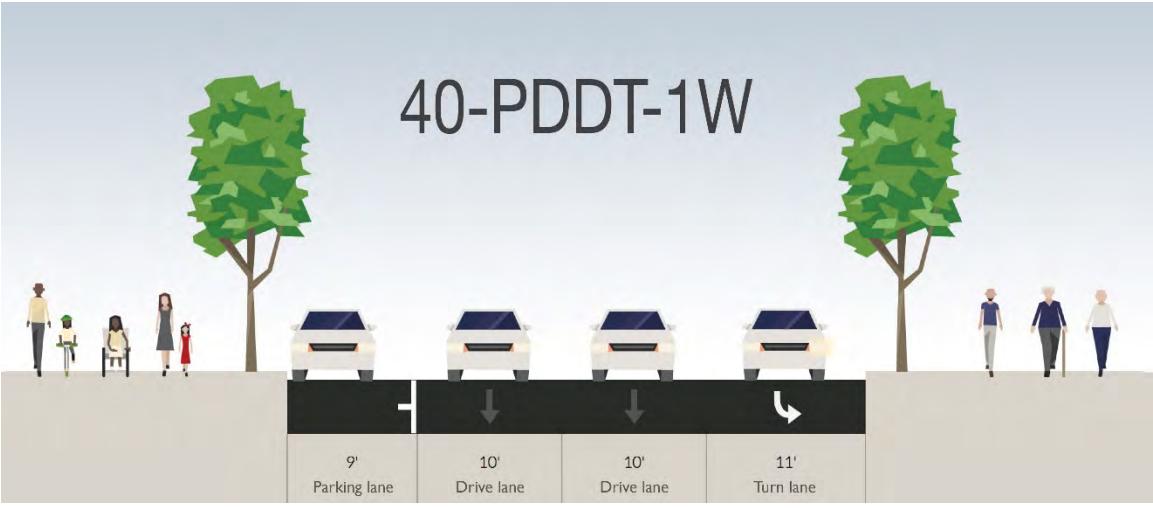

*This cross section is recommended for Main Street between Archer and 1st Streets, viewed here looking north.*



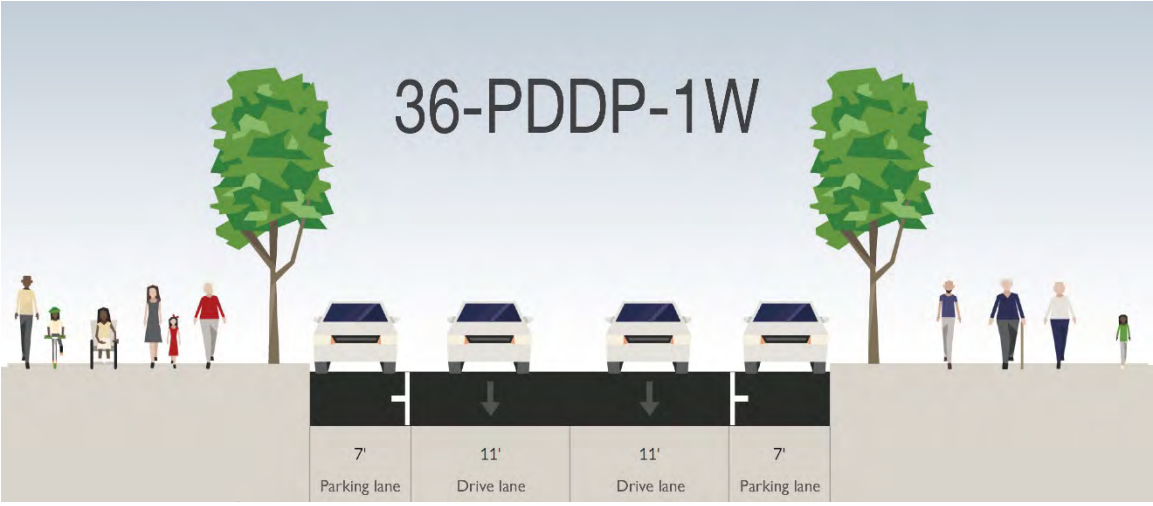

*This cross section is recommended for 11th Street between Houston Avenue and 12th Street and between Boston and Cincinnati Avenues.*




*This cross section is recommended for the half block of 1st Street west of Hartford Avenue, viewed here looking east.*

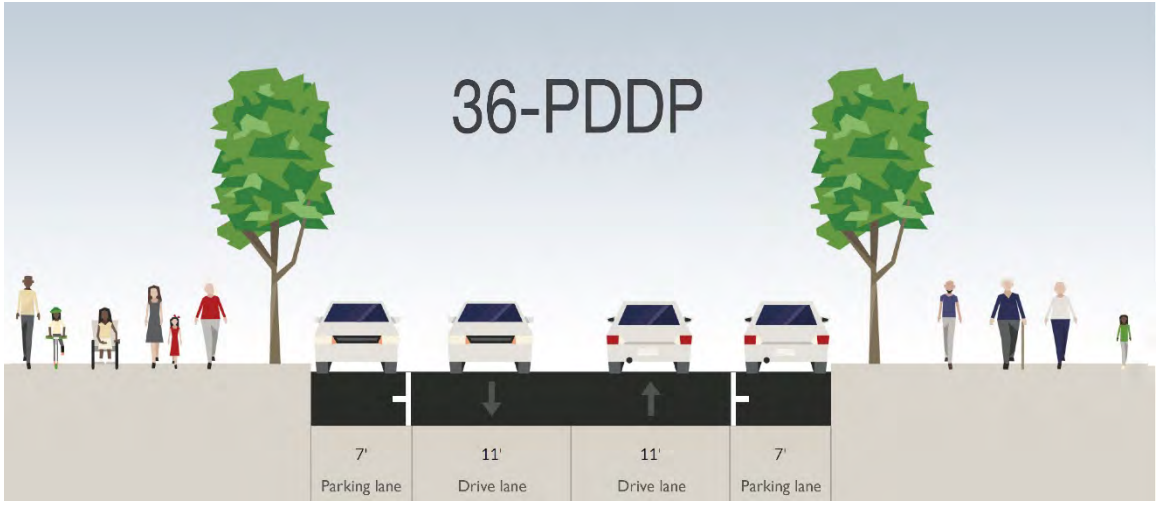



*This cross section is recommended for the half block of 1st Street east of Greenwood Avenue, viewed here looking east.*



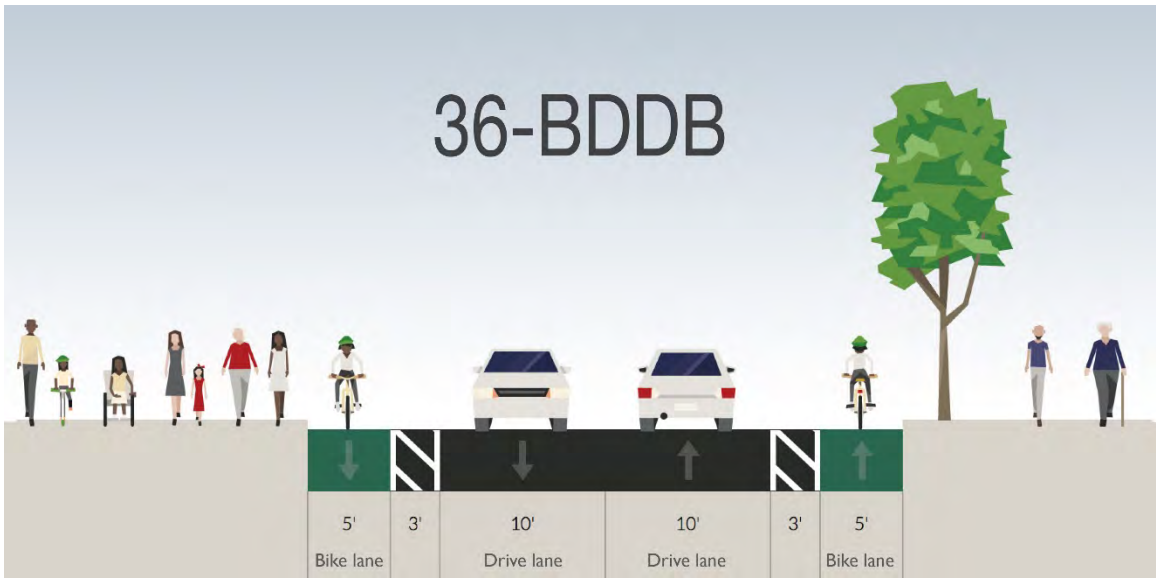

*This cross section is recommended for:*

- *Frisco Avenue between 1st and 3rd Streets, viewed here looking north;*
- *1st Street between Hartford and Lansing Avenues, viewed here looking east;*
- *8th Street between Elwood Avenue and Denver Avenue and between Boulder Avenue and Main Street, viewed here looking west.*



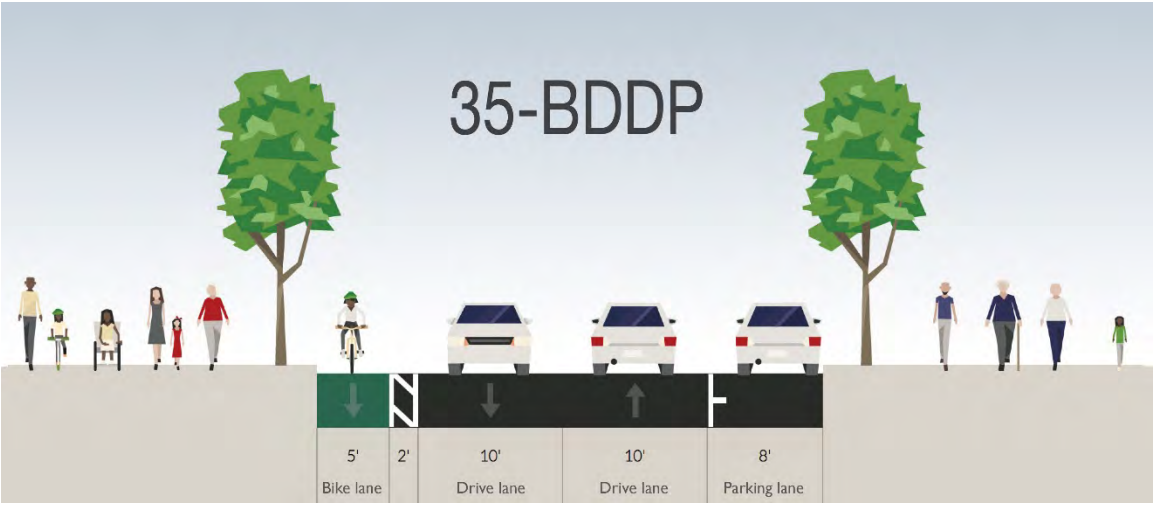

*This cross section is recommended for:*

- *Elwood Avenue between Archer and 1st Streets;*
- *Frisco Avenue between 6th and 7th Streets;*
- *5th Street between Elgin and Frankfort Avenues.*



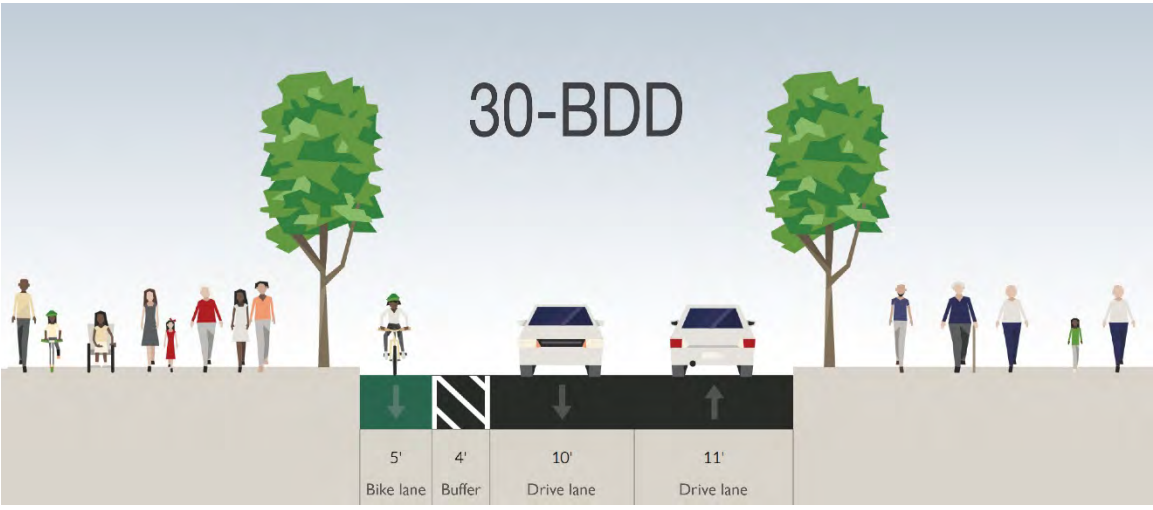

*This cross section is recommended for:*

- *Elgin Avenue between Archer Street and the railroad;*
- *Guthrie Avenue between Archer and 3rd Streets.*

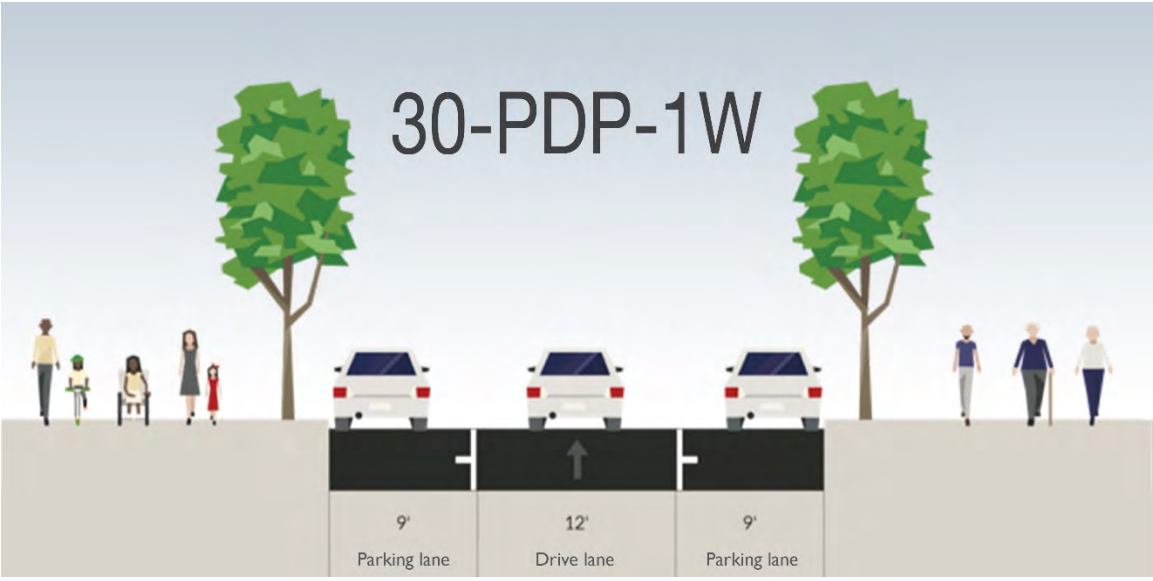



*This cross section is recommended for:*

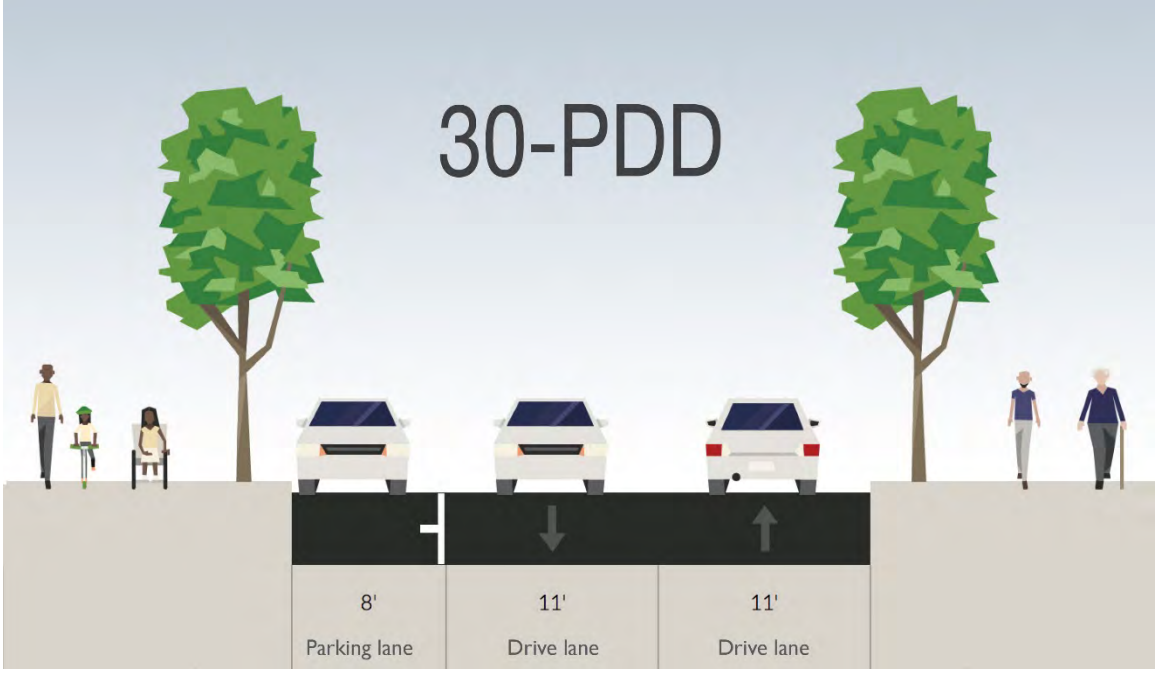
- *Boulder Avenue between the IDL and Easton Street, viewed here looking north;*
- *Cheyenne Avenue between Cameron and Archer Streets, viewed here looking south.*




*This cross section is recommended for Cheyenne Avenue between Archer Street and the railroad tracks, viewed here looking south.*

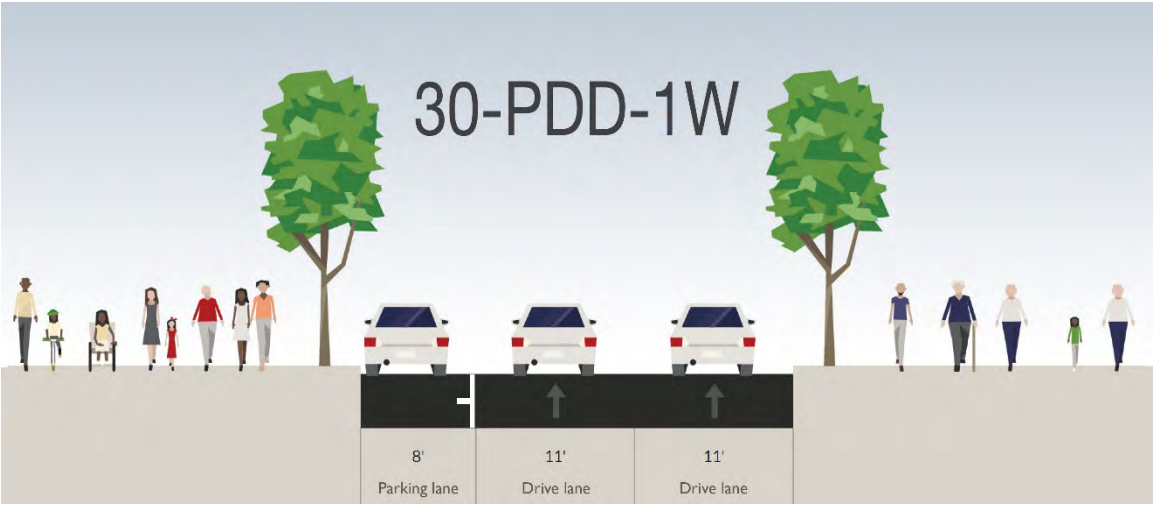



*This cross section is recommended for Kenosha Avenue between 7th and 8th Streets, viewed here looking north.*

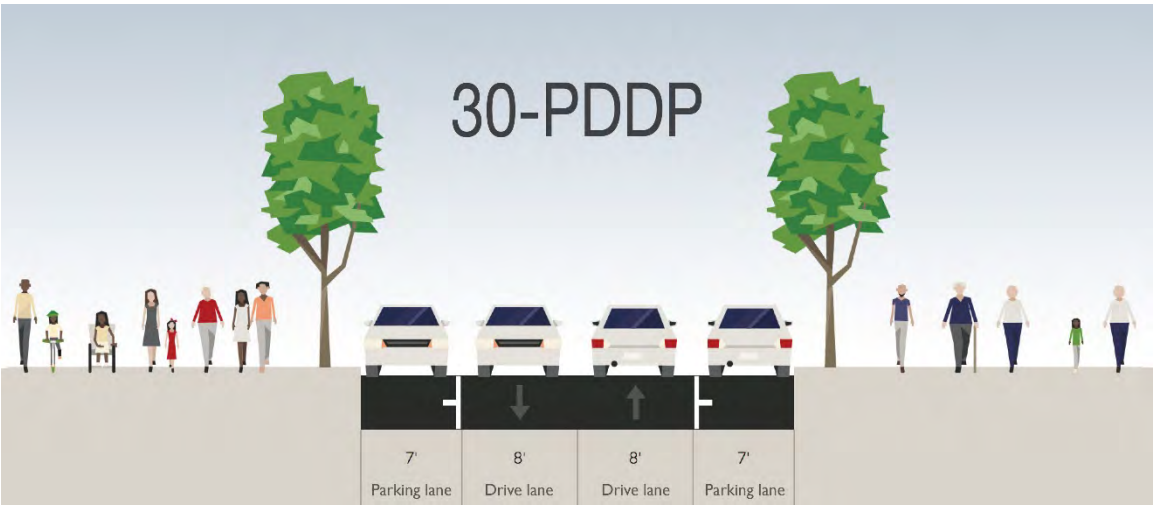



*This cross section is recommended for:*

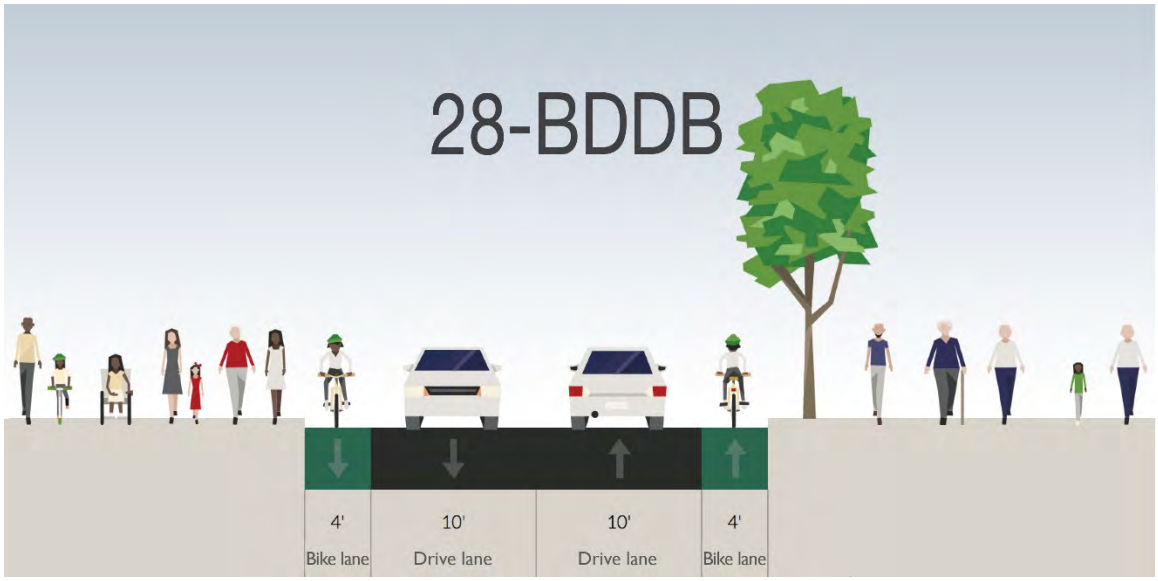
- *Frankfort Street between 4th and 7th Streets, viewed here looking south;*
- *Carson Avenue between 11th and 12th Streets, viewed here looking north;*
- *9th Street between Denver and Cheyenne Avenues, viewed here looking east;*
- *11th Street between Boston and Detroit Avenues, viewed here looking east;*
- *12th Street between Carson and Cincinnati Avenues, viewed here looking east or west (varies by block).*



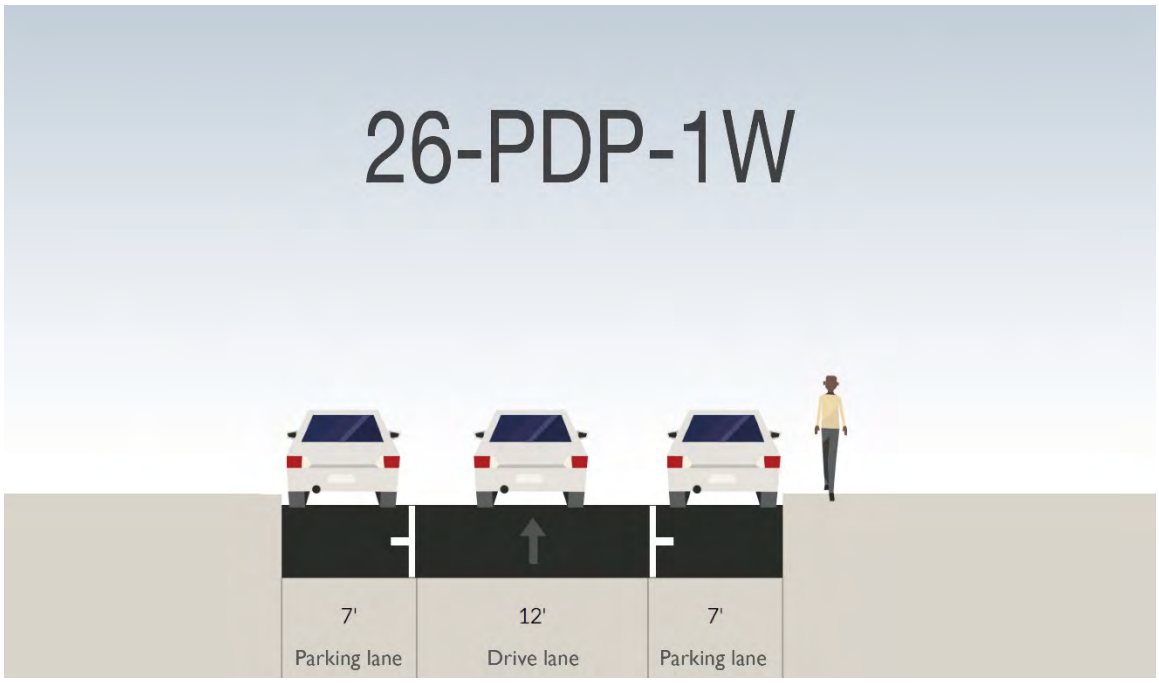

*This cross section is recommended for 8th Street between Elwood and Denver Avenues, viewed here looking east.*



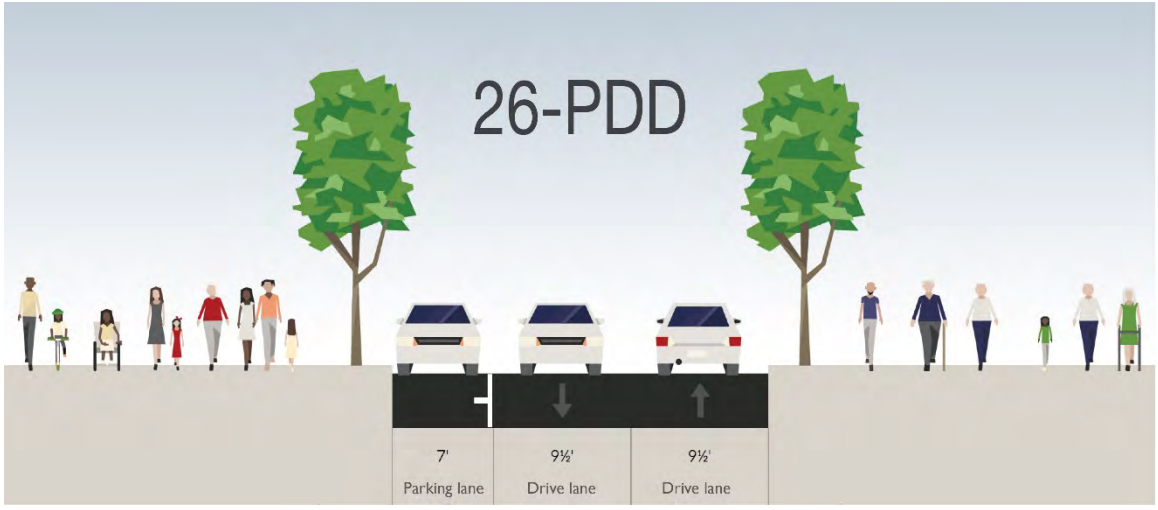

*This cross section is recommended for Main Street between 3rd and 4th Streets, viewed here looking north.*




*This cross section is recommended for Houston Avenue between Heavy Traffic Way and 3rd Street.*

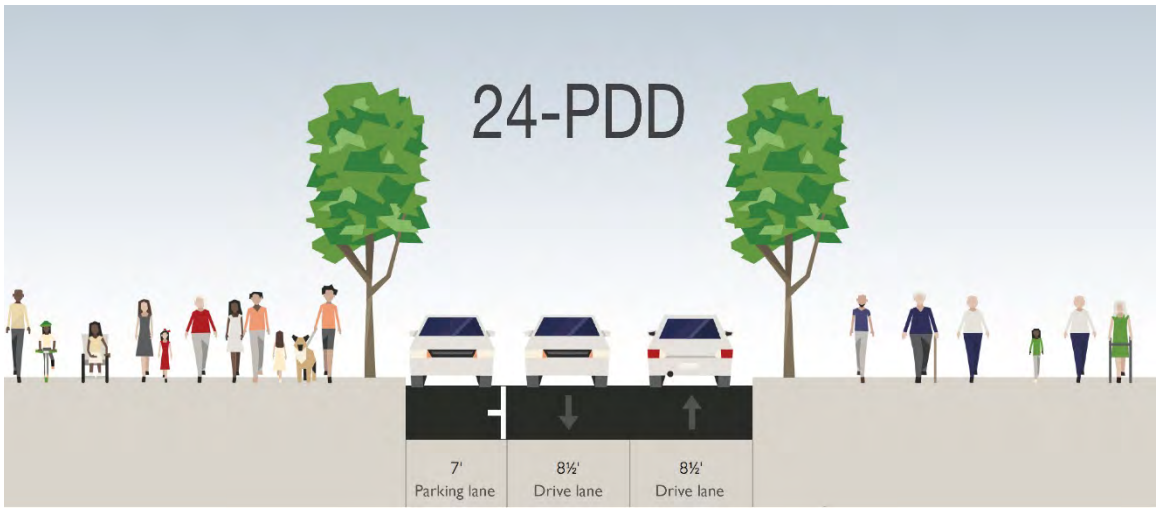



*This cross section is recommended for 4th Street between Kenosha and Lansing Avenues, viewed here looking west.*



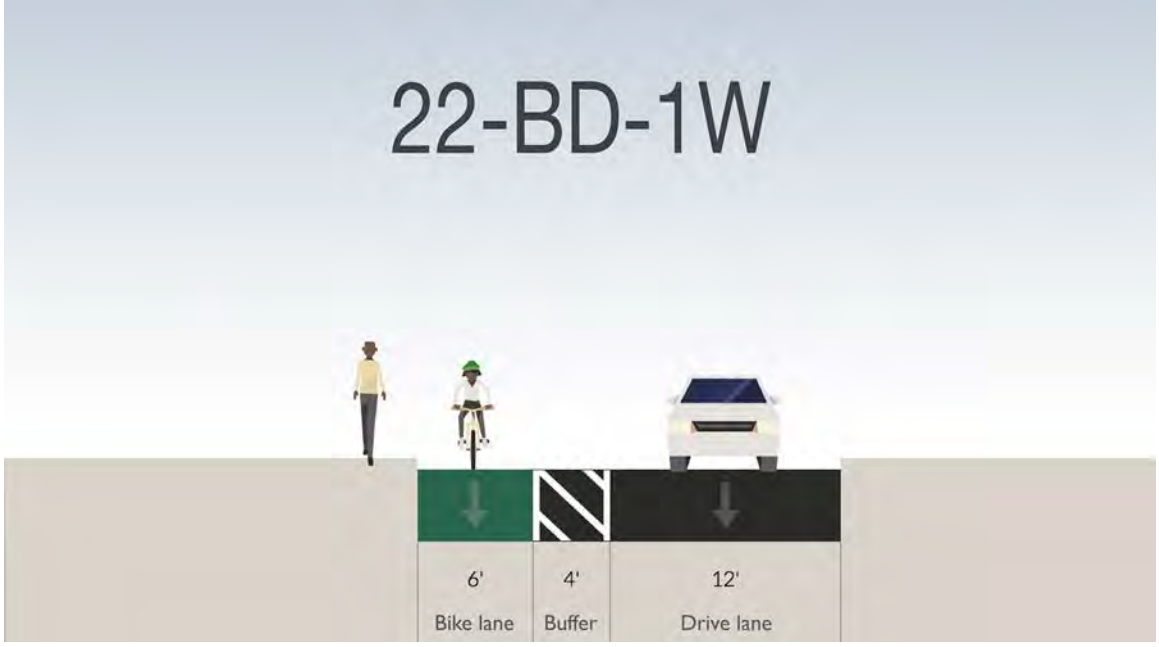

*This cross section is recommended for:*

- *The cul-de-sac on Boston Avenue north of 1st Street, viewed here looking north;*
- *12th Street between Detroit and Frankfort Avenues, viewed here looking west.*




*This cross section is recommended for:*

- *Main Street between 4th and 5th Streets, viewed here looking north;*
- *5th Street between Denver and Boulder Avenues, viewed here looking east;*
- *12th Street between Cincinnati and Detroit Avenues, viewed here looking east.*




*This cross section is recommended for 11th Street on the north side and the west side of the triangle at 12th Street, viewed here looking east (above the triangle) and north (west of the triangle).*

**North-South Streets**

As noted elsewhere, recommendations are made for every street which can be improved, irrespective of budgetary limitations. A recommended order for these improvements is discussed in Part VI: Setting Priorities.

Streets are organized from east to west. Streets with few changes recommended are mentioned briefly. Streets with significant changes receive a more thorough discussion. When a new striping pattern is recommended, the proposed street type is referenced by name, and can be seen in the Street Typology.

***Lansing Avenue***

No changes recommended.

***Kenosha Avenue***

Between 7th and 8th Streets, an absence of marked parking gives the appearance of a single 30-foot driving lane. Mark parking spaces on both flanks. *(Street Type 30-PDP-1W)*

***Hartford Avenue***

No changes recommended.

### *Greenwood Avenue*

Existing Conditions

Greenwood Avenue is a two-way street connecting the historic Greenwood District with downtown and new developments in the East Village area. It runs from the IDL to 3rd Street. There are faded bicycle sharrow markings along its course from Archer Street to 2nd Street. The street carries around 150 cars per hour at peak hour.

The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Archer Street: a 56-foot cartpath holds two driving lanes and two lanes of head-in parking.
- Archer Street to 2nd Street: a 50-foot cartpath holds four driving lanes and a striped shoulder on each side. Currently, the street is used as two driving lanes and two lanes of parallel parking.
- 2nd Street to 3rd Street: a 57-foot cartpath holds two driving lanes, a lane of parallel parking, and a lane of newly-constructed head-in parking.

Analysis

Greenwood Avenue does not need more than two driving lanes in any location except between 1st and 2nd Streets, where a center turn lane is recommended. Since it is not recommended as a cycling route, the remaining roadway should be dedicated to parking. But since the street will still attract some cyclists, the existing head-in angle parking should ideally be restriped as back-in.

Replicating the streets' proposed cross section under the bridge overpass, including striping angled parking spaces, will help calm traffic and make this a more welcoming environment to people walking and biking under the bridge. This could also create opportunities for sharing parking facilities on either side of the bridge when needed.

The recommended changes are intended to create an outcome that no longer encourages speeding, while providing more valuable on-street parking. It should be noted that there is a 4-way stop today at the intersection of Archer Street, demonstrating that the model could be replicated elsewhere in the downtown context.

Recommendation

Restripe the street to the following configurations:

- IDL to Archer Street: Re-stripe existing head-in parking as back-in parking @ 60° angle.
- Archer Street to 1st Street: *Street Type 50-ADDP:* two driving lanes, a lane of parallel parking against the east curb, and a back-in parking lane @ 60° angle against the west curb.
- 1st Street to 2nd Street: *Street Type: 50-PDTDP:* two driving lanes, a center left-turn lane and two parallel parking lanes against the curbs.
- 2nd Street to 3rd Street: *Street Type 50-ADDP:* two driving lanes, a parallel parking lane on the west curb, and a back-in parking lane @ 60° angle against the east curb in the pocket by the new development.

### *Frankfort Avenue*

Existing Conditions

Frankfort Avenue is a five-block street running from 2nd Street to 7th Street, carrying between 49 and 149 vehicles at the peak hour.

The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- 2nd Street to 4th Street: a 48-foot cartpath holds two driving lanes and two lanes of parallel parking. It widens to 55 feet just south of 3rd street for half of the block.
- 4th Street to 5th Street: a 30-foot cartpath holds two driving lanes. A lane of head-in parking on the west flank is located outside of the cartpath.
- 5th Street to 7th Street: a 30-foot cartpath holds two driving lanes.

Analysis

There is excess width throughout Frankfort Avenue. To create an outcome that no longer encourages speeding while providing more valuable on-street parking, it is recommended to narrow the driving area where possible through angled and parallel parking, as fits. Frankfort is not a biking corridor, but rear-angle parking is recommended to reduce hazards to cyclists, even though the Street is not planned to contain bicycle facilities.

Recommendation

Restripe the street to the following configurations:

- 2nd Street to 4th Street: *Street Type 48-ADDP:* two driving lanes, a parallel parking lane against the east curb, and a back-in parking lane @ 60° angle against the west curb; where cartpath widens to 55 feet just south of 3rd: *Street Type 55-ADDA:* two driving lanes flanked by two back-in parking lanes @ 45° angle.
- 4th Street to 7th Street: *Street Type 30-PDD:* two driving lanes with parallel parking along one flank. (Head-in parking to remain where constructed outside of the cartpath between 4th Street and 5th Street).

### *Elgin Avenue*

Existing Conditions

Elgin Avenue is a two-way street that connects the heart of downtown to the ONEOK Field area and provides a path to neighborhoods east of the city via its connection with 11th Street. It carries around 80 vehicles per peak hour north of Archer Street and between 338 and 741 vehicles per peak hour south of 1st Street.

The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Mathew B. Brady Street: a 46-foot cartpath holds two driving lanes, a lane of parallel parking along the east curb, and a lane of head-in parking against the west curb.
- Mathew B. Brady Street to Archer Street: a 44-foot cartpath holds two driving lanes and two lanes of parallel parking.
- Archer Street to railroad tracks: a 55-foot cartpath holding two driving lanes, one lane of parallel parking on the east curb, and one lane of head-in parking on the east curb. The street narrows at mid-block to a 36-foot cartpath holding two driving lanes and one lane of parallel parking.
- Railroad tracks to 1st Street: a 48-foot cartpath holds two driving lanes, a lane of parallel parking along the east curb, and a lane of head-in parking against the west curb.
- 1st Street to 5th Street: a 55-foot cartpath holds four driving lanes and two parallel parking lanes.

- 5th Street to 10th Street: a 55-foot cartpath holds four driving lanes and a center turn lane, narrowing to a 35-foot cartpath holding two driving lanes and a center median near the roundabout at 10th Street.

Analysis

In the Brady Arts District, the street contains 9 extra feet of width, but it's no great harm for a couple of blocks in such a busy location. South of the RR, Elgin has more than twice the capacity it needs, and is considered quite dangerous, especially at the 7th and 8th Street intersections. Traffic analysis says that the street can be two lanes in all locations, except where a center turn lane is needed between 7th and 8th Streets. Such a cross section (*Street Type 55-BDTDPB*) should generally also be used whenever a loading zone is needed—if and only if other alternatives cannot be found to handle deliveries.

Elgin Avenue, south of Archer, will become one of the primary north-south biking corridors on the east side of downtown. North of Archer, there are no bicycle facilities recommended, as the street has recently been rebuilt without them. The big bulb-out at the corner of Archer Street is also a concern for this bike facility transition, and this might be a place for a rebuild, since it's an important corner in the bike network plan.

South of Archer Street, where the cycletrack pair transitions from M.L.K. Jr. Boulevard/Cincinnati Avenue and Detroit Avenue, Elgin Avenue will become the primary biking corridor on the east side of downtown. At the transition into the 10th street roundabout, the safety of the design must be handled carefully as the cartpath narrows. First, the parking lanes should drop off, then the buffers, then the bike lanes should merge into sharrows right before the roundabout.

Recommendation

Restripe the street to the following configurations:

- IDL to Archer Street: no change but, if possible, re-stripe head-in parking as back-in.
- Archer Street to railroad: *Street Type 55-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes against the curbs. Where the cartpath narrows to 36 feet north of railroad, *Street Type 36-BDDB*: two driving lanes flanked by two buffered bike lanes.
- Railroad to 7th Street: *Street Type 55-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes against the curbs.
- 7th Street to 8th Street: *Street Type 55-BDTDPB*: two driving lanes, one center turn lane, one parallel parking lane along the eastern edge of the driving lanes, and two buffered bike lanes against the curbs.
- 8th Street to 10th Street: *Street Type 55-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes against the curbs.

- At 10th Street roundabout: As the street narrows, transition bike facilities carefully in the following sequence from north to south: from BPDDPB to BDDB to DD with marked sharrows.

### *Detroit Avenue*

Existing Conditions

Detroit Avenue is a one-way northbound street slated to be rebuilt from 2nd Street to 12th Street in 2020. Currently, the section north of Mathew B. Brady Street is finishing reconstruction. Detroit carries around 1,000 vehicles at peak hour north of Archer Street and between 232 and 608 cars at peak hour south of 1st Street.

The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Archer Street: a 59-foot cartpath holds four driving lanes and two parallel parking lanes.
- On the bridge from Archer Street to 1st Street: a 61-foot cartpath holds four driving lanes.
- 1st Street to 2nd Street: a 55-foot cartpath holds four driving lanes and two parallel parking lanes.
- 2nd Street to 12th Street: a 55-foot cartpath holds four driving lanes and two parallel parking lanes.
- 12th Street to 13th: a 45-foot cartpath holds three driving lanes and a lane of parallel parking.

Analysis

Detroit Avenue runs the full length of downtown. While recommended for eventual two-way traffic, that change is not anticipated in the near term. North of Archer, the street is designated to carry a one-way northbound cycletrack that pairs with a one-way southbound cycletrack on M.L.K. Jr. Boulevard. At Archer, the pair will transition over to Elgin Avenue.

Generally, Detroit's traffic load only requires two driving lanes, but north of Archer, an additional turn lane is needed to accommodate demand, and just south of 1st, 2nd and 7th, short turn pockets are needed to handle turning vehicles.

On-street parking can be gained throughout the corridor through the provision of 60° angled back-in parking, using the additional width from excess driving lanes. It is also recommended to stripe parking in front of the four large garage doors just north of Cameron Street, as this building seems unused.

At its north end, Detroit forks into M.L.K. Jr. north of John Hope Franklin Blvd. Were Detroit eventually to be converted to two-way travel, this fork could remain intact if Detroit was kept one-way from John Hope Franklin to the fork. At the southern ramp to the IDL, Detroit is skewed east of the ramp, so a southbound lane could be turn-only at 13th street, with two Do Not Enter signs at ramp.

Recommendation

Restripe the street to the following configurations:

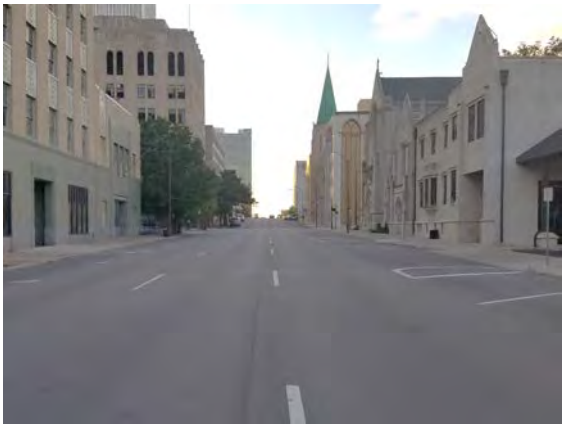
- IDL to Archer Street: *Street Type 59-BPDDDP-1W*: three driving lanes, two parallel parking lanes, and a one-way northbound buffered bikeway against the east curb. (The northern part of this section is being completed now.)
- On the bridge from Archer Street to 1st Street: *Street Type 61-ADDA-1W*: two driving lanes flanked by two back-in parking lanes @ 60° angle.
- 1st street to 12th Street: *Street Type 55-ADDA-1W*: two driving lanes flanked by two back-in parking lanes @ 45° angle. However:
- Just south of 1st Street, 2nd Street, and 7th Street: *Street Type 55-PTDDA-1W*: one turn lane, two driving lanes, a lane back-in parking @ 45° angle against the east curb, and a lane of parallel parking against the west curb.
- 12th Street to 13th Street: *Street Type 45-ADDP-1W*: two driving lanes, a back-in parking lane @ 60° angle against the west curb, and a parallel parking lane against the east curb.
- Endeavor to close all redundant curb cuts, while limiting the no-parking area around each curb cut to an area within 3 feet of each driveway edge. This will result in a large increase in the number of on-street parking stalls.

Note

Concurrent with this study, plans for restriping the northernmost sections of Detroit Avenue and M.L.K. Jr. Boulevard were modified to reflect the intentions of this Study. Those restriped sections comply with the 59-BPDDDP-1W design recommended herein, with the exception that the bike buffer was narrowed by 3 feet so that the recommended 10-foot travel lanes could instead be 11-foot lanes, as requested by the City of Tulsa for this location.

### *M.L.K. Jr. Boulevard / Cincinnati Avenue*

Existing Conditions



The name of this street changes from M.L.K. Boulevard to Cincinnati Avenue as it crosses Archer Street. It runs one way south, in a pair with Detroit Avenue. It is a major southbound corridor through downtown, carrying around 300 vehicles at peak hour north of Archer Street and between 595 and 1,517 vehicles at peak hour south of the railroad tracks.

The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Cameron Street: A 59-foot cartpath recently has been restriped to hold three driving lanes, two parallel parking lanes, and a buffered bike lane along the west curb.
- Cameron Street to Archer Street: A 59-foot cartpath holds four driving lanes and two parallel parking lanes.
- Bridge from Archer Street to 1st Street: A 61-foot cartpath holds four driving lanes, and a right turn lane just north of 1st Street.
- 1st Street to 2nd Street: A 48-foot cartpath holds three driving lanes and two parallel parking lanes.
- 2nd Street to 4th Street: A 55-foot cartpath holds four driving lanes and two parallel parking lanes.
- 4th Street to 8th Street: A 55-foot cartpath has recently been restriped to hold three driving lanes, one parallel parking lane, and one back-in parking lane.
- 8th Street to 11th Street: 55-foot cartpath holds four driving lanes and two parallel parking lanes.
- 11th Street to 12th Street: the parking lanes have been eliminated, due to curb cuts on the east flank and for no clear reason on the west flank.
- 12th Street to 13th Street: the parking lanes have been eliminated, probably due to proximity to the IDL.

Analysis

As already noted, the M.L.K. Jr. Boulevard/Cincinnati Avenue and Detroit Avenue pair are not recommended for short-term reversion to two-way traffic. Because a comprehensive two-way reversion remains the desired long-term outcome for downtown, these streets should be reconsidered for two-way traffic once the reversion of other one-way pairs is deemed a success.

Anticipating that the street will maintain its one-way configuration, the traffic analysis suggests that M.L.K. Jr. Boulevard should contain three lanes from the IDL to Cameron, two lanes from Cameron to 3rd, and three lanes from 3rd to 13th. No additional turn lanes are needed. The recent restriping between 4th and 8th has demonstrated the advantages to placing rear angle parking on this street, and a continuation of this practice is a good strategy for right-sizing the street to its anticipated demand. Because the presence of this angle parking leaves no room for cycle facilities where three lanes of traffic are present, this street cannot be a continuous biking corridor; that job will fall to Elgin Avenue. However, because Elgin cannot easily fit a cycletrack north of Archer, it has become clear that one-way bike lanes on Detroit and M.L.K. Jr./Cincinnati offer the best opportunity for bringing cyclists though the Brady Arts District. For that reason, it is proposed that M.L.K. Jr. Boulevard include a southbound one-way cycletrack on its west flank between Archer and the IDL, which will pair with the northbound one-way cycletrack proposed for Detroit north of Archer.

After roadway is dedicated to driving and biking lanes, the remaining space should be used for the configuration of parking that puts it to best use. This ranges from two flanks of parallel parking to two flanks of rear-angle parking, with an intermediate condition containing one flank of each type. The angle of that parking depends also on the space available. Spaces deeper than 18 feet should be angled at 60° to maximize their yield. Shallower spaced should be angled at 45°.

As on most streets, missing curb parking as a result of curb cuts creates large areas of wasted asphalt that are an inducement to speeding. Curb cuts should be eliminated wherever possible, and parking should be striped much closer to them than current practice, to create less open asphalt. Additionally, the only justification for removing parking from the block between 12th and 13th Streets is to speed up traffic before the highway ramp, a dangerous objective.

<u>Recommendation</u>
Restripe the street to the following configurations:

- IDL to Cameron Street: *Street Type 59-BPDDDP-1W*: three southbound driving lanes flanked by two parallel parking lanes and a one-way southbound buffered bike lane on the west curb.
- Cameron Street to Archer Street: *Street Type 59-BPDDA-1W*: two southbound driving lanes flanked by a back-in parking lane @ 60° angle against the east curb and a parallel parking lane protecting a southbound buffered bike lane running along the west curb.
- Archer Street to 1st Street: *Street Type 61-ADDA-1W*: two southbound driving lanes flanked by two back-in parking lanes @ 60° angle.
- 1st Street to 3rd Street: *Street Type 55-ADDA-1W*: two southbound driving lanes flanked by two back-in parking lanes @ 45° angle.

- 3rd Street to 4th Street, 8th Street to 13th Street: *Street Type 55-ADDDP-1W*: Three southbound driving lanes flanked by a parallel parking lane and a back-in parking lane @ 45°angle, as already completed between 4th and 8th streets.
- 4th Street to 8th Street: No change.
- Endeavor to close all redundant curb cuts, while limiting the no-parking area around each curb cut to an area within 3 feet of each driveway edge. This will result in a large increase in the number of on-street parking stalls.

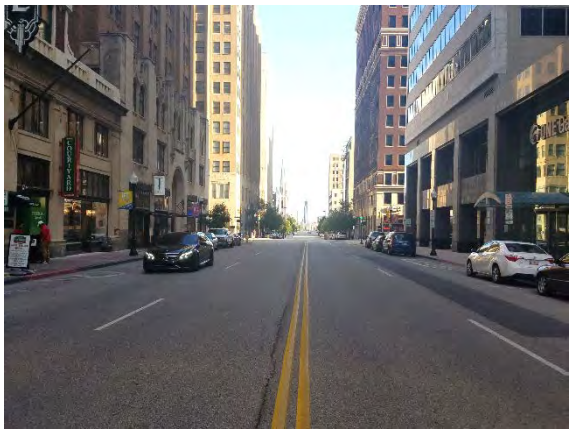
Note

Concurrent with this study, plans for restriping the northernmost sections of Detroit Avenue and M.L.K. Junior Boulevard were modified to reflect the intentions of this Study. Those restriped sections comply with the 59-BPDDDP-1W design recommended herein, with the exception that the bike buffer was narrowed by 3 feet so that the recommended 10-foot travel lanes could instead be 11-foot lanes, as requested by the City of Tulsa for this location.

### *Boston Avenue*

Existing Conditions

Boston Avenue was fully reverted back to two-way in 2008 and carries between 50 and 70 vehicles at peak hour north of Archer and between 140 and 318 at peak hour south of 3rd Street. It is the gem of downtown Tulsa, providing excellent framed vistas at either end.



The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Cameron Street: there are a variety of configurations, typically having two travel lanes with one to two parking lanes.
- Cameron Street to Archer Street: A 48-foot cartpath holds two driving lanes, a parallel parking lane, and a head-in parking lane.
- Archer to railroad tracks: the street is closed to vehicular traffic as a pedestrian bridge, holding the Center of the Universe Monument.
- North of 1st Street to railroad tracks: a 27-foot wide cul-de-sac services a parking garage and the Oklahoma Jazz Hall of Fame.
- 3rd Street to 11th Street: A 55-foot cartpath holds four driving lanes and two lanes of parallel parking.
- 11th Street to 12th Street: a 55-foot cartpath holds four driving lanes and one lane of parallel parking on the west flank.

- 12th Street to 13th Street: 55-foot cartpath holds four drive lanes, including a cut-out pocket for parking, though parking is not allowed. Once the street bends around the curve, the cartpath narrows to 45 feet with four driving lanes.
- 13th Street south to IDL: a 45-foot cartpath holds four driving lanes.

Analysis

As mentioned above, Boston Avenue is a landmark street, being the most comfortable and scenic north-south walking axis, and the most promising connection to the Community College campus. It is also the only cycling corridor for the 5-block-wide center of downtown between Cheyenne and Elgin Avenues. It performs a very limited traffic function, needing no more than two lanes at any block. Finally, it provides the best framed views in the city, with a view of the Williams Tower to the north and a view of the Boston Avenue Methodist Church to the south.

In the rebuild of this street, most of the Boston Avenue cross-section will be reduced from four travel lanes to two, to comprise a 55-BPDDPB street section, where two bike lanes line the curbs, protected by two parking lanes which can also hold occasional loading zones where needed. The provision of protected bike lanes would add to the landmark quality of this street in celebrating the new role of biking downtown by not only creating a connection to the Midland Valley Trail but also by welcoming community college students north with the help of Bike Share stations on both ends. Replacing the signals from 3rd to 6th Streets with all-way stop signs would further calm traffic on the street. Finally, people complained about the danger of crossing Archer Street without a signal; a HAWK signal at this location, potentially in combination with a raised speed table, would greatly improve this intersection for pedestrians. However, if that is cost-prohibitive, an all-way stop sign is recommended.

To further ensure the success of this street's redesign, travel lanes will be striped as 11 feet wide and parking lanes will be striped at 9 feet wide, so that there will be ample elbow room for trucks servicing buildings from designated loading zones. Where loading cannot be provided around the corner, there will be up to one loading zone per block.

Additionally, marked on-street parking is missing in several places, such as at the northeast corner near 9th Street. Likewise, providing additional on-street parking near the Boston Avenue Church at the intersection of 12th Street will help relieve parking demand from these lots on busy days.

Recommendation

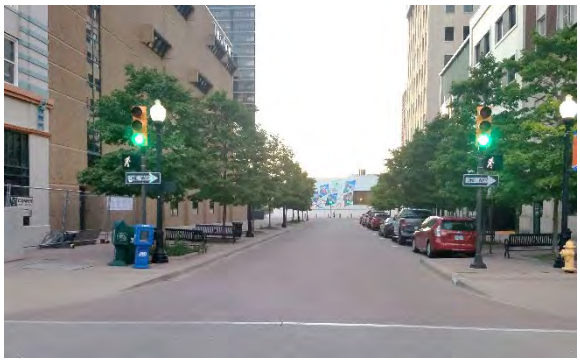
Restripe the street to the following configurations:

- IDL to Archer Street: No change in cartpath. However, install HAWK signal and potentially raised speed table at Archer Street intersection.
- Cul-de-sac north of 1st Street: *Street Type 26-PDD*: two driving lanes with a parallel parking lane against the west curb.
- 3rd Street to the curve just south of 12th Street: *Street Type 55-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes against the curb.
- From the curve south of 12th Street to the IDL: *Street Type 45-BPDDB*: two driving lanes with two buffered bike lanes at the curbs, with a parallel parking lane protecting the southbound bike lane.
- Restripe missing parallel parking where identified.

### *Main Street*

Existing Conditions

Main Street was fully reverted back to two-way in 2013 and carries between 90 and 230 vehicles at peak hour north of Archer and between 56 and 280 at peak hour south of 3rd Street. From 3rd Street to 6th Street, the street has a stamped brick texture.



The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Mathew B. Brady Street: A 55-foot cartpath holds two driving lanes and two lanes of head-in parking.
- Mathew B. Brady Street to Archer Street: A 55-foot cartpath holds two driving lanes, a parallel parking lane, and a head-in parking lane. At Archer Street, the street staggers slightly.
- Bridge from Archer Street to 1st Street: A 40-foot cartpath holds three driving lanes, two in the southbound direction and one in the northbound direction.
- 3rd Street to 4th Street: A 30-foot cartpath holds two driving lanes and one parallel parking lane.
- 4th Street to 5th Street: A 24-foot cartpath holds two driving lanes.
- 5th Street to 6th Street: A 24-foot cartpath holds two driving lanes at intersections. At mid-block, a 40-foot cartpath holds two driving lanes and two lanes of parallel parking.
- 6th Street to 7th Street: A 55-foot cartpath holds three driving lanes, one lane of parallel parking, and one lane of angle parking.
- 7th Street to 10th Street: A 55-foot cartpath holds four driving lanes and two lanes of parallel parking.

- 10th Street south to IDL: A 55-foot cartpath holds four driving lanes and two parallel parking lanes until the point where the street curves between 10th and 11th, the cartpath narrows to 45-feet, holding four driving lanes. There are parking meters along this stretch but the street is not striped for parking.

Analysis

Main Street from 3rd to 5th is a unique condition in the downtown with its narrowed width and stamped brick texture. Following a mistake many cities made, these blocks were remade as a retail street without adequate curb parking, causing stores along it to flounder. Additional parking can be created by converting this street to a "slow flow" geometry. While free flow geometry generally requires 10-foot lanes, slow-flow geometry is a technique used on low-traffic non-bus corridors, stipulating lanes about 8- to 8.5-feet wide. Since vehicles sometimes sit illegally along these curbs currently, we can see that this geometry does not pose a problem. Such a configuration would allow room for more on-street parking, which would help these downtown businesses to thrive. The Street is not planned to contain bicycle facilities.

From 6th to beyond 10th, Main Street has twice the number of lanes it needs. A four lane driving section can become two, allowing for angled parking on both sides, identical to the same condition on M.L.K. Jr. Boulevard/Cincinnati Avenue. South of the curve below 10th, Main becomes 45 feet, which can hold parallel on one side and angle on the other. There are fewer curb cuts to the west, so that should be the side with back-in angled parking.

Additionally, marked on-street parallel parking is missing in several places, such as near intersections and driveways between 8th Street and 10th Street, which could add approximately five parking spaces to the on-street supply. One of the parking lot entries just south of Brady should also be closed, to enable the on-street parking configuration on that block.

Recommendation

Restripe the street to the following configurations:

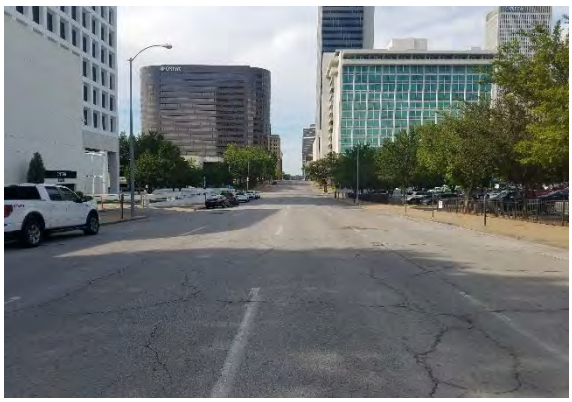
- IDL to Mathew B. Brady Street: No change in cartpath.
- Brady to Archer Street: *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle.
- Bridge from Archer Street to 1st Street: *Street Type 40-ADD*: two driving lanes with a back-in parking lane @ 60° angle against the east curb.
- 1st Street to 2nd Street: A pedestrian-friendly cut-through should also be striped at the east edge of the parking lot between 1st Street and 2nd Street to create walking connectivity.

- 3rd Street to 4th Street: *Street Type 30-PDDP*: a "slow flow" street with two extra narrow driving lanes, a parallel parking lane striped on the west curb, and one parallel parking lane in the pocket on the east curb.
- 4th Street to 5th Street: *Street Type 24-PDD*: a "slow flow" street, with two extra narrow driving lanes and an added parallel parking lane striped on the west curb.
- 5th to 6th Street: to remain as *Street Type 40–PDDP*: two driving lanes flanked by two parallel parking lanes.
- 6th to the curve just south of 10th Street: *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle.
- From the curve just south of 10th Street south to the IDL: *Street Type 45-ADDP*: two driving flanked by a back-in parking lane @ 45° angle on the west curb and parallel parking lane on the east curb.
- Restripe missing parallel parking where identified.

### *Boulder Avenue*

Existing Conditions

Boulder Avenue is set to be rebuilt in 2017 as a two-way street from 1st Street to 10th Street (north of 1st and south of 10th are already two-way today). The proposed configuration is also planned to include a one-way southbound bike lane. Boulder currently carries 60 to 85 vehicles at peak hour north of Archer and between 114 and 512 vehicles at peak hour south of the train tracks.



The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Easton Street: A 35-foot cartpath holds two driving lanes.
- Easton Street to Cameron Street: A 55-foot cartpath holds two driving lanes and two lanes of parallel parking.
- Cameron Street to Archer Street: A 55-foot cartpath holds two driving lanes and two lanes of 45-degree head-in parking.
- On the bridge from Archer Street to 1st Street: A 55-foot cartpath holds four driving lanes.
- 1st Street to 10th Street (One-way northbound section): A 55-foot holds four driving lanes and two lanes of parallel parking.
- 10th Street to 12th Street: A 44-foot cartpath holds three driving lanes, one in the southbound direction and two in the northbound direction.

- 12th Street to IDL: A 44-foot cartpath holds four driving lanes. There are parking meters on the west flank but the street is not striped for parking.

Analysis

As noted above, Boulder Avenue is a partially one-way street that is slated to be restriped from 1st to 10th Street to be a fully two-way street. The proposed design includes a one-way southbound buffered bike facility along the west flank of the street (which will pair with a one-way northbound buffered bike facility along Cheyenne Avenue). A buffered bike facility along its length will connect to a bicycle facility beyond the IDL, connecting downtown to the river and to neighborhoods both north and south of the expressway.

The preferred option for rebuilding Boulder Avenue has a cartpath with two driving lanes, one lane of parallel parking buffering the bike lane and a lane of back-in angled parking on the opposite side of the street. However, a compromised alternative would include an unnecessary turn lane at the cost of on-street parking supply. It should be noted that the main motivation for the compromise solution would be to provide a center turn lane for deliveries, but there are not many businesses requiring loading on Boulder. So, this plan therefore recommends the two driving lane cross section as the preferred alternative.

This corridor will ultimately also be designed according to the best-practice standards established by this plan, like removing extra driving lanes, reducing lane widths to only ten-feet wide, reducing the size of sight triangle requirements around driveways, and eliminating curb cuts and redundant parking lot access driveways where other entries and exits and alley access exists. Reducing sight triangles and consolidating curb cuts will allow for a more contiguous and safe walking environment, while also allowing for additional on-street parking to be striped where it is not today.

Additionally, there are a number of places missing marked-on-street parking, like the stretch between Cameron and Easton, and just south of 5th Street where two spaces are missing on the east flank curb. All new angled parking should be striped as back-in parking. Since the existing head-in angled parking between Cameron Street and Mathew B. Brady Street is done in paint and not structured by a curb extension, it can easily be reversed to back-in parking.

Recommendation

Restripe the street to the following configurations:

- IDL to Easton Street: *Street Type 35-BDDP*: two driving lanes, flanked by a parallel parking lane on the east curb and a southbound buffered bike lane on the west curb.

- Easton Street to 10th Street (Preferred Option): *Street Type 55-BPDDA*: two driving lanes flanked by a back-in parking lane @ 45° angle on the east curb and a southbound buffered bike lane running along the west curb protected by a parallel parking lane.
- Easton Street to 10th Street (Compromise Option): *Street Type 55-BPDTDP*: two driving lanes flanking a center turn lane, flanked by two parallel parking lanes with a southbound buffered bike lane running along the west curb. This three-lane section should only be used where no other solution can be found for deliveries.
- 10th Street to IDL: *Street Type 44-BPDDP*: two driving lanes flanked by two parallel parking lanes on either side, with a southbound buffered bike lane running along the west curb.
- Restripe missing parallel parking where identified.

### *Cheyenne Avenue*

Existing Conditions


Cheyenne Avenue is currently two-way north of 1st Street and one-way from 1st Street to 13th Street. The street between 1st and 10th Street is planned to be rebuilt in 2020, and converted from one-way to two-way at that time. The road carries around 35 vehicles north of the railroad at peak hour and between 266 and 787 vehicles south of 1st Street at peak hour. The cartpath contains some brick in mid-block between Cameron and Brady and for much of the street between Mathew B. Brady Street and its at-grade railroad track crossing.

The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Cameron Street: a 43-foot cartpath holds two driving lanes and two lanes of parallel parking.
- Cameron Street to Archer Street: a 35-foot cartpath holds two driving lanes and one lane of parallel parking. On the west flank at mid-block, five head-in parking spaces have been built outside of the cartpath.
- Archer Street to railroad tracks: a 30-foot cartpath holds two driving lanes and a disordered mixture of parallel parking and head-in parking.
- Railroad tracks to 1st Street: a 51-foot cartpath holds two driving lanes and two lanes of parallel parking.

- 1st Street to 11th Street: a 55-foot cartpath holds four driving lanes and two lanes of parallel parking.
- 11th Street to IDL: a 48-foot cartpath holds two driving lanes and is currently closed to traffic while the bridge over the IDL is rebuilt. During construction, the west flank of the street is being used for parking between 11th and 12th.

Analysis

As mentioned, Cheyenne Avenue is planned to be re-striped to be almost fully two-way in 2020, with a one-way northbound bike facility that will pair with that southbound facility provided on Boulder Avenue. From 1st to 11th Streets, Cheyenne should take on the exact same cross section as the main stretch of Boulder – either the preferred scenario or the compromise scenario where needed. The main motivation for the latter solution would be to provide a center turn lane for deliveries, but there are not many businesses requiring loading on Cheyenne; thus, this Study recommends the two-lane cross section, which would allow for a generous provision of on-street parking.

In the Brady Arts District, a protected lane was examined for feasibility, but since there are negligible traffic loads, many curb cuts, and a disordered array of unusual paving textures and curbs, it was determined that an integrated lane would be a smarter application.

There are a number of areas where on-street parking is missing and should be striped, such as just north of 11th Street, where about four parking spaces are missing on the west curb. Oversized sight triangles also eliminate two viable parking spaces on east flank north of 8th Street.

Recommendation

Restripe the street to the following configurations:

- IDL to Cameron Street: *Street Type 43-PBDDP*: two driving lanes, two parallel parking lanes, and a northbound bike lane against the east curb.
- Cameron Street to Archer Street: *Street Type 35-BDDP*: two driving lanes flanked by one parallel parking lane on the east curb and a northbound buffered bike lane on the west curb.
- Archer Street to railroad tracks: *Street Type 30-BDD*: two driving lanes flanked by a northbound bike lane running along the east curb.
- Railroad tracks to 1st Street: *51-PBDDA*: two driving lanes, one northbound bike lane next to a parallel parking lane on the east curb, and one back-in parking lane @ 45° angle against the west curb.
- 1st Street to 11th Street: *Street Type 55-BPDDA* (preferred) or *55-BPDTDP* (compromise): two driving lanes, a northbound buffered bike lane against the east curb protected by a parallel parking lane, and one back-in parking lane @ 45° angle against the west curb OR two driving lanes flanking a center turn

lane, flanked by two parallel parking lanes, one of which protects a northbound buffered bike lane running along the east curb. The three-lane section should only be used where no other solution can be found for deliveries.

- 11th Street to IDL: *Street Type 48-BPDDP*: two driving lanes flanked by two parallel parking lanes, one of which protects a northbound buffered bike lane running along the east curb.
- Restripe missing parallel parking where identified.

We recommend that the at-grade railway crossing not be replaced by a bridge as recommended in the DAM Plan. The fear of train/car and train/pedestrian collisions seems unfounded based on crash data downtown, and such bridges present an impediment to walkability.

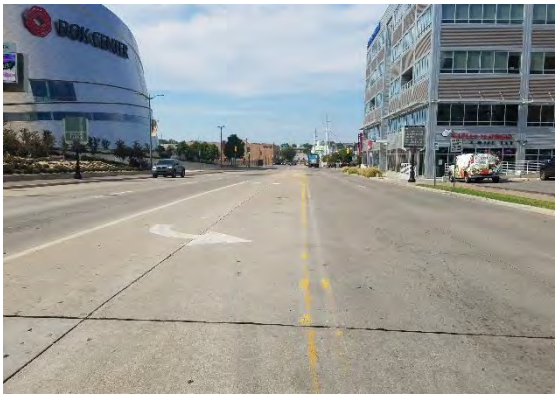
### *Carson Street*

Carson Street is a one-block street at the south end of downtown. It holds two driving lanes and one parallel parking lane in 30 feet. No changes are recommended. (*Street Type 30-PDD*)

### *Denver Avenue*

Existing Conditions

Denver Avenue, running along the western edge of the core business district, connects the city to many civic services and event centers. At peak hour, the street carries between 639 and 756 vehicles north of the railroad and between 977 and 1,914 vehicles south of 1st Street.




The cross section of this street varies over its course. From north to south, its cartpath is configured as follows:

- IDL to Easton Street: a 56-foot cartpath holds four driving lanes.
- Easton Street to Cameron Street: a 45-foot cartpath holds four driving lanes and sinks below a railroad crossing, with sidewalks above the grade of the cartpath.
- Cameron Street to Mathew B. Brady Street: a cartpath of varying width (55 to 60 feet) holds four driving lanes and a lane of parallel parking on the east curb.
- Mathew B. Brady Street to Archer Street: a 55-foot cartpath holds four driving lanes.

- Archer Street to 1st Street: a 57-foot cartpath narrows to 51 feet when it passes under the railroad bridge. Near Archer, the 57-foot cartpath holds five driving lanes and a median; Under the railroad, the 51-foot cartpath holds four driving lanes and a median; Near 1st Street, the 57-foot cartpath holds four driving lanes.
- 1st Street to 2nd Street: a 57-foot carpath holds four driving lanes, one center turn lane, and a parallel parking lane cut into the west curb outside of the cartpath.
- 2nd Street to 3rd Street: a 57-foot carpath holds four driving lanes, one center lane striped as a median for 200 feet near 2nd street and as a left-turn lane near 3rd Street, and a parallel parking lane cut into the west curb outside of the cartpath.
- 3rd Street to 4th Street: a 55-foot cartpath holds four driving lanes, a center turn lane, and some parallel parking spaces cut into the east curb outside of the cartpath.
- 4th Street to half a block south of 6th Street: a 55-foot cartpath holds four driving lanes and a center turn lane striped as a median when turn lanes are not present.
- Half block south of 6th Street to 7th Street: a 55-foot cartpath holds four driving lanes.
- 7th Street to 11th Street: a 45-foot cartpath holds four driving lanes.
- 11th Street to IDL: a 45-foot cartpath holding four driving lanes and widens to a 55-foot cartpath holding four driving lanes and a center median.

Analysis

South of 1st, Denver is already very large, and already handling too much traffic in places, to limit its number of lanes. Moreover, keeping it at its current size creates an escape valve that takes pressure off the entire system, especially Boulder and Cheyenne Avenues. Should drivers ever experience congestion on those streets, they can shift west to Denver for a less congested ride.

That said, Denver Avenue may not be allowed to maintain its current high-speed geometry. The street has the highest number of collisions involving people walking in the downtown, and it attracts large numbers of pedestrians due to the BOK Center, the bus station, and other important facilities. For this reason, the recommendations ahead, especially from 1st to 7th Streets, are a high priority.

Because Denver is so wide, and because it experiences heavy traffic only at peak times, it can be improved tremendously by adding curb parking off peak. As in all similar circumstances, such parking must be priced at a rate that causes it to be well used. The Street is not planned to contain bicycle facilities.

North of 1st Street, Denver needs only two lanes. But only from Cameron to Archer does it have potential for parking. This stretch now varies from four driving lanes to

four driving lanes plus one parking lane in 60 to 55 feet. In the future, this area should have back-in parking on both sides of the street at a 45° angle, but, when it widens past 58 feet, the angle of the parking should be switched to 60°.

Between 1st to 7th Streets, it makes sense to stay with a consistent 5-lane section. However, since the street rarely has enough traffic to justify five lanes, the outer curbs should allow parking from 10 a.m. to 4 p.m. Note that this could only happen on curbs that do not have cut-outs for parallel parking already, like in front of the Arena and Bus Station.

Additionally, to beautify this street, the center turn lane should receive median islands planted with trees wherever the left-turn lanes switch direction, and also in the large striped segments where the center lane is off limits, like near 2nd Street.

Finally, the jersey barriers at the northwest corner of Denver Avenue and 3rd Street put a tawdry face on the BOK Center's key corner and should be replaced by attractive bollards fit to honor the City's landmark civic building.

<u>Recommendation</u>

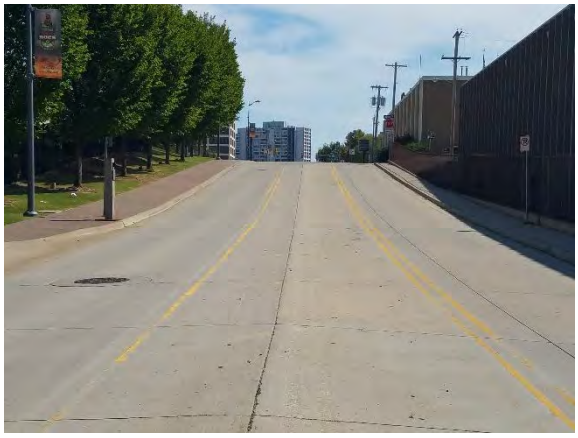
Restripe the street to the following configurations:

- IDL to Easton Street: *Street Type 56-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle.
- Easton Street to Cameron Street: *Street Type 45-ADDP*: two driving lanes, one back-in parking lane @ 45° angle on the west curb, and one parallel parking lane on the east curb.
- Cameron Street to Archer Street: *Street Type 55-ADDA*: two driving lanes flanked by two lanes of back-in parking striped @ 45° angle, except when the cartpath is 58 feet or wider, in which areas the parking should be striped @ 60° angle.
- 1st Street to 7th Street: *Street Type 55-(P)DDMDD(P)*: four driving lanes flanking median islands and turn pockets, with two driving lanes being used as parallel parking lanes at off-peak times.
- 7th Street to IDL: No change.
- Replace the jersey barriers at the Bok Center's southeast corner with attractive bollards.

### *Elwood Avenue*

Elwood Avenue is a two-block-long street north of the BOK Center that reappears for one block between 6th Street and 7th Street. The street carries around 356 cars per peak hour. Framing an at-grade railroad track crossing, a 36-foot cartpath holds two driving lanes, which should be reconfigured as *Street Type 36-PDDP*: two driving lanes flanked by two parallel parking lanes. From 6th to 7th Street, a 36-foot cartpath holds two driving lanes and two parallel parking lanes; this area needs no modification (*Street Type 36-PDDP*).

### *Frisco Avenue*



Frisco Avenue is a short road segment behind the BOK Center connecting to the Civic Center Access drive and the section of 4th Street that services the post office, library and courthouse. The street carries around 200 vehicles at peak hour.

From 1st Street to 3rd Street, a 36-foot cartpath holds two driving lanes with a striped median. From 1st Street to 2nd Street, the street is two-way, but it transitions to one-way between 2nd Street and 3rd Street. This stretch should be reconfigured as *Street Type 36-PDDP-1W*: two driving lanes flanked by two parallel parking lanes. South to Civic Center, the street is an automotive access zone. It rarely serves pedestrians, so no changes are recommended. From 6th Street to 7th Street, a 36-foot cartpath holds two driving lanes and two parallel parking lanes; no changes are planned (*Street Type 36-PDDP*).

We recommend that the at-grade railway crossing not be replaced by a bridge as recommended in the DAM Plan. The fear of train/car and train/pedestrian collisions seems unfounded based on crash data downtown, and such bridges present an impediment to walkability.

### *Civic Center Drive*

This drive is a narrow drop-off street. No changes are recommended.

### *Guthrie Avenue*

Along with a short segment of Heavy Traffic Way, Guthrie Street is a key cycling connection between the Katy Trail and Houston Avenue. Current conditions between Archer and Third include two 4-foot shoulders (not marked as bike lanes) flanking two 14-foot driving lanes. This section should be restriped to include buffered bike lanes flanking 10-foot lanes. (*Street Type 36-BDDB*). The short segment between 1st Street and Heavy Traffic Way is even wider: a 44-foot cartpath holding two driving lanes. Here, in addition to the provision of bike lanes, a parallel parking lane should be added against the west curb. (*Street Type 44-PBDDB*)

### *Houston Avenue*

<u>Existing Conditions</u>

Houston Avenue is a wide street with a median and many turn pockets carrying between 238 and 1,047 vehicles at the peak hour. The cartpath varies in width over its length.

From Heavy Traffic way to 3rd Street, a 28-foot cartpath holds two wide driving lanes. From 3rd Street to 11th Street, a typically 71- to 82-foot wide cartpath holds four driving lanes, two left-turn lanes and a median. From 7th Street to 11th Street, a 48-foot cartpath holds two northbound and two southbound driving lanes.

Analysis

Houston Avenue provides the only real opportunity for a cycling facility on the west side of downtown, which would tie together all of the proposed east-west cycling corridors. Fortunately, unbalanced traffic loads on this street create a circumstance where one northbound driving lane can be eliminated along its entire length. This lane removal allows for the insertion of cycle tracks along both flanks of the street, which requires only that the median between 4th and 7th Streets be reconstructed. It also allows for an east flank of parallel parking to be added in this location.

In the short stretch between Heavy Traffic Way and 3rd Street, striping narrow bike lanes on each flank will make the street safer for all users.

Recommendation

Restripe the street to the following configurations:

- From Heavy Traffic Way to 3rd Street: *Street Type 28-BDDB*: two driving lanes flanked by two bike lanes.
- From 3rd Street to 4th Street: *Street Type 67-BDDMTDB*: two southbound driving lanes flanked by a buffered bikeway on the west curb and, across the median, a northbound driving lane flanked by a left-turn lane and a buffered bikeway on the east curb.
- From 4th Street to 7th Street: *Street Type 67-BDDMDPB*: two southbound driving lanes flanked by a buffered bikeway on the west curb and, across a moved median, one northbound driving lane, one parallel parking lane, and a buffered bikeway on the east curb.
- From 7th Street to 11th Street: *Street Type 48-DDMDBB*: two southbound and one northbound driving lanes flanked by buffered bikeways on both curbs. Eliminate the median south of 7th Street.

The slip lane north of 7th is dangerously wide, and should be narrowed through an edge line marking.

### *Heavy Traffic Way*


Heavy Traffic Way is a high-speed street without sidewalks, designated as a bike route. However, it only makes sense as a place for bikes where it is needed to connect the cycle facility planned along Guthrie and Houston Avenues. Elsewhere, it does not present a safe environment for cycling.

In this location, a 54-foot cartpath holds four driving lanes, should be restriped as *Street Type 54-BDDDDB*: four driving lanes flanked by two 6-foot bike lanes. At Houston Avenue, bright paint should be applied to mark the bike lane turn onto Houston. Where there is a median for a 50-foot long stretch, the section should be restriped as *Street Type 54-BDDMDDB*: the bike lanes must drop to 4 feet in width.

### *Lawton Avenue*

This street rarely serves pedestrians, so no changes are recommended.

**East-West Streets**

***Easton Street***

This street's 30-foot cartpath currently holds two driving lanes and one parallel parking lane. No changes are recommended. Add shared lane markings to accommodate connections between trails and the proposed Cheyenne and Boulder Avenue bike facilities. (*Street Type 30-PDD*)

***Cameron Street***

Cameron Street runs from Denver Avenue to Detroit Avenue and carries between 53 and 152 vehicles at peak hour. Between Main Street and M.L.K. Jr. Boulevard, it has recently been rebuilt with angled parking. From Denver Avenue to Boulder Avenue, a 36 to 40-foot cartpath carries two driving lanes flanked by two parallel parking lanes. No changes are recommended for these segments.

From Boulder Avenue to Main Street, a 48-foot cartpath carries two driving lanes flanked by a lane of head-in parking along the north curb. This parking should be striped as back-in @ 60° angle, and parallel parking should be added to the south curb (*Street Type 48–ADDP*).

From Main Street to Boston Avenue, in the west half of the block, a 57-foot cartpath holds two driving lanes flanked by two lanes of head-in parking; in the east half of the block, the cartpath narrows to 38 feet with two driving lanes flanked by two lanes of parallel parking. From Boston Avenue to M.L.K. Jr. Boulevard, a 45-foot cartpath holds two driving lanes and a lane of head-in parking. From M.L.K. Jr. Boulevard to Detroit Avenue, a 30-foot cartpath holds two driving lanes and a lane of parallel parking. No changes are recommended for any of these segments.

The Street is not planned to contain bicycle facilities.

***Mathew B. Brady Street***

Existing Conditions

Mathew B. Brady Street was mostly rebuilt recently, and has the best feel of any downtown street, due to its new streetscaping and traffic- calmed atmosphere. The section from Main Street to M.L.K. Jr. Boulevard has been recently built out with bumpouts and full re-striping. The street carries between 45 and 175 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Denver Avenue to Cheyenne Avenue: a 55-foot cartpath holds two driving lanes flanked by a lane of head-in parking.
- Cheyenne Avenue to M.L.K. Jr. Boulevard: a 48-cartpath holds two driving lanes flanked by a lane of parallel parking and a lane of head-in parking.
- M.L.K. Jr. Boulevard to Elgin Avenue: a 58-foot cartpath holds two driving lanes flanked by two lanes of head-in parking.

Analysis

Mathew B. Brady Street is the iconic focal point of the Brady Arts District, connecting all-hour activity, the Guthrie Green, and ONEOK Field events. Since much of this stretch has been rebuilt, including sufficient traffic calming, there are few recommended changes. These include allowing an additional lane of angled parking where it can fit on the western end of the street, converting head-in parking to back-in parking where possible, and eliminating excessive curb cuts to allow for additional on-street parking while creating more continuous sidewalks.

This street is not planned to contain bicycle facilities.

Recommendation

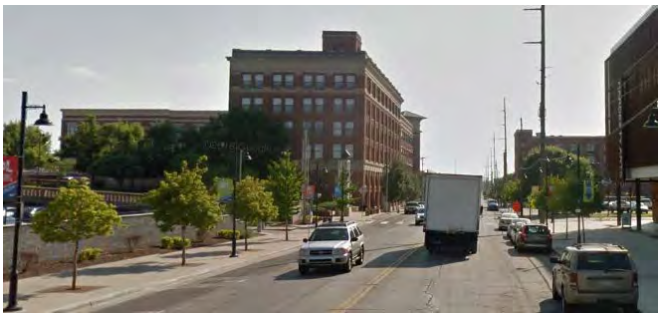
Restripe the street to the following configurations:

- Denver Avenue to Cheyenne Avenue: *Street Type 55-ADDA*: two driving lanes and two back-in parking lanes @ 45° angle. Examine possibilities for eliminating excessive curb cuts to enable more on-street parking.
- Cheyenne Avenue to M.L.K. Jr. Boulevard: *Street Type 48-PDDA*: no change, but Examine possibilities for eliminating excessive curb cuts and converting head-in parking to back-in parking.

- M.L.K. Jr. Boulevard to Elgin Avenue: *Street Type 58-ADDA*: no changes planned, but examine possibilities for converting head-in parking to back-in parking.

### *Archer Street*

Existing Conditions



Archer Street runs along the southern edge of the Brady Arts District and carries between 180 and 727 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Guthrie Avenue to Elwood Avenue: a 55-foot cartpath holds four driving lanes flanked by two bike lanes.
- Elwood Avenue to Denver Avenue: a 48-foot cartpath holds four driving lanes, including one right turn lane on the south side, and one bike lane against the north curb.
- Denver Avenue to Cheyenne Avenue: a 48-foot cartpath holds two driving lanes flanked by two lanes of parallel parking. Excessive curb cuts reduce the supply of on-street parking.
- Cheyenne Avenue to Main Street: a 55-foot cartpath holds two driving lanes flanked by two lanes of parallel parking.
- Main Street to Boston Avenue: a 48-foot cartpath holds two driving lanes flanked by two lanes of parallel parking.
- Boston Avenue to M.L.K. Jr. Boulevard: a 46-foot cartpath holds two driving lanes flanked by two lanes of parallel parking.
- M.L.K. Jr. Boulevard to Elgin Avenue: a 48-foot cartpath holds two driving lanes flanked by two lanes of parallel parking. Halfway between Detroit Avenue and Elgin Avenue, the parallel parking on the south curb becomes head-in parking.
- Elgin Avenue to Greenwood Avenue: a 48-foot cartpath holds two driving lanes flanked by two lanes of parallel parking. Halfway between Frankfort Avenue and Greenwood Avenue, the parallel parking on the north curb becomes head-in parking.
- Greenwood Avenue to IDL: a 55-foot cartpath holds four driving lanes.

Analysis

Archer Street needs two driving lanes in most areas, with exception of the area just west of Detroit where it needs a center turn lane, and on the stretch from Denver to

the IDL where two eastbound lanes are needed. Because the cartpath contains considerably more width than needed for these driving lanes, Archer is an ideal location for a buffered bikeway, which should run the length of this corridor connecting downtown to the trail systems on either side of the IDL.

The provision of additional on-street parking will help calm traffic speeds on this corridor, making this an inviting street for people biking and walking to businesses. Parallel parking should be provided on the side of the street with the fewest curb cuts, or on the side where short pockets of angled parking already exist (which should be preserved).

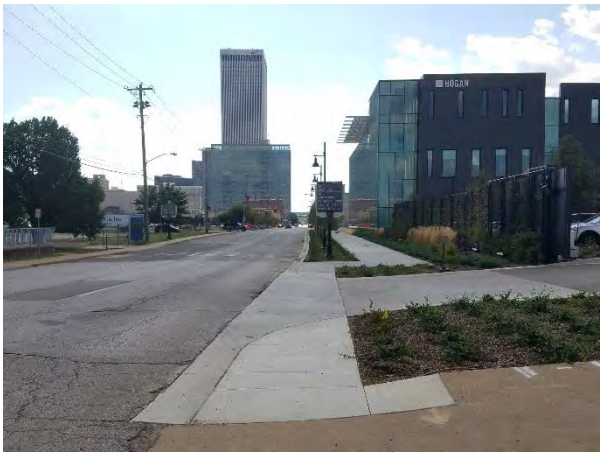
Recommendation

Restripe the street to the following configurations:

- Guthrie Avenue to Elwood Avenue: *Street Type 55-BPDDDB*: two eastbound driving lanes one westbound driving lane, one parallel parking lane, and two buffered bike lanes against the curbs.
- Elwood Avenue to Denver Avenue: *Street Type 48-BDDDB*: two eastbound driving lanes, one westbound driving lane, and two buffered bike lanes against the curbs.
- Denver Avenue to Cheyenne Avenue: *Street Type 48-BPDDB*: two driving lanes, one parallel parking lane, and two buffered bike lanes against the curbs.
- Cheyenne Avenue to Main Street: *Street Type 55-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes against the curbs.
- Main Street to Boston Avenue: *Street Type 48-BPDDB*: two driving lanes, one parallel parking lane, and two buffered bike lanes against the curbs.
- Boston Avenue to M.L.K. Jr. Boulevard: *Street Type 46-BPDDB*: two driving lanes, one parallel parking lane, and two buffered bike lanes against the curbs.
- M.L.K. Jr. Boulevard to Detroit Avenue: *Street Type 48-BDTDB*: two driving lanes flanking a center turn lane, and two bike lanes against the curbs.
- Detroit Avenue to Greenwood Avenue: *Street Type 48-BPDDB*: two driving lanes, one parallel parking lane, and two buffered bike lanes against the curbs.
- Greenwood Avenue to IDL: *Street Type 55-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes at the curbs.

***1st Street***

Existing Conditions



1st Street is currently a one-way westbound street, carrying 1,035 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Heavy Traffic Way to Denver Avenue: a 55-foot cartpath holds four driving lanes flanked by a lane of parallel parking on the south curb.
- Denver Avenue to Detroit Avenue: a 55-foot cartpath holds four driving lanes. From the alley just west of Detroit Avenue, a lane of parallel parking is striped on the south curb for half a block.
- Detroit Avenue to Greenwood Avenue: a 54-foot cartpath holds three driving lanes flanked by two lanes of parallel parking.
- Greenwood Avenue to Hartford Avenue: a 40-foot cartpath holds three driving lanes.
- Hartford Avenue to IDL: a 36-foot cartpath holds three driving lanes.

Analysis

The plan for 1st Street proposes that this corridor be converted to two-way from Denver Avenue to Greenwood Avenue. The stretch of roadway east of Elgin Street to the IDL is already planned to be rebuilt in 2017. There is a lot of speeding in that stretch between Greenwood and the IDL, since the cartpath is very wide and there are no visual cues that one is entering a city. Since only two driving lanes are needed in that stretch, this plan recommends narrowing the path of travel through the added provision of on-street parking along both curbs. While there needs to be a 3-to-2 merge from the highway ramps, this merge can take place within 300 feet of Lansing Street. Unless otherwise required by the traffic analysis, a two-way 1st Street should have a two-lane cross section, with angled parking at the curbs. The exception occurs between Cincinnati and Greenwood Avenues, where a second westbound driving lane is needed, which causes one of the angled parking lanes to be parallel instead.

This street is not planned to contain bicycle facilities.

Recommendation

Restripe the street to the following configurations:

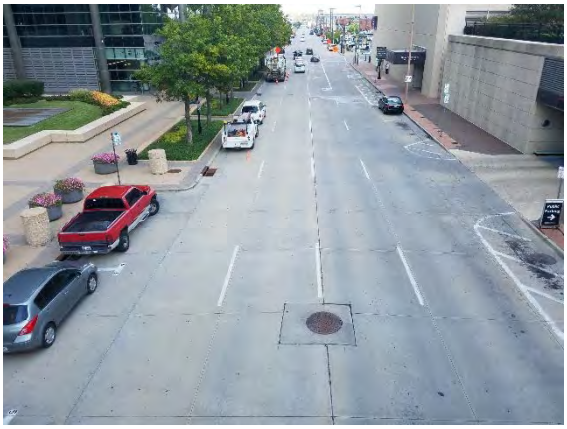
- Heavy Traffic Way to Denver Avenue: *Street Type 55-ADDA-1W*: two westbound driving lanes flanked by two back-in parking lanes @ 45° angle.
- Denver Avenue to Cincinnati Avenue: *Street Type 55-ADDA*: one westbound driving lane and one eastbound driving lane flanked by two back-in parking lanes @ 45° angle.
- Cincinnati Avenue to Greenwood Avenue: *Street Type 55-ADDDP*: two westbound driving lanes, one eastbound driving lane, one back-in parking lane @ 45° angle, and one parallel parking lane. Near the intersection of Greenwood Avenue, the street becomes *Street Type 55-PDDTTP*: two westbound driving lanes, one eastbound left-turn lane, and one eastbound turn lane, flanked by two parallel parking lanes.
- Greenwood Avenue to Hartford Avenue: *Street Type 40-PDDT-1W*: two westbound driving lanes, one westbound left-turn lane, and one lane of parallel parking on the north curb; After the left -turn lane ends, becomes *Street Type 40-PDDP-1W*: two westbound driving lanes flanked by two parallel parking lanes.
- Hartford Avenue to Lansing Avenue: *Street Type 36-PDDP-1W*: two westbound driving lanes flanked by two parallel parking lanes. The three highway lanes should merge to two lanes within three hundred feet west of the intersection of Lansing Avenue.

Note

Reconstruction of the east end of 1st Street is scheduled to occur this year. The current plans should be reviewed and potentially modified so that a near-term reversion to two-way travel does not result in funds being wasted. This may mean temporarily striping the street with removable paint.

### *2nd Street*

Existing Conditions



2nd Street is a one-way eastbound street carrying between171 and 933 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- IDL to Frisco Avenue: a 36-foot cartpath holds two driving lanes, one of which exits as a ramp from the IDL.
- Denver Avenue to Cheyenne Avenue: a 55-foot cartpath holds three driving lanes, a lane of parallel parking and a lane of head-in parking.
- Cheyenne Avenue to Boulder Avenue: a 55-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.
- Boulder Avenue to Cincinnati Avenue: a 48-foot cartpath holds four driving lanes and one lane of parallel parking.
- Cincinnati Avenue to Elgin Avenue: a 55-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.
- Elgin Avenue to Greenwood Avenue: a 55-foot cartpath holds three driving lanes, one lane of head-in parking, and one lane of parallel parking.
- Greenwood Avenue to Kenosha Avenue: a 55-foot cartpath holds four driving lanes and one lane of parallel parking.
- Kenosha Avenue to IDL: a 45-foot cartpath holds four driving lanes.

Analysis

Formerly Old Route 66, 2nd Street connects downtown to many civic and entertainment uses like the Williams Tower and Green and the BOK Center. This plan proposes that this one-way street be converted to two-way from Denver Avenue to Greenwood Avenue.

Once converted to two-way, only two travel lanes will be demanded in most sections, with exception of the long block between Boulder Avenue and Cincinnati Avenue where two eastbound lanes are needed. But such a 55-foot section with three lanes may also make sense between Cincinnati and Frankfort, due to the delivery needs of businesses.. If implemented as such, the center lane should be a continuous left-turn lane. However, as mentioned, wider roadways contribute to higher levels of speeding, so a three-lane cross section would indeed be a

compromise to a safe, walkable atmosphere, and should only be used where no delivery alternative exists.

As with 1st Street, also not a cycling corridor, the remainder of the roadway should be taken up by curb parking, which would take an angle or parallel configuration as best fits. This includes on the short segment west of Frisco Avenue, to remain one-way, where a lane of curb parking can be added approaching the intersection.

This street is not planned to contain bicycle facilities.

Recommendation

Restripe the street to the following configurations:

- IDL to Frisco Avenue: Add a parallel parking lane against the north curb east of where the ramp has ended.
- Denver Avenue to Boulder Avenue: *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle.
- Boulder Avenue to Cincinnati Avenue: *Street Type 48-PDDDP*: two eastbound driving lanes and one westbound driving lane flanked by two parallel parking lanes. Where the street widens to 55 feet just south of the Williams Tower pedestrian overpass, the street should be striped as *Street Type 55-ADDDP*: two eastbound driving lanes and one westbound driving lane flanked by one back-in parking lane, and one parallel parking lane.
- Cincinnati Avenue to Frankfort Avenue: *Street Type 55-ADTDP*: two driving lanes flanking a center turn lane, with one back-in parking lane @ 45° angle, and one parallel parking lane.
- Frankfort Avenue to Greenwood Avenue: *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes.
- Greenwood Avenue to IDL: *Street Type 55-ADDA-1W*: two one-way driving lanes flanked by two head-in parking lanes @ 45° angle.

### *3rd Street*

Existing Conditions

3rd Street is a two-way street carrying between 241 and 651 vehicles per peak hour. It was reported that many vehicles travel at high speeds near Lansing and Kenosha Avenues.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- IDL to Frisco Avenue: a 55-foot cartpath holds five driving lanes.
- Frisco Avenue to Denver Avenue: a 55-foot cartpath holds four driving lanes and one lane of parallel parking.
- Denver Avenue to Cincinnati Avenue: a 55-foot cartpath holds three driving lanes flanked by two lanes of parallel parking.
- Cincinnati Avenue to Detroit Avenue: a 45-foot cartpath holds three driving lanes and one lane of parallel parking.
- Detroit Avenue to Lansing Avenue: a 44-foot cartpath holds two driving lanes flanked by two lanes of parallel parking.

Analysis

Needing only two driving lanes to meet demand, 3rd Street should become a primary east-west biking corridor. Where space allows, the bike lanes should be curb-adjacent and parking-protected. In most other conditions, they should be buffered, with exception of on the bridge at Lansing and Madison, where they should become standard integrated bike lanes.

As usual, bike lanes need to bend around bulbouts when they are present. As an example: when there is 28 feet clear between bulbouts, the cartpath would hold two 10-foot driving lanes and two 4-foot bike lanes, but when there is 36 feet clear, the cartpath would hold two 10-foot driving lanes and two 5-foot bike lanes, each with 3-foot buffers..

Just east of Kenosha Avenue, the slip lane north of the triangle should eventually be closed, because it widens the roadway and encourages speeding. Instead, the small triangle island should become an attached green space to the north side of the block. This new green space could coordinately nicely with the open space on the southeast corner of the intersection.

Parking is also missing in a few key places and should be re-striped. Due to setbacks on the south side of blocks between Denver Avenue and Cincinnati Avenue, two parallel parking spaces are missing at either end of each block. Parking should also be added to the bridge from Lansing Avenue to Madison Avenue, which will help calm traffic as it enters into the East Village commercial district. This bridge is also planned to be rebuilt and a redesign should be considered when that happens.

Recommendation

Restripe the street to the following configurations:

- IDL to Cincinnati Avenue: *Street Type 55-BPDDPB*: two driving lanes flanked by two parallel parking lanes and two buffered bike lanes against the curbs.
- Cincinnati Avenue to Lansing Avenue: *Street Type 44-PBDDBP*: two driving lanes flanked by two bike lanes and two parallel parking lanes.
- Bridge from Lansing Avenue to Madison Avenue: *Street Type 48-PBDDBP*: two driving lanes flanked by two bike lanes and two parallel parking lanes.

When the northeast corner of the Kenosha intersection is redeveloped, close the slip lane in that location and create an attached green.

### *4th Street*

Existing Conditions

4th Street is a one-way eastbound street from Frisco Avenue to Detroit Avenue. The street carries between 134 and 467 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Frisco Avenue to Civic Center Drive: a 65-foot cartpath holds four driving lanes and one lane of parallel parking.
- Civic Center Drive to Denver Avenue: a 53-foot cartpath holds four driving lanes.
- Denver Avenue to Cheyenne Avenue: a 55-foot cartpath holds four driving lanes and one lane of parallel parking.
- Cheyenne Avenue to Detroit Avenue: a 55-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.
- Detroit Avenue to Elgin Avenue: a 55-foot cartpath holds four driving lanes, one lane of parallel parking, and one striped shoulder of no parking.

- Elgin Avenue to Frankfort Avenue: a 55-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.
- Frankfort Avenue to Kenosha Avenue: a 45-foot cartpath holds three driving lanes and one lane of parallel parking.
- Kenosha Avenue to Lansing Avenue, south of triangle: a 55-foot cartpath holds three driving lanes. North of the triangle: a 26-foot cartpath holds one westbound driving lane. East of the triangle: a 50-foot cartpath holds three driving lanes.

Analysis

4th Street is planned here to be converted to two-way from Denver Avenue to Detroit Avenue. In this two-way condition, the street will typically have a two-lane cross section with on-street parking, typically angled parking, on either side. Additional on-street parking will be a valuable asset to businesses and help calm street traffic, contributing to a more pleasant sidewalk environment.

At the intersection of Kenosha, if the parking lot on the northeast corner is ever developed, the slip lane just north of the triangle should be closed to create an attached green space, because this leg widens the roadway and encourages speeding. In the meantime, that segment should be re-striped as one driving lane with two lanes of parallel parking.

There are a few places where on-street parking is missing and should be re-striped. For example, four spaces could be restriped between Cincinnati Avenue and Detroit Avenues. The Street is not planned to contain bicycle facilities.

Recommendation

Restripe the street to the following configurations:

- Frisco Avenue to the half block east of Civic Center Drive: *Street Type 65-ADDA-1W*: two eastbound driving lanes flanked by two back-in parking lanes at @ 90° angle.
- The half block east of Civic Center Drive: *Street Type 61-ADDA-1W*: two eastbound driving lanes flanked by two back-in parking lanes at @ 90° angle. If parking is not allowed along the Post Office curbside, the north angled parking lane should be striped as an additional driving lane next to a curbside drop-off lane.
- The half block west of Denver Avenue: *Street Type 53-ADDP-1W*: two driving lanes flanked by one back-in parking lane @ 90° angle on the north curb and one parallel parking lane on the south curb. If parking is not allowed along the Post Office, the parking lane along the north curb should instead be striped as a curbside drop-off lane.
- Denver Avenue to Frankfort Avenue: *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle. Where there is pressure for

loading, stripe as *Street Type 55-ADTDP*: two driving lanes, flanking a center turn lane (which could be used for loading), one back-in parking lane @ 45° angle, and one parallel parking lane.

- Frankfort Avenue to Kenosha Avenue: *Street Type 45-ADDP*: two driving lanes flanked by one back-in parking lane @ 45° angle and one parallel parking lane.
- Kenosha Avenue to Lansing Avenue: south of the triangle, *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle; north of the triangle, *Street Type 26-PDP-1W*: one westbound driving lane flanked by two parallel parking lanes; east of the triangle, *Street Type 50-ADDP*: two driving lanes flanked by one back-in parking lane @ 60° angle and one parallel parking lane.

When the northeast corner of the Kenosha intersection is redeveloped, close the slip lane in that location and create an attached green.

Restripe missing parking spaces, especially between Cincinnati and Detroit Avenues.

### *5th Street*

Existing Conditions

5th Street is two-way, except between Boulder and Denver Avenues, where travel is westbound. This section was recently rebuilt in a chicane design. Plans are complete for a two-way conversion of this 1-way segment in 2017. The street carries between 19 and 171 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Denver Avenue to Boulder Avenue: a 24-foot cartpath holds one driving lane and one lane of parallel parking, with chicaning curbs along its course.
- Boulder Avenue to Boston Avenue: the cartpath varies in width around parking pockets on one or both flanks.
- Boston Avenue to Cincinnati Avenue: a 48-foot cartpath holds two driving lanes flanked by two lanes of parallel parking.
- Cincinnati Avenue to Elgin Avenue: a 55-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.
- Elgin Avenue to Frankfort Avenue: a 36-foot cartpath, holding two driving lanes and a lane of parallel parking, widens to a 50-foot cartpath, holding two driving lanes and a lane of back-in parking.

- Frankfort Avenue to Kenosha Avenue: a 36-foot cartpath holds two driving lanes and a lane of parallel parking.

Analysis

When its western segment is reconfigured in 2017, 5th Street will become a completely two-way street with one driving lane in each direction. To further these efforts at improvement, additional on-street parking should be striped where space allows. Additional on-street parking will be a valuable asset to businesses and help calm street traffic, contributing to a more pleasant sidewalk environment. The Street is not planned to contain bicycle facilities.

Recommendation

Restripe the street to the following configurations:

- Denver Avenue to Boulder Avenue: *Street Type 24-PDD*: one lane in each direction with parallel parking where curb pockets allow.
- Boulder Avenue to Boston Avenue: no changes recommended.
- Boston Avenue to Cincinnati Avenue: *Street Type 48-ADDP*: one lane in each direction flanked by one back-in parking lane @ 60° angle and one lane of parallel parking.
- Cincinnati Avenue to Elgin Avenue: *Street Type 55-ADDA*: one lane in each direction flanked by two back-in parking lanes @ 45° angle.
- Elgin Avenue to Frankfort Avenue: *Street Type 36-PDDP*: one lane in each direction flanked by two parallel parking lanes; widens at midblock to *Street Type 50-ADDP*: one lane in each direction flanked by one back-in parking lane @ 60° angle and one parallel parking lane.
- Frankfort Avenue to Kenosha Avenue: No change.

***6th Street***

Existing Conditions

6th Street is a two-way street carrying between 278 and 728 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- 7th Street to Civic Center Drive: a 56-foot cartpath holds three westbound driving lanes on the north side of a median, with two eastbound driving lanes on the south side.
- Civic Center Drive to Elwood Avenue: a 70-foot roadway holds four driving lanes, one unmarked bike lane, and a lane of back-in parking cut into the north curb.
- Elwood Avenue to Boulder Avenue: a 50-foot cartpath holding four driving lanes, widening near Denver Avenue to a 55-foot cartpath holding five driving lanes.
- Boulder Avenue to Main Street: a 55-foot cartpath holds three driving lanes flanked by two lanes of parallel parking. Some of the middle driving lane is partially striped as a median (where there is no left–turn lane.
- Main Street to Boston Avenue: a 50-foot cartpath holds two driving lanes and two parallel parking lanes flanking a tree-planted median.
- Boston Avenue to halfway between Elgin Avenue and Frankfort Avenue: a 55-foot cartpath holds three driving lanes flanked by two lanes of parallel parking. Some of the middle driving lane is partially striped as a median where there is not a left–turn lane.
- At midblock past Elgin Avenue to Frankfort: a 50-foot cartpath holds three driving lanes flanked by two lanes of parallel parking. Some of the narrow middle driving lane is partially striped as a median where there is not a left–turn lane.
- Frankfort Avenue to Lansing Avenue: a 48-foot cartpath narrows to 44 feet and widens back to 48 feet, holding four driving lanes the whole block.
- Lansing Avenue to IDL: a 48-foot cartpath holds four driving lanes.

Analysis

As discussed in the Go Plan and in this Study, 6th Street should be a key east-west bike corridor through downtown. Since the street needs only two driving lanes to meet demand, it has ample room for bike facilities while also providing much curb parking. The only challenge is presented by the block between Main Street and

Boston Avenue, which has already seen its traffic calmed by a treed median. The bicycle corridor should continue through that block simply with painted sharrows in the roadway.

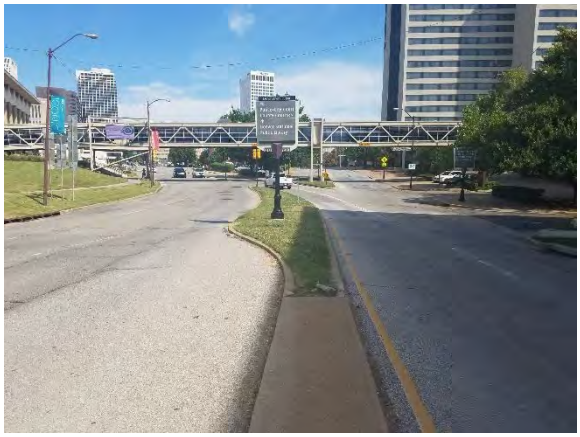
Recommendation

Restripe the street to the following configurations:

- 7th Street to Civic Center Drive: *Street Type 56-BDDMDB*: two westbound driving lanes and one eastbound driving lane on either side of the median, with two buffered bike lanes.
- Civic Center Drive to Elwood Avenue: *Street Type 70-ABDDBA*: two driving lanes, two bike lanes, and two back-in parking lanes @ 60° angle. (Existing new head-in parking should eventually be restriped as back-in.)
- Elwood Avenue to Boulder Avenue: where it is narrower approaching Denver Avenue, *Street Type 50-BPDDB*: two driving lanes flanked by one parallel parking lane and two buffered bike lanes. Where it widens, *Street Type 55-BPDDPB*: two driving lanes flanked by two parallel parking lanes and two buffered bike lanes.
- Boulder Avenue to Main Street: *Street Type 55-BPDDPB*: two driving lanes flanked by two parallel parking lanes and two buffered bike lanes. While not ideal, 4-foot bike lanes are recommended here as the best of a number of imperfect solutions.
- Main Street to Boston Avenue: No change, but stripe sharrows in driving lanes.
- Boston Avenue to halfway between Elgin avenue and Frankfort Avenue: *Street Type 55-BPDDPB*: two driving lanes flanked by two parallel parking lanes and two buffered bike lanes. While not ideal, 4-foot bike lanes are recommended here as the best of a number of imperfect solutions.
- At midblock past Elgin Avenue to Frankfort Avenue: *Street Type 50-BPDDPB*: two driving lanes flanked by two parallel parking lanes and two buffered bike lanes. While not ideal, 4-foot bike lanes are recommended here as the best of a number of imperfect solutions.
- Frankfort Avenue to IDL: *Street Type 48-PBDDBP*: two driving lanes flanked by two parallel parking lanes and two bike lanes; and, where corridor narrows between Frankfort Avenue and Lansing Avenue: *Street Type 44-PBDDBP*: two driving lanes flanked by two parallel parking lanes and two bike lanes.

***7th Street***

Existing Conditions



7th Street carries 1,604 vehicles at peak hour. West of its fork with 8th Street at Elmwood Avenue, 7th Street is a median-divided two-way. East of this point, it travels one-way westbound.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- IDL to Houston Avenue: a 21-foot cartpath carries two westbound driving lanes north of a median, south of which a 33-foot cartpath carries three eastbound driving lanes.
- Houston Avenue to 6th Street split: a 42-foot cartpath carries four westbound driving lanes north of a median, south of which a 22-foot cartpath carries two eastbound driving lanes.
- 6th Street to Elwood Avenue: a 23-foot cartpath carries two westbound driving lanes north a 5-foot median, which widens to 14-feet wide after Frisco Street. South of the median, a 22-foot cartpath carries two eastbound driving lanes.
- Elwood Avenue to Denver Avenue: a 50-foot cartpath carries three westbound driving lanes, including a left-turn lane, and narrows to a 37-foot cartpath holding two driving lanes.
- Denver Avenue to Cheyenne Avenue: a 56-foot cartpath holds four driving lanes flanked by two parallel parking lanes.
- Cheyenne Avenue to Boulder Avenue: a 56-foot cartpath holds four driving lanes flanked by a parallel parking lane on the south curb a one striped no-parking zone on the north curb (due to a garage access).
- Boulder Avenue to Cincinnati Avenue: a 55-foot cartpath holds four driving lanes flanked by two parallel parking lanes, but there are few actual parking spaces, due to the space occupied by the Holiday Inn Port-cochere, parking lot access, bank drive-throughs, and striped sight triangles.
- Cincinnati Avenue to Frankfort Avenue: a 55-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.
- Frankfort Avenue to Kenosha Avenue: a 62-foot cartpath holds four driving lanes flanked by two lanes of parallel parking.

Analysis

West of its forked intersection with 6th Street, 7th Street becomes responsible for carrying the planned 6th Street cycle facility west past the IDL. In this section, the number of lanes needed to carry projected traffic are two westbound and one eastbound; the remainder of the street space can be dedicated to bike lanes and curb parking, in that order.

At the 6th-Street fork, special bike markings will be needed to transfer the full bike facility onto 6th Street. Beyond this point, 7th Street should contain the number of drive lanes mandated by anticipated traffic, with the remainder of the street space being dedicated to parking. This means one driving lane in each direction until the 8th Street fork (at Elmwood Avenue), and then a varying number of westbound lanes beyond. This number varies between two and four lanes, as suggested by the traffic analysis. In all cases, the parking configuration is a function of what fits between the existing curbs and the number of lanes that must be dedicated to traffic.

Additionally, marked on-street parking is missing in several places and should be re-striped, such as between Cheyenne and Boulder on the north side of the street, and among the excessive number of curb cuts on Boulder and Cincinnati—such driveways should be examined for consolidation.

Recommendation

Restripe the street to the following configurations:

- IDL to 6th Street: *Street Type 68-BDDTMDB*: two westbound driving lanes, one westbound turn lane, and one westbound buffered bike lane on the north side of the median and, to the south, one eastbound driving lane and one eastbound buffered bike lane.
- 6th Street to Elwood Avenue: *Street Type 50-PDMDP*: two driving lanes flanking the center median, and one parallel parking lane on each of the outer curbs.
- Elwood Avenue to Denver Avenue: the section varies, but re-stripe the two driving lanes as ten feet wide, with the lane against the northern curb as a right-turn-only, and stripe one lane of back-in parking on the south curb.
- Denver Avenue to Boulder Avenue: *Street Type 55-ADDDP-1W*: three westbound driving lanes flanked by one back-in parking lane @ 45° angle and one parallel parking lane.
- Boulder Avenue to Cincinnati Avenue: *Street Type 55-ADDA-1W*: two westbound driving lanes flanked by two back-in parking lanes @ 45° angle.
- Cincinnati Avenue to Frankfort Avenue: No change. Remains as *Street Type 55-PDDDDP*: four westbound driving lanes flanked by two parallel parking lanes.
- Frankfort Avenue to IDL: *Street Type 62-ADDDA*: three westbound driving lanes flanked by two back-in parking lanes @ 60° angle.

***8th Street***

Existing Conditions

8th Street is a one-way eastbound street carrying between 117 and 1,502 vehicles at peak hour. Reportedly, there are a lot of wrecks and near-wrecks at its intersection with Denver Avenue.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Elwood Avenue to Denver Avenue: a 30-foot cartpath carrying two driving lanes widens to a 48-foot cartpath carrying four driving lanes.
- Denver Avenue to Cheyenne Avenue: a 48-foot cartpath carries four driving lanes.
- Cheyenne Avenue to Boulder Avenue: a 46-foot cartpath carries four driving lanes.
- Boulder Avenue to Main Street: a 36-foot cartpath carries four driving lanes, notably each 9 feet wide.
- Main Street to Boston Avenue: a 56-foot cartpath carries four driving lanes flanked by one lane of parallel parking and one striped lane area of no parking on the south flank due to parking lot driveways.
- Boston Avenue to Kenosha Avenue: a 56-foot cartpath carries four driving lanes flanked by two lanes of parallel parking. An area about three car-lengths long on both the north and south flank of the block are striped as no parking near the intersection with Kenosha Avenue.

Analysis

8th Street traffic volumes demand only two driving west of Cincinnati and three driving lanes east of Cincinnati.. Throughout the corridor, added on-street parking will be a valuable asset to businesses and help calm street traffic, contributing to a more pleasant sidewalk environment. 8th Street is not planned to contain bicycle facilities.

Recommendation

Restripe the street to the following configurations:

- Elwood Avenue to Denver Avenue: *Street Type 30-PDD-1W*: two eastbound driving lanes and one parallel parking lane on the south flank; and, where the cartpath widens, *Street Type 36-PDDP-1W*: two eastbound driving lanes flanked by two parallel parking lanes; and, where the cartpath widens again, *Street Type*

*45-ADDP-1W*: two eastbound driving lanes flanked by one back-in parking lane @ 45° angle and one parallel parking lane. The transition from parallel to angled parking must be designed carefully.

- Denver Avenue to Boulder Avenue: *Street Type 48-ADDP-1W*: two eastbound driving lanes flanked by one back-in parking lane @ 60° angle and one parallel parking lane.
- Boulder Avenue to Main Street: *Street Type 36-PDDP-1W*: two eastbound driving lanes flanked by two parallel parking lanes.
- Main Street to Detroit Avenue: *Street Type 55-ADDA-1W*: two eastbound driving lanes flanked by two back-in parking lanes @ 45° angle.
- Detroit Avenue to Kenosha Avenue: *Street Type 55-ADDDP-1W*: three eastbound driving lanes flanked by one back-in parking lane to the south @ 45° angle and one parallel parking lane to the north.

### *9th Street*

Existing Conditions

9th Street is two-way and carries between 72 and 232 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Denver Avenue to Cheyenne Avenue: a 30-foot cartpath carries two driving lanes.
- Cheyenne Avenue to Boulder Avenue: a 30-foot cartpath carrying two driving lanes and one lane of parallel parking widens to a 40-foot cartpath carrying two driving lanes flanked by two lanes of parallel parking.
- Boulder Avenue to Cincinnati Avenue: a 56-foot cartpath carries four driving lanes flanked by two lanes of parallel parking.
- Cincinnati Avenue to Elgin Avenue: a 56-foot cartpath carries four driving lanes flanked by a lane of parallel parking to the north, and a striped no-parking zone to the south due to driveway entries.

Analysis

9th Street carries low volumes of traffic, so no more than two driving lanes are demanded on any block. The street's additional width should be used for on-street parking, which will be a valuable asset to businesses and help calm street traffic, contributing to a more pleasant sidewalk environment. 9th Street is not planned to contain bicycle facilities.

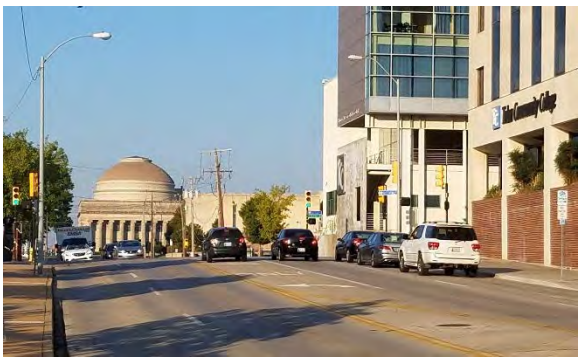
Recommendation

Restripe the street to the following configurations:

- Denver Avenue to Cheyenne Avenue: *Street Type 30-PDD*: two driving lanes and one parallel parking lane.
- Cheyenne Avenue to Boulder Avenue: No change. (Remains as *Street Type 30-PDD* and *Street Type 40-PDDP*.)
- Boulder Avenue to Elgin Avenue: *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle.

***10th Street***

Existing Conditions



10th Street runs as Route 66 from Boulder Avenue to Elgin Avenue, where it merges with 11th Street. It is a two-way street that carries between 147 and 516 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Boulder Avenue to Main Street: a 50-foot cartpath carries four driving lanes and one center left-turn lane. Near Boulder Avenue, there is no left-turn lane, and the cartpath is widened by a small painted island and 16-foot right-turn slip lane on the north flank.
- Main Street to Cincinnati Avenue: a 50-foot cartpath carries four driving lanes and one center left-turn lane. At the alley, the cartpath widens to 58 feet and carries three driving lanes, one center left-turn lane, and one striped no-parking zone.
- Cincinnati Avenue to Detroit Avenue: a 50-foot cartpath carries four driving lanes and one center left-turn lane; at the alley, the cartpath changes configuration to three driving lanes, one center left-turn lane, and one striped no-parking zone to make the merge to the narrowed section across the Detroit Avenue.
- Detroit Avenue to Elgin Avenue Roundabout: a 42-foot cartpath carries two westbound driving lanes, a median, and one eastbound driving lane.

Analysis

10th Street, also known as Route 66, does not need more than two driving lanes along any of its trajectory. A designated bike route, it should contain two buffered bike lanes, plus curb parking as space allows, typically on the south flank of the street. East of Detroit Avenue, where the street is split by a new median, the

roadway should retain its current configuration, but sharrows must be added with the temporary loss of the bike lanes approaching the roundabout. At Boulder Avenue, the south leg of the fork should be removed when that corner is developed. (See the redesign of this intersection in Part II of this Study.)

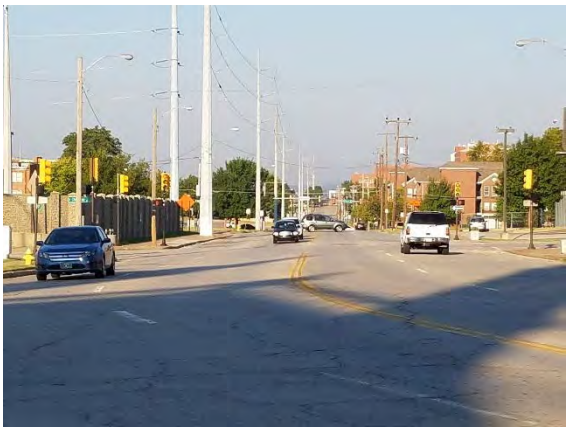
Recommendation

Restripe the street to the following configurations:

- Boulder Avenue to Detroit Avenue: *Street Type 50-BPDDB*: two driving lanes, one parallel parking lane on the south flank, and two buffered bike lanes. (Alternative: *Street Type 50-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes. While not ideal, 4-foot bike lanes are recommended here as the best of a number of imperfect solutions.)
- In those segments where the cartpath widens to 58 feet, add the missing parking lane back to the south side by using *Street Type 58-BPDDPB*: two driving lanes, two parallel parking lanes, and two buffered bike lanes.
- Detroit Avenue to Elgin Avenue Roundabout: *Street Type 42-DDMD*: two westbound driving lanes and one eastbound driving lane separated by a median, with sharrows marked in the outer driving lanes.

### *11th Street*

Existing Conditions



11th Street is a two-way street that runs as Route 66 between Denver Avenue and the 10th Street merge at Boulder Avenue. East of Main Street, 11th Street picks up again, running until it connects again with Route 66 just south of the Elgin Avenue roundabout.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Lawton Avenue to Houston Avenue: a 40-foot cartpath carries four driving lanes.
- Houston Avenue to Triangle at 12th Street: a 40-foot cartpath holds two driving lanes, except near the triangle at 12th Street, where it holds three driving lanes (two westbound, one eastbound).
- North of the 12th Street triangle: a 22-foot cartpath holds one driving lane.
- At the curved west edge of the 12th Street triangle: a 22-foot cartpath holds two driving lanes.

- 12th Street triangle to Denver Avenue: a 53-foot cartpath holds two westbound driving lanes, two eastbound driving lanes, and one eastbound left-turn lane.
- Denver Avenue to Cheyenne Avenue: a 57-foot cartpath holding four driving lanes and one center turn lane narrows via a chamfer to a 53-foot cartpath that holds four driving lanes.
- Cheyenne Avenue to Boulder Avenue: a 62-foot cartpath holds four driving lanes and widens to include a slip lane south of a triangle at the southwest corner of Boulder Avenue.
- Main Street to Boston Avenue: a 48-foot cartpath holds two driving lanes flanked by one lane of parallel parking as well as some cutouts, outside of the cartpath, for head-in parking.
- Boston Avenue to Cincinnati Avenue: a 40-foot cartpath holding two driving lanes and one lane of parallel parking narrows to a 30-foot cartpath holding two driving lanes.
- Cincinnati Avenue to Detroit Avenue: a 30-foot cartpath holds two driving lanes.
- Detroit Avenue to south of the Elgin Street roundabout: a 26-foot cartpath holds two driving lanes flanked by informal parallel parking lanes and some cut outs for head-in parking outside of the cartpath.
- 11th Street roundabout east to IDL: Varies, but typically a 35- to 40-foot cartpath holds two driving lanes and a median or center turn lane.

Analysis

In those blocks where it plays the role of Route 66, 11th Street should continue the regional east-west bike route discussed above for 10th Street. At its western end, this route will continue west on the 12th Street overpass, where restriping is already funded. In this location, the bike lanes should surround the triangle in order to make the transition to 12th Street. At its eastern end, where 11th Street takes on Route 66 again beyond the Elgin Street roundabout, sharrows should be striped in both directions to link the bike facility beyond the IDL.

The traffic analysis shows a variety of lane configurations needed for the Route 66 portion of 11th Street, with more than two driving lanes needed between the 12th Street triangle and Boulder Avenue. In all cases, the cartpath maintains a width adequate to also hold buffered bike lanes and, east of Carson Avenue, parallel parking as well.

In the street's low volume non-Route-66 segment, over-wide driving lanes present an opportunity to stripe in more curb parking, which will make the street safer and better for business.

Recommendation

Restripe the street to the following configurations:

- Lawton Avenue to Houston Avenue: No change.
- Houston Avenue to Triangle at 12th Street: *Street Type 40-PDDP*: two driving lanes and flanked by two parallel parking lanes.
- North of 12th Street Triangle: *Street Type 22-BD-1W*: one westbound driving lane and one westbound bike lane.
- Curved West Edge of Triangle: *Street Type 22-BD-1W*: one southbound driving lane and one southbound bike lane.
- 12th Street Triangle to Denver Avenue: *Street Type 53-BDDTDB*: one westbound driving lane, two eastbound driving lanes, one eastbound turn lane, and two bike lanes.
- Denver Avenue to Boulder Avenue: *Street Type 57-BDTDDB*: one westbound driving lane, one westbound left-turn lane, two eastbound driving lanes, and two bike lanes; narrows at Carson, to run from Carson Avenue to Boulder Avenue as *Street Type 53-BPDDPB*: one westbound driving lane and one eastbound driving lane flanked by two parallel parking lanes and two bike lanes. Note that the slip lane south of the triangle at Boulder Avenue should be closed, and any areas where the width of the street differs, should be striped as no-go zone.
- Main Street to Boston Avenue: *Street Type 48-ADDP*: two driving lanes flanked by a parallel parking lane on the south curb and one back-in parking lane on the north curb @ 60° angle; widens to *Street Type 55-ADDA*: two driving lanes flanked by two back-in parking lanes @ 45° angle .
- Boston Avenue to Cincinnati Avenue: *Street Type 40-PDDP*: two driving lanes flanked by two parallel parking lanes; narrows to *Street Type 30-PDD*: two driving lanes and one parallel parking lane.
- Cincinnati Avenue to Detroit Avenue: *Street Type 30-PDD*: two driving lanes and one parallel parking lane.
- Detroit Avenue to Elgin Avenue: No change.
- 11th Street roundabout east to IDL: No change except to stripe sharrows in the driving lanes until the cartpath becomes wide enough to accept the bike facilities that will continue east of the IDL.

### *12th Street*

Existing Conditions

12th Street is two-way except for a small westbound section west of Carson Avenue.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Houston Boulevard to 11th Street Triangle: a 48-foot cartpath holds four driving lanes.
- Denver Avenue to Exit Ramp Triangle: a 36-foot cartpath holds three westbound driving lanes.
- Carson Avenue to Cincinnati Avenue: a 30-foot cartpath holds two driving lanes, and select areas have cut-outs for parking outside of the cartpath.
- Cincinnati Avenue to Detroit Avenue: a 24-foot cartpath holds two driving lanes.
- Detroit Avenue to Frankfort Avenue: a 26-foot cartpath holds two driving lanes.

Analysis

12th Street does not need more than two driving lanes in any location, so the remainder of the street space can receive parallel parking where there is room for it. This parking should alternate between the north and south curb depending on needs of the block. Added on-street parking, especially in such an alternating "chicane" can help calm street traffic, contributing to a safer street for all users.

12th Street between Southwest Boulevard and 11th Street is already funded for bike lanes as a part of the Route 66 cycling corridor.

Recommendation

Restripe the street to the following configurations:

- Southwest Boulevard to 11th Street Triangle: *Street Type 48-BDTDB*: two driving lanes flanking a center turn lane, and two bike lanes at the curb.
- At the 11th Street Triangle: continue the eastbound bike lane along the south flank. The westbound bike lane here wraps the triangle to the north and the west.
- Denver Avenue to exit ramp triangle: No change.
- Carson Avenue to Cheyenne Avenue: *Street Type 30-PDD*: two driving lanes and one parallel parking lane on the north curb.

- Cheyenne Avenue to Boulder Avenue: *Street Type 30-PDD*: two driving lanes and one parallel parking lane on the south curb.
- Boulder Avenue to Main Street: *Street Type 30-PDD*: two driving lanes and one parallel parking lane on the south curb. (Ensure that the hour-restricted parking along south side is allowed at all times.)
- Main Street to Cincinnati Avenue: *Street Type 30-PDD*: two driving lanes and one parallel parking lane on the north curb.
- Cincinnati Avenue to Detroit Avenue: *Street Type 24-PDD*: a slow-flow street holding two driving lanes and one parallel parking lane.
- Detroit Avenue to Frankfort Avenue: *Street Type 26-PDD*: a slow flow street holding two driving lanes and one parallel parking lane.

### *13th Street*

Existing Conditions

13th Street is a two-way street carrying between 97 and 579 vehicles at peak hour.

The cross section of this street varies over its course. From west to east, its cartpath is configured as follows:

- Boston Avenue to Cincinnati Avenue: a 42-foot cartpath holds three driving lanes and one parallel parking lane.
- Cincinnati Avenue to IDL: a 48-foot cartpath holds four driving lanes.

Analysis

13th Street is a short segment of street connecting the Boston Avenue United Methodist Church to the IDL. As per the Go Plan, this street will serve as a bicycling connection between downtown and the facilities planned east of the IDL.

Once bike lanes are inserted there is still room for additional parking on the south curb near the Boston Avenue church, which will help alleviate parking demand in the surrounding parking lots. Parallel parking can also be added along the north curb between Cincinnati Avenue and Elgin Avenue.

Recommendation

Restripe the street to the following configurations:

- Boston Avenue to Cincinnati Avenue: *Street Type 42-BDDBP*: two driving lanes, two bike lanes, and one parallel parking lane along the south curb.
- Cincinnati Avenue to IDL: *Street Type 48-BPDDB*: two driving lanes, two bike lanes, and one parallel parking lane on the north curb.

## PART IV. A USEFUL WALK

### Ample Housing in Downtown Tulsa

As noted, downtown will be considerably more useful—and therefore more walkable—when it achieves a better balance between housing and workplace. To achieve this will require a commitment from the City to reorient its policies and practices around the stated goal of creating more housing downtown, and providing direct support in this regard.

Right now there are about 1,800 units of housing downtown, in contrast to about 40,000 jobs. Downtown population, independent of jail inmates, was counted at about 1200 in 2014. While there is a nice pipeline of residential construction—about 750 units currently planned—it is doubtful that downtown population will much exceed 3000 this decade. That suggests that the jobs/housing ratio in downtown will reach around 13:1 in the near term which, while not abysmal, is far below a healthy balance.

Right now, fewer than 300 downtown workers also live downtown—less than 1 percent of the downtown workforce. That number presents a tremendous opportunity as a commitment to walkability makes the downtown more livable, if housing is built that downtown workers can afford.

#### *Meeting the Market*

As noted, downtown has no shortage of higher-end housing. Indeed, upscale developments like the Urban 8 townhouses are having trouble selling. This reflects a condominium market that is relatively weak compared to a strong rental market, but also demonstrates that the appetite for large luxury housing downtown is quite limited. This is a market that typically cannot grow until downtown has become considerably more populated with less expensive units—and more walkable.

*The best way to increase downtown population is not with luxury condominiums but with smaller, more attainable units like at the Greenarch.*

In contrast, downtown rental units are currently 97% occupied, indicating great demand. But rents are not especially high, reflecting the local real estate market. This creates a problem, because it is difficult to build new downtown housing at a cost that makes these moderate rents profitable to developers. Building downtown is necessarily more expensive than building in the suburbs, and it is principally for

this reason that the downtown pipeline is not larger. Developers go where the profits are.

Many cities, recognizing that Developers need a bit of a push to come downtown—and understanding the great value of a better jobs/housing balance, have found ways to incentivize new attainable housing downtown. Kansas City waves *ad valorem* taxes on such developments. Des Moines offers a 10-year 100% tax abatement, sometimes in combination with Tax Increment Financing covering the next ten years. Des Moines actually offers an instructive model for Tulsa. In 2000, there were only 2500 housing units downtown. After two decades of these incentives, that number is expected to reach almost 10,000 by 2020. The Des Moines skyline is now full of cranes, as recent downtown housing developments have topped $450 million in investment.

### *Other City Support*

Of course, cities can do a lot more than offer cash incentives to spur market-rate residential development. A good example is Lowell, Massachusetts, which has significantly transformed its downtown through a focus on new housing. As recently as 2000, the heart of the city held only about 1700 housing units, of which 79 percent were subsidized and income-restricted. Eleven years later, the number of units had almost doubled and almost 85 percent of the new housing was market rate. That means that the number of non-income-restricted homes more than quadrupled.

According to Adam Baacke, Lowell's Assistant City Manager for Planning and Development, achieving this transformation was essentially a three-step process that could perhaps be best described as *politics, permitting,* and *path-finding. Politics* refers to changing attitudes on the City Council, where most members had historically shunned downtown housing because "only commercial development was considered good." Eventually, the City's new outlook motivated it to sell one of its underutilized parcels for the express purpose of creating artists' housing downtown.

*Permitting* refers to sidestepping the City's conventional zoning code, which, for example, caused this new artists' housing to require 14 distinct variances just to get built. In its place, the City treated each new residential proposal as a "special permit," and then these permits were "given out like candy" to qualified applicants. Next, the City replaced its stringent requirements for parking with the new rule that developers needed only to identify one parking space per unit, anywhere nearby, that could be leased to their residents. Most of these were spaces in municipal garages that were busy from nine to five but empty at night.

*Lowell, MA almost doubled its downtown housing stock from 2000 – 2011, largely through historic rehabilitation.*

Finally, *Path-finding* refers to setting up an extensive regime of hand-holding from city staff, to walk developers through the tricky process of winning every available federal and state subsidy, including Historic Preservation Tax Credits and Community Renewal block grants. Some of these awards are quite competitive, and the City went so far as to package all of the required letters of support from the community. The City also helped demonstrate to developer's banks—who demanded more parking than the City did—that they were satisfying this requirement by assigning city-owned spaces to specific housing developments. Such assistance requires staff time, which is not cheap. Cities like Lowell have experienced a downtown renaissance because they decided the investment was worth it.

**Market-Based Parking in Downtown Tulsa**

Parking covers more acres of urban America than any other one thing, yet until about a decade ago, there was very little discussion about how parking could be managed for the benefit of a city. Thankfully, due to the work of Donald Shoup, PhD, the author of *The High Cost of Free Parking,* there is now a comprehensive set of practices that cities can undertake to ensure that downtown parking works to make downtown more attractive, more convenient, and more successful.

These practices, which Shoup organizes as a three-legged stool, consist of the following: eliminating the on-site parking requirement; charging market-based prices for parking; and reinvesting increases in parking revenue in the very districts where that revenue is raised. We will address each of these concepts briefly.

***The On-Site Parking Requirement***

Abolishing the off-street parking requirement for all downtown uses is the first of the three cornerstones of Shoup's theory, because it allows the market to determine how much parking is needed. He notes that "removing off-street parking requirements will not eliminate off-street parking, but will instead stimulate an active commercial market for it."

This is what already happens in America's most walkable communities, and also in Tulsa's Central Business District (CB and CB1 zones). Eliminating parking minimums in this way simply allows developers to give their customers what they want, without City interference. Unfortunately, though, developers must answer to their lenders as well, and many lenders insist on higher parking ratios than developers may wish to provide. This is especially the case with attainable housing whose residents can be expected to park happily in nearby on-street spaces that are typically empty overnight.

As noted in the above discussion of Lowell, Massachusetts, active involvement by city government can be the key factor in helping developers to clear this hurdle. What such involvement would look like in Tulsa is a subject demanding more study. Suffice to say that, between its many parking structures (public and private) and on-street spaces, most of which are largely vacant overnight, Tulsa has a vast untapped resource to support downtown residential development—so vast that no attainable-housing developer should have to take on the added expense of building on-site parking. Eliminating that expense alone could make the difference between such development being profitable or not, and therefore happening or not.

***The Right Price***

One place where Tulsa falls behind some other cities is in the pricing of its parking. The current regime seems to be working against the success of downtown, in that it encourages overcrowding at some curbs and underutilization at others. This

outcome is the result of curb parking that is priced uniformly at $1 per hour, irrespective of the desirability of a given location.

In busy downtown areas, this artificially low price drives up demand for the type of parking that is already hardest to find, short-circuiting the free-market functionality that would otherwise allow people to make smart choices about where to park. The result is a scarcity of the underpriced good (curb parking), and perceptions of inconvenience among potential shoppers. In these locations, a higher meter price would send more cash-conscious parkers to private lots, so that shoppers with money to spend would find it more convenient to do so.

In less busy areas, the same $1 price, artificially high, causes most curb parking to stay empty, as people choose to park instead in reasonably-priced private lots. The result is streets whose excess asphalt invites speeding, and sidewalks that sit exposed, lacking the protection of parked cars.

As described by Shoup, the proper price for curb parking is the price that results in a steady availability of one empty parking space per curb face at all times, an occupancy rate of approximately 85 percent. At times, this occupancy can be achieved with a price of $0, but at other times the price must rise significantly to assure that "Daddy Warbucks can always find a spot near the furrier." This outcome can be often be achieved without elaborate or expensive congestion pricing devices; often, the price need only change once or twice a day.

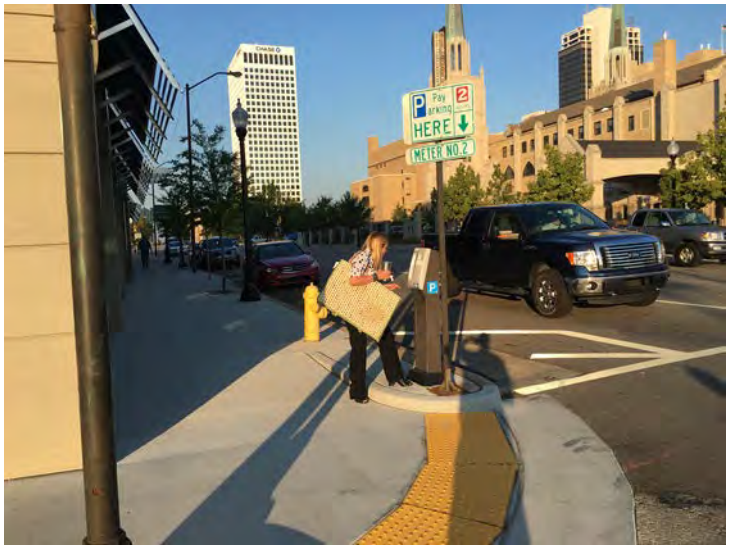
Once the role of parking meters is better understood—not as a revenue source but as a means of ensuring proper availability—then the current downtown parking regime in Tulsa begins to look most wanting. With much of the demand in certain areas in the evenings and on weekends, it seems odd that on-street meters become free at 5 PM— "unofficially 4.30 PM"—on weekdays and free all of Saturdays and Sundays. The laws of economics are not suspended at those times, so nor should a demand-based price for parking.

Surprisingly, it is sometimes downtown merchants who fight most ardently against increased meter rates or expanded hours. Their opposition is based on an instinctive fear that shoppers will be scared away, and their sales will suffer. Fortunately, this fear has no theoretical basis and no evidence to support it. In city after city, the business-owners who fought the loudest against market-based pricing were among the first to admit that, once instituted, it increased their sales dramatically. The parking meter was invented (in Oklahoma, no less) to help businesses—by increasing shopper turnover—and an underpriced parking meter is not being allowed to do its job.

A market-based pricing approach also requires new scrutiny of the City's 2-hour parking maximum now in force in much of downtown. With proper pricing, this maximum will not be necessary and can be eliminated—and indeed should be eliminated immediately in places where curbs are underutilized. Parking time

maximums only make sense in shopping districts where curb parking supply always exceeds demand, and are otherwise indicative of underpricing.

Additionally, in Tulsa, people's parking choices are thrown out of whack by the two other factors: the scarcity and poor quality of metering equipment, and the common perception that parking in downtown is not adequately enforced.




*This woman was observed struggling for several minutes with a parking pay station before seemingly giving up.*

Pay Stations

Tulsa places its pay stations in very few locations, typically at two corners per city block, mandating inconveniently long walks. Four stations per block is a more reasonable ratio. Moreover, the current equipment is quite difficult to use, especially in bright sunlight. It is encouraging that the City has updated to different machinery, with 21 new stations about to be installed in the Brady Arts District. A market-based pricing system and more consistent enforcement should generate more than enough additional revenue to fund more frequent pay stations.

While it is hoped that all equipment could be replaced before long, one short-term strategy for increasing the frequency of parking stations would be to relocate stations to busy areas from other parts of the downtown where they are not needed. In these quieter areas, where the right price is zero, the parking machines can be removed until higher demand makes new ones necessary.

Enforcement

One shared opinion among many people is that the enforcement of downtown parking is spotty at best. This creates an environment which is even less rational, in which people are tempted to break the rules. Eventually, when one gets caught,

there is a greater feeling of resentment than would be the case in a predictable system. And of course, revenues suffer markedly.

It is important to stress here that, for downtown to function properly, parking must function properly. And for parking to function properly, enforcement must be consistent and comprehensive. The most effective systems carefully train their enforcement crew as friendly downtown ambassadors, who do more than just write tickets, providing a sense of stewardship and security, while directing visitors to the pay stations.

Few cities that make an effort to price and enforce parking more carefully decide that it was a mistake. If done properly it pays for itself, and downtown businesses see their revenues rise.

### *Parking Benefits Districts*

In other cities, the third leg of Shoup's stool, the Parking Benefits District, has proven essential to winning over reluctant merchants to higher meter rates. In a Parking Benefits District, the extra money raised through increased meter revenues is invested it in that district itself. In addition to improving sidewalks, trees, lighting, and street furniture, these districts can renovate storefronts, hire public service officers, and of course keep everything clean. As has been demonstrated in Pasadena, CA, and elsewhere, these districts can initiate a virtuous cycle where parking demand begets an improved public realm, which in turn begets even greater demand.


*In Pasadena, CA, meter revenues fund local public beautification.*

Currently, only a few locations in downtown Tulsa are likely to support meter rates much higher than $1 per hour, but the Parking Benefits District should be

considered in these places as a tool to secure merchant support for market-based pricing.

If the supply and management of parking in downtown is going to work to the benefit of downtown, then a commitment to the above three basic principles of parking policy should explicitly guide City efforts. While it is not good practice for a planning study such as this to recommend another planning study, it seems clear to most educated observers that downtown Tulsa deeply needs a full reorientation around the market-based principles outlined here. How that City accomplishes that goal is a longer discussion, but it needs to be stressed that the other recommendations of this Study will have difficulty achieving their desired ends without a best-practices revamping of downtown parking rates, equipment, and enforcement.

A final note is needed about this Study's overall recommendation to increase the amount of parking on many downtown streets. This recommendation is made both to increase the downtown parking supply, and to make downtown more walkable. In terms of supply, the City has recently completed a Walker Parking study to determine where it should locate its next, expensive, publicly-funded parking structure. The changes proposed in this Study could certainly delay that structure, if not make it unnecessary.

In terms of walkability, the unnecessary and too-wide driving lanes in most downtown streets result in excessive speeding, right up against curbs that are often unprotected due to an absence of parked cars. This is a pedestrian's nightmare. Making downtown more safe by fixing this problem will also make it more welcoming, more livable, and more successful. If the experience in other cities is any indication, this has two principal outcomes: an increase in downtown property values, and an increase in the number of people coming downtown. Ironically, the more walkable a place becomes, the more people want to drive to it.

Cumulatively, these changes can be expected to make downtown private parking lots more valuable, especially as developers seek out sites for new buildings. When these lots, which blight walkability, are developed, the downtown will become more attractive yet, and the virtuous cycle will continue. It would be extremely short-sighted to delay or impede this process in order to protect current parking revenue to private-lot owners, who actually stand to benefit more than anyone as a more walkable downtown becomes more valuable.

## Useful Transit in Downtown Tulsa

### *Transit by Choice*

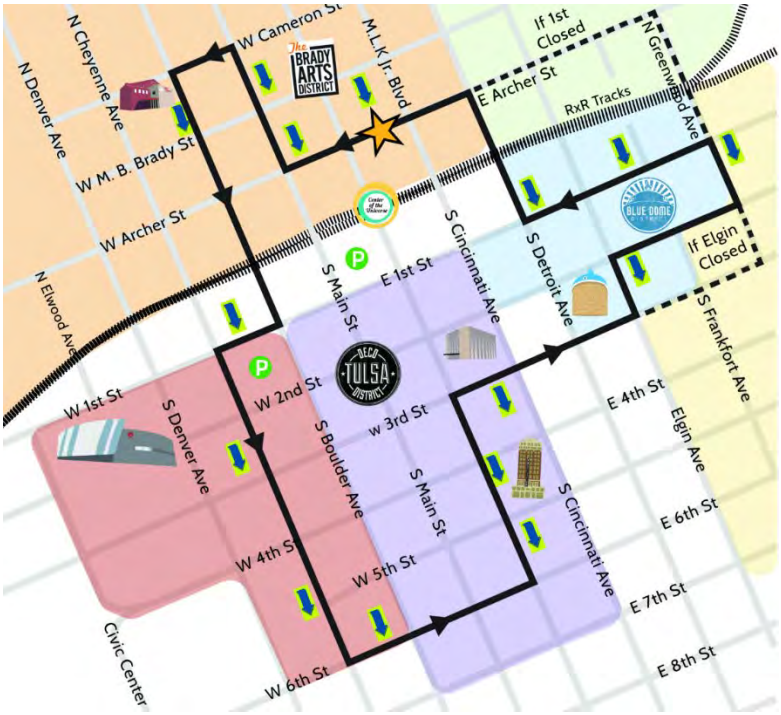
By most accounts, Tulsa Transit does a laudable job serving people who need a ride downtown—riders by need. Like in many cities that grew up around driving, buses in Tulsa have a harder time attracting riders who own cars. This circumstance will not change significantly unless the land-use patterns around the downtown change to such an extent that car ownership becomes less prevalent—only a long term possibility. In the shorter term, knowing that transit provides mobility at a lower social cost than driving, and supports walking and biking rather than undermining it, we should discuss specific opportunities for transit that might be so useful as to attract car owners despite the great convenience of driving in Tulsa. In this regard, two main services have been identified: The Loop and The Downtown Shuttle.

The Loop is an appealing nighttime service intended to conveniently move patrons among restaurants, bars, and other nightspots downtown. An inspired idea, it may not often have large ridership, but it is worth supporting in some form, not only due to its appeal, but because it presents an alternative to the increased drinking and driving that would likely occur in its absence.

*But the Loop has more of a party atmosphere with loud music inside, not appropriate for users with young children.*

That said, some people feel that the Loop is not as cool as it wants to be, and the lively music and flashing lights that make it appeal to some as a "party bus" also disqualify it as a true downtown circulator. Happily, Tulsa Transit plans to fill that void with a designated Downtown Shuttle, beginning 2019, that will follow a similar route, and run from 7 AM to 9 PM on Monday – Wednesday and 7 AM to 2 AM on Thursday – Saturday. Its route may extend slightly to reach parking lots on the fringe of downtown.

While it would be a pity to take the flashing purple bus out of commission, the proper way to avoid rider confusion would be to eliminate the Loop as a separate service, and simply fold its trips into the Downtown Shuttle. The Shuttle should therefore have a route that serves both daytime and nighttime activity properly, without changing at a certain hour. Routes that change scare away riders. The route should be as simple as possible—riders also intimidated by complicated paths—and it should be prominently displayed on the side of the vehicle and at bus stops, perhaps also as part of a logo.




*The current Loop route will want modification to properly serve a daytime Downtown Shuttle.*

Many American cities provide downtown circulators in addition to standard bus service, in order to reduce driving trips within the downtown and also to make downtown working and living more convenient. In the latter category, perhaps the greatest potential benefit of a well-run circulator is that it makes it easier for downtown residents to live car-free. For that reason, the Circulator should be understood as an incentive for increasing the downtown population, and supported as a part of that effort.

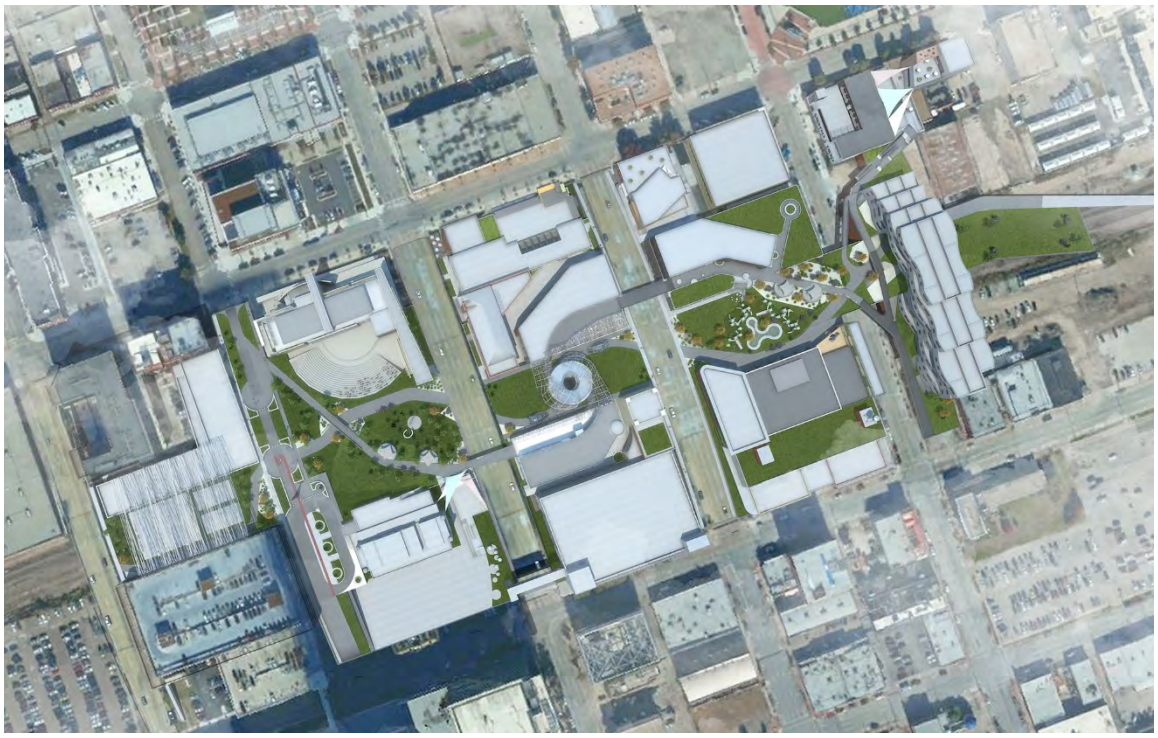
Many cities' downtown circulators are free, a key incentive. The other essential quality of a successful circulator is frequent headways. Because the distance traveled is so short, no one should ever have to wait more than 10 minutes to catch one, and 5 minute headways are better. This adds up to a service that, to achieve its goals, will require significant subsidy. An attractive, free circulator with frequent headways is a big investment that can yield big payoffs. A circulator that is either

not free or not frequent will still require a major subsidy but will yield almost no payoff.

### *Downtown Transfers, the Center of the Universe, and Bike Share*

The proper place for bus transfer hubs is in city centers, where transit riders can meet many of their daily needs on foot. While some focus group members viewed the Denver Street station as a negative feature of the downtown, it does not seem to exhibit many of the negative qualities that were described. In our visits, it was clean, orderly, and clearly providing a valuable service to many people. While it may not always offer the same impression, it is worth noting that the useful walk trumps the attractive walk when it comes down to city walkability, and effective transit is key to useful walking.

One key challenge both to rider efficiency and to perceptions of loitering is the fact that the Denver Street station is five blocks across town from the Greyhound bus terminal, even though the two serve the same population, and many regional bus trips begin or end as local Tulsa Transit trips. While it may require some complicated partnerships to accomplish, the City should make an effort to bring the Greyhound service either into the Denver Street Station proper, or onto a site closer by.



*The inventive plan for the Center of the Universe imagines the reunification of downtown Tulsa above the train tracks atop a transit hub.*

The greatest potential transit development in Tulsa would be the introduction of high-speed rail to Oklahoma City and beyond. If and when that service arrives, it would be essential to move the Denver Street bus hub to the train station, so the services can operate seamlessly. It is expected, in such a scenario, that federal and/or state dollars would be made available to support the new transit center, and that expectation has led to speculation about what shape that investment might take. A bold and appealing proposal has been designed by local architects, KKT Architects, Inc., which imagines a new park capping the train tracks above a multimodal transit hub, surrounded by new buildings. As this plan suggests, it would be lovely indeed if the investment in high-speed rail could somehow prompt the elimination of downtown's greatest discontinuity, the unpleasant trek over the railroad tracks.

A final exciting development currently underway is the launch of a bike share system, which will locate 108 bikes in 12 stations in and surrounding the downtown. This is properly included in this section on transit because it is important to think about bike share as a form of transit, similarly beneficial to walkability and equally deserving of public subsidy. Like transit, bike share takes car trips off the road and makes walking more likely. Like transit, bike share connects together parts of downtown that would otherwise be considered distant. Like transit, bike share provides a viable mobility option to many of those people who lack the resources to drive.

Bike share is also a gateway to bike ownership. While some bike shop owners in Washington, D.C. originally fought the rollout of that city's large bike share program, they were surprised to learn that exposure to the bike share experience was causing more people to purchase bikes.


*Tulsa Bike Share plans to add nineteen stations across downtown, a system which will be rolled out later this year.*

Nineteen stations is not a lot, and it is hoped that the program will be expanded to a more useful scale before it is judged for its ridership. One can also anticipate ridership to lag somewhat until more bike lanes—especially protected lanes—are painted on downtown streets, making them safe and attractive to less-experienced cyclists.

Finally, the location of the first stations will also play a key role in the program's success. Since few people drive to bike share, they should be placed in downtown areas that regularly generate a high amount of foot traffic, such as the Denver Street station, the Brady Arts District, Blue Dome, Boston Avenue around 5th Street, and at the three college campuses in and around downtown. A look at the map above shows a good distribution of bike stations, but seems to be missing locations at OSU Tulsa and Langston University to the north. Adding those stations would seem to be useful in attracting more students downtown, especially once the bike network is improved.

**Wayfinding in Downtown Tulsa**

Street signs in Tulsa commit a sin that one often finds in cities with one-way grids: at most intersections, street names are only visible to people walking in the same direction that cars are driving. For example, pedestrians walking north on Cincinnati Avenue can only find out what street they are crossing by passing the intersection and looking back over their shoulder. This is both an inconvenience and an insult to pedestrians, as well as a danger, as some make extra crossings to get their bearings. Whatever the future of street direction downtown, all intersections must receive street-name signs that face in both directions. For streets that are expected to stay one-way for some time—like Cincinnati and Detroit—the City may want to introduce less expensive pedestrian-scale street-name signs to solve this problem.

In terms of directional wayfinding, downtown Tulsa seems generally well served in a conventional sense by its collection of informational signage. The division of downtown into a number of distinct named neighborhoods like Blue Dome and the Greenwood District is also helpful, and could be celebrated more comprehensively. Such efforts also help to improve pride of place among locals.

In addition to its more conventional signage, downtown Tulsa would benefit greatly from application of a concept called "Walk Your City," which replaces or supplements conventional downtown maps with destination-specific signs that identify walking direction and time.


*A "Walk Your City" campaign would call attention to the many walkable destinations in downtown Tulsa.*

One of the things that makes *Walk Your City* so exciting is that the signs are inexpensive and understood as temporary; if they are popular and effective, they

can be made permanent with more elegant materials. Because they celebrate walking—a typical sign might say, "It's a 5-minute walk to the BOK Center"—they help to create a pedestrian culture. Some *Walk Your City* campaigns begin as "guerilla wayfinding," with signs posted without City participation or permission, but there is no reason why an officially condoned or even City-sponsored effort would not be more effective than one launched underground.

It is easy to make a first recommendation as to what destinations would be best connected by *Walk Your City* signage. These would include, roughly from north to south, the Brady Arts District, Guthrie Green, ONEOK Field, The Greenwood District, Blue Dome, the Hyatt Conference Center, the BOK Center, the Cox Business Center, Denver Avenue Station, the heart of downtown (around Boston and 5th), Tulsa Community College, and Boston Avenue Methodist Church.

Deciding where and in what number to place the signs is a trickier matter, and will require some careful planning in order to avoid overkill. Too many signs will cause them to be ignored. As noted ahead, because of the limited walkability between walkable districts in downtown Tulsa, it is will be important to identify the key paths between those districts. A Walk Your City campaign could play an instrumental role in directing pedestrians along those paths rather than through less inviting and less frequented corridors.

## PART V. A COMFORTABLE AND INTERESTING WALK

### A High-Impact Development Strategy

Most mayors, city managers, municipal planners, and other public servants feel a responsibility to their entire city. This is proper, but it can be counterproductive, because by trying to be universally good, most cities end up universally mediocre. This is particularly the case when it comes to pedestrian activity. Every city has many areas that would benefit from concerted public investment, but only a few where such investment can be expected to have a significant impact on the number of people walking and biking.

The reason for this circumstance can be found in our earlier discussion about the conditions that are needed to welcome pedestrians: the useful, safe, comfortable, and interesting walk. Unless a walk can simultaneously satisfy all four criteria, it cannot be expected to get people out of their cars. Yet, even in American cities known for their walkability, only a limited percentage of the metropolis provides a tight-grained mix of uses, let alone a collection of well-shaped streets that provide comfort and interest. It is for this reason that most walkability studies focus on downtowns; that's where walking can most easily serve a purpose.

And even within an urban downtown, all is not equal. Generally, there are two types of areas within a downtown where public investment will have a greater impact on walkability than in others:

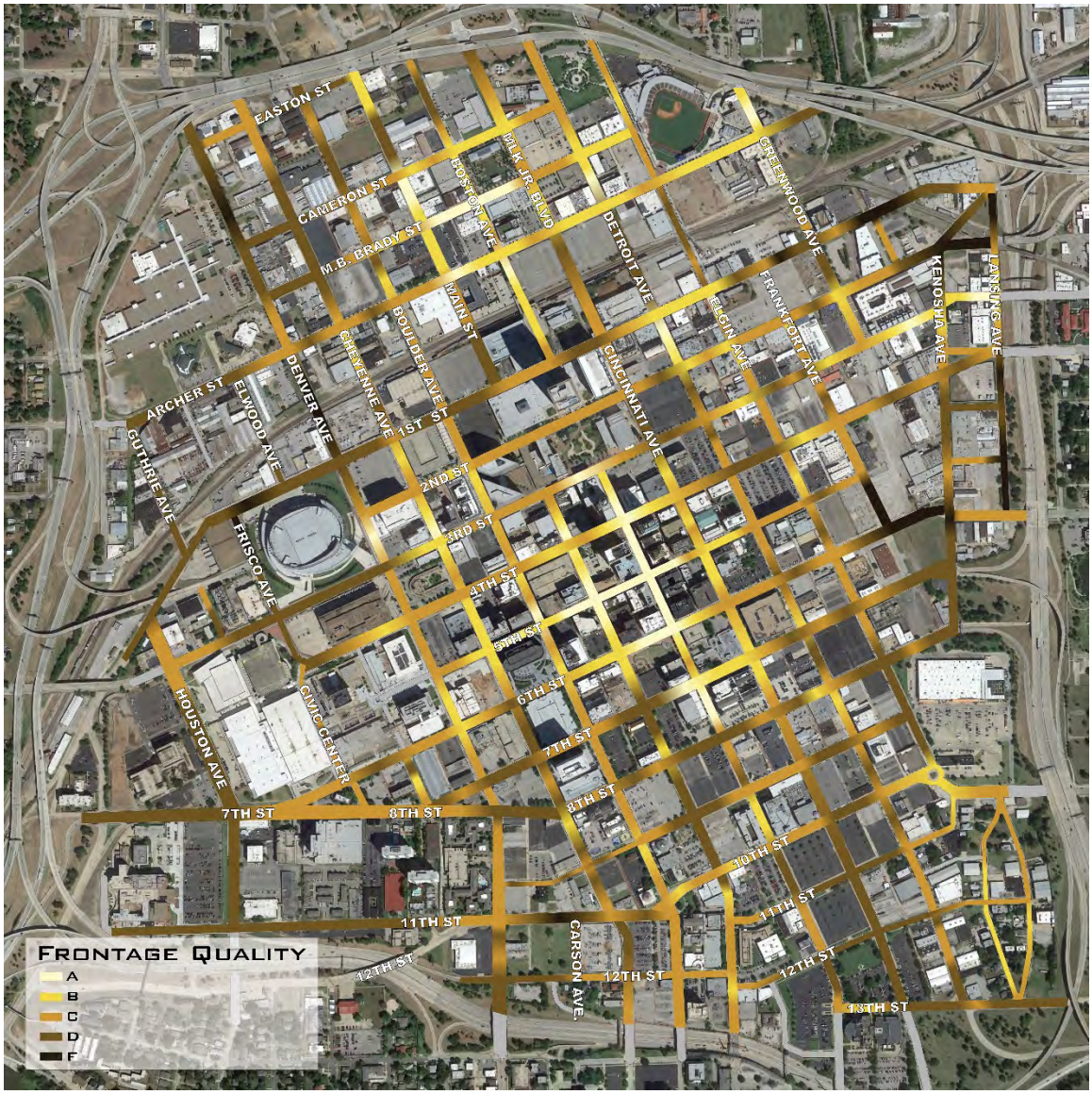
First, only certain street segments in the downtown are framed by buildings that have the potential to attract and sustain pedestrian life. There is little to be gained in livability by improving the configuration of a street that is lined by muffler shops and fast-food drive-thrus. These locations should not be allowed to go to seed; the trash must be collected and the potholes filled. But investments in walkability should be made first in those places where an improved public realm is given comfort and interest by an accommodating private realm—or a private realm that can be improved in short order.

Second, there are street segments of lower quality than those above, but which are essential pathways between downtown anchors—for example from a restaurant row to a baseball stadium—and are also needed to connect different walkable areas to each other. These streets may require greater investment to become walkable, but that investment is justified by their importance to the downtown pedestrian network.

By studying existing conditions, we can see where streets are most ready, or most needed, to support pedestrian life, and focus there.

### *The Street Frontage Quality Rating*

The drawing below is the Street Frontage Quality Rating for the study area. This map rates each street segment subjectively in terms of its pedestrian quality, based on the criteria of use, comfort and interest. Lighter-colored areas are generally useful, comfortable and interesting, and therefore capable of attracting pedestrians. Darker-colored areas fail to embrace the sidewalk with active building edges, and it is hard to imagine how limited interventions could turn them into places where pedestrians would feel comfortable.

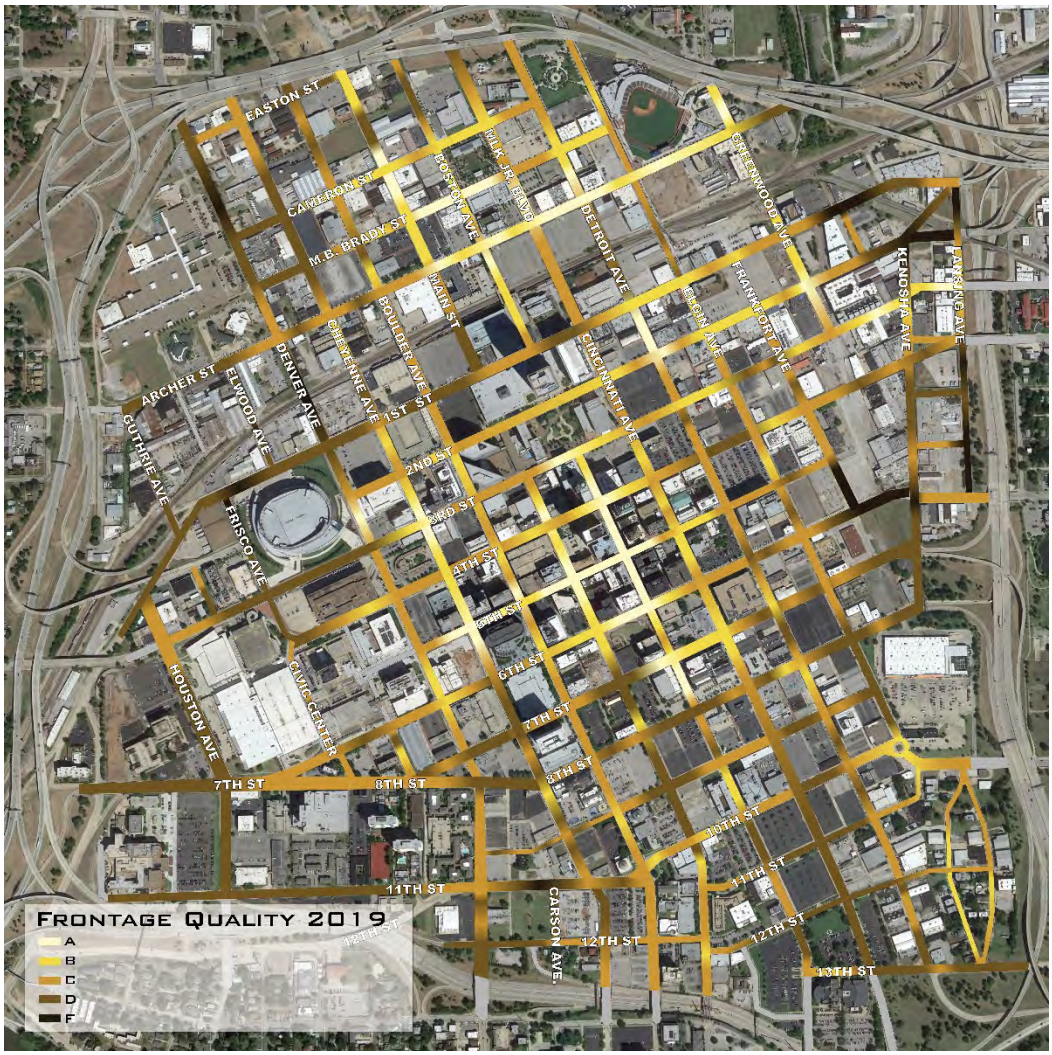



*The Street Frontage Quality Rating ignores Safety and instead focuses on the Usefulness, Comfort, and Interest of the street space.*

It is worth stressing that the three criteria measured in this diagram do not include the geometry of the street itself—whether it makes pedestrians feel safe. That

important category has already been addressed in the ***Section III: Street Reconfigurations*** section, and is unique among the four criteria in that it is something that public entities can improve very quickly, spending public dollars. In contrast, usefulness, comfort, and interest can be improved by cities over time—through design codes and, potentially, investment—but those improvements are usually achieved through the efforts of private actors, at arm's length from City government.

Given that the improvement of these three criteria—the ones rated in the drawing above—are generally not publicly controlled, and tend to take more time, it is wise for public agencies to focus on street design as a principal way to improve walkability quickly. That effort, however, needs to be prioritized based upon where the ground is already primed for such improvements to take root.




*The same map as above, updated for expected new construction.*

In this analysis, the ratings—from Best to Worst—truly cover the full range of quality, from delightful to miserable. Only those places marked A or B have frontages that are truly inviting to pedestrians. Evident from the lightest-colored areas of the drawing is that Tulsa has a number of truly walkable districts that are not that far apart, but are poorly connected to each other. The heart of downtown around Boston Avenue, Blue Dome, the east end of 3rd Street, the Brady Arts District, and North Greenwood Avenue are all pretty great places. . . if only walking between them wasn't so unpleasant!

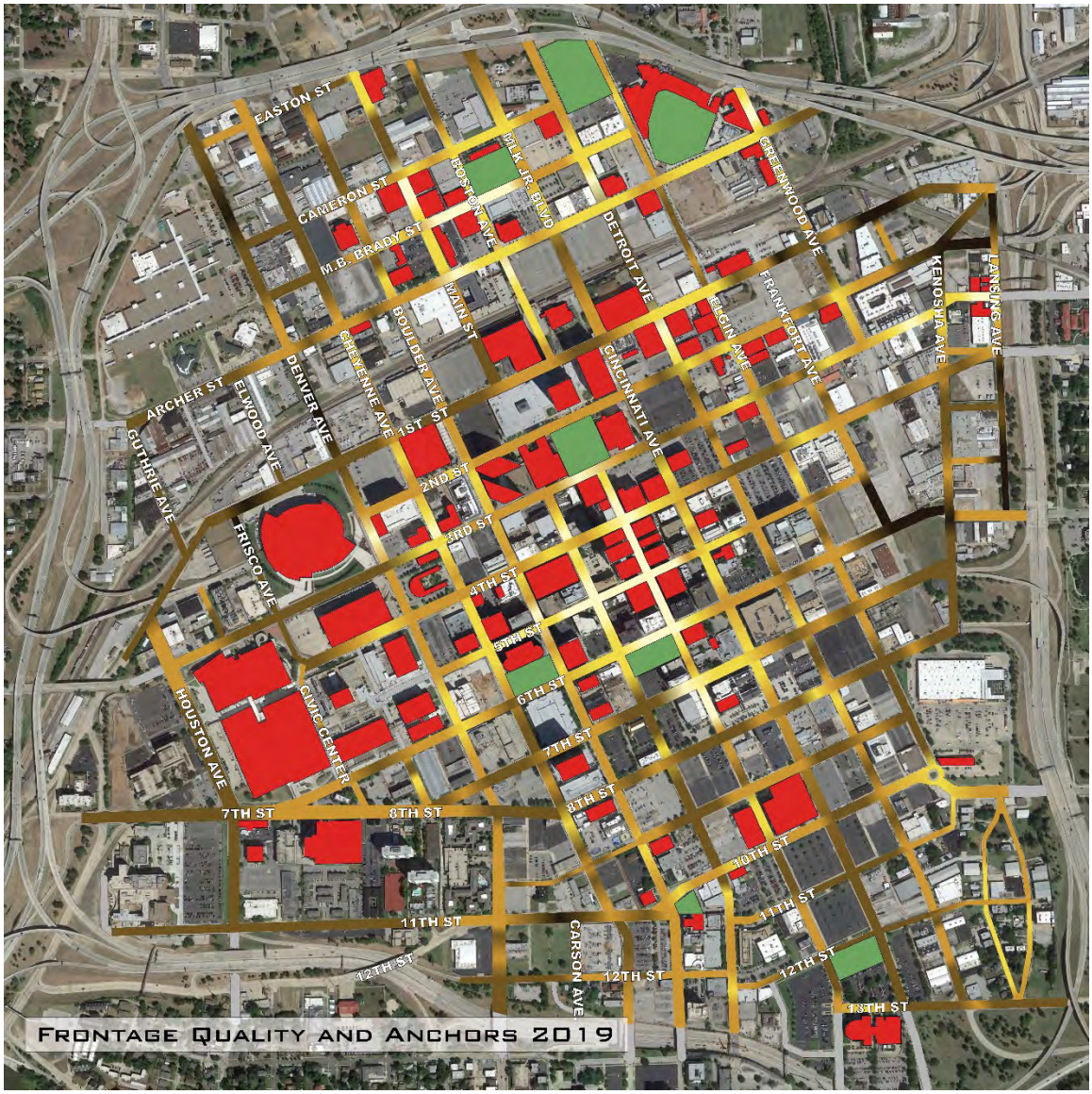
This circumstance is not unique to Tulsa, but Tulsa has it worse than most places. It is a problem that one notices immediately when first visiting the city, and which only becomes more pronounced as one spends time here. Fortunately, it is not a tremendously difficult problem to fix, if the City is willing to make a commitment to directing investment into the gaps.

To get a better sense of those gaps, it is necessary to update the first map based on the construction pipeline. Happily, a good number of sizeable building projects are expected to break ground shortly. The second drawing above modifies the Frontage Quality Rating based on those new buildings, which are shown in orange.

### *Anchors*

In terms of determining where people are likely to walk in downtown, the Frontage Quality Assessment presents half the picture. It needs to be merged with another drawing that identifies all the significant anchors in the downtown. Anchors are defined as sites that can be expected to be generators and receivers of pedestrian activity. While Frontage Quality explains where people are likely to *want* to walk, Anchors tell us where people are likely to *have* to walk. . . or at least to find it useful to walk.

Included in the diagram below are all significant shops and restaurants, hotels, meeting places, sports facilities, night spots, public buildings, civic spaces, transportation facilities, parking garages, and large office buildings in the study area. Combining these Anchors in one drawing with the Frontage Analysis gives us a full picture of where pedestrian activity is likely to happen. As a result, this drawing can then serve as a basis for creating another set of drawings that can be more instrumental in the direction of our efforts, the Networks of Walkability.




*Added in red are all the sites that can be expected to generate a significant amount of pedestrian trips.*

## *The Networks of Walkability*

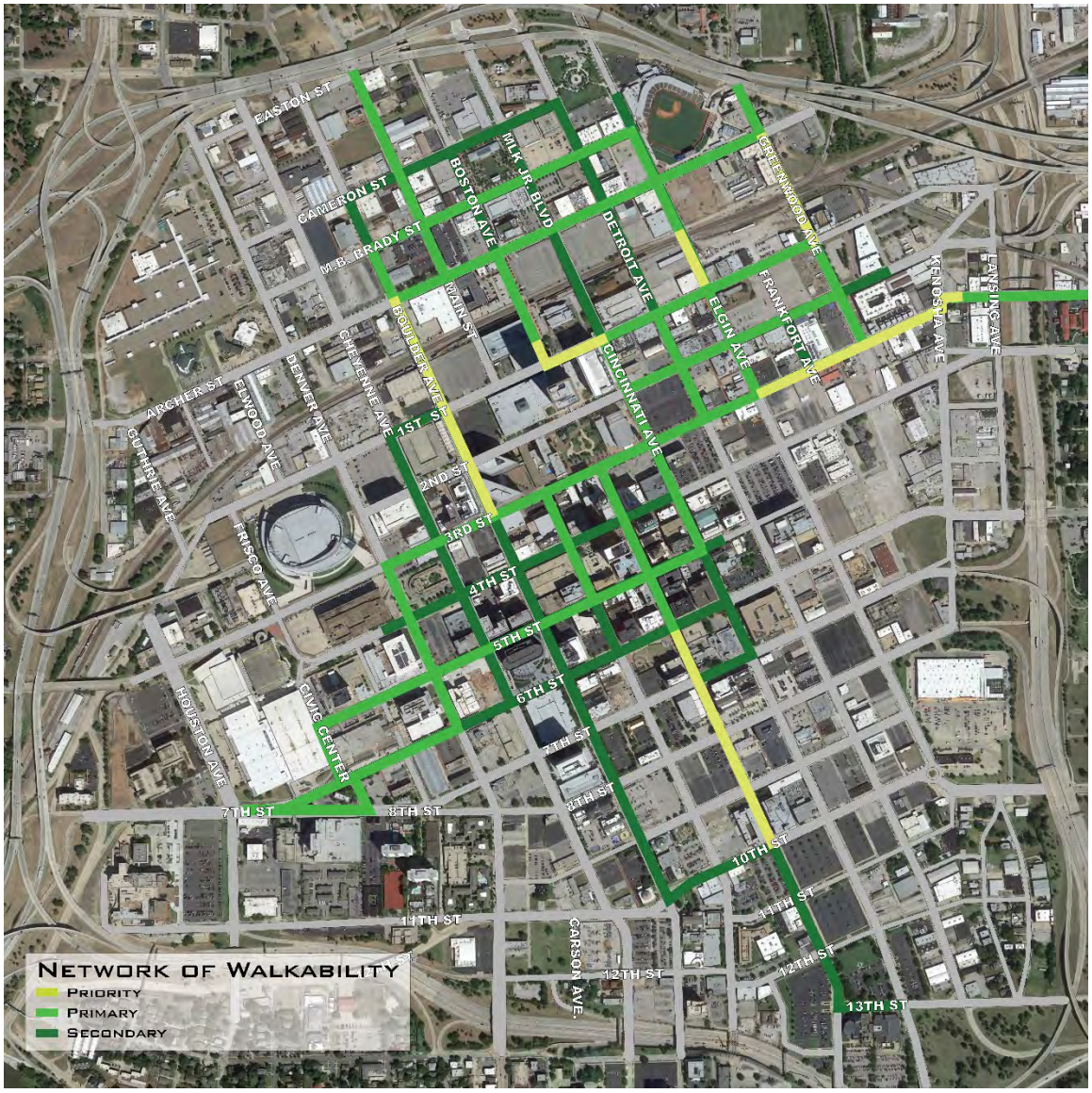
A downtown's Network of Walkability consists of those streets along which people can be expected to walk. It is central to the work of this Study, because it allows us to prioritize investment in the places where it will impact walkability. Simply put, street reconfigurations and property developments located within the Network of Walkability will do more to make Tulsa walkable than similar efforts elsewhere.

Turning a Frontage Quality Rating and Anchors diagram into a Network of Walkability is a three-step process. First, the diagram is studied for patterns that emerge, in which certain streets of higher quality come together to form clear walkable areas. Second, those streets are supplemented by the additional streets

that are necessary to connect these different areas together. Finally, that network is expanded yet further to provide the most likely paths among anchors.

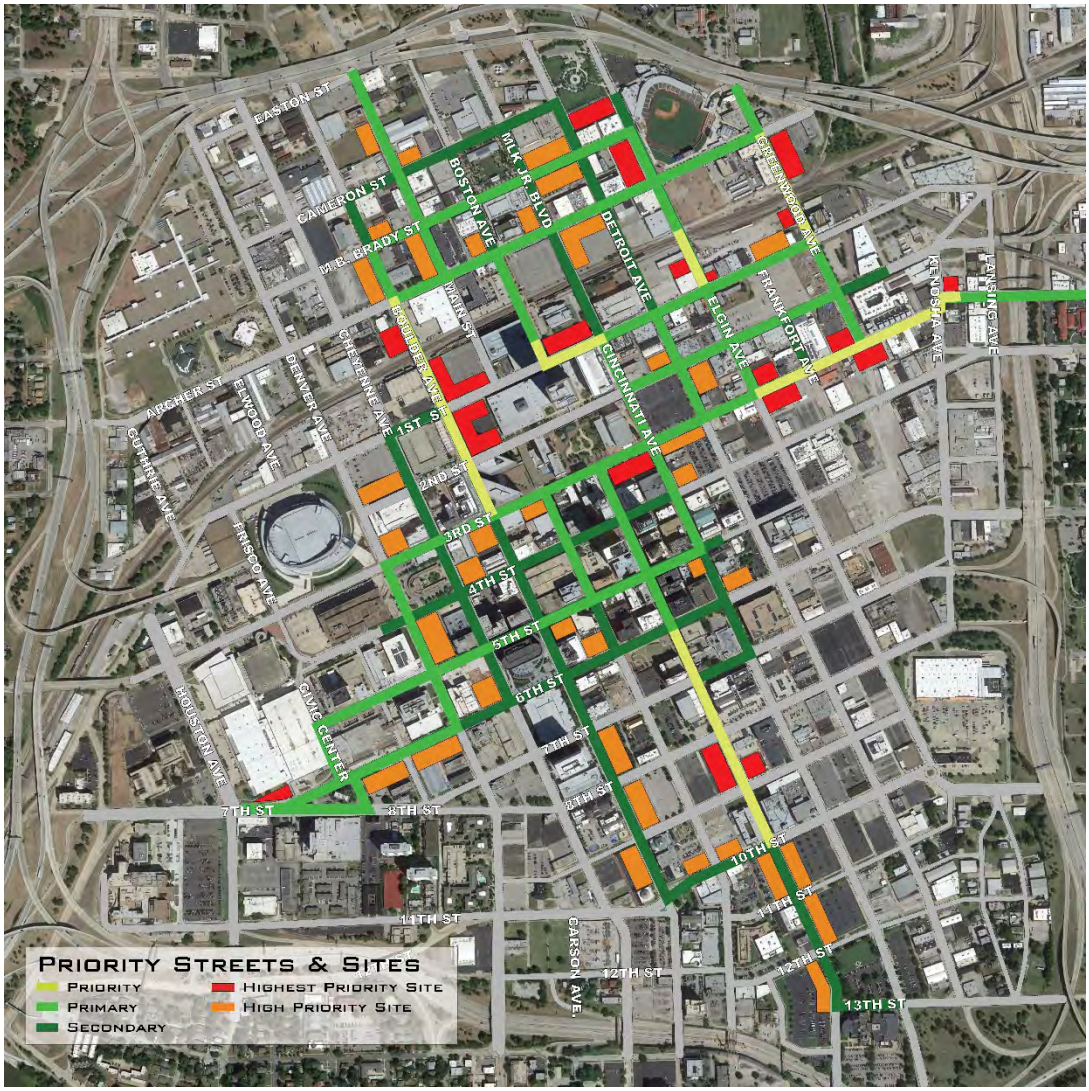
In Tulsa, it is possible to do an even more subtle analysis. As diagrammed below, what emerges are three different networks, as follows:

- The Priority Network of Walkability includes those key connections that are currently in need of the most improvement.
- The Primary Network of Walkability includes the remaining streets which are most important for walking.
- The Secondary Network of Walkability includes the remaining streets that are still important for walking, but less so than the above.




*The Networks of Walkability emerge from the Frontage Quality and Anchors.*

These three Networks are distinct from the remaining streets, shown in grey. While these streets do see people walking, they play a much smaller role in the pedestrian use of the downtown. While they may some day attract more activity, they are not currently places where investments in more walkable street configurations are likely to do much to generate more walking.




*The network of walkability implies that certain sites are higher–and highest–priority for redevelopment.*

In addition to being a tool for prioritizing the redesign of city streets, the Networks of Walkability are also a tool for prioritizing investment *along* streets. There are literally hundreds of empty sites—"missing teeth"—in downtown Tulsa. It would be nice to put new buildings on all of them. But the Networks of Walkability make it clear that buildings in some locations can be expected to have a much greater impact on walking than buildings in other locations.

This point is made by the drawing on the previous page, which indicates the non-roadway construction that is necessary to make the key downtown paths truly

walkable. This construction fills in missing teeth, hides parking lots, and otherwise turns unfriendly street edges into friendly ones. When combined with the thoroughfare redesigns already outlined, these changes will add comfort and interest to these streets' planned improvements in safety.

Creating this diagram is a bit more than a mechanical exercise, in which all missing teeth are replaced by buildings. Shown in red and orange are the 56 buildings—some quite small—that are needed to make the Primary Network of Walkability complete. But then, among these, certain buildings—the 19 red ones—have been given a yet higher priority, because they are located either along a Priority street segment or in a place where they can be expected to have a disproportionally positive impact on place-making. These include the following:

- Buildings framing the Boulder, Elgin and Greenwood Avenue railway crossings;
- Buildings framing East 3rd Street and South Boston Avenue as they approach key anchors;
- Buildings framing 1st Street across from the Williams superblock;
- Buildings giving proper edges to Reconciliation Park, ONEOK Field, and Williams Green; and
- A liner building against the blank south wall of the convention center.

The specific footprint of each building shown in the diagram can be somewhat flexible, with the understanding that buildings should sit directly against the sidewalk along the majority of their frontages, and that those frontages should receive active, open facades.

A couple of technical issues merit discussion. First, there is no reason why each red or orange rectangle in the drawing below must be a building; in some cases, a public green or other amenity may make more sense. However, any public open space must be well shaped, with buildings at its edges, if it is to be successful. Second, while the street segments marked in green are the most important for walkability, a focus on bike-ability would suggest that key cycling corridors be improved beyond just the segments shown here, since bike lanes are only useful when they reach a significant distance.

To the degree that the City or other organizations are able to sponsor or incentivize building construction in downtown, the 56 sites shown above are the ones to build first, as they perfect the downtown's key pedestrian corridors. Even greater incentives should surround the development of the 19 red sites. Investments elsewhere, while perhaps justifiable for other reasons, will not contribute as meaningfully to downtown walkability.

## Open Spaces

### *A Square, a Green and a Plaza*

In most locations, the solution to a lack of comfort and interest along a street edge is to replace a missing building. However, three sites along the Primary Network of Walkability would seem to be better suited to the creation of a public open space. We can call them Station Square, Blue Dome Green, and McNellie's Plaza.

Station Square

Probably the most critical Priority location in the Network of Walkability is the connection along 1st Street between Cincinnati and Boston Avenues. The biggest impediment to connectivity in the downtown is the super-block that obliterates both Boston and Main Avenues between 1st and Second Streets. Were the original street network intact, many more people working in the heart of downtown would be wandering over into the Brady Arts District after work. Eliminating downtown streets is never a good idea, but eliminating these two streets in this key location was a crippling act that merits a significant investment to remedy.

As can be seen in the Priority Network of Walkability, the best way to reestablish this connection is to bring pedestrians north on Cincinnati, and then entice them over to the Center of the Universe on Boston Avenue. While wayfinding will help, it is not enough. The dead block behind City Hall must be enlivened with an attraction that draws people along it. While the mute wall of City Hall is beyond remedy (other than as an art installation), the parking lot fronting the old train station presents a great opportunity. Because so much parking will be added to a reconfigured 1st Street, the 100 spaces currently in this parking lot can be replaced by spaces on-street, and the lots can be transformed into a public square, which should be landscaped, supervised, and programmed to be frequently in use.

But public spaces are only as good as their edges, and the best squares are supervised by the doors and windows of buildings. The handsome but quiet station building would not alone contribute enough oversight and energy to this space, so it would make sense to place two small buildings on either side of the square. These could hold a variety of uses, but attainably-priced housing, parked on street, would give much needed evening supervision to the green. These buildings could have doors on the Boston and Cincinnati Bridges, but should have balconies overlooking the square.

The free market will not make this change happen. It will require a City-led and City-subsidized effort, one that should pay off in spades as it at least partly heals a great wound.

Blue Dome Green

Blue Dome is a lively, evolving district with some real character but no public space to serve as its heart. It also has an historic building near its center that is strangely set well back from the street. Home to a Pizzeria, a Gelateria, and other great downtown uses, the building's streetscape is undermined by a small parking lot holding fewer than 40 spaces. These spaces and more will be generated on-street by the planned reconfigurations of Detroit Avenue and Second Street, and can be replaced by a public space.

*From left to (upper) right, quick proposals for Station Square, Blue Dome Green, and McNellie's Plaza.*

With the Annex being constructed on the parking lot to its south, and many other shops nearby, this space is poised to be a center of activity. It would make sense for its northern edge to be paved in concrete, with trees, for the expansion of sidewalk dining from the adjacent businesses. But for the majority of the space we recommend an inexpensive solution that has shown great popularity in other cities: Astroturf. If properly programmed with after-work activities, cheap, versatile, and easily-cleaned Astroturf greens help make downtowns attractive to younger residents, especially young families. With that in mind, this space, or parts of it, might be considered for a small playground and/or dog run (to be kept separate). Both are amenities that make downtown rentals more successful.

McNellie's Plaza

A strange empty space sits adjacent to McNellie's Public House, one of the most popular eating and drinking places in Tulsa. At the corner of 1st and Elgin, this small abandoned lot is faced by McNellies brick party wall to the west and a small empty building with three garage doors to the north. It is a key missing tooth in what is otherwise a lively and walkable stretch of downtown, and blights the important axis connecting Blue Dome to ONEOK Field.

With a little imagination, one can picture the three large garage doors to the north as the openings of a coffee shop or small restaurant. The wall of McNellie's is ready for a huge mural. Together, these buildings could shape a corner plaza that could serve a variety of uses related to food and drink. It could be a biergarten or a place for cornhole, ping pong, or other games associates with nights out. For versatility, it should probably just be paved in concrete, with some (eventually) large trees for shade.

*A successful new biergarten graces a corner in Washington, DC.*

Developments of this type do not happen easily, as they often require public-private partnerships to be done well. At the very least, the City should do what it can to clean up ownership issues and surmount any hurdles regarding licenses.

Ultimately, who owns a "public" space should be a function of how it can best be activated, and how much of a civic role the space is expected to play. The three spaces above have been presented in the order of most to least public. One can imagine Station Square being City-owned, the McNellies Plaza being privately owned, and Blue Dome Green being something in between, perhaps belonging to a merchant's association.

***A More Public Park***

The John Hope Franklin Reconciliation Park is an almost invisible feature of the downtown. In addition to being located at the extreme northern edge of the Greenwood District, up against the IDL, it is surrounded by a substantial gate with few openings. Its only welcoming entrances are to the parking lot to its north. It is possible to make many visits to the Brady and Greenwood Districts without ever finding oneself tempted to stroll onto it.

Perhaps this outcome is by design. If the primary goal of the Park was to create a world apart, a place of contemplation principally for visitors who schedule a trip as an intentional act, then the current plan makes sense. In this light, the "reconciliation" represented by the Park would seem to be the City's construction of the park itself, along with whatever specific events are held there to commemorate the conditions and events that make reconciliation necessary.

However, if the stewards of the Park believe that reconciliation is best accomplished not simply by investment and scheduled events, but rather through ongoing communication and increased awareness, then a more open and accessible design would seem more appropriate, one which places the park and its educational message more prominently within its community, so that it can be seen, visited, and stumbled upon more frequently by more than just those who seek it out.

While we should not be presumptuous about the Park's intentions, and wish to defer to its community's wishes—especially those of the John Hope Franklin Center for Reconciliation—it is worth pointing out there exists an excellent opportunity to better integrate the Park into its neighborhood and the lives of Tulsans by redesigning the area at the Park's southern edge. Currently, like the superblock between 1st and 2nd, the construction of the Park was allowed to consolidate several blocks, in this case snipping Cameron Street before it could reach Elgin Avenue. No corresponding axis was retained through the Park, harming the walkability of the neighborhood. Instead, the southern edge of the park consists of a block-long fence and a row of bushes directly abutting a parking lot serving two buildings to its south.

Successful public spaces are typically surrounded by buildings with doors and windows that supervise it, keep it safe, and potentially give it activity. Currently, the Park lacks supervision from all directions. Redevelopment of the parking lot to its south to include a narrow street up against the Park edge, lined by buildings facing north, would serve to unbury the Park and bring it more fully into the life of its community.


*This proposal makes Reconciliation park more visible through the introduction of a small southern street lined by rowhouses.*

The proposal shown here imagines residential buildings facing the park across a street with one side of curb parking. The bushes are eliminated in favor of street trees, and an additional park entrance is added. The buildings need not be residential, but retail use seems inappropriate, and it is nice to imagine that the housing would be subsidized to be attainably priced, with the units being offered first to descendants of those families displaced in the riots of 1921.

As with other proposals involving private land, transforming this important location will require proactive City leadership and perhaps a public/private partnership. And, of course, any efforts to reshape the Park would have to be co-lead by the John Hope Franklin Center for Reconciliation, if and only if it meets their mission.

## The One-Page Zoning Code Overlay

It is discouraging, while completing a walkability study, to witness developments coming to a downtown that one can be certain to make it less walkable. In the case of Tulsa, there is mostly good news. The three largest mixed-use developments currently underway—The Annex, Santa Fe Square, and The View—are all by-and-large excellent in the way they treat their surrounding streets. It is clear that their developers and architects are fully up to date on what makes a good urban building. Two other projects, however, call our attention to the fact that downtown is not sufficiently protected against the sort of development that will undermine its walkability.


*High-quality buildings do not help walkability when set behind parking lots.*

The first is a small one, but one that raises a red flag. The new building for Jackson Technical now being completed in Elgin Street breaks the number one rule of good urban design—literally "Rule #1" in such classic books as *City Comforts,* published 1995—Build To The Sidewalk: never put a building behind its parking lot. Front parking lots result in streets that lack spatial definition, sidewalks crossed by driveways, and a general urban environment that communicates the message that cars come first. It is a mistake that few downtowns allow any more. In this case, there were many mitigating factors that led to the final site plan, but the fact remains that an opportunity for enhancing the sidewalk with a great new building was lost. Happily, this site is located well outside the Networks of Walkability, but it calls our attention to the fact that front parking lots remain legal throughout the entirety of downtown.

The second worrisome development recently approved is much more damaging, and has the potential to inflict grave harm to the walkability of a central location in downtown. A new parking structure to be erected at the corner of Main Avenue

and 4th Street is shown lining the sidewalk with nothing but its own edges. As discussed, the mute, blank walls of parking structures should never be allowed directly adjacent to sidewalks, which rely on the interest and activity generated by active ground-floor uses. When commercial use is not viable, then a residential liner should be built instead.

At the time of this Study, the outcome of this corner is not yet resolved. There is some discussion of these blank walls being a temporary solution until proper retail tenants are identified. But experience suggests that this outcome is unlikely unless the structure is built from the get-go with attractive storefronts in place.

Parking structures directly lining sidewalks is an error that most cities have stopped making, but Tulsa lacks a mechanism to prevent it. As a result, an area that was barely hanging on, with struggling shops just across Main Avenue, is unlikely to be able to achieve the activity and success that was imagined when the City made the decision to invest in its expensive brick streetscape.

*Renderings of a planned garage show blank walls up against sidewalks.*

What could have been a key connective knuckle in the downtown's network of walkability threatens instead to become a dead zone. This mistake, and the mistake of the front parking lot, need not be repeated. With a slight change to downtown zoning codes, the City could have confidence that private construction would not undermine public success. There has been talk for some time of enacting a Downtown Zoning Code Overlay to solve this problem, but there is justly fear of the potentially lengthy and fraught political process that such an effort would entail. There is always opposition, and arcane zoning codes are hard to sell in the face of such opposition, since they can be hard to understand.

For that reason, we recommend short-circuiting this process by enacting an exceedingly simple code, one that will fit on a single page. The perfect is the enemy of the good, and a code that gets every detail right suffers the disadvantage of being difficult to communicate, promulgate, and promote. A one-page code can start as a

leaflet, become a poster, and, through widespread exposure, generate enough support to overcome opposition by those who resist change.

Also important to the success of such a code is that it not be required everywhere. While all of downtown would seem to deserve a more urban standard of architecture and site planning than the rest of the city, the fact remains that many parts of downtown will not attract significant pedestrian activity for many years. The Networks of Walkability already established acknowledge this circumstance, and identify those streets in the downtown which can be expected to attract foot traffic if maintained or developed in the proper manner. Those Networks—both Primary and Secondary—comprise the appropriate area to which the Downtown Zoning Code Overlay should be applied.

Under such a regime, a national chain like Burger King wishing to locate in the downtown would be given a choice. If they want to build in an urban manner, with no front parking lot or drive-through, they can select a site along the Networks of Walkability. If they instead wish to build a suburban-style facility, they can do so in downtown's less walkable areas.

Finally, it is worth repeating that being excluded from the Networks of Walkability is not a permanent condition, and streets can opt in by majority vote at any time. In that way, the reach of this proposed Overlay can expand without the need for a larger political process.

The proposed Overlay is presented here. One can imagine it laid out by a graphic designer to be reproduced as a leaflet, poster, and web page.

## Seven Rules for a Successful Downtown Tulsa

### *A One-Page Zoning Overlay*

All developments proposed abutting the Primary and Secondary Networks of Walkability shall be reviewed in light of the following criteria by City Planning staff, with exceptions to be granted only in the case of exemplary architectural merit, but not for "hardship."

1. ***Surface parking lots kill vitality.*** No surface parking lots may be placed between a building edge and the sidewalk.
2. ***Dead walls create dead sidewalks.*** Parking structures shall be exposed to sidewalks on the ground floor only at the locations of their vehicular entrances. Entrance drives may be no wider than 11 feet for each lane of travel. The remainder of the parking deck's ground floor (and other floors if desired) shall be shielded from the sidewalk by a habitable building edge at least 20 feet deep. That edge may be office, retail, residential, and/or vertical circulation, but retail use is not recommended where it is not adjacent to existing retail, and new retail space must have a minimum ceiling height of 12 feet.
3. ***Sidewalks need buildings near them.*** With the exception of hotel porte-cocheres (allowed only for hotels with more than 100 guest rooms), all buildings shall place their facades within 10 feet of the sidewalk edge. If retail, any setback shall be paved to match the sidewalk. If residential or office, any setback may include greenery, stoops, patios, and other construction, with the exception that no walls or fences shall exceed three feet in height. Exceptions may be granted for public or semi-public greens, plazas, or courtyards.
4. ***Curb cuts endanger people walking.*** Curb cuts are not allowed for any buildings other than parking structures and hotels with more than 100 guest rooms. Smaller hotels shall conduct loading against the curb in the parking lane, where several space shall be designated for this use. No set of curb cuts shall be more than two lanes in number.
5. ***Front doors are essential.*** Buildings with sidewalk facades and rear (or side) parking must place a primary entrance on the sidewalk frontage. Said entrance shall be unlocked whenever the parking-lot entrance is unlocked.
6. ***Residences against sidewalks need height.*** Residential facades placed within 5 feet of the sidewalk edge must have a ground floor elevation of at least 2 feet. (Live/work units may place their facades at or near grade.) Ground-floor residential units are encouraged to have front porches or stoops along the sidewalk, even where also hallway served.
7. ***Urban Buildings need friendly faces.*** Facades enfronting sidewalks shall average no less than 18 feet tall and shall have regularly-spaced door and window openings on every story, with at least one opening in every ten linear feet of wall, with rare exception granted for special architectural features. The wall-to window ratio for all facades shall not exceed 75 percent.

**Sidewalk Dining and Parklets**

One of the key indicators of—and contributors to—a walkable, livable downtown is sidewalk dining and drinking. There is really nothing like it when it comes to making a place desirable and successful. More advanced cities actively promote it, and some even subsidize it. Yet, according to focus groups, the City of Tulsa currently presents more impediments than assistance to businesses that want to introduce sidewalk dining. Getting a license was described as a "fraught process." While an effort is happily underway to streamline such permits, the City still lacks a program actively encouraging private businesses to place tables and chairs on the sidewalk.

*Sidewalk dining is synonymous with downtown living, and not just in hot weather.*

Such a program is strongly encouraged. Given the limited number of eating and drinking establishments downtown, the City should task an employee to reach out to every one, and then to hand-hold interested business and walk them through the process of obtaining permits through a one-stop permit process. The principal City controls shall be on the design and quality of the installation, the maintenance of an adequate clear zone along sidewalks, and the use of non-disposable cups, plates, and tableware, to avoid litter. While NACTO recommends that the clear zone be 10 feet wide, experience suggests that 6 feet is adequate in places where crowding is not a problem.

The other impediment to the addition of more sidewalk dining in Tulsa is the fact that most sidewalks are rather narrow. Periodically, expensive reconstruction of certain curb areas is discussed in order to solve this problem. However, a more affordable and versatile solution exists in the form of parklets, a concept that is proliferating worldwide.

A parklet is a small deck, usually built of wood (or composite decking like Trex) that occupies one or two parking spaces, sometimes temporarily. An ideal parklet is surrounded by bench backs or narrow planters that give its occupants a sense of protection from nearby traffic. An internet search under the term "parklet" turns up hundreds of great ideas for parklet designs, some of which are quite elaborate.

*A parklet installed by the City of Cedar Rapids.*

The City is encouraged to introduce its own parklet program, as others have done. Businesses that wish to construct their own parklets should be encouraged to do so, through the same outreach directed at sidewalk dining. The City may even wish to construct parklets and supply them to businesses, as we helped implement in Cedar Rapids, Iowa.

**Successful Urban Retail**

Many American cities lost the majority of their downtown shopping in the last quarter of the 20th Century. Since around 2000, we have seen it start to come back, more strongly in some places than others. Since most soft goods shopping continues to take place in suburban shopping centers and on-line, mid-size downtowns like Tulsa's have had to focus principally on food and beverage sales, entertainment, unique smaller stores, and, more generally speaking, shopping as an experience.

For better or worse, shopping is America's favorite pastime. While much purchasing of goods must be done in the most affordable and expedient way possible—from Wal-Mart or Amazon—a significant amount of each household's discretionary income is spent on shopping-for-fun. Because this activity is a form of entertainment, it lives or dies based on the quality of its environment. The recent national resurgence in downtown retail has come about principally because of preferences shifting away from artificial environments like shopping malls towards authentic places like main streets.

This trend is expected to continue. Many malls across the U.S. are dead or dying, and almost none are currently under development. Desirable retailers are increasingly willing to locate in old city centers, but only if those downtowns can provide a walkable, pleasant public realm. If they are to best adhere to the four tenets of Walkability—the useful, safe, comfortable, and interesting walk—these places should pay special attention to these criteria:

- ***Urban Building Types:*** Sometimes a national chain will try to locate in a downtown, but will demand its standard suburban footprint, surrounded by parking and/or with a drive-through. Most of these retailers will insist on using this walkability-eroding building type, threatening to abandon the site if it is not approved. Yet almost all of these companies also have a more urban store design which they use in places like Chicago and Denver. If they are not to bring down the value of the downtown for all other retailers, they must be required to make use of this more urban footprint—without front parking or drive through, unless the drive through can be placed at the rear.
- ***Continuity:*** Retail thrives in the presence of other retail. Only a large regional destination can do well if not part of a larger shopping district. Additionally, because shoppers hate being bored, there should be as few non-retail gaps between contiguous shops as possible, including banks and offices. A successful shopping district should not be interrupted by ground floor banks, offices, blank walls, or empty lots.
- ***Space-Making:*** The best places are well-shaped spaces, which is why the best shopping streets have shops on both sides. Cross-shopping—exiting one shop and seeing another across the street—is a key feature of most main streets. For

this reason, the streets should not be too wide, nor traffic too speedy to interrupt occasional jaywalking.

- ***Multiple Modes:*** People who shop are also walking, and, in downtown areas, many shoppers arrive by foot. Because parking lots interrupt walkability, merchants should be encouraged to provide no parking, relying instead on the collective parking supply. Studies have also shown that cyclists spend more per capita on purchases than people who drive, which may explain why the streets in Manhattan with new bicycle lanes have seen their revenues roughly double. A bike corral that takes up a single parking space can be a great addition to a retail district.


*Great shopping streets have sticky edges that blur the boundary between store and sidewalk.*

- ***Strategic Location of Anchors:*** Because many shoppers will continue to drive, the location of parking has a major impact on the success or failure of downtown shopping. We have already discussed the importance of ample on-street parking and the proper pricing and management of all parking spaces. Also critical is the placement of parking structures in relation to the destinations they serve. If a parking deck serving a major venue is separated a few blocks from that venue, that creates an opportunity for in-line retail that would not have existed had the two anchors been located adjacent.
- ***Sticky Edges:*** Retail suffers when there are real and perceived barriers between business interiors and the sidewalk. For example, shops in the Philcade Building at Boston and 5th are hampered by a lack of doors directly to the sidewalk. In the same vein, tinted glass and obscured window openings undermine shopping districts, while low cloth awnings, blade signs, and entry alcoves with goods displays enhance them. Anything that can be done to blur the barrier between the sidewalk and the store is generally good for business—and for walkability.

**Remedial Measures**

On-site study and meetings with focus groups raised a number of issues that deserve our attention related to the Comfort and Interest of downtown:

### *A Key Underpass*

The IDL is a true barrier that limits pedestrian connectivity beyond the downtown. Whether a tunnel under a looming viaduct or a bridge over a vehicular moat, passages beyond the IDL offer neither the comfort or the interest that attract walking. While many of these deserve our attention, one stands out and deserves investment in the short term: the Greenwood Street underpass. It is a key connector to both OSU Tulsa and Langston University, and—unlike Elgin and Archer Streets—provides quick passage under the highway. Its current artwork is tired, and needs replacing with something more noticeable and colorful. An installation that includes light as a prominent feature would make a 24-hour contribution to reviving this key corridor in and out of the Greenwood and Brady Arts Districts.

*An artful underpass in Sydney, Australia.*

### *Local Mural Talent*

Downtown suffers from blank walls in a number of key locations, most noticeably along 1st and 2nd Streets around the Williams Tower superblock. As one walks around Tulsa, it is hard not to notice all the painting talent on display. In terms of walkability, these skills would be best put to use in adorning blank walls along the Networks of Walkability. Other cities, like Philadelphia, have made tremendously positive contributions to the urban experience through well-run mural programs. Whether led by the City or a private foundation, Tulsa should so the same.

Also worth mentioning is that the public artwork installed last year at the Center of the universe has been a nice attractor of visitors, and a great amenity for pedestrians. It should be maintained or replaced by something of similar quality, and should serve as inspiration for other downtown installations.


*Rather than being tucked between buildings, murals of this quality should adorn blank walls along sidewalks.*

### *Quicker than Trees*

Street trees contribute much more to walkability and urban success than most people understand, but sometimes a quicker solution is needed for providing shade in a key location. And some locations, like bridges, are not able to hold trees large enough to provide shade. For this reason, some cities, like Austin and Phoenix, have taken to locating artistic shade structures on their sidewalks. Such installations are recommended along the Networks of Walkability, especially along the new Boulder Avenue bridge, where an artful canopy could coordinate with the attractive screens already present.

*In downtown Phoenix, shade structures add livability to parched sidewalks.*

## *A Tough Spot*

The elevated superblock enfronting the Cox Business Center has created an unfortunate interruption in the fabric of the downtown. Like many mid-century schemes, it saps vitality by splitting circulation onto two levels, resulting in a ground plane that is overshadowed by a deck and feels like the parking basement it is. To solve this problem, it is recommended that, beginning just west of the Aloft Hotel, the deck extending 5th Street toward the convention center façade be replaced by a cascading plaza that steps downward to, and includes, Civic Center Drive. To be welcoming, this plaza should be framed to the south by the Municipal Court, and to the north by a small building that contains active uses. This northern building should align just west of the Aloft hotel.


*The parking lot enfronting the Cox Business Center is a plaza in the making*

***Loitering***

A final factor that impacts the comfort of people walking in downtown Tulsa is the presence of street people. They are not that many in number, but they seem quite obvious because they form a significant percentage of the people who are walking. Seen in this light, Tulsa does not have a loitering problem as much as a walking problem; when more people chose to walk and bike, the loitering will become a much less dominant feature of the landscape.

Some of these people are homeless, a problem that we now know how to fix. This report does not concern itself with housing the homeless, but there is some useful data that merits our attention. A study produced by the Central Florida Commission on Homelessness found that, while providing desirable housing for a homeless person costs about $10,000 per year, taxpayers are currently paying about $31,000 per year for each person who lives on the streets. This number includes the law enforcement, jail, and hospitalization costs that result from homelessness.

For this reason, any best-practices effort to ending homelessness must focus on providing homes—no questions asked—as well as the social services to keep folks in them. If the experience in Florida is even remotely applicable to Oklahoma, it would appear that such an effort would cost less, not more, than the current situation. Currently, Tulsa does not have a Housing-First policy. It is recommended that the City pursue this approach right away. More information on Housing First can be found at the National Alliance to End Homelessness.[1]

That said, many of the people loitering in downtown Tulsa are not homeless per se, and even providing homes for those who are homeless does not mean that loitering will end. Many people who seem to be loitering are merely walking to and from services, services that are best located downtown—perhaps the only place in Tulsa where people who don't drive can be somewhat self-sufficient. Others are walking from the Greyhound station to the Denver Avenue Tulsa Transit station. That issue can be solved by relocating the Greyhound station as already suggested.

Again, though, the best remedy for the loitering "problem" is to make it less obvious by creating conditions that invite more walking by everyone. Once that happens, the primary remaining concern surrounds public parks, squares, and greens, which can easily become overwhelmed by street people. This concern can stand in the way of the creation of new public spaces, as people don't want to invest in public amenities that are monopolized by a single population to the exclusion of others.

*Make no mistake: street people have every right to make use of public open spaces.* But, once they are offered truly attractive alternative housing, they no longer have the right to *live* in public open spaces. Also, whatever their housing status, people do not have a

[1] http://www.endhomelessness.org/pages/housing_first

right to congregate in open spaces in a way that "claims" that space and makes others unwelcome. For that reason, it can make sense in certain public spaces to employ a security guard to limit the amount of loitering. This strategy is already employed in Chapman Centennial Green downtown, and can be used elsewhere if a problem arises.

For that reason, the fear of loitering should not be considered a proper justification for not creating more public spaces in downtown Tulsa. But, rather, any new plan for a public space must consider funding not just its construction but also its programming and maintenance over time, which may include security.

# PART VI. SETTING PRIORITIES

## A Schedule for Street Reconfigurations

As described in the previous section, certain streets are more important than others to the walkability of downtown Tulsa. In the absence of other considerations, the street segments comprising the Priority, Primary, and Secondary Networks of Walkability would be the streets to reconfigure first, in that order. However, in determining a schedule for street work, three other factors must be considered: two-way reversion, the cycling network, and already-funded construction.

Two-Way Reversion

This Study calls for the following streets to be converted to two-way traffic in short order: Cheyenne and Wyoming Avenues, and 1st, 2nd, 4th, and 5th Streets. Independent of what the Networks of Walkability may suggest, these streets need to receive high priority for reconfiguration for the full length of their change in direction of traffic.

Cycling Network

Thus Study calls for one north-south cycling facility on Boulder and Cheyenne, another on M.L.K. Jr. and Detroit connecting to Elgin, a third on South Boston Avenue, and a fourth on Guthrie and Houston, connecting briefly through Heavy Traffic Way. It calls for east-west cycling facilities on Archer Street, 3rd Street, 6th Street, and Route 66, with an eastward connection on 13th Street. These facilities cannot all be built at once, and must be prioritized in light of other objectives, with the goal of creating a network that is very useful well before it is complete.

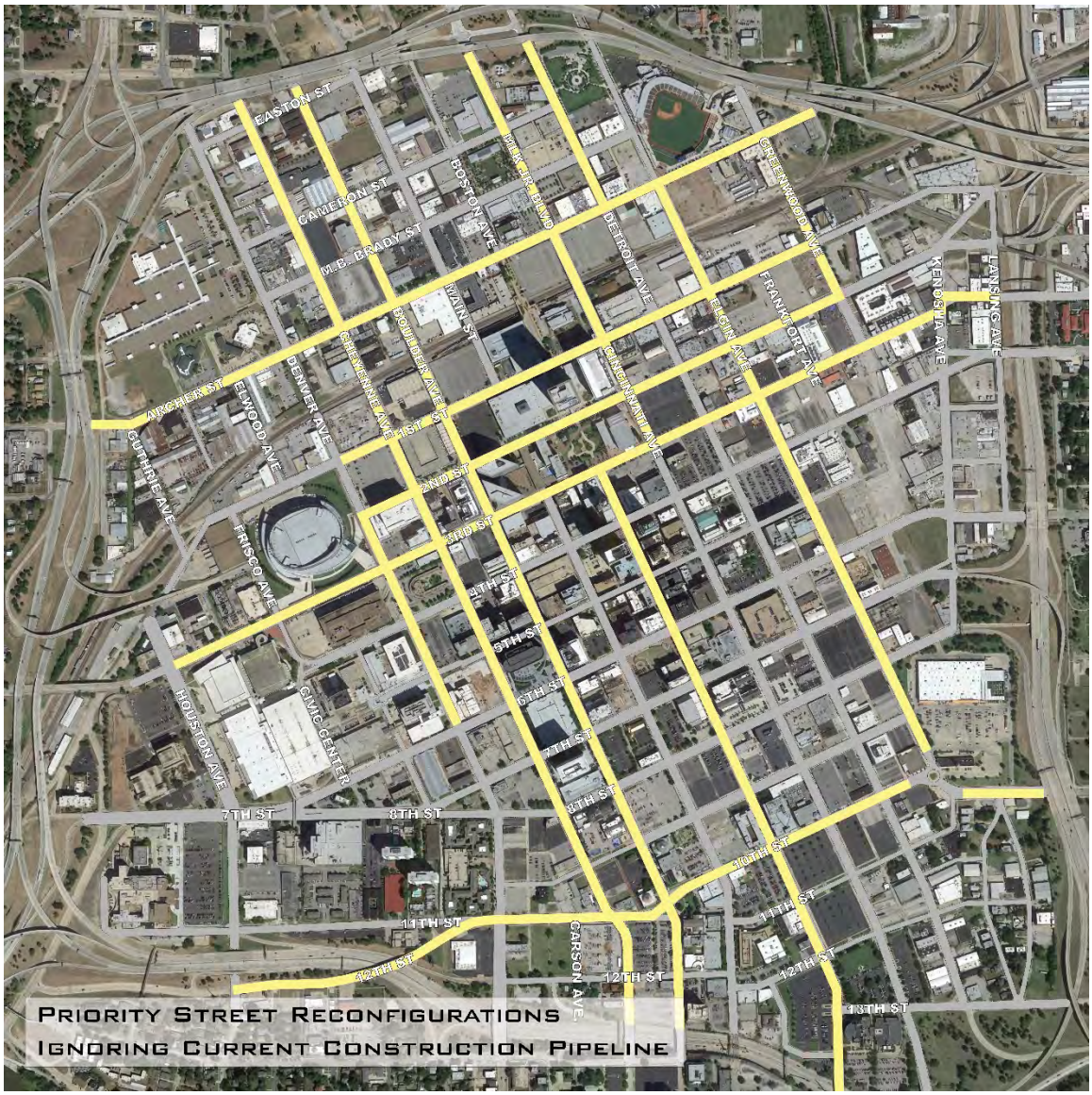
Since Boulder and Cheyenne are planned for two-way reversion, those street reconfigurations will provide a north-south bike facility serving the west half of downtown. The need for a similar facility towards the east suggests that Elgin Avenue should also be prioritized. Additionally, Boston Avenue, already central to the Network of Walkability, is the key cycling connection to Tulsa Community College, and should also not be delayed. In contrast, the far-west connection along Guthrie and Houston can wait.

Similarly, three east-west cycling connections are enough to serve downtown in the short run. These can be provided in a nicely spaced network on Archer St., 3rd Street, and Route 66. The connection on 6th Street can wait.

Ignoring the third factor, already-funded construction, one can create a Priority Street Reconfiguration map based upon the intersection of the Networks of Walkability with the goals of Two-Way Reversion and the Cycling Network. As shown below, it would suggest that street reconfigurations be made first in the following places:

North-South

- Cheyenne and Boulder Avenues;
- M.L.K. Jr. Boulevard/Cincinnati Avenue from the IDL to 3rd (already partially complete);
- Detroit Avenue from the IDL to Archer (already partially complete);
- Boston Avenue from 3rd to the IDL;
- Elgin Avenue from Archer to 10th; and
- Greenwood Avenue from Archer to 2nd

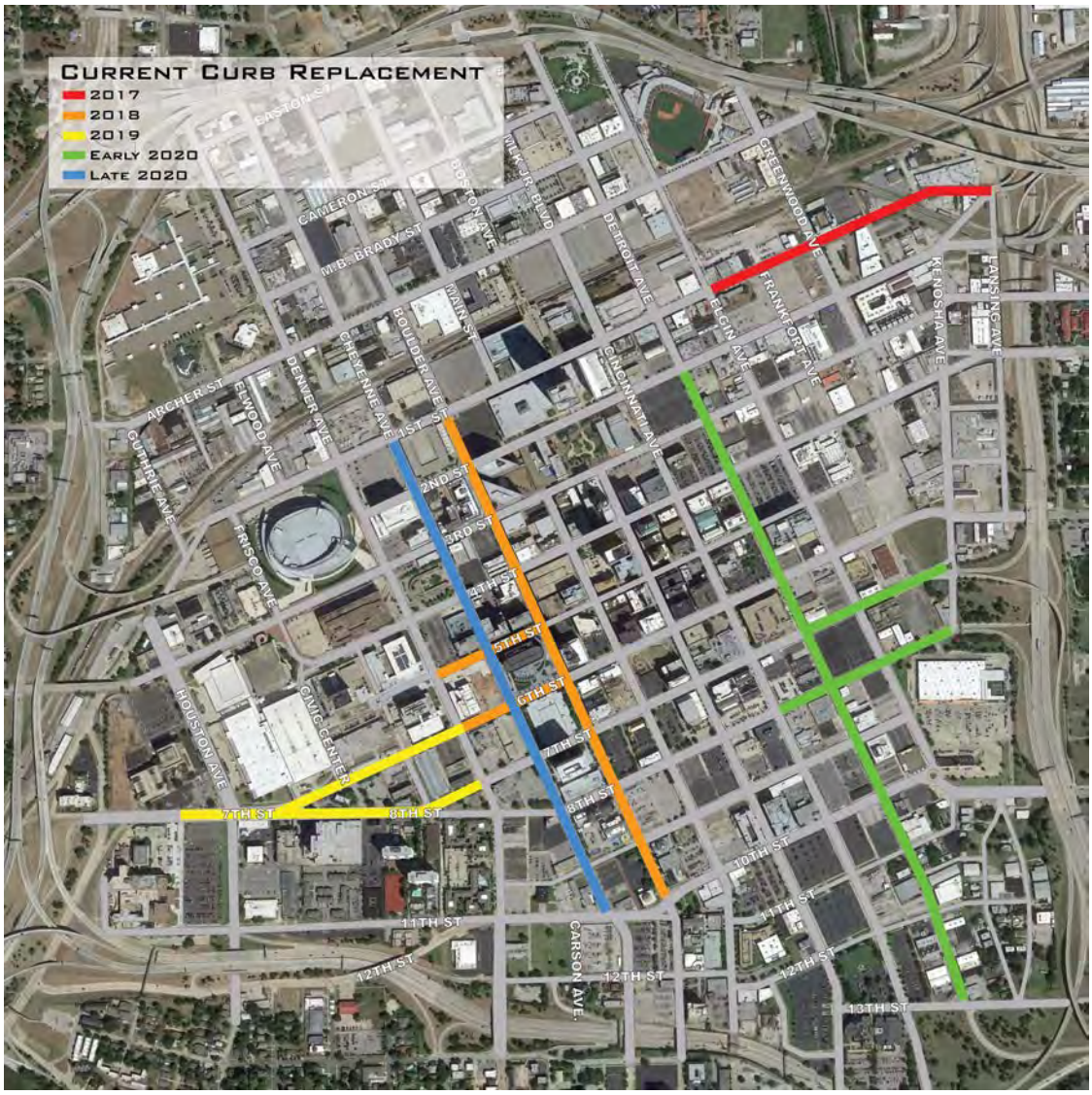



*If certain street reconstruction was not already planned, the above street segments would be the ones to reconfigure first.*

East-West

- Archer Street;
- 1st Street and 2nd Street from Denver to Greenwood;
- 3rd Street; and
- Route 66.

These are a lot of streets, and it is necessary to break this list into smaller phases. That task is assisted by the third factor already mentioned:




*Curb replacements, resulting in repaving, are already funded as shown here.*

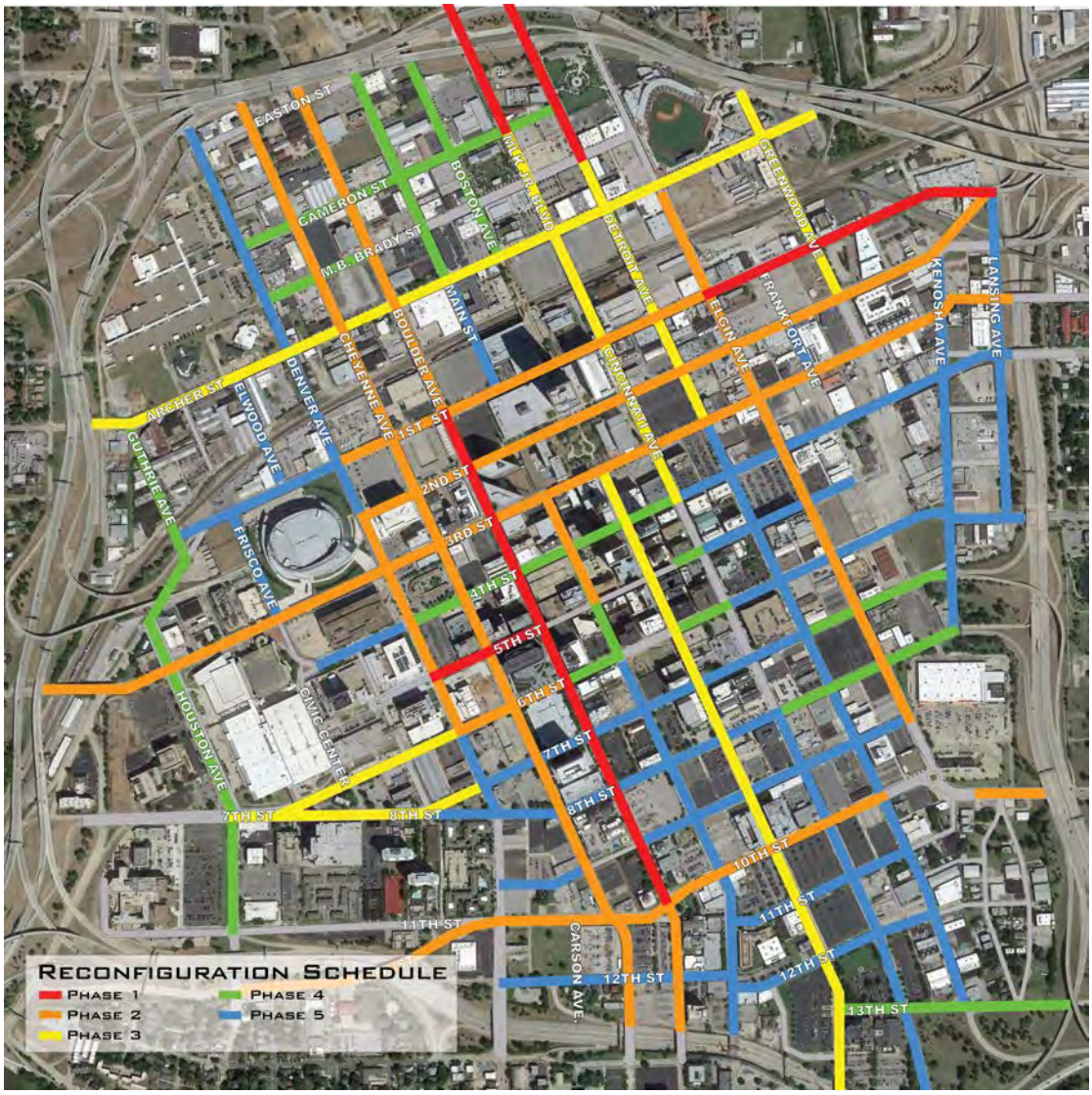
Already-Funded Construction

The drawing above shows the location of curb replacements in downtown Tulsa that are already funded and scheduled. Curb replacement is a larger job than repaving, but brings with it the repaving that allows for stripes to be reconfigured. While it is hoped that the City's embrace of this Study will cause additional changes to happen more quickly, it probably makes sense to allow currently funded and scheduled road work to proceed as mostly as planned.

Intersecting that schedule with the Priority Street Reconfigurations already shown, and thinking deeper about a rank of priorities, leads to a proposal for the timing of reconfigurations downtown. This is only a first effort, and needs to be modified if new information arises, but it should be considered our best effort to schedule the reconfiguration of all streets included in the Networks of Walkability.

In the diagram on the next page, Phase 1 is imagined as 2017, with subsequent phases occurring one per year, such that Phase 5 would happen before 2021. It is worth noting that Phase 5 street segments occur outside of both the Network of Walkability and the Cycling Network, and are therefore of considerably lower priority than the rest.

This proposal asks for only one change in the work already scheduled, speeding up the funding for a two-way Cheyenne Avenue from 2020 to 2018, so that is can properly serve as a partner to two-way Boulder, being completed this year. Otherwise, the work is scheduled to occur in tandem with these already-funded projects.




*A first proposal for the scheduling or street reconfigurations, with annual phases starting 2017.*

While the drawing is self-explanatory, it is worth describing the first few phases in greater detail:

Phase 1 is work already scheduled for 2017, including:

- The eastern end of 1st Street. (The segment from Elgin to Greenwood should receive only temporary striping, in anticipation of its two-way reversion along with 2nd Street in 2018);
- Boulder Avenue from 1st to 10th;
- 5th Street from Denver to Boulder; and
- The now-underway reconfigurations of upper M.L.K. Jr. Boulevard and Detroit Avenue.

Phase 2 is all new work to be budgeted for 2018 completion, including:

- 2nd Street and the remainder of 1st Street from the IDL to Denver;
- The entirety of Cheyenne Avenue and the remainder of Boulder Avenue; and
- Elgin Avenue, 3rd Street, and Route 66.

Phase 3 is mostly new work to be budgeted for 2019 completion, including:

- The already-budgeted western ends of 6th and 7th Streets;
- Archer Street and Greenwood Avenue;
- Detroit Avenue as far south as 3rd Street and M.L.K. Jr. Boulevard/Cincinnati Avenue south to 4th; and
- All of Boston Avenue South to beyond the IDL.

While subsequent phases are still important to a more walkable and successful downtown, these three phases will accomplish a lion's share of this Study's most vital street improvements.

As noted, this proposed schedule calls for a tremendous amount of currently unfunded road work to occur in 2018 and the years that follow. Unfortunately, because unsafe streets are the greatest threat to walkability in downtown Tulsa, this investment cannot be put forth here as optional. ***One cannot purport to ascribe to the principles laid out in this Study without supporting the funding of the near-term street reconfigurations presented here.*** For want of a more precise discussion, it is worth concluding with the estimation that, while all phases described above can be expected to reap great rewards—much greater than the investment required—the completion, in this decade, of Phases 1 through 3 should be considered essential to achieving the objectives of this Study.

**Other Key Priorities**

The street reconfigurations described above are the City's key tool for making downtown Tulsa more safe for people walking. Unfortunately, they alone are not enough. While all other recommendations in the Safe Walk section are important, two additional efforts will be key: the reduction in the number of driveways across sidewalks (curb cuts), and the market-based pricing of parking.

As noted, Tulsa's sidewalks suffer from dangerous driveways more than almost any other American city. The laws that allowed this condition to arise must be changed, and an active program to close curb cuts must be instituted, if walking downtown is to feel safe again. And, because curb parking is such a key tool for making sidewalks safe, Tulsa must adjust its parking prices to ensure that it is properly utilized. Without popular spaces costing more and unpopular spaces costing less—and improved pay stations and enforcement—irrational parking patterns will undermine the street reconfigurations recommended here.

In terms of The Useful Walk, all of this Study's recommendations to increase the supply of attainable housing in downtown add up to quite a big job. It is recommended that the City at a minimum create a full-time staff position to pursue this sole purpose. From advancing new policy to hand-holding developers to facilitating deals for shared parking, this person would apply best practices from places like Des Moines and Lowell so that Tulsa could experience a similar renaissance of downtown housing.

Regarding The Comfortable and Interesting Walk, this Study's main contribution is to designate those areas where the City should be prioritizing the development of private property, and assisting as possible, so that the downtown's walkable areas are less discontinuous. Nothing makes a city more walkable more quickly than connecting walkability to walkability, and Tulsa suffers inordinately from unpleasant unwalkable gaps among its many attractive places. For the same reason, it stands to benefit inordinately from a near-term Walk Your City wayfinding effort.

Among all the other recommendations, two stand out as most urgent. The first is the pursuit of a one-page downtown zoning overlay, to short circuit an effort that is otherwise likely to take many years. The second is the immediate implementation of a program enabling and assisting in the proliferation of sidewalk dining and parklets. Every business that wants to activate its sidewalk should be able to have its seating in place by the spring of 2018.

Tulsa is on the cusp of being a walkable city, more so that it realizes. This Study lays out the impediments which stand in its way, none of which are very difficult to fix. But fixing them requires commitment and funding. It is hoped that a desire to remain competitive—and the wish to improve the daily life of every citizen—is enough to motivate this commitment and funding in short order.

**ACKNOWLEDGEMENTS**

Many organizations and individuals were instrumental in the efforts leading up to and completing this Study. We would like to thank those who contributed their thoughts, their support, and their time in making this a truly citywide initiative. In addition to the supporters below, we would like to thank Jeff Scott, for his role as DCC Chairman, in spurring this Walkability Study as a force for positive change in an already growing Downtown landscape. Without his leadership, energy, and dedication, this Study would not exist.

We are especially grateful to all the Downtown Coordinating Council director Thomas L. Baker for his leadership and hard work, and to all the DCC members who brought this initiative to the City of Tulsa, for their recommendations to continue improving the walkability and vitality of Downtown Tulsa, and for their support of this Study's initiatives:

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Thanks especially to DCC Staff: Kyle Johnston, Steve Hardt and Adrienne Russ.

Thank you to the more than 200 attendees at the first Walkable City presentation, the initial effort to stir interest in the study, especially to the more than 70 participants in the ten fact-finding meetings, to better understand the needs of our local businesses, developers, visitors, and the greater Tulsa community:

Blue Dome District Merchants: Jo Armstrong, Miranda Farley, Tony Lenox, Matt Recktenhald, Scott Sites, Joann Frizell
East Village District Association: Carla Gregory, Stuart McDaniel, Greg Reynolds, Paddy Harwell, Bill Harwell, Michael Sager
Deco District: Julee March, William Franklin, Hannah Demuth, Rusty Rowe
Downtown Property Owners: Chris Bumgarner, Sean Weins, Greg Stone, Joe Westervelt, John Snyder, Michael Sager, Aaron Miller, Hunt Hawkins, David Atkinson
Cathedral District: Diane Haney, Andrew Coffey, Carole Huff Hicks, Lauren Brookey, Amanda DeCort, Brenda Reed, Gordy Guest, Josh Chesney, Greg Stone

Metro Tulsa Hotel and Lodging Association: Brittany Sawyer, Kerry Painter, Kathy Tinker, Vanessa Masucci, Vince Trinidad, Michelle Koskey, Travis Taylor, Kacie King, Neal Bhow, Shawn Bhow, Krista Mooney-Shea, Michelle Hartman
Tulsa Young Professionals: Daniel Sperle, Josh Westerman, Nimish Dharmadhikari, Maranda Blankenship, Andy Blankenship, Kasey St. John, Chelsea McGuire, David Shelton, Jonathan Belzley, Adam Doverspike, Julianna Monnot, Hollis McAllister, Dan Ashbaugh
Brady Arts District Owners: Scott Rodehaver, Kate Wallace, Lori Schram, Brian Elliott, Kathy Weaver, Chris Lilly, Stanton Doyle
Brady Arts District Business Association: Bob Fleischman, Aaron Post, Andy Cagle, Donna Prigmore
Greenwood District: Sherry Gamble Smith, Lee McDaniel, Jack Henderson, John Bumgarner
As well as the community activists, pedestrian and cycling committee members, INCOG representatives, and walkability fans who also attended these meetings.

Thank you to the City of Tulsa and staff who participated in numerous meetings, phone conferences, and planning sessions in preparation for the implementation of the Walkability Study:

Engineering Service: Paul Zachary, Director
Matt Liechti, Henry Som de Cerff, Doug Helt, Glen Sams, Brent Stout
Streets and Stormwater: Terry Ball, Director
Kurt Kraft, Tracy Nyholm, Lisa Simpson
Planning and Development Services: Dawn T. Warrick, AICP, Director
Luis Mercado, Steve Carr, Theron Warlick, AICP, Jennifer Gates, AICP

And finally, we wish to thank the organizations, community leaders, and individuals who helped underwrite this study with one goal in mind—to continue Downtown Tulsa's growth and prosperity as a walkable, vibrant city:

American Parking, American Residential Group, Brady Arts District Business Association, Brady Arts District Owners, James Cunningham and the Downtown Tulsa Hyatt, Kajeer Yar and The Hille Foundation, PSO, River City Development, The Ross Group, Sharp Development, SMG Tulsa, Roy Peters and the Tulsa Development Authority, Tulsa Drillers, Tulsa Regional Chamber, Tulsa Stadium Improvement Trust, Susan Neal and The University of Tulsa, and Wallace Engineering

We are grateful to all of you for your support of the vision for a more walkable Downtown Tulsa.

# APPENDICES

# APPENDIX A: A 180° TURNAROUND

After half a century of automobile-based planning, Oklahoma City rebuilds its downtown to encourage walking and biking.

# A 180° Turnaround

By Jeff Speck, AICP


Illustrations ©Office of Jim Burnett

Fifth Street, now (left), and as it will look in the future with two traffic lanes, wide sidewalks, and street trees. The street leads to the Oklahoma City National Memorial.

IN 2008, *PREVENTION* MAGAZINE named Oklahoma City the "least walkable city in America." While most other poorly ranked communities did nothing, Oklahoma City and its leading institutions responded to this wake-up call by committing to rebuild all the streets in the city's downtown core.

Prior circumstances were bleak. Most streets were multilane one-way thoroughfares, and many curbs had sacrificed their parallel parking for additional travel lanes. Bicycle facilities were nonexistent, and traffic sped too fast for bikes to share the road—or for pedestrians to feel comfortable on sidewalks—as oversized lanes encouraged highway speeds. Street trees were in short supply, and most intersections had overlong turning lanes, further discomfiting pedestrians.

All of this is changing. A predominantly one-way system is being replaced by a mostly two-way system, and many turning lanes are being eliminated. The Congress for the New Urbanism/Institute of Transportation Engineers standards for lane widths are being applied, significantly reducing design speeds. A comprehensive bicycle network is being built, with more than six miles of bike lanes. Several thousand street trees are being planted.

In addition, parallel parking slots are being bumped up by more than 800 spaces—all of them carved out of existing roadways. According to the National Main Street Center, each parking space removed from a street costs an adjacent business about $10,000 a year in sales. While that process won't work exactly the same in reverse, it is easy to see the likely benefit of turning excess driving lanes into hundreds of parking spaces. Converting the unneeded travel lanes into parking will also slow traffic while protecting currently exposed sidewalk edges from moving vehicles.

Perhaps most significantly, all of this is happening with the blessings of a conservative public works department, in a culture where the car is king. Unavoidably, this was as much a political effort as a design effort, in which the planners—this author included—had to overcome initial objections to pro-pedestrian proposals.

## Project 180

Dubbed Project 180 in honor of its initial size—now closer to 220 acres—this undertaking is actually the result of two different stories that dovetailed just in time. By 2009, plans were already well under way for Devon Tower, a new 50-story, $750 million headquarters for Devon Energy, a major U.S. oil and gas producer. Devon's CEO Larry Nichols was determined that a nine-figure tax increment financing package be used to remake the 50 blocks of streets and parks surrounding the tower. Happily, these 50 blocks coincide with Oklahoma City's central business district. The city hired the Houston-based landscape architectural team of James Burnett, partnered with Murase Associates of Portland, to begin work.

Meanwhile, Mayor Mick Cornett, an ardent planning advocate, was determined to do something about his city's poor walkability ranking. In 2009, he brought in my firm, Speck & Associates, to do a walkability study that concluded, among other things, that many downtown streets were twice the size they needed to be for the traffic they actually handled. We recommended trading traffic lanes for parking and biking lanes, converting one-way streets to two-way, and replacing the current high-speed geometrics with the CNU-ITE standard.

After being presented to the full city council, the study caused a stir and made some enemies. But it also spurred a larger public discourse about livability and the community's hopes for its downtown, prominently covered by the local newspapers. Before long, Jim Burnett asked us to join his team.

## Give and take

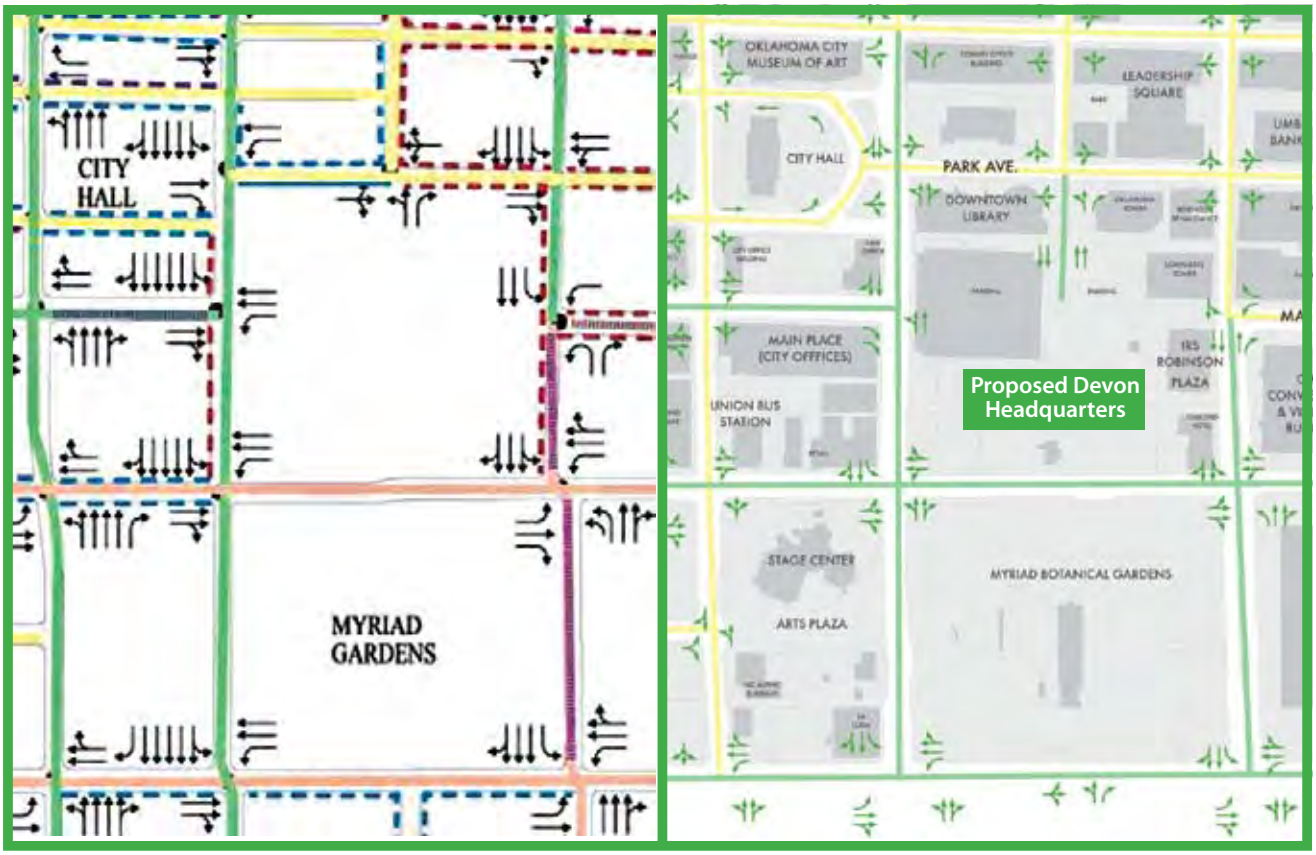
Initial resistance was to be expected, and the local transportation engineering consultant did not disappoint. Although the city's typical downtown street was a four-laner handling two lanes worth of traffic, we were told that our proposed changes would lead to gridlock. Burnett hired Glatting Jackson (since merged with AECOM) to produce a competing computer analysis, and the city eventually signed off on a slightly modified plan.

As noted, most of the planned improvements to walkability will happen between the curbs, with a focus on how vehicles affect pedestrians. But the landscape team took an equally innovative approach to the streetscape, which includes four electric charging stations, leading-edge accessible facilities, and a budget of more than $20 million for custom materials, plant selection, street furniture, and public art.

All that said, the project's most significant feature is that it is actually being built. A three-year, $90 million construction effort has begun and will be completed by January 2014.

"This is one of those 20-year overnight successes," says Russell Claus, AICP, a native of Brisbane, Australia, and Oklahoma City's planning director, who has been with the city since 1996. "It was a very long journey getting everyone to understand the value of public space in the downtown."

That journey's biggest steps have perhaps been taken by the public works department. "We have a much more cooperative relationship than before," Claus adds. "[Public works chief] Dennis Clowers has made it clear that planning has to set the vision for public works to follow, which is the opposite of how it was for a long time in this city."




A detail of downtown Oklahoma City as it looks today, with its many broad one-way streets (left) and as it will be when the plan is fully implemented (right).

It didn't hurt that city manager Jim Couch, a civil engineer, understood that traffic modeling studies are only as good as their inputs. And the proof is already evident: "The construction has effectively narrowed the streets beyond the planned amount without incident, and congestion levels are minimal," says Claus.

That explains the progressive design. The quick implementation got a push from some innovative financing. In an unusual TIF agreement, Devon Energy, whose enormous new headquarters is generating the tax increment, is the sole holder of the new bonds. Effectively, Devon has lent the city the full construction budget, which the city will then be able to pay back out of increased tax payments it receives from Devon.

In a sense, this is the old economy funding the new. "Project 180 showcases our efforts to create an overall cultural shift that reorients the city around people instead of cars," says Mayor Cornett, who celebrates walkability as a key to health. "The infrastructure that you offer your citizens both reflects and influences the lifestyles that they adopt."

## Lessons apply to all

Efforts in less flush cities suggest that you don't need oil and gas deposits to make your downtown more walkable. Much has already been published about successful one-way reversions and road diets that have given new life to struggling cities from West Palm Beach, Florida, to Vancouver, Washington. These changes need not be expensive, as shown in recently completed walkability redesigns for Davenport, Iowa, and Lowell, Massachusetts; those redesigns rely almost exclusively on signals and paint and are budgeted at less than five percent of the Oklahoma City project.

Project 180 shows us how to spend a lot of money well on walkability, but since much of its impact takes place between the curbs, it is easy to see how restriping alone can produce powerful results. The 2009 walkability study for Oklahoma City presented the following 10-step approach to street redesign. Only the final item—street trees—is expensive:

- All one-way streets will be converted to two-way streets.
- Each street will have no more driving lanes than suggested by traffic volume.
- No driving lane will be more than 11 feet wide.
- No parallel parking lane will be more than eight feet wide.
- All right-hand turning lanes will be eliminated. Left-hand turning lanes will be no longer than required by typical rush-hour stacking.
- Angle parking will be used as a tool to absorb additional roadway made available by these requirements.
- Bicycle lanes will also be used as a tool to absorb the additional roadway made available by these requirements.
- On-street parking will be provided at every curb.
- Curb return radii will be limited to a maximum of 15 feet.
- Street trees will be planted continuously along streets at a spacing distance of 30 feet on center or less.

These 10 steps are available to all American cities, and applicable to most. That they are being implemented in one of the nation's most auto-centric regions says a lot about their potential elsewhere.

Jeff Speck is the principal of Speck & Associates in Washington, D.C. He is the former design director of the National Endowment for the Arts and is coauthor of *Suburban Nation* (2000, North Point Press) and *The Smart Growth Manual* (2010, McGraw Hill).

# APPENDIX B: MEMO FROM LAURA STORY, P.E.

I have worked with Jeff Speck in the past on Project 180. He has asked that I share my observation and experience with the process Oklahoma City followed during the initial scoping, design and results with respect to Project 180's traffic studies and function. This area can be a naturally divisive topic between engineering (safety - efficiency) and planning (function - effectiveness).

Credentials:

Laura Story; retired Civil Engineer (P.E.). I was employed in the public and transportation sectors for over 32 years. I was employed with:

- Smith Roberts (Johnson) Baldischwiler,
- Oklahoma Department of Transportation,
- Traffic Engineering Consultants (TEC),
- CalTrans, and the
- City of Oklahoma City (OKC).

Specific traffic experience includes Traffic Operations, Traffic Analysis; Evaluated LOS of intersections/highways. Analyzed existing and future traffic volumes for a NEPA Traffic Study included in the NEPA process.

I worked with TEC part-time during college and summer. Steve Hofener took the time to teach me about Level of Service (LOS) and subtleties involved with traffic analysis. I have worked with Steve on complex traffic issues during my time at the City. I greatly respect this company and truly appreciate Steve. His mentoring prepared me quite well for work in Traffic Operations and Preliminary Design/Environmental process while at CalTrans. I would not have been able to write the Traffic Study for a proposed toll road's NEPA document,

Project 180 Role:

I was involved from the early development of the concept for Project 180, to the Construction of the Myriad Gardens, Bicentennial Park and 70% of the downtown street reconstruction. I completed my work for the City by developing a plan sheet database holding scanned copies of the Record Drawings for future reference. Projects 1 through 7 were scanned and placed in the database for reference by area rather than project number.

I functioned as the program manager; initially coordinating budget-funding issues and preliminary scoping studies, utility relocations and design/construction packages. I continued as a Consultant with general advisory, specification development, budget compliance, and record drawing retrieval.

One of the preliminary scoping studies was the traffic study. This study included:

- Projecting future traffic volume,
- Analyzing levels of service (LOS) with the proposed grid system,
- Removing the one-way streets,
- Narrowing the driving lane,
- Adding bike lanes and

- Reviewing the radius design to shorten the turning radius.

Project 180 Background:

Project 180 was an unexpected public improvement program spurred by the decision of Devon Energy to build its International Headquarters in Oklahoma City. Devon approached the City inquiring whether they could incorporate their Economic Development Funds/Credit toward improving the downtown streets and atmosphere. The existing conditions were a collection of:

- Four-lane one-way sections,
- Narrow two-lane sections,
- Sporadic street parking, and
- Few two-way sections.

The landscaping, sidewalk condition, and accessibility compliance left much to be desired.
The City accepted the inquiry using Economic Development funds/credits and moved forward with what is now Project 180. Project 180 was developed and scoped with a committee including the:

- City Manager's Office,
- Finance Division,
- IT Department,
- Parks Department
- Planning Department
- Public Works Department, and the
- Utilities Department.

Initial Traffic Study Results:

TEC was selected to analyze preliminary traffic with the scope:

- Grid layout,
- Two-way traffic
- Narrower driving lanes
- Designated bike lanes
- Smaller turning radius intersections
- And with preference to the Pedestrian

The initial results reflected unacceptable LOS on the proposed grid system. Public Works engineering staff accepted the report and intended to move forward with revising the scope of typical sections and number of lanes. This revision would add turn-lanes and a third lane in many situations. However, Project scoping decisions required all departments accept the Project 180 scoping proposal. Planning staff objected to the Preliminary Traffic Report acceptance. Planning staff and consultants presented information about what a successful urban downtown functioned and felt like.

Urban Design Parameters

During the committee discussions, Planning staff and the consultant insisted single lane, two-way configurations with 10,000 ADT functioned at an acceptable level. When posed with this statement, the City verified several streets functioned acceptably with 10,000 ADT in other parts of the city. In addition to reducing the number and width of traffic lanes; turn lanes and left turn bays were rejected by planning staff. The design for an urban downtown street system weighted toward the pedestrian's experience and safety does not favor cars turning over pedestrians crossing or favor cars turning through designated bike lanes.

The desire for an appropriate design enhancing the downtown function and atmosphere was so strong an outside consultant was asked to evaluate the proposed sections and traffic projections. The study proposed slight changes and the LOS did improve. This information was used in updating the Project 180 Traffic Study.

Final Traffic Study Scoping Document

The final scoping study showed LOS E and F at evening rush hour and lasted less than 30 minutes. When considering the actual time traffic was congested versus the improvements to safety through slowing vehicles down, consistent pedestrian access and through-ways, and realizing it was for future traffic ADT projections, the Study was nearing an acceptable scenario for the engineering team. Increased vehicular accommodations could be made if needed in the future. The remainder of the Study indicated other than rush hour, LOS was at acceptable levels. The next issue requiring attention was clearing downtown traffic after a Thunder game or large event. The City identified several corridors to carry this outflow and modified the Project 180 street sections. The scope of Project 180 went to the design phase with the predominantly two-way, ten foot single-lane configuration where traffic was less than 10,000 ADT. The Project 180 preferred typical street section included:

- Ten foot lanes.
- Two-way traffic,
- Smaller turning radius at intersections,
- Wider sidewalks,
- Designated bike lanes,
- Landscape trees, hardscape benches, trash receptacles, unique signals and signing.

Summary and Conclusion:

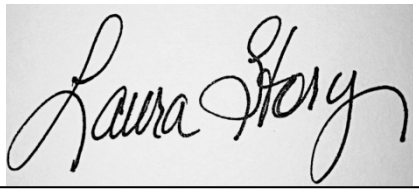
This project was initiated by the decision to build Devon Energy's International Headquarters in downtown Oklahoma City. The City was willing to match the aesthetic theme and feel of the new headquarters site. The design ultimately focused on building an urban downtown experience, improving safety and function. Traffic was a major conflict for the project committee to work through. The end design result was close to the original grid design proposed.

My experience with respect to designing and building this urban downtown street system involved changing my perspective, questioning the standard typical sections for streets, and realizing there are many users of urban streets; personal vehicles, delivery vehicles, busses, refuse collection, pedestrians, able-bodied and disabled people, and cyclists.

The street system needed improvements to slow down locations of high speed through-ways and improve access for visitors to the city. The “urban experience” concept intuitively felt correct. Creating a reasonable yet narrow lane for drivers did intuitively feel appropriate (the speed limit is 25 mph). Improving the sidewalk, accessibility and environment was a needed improvement.

The city has exploded with new recreation, entertainment and eating venues. The demographics of our city have changed so much with the influx of young adults starting their careers; downtown feels alive and metropolitan. People; single, with partners, families and their visitors all have engaging activities and destinations to walk to or just visit. Walking commuters have increase dramatically. A public elementary school, public events and year-round Myriad Garden programs are available to downtown residents. I believe this increased activity level has in large part been due to the downtown infrastructure reconstruction. I believe first impressions are crucial (not fair) when considering employment, residence, and, even at times, friends and colleagues. The neighborhood of Downtown has a new, fresh, and well-kept front yard – what urban loving individual wouldn’t enjoy this new feeling?

Despite strong skepticism, the traffic flow in the downtown Project 180 limits is better than acceptable even with additional unrelated construction within the original boundaries. The implementation of the two-way grid provides many alternate routes for exiting the downtown at the pm rush hour. The overall impact, to all users of the street rights of way, has dramatically improved.



Laura Story, Civil PE (ret)
Formerly, during Project 180:

- Assistant City Engineer, OKC PW
- Program Consultant, OKC - Project 180

# APPENDIX C: Walkability Analysis Methodology and Assumptions

NELSON
NYGAARD

# MEMORANDUM

To: City of Tulsa – Department of Engineering

From: Jesse Boudart, PE and Ralph DeNisco

Date: December 13, 2016

Subject: City of Tulsa - Walkability Study
Methodology and Assumptions for Capacity Analysis

## Multistep Traffic Analysis Process

As the traffic analysis will be designed to test multiple changes simultaneously, this memorandum lays out the assumptions, steps and processes to be used, including the following:

- Use the existing AM & PM peak hour traffic volumes and turning movement counts as the basis of all analysis
- Redistribute vehicular trips on one-way streets converted to two-way streets
- Use conservative assumptions to account for growth and traffic variability to determine the necessary lane configuration
- Review proposed turning movements to assess need for (left) turning lanes
- Complete capacity analysis

Assumptions and analysis will be completed conservatively, with the appropriate engineering judgment described in this memorandum. The sections below provide further detail on the analysis methodology for each step.

## One-Way to Two-Way Conversion

- Upon converting a one-way couplet to a two-way street, the analysis will distribute traffic in a 60/40 split, where the previous one-way will carry 60% of its original traffic with 40% diverting to the opposite couplet. This assumption is consistent with past traffic analysis efforts performed in the City of Tulsa.
- Highway ramp intersections connecting to the one-way couplets will not be modified to accommodate two-way traffic, but the one-way street to a two-way street will be converted as close as possible to the ramp intersection.
- We will evaluate the Boulder Avenue/Cheyenne Avenue and 1st Street/2nd Street couplets to be converted to two-way streets with a 60/40 traffic distribution.
- We will also plan to convert 4th Avenue and 5th Avenue from their current one-way street configuration. Where the couplet exists between 4th and 5th Avenue, we will use a 60/40 traffic distribution. But where 4th Avenue has no joining couplet, we will assume 50% of its current traffic will be retained on the street, while 25% of the 4th Avenue's traffic will be pushed to adjacent streets. At the same time, 25% of the adjacent street traffic will be

assumed to move to 4th Avenue because of the new utility for vehicles to travel westbound.

- To be especially conservative, our calculations will not take into account any trip reduction for the one-way "circling" trips that are occurring today. We note though that the direct access to destinations afforded by reversion to two-way travel will be beneficial to users and will likely reduce overall traffic volumes.

## Vehicle Volume per Lane per Hour

- We intend to use 500 vehicles per hour per lane as a threshold to determine whether one vehicular lane is needed in one direction.
- The State of Iowa uses 750 vehicles per hour per lane, per direction[1]. Applying this threshold to our analysis, 501 vehicles per hour in one direction will require two lanes in a single direction for adequate traffic flow.
- This metric incorporates a healthy buffer to allow for turning movement friction, traffic variability, and additional traffic growth onto the street network.

## Left-Turn Lane

- For the current lane supply, the existing left-turn lanes have been annotated across the City of Tulsa downtown area.
- Upon reviewing the literature and being sensitive to the City of Tulsa's downtown intersection's cycle lengths, we intend to use 100 hourly left-turning vehicles[2] as a conservative threshold to provide a left-turn lane.

### Peak Hour Factor

- Because redistributing traffic is an educated estimation, an appropriate Peak Hour Factor should be assumed. We have applied a PHF of 0.92 to the entire downtown street network, which is a default PHF value for urban areas from the Highway Capacity Manual.

[1] Knapp et al., Urban Four-Lane Undivided to Three-Lane Roadway Conversion Guidelines. Mid-Continent Transportation Research Symposium. 2003.
[2] Fitzpatrick and Wolff. "Left-Turn Lane Installation Guidelines". 2nd Urban Street Symposium of TRB. 2003.