# LIFE IN CAR LAND: FREEING SPACE FOR PEOPLE ON U.S. ROUTE 1

By

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ABSTRACT OF THE THESIS

Life in Car Land: Freeing Space for People on U.S. Route 1

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This manifesto on the car landscape interrogates and redesigns a suburban highway strip in New Jersey. The 17.2 mile stretch of U.S. Route 1 between Trenton and New Brunswick is a divided surface highway that frustrates drivers, is unsafe for pedestrians, and impossible for cyclists. The thesis questions how this failing landscape came about, and what forces prevent it from improving. In doing so, it explores the landscape implications of our co-dependence on the car, considering both the driving experience and associated land uses. The research exposes the twentieth-century illusion that mechanized speed provides individual autonomy and progress. It then looks toward the future, at the potential of autonomous vehicle technology to change our relationship with cars and thereby reshape suburban transportation infrastructure.

The proposed design solution for Route 1 separates ourselves from our cars. The design functions at multiple scales, from regional planning, to highway infrastructure, to site-scale landscapes. At its most essential, the proposal is a separation of fast through-traffic and slower local traffic, utilizing a series of flyways that bridge each intersection. That separation reverses our notion that fast is freedom by calling for discrete realms and speeds for two different autonomies: mechanized and personal. In addition, the flyways shrink the amount of space currently consumed by interchanges and highway ramps, claiming approximately 200 acres of publicly-owned land back from the car. The reclaimed landscapes at each intersection become community and ecological resources to spur new, human-centric, relationships to Route 1.

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# Introduction

We live in car-land. The car promises speed, and with speed, freedom. In exchange, it asks for land. Over time, we gave all we had, until we found we lived in car-land. And in car-land we became insignificant, constrained by the car but nevertheless relying on it to move us through the land we built for it. In this captivity, we gained speed without freedom. Cars are greedy. They always request just a little more land: another lane, a few more parking spots, a faster curve. Cars horde the spaces in car-land; there are places we will never venture without a car's permission. Life in car-land is confined, but the car keeps telling us, with more land, you, too, can be free.

Car-land is changing. In the 20th century, we were seduced. We aligned our own humanity with constant technological progress. Our coexistence with cars was a symbol of limitless human potential. In the 21st century, this relationship with machines is shifting. We are now accustomed to technology in every aspect of our lives; we are at home in car-land. In this mechanized existence, the challenge is to see our humanity apart from the machines that we depend on. Technological progress and invention is something we can take for granted. Our human potential, however, will show itself only when we express our personal autonomy as separate from those machines. Separating ourselves from cars might be the most radical change because cars are not only linked to our concepts of humanity; they also control the landscape.

While the challenge of separating life from car-land is daunting, two recent developments promise to assist us, as long as we act soon. The first is the impending introduction of autonomous vehicles. When cars have their own autonomy, it may be possible to reclaim ours. Secondly, our dissatisfaction with car-land is growing. U.S. Route 1, between Trenton and New Brunswick, New Jersey, is a stretch of highway at the edge of two major metropolitan regions. It is an example of a piece of car-land that nobody likes. It is sprawl in a slow-motion identity crisis,

traffic-jammed by its own zoning. It is frustrating and uncomfortable. It is a perfect place to start reconfiguring our relationship with cars and begin freeing space for people.

In this thesis, I design infrastructure to harness autonomous vehicle technology in order to separate life from driving and to create a suburban landscape separate from car-land. In doing so, I separate our personal autonomy from mechanical autonomy, bringing us one step closer to the future. This manifesto on car-land is based on the intensive exploration of one segment of a New Jersey highway: Route 1 between the Trenton and New Brunswick bypasses. I first assemble a five-fold theory of our relationship to cars. These five approaches then guide the identification and analysis of five problems specific to Route 1. Finally, I propose a design for the corridor to address those problems. The design functions at multiple speeds and scales in order to free space and bring life to car-land.

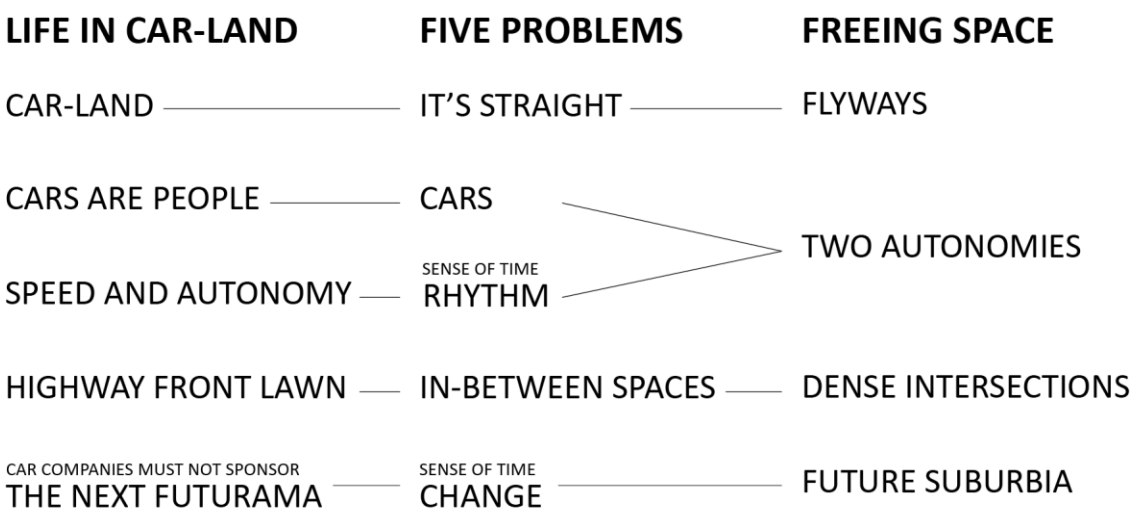



*Figure 1: Organization of the Manifesto*

# Life in Car-Land

## Car-Land

*"What we need instead of the opportunistic corrections of the city is to sense the new physical order which the car demands; we need an architecture of movement or a viaduct architecture."*
– Louis I. Kahn, 1962. Notebooks and Drawings.[1]

*Figure 2: Route 1's expansive spaces and concrete median.*

This thesis describes a 17.2 mile segment of a divided surface highway in New Jersey. The study site consists of the part of U.S. Route 1 where it overlaps with the historic route of the Trenton and New Brunswick Straight Line Turnpike. This accessible principal arterial highway ranges from four to six lanes of traffic, divided by a concrete median barrier, known as a Jersey Barrier.[2] Crossing the median is only permitted at intersections, of which there are twenty-six. Nineteen of these are signalized and at grade, and seven are grade-separated interchanges. Development along the corridor is random. Certain areas are forested, and a few farm fields survive, providing evidence of an earlier, less car-intensive culture. There are occasional strips of highway-facing local businesses. Corporate offices and corporate shopping centers comprise the balance. With few exceptions, either expansive parking lots or expansive turf, or both, separate buildings from the road (Fig. 2).

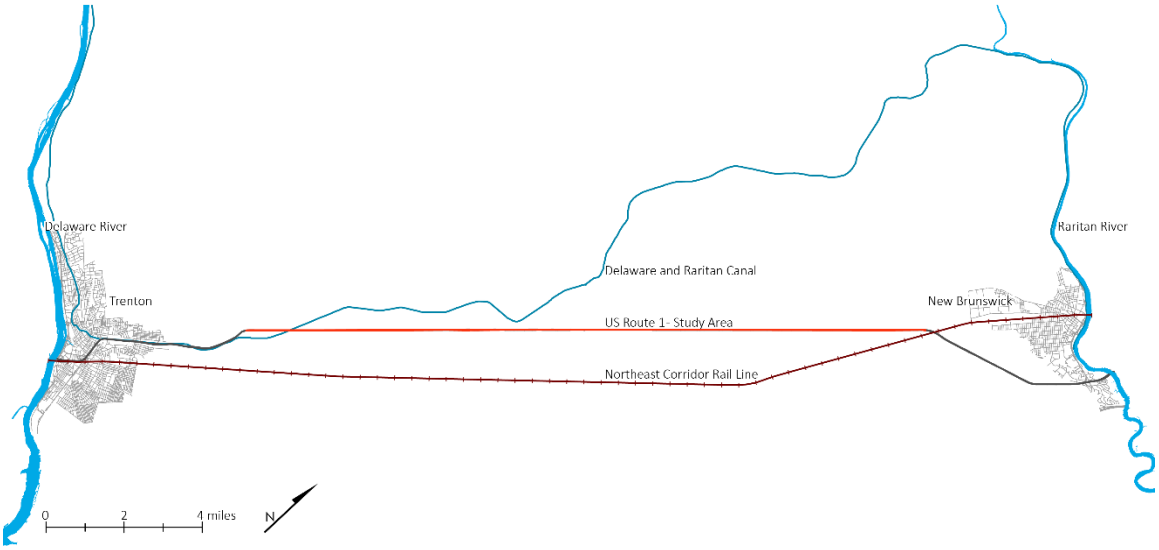



*Figure 3: Study Area Context*
The site of this thesis is Route 1 as it follows the historic Trenton and New Brunswick Straight Line Turnpike, which was constructed in 1804. The road is indeed a straight line, with no curves for the 17.2 mile extent of the study area. The study area crosses two counties, Mercer and Middlesex, and five municipalities, Lawrence, West Windsor, Plainsboro, South Brunswick and North Brunswick.

The route traces a perfectly straight line, pointing directly between downtown New Brunswick and downtown Trenton (Fig. 3). Route 1 now bypasses both cities, but the original "straight line" turnpike was chartered in 1803 as a roadway designed to provide the most direct link possible between the two city centers (Fig. 4).[3] At the end of the eighteenth century and beginning of the nineteenth, states in the young nation chartered privately constructed and managed roads in order to improve overland transport. These turnpikes were financed through private investments, and made money for their investors through toll collection. Many of these early turnpikes were "short-line" connectors between water ports and manufacturing towns.[4] In New Jersey, longer turnpikes served primarily to link Philadelphia and New York City, two major centers of commerce.[5] The Trenton and New Brunswick Straight Line Turnpike is oriented directly

between these two metropolises (as well as between the two smaller namesake cities). That orientation made it an important segment for what would eventually be nearly 100 miles of continuous road connecting New Jersey to both Philadelphia and New York. Before that uninterrupted land connection was completed, the turnpike served as an essential connector between the Delaware and the Raritan Rivers.[6]

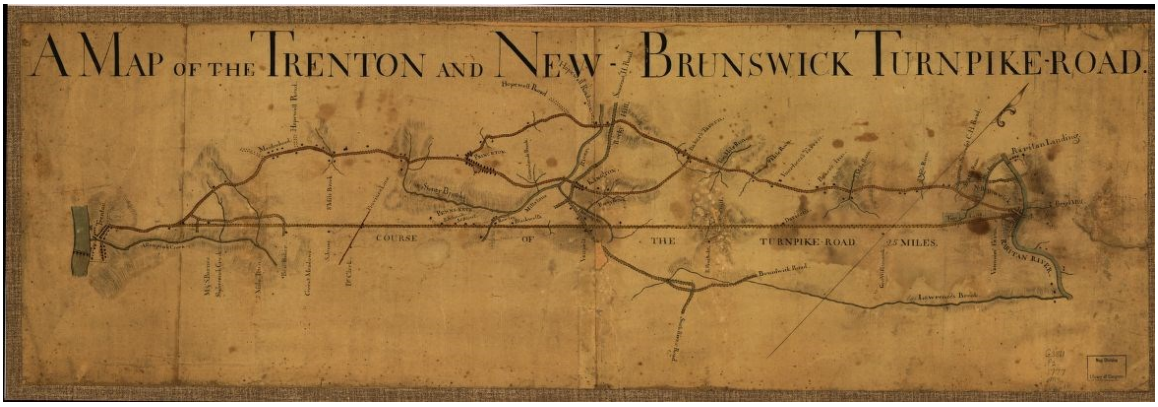



*Figure 4: A Map of the Trenton and New-Brunswick Turnpike-road (1803)*
Retrieved from the Library of Congress, https://www.loc.gov/item/73691816/. (Accessed March 19, 2017.)

When the turnpike was chartered, state commissioners surveyed the route to be perfectly straight. This alignment was in contrast to the existing old roads and pathways that wavered through every settlement and around each obstacle. The new, inflexible route required the construction of bridges and utilization of cut and fill to ease travel across waterways and steep grades. It was completed in 1807, thirty-six feet wide, of which a fifteen-foot lane was improved with six inches of gravel. Bridges crossing the streams were constructed of wood and stone.[7] The direct point-to-point route greatly improved transportation and communication between the two cities, and the first few decades of the road saw significant use.[8]

Then in the 1830's, Trenton and New Brunswick were connected by water and rail in quick succession. The Delaware and Raritan Canal and a north-south railway line changed the two cities from intermodal transport and warehousing hubs to links in the larger connected network

of industrializing cities.[9] The addition of canal and railroad between the two cities created a corridor with three parallel and somewhat redundant transportation options. The Trenton and New Brunswick Turnpike struggled to keep up since the canal and railway were so much better suited for freight. The company could hardly afford to maintain the road as long distance travelers opted for other modes.

The original charter expired in 1903, and New Jersey took over funding the road just in time for the next big transportation revolution. 1903 was also the year Henry Ford founded his motor company. The auto-industry was closing in on a mass-manufactured product that placed many more Americans in cars, and those cars needed decent roadways. In 1911, the US Office of Public Roads mapped the turnpike as part of the earliest network of transcontinental automobile routes. It was first the Quebec-Miami International Highway, and then became the Atlantic Highway when it was rerouted to go through Maine. It became U.S. Route 1 in 1925, when the numbered interstate system was adopted.[10] The roads assembled to create this original interstate linked together the major eastern colonial cities. Those cities, including Washington DC, Baltimore, Philadelphia, Trenton, and New Brunswick had been founded at the furthest inland navigable points along their respective rivers, correlating with the geology of the continent. That historic-geologic pattern means that US Route 1 traces the Fall Line, or the escarpment along which the higher Piedmont meets the lower Atlantic Coastal Plain. Route 1 between Trenton and New Brunswick roughly does the same (fig. 5).

By 1927, the USDA reported that the 94 mile stretch of Route 1 between New York City and Philadelphia was the most heavily traveled stretch of road that length in the world.[11] The road once designed to bypass built up areas started to create its own linear strip of development. The existing conditions along this part of Route 1 are 100 years of auto-oriented development.

Most of the length of the study site remained a highway through farm and forest until the 1960's, when suburban corporate office parks began to catch on.[12] The road's proximity to Princeton and

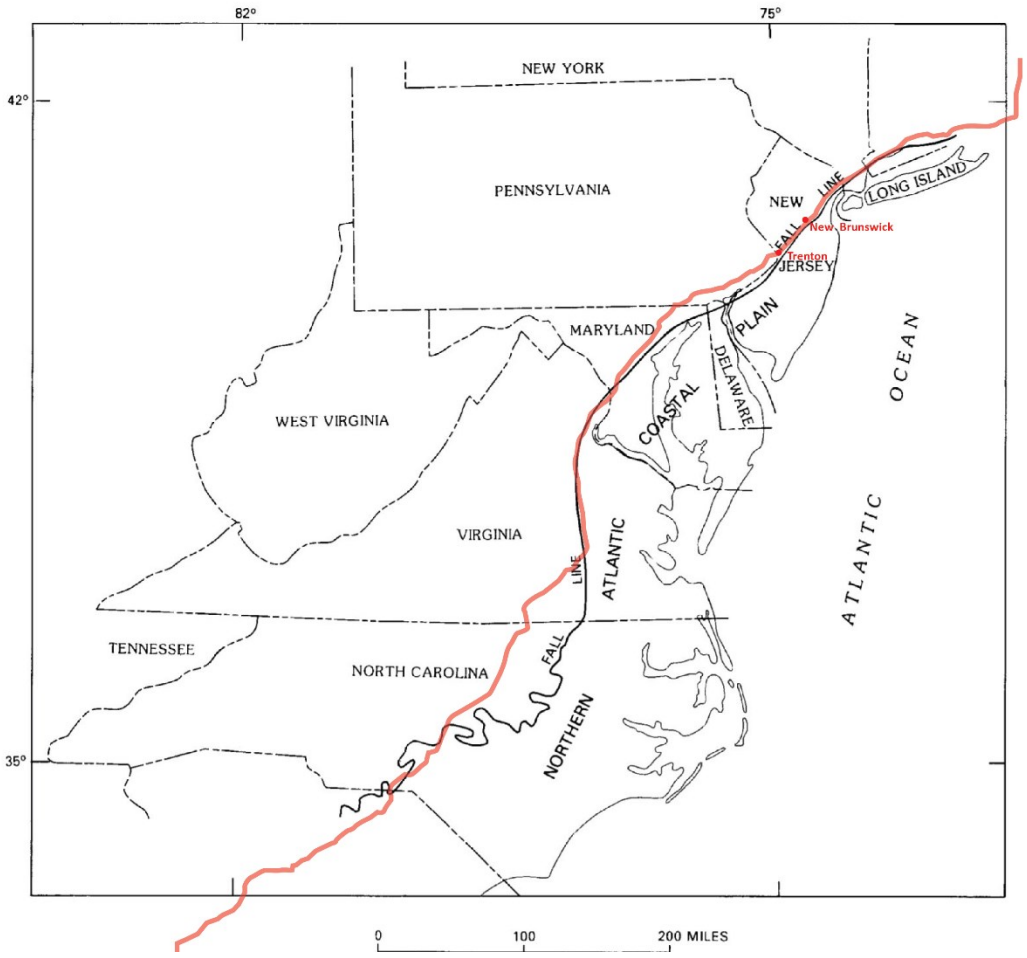



*Figure 5: Route 1 and the Atlantic Seaboard Fall Line*
Route 1 is overlaid in red on a USGS map of the Fall Line, between the Piedmont to the west, and the Atlantic Coastal Plain to the east. Source of the original Fall Line map: U.S. Geological Survey Professional Paper 1404-C, "Hydrogeologic Framework of the Virginia Coastal Plain." 1988.

Rutgers Universities made it an ideal location for research, and proposed branding for it included the "Zip-Strip," "Einstein's Alley," and the "Princeton and Rutgers Research Corridor."[13] More traffic along the road led to more construction – gas stations, motels, more offices. And with more businesses came more traffic, franchises and commercial strips.

The straight line is no longer a fast route. It is halting. The river of cars solidifies at each red light. Engines idly nudge forward. The open road seen straight ahead is empty until it fills again with green light acceleration. The stop-and-go movement reflects the erratic land uses that flank the corridor. On Route 1, neighboring parcels often have little relation to one another, and the sequence of history along this linear landscape is disordered. Corporate egoism abuts sagging abandoned buildings. Gas stations nestle into woodlands, and fields are farmed just enough to generate property tax breaks while awaiting the next development boom. Cars and land alike are impatient.

## Cars are People

*"Our machines are disturbingly lively, and we ourselves frighteningly inert"* – Donna Haraway, 1985. *A Manifesto for Cyborgs*.[14]

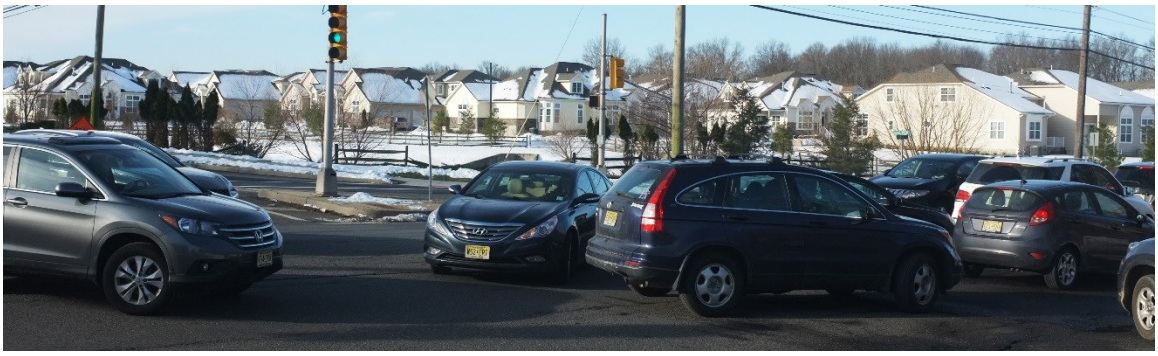


*Figure 6: A traffic jam is a community*

In Douglass Adams' Hitchhiker's Guide to the Galaxy, the alien character Ford Prefect chose his name thinking it would be "nicely inconspicuous," having "mistaken the dominant lifeform" on Earth to be cars.[15] His mistake is reasonable. The strange thing about suburbia is how few humans we see from the road. Cars envelop us as they deliver us from building to building,

and so they dominate the landscape. They pump through the arteries of the suburbs, powering all our life-actions. Cars—driven by the aggravated or the considerate, the arrogant or the distracted—act like people.

On arterials like Route 1 we may not see people on the street, but sitting in traffic, we know we are not alone. And when we pass a full parking lot we say, wow, there are a lot of people there, even if we don't see any human beings. Cars inhabit suburban space and send the message that it is occupied and alive. In a parking lot, or other places where the car-human interface occurs, humans cautiously navigate car-land, aware that they are out of place and in danger. Suburban sprawl is an animate fabric of cars, connecting buildings together. In car-land, both cars and humans are dynamic, mobile and interactive. But cars are bigger.

Car-land is difficult to love. Putting aside for a moment the question of aesthetics, car-land creates nasty environmental and health side effects such as greenhouse gas emissions, polluted run-off, traffic fatalities and obesity. Nevertheless, it signals both familiarity and adventure, comfort and freedom. Suburbia was designed and marketed to be home, and the car is built into that picture. Cars create the street life, the street sounds and the street smells. Suburbia is viewed from inside a car. Driving through the suburbs, people are cars.

The architect David Greene stated in 1972 that traffic jams and parking lots are "instantly formed and constantly changing communities." He informs that observation by saying clusters of cars are "collections of rooms," but that is not quite right.[16] Cars are not architecture, they are agents. They are not the spaces for community; they populate communities. And maybe car-land is so chaotic because their language consists of only rudimentary signals. They move as fast as they can, selfishly absorbed in their own needs and destination. Car-culture needs more facile communication between cars so they can have a tighter social contract, coordination, and empathy. Infrastructure needs to support that pursuit.

Designing in suburbia means designing for car communities. At different speeds, cars have different personalities and different sets of needs. They also occupy different kinds of space. Designing for cars means deciding how much space they should use, and questioning how human a car really is. All of these determinations are rooted in speed, since without cars, humans operate at a different speed altogether. There must be places in car-land, aside from the insides of cars and buildings, where humans move at their own pace, and are therefore home in their own bodies. Attempting to design for all speeds at once causes conflicting scales and clashing landscape. This dilemma must be reconciled in our next attempt at designing car-land. Design for cars is design for humans, but it's easy to forget that, because cars are faster.

## Speed and Autonomy

*"Freedom of movement allied with speed also produces such an hallucinatory character that it is possible to ask if, for many of our contemporaries, it does not take the place of freedom in general inasmuch as it has become its symbol."* -André Corboz, 1983, *Land as Palimpsest*[17]

The modern era was a dream of speed. With mechanization we moved ever faster, and the faster we could go, the more progress we believed we made. Moving fast was synonymous with productivity and freedom. Cars, and car infrastructure, told us we could all own a machine that provides us with progress, with acceleration, adventure, and free time. Yet, no speed seems fast enough to deliver on all those promises. Cars, desperate to satisfy the mechanized dream, demand of the roads to be more accommodating, provide more lanes, move more traffic, and make interchanges to sweep in wider, faster circles. Cars call for efficiency of movement at the cost of efficiency of space.

Louis Kahn was wary of the land-greed of the car. As a modernist, he saw our newfound speed and technological advancements as a fulfillment of human nature.[18] But he also saw a danger in urban design that tried to integrate the "go-movement of the car" with the city street. Instead he envisioned a "viaduct architecture" so that the movement of cars would be separate and contained, and the city street (which he saw as a room) would be protected.[19] He differentiated between the open road of the countryside where design for movement prioritized speed above all, and a "much more respectable kind of viaduct" in the city, where "it is using valuable land, and the city can't waste land."[20] This was in the early 1960's, when the line between city and country was just blurring. Freeway-guided sprawl was in its volatile adolescence when Kahn designed a circulation system for Philadelphia that guarded Center City from the car's land-grab.[21] Fifty years later, we now need to add a third viaduct architecture to Kahn's original two: the viaduct architecture of suburbia.

Suburbia, shaped by cars, exists in the widening gap of the modernist dichotomy between city and country. In the 1920's, Le Corbusier imagined an urbanism enabled by the speed of cars. Massive towers would be surrounded by landscape, giving us all the light and air we craved, while superfast highways provided the luxury of free time like we'd never seen before.[22] Fifteen years after Le Corbusier first presented this vision, Norman Bel Geddes entranced the American public with another ambitious agenda for speed. His wildly popular Futurama exhibit for General Motors at the 1939-40 New York World's Fair envisioned a future of uninterrupted traffic flow. If cars were free to move without obstacle between city and country, Americans would be free to live their ideal lives (and plenty of leisure time) in leafy suburbs. In that way, Le Corbusier's towers in the park that failed to capture the American imagination were replaced by little boxes in little parks, which did. Each suburban family, enabled by the car and the highway, would live in their own miniature tower in the park. This vision of the future, distributed by Shell

Oil and General Motors, is what quickly came to be in the following decades.[23] While Kahn tried to protect the city, cars found habitat in the suburbs.

Drawn as a speed landscape, developed on the free market, purchased with promises of a quick commute, of freeways—suburbia should be the ultimate convergence of fast with freedom. Nothing connotes autonomy like acceleration on an open road. All possibilities seem to open up through this feeling of escape. Driving fast is a superhuman sensation that enthralls with possibility. Body merges with machine to provide opportunity and choice. But speed is not freedom, it is only a symbol of freedom, and the car landscape entraps us in the illusion. Louis Kahn described the loss of true autonomy on a highway: "He can't go at twenty miles an hours because he's a sensitive man, against the other man who goes sixty because he's a less sensitive man. He becomes equally as insensitive. And looking at it the other way, it disregards the difference between one man and another. The motorcar has a way of demanding of you that it become a cheetah."[24]

Consider that the faster the highway, the more imperative it becomes to follow the rules. As soon as we merge off the acceleration ramp we combine with a body of other drivers. Traveling at 65 mph, we join a collective mobility mass, relinquishing our autonomy to shared traffic laws. When we don't follow these rules (after all, the driver is human), death and despair follow. The whole system fails, snaring us in traffic that is all the more frustrating for occurring on a road designed for speed. Driving on a highway is mind-numbing for this reason. The thrill of traveling at the cheetah's pace is quickly lost in our impatience to get somewhere, as well as our fear and frustration of other drivers.

The Route 1 corridor is one of the many suburban agglomerations with impressive economic power that arose unforeseen by the creators of the Interstate Highway System. Our nation's highway infrastructure was designed to move cars efficiently along open roads between

dense urban centers. It is ill-equipped to serve the polynodal inter-suburban travel that dominates the economic geography of places like Silicon Valley, the Research Triangle in North Carolina, and much of Central New Jersey.[25] The modernist's speedy, city-centered vision of mobility birthed corridors of congestion. Suburbia is perhaps most crucially in need of a better architecture of movement, since it is here that most of us live, and most of us live by way of cars.[26]

The dangerous rush of Route 1 chains us to conformity. It is at 15 mph in our cul-de-sac or the Walmart parking lot we regain choice and individuality. True autonomy comes at the slower pace (the human pace), while only the sensation of freedom is derived from acceleration. Speed's simultaneous seduction and dissatisfaction is an infrastructure problem. Car-land should be designed at two speeds in order to separate the automobile's speed from our own concept of personal autonomy. Human progress depends on slowing down.

## Highway Front Lawn

*"You might say that the clover-leaf is the cheeta [sic]. [Man] is jealous of the cheeta and the car is invented. The car gave use to its own needs and now is the clover-leaf*." – Louis I. Kahn, 1962. Notebooks and Drawings.[27]

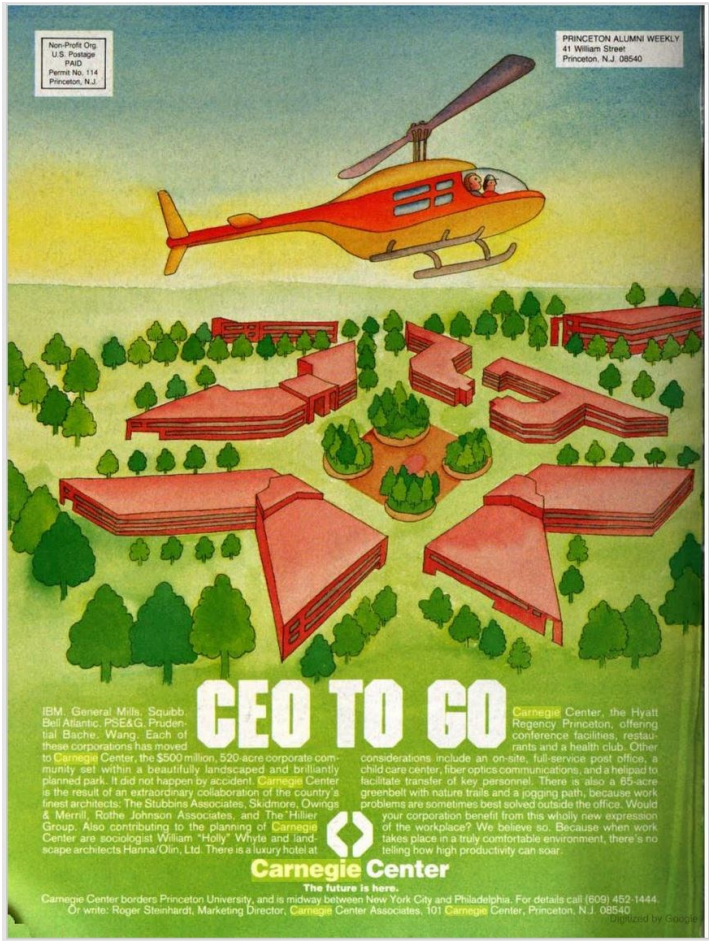



*Figure 7: Advertisement for Carnegie Center, Princeton Alumni Weekly, 1984*
Carnegie Center is an office park complex on Route 1, near Princeton. This advertisement omits the highway altogether, in favor of lawn. Presumably you fly to work. *Princeton Alumni Weekly* Vol. 85. Accessed through Google Books, owned by Princeton University Libraries.

Suburbs are about space. The single family home is a symbol of wholesome pursuit of the American dream and family values. But even more essential to suburbia than the house are the spaces between the houses. There must be a particular type and amount of landscape between every other element, and none is more important, symbolically, than the front lawn. The front lawn is the public face of the home. It is a tiny piece of personal pastoral, a reaction to urban

squalor and a nod to the English landscape tradition. Collectively, the front yardscape becomes the connective tissue of a community.[28]

The lawn did not remain a fully domestic phenomenon. Everything in suburbia has space around it: shopping centers, offices, streets and highways. Vast parking lots are an obvious and dominant type of interstitial space, yet even parking lots are usually ringed by a front lawn of sorts, some kind of green to remind us of the pastoral foundations on which suburbia is built. Sometimes that in-between landscape exists purposefully as symbol, decoration or recreational space. Other times it is accidental: leftover or extra land created through the haphazard accommodation of growth and progress. Sometimes one type may be disguised as the other.

Differentiating between "place" and "in-between space" depends on the values of the observer. For some, particularly environmentalists, most of suburbia is in-between. Sprawl is perceived as negative space, void of culture, architectural identity or ecological significance.[29] This perspective is losing ground as it becomes obvious that horizontal urban growth is dominating American land development, and that suburbia is as varied and alive as any human settlement. From a land developer's point of view, the in-between may be any open space with economic potential. To a new urbanist, car-land is the in-between.[30]

Alan Berger's manifesto on *Drosscapes* examines the in-between as "waste landscapes left over from any form or type of development."[31] His use of the word waste automatically assigns a value to these left over spaces, but he does not immediately advocate for their salvage. He sees drosscape as something that accompanies growth, and therefore marks success as well as waste.[32] His analysis captures the nuances of valuing the in-between, but he only touches on its fractal nature: in-between spaces occur at every scale within human development, and at each scale there are infinitely fuzzy lines between purpose and interstice. Berger views the "horizontal

city" from the customary perspective: zoomed out, aerial, oblique. Assessing value from an airplane is poetic, but it means he only captures the vastest scales even while admitting that it is their small and fragmented nature that makes valuation so difficult.

The view is very different when in-between space is examined at the ground level. In particular, it looks at the front lawn of Route 1. Along the highway, in-between spaces are signified by patches of lawn. Their maintenance as such sends the message that they are there on purpose, but that purpose is only to hold the in-between. They are the landscape buffers called for in zoning setback codes, and the green carpets from which corporate office centers rise. They are utility right-of-ways and they are the traffic islands at every intersection. They are not dross, or waste landscapes. A decision was made to put each where it is. But it could (should) be argued that the resources used to maintain them are wasteful. Unlike the front lawnscape of traditional residential suburbia, these lawns are not to be occupied, in fact, they send the opposite message. The turfgrass along Route 1 marks places where neither cars nor people nor wildlife are supposed to be. In that sense, it truly is in-between.

The highway lawn is a distant relative of the pastoral ideals first introduced to Americans through Frederick Law Olmsted and Calvert Vaux's design for Central Park in New York City. The designers saw the pastoral aesthetic of open lawns and gently undulating curves as remedy for the social ills of industrializing cities. They translated the same English landscape values into nineteenth century suburban developments such as Riverside, Illinois. The greenness of suburbs quickly caught on as being synonymous with moral order and the trend stuck.[33] Decades later, the pastoral extended to early car-land, with the parkway designs of the 1920s and '30s. Landscape architects curved ribbons of roadway through the countryside, seeking to harmonize travelers into the landscape through scenery and smooth alignments. The parkways lay in wide

rights-of-way in order to separate the road from surrounding land uses and the "roadside blight" of businesses and advertising that accompanied more traditional highways, such as Route 1.[34]

Road designers began experimenting with twin roadways with a variable green median between them, in order to create the most comfortable horizontal and vertical alignments. Faster design speeds led to longer curves, and as traffic congestion began to pile up, grade separated intersections became necessary. New Jersey built the first cloverleaf interchange in 1928 on Route 1 near Woodbridge. Each improvement to parkway, and then freeway, mobility added greater speed by consuming more space.[35] With cars, we chose to exchange time for land.

Few roads built later in the twentieth century were designed with the care and attention to the landscape experience as the early parkways, since engineers were dismissive of the landscape architect's perspective and prioritized efficiency over scenery. However, since highways continued to take up space, the highway lawn became ubiquitous. For purely utilitarian highways such as Route 1, the pastoral has completely given way to the pastiche. Lawns so much dominate our landscape and our American identity that they are essentially negative space. We don't notice how much space car-land is taking up because the in-between spaces wear invisibility cloaks of turfgrass. Engulfed in the speed of cars, we become completely numb to the interstitial landscapes we pass. Richard Ingersoll makes a comparison to the cinematic montage. For the driver, images flash past in a disconnected series (even more so when you use your mirrors). He writes that landscape continuity is unimportant when seen from a moving car. American sprawl is fragmented into isolated structures surrounded by the in-between. We have become accustomed to both kinds of fragmentation: the views flitting past a car window and the piecemeal film montage. Both film and automobile entered our cultural consciousness at the same moment of the twentieth century and changed the pace at which we see.[36]

A drive along a pastoral parkway feels like a nostalgic escape to moral unambiguity. In contrast, the suburban strip is less clearly good or bad. The ambiguity of suburban car-land takes physical form in the in-between-ness of the highway front lawn. At first glance it communicates goodness, but a deeper look reveals waste. As we continue to give space to the car, the larger those in-between places—and the moral questions about suburbia that accompany them—will get.

## Car Companies Must Not Sponsor The Next "Futurama"

*"To solve the problem of soul-destroying traffic, roads must go 3D, which means either flying cars or tunnels."* – The Boring Company (C.E.O. Elon Musk) 2018[37]

*"I hear too much surrendering in the question about our future right now. Just surrendering to Google or Amazon, or surrendering to your phone, or surrendering to a driverless car. We should not surrender."* –Marshall Brown, Interviewed by Anna Weiner for the New York Times Magazine, November 8, 2017[38]


*Figure 8: Spaghetti Interchange of Interstates 495 and 95 north of Baltimore, MD.*
Norman Bel Gedde's vision for the future quickly became reality, in great part due to the popularity of Futurama. This interchange is a near-perfect match to those modeled in Futurama and described in Bel Geddes' 1940 book, *Magic Motorways.* Image via Google Earth, accessed March 19, 2018.

Norman Bel Geddes was a futurist who believed in speed as progress. In 1940, cars were already delivering "modern living and prosperity," making possible a "magnificently full, rich life."[39] He proclaimed, if only our highway infrastructure could fulfill that potential and release us from the bounds of congestion we could be propelled into the promise of the future. All through the 1930's Bel Geddes dreamed of speed. With his dreams came sponsorship. First from Shell Oil, then Goodyear Tire Company, and then General Motors. These companies were invested in the same vision: enable more cars and more miles on the road. Shell Oil commissioned Geddes to build a scale model of the city he imagined so they could use it for advertising. From this model came his inspiration for an immersive experience of his motorway-driven future. The resulting massive model of a future unrestrained by traffic congestion became the most popular exhibition and the 1939 New York World's Fair. Futurama was designed and orchestrated by Bel Geddes and sponsored and hosted by General Motors. It depicted a sweeping highway system that would allow the motorist complete freedom of movement and the peaceful, prosperous life that comes with it. Five Million viewers waited in line to see the spectacle and left with a pin that said, "I have seen the future."[40]

President Franklin Delano Roosevelt was one of those visitors. Inspired by what he saw, he asked Bel Geddes to consult on an initiative to create a comprehensive cross-country highway network. The 1944 Federal-Aid Highway Act bears many similarities to the highway network Bel Geddes displayed as part of the Futurama concept, including its elaborate, spaghetti-like interchanges (fig. 8). Within just a few years, a futurist concept for American mobility went from fantasy to built reality, and it was oil, tire and car companies that became global corporate powers thanks to the federal roadway investments that subsidized their growth.[41]

The following decades saw the arrival of many more cars, sprawling, car-centric development patterns, and more traffic congestion. Now, promises of a new transportation revolution

are once again within sight. Autonomous vehicle technology is developing feverishly. Robotized driving promises to relieve our roadways of inefficiencies caused by human mistakes and emotions, while also squeezing more vehicles onto the existing road space. Autonomous vehicles will connect and communicate with each other and with their infrastructure, promising to free time for passengers for work or leisure. Mobile information technologies compliment the autonomous vehicle momentum and already enable various models of vehicle sharing and mobility on demand. The frenzy of the tech world is palpable in this moment where the future is only limited by our imaginations.

The most vocal tech guru/mobility futurist is Elon Musk. Musk specializes in realizing the impossible. He makes bold claims and then follows through with theatrical productions of his successes. We are entranced by the rate at which Musk brings the future to us. In February 2018 his company SpaceX launched an extremely powerful high-payload rocket into space to great fanfare and 2.3 million live streaming YouTube views.[42] The test was to bring the company one step closer to a manned mission to Mars and convince his captivated audience that it is indeed possible. But the performance also serves as an extravagant commercial for his electric car company, Tesla. The test cargo was Musk's own personal red Tesla roadster. For four days following the launch, a live feed displayed dramatic spacescapes via the driver's view through the windshield (fig. 9). Musk uses the same showmanship and drama that Bel Geddes did in the 1930's. We have seen the future.

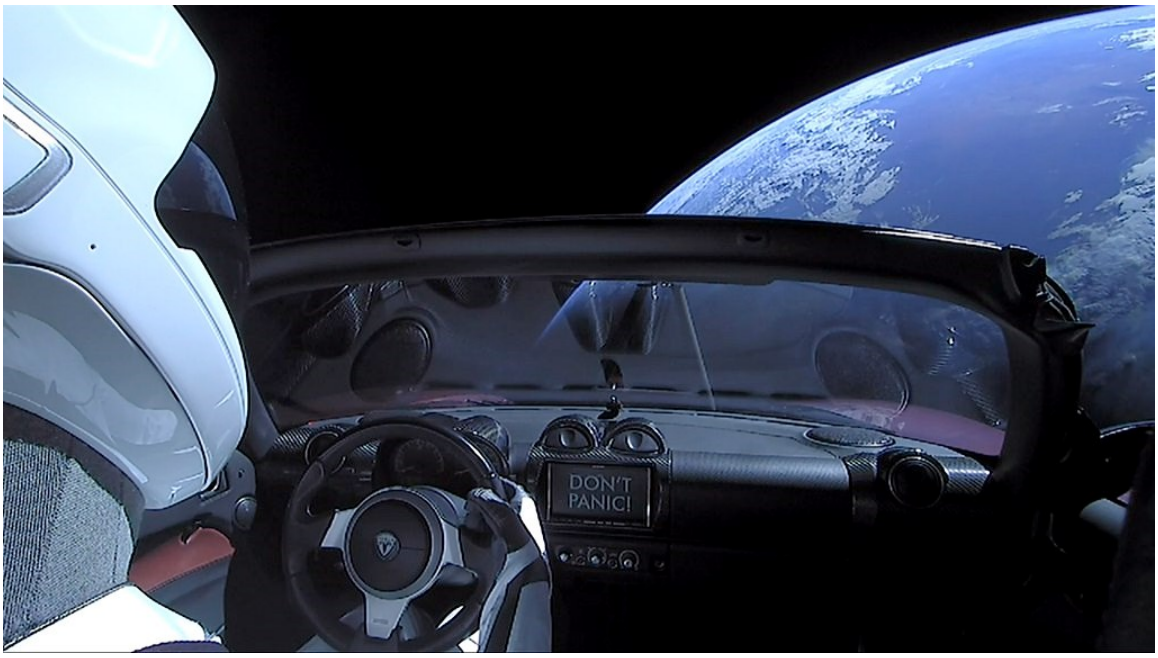



*Figure 9: The view from Elon Musk's Tesla in Space, February 2018*
Image via Wikimedia Commons, March 3, 2018.

Car companies market personal attachment to our vehicles as if the right car will become an extension of our body, making us personally faster, stronger and sexier. Elon Musk sells cars the same way car companies have sold cars for a hundred years: speed, adrenaline, sex. It should be no surprise that his vision of the future is a boyish fantasy of a red convertible in space. Another of Musk's current acts of seduction is a realistic video rendering created by his startup, The Boring Company. In a clip that could be mistaken for a scene from Minority Report, a city full of Teslas glide through a gleaming subterranean tunnel network perched on autonomous "skates", avoiding traffic congestion and emerging back onto the street on the other side of town.[43] Musk's appeal comes from how close he makes the future feel. Tunnels feel plausible because above ground, the city remains our familiar car-land. But if we all own Teslas (with or without tunnel infrastructure), we will perpetuate the twentieth century infatuation with cars that left us with major blind spots. This moment of mobility innovation should be used as an opportunity to completely reexamine our relationship to cars and thereby reshape car-land.

As stewards of the built environment, planners and landscape architects must not let car companies do all the innovation. Now that we have witnessed the potential of car-land to bring both prosperity and destruction to places like New Jersey, we can use that knowledge to craft a different future. Instead of waiting for the flashiest and most salable cars to be released and then floundering for the best way to accommodate them, this is our chance for the landscape to make demands of the technology. Our current road system was developed concurrently with the auto-mobile. As we realized cars could get faster, safer, cheaper and more reliable, highway engineers designed our roads with smoother curves and more capacity. Highway technology has not changed much since the 1950's, which is also the time the modern car reached the capabilities it has today. Almost no effort has been made by government at any level to mitigate the negative effects of cars on their surroundings by asking car design to change. Speed limits and occasional congestion pricing are about as far as we are willing to go, which doesn't stop car companies from marketing cars as personal devices capable of traveling over 120 mph.

Now we are at a watershed moment, where either car companies or cities can dictate how our roads will look and function. Our current road system has inherent failures that go far beyond traffic congestion. Roads are massive impervious surfaces that send polluted runoff into wetlands and waterways. They are ecological barriers, and they are dangerous and unpleasant to sit or walk next to. Curbside parking drains city resources, while providing essentially free storage for private property. They support sprawling development patterns. All these effects are unlikely to be vocalized by either Detroit or Silicon Valley unless new public infrastructure starts to make demands of the cars that use them.

Planners and design professionals are starting to pick up momentum and work toward this goal. They are hosting conferences and discussions about the implications of the "driverless city" and what role we will have as designers of the built environment.[44] The challenge is to make

the jump from passively cataloguing possible scenarios to designing and creating the future we want to see. The architect Marshall Brown, who leads the multidisciplinary Driverless City Project at the Illinois Institute of Technology, and Jeffrey Tumlin, a transportation planner at Nelson Nygaard, are two of the most eloquent spokespeople calling for this attitude shift. If they are heard, transit agencies will be designing our future landscape, so that transportation is shared, equitable and has a light footprint on our landscape. But they can only do that with a fundamental restructuring of political willpower.

That power shift—from private companies to public agencies—depends on disentangling our understanding of democratic freedom as it relates to cars. The fundamental confusion in the United States is whether our freedoms are best protected through complete deregulation or through hyper-regulation of the public realm. Cars occupy a messy middle place. Cars act like people and demand the same rights as people, but they depend entirely on publicly controlled, and funded, infrastructure to function. We expect complete autonomy of movement when we are in our cars and are therefore consistently unsatisfied when roads do not provide perfect freedom.

But the introduction of autonomous vehicles will change the relationship between car and infrastructure. The illusion that driving is freedom completely dissolves. Navigating a freeway with our hands on the wheel, we maintain the myth of our personal autonomy on the road. In the near future, we will willingly give that autonomy to transport machines and to the companies or agencies that control them. The vehicle will no longer be an extension of our body; it will return to its previous existence as a modernist tool. Taking that idea one step further, cars will no longer use infrastructure, they become part of the infrastructure. Perhaps that switch is all that is needed for the car to lose its romantic hold on American hearts.

When public agencies begin to treat cars as infrastructure, instead of people, the shape of our streets and car landscape can change dramatically. Car-land will have to be revalued in a framework that considers people and cars separately. The new infrastructure will need to prioritize equitable benefits for all people, and disregard the profit margins of private car companies. Suburban car-land stands to change the most from this reprioritization. Suburbia is an assemblage of car-shaped places, where mobility relies almost entirely on private car ownership. Private car ownership is not an equitable nor efficient use of public infrastructure, since it turns roads into subsidies for car companies, while excluding those who cannot afford a car and dumping negative externalities onto neighbors and the environment. It is up to public agencies, designers, and the public, to respond to the claims by car and tech companies that their command of the technology affords them the most progressive view of the future, by asking them look at the road, not the rearview mirror.

## Five Problems

I approach my analysis of Route 1 from the perspective of the driver. From the very beginning, I started with the assumption that the driving experience along this corridor is bad. I interrogated that assumption by comparing my own observations of the road to literature about roads, driving and landscape. The most influential readings were Boris Pushkarev and Christopher Tunnard's *Man-made America: Chaos or Control?* (1963), Lawrence Halprin's *Freeways* (1966), Donald Appleyard, Kevin Lynch and John Myer's *The View from the Road* (1966), Reyner Banham's *Los Angeles: The Architecture of Four Ecologies* (1971), Robert Venturi, Denise Scott Brown and Steven Izenour's *Learning from Las Vegas* (1972), Donald W. Meinig's essay "The Beholding Eye (1979)," Kevin Lynch's *Good City Form* (1984), John Brinckerhoff Jackson's essays "The Necessity for Ruins (1980," "A Sense of Place, A Sense of Time (1994)," and "Roads Belong in the Landscape (1994)," Allan Jacob's *Great Streets* (1995), Mitchell Schwarzer's *Zoomscape* (2004), and Richard Ingersoll's *Sprawltown* (2006). From these authors, I recognized that while my observations are admittedly based on a single perspective, they are still valid as such. I therefore allowed my assumption to hold true. I proceeded to investigate how the experience of being on Route 1 could be improved.

I employ three main methods of analysis: mapping, driving and walking. I used ArcGIS version 10.5.1 for geospatial analysis and map creation. I mapped land use and land cover, hydrology, topography (in plan and section), land parcels and intersections at a scale of 1 inch to ¼ mile. In addition, I created a figure-ground diagram by using LIDAR elevation imagery to select buildings and tree canopy and differentiate them from the ground plane. Viewing these maps relative to one another provided insight into the rhythms of the landscape as a whole (fig. 11). I supplemented these maps with Google Maps traffic data. I recorded the traffic levels, location of congestion and amount of delay at multiple times of day and various days of the week.

I drove the road as frequently as possible, at all times of day and night. My goal was to be at least as familiar with the road as a commuter would be. For the first few months of the project, I simply drove and observed. I then began taking the time to pull off into various parking lots and side roads to get out of the car and take photos. During the fall months, my analysis was more rigorous. I filmed the drives using a camera on the dashboard. I also recorded my speedometer as I drove the road in order to record the patterns of acceleration and deceleration. The combination of those two filming exercises allowed me to diagram and visualize the rhythm of movement in relation to the cone of vision for the driver: where was I able to stop and look around, and where did I need to be completely focused on the road ahead (fig. 10)?

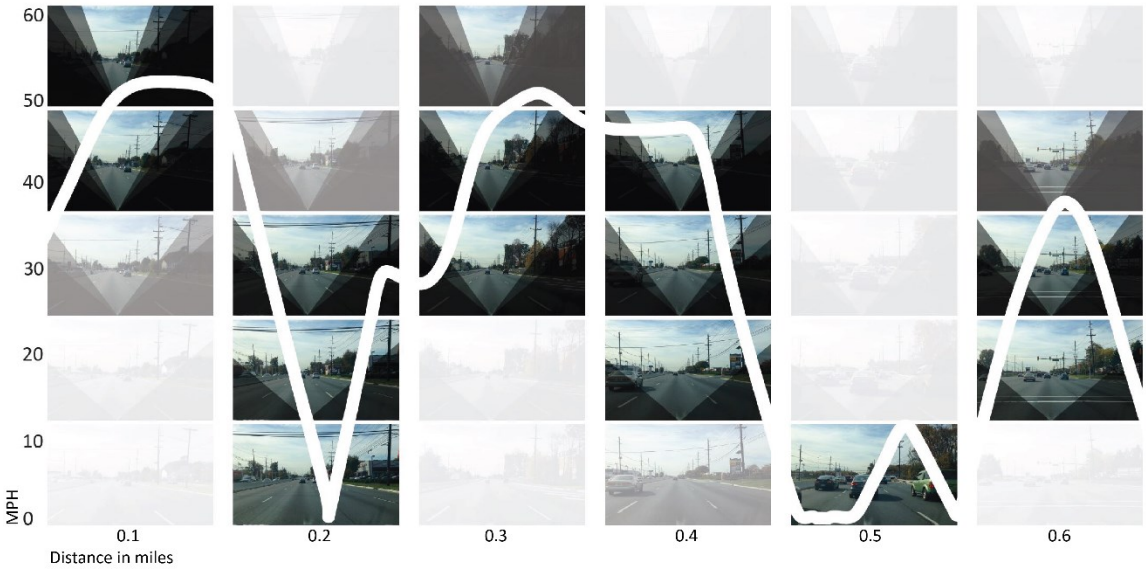



*Figure 10: Speed and cone of vision.*
This diagram samples the first portion of the journey driving north to south along Route 1. Using views captured from a video camera on the dashboard and data collected from filming the odometer, the diagram maps the speed of travel alongside the cone of vision of the driver. Wider angles are visible at slower speeds, while only a narrow cone is seen by the driver moving at 50 or 60mph. The angles are based on an analysis described in Tunnard and Puchkarev's *Man-Made America.*[45]

I found that that the most effective approach to understanding the road was to step out of the car and observe car-land as an outsider. I took two long walks of the site, spending the entire day within sight (or at least earshot) of the road. The walks allowed meditation on the relationship between human and car. I experienced speed, sound, scale and distance in a very different way than I did when I was connected to my car. I recorded both walks through photography, seeking to capture views and experiences one would only find on foot. I also stopped approximately every four miles to write freely about my observations. Those records can be found in Appendix A.

This process of questioning and reading, mapping, driving, walking, and writing led me to five problems that need to be solved through design. They are discussed below within the framework of the theory of life in car-land I present in the preceding chapter.

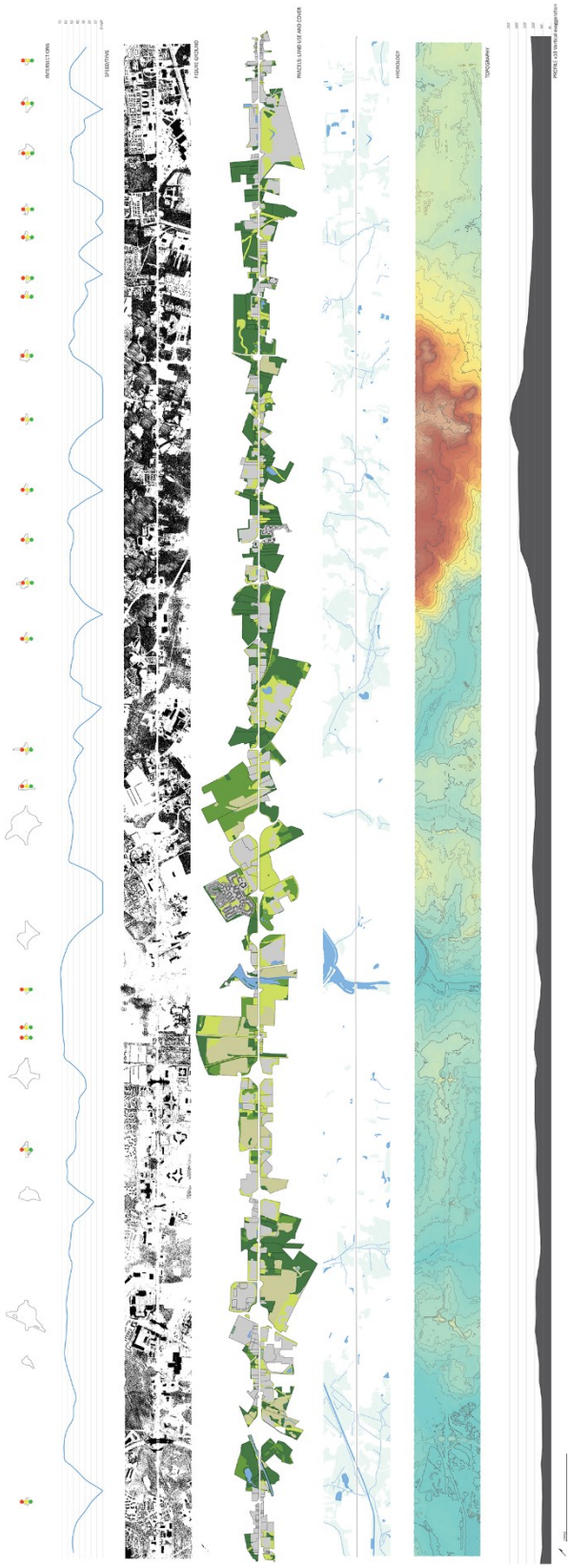


*Figure 11: Diagrams of Route 1*
From top to bottom: Intersections, speed/time, figure ground, parcels and land use, hydrology, topography, elevation profile exaggerated x10.

## It's Straight

*Figure 12: A car's eye view.*

Route 1 is straight. The Trenton and New Brunswick Straight Line Turnpike was aligned before the speed and acceleration of a car was even a thought. The two cities are a long day's travel by foot, so there was no reason to add distance with curves. The straight line is utilitarian as a road, but it does not bring joy. The landscape of the car should be dynamic, with changes in experience that communicate the traveler's progress. Curves create interest and the sensation of motion. When parkways were first designed by landscape architects, they emphasized dynamic movement using a combination of technology and picturesque cinematography.[46] Views were strategically hidden and then revealed around each curve in the road. On a straight road, movement is difficult to perceive, and the landscape's changes are more subtle.

Environmental psychologists Rachel and Stephen Kaplan developed a matrix of landscape preference based on landscape characteristics and the sensation that accompanies them. The matrix is illustrated below.[47]

Preference Matrix

| | Understanding | Exploration |
|---|---|---|
| 2-D | Coherence | Complexity |
| 3-D | Legibility | Mystery |

*Figure 13: Rachel and Stephen Kaplan's Matrix of Landscape Preference.*

2-D perception is understood immediately when looking at a landscape (the static), while the 3-D is inferred from imagining oneself within it (the dynamic). A successful landscape finds a balance within this matrix, perhaps skewed one way or another, depending on the role of the landscape. On a road, 3-D perception is especially important, because the traveler quickly becomes a part of the landscape they were just observing. Therefore, a good road balances legibility and mystery. A straight road is coherent, but it is not particularly legible because curves serve as landmarks, signaling progress. A straight road also lacks the mystery that comes from the anticipation and then reveal of rounding a bend.

The boredom derived from that lack of mystery is aggravated by physical causes of hypnosis and sleep induction. In their 1963 book, *Man-made America: Chaos or Control?* Boris Pushkarev and Christopher Tunnard diagram the cone of vision at various speeds. As a driver moves faster their peripheral vision shrinks, so that all focus is directly in front of them. At the same time, that focus must both increase and recede further into the distance in order to be prepared for the road ahead. This combination of distant focus and tunnel vision reaches a critical point at about 60 mph. As they write, "unless the point of concentration is made to move around laterally by means of a curvilinear layout of the road, driving along an uneventful highway may become as hypnotic as gazing into a crystal ball."[48] Route 1 is not an uneventful highway because

of the frequent traffic lights along its length. But, if traffic engineers and commuters had their way, and Route 1 got faster and more efficient, the unbroken landscape of the straight road could be hazardous as well as monotonous.

Without framed views around curves or prominent landmarks[49] marking progression through space, the most interesting moments along the road are the long views of the road ahead that are revealed upon cresting a rise, such as at Sand Hill Road. Those views accentuate the straightness, with a receding disappearing point on the horizon implying the road will go on forever. At either end of the straight line, there is a curve and a ramp as Route 1 continues north and south, bypassing the downtowns of both Trenton and New Brunswick. The driver accelerates up and out in relief. It feels like being in a plane taking off into the air after taxiing a runway for miles.

## Cars

Route 1 is unpleasant because it is full of cars. Alone, a single car can have romance, beauty and potential in its smooth lines and powerful engine. But in a crowd, the allure of a car is lost. The mass of cars on Route 1 is loud and smelly, and even the Federal Highway Administration admits they're an eyesore, assessing all major road improvements for their visual impact.[50] Driving the road is stressful and isolating, walking it is dangerous, and riding a bicycle is impossible, all because of cars. Driving often brings out the worst in us. The car commute is soul-sucking. It is often lonely (over 76% of American commuters drive alone[51]) and frustrating. The commuter is likely in a rush and so are all the other commuters. We cut people off and swear rudely at them.  Being in a car makes us willing to do things we would never do in person.

Route 1 is not a limited access highway. Homes and jobs exist along its length, which means people will try to reach those places however they can. However, cars prevent all but the bravest or most desperate from walking or biking. Occasional sidewalks line the edge of Route 1 in front of certain businesses. Linking those halfhearted paved paths are narrow tracks worn into the dirt, the desire lines of people walking the highway (fig. 14). The rushing sound of cars passing by is overwhelming, making the walk unpleasant. And at intersections, crossing on foot not only unpleasant but also dangerous. Pedestrians are so out of scale with the cars that they must have complete deference or risk being killed. Bicycling along the side of the road is an even greater risk, because of the way cars weave on and off the highway. But I see people attempt to bike it as well.

*Figure 14: Desire lines and sidewalk fragments.*

Lastly, cars are demanding. Their needs preempt all the choices we make in the suburbs. Even simple decisions, such as where to go out for dinner may be dictated by the parking available. Meanwhile, big projects make huge demands of car-land. The interchange at College Road is a good example of that. When a developer proposed Forrestal Village, a "walkable" outdoor mall at that intersection in the mid 1980's, projections predicted an increase of 5,000 cars daily. A dispute and lawsuit ensued, with localities, neighboring offices and the Department of Transportation demanding the developer pay for a grade separated interchange so that congestion would not strangle the area.[52] They succeeded, and the resulting interchange is the largest along the corridor, consuming over fifty acres of land. The mall has since floundered, and thirty years later, the massive, intersection still feels over-engineered.

*Figure 15: A road to a field. The car is ensuring a place for itself in the future.*

Cars continue to assert their dominance. Along Route 1 there is evidence of the car giving use to its own needs. Interchanges such as College Road and Beekman Road are unnecessarily large, installed in anticipation of predicted traffic that never came. Curb cuts and the beginnings

of roads and driveways dissolve into farm fields, as if to lay a claim for future car land (fig. 15). Cars rule with fear. We are afraid of a frustrating driving experience, we are afraid of not being able to find a parking space, and we are afraid of being killed. Grade separated interchanges, parking lots, and sidewalks acquiesce to that fear. Route 1 compounds our fear of cars because we try to treat its symptoms, instead of finding a remedy for its cause.

## Sense of Time – Rhythm

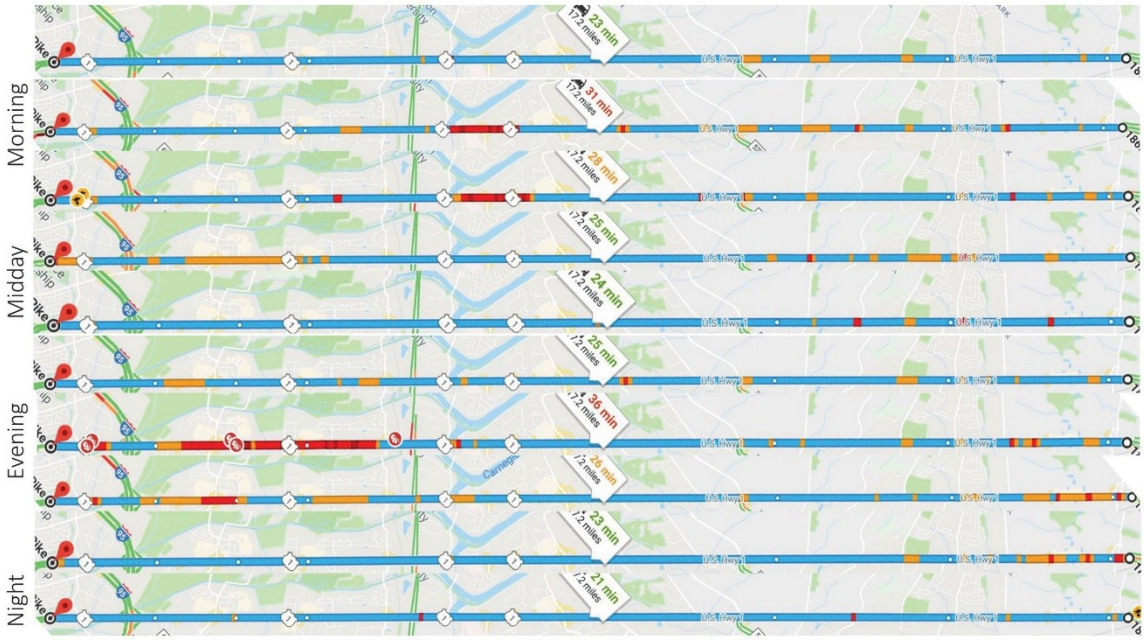



*Figure 16: Survey of drive times and points of congestion throughout the day.*
I took screen captures of the exact same drive, from north to south, across many days at various times. The images above are not all from the same day, but they reflect the general trends. At the peak of rush hour, traffic can add up to 15 minutes (or 50%) of the drive time. Usually, traffic adds 5-10 minutes. Google perceives the routine stops at traffic lights along the northern half to be traffic congestion. Drivers seem to have a similar perception. The problem with trying to model traffic on this stretch of road is that the points of congestion are constantly changing sue to the traffic lights. Google models rush hours as all orange, and non-rush hours as all green, an oversimplification of a road that has stops and starts at all times of day.

When people complain about driving on Route 1 (and everyone I talk to does), they complain about the traffic and the traffic lights. Traveling the corridor, the driver is conscious that they may have to stop at any moment. North of Princeton, there are traffic lights approximately every half mile, though often closer, sometimes further. Unlike a Manhattan avenue, where the lights are even, coordinated, and in sync, the traffic lights along Route 1 are unpredictable. In one moment everybody may be moving at 60 mph and then suddenly all shuffle to a stop. The lights give priority to Route 1 traffic over the traffic on east-west cross streets, and yet on a bad day a driver might find themselves stuck behind the same light for two cycles, or having to stop at three red lights in a row. South of Princeton, most (but not all) intersections are grade-separated, where interchange happens at high-speed. But traffic here still piles up. In fact, it seems that the mandated moments of traffic settling at the northern intersections prevent some of the more chaotic snarls that plague the stretches designed for uninterrupted speed toward the south.

The stopping and going is frustrating. Drivers are in a machine for going, on a wide road that looks like it is made for going, and yet they keep stopping. Adding to the frustration is that it feels nearly impossible to predict where or how often or for how long traffic will accumulate. The road currently serves as both an inter-regional corridor and a local land access road.[53] Near-constant entrances and exits cause curbside friction and sudden lane changes. Even considering the regularity of twice daily commuting peaks, Route 1 is arrhythmic. Driving along the road the sensation of time is stretched and condensed without pattern. Anxiety to pass through the next light or make up lost time causes erratic driving. Cars weave and tug like dogs on a leash.

J.B. Jackson describes the importance of rhythmic events in American's understanding of place. Unlike in Europe, he says Americans associate "a sense of place not so much with architecture or a monument or a designed space as with some event, some daily or weekly or seasonal occurrence which we look forward to or remember and which we share with others..."[54] Like

much of American suburbia, this long straight stretch of Route 1 has few landmarks to immediately differentiate it from other places. Jackson says that it is our sense of time that brings comfort and familiarity to otherwise placeless places. In a landscape of motion, such as a highway, even the sense of place and sense of time is not as important as the *sensation* of time, and the subsequent *sensation* of place. Traveling along a highway, the experience of movement is dominant, whereas experience of location is secondary. Motion is a feeling.

Comfort in the landscape is derived from orientation in time, or, as Kevin Lynch describes, "the deeper emotional sense of how the present moment is linked to the near or distant past and future." He continues to say, "Since our internal representation of time is poorer than our internal representation of space, we are more dependent on external clues to keep us temporally well-oriented."[55] The stops and starts of Route 1 are just as disorienting as its lack of distinctive landmarks. Whatever the time of day, sitting at red lights gives the impression of traffic congestion. Traffic does get bad on Route 1, but even at its most rainy-day rush-hour congested, it only takes about ten minutes longer to travel the length of study area than it does at its most open. Most of the time, traffic adds three or four minutes to the travel time, but it's hard to predict when that won't balloon to ten (fig. 16).

Twenty additional minutes of driving every day adds up. That's about three and half days every year spent sitting in traffic, not to mention the cost of gas for an idling vehicle, and the stress of worrying about being late to work. The Texas A&M Transportation Mobility Institute puts the total national cost of wasted time and fuel due to traffic congestion at $160 Billion.[56] Recognizing the problems caused by congestion on Route 1, planners have performed extensive studies, including horrific projections of traffic yet to come as the region develops further (fig. 17).[57]

Traffic congestion along Route 1 is problematic for its own sake, but it is particularly frustrating for being unpredictable. Driving Route 1 during rush hour is a bit like gambling with time. Drivers using Route 1 wish to traverse it as quickly as possible, and any hindrance is uncomfortable and disorienting. Efforts to ease congestion are repeatedly made in vain. An alternative solution may be to give the stops and starts a rhythm and joy of their own. One way to treat congestion is to reorganize its experience so that it has a grounding effect and time is sensed in a legible way. Congestion feels less paradoxical when it doesn't feel like sitting still on a highway.

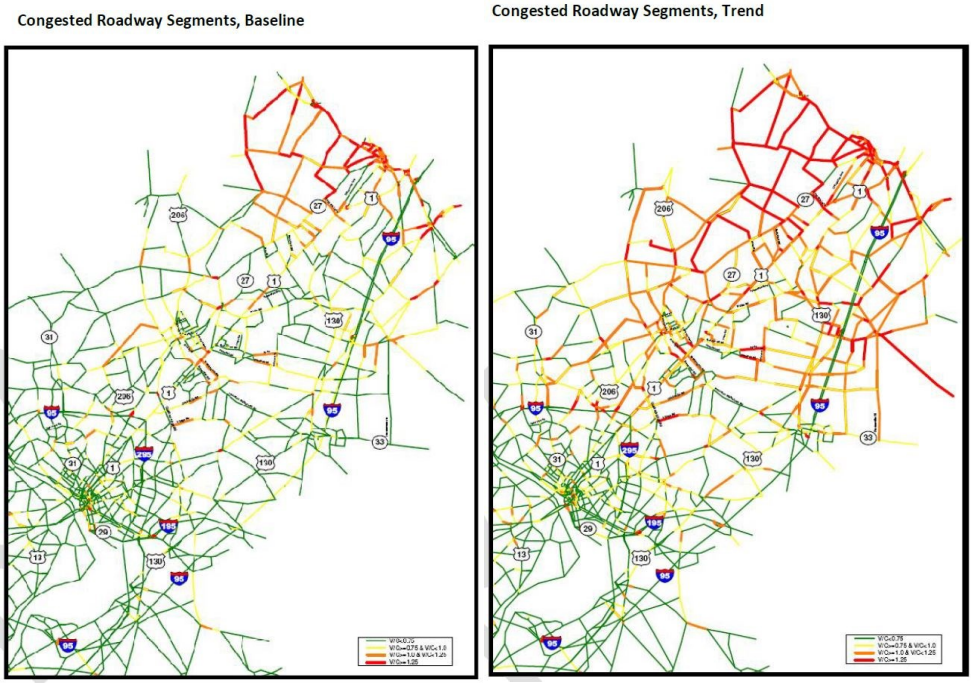



*Figure 17: Baseline and predicted 2025 roadway congestion as shown in the 2010 Route 1 Regional Growth Strategy Report.*

These models were performed by the Delaware Valley Regional Planning Commission and the New Jersey Transportation Planning Authority based on projected increases in housing and jobs in the region.[58] Traffic is shown to be particularly dire in the northern segment of the road, which does not reflect my own observations. Traffic models are often confounded by traffic lights, which likely make the congestion here appear worse than reality.

## In-between Spaces

*Figure 18: Route 1's front lawn.*
On Route 1, turfgrass indicates places neither cars nor people should occupy. It is in-between space.

The segment of Route 1 is an in-between space that contains smaller in between spaces. Zoomed out, looking at the satellite imagery of the New York and Philadelphia metropolitan regions, grey urbanization spreads out from both and then narrows into a spindle along Route 1. Between Trenton and New Brunswick, that line is at its most slender, interrupted with moments of green (fig. 19). The road is in between two small cities in between two large metropolises. Contained within the corridor, forest patches and farm fields remain in between developed land. Within and between parking lot landscapes are curb-contained plantings of lawn and trees, and between the corners and edges of those green islands accumulate pockets of debris, in which weeds grow when their roots find space in between pieces of gravel.


*Figure 19: Green between outreaching urbanization along Route 1.*
Satellite image source: Google Earth 2018.

In these nested in-between landscapes, one scale is codified. Zoning codes in the five municipalities along this corridor call for landscape buffers between roads and parking lots, between roads and buildings, and between buildings and buildings on other parcels. The use of green

space to screen suburbia from itself is a definitive characteristic. It also creates a lot of space that exists only for the sake of being green. Grassy berms weakly and redundantly hide parked cars from drivers in those same cars. Wide setbacks (the smallest allowed setback is thirty feet, but most of the zones require 100-125' of setback from Route 1) create what are essentially front lawns for commercial buildings along the corridor (Fig. 18). Parking requirements and their accompanying stormwater management create even more separation between buildings and the road. All of this mandated landscape perpetuates a car-based environment because the spaces between buildings are too large to feel comfortable walking across.[59]

With car-scaled distances between everything, the entire landscape becomes car-shaped. The more cars there are, the larger car-land becomes. The in-between spaces that separate the road from other parts of the road are perhaps the most incidental. The most compact intersections on Route 1 have just one small jug-handle of in-between space. The largest have four spiraling clover leaves and a series of accompanying triangles, so that the car can maintain a speed of 25 mph as it enters or leaves Route 1. These highway front lawns with their soggy turf grass are ideal for Canada geese, and not much else.

## Sense of Time - Change

*"Slow drifts make us uneasy, but this unease can be dealt with, not merely by the illusory devices of physical stability, but also by training people to perceive the change that encompasses them…. Change has its own constancies… designers might strive to make those constancies more legible in the environment, without incurring any sacrifice of adaptability."* - Kevin Lynch, *Good City Form*[60]

*Figure 20: Real estate signs along Route 1.*

One word to describe this stretch of Route 1 is "available." Real estate signs dot the roadside with an impressive frequency: 'available retail pad,' 'available 10 acres,' 'office space available for lease,' 'available five acres commercial,' 'available approved shopping center site,' 'luxury townhomes available,' 'available will divide,' '60,000 sq feet available.' The corridor is in wait, ready for what the future brings (fig. 20). The 17.2 mile corridor is incongruent. Vacancy cohabitates with investment and new construction. A field sits empty ten years after being graded and readied for development. Storm drains and fire hydrants grow weeds, while glass aggregate erodes off asphalt roads, abandoned before they were sealed. Nearby, glowing red circles mark the opening of two gleaming Target department stores within six miles of each other. Empty office buildings decay, while new ones fill with tenants. The whole area is in constant yet directionless and uncertain transition. It is in a temporal in-between space.

Kevin Lynch writes about the inconstancy of some places in *Good City Form*. In his terms, Route 1's availability makes it an adaptable place. It is in flux. Some level of flexibility is essential in a place, but he writes that adaptable places can be "characterless and disorienting." While people have different levels of tolerance for change, a drifting landscape generally makes people

uneasy. He writes that "one may compensate for the psychological ambiguities of a shifting landscape by establishing fixed symbolic landmarks."[61] Ideally, places would achieve a balance between adaptability and resilience so that the landscape is comfortable and non-threatening, while still allowing for experimentation and progress. However, for truly changeable and adaptable landscapes, it may be just as effective to make the existing change legible to the observer. Change that is understood as a constant, or made clear through a rhythm of events, creates its own stability.

Route 1 epitomizes an uneasy, shifting landscape, one in which change appears haphazard. While the quasi-cyclical patterns of development and abandonment feel illegible, it is this same adaptability that will allow it to participate fully in whatever New Jersey's economic future brings.[62] The economic dynamism of this corridor depends on available space and on access to that space. Currently, the traffic on Route 1 dominates conversations about land use, since all decisions must be weighed against the amount of congestion they may bring to this already overcrowded corridor. Planners made various efforts in recent decades to plan for land use and traffic together. Major NJ Department of Transportation congestion studies of the corridor started in 1984, when office park saturation would have been at its height. What followed was a string of feasibility studies, plans, and strategies for the implementation of various roadway "improvements" through the 1990s.

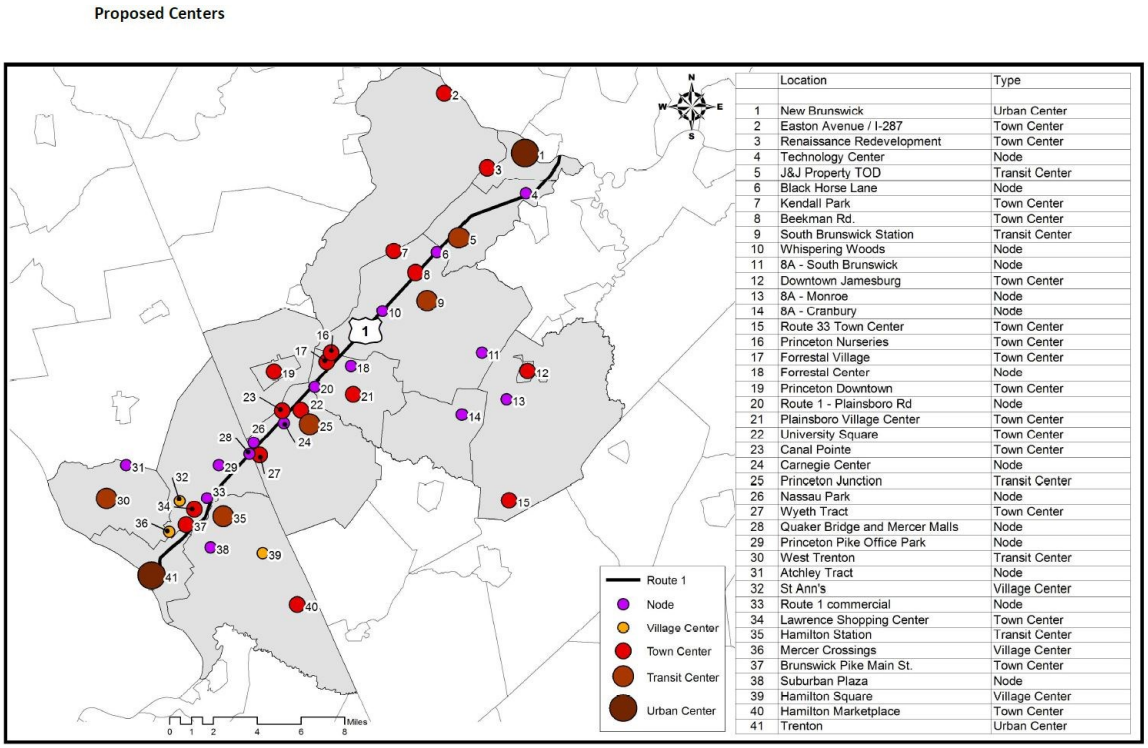
Certain areas are too complicated to easily insert sweeping highway ramps into the landscape. One of the most problematic is where County Route 571 crosses Route 1 at a historic settlement called Penn's Neck, between Princeton and West Windsor. Proposals for an overpass at that intersection—one of notorious traffic jams—led to a Congestion Management System report in 1998 to analyze whether increasing vehicle capacity was warranted. That study showed

that no commitment to alternative transportation would reduce single occupancy vehicle demand enough to keep the intersection as it was, and that an overpass must be created. It also suggested the creation of a Central Jersey Transportation Forum (CJTF) to coordinate between various agencies and levels of government in order to solve the larger issues surrounding traffic in the area. The CJTF oversaw the assembly of an environmental impact statement for the Penn's Neck Improvements, which involved a multi-year public outreach process and ballooned to over a thousand pages. The resulting report, released in 2003, was so delayed and unwieldy that no physical changes ever came to the intersection.[63]

Instead, the Central New Jersey Transportation Forum has continued to meet on a thrice annual basis and over the following nearly twenty years watched their scope become increasingly complicated and unmanageable. The Penn's Neck EIS suggested that Bus Rapid Transit (BRT) was an unfeasible and ineffective response to traffic problems. However, in the following year, the CJTF initiated a BRT feasibility study that concluded that BRT was the solution.[64] Twelve years later, implementation of BRT is still on the CJTF to-do list,[65] and the New Jersey Transit website simply states that the next step is to "identify the configuration of the initial phase of the BRT system."[66] Meanwhile, as a compliment to the BRT study, the CJTF initiated and released the "Route 1 Regional Growth Strategy," a plan for development of the area based on smart growth principles, based on the idea that more coordinated and condensed land use strategies will reduce traffic congestion because people will live closer to their destinations. Their land use vision simply puts circles around existing development and calls them nodes (fig. 21). It then connects them with the BRT system and suggests that municipalities make sure their zoning codes match the nodes (fig 22).[67] In a nutshell, no dramatic changes can be expected soon.

So, thirty-four years of studies, strategies, forums and plans have led to some larger intersections and not much else. Part of the problem is that in an attempt to be comprehensive,

the studies become so complicated that by the time they are completed, the political willpower that initiated the study has been replaced by a new administration with a different set of priorities. Another problem is that with New Jersey's governance is so intensely localized, that even this small study site comprises two counties and five municipalities, each with their own master plan and zoning code. That leaves the state government to make any comprehensive regional actions, but they are relatively powerless, because New Jersey is a home rule state, and funding for its transportation agencies is currently minimal.




| | Location | Type |
|---|---|---|
| 1 | New Brunswick | Urban Center |
| 2 | Easton Avenue / I-287 | Town Center |
| 3 | Renaissance Redevelopment | Town Center |
| 4 | Technology Center | Node |
| 5 | J&J Property TOD | Transit Center |
| 6 | Black Horse Lane | Node |
| 7 | Kendall Park | Town Center |
| 8 | Beekman Rd. | Town Center |
| 9 | South Brunswick Station | Transit Center |
| 10 | Whispering Woods | Node |
| 11 | 8A - South Brunswick | Node |
| 12 | Downtown Jamesburg | Town Center |
| 13 | 8A - Monroe | Node |
| 14 | 8A - Cranbury | Node |
| 15 | Route 33 Town Center | Town Center |
| 16 | Princeton Nurseries | Town Center |
| 17 | Forrestal Village | Town Center |
| 18 | Forrestal Center | Node |
| 19 | Princeton Downtown | Town Center |
| 20 | Route 1 - Plainsboro Rd | Node |
| 21 | Plainsboro Village Center | Town Center |
| 22 | University Square | Town Center |
| 23 | Canal Pointe | Town Center |
| 24 | Carnegie Center | Node |
| 25 | Princeton Junction | Transit Center |
| 26 | Nassau Park | Node |
| 27 | Wyeth Tract | Town Center |
| 28 | Quaker Bridge and Mercer Malls | Node |
| 29 | Princeton Pike Office Park | Node |
| 30 | West Trenton | Transit Center |
| 31 | Atchley Tract | Node |
| 32 | St Ann's | Village Center |
| 33 | Route 1 commercial | Node |
| 34 | Lawrence Shopping Center | Town Center |
| 35 | Hamilton Station | Transit Center |
| 36 | Mercer Crossings | Village Center |
| 37 | Brunswick Pike Main St. | Town Center |
| 38 | Suburban Plaza | Node |
| 39 | Hamilton Square | Village Center |
| 40 | Hamilton Marketplace | Town Center |
| 41 | Trenton | Urban Center |

*Figure 21: Proposed Growth Centers from the 2010 Route 1 Regional Growth Strategy*

The Regional Growth Strategy report takes existing concentrations of homes, employment, or both, along Route 1 and proposes that they be centers of growth in the future.[68] The circles in the diagram belie the fact that growth in so many "centers" would quickly overlap and continue its current direction toward linear, centerless development.

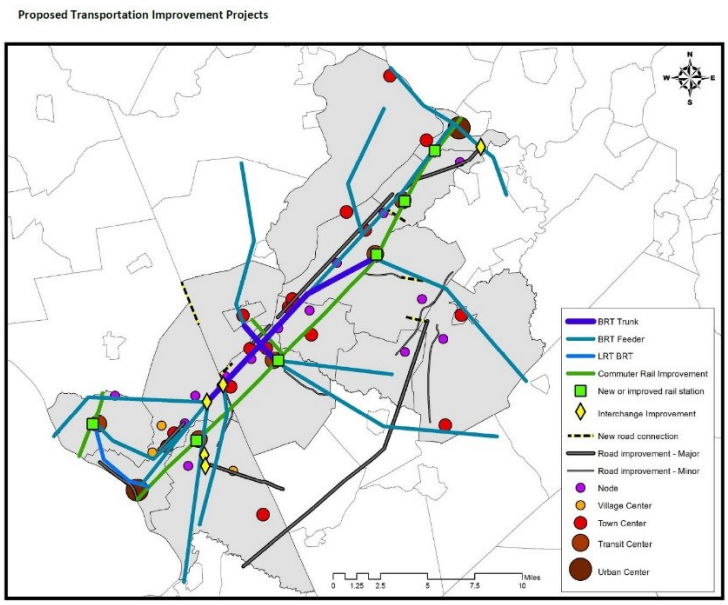



*Figure 22: Proposed Transportation Improvement Projects from the 2010 Route 1 Regional Growth Strategy*

The report connects the proposed nodes with a complex proposed transportation system that still leaves large swaths of developed land in the region unserved by mass transit.

While politics is an important reason why no action comes from regional planning efforts, there is also a fundamental problem with how Planning (as a discipline) plans. Transportation and land use planning reports such as the ones addressing the Route 1 corridor are essentially predictions and inferences based on current conditions and projected trends. In an attempt to be as rational as possible, they must assume that what already is determines what is to come. There are three dangers in that approach. First, attempting to quantify the intricacies of current conditions leads to plans that are so complicated nothing happens. Second, since metrics can be unreliable, and neither current conditions nor the future are entirely rational, the projections will be wrong. Those projections lead to plans that become irrelevant or problematic. Thirdly, plans made this way are often so boring that nothing happens simply because no one is inspired. Route 1 planning efforts up to now are some combination of the three: complicated, wrong and boring. And so the landscape continues to waver.

The truth is, we don't know what the future will bring. We do know that all the built forms currently existing along this adaptable, available corridor are up for discussion. Many are

already approaching obsolescence. Smaller retail structures are emptying while global conglomerates erect bigger-boxed proprietary architecture. Retail trends are short-lived. Office centers are likewise subject to trends. A 2016 report found that in nearby Parsippany New Jersey, 77% of the township's office inventory is "incurably obsolete," with nearly one third of the space available for lease.[69] Suburban office building vintages can be classified into pre- and post-spreadsheet, where older facilities are simply not designed for modern workflows and therefore require major upgrades.[70] Some buildings were valuable enough (in either design or location) to make the transition, others are essentially abandoned. The start of the 21st century saw a decline in employment in New Jersey for the first time since jobs were recorded.[71] In response, a newer trend divides newer offices into "me" spaces—those designed for baby-boomers who base status on personal office size—and "we" spaces—those designed for younger generations looking for more vibrant and collaborative work environments.[72] The economic face of suburbia is changing, and its built form will change too.

This constant flux is an opportunity for designers to dream and create, and to think experientially instead of rationally. While planners infer scenarios, designers invent them. In a place with as much dynamism and potential as the Route 1 corridor, change that wafts on the whims of political cycles will never make a comfortable place. Instead of waiting for car-land to follow the rational rules of development, legibility of change can be achieved through radical reimagination.

# Freeing Space

*"I feel the time has come to make a distinction between the viaduct architecture of the car and the architecture of man's activities. The tendency of designers to combine the two architectures in a simple design has confused the direction of planning and technology."* – Louis I. Kahn, 1962. *Notebooks and Drawings*.[73]

## Flyways (Infrastructure)

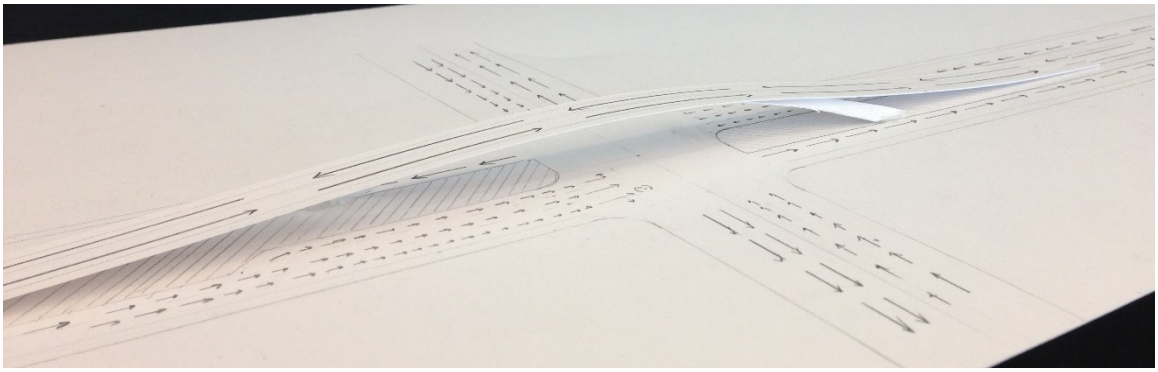


*Figure 23: A flyway with proposed traffic flow*

At the heart of this design is separation. Life is separated from driving. The sensitive, or slow moving, separates from the insensitive, or fast. True freedom (autonomy), detaches from the illusion of freedom (speed). The future is disentangled from the present to make landscape change legible. Frederick Law Olmsted and Calvert Vaux introduced the separation of uses into American landscape architecture by using bridges in their Greensward plan for Central Park. Pedestrians, carriages and cross-traffic navigated the park on separate paths, each with their own uninterrupted sequence of movement, and carefully choreographed views.[74]

In emulation of Olmsted and Vaux, two separate but parallel roadways separate uses along Route 1. Through-traffic occupies a central roadway and moves north or south as quickly as

possible. Through-travelers bypass each intersection by way of a flyway—a bridge that elevates the roadway up and over the turning traffic below (fig. 23). The flyways allow for uninterrupted north-south travel. Flanking the fast lane are local lanes. This outer roadway is a service road for land access. Travelers enter and exit the local road at will. Signalized at-grade intersections control turns and crossings under each flyway. This new configuration shrinks the footprint of the road from its current width of around 100', to an average of 75', creating more space for bicycles, pedestrians, and trees. In addition, the slow lane is a buffer between the fast lane and the uses on the side of the road, allowing for safe inclusion of bicycle and pedestrian pathways.

Interchanges between the central through lanes and the outer local lanes occur between the intersections at designated weave points (fig. 24). Humans are not particularly good at the weaving and merging required at these points, and so the use of the fast lane calls for computer-controlled, or autonomous, driving. The new infrastructure relies on autonomous driving (a technology that exists today but is not yet widely disseminated), and it also instigates its adoption by offering a fast, smooth trip up and down Route 1. Car-land will shrink and become better only by making requests of the emerging technology. In that vein, personally owned autonomous vehicles will do little to ease congestion, reduce emissions or reduce parking demands.

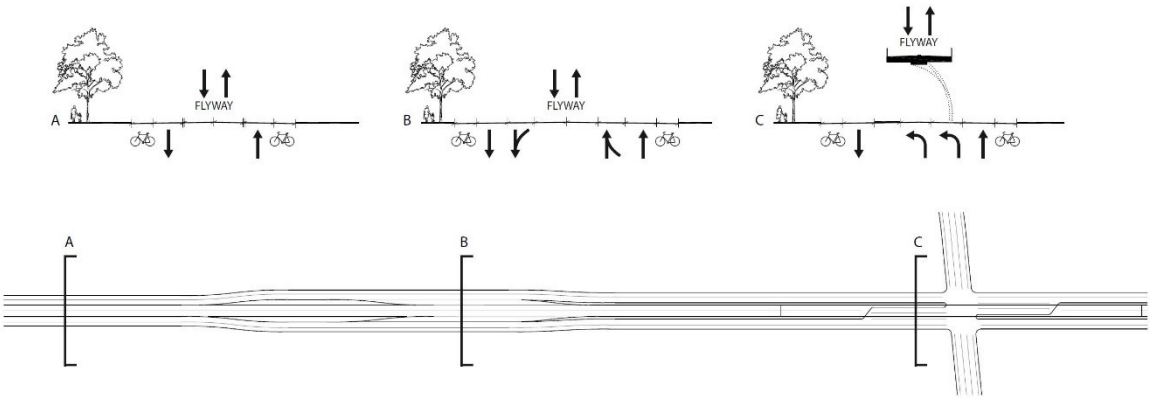



*Figure 24: Sections and Plan demonstrating the three reconfigurations of Route 1*
Section A shows the configuration of the road most of the time. Section B demonstrates the road at a weave point, and section C shows the configuration at an intersection, with the flyway above.

The fast lane will not allow privately owned single occupancy vehicles. Instead, this prioritized lane incentivizes New Jersey's transition away from the private car. The fast lane is limited to use by forms of "aspirational" transportation, whether that be subscription-based shared autonomous vehicles, mass transit, or something else yet to be developed. These vehicles must have autonomous capabilities in order to efficiently use the central roadway, which is only a single lane in each direction. They must be able to drive close together, and abide by speed regulations exactly. In addition, the aspirational vehicles should operate communally—communicating with one another and making choices that benefit not only a single vehicle, but that minimize congestion for the entire community of vehicles on the road.

Counterintuitively, it is likely that one of the reasons this section of Route 1 currently has so many traffic problems is that it is a straight line connection. In 1968, the mathematician Dietrich Braess published a paradox where if every vehicle on a network takes the route most beneficial to itself, less-than optimal travel times will ensue for everyone. That part seems clear enough. The paradox is that additions to the network designed to increase efficiency often have the opposite effect, making the network function worse as a whole because drivers will selfishly choose the new route, instead of spreading across the network.[75] This effect is why adding lanes to a highway often has the reverse of the intended effect, and why closing Broadway in Times Square, New York City, had no negative impact on Manhattan traffic as a whole.[76] Route 1 is perceived (by both human drivers and traffic algorithms such as Google Maps) to be the best route because it is the most direct. In that way, there is a good chance that it is causing the entire network to function less than optimally, and adding more lanes in its current configuration may only make it worse.

Depending on how close together autonomous vehicles can drive, this design either shrinks the capacity of the roadway, or keeps it about the same. The major difference to improve

flow is that the fast lane, perceived to be a direct link between A and B, will only be used by vehicles that are programmed to make communal, not selfish, choices. It is essentially transit infrastructure, not an open road. In addition, travelers can look ahead from the top of each flyway to assess the congestion ahead and make choices based on what they see. The ground plane is designed as a leisurely local road, with low speed limits and frequent stops. It will not be perceived as a direct connection the way the Route 1 is now, with its multiple lanes and high speed limits. When human and computer perception of Route 1 changes, the flyways will improve the efficiency of the entire road network. However, efficiency alone may not be sufficient to wean the New Jersey driver off their personal automobile. The experience of new transportation modes will have to be significantly better than the status quo. To this end, the flyways are a key element in improving the experience of travel along Route 1.

There is pleasure in the kinesthetic sensation of moving in a vehicle. The acceleration felt around smooth curves or over gentle rises and dips is particularly enjoyable. Without those experiences, on straight or flat roads, it can feel as though one is hardly moving at all, especially as a passenger.[77] Route 1 is both straight and relatively flat. Compounding that, landmarks are few and unevenly spaced. Currently, the experience of motion is only derived from the unpredictable and jarring acceleration and deceleration due to traffic and traffic lights. In the new design, that halting discomfort is replaced by continuous travel. It is important to this design that the traveler be aware of their motion. Motion is experienced over the rise and dip of the flyways—enough to recognize that one is moving across space in a vehicle. The sensation will be rhythmic and noticeable, and it will be sensed both visually and kinesthetically.

Approaching the apex of a flyway has the same anticipatory feeling one feels before rounding a bend in a curving road. The traveler knows the road will continue and something will be revealed, but can't see it yet. There is security but also mystery. Then at the top, a view opens

up. The long straight road stretches out in front. Flyways yet to be crossed are visible. Some crests reveal extremely long views, perhaps six or seven future flyways, maybe more on a clear day. Scanning to the left or right yields different views depending on what's near. On some bridges, the traveler remains enclosed on both sides by the tree canopy, so that the only view is that straight ahead, along Route 1. At more open areas, there are views of water, grassy lawns or farm fields stretching out into the distance. Being at the top sometimes reveals gardens, and beyond that, suburban life. At others, the view looks out over roof tops. In all cases, looking out from the top of a flyway situates travelers in their context: what exists now, and what is to come.

Below the flyways, on the ground plane, traffic proceeds at a much slower pace.[78] Turning vehicles must come to a complete stop at the intersection and assess the choices of the cars and people around them. Correlate to the computerized inter-vehicle communication above, the humans and vehicles below will also have to acknowledge each other. Here, choices are individualized, not communal, and therefore must be made more cautiously. On the ground plane, the bridges serve two important roles. Most essentially, they are points of porosity. Between the intersections, where the fast lane is at grade, the road forms an impenetrable barrier of speeding vehicles. But at each intersection, that roadway lifts up, providing about 400 feet where the cars are slow and cautious, and the road can be crossed.

Secondly, the flyways are big, impressive pieces of infrastructure. They become landmarks. Individually, one is impressive and beautiful, collectively they create an identity for Route 1. To paraphrase Louis Kahn, car-land needs new landmarks to replace those it destroys, so that we can have faith in something in the landscape.[79] The bridges give us faith in infrastructure, soaring structures as a sign of progress as we move on to a new car-land.

## Two Autonomies

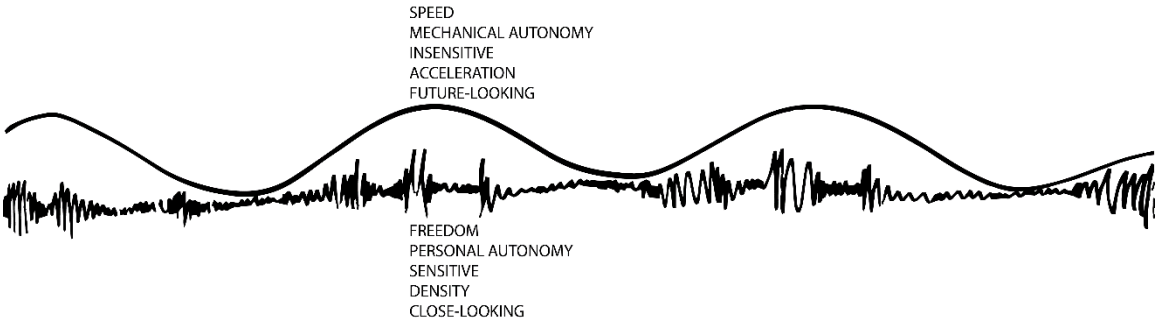



*Figure 25: Concept diagram of two separate lanes, the flyways and the ground plane.*

The previous section divides the flyways and ground plane in terms of speed, one fast, the other slow. This section discusses that same separation in terms of autonomy. Autonomy is self-governance. For this discussion, we consider that self-governance in terms of motion. The ability of an individual human to move independently through space is personal autonomy, which can also be described as freedom. Recently, the word has taken a new, distorted definition. Devices capable of functioning without direct human control are also considered autonomous.[80] This mechanized autonomy encapsulates a contradiction. The devices are not actually moving freely; they are automated, controlled by a program. For example, it would be more accurate to describe autonomous vehicles as "automated vehicles," since they are carriers, doing what we request of them.[81] However, we are accustomed to thinking of cars as people, not tools, so autonomous may not be an accurate descriptor, but it is appropriate. The design for Route 1 separates these two autonomies of movement. The important distinction is that personal autonomy is synonymous with freedom, while mechanized autonomy is not (fig. 25).

When a traveler chooses to use the fast lane, they relinquish personal autonomy. Their vehicle—which is not their own—claims autonomy and drives itself. The vehicle moves at exactly

the speed it is supposed to go. It is controlled by the infrastructure itself, and in that way, becomes part of the infrastructure. The only choice remaining for the driver is where to exit the fast lane, and even that is restricted to certain points along the road. The slow lane is the opposite. Drivers have complete control over the kind of vehicle they drive in and where they enter and leave the road. The only restrictions to their personal autonomy are basic traffic laws, including a strict speed limit. In this way, the illusion that speed is freedom is completely dismantled. Personal autonomy is only achieved when moving slowly. At faster speeds, mechanized autonomy reigns.

Both places provide freeing space for people. On the flyways, the traveler is freed from the machine. There is no personal ownership nor personal driving responsibility. While the vehicle moves autonomously, the traveler functions independently, able to think about other things, to relax, work or look out the window. On the flyway, there is free time. On the ground plane, the car brings personal autonomy through mobility. The driver is connected to the vehicle by driving it or through the emotional attachment of owning it personally. Traveler and car make choices about where to move as one entity. Moving along the slow lane, travelers are sensitive to the immediate landscape the car passes. The landscape provides opportunities for places to go, choices to be made and acted upon freely.

The ground plane offers immediate engagement with the landscape. In contrast, the flyways provide time for preparation, since travelers cannot take any individualized action in the moment. Instead, travelers observe the road ahead and make choices on the flyways that will be acted upon in the future, when personal autonomy can be regained. In that sense, flyways look toward the future, while travelers on the ground plane see the present. The experience of the road mimics and enforces this distinction. Travelers on the flyway considering their own future options will also look across the landscape toward the future of the corridor, in general. On the

slow lane, personal autonomy of motion is available all the time and therefore focuses on the present. Activity is situated near the road so that spatial and temporal perception are both focused on what is close at hand, calling for constant interaction and expression of personal will.

*Figure 26: Examples of the viewshed analysis from 30 feet above the existing ground at each intersection.*
The viewsheds (in red) were calculated using ArcMap 10.5.1. They are based on LIDAR surface data obtained from NOAA. The surface data includes tree canopy and buildings, so views are only what can be seen between existing obstacles. The most consistent views are lengthwise along Route 1.

The views experienced from the top of each flyway are windows into the dynamic patterns of the Route 1 corridor (fig. 26). This elevated vantage point approaches a bird's eye view, the map view. This perspective is that of the gods, or at least of the god-like planner.[82] Looking out at the New Jersey landscape from thirty feet up is unlikely to be a sublime experience, but it will provide understanding, and by extension, a feeling of control. The long view is a forward-looking one, one in which the land use change happening along the corridor can be seen in the context of everything around it. By taking the position as an observer in the air, as opposed to a

pawn on the ground, the landscape is known, and therefore it becomes possible to participate in the future.

While travelers above are removed from earthly speeds and concerns, vehicles on the ground plane move slower, thereby deepening their connection to the earth. They interweave with those crossing from east or west, as well as with pedestrians, bicyclists and wildlife. To be fully present in this dynamic environment, their speed must be comparable to a human pace. Any faster, and the traveler in a car leaves the immediate surroundings in exchange for something larger and more distant. As André Corboz puts it, "The present which reigns in the vehicle is related to very distant points located in a network whose scale has nothing in common with that of the network being traveled."[83] Bicycles travel about three times as fast as pedestrians. Cars should therefore travel no faster than 30 mph, or three times faster than bicycles. 30 mph is also the tipping point, after which vehicle fatalities exponentially increase with speed.[84] At that speed, travelers in cars will stay connected to the local, and therefore to the now. They will slow even more dramatically at intersections, where the density of activity will call for complete presence of mind.

## Dense Intersections

Currently, the intersections along Route 1 take up a lot of land because they are designed for free-flowing movement of cars. With the addition of the flyways, there is no more need for traffic to move through quickly on the ground plane. The intersections can be slowed, and cars take up less space. Sweeping on and off ramps with turning radii of hundreds of feet are replaced by signals requiring cars to stop and then take slow, tight turns.[85] All of the land previously consumed in traffic islands and clover-leaves will be reconnected to the surrounding landscape,

providing over 200 acres of new public space along the Route 1 corridor. That reclaimed intersection land, whether the size of one small jug handle or a full four-leaf clover, is an opportunity for life in car-land (fig. 27).


*Figure 27: An intersection with a clover-leaf, a ramp, and a jug handle*
The Beekman road intersection gives a cross section of the three main strategies for "improving" intersections on Route 1. 1) A clover-leaf, allowing for left turns and U-turns, with a high capacity for waiting cars, 2) A ramp, allowing for right turns without stopping, 3)A jug handle, the most common approach to providing for left turns across a divided highway in New Jersey.

No one wants to spend time at the intersections right now. Drivers hold their breath until they're through, praying they won't get snared by the red, guiltily flying through that elastic moment between yellow and stop, anything to get away. Buildings are set far back, separated from the crossroads with landscape buffers, retention ponds and parking lots. Only gas stations face the road, but they are also a kind of in-between space—made for passing through. An intersection designed for flow is unwelcoming. In contrast, an intersection intended to be a pause, or a resting point, has a completely different effect. It can be designed for life.

The designed intersections have three essential roles. Primarily, they must facilitate the crossing and turning of cars. They also serve as a point of porosity for any entity (human or animal) needing to cross the barrier of Route 1 at grade. And lastly they create a place of rest and enclosure. The design creates a density of life in the space of the intersection.[86] The flyway overhead creates a ceiling, grounding and containing the activity below. Enclosed as such, intersections will no longer be in-between space, instead they will become rooms, like Kahn advocated for in Philadelphia. Cars will congregate, since a slow intersection is a congested one. Their slow speed allows coexistence with a concentration of other life. It is the combination of density, porosity and interchange that will create a vibrant place.

Density and enclosure for these intersections is created with plants, structures or both. Each intersection design will take one of three typologies, depending on its existing conditions and future potential. In order to determine those three typologies and then to classify each intersection I used a decision matrix that placed each site on a scale of "green," based on its views and adjacencies. In addition, I noted the size of each site, and the significant views that would be visible from each flyway (fig. 28). While the views will not be observed by people on the ground plane, the incorporation of what is seen above situates each intersection in its larger context.

The existing green scale was based on proximity to waterways, wetlands, woods and agriculture as well as to preserved open space. Parking lots and gas stations adjacent to the intersection were subtracted from the green total. Residential housing developments and mobile home communities within a five minute walk of the intersection were also subtracted. This approach allows me to take advantage of existing natural resources that could create ecological and visual connectivity in the intersections. Equally important, however, is the potential value of a community gathering point for people living nearby. In the places that are connected to

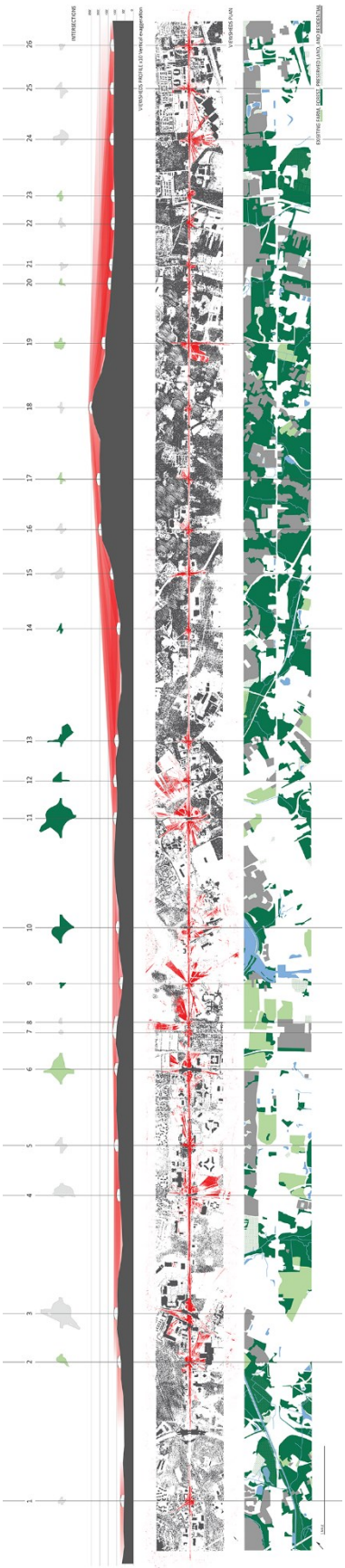


*Figure 28: Diagram of the intersection typologies*
The intersections are shown alongside viewshed analysis in plan and profile and a map of “green” used in the decision matrix.

preserved land or wetlands, creating an ecological resource makes the most sense. In others, the intersection would serve a greater purpose as a place for people who currently have few or no public resources within walking distance of their homes.

The decision matrix takes all major considerations into account, by treating each intersection equally and allowing for both objective and subjective decision-making (fig. 29). In this approach, the green scale was based on my own empirical observations of the site, supplemented with geospatial data and aerial photography. Future scenarios for the region cannot be rationally predicted or planned for using current conditions alone. Therefore my perceptions and preferences as a designer are as important as the results of computerized geospatial analysis. Using the preliminary "green-ness" classifications in the matrix illustrated in Appendix B, I mined the intersections for greater patterns along the roadway that would contribute to the overall legibility of the journey.

The identification of potential patterns along the road brought me to three typologies, each intended to create the highest concentration of life at the intersections. The greenest designs are a forest typology, intended purely as ecological amenity and connectivity. Density is achieved through the complexity of forest structure, with understory, midlevel, and canopy. Intermediate designs are intended as a nature-human interface. These are gardens, and their density is derived from a combination of structures, plants, and people. The third typology consists of configurations of buildings and courtyards. These places will be lively social nodes for both travelers and neighbors.

To decide which typology should fill a particular intersection, I used water as a guide. The intent was to incorporate as many of the significant waterways passing near or through the intersections into forest and garden designs. Moreover, streams are essential wildlife corridors in a place like central New Jersey, where fragmentation imperils habitat connectivity. I found that a

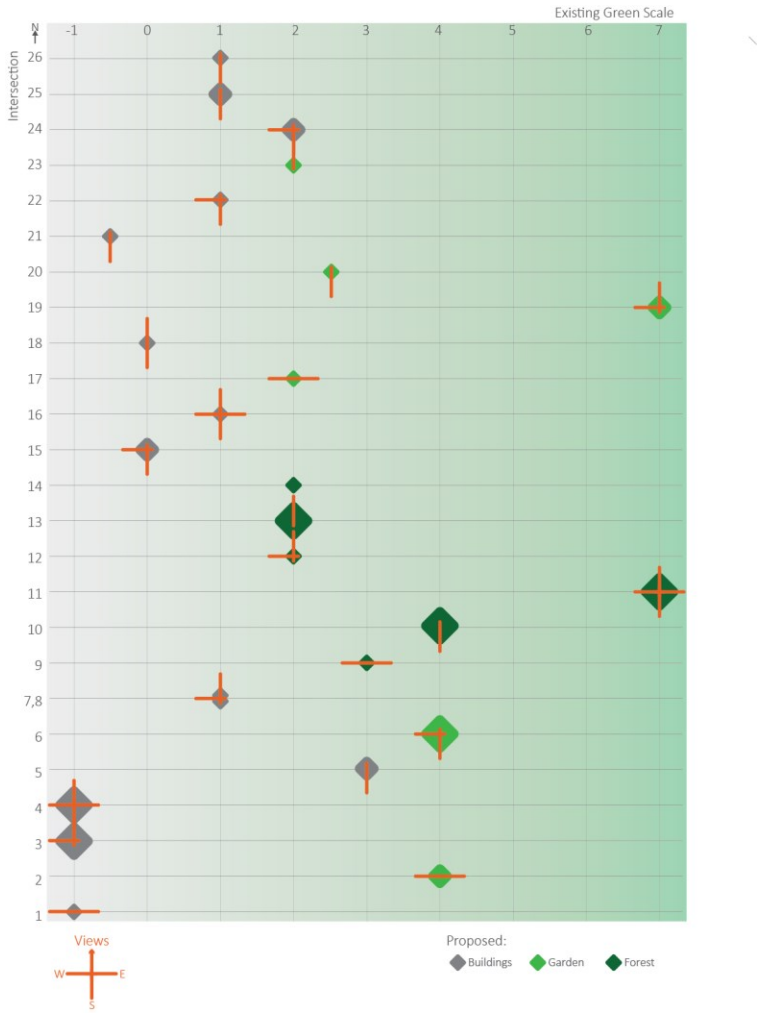



*Figure 29: Typology Matrix*
This diagram lays out each intersection in terms of the scale of the existing "green" as well as the proposed typology. The size of the square corresponds to the area of each intersection, and significant views from the flyways are noted. For more detailed information about this matrix, see Appendix B.

stretch of six intersections, from the Millstone River to the Heathcote Branch Brook, contained a concentration of important rivers and streams. These intersections, numbers 9-14 along the 17 mile stretch of Route 1, are centered between Trenton and New Brunswick, where the urbanization extending between the Philadelphia and New York City metropolitan areas is the thinnest.

Intersections 9-14 are designed as forests. The forests not only protect the waterways, but they communicate a break between the two cities.

Of the remaining twenty intersections, fourteen are configured of buildings, which serve different economic and social roles depending on their size. The smallest ones will serve travelers as meeting and resting spots as well as car service opportunities. Larger built intersections are multifaceted community hubs. They link existing retail, work and residential centers and serving an increasingly important role as social spaces when our work and shopping responsibilities shift further onto the cloud.

Interspersed between the built configurations along the route are garden intersections. These exuberantly planted spaces bring beauty and peace to the corridor. They provide spaces for people to remove themselves from suburban chaos and into another world, while still remaining close enough to the activity of the street to enjoy the contrasts. Water is an important element in these gardens as well. Existing waterways are exposed and expressed, and stormwater from the roadway is filtered and stored visibly and audibly.

The following sections describe designs for a sample intersection of each of the three typologies. The three intersections designed here cover the range of sizes: largest, midsize, and one of the smallest (fig. 30). Along the road, each of the three typologies include intersections of varying sizes, which will each need to be addressed accordingly in their designs. The sample designs show that these typologies are indeed feasible and additionally provide a template for the remaining twenty-three intersection designs.

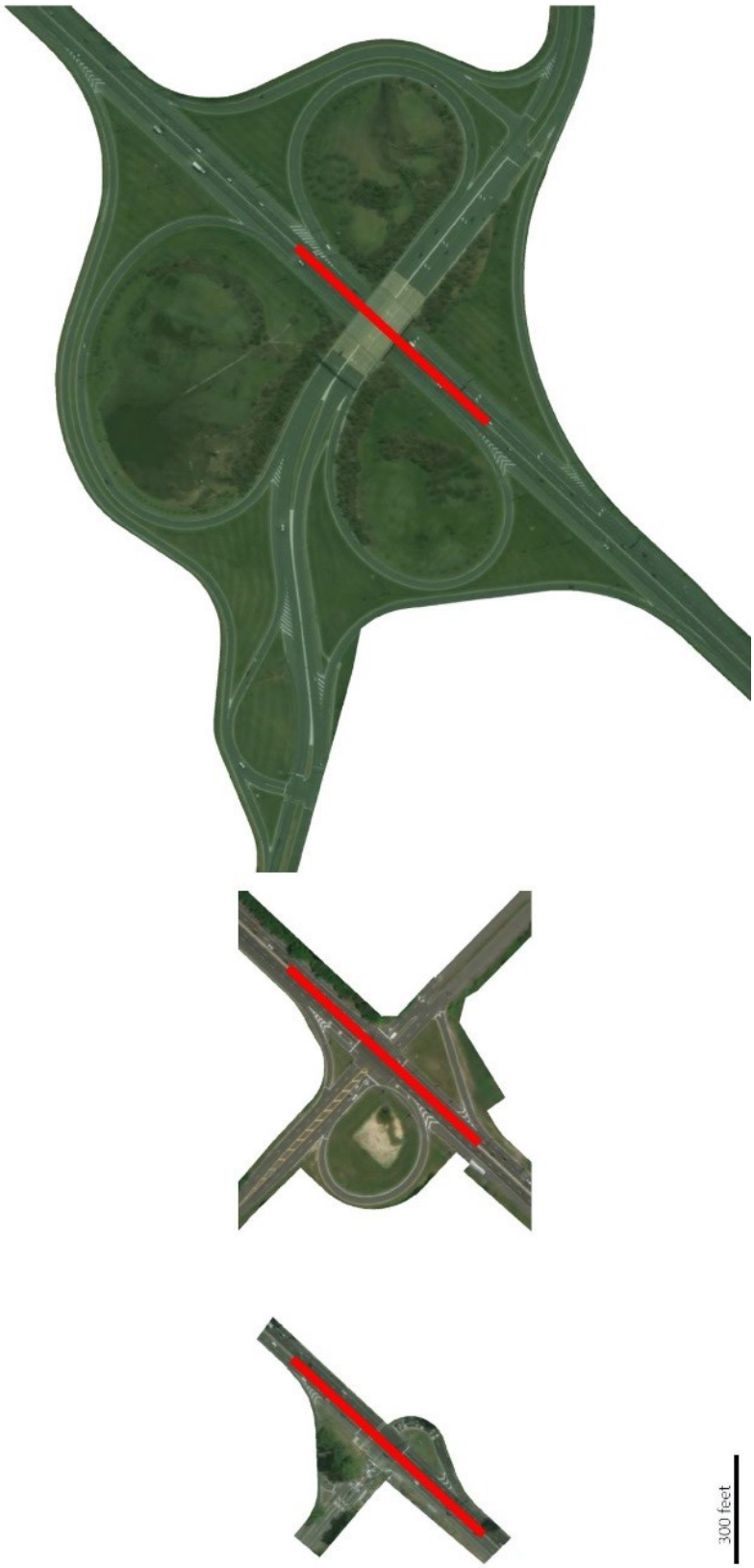



*Figure 30: Aerial images of the three intersections, to scale*
From left to right: Finnegan's Lane (2.9 acres), Beekman Road (6.3 acres), and College Road (50.7 acres). The red line is the location and size of the bridge in each intersection.

*Forest Intersection: College Road*

*Figure 31: Succession Plans of the College Road intersection.*
This follows the radial pattern of viewsheds from the flyway to create six segments. The views to the east and west along College road are open meadow. The four forested segments create density along Route 1. They start as simple successional plant communities planted on a grid and then diversify and intermix over time, following the topography.

The College Road intersection is the keystone of the "forest" intersections. At over fifty acres it is the largest, and it also lies in a key connective position between existing forest and preserved open space. Immediately adjacent to the intersection, along its northern side, is a small stream with a wide, wet, forested riparian buffer. That forest connects in the west to the Delaware and Raritan Canal State Park downstream, and in the east, to a large swath of woods among the Forrestal Center offices. Those woods reach to land preserved by the Audubon Center and Plainsboro Township one and a half miles east of the site. Converting the College Road interchange—which is currently predominantly turfgrass and highway ramps—to a landscape designed for ecological amenity will greatly increase the connectivity between existing wildlife habitats.

The overarching theme for this design is ecological succession, in which the organisms best suited for the site will replace one another as the biotic and abiotic conditions change. The goal of this design is not to install ecosystems that may have existed prior to European settlement. Instead, the design sets the initial conditions for various forest succession cycles. The growth and evolution over time is visible to observers, creating a legible pattern of change in the suburban landscape. Trees are planted in geometric grids and straight lines so that it is clear the groundwork was designed and created by humans, and that the new landscape is not attempting to perfectly replicate natural systems. The forests are a collaboration between humans and nature, because the initial planting patterns will dissolve over time as the plants adapt to the site. After the designed framework sets the succession systems in motion, only minimal maintenance will interfere with natural processes. Additionally, as the plants fill in, they create a sensation of density and closeness along the road.

The College Road interchange is so large that it can accommodate multiple plant communities as its starting point. The site is divided into quadrants based on hydrology and geology. The

northern half, adjacent to the existing stream corridor and wetlands is lower and wetter, while the southern half is higher and dryer. The east-west division is based on Route 1's position along the "Fall Line," between the Piedmont and the Inner Coastal Plain geologic formations, which also roughly divided New Jersey's plant communities between North and South Jersey. The segments along Route 1 are planted with early succession forest species dominant in each of those four conditions (fig. 31). The new forests are planted closely to create the feeling of enclosure as the driver on the ground plane experiences the intersection. However, a radial meadow planting along College Road opens up the view momentarily for travelers at the apex of the flyway.


*Figure 32: Proposed topography for the College Road Intersection.*
The grading connects the lower segments (left side of photo) to existing low sites and a stream. The higher segments (right side of photo) create upland conditions. 2-foot contours are shown on this model.

The current grade-separated interchange will be removed so that College Road, which is now an overpass, returns to the ground plane. This regrading is an opportunity to create land-forms to support various types of hydrology and microclimates. The landforms are shaped so that the northern segments connect to the adjacent wetlands and low riparian zones. The southern

half of the intersection has steeper, drier slopes with gullies for drainage. While the plantings are geometric, the grading mimics more organic forms, to encourage plan communities to find their niche and grow into naturalistic patterns (fig. 32). The regrading process also allows for soil amendments to be made. The road base materials are likely to be less fertile and rocky, and should be used in the meadow areas. More fertile soils will be relocated into the wetter forest areas, particularly the Wet Inner Coastal Plain, which will be planted with more mature hardwoods. To discourage the immediate dominance by invasive plants, soils in all but the cedar field should be acidic. While soils in this area are naturally acidic, the conditions after its life as an interchange may have affected that, in which case they can be amended with Sulphur and wood chips.[87]

Planting schedule:

| **Plant Community** | **Species** | **Size** | **Spacing** | **Notes** |
|---|---|---|---|---|
| Mesic Piedmont | Eastern Red-cedar *Juniperus virginiana* | 1 Gallon | 20' grid | Prefers nuetral soil |
| | Canada Wild Rye *Elymus canadensi* | Seed | | Nurse crop/weed suppressant |
| | Big Bluestem *Andropogon gerardii* | Seed | | |
| | | | | |
| Upland Piedmont | Grey Birch *Betula populifolia* | 1 Gallon or bare root | 20' grid | Trees and sumac interspersed into the grid at random. |
| | Bigtooth Aspen *Populus grandidentata* | 1 Gallon or bare root | 20' grid | |
| | Staghorn Sumac *Rhus typhina* | 2 Gallon | 20' grid | |
| | | | | |
| Mesic Inner Coastal Plain | Swamp White Oak *Quercus bicolor* | 4" Caliper | 40' quincunx | Oaks and Beeches interspersed into quincunx at random. |
| | Pin Oak *Quercus palustrus* | 4" Caliper | 40' quincunx | |
| | American Beech *Fagus grandifolia* | 4" Caliper | 40' quincunx | |

| | | | | |
|---|---|---|---|---|
| | Sweetgum *Liquidambar styraciflua* | Seed | 20-25 seeds/sq ft | Seed to be collected locally |
| | | | | |
| Upland Inner Coastal Plain | American Holly *Ilex opaca* | 2 Gallon | 40' grid | |
| | Black Cherry *Prunus serotina* | Tubeling | 10' | Cherry and spicebush to be planted in random distribution |
| | Northern spicebush *Lindera Benzoin* | Tubeling | 10' | |
| | | | | |
| Meadow | Little Bluestem S*chizacharium scopariu* | Seed | | |
| | Big Bluestem *Andropogon gerardii* | Seed | | |
| | Sideoats Grama *Bouteloua curtipendula* | Seed | | |
| | Slender Wheatgrass *Elymus trachycaulus* | Seed | | |
| | Canada Wild Rye *Elymus canadensi* | Seed | | Nurse crop/weed suppressant |
| | Grass-leaved goldenrod *Euthamia graminifolia* | Seed | | |
| | Rough-stemmed goldenrod *Solidago rugosa* | Seed | | |
| | Seaside Goldenrod *Solidago sempervirens* | Seed | | Salt tolerance for roadside planting |
| | Blue Wild Indigo *Baptisia australis* | Seed | | |
| | Black Eye Susan *Rudbeckia hirta* | Seed | | |
| | Lance leaf Coreupsis *Coreopsis lanceolata* | Seed | | |
| | Joe Pye Weed *Eutrochium fistulosum* | Seed | | |
| | Common Milkweed *Asclepias syriaca* | Seed | | |

*Figure 33: Planting Schedule*

The plant selection for the four forest types is kept extremely simple to mimic early succession conditions and to emphasize the sensation of density through masses of near-monoculture. Species choices are based on nearby conditions, wildlife value, and plants found in the adjacent woods and old fields. The Mesic Piedmont segment is a monoculture of eastern red-cedar, mimicking a common old-field condition in north and central New Jersey. Individual cedars currently compete with the invasive callery pears inhabiting the College Road overpass embankment. The cedar segment will grow slowly and at a uniform height, supported by an understory of grasses.

The Mesic Inner Coastal Plain area will be seeded densely with sweetgums, a common succession tree in South Jersey. Sweetgums grow quickly from seed and grow in monoculture stands in old fields.[88] Within the sweetgums, a quincunx pattern of larger oaks and beeches provide structure to the segment. Mature specimens of these hardwoods are found in the forest adjacent to this segment, which is well-established and at least 100 years old, according to historic aerial imagery.[89] The large forest trees will be able to grow in the shade of the sweetgums, especially since they are planted with several years' head start. They provide the seed stock for a hardwood forest in this segment, nursed by the sweetgums.

The Upland Piedmont segment will be another common successional community of bigtooth aspens and grey birch. This community was observed locally and thrives in old field conditions.[90] A shrub layer of staghorn sumac will build a more complex forest structure as the young trees fill in. The Dry Inner Coastal Plain is anchored by a grid of American hollies. Young hollies are found throughout the adjacent woodlands. Throughout the hollies, black cherry trees and spicebush shrubs will grow in in a random arrangement. The four communities are expected to mingle as seeds spread between them and new plants are introduced naturally. The nearby woodlands will provide additional diversity, as will seeds carried by cars along Route 1.

Annual mowing of the sixteen-acre meadow spreading from College Road will slow the integration of tree species by dividing the mesic and upland segments. Meadow habitat is valuable and rare in New Jersey, and so keeping segments of this interchange open will provide essential ecological value in addition to wide views from the flyways.[91] The meadow plan for this design is based on the tried-and-true approach to meadow cultivation in this region promoted by landscape architect and meadow expert, Larry Weaner. His strategy relies on a diversity of perennials and grasses, a nurse crop of rye, and intensive weed control for the first two years.[92] After seeding, the meadow should be mown short every six weeks for the first year. The second year should include targeted weed suppression in problem areas. After that, the meadow will only be mowed once a year, in early spring.

The other five forest intersections will also be designed to provide ecological amenity and habitat connectivity. They are not large enough to have a meadow planting, and will likely only take one or two of the forest communities described here, based on its position on the road and its hydrologic conditions. All of the forest intersection designs start with simple plant palates, based on species found in adjacent woodlands, to be planted with a dense grid.

*Garden Intersection: Beekman Road*

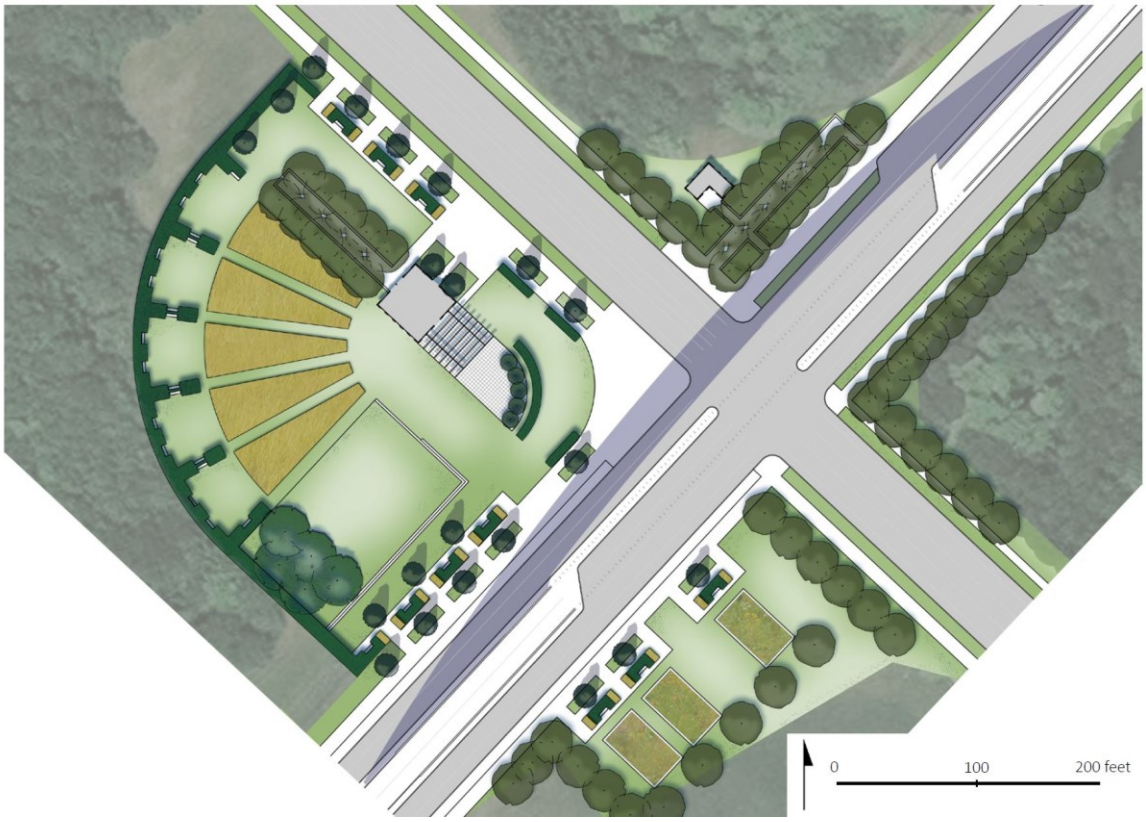



*Figure 34: Site Plan for Beekman Road Intersection*

Some of the intersections along the more built up sections of Route 1 have more proximity and affinity to nearby green spaces and waterways than they do to existing parking lots and residential development. These intersections are designed as gardens. Structure and density is achieved through plants arranged and maintained in ways to encourage human enjoyment and refuge. They are resting spots for people and also serve as connective nodes for wildlife. These gardens are cultural spaces that signify a balance between the human and the natural worlds. Through this harmony, they represent suburban ideals with sincerity.

The gardens are designed in formal geometries. A sense of enclosure and discovery is achieved through the arrangement of hedges, pergolas, walls and trees. The Beekman Road site is a midsized intersection, currently containing one clover-leaf, one jug handle, and a ramp. The

garden within the cloverleaf is hidden and revealed from Route 1 through a perforated hedge. Inside the garden, visitors wander between long beds of tall grasses or along an allée of limbed cedars to discover small garden rooms and secluded benches nestled in the hedges. Generous lawn space and a partly-covered pavilion provide opportunities for larger gatherings, and two small buildings host concessions and amenities. The mown lawn and turf pathways are essential to this design. In the garden, turfgrass signals places for people to occupy. It is the carpet. This use of lawn as occupiable space reverses the dominant message along Route 1 that the highway front lawn is a place to keep off.

*Figure 35: A windbreak of Japanese cryptomeria near the former Princeton Nurseries site*
Many of the windbreaks are cedars and spruces. The occasional overgrown row of landscape plants and specimen trees makes it unclear what was planted as a windbreak and what was an abandoned row of nursery stock.

Beekman road has a view of the northern-most farm field within this segment of Route 1. It is currently for sale, with a sign saying the owner “will divide.” The southeastern segment of the garden frames these views out toward the field, while acknowledging they may soon be gone. As the trees mature, those views will close in. The remaining agricultural and nursery production fields south of this intersection are frequently divided by tall coniferous windbreaks (fig. 35).

These agricultural remnants are brought into the garden design symbolically through the vertical elements of hedges and allées of columnar trees.

Runoff is captured and stored in a series of rectangular rain gardens in the lowest quadrant of the intersection. The roadside planting along this southeastern segment mirrors the one across Route 1 with a line of hedges and columnar oaks. Sunken basins are tiered, to accommodate for different levels of rainfall. Rain garden plantings reflect the expected saturation and flooding frequency of each level.

*Built Intersection: Finnegan's Lane*

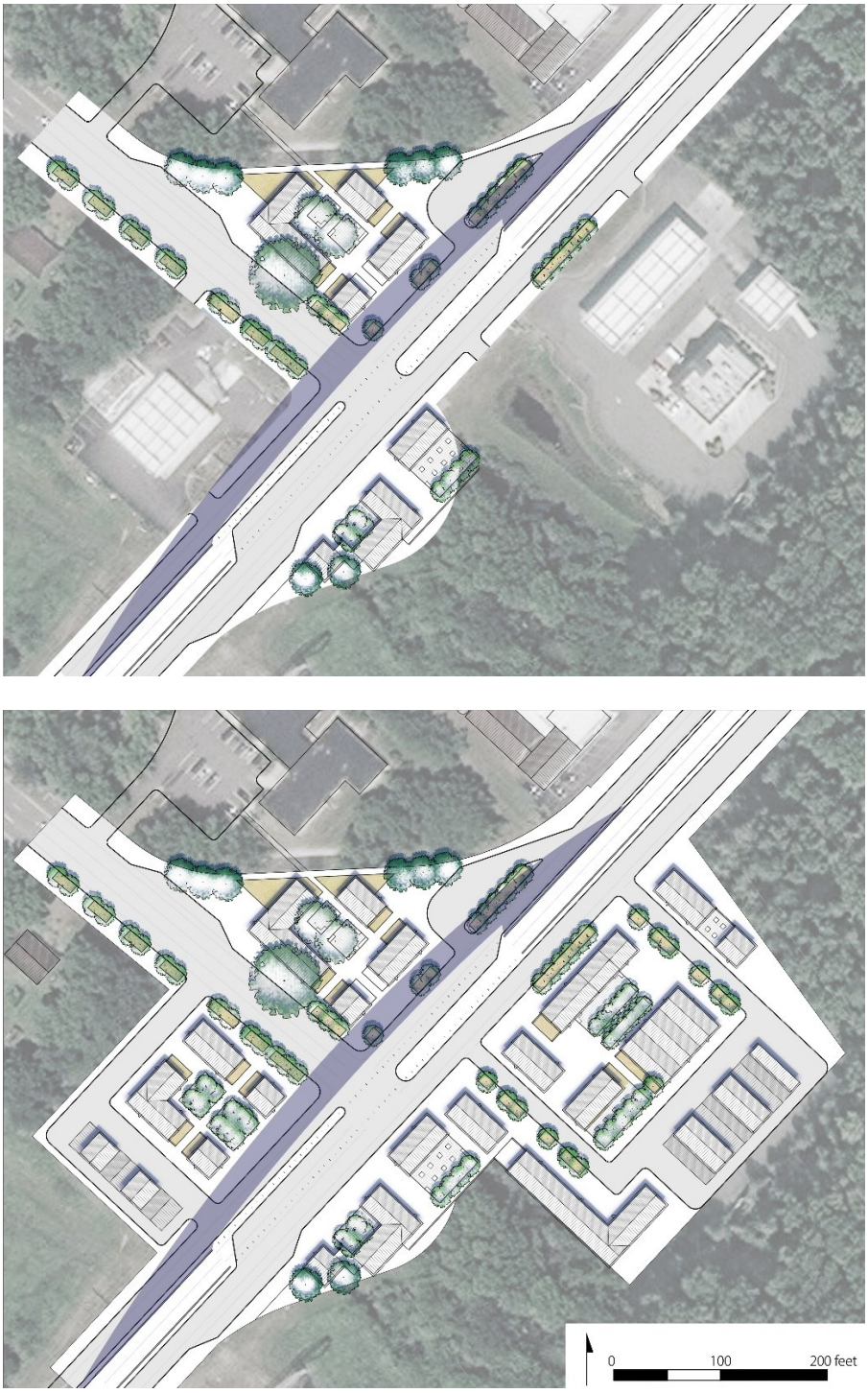



*Figure 36: Finnegan's Lane Intersection Site Plan before and after gas station "succession"*

The social nodes created at crossroads along Route 1 will provide convenient places for people driving through, and they will also serve as destinations for local residents. Residential development near Route 1 is often isolated by single-use residential zoning, meaning there are few commercial or social destinations within walking distance. The redesign of these intersections remedies that dearth. Buildings facing the street are opportunities for small retail businesses, while the buildings set back among the courtyards are places for offices and community resources such as library branches and event spaces.

The Finnegan's Lane comes to Route 1 at a T, with two small jug handles on the northwest and southeast corners. Within a quarter mile of this intersection are single family homes, a mobile home park, and a synagogue, as well as some small offices and light industry. The location has the potential for a vibrancy through a hub that physically links these currently segregated uses. Removing the two jug handle ramps frees space for small configurations of buildings and courtyards in that space. The fine grain of small single-story buildings and intimate courtyards creates spaces for local businesses and social gathering points. Our economy is moving toward one that is more cloud-based, where retail shopping and work will be increasingly handled at home, in relative isolation. Social overlap will cease to be incidental and instead become more intentional parts of our day, comparable to the way we currently go to the gym for intentional exercise in lieu of incidental exercise. The current popularity of places like Starbucks Cafés and coworking spaces show that this trend is well underway.

As transportation changes, it is likely that the current configuration of gas stations will also change. Like many along Route 1, the Finnegans Lane intersection has gas stations on two corners. This design envisions a succession of sorts, where, as the gas stations phase out, they will be replaced by similar built typologies as those constructed in the jug handles (fig. 36). With the addition of the gas station properties, the Finnegan's Lane intersection becomes a dense hub of

activity for both human interaction and vehicular service. Vehicle service occurs toward the rear of the converted gas station properties. Very little parking is included in the design, with the assumption that most visitors will either be dropped off by a shared vehicle, walk from nearby, or only stopping by temporarily for vehicle service.

The architecture for this design is based on Shane Coen and David Salmela's design for the Jackson Meadow subdivision in Minnesota.[93] Jackson Meadow is a reimagination of what a suburban subdivision could be, based on cooperative community values and harmony with the surrounding landscape. The buildings are simple and homey, referencing common suburban dimensions, such as the two car garage, but reconfigured in order to create intimate outdoor spaces within the buildings (fig. 37).

This system works well for the intersections on Route 1, which must also reference suburban architecture, but change our understanding of the spaces in between buildings. In-between spaces in the Finnegan's lane intersection have two roles. They create circulation patterns and connectivity across the streets into the different clusters of buildings. They also form protected courtyards away from the road in which to gather, eat, or work. The spaces are planted in orchard-like arrangements with cherry trees and honey locusts. Garden spaces on the sides of buildings are filled with tall perennials and function as to capture rainwater from the roofs. The effect is a dense, lush and intimate configuration of buildings that convey a sense of home and community, with no wasted space.

*Figure 37: Photographs of a scale model of the Finnegan's Lane Intersection*
Model was constructed at 1/8"=1' to show the relationship between the bridge, intersection and buildings at Finnegan's Lane.

## Future Suburbia

Travelers looking out at the landscape from the top of each flyway today would see a mix of woods, fields, shopping centers, homes and offices. But land uses fluctuate with economic cycles, and in this region very little remains constant for long. With the flyways, we initiate and then witness a changing suburbia. New Jersey's economy has shown repeatedly that it has the capacity to reinvent itself in the face of emerging technologies and shifting demographics. One key to that remarkable adaptability has been its readiness to adopt the appropriate transportation infrastructure at the right time.[94] Private land comprises the majority of the Route 1 corridor, and as the road changes, so will the uses along it. The current developed land on the strip exists because of—and in support of—a car-dominated landscape. We may not be able to predict with any precision the changes that will come with a radical shift in mobility, but we can plan for change itself.

There are two realms in which this design instigates and controls major land use change along the Route 1 Corridor. One uses the power of the New Jersey Department of Transportation as a state agency controlling both transit and land, and the other utilizes local zoning codes. The state DOT has powerful influence over the future of New Jersey development. Transportation is a potent driver of land use and economic development in the private sector. The speed and capacity of the flyway lanes, the locations of the weave points, and how aspirational transit infrastructure is integrated into the surrounding street network will all play a role in future development choices. These decisions must be made with complete transparency since their effects will be profound. Access to new forms of transit must be completely equitable, with the needs of residents who currently cannot afford cars given equal weight as those corporate commuters from Philadelphia or New York.

In addition to control of the road and transit, the NJ DOT is responsible for the use of all the land formerly consumed in the intersections. The transformation of this land from car-land to

space for people can proceed completely democratically, in which the intersections are designed in an open forum, and owned and managed in perpetuity by a public agency. However, in this society, there will always be forces pushing for a privatized capitalist approach, in which the land is sold to developers seeking to generate the highest possible productivity and profit from the land. This design calls for the former, with the design, development and management of forests, garden and built intersections controlled by the government. In this way, agencies are obligated to seek the greatest possible public good, not the highest profit.

Public control of both transit and intersection land creates opportunities to explore new economic models for the suburbs. The omnipotence of private ownership and personal capital of the suburbs can lessen. Aspirational transit will be shared, either through private subscription services or public mass transportation. And on the ground, space is also shared. The introduction of an additional 200 acres of public land to the corridor completely alters the Route 1 landscape from one in which access is essentially restricted to people in private cars, to a landscape that supports all forms of access. The intersections that become forests and gardens are traditional democratic spaces in the form of parkland. The thirteen built intersections are a different kind of shared resource. Here, the primary purpose of indoor and outdoor spaces is gathering, not the generation of capital (which will increasingly occur online, in the privacy of our electronic devices). In that way, the intersection functions more like a train station than a mall, where businesses that lease space function as concessions.

Public agencies have significant power and control over the converted Route 1 corridor, but between the intersections, most land is held privately and will be developed in response to the changes described above. The region must be prepared for this new development. Preparedness means infrastructure, such as that proposed in the previous sections, but it also means

flexibility. Private land use along the Route 1 corridor cannot be limited by restrictive and out-dated zoning codes.

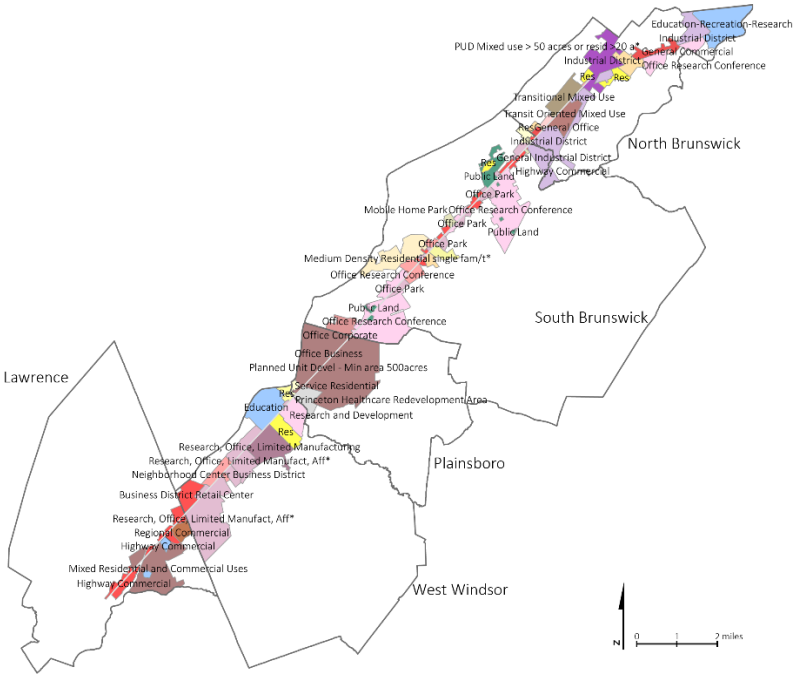



*Figure 38: A snapshot of the Route 1 zoning in the five municipalities*
Yellows signify residential uses, reds are commercial, pinks are office and research, purple is industrial, browns show mixed use areas, and blue is zoned for institutional use.

The zoning along the Route 1 corridor is controlled by five separate municipalities, each with their own municipal master plan and individual vision of what the future may bring (fig. 38). Each municipality updates their zoning code as the need arises, or on a case-by-case basis. A complete rewrite is rare. The basis of four of the zoning codes along the corridor are from the 1970's and 80's, during the boom of the suburban office economy. However, the suburban office trend is fading now. The codes along the corridor, and the construction that has (and has not) occurred as a result are reflective of that outdated vision for land use in New Jersey. [95,96]

The combination of highly prescriptive—and occasionally contradictory—zoning, and four decades of updates have made the codes so convoluted that developers may be discouraged

from building here altogether. Complicated codes can be formidable for their own sake, since they often signify a long approvals process between the developer and locality. They do even more to hinder development when they call for land uses that do not match the market.[97] On Route 1, zoning played a role in the overbuilding of office space in South Brunswick in the 1980's and 90's, which is reflected now in a disorganized and stagnant patchwork of development for the Township since the majority of zones along the corridor still call for office uses.

Route 1 is a major economic driver for townships along it. With the introduction of forward-looking transportation infrastructure, it will gain even greater potential as a nexus of innovation for the State of New Jersey. Currently, each municipality addresses the corridor individually, treating Route 1 as an edge condition, since it spans either the far western or eastern side of each town. Coordinated code for the entirety of the corridor will help it function in a connective role, instead of the piecemeal barrier it is currently. Zoning accompanying the introduction of the flyways must be a corporative effort across the municipalities. A regional overlay district that disregards municipal boundaries will announce the corridor as the foundation for a new suburban economy in the region. Along with the flyways and the addition of 200 acres of public space, private land development completes the conversion of Route 1 into a powerful linear strip.

The success of the future Route 1 strip relies on code that does not prescribe land uses. The land must be ready for land use innovation that parallels the introduction of new transportation. Zoning flexibility is achieved through a combination of performance and form-based zoning. Performance zoning specifies the effect development will have on its surroundings, not the particular type of development itself. For example, new code will minimize the number of trucks entering and leaving the site, but not dictate specifically whether or not that site can be used for

industry. On Route 1, performance zoning will prevent toxic emissions, heavy vibrations, excessive sewage use and massive traffic surges (such as those associated with arenas, for example). It will also call for sustainable measures, including the management of all stormwater on site.

Form-based code complements the performance zoning. The code will not dictate the form of built structures, because that would be unnecessarily restrictive for Route 1. Instead, the code makes specifications for the landscape. The code sets desired setbacks and lot coverage, but only if a significant proportion of the open spaces on developed parcels provide some form of amenity. These amenities may include ecological amenity (such as a restored and managed forest or wetland), recreational or social amenity (such as publicly accessible parkland), productive agricultural fields, or green infrastructure. The goal of these restrictions is to reduce the "highway front lawn," replacing it with places that foster connectivity, sustainability and activity.

# Conclusion

## A Manifesto

This design for Route 1 solves five problems of car-land. The driving experience is no longer a frustration, and humans replace cars as the dominant lifeform on the suburban strip. The design detaches our concept of personal autonomy from our desire for speed. Instead, speed is the realm of machines alone, so that cars function as tools, and not as extensions of our bodies. In the spaces reclaimed by moving at a slower, human pace below the flyways, we create places for people where there were previously only in-between spaces. The evolution of the suburban strip becomes legible as we view it from two complimentary vantage points: one from above, where the tops of the flyways offer windows into the changing region as a whole, and the other slow, sensitive, and completely engaged in the present.

Car-land's five problems are rooted in one commonality—we conflate ourselves with our cars. I solve this common problem with the only logical solution: design that separates ourselves from our cars. Throughout this paper, I position cars as the perpetrators of car-land. They stole land that is rightfully ours, and now we must claim it back. While that is true, we must remember that we are cars, and we are the perpetrators. As long as cars and humans are unwitting cyborgs, we are blind to car-land. The driving experience lets us down because our machine-speed is hindered by such human frustrations as traffic congestion, and we blame the landscape, not ourselves. As cyborgs, we are unaware of the vast space our mechanized bodies take up. We do not recognize how much bigger and faster we are than humans. And while we are cyborgs, we expect our current existence to continue, unquestioned.

This manifesto calls for a suburbia in which cars and humans function as separate entities. The design introduces a binary distinction through its two lanes. Yes, it is fast and slow, but it is also machine and organism, and by extension, order and chaos, culture and nature, male and

female. For the sake of this design, that dichotomy is essential. The two extremes must be separated in order to recognize the magnitude and complexity of car-land. Car-land needs a radical vision. It needs a good and an evil so that we can claim the side of goodness, of humanity, and thereby justify change. It needs a manifesto.

However, that binary does not actually exist, nor should it. Superficially, the design requests separation. In reality, it seeks a balance. In the twenty-first century, we all require technology in our lives, and we all seek harmony with that technology in order to retain our fundamental humanity: our autonomy. A design for Route 1 must take our need for both speeds—the fast and slow—and our need for both modes of being—the human and the mechanical, and provide for them with equal generosity. As we adjust to a world in which we are all truly cyborgs, our landscape must not trap us in one way of being. The design for two separate roadways on Route 1 allows for choice in the way we engage with machines. As Donna Haraway writes in *A Manifesto for Cyborgs,* "the machine is us, our processes, an aspect of our embodiment. We can be responsible for machines; *they* do not dominate or threaten us."[98] In claiming that responsibility, we claim autonomy and upset the current domination by car-land.

## Power

Following the examples of the many designers I cite throughout this paper, Car-land's five problems are founded on a normative approach to the landscape. Like they did, I also assume that there is particular order that makes a road a good road. The geographer Don Mitchell calls into question that assumption, stating that the public realm is a place to encounter difference, conflict, and struggle.[99] Since the public is not a single unified mass, no landscape can ever be all bad or all good, not even car-land. The changes I propose include transportation infrastructure

that is completely controlled by government agencies, and acres of reclaimed intersection land, developed by those same agencies. The questions of control, capital and power that this design brings up all warrant further examination, especially since they are linked to the experiences of a particular group of designers and decision-makers. In that vein, this topic should also be explored in terms of class, equity, and accessibility. Private car ownership and the supremacy of car-land is inherently unequal, since not everyone can own or drive a car. But what is to prevent our next aspirational transportation systems from being similarly inaccessible?

In addition, the dualisms I introduce to car-land throughout the design do not yet address the binary between male and female. Car-land was invented and designed by men. In the mid-twentieth century, suburbia became the epicenter of middle class gender inequality, when women were encouraged to manage the home, while men drove fast cars on fast lanes to and from work. The design for Route 1, separating fast and slow in order to detach human from machine should also be explored from a feminist perspective. Donna Haraway deconstructs these dualisms completely in her *Manifesto for Cyborgs.* She says that our bodies and our technologies function as both tool and gender at once, and she calls for a complete reconstruction of the boundaries in our daily lives.[100] The flyway and the ground plane can easily take gendered as well as technological identities. This design must therefore be examined to make sure it disrupts the outdated and restrictive suburban gender narrative.

In writing this manifesto, I am an observer and participant in car-land. At times I am human and other times I am a car; often I am both. I am a woman using the voice of the male cultural geographer and the male modernist architect. I am a millennial questioning the twentieth century, so that I can leave it behind. I lay claim to car-land as a landscape architect, calling on others in my profession to join me in putting forward radical visions for hostile landscapes and in probing the culture that created them in the first place. In delivering a design manifesto that

questions current power structures, I simultaneously assume my own position of power and choose who to give that power to. This design shows it is possible to free space for people in car-land, but only through a deeper examination of ourselves. There is much more to explore in car-land.

# Appendix A: Writing/Walking

I took two walks of the site, one southbound on the east side of Route 1, and the other northbound, on the west side. The first walk was on Saturday, September 23, a hot sunny day. I was still early in the process of analysis: exploring the site in unstructured ways and only just starting to form a theoretical framework for the project. The second walk was on Thursday, February 15. It was about 60 degrees and humid. It had rained during the night and the sky remained gray until about four in the afternoon. At this point, my conceptual design was finalized, and I was working on figuring out what the intersections could feel like in my designed scenario. I was also still healing from a broken ankle, so the walk was slower, and I weighed each choice to explore more carefully.

The freewriting exercises I recorded over the course of my walks are transcribed verbatim:

## September 23, 2017: N -> S

Burger King at Sand Hill Rd


Parked Cordelia Ave by small industrial lot. Sweet neighborhood of small houses with bright gardens to cut-through to back of car dealership to Main Street North Brunswick. Back entrance takes me past wetland preservation to warehouses—back of warehouse hold office for the houses—sad plantings, mysterious orchard, piles of rock and soil. Crunched across desert of proto-shopping center to civilization—delicate brick paving, road signs, roundabout (almost run over on crosswalk). Costco Parking lot—me and shopping cart attendant braving the glare. Then

to the highway—edge of highway feeling like exactly that. Small respites in strips—parking lot restful after wash of cars zipping by.

Quiet only when red light—suddenly hearing the slap and swish of September grasses before rumbling acceleration of green.

Find a ruin between a well-tended home and a pile of pallets, fork-lifted. Boat, truck, barrel, walls—suntipped leaves embrace them.

Highway exhausted—remnants of tree planting appear then an opening, a field? No-front lawn to tired office building, flanked by half-rotted trees. Almost a hayfield-displacing grasshoppers as I crunch through. Empty lot but one woman walking—a Saturday administrator on her lunchtime walk? No! A mom waiting for kids to finish skating. I've found where the kids are—constant line of minivans glide down barren roadway to the rink. Meanwhile, a building (a mistake?) is disassembled—it's out of place anyway on this otherwise empty stretch of road.

At the end I realize it keeps going, increasingly empty. Now on empty bridge and fields of concrete cisterns, forgotten. County bridge dated 2006 but the road was never sealed—colored glass aggregate erodes off and shines in swaths.

Back to the road, a tractor spreads fertilizer on hayfield—"Available, will divide."

In-between spaces abound. Everything between there and Sand Hill is available. A carwash does rapid business—cars are everything.

Forrestal Cloverleaf Picnic


Gathering energy for first underpass crossing. The 'someone mows this??' reactions are even stronger now that I'm in corporate territory. Striking the lack of boundaries for the pedestrian. At most a thicket 20' wide between one parking lot and the next. Mostly it's lawn—inviting and soft except for the blazing sun. It's a relief to be in a corporate glade—mature trees give shade, breeze and a rootedness. Offices in lawn look like they might blast off at any minute. Surrounded by retention-basin launch pads. Water has never seemed so problematic as when looking at coarse concrete shoots dashed across green dry basins—preparedness?

The Dow Jones park had an exercise lop and possible the remnants of a wildflower garden—moments of human scale in a day where I've felt tiny for having feet not wheels.

Baptist Church at Washington Road


Corporate campuses just got bigger. Took a long time to cross RWJ and then Novo Nordisk. Nordisk was flanked by just-plowed fields receding into the distance, another block rising on the horizon. Then onto a Princeton campus of sorts. Old buildings, chimney must have been where they incinerated all those animals they tested? Just a guess. Now it's offices, but cozy compared to those isolated blocks. No problem crossing from there across a newly scraped and flattened build site parking lot to be and up over a red earth mountain ridge carefully compacted

and engraved by tractor treads. Through mugwort golden rod reedy gully to shining medical center and no-shade parking lot.

More smashed mugwort to park-path-meadow. A desire path just where it was supposed to be to cross river on Rt 1 bridge constructed 2010. Didn't mess with SRI behind glowing afternoon corn. Strict no-nothing notices at the gate. Aging corn, when do they harvest? And soy in front of the sign. Tax remittance landscape architecture.

Arrived, then, to Penn's Neck Village, little church, cozy cemetery, perched in another time.

Car Dealerships, South of Quakerbridge Mall


Waiting for a Lyft surrounded on all sides by cars. The theme of this walk was feeling small; I started to like it—feeling like a mouse because there were no gates or fences for me. Everything was car-scaled so I could slip in or out of anywhere. Fun to explore, cut across instead of around. As long as I stayed on my side of the road I could go almost anywhere and no one stopped me.

South of Princeton, Rt 1 changes a lot. Much more of a highway—faster dense with cars—cars become one mass, no longer individuals.

Home

Very highway and some sketchy high-speed-close-quarters intersections brought me to the Carnegie Center. Familiar now—I've been in winter and spring. Each time it feels empty. Careful landscape secrets, designed for the happy office worker. Do they fill up? I find thoughtful lunch spots, a strolling garden with bridges and ponds, stone amphitheater with picnic proportions, groomed bocce courts. Saturday-empty this time. I find only the groundskeepers, lugging hoses.

Emerge from the safety of just-right trees and quiet pathways, back to clinging the shoulder of centripetal exit ramps. Brave another intersection and fall into a grassy basin with single concrete vein. Up and out to shopping center parking lot, single mean eating Saturday burrito, doesn't blink as woman emerges from adjacent retention basin. Hydrate and wash at Trader Joe's (ran out of water before the Carnegie Center, thirst increased by taunting campus fountains). Behind Lowes (past the shed display) I find the prettiest retention basin yet—square concrete walls enclose grove of young trees, glimpses of field behind. Escape the basin, turns out field is abandoned housing development. Manholes push up several feet above ground level, graded street curves me gracefully back toward my road. All feels very romantic in low sun gold. I tramp my straight line along highway. No respite from rushing cars now that there are no more lights. If I felt out of place walking this road north of Princeton, now I feel like an alien. I shouldn't be here.

Last overpass comes closer and I choose over this time instead of under. Poison ivy pushes me off shoulder onto ramp and I hop back when cars stream down. I find myself on islands, dashing across to safety in mall parking lot. They're not expecting pedestrians here, neither, for some reason. It's just lower speed danger here. Navigate the mall to find Lord and Taylor's restroom to wash up, then down a level, out the other side, via Sears. Across to the car dealerships, all in a colony, tucked in for the night. Sun is setting behind I-95 bridge.

## February 15, 2018: S -> N

Sunoco at Millstone River


Feet up on some homemade chainsaw benches outside the gas station. Comfortable. Layers and layers of cars in front of me. Vague view of the river. I'm the only one using a bench though everyone else idles in their car.

Lyft ride down from the Crunch parking lot to Enterprise Rent-a-Car. We talked about my project. He joked about getting hit by a truck. Pointed out the hospital on the way. Made a big point about talk about how it will be all uphill in this direction. I was surprised he even noticed. How Sand Hill will be a tough climb. I asked how he liked driving Route 1. "It sucks. I just wrote your whole paper for you. It sucks." I made a comment about how all the lights make it feel like there's a lot of traffic when it's not. How it only takes 5 minutes more time to drive during rush hour. He asked if those 5 minutes are worth a trillion dollars in infrastructure investment. I said that's not the point. People hate the lights. He says yes it's not fair to his car. Thing has 350 horsepower, for what? I ask him his favorite road around here to drive. He said 78 going opposite traffic. West in the morning, east in the afternoon, so he can zip past and watch everyone sitting there. We talked about Jersey drivers and he paraphrases Kahn. You have to be a cheetah.

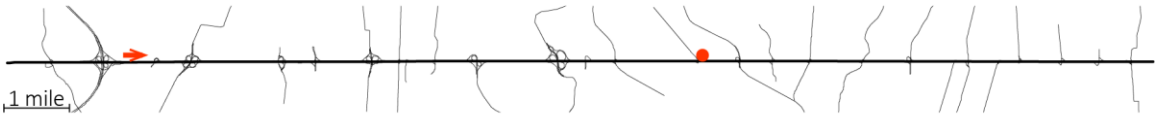
Walking north is difficult. Sidewalks, interrupted but present. People walking the crossing from Quakerbridge. Shift change 8:00. Mall parking lots still empty. Store facades floating across the asphalt. Familiar though. I know these signs, they're from anywhere. Stay on the sidewalk since it's there. Brief stop at Whole Foods, already something of a shock to see people, not cars. I cut in around and over the Quakerbridge loop, run into my Lyft driver who slows and waves.

More mall. Something about farm field on the other side and parking lot swath on this side captivates. Big Sky. Space.

Then corporate. New. Landscaped. Careful lawn edge of winter meadow. The geese enjoy. all these turf strips: goose food. Still no people. Passing a field so clearly in wait for suburbia: driveways already cut in, paved, curbed. The car giving use to its own needs. Out of corporate, across the Alexander Road loop – a crew cleaning litter, our oranges match. Amazing grade change, looking down into the loop. Wet. They took all that fill to make embankments for the ramps. [*Note: This is probably not true. The ramps are likely built on more structural road bed, trucked in.*] Almost graceful.

Under the dinky and then up into a field. The hedgerows make it irresistible in the February haze. A moment at Washington Road, trying to picture the bridge, church steeple peeking above. Then down. Field filled with fill and bulldozers.

Heathcote Brook Branch North of Raymond Road




Set up on two buckets, leaning against a tree, surrounded by a shimmering brook delta. Rivulets and rivels, snakes of wet leaves across the forest floor. Murmur and drop of water crossing tiny obstacles. The road sighs 100 feet behind me. Young beeches in the forest have held their leaves and illuminate with soft gold. In the winter, brambles which would have closed this place off give way easily. This stream here is the opposite of culvertized or channelized. It takes over the whole forest.

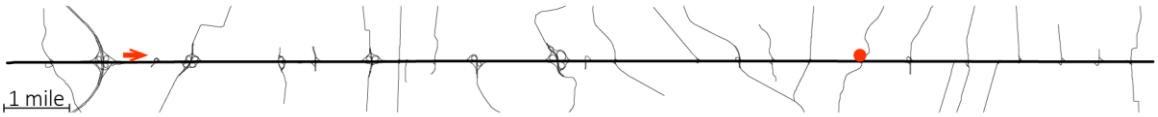
Today the water is the most beguiling. Even the reflections in detention basins hold elegance. And the streams, their alto and soprano awaken the bass and percussion of the road. It's hard to tell from just one walk how much water to expect. It rained last night and all weekend. This is a pretty wet time.

From the millstone river (geese, reeds, open), continued up along the turf edge of hotels, corporate centers, corporate hotel centers. Then woods. No trespassing signs on trees guarding a massive berm naturally invited me up. Pine-lined trail at the crest of the berm, sound barrier for brown homes in the woods. Forrestal estates? More corporate fields of gold—this one with ruled mower marks even in February. Glimpse of full corporate cafeteria. Forrestal Village, first I encounter the parking garages, then uniform streets, all feel like a rendering. Lunchtime, charming French café, everything quiet. polite. Sandwich to go and pack across the parking lot wilds. Was quiet in the protection of the village (Main street, village square, etc.) but now reemerging, there's the road: visually and aurally. I love the College Road intersection. It gives meaning to what I do. Turf, woven with ramps, forever. Village front lawn. Immaculate. The actual clover leaf was a flooded savannah, spiraling trees struggling, but very romantic.

Into the fields on the other side. The perfect geometry of hedgerows is striking. These ones seem to be cryptomeria. Another nursery remnant? Climb a mound of fill, neatly erosion controlled, look at the distant transformer and the closer intersection of Independence Way. It's a strange one. Bulldozer is perched. Something's afoot?

More corporate nonsense, and an incredible stream and old road (?) right of way? across from Dow Jones. Loud!

McDonalds Sand Hill




Stuck to the road. Memory a bit blurred. Woods alternate with random buildings. Offices (some empty), white castle, etc. Promenade full of people entering and leaving the mosque. But all cars. Are cars people?

Whispering woods, emptyish shopping center. New Road Day's Inn had a fascinating drainage system. Curb drains in the lawn then turf swales connecting to the stream, one part concrete. I think the whole thing is supposed to be wetland but that's not how it's graded. Up the hill, past 'a community of nice people,' the mobile home park that already has a giant shimmering shamrock up now that it's February 15. Also a big sign thanking the police. Amazing how that immediately spells racist now—even the shamrock loses its glimmer.

Now at the top of the hill, icing my ankle in McDonalds. Children squirming and squealing in the play set, route one rolls past silently just outside. The most life and activity this close to an intersection I've found so far. How different would it be if we could hear the cars?

Home


Quickly down the hill, sun nearly gone on the other side. Grey haired lady from the little green house checking her mail. The only true yard on the stretch. Yucca hedge, tree full of bird

feeders. Next door, a sea of cars still wrapped in white plastic. Geometric. A totally different entity than those roaring and wooshing past. These so peaceful and solid. Swampy at the bottom of the hill. Field across the way faintly glowing in the haze of sunset. cut across my last clover leaf up into the park. Along a winding drive, flawless asphalt, cozy benches, drifts of fallen leaves perfectly arranged. An extremely nice comfortable park. Glimpses of the highway through the forest but no sound. Felt like a stock photo after the Route 1 jumble. Catch a glimpse of path through the forest, straight back to the flashing cars, blazed with yellow no trespassing posts. Signs of organization in these woods. tidy stacks of logs, a collection of glass bottles nestled against a tree. Out again to the sunset road, bright signs ahead announce a return to commercial. strip malls, strip hotels. Intersections have tiny jug handles, cute after traversing the expansive ones earlier. Polite line of cars, heading home, released from the rush.

It gets darker and I wonder when to stop. Crossing the highway is unthinkable in this light. Even crossing the single lane ramps, with this unceasing busyness takes patience. The light disappears somewhere between the mobile home park gazebo and the raceway on the corner. I pass a man walking the other way as we trudge through the grass under the high tensions. I can't decide whether to say hi. We don't.

I've made it to Finnegans. Sit on a stone landscape pile at the edge of the raceway. Call a Lyft and then cancel it because the Costco sign is visible. A mile of dark woods between me and it. I can do it. I do, in a blurry way. Stop at the Farm Market grocery for a return to human scale. Last oversize parking lot to cross (BJs) and my car is in sight. Feels like home.

## Appendix B: Choice Matrix for Intersections

I used the following spreadsheet to classify the 26 intersections and look for potential patterns as I explored what each intersection could be. I had seven categories of "green," which counted as arguments for keeping the intersections green. I weighted preserved open space (state, county or municipal – not including easements or land held in trusts) twice as much as the other categories, with the assumption that that land would remain green longer. I considered adjacent woods and farm fields in a separate category than those that were disconnected but visible from the flyways.

I then chose three categories to subtract from green-ness. These were essentially used as arguments for creating a built landscape instead of parkland at those intersections. The categories included parking lots and gas stations adjacent, and significant residential development within a 5 minute walk of the intersection. The highest possible number for "green minus grey" was eight, while the lowest possible score would be -3. I found a range of -1 to 7 for intersections along this stretch of Route 1.

| Num | Name | Size | Acres | Views | Water Name | Water | Wetland Proximity | Woods Adjacent | Woods View | Farmland Adjacent | Farmland View | Preserved Land View (x2) | Green-Grey | Residential 1/4 mile | Parking Lot | Gas Stations | View Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | Adams Lane | S | 1.9 | S | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | parking lots around large building. Glimpse of scrappy woods |
| 25 | Commerce Blvd | M | 6.3 | S | Retention Basin | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | Commercial Parking lots, Retention basins, some wooded wetlands |
| 24 | Main Street | M | 9.5 | S W | | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 2 | 1 | 1 | 1 | Shopping center and County Preserved land, wetlands |
| 23 | Finnegans Lane | S | 2.9 | N | | 0 | 1 | 1 | 1 | 0 | 0 | 2 | 2 | 1 | 0 | 2 | View of gas stations, woods, high tension power line |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | Black Horse Lane | S | 2.8 | S W | Oakeys Brook | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | Ashley's Furniture and surrounding lawn, small parking lot, Woods |
| 21 | Henderson Road | S | 2.7 | S | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | -0.5 | 1 | 1 | 0.5 | Small commercial/ strip, old gas station pad, woods |
| 20 | Deans Lane | S | 1.8 | S | Pond | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2.5 | 1 | 0 | 0.5 | Motel, Gas station pad, Scrappy woods. |
| 19 | Beekman Road | M | 6.3 | N W | | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 7 | 0 | 0 | 0 | Farm field, clover leaf, woods, municipal preserved land |
| 18 | Sand Hill Road | S | 2.4 | Long Only | | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | McDonalds, Burger Kind, Water Town, Long long views |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | New Road | S | 2.9 | Wide Only | Heathcote Brook | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | Large Lawn in front of Days in hotel, woods. |
| 16 | Whispering Woods Blvd | S | 3.4 | All Views | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | Shopping center with big parking lot, woods, hints of residential |
| 15 | Promenade Blvd | M | 5.9 | S W | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | Gas station, Mosque with parking lot, retention basin with fence. Wide roads give long side views |
| 14 | Raymond Road | S | 2.4 | No Views | Heathcote Branch Brook | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 1 | Hotel with parking lot, woods, gas station |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | Ridge Road | L | 14.9 | N | | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 1 | 0 | 0 | Two hotels, woods on the NW corner are NJDOT owned, included in area total. |
| 12 | Independence Way | M | 6.3 | N W | | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 1 | 0 | Small Office parks with shaded parking lots, farmland, hotels |
| 11 | College Road | L | 50.7 | All Views | Heathcote Brook Tributary | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 7 | 0 | 1 | 0 | Lots of lawn: clover leaf, RWJ complex. Farmland, some woods, forestal village parking lot. |
| 10 | Scudders Mill Road | L | 21.7 | S | Carnegie Lake | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | 0 | Mostly woods, glimpse of hotel and hospital |
| 9 | Lower Harrison Street | S | 1.9 | Wide Only | Millstone River | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 1 | Millstone River, Farmland, hospital, park |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 8 | Washington Rd/Fisher Pl | S | 2.5 | N W | | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | Historic Church, Farmland, small wood patch homes, dinky train bridge |
| 6 | | Alexander Road | L | 28.5 | S W | | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 3 | 0 | 1 | 0 | Corporate Parking Lots, Scrappy woods, fields, shrubby clover leaf |
| 5 | | Carnegie Center | M | 5.3 | S | | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 2 | 1 | 0 | 0 | Corporate Centers, scrappy woods, distant tiny farm fields. |
| 4 | | Meadow Road | L | 15.6 | All Views | | 0 | 0 | 0 | 0 | 1 | 1 | 0 | -1 | 1 | 1 | 1 | Shopping centers, lots of parking, scrubby wooded clover leaves, farm field |
| 3 | | Quakerbridge Road | L | 40.5 | N W | | 0 | 0 | 0 | 0 | 1 | 0 | 0 | -1 | 1 | 1 | 0 | Shopping Centers and Parking |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | Mall Road | M | 5.7 | Wide Only | Retention Basin | 1 | 0 | 1 | 1 | 0 | 0 | 2 | 3 | 1 | 1 | 0 | Massive Mall Parking Lot, Woody Parch connected to DnR Park |
| 1 | Bakers Basin | S | 2.5 | Wide Only | | 0 | 0 | 0 | 0 | 0 | 0 | 2 | -1 | 1 | 1 | 1 | Shopping centers, car based businesses, |

Endnotes

[1] Kahn, *Notebooks and Drawings.*
[2] NJ Department of Transportation, "NJAC 16:47 (NJ State Highway Access Maqnagement Code)."
[3] Listokin, Berkhout, and Hughes, *New Brunswick, New Jersey*, 6.
[4] KSK Architects Planners Historians, Inc, "New Jersey Historic Roadway Study," 44.
[5] Durrenberger, *Turnpikes; a Study of the Toll Road Movement in the Middle Atlantic States and Maryland.*, 74.
[6] KSK Architects Planners Historians, Inc, "New Jersey Historic Roadway Study," 39.
[7] Durrenberger, *Turnpikes; a Study of the Toll Road Movement in the Middle Atlantic States and Maryland.*, 72.
[8] KSK Architects Planners Historians, Inc, "New Jersey Historic Roadway Study."
[9] Listokin, Berkhout, and Hughes, *New Brunswick, New Jersey*, 6.
[10] Kaszynski, *The American Highway*, 38.
[11] U.S. Department of Agriculture, "United States Route No. 1 Is a Highway of History."
[12] "NETRonline: Historic Aerials"; Mozingo, *Pastoral Capitalism*.
[13] Conversation with Dr. James Hughes, Bloustein School of Planning and Public Policy. March 1, 2018.
[14] Haraway, *The Haraway Reader*, 11.
[15] Adams, *The Ultimate Hitchhiker's Guide to the Galaxy*, 11.
[16] David Greene, "Gardener's Notebook."
[17] Corboz, "The Land as Palimpsest," 31.
[18] Kahn, *What Will Be Has Always Been*, 6.
[19] Kahn, *Notebooks and Drawings.*
[20] Kahn, *What Will Be Has Always Been*, 7.
[21] *Louis I. Kahn Traffic Study, Project, Plan of proposed traffic-movement pattern, 1952*
From the Collections of the Museum of Modern Art 389.1964
[22] Corbusier, *The City of Tomorrow and Its Planning*, 191.
[23] Blaszczyk, *Norman Bel Geddes Designs America*.
[24] Kahn, *What Will Be Has Always Been*, 7.
[25] Berger, Kotkin, and Guzman, *Infinite Suburbia*, 245.
[26] Alan Berger et al., "Where Americans Live."
[27] Kahn, *Notebooks and Drawings.*
[28] Helphand and Cynthia L. Girling, *Yard, Street, Park*, 29.
[29] "What Is Smart Growth?"; "Greenbelt Alliance | Our Challenge."
[30] Williamson, *Retrofitting Suburbia*.
[31] Berger, *Drosscape*, 5.
[32] Berger, 35.
[33] Mozingo, *Pastoral Capitalism*, 11.
[34] Davis, "The American Motor Parkway"; Rowe, *Making a Middle Landscape*, 81.
[35] Tunnard and Boris Pushkarev, *Man-Made America*, 162–64.
[36] Ingersoll, *Sprawltown*, 75–76.
[37] "The Boring Company."
[38] "Full Tilt."
[39] Geddes, *Magic Motorways*, 10.
[40] O'Toole, *Gridlock*, 189.
[41] Blaszczyk, *Norman Bel Geddes Designs America*, 299.
[42] Singleton, "SpaceX's Falcon Heavy Launch Was YouTube's Second Biggest Live Stream Ever."
[43] "The Boring Company."2018
[44] In May 2017, The American Architectural Foundation (AAF) hosted a National Summit on Design & Urban Mobility in Pittsburgh, PA, with a heavy focus on autonomous vehicles. The New York Chapter of the

American Institute of Architects (NY AIA) followed up in December 2017 with their Anticipating the Driverless City Symposium.

[45] Tunnard and Boris Pushkarev, *Man-Made America*, 175.

[46] Rowe, *Making a Middle Landscape*.

[47] Kaplan, Kaplan, and Ryan, *With People in Mind*.

[48] Tunnard and Boris Pushkarev, *Man-Made America*, 174.

[49] People who drive the road regularly have their own personal landmarks. Some of those I've heard named are: the Costco in North Brunswick, the water tower at Sand Hill, the mobile home park with prescient holiday decorations, the little yellow Turkish restaurant, and the intersection at Washington Road.

[50] "FHWA | Environmental Review Toolkit | Guidelines for the Visual Impact Assessment of Highway Projects"; "Penns Neck Area EIS, Route 1, Section 2S and 3J, Mercer and Middlesex Counties, New Jersey," 111.

[51] US Census Bureau, "Who Drives to Work?"

[52] "Road-Improvement Dispute Impairs Forrestal Complex."

[53] "Penns Neck Area EIS, Route 1, Section 2S and 3J, Mercer and Middlesex Counties, New Jersey," 4.

[54] Jackson, *A Sense of Place, A Sense of Time*, 159.

[55] Lynch, *Good City Form*, 135.

[56] "Urban Mobility Scorecard — Urban Mobility Information."

[57] NJ Department of Transportation, "Route 1 Regional Growth Strategy."

[58] NJ Department of Transportation, 19.

[59] Talen, "Zoning For and Against Sprawl," 188; Lawrence Township, Land Use Ordinance; South Brunswick Township, Zoning Ordinance, Township of North Brunsiwck, Township of Plainsboro, Township of West Windsor. All of these zoning ordinances (except Lawrence) have been amended multiple times since their original adoption, but the basic structure and map remains the same as far as I can tell.

[60] Lynch, *Good City Form*, 176.

[61] Lynch, 175.

[62] Lessinger, "The Case For Scatteration."

[63] NJ Department of Transportation, "Route 1 Corridor Transportation Study"; "Penns Neck Area EIS, Route 1, Section 2S and 3J, Mercer and Middlesex Counties, New Jersey"; NJ Department of Transportation, "Route 1 Regional Growth Strategy."

[64] STV Incorporated, "Central New Jersey Route 1 Bus Rapid Transit Alternatives Analysis Study."

[65] "DVRPC > About Us > Committees."

[66] "New Jersey Transit."

[67] NJ Department of Transportation, "Route 1 Regional Growth Strategy."

[68] NJ Department of Transportation, 34.

[69] Newman Grubb Knight Frank. *Suburban Office Obsolescence.* September 2015. www.ngkf.com

[70] Conversation with Dr. James Hughes, Bloustein School of Planning and Public Policy. March 1, 2018.

[71] Hughes and Seneca, *New Jersey's Postsuburban Economy*, 111.

[72] Hughes and Seneca, 115.

[73] Kahn, *Notebooks and Drawings.*

[74] Scobey, *Empire City*, 236.

[75] Braess, Nagurney, and Wakolbinger, "On a Paradox of Traffic Planning."

[76] "NYC DOT - Broadway."

[77] Donald Appleyard, Kevin Lynch, and John R. Myer, *The View from the Road*, 8.

[78] I have made no mention of trucking in this design, even though trucks comprise a considerable amount of traffic on Route 1. They currently drive this route because it is a free alternative to the New Jersey Turnpike, which has steep tolls for trucks. Currently the free north-south route from the 295/495/95 intersection in Wilmington, Delaware to New Brunswick/18/287/95 is only 5 minutes slower than taking the Turnpike. Disallowing trucks from the flyways will displace local trucks to the slow lane, and long haul trucks will likely need to use the NJ Turnpike or look for yet another alternative route. Trucking is a complicated state-wide issue. When the New Jersey Turnpike first raised its tolls in the 1990's, trucks used Route 31 west of Princeton to avoid the tolls, until the public got upset and eventually succeeded in lowering the

speed limit and enacting an interstate truck ban on the road. (http://www.nytimes.com/2004/11/28/nyregion/the-return-of-the-trucks-maybe.html) Few businesses along the Route 1 corridor rely on those trucks, since the majority of major warehousing facilities are much closer to the NJ Turnpike. Displacing trucks will not significantly affect the current industries along Route 1, it will only ensure that massive warehousing/fulfillment centers are not in the road's future.

[79] Kahn, *What Will Be Has Always Been*, 8.

[80] "Autonomy | Definition of Autonomy in English by Oxford Dictionaries."

[81] Wood et al., "The Potential Regulatory Challenges of Increasingly Autonomous Motor Vehicles"; Clough, "Metrics, Schmetrics! How Do You Track a UAV's Autonomy?"

[82] Corboz, "The Land as Palimpsest," 26.

[83] Corboz, 30.

[84] "Road Safety - Speed."

[85] Yes, I am asking New Jersey drivers to make left turns like the rest of the world.

[86] In suburbia, children find refuge in forts and hideouts they make in the fragments of forest between development. In that way, a child finds stability and comfort within the wild and mysterious. Contained and hidden, there is safety, ownership and a place to rest. The suburban landscape is an exposed landscape. Wide residential streets, front lawns, mandated landscape buffers and expansive parking lots give suburbia a feeling of openness. The impulse of a child to seek shelter from wide open space is human. In contrast, adults are constantly driving through that open space in a state of unrest. Intersections, wide-open and relentless, aggravate. Slowed and reclaimed intersections are opportunities for refuge.

[87] Conversation with Amy Gage, ecology PhD student in the Center for Urban Restoration Ecology at Rutgers. March 23, 2018

[88] Robichaud and Anderson, *Plant Communities of New Jersey*, 193; USDA Natural Resources Conservation Service, "Plant Factsheet: Liquidabar Styraciflua."

[89] "NETRonline: Historic Aerials."

[90] Horn, "FOREST SUCCESSION."

[91] Troy Ettel, "Raritan Piedmont Wildlife Habitat Partnership Grassland Conservation Plan."

[92] "Wildflower Meadows: Let's Get Real | Larry Weaner Landscape Associates."

[93] *The Invisible Element of Place*, 225.

[94] Hughes and Seneca, *New Jersey's Postsuburban Economy*.

[95] Township of North Brunsiwck, Zoning Ordinance, South Brunswick Township, Township of Plainsboro, Township of West Windsor; Lawrence Township, Land Use Ordinance, 2.

[96] The exception is Lawrence's code, which was written in the late 1990's, and substantially updated in 2014. This code is markedly different from the other four, incorporating principles of urban design, mixed uses and flexibility into their codes. However, while a stated purpose of the Lawrence code is to discourage automobile-centric uses, their zoning contradicts that intention. Wide separation between buildings, and generous landscape buffers are called for throughout.

[97] Levine, *Zoned Out*.

[98] Haraway, *The Haraway Reader*, 38.

[99] Mitchell, *The Right to the City*, 231.

[100] Haraway, *The Haraway Reader*, 39.

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