Identification of Urban Truck Parking Locations in the MAASTO Region

MID-AMERICA
FREIGHT COALITION

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About the Mid-America Freight Coalition (MAFC)

The industries and farms of the Mid-America region can compete in the marketplace only if their products can move reliably, safely and at reasonable cost to market.

State Departments of Transportation play an important role in providing the infrastructure that facilitates movement of the growing amount of freight. The Mid-America Freight Coalition was created to support the ten states of the Mid America Association of State Transportation Officials (MAASTO) region in their freight planning, freight research needs and in support of multi-state collaboration across the region.

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Truck parking is an important element of the United States' transportation system, as it provides truckers with safe places to rest and stage for deliveries. Demand for truck parking spaces exceeds supply, and shortages are especially common in and around urban areas. These shortages jeopardize public safety. This report seeks to examine the potential parking availability of vacant urban parcels by establishing a methodology to identify parcels and examining whether the identified parcels are suitable for truck parking. This effort is based on a previous white paper demonstrating that affordable, accessible parcels are available to accommodate truck parking and, when used in conjunction with other policies like TPIMS and re-use of parking on the right of way, adaptation of urban sites could help reduce the frequency and severity of truck parking shortages. This study expands upon this earlier white paper and examines potential urban parking in the ten-state Mid America Association of State Transportation Officials (MAASTO) region. The screening methodology is also refined to allow for greater precision and adaption to the various parcel data found across the ten states.				
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Executive Summary

Truck parking is an important element of the United States' transportation system, as it provides truckers with safe places to rest and stage for deliveries. Demand for truck parking spaces exceeds supply, and shortages are especially common in and around urban areas. These shortages jeopardize public safety as they are associated with truck parking on highway ramps and shoulders, parking in unsecure areas, and violations of truckers' maximum hours of service.

There are three types of operation and policy solutions for this parking shortage.

1. Truck Parking Information and Management Systems (TPIMS) that collect and communicate information about parking availability through either detection and communication technologies or through social media applications.
2. Construction or re-adaptation of additional parking spaces on the current or new right of way, such as closed weigh stations.
3. Collaborative planning and rehabilitation of vacant urban parcels for use as parking areas.

This report seeks to examine the potential parking availability of vacant urban parcels by establishing a methodology to identify parcels and examining whether the identified parcels are suitable for truck parking. This effort is based on a previous white paper that examined potential urban parking in three cities: St. Louis, Missouri, Columbus, Ohio, and Detroit, Michigan. The authors found that affordable, accessible parcels are available to accommodate truck parking. When used in conjunction with other policies like TPIMS and re-use of parking on the right of way, adaptation of urban sites could help reduce the frequency and severity of truck parking shortages.

This study expands upon this earlier white paper and examines potential urban parking in the ten-state Mid America Association of State Transportation Officials (MAASTO) region. The screening methodology is also refined to allow for greater precision and adaption to the various parcel data found across the ten states.

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Introduction

Efficient trucking is an essential element of the United States' economic success. In 2015, trucks carried 63% of the nation's freight traffic, about 11 billion tons of goods worth over $13.2 trillion (1). Truck tonnage is forecasted to increase 44% by 2045, while the value of goods carried by truck will increase by 84% (1). The trucking industry is an economic heavyweight: it employs 1.6 million drivers (2) and an additional seven million people in the industries that support trucking (3).

One part of trucking infrastructure that is growing in importance is truck parking, which includes publicly-owned rest stops and private, commercial truck stops.

Truck stops and rest stops serve important safety and economic purposes:

1. They provide a safe stopping point for truckers to rest.
2. They act as staging areas for drivers making scheduled deliveries.

About 31,000 truck parking spaces are provided by the public sector, with an estimated additional 167,000 to 284,000 held by the private sector (4) to support the 3.63 million class 8 trucks in operation today (5).

Trucker Experiences and Perceptions

In the United States as a whole, demand for truck parking exceeds supply, with acute parking shortages in certain areas. For example, highways with an Average Annual Daily Truck Traffic (AADTT) count greater than 1,000 have about 31,000 spots total, but there is demand for 287,000 spots on an average night, and, according to an evaluation of the Interstate America database of commercial truck stops and a survey of public rest areas in 1999 and 2000, respectively, 90% of truckers have experienced difficulty finding parking (4). In the Midwest, the focus region for this paper, 76% of drivers have reported difficulty finding parking on 30% or more of their trips (6). Parking shortages are often associated with urban areas, which typically have greater concentrations of industry.

In an American Transportation Research Institute (ATRI) survey conducted in March of 2015, these carrier results were reconfirmed. It found that private truck stops are used for 56% of parking and public rest stops are used for 44% of parking (7). Perceived difficulty of finding parking at these locations continued to be an issue. The ability to find parking was rated equally difficult for both public and private locations by 62.1% of drivers; 23.7% of respondents said private truck stops were more difficult and 14.2% of respondents stated that public rest stops were more difficult.

ATRI posed a scenario where drivers could pay to reserve a parking spot. This question, which gauged driver willingness to pay, found that 48.2% of drivers would not be willing to pay for parking, 20% would pay $1 to $5, and 19.8% would pay $6 to $10. In a subsequent question, 46.8% of drivers indicated that the carrier should pay a parking reservation fee.

As freight tonnages increase, parking shortages, and their related public safety and infrastructure problems, are likely to worsen. When truckers cannot easily find parking, they may engage in unsafe parking practices, each of which has its own problems. Parking on highway ramps is common. This practice is unsafe because it creates a collision risk for other motorists and it damages roadway shoulders not designed to support the weight of a parked truck. Drivers may also find parking in

unsecured vacant lots like malls or abandoned gas stations. This exposes them to assault, robbery, and other crime. Finally, truckers unable to find parking may continue driving beyond their legal maximum hours of service (HOS), which means they are more likely to be fatigued and at risk of the dangers of drowsy driving (8). Regardless of payment for parking, a majority of drivers of all types (local, regional, inter-regional, and long-haul) would prefer to reserve parking in major metropolitan areas over rural or small metropolitan areas (7). This supports the perception that truck parking is more difficult to access in major metropolitan areas than in other rural or smaller communities, and that it plays an important role in staging for scheduled delivery times.

There are three public policies that impact the current parking shortage. First are federal HOS regulations, which are designed to improve highway safety by keeping fatigued drivers off the road. HOS rules state that drivers may not drive for more than 11 hours after 10 consecutive hours off duty. Additionally, drivers may not drive more than 8 hours without a 30-minute, off-duty or sleeper berth break (9). These rules mean that drivers travelling greater than 7 hours from home will require some kind of parking facilities. The second policy is Jason's Law, a portion of the Federal MAP-21 spending bill passed in response to the murder of a trucker parked at an abandoned gas station. Jason's Law made truck rest areas and parking areas available for federal highway funding (10). Finally, with increasingly limited transportation funding, many states have sought to cut costs by closing rest areas and weigh stations, exacerbating existing parking shortages (8). In addition to these policy decisions, proposals for new truck parking locations are often challenged or canceled due to public concerns about safety or pollution (11, 12).

Market phenomena also have an effect on parking demand. The forecasted 44% future growth in truck tonnages will result in more trucks and increased demand for parking spots, worsening current shortages (1). The rise of just-in-time inventories and scheduled deliveries is also contributing to shortages, as drivers often need parking near destinations to wait for appointed arrival times (8).

The problem of truck parking shortages arises from a variety of causes and has a range of negative effects on safety and infrastructure. However, a simple fact remains: in many areas there are not enough parking spaces. To solve these shortages, some policies seek to increase the number of available parking spots, while others seek to improve truckers' decision making with information on parking availability.

Policy and Innovation Solutions for Truck Parking Shortages

There are three current strategies being used to address the parking shortage.

Truck Parking Information and Management System (TPIMS)

The Truck Parking Information and Management System (TPIMS) approach is designed to improve utilization of available parking by collecting and communicating information about real-time parking availability to drivers. In eight of the ten states in the Mid America Association of Transportation Officials (MAASTO) region, this is accomplished through a TPIMS, which can provide truckers with information on availability of parking at specific locations. TPIMSs show promise in "smoothing" parking demand along corridors, where some lots may be full and others open, reducing the time drivers spend off highway searching for spots. Additional information on the MAASTO TPIMS project can be found at: trucksparkhere.com.

The trucking sector has also increased productivity with the use of social media and trucker-supplied data. Software and mobile applications are created to serve this purpose. Mobile applications are attractive and easy to implement because of the high number of drivers who utilize the technology. In 2013, 50% of drivers had smartphones (14). HOS monitoring and reducing operating costs can be aided by these technologies (14). The search for truck parking is an inefficient use of a driver's time and increases fuel and operating costs, impacting both HOS and the financial bottom line.

Drivers are being aided in their search for truck parking by a range of free smartphone applications. Beyond including the location of parking, these applications often include information about upcoming parking locations and the number of available parking spots. Depending on the program, these details are recorded by drivers logging their observations of parking areas or by parking providers reporting their availability in the application. Beyond this, some applications also allow drivers to share information about amenities located in and around parking areas.

These applications created both by private companies and by industry bodies have been widely adopted to address drivers' needs. The National Association of Truck Stop Operators (NATSO) created Park My Truck, which provides drivers with information uploaded by parking providers (16). Trucker Path is perhaps the most widely used application, with a user base of over 500,000 (15). Beyond parking, the application provides information on truck stops, weigh stations, fuel prices, and has a communication system that is integrated with Facebook Messenger.

Well established technologies are being used to help drivers find suitable parking places. Vehicle detection methods including in-pavement sensors, video, and light and laser detection are used to determine the number of vehicles in the lot at a given time (18). This data is submitted for central processing and updates to variable message signs provide information to drivers without the need for a mobile application with internet connectivity (19, 20).

Re-Opening Rest Areas and Purchasing Rights of Way

A second policy option is to increase availability of parking by re-opening closed rest areas or purchasing additional rights of way (ROW). However, available rights of way for parking is not always coincidental with areas of parking shortages, so opening closed locations may not have much impact on localized shortages. Other considerations include the acquisition and site development costs of new rights of way, as well as the availability and cost of amenities at re-purposed sites.

Collaborative Planning Approach

A third policy option to improve truck parking availability could be collaborative work between state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and local governments to identify and readapt vacant urban sites and brownfields for truck parking. This approach would provide additional capacity in urban areas where tightly scheduled delivery times and congestion place further demand on available spaces. The potential use of vacant industrial properties would require the purchase or lease of vacant paved sites of a minimum size, followed by the addition of appropriate assets like restrooms, lighting, and fences, in locations with access to highways, businesses, and warehouses. Vacant industrial or commercial properties with large square footages of pavement or concrete would be ideal options. These sites are likely to be relatively low cost in terms of both land value and infrastructure construction and are more likely to have immediate access to arterial roads.

This approach is also designed to avoid residential areas, hospitals, roads with clearance issues, areas with ordinances prohibiting truck parking, and areas with high crime rates. Collaboration between state DOTs and MPOs is not required but is ideal because the organizations can defray the costs as well as share in the benefits. This paper evaluates this third policy, the Collaborative Planning Approach (CPA) as a viable alternative or addition to the traditional repurpose or purchase of ROW, and the newer TPIMS approach.

Methodology

One urban area was evaluated in each of the ten MAFC member states to identify truck parking opportunities. Each of these areas was nominated by the State DOT in which it resides. The selected urban area and sources of parcel data for each state are described in Table 1.

Table 1. MAFC states, selected urban areas, and parcel data sources.

State	Selected Area	Parcel Data Source(s)
Illinois	Greater Chicago	Cook County, https://www.cookcountyil.gov/CookCentral
Indiana	Aurora	Dearborn County, Ohio-Kentucky-Indiana Regional Council
Iowa	Des Moines	Polk county, Des Moines Area MPO
Kansas	Wichita	Sedgwick county, Wichita Area Planning Organization
Kentucky	Greater Cincinnati	Boone, Kenton Counties, Ohio-Kentucky-Indiana Regional Council
Michigan	Detroit	SEMCOG, Plan and Policy Development
Minnesota	Twin Cities	MnDOT, Anoka, Dakota, Hennepin, Ramsey, and Washington counties
Missouri	St. Louis	St. Louis City https://www.stlouis-mo.gov/data/parcels.cfm St. Louis County https://data-stlcogis.opendata.arcgis.com/datasets/parcels
Ohio	Cleveland	Cuyahoga County, Cleveland and outside areas https://data-cuyahoga.opendata.arcgis.com
Wisconsin	Milwaukee	Milwaukee County http://gis-mclio.opendata.arcgis.com Waukesha County http://data-waukeshacounty.opendata.arcgis.com

The process of identifying the number of candidate parcels was automated in order to quickly screen non-viable sites. Given that the parcel data for each urban area contained thousands of features, a series of filter criteria were applied to reduce the number of parcels to a manageable number before performing a visual analysis for suitability on those that remained.

The first criterium was the area of the parcel. A threshold of five acres was applied to allow for enough space for truck parking and associated infrastructure. With the exclusion of all parcels with an area of less than five acres, subsequent steps required less processing time.

Major freight corridors for parking evaluation were derived from the National Highway Freight Network (NHFN) for each of the areas selected. Some routes included in the NHFN but determined to be lesser corridors were excluded from the analysis. These included minor arterials or bypasses. The reason for

exclusion varied by city but given the goal of identifying locations for staging purposes, the effort was to exclude corridors that served as a bypass to the urban area rather than access to it.

For subsequent steps, additional columns were added to the parcel attributes to indicate true/false conditions and contain derived values.

With the selected freight corridors defined, vacant land parcels within 0.25 miles of the corridor were flagged. The 0.25-mile value was selected as the ideal truck parking location as it would be near the corridor and quickly accessible, and also visible from the corridor. This proximity also provides a psychological effect of providing drivers a visible destination before proceeding to an exit. An example of selection by proximity to the freight corridors is shown in Figure 1.

Figure 1. Selection of parcels within 0.25 miles of freight corridors.
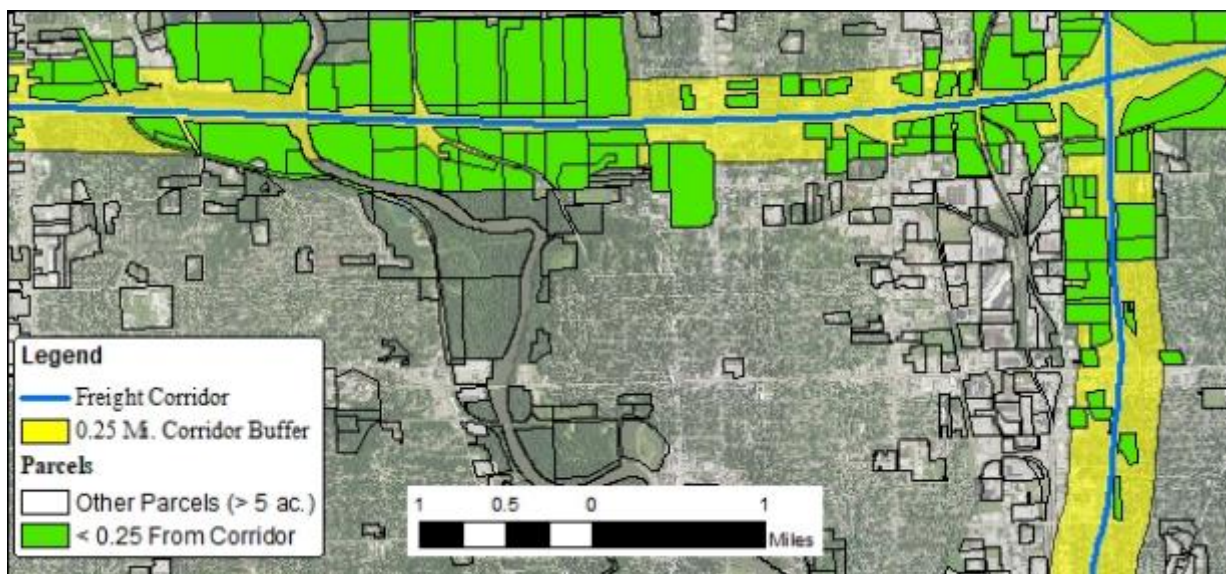
Locations of ramps that permit access to local roads were identified using satellite imagery and background street maps. In addition to the ramps on the selected corridors, ramps and access points on nearby arterials were identified where a logical exit would occur. As with the corridor proximity analysis, a parcel attribute was added to indicate being within 0.25 miles of the identified ramps or access points. Example ramps and proximate parcels is shown in Figure 2.

Figure 2. Selection of parcels within 0.25 miles of ramps or other access points.
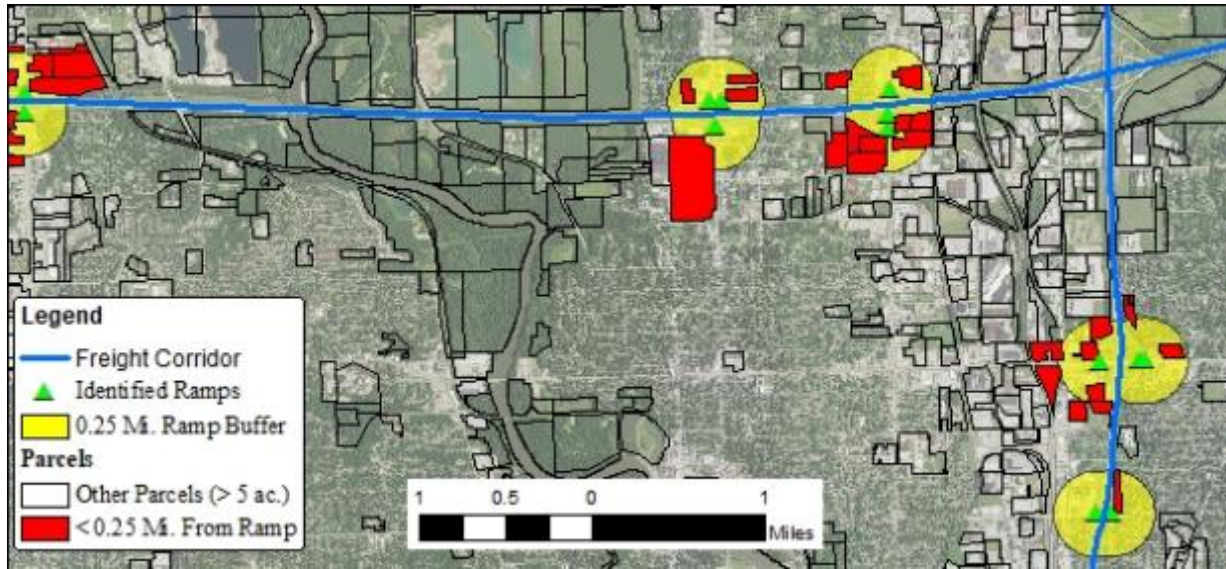
A combination attribute for each parcel was generated containing an indication of if the parcel is within 0.25 miles of a corridor, an identified ramp, or both. Parcels not meeting either criteria were excluded from subsequent steps as less than optimum solutions.

Ideal parking locations would favor proximity to city centers and areas with industrial or commercial activity. Using satellite imagery, point locations were identified where there were apparent retail centers, warehouses or other large buildings, or urban centers. These points are hereafter referred to as Industrial/Commercial centers. A distance raster (image) was generated wherein the value at a given point represents the minimum straight-line distance to any of the Industrial/Commercial points to a maximum of two miles. Parcels were overlaid on the distance raster and assigned additional attributes corresponding to the minimum, maximum, and average distance from any Industrial/Commercial center. An example distance raster and overlaid parcels meeting the five-acre area criteria and being within 0.25 miles of either a corridor or an identified access point is shown in Figure 3.

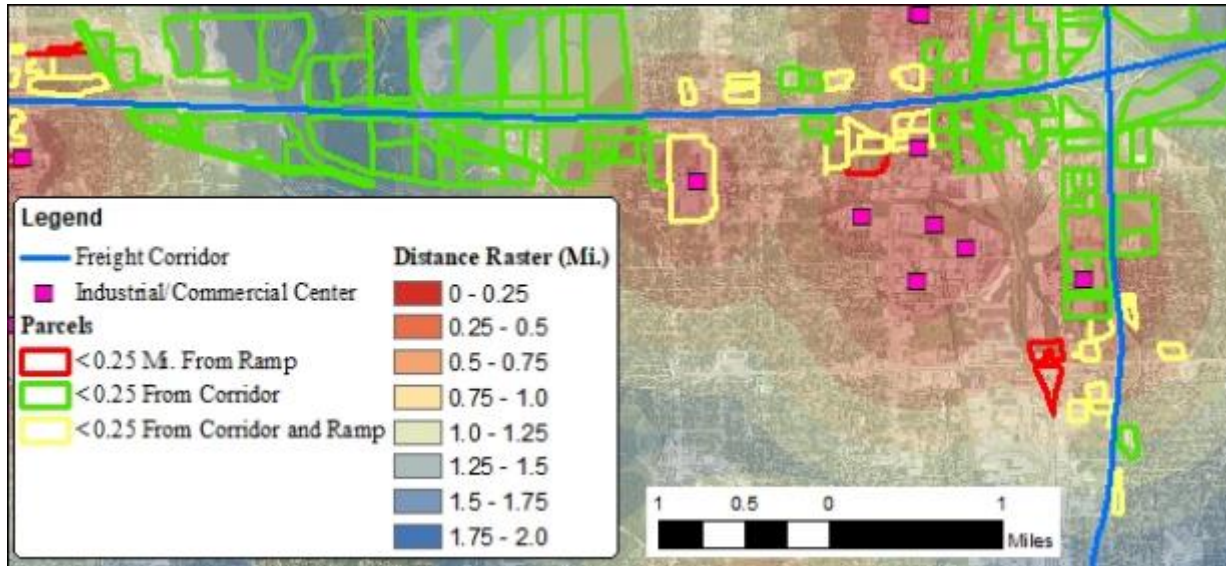Figure 3. Raster/Image representation of distance from industrial/commercial areas.

Image analysis was completed using satellite imagery from the National Agriculture Imagery Program (NAIP). The date of acquisition varied by urban area and was either 2016 or, more frequently, from 2017.
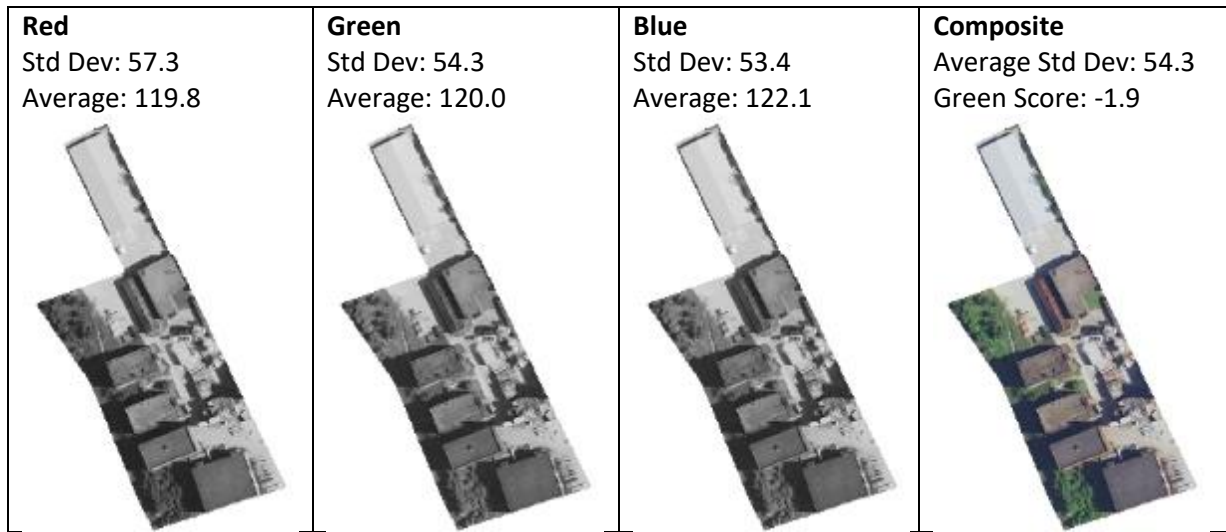
Parcels reaching this step of the analysis were evaluated using the imagery clipped to the bounds of the parcel. The composite image was first split into its component red, green, and blue bands.

The standard deviation and average pixel values were calculated for each band as well as the average standard deviation across all bands. The standard deviation value is useful to determine the degree of variability within the imagery of a parcel. A parcel with a high standard deviation in the pixel values across one or more bands typically corresponds to one that has been extensively developed with a variety of features and is therefore unsuitable for parking purposes. Conversely, a low standard deviation indicates a visual homogenous parcel.

The average pixel values of the bands are also useful to determine the level of development. The average green band pixel value is not useful in isolation as a white pixel in the color image is represented as 255 in the red, green, and blue bands. A measure of how green a parcel is, hereafter referred to as the green score, was calculated as two times the average green pixel value minus the average red and blue pixel values. High green scores correspond to parcels wherein the dominant color is green. Example parcels and resulting image analysis values are shown in Figure 4.
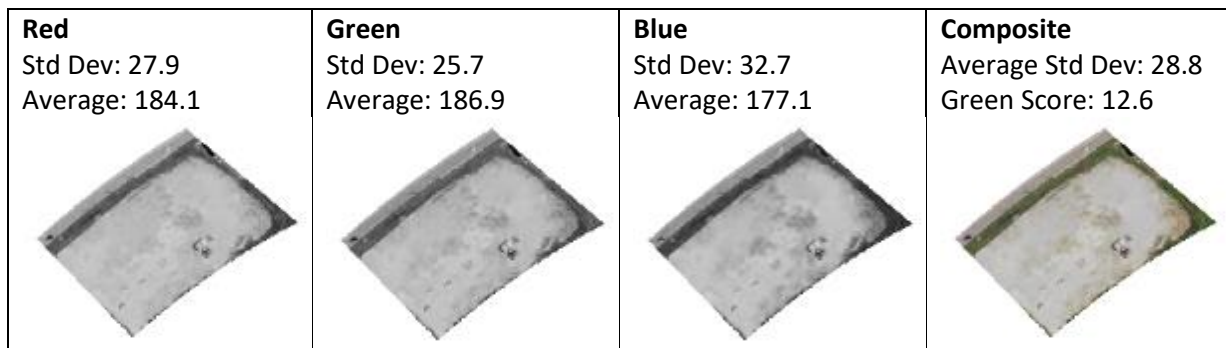
Figure 4. Analysis of parcel satellite imagery.

a. Developed parcel with heterogenous features

Red	Green	Blue	Composite
Std Dev: 57.3	Std Dev: 54.3	Std Dev: 53.4	Average Std Dev: 54.3
Average: 119.8	Average: 120.0	Average: 122.1	Green Score: -1.9

b. Homogenous, undeveloped parcel in rural area.

Red	Green	Blue	Composite
Std Dev: 10.4	Std Dev: 8.7	Std Dev: 7.2	Average Std Dev: 8.77
Average: 101.0	Average: 117.4	Average: 87.1	Green Score: 46.7
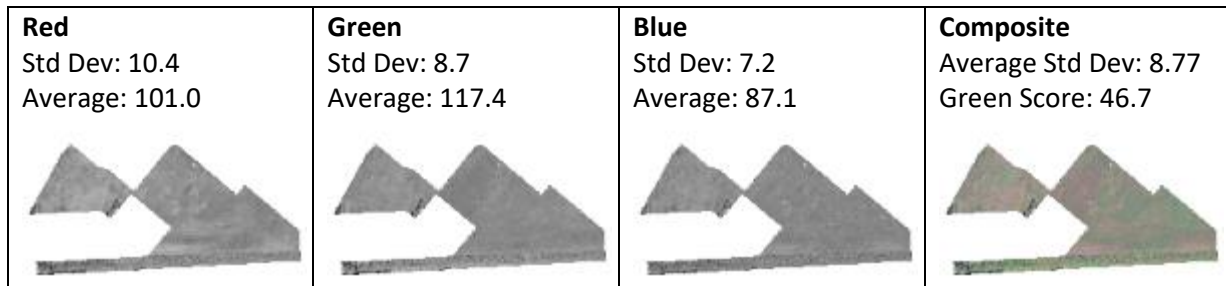
c. Ideal homogenous parcel with relatively low green score (2 x avg green – avg red – avg blue)

Red	Green	Blue	Composite
Std Dev: 27.9	Std Dev: 25.7	Std Dev: 32.7	Average Std Dev: 28.8
Average: 184.1	Average: 186.9	Average: 177.1	Green Score: 12.6

This process is useful as a screening tool but requires visual analysis as well. For example, a parcel with a large building roof and similarly colored parking lot will have low standard deviations in pixel values of the various bands and low prevalence of green but would clearly still be unsuitable for truck parking.

With the original parcels filtered to only those with areas 5 acres or larger, within 0.25 miles of a corridor or ramp/access point, and within two miles of an Industrial/Commercial center, the number of remaining parcels still ranged from the hundreds to thousands in the largest urban areas. An additional

ranking metric was created to further filter the results. For each urban area, the average standard deviation value for all bands was standardized from 0 to 1 as was the green score into respective columns. One additional metric was calculated as the standardized average standard deviation minus the standardized green score. In this metric, the lowest values correspond to homogenous green parcels and the highest values typically correspond to highly developed (not green dominant) and heterogenous parcels with little apparent green areas. By inspection, the ideal parcels tended to be clustered in the range of 0.1 to 0.4. Eliminating the parcels outside of this range reduced the hundreds or thousands of parcels down to a manageable number; in the tens of parcels. By stepping through the remaining parcels and evaluating proximity data to corridors, ramps, or industrial or urban centers and viewing satellite imagery, the best candidate locations for each urban area were identified.

Results

The results provided here a derived from attributes common to datasets in all urban areas or those that could be derived from geometries. By first eliminating parcels smaller than 5 acres in size, proximity and imagery analysis was applied to determine ideal truck parking candidate locations. The result was from four to twelve candidate sites where the optimal site would be within 0.25 miles of an exit point on a freight corridor, at a reasonably small distance from identified Industrial/Commercial centers, and be either vacant, abandoned, or minimally developed.

Table 5. Candidate Parcel Results

State	Count	Summary
Illinois	10	Several minimally developed or abandoned areas identified. Other existing paved lots with unused capacity. Potential for landowner agreements.
Indiana	5	Suitable parcels found on north and west sides of urban area. Other developed parking areas with unused capacity.
Iowa	6	One ideal parcel found north east of urban area. Other parcels are suboptimal. Developed with unused areas that may be suitable for parking. Two undeveloped, greenfield parcels in northwest.
Kansas	7	No abandoned or vacant sites identified. All candidate sites would need a landowner agreement or division parcels.
Kentucky	4	Ideal candidate sites identified, only one of which would require significant additional paving.
Michigan	6	Abandoned industrial areas and existing truck parking for private or public purposes.
Minnesota	11	Several abandoned industrial areas. Graded areas with varying paving conditions and semi-developed parcels with unused capacity.
Missouri	9	Several ideal candidate locations. Some with good pavement conditions and others that would require improvements.
Ohio	9	One abandoned industrial area with others requiring pavement improvements. Candidate parcels are large relative to other urban areas. Parcel division may be considered.
Wisconsin	5	One ideal uniform parcel but may require pavement improvement. Other parcels that are currently used at least in part for parking. One commuter parking location with adjacent space available for expansion.

A tabular view of the parcel information including a parcel identifier, acreage, and coordinates is provided in Appendix 1. Appendix 2 shows maps of the candidate parcels organized by state/urban area.

Discussion

A Geographic Information System (GIS)-based analysis for identifying suitable locations for freight parking in and around urban areas proved to be an efficient approach and several candidate locations were identified in each urban area. The attributes varied greatly between urban areas and in many cases even within them in areas where multiple counites or jurisdictions were involved. Some valuable attributes included current and future land use, current vacancy status, and estimated land value in one instance. While useful in individual cases, the approach was taken to apply uniform methods across all urban areas using only information available in common for each area. Supporting this decision was the presence of apparent inconsistencies in the attribute data. For example, incorrect vacancy or land use information as compared to recent satellite imagery. While the distribution date of a parcels dataset from a given source could be ascertained, some attribute fields seemed to be out of date. A common methodology was applied to keep the analysis simple and not introduce location-specific attributes of unknown quality or temporal accuracy.

Additional criteria including but not limited to existence or condition of local infrastructure, security situation, soil contamination, and sale availability and land valuation are best left to those with ready access to detailed land records. It is readily apparent that some parcels are out of date due to clear delineation in development that does not match parcel boundaries. Due to this, determining a current parcel identifier where parcel boundaries have changed much less a current valuation proves difficult.

Despite the value that GIS data and methods provide, there is no substitute for local knowledge of the situation. Those familiar with local freight volumes, driver preferences, and daily traffic patterns have an insight that a remote analyst cannot. Beyond this, the simple ability to visit an individual site to make a current on the ground assessment is invaluable and cannot be replaced by any remote visual representation of the site. Additionally, some candidate sites were identified wherein the parcel appears to be a parking facility. In other cases, a portion of the parcel has one or more structures while a considerable remaining portion is undeveloped or has limited utilization. For these areas, sale or rental agreements may be suitable but it would depend on landowner interaction.

Candidate parcels were identified in two steps. A subset of parcels was identified by selection criterion based on area, proximity, and image analysis. Satellite imagery of parcels meeting these criteria were evaluated visually to make the final candidate selection. The next step in the process of identifying the ideal location(s) would be an evaluation by personnel with access to property and infrastructure information and an invaluable ground truth assessment.

Conclusion

This research demonstrates that there is potential value in rehabilitating vacant urban parcels for use as truck parking facilities and that a CPA process based on GIS screening provides an effective method to identify potential parking areas.

One urban area was analyzed in each of the ten MAFC states. In total, 72 candidate parcels were identified that have a minimum area of 5 acres, are within 0.25 miles of a freight corridor and/or identified ramp or access point, are within two miles of Industrial/Commercial centers, and are vacant, could be developed, or appear to have unused capacity that could be used for truck parking purposes. Remaining filter criteria such as local freight volume, security, parcel sale status or valuation, or environmental concerns could be best addressed by those with local knowledge and ability to visit the sites in person.

These findings are especially relevant for truck parking in urban areas due to the increased need for parking close to the city center and industry. The congestion delays impacting delivery schedules and the increased concentration of trucks in industrial and commercial zones has rapidly become a major urban freight issue.

A GIS-based parcel approach combined with partnership efforts, including MPOs, DOTs, and city leaders, can support safe truck parking and reduce the incidence of unsafe parking practices and extreme congestion.

This approach can be modified to suit the community. For example, a more focused approach could be developed to avoid socially-sensitive areas or major highway bottlenecks. Alternatively, the screening process could focus on parcels close to urban police stations or well-traveled areas to increase the safety of the new facilities.

It should be noted that the problem of parking shortages extends beyond urban areas, and urban parking solutions like the one described above must be seen as a complement to, not a replacement for, the other policies of TPIMS, mobile applications, and opening of facilities along existing rights of way. Full solutions to the United States' truck parking shortage will require collaborative action between multiple levels of the government and the private sector, and application of all of the policies described above. This CPA action will not only help solve shortages but has the ability to lower costs of creating truck parking by splitting costs across multiple agencies. For freight planning and operations, this CPA approach should be considered as mitigation for freight-related urban congestion, limited truck parking, and unsafe parking practices.

Findings and data for each of the ten locations are found in the Appendices.

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Appendix 1. Candidate Parcel Table

State	Parcel IDs from sources in Table 1	Area (ac.)	Latitude	Longitude
Illinois	1927100005	14.4	41.7630	-87.7397
	2929409013	6.1	41.5731	-87.6377
	1517101017	13.1	41.8722	-87.9007
	1819301005	7.8	41.7624	-87.9070
	2526400006	8.5	41.6612	-87.5825
	1812200022	9.2	41.8028	-87.8047
	1827100001	8.8	41.7608	-87.8566
	1822304009	8.2	41.7623	-87.8557
	1231301019	10.4	41.9080	-87.9174
	1905400014	6.2	41.8079	-87.7673
Indiana	150702100020000016	9.0	39.1294	-84.8420
	150715301016000013	5.5	39.0926	-84.8693
	150721301007000013	10.8	39.0774	-84.8864
	150711200008000016	48.5	39.1145	-84.8546
	150721900025001013	118.3	39.0782	-84.8797
Iowa	792207100019	20.3	41.6705	-93.4625
	792413302008	8.0	41.6483	-93.5968
	792520400037	20.0	41.6310	-93.7801
	792515302003	16.7	41.6500	-93.7533
	792520200029	6.1	41.6431	-93.7823
	792311351004	13.3	41.6602	-93.4995
Kansas	00499470	13.3	37.6307	-97.3915
	00099484	5.7	37.6217	-97.3353
	00499498	6.7	37.6283	-97.3910
	00133437	6.2	37.6106	-97.3282
	00167734	31.0	37.6413	-97.3038
	00542150	12.4	37.6269	-97.3315
	30004993	8.1	37.7942	-97.3307
Kentucky	062.00-47-003.00	17.2	38.9863	-84.6473
	078.00-00-007.02	6.4	38.8551	-84.6283
	041-20-01-001.00	5.1	39.0610	-84.5373
	058.00-00-031.03	13.7	39.0758	-84.6529
Michigan	22022	5.5	44.7558	-93.2521
	20371	12.5	42.3911	-83.0686
	1256287	5.4	42.3899	-83.0642
	580299	14.3	42.4891	-82.9763
	583223	5.3	42.2980	-83.1796
	371041	13.2	42.3201	-83.1506

State	Parcel IDs from sources in Table 1	Area (ac.)	Latitude	Longitude
Minnesota	123-042923330032	5.1	45.0234	-93.1838
	123-042923340036	5.3	45.0235	-93.1820
	053-2202924230104	6.7	44.9875	-93.2863
	163-3602921340008	20.7	44.9512	-93.8764
	053-1002924210002	7.2	45.0193	-93.2791
	053-1711621210004	7.1	44.8612	-93.3711
	163-0502821330009	6.7	44.9357	-92.9628
	053-3102824330010	8.1	44.8630	-93.3481
	053-0302724210027	6.5	44.8604	-93.2796
	037-022092001010	5.4	44.7558	-93.2521
	037-020330075011	9.7	44.7823	-93.2921
Missouri	20K531405	5.6	38.6320	-90.3475
	27Q630422	5.2	38.5376	-90.4994
	09K120149	6.9	38.7752	-90.3525
	OL0401006	7.9	38.7743	-90.3544
	10G440310	5.4	38.7698	-90.2738
	10197000015	10.1	38.3134	-90.1916
	09K140466	17.7	38.7762	-91.3545
	20K427160	5.9	38.6301	-90.3519
	12L540043	5.2	38.7414	-90.6399
Ohio	44102001	16.6	41.4141	-81.7826
	34219005	92.1	41.4108	-81.8252
	54214002	52.0	41.4138	-81.6204
	54303002	5.2	41.4070	-81.6154
	48326002	5.2	41.3117	-87.7588
	48311007	7.2	41.3171	-81.7733
	23612004	6.1	41.4117	-81.9006
	43110001	5.4	41.4503	-81.7533
	43108006	18.9	41.4446	-81.7573
Wisconsin	3980906111	10.3	43.0334	-87.9356
	MNFV0008989	5.9	43.1787	-88.0848
	1800372000	6.1	43.1221	-88.0531
	4161301112	8.9	43.0301	-88.0362
	6249994200	5.3	42.9584	-87.9324

Appendix 2. Candidate Parcel Maps

Illinois

Parcel Id: 1927100005
Area: 14.4 ac.
Coordinates: 41.763, -87.7397

Parcel Id: 2929409013
Area: 6.1 ac.
Coordinates: 41.5731, -87.6377

Parcel Id: 1517101017
Area: 13.1 ac.
Coordinates: 41.8722, -87.9007

Parcel Id: 1819301005
Area: 7.8 ac.
Coordinates: 41.7624, -87.907
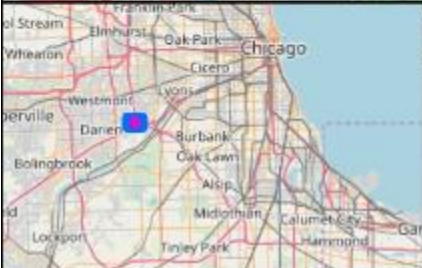
Parcel Id: 2526400006
Area: 8.5 ac.
Coordinates: 41.6612, -87.5825

Parcel Id: 1812200022
Area: 9.2 ac.
Coordinates: 41.8028, -87.8047

Parcel Id: 1827100001
Area: 8.8 ac.
Coordinates: 41.7608, -87.8566
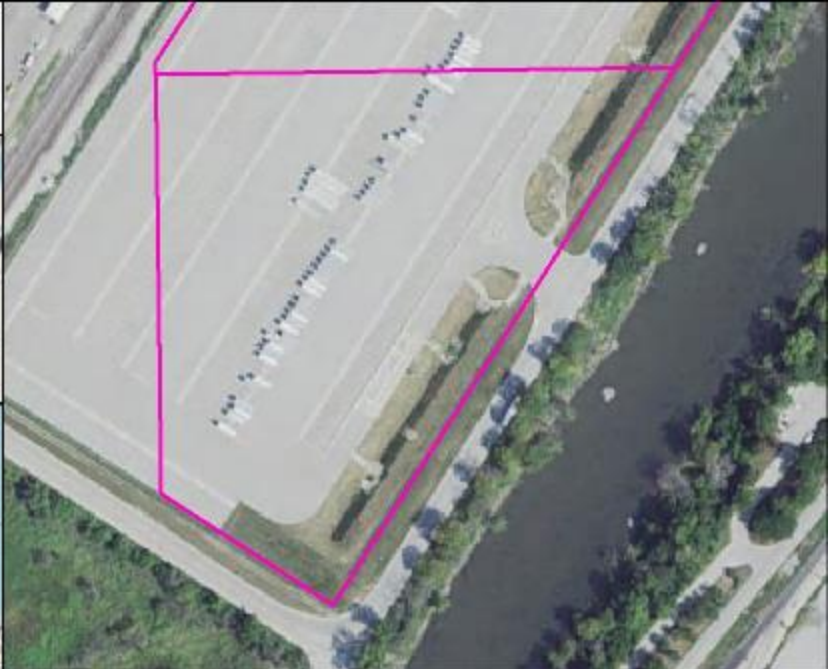
Parcel Id: 1822304009
Area: 8.2 ac.
Coordinates: 41.7623, -87.8557

Parcel Id: 1231301019
Area: 10.4 ac.
Coordinates: 41.908, -87.9174

Parcel Id: 1905400014
Area: 6.2 ac.
Coordinates: 41.8079, -87.7673

Indiana

Parcel Id: 150702100020000016
Area: 9.0 ac.
Coordinates: 39.1294, -84.842

Parcel Id: 150715301016000013
Area: 5.5 ac.
Coordinates: 39.0926, -84.8693

Parcel Id: 150721301007000013
Area: 10.8 ac.
Coordinates: 39.0774, -84.8864

Parcel Id: 150711200008000016
Area: 48.5 ac.
Coordinates: 39.1145, -84.8546
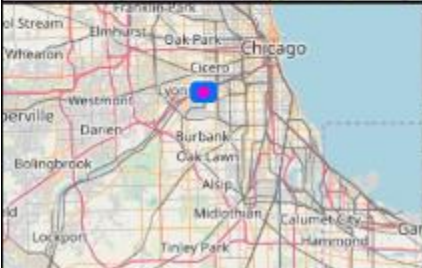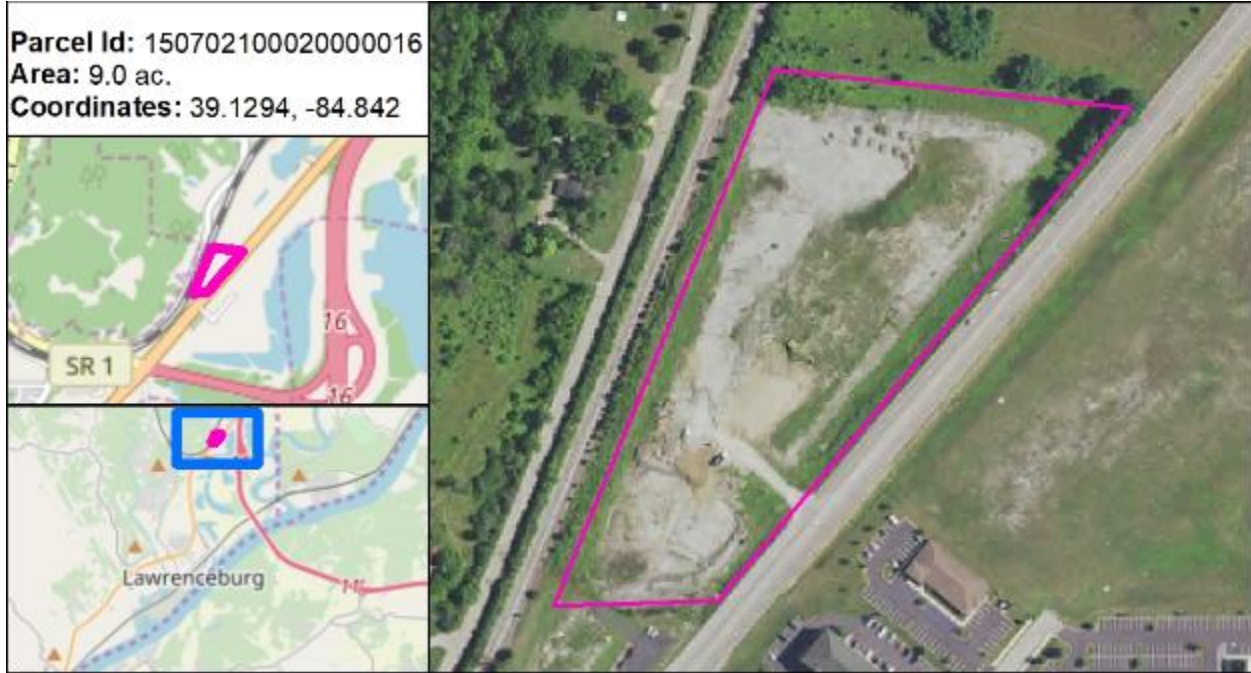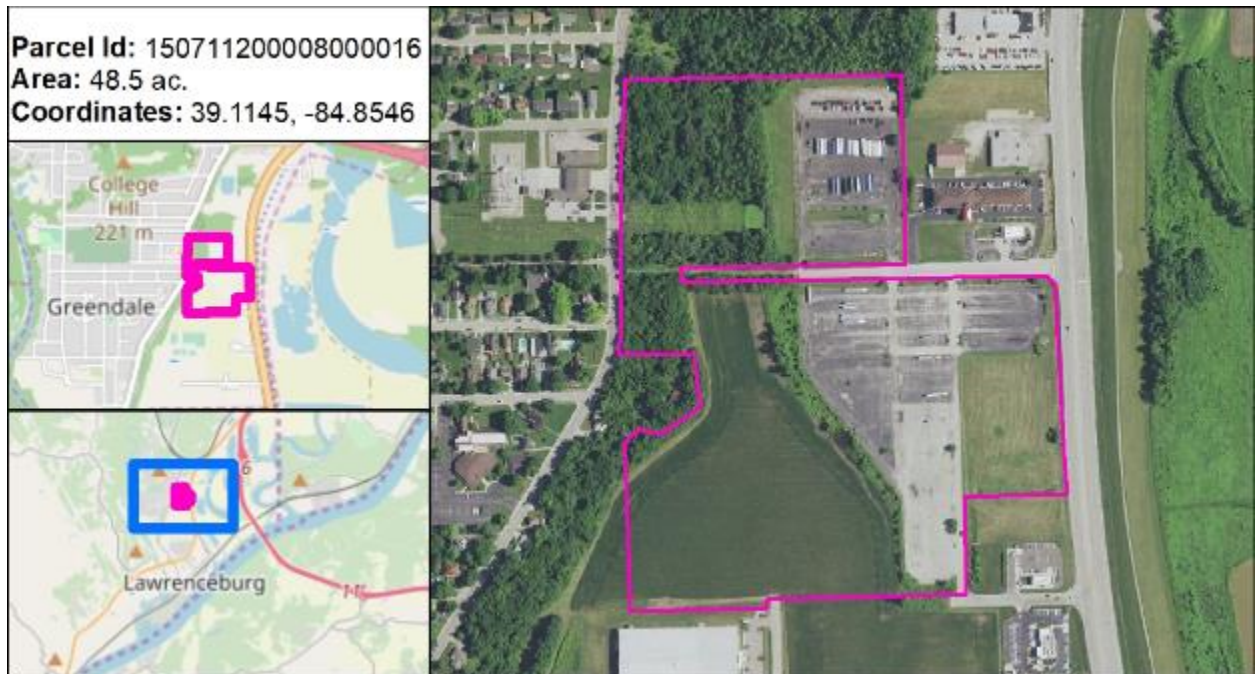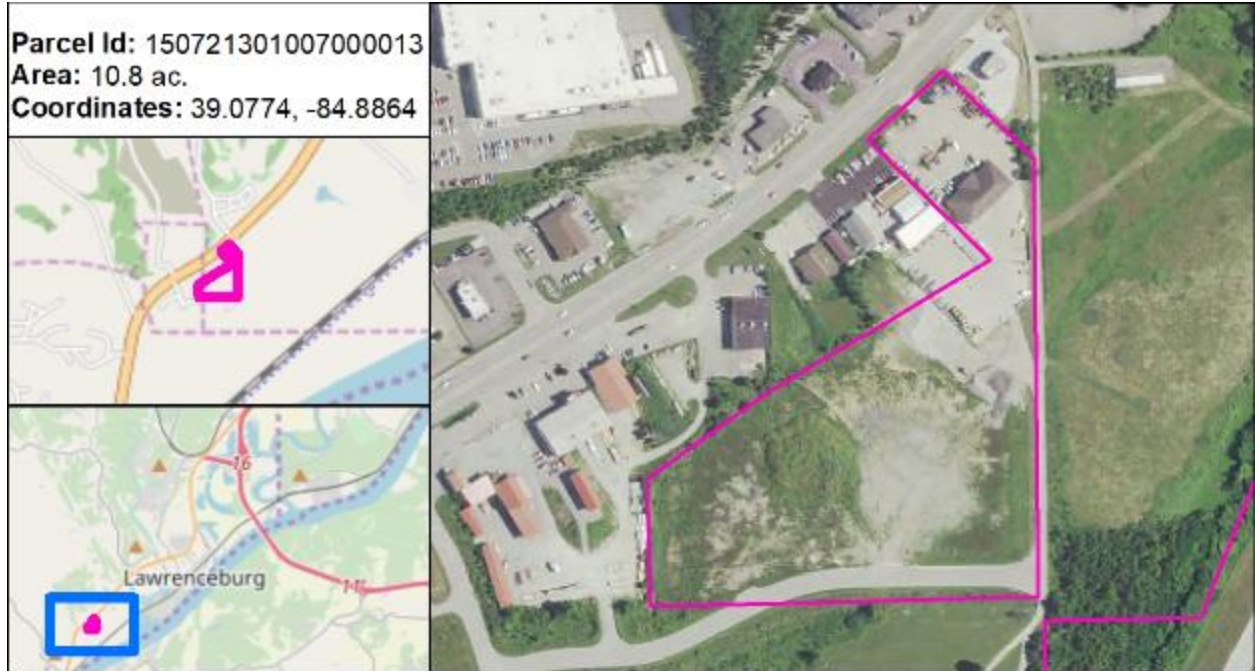
Parcel Id: 150721900025001013
Area: 118.3 ac.
Coordinates: 39.0782, -84.8797

Iowa

Parcel Id: 792207100019
Area: 20.3 ac.
Coordinates: 41.6705, -93.4625

Parcel Id: 792413302008
Area: 8.0 ac.
Coordinates: 41.6483, -93.5968
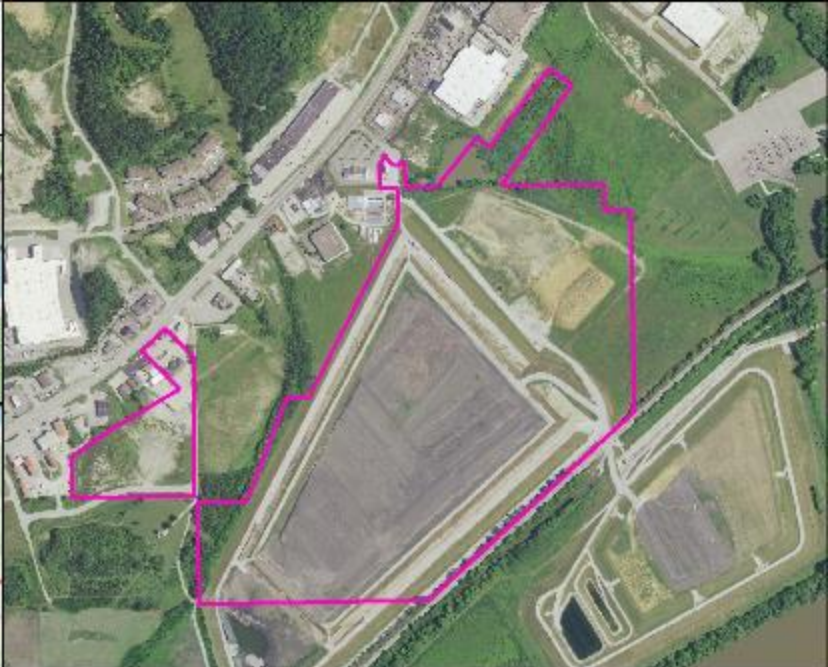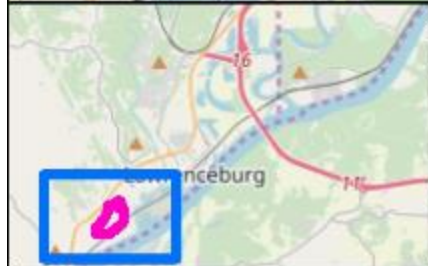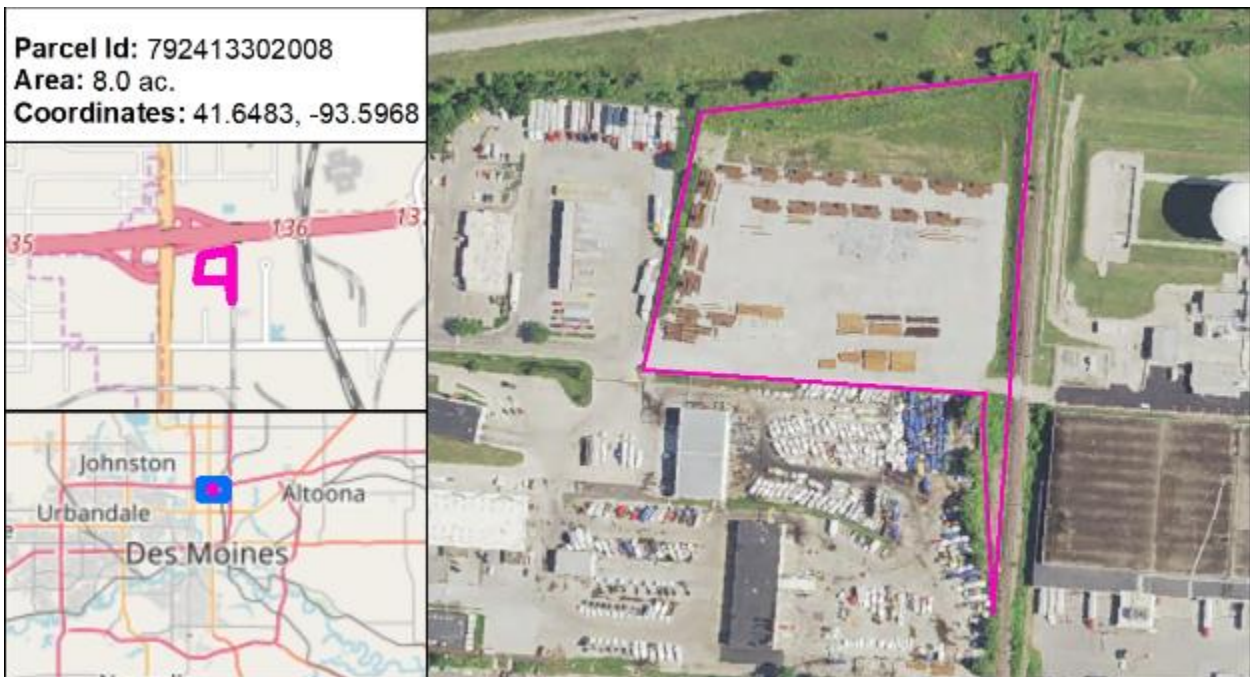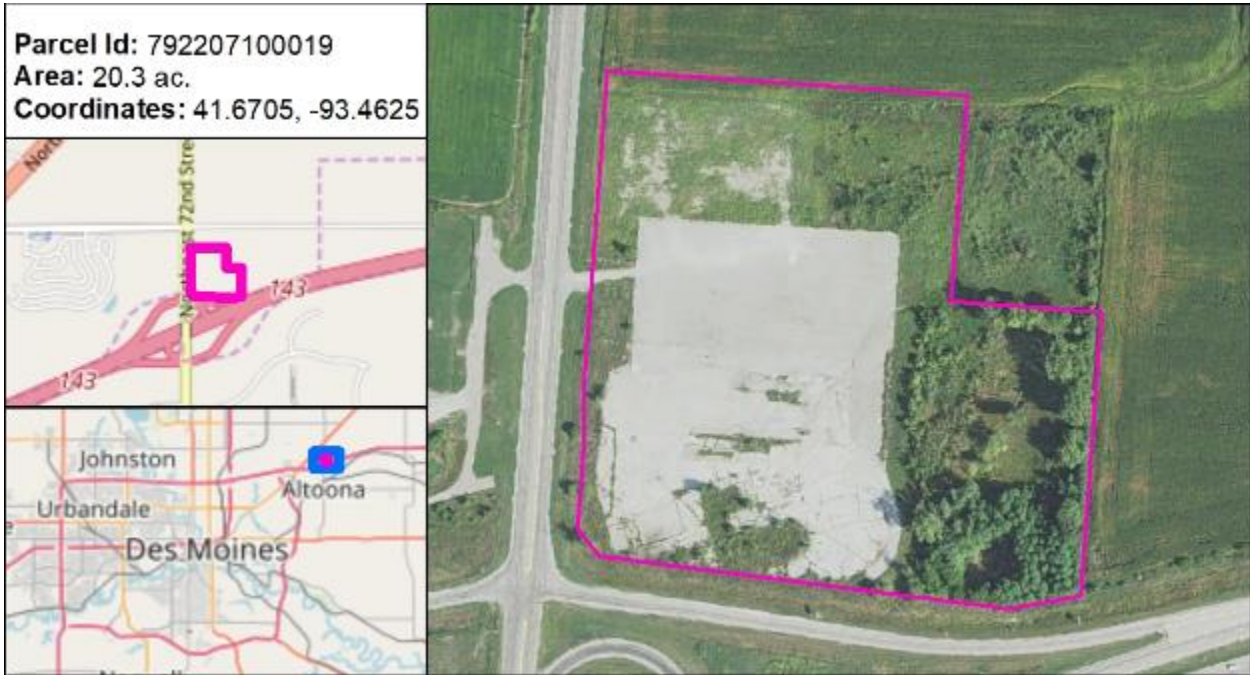
Parcel Id: 792520400037
Area: 20.0 ac.
Coordinates: 41.631, -93.7801

Parcel Id: 792515302003
Area: 16.7 ac.
Coordinates: 41.65, -93.7533

Parcel Id: 792520200029
Area: 6.1 ac.
Coordinates: 41.6431, -93.7823

Parcel Id: 792311351004
Area: 13.3 ac.
Coordinates: 41.6602, -93.4995

Kansas

Parcel Id: 00499470
Area: 13.3 ac.
Coordinates: 37.6307, -97.3915

Parcel Id: 00099484
Area: 5.7 ac.
Coordinates: 37.6217, -97.3353
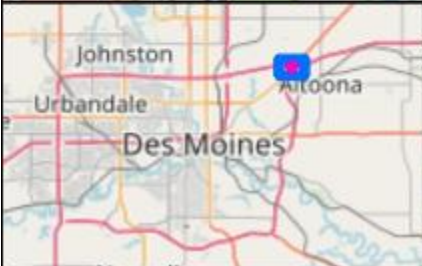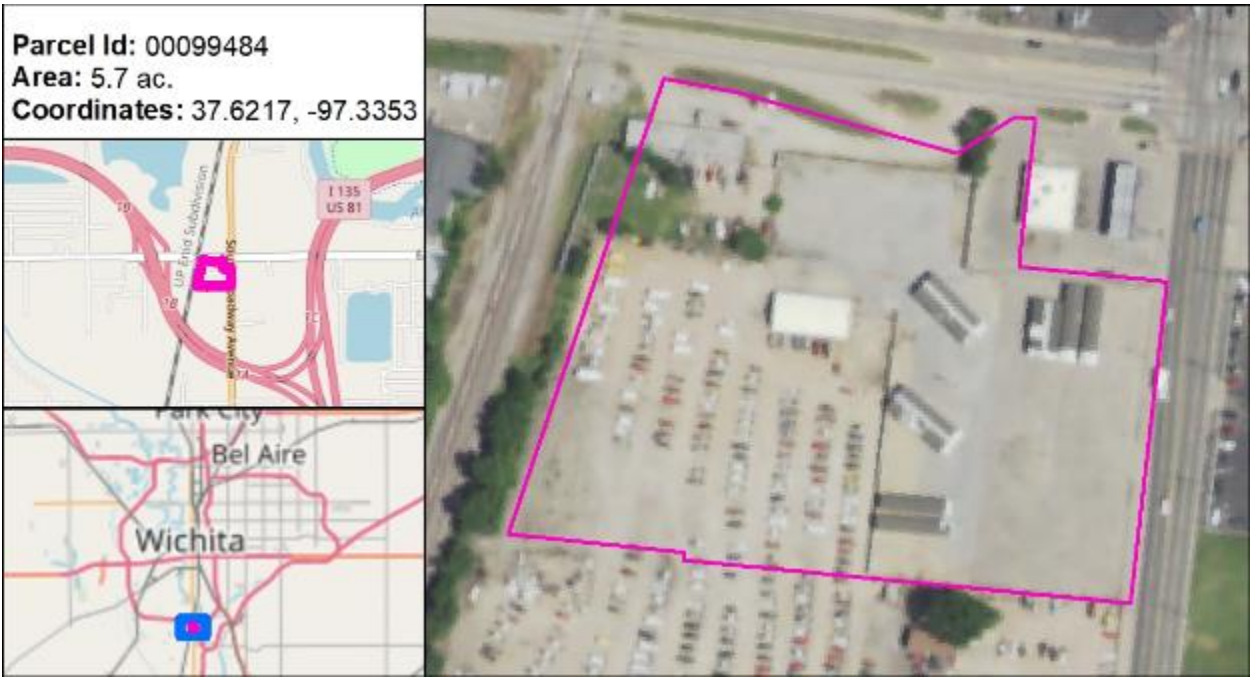
Parcel Id: 00499498
Area: 6.7 ac.
Coordinates: 37.6283, -97.391
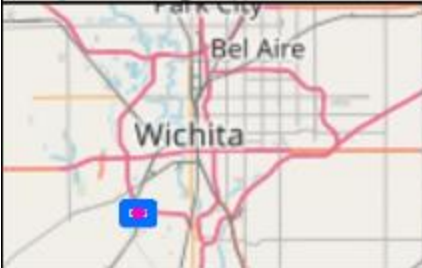
Parcel Id: 00133437
Area: 6.2 ac.
Coordinates: 37.6106, -97.3282

Parcel Id: 00167734
Area: 31.0 ac.
Coordinates: 37.6413, -97.3038
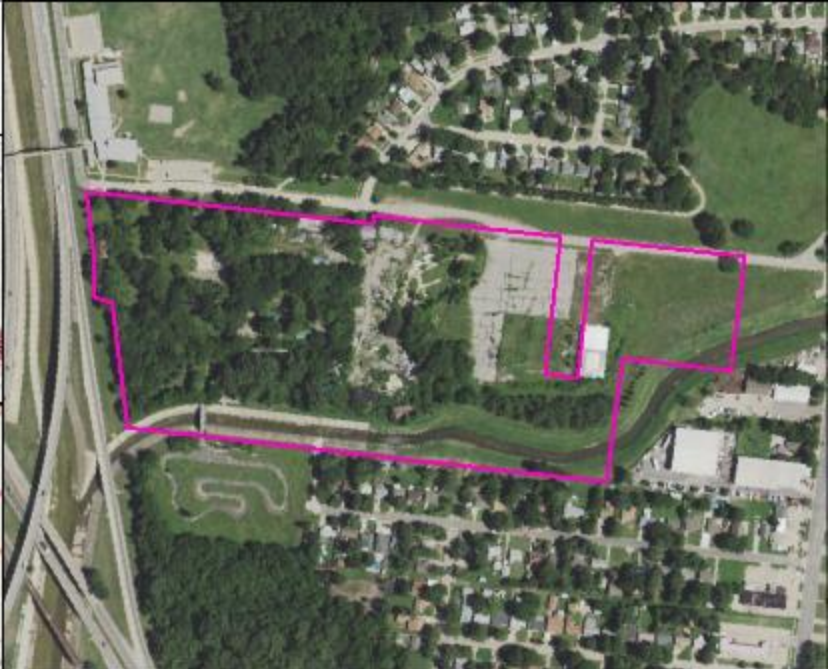
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Area: 12.4 ac.
Coordinates: 37.6269, -97.3315
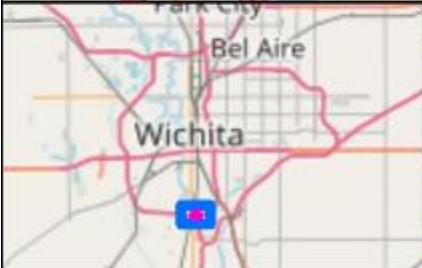
Parcel Id: 30004993
Area: 8.1 ac.
Coordinates: 37.7942, -97.3307

Kentucky

Parcel Id: 062.00-47-003.00
Area: 17.2 ac.
Coordinates: 38.9863, -84.6473

Parcel Id: 078.00-00-007.02
Area: 6.4 ac.
Coordinates: 38.8551, -84.6283
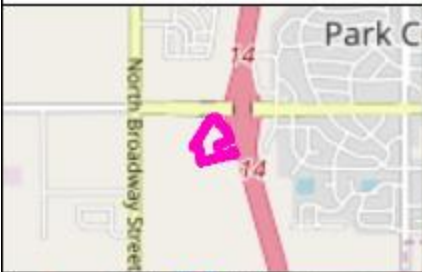
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Area: 5.1 ac.
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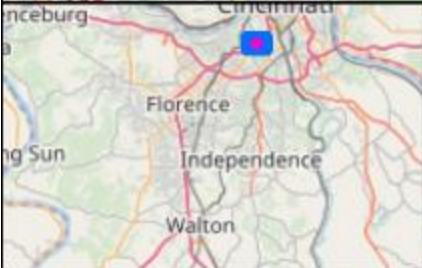
Parcel Id: 058.00-00-031.03
Area: 13.7 ac.
Coordinates: 39.0758, -84.6529

Michigan

Parcel Id: 22022
Area: 5.5 ac.
Coordinates: 42.3911, -83.0686

Parcel Id: 20371
Area: 12.5 ac.
Coordinates: 42.3899, -83.0642
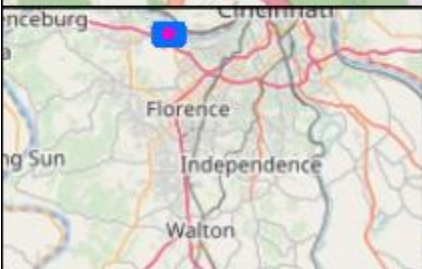
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Coordinates: 42.4891, -82.9763
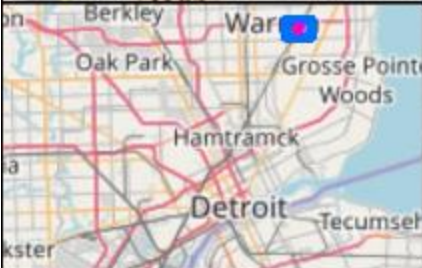
Parcel Id: 580299
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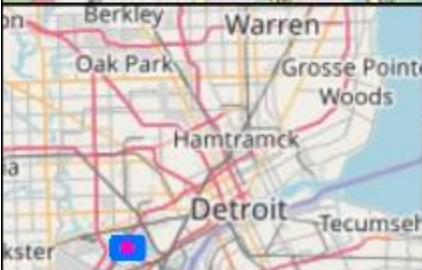
Parcel Id: 583223
Area: 5.3 ac.
Coordinates: 42.3201, -83.1506
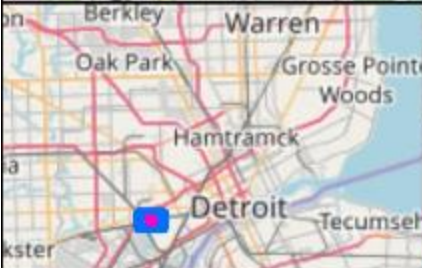
Parcel Id: 371041
Area: 13.2 ac.
Coordinates: 42.326, -83.1553

Minnesota

Parcel Id: 123-042923330032
Area: 5.1 ac.
Coordinates: 45.0234, -93.1838

Parcel Id: 123-042923340036
Area: 5.3 ac.
Coordinates: 45.0235, -93.182
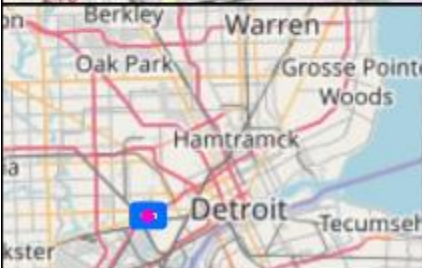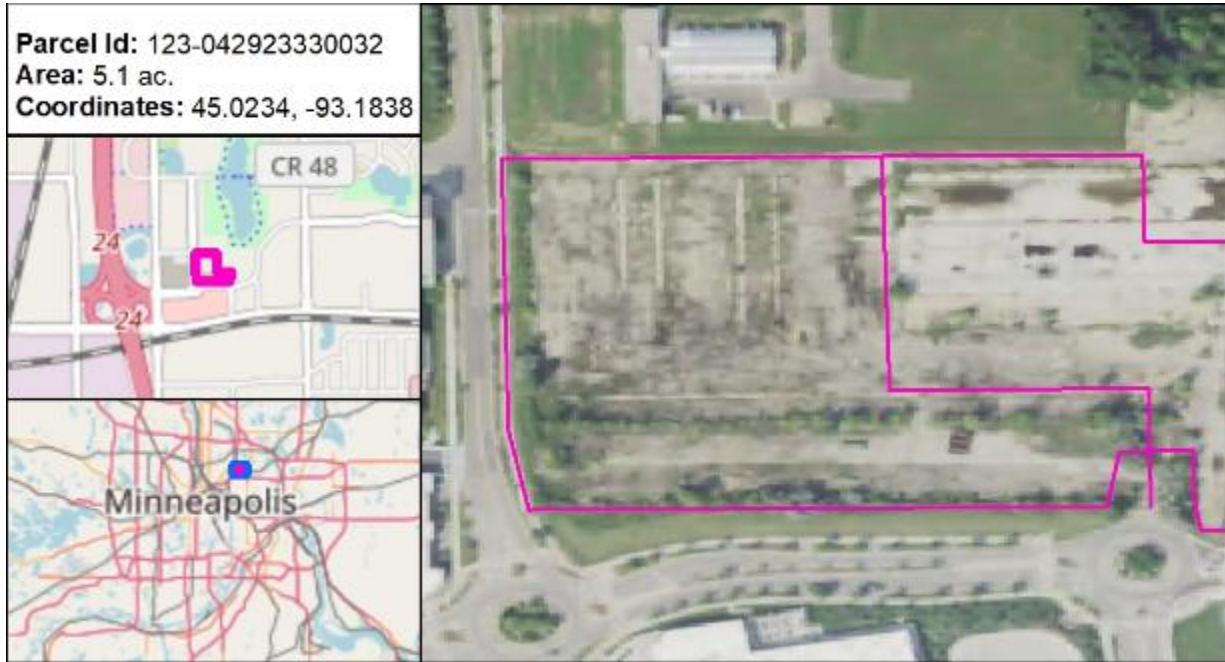
Parcel Id: 053-2202924230104
Area: 6.7 ac.
Coordinates: 44.9875, -93.2863
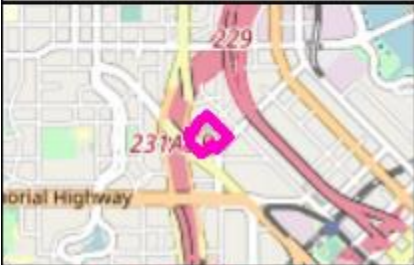
Parcel Id: 163-3602921340008
Area: 20.7 ac.
Coordinates: 44.9512, -92.8764
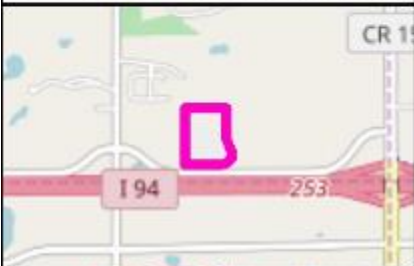
Parcel Id: 053-1002924210002
Area: 7.2 ac.
Coordinates: 45.0193, -93.2791
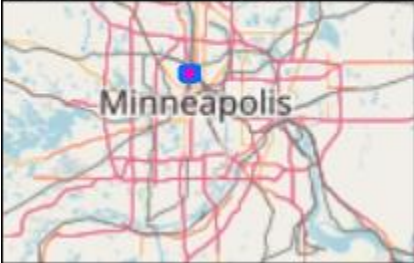
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Area: 7.1 ac.
Coordinates: 44.8612, -93.3711

Parcel Id: 163-0502821330009
Area: 6.7 ac.
Coordinates: 44.9357, -92.9628
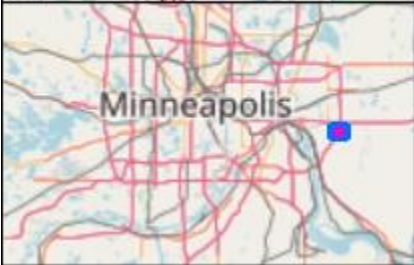
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Area: 8.1 ac.
Coordinates: 44.863, -93.3481
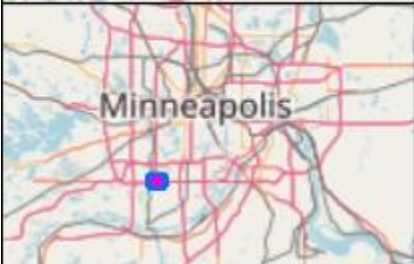
Parcel Id: 053-0302724210027
Area: 6.5 ac.
Coordinates: 44.8604, -93.2796
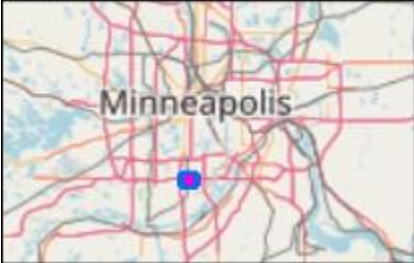
Parcel Id: 037-022092001010
Area: 5.4 ac.
Coordinates: 44.7558, -93.2521
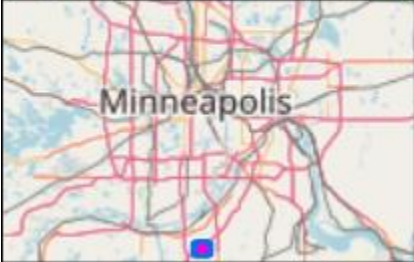
Parcel Id: 037-020330075011
Area: 9.7 ac.
Coordinates: 44.7823, -93.2921

Missouri

Parcel Id: 20K531405
Area: 5.6 ac.
Coordinates: 38.632, -90.3475

Parcel Id: 27Q630422
Area: 5.2 ac.
Coordinates: 38.5376, -90.4994
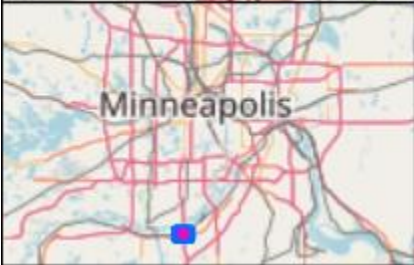
Parcel Id: 09K120149
Area: 6.9 ac.
Coordinates: 38.7752, -90.3525
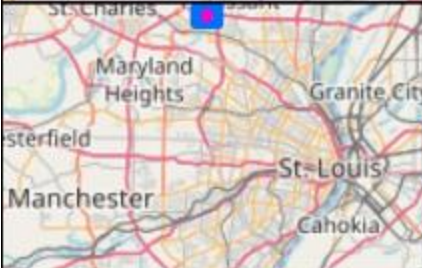
Parcel Id: OL0401006
Area: 7.9 ac.
Coordinates: 38.7743, -90.3544
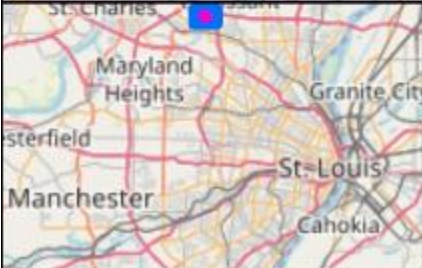
Parcel Id: 10G440310
Area: 5.4 ac.
Coordinates: 38.7698, -90.2738
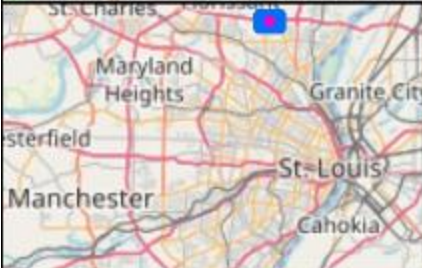
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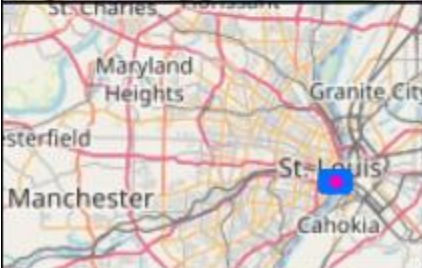
Parcel Id: 09K140466
Area: 17.7 ac.
Coordinates: 38.7762, -90.3545
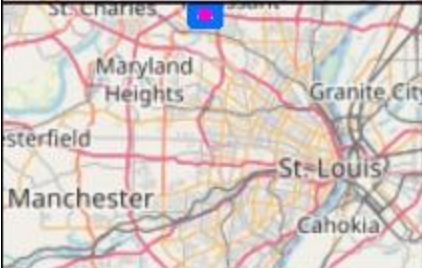
Parcel Id: 20K427160
Area: 5.9 ac.
Coordinates: 38.6301, -90.3519
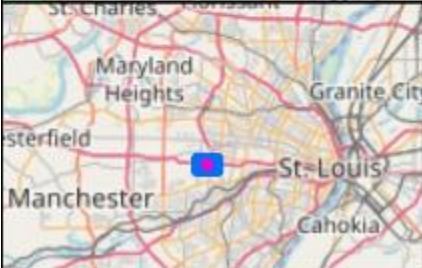
Parcel Id: 12L540043
Area: 5.2 ac.
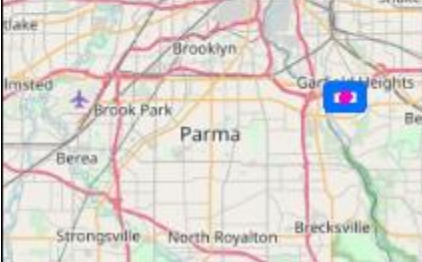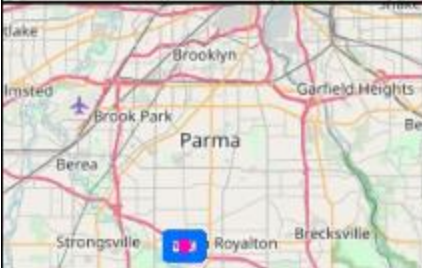Coordinates: 38.7414, -90.3699

Ohio

Parcel Id: 44102001
Area: 16.6 ac.
Coordinates: 41.4141, -81.7826

Parcel Id: 34219005
Area: 92.1 ac.
Coordinates: 41.4108, -81.8252
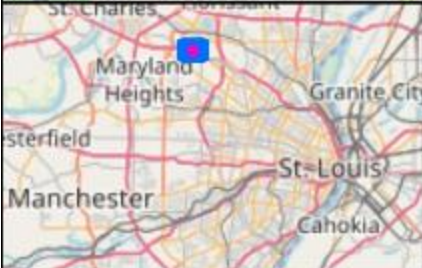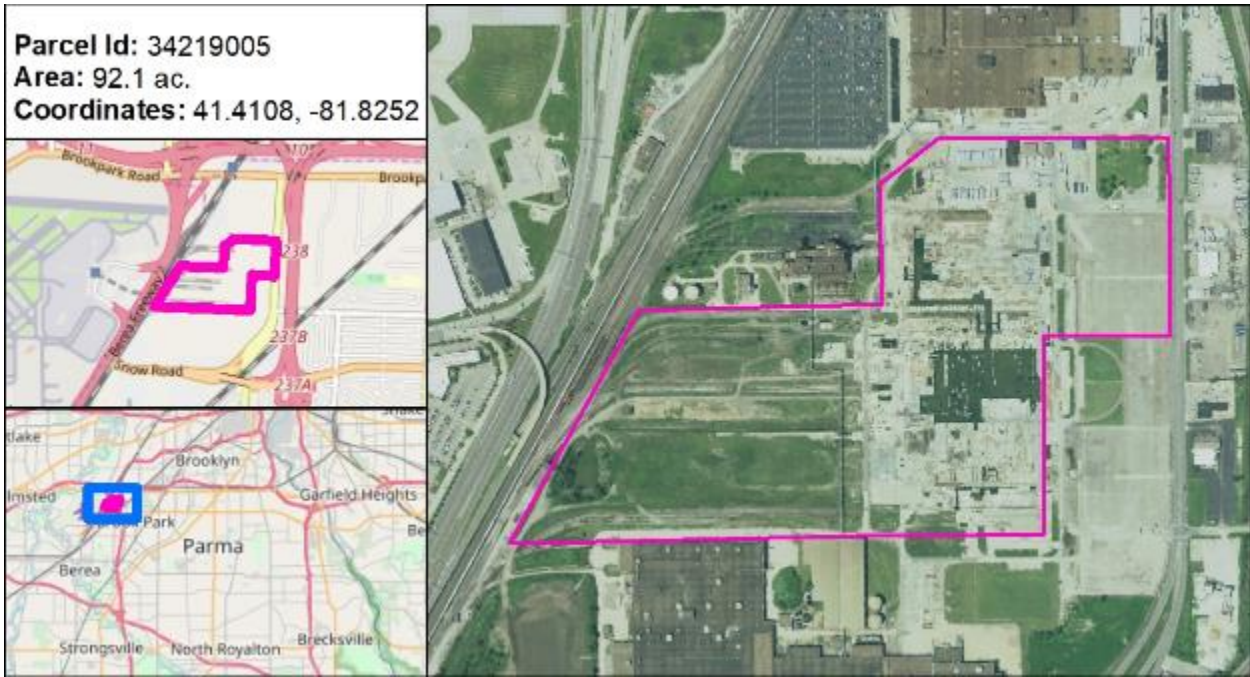
Parcel Id: 54214002
Area: 52.0 ac.
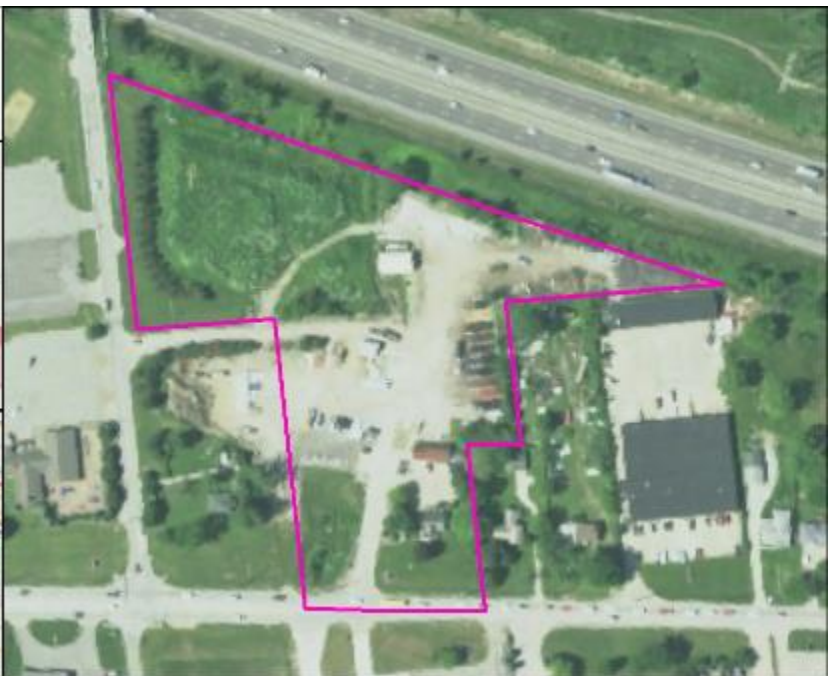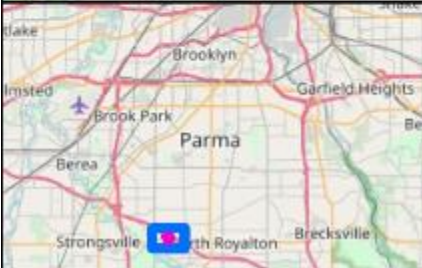Coordinates: 41.4138, -81.6204

Parcel Id: 54303002
Area: 5.2 ac.
Coordinates: 41.407, -81.6154

Parcel Id: 48326002
Area: 5.2 ac.
Coordinates: 41.3117, -81.7588

Parcel Id: 48311007
Area: 7.2 ac.
Coordinates: 41.3171, -81.7733

Parcel Id: 23612004
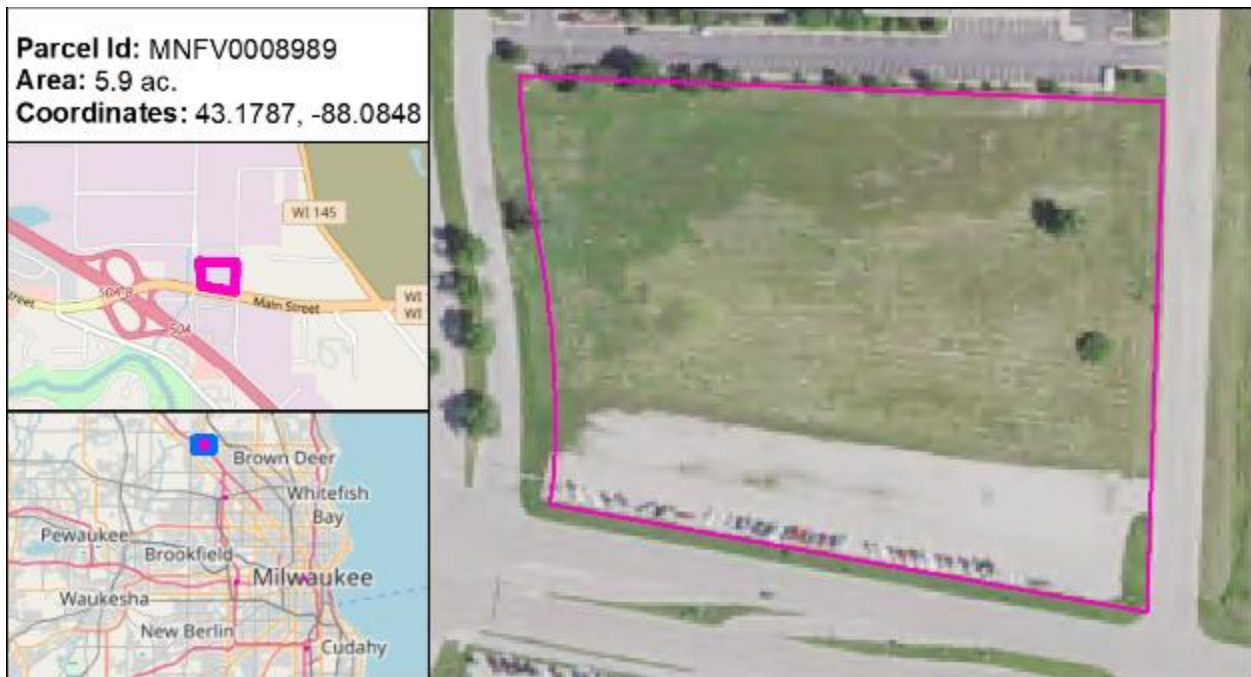Area: 6.1 ac.
Coordinates: 41.4117, -81.9006

Parcel Id: 43110001
Area: 5.4 ac.
Coordinates: 41.4503, -81.7533

Parcel Id: 43108006
Area: 18.9 ac.
Coordinates: 41.4446, -81.7573

Wisconsin

Parcel Id: 3980906111
Area: 10.3 ac.
Coordinates: 43.0334, -87.9356

Parcel Id: MNFV0008989
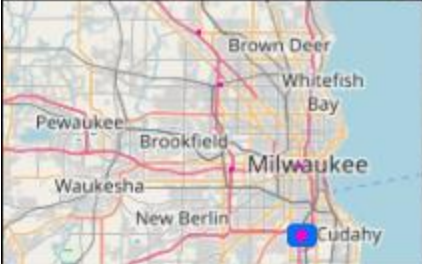Area: 5.9 ac.
Coordinates: 43.1787, -88.0848

Parcel Id: 1800372000
Area: 6.1 ac.
Coordinates: 43.1221, -88.0531

Parcel Id: 4161301112
Area: 8.9 ac.
Coordinates: 43.0301, -88.0362

Parcel Id: 6249994200
Area: 5.3 ac.
Coordinates: 42.9584, -87.9324

MID-AMERICA

FREIGHT COALITION

www.midamericafreight.org

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