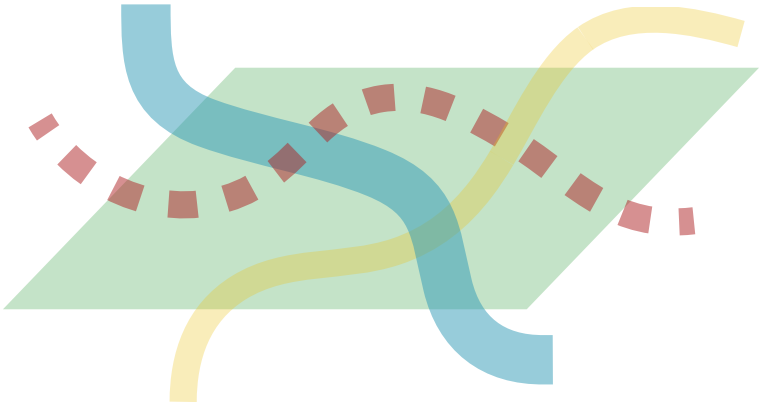
Flaxton Park

A low-impact development in Mahomet, Illinois



PREPARED BY

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December 16, 2012

Executive Summary

Flaxton Park is a sustainable, mixed-use development proposed for an 810-acre site southeast of Mahomet, Illinois. The Flaxton Park community is designed around the idea of low-impact development, a paradigm that minimizes the hydrologic impact of development by reducing impervious surfaces and applying other best management practices.

Sustainability in Flaxton Park begins with an analysis of the natural systems at work in Champaign County: slope, soil, water and green infrastructure. This analysis reveals that areas east of Mahomet, west of Rantoul and south of Urbana are among the most suitable for development.

Of these options, only the area east of Mahomet aligns with current growth trends in the county. With a strong housing market and low vacancy rates, it is also the region of the county recommended by a socioeconomic analysis.

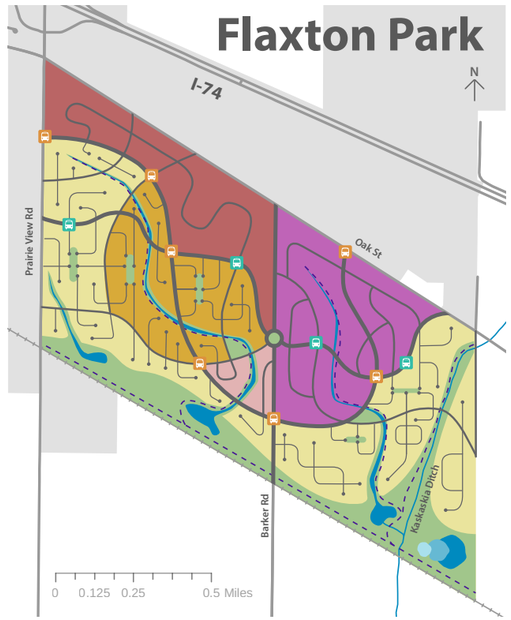
The site selection process identifies 810 acres of farmland southeast of Mahomet, half of which lies within the city limits. Comparable properties in the area suggest that the land could be acquired for approximately $19,500 per acre.

The land price—along with socioeconomic factors—are used in a pro forma analysis for three development scenarios: a conventional residential development, a retail center and a balanced, mixed-use community. Despite providing the lowest rate of return, the balanced scenario is found to be the most likely to succeed. This scenario addresses trends in population and job growth while accommodating consumer housing preferences.

Proposed land uses from the balanced scenario are used in a hydrologic analysis that compares low-impact development to three other scenarios: pre-development, current use and conventional development. The analysis reveals that low-impact development can reduce peak flows by 39% compared to conventional development, eliminating the need for off-site stormwater drainage.

Low-impact development best management practices such as green roofs and bioretention are incorporated in the master plan for Flaxton Park. The master plan proposes a loop-and-lollipop street layout to minimize impervious surfaces, a system of bioswales and retention ponds to manage stormwater and a constructed wetland to treat sewage on site. It locates land uses for maximum accessibility by residents, commuters and customers regardless of their mode of transportation. The plan also calls for connecting to a proposed regional system of green infrastructure links.

By considering natural systems and implementing low-impact development, Flaxton Park provides an example of best practices for development in Champaign County.



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INTRODUCTION

Flaxton Park, an 810-acre community proposed for Mahomet, Illinois, represents a fundamental rethinking of suburban development. From the outset, it aims to meet the needs of the community while taking advantage of natural systems to minimize its environmental impact.

Guiding the design of Flaxton Park is the low-impact development paradigm. Developed in the 1980s in Prince George's County, Maryland, low-impact development provides a framework for aligning development needs with ecosystem services. It focuses on maintaining the natural hydrology of the site by conserving natural systems; reducing impervious surfaces; slowing and cleaning runoff; and preventing pollution. Tools such as bioretention cells, bioswales and green roofs make it possible to manage stormwater on-site without the need for municipal storm sewers.

Though critical, stormwater management is only one component of the sustainability to which the development aspires. In Flaxton Park, social, environmental and economic factors converge to produce a holistic sustainability that benefits residents, the community and nature while providing a healthy return for the developer.

By "going low-impact," Flaxton Park promises to have a positive impact on the surrounding community. The plans and analyses that follow show how this impact can be realized.

Natural Systems

Suitability Analysis

Landscape architect Ian McHarg pioneered a method for considering multiple environmental factors in a single suitability analysis. McHarg described the technique in his book *Design with Nature*. In it, he laid out a system where each factor under consideration is represented by a transparent layer that is shaded according to suitability. Dark areas are the least suitable for development, while areas that are completely transparent are the most suitable. The range of values used in each layer determines its weight in the composite analysis.

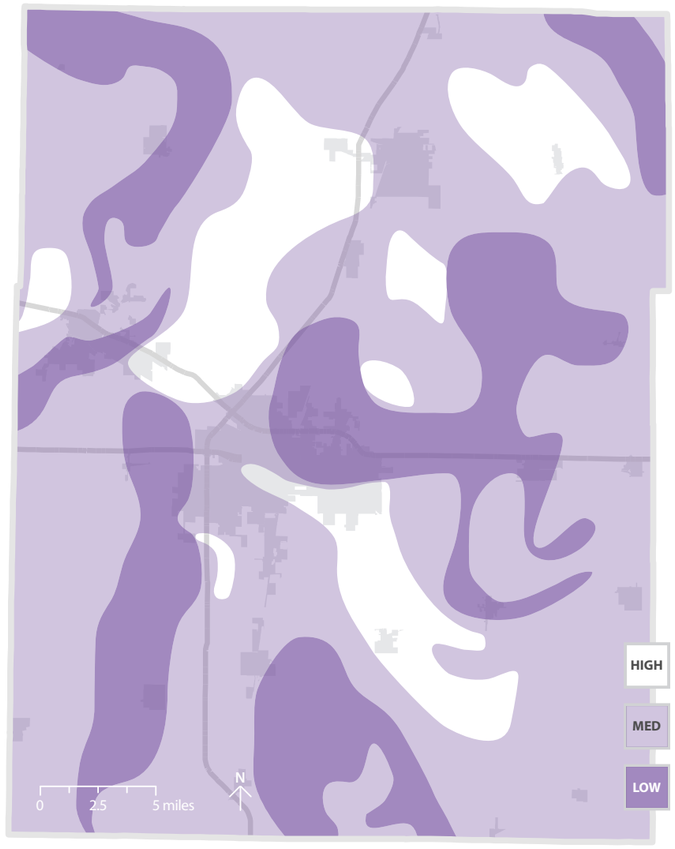


FIGURE 1: Composite Suitability Map for Champaign County
When the slope, soil, water and green infrastructure layers are compiled, several areas emerge as the most suitable for development.

COMPOSITE SUITABILITY FOR CHAMPAIGN COUNTY

As described in **Figure 3**, the natural systems analysis for Champaign County considers four factors: slope, soil, water and green infrastructure. The overall suitability map presented in **Figure 1** summarizes the results produced by overlaying the four transparent layers.

Because of its potential for flood damage and the cost of restoring aquatic ecosystems, the water layer is given the most weight in the composite.

Soil and green infrastructure are given medium weight because they represent significant development impacts. While less costly to modify than water systems, improving poor soil and rebuilding green infrastructure both represent significant expenses.

Slope is given the least weight in the analysis because it varies little among areas in Champaign County.

Of the current growth vectors, shown in **Figure 2**, only the area east of Mahomet falls in an area of high suitability. Though they are not reflected in current growth trends, the areas south of Urbana and west of Rantoul also hold promise as areas highly suitable for future urban expansion.

FIGURE 2: Growth Areas in Champaign County
Growth is taking place east and west of Mahomet; north, west and south of Champaign; and east of Urbana.

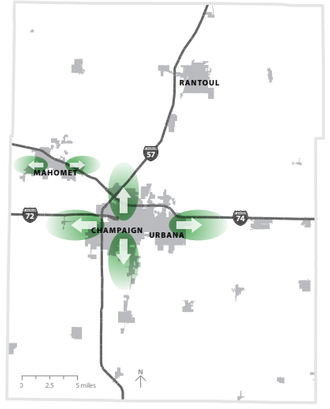


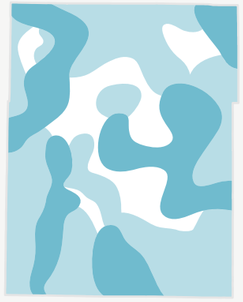
FIGURE 3: Natural Systems Suitability Layers
The natural systems analysis for Champaign County considers four factors: slope, soil, water and green infrastructure.

SLOPE

Slope varies little throughout the county, ranging from 0% to 3.04%. Slopes less than 0.5% are classified as unsuitable for development. Slopes between 0.5% and 1.0% are moderately suitable, and slopes above 1.0% are suitable.

SOIL

Of the nine soil types present in Champaign County, one is highly suitable for development, four more are moderately suitable and four are unsuitable. The moderately suitable soils can support development but may require stabilization, particularly for roads.



WATER

The county is home to significant surface water resources, which must be protected from runoff using riparian buffers. These buffers, along with federally-designated floodzones, are classified as unsuitable for development. Areas containing minor streams are classified as moderately suitable while areas without surface water considerations are suitable.

GREEN INFRASTRUCTURE

Green infrastructure in Champaign County can be described in terms of three natural hubs and three recreational hubs, which are currently connected by two natural links. The system could be extended with three additional recreational links, two of which could take advantage of existing rail right-of-way.

Socioeconomic
Trends Analysis

In planning for development, socioeconomic factors play a major role. In this analysis, trends in household size, household income, housing vacancy, home ownership, housing price and population are examined for Champaign County.

HOUSEHOLD SIZE

From 2000 to 2010, household size in the county dropped slightly from an average of 2.33 people per household to 2.29. The spatial distribution of household sizes also changed.

In 2000, most census block groups outside of Champaign-Urbana had an average household size greater than 2.5 people. In Champaign-Urbana, the largest households were located on the periphery and the smallest households near the center.

By 2010, the household size gradient expanded outward from Champaign-Urbana. Many of the overall decreases were concentrated in the triangle formed by Champaign-Urbana, Mahomet and Rantoul. The trend suggests that any residential development in the central part of the county should be targeted at slightly smaller households than currently exist.

HOUSEHOLD INCOME

From 1999 to 2010, median household income in Champaign County increased about 4.8%. However, adjusted for inflation, this change represents a decrease in purchasing power of almost $10,000 in 2010 dollars.

The largest gains in income occurred in southwest Champaign, followed by the northeast and southeast corners of the county. Since the county's overall purchasing power decreased substantially, however, the trend suggests that, outside of these areas of income growth, new development should focus on smaller, more affordable units.

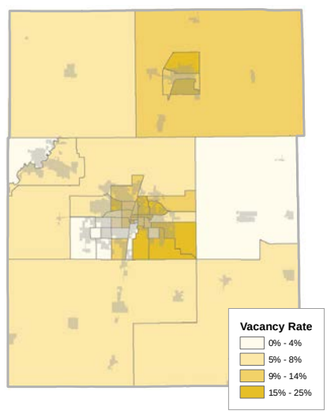


FIGURE 4: Rental Vacancy Rate by Census Tract, 2010
Urbana and Rantoul had among the highest vacancy rates in the county in 2010. For more socioeconomic trend maps, see **Appendix A**.
Data Source: U.S. Census Bureau Table DP04, 2010

HOUSING VACANCY

Overall housing vacancy in Champaign County increased from 6.2% to 10.4% from 2000 to 2010. Vacancy increased in most parts of the county except for southwest Champaign, where vacancy rates actually fell in some census tracts.

The decade from 2000 to 2010 saw substantial increases in vacancy in two cities in the county: Rantoul and Urbana. In many tracts in both cities, the 2010 vacancy rate was over 15% as shown in **Figure 4**. The overall trend toward increased vacancy suggests caution in the development of new residential areas.

HOME OWNERSHIP

From 2000 to 2010, the percentage of all occupied housing units that were owner occupied increased from 46.9% to 53.8%. The spatial trends related to home ownership largely mirror the trends in household size, with a decrease in the share of owner-occupied units in the triangular area between Champaign-Urbana, Mahomet and Rantoul and an increase in the outer parts of the county. Since small households are more likely to be renters than homeowners, this trend makes sense.

HOUSING PRICE

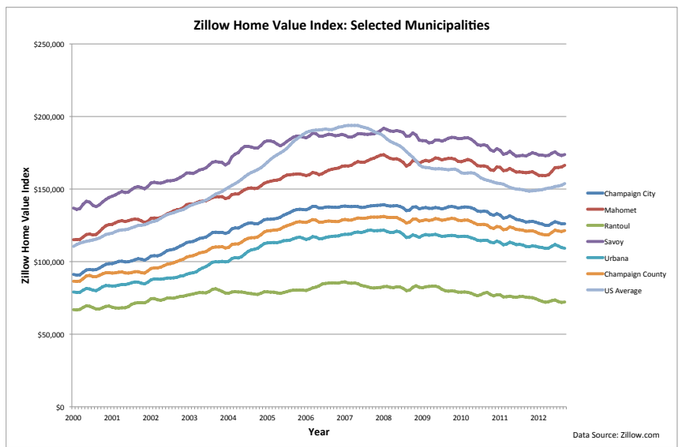
Data from the real estate tracking site Zillow.com, which appear in **Figure 5**, show that housing prices have remained fairly stable in Champaign County when compared with the US average. During the housing bubble of the last decade, housing prices in Champaign County rose and fell more slowly than the national average.

Of the municipalities selected for study, only prices in Mahomet and Savoy are consistently above the national average. The average for Champaign County tracks closely to the markets in Champaign and Urbana and remains well below the national average. These trends in housing prices suggest that residential development in Champaign County is less susceptible to the boom-and-bust cycles that occur in other U.S. housing markets.

Neighborhood Requirements Based on Density							
Neighborhood (NH) Density	DU per Acre	Population Increase	NH Population	NHs Required	Acres per NH	Total Acres	Sq Miles
Low	2.9	39,962	1,678	23.8	160	3,810	6.0
Medium	6.5		3,529	11.3		1,812	2.8
High	10.9		5,600	7.1		1,142	1.8
Very High	16.7		7,998	5.0		799	1.2
Data Sources: LEAM Population Projections for Champaign County; Anderson's *Neighborhood Planning*							

TABLE 1: Neighborhood Requirements: 2010 - 2035
Land requirements range from 6.0 to 1.2 acres depending on density.

FIGURE 5: Zillow Home Value Trends for Selected Municipalities
Housing prices in Champaign County have been relatively stable compared with the national average.



POPULATION PROJECTIONS

Based on the LEAM model, population in Champaign County is projected to increase 20.4% between 2010 and 2035, while total employment is projected to increase by 37.7%. That means that, for every new resident of the county, almost 1.3 new jobs will be created. This suggests that the balance of residential to commercial and office space should be weighted toward the latter, especially given current rental vacancy rates.

As shown in **Table 1** between 1.2 and six square miles of land would be required to accommodate the projected growth. Given the ratio of population to employment, however, the demand for commercial and office space likely would increase the land requirements substantially. As a result, the medium- or high-density options seem most appropriate for accommodating growth efficiently.

Site Selection

And Development Context

Based on the natural systems and suitability analyses, a site for Flaxton Park was selected. The recommended site is an 810-acre area southeast of Mahomet.

As shown in **Figure 6**, the site is located between U.S. Route 150 to the north and the Mahomet-Champaign rail line to the south. About half of the site is within the city limits of Mahomet, and the remainder could be annexed by the city in order to provide public utilities. The land is currently farmland, and the only existing development on the site is one farmhouse.

SITE SUITABILITY

The site has a number of features to recommend it. It provides easy access to I-74 via the Prairie View Road interchange located at the site's northwest corner, offering connectivity to Mahomet and to Champaign-Urbana.

The natural systems suitability analysis rates the site as highly suitable for development. In addition, a socioeconomic analysis reveals that Mahomet has among the highest home values in the county, trailing only Savoy, and that it has comparatively low vacancy rates.

ALTERNATIVE SITES

Two alternative sites were considered as part of the site selection: one west of Rantoul and one south of Urbana. Both of the alternative sites are in areas classified as highly suitable by the natural systems analysis. In addition, both properties are contiguous with urbanized areas.

In the socioeconomic analysis, however, both Urbana and Rantoul have higher than average vacancy rates, suggesting comparatively sluggish housing markets. In addition, both cities have housing values lower than the county average, with Rantoul among the lowest in the county.

DEVELOPMENT CONTEXT FOR FLAXTON PARK

The socioeconomic analysis presented in the previous two pages highlights several trends in Champaign County demographics and housing markets. These trends—which represent the context for developing Flaxton Park—have implications not just for the selection of a site but also for the type of development that occurs there:

- Household size in the county decreased between 2000 and 2010, especially in the central part of the county. This trend, combined with falling purchasing power in most areas, suggests the need for smaller, more affordable housing units.
- Increasing rates of vacancy and home ownership suggest caution in developing new rental units, particularly near Urbana and Rantoul. Housing prices in the county have remained relatively stable over the past decade, suggesting the viability of townhouses or condominiums, which offer home ownership to smaller households.
- Projections show that, for every new resident from 2010 to 2035, 1.3 new jobs will be created in the county. This trend, along with a land use analysis, suggests that a medium- to high-density mixed-use development is most appropriate.

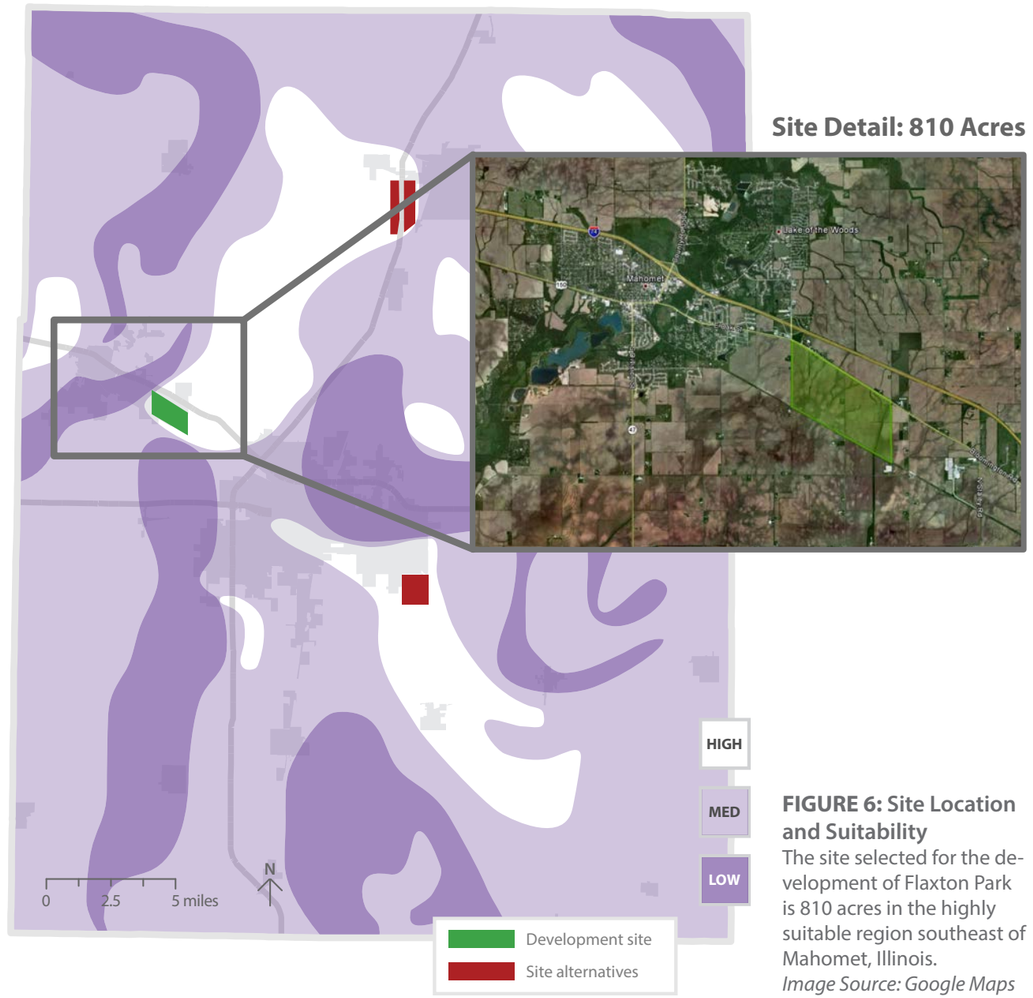


FIGURE 6: Site Location and Suitability
The site selected for the development of Flaxton Park is 810 acres in the highly suitable region southeast of Mahomet, Illinois.
Image Source: Google Maps

COMPARABLES

Not many properties similar to the chosen site are currently on the market, making the determination of realistic land prices difficult. The most comparable property is a 427-acre parcel just south of Mahomet that is currently listed for $4.5 million.[1] This site is located in an area with low suitability for development, however, and includes a large lake and substantial river frontage. As a result, only the 230 acres listed as tillable—used as a proxy for developable land—are counted in calculating the land price, yielding a price per acre of approximately $19,500. This figure is used as the assumed land price in the pro forma analysis that follows.

Pro Forma

Feasibility Analysis

Three possible scenarios for developing Flaxton Park have been evaluated using a real estate pro forma analysis. The parameters used in the scenarios and the results of the analysis appear in **Table 2**.

STATUS QUO

The status quo scenario represents the current trend in Champaign County toward low- to medium-density suburban development. In this scenario, the site is developed with 1,350 owner-occupied houses and about 1 million square feet of retail space. Assuming that all small houses sell within five years and all mansions sell within ten years, the expected internal rate of return is 16.3%.

BENEFITS

- This is a familiar pattern of development, and home ownership in Mahomet tends to be high.
- Mahomet's stable housing market suggests a continued demand for housing.

RISKS

- Because it is traditional, this type of development faces significant competition.
- The focus on housing adds to the existing jobs-housing imbalance and ignores the trend in the county toward faster job growth.
- If the housing market deteriorates, this type of development is especially vulnerable.
- The average home price in this scenario is well above the current average for Mahomet.

RETAIL CENTER

In the retail center scenario, the site is developed in the style of the North Prospect corridor in Champaign. It includes 7.5 million square feet of retail space, as well as 1,500 small and medium-size apartments targeted at retail employees and 1.9 million square feet of office space. Assuming that apartments reach 90% occupancy within six years, office space reaches 85% occupancy in five years and retail space reaches 80% occupancy within seven years, the projected internal rate of return is 23.0%.

TABLE 2: Summary of Development Scenarios
The balanced scenario includes 1,700 housing units and 5.7 million square feet of office an retail space.

Summary of Development Scenarios								
Scenario	Owner-Occupied Units	Average Home Price	Rental Units	Average Monthly Rent	Office Space (million sq. ft)	Retail Space (million sq. ft)	Open Space	Internal Rate of Return
Status Quo	1,350	$238,609	0	—	0	1.0	21.6%	16.3%
Retail Center	0	—	1,500	$743	1.9	7.5	30.3%	23.0%
Balanced	1,300	$175,616	400	$840	2.9	2.8	22.4%	13.2%

ASSUMPTIONS USED IN THE ANALYSIS

- Based on LEAM projections, jobs in Champaign County are expected to grow at about 1.3 times the rate of population.[2]
- The ideal ratio of jobs to housing is 1.5:1.[3]
- Of employed Champaign County residents, 9.5% work in retail,[4] and retail outlets average about 900 square feet per employee.[5]
- About 50% of Champaign County residents work in offices,[6] and the average office size is 175 square feet per employee.[7]
- The expected vacancy rates are about 10% for residential development,[8] 15% for retail and 20% for office space.[9]
- The average home sale price in Mahomet over the past five years is about $180,000, and housing values have remained relatively stable in spite of the downturn in the national housing market.[10]
- Since only half of the site is within an incorporated area—and because sewage pumping is required—the expected infrastructure factor is 29% for residential and 39% for retail and office space.

BENEFITS

- This scenario offers the highest rate of return and preserves the most open space..
- The average rent of $743 per month is likely to be affordable to most retail employees.
- Easy interstate access makes this site well suited for retail.

RISKS

- Stores face direct competition from the nearby North Prospect shopping district.
- This scenario concentrates risk among a few investors.
- Socioeconomic data suggest that Mahomet residents strongly prefer home ownership to renting.
- The retail center scenario exacerbates the region's jobs-housing imbalance.

BALANCED

The balanced scenario considers socioeconomic trends in allocating space. It uses the 1.5 jobs per household ideal and 1.3 jobs to population growth ratio to determine a job requirement based on its 1,700 housing units. The jobs count yields floor area requirements based on the employment percentages and average space per employee estimates. Assuming that all the leased space reaches its target occupancy within five years, that small houses sell within five years and that mansions sell within ten years, the predicted internal rate of return is 13.2%.

BENEFITS

- A balanced approach distributes the risk among various property owner and types of development.
- A balanced approach helps to correct jobs-housing imbalance and anticipates trends in job and population growth.
- The average home price is below the average for Mahomet and reflects the increasing demand for smaller, more affordable housing.
- The own-rent ratio respects the preference for home ownership while providing a variety of housing options for the area's workforce.

RISKS

- The lower rate of return may make the balanced scenario less appearing to investors.
- The distribution of housing, retail and office space is based on current demographics and projections, which could change in the future.

Despite its lower rate of return, the balanced scenario is the recommended course of action because it best reflects socioeconomic trends and avoids many of the risks associated with the other scenarios. By considering the needs of the community, it promises to enhance the quality of life in Mahomet while also offering a sound investment.

Hydro

Model Analysis

Hydrology is particularly important for Flaxton Park because it is designed to be a low-impact development. Four scenarios have been evaluated to determine their effects on the hydrology of the Flaxton Park site.

SOIL AND SLOPE

The Flaxton Park site has a slope of 0.59% and a hydraulic length of 4,153 feet. The site contains two soil associations. **Table 3** summarizes the makeup of the 810-acre site according to these soil types.

Since Varna-Elliot-Ashkum has two severe development concerns and is not the most suitable soil association in the county, it is rated as B-quality soil. Drummer-Plano-Elburn has three severe development concerns but is not the least suitable soil in the county, so it receives a C rating.

HYDROGRAPH

The unit hydrograph in **Figure 7**, which represents the flow of water across a point on the site in each of the four development scenarios, is used in the analysis that follows. It shows that the conventional development scenario has the highest peak flow, followed by green development, farmland and pre-development.

DEVELOPMENT SCENARIO SUMMARY

Table 4 summarizes the land use assumptions and peak flow for each development scenario. The land use distributions are based on the balanced scenario described in the real estate pro forma analysis, and they use the following assumptions:

- Small residential lots are assumed to be 1/8 acre.
- Medium residential lots are assumed to be 1/4 acre.
- Paved surfaces are based on the infrastructure needs of the development, which are assumed to be 29% of the developed area for residential development and 39% for commercial development.

PRE-DEVELOPMENT

A land cover map of Champaign County based on data from the early 1800s reveals that the proposed site would have been covered in meadow in its pre-development state.[11]

FARMLAND

The site is currently used as farmland except for a small grass yard and one county road that bisects the site. Each of these secondary uses makes up about 0.5% of the total site area.

TABLE 3: Soil Associations in the Flaxton Park Site
About 63% of the site contains Varna-Elliot-Ashkum, which is B-quality soil.

Soil Associations in the Flaxton Park Site				
Soil Association	**Acres**	**Area**	**Severe Development Concerns**	**Soil Category**
Varna-Elliot-Ashkum	508.28	62.73%	Low strength, frost action	B
Drummer-Plano-Elburn	302.03	37.27%	Ponding, low strength, frost action	C

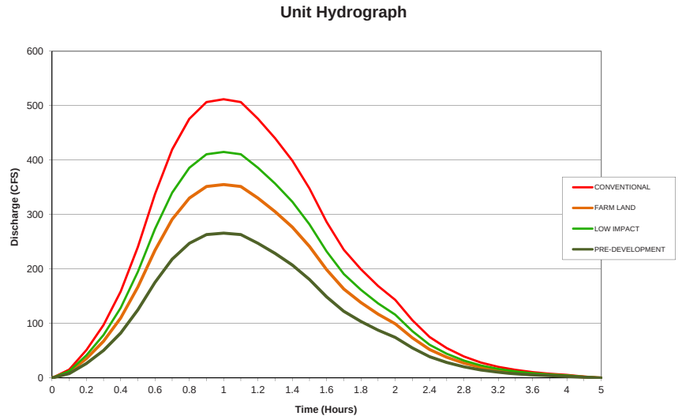


FIGURE 7: Unit Hydrograph for the Flaxton Park Site
The low impact scenario provides a 39% reduction in peak flow compared to conventional development.

CONVENTIONAL DEVELOPMENT

The conventional development scenario represents the land uses in the master plan that follows. It aims to locate the majority of the open space on the worse (C-quality) soil to avoid the need for soil stabilization. All open space in the site is planted with turf and used for parks and recreational areas.

LOW IMPACT

The low impact development paradigm attempts to preserve the natural hydrology of a site. The low impact scenario modifies the conventional development scenario in order to reduce the amount of impervious surfaces and reduce peak flow. It implements two best management practices:

- Reconfiguration of streets and sidewalks
- Use of green roofs on commercial and office buildings

The reconfiguration of streets involves a shift from the traditional grid layout to a loop-and-lollipop pattern. In addition, streets are narrowed, parking requirements reduced, and sidewalks limited to one side of the street. These strategies can reduce the total area of impervious surfaces by 26% to 33%.[12] For the purpose of this analysis, a 30% reduction in street and parking area is assumed.

Green roofs cover unused roof space with vegetation, reducing the runoff generated by buildings by as much as 70%.[13] This figure, along with the 0.6 floor area ratio (FAR) specified in the pro forma analysis, is used to reduce the amount of area classified as commercial development in the green development scenario.

The areas freed up by reductions in impervious surfaces and the use of green roofs are designated as meadows. Similarly, most of the open space in the site—with the exception of parks—is converted to meadow, further reducing runoff.

When compared with the conventional development scenario, implementation of the best management practices reduces peak flow by 39.38% and restores more than one quarter of the site to its natural state. Because of these benefits, the low impact scenario is used in the master plan that follows.

TABLE 4: Land Use and Peak Flow by Type of Development
Green development reduces runoff by limiting impervious surfaces.

Land Use and Peak Flow by Type of Development								
	Pre-Development		**Farmland**		**Conventional Development**		**Low Impact**	
	B Soil	**C Soil**	**B Soil**	**C Soil**	**B Soil**	**C Soil**	**B Soil**	**C Soil**
Meadow	62.73%	37.27%					17.09%	20.57%
Cultivated Land			61.93%	37.07%				
Open Space			0.50%		4.53%	17.90%	1.00%	1.00%
Commercial					21.73%	5.34%	12.60%	3.10%
Residential: Small Lots					12.44%		12.44%	
Residential: Medium Lots					9.26%	9.26%	9.26%	9.26%
Paved Surfaces			0.30%	0.20%	14.77%	4.77%	10.34%	3.34%
Peak Flow (CFS)		**265.93**		**355.14**		**511.76**		**414.94**

Master Plan
For Flaxton Park

From its overall layout to its technical systems, Flaxton Park embodies the principles of low-impact development while creating a convenient, welcoming environment for residents and visitors. Low-impact development seeks to maintain a site's natural hydrology using on-site, ecosystem-based stormwater management systems.

Goals of low impact development include:[14]

- Conserving natural systems
- Reducing impervious surfaces
- Slowing runoff flow
- Cleaning runoff
- Preventing pollution

These goals—and the practices illustrated below—inform the plans for Flaxton Park.

LAND USE AND TRANSPORTATION

The plan in **Figure 8** implements several best management practices from the low-impact development paradigm:

- **"Loop-and-lollipop" street layout:** This layout can reduce impervious surfaces by as much as 26% compared to a traditional grid layout.[15]
- **Attention to contours:** As much as is feasible, arterial roads follow the contours of the site, reducing the need for grading and the impact on the site's natural hydrology.
- **Neighborhood "parklets":** Located between cul-de-sacs, these mini-parks include pedestrian trails for connectivity and bioretention cells that absorb stormwater from surrounding properties.

LOW-IMPACT DEVELOPMENT BEST MANAGEMENT PRACTICES

Bioretention cells, which use specific combinations of soils and vegetation to capture and filter stormwater, can be used to reduce the peak flow during a storm.
Image Source: High Point University[16]

Bioswales use vegetation to slow the flow of runoff while conducting it toward a retention pond. They promote absorption, reducing the required retention pond area.
Image Source: Pinehurst Seattle[17]

Green roofs are shallow bioretention systems that sit atop buildings. In addition to reducing air and thermal pollution, they trap and hold stormwater, reducing peak flows.
Image Source: Our Green Home[18]

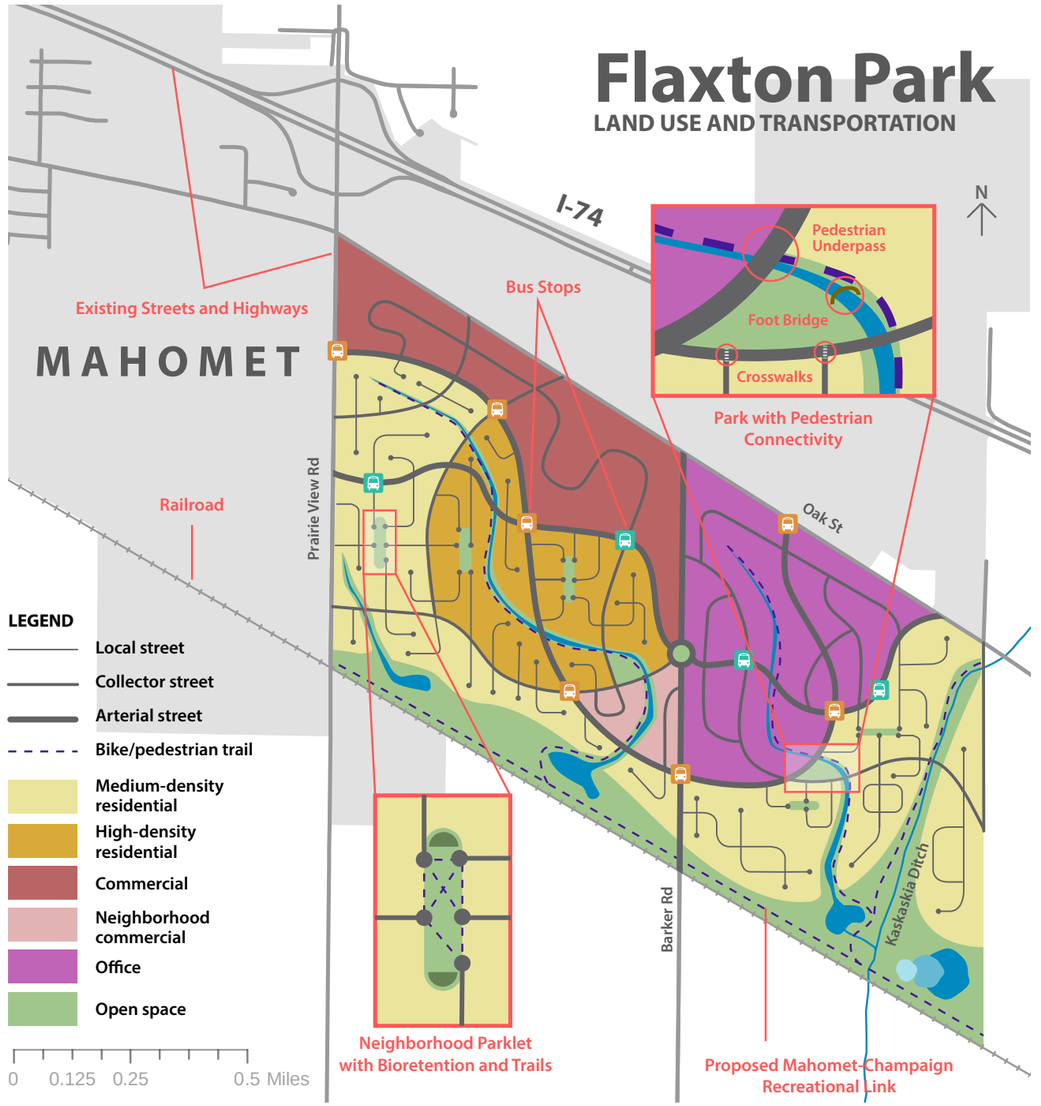


FIGURE 8: Land Use and Transportation Plan for Flaxton Park
Parklets and a loop-and-lollipop street layout help to reduce runoff as part of this low-impact development.

The loop-and-lollipop layout is used to accommodate the 1,700 residential units planned for the site. Office and commercial uses are accessed via collector and arterial streets and are located near the I-74/Prairie View Road interchange for easy accessibility by shoppers and commuters. A system of trails follows the overland stormwater system, providing access for bicyclist

and pedestrians. While Mahomet does not currently provide bus service, the street plan identifies potential bus stop locations, looking toward a future in which the growing city may offer public transit.

STORMWATER

Using low-impact development principles, Flaxton Park manages stormwater on site using an overland drainage and retention system as shown in **Figure 9**. The system, which includes a series of swales and retention ponds, takes advantage of the natural southward flow of water on the Flaxton Park site.

In addition, the ponds and swales serve as amenities for the nearby residential and office uses. The buffers surrounding the swales and ponds contain bicycle and pedestrian trails, allowing the stormwater system to double as an active transportation asset.

The size of the retention ponds is based on the projected runoff for the types of development planned for the site. As summarized in **Table 5**, the retention volume under a conventional development scenario is 18.6 million gallons, yielding a retention basin area of 14.23 acres, assuming a four-foot basin depth. However, low-impact development practices can reduce runoff by 39.38%, yielding a combined retention pond area of 8.63 acres.

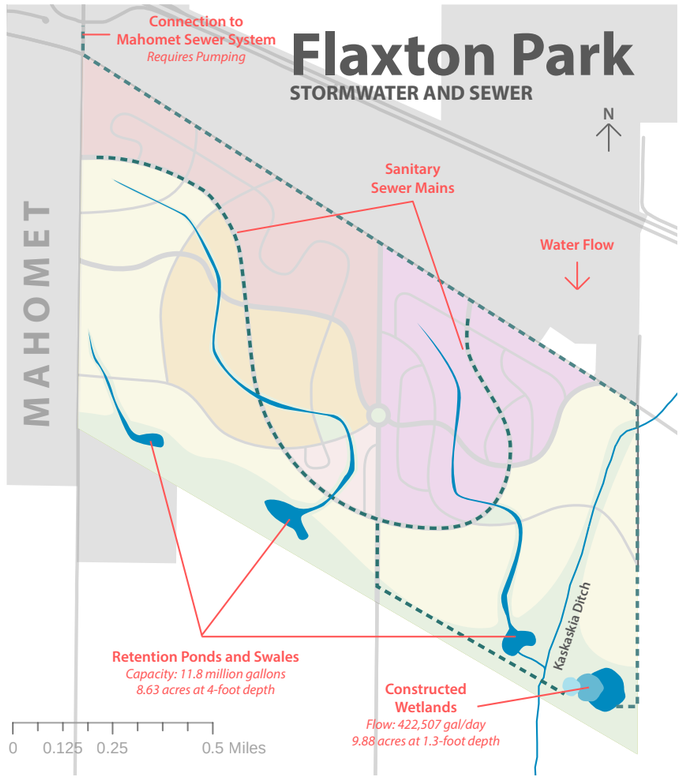


FIGURE 9: Stormwater and Sewer for Flaxton Park
Stormwater is managed using an overland system of swales and ponds while sewage is pre-treated using a constructed wetland.

SANITARY SEWER

Figure 9 shows the locations of underground sewer mains as well as constructed wetlands.

Like the stormwater system, the sewer mains take advantage of the site's topography, maximizing gravity flow.

The constructed wetlands offer on-site treatment of sewage. The wetlands are located in an undeveloped area of the site so that any potential odor does not affect residents. The size of the wetlands is based on projected sewage flows, as described in **Table 6**. Commercial development and offices are assumed to produce 15.53 gallons of wastewater per square foot per year, a rate calculated by the U.S. General Services Administration.[19] Residential development is assumed to generate 105 gallons of wastewater per unit per day. The resulting wetland volume is 4.2 million gallons, or about 9.88 acres at a depth of 1.3 feet.

TABLE 5: Retention Pond Size
The combined retention pond requirement is 8.63 acres at a 4-foot depth.

Retention Pond Size					
Type of Development	Square Feet	Retention Depth (In)	Retention Volume (Gal)	Total Area (Conventional Development)	Total Area (Low Impact Development)
Medium Density Single Family	10,345,500	0.8	5,159,314	14.23 acres at 4-foot depth	8.63 acres at 4-foot depth
Multi-Family Residential	580,800	1.0	362,057		
Industrial Office	4,857,410	1.2	3,633,595		
Commercial	4,700,719	1.3	3,809,414		
Infrastructure	6,896,298	1.3	5,588,688		
Total	27,380,727		18,553,069		

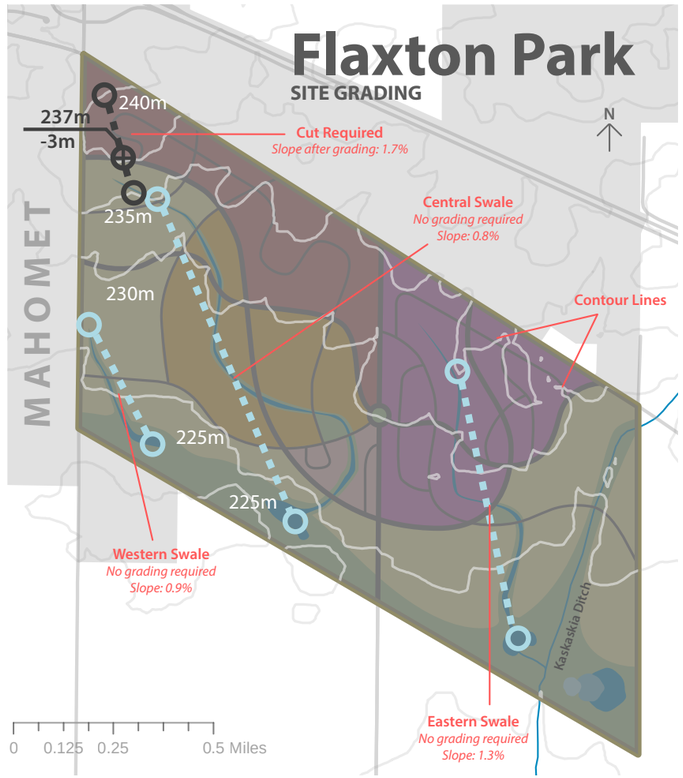


FIGURE 10: Site Grading for Flaxton Park
By using the site's natural slope, Flaxton Park minimizes cut-and-fill, preserving the natural permeability of the soil.

TABLE 6: Constructed Wetland Size
A 9.88-acre wetland is needed to treat the sewage produced by Flaxton Park.

Constructed Wetland Size				
Type of Development	Average Wastewater	Flow (Gal/Day)	Total Volume (Gal)	Total Area (Acres)
Residential	105 gal/unit/day	178,500	4,225,073	9.88 acres at 1.3-foot depth
Commercial/Office	15.53 gal/sq. ft/year	244,007		
Total		422,507		

SITE GRADING

The low-impact development paradigm specifies that runoff should be managed with as little disruption to the natural topography as possible. As displayed in **Figure 10**, the western, central and eastern swales provide overland stormwater drainage in Flaxton Park. These swales have slopes of 0.9%, 0.8% and 1.3% respectively. Since all of them exceed the 0.5% minimum slope, none of the swales requires grading.

However, the northwest corner of the Flaxton Park site requires cut-and-fill in order to allow optimal drainage. This area drains away from the central swale. A three-meter cut is needed to reverse the direction of drainage, resulting in a 1.7% slope toward the central swale.

GREEN INFRASTRUCTURE

Figure 11 shows that Central Champaign County is home to three green infrastructure hubs: one natural hub defined by land cover and two recreation hubs defined by open space. Located between the Urbana and Mahomet hubs, Flaxton Park implements part of a proposed recreational link. This trail, which runs along the southern edge of the site, connects to Flaxton Park's pedestrian and bike trails, providing residents with opportunities for recreation and active transportation.

CONCLUSION

Sustainability is at the core of Flaxton Park. The location of the site considers natural systems and attempts to preserve Champaign County's natural resources. The mix of housing, retail and office space meets the county's present and future needs while remaining financially viable for the developer.

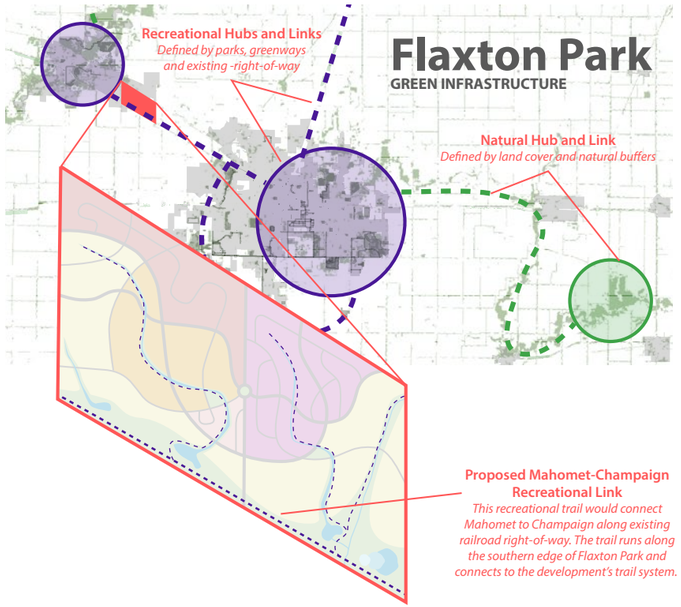


FIGURE 11: Green Infrastructure Connections
Flaxton Park connects to the proposed Mahomet-Champaign recreational link along the site's southern edge.

In its design, too, Flaxton Park attempts to balance the needs of people and natural systems. The low-impact development paradigm provides a guiding framework, and elements like bioretention cells, bioswales and green roofs minimize the disruption to the site's hydrology.

Yet "low impact" does not mean that Flaxton Park will not create change. By integrating best management practices, Flaxton Park can serve as an example for Mahomet, the county and the wider community.

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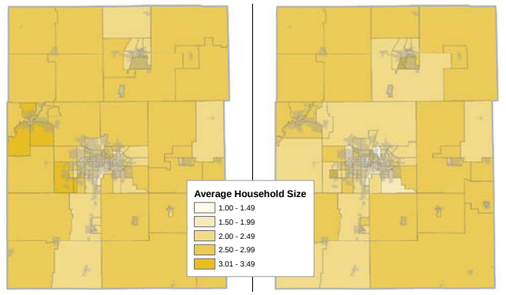
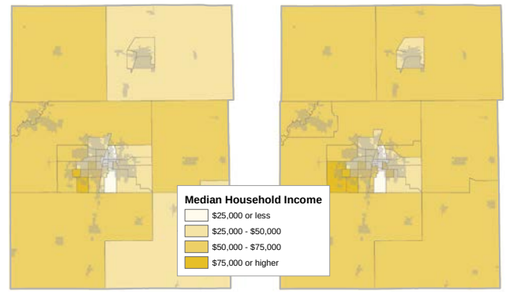
Appendix A: Socioeconomic Factors in Champaign County

AVERAGE HOUSEHOLD SIZE



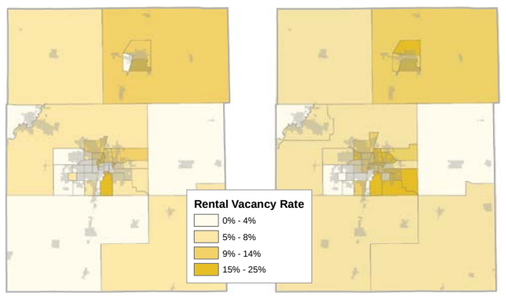
Data Source: U.S. Census Bureau Table H12, 2000 and 2010

MEDIAN HOUSEHOLD INCOME



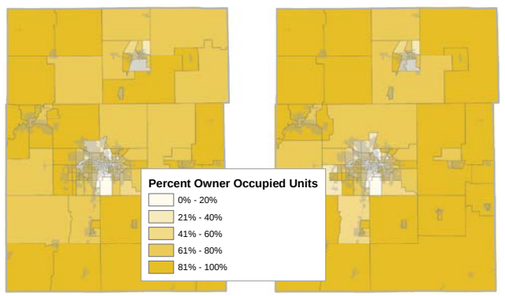
Data Source: U.S. Census Bureau Tables P053 (2000) and S1903 (2010)

RENTAL VACANCY RATE



Data Source: U.S. Census Bureau Table DP04, 2000 and 2010

OWNER OCCUPANCY



Data Source: U.S. Census Bureau Table H4, 2000 and 2010

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