



Brightfield for Bright Future Project:

Brightfield for a Brighter Future Project: Solar Potential Analysis for the City of Muncie



**URBAN
PLANNING**

**BALL STATE
UNIVERSITY**

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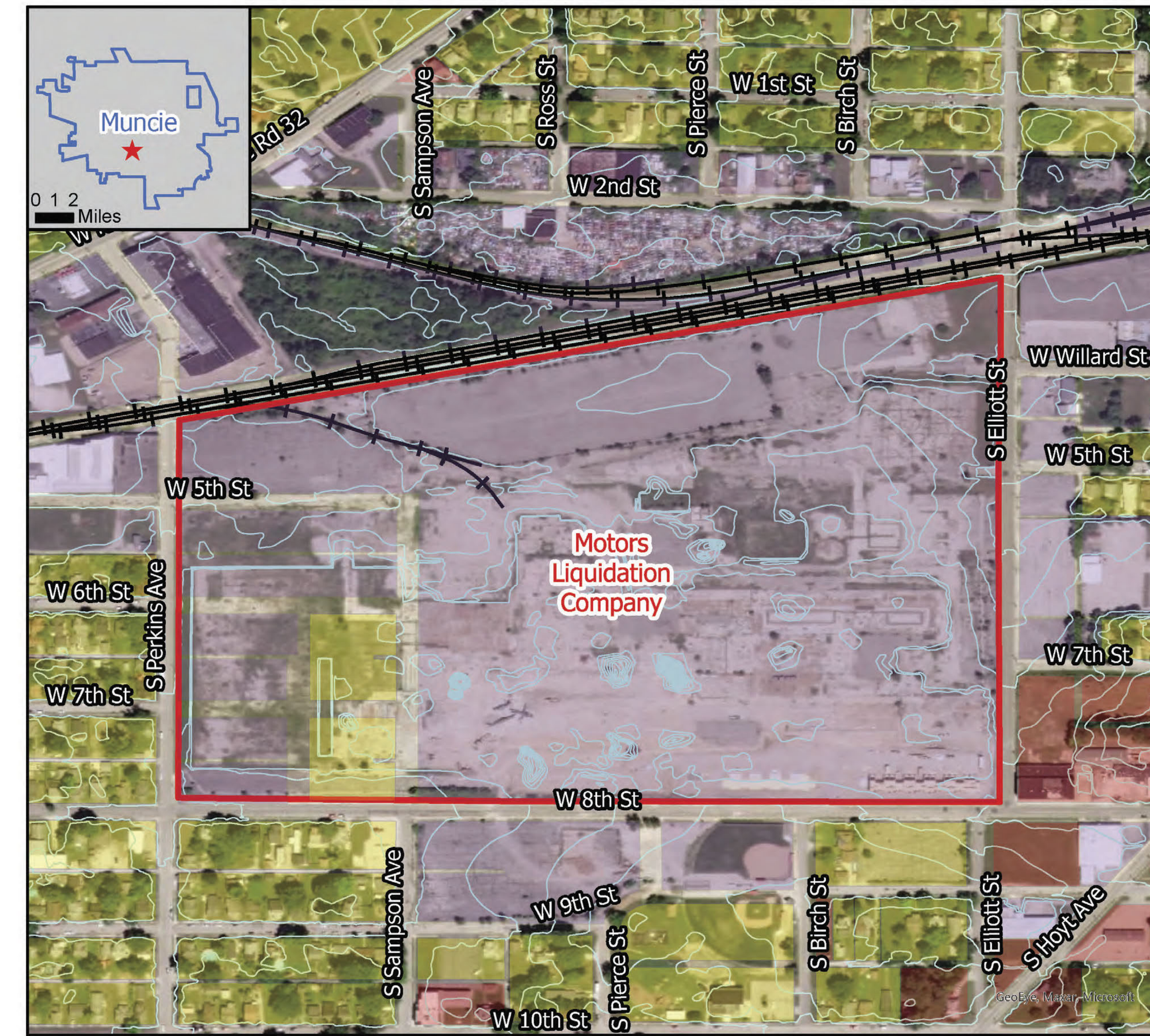
Utility-Scale Solar PV Installation:

Motors Liquidation Company

- Address: 1200 W 8th Street, Muncie, IN 47302
- Brownfield Program: EPA Brownfields
- Area: 58.39 acres
- Zoning: Intense Industrial
- Municipality: Southwest Neighborhood, City of Muncie, Delaware County, IN
- Distance to Substation: 0.6 miles
- Distance to Transmission Line: 0 miles
- Distance to Major Road: 0 miles
- Estimated Annual Solar Energy Production: 48,688,712 kWh
- Estimated Annual Energy Value: \$4,138,540
- Estimated Solar Power Capacity: 5,558.072 kW
- Greenhouse Gas Equivalencies:
 - 3,972 homes' energy use for one year,
 - 5,828 homes' electricity use for one year,
 - 44,957 acres of U.S. forests in one year

Delaware Advancement Corporation North/South

- Address: 4500 S Delaware Dr.
- Brownfield Program: EPA Brownfields
- Area: 100.1 acres
- Zoning: Industrial
- Municipality: Muncie, Delaware County, IN
- Distance to Substation: 1.27 mi
- Distance to Transmission line: 0.55 mi
- Distance to Major road: 0 mi
- Estimated Annual Solar Energy Production: 83,021,112 kWh
- Estimated Annual Energy Value: \$7,056,797
- Estimated Solar Power Capacity: 9,477,295 kW
- Greenhouse gas equivalencies:
 - 6,774 homes' energy use for one year,
 - 9,938 homes' electricity use for one year,
 - 76,658 acres of U.S. forests in one year



Legend
 Boundary Railroad Contours Residential Commercial Industrial Agriculture Institutional
 Sources: US Census Bureau, Geography Division, Delaware County, Indiana, Beacon Website, Indiana Geographic Information Council, Ball State Library GIS Database



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Abstract

The Ball State University Regional Analysis and Design studio for Spring 2021 worked in partnership with multiple Ball State University offices and other outside resources to explore the possibility of redeveloping brownfields in Delaware County, Indiana. The studio consisted of 10 sophomore urban planning students under the guidance of Dr. Sanglim Yoo. The studio explored GIS data for the county's brownfields with funding coming from the Ball State Provost Immersive Learning Grant. The studio contacted the Sierra Club Hoosier Chapter to discuss the benefits of a more sustainable Delaware County as well as the current energy production that is available to Indiana. The class used the data collected such as site characteristics, and energy output from the projects and came to the conclusion that the best sites for redevelopment as utility-scale and large-scale were the Motors Liquidation Company and the Muncie Sanitary District Water Treatment Plant, respectively.

Project Overview

The Rust Belt is a distinct region mostly comprising the Midwestern United States as well as portions of Northeastern United States which is characterized by industrial decline since the 1980s which has left many sites in these areas as abandoned industrial areas with contaminated land. Due to the past of these industrial sites, many lots have contaminated soil which leaves few options for redevelopment as human safety is a concern.

The project involved using data from the Environmental Protection Agency (EPA), Indiana Department of Environmental management (IDEM), and Beacon. According to the EPA, creating solar plants is one of the best ways to redevelop the aforementioned brownfields. The project is heavily encouraged by the City of Muncie as the mayor is promoting the development of solar energy in former brownfields.

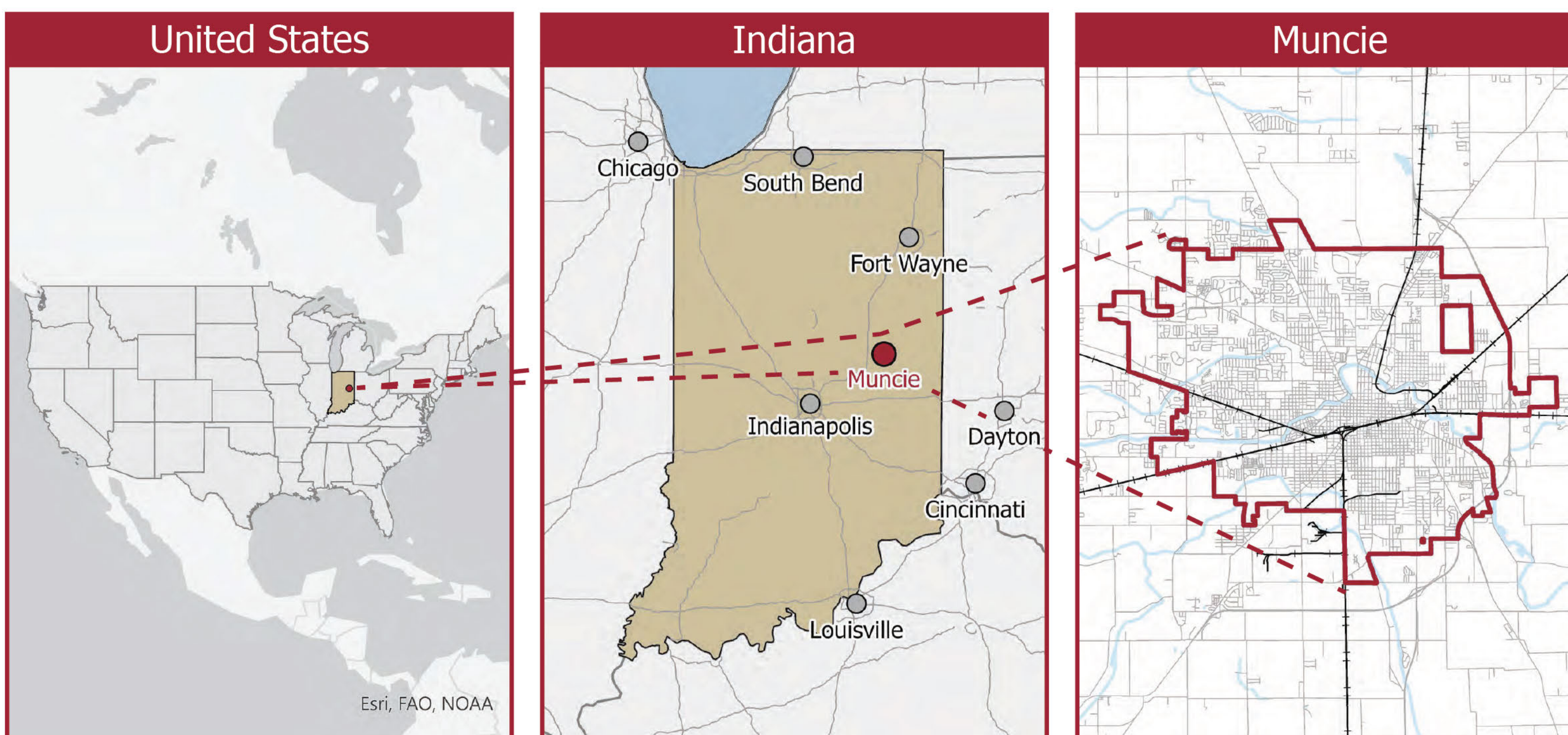
For this project, the class studied brownfield redevelopment programs and the solar potential of the 32 sites. The class visited Kokomo Solar 1 - a brownfield redevelopment that creates solar energy for the surrounding community. The class worked in partnership with Ball State University, Ball State Center for Energy Research/Education/Service, and the Hoosier Chapter of the Sierra Club.

Project Objectives

The Brownfield to Brightfield project intends to:

- Promote the use of renewable energy
- Help clean and heal the environment.
- Eliminate potential blights on the land and turn it into a renewable resource farm that helps the community.
- Educate students about renewable energy as a means to clean up areas.
- Encourage local residents to understand the economic and environmental benefits of solar farms for their community.

Region Overview



Central Eastern Indiana is composed of 8 counties that were all established in the 1800s gas boom. The 8 counties are Blackfield, Hancock, Henry, Jay, Madison, Wayne, Randolph, and Delaware. The gas boom created many glass factories, manufacturing, and automotive jobs, especially in Muncie and Anderson, the two largest cities in the region. In the 1980s, automobile among other factory jobs were declining, and the Central Eastern Indiana region became a part of the Rust Belt. This decline resulted in many vacant properties which experienced decades of polluting industry, thus becoming the brownfields seen around the city of Muncie today.

Muncie is located within Delaware County which sits in the middle of this region and was once the heart of the gas boom industry.

Site Selection Process

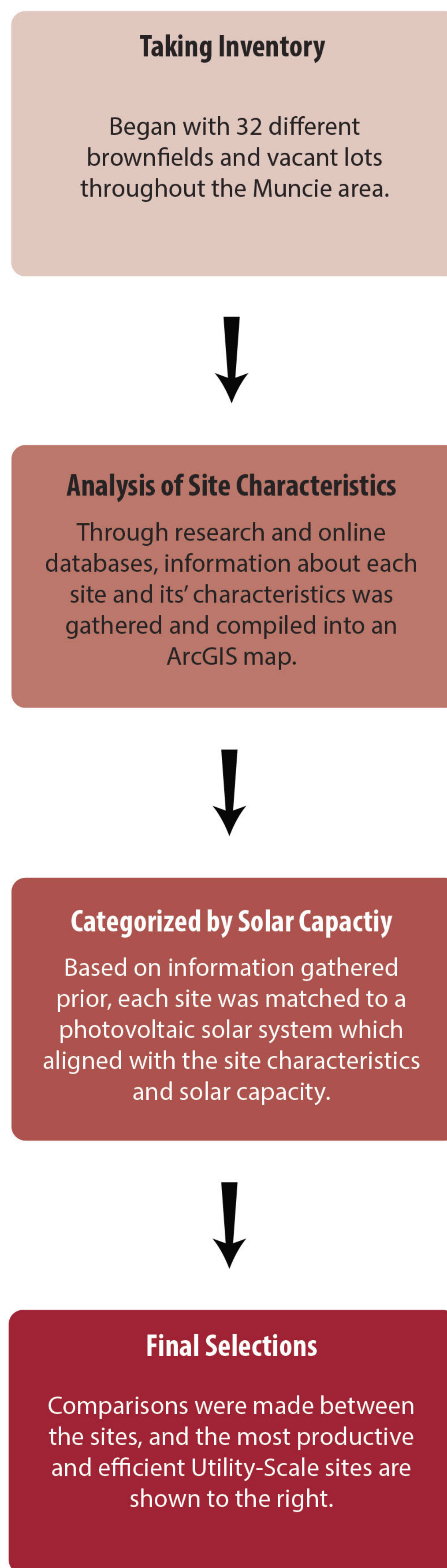
Our studio worked with 32 different brownfields and vacant lots in the Muncie area, with different scales such as, off grid, large scale, utility scale, and rooftop. We chose the top two utility-scale sites that would provide the most amount of solar energy for the city of Muncie to present. To gather information on each of the sites, we used data from the Indiana Department of Environmental management (IDEM), Beacon, and the PV Watts Calculator.

We collected the following information on every site: the address(es) of each lot, the brownfield programs each site was in, the acreage, zoning, municipality, distance to substations, transmission lines, and major roads. Each site also had information on who owned the site, a summary of the existing land use, any financial information available, the estimated solar output, how money would be saved from installing solar, and how many items could be powered by the energy produced.

We decided that we could break down each site into the following categories: off grid, large scale, and utility scale. Off grid means that the site could produce at least 2.5 kWh/m²/day. A large scale site could produce at least 3.5 kWh/m²/day, is on at least 2 acres of land, and is a maximum of 1 mile away from any transmission line or graded road. A utility scale site could produce at least 5 kWh/m²/day, is on at least 40 acres of land, and is a maximum of 10 miles away from any transmission line or graded road.

We further narrowed down which site to choose by comparing and contrasting the attributes of each site against the rest of the sites available. We took each site's shape, their distance to the substations, the size of each lot, what was on each site, as well as any contaminants in the soil into consideration before coming to a final conclusion.

Method of Site Selection



Taking Inventory

Began with 32 different brownfields and vacant lots throughout the Muncie area.

Analysis of Site Characteristics

Through research and online databases, information about each site and its' characteristics was gathered and compiled into an ArcGIS map.

Categorized by Solar Capacity

Based on information gathered prior, each site was matched to a photovoltaic solar system which aligned with the site characteristics and solar capacity.

Final Selections

Comparisons were made between the sites, and the most productive and efficient Utility-Scale sites are shown to the right.