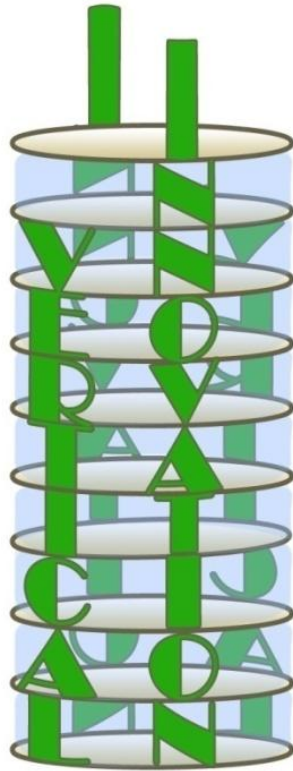


# Design of a Large-Scale Structural System for the 21st Century – Team 1



**IPRO 356**  
**Vertical Farm**  
**A Garden in the City**

# Overview

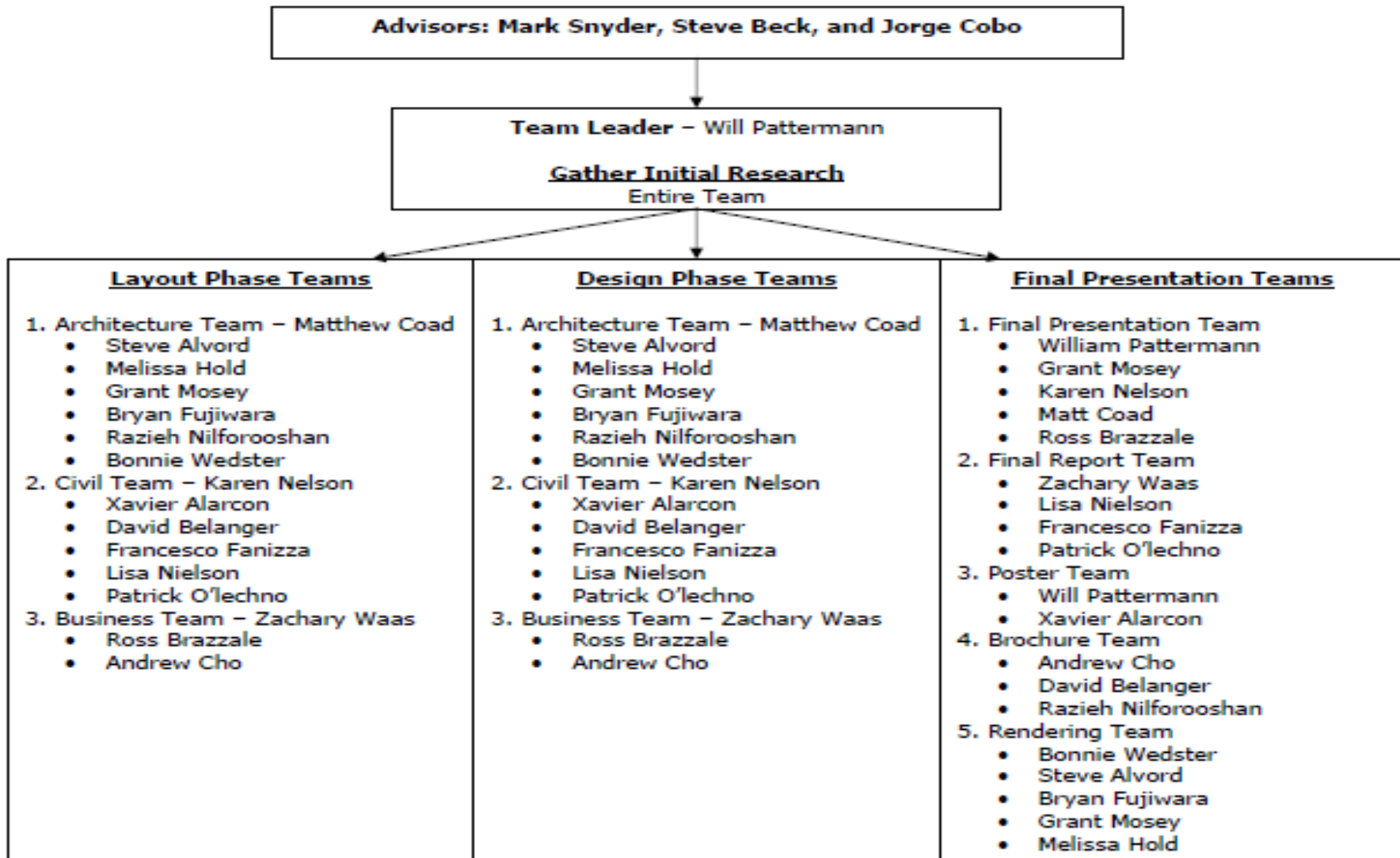
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- Project Objective
- Team Organization
- Our Vision
- Our Solution
- Development Overview
- Anchor Building Design
- Cost Analysis
- Conclusion

# Project Objective

To redevelop the 37-acre Michael Reese site, including a profitable anchor building, while considering the surrounding Bronzeville community needs.

# Team Organization



Project Objective • **Team Unity** • Our Vision • Our Solution • Development Overview  
• Anchor Building Design • Cost Analysis • Conclusion

# Vision

## Stagnant Bronzeville Infill

- Does Not Respect Heritage
- Monolithic and Inflexible
- Economically Nonviable
- Low Occupancy / Density



## Vibrant Bronzeville Infill

- Reveres Heritage
- Bright and Colorful
- Economically Strong
- High Occupancy / Density

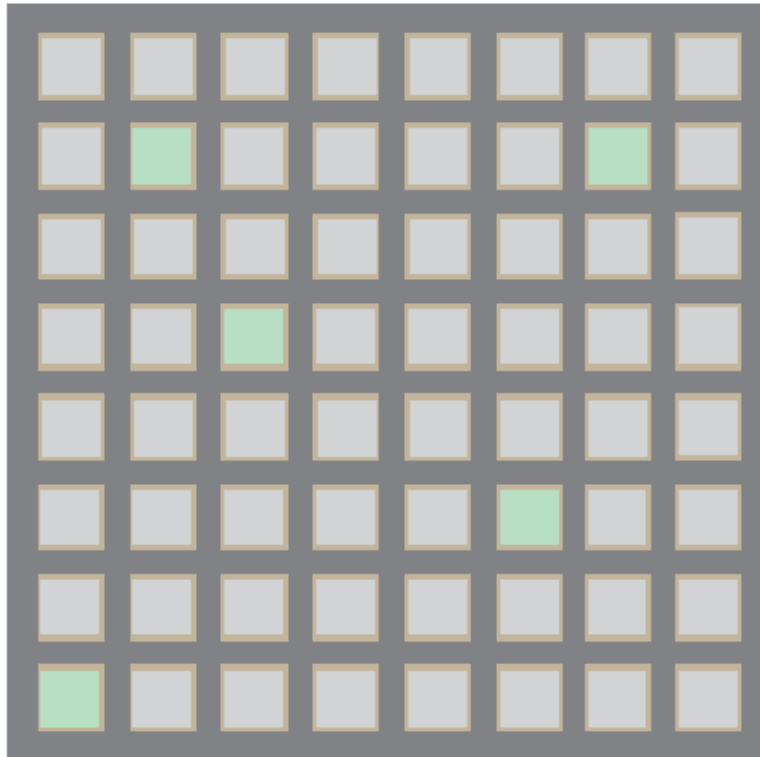


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# Vision

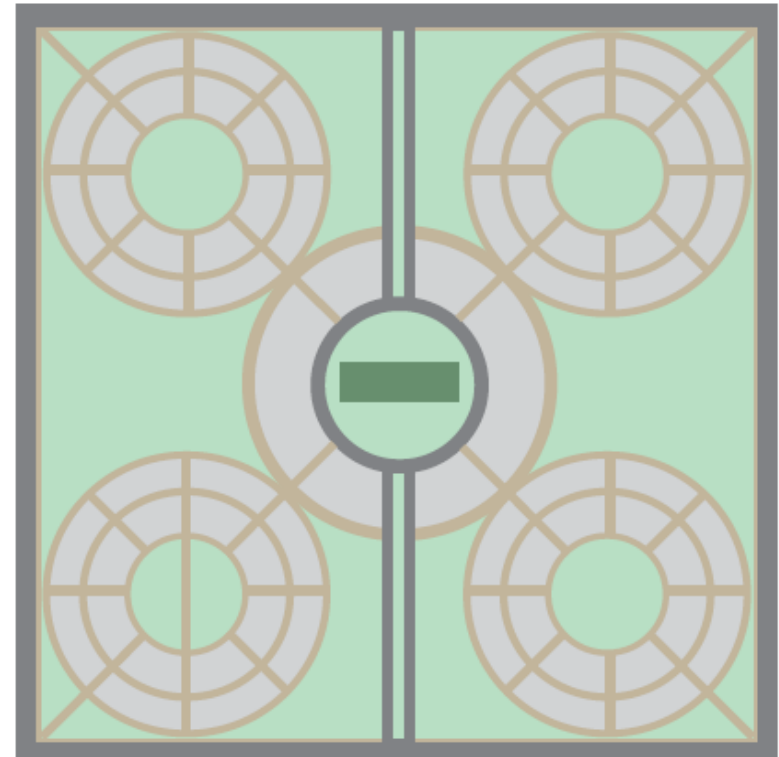
## Typical Urban Condition

- Vehicle-oriented
- Unwalkable
- Paltry, disjointed green space
- Geometrically rigid and unforgiving



## "New Urban" Condition

- Pedestrian / Public-Transit-Oriented
- Highly Walkable
- Generous, cohesive green spaces
- Geometrically Flexible and adaptable



Vehicular Way



Pedestrian Way



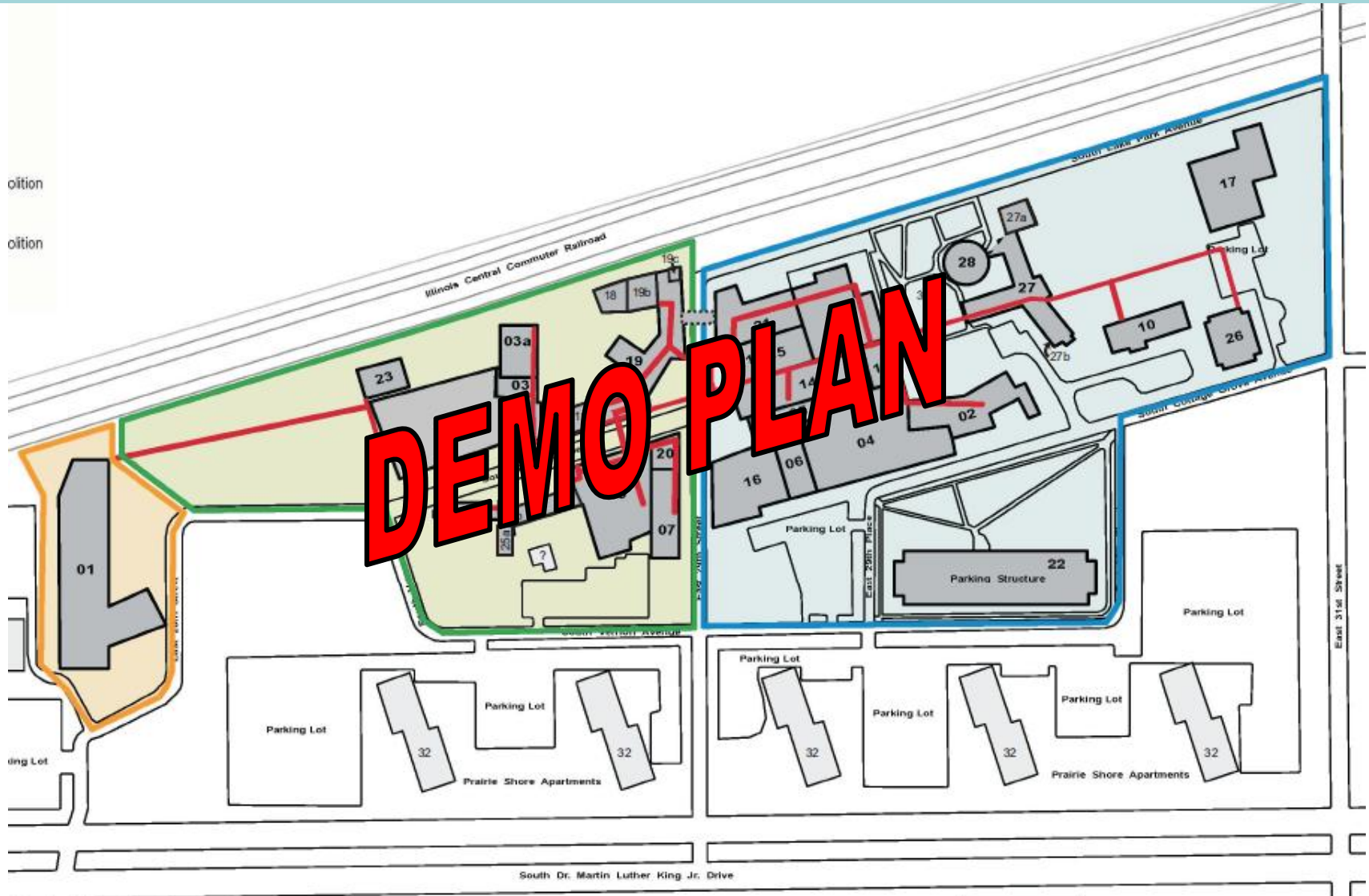
Buildings



Green Space

Project Objective • Team Unity • **Our Vision** • Our Solution • Development Overview  
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# Proposed Solution



Project Objective • Team Unity • Our Vision • **Our Solution** • Development Overview  
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# Phase 1



Project Objective • Team Unity • Our Vision • Our Solution • **Development Overview**  
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# Phase 2



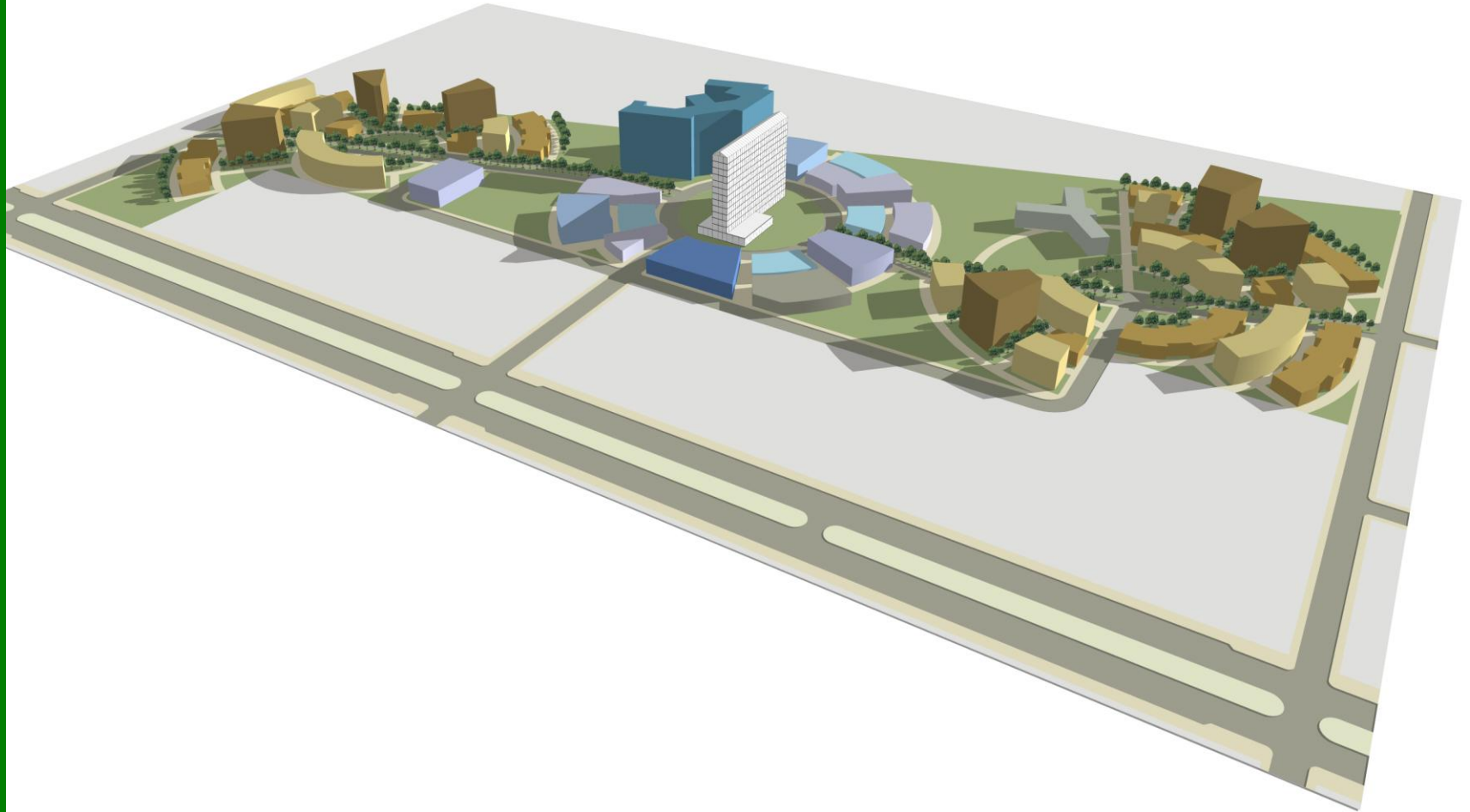
Project Objective • Team Unity • Our Vision • Our Solution • **Development Overview**  
• Anchor Building Design • Cost Analysis • Conclusion

# Phase 3



Project Objective • Team Unity • Our Vision • Our Solution • **Development Overview**  
• Anchor Building Design • Cost Analysis • Conclusion

# Site Overview



Project Objective • Team Unity • Our Vision • Our Solution • **Development Overview**  
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# Vertical Farm: The Problem

- More than 50% of world population resides in Cities
- Chicago imports most of its produce
- Global food prices have risen 75% since 2000

Produce Type	Conventional Source Estimate
	Travel Distance (Miles)
Beans	1,313
Broccoli	1,846
Carrots	1,838
Lettuce	1,823
Peppers	1,589
Spinach	1,815
Strawberries	1,830
Tomatoes	1,569
	j
<b>Total Miles</b>	<b>13,623</b>
<b>Vertical Farm</b>	<b>&lt;10</b>
*USDA data from Chicago and St. Louis Terminal Markets	



# Vertical Farm: Benefits

- Dependable crop production
- High demand for fresh produce
- No weather-related crop failures
- Beyond organic quality
- Reduces fossil fuel dependence
- Interwoven sustainable strategies
- Supports Chicago's Green City Initiative
- Relieve pressures on produce market
- Golden opportunity as iconic trend-setter



VS.



# Growing Details



Vertical Hydroponics



Aeroponics

Broccoli	Tomatoes
Romaine Lettuce	Strawberries
Carrots	Bell Peppers
Celery	Spinach
Oregano	Grapes
Basil	

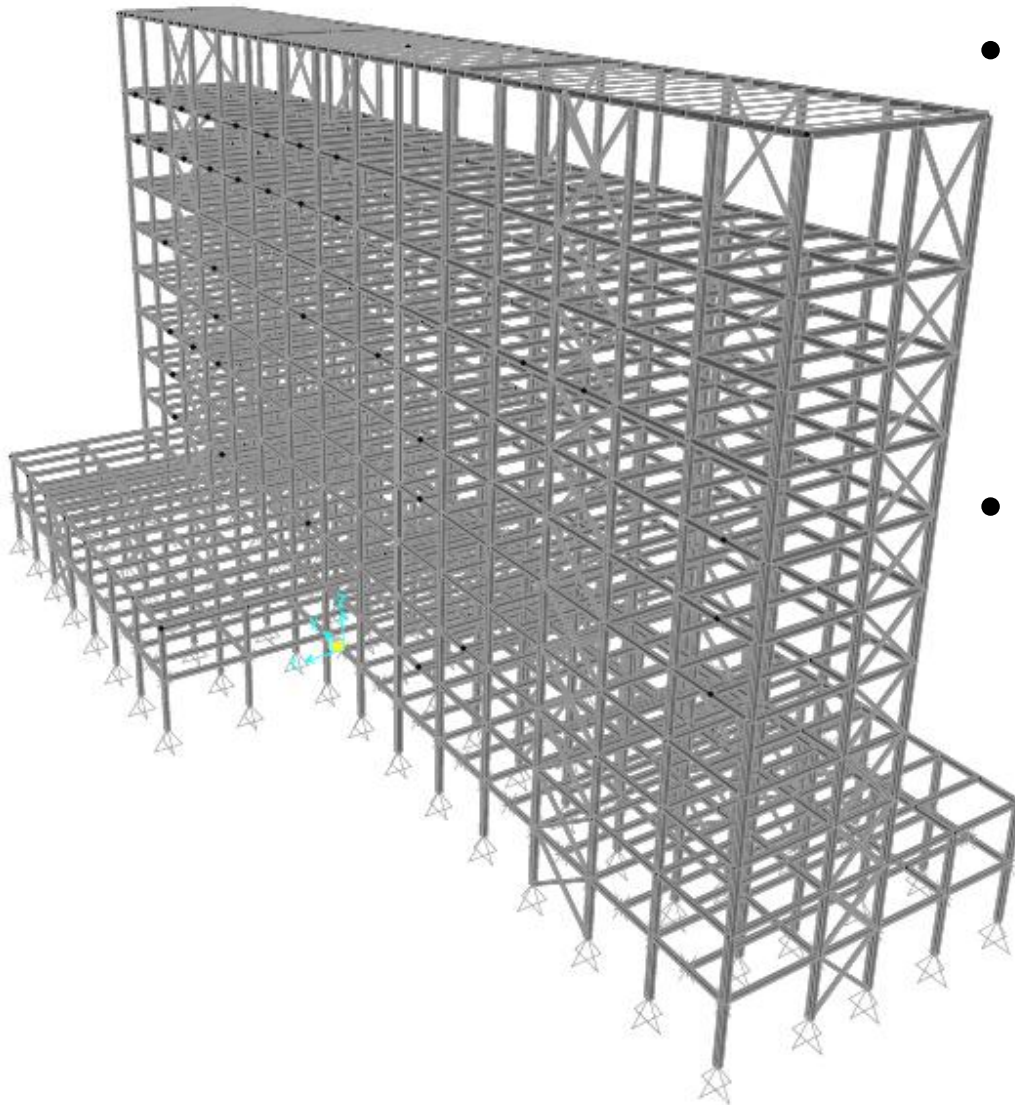
# Architectural Design

- Ten story tower
- Use of space
  - Basement parking
  - One floor of office use
  - Eight floors of grow space
  - Top floor restaurant



Project Objective • Team Unity • Our Vision • Our Solution • Development Overview  
• **Anchor Building Design** • Cost Analysis • Conclusion

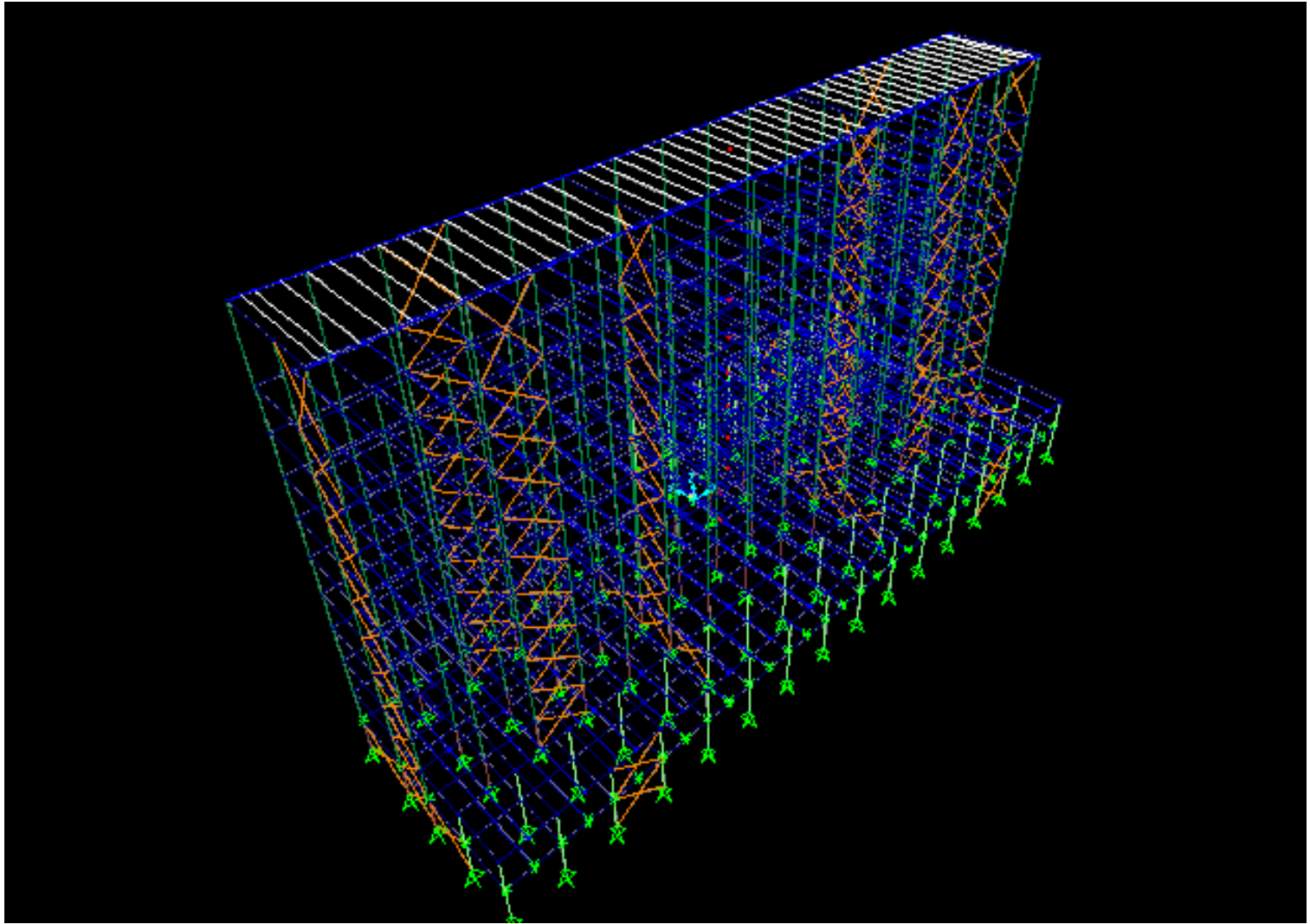
# Structural Design



- Basic Structure
  - Steel structure
  - Braced frames
  - Metal/concrete deck
  - Steel joist/glass roof
- Design Requirements
  - Chicago Building Code
  - Light Manufacturing



# Structural Design



Project Objective • Team Unity • Our Vision • Our Solution • Development Overview •  
**Anchor Building Design** • Cost Analysis • Conclusion

# Finished Product

- Deliverables
  - Architectural Drawings
  - Structural Drawings
  - Structural Model
  - 3D Renderings



Project Objective • Team Unity • Our Vision • Our Solution • Development Overview  
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# Site Development

## Two Phases of Construction

### **PHASE 1: RESIDENTIAL**

- 35 Row Houses
- 250 Mid Rise Rental Units
- 180 High Rise Rental/Condo Units
- 500 Spot Parking Garage

### **PHASE 2: COMMERCIAL AND VERTICAL FARM**

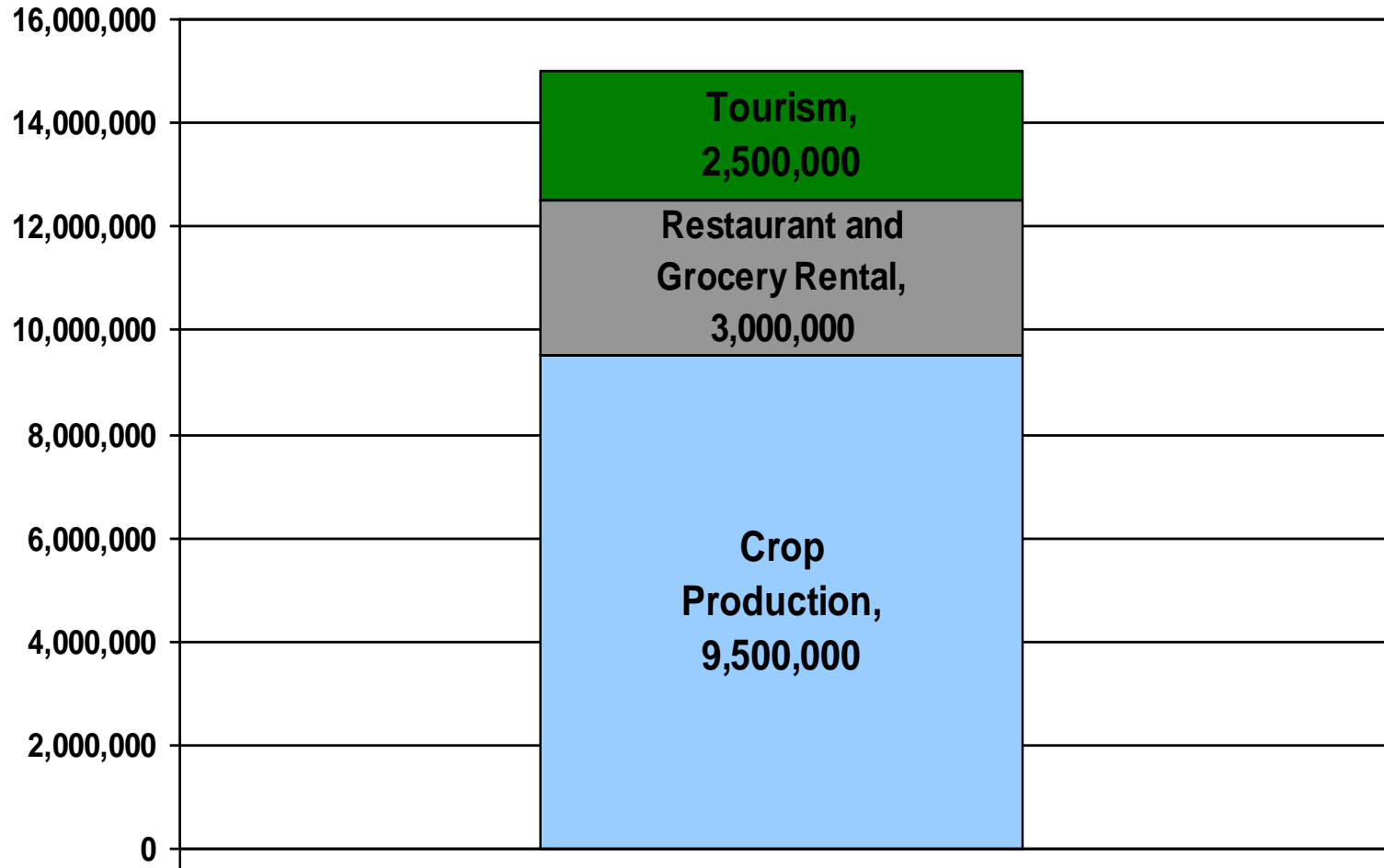
- 234,000 S.F. of Entertainment and Retail
- 190,000 S.F. Vertical Farm

# Auxiliary Value

- Rental Units
  - Low to Mid Income Units
    - \$12,000 Rent/Unit/Year, Including Parking
- Commercial Space
  - Buildings Sized for Big Box or Division
    - \$25.00 Rent/S.F./Year
    - 1<sup>st</sup> Generation Tenant Improvements High
- Parking
  - Competitive with IIT Parking
    - \$8 Spot/Year

# Vertical Farm Value

## Annual Value



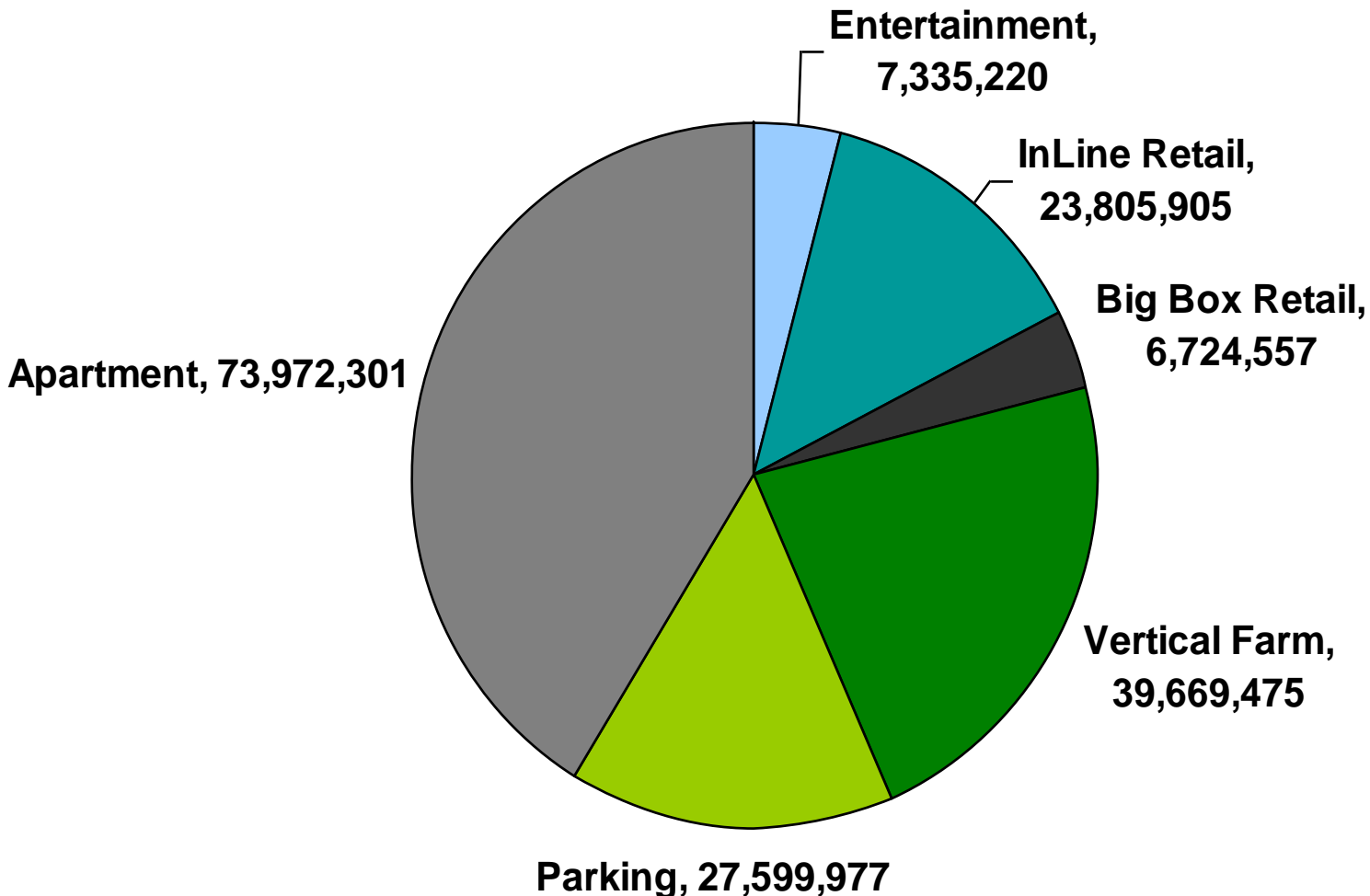
# Operational Assumptions

- Stabilized Occupancy Rate
  - 80% of Finished Development
- Operational Expenses
  - 50% of Income
- Real Estate Taxes
  - 30% of Income
- Revenue Inflation
  - 5% Versus Expense Inflation of 3%

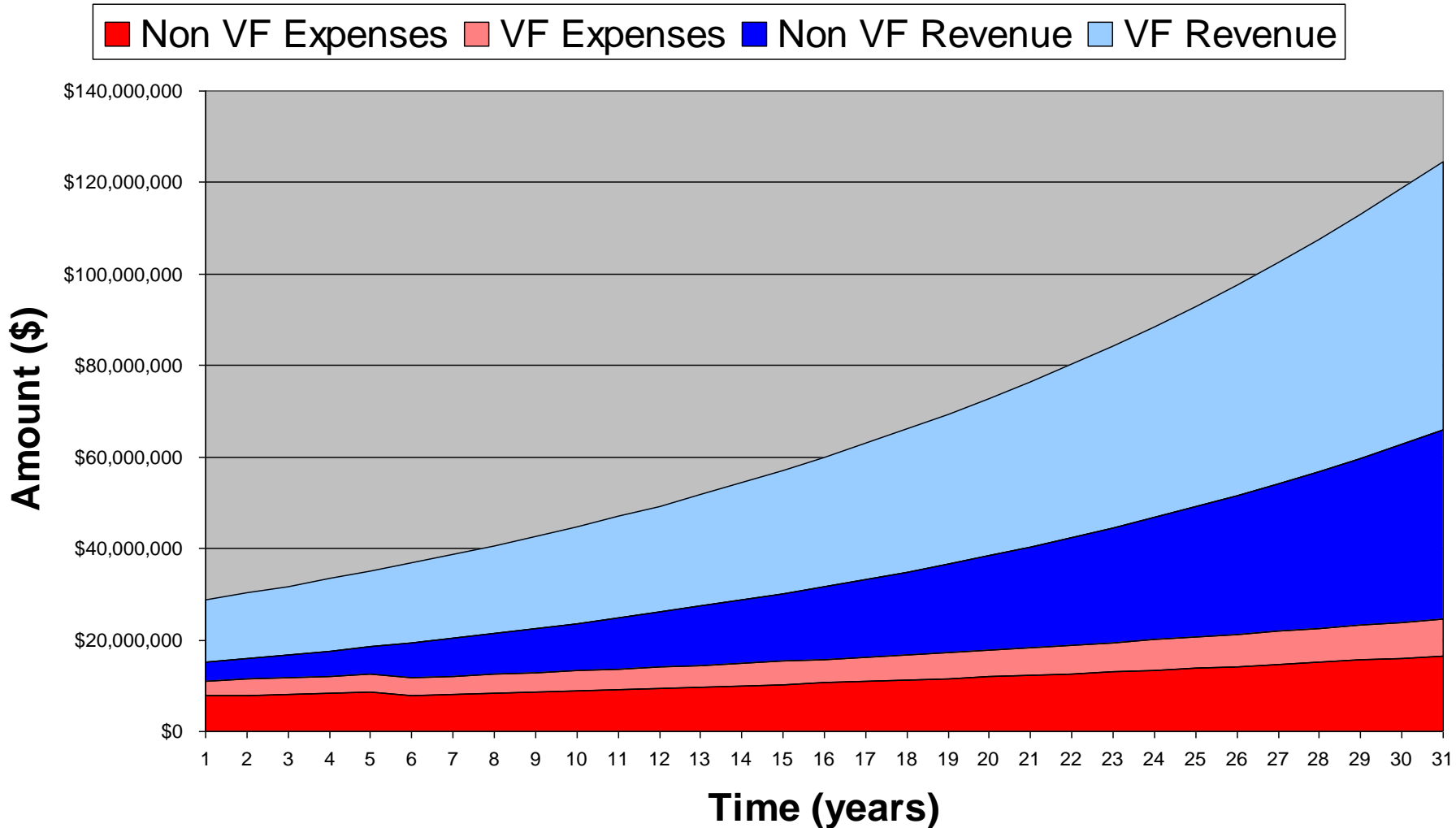
# Development Costs

**Land Cost:** \$82,000,000

**Investor Equity:** \$91,384,102 (After 65% Loan)



# Expenses and Revenues



Project Objective • Team Unity • Our Vision • Our Solution • Development Overview  
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# Cumulative Impact

Net Present Value: **\$172,277,000**

Annual Return: **23.4%**

*(Assumes a 30 Year Hold)*

Most Lucrative: Vertical Farm  
**\$120,659,000 NPV,**  
**65.83% Annual Return**

Least Lucrative: Parking  
**-\$4,829,000 NPV,**  
**9.23% Annual Return**

# Conclusion and Next Steps

- Constant reminder of conservation.
- Statement for Chicago
- Creating a “focal point”
- Further evaluation of need in the surrounding area
- Further evaluation of condominium market conditions
- Investigate most lucrative option for Phase 3

# Any Questions?

