IPRO 312

Active Porous Pavement System for Storm Water Control

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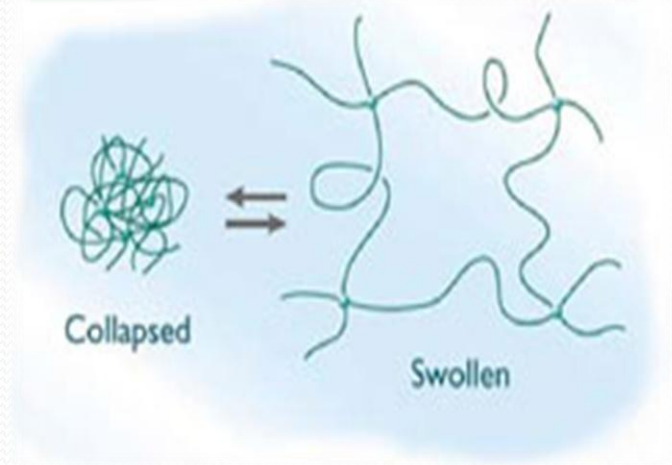
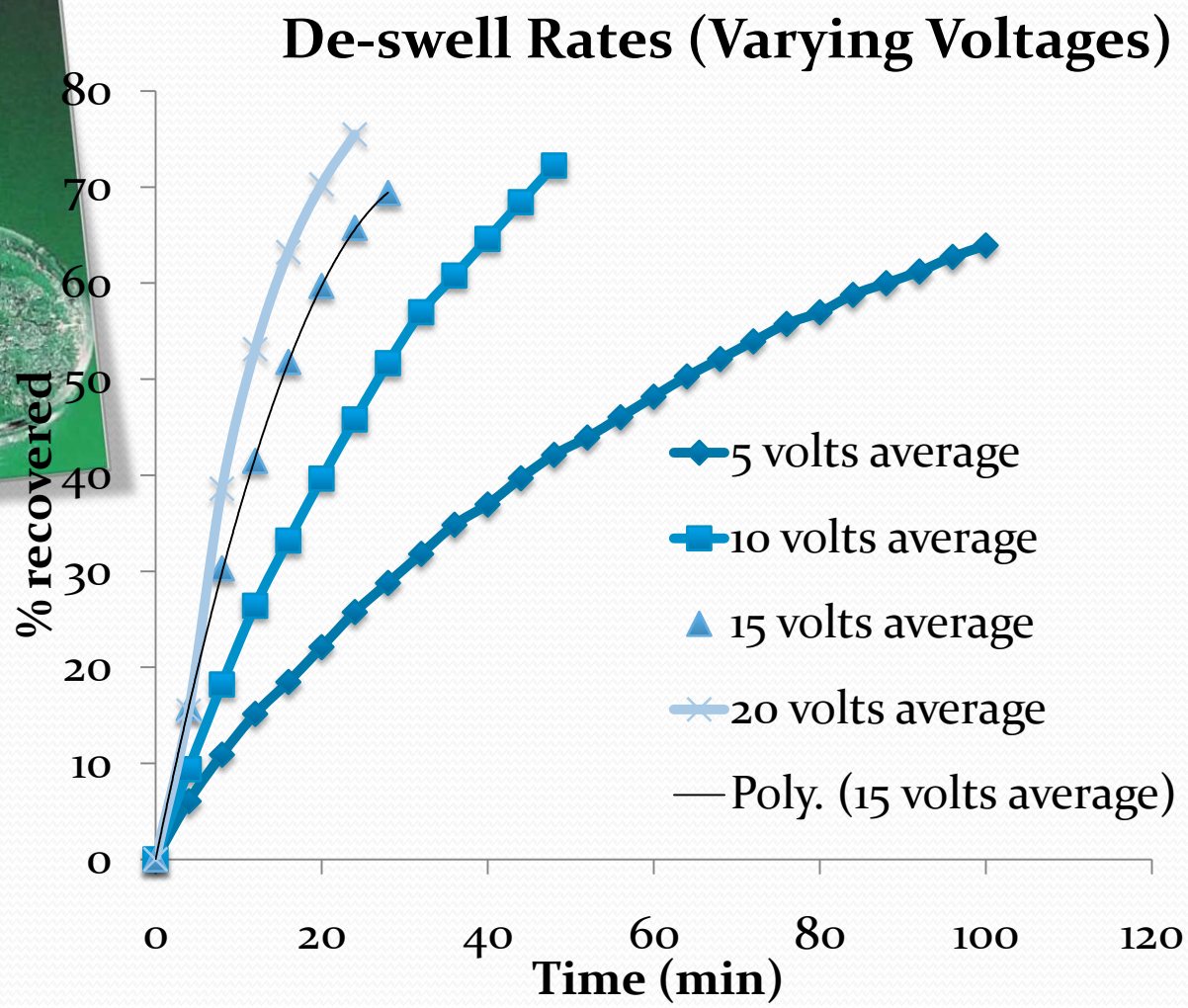
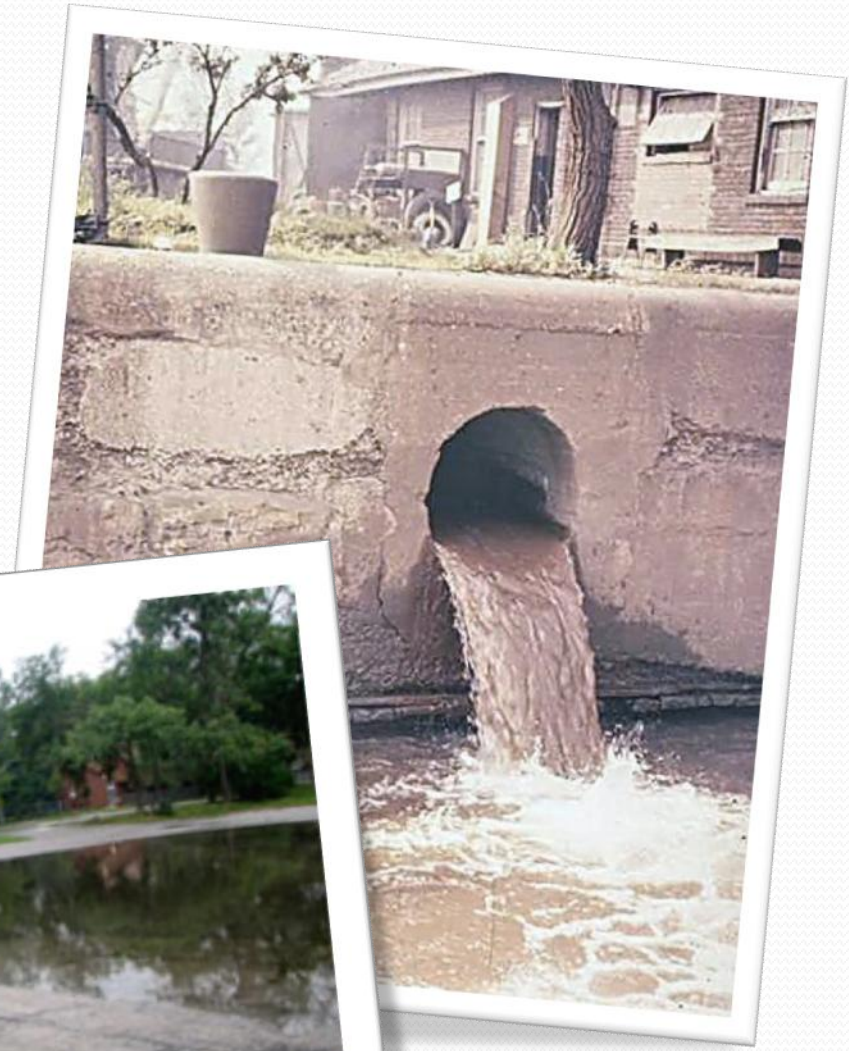
Electrically Reversible Hydrogels





Opportunities

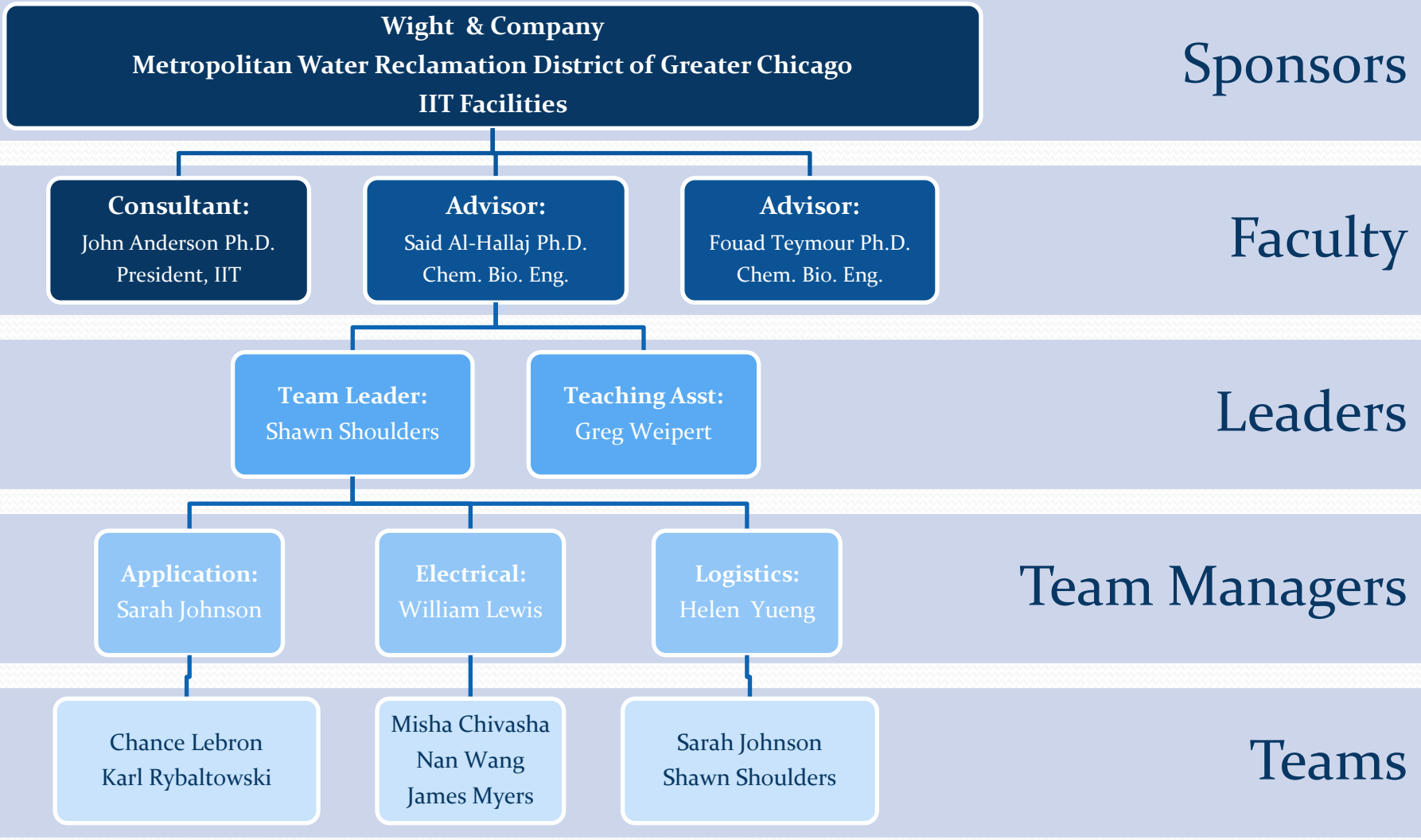
- Combined Sewer Overflow
- Flooding
- Water Management



Goals

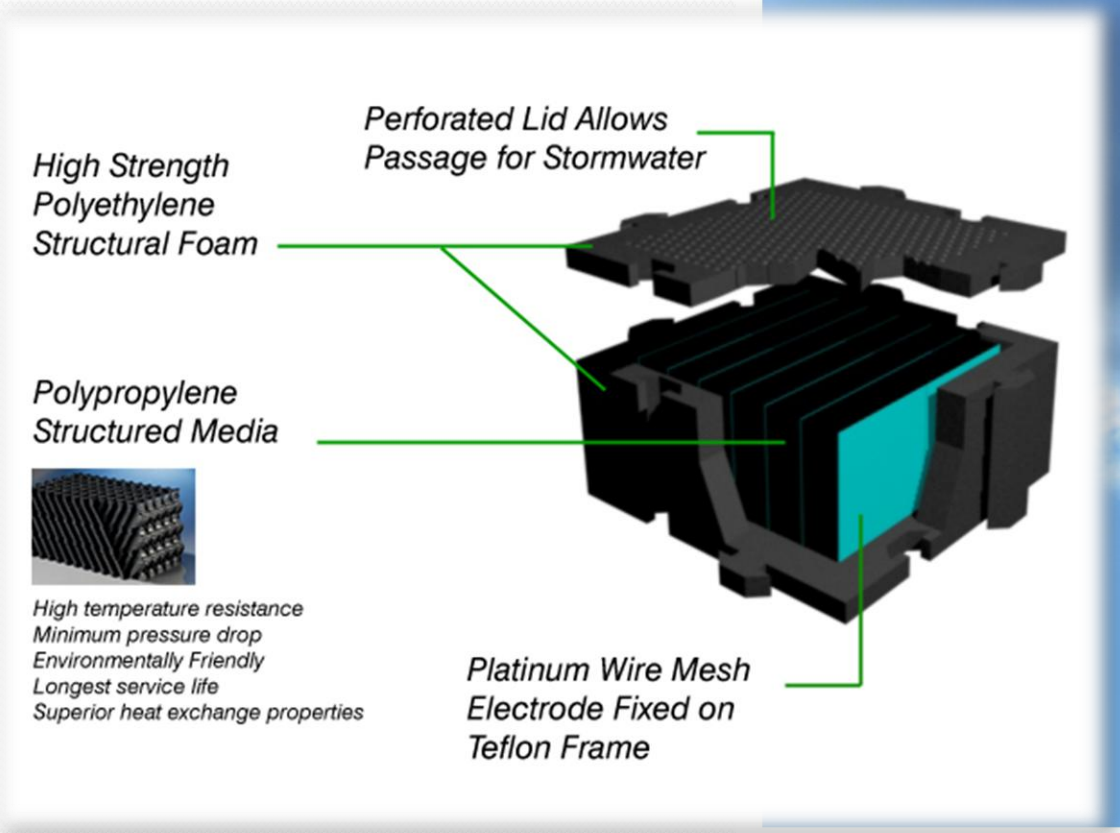
- Create a “plug and play” cell-based design incorporating hydro-gel technology, renewable energy sources and porous pavement.
- Construct a working prototype.
- Compare and contrast our design with current technologies
- Forecast the ecological/economic impact of our design on a Chicago-land neighborhood.

Team Organization



Electrical Objectives

- Power Supply
- Cell Design



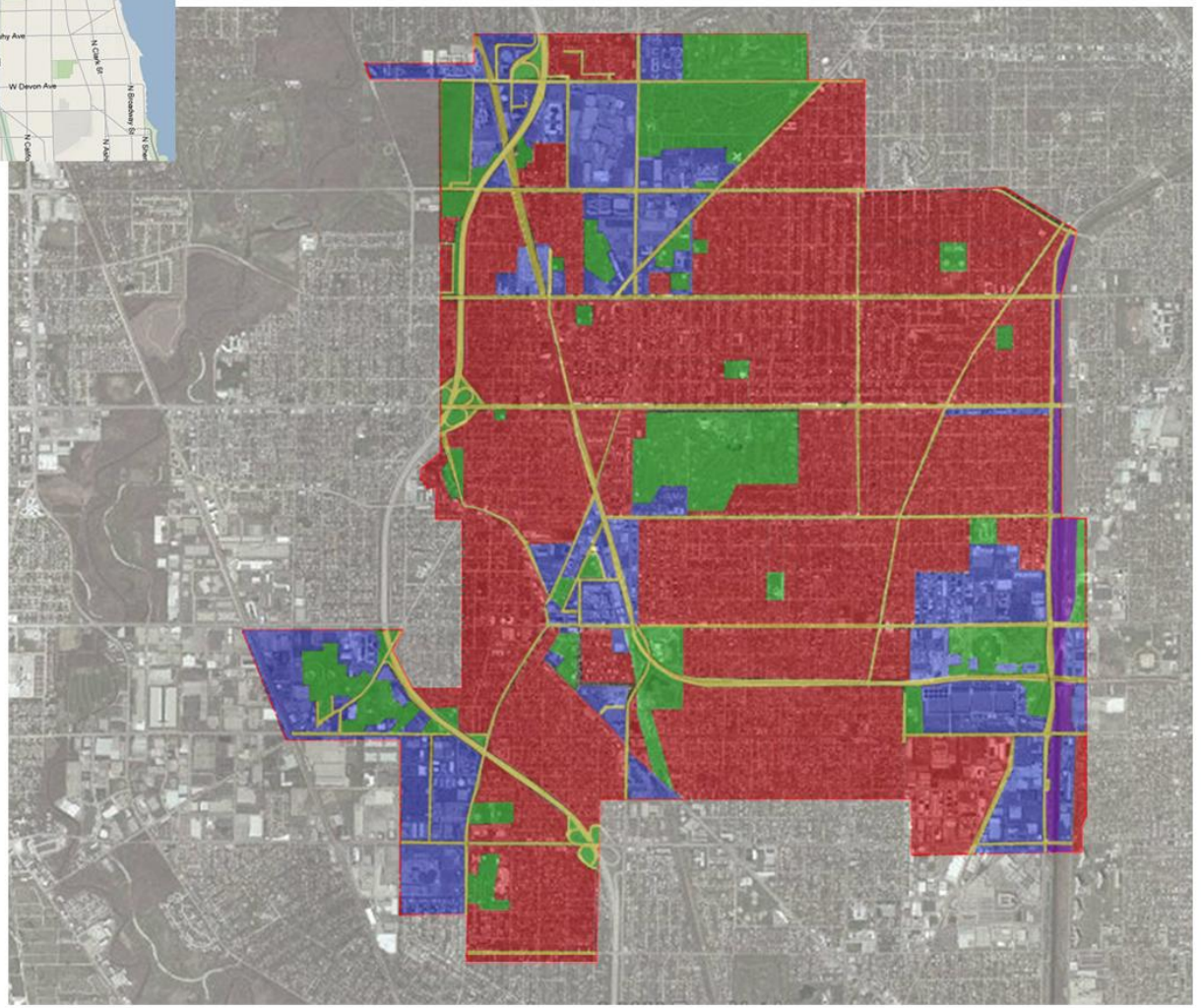
Electrical Accomplishments

- Tested Prototype
- Created initial circuitry design
- Determined Performance Characteristics

Map of Skokie, IL

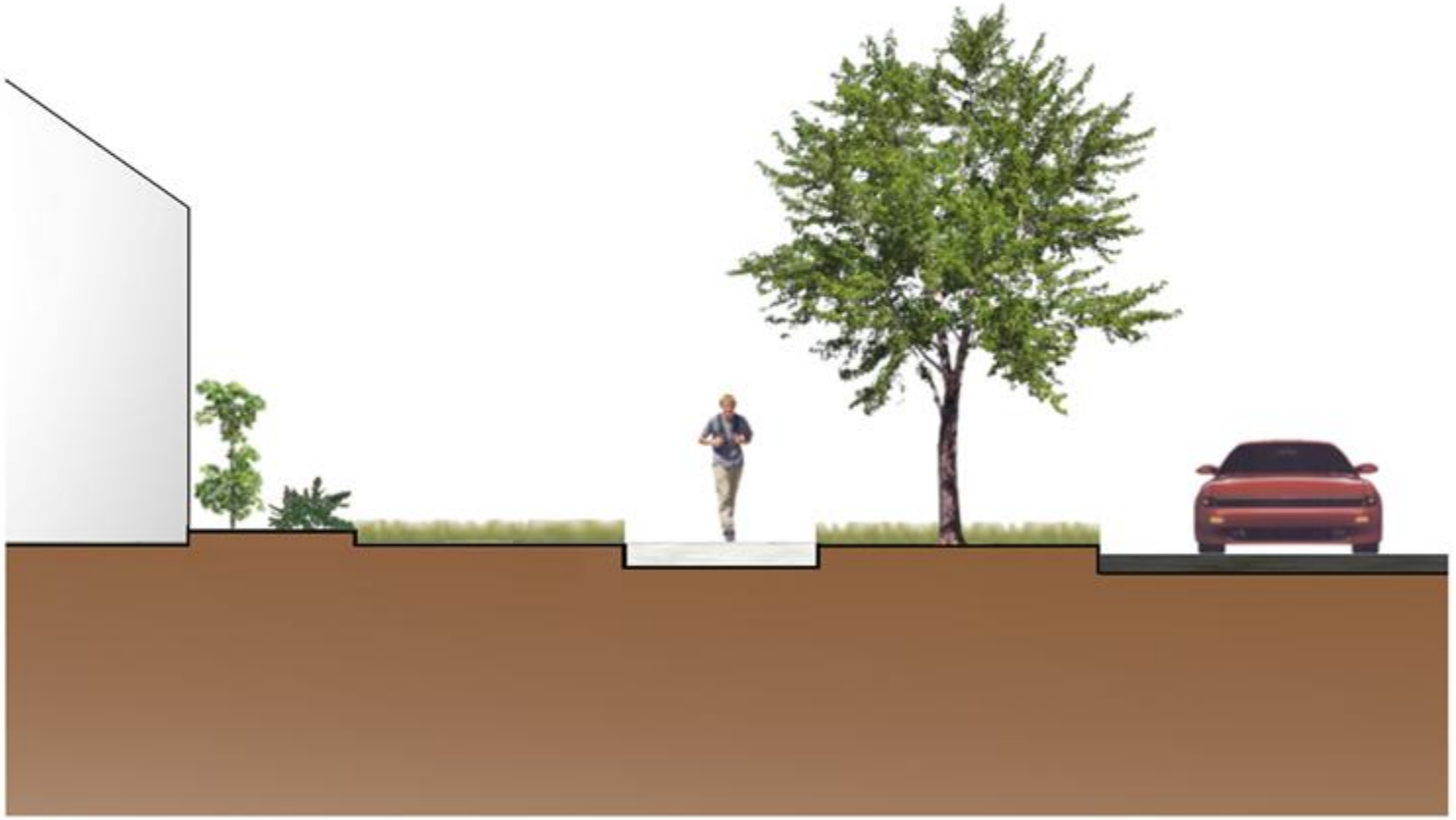
Applications

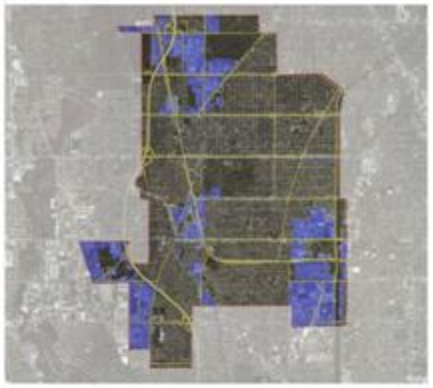
- Residential
- Commercial
- Park District



Residential Applications

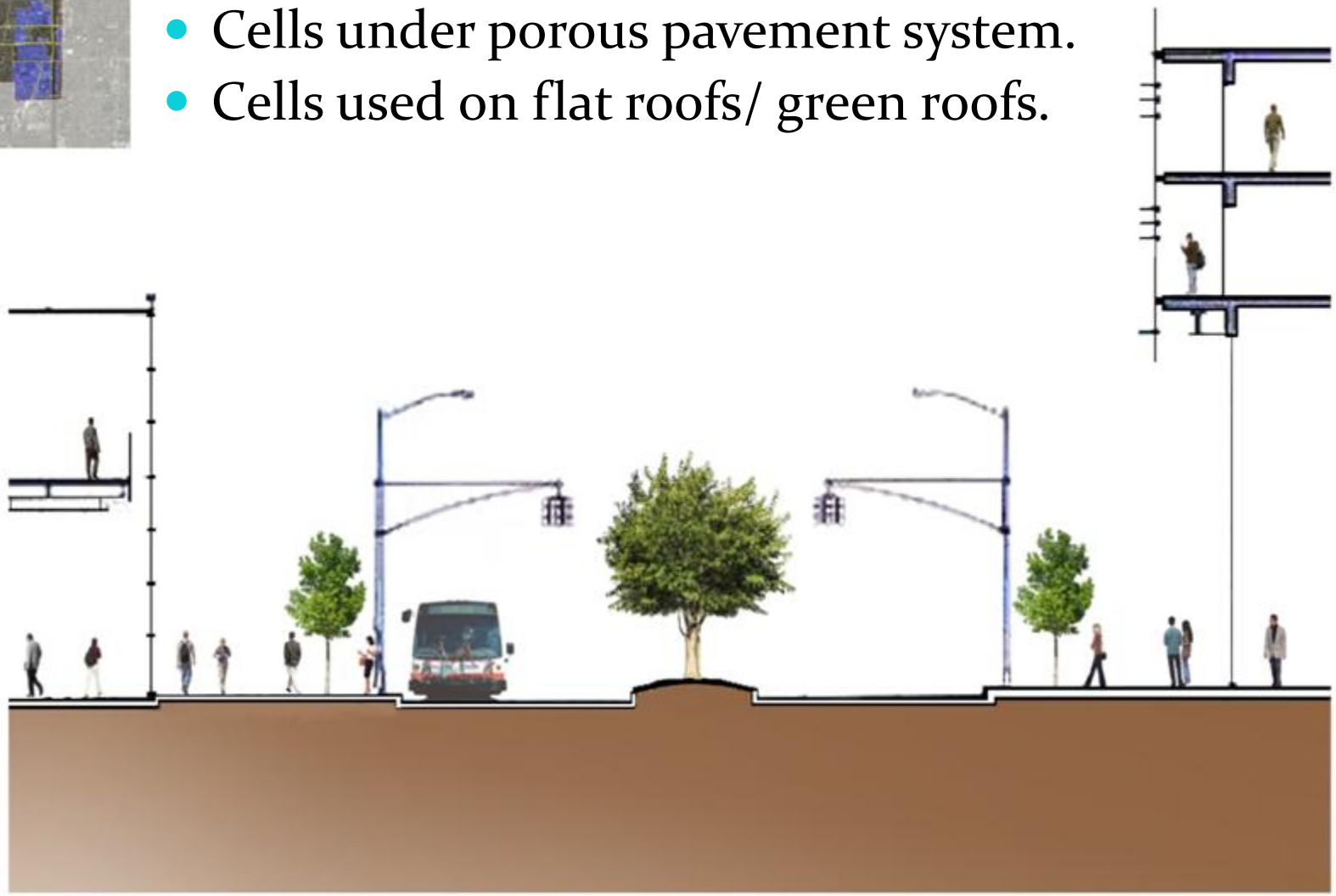
- Cells in street drainage inlets.
- Cells under porous pavement system.





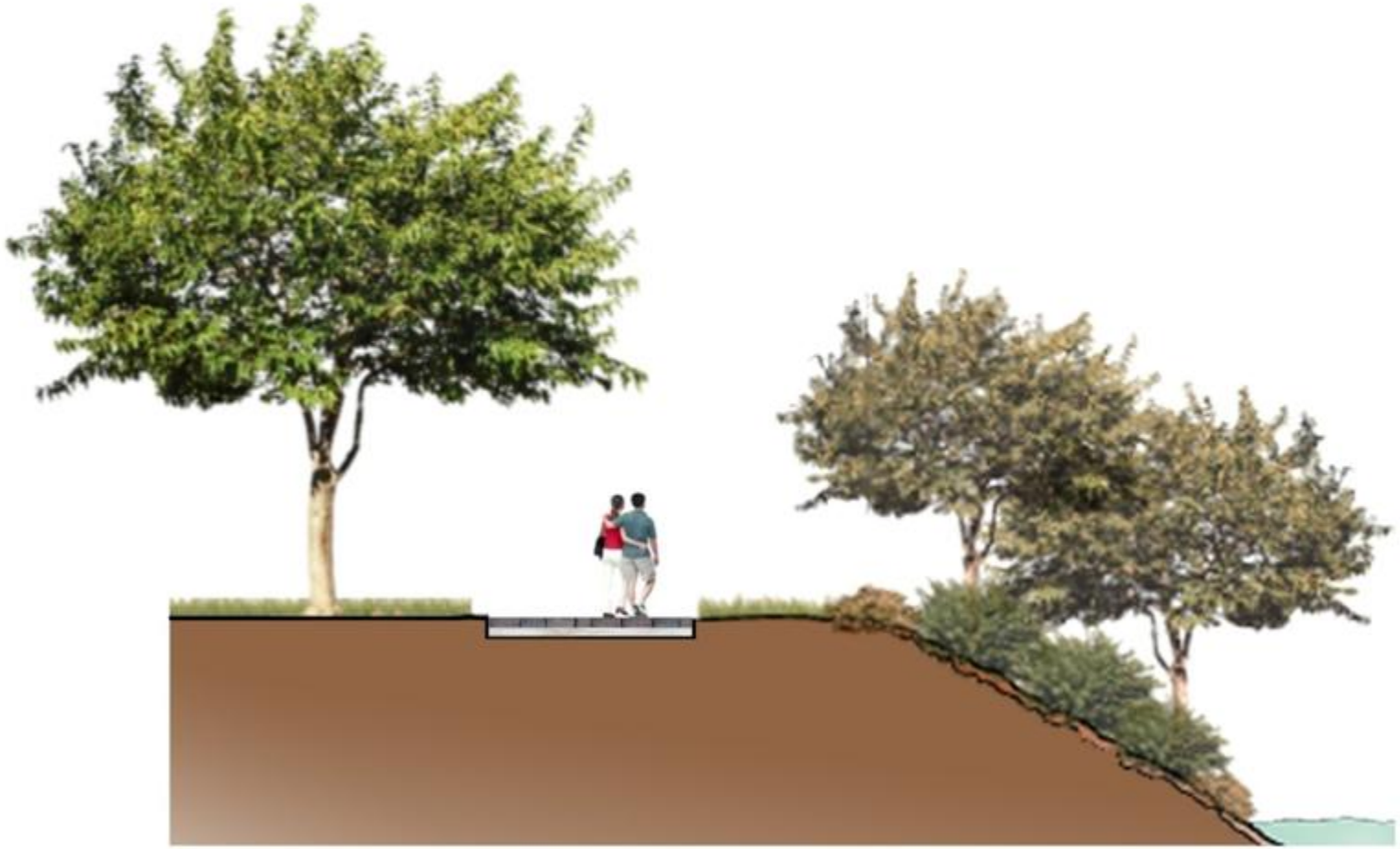
Commercial Applications

- Cells in street drainage inlets.
- Cells under porous pavement system.
- Cells used on flat roofs/ green roofs.

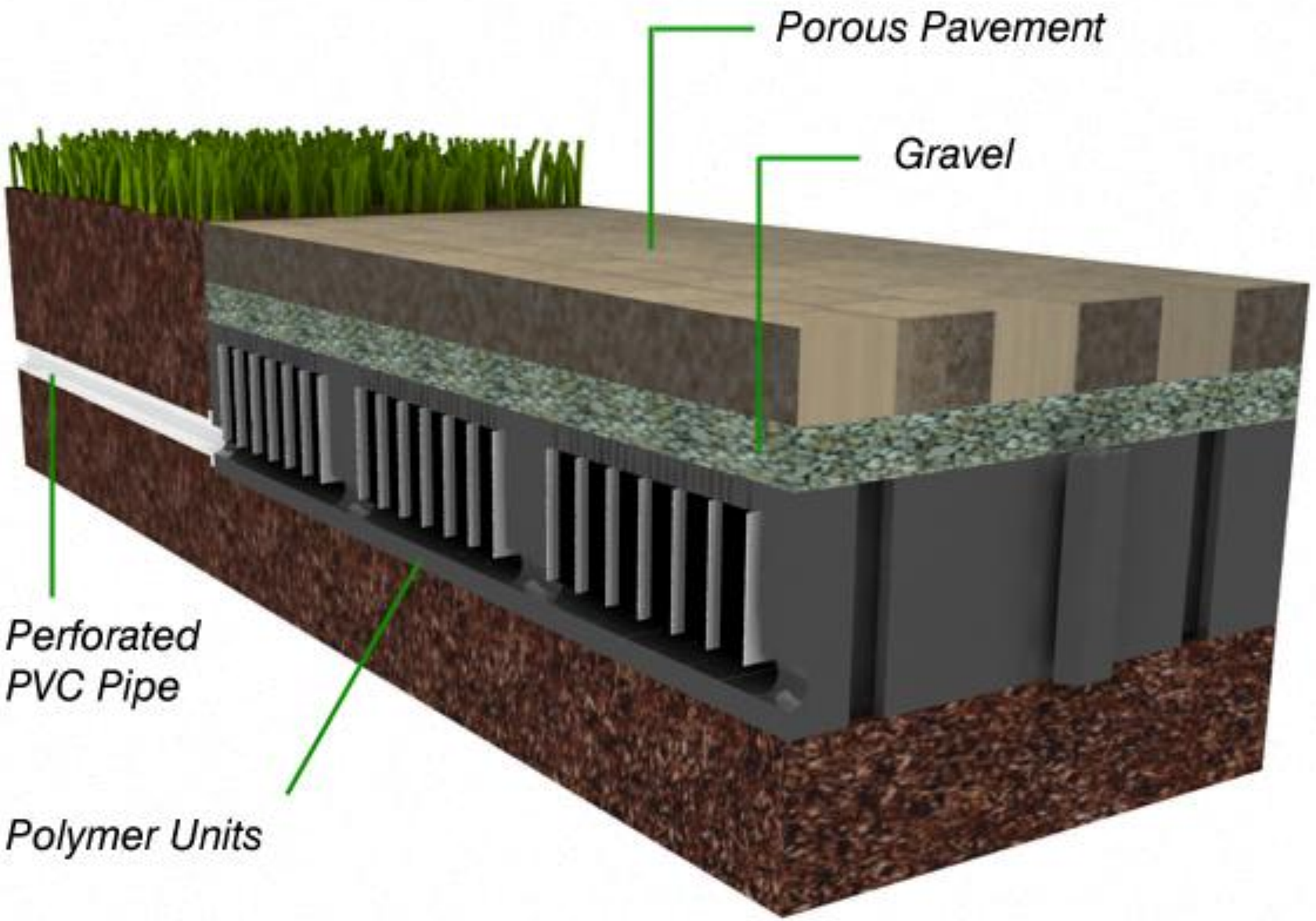


River Walk and Park/Golf Course Applications

- Cells under porous pavement system

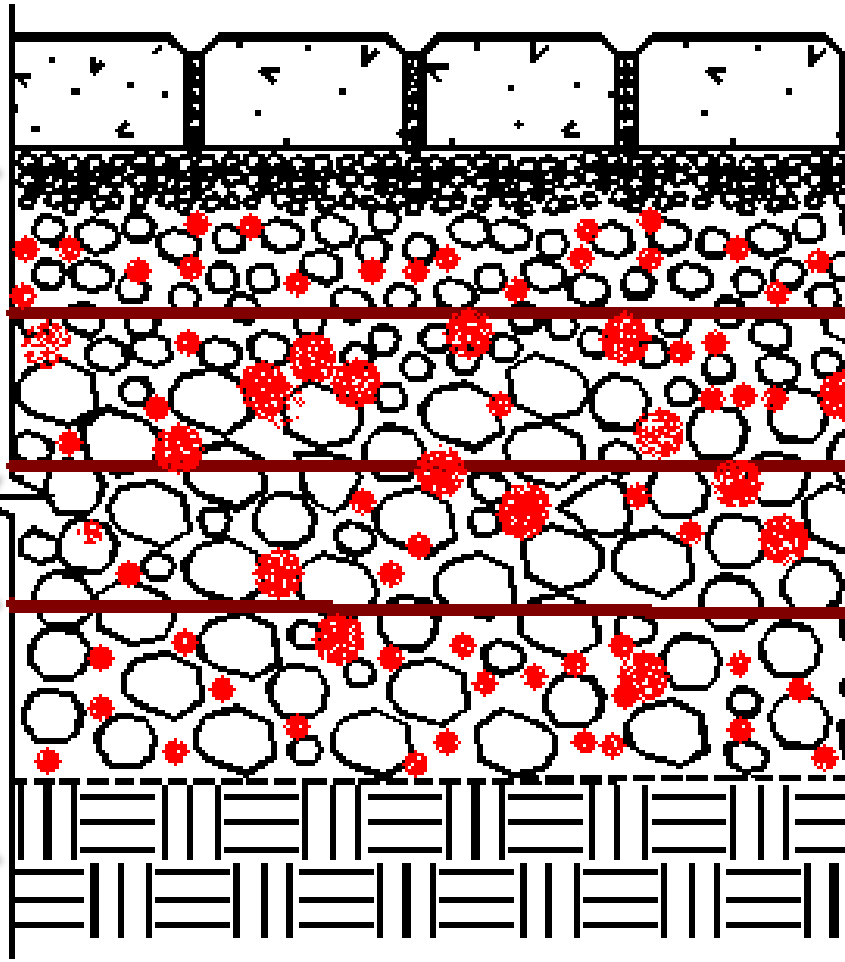


Residential Sidewalk Application:



Direct Aggregate Implementation

- Porous Pavers
- Sand layer
- Aggregate/polymer mix (white/red solids)
- Copper mesh electrode
- Compressed soil layer



Impact

- Based on NOAA data, average 2-year, 1-hour storm delivers 13,425,000 cubic feet (100,419,000 gallons) in Skokie.
- Fully implemented system can retain up to 12,926,000 cubic feet (96,687,000 gallons).
- 96% of storm water retained, or about 21% of total daily flow for NSWRP (450 MGD)

Further Impact

- Only 2% retained by inlets, so almost no water enters treatment system.
- Distributed design means less impact if individual parts fail.
- Controlled release has possible ‘urban irrigation’ applications.
- Distributed volume leaves more open space.

Economic Considerations

- Full implementation requires 2,306,000 lbs of hydrogel at minimal cost.
- Standard system cost averages $10.50/sq. ft., active system cost averages $18.00/sq. ft., or around $240 million total (does not include labor).
- Compare to $3-4 billion projected cost of NSWRP expansion.
- Full implementation would save around $600,000 per year for major storm events.

Obstacles to date

- Initial design process.
- Acquiring the right information.
- Circuitry design.
- Choosing the correct application
- Testing

Future Considerations…

- Field testing on IIT campus.
- Finalization of structural and electrical aspects of the "in gravel" design.
- Alternate applications.

Questions??