# Implementation of low impact development paving strategies in Central Arizona

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Internship for Science-Practice Integration

## What are the drivers for selecting permeable and porous pavement in the Phoenix area?

Urban development increases the proportion of impervious land area, increasing runoff and leading to negative environmental impacts such as flooding and non-point source pollution. A facet of **low impact development (LID), permeable and porous pavement/concrete** can decrease the negative impacts of urban land cover. A range of materials and designs can be used in LID paving, and choosing why and how to implement them is a new and complicated process locally.

**Potential drivers** for implementing permeable pavement materials and design:

- **Overall sustainability benefits**
- **Stormwater management and flood control regulations**
- **Treatment of runoff for increased water quality**

As the need for sustainable development increases, knowing what motivates developers to use innovative LID designs will help increase prominence of LID use in the Valley.

Also, knowing what strategies are best for local projects will help municipal planners, commercial developers, and individual homeowners decide how to best design pavement projects to meet human and environmental needs.

## Investigation of Design/Water Management Regulations and Interviews of Project Managers

**1) Literature review**

- Food control district regulations: drainage basin must capture a 100-year storm event
- National regulations: Clean Water Act (1972)
  - Stepwise implementation: at different stages in each municipality
  - National Pollutant Discharge Elimination System (NPDES) permits: control pollutant levels in water draining from the site
- Project backgrounds
- Materials and design information

**2) Interviews** questions focused on the drive for using non-traditional land covers and the successes and challenges of implementing these systems.

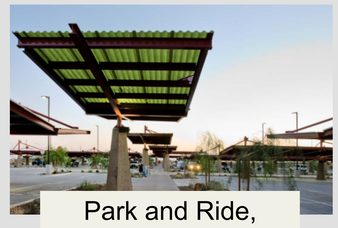
## Main drivers for choosing materials and design of non-traditional paving projects

**Drivers**

| | Overall Sustainability Benefits | Stormwater Mitigation and Flood Control | Water Quality Improvement |
|---|---|---|---|
| Project Goals | • Rainwater harvesting<br>• Urban heat island effect mitigation | • Reduction of impervious area<br>• Drainage basin size reduction<br>• COST REDUCTION | • Stormwater filtering and pollutant removal<br>• Meet EPA/ ADEQ standards<br>• NPDES permit compliance |
| Resulting Project | *Arizona State University:* pervious concrete in Mill Avenue parking lot<br><br>*UA Extension Maricopa Office*: permeable pavers above stormwater harvesting | *City of Glendale:* pervious concrete in stalls of Park and Ride<br><br>*City of Phoenix:* porous concrete and permeable pavers in Civic Space Park | Not a main driver for any projects examined. Found to be an important **FUTURE DRIVER** for LID paving as Clean Water Act regulations reach later stages of enforcement and developers are forced to consider pollutant discharge. |

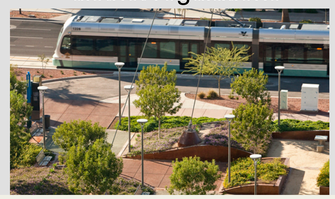
## Designs and Drivers of Local Projects

City of Glendale : Flood control district regulations



Park and Ride, pervious concrete

City of Phoenix: Flood control district regulations



Civic Space Park, pervious concrete and permeable pavers

UA Cooperative Extension: Stormwater retention

Demonstration Patio, permeable pavers

ASU: Urban heat island mitigation

Art Museum Parking Lot, pervious Portland cement

## Future Research and Potential Long Term Sustainability Implications

***The current body of local LID paving work is small and young.***

LID paving has only recently taken hold in central Arizona. The use of permeable and porous pavement is spreading, and effectiveness of paving projects will increase to better accomplish all goals of sustainability, flood control, and water quality improvement. In order to draw conclusions about what materials are best for the local environment, more pavement projects must be examined. Also due to the relative novelty of LID pavements, we are yet unable to witness the long term maintenance issues and functioning of such projects.

***The long term effects of runoff reduction into the Rio Salado Habitat Restoration Area are unknown.***

Twenty Phoenix storm drains currently empty into the Rio Salado, supplying the plants and wildlife with much needed water. Reduced runoff into storm drains will result in a reduction in flow into the river, and cutting this supply may have negative implication for the restoration goals of the area.

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