There is an urgent need for an alternate basis for urban landscape form that is in tune with the growing awareness of, and concern for, the issues of energy, environment and natural resource conservation.

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Northwest Neighborhood Association, Tucson, Arizona

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The Drachman Institute is the research and public service unit of the College of Architecture and Landscape Architecture at the University of Arizona, dedicated to the environmentally sensitive and resource-conscious development of neighborhoods and communities. The Drachman Institute dedicates its research and outreach activities to the proposition that housing is the building-block of neighborhoods, and neighborhoods are the building-blocks of communities.
All Linden Street lies within the 100 year flood plain, up to the curb.
• Addition of any obstructions will cause the flood plain to rise
• Bronx Wash watershed includes upstream neighborhoods of Jefferson Park, Feldmans, & El Cortez Heights. It flows downstream through Ocotillo-Oracle, Barrio Blue Moon and under the freeway to the Santa Cruz River.
Project Goal

Improve the walkability of Linden Street through simultaneous enhancement to pedestrian (and automobile) safety, 1) increased infiltration of run-off, 2) creation of a continuous street tree system along a five-block section of Linden Street, and 3) improve both automobile and pedestrian safety.

- Convert to Linden Street to one-way traffic on each side of channel.
- Reduce Linden Street width by 2 feet on each side of the channel. Currently roadways are 22’-wide, with two-way traffic, and on-street parking. Proposed width is 20’-wide, with one-way traffic, and on-street parking.
- Create a 2’-wide armored infiltration strip adjacent to the channel where surface flows on street permit.
- Plant the infiltration strip with vertical trees, forming a hazard delineation along the channel edge, simultaneously increasing infiltration capacity, creating shade and improving appearance of the street.
- Tree plantings create strong visual hazard delineation where intersecting and dead-end streets meet the Bronx Wash channel.
<table>
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<tr>
<th>Watershed/Sub-watershed</th>
<th>Water flow/route</th>
<th>Measurement (Control) Point</th>
<th>100 yr flood rate cubic feet per second</th>
<th>Water flow entering Lin-den Street or Bronx Wash channel</th>
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Map/data courtesy of Frank Sousa, City of Tucson
Proposed Sustainable Urban Drainage (SUD’s) improvements, Linden Street at the Bronx Wash, Northwest Neighborhood

Infiltration Basins

Retention Devices

Infiltration Strips

Large capacity, vegetated basins, double as inviting neighborhood spaces.

Corner structural devices retain soils and surface flow in reinforced basins.

Two-feet wide, rock-armored strips along the edge of Linden Street, adjacent to the Bronx Wash channel allow light surface flows to infiltrated into the ground.
Put large useless and unsightly areas to multiple good uses; retention basins with lush vegetation and benches become amenities for the community rather than eyesores and heat sinks.

Infiltration Basins

Linden Street at 6th Avenue, looking east

Southeast corner of Linden and 6th Avenue after multi-use infiltration basin.

Small basin and shaded sitting wall, with neighborhood signage/art at Linden Street & 1st Ave., looking southeast.
Corner Retention Devices

- Retain precious desert topsoil, capture run-off, support extensive street tree system.
- Maximize rain fall as a resource to keep, rather than a hazard directed away at every opportunity.
- Constructed retention devices prevent erosion, attenuate peak flow, & support lush vegetation.

4th Avenue at Linden Street, SW corner

Erosion and soil loss, Linden Street at 1st Ave.

Dunbar Spring, Tucson, lush drainage basins
**Infiltration Strips**

The proposed infiltration strip is a 2-foot strip of rock-clad earth, with narrow vegetation that canopies over the channel. Located between along the roadway adjacent to the channel, the strip captures and infiltrates the majority of surface flow from low-flow events. High flow events will spill flow along the roadway and spill into the channel as before.

Looking west down Linden Street (near 1st Ave.). FEMA 100-year flow rate along this strip Linden is less than 94 cfs.
**Principles of Sustainable Urban Drainage Systems (SUDS)**

- Attenuate flow
- Reduce peak flow and increase duration of flow event
- Divide into sub-catchment, layer management strategies
- Manage drainage close to source

**Conventional Engineered Drainage Systems**

- Are straight, cement-lined
- Increase speed & volume of water flow
- Destroy critical habitat
- Exacerbate flooding & erosion downstream
- Eliminate infiltration/recharge opportunities

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*Image Credit:
Civano, Tucson
Seattle SEA Streets
Portland OR
Linden Street, July 31, 2007*
The natural hydrologic process is an essential life process that filters, infiltrates and conserves rainwater. Riparian systems are integral to the hydrologic process.

Riparian Systems

- Provide habitat, for both humans and wildlife
- Support richness/diversity of species
- Provide critical hydrological functions: filtration, infiltration, conveyance
- Reduce urban heat island effect
- Improve quality of life

After urbanization, peak flow coincides closely with peak rainfall and accumulates very quickly and at high velocity. The duration of peak flow is very short, terminating shortly after the storm event. Unfortunately, urban drainage systems must be designed to convey the 100 year flood, peak flow. As a result, conventional urban drainage systems remove almost all water from even frequent small events, resulting in very little infiltration of rainfall.