



PLANNING COMMISSION

Planning and Development Services • 201 N. Stone Avenue • Tucson, AZ 85726-7210

DATE: February 1, 2012

TO: Planning Commission

FROM: Ernie Duarte
Executive Secretary

SUBJECT: Sustainable Land Use Code – Comments from Dr. Joseph A. Tabor, soil scientist at University of Arizona regarding Pervious Pavements

Below is a recounting of the staff memo regarding the Sustainable Land Use Code project specifically on the topic of pervious pavements. Most of the narrative is the same as in the original staff memo. The areas that are shaded are comments by Dr. Joseph A. Tabor, a soil scientist from the University of Arizona. He mainly gives his input on concerns raised by City staff on the use of pervious pavements.

Background: Below are brief summaries of the consultant's position followed by staff comments on the Target Research item.

Pervious Pavement (PP) Policy Overview -

The consultant points out that a key relationship is that between stormwater runoff and PP especially in a desert environment. Currently, the City policy only addresses PP as an option without much clarity or guidance. The consultant points out some potential benefits of PP which include reducing runoff substantially, assisting in meeting EPA stormwater regulations, reducing the need for underground stormwater systems, requiring less repair and patching, and reducing temperatures by three to seven degrees Fahrenheit.

They further indicate the gap in current City policy noting that 1) pervious materials are not required for street or sidewalks, 2) current policy does not provide a clear process to propose them, 3) policy does not provide incentives to reduce impervious surfaces.

They suggest the following:

- Allow broader variety of pervious paving materials on streets and sidewalks;
- Provide clear criteria for approval of pervious surfaces;
- Do not count pervious surfaces towards lot coverage limits, or discount surfaces some percentages, e.g. 50 per cent;
- Clarify what types of pervious materials are suitable for Tucson's soils and climate.

They also note that Scottsdale, AZ grants points for its Green Building Program to construct 80 percent of exposed paving with light colored and permeable materials.

Pervious Pavement Policy Evaluation by PDS Engineering staff -

Below are comments by our department's civil engineer. A key point is that a pervious pavements policy is received as debatable here in the desert with its tendency toward less permeable soils.

His recommendation is that permeable surfaces may work on a case by case basis after first evaluating a set of findings that may look at the features of the setting, the effectiveness of the material and the downstream impact on adjoining property. Below is a summary of his comments:

The soils in the greater Tucson are generally permeable (USDA's Soil Survey of Pima County, Arizona, Eastern Part, 2008; <http://soildatamart.nrcs.usda.gov/Manuscripts/AZ669/0/pima.pdf>) and their locations are mapped in detail (in paper and GIS format). This document includes the necessary engineering characteristics (e.g., permeability, water holding capacity, soil depth, and depth to restrictive layers such as caliche) to define policy criteria and identify locations for planning. The reviewer may have been referring to reduced soil infiltration that occurs when the soil's surface is compacted, a common situation in urban environments. Compacted soil surfaces can be plowed or otherwise loosed to increase infiltration and if the area is expected to receive heavy traffic then a surface mulch of gravel similar to the Tucson Nature Conservancy's gravelpave2 parking lot or gravel and permeable pavers may be used. (Dr. Joseph A. Tabor, Certified Professional Soil Scientist)

Clarion's evaluation as how we handle pervious pavements (PP) is essentially correct.

The current LUC is quite specific regarding hardscape materials;

- **it can and has been interpreted that unless it is "asphalt or concrete" permission to use alternate materials must be obtained;**
- **There is no clear criteria for the application of the pervious materials;**
- **And pervious materials alone may not be used to as part of the stormwater calculations to comply with Floodplain Ordinance.**

Stormwater Retention/Detention Manual

The current Stormwater Retention/Detention Manual does the following

- **gives us the flexibility to consider and allow pervious pavements to accept some of the stormwater runoff demands;**
- **This point is not noted in the Clarion research memo;**
- **Much of Clarion's generic discussion of the advantages of PP does not apply to the Tucson area. The benefit combination mentioned of sewers with storm &**

sanitary sewer discharge in the same pipes are not allowed here;

- **Aquatic thermal shock requires standing or running water for this to be an issue and both are in short supply in Tucson.**

Floodplain Ordinance

Key points are the following:

- **all on-site runoff must be accounted for;**
- **an on-site retention/detention system meters the off-site discharge to the pre-development runoff conditions;**
- **groundwater recharge from individual systems, in our area, is a fallacy;**
- **the most effective way for stormwater to recharge our aquifer is to transport runoff as quickly as possible to the major watercourse to allow percolation via their sandy bottoms.**

Analysis

A PP system could be attractive in jurisdictions that do not have floodplain management regulations. In situations, for example, where the individual is responsible not to cause any downstream problems, PP systems might be an option.

Permeable pavement is just one component of a stormwater disposal system i.e, the top layer. Once the water travels down through the pavement, around the pavers, then what ? The local soils are not very permeable. Once the stormwater travels through six inches of pavement, the water will sit and pond.

The above two sentences are incorrect. Refer to comments made in the section Pervious Pavement Policy Evaluation by PDSD Engineering staff - (Dr. Joseph A. Tabor, Certified Professional Soil Scientist)

A PP system has a reservoir of some type below grade. This usually consists of a graded area with the same sized aggregate, that varies a few to many feet in depth. This subterranean, stone filled vault contains the water and if successful the stormwater will percolate into the earth.

Comparing the above system to the commonly used surface retention/detention systems, there is a hole, but there is no rock or pavement on top of it. Occasionally, the designers will cover a retention/detention basin so they may park on it. Rather than the stormwater flowing through countless little pores in the pavement the only effective way to rehabilitate the PP is to have an industrial vacuum cleaner periodically clean the entire parking lot.

A PP system has the potential to create an environmental "hot spot". Heavy metals and pollutants are concentrated in the stone under the permeable pavement. Unlike an open air retention/detention basin where the contaminated top layer of soil can be removed and safely disposed of, the entire PP system surface must be removed and all of the contaminated aggregate must be removed and transported to a suitable disposal site.

These statements need to be supported by scientific peer reviewed publications and better explained how and how common this hypothetical situation might occur. If appropriate sites are selected that do not have subsurface restricted layers then most contaminates in the water will percolate to the water table. Otherwise the runoff will end up in the washes and percolate to the water table. (Dr. Joseph A. Tabor, environmental epidemiologist)

PP maintenance can cause issues on surrounding property. If they cease to function properly, water damage may occur to downstream properties.

Permeable pavements (PP) if designed and constructed correctly (to be defined in building codes) would not divert surface drainage and would pose no risks to neighboring properties. It would reduce the runoff and the threat of flooding to neighboring properties that are downstream in the natural drainage ways. The PP would not require maintenance to maintain functionality. If landscaping is included in the plan then the maintenance would be for the landscaping (e.g., mowing grass, weeding). (Dr. Joseph A. Tabor, Certified Professional Soil Scientist)

In summary, our floodplain regulations give the designer and staff the ability to review and weigh the merits of the use of PP systems. Considering the soil and runoff issues in Tucson, PP systems have debatable elements.

Conversely, if the PP system adequately disposes of the stormwater and there is an assurance the system will be maintained to function per the Floodplain Ordinance, we would not discourage the applicant's proposal.

We do not see many parking lot subgrade systems because they are prohibitively expensive to install and maintain. Unless a parking area is at a premium, there is no incentive or benefit to install a subterranean system.

One option to consider is to remove references to specific paving materials, e.g. concrete, asphalt from the Code. Staff can review a set of findings in approving an appropriate paving material is on a case-by-case basis.