File No. 08-0102

TO THE COUNCIL OF THE
CITY OF LOS ANGELES

Your PUBLIC WORKS COMMITTEE

reports as follows:

PUBLIC WORKS COMMITTEE REPORT relative to the feasibility of implementing a Green Alley Program in the City.

Recommendations for Council action, in response to Motion (LaBonge - Hahn - Rosendahl):

1. ADOPT the report and recommendations as contained in Appendix C of the October 15, 2008 Board of Public Works (BPW) report and attached to the Committee report.

2. DIRECT the Green Alleys Subcommittee to commence pilot project testing and evaluation, to include development of project selection criteria.

3. DIRECT the Bureaus of Engineering (BOE), Street Services (BOSS), and Sanitation (BOS) to research and develop an estimate of costs for green alley options.

4. DIRECT the BOE to work with the USC Center for Sustainable Cities to compile maps of the alleys in the City.

5. DIRECT the BOS, BOSS and BOE to develop a work plan for completion of design guidelines for green alleys and to report back to Council with said plan within 30 days.

6. DIRECT the Department of City Planning to incorporate Green Alleys policy and concepts into the General Plan, Community Plan Updates, and new Community Plans.

7. DIRECT the Green Streets Committee to include Green Alleys in its report back to the Public Works Committee of the Los Angeles City Council in regard to funding options.

8. SUPPORT the development and installation of Green Alley pilot projects as identified by the Green Alleys Subcommittee.

9. SUPPORT the prioritization of all pending alley pavement projects for possible compliance with design guidelines for Green Alleys.

10. SUPPORT the development of Green Alley projects through coordination, through the Green Alleys Subcommittee, with private development adjacent to public alleys, and that the Green Alley Subcommittee develop policy guidelines for said projects.

Fiscal Impact Statement: Neither the City Administrative Officer (CAO) or the Chief Legislative Analyst (CLA) have completed a financial analysis of this report.

Community Impact Statement: None submitted

(Also referred to the Energy and Environment Committee for consideration)

SUMMARY

On January 15, 2008, Council introduced a Motion (LaBonge - Hahn - Rosendahl) calling for requesting the City Attorney and directing the Bureau of Street Lighting, BOS, Department of Environmental Affairs (EAD), CAO, CLA, and any other appropriate City agency to report on the feasibility of implementing in the City, a Green Alley Program that is similar to the one in Chicago whereby alleys are retrofitted with environmentally sustainable road-building materials. Additionally, the Motion calls for the above entities to provide a report, with recommendations, to Council in 90 days regarding the feasibility of implementing such a program.

Subsequently, on October 15, 2008, your Committee considered an October 15, 2008 Board of Public Works (BPW) report in response to the above Motion relative to the feasibility of implementing a Green Alley Program in the City. According to the BPW, there are over 900 linear miles of alleys in Los Angeles in the form of over 12,000 alley segments. Alleys are widely distributed across the city but are especially concentrated in the South (26.9% of the total alleys in Los Angeles), the San Fernando Valley (26.7%), and the Metro (20.8%) subregions of the City. To put the scope of the alley network in perspective, it is roughly half the size of the largest municipal park in the nation, Griffith Park (4,100 acres).

Alleys are often considered a nuisance but could be an asset, with great potential as open space amenities that offer the following benefits:

a. Improving water quality and supply. Simple infrastructure changes such as using permeable pavement or adding bioswales in alleys will reduce urban runoff, recharge groundwater, and improve water quality in streams, rivers, and coastal waters.

b. Creating recreational opportunities. Alleys are a vital land resource in many park-poor neighborhoods. Transforming alleys into walkable, bikeable, playable spaces can supplement scarce park resources by using existing underused infrastructure.

c. Encouraging neighborhood walkability and connectivity. Active, green alleys can provide connections between parks, schools and neighborhood centers. Converted alleys will encourage people to walk rather than drive when making trips to stores, parks, and other nearby destinations.

d. Greening the Urban Matrix. Planting drought-tolerant, California-friendly plants in combination with permeable pavement will create shade, retain rainwater, reduce the heat-island effect and provide habitat for native species.

e. Reducing crime. Many residents perceive alleys as unsafe. Improving lighting and making alleys attractive will help address safety concerns and encourage their use.

Other cities around the world have recognized the value of alleys and in many great cities they are walkways with storefronts. In Chicago, the Mayor initiated a Green Alleys project, to resurface its alleys with environmentally friendly materials, including permeable asphalt and/or concrete. Chicago launched its program with six pilot projects in 2006, and has since resurfaced 15 to 20 alleys per year, with 30 expected to be completed by 2008.

After further consideration and having provided an opportunity for public comment, the Committee moved to recommend approval of the recommendations as contained in Section C of the October 15, 2008 BPW report. This matter is now submitted to Council for its consideration.

Respectfully submitted,

PUBLIC WORKS COMMITTEE

MEMBER	VOTE
ROSENDAHL:	YES
ALARCÓN:	ABSENT
SMITH:	YES

ARL
11/25/08
#080102

ATTACHMENT

- Not Official Until Council Acts -

FORM GEN. 160 (Rev. 6-80)

CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

Date: October 15, 2008

To: Honorable Bill Rosendahl, Chair
Public Works Committee, Los Angeles City Council

From: Paula Daniels, Commissioner
Board of Public Works

Subject: **COMBINED REPORT FOR:**

- **CF 05-0752 ALTERNATIVE STREET SURFACING MATERIALS;**
- **GREEN STREETS;**
- **CF 08-0102 GREEN ALLEYS**

This report consolidates pending items regarding alternative street surfacing materials, Green Streets, and Green Alleys. The adoption of the alternative street surfacing materials report was continued from the August 6, 2008 Public Works Committee hearing, as a request was made at that time to include it as part of a report back to the Committee on the implementation of "Green Streets" elements in public right–of–away such as streets, parkways, sidewalks, and medians where feasible. The Green Alleys section in this report is in response to the Motion of January 15, 2008 (LaBonge, Hahn, and Rosendahl; C.F. 08-0102), in which the Department of Public Works is to report back on the feasibility of implementing in the City: "...a Green Alley Program that is similar to the one in Chicago whereby alleys are retrofitted with environmentally sustainable road-building materials."

RECOMMENDATIONS

A. **Alternative Street Surfacing Materials** – The Department of Public Works (DPW) recommends that the Public Works Committee adopt the Alternative Street Surfaces Report regarding the use of porous pavement, and the report's recommendations (Appendix A). The Energy and the Environment Committee adopted this report at its July 1, 2008 meeting.

B. **Green Streets** – The Department of Public Works (DPW) recommends that the Public Works and Energy and the Environment Committees undertake the following actions:

1. Recommend that the City Council support the inclusion of "Green Street" elements in street, parkway, sidewalk and median designs where feasible, and support the stated efforts of the Green Streets Committee;

2. Direct the Department of Public Works (DPW) to develop a strategy for the adoption of design guidelines within 30 days. The goal is to have available, as soon as possible, an array of design options for streets, parkways, sidewalks, and medians incorporating

"Green Streets" elements, for implementation as part of standard plans. This will include but is not limited to curb inlets and recessed planters in parkways, sidewalks, and medians. The completion of these design guidelines is important for implementation of several of the other action items below; therefore, DPW is directed to report back regarding their strategy at the next Public Works Committee meeting;

3. Direct the Bureaus of Street Services and Engineering to include green streets elements into all new and pending street capital improvement projects involving parkways, sidewalk or median construction or reconstruction, to the maximum extent feasible;

4. Direct the Department of City Planning to incorporate Green Streets policy and concepts into the General Plan, Community Plan Updates, and new Community Plans;

5. Direct the Green Streets Committee to work with the CLA and CAO on a report regarding the feasibility of developing a fee on all new construction projects, which would be dedicated to funding Green Streets construction and maintenance, and also to support the sustainability planning of the City of Los Angeles;

6. Direct the Green Streets Committee to report back on Low Impact Development policies and/or a potential ordinance, at the next Public Works Committee meeting;

7. Direct the Green Streets Committee to prepare a list of projects that would have (a) permeability components and/or (b) green streets designs; in compiling this list the committee should use, where available, TMDL compliance data as a high priority criteria in ranking the project; further, that the committee deliver the list to the Regional Water Quality Control Board and the City Attorney's office for potential funding through their mitigation programs;

8. Direct the Bureau of Sanitation to complete its SUSMP infiltration guidelines booklet to include an array of biofiltration best management practices (BMP's) concepts, within four months, and to present the updated document at the January 2009 Public Works Committee meeting;

9. Recommend that the City Council and relevant departments approve projects that contain Green Street elements, not yet part of the standard plans, as part of a testing and evaluation process for the Green Street elements.

C. **Green Alleys** – The Department of Public Works (DPW) recommends that the Public Works and Energy and the Environment Committees undertake the following actions:

1. Direct the Green Alleys Subcommittee to commence pilot project testing and evaluation, to include development of project selection criteria;

2. Direct the Green Alleys Subcommittee to create a tiered and prioritized list of pilot projects;

3. Direct the Bureaus of Engineering, Street Services, and Sanitation to research and develop an estimate of costs for green alley options;

4. Direct the Bureau of Engineering to work with the USC Center for Sustainable Cities to compile maps of the alleys in the City;

5. Direct the Bureaus of Sanitation, Street Services, and Engineering to develop a work plan for completion of design guidelines for green alleys, and report back with that plan within thirty days;

6. Direct the Department of City Planning to incorporate Green Alleys policy and concepts into the General Plan, Community Plan Updates, and new Community Plans;

7. Direct the Green Streets committee to include Green Alleys in its report back to the Public Works committee, regarding funding options;

8. Recommend that the City support the development and installation of Green Alley pilot projects as identified by the Green Alleys Subcommittee;

9. Recommend that the City prioritize all pending alley pavement projects for possible compliance with design guidelines for Green Alleys;

10. Recommend that the City support the development of Green Alley projects through coordination, through the Green Alleys Subcommittee, with private development adjacent to public alleys, and that the Green Alley Subcommittee develop policy guidelines for same.

SUMMARY

The Green Street Initiative is an aggressive, proactive measure that aims not only to meet water quality objectives but also to address multiple beneficial uses such as infiltration to recharge groundwater aquifers, using "green" BMPs such as landscaping to provide aesthetics as well as reducing the heat island effect, and to implement these objectives with minimum impact to the environment. The initiative aims to utilize natural landscape systems to capture and infiltrate storm water and urban runoff. The areas of focus to install such systems are the parkway areas between the roadway and sidewalk where storm water can be easily directed from the streets and sidewalks into the parkways.

The initiative is being managed by the Green Streets Committee, an inter-bureau, inter-departmental committee (described further below). Successful implementation of the initiative requires that various action items be completed. The Department of Public Works is the lead in carrying out these action items, which include: preparation of design guidelines, standard plan adoption, development of policies, identifying priority projects, and identifying funding sources.

Developing and constructing Green Street elements, such as infiltration swales, bio-swales, and permeable pavement, in the public right-of-way will address many environmental issues within the City and will:

- Reduce the amount of storm water runoff currently flowing untreated into storm drains
- Improve the water quality of storm water runoff that flows to the ocean

- Increase the City's water supply by recharging local ground water basins
- Improve air quality and reduce the heat island effect of street pavement
- Enhance pedestrian use of sidewalks and encourage alternate means of transportation

A study conducted by Community Conservancy International in March 2008 found that nearly 40% of L.A. County's needs for cleaning polluted runoff could be met by implementing low impact development (LID) projects on existing public lands.

DISCUSSION

Green Streets

The City of Los Angeles has approximately 6,500 miles of streets with 10,000 miles of sidewalk, 900 linear miles of alleys, and 34,000 catch basins. The streets are currently constructed of concrete and asphalt and often contribute to urban blight. They are also part of the City's storm drain system. Storm water runoff flows down the streets into catch basins that are connected to storm drain lines that flow directly into channels, rivers, lakes and the ocean. As the storm water is not treated prior to being discharged into the receiving water bodies, all pollutants, including trash, grease, oil, and sediments, are carried into the ocean causing pollution in the waterways and along the shores. Contaminated stormwater runoff is the number one source of ocean pollution in Southern California, and the city's street infrastructure plays a major role in flushing these pollutants out to sea.

These streets and alleys have the potential to be converted from impervious surfaces to permeable surfaces or Green Streets. The public right-of-way provides a large area where infiltration swales or other types of pervious surfaces can be constructed to collect, retain, or detain storm water runoff. The transformation of the City's existing paved streets into Green Streets can alleviate many of the storm water pollution issues while providing greener city streets and a sustainable urban environment.

Figure 1. Oros Green Street

A Green Street is designed with a landscape system to capture and infiltrate or filter storm water runoff through a natural system. The parkway area between the roadway and the sidewalk is an ideal location for the landscape infiltration swale. As the parkway is generally located directly adjacent to the roadway, storm water runoff can easily be directed from the streets into the parkways. The landscape parkways also provide a buffer zone between vehicular traffic in the streets and the pedestrians on the sidewalks.

A Green Street typically performs the following functions:

- Handles stormwater on site through use of vegetated facilities.
- Provides water quality benefits and replenishes groundwater (if an infiltration facility).

- Creates attractive streetscapes that enhance neighborhood livability by enhancing the pedestrian environment and introducing park-like elements into neighborhoods.

- Meets broader community goals by providing pedestrian and, where appropriate, bicycle access.

- Serves as an urban greenway segment that connects neighborhoods, parks, recreation facilities, schools, main streets, and wildlife habitats.

Green Street parkways generally consist of depressed planters that are capable of capturing and retaining storm water and urban runoff. They minimize the impacts of storm water runoff on the receiving water bodies by reducing the volume of polluted storm water that currently flows untreated into City's storm drain system. The reduction of the storm water flow is achieved by allowing the storm water in the infiltration swales to percolate into the ground below or to be filtered through the soil matrix. Green Street parkways also provide adequate space for street trees to mature and develop significant canopy coverage which will improve air quality as well as reduce the heat island effect from urban pavements.

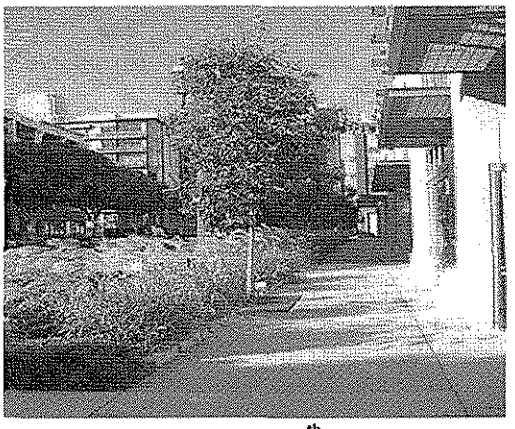

Figure 2. Green Street on 11th & Hope streets in downtown Los Angeles

Typical infiltration swales consist of long trenches composed of gravel and rock for detention of storm water prior to infiltration into the ground. Runoff is stored in the void space between the gravel and rocks and infiltrates through the bottom and sides of the trench into the soil matrix. Infiltration swales can include pre-screening devices in order to reduce the sediment load contained in the runoff and to reduce clogging of the infiltration system. Sub-drain systems and overflow drainage may be provided to prevent flooding in the parkways.

Green Alleys

There are over 900 linear miles of alleys in Los Angeles, in the form of over 12,000 alley segments. Alleys are widely distributed across the city but especially concentrated in the South (26.9% of the total alleys in Los Angeles), the San Fernando Valley (26.7%), and the Metro (20.8%) subregions of Los Angeles[1]. To put the scope of the alley network in perspective, it is roughly half the size of the largest municipal park in the nation, Griffith Park (4,100 acres)[1].

Alleys are often considered a nuisance but could be an asset, with great potential as open space amenities that offer the following benefits[1]:

- *Improving water quality and supply.* Simple infrastructure changes such as using permeable pavement or adding bioswales in alleys will reduce urban runoff, recharge groundwater, and improve water quality in streams, rivers, and coastal waters.

[1] *Transforming Alleys into Green Infrastructure for Los Angeles.* USC Center for Sustainable Studies.

- *Creating recreational opportunities.* Alleys are a vital land resource in many park-poor neighborhoods. Transforming alleys into walkable, bikeable, playable spaces can supplement scarce park resources by using existing underused infrastructure.

- *Encouraging neighborhood walkability and connectivity.* Active, green alleys can provide connections between parks, schools and neighborhood centers. Converted alleys will encourage people to walk rather than drive when making trips to stores, parks, and other nearby destinations.

- *Greening the Urban Matrix.* Planting drought-tolerant, California-friendly plants in combination with permeable pavement will create shade, retain rainwater, reduce the heat-island effect and provide habitat for native species.

- *Reducing crime.* Many residents perceive alleys as unsafe. Improving lighting and making alleys attractive will help address safety concerns and encourage their use.

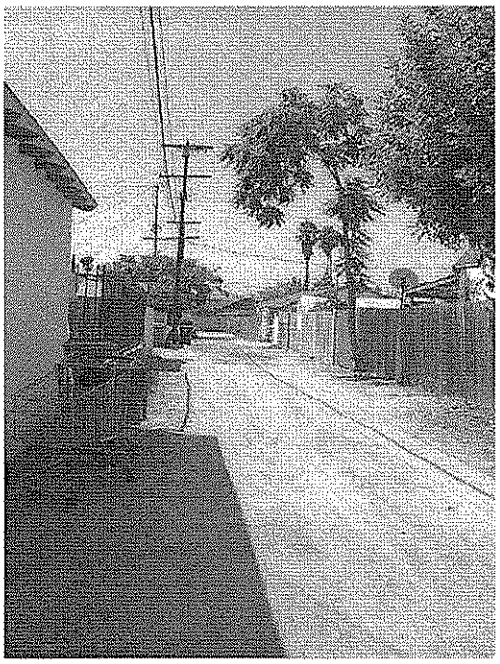

Figure 4. Existing conditions, alley east of Vineland Avenue between Hatteras and Emelita Streets in Los Angeles

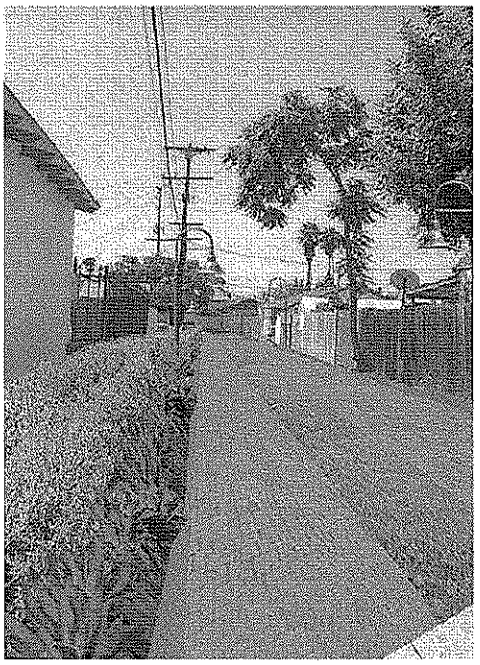

Figure 3. Rendering of the greened alley, featuring a "Hollywood driveway" with Grasscrete and permeable pavement, as well as drought-resistant landscaping and energy efficient streetlights.

Other cities around the world have recognized the value of alleys and in many great cities they are walkways with storefronts. In Chicago, the Mayor initiated a Green Alleys project, to resurface its alleys with environmentally friendly materials, including permeable asphalt and/or concrete. Chicago launched its program with six pilot projects in 2006, and has since resurfaced 15 to 20 alleys per year, with 30 expected to be completed by 2008.

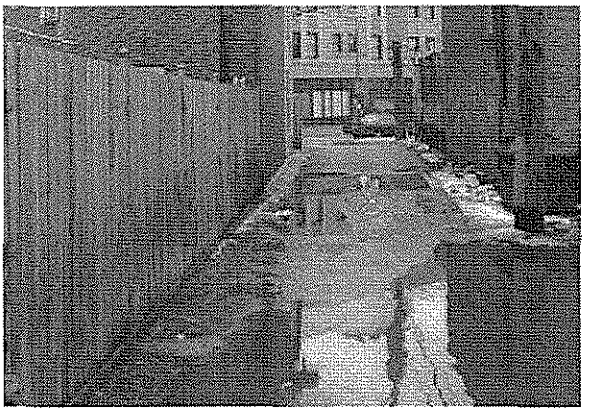

Figure 5. Chicago alley with impermeable pavement and poor drainage.

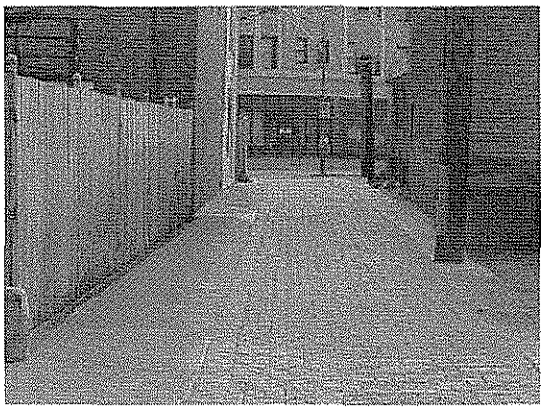

Figure 6. Chicago alley retrofitted with permeable pavement.

Green Streets Committee

The Board of Public Works of the City of Los Angeles adopted a Green Streets initiative in May 2007 with the idea that the streets of Los Angeles offer an important opportunity to infiltrate, capture, and filter urban runoff to prevent pollution and to convert stormwater into a valuable source of groundwater and recycled water. Its purpose is to promote, advance and evaluate the implementation and design of streets and parking lots to maximize capture and infiltration of urban runoff and to increase nature services and community beautification benefits.

The Green Streets Committee is comprised of members from: Board of Public Works; Bureau of Sanitation; Bureau of Street Services; Bureau of Engineering; Community Redevelopment Agency; Department of Building and Safety; Department of City Planning; Department of Transportation; Department of Water and Power; Environmental Affairs Department; and Recreation and Parks Department.

The Green Streets Committee is working on several primary objectives, including the following:

1. Identify and review pilot projects for city property, including streets, parkways, sidewalks, parking lots, and alleys, using infiltration methods (i.e. porous pavements/gutters/vegetated berms, swales, strips, etc.);
2. Identify funding streams for construction and any specialized maintenance of such projects;
3. Develop design standards for green streets (where, what, levels, Green book);
4. Identify private and public responsibilities for development and maintenance;
5. Cultivate expertise by inviting participation and/or information from guest speakers, such as academic researchers.

The Green Streets Committee is in the process of developing design guidelines for green streets elements. The City of Los Angeles' Standard Street Dimension are specified in the Department of Public Works, Bureau of Engineering, Standard Plan S-470-0. The standard plan shows the required dimensions for twelve different types of City streets, classified under

four major headings: Highway, Collector, Local and Hillside. However, to consolidate the number of Green Street types, plan and details for the following five types of Green Streets will be developed:

1. Commercial Streets with street parking
2. Commercial Streets with no street parking
3. Residential Streets
4. Street Curb Extensions
5. Alleys with permeable pavement gutters

Figure 7. Rendering of Riverdale Avenue Green Street Project.

In the past year, the Green Streets Committee developed a draft pilot project list and selection criteria, and obtained funding from the Coastal Conservancy for a pilot project on Riverdale Avenue in Elysian Park. The Riverdale Avenue Green Street project was proposed with the goal of establishing a City standard to promote infiltration of street runoff and to promote runoff management. The project will reconstruct the existing parkways on both sides of Riversdale Avenue between Crystal Street and its terminus at the south side of the Los Angeles River. The proposed parkway swales will be able to capture and treat urban runoff from 14.6 acres of residential land with the dual benefit of irrigating the parkway plants and infiltrating the street runoff and thereby protecting the Los Angeles River from the pollutants in storm water and urban runoff.

The Green Streets Committee will use all the information on completed projects to finalize design guidelines to incorporate into city standard plans. With the implementation of the design guidelines, it is anticipated that the Bureaus of Street Services and Engineering will include green streets elements into all new and pending street capital improvement projects involving parkways, sidewalk or median construction or reconstruction and that the City Planning Department will incorporate Green Streets policy and concepts into the General and Community Plans. The Green Streets Committee continues to examine funding issues for construction and maintenance of future projects.

Green Alleys Subcommittee

The Green Alleys Subcommittee was recently established by the Green Streets Committee to identify alleys in Los Angeles that could become pilot projects for a green retrofit. They are also investigating funding opportunities. The subcommittee is comprised of members from the Board of Public Works; Bureau of Sanitation; Community Redevelopment Agency; Department of

Planning; and USC Center for Sustainability. The Community Redevelopment Agency will be piloting Green Alleys for its project areas.

USC is a participant in this Subcommittee due to their ongoing initiatives in this area. The USC Center for Sustainable Cities undertook a major research project on alleys in the City of Los Angeles. They conducted physical audits of 300 alleys across the city, studied behavioral activity patterns in alleys, analyzed soil pollution levels in alleys, and held focus groups with residents to better understand attitudes and concerns about alleys. Their findings suggested that alleys, which are concentrated in flood-prone, park-poor communities, constitute a major opportunity to create green infrastructure to support watershed health, community interaction, and physical activity. On the basis of these findings, the Center is collaborating with the Departments of Public Works, Planning, Recreation and Parks, and CRA to develop policy and program ideas, and potential demonstration projects, for alley greening.

Funding

The construction of Green Streets demonstration projects are currently funded by grants. However, in order to implement the Green Streets Program on a large scale throughout the City, a funding mechanism must be established. A Green Infrastructure Maintenance Task Force was recently formed to prepare a report on potential funding options to sustain the Green Street Initiative as well as existing landscaping. The Task Force is comprised of members from the Board of Public Works; Bureau of Sanitation; Bureau of Street Services, Bureau of Engineering; Chief Administrative Officer's Office; and Department of Water and Power.

Figure 8. Infiltration planters in Portland, OR.

The Task Force is examing the following funding options: an increase in Stormwater Pollution Abatement fee; creating a new funding streams through fee on construction; Maintenance Assessment Districts; a City Wide Assessment such as that recently passed in the City of Santa Monica (Measure V); Parcel Assessments; and Public Private Partnerships (such as partnerships with Business Improvement Districts). The first draft of the report is expected to be complete by December 1, 2008.

Maintenance

Currently, the streets and alleys are maintained by the City's Department of Public Works, Bureau of Street Services. However, sidewalks and parkways are required to be maintained by the abutting private property owners per the California Street and Highways Code (State of California Improvement Act of 1911). This includes the installation and maintenance of the irrigation systems for the parkway vegetation.

In July of 1974, Ordinance No. 146,040 which amended Los Angeles Municipal Code section 62.104, exempted homeowners from the responsibility for sidewalk repairs caused by City tree root growth and placed the responsibility for these repairs on the Department of Public Works, Bureau of Street Services. In 2000-2003, the City funded a Sidewalk Repair Program to repair approximately 164 miles of the most damaged sidewalks.

The maintenance cost of Green Street improvements is difficult to determine at this time as there are not yet enough such improvements in place to develop a sufficient database. Regardless, maintenance funds will be required to maintain the additional trees, landscaping, irrigation system, curb inlets and to provide for general trash removal. Where Green Street improvements are constructed as part as a required condition of a private development, the City can require the developer to file a covenant and agreement with the City to guarantee maintenance of the Green Street improvements.

Case Studies

A number of cities around the nation already have regulations, programs and projects underway that are similar to the Green Streets Initiative. While some these programs are referred to as "low impact development" programs, a common aspect is the more comprehensive stormwater management through properly designed best management practices in streets and landscaping. Below are some leading examples, pertinent to the Green Streets initiative of the City of Los Angeles.

Los Angeles County

On October 7, 2008 the Los Angeles County Board of Supervisors unanimously approved three far-reaching green development ordinances: Low Impact Development, Green Building and Drought Tolerant landscaping. Some examples of the new requirements:

- New development and redevelopment (over a certain threshold) of five units or more and commercial must infiltrate or treat all of the stormwater runoff created by the development (as compared to 0 impervious surface conditions).
- All new developments must install smart irrigation controllers for landscape irrigation.
- All buildings above 10,000 square feet and above must be LEED Certified; above 25,000 must be LEED Silver.
- All new buildings to consume at least 15% less energy (than the usage permitted by 2005 Energy Efficiency Standards).
- A minimum of 75% of total landscaped area shall be plants that are drought-tolerant.

City of Ventura – Green Streets

On July 7, 2008 the City of Ventura adopted a Green Streets program. Among other things, they directed that Green Street elements be incorporated into repaving projects on a city wide basis, and are developing design guidelines. They are working with developers in new subdivisions to include Green Street elements in their projects, and have formed a committee to develop a Green Streets Improvements Plan for existing streets, and committed 20% of their street resurfacing fund to Green Streets projects.

Portland, Oregon – Green Streets
In April 2007, the Portland City Council approved a Green Streets resolution, report, and policy to promote and incorporate the use of green street facilities in public and private development and redevelopment. Under the new policy, green street facilities will be incorporated into all city-funded development, redevelopment, or enhancement projects, according to Portland's stormwater management manual. Designers and planners can find precise minimum design specifications for the types of green infrastructure elements that are allowed, their location, materials, and varying condition under the Green Streets policy. Those design standards can be adapted to fit right-of-way patterns in the city's transportation system plan[2]. The City also established a 1% fee on street construction projects to establish a Green Streets fund. Monitored projects show cost-effective on-site capture of 80-95% of stormwater runoff, significant sewer overflow reductions and pollutant removal, and 40% cost savings compared to conventional design[3].

Seattle, Washington – SEA Streets
Seattle's pilot Street Edge Alternatives Project (SEA Streets) was completed in the spring of 2001. It was designed to provide drainage that more closely mimics the natural landscape prior to development than traditional piped systems. Seattle Public Utilities reduced impervious surfaces to 11 percent less than a traditional street, provided surface detention in swales, eliminated curbs, and added over 1,200 trees and shrubs. Two years of monitoring show that SEA Street has reduced the total volume of stormwater leaving the street by 99 percent[4]. In addition, the project had a 25% cost savings compared to conventional design.

Chicago, Illinois – Green Alleys
The Chicago Department of Transportation (CDOT) has begun a pilot program to construct "green alleys" that provide environmental benefits. CDOT has identified three types of green alleys[5]:

- Green alleys that use a permeable pavement (asphalt, concrete or pavers) that allows stormwater to drain into the ground, instead of collecting on hard surfaces or draining into the sewer system.
- Green alleys that use a high albedo pavement, a lighter-colored surface that absorbs less heat and helps reduce the urban heat island effect.
- Green alleys that use recycled materials, such as concrete aggregate, slag and recycled tire rubber.

Other green alley techniques CDOT uses include using proper grading and pitch to facilitate drainage, and using dark sky-compliant light fixtures to reduce light pollution and provide uniform illumination. Green Alleys are part of CDOT's "green infrastructure" -- which includes recycled construction materials, permeable pavement, recycled rubber sidewalks and other efforts.

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[2] http://www.planning.org/planning/nonmember/default1.htm.

[3] http://www.cnt.org/repository/BMP-Performance.pdf; http://www.cnt.org/repository/Portland.pdf.

[4] http://www.seattle.gov/UTIL/About_SPU/Drainage_&_Sewer_System.

[5] http://egov.cityofchicago.org/

CONCLUSION

Currently, there are approximately 6500 miles of dedicated streets within the City of Los Angeles that often undergo reconstruction. In addition, the City has a capital improvement program for new roadway construction projects. Using traditional end-of-line treatment systems as mitigation measures for these new/reconstruction projects will often require large amounts of land, which is very limited for this highly developed metropolitan city. The Green Street Initiative takes an alternate approach to the traditional structural treatment systems by exploring public right-of-ways where infiltration swales or other types of pervious surfaces can be constructed to collect, retain, or detain storm water runoff. This "Green Streets" approach embraces a more regional, sustainable solution with multiple beneficial uses and is consistent with the Low Impact Development (LID) concepts, which looks at and identify opportunity sites within the upper watershed to implement small scale, low cost solutions. In addition, it is expected that the new Los Angeles County NPDES Permit will require storm water mitigation for roadway construction projects.

Correctly implemented, this Initiative will also help conserve the City's limiting and ever-decreasing water supply. Water use in the City of Los Angeles in the 2007-2008 fiscal year was well over 650,000 acre-feet. While demand continues to grow, recent drought years have put a tremendous strain on the City's water supply. To address this problem, the City's Department of Water and Power implemented a plan to enhance storm water capture and expand ground water storage. This Green Street Initiative will help towards achieving the goals of the water conservation plan.

The Green Street Initiative will address the new NPDES Permit requirements, reduce stormwater runoff, improve water quality, supplement the City's water supply via groundwater recharge (where applicable), improve air quality through reduction of heat island effects from street pavement, and provide a more aesthetically pleasing environment.

APPENDIX A

Alternative Street Surfaces

Report

CITY OF LOS ANGELES
INTER-DEPARTMENTAL CORRESPONDENCE

DATE: May 21, 2008

TO: Honorable Jan Perry, Chairperson
Energy and the Environment Committee

C/o Maria Espinoza, Legislative Assistant
Office of the City Clerk
Room 395 City Hall

FROM: Cynthia Ruiz, Board President
Department of Public Works

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SUBJECT: CF: 05-0752 ALTERNATIVE STREET SURFACING MATERIALS

This document reports "*on the feasibility of using alternative street-surfacing materials that are more environmentally friendly, thus, allowing ground water to percolate and possibly have a longer life span than the current asphalt which often shows some sign of surface distress whenever it rains*" as requested by Council Motion, under the subject Council File.

RECOMMENDATIONS:

The Departments of Public Works (DPW) and Environmental Affairs (EAD) jointly recommend that the Energy and the Environment Committee undertake the following actions:

INSTRUCT the Department of Public Works, Bureaus of Street Services (BSS), Engineering (BOE), and Sanitation (BOS), EAD, and General Services Department (GSD) to further investigate technologies for permeable pavement systems and report annually on the feasibility of utilizing those systems.

INSTRUCT the DPW to identify, construct, and evaluate a series of pilot projects (i.e. permeable concrete gutters, parking areas, landscaped medians, larger tree wells, and meandering sidewalks) with permeable technologies as adequate funding is available for construction and maintenance, and to report annually on the results of the projects.

INSTRUCT the BOE to use permeable pavement systems in conjunction with other onsite infiltration measures, to the maximum extent practicable on future designs and construction of sidewalks, parking lots and walkways.

INSTRUCT the DPW, the EAD, the Department of City Planning (Planning), the Department of Recreation and Parks (RAP), GSD, the Department of Building and Safety, and the Department of Transportation (DOT) to participate in the existing Green Streets Committee and to develop opportunities in each Department to utilize infiltration methods to assist in meeting water quality standards and to maximize water use efficiency.

INSTRUCT the Green Streets Committee to report annually on achievements and challenges to promote, advance, fund, and evaluate the implementation and design of streets and parking lots to maximize capture and infiltration of urban runoff and to increase nature services and community beautification benefits.

INSTRUCT all Departments to maximize water infiltration and to utilize, when practicable, permeable pavement systems for projects performed under their respective jurisdictions, such as bikeways, parking lots, recreational pathways, golf course pathways, trails, driveways, and landscaped areas for all City facilities.

INSTRUCT Planning to revise the City's Planning and Zoning Code to require yard setbacks to be applied to building subterranean levels in order to allow for the implementation of Standard Urban Stormwater Mitigation Plans (SUSMP), infiltration systems including the use of permeable pavement systems in parking lots, walkways, and other hardscape and landscape areas.

INSTRUCT the Street Standards Committee to create street standards for major and secondary roads that require the addition of parkways capable of infiltrating runoff from adjacent sidewalks and streets.

REQUEST that the Port of Los Angeles, Department of Water and Power, and Los Angeles World Airports (LAWA) participate in the Green Streets Committee and consider utilization of permeable pavement systems as they plan, develop, modify or enhance their facilities, including road, sidewalks, medians, pathways, parking lots, and other landscaped areas.

FISCAL IMPACT STATEMENT:

The direct cost of permeable pavement currently exceeds the cost of conventional asphalt or Portland cement concrete pavements. Onsite treatments, such as using permeable pavements, will minimize the volume of urban runoff and preserve flood control system capacity and can ultimately reduce the costs of urban runoff treatment. Another benefit of onsite water treatment is that water is returned to aquifers and available to supplement the potable water supply, reducing the need for expensive water purchases.

SUMMARY:

Although the original City Council motion directed the Departments to focus on alternative pavements as a mechanism to infiltrate urban runoff, subsequent discussions with Councilmembers and City staff have led us to expand the report to more comprehensively discuss multiple methods of infiltration and also to consider locating permeable pavements beyond the street. In addition, during development of this report, it became clear that additional work was necessary to identify institutional restrictions that limit "green" technologies, evaluate the validity of those restrictions and to recommend changes in standards, practices and laws.

Since May 2007, several City Departments are partnering through the Green Streets Committee to develop opportunities and address challenges of infiltrating urban and stormwater runoff through an integrated approach using permeable pavements and other green technologies. Many of the issues involved are complex and overlap areas of responsibility and expertise. This report

responds to the Council Motion regarding use of alternative street surfacing materials and extends to related solutions beyond the public right of way.

To be better stewards of the environment and create a more sustainable City, staff is examining opportunities to use permeable surfacing instead of more traditional paving materials. While issues such as climate change, the decline of the Bay Delta and associated court required water reductions, and the resulting need for Southern California to reduce the use of imported water are not always consistent with street maintenance priorities such as cost, pavement preservation, structural integrity and reliability, and maximizing recycling capability. They are important considerations for policies affecting future growth and development of Los Angeles. The water crisis in Southern California will require the City to rely more heavily on local water resources rather than imported water to meet our needs. Stormwater is a valuable water supply when captured and stored for long-term use. A major paradigm shift, requiring comprehensive cross-functional efforts between various Departments is needed to meet these goals.

Permeable pavements continue to become more widely utilized, not as a means to keep pavement from degrading but as an aid in the diversion and passive treatment of stormwater. Where practicable, permeable pavements offer the greatest impact in ultra-urban areas, like Los Angeles, where more than half of the City is covered with impermeable surfaces. Permeable pavements are used in ultra-urban areas because they can be incorporated into existing structures, such as roads, parking lots, and driveways and do not need additional space required for construction of other stormwater capture systems such as bio-swales, retention ponds, and settling basins.

Historically, the City used impermeable paving surfaces to create streets, sidewalks, parking lots, and alleys. Conventional pavement is an impermeable surface that sheds rainfall and associated surface pollutants, forcing the water to run off of paved surfaces directly into nearby storm drains and then into the Los Angeles River, local streams, or Santa Monica Bay. In contrast, permeable pavement is designed to allow percolation or infiltration of stormwater or urban runoff through the surface and into the soil below, where the water is naturally filtered and pollutants are removed.

Increasing stormwater capture through permeable pavement provides additional capacity for the City's ultra-urban environment and which results in groundwater recharge. Los Angeles cannot afford to lose any source of water supply including stormwater. At this time, conventional impermeable asphalt pavements continue to be the standard for all City streets, but street runoff can be directed to drain to permeable areas such as swales, tree wells, gutters, and medians where hydrologically feasible. The capital cost of permeable pavements can be twice as much as the cost of conventional pavement and maintenance costs can be significantly higher.

Departments are increasingly adopting improved sustainable design, construction, and maintenance practices. Several City projects have incorporated permeable pavement as part of the design. Applications outside roadways offer many of the best short-term opportunities for alternative surfaces, stormwater capture, and BMP implementation. These include sidewalks,

parking lots, parks, bikepaths, jogging paths, landscapes, medians, gutters and tree wells that can readily accept permeable pavements and the necessary infrastructure for runoff capture.

When funds for streetscape or pedestrian improvements are allocated, the standard practice is to maximize the extent of planted materials and permeable surfaces. Permeable pavement systems are considered to be most appropriate with either light vehicle loading or heavy vehicle loads at high interstate speeds. In addition to the public right-of-way, areas such as passenger vehicle parking lots, recreational areas, golf cart pathways, playgrounds, bike paths, and walkways are prime opportunities for the utilization of permeable pavements.

DISCUSSION:

In response to the Council Motion to report on the feasibility of using alternative permeable surfacing materials, the Green Streets Committee has researched and evaluated the available technologies and opportunities surrounding the use of permeable surfaces on different parts of the City infrastructure, including sidewalks, parking lots, and other areas. This report considers opportunities for numerous Departments to incorporate these technologies into their projects.

A. Permeable pavements

Permeable pavements can be integral parts of broader stormwater management strategies and many of these strategies are becoming increasingly necessary in our ultra-urban environment. There are many types of permeable pavement, including decks built above an open surface, paving blocks filled with turf or gravel, interlocking pavers, porous asphalt, and permeable concrete. Porous asphalt is sometimes called open-graded asphalt or gap-graded asphalt. Porous asphalt and permeable concrete are most similar to traditional surfaces and offer the best potential for large-scale applications.

Porous asphalt has been more popular and offered lower initial cost than permeable concrete. Porous asphalt has been used as an overlay on interstate highways and found to have the same lifespan until first maintenance as conventional asphalt. "First maintenance" is defined as the lapsed time for a newly constructed pavement to require substantial maintenance. Porous asphalt has been used for parking lots and found to be in good condition after more than 25 years. The material costs for porous pavements are higher than for conventional pavements.

Recent successful projects in the Los Angeles area include:

- LAWA's South Airfield renovation project installed more than 438,000 square feet of a permeable paving system. The system was designed to eliminate standing water, increase runway safety, reduce discharge to nearby drainage systems, and maximize infiltration.
- Palos Verdes Peninsula Land Conservancy, RAP, and BOE designed and built a 44 car parking lot and bus drop off at the White Point Nature Preserve using gravel pavers to allow for 100 percent infiltration as required by the environmental documentation for the biologically significant site. The cost of the pavers and the excavation of the 25,000 square foot lot was approximately $7 per square foot installed. It was determined that the cost for this type of treatment

was significantly lower than the cost to build a stormwater capture and treatment facility.

- BSS designed and constructed the Oros "Green Street" project in collaboration with NorthEast Trees and the community. Funding was provided by NorthEast Trees and Proposition "O". The project directs runoff from the residential lots into parkway gardens and from the street into a pocket park at the end of the street for infiltration. Approximately 35% of the stormwater flow will enter into the parkway gardens and the remaining 65% of the flow will enter an infiltration trench in the pocket park eliminating the runoff that would otherwise flow into the LA River.

B. Environmental Benefits

The main advantage of permeable surfaces is providing designers with alternate means to manage stormwater, urban runoff, and the pollutants they carry into our waterways. Depending on the project budget and the amount of runoff capture desired, permeable pavements can play a key role to locally infiltrate full design flow (all stormwater and urban runoff) or partial flow (a percentage of stormwater and urban runoff). Both help decrease the amount of pollutants entering receiving waters, minimize downstream flooding by reducing the volume of runoff, and mitigate a percentage of the highly polluted "first flush" storm water. Permeable surfaces can also help address problems with standing water and aide in providing groundwater recharge.

Permeable surfaces can play an important part of urban runoff management by eliminating or reducing the requirement for conventional stormwater systems. In fact, permeable surfaces are advocated as a stormwater BMP by the United States Environmental Protection Agency to control selected pollutants. Based on studies of a Florida demonstration project, a properly operating permeable pavement system can be very efficient at reducing Total Suspended Solids (TSS), nutrients (natural and manmade fertilizers), and metals. The permeable surface, in conjunction with a swale, achieved 91 percent removal efficiency for TSS and up to 92 percent removal for metals, substantially higher than traditional surfaces with a swale. At the recently completed Inland Empire Utilities Agency Headquarters in Chino, California, their permeable pavement system removed 89 percent TSS, over 74 percent nutrients, and over 76 percent metals.

There are other benefits and uses for permeable surfaces. On roads and highways, porous asphalt overlays enhance safety by improving drainage, traction, and visibility. Permeable pavement conserves rainfall onsite, promoting healthier plant life and urban forests in the adjacent areas. Permeable surfaces also help earn points under the Leadership in Energy and Environmental Design (LEED) rating system for stormwater management, local/regional materials, and exterior design to reduce heat islands.

C. Regulatory Compliance

In 1998, environmental groups sued the EPA for failure to make timely progress in regulating pollutants in water bodies. The EPA requires states to establish maximum limits for specific pollutants that can be discharged into a water body without causing it to become impaired; these are called Total Maximum Daily Loads (TMDLs). Los Angeles will implement 67 TMDLs over a 13-year period. Violation of discharge limits

exposes the City to potentially severe financial penalties. The City must develop solutions that reduce pollutants to meet these limits. Stormwater management systems include streets, sidewalks, and other City-owned or City-maintained facilities and, consequently, the design, construction, and maintenance of stormwater and pavement systems must be examined together.

The State and Regional Water Quality Control Boards have adopted stringent requirements for storm water pollutant discharges into receiving water bodies. Storm water runoff management is regulated through the Standard Urban Stormwater Mitigation Plan (SUSMP) contained in the National Pollutant Discharge Elimination System (NPDES) permits. SUSMP limits and controls stormwater runoff by requiring best management practices (BMPs) to be incorporated into both residential and commercial/industrial developments and redevelopments. These BMPs are required to capture, infiltrate, and treat a percentage of anticipated runoff from a storm event. The BMPs require developers to set aside land for construction of detention and capture facilities. In an ultra-urban environment, however, little space is available for the construction of BMPs such as bio-swales, wetlands, ponds, or infiltration basins. By utilizing permeable pavement with existing structures, the additional space required for the construction of more traditional stormwater capture systems is not needed.

In 2002, SUSMP requirements became mandatory for all municipal separate storm sewer systems. SUSMP and other performance standards in storm water discharge permits require new developments and significant redevelopments to apply BMPs to mitigate the effects of the storm water runoff form impermeable surfaces. These BMPs capture, infiltrate, and/or treat all dry weather runoff and the first ¾-inch of storm water runoff from storm events.

D. Construction Requirements for Streets

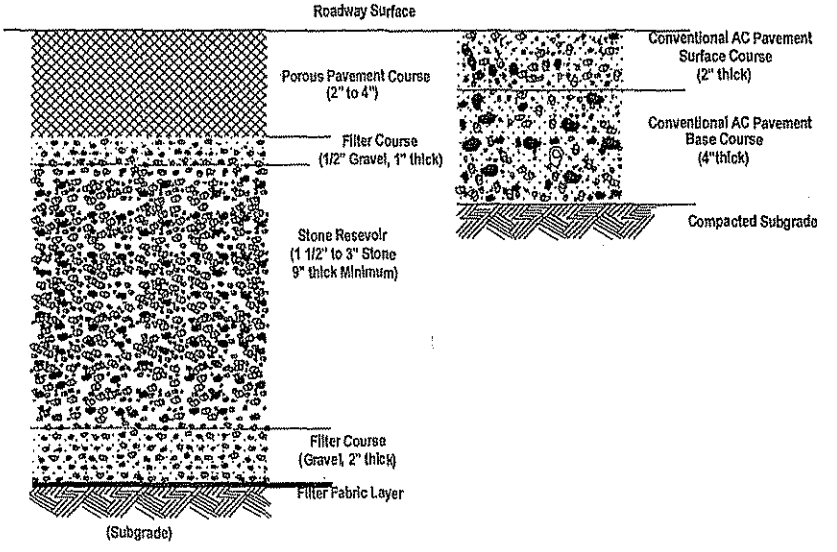
Permeable pavement installation begins with strategically choosing locations that meet several criteria. It is challenging to build entire streets using permeable pavement because of the complex design, supporting infrastructure, and construction processes. There have been few accounts of failed permeable pavement projects, however the exact cause has not been established. The additional depth required under permeable pavements may infringe on the depths of existing infrastructure including natural gas, communications, water, and electrical lines. Complete retrofits of existing paved streets with permeable surfaces can be difficult without re-engineering and reconstructing substrate and fill materials. Partial retrofits may be possible by grading and altering the street slope to drain runoff to adjacent permeable surfaces or open space, including medians, to maximize infiltration opportunities. The incremental costs are dramatically lower to build all-new infrastructure at greater depth when included as part of a new development project.

To ensure proper drainage using permeable pavement, certain conditions must be considered and the location must be carefully chosen. Some parts of the City have excellent drainage characteristics, whereas other areas may not offer ideal conditions for infiltration. Soils at the site must have acceptable permeability rates and there should be adequate distance between the bottom of the system and the underlying bedrock and/or ground water table. If there is not adequate infiltration capacity, a subdrainage system may be required to divert captured stormwater or runoff to an adjacent detention basin,

infiltration basin, or drainage system. The area should be nearly flat or limited to very gentle slopes. The location must also be confirmed to protect groundwater drinking water supplies. Permeable pavement should not be used near drinking supply wells or brownfields known to have, or suspected to have, toxic residue.

The generalized figure below shows cross-sections of typical permeable and impermeable roadways, showing that there are additional depth requirements for permeable pavements.

Schematic Comparison of Typical Sections of
Porous Pavement and Conventional AC Pavement



Pavements require regular maintenance, but the techniques and frequency vary for various types of pavement. Conventional street sweeping or manual sweeping can clean conventional pavements. In addition to brush sweeping, the Urban Land Institute recommends vacuum sweeping up to four times a year to help maintain the porosity of permeable pavements. If severe clogging occurs, the entire structure may have to be recovered or replaced. When permeable pavement reaches its first maintenance life and porosity is to be maintained, the entire surface often must be replaced. Permeable pavement will lose its porosity with traditional slurries, seals, or overlays. Porous asphalt pavements are particularly vulnerable to rutting and other deterioration. This is different from conventional pavements, which can usually have service life economically extended beyond first maintenance.

Funding for the design and construction of permeable pavements and the annual cost for maintenance, are currently not budgeted. BSS is charged with maximizing the amount of useable road surface, and funding is expected to remain inadequate for proper maintenance and management of existing roadways. With additional funding, such as grants, BSS can work with other Departments to identify areas where permeable pavement can be used successfully.

E. Permeable Pavement for Public Sidewalks

Permeable sidewalks can require less-complicated design plans than streets, but to be most effective they also require an evaluation of workable site conditions, acceptable terrain, and the soil percolation rates. Decomposed granite, engineered soil, or natural paths can be used in areas where standard walkways are not subject to ADA regulations. Because sidewalks are sometimes near structures, there may be a need to ensure that soil saturation from a permeable sidewalk does not destabilize building foundations or other adjacent structures. To maximize infiltration, adjacent structures and slopes must be constructed for water to flow over sidewalks or other permeable areas without flooding.

In areas with sidewalks and gutters, designs should direct runoff and irrigation overspray to adjacent street tree wells and parkways. By enlarging tree wells and allowing runoff to more easily reach the root areas of trees, the City will improve the health of the urban forest, remove contaminants from runoff, and decrease the amount of polluted runoff that needs to be treated before entering waterways.

Good drainage in soils near trees is particularly important because high soil moisture under a permeable sidewalk surface can be a factor in attracting tree roots and the subsequent deformation, cracking, and lifting of sidewalks. Engineered materials may be needed for best results. Permeable sidewalks also require vacuuming to maintain permeability.

To increase and improve the usage of permeable pavements for sidewalks, BSS has identified several areas that it intends to pursue, including:

- Expand the use of permeable pavements and landscaping in street medians.
- Develop improved methods to care for the tree root zone.
- Develop guidelines for using engineered backfill and soils to improve permeability and control tree root growth.
- Enlarge tree wells to increase the permeable surface area and reduce the impact of further root growth on adjacent sidewalks. In addition, modifications to impermeable gutters or curbs can be made adjacent to these tree wells, to infiltrate urban runoff into the wells.
- Expand the use of meandering sidewalks to increase the permeable area, reduce impacts of further root growth on adjacent sidewalks and add character to walkways.
- Continue research and consideration of new technologies and materials such as rubberized walkways. BSS currently has a few pilot projects using rubberized surfaces installed and under study.
- Continue discussions with the BOE to develop or revise existing DPW standards to implement the uses of permeable surfaces.

F. Other Efforts Promoting Green Technologies

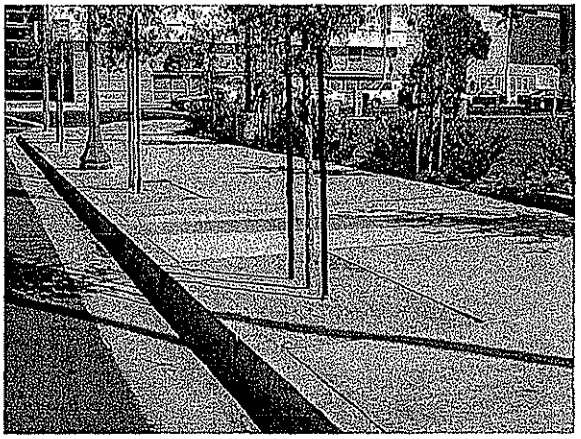
In May 2007, the Green Streets Committee was established by Ms. Paula Daniels, Public Works Commissioner. As the chair of the committee, Ms. Daniels directs the goals of the committee which include the coordination of green technology efforts across various City departments, regional agencies and non-profit organizations. Key goals of the committee include obtaining funds for green technologies, integrating green technologies with private development, adopting City standards for the installation of green technology in the public right-of-way, and identifying potential projects within the City.

It should be noted that BSS also uses the following environmentally progressive technologies as part of their standard practices.

- Recycles all recoverable asphalt removed from streets during resurfacing or reconstruction, instead of disposing deteriorated asphalt;
- Pursues more energy-efficient means and temperatures to produce the same quality asphalt concrete as traditional methods;
- Integrates recycled components in specifications for conventional Portland concretes to reduce the demand new materials; and
- Re-uses approximately 26,000 waste tires to produce rubberized slurry seal for every 100 miles of City streets it rejuvenates with slurry.

Conclusions

Permeable pavements can provide measurable stormwater and urban runoff benefits through infiltration. These include reductions in both the amount of runoff entering the storm drain system, as well as the pollutants that runoff carries. Permeable pavement can assist with groundwater recharge, provide water to trees and other landscaping, and increase public safety by reducing standing water. Many permeable pavements are considered more aesthetically pleasing than ordinary Portland cement concrete or asphalt concrete.



Many sites considered for permeable pavement construction will require site-specific studies to determine practicability. Construction costs for permeable pavements are higher and may require additional maintenance with vacuum sweepers. For non-street areas such as sidewalks, pedestrian accesses, and street medians, permeable pavement will be a preferred alternative. Areas, such as passenger vehicle parking lots, recreational areas, golf cart pathways, playgrounds, bike paths, and walkways are prime opportunities. However, complete retrofit of streets with permeable pavements does not appear practicable at this time. Permeable pavement systems are considered to be most appropriate with either light vehicle loading or heavy vehicle loads at high interstate speeds to reduce rutting and other structural failures.

The Green Streets Committee leads City efforts in using permeable pavement and other biofiltration methods. Committee members participate in pilot studies, research, and evaluations regarding the economics for alternative paving systems to expand their applications. Funding for the design, construction, and maintenance of permeable pavement and other infiltration infrastructure is critical. Unless other site-specific cost offsets are available as the result of savings created by the use of permeable pavement, there will often exist a need to identify adequate funding sources for the incremental cost increase. If supported by all Departments, the Green Streets Committee will provide not only a forum for sharing information regarding permeable pavements, but also increased opportunities for Departments to develop partnerships in designing, building, maintaining, and funding permeable pavement projects.