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August 3, 2006

The Los Angeles City Council

Honorable Ed P. Reyes, Chair  
Planning & Land Use Management Committee  
Los Angeles City Council

c/o Barbara Greaves  
City Clerk  
City Hall Room 350

Dear Councilmember Reyes and Honorable Members:

**INCORPORATE ROOFTOP GREEN SPACES AS AN ENERGY EFFICIENCY  
MECHANISM - COUNCIL FILE 04-0074**

The following is an interim report in response to the Council Planning and Land Use Management (PLUM) Committee's direction on May 2, 2006 to prepare a proposal for a pilot program to demonstrate green roof technology on City buildings.

**Recommendation:**

Direct the City Engineer to analyze the viability of the installation of a green roof on the two low rise wings of City Hall, and report back to the PLUM Committee within 90 days on the scope, design and construction costs, maintenance costs, and schedule.

**A. Options for New City Projects With a Green Roof**

The PLUM Committee requested one or more options for new City projects that could incorporate a green roof. The following objectives have been identified to guide the decision on the pilot project:

**Objectives for Pilot Project:**

1. Clear environmental benefits
2. Visible to the public
3. Fundable, with maintenance dollars identified



4. Technically feasible
5. Accessible for monitoring
6. Over an inhabited and conditioned space
7. Achievable in the near term
8. Possibly identify two similar projects for comparison, one intensive<sup>1</sup> roof and one extensive<sup>1</sup> roof, or one with a green roof and one without green roof, in order to compare the performance
9. Possibly identify a green roof to replace lost ground level green space
10. Possibly locate where storm water concerns are greatest (such as Sun Valley)
11. Tailor the project to the potential funding sources, both City and grant funding. Work with the City Administrative Officer's staff to identify City funding. Also, with assistance from the Environmental Affairs Department, identify other potential funding sources such as:
  - Los Angeles Department of Water and Power
  - Federal Department of Energy
  - Federal Environmental Protection Agency
  - California Environmental Protection Agency
  - California Energy Commission
  - South Coast Air Quality Management District
  - Metropolitan Water District
  - A corporate sponsor
  - Foundations such as the California Endowment, the Hewlett Fund, the Graham Foundation

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<sup>1</sup> 1. "**Intensive roofs** are essentially conventional gardens that happen to be located on the roof of a building. They may include moderate sized trees, shrubs, ornamentals and even crops planted in at least 12 inches (30 cm) of soil and are designed for traditional garden uses including recreation, relaxation and food production. Intensive green roofs add a considerable weight load (typically from 80 to 150 lb/ft<sup>2</sup> or 391 to 732 kg/m<sup>2</sup>) to a structure and usually require intensive maintenance. As such, they are designed to be routinely accessible in keeping with their intended use (Scholz-Barth, 2001) and may only cover a small fraction of the roof surface. **Extensive green roofs**, on the other hand, are not meant to be accessible except for occasional maintenance. Extensive green roofs consist of a blanket of low vegetation planted in just a few inches of a specialized, lightweight growing medium that covers a considerable portion of a roof. Extensive green roofs are primarily designed to achieve an array of environmental benefits as discussed below. While many of the benefits of extensive green roofs apply to intensive green roofs as well, extensive roofs are strictly designed with these benefits in mind, while intensive roofs are generally built for other reasons."

Options for City Projects

- Bureau of Engineering solicited project nominations from:
  - Proposition F: Fire stations and Animal Care Facilities
  - Port of Los Angeles
  - Proposition Q: Police Facilities
  - Other Municipal Facilities Projects
  - Los Angeles Department of Water and Power
  - Los Angeles Zoo

- List of Nominated Projects – New Construction:

Council District 9 - Neighborhood City Hall

Location: 4301 S. Central Avenue – CD9

Description: 7,400 sf field offices with green roof, 1,900 sf training room

Construction Budget: \$7.3M

Consultant: Paul Murdoch Architects

Status: 90% Construction Documents

Client: Council District 9

Comments: This is already being designed with an intensive green roof that will be accessible to the public. Additional funding could be applied to monitoring the performance of the green roof.

Reptile and Insect Center

Location: 5333 Zoo Drive – CD4

Description: 9,000 sf

Construction Budget: \$7.8M

Completion: September 2009

Consultant: Portico Group

Status: Pre-design

Client: Zoo Department

Comments: Additional funding will need to be identified for the green roof. This roof will be visible to the public from an elevated public walkway that will rise 30' to a treetop terrace.

Trans Pacific Container Terminal - Maintenance and Repair Building

Location: 500 W. Water Street. – CD 15

Description: 40,000 sf. Maintenance & Admin (5,000 sf green roof space)

Construction Budget: \$13M

Completion: March 2009

Consultant: Port of Los Angeles in-house design

Status: 40% Construction Documents

Comments: Not visible to the public.

Fire Station #82

Location: Somewhere in CD 13

Description: Fire Station

Construction Budget: \$8.7M

Status: On hold awaiting site acquisition

Completion: Approximately December 2009

Comments: Project timeline not yet established. Additional funding will have to be identified for the green roof.

Robertson Recreation Center

Location: CD 5

Description: 12,000 sq ft gym and support areas (4,000 sq ft green roof)

Construction Budget: \$4.5M - \$5M

Status: On hold awaiting additional funding

Comments: Council office is very supportive of adding the green roof to this project. Base project is short funded.

East Valley Multi-Purpose Center

Location: 5056 Van Nuys Blvd, Sherman Oaks – CD 2

Description: 17,000 sq ft gym and support areas

Construction Budget: \$13M

Status: Design

Comments: Construction funding has not yet been appropriated.

Construction funds will be allocated in fiscal year 2007-2008.

Fred Roberts Gymnasium

Location: 4600 S. Honduras – CD 9

Description: 11,000 sq ft gym & support areas (7,000 sq ft green roof)

Construction Budget: \$4.5M

Status: Schematic design

Comments: Base project is short funded.

- Other Project Suggestions – Existing Buildings:

City Hall

Description: A high profile, retrofit opportunity would be to install a green roof on the low rise wings of City Hall, as was done with the Chicago City Hall.

Comments: This would require an investigation of the capacity of the roof to carry the additional weight. This would also require a historic structure review as City Hall is listed as a historic landmark by the City of Los Angeles, and is eligible for listing on the federal register of historic structures. In an initial conversation with the structural engineer for the City Hall seismic upgrade, he indicated that a light weight (extensive) green roof was probably feasible, but a more detailed analysis will be required.

### Other Project Possibilities

- Other existing City buildings such as existing neighborhood City Halls
- Airport projects
- City funded affordable housing projects
- Non-city projects in partnership with the City (such as Los Angeles Unified School District, Los Angeles Community College District, or a facility for a non-profit)

### **B. Cost of Design, Construction, Operation, and Maintenance of Green Roofs**

The following cost estimates are for a typical green roof installation in our area. The estimates include vegetation, a growing medium, growing containers, and waterproofing. Specific costs will need to be developed for the identified pilot project, and each cost analysis will have to add additional building elements as required, such as a heavier structural system, access/egress stairs, walkways, an elevator, lighting, or exterior furniture. The design of green roofs is a specialty expertise, and the City Engineer recommends soliciting proposals from green roof consultants to execute the pilot project.

#### **Intensive Roof**

	<b>New Bldg</b>	<b>Existing Bldg</b> (It is rare an existing building could support an intensive green roof.)
Design	\$2-\$3 per sq ft	\$3-\$4 per sq ft
Installation	\$30-\$45 per sq ft	\$40-\$60 per sq ft
Maintenance	\$0.40 / sq ft / year	\$0.40 / sq ft / year

#### **Extensive roof**

	<b>New Bldg</b>	<b>Existing Bldg</b>
Design	\$2-\$3 per sq ft	\$3-\$4 per sq ft
Installation	\$20 per sq ft and up	\$25 per sq ft and up
Maintenance	\$0.25 / sq ft / year	\$0.25 / sq ft / year

As a basis for comparison, the Bureau of Engineering has also contacted the designers for the new Los Angeles Unified School in Exposition Park, the Theodore Alexander Junior Science Center, which is a new building with an intensive green roof. This information is not yet available.

**C. Procedures to Collect and Analyze Data From the Pilot Program**

Savings and Benefits – Measures to Consider

The following is an initial listing of the characteristics of green roofs that should be considered in a monitoring program for this pilot effort. Depending on the specifics of the pilot project, this list would be refined to identify appropriate characteristics to monitor for that project.

- Protection of roof membrane resulting in a longer material lifespan (it is estimated that green roofs will last up to twice as long as conventional roofs), resulting in decreased maintenance and savings in replacement costs.
- Savings on energy heating and cooling costs, depending on the size of the building, climate and type of green roof. Using a Micro Axxess Simulation model, Environment Canada found that a typical one storey building with a grass roof and 10 cm (3.9 inches) of growing medium would result in a 25% reduction in summer cooling needs. Field experiments by Karen Liu in Ottawa Canada, found that a 6 inch extensive green roof reduced heat gains by 95% and heat losses by 26% compared to a reference roof.
- Soil, plants and the trapped layer of air can be used to insulate for sound. Sound waves that are produced by machinery, traffic or airplanes can be absorbed, reflected or deflected. The substrate tends to block lower sound frequencies and the plants block higher frequencies.
- Cost savings from increased stormwater retention and decreased need to expand or rebuild related infrastructure.
- Decreased cost of meeting greenhouse gas reductions and adapting to climate change by reducing the "Urban Heat Island Effect" and the need for interior building insulation.

**D. Plan to Identify Funding Opportunities for Design, Construction and Data Collection**

With the identification of the pilot project, the City Administrative Office along with the Department of Environmental Affairs and the Bureau of Engineering can develop potential funding opportunities for design, construction, maintenance and data collection and analysis, and report back to the PLUM Committee.

August 3, 2006

Planning & Land Use Management

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Sincerely,



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