HUD Water Wednesdays
Greywater Reuse—Is it Right for Your Facilities?

September 30, 2015
Charlotte Ely, EPA
Megan Prier, Hyphae Design Laboratory
Rene Rodriguez, Abode Communities
Housekeeping

• All attendees are muted to minimize background noise.

• Please type questions into the questions/chat box in your GoToWebinar panel. We will have a dedicated time for Q&A.

• A recording of this presentation will be posted on the WaterSense website at http://epa.gov/watersense/hudwebinars
Poll Question

- Have we met?
  - Yes, I attended one of the earlier live webinars.
  - Kind of, I watched one of the recorded webinars.
  - No, this is my first time!
Today’s Presenters

• Charlotte Ely, Region 9 WaterSense liaison

• Megan Prier, Hyphae Design Laboratory

• Rene Rodriguez, Abode Communities
The Bigger Picture

- Federal Requirements
- Energy/Water Nexus
- Costs
- Water Use
- Weather and Climate
- The Opportunity
Current Newsworthy Driver

U.S. Drought Monitor

September 15, 2015
(Released Thursday, Sep. 17, 2015)
Valid 12 a.m. EDT

Drought Impact Types:
- D0 Abnormally Dry
- D1 Moderately Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

Intensity:
- F = Forecasts
- L = Long Term
- S = Short Term

The Drought Monitor focuses on broad-scale conditions, social conditions may have local impacts that are not reflected in the Drought Monitor. For forecast statements, visit http://droughtmonitor.unl.edu/

U.S. Seasonal Drought Outlook
Valid for September 17 - December 31, 2015
Released September 17, 2015

Valid for September – December outlook

http://go.usa.gov/3eZ73
EPA and WaterSense - the why and what

Water shortages expected in 36 states
Communities face major infrastructure investments
Consumers challenged by rising utility bills
Much of water used outdoors is wasted
No ENERGY STAR-like program for water

2006
Identify high-performing technology
Promote water efficient behavior/action
Help consumers save money
Reduce need to expand infrastructure capacity
Save water for critical needs
WaterSense Approaches

Specific fixtures and technologies save water

Actions that can be taken to reduce water use -- at home, outdoors and at work

Partners reach users to change behavior
What we have covered to date

• Webinar 1 - How to identify water-efficient WaterSense labeled products and purchase them through the Quantity Quotes bulk purchasing platform

• Webinar 2 - How to communicate with residents about water efficiency

• Webinar 3 – How to build more water efficient housing using WaterSense and LEED criteria
What we have covered to date

• Webinar 4 – Covered a variety of best management practices (BMPs) for multi-family housing

• Webinar 5 – Tracking Water and Energy Savings
Alternative Water Sources

• Chapter 8 of WaterSense at Work discusses alternative water sources

• Consider where water can be reused on site as an alternative to potable water – considering possible state/local restrictions

• Potential sources include
  – Rainwater/stormwater
  – Treated gray water
  – Condensate and reject water
  – Cooling equipment blowdown

• Potential uses include
  • Irrigation
  • Toilet/urinal flushing
  • Cooling tower make-up
Greywater

- What is it?
- What are the benefits?
- Is it legal?
- How much does it cost?
Greywater: what is it?

- Greywater comes from:
  - Showers/baths
  - Washing machines
  - Bathroom sinks
  - Dehumidifiers
  - Kitchen sinks (not in CA)
- Greywater is not:
  - Toilet or diaper wash water
  - Dishwasher water

A note on greywater quality

Knowledge is lacking on the long term effects of greywater irrigation on landscape plants, soil microflora, and human health. Existing studies suggest immediate benefits to plants and soil microflora. While well-established that greywater exceeds allowable levels of fecal coliform for wastewater discharge, there are no documented cases of illness transmitted from a greywater system in the US. While greywater reuse poses minimal health risks so too do the risks associated with water shortages, sewer overflows and leaky septic tanks—the likelihood of which can be lessened with the use of greywater.
Greywater: the benefits

• Saves Water
  – Irrigates landscapes, lessening (potentially eliminating) the use of drinking water to irrigate plants

• Saves energy
  – Reduces the energy used to collect, transport and treat water and wastewater

• Improves water quality
  – Reduces strain on septic systems
  – Encourages healthy product choices
  – Lessens the need for fertilizer

Source: The San Francisco Public Utility Commission's Greywater Design Manual for Outdoor Irrigation
Greywater: Is it legal?

- Regulations are on a state-to-state basis, and can be superseded by local guidelines.
- Existing codes are usually performance-based or prescriptive
  - E.g. ADEQ’s Guide to Complying with the Type 1 General Permit:

Source: Treatment, Public Health, and Regulatory Issues Associated with Greywater Reuse
## Greywater: the cost

### Professionally-Installed

<table>
<thead>
<tr>
<th>Materials/Labor/Permit $</th>
<th>Laundry to Landscape</th>
<th>Branched-Drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>$350.00</td>
<td>$500.00</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>$750.00</strong></td>
<td><strong>$1,740.00</strong></td>
</tr>
<tr>
<td>High</td>
<td>2,000.00</td>
<td>4,250.00</td>
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</tbody>
</table>

### Homeowner-Installed

<table>
<thead>
<tr>
<th>Materials/Labor/Permit $</th>
<th>Laundry to Landscape</th>
<th>Branched-Drain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>$100.00</td>
<td>$250.00</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>$250.00</strong></td>
<td><strong>$715.00</strong></td>
</tr>
<tr>
<td>High</td>
<td>500</td>
<td>1,750.00</td>
</tr>
</tbody>
</table>

Source: Residential Greywater Irrigation Systems in California: An Evaluation of Soil and Water Quality, User Satisfaction, and Installation Costs
Poll Question

• Where are you on considering greywater reuse?
  – I’m doing it!
  – I need to learn more before deciding.
  – I’m skeptical as to whether it makes sense for me.
  – It’s not allowed in my area.
www.enterprisecommunity.org/Green
GRAYWATER SYSTEMS IN MULTI-FAMILY RESIDENCES

Case Study: Eden Housing Water Reuse Project

Megan Prier
Project Designer, Hyphae Design Laboratory
942 Clay Street Oakland, CA 94607
Megan@hyphae.net
(Cell): 610.883.3351
(Office): 510.922.9355
Irrigation demand highest in summer

Graywater demand constant

Rainfall highest in winter
SUPPLIES

SYSTEM OPTIONS

REUSE

LAUNDRY TO LANDSCAPE DIRECT

BRANCHED DRAIN

PUMPED

FILTERED TO DRIP IRRIGATION

LANDSCAPE

INDOOR NON-POTABLE

DIRECT BATHROOM SINK TO TOILET

FILTERED & UV TREATED
Laundry machine pumps directly to landscape mulch basins

Pros: Low upfront cost, easy retrofit, permits not required, takes advantage of laundry machine pressure

Cons: Reduces life of laundry machine, less efficient use of water than drip irrigation
Graywater flows by gravity to mulch basins

Pros: Low upfront cost, easy retrofit, permits not required, applicable for fixtures above first floor and on first floor where site grading permits

Cons: Only feasible where site grading allows, less control over timing of water, less efficient use of water compared to drip irrigation
Collects graywater in a basin by gravity and pumps to landscape basins.

Pros: Greater flexibility to site grading and conditions, can reach landscapes further away from fixtures

Cons: Higher upfront and maintenance costs than branch drain, limited landscape application (plant type and mulch basin)
Filters graywater and adds to pressurized drip irrigation system

Pros: Efficient use of graywater, higher water savings, greater flexibility to plant type and site conditions, applicable for wider variety of landscapes

Cons: Higher upfront and maintenance costs, requires purple pipe, usually requires permit
Directs graywater from sink to toilet or collects graywater in basin, treats, and pumps to toilets

Pros: Offsets building non-potable water, applicable for sites with minimal landscape

Cons: Higher upfront and maintenance costs, requires UV treatment, not allowed everywhere, requires permits, feasible only where plumbing is exposed in building retrofits
SUMMARY COST & WATER SAVINGS

### SUMMARY

<table>
<thead>
<tr>
<th>GW TO LANDSCAPE</th>
<th>Upfront Costs</th>
<th>Payback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Branched Drain</td>
<td>$4,300 - $5,400</td>
<td>7-10 years</td>
</tr>
<tr>
<td>Graywater to Landscape Pumped</td>
<td>$5,250 - $6,500</td>
<td>8-15 years</td>
</tr>
<tr>
<td>Graywater to Landscape High Tech Pumped</td>
<td>$15,000 - $22,000</td>
<td>22-25 years</td>
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### WATER SAVINGS

<table>
<thead>
<tr>
<th>GW TO INDOOR</th>
<th>LOW COST</th>
<th>Higher Water Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filtered &amp; Treated</td>
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Hyphae Design Laboratory
Eden Housing:
Affordable housing company founded in 1968 that provides housing and support services to residents in 13 counties across the state of California.
Eden Housing Project:

1. Site Survey
2. Site Visits
3. Water Analysis
4. Schematic Design
5. Cost estimating
DECISION MAKING - EXISTING SITES

1. Existing water balance
2. Site conditions
3. Building characteristics
4. Management & tenant preferences
5. Cost considerations

Existing Infrastructure?  Space for tank?

AC Condensate?  Pipes exposed?  Existing Landscape?
WINDSCAPE

Proposed Systems

1. Rainwater to Toilets:
For units w. accessible plumbing above parking

2. Laundry to Landscape:
Graywater to irrigate landscape in front of building

<table>
<thead>
<tr>
<th>WINDSCAPE COST ESTIMATE</th>
<th>Upfront Cost</th>
<th>Payback</th>
<th>Water Saved (gallons/year)</th>
<th>% Water Saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rainwater to Toilets</td>
<td>$36,000-$51,850</td>
<td>17 - None</td>
<td>32,256</td>
<td>19%</td>
</tr>
<tr>
<td>2. Laundry to Landscape</td>
<td>$5,250-$6,500</td>
<td>16-18</td>
<td>34,187</td>
<td>38%</td>
</tr>
<tr>
<td>2B. Laundry to Landscape (Turf)</td>
<td>$5,250-$6,500</td>
<td>10-12</td>
<td>54,699</td>
<td>61%</td>
</tr>
</tbody>
</table>

SITE EXAMPLE

Lower payback & higher water savings w. turf conversion

Laundry to Landscape System
ONLINE TOOL

1. Database
   Inputs: Online dashboard for property managers to input site information
   Outputs: Suggested system designs and cost estimates

2. Live tool updated to reflect changing pricing

3. Real time data collection from water meters
Casa Dominguez: An Affordable housing Case Study

HUD Water Wednesdays
Greywater Reuse: Is it Right for Your Facilities?
September 16, 2014,
Abode Communities:

Founded in **1968** as a volunteer organization of architects, Abode Communities has provided comprehensive architectural services and technical assistance to more than 500 community groups on projects including permanent, sustainable affordable housing, homeless shelters, child care centers, health clinics and senior centers.
Casa Dominguez
The Project:

A little History...

A Former 3.5 Acre Brownfield site. In the East Rancho Dominguez, a neighborhood with Unincorporated LA County bordering the city of Compton
A little History…

A Former 3.5 Acre Brownfield site. In the East Rancho Dominguez, a neighborhood with Unincorporated LA County bordering the city of Compton.

The Project: completed December 2009
Grey Water
Why Grey Water? Why not?

• Mission Alignment
  • By recycling grey water your doubling the mileage out of each gallon of water. You’re saving potable water and preventing this water from going into the sewer system, reducing the impact on the infrastructure.

• Cost
  • By using grey water for irrigation the owner reduces the cost of watering plus using the right metric can also reduce sewer fees by reducing the amount of water dumped into the utility's infrastructure (if not individually metered).

• Scale
  • Due to the size of the landscaping areas of the project and the amount of water generated from the laundry system it represented an appropriate alignment based on the projected payback.
Why Grey Water? Why not?

- Challenges
  - Permitting environment:
    Since this was the first time The County of Los Angeles reviewed this type of system, the review and permitting process was extremely thorough and challenging. The county’s agencies, mainly the department of Public Health wanted to know, without a doubt that the system would function properly and that well thought-out safety measures would be incorporated to address the possibility of system failure.
Why Grey Water? Why not?

• Challenges:

• Design Changes:

As this was a change made during construction speed was of essence. It was critical to have a design team ready to jump on this, including the Plumbing Engineer and Landscape Architect, and a General Contractor willing to be patient...

...not the easiest thing to find
Why Grey Water? Why not?
Our System:

- **Rapid sand filters**
  This type of filter pumps greywater, rapidly through a sand filter where the hair, lint, and other particles stick in the sand; filtered greywater comes out Filtration is adequate for drip irrigation systems without clogging the small emitters
Our System:

3. Storage tank

Irrigation And Pump Controllers

Sand Filter System

Connection to storage tank

Warning Signs
Resident Training:
System’s Performance
“the proof is in the pudding”
Success in Numbers:

By benchmarking and monitoring the usage of the systems, the client was able to see the performance of the system.

The system is offsetting an average of 85% of the total irrigation load.

Only two (2) service calls in the five (5) years of operation.
The grounds:

Courtyard and surrounding areas
Future:

- Technological Advances:
  - There are whole new systems available for the use of grey water in different applications. Tread carefully
  - More knowledgeable regulatory environment

- Financing/Permitting Environment:
  - There are some incentives for new technologies such as these, but there are still many challenges in reference to implementation

- Environmental responsibility:
  - Drought in California /Governor’s charge to the state to reduce potable water use by 25%
  - This technology is readily available
• Rene Rodriguez, rrodriguez@abodecommunities.org
  Associate, Abode Communities, Architecture
Questions?
Future HUD Water Wednesday Webinars

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>October 28*</td>
<td>Incorporating Green Infrastructure into Housing Developments</td>
</tr>
<tr>
<td></td>
<td>Learn about EPA resources to help integrate green infrastructure and hear about experiences from HUD grantees</td>
</tr>
</tbody>
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* Dates subject to change.
Poll Question

- Should WaterSense and HUD work together to have more webinars?
  - Yes.
  - No.
  - It depends on what you plan to cover.
• In concert with this training, HUD is requesting feedback on water issues via the public forum “Water Watch” on Switchboard.


• Please let them know (a) what challenges your community or organization is facing with water access and water quality; and (b) what more do you think HUD can do to help?
WaterSense Information

Visit us online!

- [www.epa.gov/watersense](http://www.epa.gov/watersense)
  - [HUD webinars at](http://www.epa.gov/watersense/hudwebinars)
  - BMPs at [www.epa.gov/watersense/commercial](http://www.epa.gov/watersense/commercial)
- [www.facebook.com/epawatersense](http://www.facebook.com/epawatersense)
- [www.twitter.com/epawatersense](http://www.twitter.com/epawatersense)

Questions?

E-mail: [watersense@epa.gov](mailto:watersense@epa.gov)

Helpline: (866) WTR-SENS (987-7367)