FEASIBILITY AND LIFE CYCLE ASSESSMENT OF DECENTRALIZED WATER, WASTEWATER, AND STORMWATER ALTERNATIVES FOR RESIDENTIAL COMMUNITIES WITH A VARIETY OF POPULATION DENSITIES

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FEASIBILITY AND LIFE CYCLE ASSESSMENT OF DECENTRALIZED WATER, WASTEWATER, AND STORMWATER ALTERNATIVES FOR RESIDENTIAL COMMUNITIES WITH A VARIETY OF POPULATION DENSITIES

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To my parents who are the greatest people in my world and
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LIST OF SYMBOLS AND ABBREVIATIONS

BGY	Billion Gallon per Year
BNR	Biological Nutrient Removal
CI	Centralized Infrastructure
COA	The City of Atlanta
CN	Curve Number
CSS	Combined Sewer System
CWSS	Centralized Water Supply System
CWTS	Centralized Wastewater Treatment System
DALYs	Disability-Adjusted loss of Life Years
FAR	Floor to Area Ratio
GHG	Greenhouse Gas
gpcd	Gallon Per Capita per Day
HI	Hybrid Infrastructure
ISA	Impervious Surface Area
LCA	Life Cycle Assessment
LID	Low Impact Development
MBR	Membrane Bioreactor
mgd	Million Gallon per Day
PDF	Potentially Disappeared Fraction of species
SSS	Separate Sewer System
TOSR	Total Open Space Ratio
UOSR	Usable Open Space Ratio

WRI	Water Reuse Index
WRC	Wastewater Reclamation Center

SUMMARY

Centralized infrastructure (CI) is difficult to sustain with limited water and fossil fuel resources because CI withdraws 100% of water demand from the environment as an open-loop system and electricity is consumed to transport and treat water and wastewater while demand is increasing. Hybrid infrastructure (HI) is proposed to combine CI with decentralized alternatives such as low impact development (LID) technologies (i.e., xeriscaping, rain gardens, and rainwater harvesting) or greywater reclamation systems with membrane bioreactors (MBRs). Water, wastewater, and stormwater systems in the City of Atlanta (COA) were regarded as CI. HI was compared to CI using life cycle environmental impacts measured by water reuse index (WRI) and life cycle assessment (LCA) scores. WRI is a ratio of water withdrawal to sustainable water resources of wastewater (i.e., return flow) and stormwater discharge, which presents water stress level (e.g., 0.2 ~ 0.4: medium-high level). LCA score is determined as % of annual world average environmental damage per capita. As stormwater runoff, water demand, greywater generation, rainwater harvesting, etc. vary depending on land use and population density, feasibility of decentralized alternatives was evaluated in eleven residential communities. Five single-family residential communities were designated as between R-1 of 16 people/10 acres and R-5 of 169 people/10 acres and six multi-family residential communities were designated as between RG-1 of 148 people/10 acres and RG-6 of 5,808 people/10 acres. HI with LID technologies reduced WRI of COA that relies on CI from 0.45 to 0.12. HI reduced the LCA scores of CI with combined sewer system (CSS) by between 1% for RG-6 and 68% for R-1 and the LCA scores of CI with

separate sewer system (SSS) by between 0% for RG-6 and 18% for R-1. As population density increases for the multi-family residential communities, harvested rainwater decreases and a small amount of water demand is satisfied. Consequently, it has a negligible impact on the LCA scores in RG-6. HI with greywater reclamation system reduced WRI of COA from 0.45 to 0.35. HI resulted in the LCA scores greater as compared to CI in the five single-family communities and RG-1, RG-2, and RG-3 because of the electricity consumption of small-scale MBR. However, the electricity consumption per kgal decreases with increasing MBR treatment capacity and the LCA scores were reduced by 5% for RG-4, 15% for RG-5, and 21% for RG-6. The MBR treatment capacity of RG-4 is 15.6 kgal/day.

CHAPTER 1

INTRODUCTION

Centralized water, wastewater, and stormwater infrastructure usually involves long-distance channels or pipelines to transport water, wastewater, or stormwater between water bodies and urban areas. And potable water produced in large-scale central treatment plants is supplied even for non-potable use. These attributes increase electricity consumption and freshwater use. Accordingly, decentralized alternatives such as low-impact development (LID) technologies (e.g., rain gardens, green roof, rainwater harvesting, etc.) and greywater reclamation system have been implemented. Those alternatives control stormwater, treat wastewater, or supply water on site with diversifying water resources and/or using less energy as compared to centralized infrastructure (CI). In addition, environmental concerns about water, wastewater, and stormwater infrastructure has been changed from end-pipe thinking that only considers treatment level and water quality to more comprehensive issues that include electricity consumption and water resource utilization during infrastructure life cycle. All these ideas initiated this research to investigate feasibility and life cycle assessment (LCA) of decentralized alternatives for residential communities of different land uses and population densities.

1.1 Limitation of Centralized Water, Wastewater, and Stormwater Infrastructure

Centralized water, wastewater, and stormwater infrastructure can involve long-distance transport by channels or pipelines and large-scale treatment plants. Four percent of total energy consumed in the United States is used to treat and transport water and wastewater.[1] Approximately, 80–85% of the electricity consumption for water supply is used to transport water.[1] Also, large-scale plants supply potable water even for non-potable purposes such as irrigation, toilet flushing, and laundry. As combined sewer system (CSS) collects and treats stormwater runoff with domestic wastewater, more electricity and chemicals are consumed as compared to separate sewer system (SSS) that collects stormwater runoff separately and discharges it into surface waters. CSS is also easily affected by unexpectedly intense rainfall events. For example, the combined sewer in the city of Atlanta (COA) overflowed during 2009, a historic flooding year (a 500-year flood).

Electricity consumption of water, wastewater, or stormwater system, energy sources, and environmental impacts depends on the location. COA relies on the Chattahoochee River which is within the city boundary. The electricity consumption of COA's conventional water supply system was estimated as ~2.0 kWh per 10^3 gallon of potable water according to the energy bills provided by Georgia Power. In contrast, Phoenix (Arizona) consumes ~5.0 kWh/10^3 gallon which is 2.5 times more than COA because water is imported from the Colorado River 336 miles away.[2] According to local energy production mix,[3] 1.34 kg CO_2,eq per 10^3 gallons for water supply is released for Phoenix (67% fossil fuel, 27% nuclear, and 6% hydroelectric) as compared to 0.58 kg CO_2,eq per 10^3 gallons for COA (70% fossil fuel, 25% nuclear, 3% hydroelectric, and 2% biomass).

Water resources are limited and this is exacerbated by using a centralized infrastructure that is an open loop system. Such systems withdraw 100% of water demand from environment and discharges treated wastewater back into the environment. Metro Atlanta, one of the 10 metro areas with the largest population growth, expanded to more than 5.3 million residents in 2010, representing a population increase of more than one million people over the last decade.[4] The population is projected to be 7.5 million (a 36% increase) by 2035, and correspondingly, water demand would increase by ~50%.[5] Such future water demand will aggravate the conflicts among Alabama, Florida, and Georgia, which share the Apalachicola-Chattahoochee-Flint River Basin and the Alabama-Coosa-Tallapoosa River Basin. Several litigations have occurred between the states since the Buford Dam and Lake Lanier were built in Georgia to increase hydroelectric power and increase the water supply for COA expansion.[6-7] Also, water supplies that rely on such open loop system are susceptible to unexpected drought events. The drought in 2007 (a 100-year drought) caused a serious water shortage in Georgia such that the residents relied completely on Lake Lanier and Lake Allatoona. The water level of Lake Lanier decreased to 1050.79 ft., approximately 20 ft. below its full level,[8] and outdoor watering was banned in 61 Georgia counties.[9]

Environmental concerns about centralized water, wastewater, and stormwater infrastructure have increased from end-pipe thinking that only considers treatment level and water quality to more comprehensive issues that include electricity consumption and water resource utilization during the infrastructure life cycle. Consequently, LCA was conducted to evaluate the environmental impacts caused by all inputs (e.g., energy, materials, land, etc.) and outputs (e.g., CO_2 emission, nutrient emission, fossil fuel depletion, etc.) involved in the life cycle of water, wastewater, and stormwater systems. The LCA allows water purveyors to determine the major environmental issues of existing infrastructure and suggest alternatives. Sharaai et al. (2010) and Stokes and Horvath (2011) evaluated local water system and determined major sources of environmental impact as energy consumption and chemical use. Friedrich et al. (2007) performed LCAs for five systems (i.e., water treatment, water distribution, wastewater collection, wastewater treatment, and tertiary treatment for wastewater recycling), and proposed electricity consumption as the most important environmental performance indicator. Stokes and Horvath (2009), Lyons et al. (2009), and Pasqualino et al. (2010) studied centralized water supply systems consisting of long-distance water importation, desalination, and reclamation. They demonstrated that reclamation was the environmentally favorable option on the basis of life cycle environmental impacts which were primarily caused by electricity consumption. Muñoz et al. (2010) evaluated two different water supply systems that provided agricultural and domestic water. The water supply system relied on surface water, seawater, groundwater, brackish water, and reclaimed water. This approach resulted in a diversity of water resources and treatment option, which was found to be more environmentally beneficial as compared to the other water supply system that relied only on surface water that provided only potable water for agriculture.

1.2 Decentralized Alternatives

LID technologies, such as rain gardens, wetlands, permeable pavement, and rainwater harvesting, are decentralized alternatives to control stormwater or supply water on site. There have been many studies that describe how LID technologies control the rate and volume of stormwater runoff or prevent surface water quality and aquatic habitats from being degraded.[16-21] Rainwater harvesting technology converts some of the potential stormwater runoff into water resources, which can be used for groundwater recharge or non-potable purposes such as irrigation, toilet flushing, and laundry[22-26]. In addition, open space can be created, which reduces heat stress mortality, and increases property value and recreational opportunities.[27-28]

However, few studies consider community land uses or centralized water, wastewater, and stormwater infrastructure for the purpose of LCAs of LID technologies. Angrill et al. (2012) performed an LCA to determine tank location for rooftop rainwater harvesting in two different residential types of detached single-family houses and 5-story apartment buildings. Storage tanks that were distributed over the roof of each apartment building showed the best LCA performance in their study. Spatari et al. (2011) compared permeable pavement and street trees to a conventional street design on the basis of life cycle energy consumption and greenhouse gas (GHG) emissions. Permeable pavement and street tree planting results in more embodied energy as compared to conventional street construction but reduces stormwater runoff and the energy demand of a combined sewer system. Accordingly, energy payback time and GHG payback time was determined as 70-100 years and 130-180 years, respectively[30]. De Sousa et al. (2012) compared carbon emissions of three strategies to control combined sewer overflow (CSO), i.e., LID, combined sewer detention facilities, and combined sewer detention and treatment facilities. The LID strategy involved permeable pavement, rain gardens, and subgrade cistern to reduce or delay stormwater runoff flowing into CSS. As a result, the carbon emission of LID strategy was 78% lower as compared to combined sewer detention facility and 95% lower as compared to combined sewer detention and treatment facility. With regard to another facet of infrastructure development, Domènech and Saurí (2011) evaluated rooftop rainwater harvesting in terms of policies (i.e., subsidies, regulations and incentives), drinking water savings, costs, and human health risk in a single-family house community and a multi-family apartment community. The rooftop rainwater harvesting could supply more than 60% of landscape irrigation demand in both community types and residents were satisfied with water saving and expected environmental improvements. Accordingly, this study suggested that regulations and subsidies would be beneficial to advocate and expand rainwater harvesting technology.

Large or small-scale wastewater reclamation technology has been studied as an alternative to resolve those issues of CI. Orange County Groundwater Replenishment System (California) have produced up to 70 mgd equivalent to 600,000 residents' water demand in order to recharge groundwater for indirect potable reuse and seawater intrusion prevention.[33] The city of Tampa (Florida) has reclaimed 35 mgd of wastewater for irrigation, a significant fraction of 2030 water demand (111 mgd), and replaces 5 mgd of annual well withdrawal.[34] It has been reported that life cycle environmental impact of water or wastewater system primarily results from electricity consumption and large-scale wastewater reclamation technology for water supply causes less impact as compared to long-distance water importation or desalination.[13-14, 35]

Meanwhile, small-scale wastewater reclamation system has been implemented as a decentralized wastewater treatment or water supply alternative. It has been reported that a membrane bioreactor (MBR) can properly treat wastewater for non-potable uses, even though small-scale systems are susceptible to unexpected flow and strength of wastewater and domestic products (i.e., bleach, caustic soda, perfume, vegetable oil, and washing powder), which are toxic to biomass (i.e., activated sludge).[36-41] MBR is similar to an activated sludge system whereby membrane filters have replaced the secondary clarifier and there have been several studies to confirm that the effluent quality of small-scale submerged MBR. Separating greywater (i.e., faucet, shower, bath, dishwashers, and laundry) from blackwater (i.e., toilet flushing) is also helpful to produce reclaimed water for non-potable demand for laundry. Practically, greywater is treated with on-site and small-scale MBR system of submerged ultrafiltration modules and is used for toilet flushing, laundry, or irrigation in an office building in German and a dormitory building in Vietnam.[40-41] The effluent water quality complies with the standard of German Association for Rainwater Harvesting and Water Recycling (fbr).[40-41] There are a few on-site water reuse standards such as fbr standard, NSF International Standard/American National Standard for on-site residential and commercial water reuse treatment systems (NSF/ANSI 350), and the standard of Queensland Department of Infrastructure and Planning for water reuse. Those standards are presented in APPENDIX E.[40, 42]

However, electricity consumption for small-scale MBR operation has been pointed out as a crucial element to determine life cycle environmental impact of the technology.[43-44] More than 50% of electricity consumption for submerged MBR is caused by aeration to scour the membrane surface to prevent fouling and retain the biosolids in the aeration tanks.[45-46] Also, electricity consumption increases as treatment scale decreases;[46-49] and accordingly, further study is required to determine treatment capacity that saves energy as compared to CI.[49] In addition, it should be noted that energy consumption of CI and energy sources influences the life cycle environmental impacts of the option. For example, the small-scale MBR operation is expected to be more environmentally beneficial in Southern California as compared to COA because electricity consumption for CI in Southern California is ~2.5 times more than COA CI for one kgal water and wastewater. In addition, as it turns out in this study, California uses mostly natural gas for electricity production and this reduces the life cycle environmental impacts of decentralized greywater treatment in Southern California as compared to Georgia that uses mainly coal.

1.3 Research Objective

This study aimed at investigating how differently decentralized alternatives are feasible depending on land use and population density of residential community and how much environmental impact of CI is improved by decentralized alternatives. Targeted alternatives are LID technologies (i.e., rain gardens, xeriscaping, and rainwater harvesting) and on-site and small-scale greywater reclamation system. In order to achieve the objective accurately, comprehensive assessment, quantitative comparison, and interdisciplinary approach was pursued. As the decentralized alternatives provide the services of non-potable water supply, wastewater treatment, or stormwater runoff control. However, the alternatives do not provide all the services and hybrid infrastructure (HI) was proposed. HI is to combine the LID technologies or the greywater reclamation system with centralized infrastructure. Accordingly, HI was compared to CI in this study. This comprehensive assessment is different with the studies that compare individual alternatives to corresponding centralized systems, e.g., rainwater harvesting vs. centralized water supply system (CWSS), on the basis of a same volume of water, wastewater, or stormwater. For the purpose of quantitative comparison, water reuse index (WRI) and LCA score was measured for annual per capita water demand and wastewater and stormwater generation. LCA was conducted to quantify the score, percentage of an annual world average damage per capita. WRI is the ratio of water that is withdrawn for the CI divided by the return flow plus storm water discharge. WRI was used to measure water stress level because most LCA tools that used to evaluate life cycle environmental impacts in many literatures but under developing do not consider the impact on water resources. Also, interdisciplinary approach is not avoidable to compare HI to CI. For example, as it turns out in this study, even though rainwater harvesting technology can supply non-potable water, its supply potential can vary depending on rooftop area and non-potable water demand for a same size of community in a same region (i.e., the City of Atlanta). Accordingly, eleven residential communities were designed to consider the physical and social aspects of land use and population density in the comparison of HI to CI. Conclusively, different feasibility of alternatives was resulted and subsequently, different WRI and LCA score was calculated depending on community and infrastructure type.

CHAPTER 2

METHODOLOGY

Decentralized alternatives of LID technologies (i.e., rain gardens, xeriscaping, and rooftop rainwater harvesting) and on-site greywater reclamation system with small-scale MBRs were considered in this study. HI was proposed to combine the decentralized alternatives with CI. The centralized water, wastewater, and stormwater systems of COA was evaluated, which was considered as CI. As the feasibility of alternatives was expected to vary with land uses and population densities, eleven residential communities were designed according to COA zoning code. Annual per capita volumes of stormwater runoff, water demand, rainwater harvesting, greywater generation, or wastewater generation were determined for each community. With using the volumes as functional units, life cycle environmental impacts of HI was compared to CI using WRI and LCA.

2.1 Hybrid Infrastructure (HI) and Centralized Infrastructure (CI)

Rain gardens, xeriscaping, and rooftop rainwater harvesting were considered as the LID technologies of this study. Stormwater runoff is controlled using rain gardens. Consumptive water use for irrigation is reduced by xeriscaping in which native or low water use plants are used. Rainwater harvested from rooftop or building top is used for non-potable purposes (i.e., irrigation, toilet flushing, and laundry). Even though these LID technologies are implemented, CI for drinking water demand and wastewater treatment is still needed. Therefore, HI was proposed to combine the LID technologies with centralized water, wastewater, and stormwater infrastructure. Two centralized wastewater collection systems were considered for CI: (1) combined sewer system (CSS), and (2) separate sewer system (SSS). The life cycle environmental impacts of HI were compared to CI for eleven residential communities with different land uses and population densities.

Greywater is reclaimed using screening, submerged MBR, and UV disinfection and used for non-potable purposes (i.e., irrigation, toilet flushing, and laundry). HI was proposed to combine the reclamation system with CI because potable water demand cannot be met without it. The HI was compared to CI using the water reuse index (WRI) and life cycle assessment (LCA) score. Separate sewer system was assumed to collect stormwater and the flow for storm water collection was identical for HI and CI because the reclamation technology does not affect stormwater runoff and control.

2.2 Residential Community Design

The zoning code of the city of Atlanta (COA) designates five single-family residential communities as R-1, R-2, R-3, R-4, and R-5 and six multi-family residential communities as RG-1, RG-2, RG-3, RG-4, RG-5, and RG-6. The zoning codes for single-family residential communities stipulate the lot size, land use ratio of paved area and rooftop, setback distance from sidewalk to house, street frontage length, and parking space. Land uses of rooftop area, parking space, driveway and walkway, and open space (i.e., private yard) were designed with using COA's zoning code and design examples of city reports.[50-52] The city's street guidelines were also used to determine sidewalks and streets in the single-family residential communities.[53] COA's zoning code stipulates the required parking spaces, land use intensity ratios of floor-to-area ratio (FAR), total open space ratio (TOSR), and usable open space ratio (UOSR) for multi-family residential communities.[51] FAR is the ratio of total building area to community size; TOSR is the ratio of open space and paved area to community size; and UOSR is the ratio of open space as compared to community size and required parking space.

However, the zoning code does not regulate the ratio of irrigated or indigenous open space as compared to total open space. Total open space was equally divided into irrigated open space and indigenous open space in both types of residential community. Detailed designs for eleven residential communities are presented in APPENDIX B. Population density of each community was determined with using the household size of *3*.3 people per single-family house and 2.5 people per apartment unit of 1,200 ft^2.[4, 54]

2.3 Water Balance of the City of Atlanta (COA) and Water Reuse Index (WRI)

Estimating water, wastewater, and stormwater flows, a water balance of COA to determine the water stress level was conducted because the impact on the water resource is not considered in LCAs. The water and wastewater flow rates were calculated using the numbers of residents and employees as well as per resident and employee indoor and outdoor water use data.[5, 55-56] To determine the stormwater discharged into nearby streams, the approach suggested by these researchers was used in this study. [57-58] The approach involves collecting daily flow rates of streams upstream and downstream in the watershed areas of COA. The flow data from 2010 data of U.S. Geology Survey (USGS) website was collected to determine the stormwater discharge flow rate per area. Annual stormwater discharge of COA was quantified by multiplying the area specific stormwater discharge (0.31 BGY/mi^2) by the city's area of 133.7 mi^2. The stormwater runoff volume was calculated according to the city-wide runoff coefficient of 0.34, [59] and infiltrated stormwater volume was estimated as the difference between stormwater discharge and stormwater runoff. Precipitation data (2010) were obtained from the National Oceanic

Atmospheric and Administration [60] website, and the difference between precipitation and stormwater discharge was attributed to evaporation and transpiration as groundwater recharge was negligible due to the bedrock geology of COA area.[5]

Water reuse index (WRI) was determined on the basis of COA water balance in order to show its water stress level. The index is the ratio of water withdrawals for domestic, industry, and agricultural purposes as compared to sustainable water resources that include treated wastewater discharge (i.e., return flow) and stormwater discharge as shown in Eq. 1.[61]

$$Water\ Reuse\ Index = \frac{D+I+A}{Q} \quad (1)$$

D: water withdrawal for domestic demand

I: water withdrawal for industrial demand

A: water withdrawal for agriculture demand

Q: wastewater and stormwater discharge

With regarding WRI greater than 0.4 as intense water use level not to remain freshwater ecosystems healthy [62], values between 0.2 and 0.4 are the medium-high level of water stress.[61, 63] With simulating water withdrawal, wastewater discharge (i.e. return flow), and stormwater discharge that are changed by the decentralized alternatives, WRIs were determined for each infrastructure and community type. Also, the effect of HI on the COA WRI was also estimated.

2.4 Water, Wastewater, and Stormwater Volumes of Eleven Residential Communities with Centralized Infrastructure (CI)

Stormwater runoff of each community was quantified using the Soil Conservation Service (SCS) method which correlated runoff volumes (in.) with rainfall intensities (in.)

depending on curve numbers (CNs).[64] Rainfall intensities (in.) are daily precipitation over 24 hours. The daily precipitation data (in./24-hr) of 2010 for COA were collected from the Advanced Hydrologic Prediction Service (AHPS) of National Oceanic Atmospheric Administration (NOAA) website and averaged for 21 different collection points within the city[60]. CNs of each community were determined on the basis of the impermeable surface area (ISA) and CN of permeable area for a community. The CN of permeable area depends on soil moisture condition that is determined by seasons (i.e., dormant or growing season) and 5-day total antecedent rainfall intensity.[64-66] The CNs of each community and the correlation formula between rainfall intensity and runoff are presented in APPENDIX C.

Water demand was determined by summing indoor water use and outdoor water use for irrigation. Water use of multi-family households can be smaller than single-family households because of low-income level and built-in low-flow fixtures or appliances that limits water use in multi-family households.[67-69] However, the frequency of toilet use and duration of showering does not vary on house types.[67-69] Accordingly, an equivalent indoor water demand of 79 gpcd (gallon per capita day) was used for both residential types in order to focus on the relation of water demand to land use and population density of each community.[5] Outdoor water use for conventional irrigation was computed by multiplying irrigation factor of 4.04 gallon/ft^2·yr by irrigated open space size of each community.[70] The irrigation factor corresponds to medium level water use for densely planted open space in residential community of Atlanta (humid southern zone), which was provided by the U.S. Department of energy (DOE).[70] Outdoor water use for irrigation certainly varies with community affluence, irrigation system, or homeowner association, but such socio-economic aspects are ignored in this study.

Annual per capita wastewater volumes were regarded as annual per capita indoor water use that discharges to sewer system. The wastewater volume for HI or CI is identical because LID technologies do not change indoor water demand that is 2.9E+04 gal/yr per capita (79 gal/day per capita).

2.5 Water, Wastewater, and Stormwater Volumes of Eleven Residential Communities for Hybrid Infrastructure (HI) with Low-Impact Development (LID) Technologies

Stormwater runoff flows into CSS or SSS of CI or infiltrates into rain gardens of HI. In the case of CI with CSS, all of stormwater runoff that generated from residential communities are assumed to be treated in centralized wastewater treatment system (CWTS). For CI with SSS, stormwater runoff discharges directly into surface water bodies through separate sewer lines. Rain gardens of HI were designed in open space to collect stormwater runoff of up to a 100-yr return period rainfall intensity (7.92 in./24 hr). For rain garden design, the depth of rain gardens was 12 in.; the infiltration rate of soil media was 1.02 in./hr, and the soil layer depth was 24 in.; and, the gravel bed was 6 in. deep.[71-72] Drainage pipes were also designed to prevent rain gardens from flooding.

The irrigated open space is landscaped with native or low water use plants (i.e., xeriscaping) in order to save water use for irrigation for HI. The irrigation water demand for xeriscaped open space was assumed to reduce up to 30% of conventional irrigation (4.04 gallon/$ft^2 \cdot yr$).[73-74] Rooftop rainwater harvesting technology was designed to supply rainwater for non-potable purposes (i.e., irrigation, toilet flushing, and laundry). The rainwater harvesting potential was simulated with precipitation, rooftop size, and water loss for rooftop wetting, evaporation, and first flushing (25 gal per 1,000 ft^2 rooftop area).[75-76] Rainwater collected from rooftop goes through 5-micron sediment filter before being stored in above-ground polyethylene tanks. The rainwater is supplied for irrigation or disinfected with UV for toilet flushing and laundry purposes.[77] The space required to install the storage tanks was calculated by multiplying the bottom size of above-ground tank, ~130 ft^2 for 10,000 gallon, by the number of tanks required for each community and compared with the open space in each community.

2.6 Water, Wastewater, and Stormwater Volumes of Eleven Residential Communities with Hybrid Infrastructure of Small-Scale Greywater Reclamation System

Annual per capita water supplied from CWSS, greywater reclaimed on-site, wastewater discharged into centralized wastewater treatment system (CWTS), and stormwater runoff collected by sewer system were determined for each community. Outdoor water demand for irrigation was quantified by multiplying irrigation factor of 4.04 $gallon/ft^2 \cdot yr$ by irrigated open space size. 79 gal/day per capita was used for the indoor water demand in this study, which is composed of toilet flushing (25 gal/day per capita), laundry (20 gal/day per capita), and potable demand (35 gal/day per capita) for shower, faucet, bath, and dishwasher.[5] The indoor water demand is equal to wastewater generation. For CI, total water demand is supplied from CWSS and wastewater is treated in a CWTS. For HI, greywater is reclaimed for non-potable water demand (i.e., irrigation, toilet flushing, and laundry) and accordingly, less water is supplied from CWSS and less wastewater is discharged into CWTS as compared to CI. Annual per capita stormwater runoff volume of CI was between 1.4E+05 gal/yr per capita for R-1 and 5.8E+02 gal/yr per capita for RG-6, which was the sum of runoff volumes simulated with daily precipitations up to 3.9 in./24-hr for 2010 (44.5 in./yr) in Chapter 4 for LID technologies.[78]

In addition, water supplied by greywater reclamation and/ or rainwater harvesting was compared to total or non-potable water demand in case outdoor water demand was reduced to 30% of conventional irrigation by xeriscaping. The rainwater harvesting potential and the total or non-potable water demand was given from Chapter 4 about feasibility and life cycle assessment of low impact development (LID) technologies.[78] The harvesting potential was simulated with 2010 COA daily precipitation data of which accumulative rainfall is 44.5 in./yr. Accordingly, it was presented how much water can be saved at most for eleven residential communities.

2.7 Life Cycle Assessment (LCA)

LCA was conducted using SimaPro 7.3.3 (PRé Consultants) to determine the life cycle environmental impact of technologies, systems, and infrastructure. The software includes emission database (e.g., ecoinvent, US input output, ETH-ESU 96, etc.), impact assessment methodologies (e.g., ReCiPe, Eco-indicator 99, TRACI, etc.), and an uncertainty analysis tool. As the input data of a targeted technology or system are entered using the ecoinvent database, air, soil, and water emissions and resource depletions are inventoried. World ReCiPe midpoint and endpoint methods were used in this study. All emissions and resource depletion is characterized by eighteen impact categories (i.e., midpoint) including climate change (kg CO_2 eq), ozone depletion (kg CFC-11 eq), human toxicity (kg 1,4-DB eq), particulate matter formation (kg PM_{10} eq), terrestrial acidification (kg SO_2 eq), freshwater eutrophication (kg P eq), etc. Those impacts are counted in one of three damages for human health, ecosystem diversity, and resource availability. However, marine eutrophication and freshwater depletion impacts are not counted in damages owing to the deficiency of characterization factors in the methodology. Climate change impact is counted in two damage categories of human health and ecosystem diversity. Human health damage is measured in disability-adjusted loss of life years (DALYs) modeled by statistics of life years lost or disabled by environmental impacts such as climate change, ozone depletion, human toxicity, etc. As the change of climate, eutrophication, land use, etc. affects species diversity, ecosystem damage is measured as loss of species during a year (species·yr). The value is quantified by multiplying potentially disappeared fraction of species (PDF) during a year by total number of species estimated for terrestrial, freshwater, or marine water systems. [79]. The damage for resource availability is quantified in increased cost ($) as the additional costs society has to pay to extract resources which become rarer and more difficult to gather (e.g., mine or drill). Damage values are normalized with corresponding world average damage values on individual substances emitted or depleted, and normalized damages are weighted with 40% on human health, 40% on ecosystem diversity, and 20% on resource availability. This weighting corresponds to a hierarchical perspective determined by scientist consensus for damage inclusion.[80] As a results, a composite single score refers to % of annual world average environmental damage per capita. To use single scores is very efficient in this study because scores of each system or technology should be added to determine a LCA score for a type of infrastructure and compare multiple cases.

With regarding lognormal distribution as realistic approximation of input data uncertainty, geometric standard deviations were calculated to define data uncertainty in ecovinent. Basic uncertainty factors are about measurement errors, which took pattern from published works and depending on input or output group. For example, the basic uncertainty factor of electricity is 1.05, which is modified with assessing six data quality indicators of reliability (i.e. data verification), completeness (i.e., representativeness), temporal correlation, geographic correlation, further technological correlation, and sample size.[81] The table to determine the basic uncertainty factors and six data quality indicators are presented in APPENDIX F. Foreground data uncertainty was determined according to the way that ecoinvent database defines data uncertainty and background data uncertainty was modified on the basis of data uncertainties compiled in ecoinvent database. As the individual datasets of ecoinvent were investigated mainly under the condition of Europe, the data quality indicators of background data were modified mainly in terms of geographical correlation. Using Monte Carlo method, single score calculation was repeated within the variations of individual data. As a result, arithmetic mean, median, minimum and maximum at 95% confidence interval, and arithmetic standard deviation were determined to present the variability of LCA scores for water, wastewater, and stormwater systems.

When LCA scores are compared between different types of infrastructure, the variations of LCA scores is used to determine the probability that HI is better than CI. Given this information, stakeholders and policy makers can make better decisions for water, wastewater, or stormwater infrastructure development.

The LCA scores of CI and HI with LID technologies were recalculated with changing the following assumptions: (a) the size of irrigated open space that was 50% of open space; (b) the irrigation requirement of xeriscaped open space that was 30% of conventional irrigation (i.e., 4.04 gal/ft^2 per year); and (c) the precipitation data for 2010 (44.5 in./yr). Accordingly, the sensitivity of LCA scores was determined with ±10% of outdoor water demand for irrigation, which refers to ±10% of the size of irrigated open space or ±10% of the irrigation need for xeriscaping. And the LCA scores of CI and HI were simulated with the daily precipitation data of a drought year (2007), 34.5 in./yr, and a flood year (2009), 73.4 in./yr. flood year

Also, the sensitivity analysis was conducted to show how electricity consumption and energy sources affect LCA scores of CI and HI with small-scale greywater reclamation system. Accordingly, the LCA scores of CI and HI were recalculated for Southern California where the electricity consumption for water production (10.2 kWh/kgal) is much higher than COA (2.05 kWh/kgal), because the water has to be transported a long-distance (~2,500 miles). However, the electricity consumption for wastewater treatment (2.5 kWh/kgal) is similar to COA (3.01 kWh/kgal).[13, 82] The electricity consumption for greywater reclamation system is same for a treatment capacity in both areas. The energy sources of Southern California are composed of natural gas (53%), coal (7.5%), oil (1.5%), hydro (13%), biomass (3%), nuclear (15%), geothermal (4%), and wind (3%), which is less coal-based as compared to Georgia energy sources of coal (67%), nuclear (21%), gas (10%), and hydro (2%).[3]

CHAPTER 3

LIFE CYCLE ASSESSMENT (LCA) OF CENTRALIZED WATER, WASTWEATER, AND STORMWATER INFRASTRUCTURE IN THE CITY OF ATLANTA (COA)

This chapter was aimed at presenting life cycle environmental impacts of COA's CI, which includes water supply system, wastewater collection and treatment system, and stormwater collection system. A water balance of COA was estimated to determine water stress level for the city's existing water, wastewater, and stormwater systems. LCA scores for water supply, wastewater collection and treatment, and stormwater collection were analyzed on the basis of damage categories (i.e., human health, ecosystem diversity, and resource availability), impact categories (e.g., climate change, human toxicity, fossil fuel depletion, etc.), inputs (e.g., electricity consumption, chemical usage, construction materials, etc.), and life cycle phases of construction, operation, and decommissioning. This study suggested a reference value of CI to be compared with the HI to combine the CI with decentralized alternatives such as low impact development (LID) technologies (e.g., rain gardens, xeriscaping, rainwater harvesting, etc.) and on-site greywater reclamation technology.

3.1 Water Balance of the City of Atlanta (COA) and Water Reuse Index (WRI)

The water, wastewater, and stormwater flow rates within the boundary of COA are shown in Figure 1. The size of the city is 133.7 mi^2 (85,687 acre), in which 420,003 residents live (2010) [83] and 378,109 employees work (2009).[4] The total water demand of COA was calculated on the basis of the number of residents and employees in the city and corresponding per capita water use for indoor and outdoor.[5] Total water demand is 28 BGY (77 mgd), which is comprised of indoor use, 21 BGY (59 mgd), and outdoor irrigation, 7 BGY (18 mgd). The indoor water use was assumed to be as wastewater flow discharged to sewer system. The stormwater discharge and stormwater runoff were estimated to be 41 BGY and 34 BGY, respectively. The difference between them, 7 BGY, was regarded as infiltrated stormwater, which then recharged the Chattahoochee and the South Rivers. And the difference between the total stormwater discharge of 41 BGY and 2010 precipitation of 103 BGY (44.5 in./yr) was assumed to be evaporation and transpiration (62 BGY) as groundwater recharge was negligible due to bedrock geology of the area.[5]

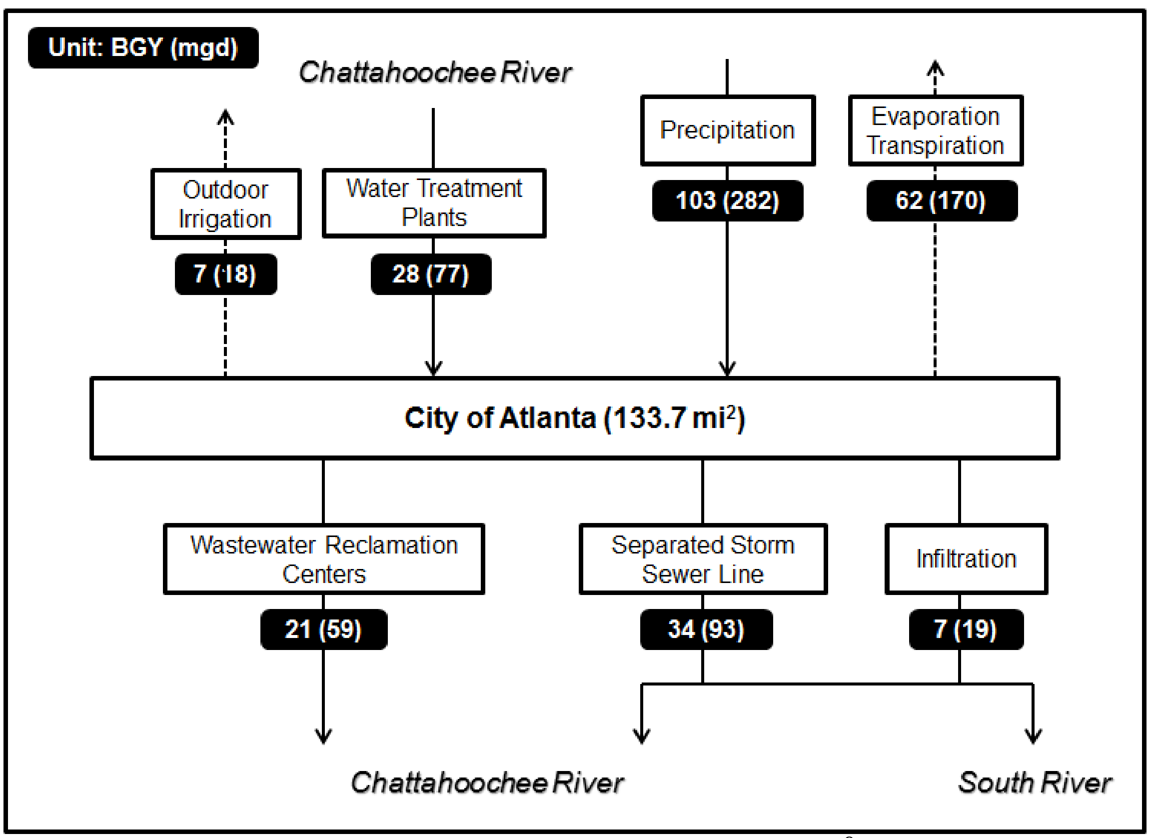

Figure 1. Water balance for the City of Atlanta (COA) (BGY: 10^9 gallon per year, mgd: 10^6 gallon per day)

Therefore, WRI of COA is 0.45 which is high stress level similar with WRI (0.42) of the Austin-Travis Lakes Watershed (1,260 mi.^{2}) and much higher than WRI (0.25) of the Middle Chattahoochee-Lake Harding Watershed (3,060 mi.^{2}). [84] The Austin-Travis Lakes Watershed has ~1/3 of COA population density (i.e., ~3,000/mi^2), and ~2/3 of COA precipitation (i.e., ~45 in./yr). [85] The Middle Chattahoochee-lake Harding watershed has similar precipitation with COA but the population densities of counties lying within the watershed is in the range between 1/50 and 1/5 of COA population density. [85]

3.2 Life Cycle Inventory and Impact Assessment

Capacities of the city's system components such as pump station, treatment plant, storage tank, etc. and average daily water and wastewater flows and annual stormwater runoff volume are presented in Table 1. End of life for each system was assumed to be 70 years for water system components and sewer pipelines and 30 years for wastewater system components except sewer pipelines.

Table 1. System components and capacities for centralized water, wastewater, and stormwater infrastructure of the city of Atlanta (COA)

System	System Component	Capacity	
Water supply [4-5, 56, 86-87]	Service area	650	$mi.^2$
	Pump station	440	mgd
	Water treatment plant capacity	246	mgd
	Average daily flow	100	mgd
	Booster pump station	148	mgd
	Storage tank	42	10^6 gallon
	Distribution pipelines	2,700	mi.
Wastewater collection and treatment [4, 55-56, 86-89]	Service area	225	$mi.^2$
	Pump station	60.5	mgd
	Sewer pipelines	2,126	mi.
	Wastewater reclamation centers (WRCs)	220	mgd
	Average daily flow	124	mgd
Stormwater collection [4, 90]	Service area	225	$mi.^2$
	Discharge	57	BGY
	Separate sewer pipelines	1,610	mi.

Water withdrawn from the Chattahoochee River is treated using coagulation/flocculation and filtration processes.[91] Aluminum sulfate is utilized as a coagulant. After filtration, some residual metals in water are precipitated as lime precipitates in clear wells. Phosphoric acid is added for pipe corrosion protection, fluoride is added for teeth protection, and sodium hypochlorite is used as a disinfectant before potable water is distributed. Advanced wastewater treatment processes were adopted in the three wastewater reclamation plants. Soluble reactive phosphorus is treated by biological nutrient removal (BNR) process and chemical precipitation. Sludge is digested anaerobically, dewatered with centrifuges, and incinerated. Approximately, 75% of the ash is used for brick manufacturing, and the rest is landfilled. Those treatment processes are presented in APPENDIX A and input data for the operation phase are organized in Table 2.The concentrations of water pollutants in stormwater runoff are also presented in Table 2. Georgia electricity mix for the year 2010 was composed of coal (67%), nuclear (21%), gas (10%), and hydro (2%) of 2010 total generation[92]. Detailed information for raw data, data sources, ecoinvent data use, etc. is presented in APPENDIX A. The concentrations of water pollutants discharged by stormwater collection system were regarded as median values of downstream water quality data for several rainfall events [58], and the water quality data were collected from 2010 water resource data of USGS (2012 website for the watersheds lying within the city.

Table 2. Operational phase input data for centralized water, wastewater, and stormwater infrastructure of the city of Atlanta (COA)

System	Unit	Input		unit
Water supply	1 kgal water	Aluminum sulfate	3.28E-01	lbs
		Sodium hypochlorite	1.47E-01	lbs
		Water for filtration bed backwashing	6.22E+01	lbs
		Lime	1.61E-01	lbs
		Phosphoric acid	7.97E+00	lbs
		Hydrofluosilicic acid	3.67E-02	lbs
		Truck transport	6.88E-02	tkm
		GA electricity	2.03E+00	kWh
		Natural gas	1.12E-01	ft^3
		Sludge sent to R.M. Clayton wastewater reclamation center (WRC)	9.27E-05	lbs
Wastewater collection and treatment	1 kgal wastewater	Ferric chloride	1.34E-01	lbs
		Caustic soda	4.55E-01	lbs
		Magnesium hydroxide	4.28E-03	lbs
		Dewatering polymer	1.67E-02	lbs
		GA electricity	3.01E+00	kWh
		Natural gas	1.88E+00	ft^3
		Truck transport	2.79E-05	tkm
		Train transport	6.88E-02	tkm
		CO_2 emission from digester gas combustion	5.15E+00	lbs as carbon
		Total phosphorus	1.5	mg/L as P
		Total nitrogen	3	Mg/L as N
		Dry sludge generation	6.42E-01	lbs
		Ash to brick	2.46E-01	lbs
		Ash to landfill	8.12E-02	lbs

Table 2. Operational phase input data for centralized water, wastewater, and stormwater infrastructure of the city of Atlanta (COA) (continued)

System	Unit	Input		unit
Stormwater collection [90]	Water pollutant concentration*	Phosphate	1.14E+00	mg/L
		Manganese	5.07E-02	mg/L
		Molybdenum	6.10E-04	mg/L
		Zinc, ion	1.20E-02	mg/L
		Lead	7.37E-04	mg/L
		Nickel, ion	1.42E-03	mg/L
		Silver, ion	1.20E-05	mg/L
		Cadmium, ion	3.26E-06	mg/L
		Chromium, ion	5.49E-03	mg/L

*Water pollutants listed in the table were only for the pollutants that contributed to LCA scores, and all the pollutant concentrations were provided in APPENDIX A.

Annual per capita water and wastewater volumes and the city's annual stormwater runoff volume divided by the city's population were used as the functional units: (1) 39 kgal/yr per capita for water supply system, (2) 29 kgal/yr per capita for wastewater collection and treatment system, and (3) 81 kgal/yr per capita for stormwater collection system (i.e. SSS). Annual per capita water supply of 39 kgal includes 29 kgal of indoor use and 10 kgal of outdoor irrigation. The impact, damage, and single–score values of the city's centralized infrastructure were evaluated using World ReCiPe midpoint and endpoint methodologies.

According to World ReCiPe midpoint method, eighteen impact categories were evaluated and the contributions of inputs to the individual impacts were plotted in Figure 2. For better understanding, the inputs were categorized as construction, electricity, chemicals, etc. that contributed at least 5% of each impact. As it turns out in this study, major impacts that influence damage and single score values are climate change, human toxicity, particulate matter, and fossil fuel depletion impacts. The electricity consumption of water and wastewater systems contributes 28% (water: 13% and wastewater: 15%) of the climate change impact. CO_2 emission from combustion of sludge-digester gas corresponds to 48% of the impact. Also, the electricity consumption of water and wastewater systems contributes 38% (water: 18% and wastewater: 20%) of human toxicity impact and trace metals in particulate matter or bottom ash of coal-fired electricity generation cause human toxicity [93]. The electricity consumption causes 47% (water: 22% and wastewater: 25%) of particulate matter formation impact as flue gas of coal fired-plants includes particulate matter [93]. Also, 56% (water: 27% and wastewater 29%) of fossil fuel depletion impact (68 kg oil eq) corresponds to the electricity consumption because ~77% GA electricity generation is from fossil fuels (coal: 67% and natural gas: 10%).

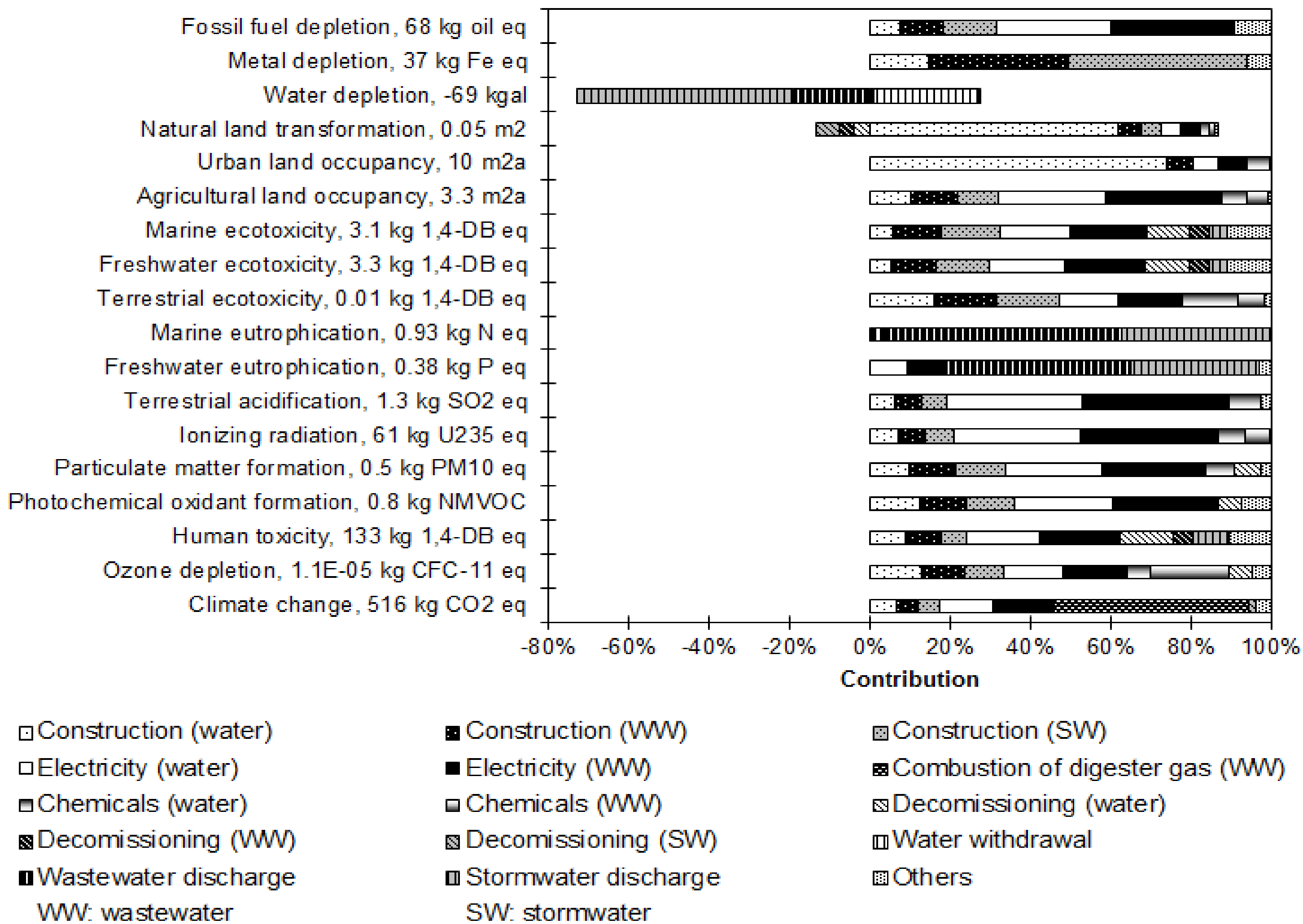

Figure 2. Contributions of input and output data to individual impacts

The electricity consumption of water and wastewater systems contributes at least up to ~30% of the impacts of photochemical oxidant formation, ionizing radiation, terrestrial acidification, terrestrial, marine, and freshwater ecotoxicity, and agricultural land occupation as shown in Figure 2. Ozone depletion impact results mainly from the chemicals used for wastewater treatment (e.g., iron chloride). Wastewater effluent and stormwater runoff contributed 43% and 30% of the freshwater eutrophication impact, respectively. They also contributed 58% and 37% of the marine eutrophication impact in that order. Even though freshwater and marine eutrophication impacts are critical indicators to evaluate water infrastructure, those impacts are of little importance for damage and single score values. This issue is a limitation of World ReCiPe method that characterizes all emissions and resource depletion with environmental mechanisms of global scope while eutrophication impact depends on regional condition. In addition to eutrophication impact, the impacts of acidification, photochemical ozone formation, toxicity, and land use also depend on a regional condition. Urban and natural land is used mainly in order to construct water supply system. The decommissioning process of water, wastewater, or stormwater system results in minus contribution to natural land transformation impact, which refers to natural land restoration and conservation. The water depletion impact is around -69 kgal, which is close to the difference between water (39 kgal) withdrawal and wastewater (29 kgal) and stormwater (81 kgal) discharge. The metal depletion impact is caused primarily by construction of wastewater collection and treatment system and stormwater collection system owing to sewer pipeline.

All the emissions and depletion were also characterized into damage values of human health, ecosystem, and resource as shown in Table 3. It should be remarked that climate change impact is counted to human health and ecosystem and marine eutrophication and water depletion impacts are excluded. Instead, we evaluated water depletion impact using WRI, but marine eutrophication impact which can be critical to evaluate water infrastructure is but still overlooked. Human health damage is 9.36E-04 DALYs, ecosystem damage is 4.45E-06 species·yr, and resource damage is $1.09E+03. As it was converted into single scores, the human health, ecosystem, and resource damages occupy 70%, 5%, and 25% of the total single score of 3.97%, respectively. The LCA score of wastewater system (2.36%) is greater than water (1.22%) or stormwater (0.392%) system in spite of smaller flow volume. It has a great impact because electricity consumption for 1 kgal wastewater collection and treatment (3.0 kWh/kgal) is greater than water system (2.0 kWh/kgal) and wastewater system involves the direct air emission of CO_2 from digester gas combustion. The score for the stormwater collection system is 0.392%, which is caused by the separate pipeline construction and the water pollutants emitted directly to the river (Table 3).

Table 3. Human health, ecosystem, and resource damage values and single scores

	Human health (DALY)	Ecosystem (species·yr)	Resource ($)	Single score (%)
Water supply	2.57E-04	1.2E-06	440	1.22
Wastewater collection and treatment	5.99E-04	2.96E-06	498	2.36
Stormwater collection	8.06E-05	2.91E-07	155	0.392
Sum of damage	9.36E-04	4.45E-06	1.09E+03	
Single score (%)	2.78	0.21	0.99	3.97

As the contributions to single score 3.97 % was analyzed depending on impact categories, systems of water, wastewater, and stormwater, and damages of human health, ecosystem, and resources, which is presented in Table 4. As climate change, human toxicity, particulate matter formation, and fossil fuel depletion impacts are the major contributorsto the LCA score (3.97%). Climate change impact causes human health damage and ecosystem damage that contributes 54% and 5% of the LCA score. And human toxicity, particulate matter formation, and fossil fuel depletion correspond to 7%, 9%, and 25%, respectively.

Table 4. LCA scores of water supply, wastewater collection and treatment, and stormwater collection systems depending on impact and damage categories

Damage	Impact	LCA score, % of annual world average environmental load per capita				Contri-bution, %
		Water	Wastewater	Stormwater	Total	
Human health	Climate change	4.81E-01	1.52E+00	1.45E-01	2.14E+00	54%
	Ozone depletion	2.92E-05	4.43E-05	1.07E-05	8.42E-05	-
	Human toxicity	1.23E-01	1.11E-01	4.23E-02	2.77E-01	7%
	Photochemical oxidant formation	3.94E-05	3.72E-05	1.27E-05	8.93E-05	-
	Particulate matter formation	1.56E-01	1.45E-01	5.16E-02	3.53E-01	9%
	Ionizing radiation	1.35E-03	1.38E-03	2.19E-04	2.94E-03	-
	Subtotal	7.61E-01	1.78E+00	2.39E-01	2.78E+00	70%
Ecosystem diversity	Climate change	4.28E-02	1.35E-01	1.29E-02	1.91E-01	5%
	Terrestrial acidification	1.66E-04	1.54E-04	2.46E-05	3.44E-04	-
	Freshwater eutrophication	9.70E-05	1.02E-04	2.48E-04	4.48E-04	-
	Terrestrial ecotoxicity	3.54E-05	3.08E-05	1.27E-05	7.89E-05	-
	Freshwater ecotoxicity	1.48E-05	1.66E-05	8.07E-06	3.95E-05	-
	Marine ecotoxicity	4.29E-08	4.86E-08	2.49E-08	1.16E-07	-
	Agricultural land occupation	7.65E-04	7.95E-04	1.97E-04	1.76E-03	-
	Urban land occupation	7.52E-03	1.35E-03	2.96E-04	9.16E-03	-
	Natural land transformation	4.30E-03	4.23E-04	-1.06E-04	4.62E-03	-
	Subtotal	5.57E-02	1.38E-01	1.36E-02	2.07E-01	5%
Resource availability	Metal depletion	4.34E-04	9.14E-04	1.05E-03	2.40E-03	-
	Fossil fuel depletion	3.98E-01	4.50E-01	1.39E-01	9.86E-01	25%
	Subtotal	3.98E-01	4.51E-01	1.40E-01	9.89E-01	25%
Total		1.22E+00	2.36E+00	3.92E-01	3.97E+00	100%

Climate change related to human health damage is the most important as 54% of the total score and it is also significant in each system as 40% of water system LCA score, 64% of wastewater system LCA score, and 37% of stormwater system LCA score. Climate change, human toxicity, and particulate matter formation impacts contributes 77%, 10%, and 13%, respectively, to the score of human health damage. Climate change impact also corresponds to 100% of ecosystem damage as the other impacts related to the ecosystem damage are negligible. Fossil fuel depletion impact corresponds to 100% of resource damage.

38% of the impact on climate change is caused by the electricity consumption of water and wastewater systems and 48% of the impact is caused by combustion of digester gas (Figure 2). Accordingly, electricity consumption and digester gas combustion contribute 38% and 28% of the total score. In the same way, the construction of water, wastewater, and stormwater systems causes ~7% each. Even though stormwater collection system does not include treatment plants, its construction phase is significant as much as water and wastewater system construction as the functional unit for the stormwater collection system (81 kgal/capita·yr) is larger than the water or wastewater system and the collection pipelines are used to transport intermittent and inconsistent stormwater runoff flows.

As electricity consumption was a major contributor, water spent on the electricity produced in Georgia power plants was estimated. The electricity consumption is 78 kWh for annual per capita water supply (39 kgal) and 93 kWh for annual per capita wastewater collection and treatment (29 kgal). Water consumption for the electricity usage is approximately 0.3 kgal according to evaporative water loss of the GA energy mix, ~1.65

gal/kWh [94]. The amount of water is negligible as compared to annual per capita consumptive water use for outdoor irrigation (10 kgal/yr).

The LCA scores were also analyzed depending on three phases of life cycle in Figure 3. Operation phase contributes 72% of the score for the city's centralized water, wastewater and stormwater infrastructure primarily because of electricity consumption and digester gas combustion. The operational phase is 68% of the LCA score for water supply system and 85% of the LCA score for wastewater collection and treatment system. However, the operational phase of stormwater collection system (i.e., SSS) is not significant as water pollutants discharged in the phase contribute less than 1% of the total LCA score and 6% of the LCA score of stormwater system. Therefore, even though the stormwater runoff volume and the associated water pollutant concentrations fluctuate with precipitation, the change of LCA scores will be slight. The construction phase corresponds to ~22% of the total score (3.97%) and, for water or wastewater system, the construction phase is 24% of the water LCA score and 12% of the wastewater LCA score. For the stormwater collection system, the construction phase for pipelines is 78% because the stormwater collection system does not consume electricity in the operational phase and the pipe network is a significant investment in terms of material and construction. For the same reasons, the decommissioning phase is 16% of the LCA score for stormwater collection system, while it is 8% for water system and 3% for wastewater system. In total, the decommissioning phase corresponds to ~6% of the total LCA score (3.97%).

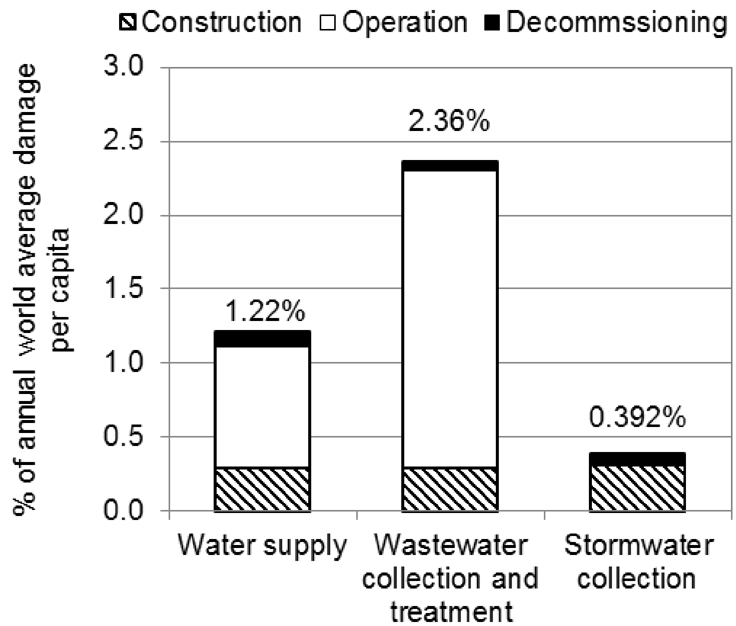

Figure 3. LCA scores of three phases (construction, operation, and decommissioning) for water, wastewater, and stormwater systems

3.3 Uncertainty Test

The LCA scores (i.e., 1.22% for water, 2.36% for wastewater, and 0.392% for stormwater) were estimated using input data collected for COA and the scores are regarded as deterministic mean values. As a result of Monte Carlo simulation, arithmetic mean, median, minimum and maximum at 95% confidence interval, and arithmetic standard deviation of LCA scores are determined as shown in Table 5.

Table 5. Variability of LCA scores for centralized water, wastewater, and stormwater systems

	Mean/median	Minimum (2.5%)	Maximum (97.5%)	SD (standard deviation)	Standard error of mean
Water supply system	1.21/1.09	0.808	2.41	0.465	0.000999
Wastewater collection and treatment system	2.38/2.24	1.88	3.78	0.617	0.000999
Stormwater collection system	0.390/0.337	0.149	0.942	0.213	0.00100

When LCA scores are compared between different types of infrastructure, the ranges of LCA scores can be used to determine the probability that one option is better than the other option. Given this information, stakeholders and policy makers can make better decisions for water, wastewater, or stormwater infrastructure development.

CHAPTER 4

FEASIBILITY AND LIFE CYCLE ASSESSMENT (LCA) OF LOW-IMPACT DEVELOPMENT (LID) TECHNOLOGIES FOR RESIDENTIAL COMMUNITIES WITH A VARIETY OF POPULATION DENSITIES

Stormwater runoff is controlled using rain gardens. Outdoor water demand for irrigation is reduced by xeriscaping in which native or low water use plants are used. Rainwater harvested from rooftop or building top is used for non-potable purposes (i.e., irrigation, toilet flushing, and laundry). Even though these LID technologies are implemented, CI is still need for potable water supply and wastewater treatment. Therefore, hybrid infrastructure (HI) is proposed to combine the LID technologies with centralized water, wastewater, and stormwater infrastructure. I considered two centralized wastewater collection systems: (1) combined sewer system (CSS), and (2) separate sewer system (SSS). Using WRIs and LCA scores, the life cycle environmental impacts of HI were compared to CI for eleven residential communities with different land uses and population densities. Accordingly, stormwater runoff, water demand, and rainwater harvesting potential varied depending on communities and it was evaluated how much the HI reduced the life cycle environmental impacts of CI for different land uses and population densities.

4.1 Land Uses and Population Densities of Eleven Residential Communities

Land use percentages of rooftop or building top area, paved area (i.e., parking space, driveways, walkways, streets, and sidewalks), irrigated open space, and indigenous open space are presented in Figure 4 depending on zoning code and population density for the eleven residential communities. As physical footprint of a single-family house decreases from 19,400 ft^2 for R-1 to 2,750 ft^2 for R-5, the number of house increases from 4.8 for R-1 to 51.2 for R-5 in 10 acres. Rooftop area increases from 21% for R-1 to 32% for R-5 of the community size and the population increases from 16 people for R-1 to 169 people for R-5 in 10 acres, respectively. Paved area for residents' travel also expands from 9% for R-1 to 28% for R-5 of the community size. However, the open space decreases from 70% for R-1 to 40% for R-5 and the open space is divided equally into indigenous open space and irrigated open space. For multi-family residential communities, the total building floor area increases dramatically from 16% for RG-1 to 640% for RG-6 of the community size (10 acres), the building top area increases from 8% for RG-1 to 26% for RG-6 and the building story increases from 2 floors for RG-1 to 25 floors for RG-6. Population increases from 147 people for RG-1 to 5,808 people for RG-6 in 10 acres and paved area increases from 24% for RG-1 to 41% for RG-6. Open space is reduced from 67% for RG-1 to 33% for RG-6 of the community size (10 acres) and it is divided equally between irrigated open space and indigenous open space.

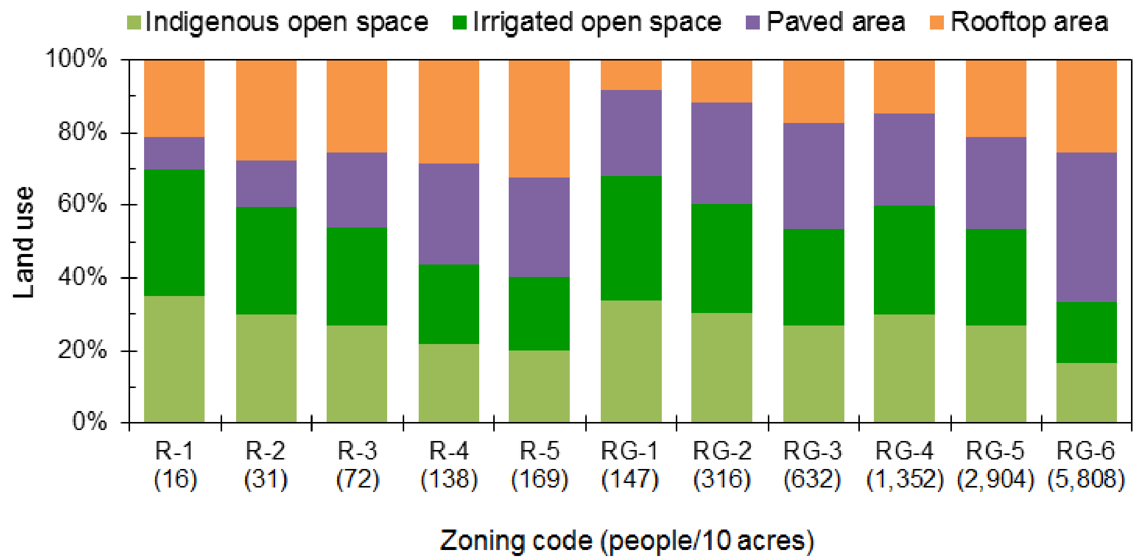

Figure 4. Land use and population density of eleven residential communities

4.2 Stormwater Runoff Control

The cumulative stormwater runoff volume for 2010 was plotted for each community in Figure 5, which is in case the LID technologies were not implemented. For the single-family residential communities, the ISA is between 30% for R-1 and 60% for R-5 and the runoff volume is between 8 in./yr for R-1 and 12 in./yr for R-5. For multi-family residential communities, ISA increases from 32% for RG-1 to 67% for RG-6 and the runoff volume increases from 8.5 in./yr for RG-1 to 12.5 in./yr for RG-6. Therefore, annual per capita stormwater runoff volume is between 578 gal/yr per capita for RG-6 and 1.36E+05 gal/yr per capita for R-1 and the runoff flows into CSS or SSS of CI.

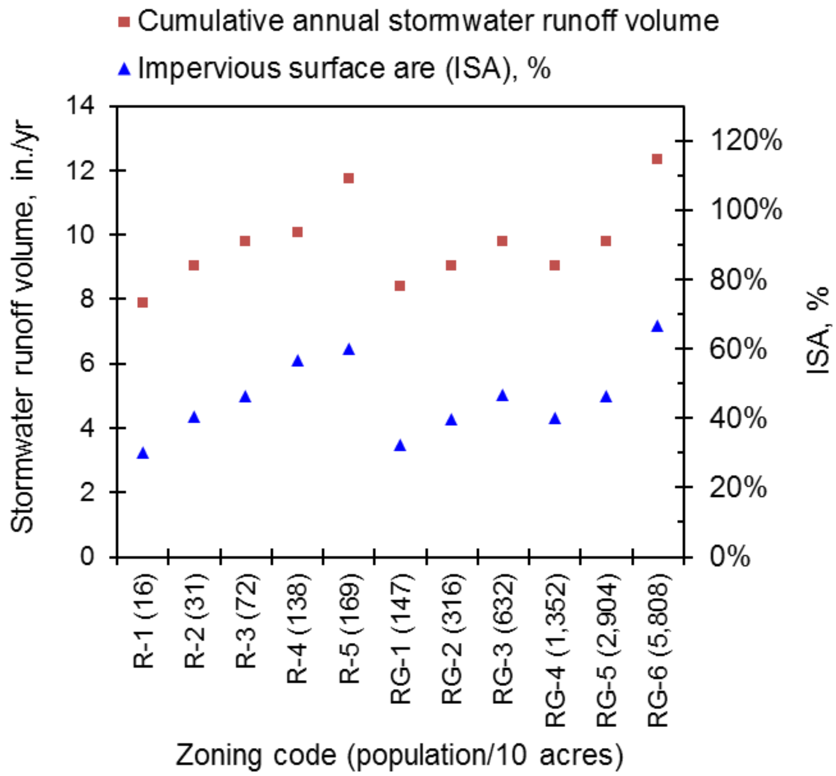

Figure 5. Impervious surface area (ISA) and 2010 accumulative stormwater runoff volume without LID of eleven residential communities

For HI, stormwater runoff infiltrates into rain gardens that are designed to control runoff of up to the 100-yr return period rainfall intensity (7.92 in./24 hr) that is between 6.5 in./24 hr for R-1 and 7.1 in./24 hr for RG-6. Accordingly, the rain garden size is between 20% (i.e., 87,500 ft^2) for R-1 and 22% (95,500 ft^2) for RG-6 of the community size (10 acres), which corresponds to between 29% of the open space for R-1 and 67% of open space for RG-6 community. Therefore, theoretical annual per capita rain garden size is between 0.329 ft^2 for RG-6 and 111 ft^2 for R-1. Stormwater runoff volumes and rain garden sizes for each community and infrastructure type are presented in APPENDIX C.

4.3 Water Demand and Rainwater Harvesting

Annual per capita indoor and outdoor water demand and water supplied from CWSS or rooftop rainwater harvesting are presented in Table 6. Indoor water demand is equal to wastewater generation and remains at 28,800 gal/yr per capita regardless of infrastructure or community types. Per capita size of irrigated open space decreases from 9,655 ft^2 for R-1 to 517 ft^2 for R-5 for single-family residential communities and from 1,006 ft^2 for RG-1 to 13 ft^2 for RG-6 for multi-family residential communities. Accordingly, per capita outdoor water demand for irrigation also decreases from 39,000 gal/yr for R-1 to 2,090 gal/yr for R-5 and from 4,060 gal/yr for RG-1 to 51 gal/yr·for RG-6. The outdoor water demand of HI reduces to 30% of the outdoor water demand of CI because of xeriscaping.

Table 6. Annual per capita indoor and outdoor water demand and supply for eleven residential communities (unit: gal/yr per capita)

Community	Indoor water demand for CI and HI	CI		HI		
		Outdoor water demand for irrigation	Water supplied by CWSS	Outdoor water demand for irrigation	Water supplied by CWSS	Water supplied by rainwater harvesting
R-1	2.88E+04	3.90E+04	6.78E+04	1.17E+04	1.24E+04	2.81E+04
R-2	2.88E+04	1.70E+04	4.58E+04	5.10E+03	1.24E+04	2.15E+04
R-3	2.88E+04	6.60E+03	3.54E+04	1.98E+03	1.24E+04	1.84E+04
R-4	2.88E+04	2.78E+03	3.16E+04	8.33E+02	1.24E+04	1.73E+04
R-5	2.88E+04	2.09E+03	3.09E+04	6.26E+02	1.24E+04	1.71E+04
RG-1	2.88E+04	4.06E+03	3.29E+04	1.22E+03	2.41E+04	5.96E+03
RG-2	2.88E+04	1.68E+03	3.05E+04	5.05E+02	2.54E+04	3.98E+03
RG-3	2.88E+04	7.47E+02	2.96E+04	2.24E+02	2.61E+04	2.98E+03
RG-4	2.88E+04	3.91E+02	2.92E+04	1.17E+02	2.78E+04	1.19E+03
RG-5	2.88E+04	1.63E+02	2.90E+04	4.88E+01	2.81E+04	7.94E+02
RG-6	2.88E+04	5.06E+01	2.89E+04	1.52E+01	2.84E+04	4.77E+02

For single-family residential communities, rooftop rainwater harvesting is greater than non-potable water demand and all of non-potable water demand is met by rainwater, which is between 60% for R-5 and 70% for R-1 of total water demand. For HI, potable demand is supplied from CWSS. For multi-family residential communities, as building top area expands from 8% for RG-1 to 26% for RG-6 of community size, total rainwater harvesting potential of community increases from 8.77E+05 gal/yr for RG-1 to 2.77E+06 gal/yr for RG-6 as shown in Figure 6. However, the total water demand of community increases dramatically from 4.42E+06 gal/yr for RG-1 to 1.68E+08 gal/yr for RG-6 because of the dramatic population increase. Therefore, the rainwater harvesting satisfies between 2% for RG-6 and 20% for RG-1 of total water demand as shown in Figure 6, while non-potable water demand is ~60% is of total water demand. Therefore, most water demand between 80% for RG-1 and 98% for RG-6 must be supplied from CWSS for multi-family residential communities. This is because per capita building top area between 19 ft^2 for RG-6 and 240 ft^2 for RG-1 is much smaller than per capita rooftop area of single-family house, which is between 833 ft^2 for R-5 and 5,879 ft^2 for R-1. Meanwhile, for RG-6 community which has the smallest open space and needs the maximum number of rainwater storage tanks (64), the space required to install the tanks is ~2% of community size (10 acres) and ~5% of the open space. Accordingly, space availability does not limit the installation of storage tanks.

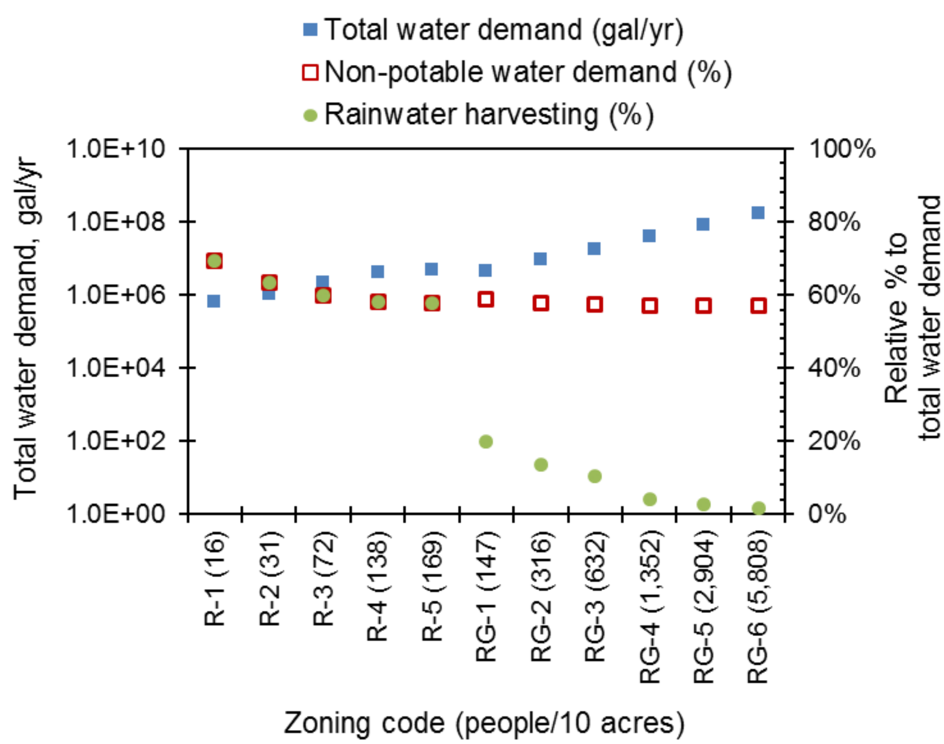

Figure 6. Rooftop rainwater harvesting potential and non-potable water demand compared to total water demand of eleven residential communities

4.4 Water Reuse Index (WRI)

The WRI for each infrastructure and community type is presented in Figure 7. WRIs for both infrastructure types increase as water demand increase with population density. As water demand is reduced by xeriscaping and rainwater use, the HI reduces the WRIs of CI by ~34% similar for the five single-family residential communities. The HI reduces the WRIs of CI by between 1% for RG-6 and 15% for RG-1 as the reduction weakens because water supplied by the rainwater harvesting decreases and outdoor water demand reduced by xeriscaping is small.

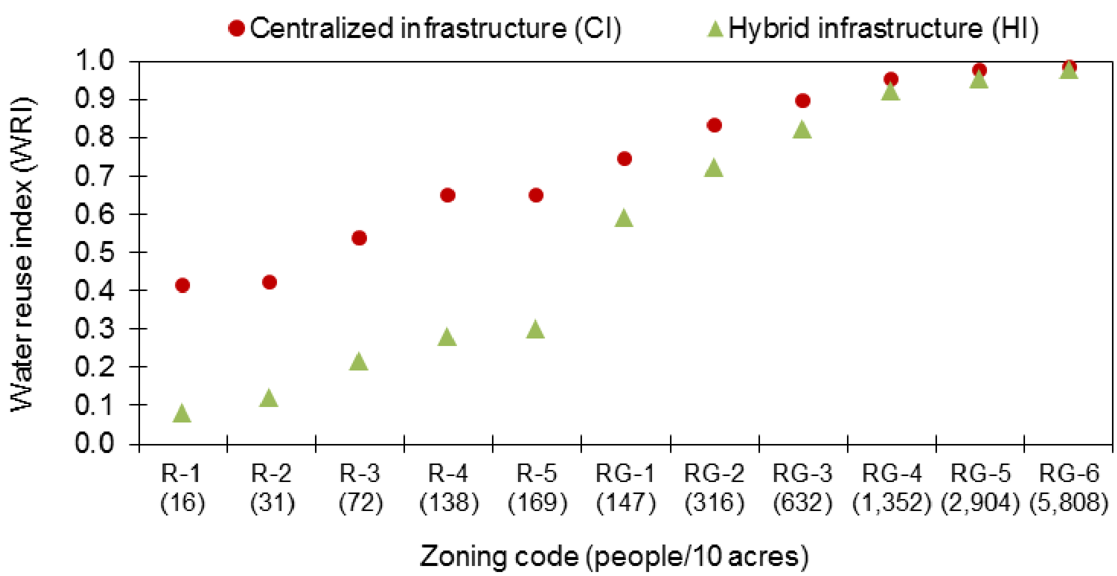

Figure 7. Water reuse index (WRI) of eleven residential communities relying on centralized infrastructure (CI) or hybrid infrastructure (HI)

It is natural that WRI increases as population and subsequent water demand increases from R-1 to RG-6 community. WRI is generally measured for a region that is composed of residential, commercial, agricultural, or industrial area, transport infrastructure, undeveloped area, etc. The WRI of COA was 0.45 because water demand was 28 billion gallon per year (BGY) and wastewater and stormwater discharge was 21

BGY and 41 BGY, respectively.[95] Residential water demand is 15 BGY and the rest (i.e., 13 BGY) is for commercial demand. The water demand for single-family houses is 10.5 BGY that includes the outdoor water demand of 2.8 BGY and the water demand for multi-family houses is 4.5 BGY that includes the outdoor water demand of 0.5 BGY. Those values were estimated from the number of residents and employees[4] and per capita indoor and outdoor water demand.[5] Xeriscaping saves 70% of outdoor water demand. It was calculated that, on average, 62% and 9% of water demand was supplied by rainwater for single-family residential communities and multi-family residential communities, respectively. Therefore, water supplied from CWSS is 3.2 BGY for single-family houses and 3.7 BGY for multi-family houses. Return flow does not change as 21 BGY and stormwater discharge is estimated 35.3 BGY by subtracting harvested rainwater of 5.7 BGY form the stormwater discharge (i.e., 41 BGY). Accordingly, the WRI can be improved from 0.45 to 0.12 which is the low level of water stress.

4.5 Life Cycle Assessment (LCA) Scores

The LCA scores of centralized water, wastewater, and storwmater (i.e., SSS) systems are 3.11E-05%, 8.20E-05%, and 4.85E-06% per gallon, respectively, which were estimated in Chapter 3[95]. The LCA score of rain garden is 1.11E-02% per ft^2, the LCA scores of rooftop rainwater harvesting technology are between 1.84E-05% for R-1 and 3.52E-05% for RG-6 per gallon, and all of them are presented in APPENDIX D. On the basis of water, stormwater, wastewater, and rainwater volumes and rain garden size calculated for each community, the LCA scores of each infrastructure were determined for eleven residential communities, which are presented in APPENDIX D. As an example, the LCA scores for the least dense community and the densest community of single-family and multi-family residential communities are presented in Figure 8.

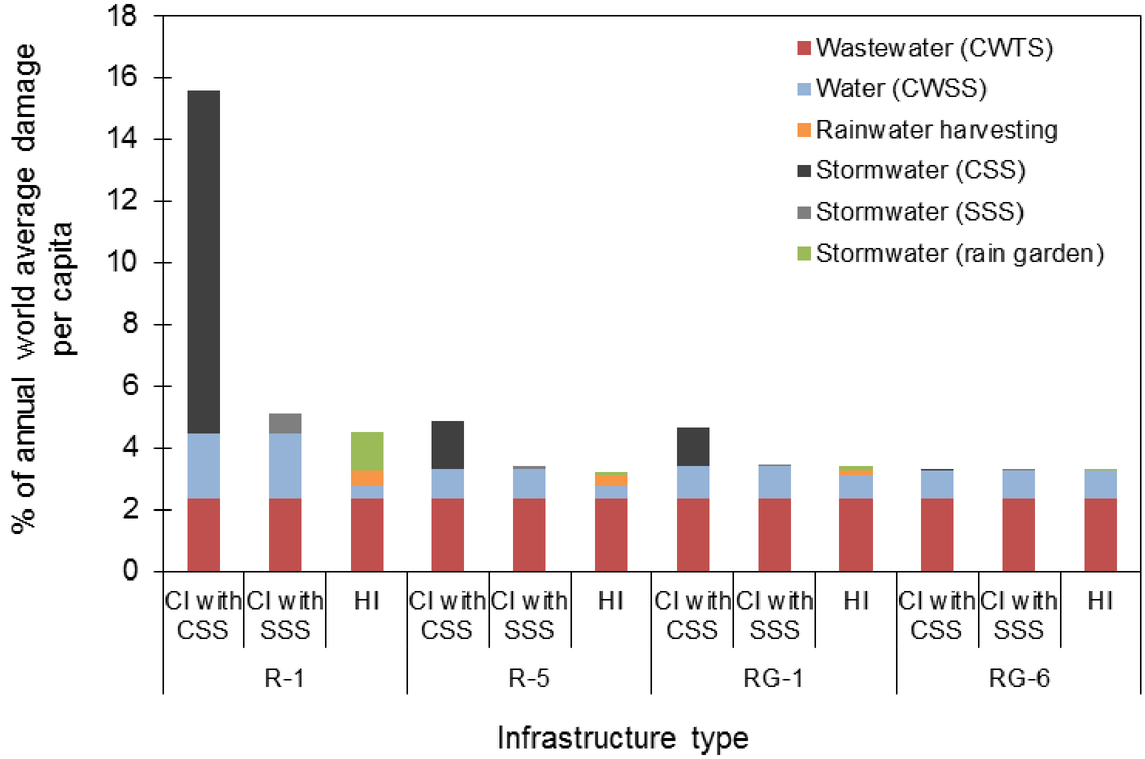

Figure 8. Life cycle assessment (LCA) scores of centralized infrastructure (CI) and hybrid infrastructure (HI) in R-1 and R-5 single-family residential communities and RG-1 and RG-6 multi-family residential communities. (CWTS: centralized wastewater treatment system; CWSS: centralized water supply system; CSS: combined sewer system; and SSS: separate sewer system)

For eleven residential communities, as population density increases from 16 people for R-1 to 5,808 people for RG-6 in 10 acres, the LCA score of CI with CSS decreases by 79% from 15.6% for R-1 to 9% for RG-6 and the score of CI with SSS decreases by 36% from 5.1% for R-1 to 3.3% for RG-6. The reduction is because per capita stormwater runoff and outdoor water demand for irrigation decreases as more people share a same size of community (10 acres). Accordingly, as population density increases, the LCA score of CI is dominated by per capita indoor water demand supplied from CWSS and wastewater treated in CWTS. The LCA score of HI also decreases by 27% from 4.5% for R-1 to 3.3% for RG-6 as population density increases. This reduction occurs because per capita rain garden size and irrigation for xeriscaped open space decreases as population density increases. However, as per capita rainwater use decreases from 70% of water demand for R-1 to 2% for RG-6, water supplied from CWSS increases. Accordingly, as population density increases, the LCA score of HI is also dominated by per capita indoor water demand supplied from CWSS and wastewater treated in CWTS. Therefore, LCA score of HI converges toward the LCA score of CI as population increases. In other words, HI reduces the LCA score of CI and the reduction decreases from 71% for R-1 to 1% for RG-6 in case CI includes CSS and from 12% for R-1 to 0% for RG-6 in case CI includes SSS.

However, there is an exception caused by the difference of residential type. Even though a little more people live in R-5 (169 people/10 acres) than RG-1 (147 people/10 acres), the LCA score reduction from CI to HI is greater in R-5 (34%) than RG-1 (27%) in case CI includes CSS. Also, the reduction is 6% for R-5, which is greater than 2% for RG-1 in case CI includes SSS. The difference is because rooftop rainwater harvesting technology supplies 58% of water demand (i.e., 100% of non-potable water demand) for R-5, while it is only 20% of water demand (i.e., 66% of non-potable water demand) for RG-1. In other words, it is because per capita rooftop area is greater in single-family house of R-5, 833 ft^2, than multi-family apartment building of RG-1, 240 ft^2.

This study is the first step to simulate the feasibility of LID technologies on the basis of CI and evaluate life cycle environmental impacts for a variety of residential communities and population densities. Accordingly, this study provides a baseline to simulate stormwater runoff controlled or water saved by the LID technologies depending on land use and population density. This will provide useful information for policy makers or community developers.

4.6 Uncertainty Test and Sensitivity Analysis

The probability that HI results in LCA scores less than the CI is presented in APPENDIX D for eleven residential communities. The probability was 1 for all the communities in case HI is compared to CI with CSS. In case HI is compared to CI with

SSS, the probability decreases from 1 for R-1 to 0.25 for RG-6 because the LCA score of HI converges toward the LCA score of the CI as population density increases. The probabilities are presented in APPENDIX D for all the communities.

The sensitivity analysis of LCA scores was conducted with ±10% of outdoor water demand for irrigation. For R-1 community where has the largest irrigated open space, the variations of LCA scores are ±0.8%, ±2.4%, and ±0.5% for CI with CSS, CI with SSS, and HI, respectively. Such variation weakens as population density increases because per capita irrigated open space decreases from 9,655 (R-1) to 13 (RG-6) ft^2/capita. Accordingly, the variation of LCA score is within ±2.4% for ±10% of outdoor water demand for irrigation in all residential communities. The variations of LCA scores are presented in APPENDIX D for all the communities.

The sensitivity analysis was also conducted with daily precipitation data of a drought year (2007, 34.5 in./yr) and a flood year (2009, 73.5 in./yr). The water volume supplied by CWSS or rooftop rainwater harvesting and the stormwater runoff volume collected by CSS or SSS changes according to the precipitation data. Accordingly, the LCA scores of CI and HI were changed and compared to the LCA scores of 2010, which are presented in the SI. Stormwater runoff volume influences the LCA score of CI. The change of LCA score is maximized in the R-1 where per captia stormwater runoff volume is greater than any other communities. The LCA score of CI with CSS for R-1 increases by 103% for the flood year and decreases by 43.5% for the drought year. The LCA score of CI with SSS for R-1 increases by 18% for the flood year and decreases by 7.8% for the drought year. The changes of LCA scores decrease up to 0% because the change of per capita stormwater runoff is close to 0 gal/yr due to population increase. For HI, the rain gardens designed for a 100-year return period rainfall intensity (i.e., 7.92 in./24 hr) can control all the stormwater runoff of 2009 because its maximum rainfall intensity is 4.5 in./24 hr and therefore, the LCA score of rain gardens is identical for 2007, 2009, and 2010. However, the rainwater harvesting potential influences the LCA score of HI. For

R-1, R-2, and R-3 communities, all of non-potable water demand is satisfied even in the drought year, which is same with 2009 and 2010. For the rest communities, even though harvested rainwater was larger for the flood year or less for the drought year, the change of LCA score of HI is less than 1 % as compared to the LCA score of HI for 2010. This small change is because per capita harvested rainwater volume changes little as the population density increases. The differences between the LCA scores of the flood or drought year and the LCA scores of 2010 are presented in APPENDIX D.

CHAPTER 5

FEASIBILITY AND LIFE CYCLE ASSESSMENT (LCA) OF SMALL-SCALE GREYWATER RECLAMATION SYSTEM FOR RESIDENTIAL COMMUNITIES WITH A VARIETY OF POPULATION DENSITIES

The feasibility and life cycle environmental impacts of on-site and small-scale greywater reclamation system were evaluated for 11 residential communities with a variety of population densities between15.8 and 5,808 people in 10 acres. Greywater is reclaimed using screening, submerged MBR, and UV disinfection and used for non-potable purposes (i.e., irrigation, toilet flushing, and laundry). HI is proposed to combine the reclamation system with CI because CI is required to supply potable water and control stormwater. The HI was compared to CI using WRIs and LCA scores for eleven residential communities.

5.1 Water demand, greywater reclamation, and wastewater generation

Annual per capita water distributed from CWSS, greywater reclaimed by MBR on site, wastewater discharged to CWTS, and stormwater runoff collected by SSS is presented in Figure 9 for eleven residential communities.

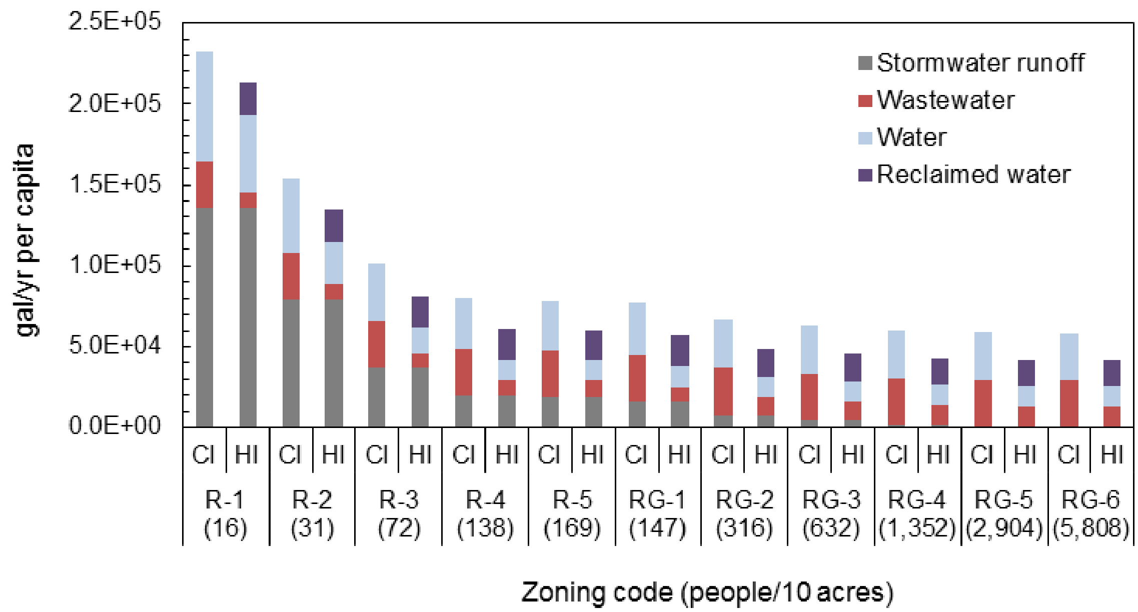

Figure 9. Annual per capita volumes of water, wastewater, reclaimed water, and stormwater runoff for centralized infrastructure (CI) and hybrid infrastructure (HI) in eleven residential communities

Outdoor water demand for open space irrigation decreases from 3.90E+04 gal/yr per capita for R-1 to 5.06E+01 gal/yr per capita for RG-6 as irrigated open space decreases from 9,655 ft^2/capita for R-1 to 13 ft^2/capita for RG-6. Accordingly, annual per capita water demand decreases from 6.78E+04 gal/yr per capita for R-1 to 2.89E+04 gal/yr per capita for RG-6 and non-potable water demand decreases from 1.90E+04 gal/yr per capita for R-1 to 1.65E+04 gal/yr per capita for RG-6. For CI, the water is provided by CWSS and wastewater flow rate is identical for all cases (equivalent to indoor water use is treated by CWTS).

For HI, greywater generation is constant (i.e. 1.97E+04 gal/yr per capita) regardless of community type. For R-1, R-2, and R-3 communities, the non-potable water demand is greater than greywater generation because the water demand for irrigation is larger for these communities. Consequently, all of greywater should be reclaimed for these communities and additional potable water must be supplied from CWSS for non-potable use. For the other communities, the non-potable water demand is less than what could be supplied using greywater; consequently, the greywater flow rate that is reclaimed should be that which is required for non-potable water demand. And potable water should be supplied from CWSS. Accordingly, the remaining untreated greywater flow rate is conveyed to CWTS with the blackwater. Wastewater sent to CWTS increases from 9.63E+03 gal/yr per capita for R-4 to 1.24E+04 gal/yr per capita for RG-6 as the non-potable water demand decreases from 1.92E+04 gal/yr per capita for R-4 to 1.65E+04 gal/yr per capita for RG-6 which is equivalent to reclaimed water production. Stormwater runoff volumes collected by SSS are same for a community regardless of infrastructure type. The stormwater runoff volume is presented in Figure 9 on a per capita basis and decreases as the population density increases.

Water supplied by greywater reclamation and/or rainwater harvesting and non-potable water demand is compared to total water demand in Figure 10 for the eleven residential communities. It should be noted that the total and non-potable water demand was in case outdoor water demand was reduced to 30% of conventional irrigation.

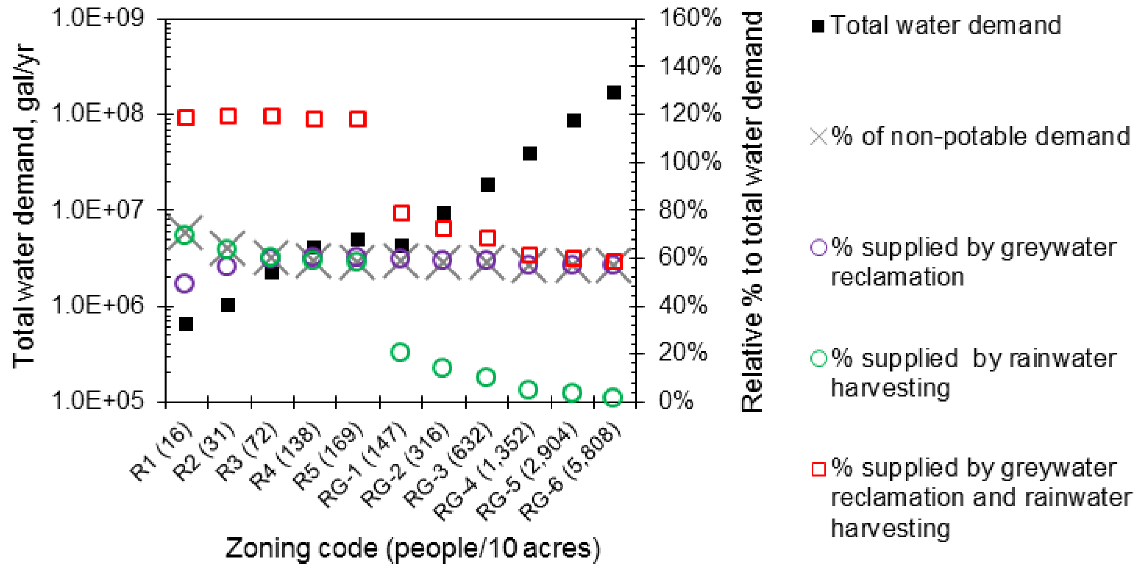

Figure 10. Water supply potential of greywater reclamation and rainwater harvesting

For the single-family residential communities, the non-potable water demand is between ~60% for R-5 and ~70% for R-1 of total water demand, which can be met completely by rainwater harvesting. For the multi-family residential communities, all the non-potable water demand is ~60%, which can be met completely by greywater reclamation. Furthermore, for the single-family residential communities, the water supply potential for both technologies is ~120% of total water demand and between 170% for R-1 and 200% for R-5 of the non-potable demand. However, the rainwater harvesting potential drops from 20% for RG-1 to 2% for RG-6 as per capita rooftop size of multi-family residential communities decreases with increasing building story from 2 floors to 25 floors. Accordingly, the water supply potential of both technologies drops from 80% for RG-1 to 60% for RG-6 for the multi-family residential communities. Even though more than non-potable demand can be supplied by the two technologies regardless of community type, water supply potential remains at the level of non-potable water demand because rainwater and reclaimed water cannot be used for potable use (i.e., faucet, shower, bath, and dishwashers).

5.2 Water Reuse Index (WRI)

With the annual per capita volumes of water, wastewater, and stormwater runoff (Figure 9), water withdrawal, return flow, and stormwater runoff for a community was determined and water reuse index was calculated for eleven residential communities according to infrastructure type (Figure 11).

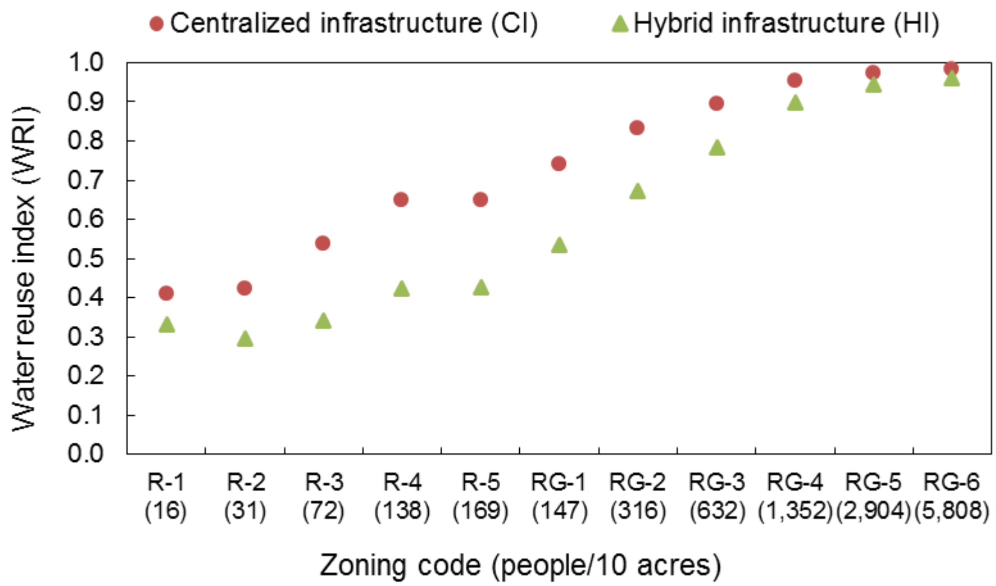

Figure 11. Water reuse index (WRI) of eleven residential communities (10 acres) involving centralized or hybrid infrastructure

The CI WRI increases from 0.41 for R-1 to 0.98 for RG-6 because the water demand increases for an increasing population. According to Eq. 1 that defines the WRI, the numerator is equal to the water supplied by CWSS and the denominator would be equal to the return flow plus the stormwater runoff, which only increases a small amount. Consequently, WRI approaches 1 as the population density increases. The water demand and return flow increase from 1.07E+06 gal/yr for R-1 to 1.68E+08 gal/yr for RG-6 and from 4.55E+05 gal/yr for R-1 to 1.67E+08 gal/yr for RG-6, respectively and the population increases from 16 people for R-1 to 5,808 people for RG-6 per 10 acres.

Stomrwater runoff discharge increases little from 2.15E+06 gal/yr for R-1 to 3.36E+06 gal/yr for RG-6 because the amount of impervious surface area increases with increasing density. For the reason, the HI WRI increases from 0.33 for R-1 to 0.96 for RG-6. HI reduces the WRIs that result from CI for all the communities because ~60% of water that is supplied from CWSS is replaced with reclaimed water. However, the mitigation is much less for RG-4 to RG-6 communities because stormwater runoff increases by a small amount as compared to water demand and return flow.

It is natural that the impact on water resources (WRI) should increase as population and subsequent water demand increases from R-1 to RG-6 community. Practically, WRI is measured for a region that is composed of residential, commercial, agricultural, or industrial area, transport infrastructure, undeveloped area, etc. In the case of COA, water withdrawal was 28 billion gallon per year (BGY), return flow was 21 BGY, and stormwter discharge was 41 BGY, which resulted in the WRI of 0.45 for 2010.[95] For the residential water demand of 15 BGY, if 60% (~9 BGY) is supplied by on-site greywater reclamation system, water withdrawal decreases to 6 BGY and return flow decreases to 12 BGY. The flow (41 BGY) of stormwater discharge is constant. Accordingly, the reclamation option reduces the WRI of COA from 0.45 to 0.35.

5.3 Life Cycle Assessment (LCA) Score of Small-Scale Greywater Reclamation System

As shown in Figure 12, the electricity consumption of MBR was estimated for each community by developing a correlation between electricity consumption per 1 kgal and MBR treatment capacity. The electricity consumption is between 44.9 kWh/kgal for R-1 and 45.8 kWh/kgal for R-5 depending on the treatment capacity between 0.167 kgal/day per house for R-5 and 0.178 kgal/day per house for R-1. The treatment capacity for an apartment building is between 1.98 kgal/day for RG-1 and 65.5 kgal/day for RG-6, and the electricity consumption is between 6.54 kWh/kgal for RG-6 and 20.5 kWh/kgal for RG-1, which is much lower than the electricity consumption of MBRs for single-family houses.

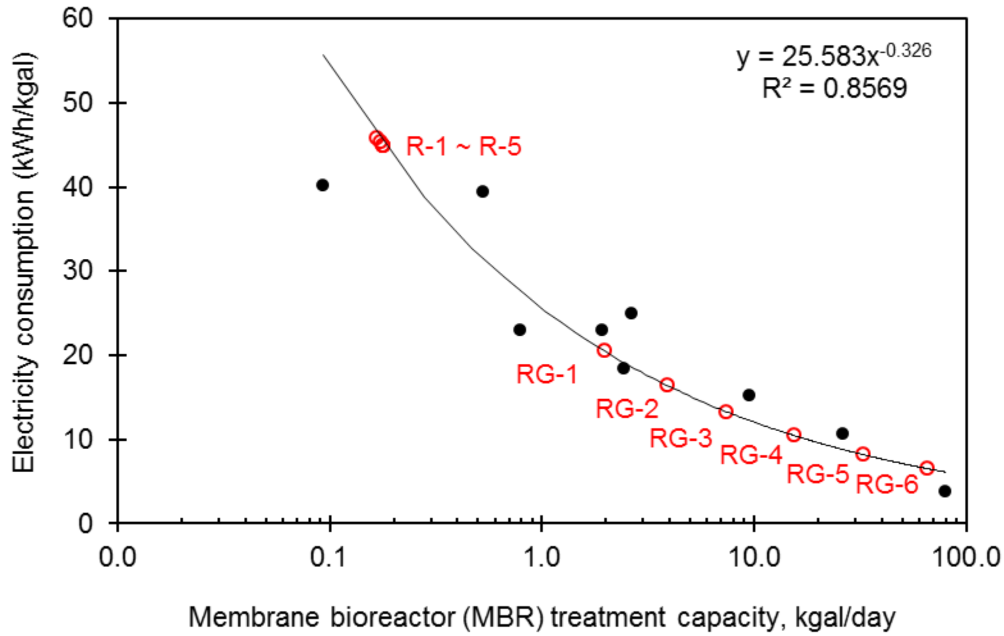

Figure 12. Correlation between electricity consumption for one kgal greywater reclamation and membrane bioreactor (MBR) treatment capacity[43, 45, 96-101]

As a result, LCA score of greywater reclamation system is between 7.14E-05% for RG-6 and 4.10E-04% for R-1 per gallon of greywater and the electricity consumption for MBRs contributes at least 98% to the LCA score. Detailed impact values of climate change (kg CO_2 eq), ozone depletion (kg CFC-11 eq), etc. and damage values for human health, ecosystem diversity, and resource availability are presented in APPENDIX E.

5.4 Life Cycle Assessment (LCA) Score of Centralized Infrastructure (CI) and Hybrid Infrastructure (HI)

LCA scores for each infrastructure were determined based on annual per capita water, wastewater, reclaimed water, and stormwater runoff volumes (Figure 9). As shown in Figure 13, the LCA score of CI decreases from 5.13% for R-1 to 3.27% for RG-6. This is a direct result of decreasing annual per capita water demand from 6.78E+04 gal for R-1 to 2.89E+04 gal for RG-6 (Figure 9) and the decrease in outdoor water demand for irrigation (from 3.90E+04 gal/yr per capita for R-1 to 5.10E+01 gal/yr per capita for RG-6). The LCA scores for wastewater of CI and HI are different because of greywater reclamation is used for HI but constant for all the community designs because the wastewater generation is equal to indoor water demand (i.e., 2.88E+04 gal/yr per capita). The LCA score that resulted from stormwater runoff collected by SSS diminishes from 0.659% for R-1 to 2.80E-03% for RG-6, which is same regardless of infrastructure type and almost negligible as compared to the LCA score of water or wastewater system.

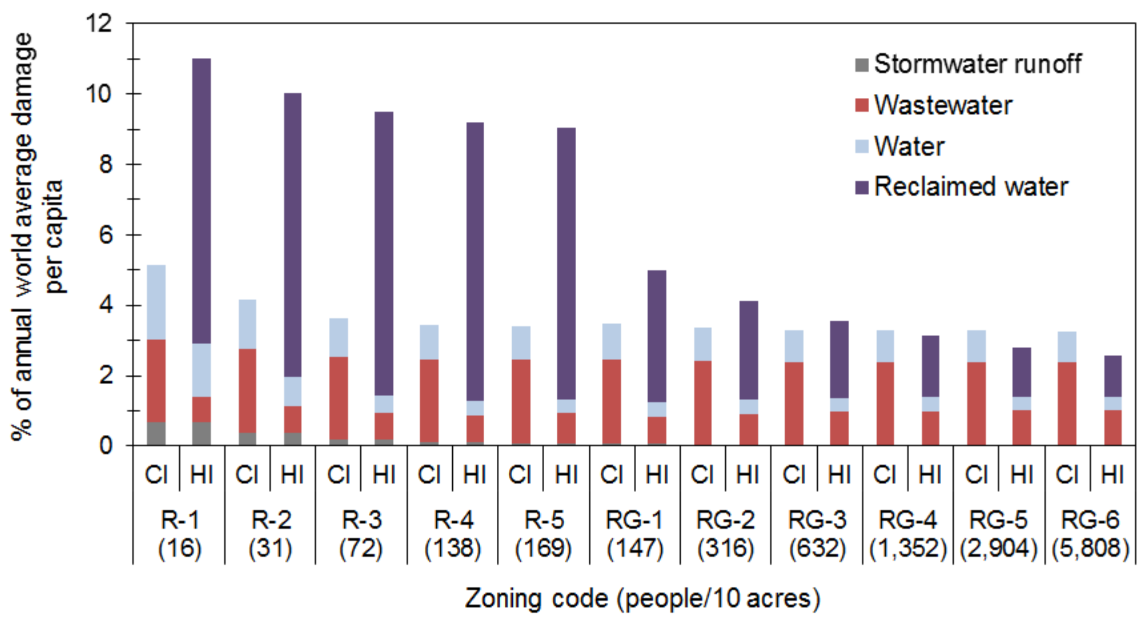

Figure 13. LCA scores of centralized infrastructure (CI) and hybrid infrastructure (HI) for eleven residential communities

For the single-family residential communities, the LCA score of HI decreases a little from 11.0% for R-1 to 9.06% for R-5 as shown in Figure 13. It is because water demand decreases as outdoor water demand for irrigation decreases from R-1 to R-5. The LCA score for reclaimed water is almost constant regardless of population density because one MBR of ~ 2 kgal/day is required for each household and accordingly, the electricity consumption is constant as ~45 kWh/kgal. For multi-family residential communities, the LCA score of HI decreases from 5.00% for RG-1 to 2.58% for RG-6 as the electricity consumption for a same volume of greywater decreases from 20.5 kWh/kgal for RG-1 to 6.54 kWh/kgal for RG-6 as an apartment building size and MBR capacity increases with increasing population. On average, the LCA score of HI for five single-family residential communities, 9.76%, is reduced by 64% to 3.52% for six multi-family residential communities.

For single-family residential communities, the LCA scores of CI are between 3.42% for R-5 and 5.13% for R-1 while the LCA score of HI are between 9.06% for R-5 and 11.1% for R-1. On average, the HI results in the LCA score that is three times greater as compared to the CI in single-family residential communities. It is mainly because the electricity consumption for the small-scale MBR (i.e., ~45 kWh/kgal) is much greater as compared to CI (i.e., 2.03 kWh/kgal for water and 3.01 kwh/kgal for wastewater). For multi-family residential communities, the LCA scores of CI are between 3.27% for RG-6 and 3.46% for RG-1 of annual world average environmental per capita while the scores of HI are between 2.58% for RG-6 and 5.00% for RG-1. On average, the LCA score of HI is 7% greater than the LCA score of CI. However, the LCA score of HI is smaller as compared to the CI for RG-4, RG-5 and RG-6. In other words, greywater reclamation system is environmentally beneficial as treatment capacity is greater than or equal to 15.6 kgal/day for RG-4 in the case of COA. The HI reduces the LCA score of CI by up to ~25% in RG-6. Accordingly, the reclamation system can be beneficial in multi-family residential communities as MBR treatment capacity can increase.

Greywater reclamation system was not favorable for single-family residential communities; however, further study for MBR design at the neighborhood scale would be interesting. It is likely, that the energy to pump the reclaimed water back to the neighborhood would be small as compared to the energy reduction that would result from using a larger MBR. Also, if the impact on water resources measured by WRI is counted in LCA, the HI WRIs lower than CI WRIs increase the LCA scores of HI less than CI. Especially, for the cities that are facing a shortage of water resources, the effect of greywater reclamation to reduce water resource use may be more important than other impacts such as climate change, ozone depletion, fossil fuel depletion, etc.

5.5 Uncertainty Test and Sensitivity Analysis

The average LCA scores have been compared between HI and CI for each community (Figure 13), and here an uncertainty analysis on the parameter inputs was included in order to estimate the probability that HI is environmentally more sustainable than CI. Table 7 displays the probability that the HI would be better than CI environmentally. There is no possibility that the HI is better for the single-family residential communities. The probability is not less than 80% for the communities between RG-4 and RG-6. These probabilities may allow stakeholders and policy makers to make better decisions for the implementation of on-site greywater reclamation system as compared to CI for COA.

Table 7. Probability that hybrid infrastructure (HI) with greywater reclamation system is environmentally more beneficial than centralized infrastructure (CI)

Community	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Probability	0%	0%	0%	0%	0%	19%	34%	50%	80%	90%	97%

The LCA scores of CI and HI were recalculated with the electricity consumption of CI and the energy mix for Southern California, which is presented in Figure 14. The score of CI is between 3.39% for RG-6 and 6.47% for R-1 for Southern California. Even though its electricity consumption is ~2.5 times more than COA for 1 kgal water and wastewater, the LCA score is only a little higher than the LCA score for COA which is between 3.27% for RG-6 and 5.13% for R-1 for COA. Because Southern California uses mostly natural gas for energy production, while GA uses mainly coal. Also, the LCA score of HI is much less than the score of COA for the same reason. Therefore, the difference between CI and HI is less as compared to COA. Accordingly, the HI is environmentally beneficial as compared to CI in all of multi-family residential communities where the treatment capacity is not less than 1.98 kgal/day and subsequent electricity consumption is not more than 20.5 kWh/kgal for RG-1. Moreover, the smallest treatment capacity of MBR that gives a lower LCA score for HI is reduced by 87% that was 15.6 kgal/day (RG-4) for COA case.

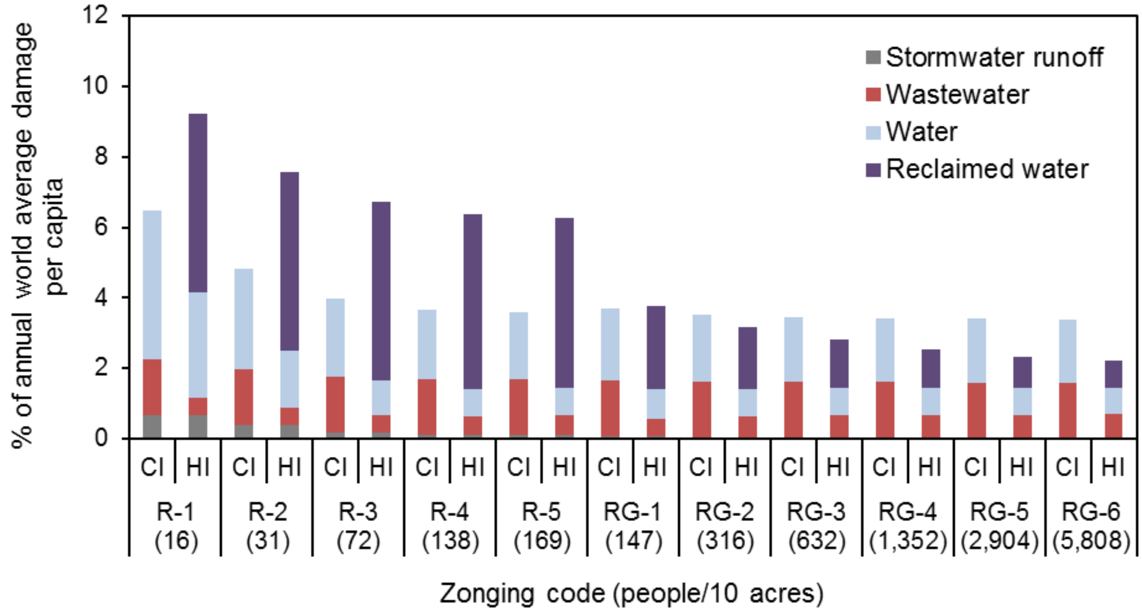

Figure 14. LCA scores of hybrid infrastructure (HI) as compared to centralized infrastructure (CI) for eleven residential communities under the condition of Southern California

CHAPTER 6

CONCLUSION

The centralized water, wastewater, and stormwater systems of COA were regarded as CI and its life cycle environmental impacts were evaluated with WRI and LCA score. I proposed HI that combined CI with the decentralized alternatives of the LID technologies (i.e., rain gardens, xeriscaping, and rooftop rainwater harvesting) or on-site and small-scale greywater reclamation system. WRIs and LCA scores were compared between CI and HI for eleven residential communities with different land use and population density. Major findings and suggestion and future work was demonstrated in this chapter.

6.1 Major Findings and Suggestion

COA relies on CI and the WRI is 0.45; that is a high level of water stress. The LCA score of COA CI is 3.97% of annual world average damage per capita. That score is the sum of 1.22% for water supply (39 kgal/capita·yr), 2.36% for wastewater collection and treatment (28 kgal/capita·yr), and 0.392% for stormwater collection (81 kgal/capita·yr). Similar to the other LCA studies for conventional water or wastewater system [10-12, 102], electricity consumption is significant and contributes 38% to the LCA score (3.97%) of COA CI. Digester gas combustion was determined as another significant contributor and it corresponds to 28% of the LCA score of COA CI. Water, wastewater, and stormwater system construction cause ~7% each.

The HI with LID technologies reduced the WRIs of CI by ~34% for single-family residential communities and by between 1% for RG-6 and 15% for RG-1 for multi-family residential communities. In case the HI is implemented in COA, the WRI of COA (i.e., 0.45) decreases to 0.12, which is a low level of water stress. The HI reduced the LCA scores of CI with CSS by between 33% for R-5 and 68% for R-1 and by between 1% for RG-6 and 26% for RG-1. Also, the HI reduced the LCA scores of CI with SSS by between 8% for R-5 and 18% for R-1 and by between 0% for RG-6 and 1% for RG-1. For the multi-family residences, harvested rainwater can only meet a small amount of the water demand for the non-potable uses; consequently, it has a negligible impact on the LCA score.

The WRIs for the HI with small-scale greywater reclamation system were lower than for CIs. In fact, HI for communities were lower by 19% for R-1, 30% for R-2, 37% for R-3, 35% for R-4, 34% for R-5, 28% for RG-1, 20% for RG-2, 13% for RG-3, 6% for RG-4, 3% for RG-5, and 2% for RG-6. In case small-scale greywater reclamation system is implemented in all of the residential communities of COA, the WRI of COA is 0.35, which is still high level of water stress but lower than the WRI (0.45) of COA that relies on CI. The reduction of WRI is less than the HI with the LID technologies and it was mainly because the greywater reclamation system reduces wastewater discharge (i.e. return flow) instead of supplying reclaimed water for non-potable demand. Larger LCA scores in HI than CI were found for R-1 to RG-3 because of the energy use by the MBR. They were higher by 114% for R-1, 140% for R-2, 160% for R-3, 167% for R-4, 165% for R-5, 44% for RG-1, 22% for RG-2, and 7% for RG-3. However, electricity consumption per kgal decreases with increasing MBR treatment capacity, and the LCA scores of HI was reduced by 5% for RG-4, 15% for RG-5, and 21% for RG-6 as compared to CI. In addition, it should be noted that energy consumption of CI and energy sources influence the environmental impacts of the option. For example, the small-scale MBR operation for greywater reclamation was more environmentally beneficial in Southern California as compared to COA because electricity consumption for CI in Southern California is ~2.5 times more than COA CI for one kgal water and wastewater. In addition, Southern California uses mostly natural gas for electricity production and this reduces the LCA scores of decentralized greywater reclamation in Southern California as compared to Georgia that uses mainly coal.

This study is the first step to simulate the feasibility of LID technologies and small-scale greywater reclamation system for residential communities with different land use and population density. This study also provides a baseline to present how life cycle environmental impacts are changed by the decentralized alternatives as compared to centralized systems depending on community type. The information could be given to policy makers or community developers who regulate or develop communities with considering stormwater runoff control and water reuse.

COA would announce an ordinance to regulate stormwater runoff volume changed by community development or redevelopment. 0% increase of stormwater runoff volume is required for new development as compared to pre-developed condition and 20% reduction is required for community redevelopment as compared to previous condition. For example, if a community of R-1 is redeveloped to a community of RG-2, annual stormwater runoff volume is expected to increases from 2.1 million gallons per year to 2.5 million gallons for 10-acre community (APPENDIX G), which is equal to 19% increase. Accordingly, ~8 million gallons of storwmater runoff should be mitigated on site to meet the regulation to require 20% reduction for community redevelopment.

With using the baseline to simulate rainwater harvesting and rain gardens in this study, stormwater runoff control could be simulated for the redevelopment and life cycle environmental impacts could be also estimated.

Chattahoochee Riverkeeper concluded that metro Atlanta could save as much as 140 MGD as compared to 2010 water demand of ~750 MGD with fixing system leaks, replacing outdated plumbing fixture, and pricing water right in 2012.[103] It includes 27 MGD from large-scale rainwater harvesting at homes and businesses. With implementing more water reuse options, water saving up to 234 ~ 400 MGD has been estimated over the next decade[103] and the water demand of 2020 is ~850 MGD.[5] Such effort is to resolve the conflict with Alabama and Florida over allocation of Lake Lanier for water supply. This study shows that ~60% of water supply for residential communities can be saved by rooftop rainwater harvesting or greywater reclamation system and 53% of total water demand (~850 MGD in 2020) is for residential communities.[5] Accordingly, ~270 MGD can be saved in residential communities, which is a significant amount as compared to the water saving target of 234 ~ 400 MGD. As it turns out in this study, rainwater harvested from rooftop is not enough to satisfy non-potable demand for the six multi-family residential communities. In addition, even though small-scale greywater reclamation system could supply all of non-potable water demand, the system designed per an apartment building was not feasible in between RG-1 and RG-3 communities because of its high energy consumption and subsequent environmental impacts. Accordingly, as it would be mentioned in the following section for future work, neighborhood scale study for greywater reclamation is required. In this way, this study has a potential to consult stormwater runoff control or water saving plan of the city of

Atlanta area. As the module to simulate stormwater runoff control and water saving was built, with modifying some factors such as precipitation, community land use, energy mix, etc., it could be applied to another region.

6.2 Future Work

The HI with the LID technologies or greywater reclamation system was compared to CI in this study. A future work could aim at comparing the HI with both alternatives to CI for each community. Rain gardens could be implemented to control stormwater runoff and xeriscaping could reduce outdoor water demand for irrigation. Rooftop rainwater harvesting and greywater reclamation technologies are to supply water for non-potable uses for irrigation, toilet flushing, and laundry with controlling stormwater or wastewater. As it turns out in this study, the potential of rainwater harvesting and greywater reclamation is not less than non-potable water demand for every community. For the single-family residential communities, the potential was ~ 120% of total water demand even though its use is limited to non-potable purposes. For the multi-family residential communities, the potential was between 60% for RG-6 and 80% for RG-1 of total demand. Accordingly, the water volumes supplied by rainwater harvesting and greywater reclamation need to be optimized in order to supply 100% of non-potable demand while minimizing environmental impacts.

Also, it is interesting to modify major contributors to the LCA scores of alternatives. One of major contributors to the LCA scores of rooftop rainwater harvesting for multi-family residential communities was electricity consumed to supply rainwater from above-ground storage tanks up to top floors of apartment buildings. Accordingly, it could be useful to study the location of rainwater storage tanks to reduce the LCA scores of rooftop rainwater harvesting technology. Small-scale greywater reclamation system was not favorable for single-family residential communities; however, further study for MBR design at the neighborhood scale would be interesting. It is likely, that the energy to pump the reclaimed water back to the neighborhood would be small as compared to the energy reduction that would result from using a larger MBR.

This study could be refined with varying the physical and social aspects of land uses and population densities. The aspects were limited to residential communities in this study, but can extend to commercial, industrial, agricultural, or undeveloped areas. This could provide a baseline to show how environmental impacts of CI are changed by the decentralized alternatives in a city, a state, or a nation level.

APPENDIX A

LIFE CYCLE ASSESSMENT OF CENTRALIZED WATER, WASTEWATER, AND STORMWATER IFNRASTRUCTURE IN THE CITY OF ATLANTA

Table 8. Treatment capacities and average daily flowrates of three water treatment plants (WTPs) in the City of Atlanta (COA)

Water Treatment Plants (WTPs)	Treatment capacity [5]	Average Daily Flow (Data Provided by the City of Atlanta, COA)	Unit
Hemphill	136.5	40	mgd
Chattahoochee	64.9	38	mgd
Atlanta-Fulton County	90 × 50%	22	mgd
Total	246	100	mgd

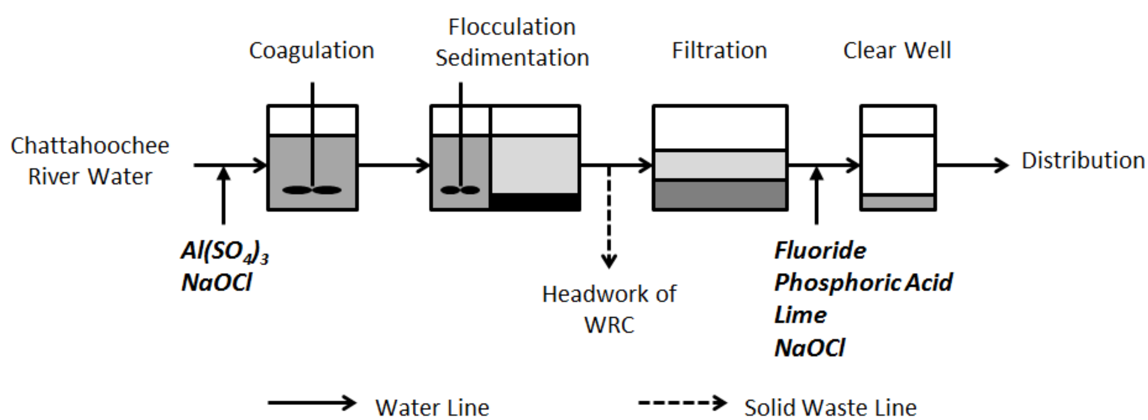

Figure 15. Treatment process of the Chattahoochee water treatment plant[91]

Table 9. Treatment capacities and average daily flowrates of three wastewater reclamation centers (WRCs) in the City of Atlanta

Wastewater Reclamation Centers (WRCs)	Design Capacity [55]	Average Daily Flow (Data Provided by the City of Atlanta)	Unit
RM Clayton	122	75	mgd
Utoy Creek	44	24	mgd
South River	54	25	mgd
Total	220	124	mgd

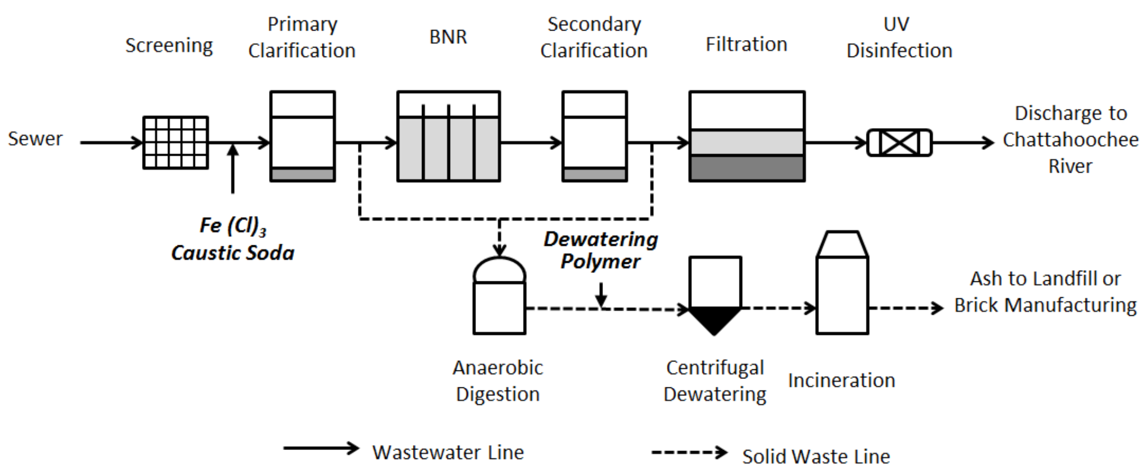

Figure 16. Treatment process of Utoy Creek wastewater reclamation center (BNR: biological nutrient removal)[88-89]

Table 10. Construction and decommissioning phase input data for life cycle inventory - water, wastewater, and stormwater systems

System	Component	Capacity		Data source	ecoinvent name	per kgal per yr		Calculation
Water supply system	Pump stations for water intake	440	mgd	[4-5, 56, 86-87, 91]	pump station/p/CH/I; 1p = 644,546 m3/yr	3.69E-07	p	Normalized by daily average flow rate of 100 mgd (Table 1) and 70 yr life expectancy
	Water treatment plants	246	mgd		water works/p/CH/I; 1p = 644,546 m3/yr	2.06E-07	p	
	Booster pump stations	148	mgd		pump station/p/CH/I; 1p = 644,546 m3/yr	1.24E-07	p	
	Storage tanks	41.5	10^6 gallon		water storage/p/CH/I; 1p = 2,500 m3	2.46E-08	p	
	Distribution pipelines	2,700	miles		water supply network/km/CH/I	1.06E-06	miles	
Wastewater collection and treatment	Pump stations	60.5	mgd	[4, 55-56, 86-89]	pump station/p/CH/I; 1p = 644,546 m3/yr	9.55E-08	p	Normalized by daily average flow rate of124 mgd (Table 1) and 30 yr life expectancy
	Sewer pipelines	2,126	miles		sewer grid, class 1/km/CH/I	6.71E-07	mi.	Normalized by daily average flow rate of124 mgd (Table 1) and 70 yr life expectancy
	Wastewater reclamation centers	220	mgd		wastewater treatment plant, class 1/p/CH/I; 1p = 47,100,000 m3/yr	4.75E-09	p	Normalized by daily average flow rate of124 mgd (Table 1) and 30 yr life expectancy
Stormwater collection	Sewer pipelines	1,610	miles	[56, 86-87]	sewer grid, class 1/km/CH/I	4.04E-07	miles	Normalized by annual stormwater runoff of 57 BGY (from water balance) and 70 yr life expectancy

Table 11. Operational phase input data for life cycle inventory - material and process input for water and wastewater systems

System	Input	Quantity		Data source	ecoinvent name	per kgal per yr		calculation
Water supply system	Water	1	kgal		Water, river	-1	kgal	
	Aluminum sulfate	4,579,875	lbs/yr	Chattahoochee water treatment plant data from COA	Aluminum sulfate, powder, at plant/RER U	3.28E-01	lbs	Normalized by daily average flow rate of 38.2 mgd for Chattahoochee water treatment plant (Table 1)
	Sodium hypochlorite	2,044,717	lbs/yr		Sodium hypochlorite, 15% in H2O, at plant/RER U	1.47E-01	lbs	
	Water for filtration bed backwashing	123,000	gal/each	91	Tab water, at user/CH U	6.22E+01	lbs	Normalized by the treatment capacity of each filtration bed (5.5 MGD) and backwashing frequency (every 72 hrs)
	lime	2,243,850	lbs/yr	Chattahoochee water treatment plant data from COA	Lime, hydraulic, at plant/CH U	1.61E-01	lbs	Normalized by daily average flow rate of 38.2 mgd for Chattahoochee water treatment plant (Table 1)
	phosphoric acid	244,660	lbs/yr		Phosphoric acid, industrial grade, 85% in H2O, at plant/RER U	1.75E-02	lbs	
	Hydrofluosilic acid	511,073	lbs/yr		Fluosilicic acid, 2% in H2O, at plant/US U	3.67E-02	lbs	
	Sodium hypochlorite	858,158	lbs/yr		Sodium hypochlorite, 15% in H2O, at plant/RER U	6.15E-02	lbs	

Table 11. Operational phase input data for life cycle inventory - material and process input for water and wastewater systems (continued)

System	Input	Quantity		Data source	ecoinvent name	per kgal per yr		calculation
Water supply system	Natural gas	41,839	therms/yr	Electricity and natural gas consumption data for COA water supply system from Georgia Power	Natural gas, at long-distance pipeline/RER U	1.12E-01	ft^3	Normalized by daily average flow rate (100 mgd) of COA (Table 1)
	Electricity	74,048,700	kWh/yr		Electricity, hard coal, at power plant/US U (67%); Electricity, natural gas, at power plant/US U (10%); Electricity, nuclear, at power plant/US U (21%); Electricity, hydropower, at power plant/FR U (2%)	2.03	kWh	Normalized by daily average flow rate of 100 mgd (Table 1)
	Sludge sent to clayton WRC	1,292.6	lbs/yr	Chattahoochee water treatment plant data from COA	Disposal, digester sludge, to municipal incineration/CH U	9.27E-05	lbs	Normalized by daily average flow rate of 38.2 mgd for Chattahoochee water treatment plant (Table 1)
Wastewater collection and treatment	Treated wastewater discharge	1	kgal		Water, river	1	kgal	
	Ferric Chloride (40%)	1,157,400	lbs/yr	Utoy Creek WRC data from COA	Iron (III) chloride, 40% in H2O, at plant/CH U	1.34E-01	lbs	Normalized by daily average flow rate (23.7 mgd) of Utoy Creek wastewater reclamation center (Table 2)
	Caustic soda (50%)	1,784,950	lbs/yr		Sodium hydroxide, 50% in H2O, production mix, at plant/RER U	2.06E-01	lbs	

Table 11. Operational phase input data for life cycle inventory - material and process input for water and wastewater systems (continued)

System	Input	Quantity		Data source	ecoinvent name	per kgal per yr		calculation
Wastewater collection and treatment	Magnesium hydroxide powder	16,794	gal/yr	Utoy Creek WRC data from COA	Sodium hydroxide, 50% in H2O, production mix, at plant/RER U	5.24E-02	lbs	Normalized by daily average flow rate (23.7 mgd) of Utoy Creek wastewater reclamation center (Table 2) Specific gravity of magnesium hydroxide powder = 2.36, 1 gallon magnesium hydroxide (19.7 lbs) = 13.5 lb sodium hydroxide powder = 27 lbs sodium hydroxide 50% (wt.) in water
	Dewatering polymer	65,527	lbs/yr		Acrylonitrile-butadiene-styrene copolymer, ABS, at plant/RER U	7.57E-03		Normalized by daily average flow rate (23.7 mgd) of Utoy Creek wastewater reclamation center (Table 2)
	Electricity	136,177,852	kwh	Electricity and natural gas consumption data for COA wastewater collection and treatment system from Georgia Power	Electricity, hard coal, at power plant/US U 67%; Electricity, natural gas, at power plant/US U 10%; Electricity, nuclear, at power plant/US U 21%; Electricity, hydropower, at power plant/FR U 2%	3.01	kWh	Normalized by daily average flow rate (124 mgd) of COA (Table 1)

Table 11. Operational phase input data for life cycle inventory - material and process input for water and wastewater systems (continued)

System	Input	Quantity		Data source	ecoinvent name	per kgal per yr		calculation
Wastewater collection and treatment	Natural gas	871,407	therms/yr	Electricity and natural gas consumption data for COA wastewater collection and treatment system from Georgia Power	Natural gas, at long-distance pipeline/RER U	1.88E+00	cuft	Normalized by daily average flow rate (124 mgd) of COA (Table 1) and 1,000 cuft = 10.23 therm
	Water pollutant discharge	1.5	mg/L as P		Phosphorus, Total			{Carey, 2009 #527}
		3	mg/L as N		Nitrogen, Total			
	CO2 emission from combustion of sludge digestion gas	5.15	lbs as carbon	Hardy (2011)	carbon dioxide emission to air	1.89E+01	lbs as CO_2	Carbon amount in 11,000 scft/10^6 gal wastewater (RM clayton WRC) = 1.95E+02 mole/kgal
	Sludge disposal	2,519,697	kg/yr	Utoy Creek WRC data from COA	Disposal, municipal solid waste, 22.9% water, to municipal incineration/CH U	6.42E-01	lbs	Normalized by daily average flow rate (23.7 mgd) of Utoy Creek wastewater reclamation center (Table 2)
	Ash to brick	964,608	kg/yr		clay and soil, extracted for use	-2.46E-01	lbs	
	Ash to landfill	3,185,96	kg/yr		Disposal, inert waste, 5% water, to inert material landfill/CH U	8.12E-02	lbs	

Table 12. Operational phase input data for life cycle inventory – transport for water and wastewater systems

System	Input	Manufacturer location or destination	Truck, mi.	Train, mi.	Data source	ecoinvent name	Truck, tkm	Train, tkm
Water supply system	Aluminum sulfate	Macon, GA	100	-	Chemical cost information from Clayton county water authority	Transport, combination truck, average fuel mix/US	2.40E-02	-
	Sodium hypochlorite	Allied Ranger, GA	80				8.56E-03	
	lime	Campobello, SC	200				2.35E-02	
	phosphoric acid	Augusta, GA	170				2.18E-03	
	Hydrofluosilic acid	Red Hill, NC	260				6.96E-03	
	Sodium hypochlorite	Ranger, GA	80				3.59E-03	
	Sludge sent to RM Clayton WRC	R.M clayton WRC	10	-	Chattahoochee water treatment plant data from COA		6.77E-07	
Total							4.53E-02	-
Wastewater collection and treatment	Ferric Chloride, 40%	Detroit, MI	20	730	Chemical suppliers' information for Utoy Creek WRC from COA	Transport, combination truck, average fuel mix/US or Transport, train, diesel powered/US	1.95E-03	7.13E-02
	Caustic soda, 50%	Savannah, GA	260	-			3.92E-02	-
	Magnesium hydroxide	Philadelphia, PA	15	900			5.74E-04	3.44E-02
	Dewatering polymer	Waxhaw, NC	280	-			1.55E-03	-
	Ash to brick	Smyrna, GA	10	-			1.79E-03	-
	Ash to landfill	Buford, GA	55	-			3.26E-03	-
Total							4.83E-02	1.06E-01

Table 13. Operational phase input data for life cycle inventory - water pollutant concentrations of stormwater runoff [57-58, 90]

Water pollutant	ecoinvent name	Amount	unit
Phosphorus, water, unfiltered	Phosphate	1.14E+00	mg/l as PO_4^{3-}
Nitrate, water, filtered	Nitrate	3.00E+00	mg/l as NO_3^-
Nitrite, water, filtered	Nitrite	5.57E-02	mg/l as NO_2^-
Ammonia plus organic nitrogen, water unfiltered	Ammonia, as N	4.21E-01	mg/l as N
Potassium, water, filtered	Potassium	3.56E+00	mg/l as K
Sodium, water, filtered	Sodium, ion	6.48E+00	mg/l
Chloride, water, filtered	Chloride	8.19E+00	mg/l
Silica, water, filtered	Silicon	4.19E+00	mg/l as Si
Sulfate, water, filtered	Sulfate	1.20E+01	mg/l
Calcium, water, filtered	Calcium, ion	1.05E+01	mg/l
Magnesium, water, filtered	Magnesium	2.32E+00	mg/l
Aluminum, water, filtered	Aluminum	1.37E+02	µg/l
Cadmium, water, filtered	Cadmium, ion	3.26E-02	µg/l
Chromium	Chromium, ion	5.49E+00	µg/l
Copper, water, filtered	Copper, ion	3.96E+00	µg/l
Iron, water, filtered	Iron, ion	3.08E+02	µg/l
Lead, water, filtered	Lead	7.37E-01	µg/l
Manganese, water, filtered	Manganese	5.06E+01	µg/l
Nickel, water, filtered	Nickel, ion	1.42E+00	µg/l
Silver, water, filtered	Silver, ion	1.21E-02	µg/l
Zinc, water, filtered	Zinc, ion	1.20E+01	µg/l
Barium	Barium compounds	1.18E-01	mg/l
Beryllium	Beryllium compounds	5.89E-04	mg/l
Cobalt	Cobalt compounds	5.49E-03	mg/l
Lithium	Lithium, in ground	2.28E-06	mg/l
Mercury	Mercury compounds	2.44E-05	mg/l

Table 13. Operational phase input data for life cycle inventory - water pollutant concentrations of stormwater runoff [57-58, 90] (continued)

Water pollutant	ecoinvent name	Amount	unit
Molybdenum	Molybdenum	6.10E-04	mg/l
Strontium	Strontium	1.67E-02	mg/l
Thallium	Thallium compounds	2.03E-02	mg/l
Vanadium	Vanadium	2.44E-02	mg/l
Antimony	Antimony compounds	2.41E+00	mg/l
Arsenic	Arsenic compounds	9.89E+00	mg/l
Selenium	Selenium compounds	1.09E+00	mg/l

Table 14. World ReCiPe life cycle impact (midpoint) results

Impact category	Unit	Water supply system	Wastewater collection and treatment system	Stormwater collection system
Climate change	kg CO2 eq	1.16E+02	3.66E+02	3.49E+01
Ozone depletion	kg CFC-11 eq	4.27E-06	5.79E-06	1.39E-06
Human toxicity	kg 1,4-DB eq	5.92E+01	5.37E+01	2.04E+01
Photochemical oxidant formation	kg NMVOC	3.41E-01	3.22E-01	1.10E-01
Particulate matter formation	kg PM10 eq	2.03E-01	1.88E-01	6.69E-02
Ionizing radiation	kg U235 eq	2.77E+01	2.83E+01	4.50E+00
Terrestrial acidification	kg SO2 eq	6.13E-01	5.71E-01	9.09E-02
Freshwater eutrophication	kg P eq	4.74E-02	2.14E-01	1.21E-01
Marine eutrophication	kg N eq	2.07E-02	5.67E-01	3.50E-01
Terrestrial ecotoxicity	kg 1,4-DB eq	5.99E-03	5.21E-03	2.15E-03
Freshwater ecotoxicity	kg 1,4-DB eq	1.22E+00	1.37E+00	6.66E-01
Marine ecotoxicity	kg 1,4-DB eq	1.15E+00	1.30E+00	6.67E-01
Agricultural land occupation	m2a	1.46E+00	1.52E+00	3.69E-01
Urban land occupation	m2a	8.37E+00	1.50E+00	3.30E-01
Natural land transformation	m2	4.44E-02	6.46E-03	-6.98E-04
Water depletion	m3	1.52E+02	-1.09E+02	-3.05E+02
Metal depletion	kg Fe eq	6.70E+00	1.41E+01	1.63E+01
Fossil fuel depletion	kg oil eq	2.74E+01	3.09E+01	9.55E+00

Table 15. World ReCiPe life cycle damage (endpoint) results

Damage	Impact category	Unit	Water supply system	Wastewater collection and treatment system	Stormwater collection system
Human health	Climate change Human Health	DALY	1.62E-04	5.12E-04	4.88E-05
	Ozone depletion	DALY	9.86E-09	1.49E-08	3.62E-09
	Human toxicity	DALY	4.14E-05	3.76E-05	1.43E-05
	Photochemical oxidant formation	DALY	1.33E-08	1.25E-08	4.28E-09
	Particulate matter formation	DALY	5.27E-05	4.88E-05	1.74E-05
	Ionizing radiation	DALY	4.55E-07	4.65E-07	7.38E-08
Ecosystem diversity	Climate change Ecosystems	species.yr	9.18E-07	2.90E-06	2.77E-07
	Terrestrial acidification	species.yr	3.55E-09	3.31E-09	5.27E-10
	Freshwater eutrophication	species.yr	2.08E-09	2.19E-09	5.33E-09
	Terrestrial ecotoxicity	species.yr	7.61E-10	6.62E-10	2.73E-10
	Freshwater ecotoxicity	species.yr	3.17E-10	3.57E-10	1.73E-10
	Marine ecotoxicity	species.yr	9.21E-13	1.04E-12	5.34E-13
	Agricultural land occupation	species.yr	1.64E-08	1.71E-08	4.23E-09
	Urban land occupation	species.yr	1.61E-07	2.90E-08	6.36E-09
	Natural land transformation	species.yr	9.24E-08	9.08E-09	-2.28E-09
Resource availability	Metal depletion	$	4.79E-01	1.01E+00	1.16E+00
	Fossil fuel depletion	$	4.40E+02	4.97E+02	1.54E+02

Table 16. Seven data qualities and geometric standard deviation - Construction and decommissioning phase input data for water, wastewater, and storwmater systems

System	Component	Basic uncertainty factor and six data quality indicators*	Sqaure of geometrics standard deviation
Water supply system	Pump station for water intake	3.00, 1, 1, 1, 1, 1, na	3.23
	Water treatment plant	3.00, 1, 1, 1, 1, 4, na	3
	Booster pump station	3.00, 1, 1, 1, 1, 1, na	3
	Storage tank	3.00, 1, 1, 1, 1, 1, na	3
	Distribution pipelines	3.00, 1, 1, 1, 1, 1, na	3
Wastewater collection and treatment	Pump station	3.00, 1, 1, 1, 1, 1, na	3
	Sewer pipelines	3.00, 1, 1, 1, 1, 1, na	3
	Wastewater reclamation centers	3.00, 1, 1, 1, 1, 1, na	3
Stormwater collection	Sewer pipelines	3.00, 1, 1, 1, 1, 4, na	3.23

*Basic uncertainty factor for measurement error and six data quality indicators for reliability (i.e. data verification), completeness (i.e., representativeness), temporal correlation, geographic correlation, further technological correlation, and sample size were in the order, which were determined on the basis of Table 11 and Table 12)

Table 17. Seven data qualities and geometric standard deviation – operational phase input for water, wastewater, and stormwater systems

System	Input	Basic uncertainty and six data quality indicators*	Standard deviation
Water supply system	Water intake	-	Data quality indicators are not applicable to input from nature.
	Aluminum sulfate	1.05, 2, 3, 1, 1, 1, na	1.09
	Sodium hypochlorite	1.05, 2, 3, 1, 1, 1, na	1.09
	Water for filtration bed backwashing	1.05, 3, 3, 1, 1, 4, na	1.53
	lime	1.05, 2, 3, 1, 1, 1, na	1.09
	phosphoric acid	1.05, 2, 3, 1, 1, 1, na	1.09
	Hydrofluosilic acid	1.05, 2, 3, 1, 1, 1, na	1.09
	Sodium hypochlorite	1.05, 2, 3, 1, 1, 1, na	1.09
	Natural gas	1.05, 1, 1, 1, 1, 1, na	1.05
	Electricity	1.05, 1, 1, 1, 1, 1, na	1.05
	Sludge sent to clayton WRC	1.05, 1, 3, 1, 1, 4, na	1.51
	Truck transport	2.00, 3, 3, 1, 1, 1, na	2.02

*Basic uncertainty factor for measurement error and six data quality indicators for reliability (i.e. data verification), completeness (i.e., representativeness), temporal correlation, geographic correlation, further technological correlation, and sample size were in the order, which were determined on the basis of Table 43 and Table 44)

Table 17. Seven data qualities and geometric standard deviation – operational phase input for water, wastewater, and stormwater systems (continued)

System	Input	Basic uncertainty and six data quality indicators*	Standard deviation
Wastewater collection and treatment	Treated wastewater discharge	na	Data quality indicators are not applicable to input from nature
	Ferric Chloride (40%)	1.05, 1, 3, 1, 1, 1, na	1.07
	Caustic soda (50%)	1.05, 1, 3, 1, 1, 1, na	1.07
	Magnesium hydroxide	1.05, 1, 3, 1, 1, 4, na	1.51
	Dewatering polymer	1.05, 1, 3, 1, 1, 4, na	1.51
	Electricity	1.05, 1, 1, 1, 1, 1, na	1.05
	Natural gas	1.05, 1, 1, 1, 1, 1, na	1.05
	CO2 emission from combustion of sludge digestion gas	1.05, 3, 3, 1, 1, 1, na	1.12
	Sludge disposal	1.05, 2, 3, 1, 1, 4, na	1.51
	Ash to brick	na	
	Ash to landfill	1.05, 2, 3, 1, 1, 1, na	1.09
	Truck transport	2.00, 3, 3, 1, 1, 1, na	2.02
	Train transport	2.00, 3, 3, 1, 1, 1, na	2.02
Stormwater collection system	Water pollutants	1.05, 2, 2, 1, 1, 1, na	1.07

*Basic uncertainty factor for measurement error and six data quality indicators for reliability (i.e. data verification), completeness (i.e., representativeness), temporal correlation, geographic correlation, further technological correlation, and sample size were in the order, which were determined on the basis of Table 43 and Table 44)

APPENDIX B

RESIDENTIAL COMMUNITY DESIGNS

Table 18. Design parameters of zoning code and land use design of five sing-family residential communities

		Unit	R-1	R-2	R-3	R-4	R-5
Design parameter	Minimum lot area	ft^2	87,120	43,560	18,000	9,000	7,500
	Maximum lot coverage[a]	%	25%	35%	40%	50%	55%
	Minimum front setbacks	ft	60	60	50	35	30
	Minimum street frontage	ft	200	150	100	70	50
	Minimum parking spots per house		2	2	2	2	2
	Street width	ft	10	10	10	10	10
	Sidewalk width	ft	10	10	10	10	10
Land use design	Rooftop[b]	ft^2	19,400	12,900	5,100	2,950	2,750
	Driveway[c]	ft^2	1,600	1,600	1,333	933	800
	Walkway[c]	ft^2	1,996	904	380	178	140
	Parking space[d]	ft^2	400	400	400	400	400
	Sidewalk and street[e]	ft^2	4,000	3,000	2,000	1,400	1,000
	Irrigated open space[f]	ft^2	31,862	13,878	5,393	2,269	1,705
	Indigenous open space[f]	ft^2	31,862	13,878	5,393	2,269	1,705
	Lot area + sidewalk and street per house	ft^2	91,120	46,560	20,000	10,400	8,500
	Number of houses[g]	per 10 acres	4.8	9.4	21.8	41.9	51.2
	Population density[h]	per 10 acres	15.8	30.9	71.9	138.2	169.1

[a]Maximum lot coverage = rooftop + driveway + walkways + garage
[b]Rooftop area was determined by subtracting the sum of the driveway, walkways, and garage from the lot coverage.
[c]Driveway size was extrapolated with the setback length of each community on the basis of the driveway size of 800 ft^2 and the setback length of R-5.
[d]Parking space = number of parking spots per house × 200 ft^2 per space
[e]Sidewalk and Street = Street frontage (ft) × Sidewalk or street width[53], 10 ft
[f]Open space = Lot area × (1 – Lot coverage), 50% is irrigated open space and the rest is indigenous open space.
[g]Number of house in 10 acres = 10 acres/(per house lot area, sidewalk, and street)
[h]Population density = Number of house in 10 acres × 2.5 capita per household

Table 19. Design parameters of zoning code and land use design of six multi-family residential community designs

		Unit	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Design parameter	FAR[a]	-	0.162	0.348	0.696	1.49	3.2	6.4
	TOSR[b]	-	0.77	0.73	0.69	0.68	0.86	1.46
	UOSR[c]	-	0.53	0.45	0.4	0.43	0.61	1.05
Land use design	Total building area[d]	ft^2 (acre)	70,567 (1.6)	151,589 (3.5)	303,178 (7)	649,044 (15)	1,393,920(32)	2,787,840 (64)
	Building story[e]	-	2	3	4	10	15	25
	Total building top area[f]	ft^2	35,284	50,530	75,794	64,904	92,928	111,514
	Paved area[g]	ft^2	104,544	121,968	126,324	108,900	108,900	178,596
	Irrigated open space	ft^2	147,886	131,551	116,741	130,898	116,886	72,745
	Indigenous open space	ft^2	147,886	131,551	116,741	130,898	116,886	72,745
	Number of building[h]	4	4	4	4	4	4	4
	Building top area per building[i]	ft^2	8,821	12,632	18,949	16,226	23,232	27,878
	Number of apartment units[j]	per 10 acres	59	126	253	541	1,162	2,323
	Population density[k]	per 10 acres	147	316	632	1,352	2,904	5,808

[a]Floor to area ration (FAR) is the ratio of total building area to lot size (10 acres).
[b]Total open space ratio (TOSR) is the ratio of physical footprint of open space and paved area to lot size (10 acres).
[c]Usable open space ratio (UOSR) is the ratio of physical footprint of open space only to lot size (10 acres).
[d]Total building area = FAR × community size (10 acres) = Building top area × Building stories
[e]Apartment building story was assumed on the basis of the apartment buildings built in the city of Atlanta.
[f]Building top area = Total building area ÷ Building story

[g]Paved areas = TOSR – UOSR, which includes driveways, walkways, sidewalks, streets, and physical footprint of parking space.
[h]Number of building was fixed as 4 to increase the scale of an apartment building according to FAR.
[i]Building top area per building = Total building top area ÷ Number of building
[j]Number of apartment unit = Total building area ÷ Apartment unit size of 1,200 ft^2
[k]Population density = Number of apartment unit × 2.5 capita per apartment unit of 1,200 ft^2

APPENDIX C

RAIN GARDEN AND RAINWATER HARVESTING DESIGN AND LIFE CYCLE ASSESSMENT

Table 20. Curve numbers (CNs) according to imperviousness and antecedent moisture condition (AMC) group

Zoning code	Imperviousness	AMC[a] group I	AMC group II	AMC group III
R-1	30%	64	77	88
R-2	40%	69	80	90
R-3	47%	72	82	91
R-4	56%	77	85	92
R-5	60%	79	86	93
RG-1	32%	64	77	88
RG-2	40%	69	80	90
RG-3	46%	72	82	91
RG-4	40%	69	80	90
RG-5	46%	72	82	91
RG-6	67%	82	88	93

[a]antecedent moisture condition indicates soil moisture content of pervious area.

Table 21. Criteria of antecedent moisture condition (AMC) group[65]

AMC group	**5-day antecedent rainfall, in.**	
	Dormant season (November ~ March)	Growing season (April ~ October)
I	<0.5	<1.4
II	0.5–1.1	1.4-2.1
III	>1.1	>2.1

CN of pervious surface (i.e., 69 for open space with grass cover 50% to 75%) is modified to 50 for AMC group I, 69 for AMC group II, or 84 for AMC group III.[105] A composite CN for pervious surface and impervious surface is calculated for each rainfall event.[105] Stormwater runoff volume is determined according to a composite CN and a rainfall intensity with the following equation.

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} \quad \text{. . . . . (2)}$$

Where: Q = accumulated direct runoff (in.)
P = accumulated rainfall (potential maximum runoff) (in.)
S = potential maximum soil retention (in.), 1000/CN-10
For 24-hr or 1-day

Table 22. Rooftop rainwater harvesting design (per single house)

Input	Reference	Unit	R-1	R-2	R-3	R-4	R-5
Annual harvested rainwater		gal/yr	92,442	70,668	60,683	56,932	56,321
Daily water use		gal/day	253	194	166	156	154
Gutters	All sides of rooftop	ft	591	482	303	230	223
Down pipe	5’’ PVC pipe	ft	30	30	30	30	30
Above-ground tank size	HDPE tank	gallon	10,208	7,766	6,743	7,900	8,203
Pump	0.2 HP submersible pump	unit	1	1	1	1	1
Pumping energy	80% efficiency	kWh/gal	1.1926E-04	1.1926E-04	1.1926E-04	1.1926E-04	1.1926E-04
Treatment	Polyester sediment filter unit	Unit	1	1	1	1	1
	Energy for UV disinfection	kWh/gal	8.0E-05	8.0E-05	8.0E-05	8.0E-05	8.0E-05
Supply pipe	1’’ PVC pipe	ft	79	70	55	49	49
Transport	Assumption: 100 km truck transport	km	100	100	100	100	100

Table 23. Inventory data per gallon harvested rainwater of each single-family residential community

Input	Reference	ecoinvent name	Unit	R-1	R-2	R-3	R-4	R-5	Basic uncertainty factor and six data quality	σ_g^2
Gutters	18 yr life expectancy, 0.513 lb/ft	Galvanized steel sheet, at plant/RNA	lbs	1.82E-04	1.94E-04	1.42E-04	1.15E-04	1.13E-04	1.05, 4, 4, 1, 1, 1, na	1.24
Down pipe	5'' PVC pipe, 3.8 lb/ft,50 yr life expectancy	Polyvinylchloride, bulk polymerized, at plant/RER U	lbs	2.46E-05	3.22E-05	3.75E-05	3.99E-05	4.04E-05	1.05, 4, 4, 1, 1, 1, na	1.24
		Extrusion, plastic pipes/RER U	lbs	2.46E-05	3.22E-05	3.75E-05	3.99E-05	4.04E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Above-ground tank size	1,800 lb per 10,000 gallon HDPE tank, 50 yr life expectancy	Polyethylene, HDPE, granulate, at plant	lbs	3.98E-04	3.96E-04	4.00E-04	5.00E-04	5.24E-04	1.05, 4, 4, 1, 1, 1, na	1.24
		Injection molding/RER U	lbs	3.98E-04	3.96E-04	4.00E-04	5.00E-04	5.24E-04	1.05, 4, 4, 1, 1, 1, na	1.24
Pump	6.03E-03 lb steel per kgal rainwater, 10 yr life expectancy	Steel, converter, unalloyed, at plant/RER U	lbs	5.41E-05	7.07E-05	8.24E-05	8.78E-05	8.88E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Pumping energy	GA energy mix	*	kWh	3.93E-05	3.93E-05	3.93E-05	3.93E-05	3.93E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Sediment filter	Sediment filter, 1.3 lb/unit, 10 yr life expectancy	Polyester resin, unsaturated, at plant/RER U	lbs	2.81E-06	3.68E-06	4.28E-06	4.57E-06	4.62E-06	1.05, 4, 4, 1, 1, 1, na	1.24
		Fleece production, polyethylene terephthalate/RER U	lbs	2.81E-06	3.68E-06	4.28E-06	4.57E-06	4.62E-06	1.05, 4, 4, 1, 1, 1, na	1.24

*According to the GA energy source (coal 67%, natural gas 10%, nuclear 21%, and hydropower 2%),[3] ecoinvent database of Electricity, hard coal, at power plant/US U; Electricity, natural gas, at power plant/US U; Electricity, nuclear, at power plant/US U; and Electricity, hydropower, at power plant/FR U was used to inventory the GA energy mix emission.

Table 23. Inventory data per gallon harvested rainwater of each single-family residential community (continued)

Input	Reference	ecoinvent name	Unit	R-1	R-2	R-3	R-4	R-5	Basic uncertainty factor and six data quality	σ_g^2
Energy for UV disinfection	GA energy mix	*	kWh	8.00E-05	8.00E-05	8.0E-05	8.00E-05	8.00E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Supply pipe	1'' PVC pipe, 0.2 lb/ft, 50 yr life expectancy	Polyvinylchloride, bulk polymerized, at plant/RER U	lbs	1.71E-04	1.98E-04	1.8209 E-04	1.73E-04	1.72E-04	1.05, 4, 4, 1, 1, 1, na	1.24
		Extrusion, plastic pipes/RER U	lbs	1.7145 E-04	1.9849 E-04	1.8209 E-04	1.7285 E-04	1.7237 E-04	1.05, 4, 4, 1, 1, 1, na	1.24
Transport	100 km truck transport	Transport, combination truck, average fuel mix/US	tkm	3.420E -05	3.592E -05	3.305E -05	3.594E -05	3.692E -05	2.00, 5, 5, 1, 1, 1, na	2.28

*According to the GA energy source (coal 67%, natural gas 10%, nuclear 21%, and hydropower 2%),[3] ecoinvent database of Electricity, hard coal, at power plant/US U; Electricity, natural gas, at power plant/US U; Electricity, nuclear, at power plant/US U; and Electricity, hydropower, at power plant/FR U was used to inventory the GA energy mix emission.

Table 24.Rooftop rainwater harvesting designs (per apartment building)

Input	Reference	Unit	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Annual harvested rainwater		gal/yr	219,166	313,867	470,801	403,157	576,325	692,673
Daily water use		gal/day	600	860	1,290	4,418	6,316	7,591
Gutters	All sides of rooftop	ft	399	477	584	540	647	708
Down pipe	5’’ PVC pipe	ft	20	30	40	100	150	250
Above-ground tank size	HDPE tank	gallon	49,000	70,250	105,250	90,000	128,750	154,575
	# of tanks per building		5	7	10.5	9	13	15.5
Pump		lbs/kgal	1	1	1	1	1	1
Pumping energy	80% efficiency	kWh/gal	3.93E-05	5.89E-05	7.85E-05	1.96E-04	2.94E-04	4.91E-04
Treatment	Polyester sediment filter unit	Unit	1	1	1	1	1	1
	Energy for UV disinfection	kWh/gal	8.00E-05	8.00E-05	8.00E-05	8.00E-05	8.00E-05	8.00E-05
Supply pipe	1’’ PVC pipe	ft	54	70	89	145	204	309
Transport	Assumption: 100 km truck transport.	km	100	100	100	100	100	100

Table 25. Inventory data per gallon harvested rainwater of each multi-family residential community

Input	Reference	ecoinvent name	Unit	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6	Basic uncertainty factor and six data quality	σ_g^2
Gutters	18 yr life expectancy, 0.513 lb/ft, 4 sides of roof	Galvanized steel sheet, at plant/RNA	lb	5.18E-05	4.33E-05	3.54E-05	3.82E-05	3.20E-05	2.91E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Down pipe	6.3’’ PVC pipe, 6.3 lb/ft,50 yr life expectancy	Polyvinylchloride, bulk polymerized, at plant/RER U	lb	1.14E-05	1.20E-05	1.07E-05	3.11E-05	3.26E-05	4.53E-05	1.05, 4, 4, 1, 1, 1, na	1.24
		Extrusion, plastic pipes/RER U	lb	1.14E-05	1.20E-05	1.07E-05	3.11E-05	3.26E-05	4.53E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Above-ground tank size	1,800 lb per 10,000 gallon HDPE tank, 50 yr life expectancy	Polyethylene, HDPE, granulate, at plant	lb	8.05E-04	8.06E-04	8.05E-04	8.04E-04	8.04E-04	8.03E-04	1.05, 4, 4, 1, 1, 1, na	1.24
		Injection molding/RER U	lb	8.05E-04	8.06E-04	8.05E-04	8.04E-04	8.04E-04	8.03E-04	1.05, 4, 4, 1, 1, 1, na	1.24
Pump	6.03E-03 lb steel per kgal rainwater, 10 yr life expectancy	Steel, converter, unalloyed, at plant/RER U	lb	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	6.03E-06	1.05, 4, 4, 1, 1, 1, na	1.24

Table 25. Inventory data per gallon harvested rainwater of each multi-family residential community (continued)

Input	Reference	ecoinvent name	Unit	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6	Basic uncertainty factor and six data quality	σ_g^2
Pumping energy	80% efficiency	*	lb	5.63E-04	5.85E-04	6.08E-04	7.42E-04	8.55E-04	1.08E-03	1.05, 4, 4, 1, 1, 1, na	1.24
Sediment filter	Sediment filter, 1.3 lb/unit, 10 yr life expectancy	Polyester resin, unsaturated, at plant/RER U	lb	1.19E-06	8.28E-07	5.52E-07	6.45E-07	4.51E-07	3.75E-07	1.05, 4, 4, 1, 1, 1, na	1.24
		Fleece production, polyethylene terephthalate/RER U	lb	1.19E-06	8.28E-07	5.52E-07	6.45E-07	4.51E-07	3.75E-07	1.05, 4, 4, 1, 1, 1, na	1.24
Energy for UV disinfection	8.00E-05 kWh/gal	*		8.00E-05	8.00E-05	8.00E-05	8.00E-05	8.00E-05	8.00E-05	1.05, 4, 4, 1, 1, 1, na	1.24
Supply pipe	0.75''~ 3'' PVC pipe, 0.21 ~ 2.1 lbs/ft, 50 yr life expectancy	Polyvinylchloride, bulk polymerized, at plant/RER U	lb	5.58E-06	9.87E-06	1.67E-05	9.26E-05	1.93E-04	3.74E-04	1.05, 4, 4, 1, 1, 1, na	1.24
		Extrusion, plastic pipes/RER U	lb	5.58E-06	9.87E-06	1.67E-05	9.26E-05	1.93E-04	3.74E-04	1.05, 4, 4, 1, 1, 1, na	1.24
Transport	100 km truck transport	Transport, combination truck, average fuel mix/US	tkm	4.00E-05	3.96E-05	3.90E-05	4.04E-05	4.02E-05	4.08E-05	2.00, 5, 5, 1, 1, 1, na	2.28

*According to the GA energy source (coal 67%, natural gas 10%, nuclear 21%, and hydropower 2%),[3] ecoinvent database of Electricity, hard coal, at power plant/US U; Electricity, natural gas, at power plant/US U; Electricity, nuclear, at power plant/US U; and Electricity, hydropower, at power plant/FR U was used to inventory the GA energy mix emission.

Table 26. Rain garden size of each community

Single-family residential community		R-1	R-2	R-3	R-4	R-5	
Stormwater runoff volume	in./24-hr	6.5	6.7	6.8	7.0	7.1	
Rain garden size	ft^2	87,500	90,500	91,500	94,500	95,500	
Rain garden size per house	ft^2	18,303	9,673	4,201	2,256	1,863	
Multi-family residential community		RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Stormwater runoff volume	in./24-hr	6.6	6.7	6.8	6.7	6.8	7.1
Rain garden size	ft^2	89,000	90,500	91,500	90,500	91,500	95,500
Rain garden size per apartment building	ft^2	22,250	22,625	22,875	22,625	22,875	23,875

Table 27. Inventory data per ft^2 rain garden of 50-yr life expectancy

Input	Reference	Database	Unit		Basic uncertainty factor and six data quality	σ_g^2
Land use	From irrigated or indigenous open space to rain garden		ft^2	1		
Planting		Planting/CH U	ft^2	1	1.05, 4, 4, 1, 1, 1, na	1.24
Digger		Excavation, hydraulic digger/RER U	ft^2	3.5	1.05, 4, 4, 1, 1, 1, na	1.24
Backfilling		Excavation, hydraulic digger/RER U	ft^2	2.5	1.05, 4, 4, 1, 1, 1, na	1.24
Soil media	50 lb/ft^3	Soil, unspecified, in ground	lb	100	1.05, 4, 4, 1, 1, 1, na	1.24
Gravel layer	50lb/ft^3	Sand and gravel, unspecified, in ground	lb	25	1.05, 4, 4, 1, 1, 1, na	1.24
Drain pipe	6’’ PVC pipe, 5.8 lb/ft, 50-yr life expectancy	Polyvinylchloride, at regional storage/RER U	lb	2.594E-01	1.05, 4, 4, 1, 1, 1, na	1.24
		Extrusion, plastic pipes/RER U	lb	2.594E-01	1.05, 4, 4, 1, 1, 1, na	1.24
Transport[a]		Transport, combination truck, average fuel mix/US	tkm	1.134	2.00, 5, 5, 1, 1, 1, na	2.28

[a]The transport distance was assumed as 100 km.

Table 28. Rooftop rainwater harvesting LCA scores per gallon harvested rainwater (unit: % of annual world average damage per capita)

	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Total	1.84E-05	1.86E-05	1.80E-05	2.00E-05	2.05E-05	2.52E-05	2.53E-05	2.55E-05	2.82E-05	3.05E-05	3.52E-05
Climate change Human Health	6.27E-06	6.34E-06	6.06E-06	6.52E-06	6.66E-06	7.66E-06	7.72E-06	7.77E-06	8.72E-06	9.53E-06	1.12E-05
Ozone depletion	8.47E-10	8.47E-10	8.56E-10	1.04E-09	1.09E-09	1.59E-09	1.59E-09	1.59E-09	1.62E-09	1.64E-09	1.68E-09
Human toxicity	7.18E-07	7.18E-07	7.10E-07	7.60E-07	7.73E-07	8.64E-07	8.78E-07	8.92E-07	1.02E-06	1.12E-06	1.33E-06
Photochemical oxidant formation	5.25E-10	5.32E-10	5.13E-10	5.64E-10	5.78E-10	6.92E-10	6.96E-10	7.02E-10	7.93E-10	8.74E-10	1.04E-09
Particulate matter formation	1.43E-06	1.44E-06	1.39E-06	1.48E-06	1.51E-06	1.70E-06	1.71E-06	1.73E-06	1.96E-06	2.14E-06	2.52E-06
Ionizing radiation	1.44E-08	1.44E-08	1.43E-08	1.57E-08	1.61E-08	1.90E-08	1.92E-08	1.95E-08	2.15E-08	2.33E-08	2.68E-08
Climate change Ecosystems	5.57E-07	5.64E-07	5.39E-07	5.80E-07	5.92E-07	6.82E-07	6.86E-07	6.91E-07	7.76E-07	8.48E-07	9.95E-07
Terrestrial acidification	1.82E-09	1.83E-09	1.75E-09	1.83E-09	1.86E-09	2.03E-09	2.05E-09	2.07E-09	2.35E-09	2.58E-09	3.05E-09
Freshwater eutrophication	9.67E-10	9.64E-10	9.56E-10	1.03E-09	1.05E-09	1.19E-09	1.21E-09	1.23E-09	1.38E-09	1.51E-09	1.76E-09
Terrestrial ecotoxicity	2.76E-10	2.83E-10	2.72E-10	2.92E-10	2.98E-10	3.26E-10	3.27E-10	3.29E-10	3.79E-10	4.23E-10	5.13E-10
Freshwater ecotoxicity	1.02E-10	1.02E-10	1.00E-10	1.06E-10	1.08E-10	1.19E-10	1.21E-10	1.22E-10	1.39E-10	1.52E-10	1.80E-10

Table 28. Rooftop rainwater harvesting LCA scores per gallon harvested rainwater (unit: % of annual world average damage per capita) (continued)

	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Total	1.84E-05	1.86E-05	1.80E-05	2.00E-05	2.05E-05	2.52E-05	2.53E-05	2.55E-05	2.82E-05	3.05E-05	3.52E-05
Marine ecotoxicity	2.76E-13	2.75E-13	2.73E-13	2.93E-13	2.99E-13	3.37E-13	3.43E-13	3.48E-13	3.94E-13	4.31E-13	5.07E-13
Agricultural land occupation	1.75E-08	1.76E-08	1.77E-08	2.07E-08	2.15E-08	2.91E-08	2.93E-08	2.95E-08	3.25E-08	3.54E-08	4.11E-08
Urban land occupation	6.15E-09	6.09E-09	6.00E-09	6.22E-09	6.28E-09	6.57E-09	6.73E-09	6.89E-09	8.00E-09	8.89E-09	1.07E-08
Natural land transformation	4.81E-09	4.82E-09	4.84E-09	5.40E-09	5.54E-09	6.74E-09	6.81E-09	6.88E-09	7.60E-09	8.18E-09	9.39E-09
Metal depletion	8.99E-10	9.06E-10	9.13E-10	9.97E-10	1.02E-09	1.18E-09	1.19E-09	1.20E-09	1.60E-09	1.43E-09	1.65E-09
Fossil fuel depletion	9.39E-06	9.47E-06	9.28E-06	1.06E-05	1.09E-05	1.42E-05	1.43E-05	1.43E-05	1.56E-05	1.68E-05	1.91E-05

Table 29. Rain garden LCA score per ft^2

Impact	% of annual world average damage per capita
Total	1.11E-02
Climate change for human health	3.73E-03
Ozone depletion	1.13E-07
Human toxicity	6.65E-04
Photochemical oxidant formation	7.40E-07
Particulate matter formation	1.24E-03
Ionizing radiation	1.46E-06
Climate change for ecosystem	3.31E-04
Terrestrial acidification	1.13E-06
Freshwater eutrophication	9.55E-08
Terrestrial ecotoxicity	1.34E-07
Freshwater ecotoxicity	3.34E-08
Marine ecotoxicity	1.03E-10
Agricultural land occupation	6.05E-06
Urban land occupation	5.90E-07
Natural land transformation	3.56E-06
Metal depletion	4.69E-07
Fossil fuel depletion	5.10E-03

APPENDIX D

LIFE CYCLE ASSESSMENT (LCA) SCORES OF CENTRALIZED INFRASTRUCTURE (CI) TO HYBRID INFRASTRUCTION WITH LOW-IMPACT DEVELOPMENT (LID) TECHNOLOGIES

Table 30. LCA scores of centralized infrastructure (CI) and hybrid infrastructure (HI) for eleven residential communities (unit: % of annual world average damage per capita)

Community	Infrastructure type		CSS	SSS	Rain gardens	Water treatment plants and distribution system	Rooftop rainwater harvesting	Wastewater transport and treatment plants	Sum
R-1	CI	w/ CSS	1.11E+01			2.11E+00		2.36E+00	1.56E+01
		w/ SSS		6.57E-01		2.11E+00		2.36E+00	5.13E+00
	HI				1.23E+00		5.18E-01	2.36E+00	4.50E+00
R-2	CI	w/ CSS	6.51E+00			1.43E+00		2.36E+00	1.03E+01
		w/ SSS		3.85E-01		1.43E+00		2.36E+00	4.17E+00
	HI				6.49E-01		4.00E-01	2.36E+00	3.80E+00
R-3	CI	w/ CSS	3.03E+00			1.10E+00		2.36E+00	6.49E+00
		w/ SSS		1.79E-01		1.10E+00		2.36E+00	3.65E+00
	HI				2.82E-01		3.32E-01	2.36E+00	3.36E+00
R-4	CI	w/ CSS	1.62E+00			9.84E-01		2.36E+00	4.97E+00
		w/ SSS		9.58E-02		9.84E-01		2.36E+00	3.44E+00
	HI				1.51E-01		3.45E-01	2.36E+00	3.25E+00
R-5	CI	w/ CSS	1.54E+00			9.62E-01		2.36E+00	4.87E+00
		w/ SSS		9.12E-02		9.62E-01		2.36E+00	3.42E+00
	HI				1.25E-01		3.50E-01	2.36E+00	3.23E+00

Table 30. LCA scores of centralized infrastructure and hybrid infrastructure for eleven residential communities (unit: % of annual world average damage per capita) (continued)

Community	Infrastructure type		CSS	SSS	Rain gardens	Water treatment plants and distribution system	Rooftop rainwater harvesting	Wastewater transport and treatment plants	Sum
RG-1	CI	w/ CSS	1.27E+00			1.02E+00		2.36E+00	4.66E+00
		w/ SSS		7.52E-02		1.02E+00		2.36E+00	3.46E+00
	HI				1.34E-01		1.50E-01	2.36E+00	3.40E+00
RG-2	CI	w/ CSS	6.37E-01			9.49E-01		2.36E+00	3.95E+00
		w/ SSS		3.77E-02		9.49E-01		2.36E+00	3.35E+00
	HI				6.35E-02		1.01E-01	2.36E+00	3.32E+00
RG-3	CI	w/ CSS	3.44E-01			9.20E-01		2.36E+00	3.63E+00
		w/ SSS		2.04E-02		9.20E-01		2.36E+00	3.30E+00
	HI				3.21E-02		7.60E-02	2.36E+00	3.28E+00
RG-4	CI	w/ CSS	1.49E-01			9.09E-01		2.36E+00	3.42E+00
		w/ SSS		8.79E-03		9.09E-01		2.36E+00	3.28E+00
	HI				1.48E-02		3.36E-02	2.36E+00	3.28E+00
RG-5	CI	w/ CSS	7.49E-02			9.02E-01		2.36E+00	3.34E+00
		w/ SSS		4.43E-03		9.02E-01		2.36E+00	3.27E+00
	HI				6.98E-03		2.42E-02	2.36E+00	3.27E+00
RG-6	CI	w/ CSS	4.73E-02			8.99E-01		2.36E+00	3.31E+00
		w/ SSS		2.80E-03		8.99E-01		2.36E+00	3.27E+00
	HI				3.64E-03		1.68E-02	2.36E+00	3.27E+00

Table 31. Probability that hybrid infrastructure (HI) is more environmentally sustainable than CI (CI) with combined sewer systm (CSS) or separate sewer system (SSS) for eleven residential communities.

Single-family residential community	CI with CSS	CI with SSS	Multi-familry residential community	CI with CSS	CI with SSS
R-1	100%	100%	RG-1	100%	78%
R-2	100%	100%	RG-2	100%	75%
R-3	100%	100%	RG-3	100%	70%
R-4	100%	98%	RG-4	100%	50%
R-5	100%	92%	RG-5	100%	40%
			RG-6	100%	25%

Table 32. LCA score sensitivity to ±10% of outdoor water demand

	10% of outdoor water demand for irrigation		LCA score change		LCA score change		
	gal/yr per capita		% of annual world average damage per capita		%		
	Centralized infrastructure	Hybrid infrastructure	Centralized infrastructure	Hybrid infrastructure	Centralized infrastructure with CSS	Centralized infrastructure with SSS	Hybrid infrastructure
R-1	±3.90E+03	±1.17E+03	±1.21E-01	±2.15E-02	±0.8%	±2.4%	±0.5%
R-2	±1.70E+03	±5.10E+02	±5.29E-02	±9.47E-03	±0.5%	±1.3%	±0.2%
R-3	±6.60E+02	±1.98E+02	±2.05E-02	±3.57E-03	±0.3%	±0.6%	±0.1%
R-4	±2.78E+02	±8.33E+01	±8.64E-03	±1.67E-03	±0.2%	±0.3%	±0.1%
R-5	±2.09E+02	±6.26E+01	±6.49E-03	±1.29E-03	±0.1%	±0.2%	±0.0%
RG-1	±4.06E+02	±1.22E+02	±1.26E-02	±3.79E-03	±0.3%	±0.4%	±0.1%
RG-2	±1.68E+02	±5.05E+01	±5.24E-03	±1.57E-03	±0.1%	±0.2%	±0.0%
RG-3	±7.47E+01	±2.24E+01	±2.32E-03	±6.97E-04	±0.1%	±0.1%	±0.0%
RG-4	±3.91E+01	±1.17E+01	±1.22E-03	±3.65E-04	±0.0%	±0.0%	±0.0%
RG-5	±1.63E+01	±4.88E+00	±5.06E-04	±1.52E-04	±0.0%	±0.0%	±0.0%
RG-6	±5.06E+00	±1.52E+00	±1.57E-04	±4.72E-05	±0.0%	±0.0%	±0.0%

The variations for eleven residential communities are presented in the SI. The change (±10%) of outdoor water demand for irrigation is ±3.90E+03 gal/yr per capita in R-1 under the condition of centralized infrastructure and corresponding LCA score change is

±1.21E-01% of annual world average damage per capita. It results in ±0.8% as compared to the LCA score of centralized infrastructure with CSS and it is ±2.4% as compared to centralized infrastructure with SSS (±0.8%). As irrigated open space and outdoor water demand for irrigation decreases due to the dramatic population increase from R-1 to RG-6, ±10% of outdoor water demand for irrigation becomes negligible and the change of LCA score is close to 0%. For hybrid infrastructure, as the irrigated open space is xeriscaped, ±10% of outdoor water demand for irrigation is ±1.17E+03 gal in R-1, which is smaller as compared to the centralized infrastructure case. For single-family residential communities, as rainwater harvesting potential is greater than non-potable water demand, the change of outdoor water demand means the change of rainwater use, and therefore, it is ±0.5% for R-1 community. However, for the multi-family residential communities, as non-potable water demand is much greater than harvesting potential, water from CWSS changes is saved or supplied more as a result of the change of outdoor water demand. Nevertheless, the LCA scores of hybrid infrastructure are almost constant regardless of the changes of outdoor water demand. Two reasons are suggested: (1) the outdoor water demand is too small to result in noticeable difference and (2) LCA scores of rainwater harvesting technology get close to the score of CWSS because the storage tank size was maximized to harvest rainwater as much as possible and more pumping energy is required to supply rainwater to top story.

Table 33. LCA score sensitivity to drought or flooding year precipitation data

Drought year 2007										
	Change of storwmater runoff and rainwater harvesting			LCA score change				LCA score change, %		
	Centralized infrastructure	Hybrid infrastructure		Centralized infrastructure		Hybrid infrastructure		Centralize infrastructure		Hybrid infrastructure
	Stormwater runoff change	Stormwater runoff change	Rainwater harvesting change	w/ CSS	w/ SSS	rain garden	rainwater harvesting	w/ CSS	w/ SSS	
R-1	-82,666	-79,455	0	-6.78E+00	-4.01E-01	0		-43.5%	-7.8%	0.0%
R-2	-45,780	-40,874	0	-3.75E+00	-2.22E-01	0		-36.4%	-5.3%	0.0%
R-3	-20,548	-12,899	0	-1.68E+00	-9.96E-02	0		-25.9%	-2.7%	0.0%
R-4	-10,515	-6,949	-475	-8.62E-01	-5.10E-02	0	5.28E-03	-17.4%	-1.5%	0.2%
R-5	-9,650	-3,319	-1,410	-7.91E-01	-4.68E-02	0	1.49E-02	-16.2%	-1.4%	0.5%
RG-1	-9,215	-5,758	-1,457	-7.55E-01	-4.47E-02	0	8.67E-03	-16.2%	-1.3%	0.3%
RG-2	-4,475	-3,091	-988	-3.67E-01	-2.17E-02	0	5.71E-03	-9.3%	-0.6%	0.2%
RG-3	-2,338	-1,141	-728	-1.92E-01	-1.13E-02	0	4.09E-03	-5.3%	-0.3%	0.1%
RG-4	-1,045	-577	-294	-8.57E-02	-5.07E-03	0	8.67E-04	-2.5%	-0.2%	0.0%
RG-5	-509	-213	-192	-4.17E-02	-2.47E-03	0	1.17E-04	-1.2%	-0.1%	0.0%
RG-6	-290	-89	-118	-2.38E-02	-1.40E-03	0	-4.85E-04	-0.7%	0.0%	0.0%

Table 33. LCA score sensitivity to drought or flooding year precipitation data (continued)

Flooding year 2009										
	Change of storwmater runoff and rainwater harvesting			LCA score change				LCA score change, %		
	Centralized infrastructure	Hybrid infrastructure		Centralized infrastructure		Hybrid infrastructure		Centralized infrastructure		Hybrid infrastructure
	Stormwater runoff change	Stormwater runoff change	Rainwater harvesting change	w/ CSS	w/ SSS	Rain garden	Rainwater harvesting	w/ CSS	w/ SSS	
R-1	1.96E+05	192,982	0	1.60E+01	9.35E-01	0	0	103%	18%	0%
R-2	1.16E+05	110,654	0	9.50E+00	5.36E-01	0	0	92%	13%	0%
R-3	5.39E+04	43,819	0	4.42E+00	2.12E-01	0	0	68%	6%	0%
R-4	2.85E+04	29,444	0	2.33E+00	1.43E-01	0	0	47%	4%	0%
R-5	2.68E+04	24,574	0	2.20E+00	1.19E-01	0	0	45%	3%	0%
RG-1	2.25E+04	17,212	4,185	1.84E+00	8.34E-02	0	-0.02	40%	2%	-1%
RG-2	1.13E+04	9,260	2,790	9.29E-01	4.49E-02	0	-0.02	24%	1%	0%
RG-3	6.13E+03	4,363	2,093	5.02E-01	2.12E-02	0	-0.01	14%	1%	0%
RG-4	2.65E+03	1,941	837	2.17E-01	9.41E-03	0	0.00	6%	0%	0%
RG-5	1.33E+03	897	557	1.09E-01	4.35E-03	0	0.00	3%	0%	0%
RG-6	7.93E+02	541	335	6.50E-02	2.62E-03	0	0.00	2%	0%	0%

APPENDIX E

GREYWATER RECLAMATION SYSTEM DESIGN AND LIFE CYCLE ASSESSMENT (LCA)

Table 34. Water quality standard for on-site water reuse

	Use	BOD	TSS or Turbidity	Bacterial indicators
NSF/ANSI standard 350[42]	Restricted indoor and unrestricted outdoor use of residential treatment system	CBOD5 (average) 10 mg/l	TSS < 10 mg/l Turbidity < 5 NTU	E.coli 14 MPN/100 ml
Queensland Department of Infrastructure and Planning[42]	toilet flushing and laundry, urinals, vehicle wash	BOD5 <10 mg/l	TSS < 10 mg/L Turbidity (max) < 5 NTU Turbidity (95th percentile) < 2 NTU	E.coli (max) < 10 cfu/100 ml E. coil (95th percentile)<1 cfu/100 ml
fbr (German Association for Rainwater Harvesting and Water Recycling) guideline[40]	Toilet flushing and laundry	BOD7 <5 mg/l	-	Total coliform <100/ml Fecal coliform <10/ml Pseudomonas aeruginosa <1/ml
	Outdoor irrigation			Fecal coliform <1/ml

Table 35. Life cycle inventory of construction phase for greywater reclamation technology

System component	Reference	Material	Life expectancy, yr	Amounts for 50 yrs, lbs	lbs/gal	ecoinvent name	Basic uncertainty and six data qualities	Geometric standard deviation
Fine screen	Referred to material inventory for 5,000 gal/day membrane bioreactor system [106]	Steel	50	1,500	1.64E-02	Steel, converter, unalloyed, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Concrete pad excavation		Dirt	50	108,000	1.66E-03	Excavation, hydraulic digger/RER U	(2, 4, 1, 1, 1, na)	1.12
Concrete pad		Concrete	50	22,750	1.66E-03	Concrete, normal, at plant/CH U	(2, 4, 1, 1, 1, na)	1.12
Steel container		Steel	50	7,380	8.09E-02	Steel, converter, unalloyed, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Mixer		Steel	10	1,650	1.81E-02	Steel, converter, unalloyed, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Aeration system piping		PVC	50	71	7.78E-04	Polyvinylchloride, at regional storage/RER U	(2, 4, 1, 1, 1, na)	1.12
Aeration system rubber piping		Rubber-silicon based	50	300	3.29E-03	Synthetic rubber, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Pump		Steel	10	800	8.77E-03	Steel, converter, unalloyed, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
MBR reactor steel housing		Steel	50	880	9.64E-03	Steel, converter, unalloyed, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Membranes		Polyvinylidene flouoride (PVDF)	10	250	2.74E-03	Polyvinylidenchloride, granulate, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12

Table 35. Life cycle inventory of construction phase for greywater reclamation technology (continued)

System component	Reference	Material	Life expectancy, yr	Amounts for 50 yrs, lbs	lbs/gal	ecoinvent name	Basic uncertainty and six data qualities	Geometric standard deviation
Recycle pump	Referred to material inventory for 5,000 gal/day membrane bioreactor system [106]	Steel	10	550	6.03E-03	Steel, converter, unalloyed, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Air blower		Cast iron	15	785	8.60E-03	Cast iron, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Controls/portable instruments		Polyester	25	50	5.48E-04	Polyester resin, unsaturated, at plant/RER U	(2, 4, 1, 1, 1, na)	1.12
Pipelines	Estimated from single-family house or apartment building dimension	PVC	50	Table 5		Polyvinylchloride, at regional storage/RER U	(2, 4, 1, 1, 1, na)	1.12

Table 36. Greywater collection and reclaimed water distribution pipeline designs for eleven residential communities

		R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Greywater reclamation capacity, gallon/yr per house or building		6.50E+04	6.50E+04	6.50E+04	6.34E+04	6.11E+04	7.24E+05	1.43E+06	2.71E+06	5.68E+06	1.20E+07	2.39E+07
Single house or apartment building dimension	Building top area	19,400	12,900	5,100	2,950	2,750	8,821	12,633	18,949	16,226	23,232	27,878
	Length[a]	197	161	101	77	74	133	159	195	180	216	236
	Height[b]	30	30	30	30	30	20	30	40	100	150	250
Pipe diameter, in.		0.50	0.50	0.50	0.50	0.50	0.75	1.00	1.25	2.00	2.50	3.00
Pipe line length[c], ft		848	702	464	367	357	571.3	1013.7	1637.4	3802.9	6766.7	12306.4
Lbs/ft		1.51E-01	1.51E-01	1.51E-01	1.51E-01	1.51E-01	2.14E-01	3.06E-01	4.82E-01	9.82E-01	1.65E+00	2.11E+00
PVC pipe amount, lbs	For 50 yrs	128	106	70	56	54	122.2	309.9	788.5	3735.1	11147.6	25910.8
	Per gallon	3.94E-05	3.27E-05	2.16E-05	1.75E-05	1.77E-05	3.37E-06	4.34E-06	5.82E-06	1.31E-05	1.85E-05	2.17E-05

[a]with assuming length to width of rectangular building top as 2:1

[b]Height = story x 15 ft (single-family house) or 10 ft (multi-family apartment building)

[c]Pipeline length = length x story + height

Table 37. Life cycle inventory of operation phase for greywater reclamation technology

<table>
<tr><th>System component</th><th colspan="2">Reference</th><th></th><th>ecoinvent name</th><th>Basic uncertainty and six data qualities</th><th>Geometric standard deviation</th></tr>
<tr><td>Energy for MBR, kWh/kgal</td><td>Estimated from the correlation between electricity consumption and MBR treatment capacity</td><td rowspan="3">According to the GA energy source (coal 67%, natural gas 10%, nuclear 21%, and hydropower 2%)[3]</td><td>Table 37</td><td rowspan="3">Electricity, hard coal, at power plant/US U (67%); Electricity, natural gas, at power plant/US U (10%); Electricity, nuclear, at power plant/US U (21%); Electricity, hydropower, at power plant/FR U (2%)</td><td>(2,4,1,1,1,na)</td><td>1.12</td></tr>
<tr><td>Energy for UV disinfection, kWh/gal</td><td>From a literature</td><td>8.00E-02</td><td>(4,4,1,1,1,na)</td><td>1.24</td></tr>
<tr><td>Pumping energy, kWh/kgal</td><td>Estimated from the dimension of house or building</td><td>Table 37</td><td>(2,4,1,1,1,na)</td><td>1.12</td></tr>
<tr><td>Chemicals, lbs/gal</td><td>2 times/yr, 5,600 lbs for 50 yr 5,000 gal/day MBR operation</td><td>Sodium hypochlorite</td><td>6.14E-05</td><td>Sodium hypochlorite, 15% in H2O, at plant/RER U</td><td>(2, 4, 1, 1, 1, na)</td><td>1.12</td></tr>
<tr><td>Sludge disposal, lbs/gal</td><td>Estimated from (reference)</td><td>Being sent to centralized wastewater treatment system</td><td>5.00E-02</td><td>Disposal, digester sludge, to municipal incineration/CH U</td><td>(2, 4, 1, 1, 1, na)</td><td>1.12</td></tr>
</table>

Table 38. Electricity consumption for MBR and pumping for eleven residential communities

	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
MBR treatment capacity, kgal/day	1.78E-01	1.78E-01	1.78E-01	1.74E-01	1.67E-01	1.98E+00	3.92E+00	7.43E+00	1.56E+01	3.30E+01	6.55E+01
MBR reactor energy, kWh/kgal	4.49E+01	4.49E+01	4.49E+01	4.53E+01	4.58E+01	2.05E+01	1.64E+01	1.33E+01	1.05E+01	8.18E+00	6.54E+00
Pumping energy, kWh/kgal	6.48E-01	6.37E-01	6.20E-01	6.13E-01	6.12E-01	5.63E-01	5.85E-01	6.08E-01	7.42E-01	8.55E-01	1.08E+00

Table 39. Life cycle inventory of transport and decommissioning phases for greywater reclamation technology

	Calculation	ecoinvent name	Basic uncertainty and six data qualities	Geometric standard deviation
Transport	Sum of all material amounts lbs/gal x 100 km truck transport (assumption)	Transport, combination truck, average fuel mix/US	2.00, 5, 5, 1, 1, 1, na	2.28
Disposal	Steel and cast iron, lbs/gal	Recycling steel and iron/RER U	1.05, 4, 5, 1, 1, 1, na	1.3
	Concrete, lbs/gal	Disposal, building, concrete, not reinforced, to final disposal/CH U	1.05, 4, 5, 1, 1, 1, na	1.3
	PVC, lbs/gal	Disposal, building, polyvinylchloride products, to final disposal/CH U	1.05, 4, 5, 1, 1, 1, na	1.3

Table 40. Life cycle environmental impacts of greywater reclamation technology (per gallon of greywater)

		R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Climate change	kg CO2 eq	3.99E-02	3.99E-02	3.98E-02	4.02E-02	4.06E-02	1.85E-02	1.50E-02	1.23E-02	1.00E-02	8.13E-03	6.91E-03
Ozone depletion	kg CFC-11 eq	9.75E-10	9.74E-10	9.74E-10	9.81E-10	9.91E-10	4.88E-10	4.07E-10	3.46E-10	2.93E-10	2.49E-10	2.21E-10
Human toxicity	kg 1,4-DB eq	1.40E-02	1.40E-02	1.40E-02	1.42E-02	1.43E-02	6.56E-03	5.31E-03	4.37E-03	3.56E-03	2.89E-03	2.46E-03
Photochemical oxidant formation	kg NMVOC	1.03E-04	1.03E-04	1.03E-04	1.03E-04	1.04E-04	4.78E-05	3.87E-05	3.19E-05	2.60E-05	2.11E-05	1.79E-05
Particulate matter formation	kg PM10 eq	5.95E-05	5.95E-05	5.94E-05	5.99E-05	6.06E-05	2.78E-05	2.25E-05	1.86E-05	1.51E-05	1.23E-05	1.05E-05
Ionizing radiation	kg U235 eq	1.07E-02	1.07E-02	1.07E-02	1.08E-02	1.09E-02	4.97E-03	4.01E-03	3.30E-03	2.68E-03	2.16E-03	1.83E-03
Terrestrial acidification	kg SO2 eq	2.38E-04	2.38E-04	2.38E-04	2.40E-04	2.42E-04	1.11E-04	8.93E-05	7.34E-05	5.95E-05	4.81E-05	4.07E-05
Freshwater eutrophication	kg P eq	1.92E-05	1.92E-05	1.91E-05	1.93E-05	1.95E-05	8.94E-06	7.24E-06	5.96E-06	4.85E-06	3.93E-06	3.34E-06
Marine eutrophication	kg N eq	7.76E-06	7.76E-06	7.75E-06	7.81E-06	7.89E-06	3.74E-06	3.07E-06	2.57E-06	2.13E-06	1.77E-06	1.54E-06
Terrestrial ecotoxicity	kg 1,4-DB eq	1.08E-06	1.08E-06	1.07E-06	1.08E-06	1.10E-06	5.05E-07	4.11E-07	3.39E-07	2.78E-07	2.27E-07	1.95E-07
Freshwater ecotoxicity	kg 1,4-DB eq	3.40E-04	3.39E-04	3.39E-04	3.42E-04	3.46E-04	1.58E-04	1.28E-04	1.05E-04	8.56E-05	6.94E-05	5.90E-05
Marine ecotoxicity	kg 1,4-DB eq	3.03E-04	3.03E-04	3.03E-04	3.06E-04	3.09E-04	1.41E-04	1.15E-04	9.42E-05	7.67E-05	6.22E-05	5.29E-05
Agricultural land occupation	m2a	4.98E-04	4.98E-04	4.98E-04	5.02E-04	5.08E-04	2.33E-04	1.89E-04	1.56E-04	1.27E-04	1.03E-04	8.79E-05

Table 40. Life cycle environmental impacts of greywater reclamation technology (per gallon of greywater) (continued)

		R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Urban land occupation	m2a	3.49E-04	3.49E-04	3.49E-04	3.52E-04	3.56E-04	1.63E-04	1.32E-04	1.08E-04	8.78E-05	7.10E-05	6.02E-05
Natural land transformation	m2	1.85E-06	1.85E-06	1.85E-06	1.87E-06	1.89E-06	8.70E-07	7.06E-07	5.83E-07	4.76E-07	3.88E-07	3.31E-07
Water depletion	m3	1.14E-04	1.14E-04	1.13E-04	1.14E-04	1.16E-04	5.34E-05	4.35E-05	3.60E-05	2.95E-05	2.41E-05	2.07E-05
Metal depletion	kg Fe eq	3.62E-04	3.62E-04	3.62E-04	3.64E-04	3.67E-04	2.17E-04	1.93E-04	1.74E-04	1.59E-04	1.46E-04	1.38E-04
Fossil fuel depletion	kg oil eq	1.06E-02	1.06E-02	1.06E-02	1.07E-02	1.08E-02	4.92E-03	3.98E-03	3.28E-03	2.67E-03	2.16E-03	1.84E-03

Table 41. Life cycle environmental damages of greywater reclamation technology (per gallon of greywater)

Impact category	Unit	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Climate change Human Health	DALY	5.58E-08	5.58E-08	5.57E-08	5.62E-08	5.68E-08	2.60E-08	2.10E-08	1.73E-08	1.40E-08	1.14E-08	9.67E-09
Ozone depletion	DALY	1.65E-12	1.65E-12	1.65E-12	1.66E-12	1.68E-12	7.77E-13	6.31E-13	5.22E-13	4.27E-13	3.48E-13	2.98E-13
Human toxicity	DALY	9.83E-09	9.83E-09	9.82E-09	9.90E-09	1.00E-08	4.59E-09	3.72E-09	3.06E-09	2.49E-09	2.02E-09	1.72E-09
Photochemical oxidant formation	DALY	4.00E-12	4.00E-12	4.00E-12	4.03E-12	4.07E-12	1.87E-12	1.51E-12	1.24E-12	1.01E-12	8.22E-13	7.00E-13
Particulate matter formation	DALY	1.55E-08	1.55E-08	1.55E-08	1.56E-08	1.58E-08	7.23E-09	5.86E-09	4.83E-09	3.94E-09	3.20E-09	2.72E-09
Ionizing radiation	DALY	1.75E-10	1.75E-10	1.75E-10	1.77E-10	1.79E-10	8.15E-11	6.58E-11	5.41E-11	4.39E-11	3.55E-11	3.00E-11
Climate change Ecosystems	species·yr	3.16E-10	3.16E-10	3.16E-10	3.18E-10	3.22E-10	1.47E-10	1.19E-10	9.78E-11	7.96E-11	6.45E-11	5.48E-11
Terrestrial acidification	species·yr	1.38E-12	1.38E-12	1.38E-12	1.39E-12	1.41E-12	6.41E-13	5.18E-13	4.25E-13	3.45E-13	2.79E-13	2.36E-13
Freshwater eutrophication	species·yr	8.42E-13	8.42E-13	8.41E-13	8.48E-13	8.58E-13	3.93E-13	3.18E-13	2.62E-13	2.13E-13	1.73E-13	1.47E-13
Terrestrial ecotoxicity	species·yr	1.37E-13	1.37E-13	1.36E-13	1.38E-13	1.39E-13	6.41E-14	5.21E-14	4.31E-14	3.53E-14	2.89E-14	2.47E-14
Freshwater ecotoxicity	species·yr	8.84E-14	8.83E-14	8.83E-14	8.90E-14	9.00E-14	4.12E-14	3.33E-14	2.74E-14	2.23E-14	1.81E-14	1.53E-14
Marine ecotoxicity	species·yr	2.43E-16	2.43E-16	2.43E-16	2.45E-16	2.47E-16	1.13E-16	9.16E-17	7.54E-17	6.14E-17	4.98E-17	4.23E-17
Agricultural land occupation	species·yr	5.59E-12	5.59E-12	5.58E-12	5.63E-12	5.69E-12	2.61E-12	2.12E-12	1.75E-12	1.42E-12	1.16E-12	9.85E-13

Table 41. Life cycle environmental damages of greywater reclamation technology (per gallon of greywater)

Impact category	Unit	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
Urban land occupation	species·yr	6.75E-12	6.74E-12	6.74E-12	6.80E-12	6.87E-12	3.14E-12	2.54E-12	2.09E-12	1.69E-12	1.37E-12	1.16E-12
Natural land transformation	species·yr	3.09E-12	3.09E-12	3.08E-12	3.11E-12	3.14E-12	1.45E-12	1.17E-12	9.69E-13	7.91E-13	6.43E-13	5.49E-13
Metal depletion	$	2.59E-05	2.59E-05	2.58E-05	2.60E-05	2.62E-05	1.55E-05	1.38E-05	1.25E-05	1.14E-05	1.04E-05	9.85E-06
Fossil fuel depletion	$	1.70E-01	1.70E-01	1.70E-01	1.71E-01	1.73E-01	7.91E-02	6.40E-02	5.27E-02	4.29E-02	3.48E-02	2.96E-02

Table 42. Life cycle assessment (LCA) score of greywater reclamation technology (per gallon of greywater)

	R-1	R-2	R-3	R-4	R-5	RG-1	RG-2	RG-3	RG-4	RG-5	RG-6
% of annual world damage per capita	4.10E-04	4.10E-04	4.10E-04	4.13E-04	4.18E-04	1.91E-04	1.55E-04	1.27E-04	1.04E-04	8.39E-05	7.14E-05

APPENDIX F

DATA UNCERTAINTY FACTORS

Table 43. Basic uncertainty factors applied to technosphere inputs and outputs and for elementary flows (c: combustion emissions; p: process emissions; a: agricultural emissions)[81]

Input/output group			
c=combustion emissions, p=process emissions, a=agricultural emissions	c	p	a
Demand of:			
Thermal energy, electricity, semi-finished products, working materials, waste treatment	1.05	1.05	1.05
Transport services (tkm)	2.00	2.00	2.00
Infrastructure	3.00	3.00	3.00
Resources:			
Primary energy carriers, metals, salts	1.05	1.05	1.05
Land use, occupation	1.50	1.50	1.50
Land use, transformation	2.00	2.00	2.00
Pollutants emitted to water:			
BOD, COD, DOC, TOC, inorganic compounds (NH_4, PO_4, NO_3, Cl, Na, etc.)		1.50	
Individual hydrocarbons, PAH		3.00	
Heavy metals		5.00	1.80
Pesticides			1.50
NO_3, PO_4			1.50
Pollutants emitted to soil:			
Oil, hydrocarbon total		1.50	
Heavy metals		1.50	1.50
Pesticides			1.20
Pollutants emitted to air:			
CO_2	1.05	1.05	
SO_2	1.05		
NMVOC total	1.50		
NO_x, N_2O	1.50		1.40
CH_4, NH_3	1.50		1.20

Table 43. Basic uncertainty factors applied to technosphere inputs and outputs and for elementary flows (c: combustion emissions; p: process emissions; a: agricultural emissions)[81] (continued)

Input/output group			
Individual hydrocarbons	1.50	2.00	
PM>10	1.50	1.50	
PM10	2.00	2.00	
PM2.5	3.00	3.00	
Polycyclic aromatic hydrocarbons (PAH)		3.00	
CO, heavy metals		5.00	
Inorganic emissions, others		1.50	
Radionuclides (e.g., Radon-222)		3.00	

Table 44. Data quality assessment criteria from SimaPro and Frischknecht et al. (2004)

<table>
<tr><td></td><td>1</td><td colspan="2">2</td><td colspan="2">3</td><td colspan="2">4</td><td colspan="2">5</td></tr>
<tr><td rowspan="2">Reliability</td><td>Verified data based on measurement</td><td>Verified based on assumptions</td><td>Non-verified based on measurements</td><td colspan="2">Non-verified data partly based on qualified estimates</td><td>Qualified estimate</td><td>Data derived from theoretical information</td><td colspan="2">Non-qualified estimate</td></tr>
<tr><td>Remark</td><td colspan="8">Verified means: published in public environmental reports of companies, official statistics, etc.
Unverified means: personal information by letter, fax or e-mail</td></tr>
<tr><td rowspan="2">Completeness</td><td>Representative data from all sites</td><td colspan="2">Representative data from >50% of the sites relevant</td><td>Representative data from only some sites (<50%)</td><td>>50% of sites from shorter periods</td><td>Representative data from only one site relevant</td><td>Data from some sites from shorter periods</td><td colspan="2">Representativeness unknown</td></tr>
<tr><td>Remark</td><td colspan="8">Length of adequate period depends on process/technology</td></tr>
<tr><td rowspan="2">Temporal correlation</td><td>Less than 3 years of difference to our reference year (2000)</td><td colspan="2">Less than 6 years of difference to our reference year (2000)</td><td colspan="2">Less than 10 years of difference to our reference year (2000)</td><td colspan="2">Less than 15 years of difference to our reference year (2000)</td><td>Age of data unknown</td><td>Age of data more than 15 years from reference year (2000)</td></tr>
<tr><td>Remark</td><td colspan="8">Less than 3 years means: data measured in 1997 or later; score for processes with investment cycles of <10 years; for other cases, scoring adjustments can be made accordingly</td></tr>
<tr><td rowspan="2">Geographical correlation</td><td>Data from area under study</td><td colspan="2">Average data from larger area in which the area under the study in included</td><td>Data from smaller area than area under study</td><td>Data from similar area</td><td colspan="2"></td><td>Data from unknown area</td><td>Data from distinctly different area</td></tr>
<tr><td>Remark</td><td colspan="8">Similarity expressed in terms of environmental legislation. Suggestion for grouping: North America, Australia; European Union, Japan, South Africa and Middle East; Russia, China, Far East Asia</td></tr>
</table>

Table 44. Data quality assessment criteria from SimaPro and Frischknecht et al. (2004) (continued)

	1	2	3	4		5
Further technological correlation	Data from enterprises, processes and materials under study		Data from related processes on laboratory scale of different technology	Data from related processes or materials but different technology	Data from laboratory scale processes and same technology	Data on related processes or materials but on laboratory scale of different technology
	Remark	Examples for different technology: steam turbine instead of motor propulsion in ships vs. Emission factor for diesel train based on lorry motor data Examples for related processes or materials: data for tiles instead of bricks production vs. data of refinery infrastructure for chemical plants infrastructure				
Sample size	>100, continuous measurement	>20	>10, aggregated figure in environmental report	>=3		unknown
	Remark	Sample size behind a figure reported in the information source				

APPENDIX G

STORMWATER RUNOFF AND RAINWTER HARVESTING

SIMULATION EXCEL SHEET

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
1/1/2010	0.0248	50	64	0.00	0	0	54	0.00
1/2/2010	0.0248	50	64	0.00	0	0	54	0.00
1/3/2010	0.0000	50	64	0.00	0	0	54	0.00
1/4/2010	0.0000	50	64	0.00	0	0	54	0.00
1/5/2010	0.0000	50	64	0.00	0	0	54	0.00
1/6/2010	0.0000	50	64	0.00	0	0	54	0.00
1/7/2010	0.0000	50	64	0.00	0	0	54	0.00
1/8/2010	0.1119	50	64	0.00	4,153	0	54	0.00
1/9/2010	0.0000	50	64	0.00	0	0	54	0.00
1/10/2010	0.0000	50	64	0.00	0	0	54	0.00
1/11/2010	0.0000	50	64	0.00	0	0	54	0.00
1/12/2010	0.0000	50	64	0.00	0	0	54	0.00
1/13/2010	0.0000	50	64	0.00	0	0	54	0.00
1/14/2010	0.0000	50	64	0.00	0	0	54	0.00
1/15/2010	0.0000	50	64	0.00	0	0	54	0.00
1/16/2010	0.0000	50	64	0.00	0	0	54	0.00
1/17/2010	1.2157	84	88	0.39	22,514	45,482	85	0.33
1/18/2010	0.0690	84	88	0.00	1,216	458	85	0.00
1/19/2010	0.0000	84	88	0.00	0	0	85	0.00
1/20/2010	0.0000	84	88	0.00	0	0	85	0.00
1/21/2010	0.0729	84	88	0.00	1,894	0	85	0.00
1/22/2010	0.6319	69	77	0.00	2,968	31,260	72	0.00
1/23/2010	0.0000	69	77	0.00	0	0	72	0.00
1/24/2010	0.0462	69	77	0.00	352	0	72	0.00
1/25/2010	1.9390	84	88	0.92	3,295	106,537	85	0.91
1/26/2010	0.0000	84	88	0.00	0	0	85	0.00
1/27/2010	0.0000	84	88	0.00	0	0	85	0.00
1/28/2010	0.0000	84	88	0.00	0	0	85	0.00
1/29/2010	0.0000	84	88	0.00	0	0	85	0.00
1/30/2010	0.5038	69	77	0.00	6,078	20,742	72	0.00
1/31/2010	0.0129	69	77	0.00	0	0	72	0.00
2/1/2010	0.0000	69	77	0.00	0	0	72	0.00
2/2/2010	0.3514	69	77	0.00	3,647	14,359	72	0.00
2/3/2010	0.0062	69	77	0.00	0	0	72	0.00
2/4/2010	0.0000	50	64	0.00	0	0	54	0.00
2/5/2010	1.7571	84	88	0.77	3,647	95,664	85	0.77

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
2/6/2010	0.6181	84	88	0.07	1,216	32,214	85	0.07
2/7/2010	0.0000	84	88	0.00	0	0	85	0.00
2/8/2010	0.0000	84	88	0.00	0	0	85	0.00
2/9/2010	0.0000	84	88	0.00	0	0	85	0.00
2/10/2010	0.1967	69	77	0.00	4,863	4,193	72	0.00
2/11/2010	0.0000	50	64	0.00	0	0	54	0.00
2/12/2010	0.0000	50	64	0.00	0	0	54	0.00
2/13/2010	0.2186	50	64	0.00	3,647	6,675	54	0.00
2/14/2010	0.0000	50	64	0.00	0	0	54	0.00
2/15/2010	0.2229	50	64	0.00	2,431	8,139	54	0.00
2/16/2010	0.0186	50	64	0.00	0	0	54	0.00
2/17/2010	0.0000	50	64	0.00	0	0	54	0.00
2/18/2010	0.0000	50	64	0.00	0	0	54	0.00
2/19/2010	0.0000	50	64	0.00	0	0	54	0.00
2/20/2010	0.0000	50	64	0.00	0	0	54	0.00
2/21/2010	0.0000	50	64	0.00	0	0	54	0.00
2/22/2010	0.6610	69	77	0.00	8,510	27,399	72	0.00
2/23/2010	0.0014	69	77	0.00	0	0	72	0.00
2/24/2010	0.0000	69	77	0.00	0	0	72	0.00
2/25/2010	0.0000	69	77	0.00	0	0	72	0.00
2/26/2010	0.0000	69	77	0.00	0	0	72	0.00
2/27/2010	0.0000	50	64	0.00	0	0	54	0.00
2/28/2010	0.0000	50	64	0.00	0	0	54	0.00
3/1/2010	0.0000	50	64	0.00	0	0	54	0.00
3/2/2010	0.3129	50	64	0.00	9,725	6,050	54	0.00
3/3/2010	0.4448	69	77	0.00	1,216	22,189	72	0.00
3/4/2010	0.0000	69	77	0.00	0	0	72	0.00
3/5/2010	0.0000	69	77	0.00	0	0	72	0.00
3/6/2010	0.0000	69	77	0.00	0	0	72	0.00
3/7/2010	0.0000	50	64	0.00	0	0	54	0.00
3/8/2010	0.0000	50	64	0.00	0	0	54	0.00
3/9/2010	0.0000	50	64	0.00	0	0	54	0.00
3/10/2010	0.2852	50	64	0.00	8,510	5,668	54	0.00
3/11/2010	1.9786	84	88	0.95	1,216	110,902	85	0.95
3/12/2010	0.0805	84	88	0.00	1,216	1,119	85	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
3/13/2010	0.7252	84	88	0.11	1,216	38,411	85	0.11
3/14/2010	0.0238	84	88	0.00	0	0	85	0.00
3/15/2010	0.0962	84	88	0.00	2,431	813	85	0.00
3/16/2010	0.0000	69	77	0.00	0	0	72	0.00
3/17/2010	0.0000	69	77	0.00	0	0	72	0.00
3/18/2010	0.1652	50	64	0.00	3,647	3,591	54	0.00
3/19/2010	0.0000	50	64	0.00	0	0	54	0.00
3/20/2010	0.0000	50	64	0.00	0	0	54	0.00
3/21/2010	0.0019	50	64	0.00	0	0	54	0.00
3/22/2010	0.4181	69	77	0.00	4,863	17,000	72	0.00
3/23/2010	0.1319	69	77	0.00	1,216	4,094	72	0.00
3/24/2010	0.0000	69	77	0.00	0	0	72	0.00
3/25/2010	0.0000	69	77	0.00	0	0	72	0.00
3/26/2010	0.0614	69	77	0.00	1,233	0	72	0.00
3/27/2010	0.0000	50	64	0.00	0	0	54	0.00
3/28/2010	0.0029	50	64	0.00	0	0	54	0.00
3/29/2010	0.1105	50	64	0.00	4,070	0	54	0.00
3/30/2010	0.0000	50	64	0.00	0	0	54	0.00
3/31/2010	0.0000	50	64	0.00	0	0	54	0.00
4/1/2010	0.0000	50	64	0.00	0	0	54	0.00
4/2/2010	0.0000	50	64	0.00	0	0	54	0.00
4/3/2010	0.0000	50	64	0.00	0	0	54	0.00
4/4/2010	0.0000	50	64	0.00	0	0	54	0.00
4/5/2010	0.0000	50	64	0.00	0	0	54	0.00
4/6/2010	0.0000	50	64	0.00	0	0	54	0.00
4/7/2010	0.0000	50	64	0.00	0	0	54	0.00
4/8/2010	0.0000	50	64	0.00	0	0	54	0.00
4/9/2010	0.6186	50	64	0.00	15,363	18,095	54	0.00
4/10/2010	0.0000	50	64	0.00	0	0	54	0.00
4/11/2010	0.0000	50	64	0.00	0	0	54	0.00
4/12/2010	0.0000	50	64	0.00	0	0	54	0.00
4/13/2010	0.0000	50	64	0.00	0	0	54	0.00
4/14/2010	0.0000	50	64	0.00	0	0	54	0.00
4/15/2010	0.0000	50	64	0.00	0	0	54	0.00
4/16/2010	0.0000	50	64	0.00	0	0	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
4/17/2010	0.0000	50	64	0.00	0	0	54	0.00
4/18/2010	0.0000	50	64	0.00	0	0	54	0.00
4/19/2010	0.0000	50	64	0.00	0	0	54	0.00
4/20/2010	0.0552	50	64	0.00	875	0	54	0.00
4/21/2010	0.1767	50	64	0.00	7,899	0	54	0.00
4/22/2010	0.0000	50	64	0.00	0	0	54	0.00
4/23/2010	0.0000	50	64	0.00	0	0	54	0.00
4/24/2010	0.3495	50	64	0.00	9,461	8,435	54	0.00
4/25/2010	1.3319	69	77	0.14	1,216	73,500	72	0.13
4/26/2010	0.0124	69	77	0.00	0	0	72	0.00
4/27/2010	0.0000	69	77	0.00	0	0	72	0.00
4/28/2010	0.0567	69	77	0.00	958	0	72	0.00
4/29/2010	0.0000	69	77	0.00	0	0	72	0.00
4/30/2010	0.0000	50	64	0.00	0	0	54	0.00
5/1/2010	0.0000	50	64	0.00	0	0	54	0.00
5/2/2010	0.0000	50	64	0.00	0	0	54	0.00
5/3/2010	3.9062	84	88	2.64	8,768	214,841	85	2.62
5/4/2010	0.4829	84	88	0.03	1,216	24,392	85	0.03
5/5/2010	0.0000	84	88	0.00	0	0	85	0.00
5/6/2010	0.0000	84	88	0.00	0	0	85	0.00
5/7/2010	0.0000	84	88	0.00	0	0	85	0.00
5/8/2010	0.0000	50	64	0.00	0	0	54	0.00
5/9/2010	0.0000	50	64	0.00	0	0	54	0.00
5/10/2010	0.0000	50	64	0.00	0	0	54	0.00
5/11/2010	0.2057	50	64	0.00	8,510	1,069	54	0.00
5/12/2010	0.0000	50	64	0.00	0	0	54	0.00
5/13/2010	0.0000	50	64	0.00	0	0	54	0.00
5/14/2010	0.0000	50	64	0.00	0	0	54	0.00
5/15/2010	0.1286	50	64	0.00	4,863	254	54	0.00
5/16/2010	0.0014	50	64	0.00	0	0	54	0.00
5/17/2010	0.0862	50	64	0.00	2,431	234	54	0.00
5/18/2010	0.0000	50	64	0.00	0	0	54	0.00
5/19/2010	0.0000	50	64	0.00	0	0	54	0.00
5/20/2010	0.0000	50	64	0.00	0	0	54	0.00
5/21/2010	1.0329	50	64	0.00	4,863	52,557	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
5/22/2010	0.4286	69	77	0.00	1,216	21,253	72	0.00
5/23/2010	0.0000	69	77	0.00	0	0	72	0.00
5/24/2010	0.0000	69	77	0.00	0	0	72	0.00
5/25/2010	0.0000	69	77	0.00	0	0	72	0.00
5/26/2010	0.0005	50	64	0.00	0	0	54	0.00
5/27/2010	0.1033	50	64	0.00	3,657	0	54	0.00
5/28/2010	0.0019	50	64	0.00	0	0	54	0.00
5/29/2010	0.7757	50	64	0.00	4,853	37,694	54	0.00
5/30/2010	0.1686	50	64	0.00	1,216	6,215	54	0.00
5/31/2010	0.1319	50	64	0.00	1,216	4,094	54	0.00
6/1/2010	0.1338	50	64	0.00	1,216	4,204	54	0.00
6/2/2010	0.2290	69	77	0.00	1,216	9,713	72	0.00
6/3/2010	0.3914	50	64	0.00	1,216	19,104	54	0.00
6/4/2010	0.0000	50	64	0.00	0	0	54	0.00
6/5/2010	0.3252	50	64	0.00	2,431	14,060	54	0.00
6/6/2010	0.0000	50	64	0.00	0	0	54	0.00
6/7/2010	0.0319	50	64	0.00	0	0	54	0.00
6/8/2010	0.0000	50	64	0.00	0	0	54	0.00
6/9/2010	0.0162	50	64	0.00	0	0	54	0.00
6/10/2010	0.0114	50	64	0.00	0	0	54	0.00
6/11/2010	0.0452	50	64	0.00	297	0	54	0.00
6/12/2010	0.0476	50	64	0.00	435	0	54	0.00
6/13/2010	0.0000	50	64	0.00	0	0	54	0.00
6/14/2010	0.0000	50	64	0.00	0	0	54	0.00
6/15/2010	0.0000	50	64	0.00	0	0	54	0.00
6/16/2010	0.6129	50	64	0.00	12,641	20,486	54	0.00
6/17/2010	0.0605	50	64	0.00	1,178	0	54	0.00
6/18/2010	0.0462	50	64	0.00	352	0	54	0.00
6/19/2010	0.0386	50	64	0.00	0	0	54	0.00
6/20/2010	0.0333	50	64	0.00	0	0	54	0.00
6/21/2010	0.0010	50	64	0.00	0	0	54	0.00
6/22/2010	0.0024	50	64	0.00	0	0	54	0.00
6/23/2010	0.0024	50	64	0.00	0	0	54	0.00
6/24/2010	0.0124	50	64	0.00	0	0	54	0.00
6/25/2010	0.0000	50	64	0.00	0	0	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
6/26/2010	0.0086	50	64	0.00	0	0	54	0.00
6/27/2010	0.0000	50	64	0.00	0	0	54	0.00
6/28/2010	0.0000	50	64	0.00	0	0	54	0.00
6/29/2010	0.0052	50	64	0.00	0	0	54	0.00
6/30/2010	0.3495	50	64	0.00	15,489	2,407	54	0.00
7/1/2010	0.0695	50	64	0.00	1,216	486	54	0.00
7/2/2010	0.0010	50	64	0.00	0	0	54	0.00
7/3/2010	0.0057	50	64	0.00	0	0	54	0.00
7/4/2010	0.0000	50	64	0.00	0	0	54	0.00
7/5/2010	0.0000	50	64	0.00	0	0	54	0.00
7/6/2010	0.0000	50	64	0.00	0	0	54	0.00
7/7/2010	0.0000	50	64	0.00	0	0	54	0.00
7/8/2010	0.0000	50	64	0.00	0	0	54	0.00
7/9/2010	0.0000	50	64	0.00	0	0	54	0.00
7/10/2010	0.2843	50	64	0.00	10,941	3,182	54	0.00
7/11/2010	0.0000	50	64	0.00	0	0	54	0.00
7/12/2010	0.0129	50	64	0.00	0	0	54	0.00
7/13/2010	0.7676	50	64	0.00	3,647	38,431	54	0.00
7/14/2010	0.6229	69	77	0.00	1,216	32,490	72	0.00
7/15/2010	0.0000	69	77	0.00	0	0	72	0.00
7/16/2010	0.0005	69	77	0.00	0	0	72	0.00
7/17/2010	0.0748	69	77	0.00	2,005	0	72	0.00
7/18/2010	0.1138	50	64	0.00	2,858	1,405	54	0.00
7/19/2010	0.4638	50	64	0.00	1,216	23,291	54	0.00
7/20/2010	0.0000	50	64	0.00	0	0	54	0.00
7/21/2010	0.0438	50	64	0.00	214	0	54	0.00
7/22/2010	0.0662	50	64	0.00	1,509	0	54	0.00
7/23/2010	0.0005	50	64	0.00	0	0	54	0.00
7/24/2010	0.0786	50	64	0.00	2,225	0	54	0.00
7/25/2010	0.0033	50	64	0.00	0	0	54	0.00
7/26/2010	0.0000	50	64	0.00	0	0	54	0.00
7/27/2010	0.5629	50	64	0.00	5,777	24,458	54	0.00
7/28/2010	0.0314	50	64	0.00	0	0	54	0.00
7/29/2010	0.0900	50	64	0.00	2,431	455	54	0.00
7/30/2010	0.0000	50	64	0.00	0	0	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
7/31/2010	0.0000	50	64	0.00	0	0	54	0.00
8/1/2010	0.3214	50	64	0.00	3,647	12,624	54	0.00
8/2/2010	0.5257	50	64	0.00	1,216	26,871	54	0.00
8/3/2010	0.0000	50	64	0.00	0	0	54	0.00
8/4/2010	0.0571	50	64	0.00	985	0	54	0.00
8/5/2010	0.0000	50	64	0.00	0	0	54	0.00
8/6/2010	0.0057	50	64	0.00	0	0	54	0.00
8/7/2010	0.4238	50	64	0.00	5,093	17,100	54	0.00
8/8/2010	0.0005	50	64	0.00	0	0	54	0.00
8/9/2010	0.0000	50	64	0.00	0	0	54	0.00
8/10/2010	0.0000	50	64	0.00	0	0	54	0.00
8/11/2010	0.0000	50	64	0.00	0	0	54	0.00
8/12/2010	0.0000	50	64	0.00	0	0	54	0.00
8/13/2010	0.0000	50	64	0.00	0	0	54	0.00
8/14/2010	0.1281	50	64	0.00	5,089	0	54	0.00
8/15/2010	0.1529	50	64	0.00	4,636	1,885	54	0.00
8/16/2010	0.0000	50	64	0.00	0	0	54	0.00
8/17/2010	0.0000	50	64	0.00	0	0	54	0.00
8/18/2010	0.0224	50	64	0.00	0	0	54	0.00
8/19/2010	0.0000	50	64	0.00	0	0	54	0.00
8/20/2010	0.0224	50	64	0.00	0	0	54	0.00
8/21/2010	1.1257	50	64	0.00	7,294	55,496	54	0.00
8/22/2010	0.1319	50	64	0.00	1,216	4,094	54	0.00
8/23/2010	0.0000	50	64	0.00	0	0	54	0.00
8/24/2010	0.0000	50	64	0.00	0	0	54	0.00
8/25/2010	0.0000	50	64	0.00	0	0	54	0.00
8/26/2010	0.9524	50	64	0.00	4,863	47,902	54	0.00
8/27/2010	0.3010	50	64	0.00	1,216	13,871	54	0.00
8/28/2010	0.0005	50	64	0.00	0	0	54	0.00
8/29/2010	0.0662	50	64	0.00	1,509	0	54	0.00
8/30/2010	0.0000	50	64	0.00	0	0	54	0.00
8/31/2010	0.0000	50	64	0.00	0	0	54	0.00
9/1/2010	0.0000	50	64	0.00	0	0	54	0.00
9/2/2010	0.0000	50	64	0.00	0	0	54	0.00
9/3/2010	0.0000	50	64	0.00	0	0	54	0.00
9/4/2010	0.0000	50	64	0.00	0	0	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
9/5/2010	0.0000	50	64	0.00	0	0	54	0.00
9/6/2010	0.0000	50	64	0.00	0	0	54	0.00
9/7/2010	0.0000	50	64	0.00	0	0	54	0.00
9/8/2010	0.0000	50	64	0.00	0	0	54	0.00
9/9/2010	0.0195	50	64	0.00	0	0	54	0.00
9/10/2010	0.0000	50	64	0.00	0	0	54	0.00
9/11/2010	0.0000	50	64	0.00	0	0	54	0.00
9/12/2010	0.3424	50	64	0.00	17,483	0	54	0.00
9/13/2010	0.0000	50	64	0.00	0	0	54	0.00
9/14/2010	0.0000	50	64	0.00	0	0	54	0.00
9/15/2010	0.0000	50	64	0.00	0	0	54	0.00
9/16/2010	0.0000	50	64	0.00	0	0	54	0.00
9/17/2010	0.0000	50	64	0.00	0	0	54	0.00
9/18/2010	0.0010	50	64	0.00	0	0	54	0.00
9/19/2010	0.0000	50	64	0.00	0	0	54	0.00
9/20/2010	0.0000	50	64	0.00	0	0	54	0.00
9/21/2010	0.0000	50	64	0.00	0	0	54	0.00
9/22/2010	0.0000	50	64	0.00	0	0	54	0.00
9/23/2010	0.0443	50	64	0.00	242	0	54	0.00
9/24/2010	0.0000	50	64	0.00	0	0	54	0.00
9/25/2010	0.0000	50	64	0.00	0	0	54	0.00
9/26/2010	0.0614	50	64	0.00	1,233	0	54	0.00
9/27/2010	0.9367	50	64	0.00	17,219	34,637	54	0.00
9/28/2010	0.2852	50	64	0.00	1,216	12,962	54	0.00
9/29/2010	0.0000	50	64	0.00	0	0	54	0.00
9/30/2010	0.5414	69	77	0.00	2,431	26,564	72	0.00
10/1/2010	0.0038	69	77	0.00	0	0	72	0.00
10/2/2010	0.0000	50	64	0.00	0	0	54	0.00
10/3/2010	0.0000	50	64	0.00	0	0	54	0.00
10/4/2010	0.0000	50	64	0.00	0	0	54	0.00
10/5/2010	0.0000	50	64	0.00	0	0	54	0.00
10/6/2010	0.0000	50	64	0.00	0	0	54	0.00
10/7/2010	0.0000	50	64	0.00	0	0	54	0.00
10/8/2010	0.0000	50	64	0.00	0	0	54	0.00
10/9/2010	0.0000	50	64	0.00	0	0	54	0.00
10/10/2010	0.0000	50	64	0.00	0	0	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
10/11/2010	0.0000	50	64	0.00	0	0	54	0.00
10/12/2010	0.0000	50	64	0.00	0	0	54	0.00
10/13/2010	0.0181	50	64	0.00	0	0	54	0.00
10/14/2010	0.0000	50	64	0.00	0	0	54	0.00
10/15/2010	0.0000	50	64	0.00	0	0	54	0.00
10/16/2010	0.0000	50	64	0.00	0	0	54	0.00
10/17/2010	0.0000	50	64	0.00	0	0	54	0.00
10/18/2010	0.0000	50	64	0.00	0	0	54	0.00
10/19/2010	0.0000	50	64	0.00	0	0	54	0.00
10/20/2010	0.0414	50	64	0.00	77	0	54	0.00
10/21/2010	0.0000	50	64	0.00	0	0	54	0.00
10/22/2010	0.0000	50	64	0.00	0	0	54	0.00
10/23/2010	0.0000	50	64	0.00	0	0	54	0.00
10/24/2010	0.0000	50	64	0.00	0	0	54	0.00
10/25/2010	0.0005	50	64	0.00	0	0	54	0.00
10/26/2010	0.1195	50	64	0.00	4,594	0	54	0.00
10/27/2010	0.0105	50	64	0.00	0	0	54	0.00
10/28/2010	1.6743	69	77	0.29	29,369	65,150	72	0.22
10/29/2010	0.0000	69	77	0.00	0	0	72	0.00
10/30/2010	0.0000	69	77	0.00	0	0	72	0.00
10/31/2010	0.0000	69	77	0.00	0	0	72	0.00
11/1/2010	0.0000	84	88	0.00	0	0	85	0.00
11/2/2010	0.0000	50	64	0.00	0	0	54	0.00
11/3/2010	0.1724	50	64	0.00	7,294	357	54	0.00
11/4/2010	0.4038	69	77	0.00	1,216	19,820	72	0.00
11/5/2010	0.0000	69	77	0.00	0	0	72	0.00
11/6/2010	0.0467	69	77	0.00	380	0	72	0.00
11/7/2010	0.0000	69	77	0.00	0	0	72	0.00
11/8/2010	0.0000	50	64	0.00	0	0	54	0.00
11/9/2010	0.0000	50	64	0.00	0	0	54	0.00
11/10/2010	0.0000	50	64	0.00	0	0	54	0.00
11/11/2010	0.0000	50	64	0.00	0	0	54	0.00
11/12/2010	0.0000	50	64	0.00	0	0	54	0.00
11/13/2010	0.0000	50	64	0.00	0	0	54	0.00
11/14/2010	0.0000	50	64	0.00	0	0	54	0.00
11/15/2010	0.4871	50	64	0.00	12,993	12,863	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
11/16/2010	1.2752	84	88	0.42	1,216	70,223	85	0.42
11/17/2010	0.0543	84	88	0.00	820	0	85	0.00
11/18/2010	0.0000	84	88	0.00	0	0	85	0.00
11/19/2010	0.0000	84	88	0.00	0	0	85	0.00
11/20/2010	0.0000	84	88	0.00	0	0	85	0.00
11/21/2010	0.0000	50	64	0.00	0	0	54	0.00
11/22/2010	0.0000	50	64	0.00	0	0	54	0.00
11/23/2010	0.0000	50	64	0.00	0	0	54	0.00
11/24/2010	0.1462	50	64	0.00	6,136	0	54	0.00
11/25/2010	0.0000	50	64	0.00	0	0	54	0.00
11/26/2010	0.0119	50	64	0.00	0	0	54	0.00
11/27/2010	0.1014	50	64	0.00	3,547	0	54	0.00
11/28/2010	0.0000	50	64	0.00	0	0	54	0.00
11/29/2010	0.0000	50	64	0.00	0	0	54	0.00
11/30/2010	0.5062	69	77	0.00	6,517	20,441	72	0.00
12/1/2010	2.2162	84	88	1.14	1,216	124,646	85	1.14
12/2/2010	0.0000	84	88	0.00	0	0	85	0.00
12/3/2010	0.0000	84	88	0.00	0	0	85	0.00
12/4/2010	0.0000	84	88	0.00	0	0	85	0.00
12/5/2010	0.0000	84	88	0.00	0	0	85	0.00
12/6/2010	0.0000	50	64	0.00	0	0	54	0.00
12/7/2010	0.0000	50	64	0.00	0	0	54	0.00
12/8/2010	0.0000	50	64	0.00	0	0	54	0.00
12/9/2010	0.0000	50	64	0.00	0	0	54	0.00
12/10/2010	0.0000	50	64	0.00	0	0	54	0.00
12/11/2010	0.0000	50	64	0.00	0	0	54	0.00
12/12/2010	0.5533	69	77	0.00	13,372	16,312	72	0.00
12/13/2010	0.0081	69	77	0.00	0	0	72	0.00
12/14/2010	0.0000	69	77	0.00	0	0	72	0.00
12/15/2010	0.0000	69	77	0.00	0	0	72	0.00
12/16/2010	0.0343	69	77	0.00	0	0	72	0.00
12/17/2010	0.1957	50	64	0.00	6,078	2,922	54	0.00
12/18/2010	0.0610	50	64	0.00	1,206	0	54	0.00
12/19/2010	0.1176	50	64	0.00	1,226	3,258	54	0.00
12/20/2010	0.0000	50	64	0.00	0	0	54	0.00
12/21/2010	0.0000	50	64	0.00	0	0	54	0.00

Table 45. Stormwater runoff and rainwater harvesting calculation for R-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 30%		Rainwater harvesting		Imperviousness, 11% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff*, in./24-hr
12/22/2010	0.0076	50	64	0.00	0	0	54	0.00
12/23/2010	0.0000	50	64	0.00	0	0	54	0.00
12/24/2010	0.0000	50	64	0.00	0	0	54	0.00
12/25/2010	0.0000	50	64	0.00	0	0	54	0.00
12/26/2010	0.3929	50	64	0.00	8,510	11,893	54	0.00
12/27/2010	0.0162	50	64	0.00	0	0	54	0.00
12/28/2010	0.0000	50	64	0.00	0	0	54	0.00
12/29/2010	0.0000	50	64	0.00	0	0	54	0.00
12/30/2010	0.0000	50	64	0.00	0	0	54	0.00
12/31/2010	0.0043	50	64	0.00	0	0	54	0.00
Total	44.45			7.88	443,723	1,861,655		7.69

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
1/1/2010	0.0248	50	69	0.00	0	0	54	0.00
1/2/2010	0.0248	50	69	0.00	0	0	54	0.00
1/3/2010	0.0000	50	69	0.00	0	0	54	0.00
1/4/2010	0.0000	50	69	0.00	0	0	54	0.00
1/5/2010	0.0000	50	69	0.00	0	0	54	0.00
1/6/2010	0.0000	50	69	0.00	0	0	54	0.00
1/7/2010	0.0000	50	69	0.00	0	0	54	0.00
1/8/2010	0.1119	50	69	0.00	5,401	0	54	0.00
1/9/2010	0.0000	50	69	0.00	0	0	54	0.00
1/10/2010	0.0000	50	69	0.00	0	0	54	0.00
1/11/2010	0.0000	50	69	0.00	0	0	54	0.00
1/12/2010	0.0000	50	69	0.00	0	0	54	0.00
1/13/2010	0.0000	50	69	0.00	0	0	54	0.00
1/14/2010	0.0000	50	69	0.00	0	0	54	0.00
1/15/2010	0.0000	50	69	0.00	0	0	54	0.00
1/16/2010	0.0000	50	69	0.00	0	0	54	0.00
1/17/2010	1.2157	84	90	0.47	34,547	53,879	85	0.36
1/18/2010	0.0690	84	90	0.00	1,820	357	85	0.00
1/19/2010	0.0000	84	90	0.00	0	0	85	0.00
1/20/2010	0.0000	84	90	0.00	0	0	85	0.00
1/21/2010	0.0729	84	90	0.00	2,464	0	85	0.00
1/22/2010	0.6319	69	80	0.01	4,818	39,695	72	0.00
1/23/2010	0.0000	69	80	0.00	0	0	72	0.00
1/24/2010	0.0462	69	80	0.00	458	0	72	0.00
1/25/2010	1.9390	84	90	1.04	5,004	137,830	85	1.00
1/26/2010	0.0000	84	90	0.00	0	0	85	0.00
1/27/2010	0.0000	84	90	0.00	0	0	85	0.00
1/28/2010	0.0000	84	90	0.00	0	0	85	0.00
1/29/2010	0.0000	84	90	0.00	0	0	85	0.00
1/30/2010	0.5038	69	80	0.00	9,102	25,776	72	0.00
1/31/2010	0.0129	69	80	0.00	0	0	72	0.00
2/1/2010	0.0000	69	80	0.00	0	0	72	0.00
2/2/2010	0.3514	69	80	0.00	5,461	17,956	72	0.00
2/3/2010	0.0062	69	80	0.00	0	0	72	0.00
2/4/2010	0.0000	50	69	0.00	0	0	54	0.00
2/5/2010	1.7571	84	90	0.89	5,461	123,689	85	0.85
2/6/2010	0.6181	84	90	0.10	1,820	41,654	85	0.09

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
2/7/2010	0.0000	84	90	0.00	0	0	85	0.00
2/8/2010	0.0000	84	90	0.00	0	0	85	0.00
2/9/2010	0.0000	84	90	0.00	0	0	85	0.00
2/10/2010	0.1967	69	80	0.00	7,282	4,494	72	0.00
2/11/2010	0.0000	50	69	0.00	0	0	54	0.00
2/12/2010	0.0000	50	69	0.00	0	0	54	0.00
2/13/2010	0.2186	50	69	0.00	5,461	7,962	54	0.00
2/14/2010	0.0000	50	69	0.00	0	0	54	0.00
2/15/2010	0.2229	50	69	0.00	3,641	10,105	54	0.00
2/16/2010	0.0186	50	69	0.00	0	0	54	0.00
2/17/2010	0.0000	50	69	0.00	0	0	54	0.00
2/18/2010	0.0000	50	69	0.00	0	0	54	0.00
2/19/2010	0.0000	50	69	0.00	0	0	54	0.00
2/20/2010	0.0000	50	69	0.00	0	0	54	0.00
2/21/2010	0.0000	50	69	0.00	0	0	54	0.00
2/22/2010	0.6610	69	80	0.01	12,743	33,955	72	0.00
2/23/2010	0.0014	69	80	0.00	0	0	72	0.00
2/24/2010	0.0000	69	80	0.00	0	0	72	0.00
2/25/2010	0.0000	69	80	0.00	0	0	72	0.00
2/26/2010	0.0000	69	80	0.00	0	0	72	0.00
2/27/2010	0.0000	50	69	0.00	0	0	54	0.00
2/28/2010	0.0000	50	69	0.00	0	0	54	0.00
3/1/2010	0.0000	50	69	0.00	0	0	54	0.00
3/2/2010	0.3129	50	69	0.00	14,564	5,952	54	0.00
3/3/2010	0.4448	69	80	0.00	1,820	28,617	72	0.00
3/4/2010	0.0000	69	80	0.00	0	0	72	0.00
3/5/2010	0.0000	69	80	0.00	0	0	72	0.00
3/6/2010	0.0000	69	80	0.00	0	0	72	0.00
3/7/2010	0.0000	50	69	0.00	0	0	54	0.00
3/8/2010	0.0000	50	69	0.00	0	0	54	0.00
3/9/2010	0.0000	50	69	0.00	0	0	54	0.00
3/10/2010	0.2852	50	69	0.00	12,743	5,695	54	0.00
3/11/2010	1.9786	84	90	1.08	1,820	143,986	85	1.04
3/12/2010	0.0805	84	90	0.00	1,820	1,216	85	0.00
3/13/2010	0.7252	84	90	0.16	1,820	49,713	85	0.14
3/14/2010	0.0238	84	90	0.00	0	0	85	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
3/15/2010	0.0962	84	90	0.00	3,641	578	85	0.00
3/16/2010	0.0000	69	80	0.00	0	0	72	0.00
3/17/2010	0.0000	69	80	0.00	0	0	72	0.00
3/18/2010	0.1652	50	69	0.00	5,461	3,951	54	0.00
3/19/2010	0.0000	50	69	0.00	0	0	54	0.00
3/20/2010	0.0000	50	69	0.00	0	0	54	0.00
3/21/2010	0.0019	50	69	0.00	0	0	54	0.00
3/22/2010	0.4181	69	80	0.00	7,282	21,150	72	0.00
3/23/2010	0.1319	69	80	0.00	1,820	5,085	72	0.00
3/24/2010	0.0000	69	80	0.00	0	0	72	0.00
3/25/2010	0.0000	69	80	0.00	0	0	72	0.00
3/26/2010	0.0614	69	80	0.00	1,604	0	72	0.00
3/27/2010	0.0000	50	69	0.00	0	0	54	0.00
3/28/2010	0.0029	50	69	0.00	0	0	54	0.00
3/29/2010	0.1105	50	69	0.00	5,293	0	54	0.00
3/30/2010	0.0000	50	69	0.00	0	0	54	0.00
3/31/2010	0.0000	50	69	0.00	0	0	54	0.00
4/1/2010	0.0000	50	69	0.00	0	0	54	0.00
4/2/2010	0.0000	50	69	0.00	0	0	54	0.00
4/3/2010	0.0000	50	69	0.00	0	0	54	0.00
4/4/2010	0.0000	50	69	0.00	0	0	54	0.00
4/5/2010	0.0000	50	69	0.00	0	0	54	0.00
4/6/2010	0.0000	50	69	0.00	0	0	54	0.00
4/7/2010	0.0000	50	69	0.00	0	0	54	0.00
4/8/2010	0.0000	50	69	0.00	0	0	54	0.00
4/9/2010	0.6186	50	69	0.00	24,051	19,460	54	0.00
4/10/2010	0.0000	50	69	0.00	0	0	54	0.00
4/11/2010	0.0000	50	69	0.00	0	0	54	0.00
4/12/2010	0.0000	50	69	0.00	0	0	54	0.00
4/13/2010	0.0000	50	69	0.00	0	0	54	0.00
4/14/2010	0.0000	50	69	0.00	0	0	54	0.00
4/15/2010	0.0000	50	69	0.00	0	0	54	0.00
4/16/2010	0.0000	50	69	0.00	0	0	54	0.00
4/17/2010	0.0000	50	69	0.00	0	0	54	0.00
4/18/2010	0.0000	50	69	0.00	0	0	54	0.00
4/19/2010	0.0000	50	69	0.00	0	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
4/20/2010	0.0552	50	69	0.00	1,138	0	54	0.00
4/21/2010	0.1767	50	69	0.00	10,272	0	54	0.00
4/22/2010	0.0000	50	69	0.00	0	0	54	0.00
4/23/2010	0.0000	50	69	0.00	0	0	54	0.00
4/24/2010	0.3495	50	69	0.00	15,897	7,377	54	0.00
4/25/2010	1.3319	69	80	0.21	1,820	95,345	72	0.19
4/26/2010	0.0124	69	80	0.00	0	0	72	0.00
4/27/2010	0.0000	69	80	0.00	0	0	72	0.00
4/28/2010	0.0567	69	80	0.00	1,246	0	72	0.00
4/29/2010	0.0000	69	80	0.00	0	0	72	0.00
4/30/2010	0.0000	50	69	0.00	0	0	54	0.00
5/1/2010	0.0000	50	69	0.00	0	0	54	0.00
5/2/2010	0.0000	50	69	0.00	0	0	54	0.00
5/3/2010	3.9062	84	90	2.83	13,318	277,478	85	2.75
5/4/2010	0.4829	84	90	0.05	1,820	31,482	85	0.04
5/5/2010	0.0000	84	90	0.00	0	0	85	0.00
5/6/2010	0.0000	84	90	0.00	0	0	85	0.00
5/7/2010	0.0000	84	90	0.00	0	0	85	0.00
5/8/2010	0.0000	50	69	0.00	0	0	54	0.00
5/9/2010	0.0000	50	69	0.00	0	0	54	0.00
5/10/2010	0.0000	50	69	0.00	0	0	54	0.00
5/11/2010	0.2057	50	69	0.00	12,457	0	54	0.00
5/12/2010	0.0000	50	69	0.00	0	0	54	0.00
5/13/2010	0.0000	50	69	0.00	0	0	54	0.00
5/14/2010	0.0000	50	69	0.00	0	0	54	0.00
5/15/2010	0.1286	50	69	0.00	6,654	0	54	0.00
5/16/2010	0.0014	50	69	0.00	0	0	54	0.00
5/17/2010	0.0862	50	69	0.00	3,466	0	54	0.00
5/18/2010	0.0000	50	69	0.00	0	0	54	0.00
5/19/2010	0.0000	50	69	0.00	0	0	54	0.00
5/20/2010	0.0000	50	69	0.00	0	0	54	0.00
5/21/2010	1.0329	50	69	0.00	8,370	66,302	54	0.00
5/22/2010	0.4286	69	80	0.00	1,820	27,399	72	0.00
5/23/2010	0.0000	69	80	0.00	0	0	72	0.00
5/24/2010	0.0000	69	80	0.00	0	0	72	0.00
5/25/2010	0.0000	69	80	0.00	0	0	72	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
5/26/2010	0.0005	50	69	0.00	0	0	54	0.00
5/27/2010	0.1033	50	69	0.00	4,756	0	54	0.00
5/28/2010	0.0019	50	69	0.00	0	0	54	0.00
5/29/2010	0.7757	50	69	0.00	7,987	47,343	54	0.00
5/30/2010	0.1686	50	69	0.00	1,820	7,842	54	0.00
5/31/2010	0.1319	50	69	0.00	1,820	5,085	54	0.00
6/1/2010	0.1338	50	69	0.00	1,820	5,228	54	0.00
6/2/2010	0.2290	69	80	0.00	1,820	12,391	72	0.00
6/3/2010	0.3914	50	69	0.00	1,820	24,605	54	0.00
6/4/2010	0.0000	50	69	0.00	0	0	54	0.00
6/5/2010	0.3252	50	69	0.00	3,641	17,806	54	0.00
6/6/2010	0.0000	50	69	0.00	0	0	54	0.00
6/7/2010	0.0319	50	69	0.00	0	0	54	0.00
6/8/2010	0.0000	50	69	0.00	0	0	54	0.00
6/9/2010	0.0162	50	69	0.00	0	0	54	0.00
6/10/2010	0.0114	50	69	0.00	0	0	54	0.00
6/11/2010	0.0452	50	69	0.00	386	0	54	0.00
6/12/2010	0.0476	50	69	0.00	565	0	54	0.00
6/13/2010	0.0000	50	69	0.00	0	0	54	0.00
6/14/2010	0.0000	50	69	0.00	0	0	54	0.00
6/15/2010	0.0000	50	69	0.00	0	0	54	0.00
6/16/2010	0.6129	50	69	0.00	19,074	24,007	54	0.00
6/17/2010	0.0605	50	69	0.00	1,532	0	54	0.00
6/18/2010	0.0462	50	69	0.00	458	0	54	0.00
6/19/2010	0.0386	50	69	0.00	0	0	54	0.00
6/20/2010	0.0333	50	69	0.00	0	0	54	0.00
6/21/2010	0.0010	50	69	0.00	0	0	54	0.00
6/22/2010	0.0024	50	69	0.00	0	0	54	0.00
6/23/2010	0.0024	50	69	0.00	0	0	54	0.00
6/24/2010	0.0124	50	69	0.00	0	0	54	0.00
6/25/2010	0.0000	50	69	0.00	0	0	54	0.00
6/26/2010	0.0086	50	69	0.00	0	0	54	0.00
6/27/2010	0.0000	50	69	0.00	0	0	54	0.00
6/28/2010	0.0000	50	69	0.00	0	0	54	0.00
6/29/2010	0.0052	50	69	0.00	0	0	54	0.00
6/30/2010	0.3495	50	69	0.00	23,274	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
7/1/2010	0.0695	50	69	0.00	2,043	170	54	0.00
7/2/2010	0.0010	50	69	0.00	0	0	54	0.00
7/3/2010	0.0057	50	69	0.00	0	0	54	0.00
7/4/2010	0.0000	50	69	0.00	0	0	54	0.00
7/5/2010	0.0000	50	69	0.00	0	0	54	0.00
7/6/2010	0.0000	50	69	0.00	0	0	54	0.00
7/7/2010	0.0000	50	69	0.00	0	0	54	0.00
7/8/2010	0.0000	50	69	0.00	0	0	54	0.00
7/9/2010	0.0000	50	69	0.00	0	0	54	0.00
7/10/2010	0.2843	50	69	0.00	16,384	1,983	54	0.00
7/11/2010	0.0000	50	69	0.00	0	0	54	0.00
7/12/2010	0.0129	50	69	0.00	0	0	54	0.00
7/13/2010	0.7676	50	69	0.00	5,461	49,260	54	0.00
7/14/2010	0.6229	69	80	0.01	1,820	42,013	72	0.00
7/15/2010	0.0000	69	80	0.00	0	0	72	0.00
7/16/2010	0.0005	69	80	0.00	0	0	72	0.00
7/17/2010	0.0748	69	80	0.00	2,607	0	72	0.00
7/18/2010	0.1138	50	69	0.00	4,675	869	54	0.00
7/19/2010	0.4638	50	69	0.00	1,820	30,049	54	0.00
7/20/2010	0.0000	50	69	0.00	0	0	54	0.00
7/21/2010	0.0438	50	69	0.00	279	0	54	0.00
7/22/2010	0.0662	50	69	0.00	1,962	0	54	0.00
7/23/2010	0.0005	50	69	0.00	0	0	54	0.00
7/24/2010	0.0786	50	69	0.00	2,893	0	54	0.00
7/25/2010	0.0033	50	69	0.00	0	0	54	0.00
7/26/2010	0.0000	50	69	0.00	0	0	54	0.00
7/27/2010	0.5629	50	69	0.00	9,429	29,891	54	0.00
7/28/2010	0.0314	50	69	0.00	0	0	54	0.00
7/29/2010	0.0900	50	69	0.00	3,641	112	54	0.00
7/30/2010	0.0000	50	69	0.00	0	0	54	0.00
7/31/2010	0.0000	50	69	0.00	0	0	54	0.00
8/1/2010	0.3214	50	69	0.00	5,461	15,699	54	0.00
8/2/2010	0.5257	50	69	0.00	1,820	34,706	54	0.00
8/3/2010	0.0000	50	69	0.00	0	0	54	0.00
8/4/2010	0.0571	50	69	0.00	1,282	0	54	0.00
8/5/2010	0.0000	50	69	0.00	0	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
8/6/2010	0.0057	50	69	0.00	0	0	54	0.00
8/7/2010	0.4238	50	69	0.00	7,821	21,041	54	0.00
8/8/2010	0.0005	50	69	0.00	0	0	54	0.00
8/9/2010	0.0000	50	69	0.00	0	0	54	0.00
8/10/2010	0.0000	50	69	0.00	0	0	54	0.00
8/11/2010	0.0000	50	69	0.00	0	0	54	0.00
8/12/2010	0.0000	50	69	0.00	0	0	54	0.00
8/13/2010	0.0000	50	69	0.00	0	0	54	0.00
8/14/2010	0.1281	50	69	0.00	6,618	0	54	0.00
8/15/2010	0.1529	50	69	0.00	7,945	536	54	0.00
8/16/2010	0.0000	50	69	0.00	0	0	54	0.00
8/17/2010	0.0000	50	69	0.00	0	0	54	0.00
8/18/2010	0.0224	50	69	0.00	0	0	54	0.00
8/19/2010	0.0000	50	69	0.00	0	0	54	0.00
8/20/2010	0.0224	50	69	0.00	0	0	54	0.00
8/21/2010	1.1257	50	69	0.01	10,923	70,734	54	0.00
8/22/2010	0.1319	50	69	0.00	1,820	5,085	54	0.00
8/23/2010	0.0000	50	69	0.00	0	0	54	0.00
8/24/2010	0.0000	50	69	0.00	0	0	54	0.00
8/25/2010	0.0000	50	69	0.00	0	0	54	0.00
8/26/2010	0.9524	50	69	0.00	7,282	61,337	54	0.00
8/27/2010	0.3010	50	69	0.00	1,820	17,800	54	0.00
8/28/2010	0.0005	50	69	0.00	0	0	54	0.00
8/29/2010	0.0662	50	69	0.00	1,962	0	54	0.00
8/30/2010	0.0000	50	69	0.00	0	0	54	0.00
8/31/2010	0.0000	50	69	0.00	0	0	54	0.00
9/1/2010	0.0000	50	69	0.00	0	0	54	0.00
9/2/2010	0.0000	50	69	0.00	0	0	54	0.00
9/3/2010	0.0000	50	69	0.00	0	0	54	0.00
9/4/2010	0.0000	50	69	0.00	0	0	54	0.00
9/5/2010	0.0000	50	69	0.00	0	0	54	0.00
9/6/2010	0.0000	50	69	0.00	0	0	54	0.00
9/7/2010	0.0000	50	69	0.00	0	0	54	0.00
9/8/2010	0.0000	50	69	0.00	0	0	54	0.00
9/9/2010	0.0195	50	69	0.00	0	0	54	0.00
9/10/2010	0.0000	50	69	0.00	0	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
9/11/2010	0.0000	50	69	0.00	0	0	54	0.00
9/12/2010	0.3424	50	69	0.00	22,736	0	54	0.00
9/13/2010	0.0000	50	69	0.00	0	0	54	0.00
9/14/2010	0.0000	50	69	0.00	0	0	54	0.00
9/15/2010	0.0000	50	69	0.00	0	0	54	0.00
9/16/2010	0.0000	50	69	0.00	0	0	54	0.00
9/17/2010	0.0000	50	69	0.00	0	0	54	0.00
9/18/2010	0.0010	50	69	0.00	0	0	54	0.00
9/19/2010	0.0000	50	69	0.00	0	0	54	0.00
9/20/2010	0.0000	50	69	0.00	0	0	54	0.00
9/21/2010	0.0000	50	69	0.00	0	0	54	0.00
9/22/2010	0.0000	50	69	0.00	0	0	54	0.00
9/23/2010	0.0443	50	69	0.00	315	0	54	0.00
9/24/2010	0.0000	50	69	0.00	0	0	54	0.00
9/25/2010	0.0000	50	69	0.00	0	0	54	0.00
9/26/2010	0.0614	50	69	0.00	1,604	0	54	0.00
9/27/2010	0.9367	50	69	0.00	29,817	37,620	54	0.00
9/28/2010	0.2852	50	69	0.00	1,820	16,618	54	0.00
9/29/2010		50	69	0.00	0	0	54	0.00
9/30/2010	0.5414	69	80	0.00	3,641	34,067	72	0.00
10/1/2010	0.0038	69	80	0.00	0	0	72	0.00
10/2/2010	0.0000	50	69	0.00	0	0	54	0.00
10/3/2010	0.0000	50	69	0.00	0	0	54	0.00
10/4/2010	0.0000	50	69	0.00	0	0	54	0.00
10/5/2010	0.0000	50	69	0.00	0	0	54	0.00
10/6/2010	0.0000	50	69	0.00	0	0	54	0.00
10/7/2010	0.0000	50	69	0.00	0	0	54	0.00
10/8/2010	0.0000	50	69	0.00	0	0	54	0.00
10/9/2010	0.0000	50	69	0.00	0	0	54	0.00
10/10/2010	0.0000	50	69	0.00	0	0	54	0.00
10/11/2010	0.0000	50	69	0.00	0	0	54	0.00
10/12/2010	0.0000	50	69	0.00	0	0	54	0.00
10/13/2010	0.0181	50	69	0.00	0	0	54	0.00
10/14/2010	0.0000	50	69	0.00	0	0	54	0.00
10/15/2010	0.0000	50	69	0.00	0	0	54	0.00
10/16/2010	0.0000	50	69	0.00	0	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
10/17/2010	0.0000	50	69	0.00	0	0	54	0.00
10/18/2010	0.0000	50	69	0.00	0	0	54	0.00
10/19/2010	0.0000	50	69	0.00	0	0	54	0.00
10/20/2010	0.0414	50	69	0.00	100	0	54	0.00
10/21/2010	0.0000	50	69	0.00	0	0	54	0.00
10/22/2010	0.0000	50	69	0.00	0	0	54	0.00
10/23/2010	0.0000	50	69	0.00	0	0	54	0.00
10/24/2010	0.0000	50	69	0.00	0	0	54	0.00
10/25/2010	0.0005	50	69	0.00	0	0	54	0.00
10/26/2010	0.1195	50	69	0.00	5,974	0	54	0.00
10/27/2010	0.0105	50	69	0.00	0	0	54	0.00
10/28/2010	1.6743	69	80	0.38	44,899	78,019	72	0.27
10/29/2010	0.0000	69	80	0.00	0	0	72	0.00
10/30/2010	0.0000	69	80	0.00	0	0	72	0.00
10/31/2010	0.0000	69	80	0.00	0	0	72	0.00
11/1/2010	0.0000	84	90	0.00	0	0	85	0.00
11/2/2010	0.0000	50	69	0.00	0	0	54	0.00
11/3/2010	0.1724	50	69	0.00	9,949	0	54	0.00
11/4/2010	0.4038	69	80	0.00	2,794	24,563	72	0.00
11/5/2010	0.0000	69	80	0.00	0	0	72	0.00
11/6/2010	0.0467	69	80	0.00	494	0	72	0.00
11/7/2010	0.0000	69	80	0.00	0	0	72	0.00
11/8/2010	0.0000	50	69	0.00	0	0	54	0.00
11/9/2010	0.0000	50	69	0.00	0	0	54	0.00
11/10/2010	0.0000	50	69	0.00	0	0	54	0.00
11/11/2010	0.0000	50	69	0.00	0	0	54	0.00
11/12/2010	0.0000	50	69	0.00	0	0	54	0.00
11/13/2010	0.0000	50	69	0.00	0	0	54	0.00
11/14/2010	0.0000	50	69	0.00	0	0	54	0.00
11/15/2010	0.4871	50	69	0.00	19,531	14,094	54	0.00
11/16/2010	1.2752	84	90	0.51	1,820	91,083	85	0.49
11/17/2010	0.0543	84	90	0.00	1,067	0	85	0.00
11/18/2010	0.0000	84	90	0.00	0	0	85	0.00
11/19/2010	0.0000	84	90	0.00	0	0	85	0.00
11/20/2010	0.0000	84	90	0.00	0	0	85	0.00
11/21/2010	0.0000	50	69	0.00	0	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
11/22/2010	0.0000	50	69	0.00	0	0	54	0.00
11/23/2010	0.0000	50	69	0.00	0	0	54	0.00
11/24/2010	0.1462	50	69	0.00	7,980	0	54	0.00
11/25/2010	0.0000	50	69	0.00	0	0	54	0.00
11/26/2010	0.0119	50	69	0.00	0	0	54	0.00
11/27/2010	0.1014	50	69	0.00	4,613	0	54	0.00
11/28/2010	0.0000	50	69	0.00	0	0	54	0.00
11/29/2010	0.0000	50	69	0.00	0	0	54	0.00
11/30/2010	0.5062	69	80	0.00	11,828	23,230	72	0.00
12/1/2010	2.2162	84	90	1.28	1,820	161,859	85	1.25
12/2/2010	0.0000	84	90	0.00	0	0	85	0.00
12/3/2010	0.0000	84	90	0.00	0	0	85	0.00
12/4/2010	0.0000	84	90	0.00	0	0	85	0.00
12/5/2010	0.0000	84	90	0.00	0	0	85	0.00
12/6/2010	0.0000	50	69	0.00	0	0	54	0.00
12/7/2010	0.0000	50	69	0.00	0	0	54	0.00
12/8/2010	0.0000	50	69	0.00	0	0	54	0.00
12/9/2010	0.0000	50	69	0.00	0	0	54	0.00
12/10/2010	0.0000	50	69	0.00	0	0	54	0.00
12/11/2010	0.0000	50	69	0.00	0	0	54	0.00
12/12/2010	0.5533	69	80	0.00	20,025	18,579	72	0.00
12/13/2010	0.0081	69	80	0.00	0	0	72	0.00
12/14/2010	0.0000	69	80	0.00	0	0	72	0.00
12/15/2010	0.0000	69	80	0.00	0	0	72	0.00
12/16/2010	0.0343	69	80	0.00	0	0	72	0.00
12/17/2010	0.1957	50	69	0.00	9,102	2,602	54	0.00
12/18/2010	0.0610	50	69	0.00	1,568	0	54	0.00
12/19/2010	0.1176	50	69	0.00	2,073	3,758	54	0.00
12/20/2010	0.0000	50	69	0.00	0	0	54	0.00
12/21/2010	0.0000	50	69	0.00	0	0	54	0.00
12/22/2010	0.0076	50	69	0.00	0	0	54	0.00
12/23/2010	0.0000	50	69	0.00	0	0	54	0.00
12/24/2010	0.0000	50	69	0.00	0	0	54	0.00
12/25/2010	0.0000	50	69	0.00	0	0	54	0.00
12/26/2010	0.3929	50	69	0.00	12,743	13,790	54	0.00
12/27/2010	0.0162	50	69	0.00	0	0	54	0.00

Table 46. Stormwater runoff and rainwater harvesting calculation for R-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 40%		Rainwater harvesting		Imperviousness, 18% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
12/28/2010	0.0000	50	69	0.00	0	0	54	0.00
12/29/2010	0.0000	50	69	0.00	0	0	54	0.00
12/30/2010	0.0000	50	69	0.00	0	0	54	0.00
12/31/2010	0.0043	50	69	0.00	0	0	54	0.00
Total	44.45			9.03	664,466	2,333,609		8.48

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
1/1/2010	0.0248	50	72	0.00	0	0	57	0.00
1/2/2010	0.0248	50	72	0.00	0	0	57	0.00
1/3/2010	0.0000	50	72	0.00	0	0	57	0.00
1/4/2010	0.0000	50	72	0.00	0	0	57	0.00
1/5/2010	0.0000	50	72	0.00	0	0	57	0.00
1/6/2010	0.0000	50	72	0.00	0	0	57	0.00
1/7/2010	0.0000	50	72	0.00	0	0	57	0.00
1/8/2010	0.1119	50	72	0.00	4,972	0	57	0.00
1/9/2010	0.0000	50	72	0.00	0	0	57	0.00
1/10/2010	0.0000	50	72	0.00	0	0	57	0.00
1/11/2010	0.0000	50	72	0.00	0	0	57	0.00
1/12/2010	0.0000	50	72	0.00	0	0	57	0.00
1/13/2010	0.0000	50	72	0.00	0	0	57	0.00
1/14/2010	0.0000	50	72	0.00	0	0	57	0.00
1/15/2010	0.0000	50	72	0.00	0	0	57	0.00
1/16/2010	0.0000	50	72	0.00	0	0	57	0.00
1/17/2010	1.2157	84	91	0.52	81,403	0	86	0.23
1/18/2010	0.0690	84	91	0.00	2,004	0	86	0.00
1/19/2010	0.0000	84	91	0.00	0	0	86	0.00
1/20/2010	0.0000	84	91	0.00	0	0	86	0.00
1/21/2010	0.0729	84	91	0.00	2,268	0	86	0.00
1/22/2010	0.6319	69	82	0.02	20,089	20,889	73	0.00
1/23/2010	0.0000	69	82	0.00	0	0	73	0.00
1/24/2010	0.0462	69	82	0.00	421	0	73	0.00
1/25/2010	1.9390	84	91	1.11	10,452	121,037	86	0.95
1/26/2010	0.0000	84	91	0.00	0	0	86	0.00
1/27/2010	0.0000	84	91	0.00	0	0	86	0.00
1/28/2010	0.0000	84	91	0.00	0	0	86	0.00
1/29/2010	0.0000	84	91	0.00	0	0	86	0.00
1/30/2010	0.5038	69	82	0.00	18,122	13,987	73	0.00
1/31/2010	0.0129	69	82	0.00	0	0	73	0.00
2/1/2010	0.0000	69	82	0.00	0	0	73	0.00
2/2/2010	0.3514	69	82	0.00	10,873	10,684	73	0.00
2/3/2010	0.0062	69	82	0.00	0	0	73	0.00
2/4/2010	0.0000	50	72	0.00	0	0	57	0.00
2/5/2010	1.7571	84	91	0.95	10,873	108,020	86	0.80
2/6/2010	0.6181	84	91	0.13	3,624	36,398	86	0.08

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
2/6/2010	0.6181	84	91	0.13	3,624	36,398	86	0.08
2/7/2010	0.0000	84	91	0.00	0	0	86	0.00
2/8/2010	0.0000	84	91	0.00	0	0	86	0.00
2/9/2010	0.0000	84	91	0.00	0	0	86	0.00
2/10/2010	0.1967	69	82	0.00	10,841	0	73	0.00
2/11/2010	0.0000	50	72	0.00	0	0	57	0.00
2/12/2010	0.0000	50	72	0.00	0	0	57	0.00
2/13/2010	0.2186	50	72	0.00	12,358	0	57	0.00
2/14/2010	0.0000	50	72	0.00	0	0	57	0.00
2/15/2010	0.2229	50	72	0.00	9,421	3,234	57	0.00
2/16/2010	0.0186	50	72	0.00	0	0	57	0.00
2/17/2010	0.0000	50	72	0.00	0	0	57	0.00
2/18/2010	0.0000	50	72	0.00	0	0	57	0.00
2/19/2010	0.0000	50	72	0.00	0	0	57	0.00
2/20/2010	0.0000	50	72	0.00	0	0	57	0.00
2/21/2010	0.0000	50	72	0.00	0	0	57	0.00
2/22/2010	0.6610	69	82	0.02	25,371	17,619	73	0.00
2/23/2010	0.0014	69	82	0.00	0	0	73	0.00
2/24/2010	0.0000	69	82	0.00	0	0	73	0.00
2/25/2010	0.0000	69	82	0.00	0	0	73	0.00
2/26/2010	0.0000	69	82	0.00	0	0	73	0.00
2/27/2010	0.0000	50	72	0.00	0	0	57	0.00
2/28/2010	0.0000	50	72	0.00	0	0	57	0.00
3/1/2010	0.0000	50	72	0.00	0	0	57	0.00
3/2/2010	0.3129	50	72	0.00	18,886	0	57	0.00
3/3/2010	0.4448	69	82	0.00	13,733	14,287	73	0.00
3/4/2010	0.0000	69	82	0.00	0	0	73	0.00
3/5/2010	0.0000	69	82	0.00	0	0	73	0.00
3/6/2010	0.0000	69	82	0.00	0	0	73	0.00
3/7/2010	0.0000	50	72	0.00	0	0	57	0.00
3/8/2010	0.0000	50	72	0.00	0	0	57	0.00
3/9/2010	0.0000	50	72	0.00	0	0	57	0.00
3/10/2010	0.2852	50	72	0.00	16,974	0	57	0.00
3/11/2010	1.9786	84	91	1.14	12,021	122,205	86	0.98
3/12/2010	0.0805	84	91	0.00	2,795	0	86	0.00
3/13/2010	0.7252	84	91	0.18	4,453	42,988	86	0.12

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
3/14/2010	0.0238	84	91	0.00	0	0	86	0.00
3/15/2010	0.0962	84	91	0.00	3,884	0	86	0.00
3/16/2010	0.0000	69	82	0.00	0	0	73	0.00
3/17/2010	0.0000	69	82	0.00	0	0	73	0.00
3/18/2010	0.1652	50	72	0.00	8,665	0	57	0.00
3/19/2010	0.0000	50	72	0.00	0	0	57	0.00
3/20/2010	0.0000	50	72	0.00	0	0	57	0.00
3/21/2010	0.0019	50	72	0.00	0	0	57	0.00
3/22/2010	0.4181	69	82	0.00	20,071	6,102	73	0.00
3/23/2010	0.1319	69	82	0.00	3,624	2,732	73	0.00
3/24/2010	0.0000	69	82	0.00	0	0	73	0.00
3/25/2010	0.0000	69	82	0.00	0	0	73	0.00
3/26/2010	0.0614	69	82	0.00	1,477	0	73	0.00
3/27/2010	0.0000	50	72	0.00	0	0	57	0.00
3/28/2010	0.0029	50	72	0.00	0	0	57	0.00
3/29/2010	0.1105	50	72	0.00	4,873	0	57	0.00
3/30/2010	0.0000	50	72	0.00	0	0	57	0.00
3/31/2010	0.0000	50	72	0.00	0	0	57	0.00
4/1/2010	0.0000	50	72	0.00	0	0	57	0.00
4/2/2010	0.0000	50	72	0.00	0	0	57	0.00
4/3/2010	0.0000	50	72	0.00	0	0	57	0.00
4/4/2010	0.0000	50	72	0.00	0	0	57	0.00
4/5/2010	0.0000	50	72	0.00	0	0	57	0.00
4/6/2010	0.0000	50	72	0.00	0	0	57	0.00
4/7/2010	0.0000	50	72	0.00	0	0	57	0.00
4/8/2010	0.0000	50	72	0.00	0	0	57	0.00
4/9/2010	0.6186	50	72	0.00	40,055	0	57	0.00
4/10/2010	0.0000	50	72	0.00	0	0	57	0.00
4/11/2010	0.0000	50	72	0.00	0	0	57	0.00
4/12/2010	0.0000	50	72	0.00	0	0	57	0.00
4/13/2010	0.0000	50	72	0.00	0	0	57	0.00
4/14/2010	0.0000	50	72	0.00	0	0	57	0.00
4/15/2010	0.0000	50	72	0.00	0	0	57	0.00
4/16/2010	0.0000	50	72	0.00	0	0	57	0.00
4/17/2010	0.0000	50	72	0.00	0	0	57	0.00
4/18/2010	0.0000	50	72	0.00	0	0	57	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
4/19/2010	0.0000	50	72	0.00	0	0	57	0.00
4/20/2010	0.0552	50	72	0.00	1,048	0	57	0.00
4/21/2010	0.1767	50	72	0.00	9,456	0	57	0.00
4/22/2010	0.0000	50	72	0.00	0	0	57	0.00
4/23/2010	0.0000	50	72	0.00	0	0	57	0.00
4/24/2010	0.3495	50	72	0.00	21,425	0	57	0.00
4/25/2010	1.3319	69	82	0.26	41,271	48,177	73	0.11
4/26/2010	0.0124	69	82	0.00	0	0	73	0.00
4/27/2010	0.0000	69	82	0.00	0	0	73	0.00
4/28/2010	0.0567	69	82	0.00	1,147	0	73	0.00
4/29/2010	0.0000	69	82	0.00	0	0	73	0.00
4/30/2010	0.0000	50	72	0.00	0	0	57	0.00
5/1/2010	0.0000	50	72	0.00	0	0	57	0.00
5/2/2010	0.0000	50	72	0.00	0	0	57	0.00
5/3/2010	3.9062	84	91	2.93	27,848	239,852	86	2.65
5/4/2010	0.4829	84	91	0.06	3,624	27,033	86	0.03
5/5/2010	0.0000	84	91	0.00	0	0	86	0.00
5/6/2010	0.0000	84	91	0.00	0	0	86	0.00
5/7/2010	0.0000	84	91	0.00	0	0	86	0.00
5/8/2010	0.0000	50	72	0.00	0	0	57	0.00
5/9/2010	0.0000	50	72	0.00	0	0	57	0.00
5/10/2010	0.0000	50	72	0.00	0	0	57	0.00
5/11/2010	0.2057	50	72	0.00	11,467	0	57	0.00
5/12/2010	0.0000	50	72	0.00	0	0	57	0.00
5/13/2010	0.0000	50	72	0.00	0	0	57	0.00
5/14/2010	0.0000	50	72	0.00	0	0	57	0.00
5/15/2010	0.1286	50	72	0.00	6,126	0	57	0.00
5/16/2010	0.0014	50	72	0.00	0	0	57	0.00
5/17/2010	0.0862	50	72	0.00	3,191	0	57	0.00
5/18/2010	0.0000	50	72	0.00	0	0	57	0.00
5/19/2010	0.0000	50	72	0.00	0	0	57	0.00
5/20/2010	0.0000	50	72	0.00	0	0	57	0.00
5/21/2010	1.0329	50	72	0.02	40,830	27,911	57	0.00
5/22/2010	0.4286	69	82	0.00	3,624	23,274	73	0.00
5/23/2010	0.0000	69	82	0.00	0	0	73	0.00
5/24/2010	0.0000	69	82	0.00	0	0	73	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
5/25/2010	0.0000	69	82	0.00	0	0	73	0.00
5/26/2010	0.0005	50	72	0.00	0	0	57	0.00
5/27/2010	0.1033	50	72	0.00	4,378	0	57	0.00
5/28/2010	0.0019	50	72	0.00	0	0	57	0.00
5/29/2010	0.7757	50	72	0.00	20,992	29,944	57	0.00
5/30/2010	0.1686	50	72	0.00	3,624	5,271	57	0.00
5/31/2010	0.1319	50	72	0.00	3,624	2,732	57	0.00
6/1/2010	0.1338	50	72	0.00	3,624	2,864	57	0.00
6/2/2010	0.2290	69	82	0.00	3,624	9,459	73	0.00
6/3/2010	0.3914	50	72	0.00	3,624	20,702	57	0.00
6/4/2010	0.0000	50	72	0.00	0	0	57	0.00
6/5/2010	0.3252	50	72	0.00	7,249	12,495	57	0.00
6/6/2010	0.0000	50	72	0.00	0	0	57	0.00
6/7/2010	0.0319	50	72	0.00	0	0	57	0.00
6/8/2010	0.0000	50	72	0.00	0	0	57	0.00
6/9/2010	0.0162	50	72	0.00	0	0	57	0.00
6/10/2010	0.0114	50	72	0.00	0	0	57	0.00
6/11/2010	0.0452	50	72	0.00	355	0	57	0.00
6/12/2010	0.0476	50	72	0.00	520	0	57	0.00
6/13/2010	0.0000	50	72	0.00	0	0	57	0.00
6/14/2010	0.0000	50	72	0.00	0	0	57	0.00
6/15/2010	0.0000	50	72	0.00	0	0	57	0.00
6/16/2010	0.6129	50	72	0.00	38,992	667	57	0.00
6/17/2010	0.0605	50	72	0.00	1,411	0	57	0.00
6/18/2010	0.0462	50	72	0.00	421	0	57	0.00
6/19/2010	0.0386	50	72	0.00	0	0	57	0.00
6/20/2010	0.0333	50	72	0.00	0	0	57	0.00
6/21/2010	0.0010	50	72	0.00	0	0	57	0.00
6/22/2010	0.0024	50	72	0.00	0	0	57	0.00
6/23/2010	0.0024	50	72	0.00	0	0	57	0.00
6/24/2010	0.0124	50	72	0.00	0	0	57	0.00
6/25/2010	0.0000	50	72	0.00	0	0	57	0.00
6/26/2010	0.0086	50	72	0.00	0	0	57	0.00
6/27/2010	0.0000	50	72	0.00	0	0	57	0.00
6/28/2010	0.0000	50	72	0.00	0	0	57	0.00
6/29/2010	0.0052	50	72	0.00	0	0	57	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
6/30/2010	0.3495	50	72	0.00	21,425	0	57	0.00
7/1/2010	0.0695	50	72	0.00	2,037	0	57	0.00
7/2/2010	0.0010	50	72	0.00	0	0	57	0.00
7/3/2010	0.0057	50	72	0.00	0	0	57	0.00
7/4/2010	0.0000	50	72	0.00	0	0	57	0.00
7/5/2010	0.0000	50	72	0.00	0	0	57	0.00
7/6/2010	0.0000	50	72	0.00	0	0	57	0.00
7/7/2010	0.0000	50	72	0.00	0	0	57	0.00
7/8/2010	0.0000	50	72	0.00	0	0	57	0.00
7/9/2010	0.0000	50	72	0.00	0	0	57	0.00
7/10/2010	0.2843	50	72	0.00	16,908	0	57	0.00
7/11/2010	0.0000	50	72	0.00	0	0	57	0.00
7/12/2010	0.0129	50	72	0.00	0	0	57	0.00
7/13/2010	0.7676	50	72	0.00	50,375	0	57	0.00
7/14/2010	0.6229	69	82	0.01	8,905	31,447	73	0.00
7/15/2010	0.0000	69	82	0.00	0	0	73	0.00
7/16/2010	0.0005	69	82	0.00	0	0	73	0.00
7/17/2010	0.0748	69	82	0.00	2,400	0	73	0.00
7/18/2010	0.1138	50	72	0.00	5,104	0	57	0.00
7/19/2010	0.4638	50	72	0.00	10,618	18,720	57	0.00
7/20/2010	0.0000	50	72	0.00	0	0	57	0.00
7/21/2010	0.0438	50	72	0.00	257	0	57	0.00
7/22/2010	0.0662	50	72	0.00	1,806	0	57	0.00
7/23/2010	0.0005	50	72	0.00	0	0	57	0.00
7/24/2010	0.0786	50	72	0.00	2,664	0	57	0.00
7/25/2010	0.0033	50	72	0.00	0	0	57	0.00
7/26/2010	0.0000	50	72	0.00	0	0	57	0.00
7/27/2010	0.5629	50	72	0.00	24,269	11,929	57	0.00
7/28/2010	0.0314	50	72	0.00	0	0	57	0.00
7/29/2010	0.0900	50	72	0.00	3,455	0	57	0.00
7/30/2010	0.0000	50	72	0.00	0	0	57	0.00
7/31/2010	0.0000	50	72	0.00	0	0	57	0.00
8/1/2010	0.3214	50	72	0.00	14,667	4,813	57	0.00
8/2/2010	0.5257	50	72	0.00	3,624	30,001	57	0.00
8/3/2010	0.0000	50	72	0.00	0	0	57	0.00
8/4/2010	0.0571	50	72	0.00	1,180	0	57	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
8/5/2010	0.0000	50	72	0.00	0	0	57	0.00
8/6/2010	0.0057	50	72	0.00	0	0	57	0.00
8/7/2010	0.4238	50	72	0.00	16,942	9,627	57	0.00
8/8/2010	0.0005	50	72	0.00	0	0	57	0.00
8/9/2010	0.0000	50	72	0.00	0	0	57	0.00
8/10/2010	0.0000	50	72	0.00	0	0	57	0.00
8/11/2010	0.0000	50	72	0.00	0	0	57	0.00
8/12/2010	0.0000	50	72	0.00	0	0	57	0.00
8/13/2010	0.0000	50	72	0.00	0	0	57	0.00
8/14/2010	0.1281	50	72	0.00	6,093	0	57	0.00
8/15/2010	0.1529	50	72	0.00	7,807	0	57	0.00
8/16/2010	0.0000	50	72	0.00	0	0	57	0.00
8/17/2010	0.0000	50	72	0.00	0	0	57	0.00
8/18/2010	0.0224	50	72	0.00	0	0	57	0.00
8/19/2010	0.0000	50	72	0.00	0	0	57	0.00
8/20/2010	0.0224	50	72	0.00	0	0	57	0.00
8/21/2010	1.1257	50	72	0.03	36,841	38,330	57	0.00
8/22/2010	0.1319	50	72	0.00	3,624	2,732	57	0.00
8/23/2010	0.0000	50	72	0.00	0	0	57	0.00
8/24/2010	0.0000	50	72	0.00	0	0	57	0.00
8/25/2010	0.0000	50	72	0.00	0	0	57	0.00
8/26/2010	0.9524	50	72	0.01	14,498	48,671	57	0.00
8/27/2010	0.3010	50	72	0.00	3,624	14,438	57	0.00
8/28/2010	0.0005	50	72	0.00	0	0	57	0.00
8/29/2010	0.0662	50	72	0.00	1,806	0	57	0.00
8/30/2010	0.0000	50	72	0.00	0	0	57	0.00
8/31/2010	0.0000	50	72	0.00	0	0	57	0.00
9/1/2010	0.0000	50	72	0.00	0	0	57	0.00
9/2/2010	0.0000	50	72	0.00	0	0	57	0.00
9/3/2010	0.0000	50	72	0.00	0	0	57	0.00
9/4/2010	0.0000	50	72	0.00	0	0	57	0.00
9/5/2010	0.0000	50	72	0.00	0	0	57	0.00
9/6/2010	0.0000	50	72	0.00	0	0	57	0.00
9/7/2010	0.0000	50	72	0.00	0	0	57	0.00
9/8/2010	0.0000	50	72	0.00	0	0	57	0.00
9/9/2010	0.0195	50	72	0.00	0	0	57	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
9/10/2010	0.0000	50	72	0.00	0	0	57	0.00
9/11/2010	0.0000	50	72	0.00	0	0	57	0.00
9/12/2010	0.3424	50	72	0.00	20,931	0	57	0.00
9/13/2010	0.0000	50	72	0.00	0	0	57	0.00
9/14/2010	0.0000	50	72	0.00	0	0	57	0.00
9/15/2010	0.0000	50	72	0.00	0	0	57	0.00
9/16/2010	0.0000	50	72	0.00	0	0	57	0.00
9/17/2010	0.0000	50	72	0.00	0	0	57	0.00
9/18/2010	0.0010	50	72	0.00	0	0	57	0.00
9/19/2010	0.0000	50	72	0.00	0	0	57	0.00
9/20/2010	0.0000	50	72	0.00	0	0	57	0.00
9/21/2010	0.0000	50	72	0.00	0	0	57	0.00
9/22/2010	0.0000	50	72	0.00	0	0	57	0.00
9/23/2010	0.0443	50	72	0.00	290	0	57	0.00
9/24/2010	0.0000	50	72	0.00	0	0	57	0.00
9/25/2010	0.0000	50	72	0.00	0	0	57	0.00
9/26/2010	0.0614	50	72	0.00	1,477	0	57	0.00
9/27/2010	0.9367	50	72	0.01	62,081	0	57	0.00
9/28/2010	0.2852	50	72	0.00	16,974	0	57	0.00
9/29/2010	0.0000	50	72	0.00	0	0	57	0.00
9/30/2010	0.5414	69	82	0.00	19,671	15,042	73	0.00
10/1/2010	0.0038	69	82	0.00	0	0	73	0.00
10/2/2010	0.0000	50	72	0.00	0	0	57	0.00
10/3/2010	0.0000	50	72	0.00	0	0	57	0.00
10/4/2010	0.0000	50	72	0.00	0	0	57	0.00
10/5/2010	0.0000	50	72	0.00	0	0	57	0.00
10/6/2010	0.0000	50	72	0.00	0	0	57	0.00
10/7/2010	0.0000	50	72	0.00	0	0	57	0.00
10/8/2010	0.0000	50	72	0.00	0	0	57	0.00
10/9/2010	0.0000	50	72	0.00	0	0	57	0.00
10/10/2010	0.0000	50	72	0.00	0	0	57	0.00
10/11/2010	0.0000	50	72	0.00	0	0	57	0.00
10/12/2010	0.0000	50	72	0.00	0	0	57	0.00
10/13/2010	0.0181	50	72	0.00	0	0	57	0.00
10/14/2010	0.0000	50	72	0.00	0	0	57	0.00
10/15/2010	0.0000	50	72	0.00	0	0	57	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
10/16/2010	0.0000	50	72	0.00	0	0	57	0.00
10/17/2010	0.0000	50	72	0.00	0	0	57	0.00
10/18/2010	0.0000	50	72	0.00	0	0	57	0.00
10/19/2010	0.0000	50	72	0.00	0	0	57	0.00
10/20/2010	0.0414	50	72	0.00	92	0	57	0.00
10/21/2010	0.0000	50	72	0.00	0	0	57	0.00
10/22/2010	0.0000	50	72	0.00	0	0	57	0.00
10/23/2010	0.0000	50	72	0.00	0	0	57	0.00
10/24/2010	0.0000	50	72	0.00	0	0	57	0.00
10/25/2010	0.0005	50	72	0.00	0	0	57	0.00
10/26/2010	0.1195	50	72	0.00	5,499	0	57	0.00
10/27/2010	0.0105	50	72	0.00	0	0	57	0.00
10/28/2010	1.6743	69	82	0.44	95,892	17,264	73	0.16
10/29/2010	0.0000	69	82	0.00	0	0	73	0.00
10/30/2010	0.0000	69	82	0.00	0	0	73	0.00
10/31/2010	0.0000	69	82	0.00	0	0	73	0.00
11/1/2010	0.0000	84	91	0.00	0	0	86	0.00
11/2/2010	0.0000	50	72	0.00	0	0	57	0.00
11/3/2010	0.1724	50	72	0.00	9,159	0	57	0.00
11/4/2010	0.4038	69	82	0.00	16,211	8,973	73	0.00
11/5/2010	0.0000	69	82	0.00	0	0	73	0.00
11/6/2010	0.0467	69	82	0.00	454	0	73	0.00
11/7/2010	0.0000	69	82	0.00	0	0	73	0.00
11/8/2010	0.0000	50	72	0.00	0	0	57	0.00
11/9/2010	0.0000	50	72	0.00	0	0	57	0.00
11/10/2010	0.0000	50	72	0.00	0	0	57	0.00
11/11/2010	0.0000	50	72	0.00	0	0	57	0.00
11/12/2010	0.0000	50	72	0.00	0	0	57	0.00
11/13/2010	0.0000	50	72	0.00	0	0	57	0.00
11/14/2010	0.0000	50	72	0.00	0	0	57	0.00
11/15/2010	0.4871	50	72	0.00	30,954	0	57	0.00
11/16/2010	1.2752	84	91	0.56	12,084	73,441	86	0.44
11/17/2010	0.0543	84	91	0.00	982	0	86	0.00
11/18/2010	0.0000	84	91	0.00	0	0	86	0.00
11/19/2010	0.0000	84	91	0.00	0	0	86	0.00
11/20/2010	0.0000	84	91	0.00	0	0	86	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
11/21/2010	0.0000	50	72	0.00	0	0	57	0.00
11/22/2010	0.0000	50	72	0.00	0	0	57	0.00
11/23/2010	0.0000	50	72	0.00	0	0	57	0.00
11/24/2010	0.1462	50	72	0.00	7,346	0	57	0.00
11/25/2010	0.0000	50	72	0.00	0	0	57	0.00
11/26/2010	0.0119	50	72	0.00	0	0	57	0.00
11/27/2010	0.1014	50	72	0.00	4,246	0	57	0.00
11/28/2010	0.0000	50	72	0.00	0	0	57	0.00
11/29/2010	0.0000	50	72	0.00	0	0	57	0.00
11/30/2010	0.5062	69	82	0.00	32,273	0	73	0.00
12/1/2010	2.2162	84	91	1.35	9,518	141,161	86	1.18
12/2/2010	0.0000	84	91	0.00	0	0	86	0.00
12/3/2010	0.0000	84	91	0.00	0	0	86	0.00
12/4/2010	0.0000	84	91	0.00	0	0	86	0.00
12/5/2010	0.0000	84	91	0.00	0	0	86	0.00
12/6/2010	0.0000	50	72	0.00	0	0	57	0.00
12/7/2010	0.0000	50	72	0.00	0	0	57	0.00
12/8/2010	0.0000	50	72	0.00	0	0	57	0.00
12/9/2010	0.0000	50	72	0.00	0	0	57	0.00
12/10/2010	0.0000	50	72	0.00	0	0	57	0.00
12/11/2010	0.0000	50	72	0.00	0	0	57	0.00
12/12/2010	0.5533	69	82	0.01	35,538	0	73	0.00
12/13/2010	0.0081	69	82	0.00	0	0	73	0.00
12/14/2010	0.0000	69	82	0.00	0	0	73	0.00
12/15/2010	0.0000	69	82	0.00	0	0	73	0.00
12/16/2010	0.0343	69	82	0.00	0	0	73	0.00
12/17/2010	0.1957	50	72	0.00	10,775	0	57	0.00
12/18/2010	0.0610	50	72	0.00	1,444	0	57	0.00
12/19/2010	0.1176	50	72	0.00	5,367	0	57	0.00
12/20/2010	0.0000	50	72	0.00	0	0	57	0.00
12/21/2010	0.0000	50	72	0.00	0	0	57	0.00
12/22/2010	0.0076	50	72	0.00	0	0	57	0.00
12/23/2010	0.0000	50	72	0.00	0	0	57	0.00
12/24/2010	0.0000	50	72	0.00	0	0	57	0.00
12/25/2010	0.0000	50	72	0.00	0	0	57	0.00
12/26/2010	0.3929	50	72	0.00	24,426	0	57	0.00

Table 47. Stormwater runoff and rainwater harvesting calculation for R-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 47%		Rainwater harvesting		Imperviousness, 28% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
12/27/2010	0.0162	50	72	0.00	0	0	57	0.00
12/28/2010	0.0000	50	72	0.00	0	0	57	0.00
12/29/2010	0.0000	50	72	0.00	0	0	57	0.00
12/30/2010	0.0000	50	72	0.00	0	0	57	0.00
12/31/2010	0.0043	50	72	0.00	0	0	57	0.00
Total	44.45			9.77	1,322,897	1,437,152		7.74

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
1/1/2010	0.0248	50	77	0.00	0	0	69	0.00
1/2/2010	0.0248	50	77	0.00	0	0	69	0.00
1/3/2010	0.0000	50	77	0.00	0	0	69	0.00
1/4/2010	0.0000	50	77	0.00	0	0	69	0.00
1/5/2010	0.0000	50	77	0.00	0	0	69	0.00
1/6/2010	0.0000	50	77	0.00	0	0	69	0.00
1/7/2010	0.0000	50	77	0.00	0	0	69	0.00
1/8/2010	0.1119	50	77	0.00	5,531	0	69	0.00
1/9/2010	0.0000	50	77	0.00	0	0	69	0.00
1/10/2010	0.0000	50	77	0.00	0	0	69	0.00
1/11/2010	0.0000	50	77	0.00	0	0	69	0.00
1/12/2010	0.0000	50	77	0.00	0	0	69	0.00
1/13/2010	0.0000	50	77	0.00	0	0	69	0.00
1/14/2010	0.0000	50	77	0.00	0	0	69	0.00
1/15/2010	0.0000	50	77	0.00	0	0	69	0.00
1/16/2010	0.0000	50	77	0.00	0	0	69	0.00
1/17/2010	1.2157	84	92	0.52	90,565	0	90	0.47
1/18/2010	0.0690	84	92	0.00	2,230	0	90	0.00
1/19/2010	0.0000	84	92	0.00	0	0	90	0.00
1/20/2010	0.0000	84	92	0.00	0	0	90	0.00
1/21/2010	0.0729	84	92	0.00	2,523	0	90	0.00
1/22/2010	0.6319	69	85	0.03	45,590	0	80	0.01
1/23/2010	0.0000	69	85	0.00	0	0	80	0.00
1/24/2010	0.0462	69	85	0.00	469	0	80	0.00
1/25/2010	1.9390	84	92	1.11	127,478	18,810	90	1.12
1/26/2010	0.0000	84	92	0.00	0	0	90	0.00
1/27/2010	0.0000	84	92	0.00	0	0	90	0.00
1/28/2010	0.0000	84	92	0.00	0	0	90	0.00
1/29/2010	0.0000	84	92	0.00	0	0	90	0.00
1/30/2010	0.5038	69	85	0.01	32,677	3,045	80	0.00
1/31/2010	0.0129	69	85	0.00	0	0	80	0.00
2/1/2010	0.0000	69	85	0.00	0	0	80	0.00
2/2/2010	0.3514	69	85	0.00	19,606	4,377	80	0.00
2/3/2010	0.0062	69	85	0.00	0	0	80	0.00
2/4/2010	0.0000	50	77	0.00	0	0	69	0.00
2/5/2010	1.7571	84	92	0.95	19,606	112,668	90	1.39
2/6/2010	0.6181	84	92	0.13	6,535	37,991	90	0.21

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI				
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)		
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
2/7/2010	0.0000	84	92	0.00	0	0	90	0.00
2/8/2010	0.0000	84	92	0.00	0	0	90	0.00
2/9/2010	0.0000	84	92	0.00	0	0	90	0.00
2/10/2010	0.1967	69	85	0.00	12,061	0	80	0.00
2/11/2010	0.0000	50	77	0.00	0	0	69	0.00
2/12/2010	0.0000	50	77	0.00	0	0	69	0.00
2/13/2010	0.2186	50	77	0.00	13,748	0	69	0.00
2/14/2010	0.0000	50	77	0.00	0	0	69	0.00
2/15/2010	0.2229	50	77	0.00	14,079	0	69	0.00
2/16/2010	0.0186	50	77	0.00	0	0	69	0.00
2/17/2010	0.0000	50	77	0.00	0	0	69	0.00
2/18/2010	0.0000	50	77	0.00	0	0	69	0.00
2/19/2010	0.0000	50	77	0.00	0	0	69	0.00
2/20/2010	0.0000	50	77	0.00	0	0	69	0.00
2/21/2010	0.0000	50	77	0.00	0	0	69	0.00
2/22/2010	0.6610	69	85	0.04	47,828	0	80	0.01
2/23/2010	0.0014	69	85	0.00	0	0	80	0.00
2/24/2010	0.0000	69	85	0.00	0	0	80	0.00
2/25/2010	0.0000	69	85	0.00	0	0	80	0.00
2/26/2010	0.0000	69	85	0.00	0	0	80	0.00
2/27/2010	0.0000	50	77	0.00	0	0	69	0.00
2/28/2010	0.0000	50	77	0.00	0	0	69	0.00
3/1/2010	0.0000	50	77	0.00	0	0	69	0.00
3/2/2010	0.3129	50	77	0.00	21,012	0	69	0.00
3/3/2010	0.4448	69	85	0.00	31,173	0	80	0.00
3/4/2010	0.0000	69	85	0.00	0	0	80	0.00
3/5/2010	0.0000	69	85	0.00	0	0	80	0.00
3/6/2010	0.0000	69	85	0.00	0	0	80	0.00
3/7/2010	0.0000	50	77	0.00	0	0	69	0.00
3/8/2010	0.0000	50	77	0.00	0	0	69	0.00
3/9/2010	0.0000	50	77	0.00	0	0	69	0.00
3/10/2010	0.2852	50	77	0.00	18,884	0	69	0.00
3/11/2010	1.9786	84	92	1.14	56,885	92,448	90	1.49
3/12/2010	0.0805	84	92	0.00	3,110	0	90	0.00
3/13/2010	0.7252	84	92	0.18	9,961	42,820	90	0.29
3/14/2010	0.0238	84	92	0.00	0	0	90	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
3/15/2010	0.0962	84	92	0.00	4,321	0	90	0.00
3/16/2010	0.0000	69	85	0.00	0	0	80	0.00
3/17/2010	0.0000	69	85	0.00	0	0	80	0.00
3/18/2010	0.1652	50	77	0.00	9,640	0	69	0.00
3/19/2010	0.0000	50	77	0.00	0	0	69	0.00
3/20/2010	0.0000	50	77	0.00	0	0	69	0.00
3/21/2010	0.0019	50	77	0.00	0	0	69	0.00
3/22/2010	0.4181	69	85	0.00	29,119	0	80	0.00
3/23/2010	0.1319	69	85	0.00	7,072	0	80	0.00
3/24/2010	0.0000	69	85	0.00	0	0	80	0.00
3/25/2010	0.0000	69	85	0.00	0	0	80	0.00
3/26/2010	0.0614	69	85	0.00	1,643	0	80	0.00
3/27/2010	0.0000	50	77	0.00	0	0	69	0.00
3/28/2010	0.0029	50	77	0.00	0	0	69	0.00
3/29/2010	0.1105	50	77	0.00	5,421	0	69	0.00
3/30/2010	0.0000	50	77	0.00	0	0	69	0.00
3/31/2010	0.0000	50	77	0.00	0	0	69	0.00
4/1/2010	0.0000	50	77	0.00	0	0	69	0.00
4/2/2010	0.0000	50	77	0.00	0	0	69	0.00
4/3/2010	0.0000	50	77	0.00	0	0	69	0.00
4/4/2010	0.0000	50	77	0.00	0	0	69	0.00
4/5/2010	0.0000	50	77	0.00	0	0	69	0.00
4/6/2010	0.0000	50	77	0.00	0	0	69	0.00
4/7/2010	0.0000	50	77	0.00	0	0	69	0.00
4/8/2010	0.0000	50	77	0.00	0	0	69	0.00
4/9/2010	0.6186	50	77	0.00	44,563	0	69	0.00
4/10/2010	0.0000	50	77	0.00	0	0	69	0.00
4/11/2010	0.0000	50	77	0.00	0	0	69	0.00
4/12/2010	0.0000	50	77	0.00	0	0	69	0.00
4/13/2010	0.0000	50	77	0.00	0	0	69	0.00
4/14/2010	0.0000	50	77	0.00	0	0	69	0.00
4/15/2010	0.0000	50	77	0.00	0	0	69	0.00
4/16/2010	0.0000	50	77	0.00	0	0	69	0.00
4/17/2010	0.0000	50	77	0.00	0	0	69	0.00
4/18/2010	0.0000	50	77	0.00	0	0	69	0.00
4/19/2010	0.0000	50	77	0.00	0	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
4/20/2010	0.0552	50	77	0.00	1,166	0	69	0.00
4/21/2010	0.1767	50	77	0.00	10,520	0	69	0.00
4/22/2010	0.0000	50	77	0.00	0	0	69	0.00
4/23/2010	0.0000	50	77	0.00	0	0	69	0.00
4/24/2010	0.3495	50	77	0.00	23,837	0	69	0.00
4/25/2010	1.3319	69	85	0.32	99,516	0	80	0.21
4/26/2010	0.0124	69	85	0.00	0	0	80	0.00
4/27/2010	0.0000	69	85	0.00	0	0	80	0.00
4/28/2010	0.0567	69	85	0.00	1,276	0	80	0.00
4/29/2010	0.0000	69	85	0.00	0	0	80	0.00
4/30/2010	0.0000	50	77	0.00	0	0	69	0.00
5/1/2010	0.0000	50	77	0.00	0	0	69	0.00
5/2/2010	0.0000	50	77	0.00	0	0	69	0.00
5/3/2010	3.9062	84	92	2.93	95,215	202,614	90	3.83
5/4/2010	0.4829	84	92	0.06	6,535	27,573	90	0.11
5/5/2010	0.0000	84	92	0.00	0	0	90	0.00
5/6/2010	0.0000	84	92	0.00	0	0	90	0.00
5/7/2010	0.0000	84	92	0.00	0	0	90	0.00
5/8/2010	0.0000	50	77	0.00	0	0	69	0.00
5/9/2010	0.0000	50	77	0.00	0	0	69	0.00
5/10/2010	0.0000	50	77	0.00	0	0	69	0.00
5/11/2010	0.2057	50	77	0.00	12,758	0	69	0.00
5/12/2010	0.0000	50	77	0.00	0	0	69	0.00
5/13/2010	0.0000	50	77	0.00	0	0	69	0.00
5/14/2010	0.0000	50	77	0.00	0	0	69	0.00
5/15/2010	0.1286	50	77	0.00	6,815	0	69	0.00
5/16/2010	0.0014	50	77	0.00	0	0	69	0.00
5/17/2010	0.0862	50	77	0.00	3,550	0	69	0.00
5/18/2010	0.0000	50	77	0.00	0	0	69	0.00
5/19/2010	0.0000	50	77	0.00	0	0	69	0.00
5/20/2010	0.0000	50	77	0.00	0	0	69	0.00
5/21/2010	1.0329	50	77	0.04	76,478	0	69	0.00
5/22/2010	0.4286	69	85	0.00	18,037	11,890	80	0.00
5/23/2010	0.0000	69	85	0.00	0	0	80	0.00
5/24/2010	0.0000	69	85	0.00	0	0	80	0.00
5/25/2010	0.0000	69	85	0.00	0	0	80	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
5/26/2010	0.0005	50	77	0.00	0	0	69	0.00
5/27/2010	0.1033	50	77	0.00	4,871	0	69	0.00
5/28/2010	0.0019	50	77	0.00	0	0	69	0.00
5/29/2010	0.7757	50	77	0.00	40,877	15,792	69	0.00
5/30/2010	0.1686	50	77	0.00	6,535	3,361	69	0.00
5/31/2010	0.1319	50	77	0.00	6,535	537	69	0.00
6/1/2010	0.1338	50	77	0.00	6,535	683	69	0.00
6/2/2010	0.2290	69	85	0.00	6,535	8,020	80	0.00
6/3/2010	0.3914	50	77	0.00	6,535	20,529	69	0.00
6/4/2010	0.0000	50	77	0.00	0	0	69	0.00
6/5/2010	0.3252	50	77	0.00	13,071	8,895	69	0.00
6/6/2010	0.0000	50	77	0.00	0	0	69	0.00
6/7/2010	0.0319	50	77	0.00	0	0	69	0.00
6/8/2010	0.0000	50	77	0.00	0	0	69	0.00
6/9/2010	0.0162	50	77	0.00	0	0	69	0.00
6/10/2010	0.0114	50	77	0.00	0	0	69	0.00
6/11/2010	0.0452	50	77	0.00	395	0	69	0.00
6/12/2010	0.0476	50	77	0.00	579	0	69	0.00
6/13/2010	0.0000	50	77	0.00	0	0	69	0.00
6/14/2010	0.0000	50	77	0.00	0	0	69	0.00
6/15/2010	0.0000	50	77	0.00	0	0	69	0.00
6/16/2010	0.6129	50	77	0.00	44,123	0	69	0.00
6/17/2010	0.0605	50	77	0.00	1,569	0	69	0.00
6/18/2010	0.0462	50	77	0.00	469	0	69	0.00
6/19/2010	0.0386	50	77	0.00	0	0	69	0.00
6/20/2010	0.0333	50	77	0.00	0	0	69	0.00
6/21/2010	0.0010	50	77	0.00	0	0	69	0.00
6/22/2010	0.0024	50	77	0.00	0	0	69	0.00
6/23/2010	0.0024	50	77	0.00	0	0	69	0.00
6/24/2010	0.0124	50	77	0.00	0	0	69	0.00
6/25/2010	0.0000	50	77	0.00	0	0	69	0.00
6/26/2010	0.0086	50	77	0.00	0	0	69	0.00
6/27/2010	0.0000	50	77	0.00	0	0	69	0.00
6/28/2010	0.0000	50	77	0.00	0	0	69	0.00
6/29/2010	0.0052	50	77	0.00	0	0	69	0.00
6/30/2010	0.3495	50	77	0.00	23,837	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
7/1/2010	0.0695	50	77	0.00	2,266	0	69	0.00
7/2/2010	0.0010	50	77	0.00	0	0	69	0.00
7/3/2010	0.0057	50	77	0.00	0	0	69	0.00
7/4/2010	0.0000	50	77	0.00	0	0	69	0.00
7/5/2010	0.0000	50	77	0.00	0	0	69	0.00
7/6/2010	0.0000	50	77	0.00	0	0	69	0.00
7/7/2010	0.0000	50	77	0.00	0	0	69	0.00
7/8/2010	0.0000	50	77	0.00	0	0	69	0.00
7/9/2010	0.0000	50	77	0.00	0	0	69	0.00
7/10/2010	0.2843	50	77	0.00	18,811	0	69	0.00
7/11/2010	0.0000	50	77	0.00	0	0	69	0.00
7/12/2010	0.0129	50	77	0.00	0	0	69	0.00
7/13/2010	0.7676	50	77	0.00	56,045	0	69	0.00
7/14/2010	0.6229	69	85	0.03	44,893	0	80	0.01
7/15/2010	0.0000	69	85	0.00	0	0	80	0.00
7/16/2010	0.0005	69	85	0.00	0	0	80	0.00
7/17/2010	0.0748	69	85	0.00	2,670	0	80	0.00
7/18/2010	0.1138	50	77	0.00	5,678	0	69	0.00
7/19/2010	0.4638	50	77	0.00	32,641	0	69	0.00
7/20/2010	0.0000	50	77	0.00	0	0	69	0.00
7/21/2010	0.0438	50	77	0.00	285	0	69	0.00
7/22/2010	0.0662	50	77	0.00	2,010	0	69	0.00
7/23/2010	0.0005	50	77	0.00	0	0	69	0.00
7/24/2010	0.0786	50	77	0.00	2,963	0	69	0.00
7/25/2010	0.0033	50	77	0.00	0	0	69	0.00
7/26/2010	0.0000	50	77	0.00	0	0	69	0.00
7/27/2010	0.5629	50	77	0.00	40,271	0	69	0.00
7/28/2010	0.0314	50	77	0.00	0	0	69	0.00
7/29/2010	0.0900	50	77	0.00	3,844	0	69	0.00
7/30/2010	0.0000	50	77	0.00	0	0	69	0.00
7/31/2010	0.0000	50	77	0.00	0	0	69	0.00
8/1/2010	0.3214	50	77	0.00	21,672	0	69	0.00
8/2/2010	0.5257	50	77	0.00	37,410	0	69	0.00
8/3/2010	0.0000	50	77	0.00	0	0	69	0.00
8/4/2010	0.0571	50	77	0.00	1,313	0	69	0.00
8/5/2010	0.0000	50	77	0.00	0	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
8/6/2010	0.0057	50	77	0.00	0	0	69	0.00
8/7/2010	0.4238	50	77	0.00	29,559	0	69	0.00
8/8/2010	0.0005	50	77	0.00	0	0	69	0.00
8/9/2010	0.0000	50	77	0.00	0	0	69	0.00
8/10/2010	0.0000	50	77	0.00	0	0	69	0.00
8/11/2010	0.0000	50	77	0.00	0	0	69	0.00
8/12/2010	0.0000	50	77	0.00	0	0	69	0.00
8/13/2010	0.0000	50	77	0.00	0	0	69	0.00
8/14/2010	0.1281	50	77	0.00	6,779	0	69	0.00
8/15/2010	0.1529	50	77	0.00	8,686	0	69	0.00
8/16/2010	0.0000	50	77	0.00	0	0	69	0.00
8/17/2010	0.0000	50	77	0.00	0	0	69	0.00
8/18/2010	0.0224	50	77	0.00	0	0	69	0.00
8/19/2010	0.0000	50	77	0.00	0	0	69	0.00
8/20/2010	0.0224	50	77	0.00	0	0	69	0.00
8/21/2010	1.1257	50	77	0.06	83,632	0	69	0.01
8/22/2010	0.1319	50	77	0.00	7,072	0	69	0.00
8/23/2010	0.0000	50	77	0.00	0	0	69	0.00
8/24/2010	0.0000	50	77	0.00	0	0	69	0.00
8/25/2010	0.0000	50	77	0.00	0	0	69	0.00
8/26/2010	0.9524	50	77	0.02	56,436	13,843	69	0.00
8/27/2010	0.3010	50	77	0.00	6,535	13,559	69	0.00
8/28/2010	0.0005	50	77	0.00	0	0	69	0.00
8/29/2010	0.0662	50	77	0.00	2,010	0	69	0.00
8/30/2010	0.0000	50	77	0.00	0	0	69	0.00
8/31/2010	0.0000	50	77	0.00	0	0	69	0.00
9/1/2010	0.0000	50	77	0.00	0	0	69	0.00
9/2/2010	0.0000	50	77	0.00	0	0	69	0.00
9/3/2010	0.0000	50	77	0.00	0	0	69	0.00
9/4/2010	0.0000	50	77	0.00	0	0	69	0.00
9/5/2010	0.0000	50	77	0.00	0	0	69	0.00
9/6/2010	0.0000	50	77	0.00	0	0	69	0.00
9/7/2010	0.0000	50	77	0.00	0	0	69	0.00
9/8/2010	0.0000	50	77	0.00	0	0	69	0.00
9/9/2010	0.0195	50	77	0.00	0	0	69	0.00
9/10/2010	0.0000	50	77	0.00	0	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
9/11/2010	0.0000	50	77	0.00	0	0	69	0.00
9/12/2010	0.3424	50	77	0.00	23,286	0	69	0.00
9/13/2010	0.0000	50	77	0.00	0	0	69	0.00
9/14/2010	0.0000	50	77	0.00	0	0	69	0.00
9/15/2010	0.0000	50	77	0.00	0	0	69	0.00
9/16/2010	0.0000	50	77	0.00	0	0	69	0.00
9/17/2010	0.0000	50	77	0.00	0	0	69	0.00
9/18/2010	0.0010	50	77	0.00	0	0	69	0.00
9/19/2010	0.0000	50	77	0.00	0	0	69	0.00
9/20/2010	0.0000	50	77	0.00	0	0	69	0.00
9/21/2010	0.0000	50	77	0.00	0	0	69	0.00
9/22/2010	0.0000	50	77	0.00	0	0	69	0.00
9/23/2010	0.0443	50	77	0.00	322	0	69	0.00
9/24/2010	0.0000	50	77	0.00	0	0	69	0.00
9/25/2010	0.0000	50	77	0.00	0	0	69	0.00
9/26/2010	0.0614	50	77	0.00	1,643	0	69	0.00
9/27/2010	0.9367	50	77	0.02	69,068	0	69	0.00
9/28/2010	0.2852	50	77	0.00	18,884	0	69	0.00
9/29/2010	0.0000	50	77	0.00	0	0	69	0.00
9/30/2010	0.5414	69	85	0.01	38,620	0	80	0.00
10/1/2010	0.0038	69	85	0.00	0	0	80	0.00
10/2/2010	0.0000	50	77	0.00	0	0	69	0.00
10/3/2010	0.0000	50	77	0.00	0	0	69	0.00
10/4/2010	0.0000	50	77	0.00	0	0	69	0.00
10/5/2010	0.0000	50	77	0.00	0	0	69	0.00
10/6/2010	0.0000	50	77	0.00	0	0	69	0.00
10/7/2010	0.0000	50	77	0.00	0	0	69	0.00
10/8/2010	0.0000	50	77	0.00	0	0	69	0.00
10/9/2010	0.0000	50	77	0.00	0	0	69	0.00
10/10/2010	0.0000	50	77	0.00	0	0	69	0.00
10/11/2010	0.0000	50	77	0.00	0	0	69	0.00
10/12/2010	0.0000	50	77	0.00	0	0	69	0.00
10/13/2010	0.0181	50	77	0.00	0	0	69	0.00
10/14/2010	0.0000	50	77	0.00	0	0	69	0.00
10/15/2010	0.0000	50	77	0.00	0	0	69	0.00
10/16/2010	0.0000	50	77	0.00	0	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
10/17/2010	0.0000	50	77	0.00	0	0	69	0.00
10/18/2010	0.0000	50	77	0.00	0	0	69	0.00
10/19/2010	0.0000	50	77	0.00	0	0	69	0.00
10/20/2010	0.0414	50	77	0.00	102	0	69	0.00
10/21/2010	0.0000	50	77	0.00	0	0	69	0.00
10/22/2010	0.0000	50	77	0.00	0	0	69	0.00
10/23/2010	0.0000	50	77	0.00	0	0	69	0.00
10/24/2010	0.0000	50	77	0.00	0	0	69	0.00
10/25/2010	0.0005	50	77	0.00	0	0	69	0.00
10/26/2010	0.1195	50	77	0.00	6,118	0	69	0.00
10/27/2010	0.0105	50	77	0.00	0	0	69	0.00
10/28/2010	1.6743	69	85	0.52	125,892	0	80	0.38
10/29/2010	0.0000	69	85	0.00	0	0	80	0.00
10/30/2010	0.0000	69	85	0.00	0	0	80	0.00
10/31/2010	0.0000	69	85	0.00	0	0	80	0.00
11/1/2010	0.0000	84	92	0.00	0	0	90	0.00
11/2/2010	0.0000	50	77	0.00	0	0	69	0.00
11/3/2010	0.1724	50	77	0.00	10,190	0	69	0.00
11/4/2010	0.4038	69	85	0.00	28,019	0	80	0.00
11/5/2010	0.0000	69	85	0.00	0	0	80	0.00
11/6/2010	0.0467	69	85	0.00	506	0	80	0.00
11/7/2010	0.0000	69	85	0.00	0	0	80	0.00
11/8/2010	0.0000	50	77	0.00	0	0	69	0.00
11/9/2010	0.0000	50	77	0.00	0	0	69	0.00
11/10/2010	0.0000	50	77	0.00	0	0	69	0.00
11/11/2010	0.0000	50	77	0.00	0	0	69	0.00
11/12/2010	0.0000	50	77	0.00	0	0	69	0.00
11/13/2010	0.0000	50	77	0.00	0	0	69	0.00
11/14/2010	0.0000	50	77	0.00	0	0	69	0.00
11/15/2010	0.4871	50	77	0.00	34,438	0	69	0.00
11/16/2010	1.2752	84	92	0.56	95,150	0	90	0.51
11/17/2010	0.0543	84	92	0.00	1,092	0	90	0.00
11/18/2010	0.0000	84	92	0.00	0	0	90	0.00
11/19/2010	0.0000	84	92	0.00	0	0	90	0.00
11/20/2010	0.0000	84	92	0.00	0	0	90	0.00
11/21/2010	0.0000	50	77	0.00	0	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
11/22/2010	0.0000	50	77	0.00	0	0	69	0.00
11/23/2010	0.0000	50	77	0.00	0	0	69	0.00
11/24/2010	0.1462	50	77	0.00	8,173	0	69	0.00
11/25/2010	0.0000	50	77	0.00	0	0	69	0.00
11/26/2010	0.0119	50	77	0.00	0	0	69	0.00
11/27/2010	0.1014	50	77	0.00	4,724	0	69	0.00
11/28/2010	0.0000	50	77	0.00	0	0	69	0.00
11/29/2010	0.0000	50	77	0.00	0	0	69	0.00
11/30/2010	0.5062	69	85	0.01	35,906	0	80	0.00
12/1/2010	2.2162	84	92	1.35	123,261	44,377	90	1.48
12/2/2010	0.0000	84	92	0.00	0	0	90	0.00
12/3/2010	0.0000	84	92	0.00	0	0	90	0.00
12/4/2010	0.0000	84	92	0.00	0	0	90	0.00
12/5/2010	0.0000	84	92	0.00	0	0	90	0.00
12/6/2010	0.0000	50	77	0.00	0	0	69	0.00
12/7/2010	0.0000	50	77	0.00	0	0	69	0.00
12/8/2010	0.0000	50	77	0.00	0	0	69	0.00
12/9/2010	0.0000	50	77	0.00	0	0	69	0.00
12/10/2010	0.0000	50	77	0.00	0	0	69	0.00
12/11/2010	0.0000	50	77	0.00	0	0	69	0.00
12/12/2010	0.5533	69	85	0.01	39,537	0	80	0.00
12/13/2010	0.0081	69	85	0.00	0	0	80	0.00
12/14/2010	0.0000	69	85	0.00	0	0	80	0.00
12/15/2010	0.0000	69	85	0.00	0	0	80	0.00
12/16/2010	0.0343	69	85	0.00	0	0	80	0.00
12/17/2010	0.1957	50	77	0.00	11,988	0	69	0.00
12/18/2010	0.0610	50	77	0.00	1,606	0	69	0.00
12/19/2010	0.1176	50	77	0.00	5,971	0	69	0.00
12/20/2010	0.0000	50	77	0.00	0	0	69	0.00
12/21/2010	0.0000	50	77	0.00	0	0	69	0.00
12/22/2010	0.0076	50	77	0.00	0	0	69	0.00
12/23/2010	0.0000	50	77	0.00	0	0	69	0.00
12/24/2010	0.0000	50	77	0.00	0	0	69	0.00
12/25/2010	0.0000	50	77	0.00	0	0	69	0.00
12/26/2010	0.3929	50	77	0.00	27,175	0	69	0.00
12/27/2010	0.0162	50	77	0.00	0	0	69	0.00

Table 48. Stormwater runoff and rainwater harvesting calculation for R-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 56%		Rainwater harvesting		Imperviousness, 39% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
12/28/2010	0.0000	50	77	0.00	0	0	69	0.00
12/29/2010	0.0000	50	77	0.00	0	0	69	0.00
12/30/2010	0.0000	50	77	0.00	0	0	69	0.00
12/31/2010	0.0043	50	77	0.00	0	0	69	0.00
Total	44.45			10.06	2,385,444	683,830		8.25

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
1/1/2010	0.0248	50	79	0.00	0	0	69	0.00
1/2/2010	0.0248	50	79	0.00	0	0	69	0.00
1/3/2010	0.0000	50	79	0.00	0	0	69	0.00
1/4/2010	0.0000	50	79	0.00	0	0	69	0.00
1/5/2010	0.0000	50	79	0.00	0	0	69	0.00
1/6/2010	0.0000	50	79	0.00	0	0	69	0.00
1/7/2010	0.0000	50	79	0.00	0	0	69	0.00
1/8/2010	0.1119	50	79	0.00	6,307	0	69	0.00
1/9/2010	0.0000	50	79	0.00	0	0	69	0.00
1/10/2010	0.0000	50	79	0.00	0	0	69	0.00
1/11/2010	0.0000	50	79	0.00	0	0	69	0.00
1/12/2010	0.0000	50	79	0.00	0	0	69	0.00
1/13/2010	0.0000	50	79	0.00	0	0	69	0.00
1/14/2010	0.0000	50	79	0.00	0	0	69	0.00
1/15/2010	0.0000	50	79	0.00	0	0	69	0.00
1/16/2010	0.0000	50	79	0.00	0	0	69	0.00
1/17/2010	1.2157	84	93	0.62	103,270	0	90	0.32
1/18/2010	0.0690	84	93	0.00	2,542	0	90	0.00
1/19/2010	0.0000	84	93	0.00	0	0	90	0.00
1/20/2010	0.0000	84	93	0.00	0	0	90	0.00
1/21/2010	0.0729	84	93	0.00	2,877	0	90	0.00
1/22/2010	0.6319	69	86	0.05	51,986	0	80	0.00
1/23/2010	0.0000	69	86	0.00	0	0	80	0.00
1/24/2010	0.0462	69	86	0.00	535	0	80	0.00
1/25/2010	1.9390	84	93	1.26	166,811	0	90	0.71
1/26/2010	0.0000	84	93	0.00	0	0	90	0.00
1/27/2010	0.0000	84	93	0.00	0	0	90	0.00
1/28/2010	0.0000	84	93	0.00	0	0	90	0.00
1/29/2010	0.0000	84	93	0.00	0	0	90	0.00
1/30/2010	0.5038	69	86	0.02	40,734	0	80	0.00
1/31/2010	0.0129	69	86	0.00	0	0	80	0.00
2/1/2010	0.0000	69	86	0.00	0	0	80	0.00
2/2/2010	0.3514	69	86	0.00	27,348	1,699	80	0.00
2/3/2010	0.0062	69	86	0.00	0	0	80	0.00
2/4/2010	0.0000	50	79	0.00	0	0	69	0.00
2/5/2010	1.7571	84	93	1.09	150,831	127,130	90	1.01
2/6/2010	0.6181	84	93	0.18	50,773	42,873	90	0.15

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
2/7/2010	0.0000	84	93	0.00	0	0	90	0.00
2/8/2010	0.0000	84	93	0.00	0	0	90	0.00
2/9/2010	0.0000	84	93	0.00	0	0	90	0.00
2/10/2010	0.1967	69	86	0.00	13,753	0	80	0.00
2/11/2010	0.0000	50	79	0.00	0	0	69	0.00
2/12/2010	0.0000	50	79	0.00	0	0	69	0.00
2/13/2010	0.2186	50	79	0.00	15,677	0	69	0.00
2/14/2010	0.0000	50	79	0.00	0	0	69	0.00
2/15/2010	0.2229	50	79	0.00	16,054	0	69	0.00
2/16/2010	0.0186	50	79	0.00	0	0	69	0.00
2/17/2010	0.0000	50	79	0.00	0	0	69	0.00
2/18/2010	0.0000	50	79	0.00	0	0	69	0.00
2/19/2010	0.0000	50	79	0.00	0	0	69	0.00
2/20/2010	0.0000	50	79	0.00	0	0	69	0.00
2/21/2010	0.0000	50	79	0.00	0	0	69	0.00
2/22/2010	0.6610	69	86	0.06	54,538	0	80	0.01
2/23/2010	0.0014	69	86	0.00	0	0	80	0.00
2/24/2010	0.0000	69	86	0.00	0	0	80	0.00
2/25/2010	0.0000	69	86	0.00	0	0	80	0.00
2/26/2010	0.0000	69	86	0.00	0	0	80	0.00
2/27/2010	0.0000	50	79	0.00	0	0	69	0.00
2/28/2010	0.0000	50	79	0.00	0	0	69	0.00
3/1/2010	0.0000	50	79	0.00	0	0	69	0.00
3/2/2010	0.3129	50	79	0.00	23,960	0	69	0.00
3/3/2010	0.4448	69	86	0.01	35,547	0	80	0.00
3/4/2010	0.0000	69	86	0.00	0	0	80	0.00
3/5/2010	0.0000	69	86	0.00	0	0	80	0.00
3/6/2010	0.0000	69	86	0.00	0	0	80	0.00
3/7/2010	0.0000	50	79	0.00	0	0	69	0.00
3/8/2010	0.0000	50	79	0.00	0	0	69	0.00
3/9/2010	0.0000	50	79	0.00	0	0	69	0.00
3/10/2010	0.2852	50	79	0.00	21,534	0	69	0.00
3/11/2010	1.9786	84	93	1.29	170,282	90,633	90	1.02
3/12/2010	0.0805	84	93	0.00	3,546	0	90	0.00
3/13/2010	0.7252	84	93	0.25	60,185	47,931	90	0.21
3/14/2010	0.0238	84	93	0.00	0	0	90	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
3/15/2010	0.0962	84	93	0.00	4,927	0	90	0.00
3/16/2010	0.0000	69	86	0.00	0	0	80	0.00
3/17/2010	0.0000	69	86	0.00	0	0	80	0.00
3/18/2010	0.1652	50	79	0.00	10,992	0	69	0.00
3/19/2010	0.0000	50	79	0.00	0	0	69	0.00
3/20/2010	0.0000	50	79	0.00	0	0	69	0.00
3/21/2010	0.0019	50	79	0.00	0	0	69	0.00
3/22/2010	0.4181	69	86	0.00	33,204	0	80	0.00
3/23/2010	0.1319	69	86	0.00	8,064	0	80	0.00
3/24/2010	0.0000	69	86	0.00	0	0	80	0.00
3/25/2010	0.0000	69	86	0.00	0	0	80	0.00
3/26/2010	0.0614	69	86	0.00	1,873	0	80	0.00
3/27/2010	0.0000	50	79	0.00	0	0	69	0.00
3/28/2010	0.0029	50	79	0.00	0	0	69	0.00
3/29/2010	0.1105	50	79	0.00	6,182	0	69	0.00
3/30/2010	0.0000	50	79	0.00	0	0	69	0.00
3/31/2010	0.0000	50	79	0.00	0	0	69	0.00
4/1/2010	0.0000	50	79	0.00	0	0	69	0.00
4/2/2010	0.0000	50	79	0.00	0	0	69	0.00
4/3/2010	0.0000	50	79	0.00	0	0	69	0.00
4/4/2010	0.0000	50	79	0.00	0	0	69	0.00
4/5/2010	0.0000	50	79	0.00	0	0	69	0.00
4/6/2010	0.0000	50	79	0.00	0	0	69	0.00
4/7/2010	0.0000	50	79	0.00	0	0	69	0.00
4/8/2010	0.0000	50	79	0.00	0	0	69	0.00
4/9/2010	0.6186	50	79	0.00	50,815	0	69	0.00
4/10/2010	0.0000	50	79	0.00	0	0	69	0.00
4/11/2010	0.0000	50	79	0.00	0	0	69	0.00
4/12/2010	0.0000	50	79	0.00	0	0	69	0.00
4/13/2010	0.0000	50	79	0.00	0	0	69	0.00
4/14/2010	0.0000	50	79	0.00	0	0	69	0.00
4/15/2010	0.0000	50	79	0.00	0	0	69	0.00
4/16/2010	0.0000	50	79	0.00	0	0	69	0.00
4/17/2010	0.0000	50	79	0.00	0	0	69	0.00
4/18/2010	0.0000	50	79	0.00	0	0	69	0.00
4/19/2010	0.0000	50	79	0.00	0	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
4/20/2010	0.0552	50	79	0.00	1,329	0	69	0.00
4/21/2010	0.1767	50	79	0.00	11,996	0	69	0.00
4/22/2010	0.0000	50	79	0.00	0	0	69	0.00
4/23/2010	0.0000	50	79	0.00	0	0	69	0.00
4/24/2010	0.3495	50	79	0.00	27,181	0	69	0.00
4/25/2010	1.3319	69	86	0.38	113,477	0	80	0.14
4/26/2010	0.0124	69	86	0.00	0	0	80	0.00
4/27/2010	0.0000	69	86	0.00	0	0	80	0.00
4/28/2010	0.0567	69	86	0.00	1,455	0	80	0.00
4/29/2010	0.0000	69	86	0.00	0	0	80	0.00
4/30/2010	0.0000	50	79	0.00	0	0	69	0.00
5/1/2010	0.0000	50	79	0.00	0	0	69	0.00
5/2/2010	0.0000	50	79	0.00	0	0	69	0.00
5/3/2010	3.9062	84	93	3.13	339,612	208,190	90	2.65
5/4/2010	0.4829	84	93	0.10	38,893	30,993	90	0.08
5/5/2010	0.0000	84	93	0.00	0	0	90	0.00
5/6/2010	0.0000	84	93	0.00	0	0	90	0.00
5/7/2010	0.0000	84	93	0.00	0	0	90	0.00
5/8/2010	0.0000	50	79	0.00	0	0	69	0.00
5/9/2010	0.0000	50	79	0.00	0	0	69	0.00
5/10/2010	0.0000	50	79	0.00	0	0	69	0.00
5/11/2010	0.2057	50	79	0.00	14,548	0	69	0.00
5/12/2010	0.0000	50	79	0.00	0	0	69	0.00
5/13/2010	0.0000	50	79	0.00	0	0	69	0.00
5/14/2010	0.0000	50	79	0.00	0	0	69	0.00
5/15/2010	0.1286	50	79	0.00	7,771	0	69	0.00
5/16/2010	0.0014	50	79	0.00	0	0	69	0.00
5/17/2010	0.0862	50	79	0.00	4,048	0	69	0.00
5/18/2010	0.0000	50	79	0.00	0	0	69	0.00
5/19/2010	0.0000	50	79	0.00	0	0	69	0.00
5/20/2010	0.0000	50	79	0.00	0	0	69	0.00
5/21/2010	1.0329	50	79	0.08	87,207	0	69	0.00
5/22/2010	0.4286	69	86	0.01	34,124	5,493	80	0.00
5/23/2010	0.0000	69	86	0.00	0	0	80	0.00
5/24/2010	0.0000	69	86	0.00	0	0	80	0.00
5/25/2010	0.0000	69	86	0.00	0	0	80	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
5/26/2010	0.0005	50	79	0.00	0	0	69	0.00
5/27/2010	0.1033	50	79	0.00	5,554	0	69	0.00
5/28/2010	0.0019	50	79	0.00	0	0	69	0.00
5/29/2010	0.7757	50	79	0.02	64,619	14,871	69	0.00
5/30/2010	0.1686	50	79	0.00	11,285	3,385	69	0.00
5/31/2010	0.1319	50	79	0.00	8,064	164	69	0.00
6/1/2010	0.1338	50	79	0.00	8,231	331	69	0.00
6/2/2010	0.2290	69	86	0.00	16,598	8,697	80	0.00
6/3/2010	0.3914	50	79	0.00	30,862	22,961	69	0.00
6/4/2010	0.0000	50	79	0.00	0	0	69	0.00
6/5/2010	0.3252	50	79	0.00	25,047	9,247	69	0.00
6/6/2010	0.0000	50	79	0.00	0	0	69	0.00
6/7/2010	0.0319	50	79	0.00	0	0	69	0.00
6/8/2010	0.0000	50	79	0.00	0	0	69	0.00
6/9/2010	0.0162	50	79	0.00	0	0	69	0.00
6/10/2010	0.0114	50	79	0.00	0	0	69	0.00
6/11/2010	0.0452	50	79	0.00	451	0	69	0.00
6/12/2010	0.0476	50	79	0.00	660	0	69	0.00
6/13/2010	0.0000	50	79	0.00	0	0	69	0.00
6/14/2010	0.0000	50	79	0.00	0	0	69	0.00
6/15/2010	0.0000	50	79	0.00	0	0	69	0.00
6/16/2010	0.6129	50	79	0.00	50,313	0	69	0.00
6/17/2010	0.0605	50	79	0.00	1,790	0	69	0.00
6/18/2010	0.0462	50	79	0.00	535	0	69	0.00
6/19/2010	0.0386	50	79	0.00	0	0	69	0.00
6/20/2010	0.0333	50	79	0.00	0	0	69	0.00
6/21/2010	0.0010	50	79	0.00	0	0	69	0.00
6/22/2010	0.0024	50	79	0.00	0	0	69	0.00
6/23/2010	0.0024	50	79	0.00	0	0	69	0.00
6/24/2010	0.0124	50	79	0.00	0	0	69	0.00
6/25/2010	0.0000	50	79	0.00	0	0	69	0.00
6/26/2010	0.0086	50	79	0.00	0	0	69	0.00
6/27/2010	0.0000	50	79	0.00	0	0	69	0.00
6/28/2010	0.0000	50	79	0.00	0	0	69	0.00
6/29/2010	0.0052	50	79	0.00	0	0	69	0.00
6/30/2010	0.3495	50	79	0.00	27,181	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
7/1/2010	0.0695	50	79	0.00	2,584	0	69	0.00
7/2/2010	0.0010	50	79	0.00	0	0	69	0.00
7/3/2010	0.0057	50	79	0.00	0	0	69	0.00
7/4/2010	0.0000	50	79	0.00	0	0	69	0.00
7/5/2010	0.0000	50	79	0.00	0	0	69	0.00
7/6/2010	0.0000	50	79	0.00	0	0	69	0.00
7/7/2010	0.0000	50	79	0.00	0	0	69	0.00
7/8/2010	0.0000	50	79	0.00	0	0	69	0.00
7/9/2010	0.0000	50	79	0.00	0	0	69	0.00
7/10/2010	0.2843	50	79	0.00	21,450	0	69	0.00
7/11/2010	0.0000	50	79	0.00	0	0	69	0.00
7/12/2010	0.0129	50	79	0.00	0	0	69	0.00
7/13/2010	0.7676	50	79	0.02	63,908	0	69	0.00
7/14/2010	0.6229	69	86	0.05	51,191	0	80	0.00
7/15/2010	0.0000	69	86	0.00	0	0	80	0.00
7/16/2010	0.0005	69	86	0.00	0	0	80	0.00
7/17/2010	0.0748	69	86	0.00	3,044	0	80	0.00
7/18/2010	0.1138	50	79	0.00	6,475	0	69	0.00
7/19/2010	0.4638	50	79	0.00	37,220	0	69	0.00
7/20/2010	0.0000	50	79	0.00	0	0	69	0.00
7/21/2010	0.0438	50	79	0.00	325	0	69	0.00
7/22/2010	0.0662	50	79	0.00	2,292	0	69	0.00
7/23/2010	0.0005	50	79	0.00	0	0	69	0.00
7/24/2010	0.0786	50	79	0.00	3,379	0	69	0.00
7/25/2010	0.0033	50	79	0.00	0	0	69	0.00
7/26/2010	0.0000	50	79	0.00	0	0	69	0.00
7/27/2010	0.5629	50	79	0.00	45,921	0	69	0.00
7/28/2010	0.0314	50	79	0.00	0	0	69	0.00
7/29/2010	0.0900	50	79	0.00	4,383	0	69	0.00
7/30/2010	0.0000	50	79	0.00	0	0	69	0.00
7/31/2010	0.0000	50	79	0.00	0	0	69	0.00
8/1/2010	0.3214	50	79	0.00	24,713	0	69	0.00
8/2/2010	0.5257	50	79	0.00	42,658	0	69	0.00
8/3/2010	0.0000	50	79	0.00	0	0	69	0.00
8/4/2010	0.0571	50	79	0.00	1,497	0	69	0.00
8/5/2010	0.0000	50	79	0.00	0	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
8/6/2010	0.0057	50	79	0.00	0	0	69	0.00
8/7/2010	0.4238	50	79	0.00	33,706	0	69	0.00
8/8/2010	0.0005	50	79	0.00	0	0	69	0.00
8/9/2010	0.0000	50	79	0.00	0	0	69	0.00
8/10/2010	0.0000	50	79	0.00	0	0	69	0.00
8/11/2010	0.0000	50	79	0.00	0	0	69	0.00
8/12/2010	0.0000	50	79	0.00	0	0	69	0.00
8/13/2010	0.0000	50	79	0.00	0	0	69	0.00
8/14/2010	0.1281	50	79	0.00	7,729	0	69	0.00
8/15/2010	0.1529	50	79	0.00	9,905	0	69	0.00
8/16/2010	0.0000	50	79	0.00	0	0	69	0.00
8/17/2010	0.0000	50	79	0.00	0	0	69	0.00
8/18/2010	0.0224	50	79	0.00	0	0	69	0.00
8/19/2010	0.0000	50	79	0.00	0	0	69	0.00
8/20/2010	0.0224	50	79	0.00	0	0	69	0.00
8/21/2010	1.1257	50	79	0.11	95,364	0	69	0.01
8/22/2010	0.1319	50	79	0.00	8,064	0	69	0.00
8/23/2010	0.0000	50	79	0.00	0	0	69	0.00
8/24/2010	0.0000	50	79	0.00	0	0	69	0.00
8/25/2010	0.0000	50	79	0.00	0	0	69	0.00
8/26/2010	0.9524	50	79	0.06	80,138	0	69	0.00
8/27/2010	0.3010	50	79	0.00	22,914	0	69	0.00
8/28/2010	0.0005	50	79	0.00	0	0	69	0.00
8/29/2010	0.0662	50	79	0.00	2,292	0	69	0.00
8/30/2010	0.0000	50	79	0.00	0	0	69	0.00
8/31/2010	0.0000	50	79	0.00	0	0	69	0.00
9/1/2010	0.0000	50	79	0.00	0	0	69	0.00
9/2/2010	0.0000	50	79	0.00	0	0	69	0.00
9/3/2010	0.0000	50	79	0.00	0	0	69	0.00
9/4/2010	0.0000	50	79	0.00	0	0	69	0.00
9/5/2010	0.0000	50	79	0.00	0	0	69	0.00
9/6/2010	0.0000	50	79	0.00	0	0	69	0.00
9/7/2010	0.0000	50	79	0.00	0	0	69	0.00
9/8/2010	0.0000	50	79	0.00	0	0	69	0.00
9/9/2010	0.0195	50	79	0.00	0	0	69	0.00
9/10/2010	0.0000	50	79	0.00	0	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
9/11/2010	0.0000	50	79	0.00	0	0	69	0.00
9/12/2010	0.3424	50	79	0.00	26,553	0	69	0.00
9/13/2010	0.0000	50	79	0.00	0	0	69	0.00
9/14/2010	0.0000	50	79	0.00	0	0	69	0.00
9/15/2010	0.0000	50	79	0.00	0	0	69	0.00
9/16/2010	0.0000	50	79	0.00	0	0	69	0.00
9/17/2010	0.0000	50	79	0.00	0	0	69	0.00
9/18/2010	0.0010	50	79	0.00	0	0	69	0.00
9/19/2010	0.0000	50	79	0.00	0	0	69	0.00
9/20/2010	0.0000	50	79	0.00	0	0	69	0.00
9/21/2010	0.0000	50	79	0.00	0	0	69	0.00
9/22/2010	0.0000	50	79	0.00	0	0	69	0.00
9/23/2010	0.0443	50	79	0.00	367	0	69	0.00
9/24/2010	0.0000	50	79	0.00	0	0	69	0.00
9/25/2010	0.0000	50	79	0.00	0	0	69	0.00
9/26/2010	0.0614	50	79	0.00	1,873	0	69	0.00
9/27/2010	0.9367	50	79	0.05	78,758	0	69	0.00
9/28/2010	0.2852	50	79	0.00	21,534	0	69	0.00
9/29/2010	0.0000	50	79	0.00	0	0	69	0.00
9/30/2010	0.5414	69	86	0.03	44,038	0	80	0.00
10/1/2010	0.0038	69	86	0.00	0	0	80	0.00
10/2/2010	0.0000	50	79	0.00	0	0	69	0.00
10/3/2010	0.0000	50	79	0.00	0	0	69	0.00
10/4/2010	0.0000	50	79	0.00	0	0	69	0.00
10/5/2010	0.0000	50	79	0.00	0	0	69	0.00
10/6/2010	0.0000	50	79	0.00	0	0	69	0.00
10/7/2010	0.0000	50	79	0.00	0	0	69	0.00
10/8/2010	0.0000	50	79	0.00	0	0	69	0.00
10/9/2010	0.0000	50	79	0.00	0	0	69	0.00
10/10/2010	0.0000	50	79	0.00	0	0	69	0.00
10/11/2010	0.0000	50	79	0.00	0	0	69	0.00
10/12/2010	0.0000	50	79	0.00	0	0	69	0.00
10/13/2010	0.0181	50	79	0.00	0	0	69	0.00
10/14/2010	0.0000	50	79	0.00	0	0	69	0.00
10/15/2010	0.0000	50	79	0.00	0	0	69	0.00
10/16/2010	0.0000	50	79	0.00	0	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipi tation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
10/17/2010	0.0000	50	79	0.00	0	0	69	0.00
10/18/2010	0.0000	50	79	0.00	0	0	69	0.00
10/19/2010	0.0000	50	79	0.00	0	0	69	0.00
10/20/2010	0.0414	50	79	0.00	116	0	69	0.00
10/21/2010	0.0000	50	79	0.00	0	0	69	0.00
10/22/2010	0.0000	50	79	0.00	0	0	69	0.00
10/23/2010	0.0000	50	79	0.00	0	0	69	0.00
10/24/2010	0.0000	50	79	0.00	0	0	69	0.00
10/25/2010	0.0005	50	79	0.00	0	0	69	0.00
10/26/2010	0.1195	50	79	0.00	6,977	0	69	0.00
10/27/2010	0.0105	50	79	0.00	0	0	69	0.00
10/28/2010	1.6743	69	86	0.61	143,553	0	80	0.25
10/29/2010	0.0000	69	86	0.00	0	0	80	0.00
10/30/2010	0.0000	69	86	0.00	0	0	80	0.00
10/31/2010	0.0000	69	86	0.00	0	0	80	0.00
11/1/2010	0.0000	84	93	0.00	0	0	90	0.00
11/2/2010	0.0000	50	79	0.00	0	0	69	0.00
11/3/2010	0.1724	50	79	0.00	11,620	0	69	0.00
11/4/2010	0.4038	69	86	0.00	31,949	0	80	0.00
11/5/2010	0.0000	69	86	0.00	0	0	80	0.00
11/6/2010	0.0467	69	86	0.00	576	0	80	0.00
11/7/2010	0.0000	69	86	0.00	0	0	80	0.00
11/8/2010	0.0000	50	79	0.00	0	0	69	0.00
11/9/2010	0.0000	50	79	0.00	0	0	69	0.00
11/10/2010	0.0000	50	79	0.00	0	0	69	0.00
11/11/2010	0.0000	50	79	0.00	0	0	69	0.00
11/12/2010	0.0000	50	79	0.00	0	0	69	0.00
11/13/2010	0.0000	50	79	0.00	0	0	69	0.00
11/14/2010	0.0000	50	79	0.00	0	0	69	0.00
11/15/2010	0.4871	50	79	0.00	39,270	0	69	0.00
11/16/2010	1.2752	84	93	0.67	108,499	0	90	0.35
11/17/2010	0.0543	84	93	0.00	1,246	0	90	0.00
11/18/2010	0.0000	84	93	0.00	0	0	90	0.00
11/19/2010	0.0000	84	93	0.00	0	0	90	0.00
11/20/2010	0.0000	84	93	0.00	0	0	90	0.00
11/21/2010	0.0000	50	79	0.00	0	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
11/22/2010	0.0000	50	79	0.00	0	0	69	0.00
11/23/2010	0.0000	50	79	0.00	0	0	69	0.00
11/24/2010	0.1462	50	79	0.00	9,319	0	69	0.00
11/25/2010	0.0000	50	79	0.00	0	0	69	0.00
11/26/2010	0.0119	50	79	0.00	0	0	69	0.00
11/27/2010	0.1014	50	79	0.00	5,387	0	69	0.00
11/28/2010	0.0000	50	79	0.00	0	0	69	0.00
11/29/2010	0.0000	50	79	0.00	0	0	69	0.00
11/30/2010	0.5062	69	86	0.02	40,943	0	80	0.00
12/1/2010	2.2162	84	93	1.51	191,156	1,655	90	0.87
12/2/2010	0.0000	84	93	0.00	0	0	90	0.00
12/3/2010	0.0000	84	93	0.00	0	0	90	0.00
12/4/2010	0.0000	84	93	0.00	0	0	90	0.00
12/5/2010	0.0000	84	93	0.00	0	0	90	0.00
12/6/2010	0.0000	50	79	0.00	0	0	69	0.00
12/7/2010	0.0000	50	79	0.00	0	0	69	0.00
12/8/2010	0.0000	50	79	0.00	0	0	69	0.00
12/9/2010	0.0000	50	79	0.00	0	0	69	0.00
12/10/2010	0.0000	50	79	0.00	0	0	69	0.00
12/11/2010	0.0000	50	79	0.00	0	0	69	0.00
12/12/2010	0.5533	69	86	0.03	45,084	0	80	0.00
12/13/2010	0.0081	69	86	0.00	0	0	80	0.00
12/14/2010	0.0000	69	86	0.00	0	0	80	0.00
12/15/2010	0.0000	69	86	0.00	0	0	80	0.00
12/16/2010	0.0343	69	86	0.00	0	0	80	0.00
12/17/2010	0.1957	50	79	0.00	13,669	0	69	0.00
12/18/2010	0.0610	50	79	0.00	1,831	0	69	0.00
12/19/2010	0.1176	50	79	0.00	6,809	0	69	0.00
12/20/2010	0.0000	50	79	0.00	0	0	69	0.00
12/21/2010	0.0000	50	79	0.00	0	0	69	0.00
12/22/2010	0.0076	50	79	0.00	0	0	69	0.00
12/23/2010	0.0000	50	79	0.00	0	0	69	0.00
12/24/2010	0.0000	50	79	0.00	0	0	69	0.00
12/25/2010	0.0000	50	79	0.00	0	0	69	0.00
12/26/2010	0.3929	50	79	0.00	30,987	0	69	0.00
12/27/2010	0.0162	50	79	0.00	0	0	69	0.00

Table 49. Stormwater runoff and rainwater harvesting calculation for R-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI			
			Imperviousness, 60%		Rainwater harvesting		Imperviousness, 41% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr	Harvesting, gal	Overflow, gal	CN	Runoff, in./24-hr
12/28/2010	0.0000	50	79	0.00	0	0	69	0.00
12/29/2010	0.0000	50	79	0.00	0	0	69	0.00
12/30/2010	0.0000	50	79	0.00	0	0	69	0.00
12/31/2010	0.0043	50	79	0.00	0	0	69	0.00
Total	44.45			11.72	2,883,619	616,253		7.78

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
1/1/2010	0.0248	50	66	0.00	0	59	0.00
1/2/2010	0.0248	50	66	0.00	0	59	0.00
1/3/2010	0.0000	50	66	0.00	0	59	0.00
1/4/2010	0.0000	50	66	0.00	0	59	0.00
1/5/2010	0.0000	50	66	0.00	0	59	0.00
1/6/2010	0.0000	50	66	0.00	0	59	0.00
1/7/2010	0.0000	50	66	0.00	0	59	0.00
1/8/2010	0.1119	50	66	0.00	1,579	59	0.00
1/9/2010	0.0000	50	66	0.00	0	59	0.00
1/10/2010	0.0000	50	66	0.00	0	59	0.00
1/11/2010	0.0000	50	66	0.00	0	59	0.00
1/12/2010	0.0000	50	66	0.00	0	59	0.00
1/13/2010	0.0000	50	66	0.00	0	59	0.00
1/14/2010	0.0000	50	66	0.00	0	59	0.00
1/15/2010	0.0000	50	66	0.00	0	59	0.00
1/16/2010	0.0000	50	66	0.00	0	59	0.00
1/17/2010	1.2157	84	89	0.43	25,857	86	0.30
1/18/2010	0.0690	84	89	0.00	637	86	0.00
1/19/2010	0.0000	84	89	0.00	0	86	0.00
1/20/2010	0.0000	84	89	0.00	0	86	0.00
1/21/2010	0.0729	84	89	0.00	720	86	0.00
1/22/2010	0.6319	69	78	0.00	13,017	74	0.00
1/23/2010	0.0000	69	78	0.00	0	74	0.00
1/24/2010	0.0462	69	78	0.00	134	74	0.00
1/25/2010	1.9390	84	89	0.98	41,767	86	0.76
1/26/2010	0.0000	84	89	0.00	0	86	0.00
1/27/2010	0.0000	84	89	0.00	0	86	0.00
1/28/2010	0.0000	84	89	0.00	0	86	0.00
1/29/2010	0.0000	84	89	0.00	0	86	0.00
1/30/2010	0.5038	69	78	0.00	10,199	74	0.00
1/31/2010	0.0129	69	78	0.00	0	74	0.00
2/1/2010	0.0000	69	78	0.00	0	74	0.00
2/2/2010	0.3514	69	78	0.00	6,848	74	0.00
2/3/2010	0.0062	69	78	0.00	0	74	0.00
2/4/2010	0.0000	50	66	0.00	0	59	0.00
2/5/2010	1.7571	84	89	0.83	37,766	86	0.64

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
2/6/2010	0.6181	84	89	0.09	12,713	86	0.05
2/7/2010	0.0000	84	89	0.00	0	86	0.00
2/8/2010	0.0000	84	89	0.00	0	86	0.00
2/9/2010	0.0000	84	89	0.00	0	86	0.00
2/10/2010	0.1967	69	78	0.00	3,444	74	0.00
2/11/2010	0.0000	50	66	0.00	0	59	0.00
2/12/2010	0.0000	50	66	0.00	0	59	0.00
2/13/2010	0.2186	50	66	0.00	3,925	59	0.00
2/14/2010	0.0000	50	66	0.00	0	59	0.00
2/15/2010	0.2229	50	66	0.00	4,020	59	0.00
2/16/2010	0.0186	50	66	0.00	0	59	0.00
2/17/2010	0.0000	50	66	0.00	0	59	0.00
2/18/2010	0.0000	50	66	0.00	0	59	0.00
2/19/2010	0.0000	50	66	0.00	0	59	0.00
2/20/2010	0.0000	50	66	0.00	0	59	0.00
2/21/2010	0.0000	50	66	0.00	0	59	0.00
2/22/2010	0.6610	69	78	0.00	13,656	74	0.00
2/23/2010	0.0014	69	78	0.00	0	74	0.00
2/24/2010	0.0000	69	78	0.00	0	74	0.00
2/25/2010	0.0000	69	78	0.00	0	74	0.00
2/26/2010	0.0000	69	78	0.00	0	74	0.00
2/27/2010	0.0000	50	66	0.00	0	59	0.00
2/28/2010	0.0000	50	66	0.00	0	59	0.00
3/1/2010	0.0000	50	66	0.00	0	59	0.00
3/2/2010	0.3129	50	66	0.00	5,999	59	0.00
3/3/2010	0.4448	69	78	0.00	8,900	74	0.00
3/4/2010	0.0000	69	78	0.00	0	74	0.00
3/5/2010	0.0000	69	78	0.00	0	74	0.00
3/6/2010	0.0000	69	78	0.00	0	74	0.00
3/7/2010	0.0000	50	66	0.00	0	59	0.00
3/8/2010	0.0000	50	66	0.00	0	59	0.00
3/9/2010	0.0000	50	66	0.00	0	59	0.00
3/10/2010	0.2852	50	66	0.00	5,392	59	0.00
3/11/2010	1.9786	84	89	1.01	42,636	86	0.79
3/12/2010	0.0805	84	89	0.00	888	86	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
3/13/2010	0.7252	84	89	0.13	15,069	86	0.08
3/14/2010	0.0238	84	89	0.00	0	86	0.00
3/15/2010	0.0962	84	89	0.00	1,234	86	0.00
3/16/2010	0.0000	69	78	0.00	0	74	0.00
3/17/2010	0.0000	69	78	0.00	0	74	0.00
3/18/2010	0.1652	50	66	0.00	2,752	59	0.00
3/19/2010	0.0000	50	66	0.00	0	59	0.00
3/20/2010	0.0000	50	66	0.00	0	59	0.00
3/21/2010	0.0019	50	66	0.00	0	59	0.00
3/22/2010	0.4181	69	78	0.00	8,314	74	0.00
3/23/2010	0.1319	69	78	0.00	2,019	74	0.00
3/24/2010	0.0000	69	78	0.00	0	74	0.00
3/25/2010	0.0000	69	78	0.00	0	74	0.00
3/26/2010	0.0614	69	78	0.00	469	74	0.00
3/27/2010	0.0000	50	66	0.00	0	59	0.00
3/28/2010	0.0029	50	66	0.00	0	59	0.00
3/29/2010	0.1105	50	66	0.00	1,548	59	0.00
3/30/2010	0.0000	50	66	0.00	0	59	0.00
3/31/2010	0.0000	50	66	0.00	0	59	0.00
4/1/2010	0.0000	50	66	0.00	0	59	0.00
4/2/2010	0.0000	50	66	0.00	0	59	0.00
4/3/2010	0.0000	50	66	0.00	0	59	0.00
4/4/2010	0.0000	50	66	0.00	0	59	0.00
4/5/2010	0.0000	50	66	0.00	0	59	0.00
4/6/2010	0.0000	50	66	0.00	0	59	0.00
4/7/2010	0.0000	50	66	0.00	0	59	0.00
4/8/2010	0.0000	50	66	0.00	0	59	0.00
4/9/2010	0.6186	50	66	0.00	12,723	59	0.00
4/10/2010	0.0000	50	66	0.00	0	59	0.00
4/11/2010	0.0000	50	66	0.00	0	59	0.00
4/12/2010	0.0000	50	66	0.00	0	59	0.00
4/13/2010	0.0000	50	66	0.00	0	59	0.00
4/14/2010	0.0000	50	66	0.00	0	59	0.00
4/15/2010	0.0000	50	66	0.00	0	59	0.00
4/16/2010	0.0000	50	66	0.00	0	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
4/17/2010	0.0000	50	66	0.00	0	59	0.00
4/18/2010	0.0000	50	66	0.00	0	59	0.00
4/19/2010	0.0000	50	66	0.00	0	59	0.00
4/20/2010	0.0552	50	66	0.00	333	59	0.00
4/21/2010	0.1767	50	66	0.00	3,004	59	0.00
4/22/2010	0.0000	50	66	0.00	0	59	0.00
4/23/2010	0.0000	50	66	0.00	0	59	0.00
4/24/2010	0.3495	50	66	0.00	6,806	59	0.00
4/25/2010	1.3319	69	78	0.16	28,413	74	0.09
4/26/2010	0.0124	69	78	0.00	0	74	0.00
4/27/2010	0.0000	69	78	0.00	0	74	0.00
4/28/2010	0.0567	69	78	0.00	364	74	0.00
4/29/2010	0.0000	69	78	0.00	0	74	0.00
4/30/2010	0.0000	50	66	0.00	0	59	0.00
5/1/2010	0.0000	50	66	0.00	0	59	0.00
5/2/2010	0.0000	50	66	0.00	0	59	0.00
5/3/2010	3.9062	84	89	2.74	85,034	86	2.30
5/4/2010	0.4829	84	89	0.04	9,738	86	0.02
5/5/2010	0.0000	84	89	0.00	0	86	0.00
5/6/2010	0.0000	84	89	0.00	0	86	0.00
5/7/2010	0.0000	84	89	0.00	0	86	0.00
5/8/2010	0.0000	50	66	0.00	0	59	0.00
5/9/2010	0.0000	50	66	0.00	0	59	0.00
5/10/2010	0.0000	50	66	0.00	0	59	0.00
5/11/2010	0.2057	50	66	0.00	3,643	59	0.00
5/12/2010	0.0000	50	66	0.00	0	59	0.00
5/13/2010	0.0000	50	66	0.00	0	59	0.00
5/14/2010	0.0000	50	66	0.00	0	59	0.00
5/15/2010	0.1286	50	66	0.00	1,946	59	0.00
5/16/2010	0.0014	50	66	0.00	0	59	0.00
5/17/2010	0.0862	50	66	0.00	1,014	59	0.00
5/18/2010	0.0000	50	66	0.00	0	59	0.00
5/19/2010	0.0000	50	66	0.00	0	59	0.00
5/20/2010	0.0000	50	66	0.00	0	59	0.00
5/21/2010	1.0329	50	66	0.00	21,836	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
5/22/2010	0.4286	69	78	0.00	8,544	74	0.00
5/23/2010	0.0000	69	78	0.00	0	74	0.00
5/24/2010	0.0000	69	78	0.00	0	74	0.00
5/25/2010	0.0000	69	78	0.00	0	74	0.00
5/26/2010	0.0005	50	66	0.00	0	59	0.00
5/27/2010	0.1033	50	66	0.00	1,391	59	0.00
5/28/2010	0.0019	50	66	0.00	0	59	0.00
5/29/2010	0.7757	50	66	0.00	16,180	59	0.00
5/30/2010	0.1686	50	66	0.00	2,826	59	0.00
5/31/2010	0.1319	50	66	0.00	2,019	59	0.00
6/1/2010	0.1338	50	66	0.00	2,061	59	0.00
6/2/2010	0.2290	69	78	0.00	4,156	74	0.00
6/3/2010	0.3914	50	66	0.00	7,727	59	0.00
6/4/2010	0.0000	50	66	0.00	0	59	0.00
6/5/2010	0.3252	50	66	0.00	6,271	59	0.00
6/6/2010	0.0000	50	66	0.00	0	59	0.00
6/7/2010	0.0319	50	66	0.00	0	59	0.00
6/8/2010	0.0000	50	66	0.00	0	59	0.00
6/9/2010	0.0162	50	66	0.00	0	59	0.00
6/10/2010	0.0114	50	66	0.00	0	59	0.00
6/11/2010	0.0452	50	66	0.00	113	59	0.00
6/12/2010	0.0476	50	66	0.00	165	59	0.00
6/13/2010	0.0000	50	66	0.00	0	59	0.00
6/14/2010	0.0000	50	66	0.00	0	59	0.00
6/15/2010	0.0000	50	66	0.00	0	59	0.00
6/16/2010	0.6129	50	66	0.00	12,598	59	0.00
6/17/2010	0.0605	50	66	0.00	448	59	0.00
6/18/2010	0.0462	50	66	0.00	134	59	0.00
6/19/2010	0.0386	50	66	0.00	0	59	0.00
6/20/2010	0.0333	50	66	0.00	0	59	0.00
6/21/2010	0.0010	50	66	0.00	0	59	0.00
6/22/2010	0.0024	50	66	0.00	0	59	0.00
6/23/2010	0.0024	50	66	0.00	0	59	0.00
6/24/2010	0.0124	50	66	0.00	0	59	0.00
6/25/2010	0.0000	50	66	0.00	0	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
6/26/2010	0.0086	50	66	0.00	0	59	0.00
6/27/2010	0.0000	50	66	0.00	0	59	0.00
6/28/2010	0.0000	50	66	0.00	0	59	0.00
6/29/2010	0.0052	50	66	0.00	0	59	0.00
6/30/2010	0.3495	50	66	0.00	6,806	59	0.00
7/1/2010	0.0695	50	66	0.00	647	59	0.00
7/2/2010	0.0010	50	66	0.00	0	59	0.00
7/3/2010	0.0057	50	66	0.00	0	59	0.00
7/4/2010	0.0000	50	66	0.00	0	59	0.00
7/5/2010	0.0000	50	66	0.00	0	59	0.00
7/6/2010	0.0000	50	66	0.00	0	59	0.00
7/7/2010	0.0000	50	66	0.00	0	59	0.00
7/8/2010	0.0000	50	66	0.00	0	59	0.00
7/9/2010	0.0000	50	66	0.00	0	59	0.00
7/10/2010	0.2843	50	66	0.00	5,371	59	0.00
7/11/2010	0.0000	50	66	0.00	0	59	0.00
7/12/2010	0.0129	50	66	0.00	0	59	0.00
7/13/2010	0.7676	50	66	0.00	16,002	59	0.00
7/14/2010	0.6229	69	78	0.00	12,818	74	0.00
7/15/2010	0.0000	69	78	0.00	0	74	0.00
7/16/2010	0.0005	69	78	0.00	0	74	0.00
7/17/2010	0.0748	69	78	0.00	762	74	0.00
7/18/2010	0.1138	50	66	0.00	1,621	59	0.00
7/19/2010	0.4638	50	66	0.00	9,319	59	0.00
7/20/2010	0.0000	50	66	0.00	0	59	0.00
7/21/2010	0.0438	50	66	0.00	81	59	0.00
7/22/2010	0.0662	50	66	0.00	574	59	0.00
7/23/2010	0.0005	50	66	0.00	0	59	0.00
7/24/2010	0.0786	50	66	0.00	846	59	0.00
7/25/2010	0.0033	50	66	0.00	0	59	0.00
7/26/2010	0.0000	50	66	0.00	0	59	0.00
7/27/2010	0.5629	50	66	0.00	11,498	59	0.00
7/28/2010	0.0314	50	66	0.00	0	59	0.00
7/29/2010	0.0900	50	66	0.00	1,097	59	0.00
7/30/2010	0.0000	50	66	0.00	0	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
7/31/2010	0.0000	50	66	0.00	0	59	0.00
8/1/2010	0.3214	50	66	0.00	6,188	59	0.00
8/2/2010	0.5257	50	66	0.00	10,681	59	0.00
8/3/2010	0.0000	50	66	0.00	0	59	0.00
8/4/2010	0.0571	50	66	0.00	375	59	0.00
8/5/2010	0.0000	50	66	0.00	0	59	0.00
8/6/2010	0.0057	50	66	0.00	0	59	0.00
8/7/2010	0.4238	50	66	0.00	8,440	59	0.00
8/8/2010	0.0005	50	66	0.00	0	59	0.00
8/9/2010	0.0000	50	66	0.00	0	59	0.00
8/10/2010	0.0000	50	66	0.00	0	59	0.00
8/11/2010	0.0000	50	66	0.00	0	59	0.00
8/12/2010	0.0000	50	66	0.00	0	59	0.00
8/13/2010	0.0000	50	66	0.00	0	59	0.00
8/14/2010	0.1281	50	66	0.00	1,935	59	0.00
8/15/2010	0.1529	50	66	0.00	2,480	59	0.00
8/16/2010	0.0000	50	66	0.00	0	59	0.00
8/17/2010	0.0000	50	66	0.00	0	59	0.00
8/18/2010	0.0224	50	66	0.00	0	59	0.00
8/19/2010	0.0000	50	66	0.00	0	59	0.00
8/20/2010	0.0224	50	66	0.00	0	59	0.00
8/21/2010	1.1257	50	66	0.00	23,878	59	0.00
8/22/2010	0.1319	50	66	0.00	2,019	59	0.00
8/23/2010	0.0000	50	66	0.00	0	59	0.00
8/24/2010	0.0000	50	66	0.00	0	59	0.00
8/25/2010	0.0000	50	66	0.00	0	59	0.00
8/26/2010	0.9524	50	66	0.00	20,065	59	0.00
8/27/2010	0.3010	50	66	0.00	5,737	59	0.00
8/28/2010	0.0005	50	66	0.00	0	59	0.00
8/29/2010	0.0662	50	66	0.00	574	59	0.00
8/30/2010	0.0000	50	66	0.00	0	59	0.00
8/31/2010	0.0000	50	66	0.00	0	59	0.00
9/1/2010	0.0000	50	66	0.00	0	59	0.00
9/2/2010	0.0000	50	66	0.00	0	59	0.00
9/3/2010	0.0000	50	66	0.00	0	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
9/4/2010	0.0000	50	66	0.00	0	59	0.00
9/5/2010	0.0000	50	66	0.00	0	59	0.00
9/6/2010	0.0000	50	66	0.00	0	59	0.00
9/7/2010	0.0000	50	66	0.00	0	59	0.00
9/8/2010	0.0000	50	66	0.00	0	59	0.00
9/9/2010	0.0195	50	66	0.00	0	59	0.00
9/10/2010	0.0000	50	66	0.00	0	59	0.00
9/11/2010	0.0000	50	66	0.00	0	59	0.00
9/12/2010	0.3424	50	66	0.00	6,649	59	0.00
9/13/2010	0.0000	50	66	0.00	0	59	0.00
9/14/2010	0.0000	50	66	0.00	0	59	0.00
9/15/2010	0.0000	50	66	0.00	0	59	0.00
9/16/2010	0.0000	50	66	0.00	0	59	0.00
9/17/2010	0.0000	50	66	0.00	0	59	0.00
9/18/2010	0.0010	50	66	0.00	0	59	0.00
9/19/2010	0.0000	50	66	0.00	0	59	0.00
9/20/2010	0.0000	50	66	0.00	0	59	0.00
9/21/2010	0.0000	50	66	0.00	0	59	0.00
9/22/2010	0.0000	50	66	0.00	0	59	0.00
9/23/2010	0.0443	50	66	0.00	92	59	0.00
9/24/2010	0.0000	50	66	0.00	0	59	0.00
9/25/2010	0.0000	50	66	0.00	0	59	0.00
9/26/2010	0.0614	50	66	0.00	469	59	0.00
9/27/2010	0.9367	50	66	0.00	19,720	59	0.00
9/28/2010	0.2852	50	66	0.00	5,392	59	0.00
9/29/2010	0.0000	50	66	0.00	0	59	0.00
9/30/2010	0.5414	69	78	0.00	11,027	74	0.00
10/1/2010	0.0038	69	78	0.00	0	74	0.00
10/2/2010	0.0000	50	66	0.00	0	59	0.00
10/3/2010	0.0000	50	66	0.00	0	59	0.00
10/4/2010	0.0000	50	66	0.00	0	59	0.00
10/5/2010	0.0000	50	66	0.00	0	59	0.00
10/6/2010	0.0000	50	66	0.00	0	59	0.00
10/7/2010	0.0000	50	66	0.00	0	59	0.00
10/8/2010	0.0000	50	66	0.00	0	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
10/9/2010	0.0000	50	66	0.00	0	59	0.00
10/10/2010	0.0000	50	66	0.00	0	59	0.00
10/11/2010	0.0000	50	66	0.00	0	59	0.00
10/12/2010	0.0000	50	66	0.00	0	59	0.00
10/13/2010	0.0181	50	66	0.00	0	59	0.00
10/14/2010	0.0000	50	66	0.00	0	59	0.00
10/15/2010	0.0000	50	66	0.00	0	59	0.00
10/16/2010	0.0000	50	66	0.00	0	59	0.00
10/17/2010	0.0000	50	66	0.00	0	59	0.00
10/18/2010	0.0000	50	66	0.00	0	59	0.00
10/19/2010	0.0000	50	66	0.00	0	59	0.00
10/20/2010	0.0414	50	66	0.00	29	59	0.00
10/21/2010	0.0000	50	66	0.00	0	59	0.00
10/22/2010	0.0000	50	66	0.00	0	59	0.00
10/23/2010	0.0000	50	66	0.00	0	59	0.00
10/24/2010	0.0000	50	66	0.00	0	59	0.00
10/25/2010	0.0005	50	66	0.00	0	59	0.00
10/26/2010	0.1195	50	66	0.00	1,747	59	0.00
10/27/2010	0.0105	50	66	0.00	0	59	0.00
10/28/2010	1.6743	69	78	0.31	35,944	74	0.20
10/29/2010	0.0000	69	78	0.00	0	74	0.00
10/30/2010	0.0000	69	78	0.00	0	74	0.00
10/31/2010	0.0000	69	78	0.00	0	74	0.00
11/1/2010	0.0000	84	89	0.00	0	86	0.00
11/2/2010	0.0000	50	66	0.00	0	59	0.00
11/3/2010	0.1724	50	66	0.00	2,909	59	0.00
11/4/2010	0.4038	69	78	0.00	8,000	74	0.00
11/5/2010	0.0000	69	78	0.00	0	74	0.00
11/6/2010	0.0467	69	78	0.00	144	74	0.00
11/7/2010	0.0000	69	78	0.00	0	74	0.00
11/8/2010	0.0000	50	66	0.00	0	59	0.00
11/9/2010	0.0000	50	66	0.00	0	59	0.00
11/10/2010	0.0000	50	66	0.00	0	59	0.00
11/11/2010	0.0000	50	66	0.00	0	59	0.00
11/12/2010	0.0000	50	66	0.00	0	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
11/13/2010	0.0000	50	66	0.00	0	59	0.00
11/14/2010	0.0000	50	66	0.00	0	59	0.00
11/15/2010	0.4871	50	66	0.00	9,833	59	0.00
11/16/2010	1.2752	84	89	0.47	27,167	86	0.34
11/17/2010	0.0543	84	89	0.00	312	86	0.00
11/18/2010	0.0000	84	89	0.00	0	86	0.00
11/19/2010	0.0000	84	89	0.00	0	86	0.00
11/20/2010	0.0000	84	89	0.00	0	86	0.00
11/21/2010	0.0000	50	66	0.00	0	59	0.00
11/22/2010	0.0000	50	66	0.00	0	59	0.00
11/23/2010	0.0000	50	66	0.00	0	59	0.00
11/24/2010	0.1462	50	66	0.00	2,333	59	0.00
11/25/2010	0.0000	50	66	0.00	0	59	0.00
11/26/2010	0.0119	50	66	0.00	0	59	0.00
11/27/2010	0.1014	50	66	0.00	1,349	59	0.00
11/28/2010	0.0000	50	66	0.00	0	59	0.00
11/29/2010	0.0000	50	66	0.00	0	59	0.00
11/30/2010	0.5062	69	78	0.00	10,252	74	0.00
12/1/2010	2.2162	84	89	1.21	47,863	86	0.96
12/2/2010	0.0000	84	89	0.00	0	86	0.00
12/3/2010	0.0000	84	89	0.00	0	86	0.00
12/4/2010	0.0000	84	89	0.00	0	86	0.00
12/5/2010	0.0000	84	89	0.00	0	86	0.00
12/6/2010	0.0000	50	66	0.00	0	59	0.00
12/7/2010	0.0000	50	66	0.00	0	59	0.00
12/8/2010	0.0000	50	66	0.00	0	59	0.00
12/9/2010	0.0000	50	66	0.00	0	59	0.00
12/10/2010	0.0000	50	66	0.00	0	59	0.00
12/11/2010	0.0000	50	66	0.00	0	59	0.00
12/12/2010	0.5533	69	78	0.00	11,288	74	0.00
12/13/2010	0.0081	69	78	0.00	0	74	0.00
12/14/2010	0.0000	69	78	0.00	0	74	0.00
12/15/2010	0.0000	69	78	0.00	0	74	0.00
12/16/2010	0.0343	69	78	0.00	0	74	0.00
12/17/2010	0.1957	50	66	0.00	3,423	59	0.00

Table 50. Stormwater runoff and rainwater harvesting calculation for RG-1 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 32%		Rainwater harvesting, gal	Imperviousness, 26% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
12/18/2010	0.0610	50	66	0.00	459	59	0.00
12/19/2010	0.1176	50	66	0.00	1,705	59	0.00
12/20/2010	0.0000	50	66	0.00	0	59	0.00
12/21/2010	0.0000	50	66	0.00	0	59	0.00
12/22/2010	0.0076	50	66	0.00	0	59	0.00
12/23/2010	0.0000	50	66	0.00	0	59	0.00
12/24/2010	0.0000	50	66	0.00	0	59	0.00
12/25/2010	0.0000	50	66	0.00	0	59	0.00
12/26/2010	0.3929	50	66	0.00	7,759	59	0.00
12/27/2010	0.0162	50	66	0.00	0	59	0.00
12/28/2010	0.0000	50	66	0.00	0	59	0.00
12/29/2010	0.0000	50	66	0.00	0	59	0.00
12/30/2010	0.0000	50	66	0.00	0	59	0.00
12/31/2010	0.0043	50	66	0.00	0	59	0.00
Total	44.45			8.40	876,664		6.53

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
1/1/2010	0.0248	50	69	0.00	0	66	0.00
1/2/2010	0.0248	50	69	0.00	0	66	0.00
1/3/2010	0.0000	50	69	0.00	0	66	0.00
1/4/2010	0.0000	50	69	0.00	0	66	0.00
1/5/2010	0.0000	50	69	0.00	0	66	0.00
1/6/2010	0.0000	50	69	0.00	0	66	0.00
1/7/2010	0.0000	50	69	0.00	2,262	66	0.00
1/8/2010	0.1119	50	69	0.00	0	66	0.00
1/9/2010	0.0000	50	69	0.00	0	66	0.00
1/10/2010	0.0000	50	69	0.00	0	66	0.00
1/11/2010	0.0000	50	69	0.00	0	66	0.00
1/12/2010	0.0000	50	69	0.00	0	66	0.00
1/13/2010	0.0000	50	69	0.00	0	66	0.00
1/14/2010	0.0000	50	69	0.00	0	66	0.00
1/15/2010	0.0000	50	69	0.00	0	66	0.00
1/16/2010	0.0000	50	69	0.00	37,030	66	0.00
1/17/2010	1.2157	84	90	0.47	912	89	0.38
1/18/2010	0.0690	84	90	0.00	0	89	0.00
1/19/2010	0.0000	84	90	0.00	0	89	0.00
1/20/2010	0.0000	84	90	0.00	1,032	89	0.00
1/21/2010	0.0729	84	90	0.00	18,641	89	0.00
1/22/2010	0.6319	69	80	0.01	0	78	0.00
1/23/2010	0.0000	69	80	0.00	192	78	0.00
1/24/2010	0.0462	69	80	0.00	59,815	78	0.00
1/25/2010	1.9390	84	90	1.04	0	89	0.86
1/26/2010	0.0000	84	90	0.00	0	89	0.00
1/27/2010	0.0000	84	90	0.00	0	89	0.00
1/28/2010	0.0000	84	90	0.00	0	89	0.00
1/29/2010	0.0000	84	90	0.00	14,606	89	0.00
1/30/2010	0.5038	69	80	0.00	0	78	0.00
1/31/2010	0.0129	69	80	0.00	0	78	0.00
2/1/2010	0.0000	69	80	0.00	9,806	78	0.00
2/2/2010	0.3514	69	80	0.00	0	78	0.00
2/3/2010	0.0062	69	80	0.00	0	78	0.00
2/4/2010	0.0000	50	69	0.00	54,085	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
2/5/2010	1.7571	84	90	0.89	18,206	89	0.73
2/6/2010	0.6181	84	90	0.10	0	89	0.08
2/7/2010	0.0000	84	90	0.00	0	89	0.00
2/8/2010	0.0000	84	90	0.00	0	89	0.00
2/9/2010	0.0000	84	90	0.00	4,932	89	0.00
2/10/2010	0.1967	69	80	0.00	0	78	0.00
2/11/2010	0.0000	50	69	0.00	0	66	0.00
2/12/2010	0.0000	50	69	0.00	5,622	66	0.00
2/13/2010	0.2186	50	69	0.00	0	66	0.00
2/14/2010	0.0000	50	69	0.00	5,757	66	0.00
2/15/2010	0.2229	50	69	0.00	0	66	0.00
2/16/2010	0.0186	50	69	0.00	0	66	0.00
2/17/2010	0.0000	50	69	0.00	0	66	0.00
2/18/2010	0.0000	50	69	0.00	0	66	0.00
2/19/2010	0.0000	50	69	0.00	0	66	0.00
2/20/2010	0.0000	50	69	0.00	0	66	0.00
2/21/2010	0.0000	50	69	0.00	19,556	66	0.00
2/22/2010	0.6610	69	80	0.01	0	78	0.00
2/23/2010	0.0014	69	80	0.00	0	78	0.00
2/24/2010	0.0000	69	80	0.00	0	78	0.00
2/25/2010	0.0000	69	80	0.00	0	78	0.00
2/26/2010	0.0000	69	80	0.00	0	78	0.00
2/27/2010	0.0000	50	69	0.00	0	66	0.00
2/28/2010	0.0000	50	69	0.00	0	66	0.00
3/1/2010	0.0000	50	69	0.00	8,591	66	0.00
3/2/2010	0.3129	50	69	0.00	12,746	66	0.00
3/3/2010	0.4448	69	80	0.00	0	78	0.00
3/4/2010	0.0000	69	80	0.00	0	78	0.00
3/5/2010	0.0000	69	80	0.00	0	78	0.00
3/6/2010	0.0000	69	80	0.00	0	78	0.00
3/7/2010	0.0000	50	69	0.00	0	66	0.00
3/8/2010	0.0000	50	69	0.00	0	66	0.00
3/9/2010	0.0000	50	69	0.00	7,721	66	0.00
3/10/2010	0.2852	50	69	0.00	61,060	66	0.00
3/11/2010	1.9786	84	90	1.08	1,272	89	0.89

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
3/12/2010	0.0805	84	90	0.00	21,581	89	0.00
3/13/2010	0.7252	84	90	0.16	0	89	0.12
3/14/2010	0.0238	84	90	0.00	1,767	89	0.00
3/15/2010	0.0962	84	90	0.00	0	89	0.00
3/16/2010	0.0000	69	80	0.00	0	78	0.00
3/17/2010	0.0000	69	80	0.00	3,942	78	0.00
3/18/2010	0.1652	50	69	0.00	0	66	0.00
3/19/2010	0.0000	50	69	0.00	0	66	0.00
3/20/2010	0.0000	50	69	0.00	0	66	0.00
3/21/2010	0.0019	50	69	0.00	11,906	66	0.00
3/22/2010	0.4181	69	80	0.00	2,892	78	0.00
3/23/2010	0.1319	69	80	0.00	0	78	0.00
3/24/2010	0.0000	69	80	0.00	0	78	0.00
3/25/2010	0.0000	69	80	0.00	672	78	0.00
3/26/2010	0.0614	69	80	0.00	0	78	0.00
3/27/2010	0.0000	50	69	0.00	0	66	0.00
3/28/2010	0.0029	50	69	0.00	2,217	66	0.00
3/29/2010	0.1105	50	69	0.00	0	66	0.00
3/30/2010	0.0000	50	69	0.00	0	66	0.00
3/31/2010	0.0000	50	69	0.00	0	66	0.00
4/1/2010	0.0000	50	69	0.00	0	66	0.00
4/2/2010	0.0000	50	69	0.00	0	66	0.00
4/3/2010	0.0000	50	69	0.00	0	66	0.00
4/4/2010	0.0000	50	69	0.00	0	66	0.00
4/5/2010	0.0000	50	69	0.00	0	66	0.00
4/6/2010	0.0000	50	69	0.00	0	66	0.00
4/7/2010	0.0000	50	69	0.00	0	66	0.00
4/8/2010	0.0000	50	69	0.00	18,221	66	0.00
4/9/2010	0.6186	50	69	0.00	0	66	0.00
4/10/2010	0.0000	50	69	0.00	0	66	0.00
4/11/2010	0.0000	50	69	0.00	0	66	0.00
4/12/2010	0.0000	50	69	0.00	0	66	0.00
4/13/2010	0.0000	50	69	0.00	0	66	0.00
4/14/2010	0.0000	50	69	0.00	0	66	0.00
4/15/2010	0.0000	50	69	0.00	0	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
4/16/2010	0.0000	50	69	0.00	0	66	0.00
4/17/2010	0.0000	50	69	0.00	0	66	0.00
4/18/2010	0.0000	50	69	0.00	0	66	0.00
4/19/2010	0.0000	50	69	0.00	477	66	0.00
4/20/2010	0.0552	50	69	0.00	4,302	66	0.00
4/21/2010	0.1767	50	69	0.00	0	66	0.00
4/22/2010	0.0000	50	69	0.00	0	66	0.00
4/23/2010	0.0000	50	69	0.00	9,746	66	0.00
4/24/2010	0.3495	50	69	0.00	40,690	66	0.00
4/25/2010	1.3319	69	80	0.21	0	78	0.15
4/26/2010	0.0124	69	80	0.00	0	78	0.00
4/27/2010	0.0000	69	80	0.00	522	78	0.00
4/28/2010	0.0567	69	80	0.00	0	78	0.00
4/29/2010	0.0000	69	80	0.00	0	78	0.00
4/30/2010	0.0000	50	69	0.00	0	66	0.00
5/1/2010	0.0000	50	69	0.00	0	66	0.00
5/2/2010	0.0000	50	69	0.00	121,777	66	0.00
5/3/2010	3.9062	84	90	2.83	13,946	89	2.42
5/4/2010	0.4829	84	90	0.05	0	89	0.03
5/5/2010	0.0000	84	90	0.00	0	89	0.00
5/6/2010	0.0000	84	90	0.00	0	89	0.00
5/7/2010	0.0000	84	90	0.00	0	89	0.00
5/8/2010	0.0000	50	69	0.00	0	66	0.00
5/9/2010	0.0000	50	69	0.00	0	66	0.00
5/10/2010	0.0000	50	69	0.00	5,217	66	0.00
5/11/2010	0.2057	50	69	0.00	0	66	0.00
5/12/2010	0.0000	50	69	0.00	0	66	0.00
5/13/2010	0.0000	50	69	0.00	0	66	0.00
5/14/2010	0.0000	50	69	0.00	2,787	66	0.00
5/15/2010	0.1286	50	69	0.00	0	66	0.00
5/16/2010	0.0014	50	69	0.00	1,452	66	0.00
5/17/2010	0.0862	50	69	0.00	0	66	0.00
5/18/2010	0.0000	50	69	0.00	0	66	0.00
5/19/2010	0.0000	50	69	0.00	0	66	0.00
5/20/2010	0.0000	50	69	0.00	31,271	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
5/21/2010	1.0329	50	69	0.00	12,236	66	0.00
5/22/2010	0.4286	69	80	0.00	0	78	0.00
5/23/2010	0.0000	69	80	0.00	0	78	0.00
5/24/2010	0.0000	69	80	0.00	0	78	0.00
5/25/2010	0.0000	69	80	0.00	0	78	0.00
5/26/2010	0.0005	50	69	0.00	1,992	66	0.00
5/27/2010	0.1033	50	69	0.00	0	66	0.00
5/28/2010	0.0019	50	69	0.00	23,171	66	0.00
5/29/2010	0.7757	50	69	0.00	4,047	66	0.00
5/30/2010	0.1686	50	69	0.00	2,892	66	0.00
5/31/2010	0.1319	50	69	0.00	2,952	66	0.00
6/1/2010	0.1338	50	69	0.00	5,952	66	0.00
6/2/2010	0.2290	69	80	0.00	11,066	78	0.00
6/3/2010	0.3914	50	69	0.00	0	66	0.00
6/4/2010	0.0000	50	69	0.00	8,981	66	0.00
6/5/2010	0.3252	50	69	0.00	0	66	0.00
6/6/2010	0.0000	50	69	0.00	0	66	0.00
6/7/2010	0.0319	50	69	0.00	0	66	0.00
6/8/2010	0.0000	50	69	0.00	0	66	0.00
6/9/2010	0.0162	50	69	0.00	0	66	0.00
6/10/2010	0.0114	50	69	0.00	162	66	0.00
6/11/2010	0.0452	50	69	0.00	237	66	0.00
6/12/2010	0.0476	50	69	0.00	0	66	0.00
6/13/2010	0.0000	50	69	0.00	0	66	0.00
6/14/2010	0.0000	50	69	0.00	0	66	0.00
6/15/2010	0.0000	50	69	0.00	18,041	66	0.00
6/16/2010	0.6129	50	69	0.00	642	66	0.00
6/17/2010	0.0605	50	69	0.00	192	66	0.00
6/18/2010	0.0462	50	69	0.00	0	66	0.00
6/19/2010	0.0386	50	69	0.00	0	66	0.00
6/20/2010	0.0333	50	69	0.00	0	66	0.00
6/21/2010	0.0010	50	69	0.00	0	66	0.00
6/22/2010	0.0024	50	69	0.00	0	66	0.00
6/23/2010	0.0024	50	69	0.00	0	66	0.00
6/24/2010	0.0124	50	69	0.00	0	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
6/25/2010	0.0000	50	69	0.00	0	66	0.00
6/26/2010	0.0086	50	69	0.00	0	66	0.00
6/27/2010	0.0000	50	69	0.00	0	66	0.00
6/28/2010	0.0000	50	69	0.00	0	66	0.00
6/29/2010	0.0052	50	69	0.00	9,746	66	0.00
6/30/2010	0.3495	50	69	0.00	927	66	0.00
7/1/2010	0.0695	50	69	0.00	0	66	0.00
7/2/2010	0.0010	50	69	0.00	0	66	0.00
7/3/2010	0.0057	50	69	0.00	0	66	0.00
7/4/2010	0.0000	50	69	0.00	0	66	0.00
7/5/2010	0.0000	50	69	0.00	0	66	0.00
7/6/2010	0.0000	50	69	0.00	0	66	0.00
7/7/2010	0.0000	50	69	0.00	0	66	0.00
7/8/2010	0.0000	50	69	0.00	0	66	0.00
7/9/2010	0.0000	50	69	0.00	7,691	66	0.00
7/10/2010	0.2843	50	69	0.00	0	66	0.00
7/11/2010	0.0000	50	69	0.00	0	66	0.00
7/12/2010	0.0129	50	69	0.00	22,916	66	0.00
7/13/2010	0.7676	50	69	0.00	18,356	66	0.00
7/14/2010	0.6229	69	80	0.01	0	78	0.00
7/15/2010	0.0000	69	80	0.00	0	78	0.00
7/16/2010	0.0005	69	80	0.00	1,092	78	0.00
7/17/2010	0.0748	69	80	0.00	2,322	78	0.00
7/18/2010	0.1138	50	69	0.00	13,346	66	0.00
7/19/2010	0.4638	50	69	0.00	0	66	0.00
7/20/2010	0.0000	50	69	0.00	117	66	0.00
7/21/2010	0.0438	50	69	0.00	822	66	0.00
7/22/2010	0.0662	50	69	0.00	0	66	0.00
7/23/2010	0.0005	50	69	0.00	1,212	66	0.00
7/24/2010	0.0786	50	69	0.00	0	66	0.00
7/25/2010	0.0033	50	69	0.00	0	66	0.00
7/26/2010	0.0000	50	69	0.00	16,466	66	0.00
7/27/2010	0.5629	50	69	0.00	0	66	0.00
7/28/2010	0.0314	50	69	0.00	1,572	66	0.00
7/29/2010	0.0900	50	69	0.00	0	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
7/30/2010	0.0000	50	69	0.00	0	66	0.00
7/31/2010	0.0000	50	69	0.00	8,861	66	0.00
8/1/2010	0.3214	50	69	0.00	15,296	66	0.00
8/2/2010	0.5257	50	69	0.00	0	66	0.00
8/3/2010	0.0000	50	69	0.00	537	66	0.00
8/4/2010	0.0571	50	69	0.00	0	66	0.00
8/5/2010	0.0000	50	69	0.00	0	66	0.00
8/6/2010	0.0057	50	69	0.00	12,086	66	0.00
8/7/2010	0.4238	50	69	0.00	0	66	0.00
8/8/2010	0.0005	50	69	0.00	0	66	0.00
8/9/2010	0.0000	50	69	0.00	0	66	0.00
8/10/2010	0.0000	50	69	0.00	0	66	0.00
8/11/2010	0.0000	50	69	0.00	0	66	0.00
8/12/2010	0.0000	50	69	0.00	0	66	0.00
8/13/2010	0.0000	50	69	0.00	2,772	66	0.00
8/14/2010	0.1281	50	69	0.00	3,552	66	0.00
8/15/2010	0.1529	50	69	0.00	0	66	0.00
8/16/2010	0.0000	50	69	0.00	0	66	0.00
8/17/2010	0.0000	50	69	0.00	0	66	0.00
8/18/2010	0.0224	50	69	0.00	0	66	0.00
8/19/2010	0.0000	50	69	0.00	0	66	0.00
8/20/2010	0.0224	50	69	0.00	34,196	66	0.00
8/21/2010	1.1257	50	69	0.01	2,892	66	0.00
8/22/2010	0.1319	50	69	0.00	0	66	0.00
8/23/2010	0.0000	50	69	0.00	0	66	0.00
8/24/2010	0.0000	50	69	0.00	0	66	0.00
8/25/2010	0.0000	50	69	0.00	28,736	66	0.00
8/26/2010	0.9524	50	69	0.00	8,216	66	0.00
8/27/2010	0.3010	50	69	0.00	0	66	0.00
8/28/2010	0.0005	50	69	0.00	822	66	0.00
8/29/2010	0.0662	50	69	0.00	0	66	0.00
8/30/2010	0.0000	50	69	0.00	0	66	0.00
8/31/2010	0.0000	50	69	0.00	0	66	0.00
9/1/2010	0.0000	50	69	0.00	0	66	0.00
9/2/2010	0.0000	50	69	0.00	0	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
9/3/2010	0.0000	50	69	0.00	0	66	0.00
9/4/2010	0.0000	50	69	0.00	0	66	0.00
9/5/2010	0.0000	50	69	0.00	0	66	0.00
9/6/2010	0.0000	50	69	0.00	0	66	0.00
9/7/2010	0.0000	50	69	0.00	0	66	0.00
9/8/2010	0.0000	50	69	0.00	0	66	0.00
9/9/2010	0.0195	50	69	0.00	0	66	0.00
9/10/2010	0.0000	50	69	0.00	0	66	0.00
9/11/2010	0.0000	50	69	0.00	9,521	66	0.00
9/12/2010	0.3424	50	69	0.00	0	66	0.00
9/13/2010	0.0000	50	69	0.00	0	66	0.00
9/14/2010	0.0000	50	69	0.00	0	66	0.00
9/15/2010	0.0000	50	69	0.00	0	66	0.00
9/16/2010	0.0000	50	69	0.00	0	66	0.00
9/17/2010	0.0000	50	69	0.00	0	66	0.00
9/18/2010	0.0010	50	69	0.00	0	66	0.00
9/19/2010	0.0000	50	69	0.00	0	66	0.00
9/20/2010	0.0000	50	69	0.00	0	66	0.00
9/21/2010	0.0000	50	69	0.00	0	66	0.00
9/22/2010	0.0000	50	69	0.00	132	66	0.00
9/23/2010	0.0443	50	69	0.00	0	66	0.00
9/24/2010	0.0000	50	69	0.00	0	66	0.00
9/25/2010	0.0000	50	69	0.00	672	66	0.00
9/26/2010	0.0614	50	69	0.00	28,241	66	0.00
9/27/2010	0.9367	50	69	0.00	7,721	66	0.00
9/28/2010	0.2852	50	69	0.00	0	66	0.00
9/29/2010	0.0000	50	69	0.00	15,791	66	0.00
9/30/2010	0.5414	69	80	0.00	0	78	0.00
10/1/2010	0.0038	69	80	0.00	0	78	0.00
10/2/2010	0.0000	50	69	0.00	0	66	0.00
10/3/2010	0.0000	50	69	0.00	0	66	0.00
10/4/2010	0.0000	50	69	0.00	0	66	0.00
10/5/2010	0.0000	50	69	0.00	0	66	0.00
10/6/2010	0.0000	50	69	0.00	0	66	0.00
10/7/2010	0.0000	50	69	0.00	0	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
10/8/2010	0.0000	50	69	0.00	0	66	0.00
10/9/2010	0.0000	50	69	0.00	0	66	0.00
10/10/2010	0.0000	50	69	0.00	0	66	0.00
10/11/2010	0.0000	50	69	0.00	0	66	0.00
10/12/2010	0.0000	50	69	0.00	0	66	0.00
10/13/2010	0.0181	50	69	0.00	0	66	0.00
10/14/2010	0.0000	50	69	0.00	0	66	0.00
10/15/2010	0.0000	50	69	0.00	0	66	0.00
10/16/2010	0.0000	50	69	0.00	0	66	0.00
10/17/2010	0.0000	50	69	0.00	0	66	0.00
10/18/2010	0.0000	50	69	0.00	0	66	0.00
10/19/2010	0.0000	50	69	0.00	42	66	0.00
10/20/2010	0.0414	50	69	0.00	0	66	0.00
10/21/2010	0.0000	50	69	0.00	0	66	0.00
10/22/2010	0.0000	50	69	0.00	0	66	0.00
10/23/2010	0.0000	50	69	0.00	0	66	0.00
10/24/2010	0.0000	50	69	0.00	0	66	0.00
10/25/2010	0.0005	50	69	0.00	2,502	66	0.00
10/26/2010	0.1195	50	69	0.00	0	66	0.00
10/27/2010	0.0105	50	69	0.00	51,475	66	0.00
10/28/2010	1.6743	69	80	0.38	0	78	0.28
10/29/2010	0.0000	69	80	0.00	0	78	0.00
10/30/2010	0.0000	69	80	0.00	0	78	0.00
10/31/2010	0.0000	69	80	0.00	0	78	0.00
11/1/2010	0.0000	84	90	0.00	0	89	0.00
11/2/2010	0.0000	50	69	0.00	4,167	66	0.00
11/3/2010	0.1724	50	69	0.00	11,456	66	0.00
11/4/2010	0.4038	69	80	0.00	0	78	0.00
11/5/2010	0.0000	69	80	0.00	207	78	0.00
11/6/2010	0.0467	69	80	0.00	0	78	0.00
11/7/2010	0.0000	69	80	0.00	0	78	0.00
11/8/2010	0.0000	50	69	0.00	0	66	0.00
11/9/2010	0.0000	50	69	0.00	0	66	0.00
11/10/2010	0.0000	50	69	0.00	0	66	0.00
11/11/2010	0.0000	50	69	0.00	0	66	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
11/12/2010	0.0000	50	69	0.00	0	66	0.00
11/13/2010	0.0000	50	69	0.00	0	66	0.00
11/14/2010	0.0000	50	69	0.00	14,081	66	0.00
11/15/2010	0.4871	50	69	0.00	38,905	66	0.00
11/16/2010	1.2752	84	90	0.51	447	89	0.41
11/17/2010	0.0543	84	90	0.00	0	89	0.00
11/18/2010	0.0000	84	90	0.00	0	89	0.00
11/19/2010	0.0000	84	90	0.00	0	89	0.00
11/20/2010	0.0000	84	90	0.00	0	89	0.00
11/21/2010	0.0000	50	69	0.00	0	66	0.00
11/22/2010	0.0000	50	69	0.00	0	66	0.00
11/23/2010	0.0000	50	69	0.00	3,342	66	0.00
11/24/2010	0.1462	50	69	0.00	0	66	0.00
11/25/2010	0.0000	50	69	0.00	0	66	0.00
11/26/2010	0.0119	50	69	0.00	1,932	66	0.00
11/27/2010	0.1014	50	69	0.00	0	66	0.00
11/28/2010	0.0000	50	69	0.00	0	66	0.00
11/29/2010	0.0000	50	69	0.00	14,681	66	0.00
11/30/2010	0.5062	69	80	0.00	68,544	78	0.00
12/1/2010	2.2162	84	90	1.28	0	89	1.07
12/2/2010	0.0000	84	90	0.00	0	89	0.00
12/3/2010	0.0000	84	90	0.00	0	89	0.00
12/4/2010	0.0000	84	90	0.00	0	89	0.00
12/5/2010	0.0000	84	90	0.00	0	89	0.00
12/6/2010	0.0000	50	69	0.00	0	66	0.00
12/7/2010	0.0000	50	69	0.00	0	66	0.00
12/8/2010	0.0000	50	69	0.00	0	66	0.00
12/9/2010	0.0000	50	69	0.00	0	66	0.00
12/10/2010	0.0000	50	69	0.00	0	66	0.00
12/11/2010	0.0000	50	69	0.00	16,166	66	0.00
12/12/2010	0.5533	69	80	0.00	0	78	0.00
12/13/2010	0.0081	69	80	0.00	0	78	0.00
12/14/2010	0.0000	69	80	0.00	0	78	0.00
12/15/2010	0.0000	69	80	0.00	0	78	0.00
12/16/2010	0.0343	69	80	0.00	4,902	78	0.00

Table 51. Stormwater runoff and rainwater harvesting calculation for RG-2 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
12/17/2010	0.1957	50	69	0.00	657	66	0.00
12/18/2010	0.0610	50	69	0.00	2,442	66	0.00
12/19/2010	0.1176	50	69	0.00	0	66	0.00
12/20/2010	0.0000	50	69	0.00	0	66	0.00
12/21/2010	0.0000	50	69	0.00	0	66	0.00
12/22/2010	0.0076	50	69	0.00	0	66	0.00
12/23/2010	0.0000	50	69	0.00	0	66	0.00
12/24/2010	0.0000	50	69	0.00	0	66	0.00
12/25/2010	0.0000	50	69	0.00	11,111	66	0.00
12/26/2010	0.3929	50	69	0.00	0	66	0.00
12/27/2010	0.0162	50	69	0.00	0	66	0.00
12/28/2010	0.0000	50	69	0.00	0	66	0.00
12/29/2010	0.0000	50	69	0.00	0	66	0.00
12/30/2010	0.0000	50	69	0.00	0	66	0.00
12/31/2010	0.0043	50	69	0.00	0	66	0.00
Total	44.45			9.03	1,255,469		7.42

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
1/1/2010	0.0248	50	72	0.00	0	66	0.00
1/2/2010	0.0248	50	72	0.00	0	66	0.00
1/3/2010	0.0000	50	72	0.00	0	66	0.00
1/4/2010	0.0000	50	72	0.00	0	66	0.00
1/5/2010	0.0000	50	72	0.00	0	66	0.00
1/6/2010	0.0000	50	72	0.00	0	66	0.00
1/7/2010	0.0000	50	72	0.00	0	66	0.00
1/8/2010	0.1119	50	72	0.00	3,392	66	0.00
1/9/2010	0.0000	50	72	0.00	0	66	0.00
1/10/2010	0.0000	50	72	0.00	0	66	0.00
1/11/2010	0.0000	50	72	0.00	0	66	0.00
1/12/2010	0.0000	50	72	0.00	0	66	0.00
1/13/2010	0.0000	50	72	0.00	0	66	0.00
1/14/2010	0.0000	50	72	0.00	0	66	0.00
1/15/2010	0.0000	50	72	0.00	0	66	0.00
1/16/2010	0.0000	50	72	0.00	0	66	0.00
1/17/2010	1.2157	84	91	0.52	55,546	89	0.35
1/18/2010	0.0690	84	91	0.00	1,368	89	0.00
1/19/2010	0.0000	84	91	0.00	0	89	0.00
1/20/2010	0.0000	84	91	0.00	0	89	0.00
1/21/2010	0.0729	84	91	0.00	1,548	89	0.00
1/22/2010	0.6319	69	82	0.02	27,962	79	0.00
1/23/2010	0.0000	69	82	0.00	0	79	0.00
1/24/2010	0.0462	69	82	0.00	288	79	0.00
1/25/2010	1.9390	84	91	1.11	89,722	89	0.81
1/26/2010	0.0000	84	91	0.00	0	89	0.00
1/27/2010	0.0000	84	91	0.00	0	89	0.00
1/28/2010	0.0000	84	91	0.00	0	89	0.00
1/29/2010	0.0000	84	91	0.00	0	89	0.00
1/30/2010	0.5038	69	82	0.00	21,909	79	0.00
1/31/2010	0.0129	69	82	0.00	0	79	0.00
2/1/2010	0.0000	69	82	0.00	0	79	0.00
2/2/2010	0.3514	69	82	0.00	14,710	79	0.00
2/3/2010	0.0062	69	82	0.00	0	79	0.00
2/4/2010	0.0000	50	72	0.00	0	66	0.00
2/5/2010	1.7571	84	91	0.95	81,127	89	0.69

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
2/6/2010	0.6181	84	91	0.13	27,309	89	0.07
2/7/2010	0.0000	84	91	0.00	0	89	0.00
2/8/2010	0.0000	84	91	0.00	0	89	0.00
2/9/2010	0.0000	84	91	0.00	0	89	0.00
2/10/2010	0.1967	69	82	0.00	7,397	79	0.00
2/11/2010	0.0000	50	72	0.00	0	66	0.00
2/12/2010	0.0000	50	72	0.00	0	66	0.00
2/13/2010	0.2186	50	72	0.00	8,432	66	0.00
2/14/2010	0.0000	50	72	0.00	0	66	0.00
2/15/2010	0.2229	50	72	0.00	8,635	66	0.00
2/16/2010	0.0186	50	72	0.00	0	66	0.00
2/17/2010	0.0000	50	72	0.00	0	66	0.00
2/18/2010	0.0000	50	72	0.00	0	66	0.00
2/19/2010	0.0000	50	72	0.00	0	66	0.00
2/20/2010	0.0000	50	72	0.00	0	66	0.00
2/21/2010	0.0000	50	72	0.00	0	66	0.00
2/22/2010	0.6610	69	82	0.02	29,334	79	0.00
2/23/2010	0.0014	69	82	0.00	0	79	0.00
2/24/2010	0.0000	69	82	0.00	0	79	0.00
2/25/2010	0.0000	69	82	0.00	0	79	0.00
2/26/2010	0.0000	69	82	0.00	0	79	0.00
2/27/2010	0.0000	50	72	0.00	0	66	0.00
2/28/2010	0.0000	50	72	0.00	0	66	0.00
3/1/2010	0.0000	50	72	0.00	0	66	0.00
3/2/2010	0.3129	50	72	0.00	12,887	66	0.00
3/3/2010	0.4448	69	82	0.00	19,119	79	0.00
3/4/2010	0.0000	69	82	0.00	0	79	0.00
3/5/2010	0.0000	69	82	0.00	0	79	0.00
3/6/2010	0.0000	69	82	0.00	0	79	0.00
3/7/2010	0.0000	50	72	0.00	0	66	0.00
3/8/2010	0.0000	50	72	0.00	0	66	0.00
3/9/2010	0.0000	50	72	0.00	0	66	0.00
3/10/2010	0.2852	50	72	0.00	11,582	66	0.00
3/11/2010	1.9786	84	91	1.14	91,589	89	0.83
3/12/2010	0.0805	84	91	0.00	1,908	89	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
3/13/2010	0.7252	84	91	0.18	32,371	89	0.11
3/14/2010	0.0238	84	91	0.00	0	89	0.00
3/15/2010	0.0962	84	91	0.00	2,650	89	0.00
3/16/2010	0.0000	69	82	0.00	0	79	0.00
3/17/2010	0.0000	69	82	0.00	0	79	0.00
3/18/2010	0.1652	50	72	0.00	5,912	66	0.00
3/19/2010	0.0000	50	72	0.00	0	66	0.00
3/20/2010	0.0000	50	72	0.00	0	66	0.00
3/21/2010	0.0019	50	72	0.00	0	66	0.00
3/22/2010	0.4181	69	82	0.00	17,859	79	0.00
3/23/2010	0.1319	69	82	0.00	4,337	79	0.00
3/24/2010	0.0000	69	82	0.00	0	79	0.00
3/25/2010	0.0000	69	82	0.00	0	79	0.00
3/26/2010	0.0614	69	82	0.00	1,008	79	0.00
3/27/2010	0.0000	50	72	0.00	0	66	0.00
3/28/2010	0.0029	50	72	0.00	0	66	0.00
3/29/2010	0.1105	50	72	0.00	3,325	66	0.00
3/30/2010	0.0000	50	72	0.00	0	66	0.00
3/31/2010	0.0000	50	72	0.00	0	66	0.00
4/1/2010	0.0000	50	72	0.00	0	66	0.00
4/2/2010	0.0000	50	72	0.00	0	66	0.00
4/3/2010	0.0000	50	72	0.00	0	66	0.00
4/4/2010	0.0000	50	72	0.00	0	66	0.00
4/5/2010	0.0000	50	72	0.00	0	66	0.00
4/6/2010	0.0000	50	72	0.00	0	66	0.00
4/7/2010	0.0000	50	72	0.00	0	66	0.00
4/8/2010	0.0000	50	72	0.00	0	66	0.00
4/9/2010	0.6186	50	72	0.00	27,332	66	0.00
4/10/2010	0.0000	50	72	0.00	0	66	0.00
4/11/2010	0.0000	50	72	0.00	0	66	0.00
4/12/2010	0.0000	50	72	0.00	0	66	0.00
4/13/2010	0.0000	50	72	0.00	0	66	0.00
4/14/2010	0.0000	50	72	0.00	0	66	0.00
4/15/2010	0.0000	50	72	0.00	0	66	0.00
4/16/2010	0.0000	50	72	0.00	0	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
4/17/2010	0.0000	50	72	0.00	0	66	0.00
4/18/2010	0.0000	50	72	0.00	0	66	0.00
4/19/2010	0.0000	50	72	0.00	0	66	0.00
4/20/2010	0.0552	50	72	0.00	715	66	0.00
4/21/2010	0.1767	50	72	0.00	6,452	66	0.00
4/22/2010	0.0000	50	72	0.00	0	66	0.00
4/23/2010	0.0000	50	72	0.00	0	66	0.00
4/24/2010	0.3495	50	72	0.00	14,620	66	0.00
4/25/2010	1.3319	69	82	0.26	61,035	79	0.15
4/26/2010	0.0124	69	82	0.00	0	79	0.00
4/27/2010	0.0000	69	82	0.00	0	79	0.00
4/28/2010	0.0567	69	82	0.00	783	79	0.00
4/29/2010	0.0000	69	82	0.00	0	79	0.00
4/30/2010	0.0000	50	72	0.00	0	66	0.00
5/1/2010	0.0000	50	72	0.00	0	66	0.00
5/2/2010	0.0000	50	72	0.00	0	66	0.00
5/3/2010	3.9062	84	91	2.93	182,666	89	2.26
5/4/2010	0.4829	84	91	0.06	20,919	89	0.03
5/5/2010	0.0000	84	91	0.00	0	89	0.00
5/6/2010	0.0000	84	91	0.00	0	89	0.00
5/7/2010	0.0000	84	91	0.00	0	89	0.00
5/8/2010	0.0000	50	72	0.00	0	66	0.00
5/9/2010	0.0000	50	72	0.00	0	66	0.00
5/10/2010	0.0000	50	72	0.00	0	66	0.00
5/11/2010	0.2057	50	72	0.00	7,825	66	0.00
5/12/2010	0.0000	50	72	0.00	0	66	0.00
5/13/2010	0.0000	50	72	0.00	0	66	0.00
5/14/2010	0.0000	50	72	0.00	0	66	0.00
5/15/2010	0.1286	50	72	0.00	4,180	66	0.00
5/16/2010	0.0014	50	72	0.00	0	66	0.00
5/17/2010	0.0862	50	72	0.00	2,177	66	0.00
5/18/2010	0.0000	50	72	0.00	0	66	0.00
5/19/2010	0.0000	50	72	0.00	0	66	0.00
5/20/2010	0.0000	50	72	0.00	0	66	0.00
5/21/2010	1.0329	50	72	0.02	46,906	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
5/22/2010	0.4286	69	82	0.00	18,354	79	0.00
5/23/2010	0.0000	69	82	0.00	0	79	0.00
5/24/2010	0.0000	69	82	0.00	0	79	0.00
5/25/2010	0.0000	69	82	0.00	0	79	0.00
5/26/2010	0.0005	50	72	0.00	0	66	0.00
5/27/2010	0.1033	50	72	0.00	2,987	66	0.00
5/28/2010	0.0019	50	72	0.00	0	66	0.00
5/29/2010	0.7757	50	72	0.00	34,756	66	0.00
5/30/2010	0.1686	50	72	0.00	6,070	66	0.00
5/31/2010	0.1319	50	72	0.00	4,337	66	0.00
6/1/2010	0.1338	50	72	0.00	4,427	66	0.00
6/2/2010	0.2290	69	82	0.00	8,927	79	0.00
6/3/2010	0.3914	50	72	0.00	16,599	66	0.00
6/4/2010	0.0000	50	72	0.00	0	66	0.00
6/5/2010	0.3252	50	72	0.00	13,472	66	0.00
6/6/2010	0.0000	50	72	0.00	0	66	0.00
6/7/2010	0.0319	50	72	0.00	0	66	0.00
6/8/2010	0.0000	50	72	0.00	0	66	0.00
6/9/2010	0.0162	50	72	0.00	0	66	0.00
6/10/2010	0.0114	50	72	0.00	0	66	0.00
6/11/2010	0.0452	50	72	0.00	243	66	0.00
6/12/2010	0.0476	50	72	0.00	355	66	0.00
6/13/2010	0.0000	50	72	0.00	0	66	0.00
6/14/2010	0.0000	50	72	0.00	0	66	0.00
6/15/2010	0.0000	50	72	0.00	0	66	0.00
6/16/2010	0.6129	50	72	0.00	27,062	66	0.00
6/17/2010	0.0605	50	72	0.00	963	66	0.00
6/18/2010	0.0462	50	72	0.00	288	66	0.00
6/19/2010	0.0386	50	72	0.00	0	66	0.00
6/20/2010	0.0333	50	72	0.00	0	66	0.00
6/21/2010	0.0010	50	72	0.00	0	66	0.00
6/22/2010	0.0024	50	72	0.00	0	66	0.00
6/23/2010	0.0024	50	72	0.00	0	66	0.00
6/24/2010	0.0124	50	72	0.00	0	66	0.00
6/25/2010	0.0000	50	72	0.00	0	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
6/26/2010	0.0086	50	72	0.00	0	66	0.00
6/27/2010	0.0000	50	72	0.00	0	66	0.00
6/28/2010	0.0000	50	72	0.00	0	66	0.00
6/29/2010	0.0052	50	72	0.00	0	66	0.00
6/30/2010	0.3495	50	72	0.00	14,620	66	0.00
7/1/2010	0.0695	50	72	0.00	1,390	66	0.00
7/2/2010	0.0010	50	72	0.00	0	66	0.00
7/3/2010	0.0057	50	72	0.00	0	66	0.00
7/4/2010	0.0000	50	72	0.00	0	66	0.00
7/5/2010	0.0000	50	72	0.00	0	66	0.00
7/6/2010	0.0000	50	72	0.00	0	66	0.00
7/7/2010	0.0000	50	72	0.00	0	66	0.00
7/8/2010	0.0000	50	72	0.00	0	66	0.00
7/9/2010	0.0000	50	72	0.00	0	66	0.00
7/10/2010	0.2843	50	72	0.00	11,537	66	0.00
7/11/2010	0.0000	50	72	0.00	0	66	0.00
7/12/2010	0.0129	50	72	0.00	0	66	0.00
7/13/2010	0.7676	50	72	0.00	34,374	66	0.00
7/14/2010	0.6229	69	82	0.01	27,534	79	0.00
7/15/2010	0.0000	69	82	0.00	0	79	0.00
7/16/2010	0.0005	69	82	0.00	0	79	0.00
7/17/2010	0.0748	69	82	0.00	1,638	79	0.00
7/18/2010	0.1138	50	72	0.00	3,482	66	0.00
7/19/2010	0.4638	50	72	0.00	20,019	66	0.00
7/20/2010	0.0000	50	72	0.00	0	66	0.00
7/21/2010	0.0438	50	72	0.00	175	66	0.00
7/22/2010	0.0662	50	72	0.00	1,233	66	0.00
7/23/2010	0.0005	50	72	0.00	0	66	0.00
7/24/2010	0.0786	50	72	0.00	1,818	66	0.00
7/25/2010	0.0033	50	72	0.00	0	66	0.00
7/26/2010	0.0000	50	72	0.00	0	66	0.00
7/27/2010	0.5629	50	72	0.00	24,699	66	0.00
7/28/2010	0.0314	50	72	0.00	0	66	0.00
7/29/2010	0.0900	50	72	0.00	2,357	66	0.00
7/30/2010	0.0000	50	72	0.00	0	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
7/31/2010	0.0000	50	72	0.00	0	66	0.00
8/1/2010	0.3214	50	72	0.00	13,292	66	0.00
8/2/2010	0.5257	50	72	0.00	22,944	66	0.00
8/3/2010	0.0000	50	72	0.00	0	66	0.00
8/4/2010	0.0571	50	72	0.00	805	66	0.00
8/5/2010	0.0000	50	72	0.00	0	66	0.00
8/6/2010	0.0057	50	72	0.00	0	66	0.00
8/7/2010	0.4238	50	72	0.00	18,129	66	0.00
8/8/2010	0.0005	50	72	0.00	0	66	0.00
8/9/2010	0.0000	50	72	0.00	0	66	0.00
8/10/2010	0.0000	50	72	0.00	0	66	0.00
8/11/2010	0.0000	50	72	0.00	0	66	0.00
8/12/2010	0.0000	50	72	0.00	0	66	0.00
8/13/2010	0.0000	50	72	0.00	0	66	0.00
8/14/2010	0.1281	50	72	0.00	4,157	66	0.00
8/15/2010	0.1529	50	72	0.00	5,327	66	0.00
8/16/2010	0.0000	50	72	0.00	0	66	0.00
8/17/2010	0.0000	50	72	0.00	0	66	0.00
8/18/2010	0.0224	50	72	0.00	0	66	0.00
8/19/2010	0.0000	50	72	0.00	0	66	0.00
8/20/2010	0.0224	50	72	0.00	0	66	0.00
8/21/2010	1.1257	50	72	0.03	51,293	66	0.00
8/22/2010	0.1319	50	72	0.00	4,337	66	0.00
8/23/2010	0.0000	50	72	0.00	0	66	0.00
8/24/2010	0.0000	50	72	0.00	0	66	0.00
8/25/2010	0.0000	50	72	0.00	0	66	0.00
8/26/2010	0.9524	50	72	0.01	43,104	66	0.00
8/27/2010	0.3010	50	72	0.00	12,325	66	0.00
8/28/2010	0.0005	50	72	0.00	0	66	0.00
8/29/2010	0.0662	50	72	0.00	1,233	66	0.00
8/30/2010	0.0000	50	72	0.00	0	66	0.00
8/31/2010	0.0000	50	72	0.00	0	66	0.00
9/1/2010	0.0000	50	72	0.00	0	66	0.00
9/2/2010	0.0000	50	72	0.00	0	66	0.00
9/3/2010	0.0000	50	72	0.00	0	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
9/4/2010	0.0000	50	72	0.00	0	66	0.00
9/5/2010	0.0000	50	72	0.00	0	66	0.00
9/6/2010	0.0000	50	72	0.00	0	66	0.00
9/7/2010	0.0000	50	72	0.00	0	66	0.00
9/8/2010	0.0000	50	72	0.00	0	66	0.00
9/9/2010	0.0195	50	72	0.00	0	66	0.00
9/10/2010	0.0000	50	72	0.00	0	66	0.00
9/11/2010	0.0000	50	72	0.00	0	66	0.00
9/12/2010	0.3424	50	72	0.00	14,282	66	0.00
9/13/2010	0.0000	50	72	0.00	0	66	0.00
9/14/2010	0.0000	50	72	0.00	0	66	0.00
9/15/2010	0.0000	50	72	0.00	0	66	0.00
9/16/2010	0.0000	50	72	0.00	0	66	0.00
9/17/2010	0.0000	50	72	0.00	0	66	0.00
9/18/2010	0.0010	50	72	0.00	0	66	0.00
9/19/2010	0.0000	50	72	0.00	0	66	0.00
9/20/2010	0.0000	50	72	0.00	0	66	0.00
9/21/2010	0.0000	50	72	0.00	0	66	0.00
9/22/2010	0.0000	50	72	0.00	0	66	0.00
9/23/2010	0.0443	50	72	0.00	198	66	0.00
9/24/2010	0.0000	50	72	0.00	0	66	0.00
9/25/2010	0.0000	50	72	0.00	0	66	0.00
9/26/2010	0.0614	50	72	0.00	1,008	66	0.00
9/27/2010	0.9367	50	72	0.01	42,361	66	0.00
9/28/2010	0.2852	50	72	0.00	11,582	66	0.00
9/29/2010	0.0000	50	72	0.00	0	66	0.00
9/30/2010	0.5414	69	82	0.00	23,687	79	0.00
10/1/2010	0.0038	69	82	0.00	0	79	0.00
10/2/2010	0.0000	50	72	0.00	0	66	0.00
10/3/2010	0.0000	50	72	0.00	0	66	0.00
10/4/2010	0.0000	50	72	0.00	0	66	0.00
10/5/2010	0.0000	50	72	0.00	0	66	0.00
10/6/2010	0.0000	50	72	0.00	0	66	0.00
10/7/2010	0.0000	50	72	0.00	0	66	0.00
10/8/2010	0.0000	50	72	0.00	0	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
10/9/2010	0.0000	50	72	0.00	0	66	0.00
10/10/2010	0.0000	50	72	0.00	0	66	0.00
10/11/2010	0.0000	50	72	0.00	0	66	0.00
10/12/2010	0.0000	50	72	0.00	0	66	0.00
10/13/2010	0.0181	50	72	0.00	0	66	0.00
10/14/2010	0.0000	50	72	0.00	0	66	0.00
10/15/2010	0.0000	50	72	0.00	0	66	0.00
10/16/2010	0.0000	50	72	0.00	0	66	0.00
10/17/2010	0.0000	50	72	0.00	0	66	0.00
10/18/2010	0.0000	50	72	0.00	0	66	0.00
10/19/2010	0.0000	50	72	0.00	0	66	0.00
10/20/2010	0.0414	50	72	0.00	63	66	0.00
10/21/2010	0.0000	50	72	0.00	0	66	0.00
10/22/2010	0.0000	50	72	0.00	0	66	0.00
10/23/2010	0.0000	50	72	0.00	0	66	0.00
10/24/2010	0.0000	50	72	0.00	0	66	0.00
10/25/2010	0.0005	50	72	0.00	0	66	0.00
10/26/2010	0.1195	50	72	0.00	3,752	66	0.00
10/27/2010	0.0105	50	72	0.00	0	66	0.00
10/28/2010	1.6743	69	82	0.44	77,212	79	0.28
10/29/2010	0.0000	69	82	0.00	0	79	0.00
10/30/2010	0.0000	69	82	0.00	0	79	0.00
10/31/2010	0.0000	69	82	0.00	0	79	0.00
11/1/2010	0.0000	84	91	0.00	0	89	0.00
11/2/2010	0.0000	50	72	0.00	0	66	0.00
11/3/2010	0.1724	50	72	0.00	6,250	66	0.00
11/4/2010	0.4038	69	82	0.00	17,184	79	0.00
11/5/2010	0.0000	69	82	0.00	0	79	0.00
11/6/2010	0.0467	69	82	0.00	310	79	0.00
11/7/2010	0.0000	69	82	0.00	0	79	0.00
11/8/2010	0.0000	50	72	0.00	0	66	0.00
11/9/2010	0.0000	50	72	0.00	0	66	0.00
11/10/2010	0.0000	50	72	0.00	0	66	0.00
11/11/2010	0.0000	50	72	0.00	0	66	0.00
11/12/2010	0.0000	50	72	0.00	0	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
11/13/2010	0.0000	50	72	0.00	0	66	0.00
11/14/2010	0.0000	50	72	0.00	0	66	0.00
11/15/2010	0.4871	50	72	0.00	21,122	66	0.00
11/16/2010	1.2752	84	91	0.56	58,358	89	0.39
11/17/2010	0.0543	84	91	0.00	670	89	0.00
11/18/2010	0.0000	84	91	0.00	0	89	0.00
11/19/2010	0.0000	84	91	0.00	0	89	0.00
11/20/2010	0.0000	84	91	0.00	0	89	0.00
11/21/2010	0.0000	50	72	0.00	0	66	0.00
11/22/2010	0.0000	50	72	0.00	0	66	0.00
11/23/2010	0.0000	50	72	0.00	0	66	0.00
11/24/2010	0.1462	50	72	0.00	5,012	66	0.00
11/25/2010	0.0000	50	72	0.00	0	66	0.00
11/26/2010	0.0119	50	72	0.00	0	66	0.00
11/27/2010	0.1014	50	72	0.00	2,897	66	0.00
11/28/2010	0.0000	50	72	0.00	0	66	0.00
11/29/2010	0.0000	50	72	0.00	0	66	0.00
11/30/2010	0.5062	69	82	0.00	22,022	79	0.00
12/1/2010	2.2162	84	91	1.35	102,816	89	1.00
12/2/2010	0.0000	84	91	0.00	0	89	0.00
12/3/2010	0.0000	84	91	0.00	0	89	0.00
12/4/2010	0.0000	84	91	0.00	0	89	0.00
12/5/2010	0.0000	84	91	0.00	0	89	0.00
12/6/2010	0.0000	50	72	0.00	0	66	0.00
12/7/2010	0.0000	50	72	0.00	0	66	0.00
12/8/2010	0.0000	50	72	0.00	0	66	0.00
12/9/2010	0.0000	50	72	0.00	0	66	0.00
12/10/2010	0.0000	50	72	0.00	0	66	0.00
12/11/2010	0.0000	50	72	0.00	0	66	0.00
12/12/2010	0.5533	69	82	0.01	24,249	79	0.00
12/13/2010	0.0081	69	82	0.00	0	79	0.00
12/14/2010	0.0000	69	82	0.00	0	79	0.00
12/15/2010	0.0000	69	82	0.00	0	79	0.00
12/16/2010	0.0343	69	82	0.00	0	79	0.00
12/17/2010	0.1957	50	72	0.00	7,352	66	0.00

Table 52. Stormwater runoff and rainwater harvesting calculation for RG-3 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 35% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
12/18/2010	0.0610	50	72	0.00	985	66	0.00
12/19/2010	0.1176	50	72	0.00	3,662	66	0.00
12/20/2010	0.0000	50	72	0.00	0	66	0.00
12/21/2010	0.0000	50	72	0.00	0	66	0.00
12/22/2010	0.0076	50	72	0.00	0	66	0.00
12/23/2010	0.0000	50	72	0.00	0	66	0.00
12/24/2010	0.0000	50	72	0.00	0	66	0.00
12/25/2010	0.0000	50	72	0.00	0	66	0.00
12/26/2010	0.3929	50	72	0.00	16,667	66	0.00
12/27/2010	0.0162	50	72	0.00	0	66	0.00
12/28/2010	0.0000	50	72	0.00	0	66	0.00
12/29/2010	0.0000	50	72	0.00	0	66	0.00
12/30/2010	0.0000	50	72	0.00	0	66	0.00
12/31/2010	0.0043	50	72	0.00	0	66	0.00
Total	44.45			9.77	1,883,204		6.98

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
1/1/2010	0.0248	50	69	0.00	0	64	0.00
1/2/2010	0.0248	50	69	0.00	0	64	0.00
1/3/2010	0.0000	50	69	0.00	0	64	0.00
1/4/2010	0.0000	50	69	0.00	0	64	0.00
1/5/2010	0.0000	50	69	0.00	0	64	0.00
1/6/2010	0.0000	50	69	0.00	0	64	0.00
1/7/2010	0.0000	50	69	0.00	0	64	0.00
1/8/2010	0.1119	50	69	0.00	2,905	64	0.00
1/9/2010	0.0000	50	69	0.00	0	64	0.00
1/10/2010	0.0000	50	69	0.00	0	64	0.00
1/11/2010	0.0000	50	69	0.00	0	64	0.00
1/12/2010	0.0000	50	69	0.00	0	64	0.00
1/13/2010	0.0000	50	69	0.00	0	64	0.00
1/14/2010	0.0000	50	69	0.00	0	64	0.00
1/15/2010	0.0000	50	69	0.00	0	64	0.00
1/16/2010	0.0000	50	69	0.00	0	64	0.00
1/17/2010	1.2157	84	90	0.47	47,565	88	0.33
1/18/2010	0.0690	84	90	0.00	1,171	88	0.00
1/19/2010	0.0000	84	90	0.00	0	88	0.00
1/20/2010	0.0000	84	90	0.00	0	88	0.00
1/21/2010	0.0729	84	90	0.00	1,325	88	0.00
1/22/2010	0.6319	69	80	0.01	23,944	77	0.00
1/23/2010	0.0000	69	80	0.00	0	77	0.00
1/24/2010	0.0462	69	80	0.00	246	77	0.00
1/25/2010	1.9390	84	90	1.04	76,831	88	0.78
1/26/2010	0.0000	84	90	0.00	0	88	0.00
1/27/2010	0.0000	84	90	0.00	0	88	0.00
1/28/2010	0.0000	84	90	0.00	0	88	0.00
1/29/2010	0.0000	84	90	0.00	0	88	0.00
1/30/2010	0.5038	69	80	0.00	18,761	77	0.00
1/31/2010	0.0129	69	80	0.00	0	77	0.00
2/1/2010	0.0000	69	80	0.00	0	77	0.00
2/2/2010	0.3514	69	80	0.00	12,596	77	0.00
2/3/2010	0.0062	69	80	0.00	0	77	0.00
2/4/2010	0.0000	50	69	0.00	0	64	0.00
2/5/2010	1.7571	84	90	0.89	69,471	88	0.66

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
2/6/2010	0.6181	84	90	0.10	23,385	88	0.06
2/7/2010	0.0000	84	90	0.00	0	88	0.00
2/8/2010	0.0000	84	90	0.00	0	88	0.00
2/9/2010	0.0000	84	90	0.00	0	88	0.00
2/10/2010	0.1967	69	80	0.00	6,334	77	0.00
2/11/2010	0.0000	50	69	0.00	0	64	0.00
2/12/2010	0.0000	50	69	0.00	0	64	0.00
2/13/2010	0.2186	50	69	0.00	7,221	64	0.00
2/14/2010	0.0000	50	69	0.00	0	64	0.00
2/15/2010	0.2229	50	69	0.00	7,394	64	0.00
2/16/2010	0.0186	50	69	0.00	0	64	0.00
2/17/2010	0.0000	50	69	0.00	0	64	0.00
2/18/2010	0.0000	50	69	0.00	0	64	0.00
2/19/2010	0.0000	50	69	0.00	0	64	0.00
2/20/2010	0.0000	50	69	0.00	0	64	0.00
2/21/2010	0.0000	50	69	0.00	0	64	0.00
2/22/2010	0.6610	69	80	0.01	25,119	77	0.00
2/23/2010	0.0014	69	80	0.00	0	77	0.00
2/24/2010	0.0000	69	80	0.00	0	77	0.00
2/25/2010	0.0000	69	80	0.00	0	77	0.00
2/26/2010	0.0000	69	80	0.00	0	77	0.00
2/27/2010	0.0000	50	69	0.00	0	64	0.00
2/28/2010	0.0000	50	69	0.00	0	64	0.00
3/1/2010	0.0000	50	69	0.00	0	64	0.00
3/2/2010	0.3129	50	69	0.00	11,036	64	0.00
3/3/2010	0.4448	69	80	0.00	16,372	77	0.00
3/4/2010	0.0000	69	80	0.00	0	77	0.00
3/5/2010	0.0000	69	80	0.00	0	77	0.00
3/6/2010	0.0000	69	80	0.00	0	77	0.00
3/7/2010	0.0000	50	69	0.00	0	64	0.00
3/8/2010	0.0000	50	69	0.00	0	64	0.00
3/9/2010	0.0000	50	69	0.00	0	64	0.00
3/10/2010	0.2852	50	69	0.00	9,918	64	0.00
3/11/2010	1.9786	84	90	1.08	78,430	88	0.81
3/12/2010	0.0805	84	90	0.00	1,633	88	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		Rainwater harvesting, gal	HI	
			Imperviousness, 40%			Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
3/13/2010	0.7252	84	90	0.16	27,720	88	0.10
3/14/2010	0.0238	84	90	0.00	0	88	0.00
3/15/2010	0.0962	84	90	0.00	2,269	88	0.00
3/16/2010	0.0000	69	80	0.00	0	77	0.00
3/17/2010	0.0000	69	80	0.00	0	77	0.00
3/18/2010	0.1652	50	69	0.00	5,063	64	0.00
3/19/2010	0.0000	50	69	0.00	0	64	0.00
3/20/2010	0.0000	50	69	0.00	0	64	0.00
3/21/2010	0.0019	50	69	0.00	0	64	0.00
3/22/2010	0.4181	69	80	0.00	15,293	77	0.00
3/23/2010	0.1319	69	80	0.00	3,714	77	0.00
3/24/2010	0.0000	69	80	0.00	0	77	0.00
3/25/2010	0.0000	69	80	0.00	0	77	0.00
3/26/2010	0.0614	69	80	0.00	863	77	0.00
3/27/2010	0.0000	50	69	0.00	0	64	0.00
3/28/2010	0.0029	50	69	0.00	0	64	0.00
3/29/2010	0.1105	50	69	0.00	2,847	64	0.00
3/30/2010	0.0000	50	69	0.00	0	64	0.00
3/31/2010	0.0000	50	69	0.00	0	64	0.00
4/1/2010	0.0000	50	69	0.00	0	64	0.00
4/2/2010	0.0000	50	69	0.00	0	64	0.00
4/3/2010	0.0000	50	69	0.00	0	64	0.00
4/4/2010	0.0000	50	69	0.00	0	64	0.00
4/5/2010	0.0000	50	69	0.00	0	64	0.00
4/6/2010	0.0000	50	69	0.00	0	64	0.00
4/7/2010	0.0000	50	69	0.00	0	64	0.00
4/8/2010	0.0000	50	69	0.00	0	64	0.00
4/9/2010	0.6186	50	69	0.00	23,405	64	0.00
4/10/2010	0.0000	50	69	0.00	0	64	0.00
4/11/2010	0.0000	50	69	0.00	0	64	0.00
4/12/2010	0.0000	50	69	0.00	0	64	0.00
4/13/2010	0.0000	50	69	0.00	0	64	0.00
4/14/2010	0.0000	50	69	0.00	0	64	0.00
4/15/2010	0.0000	50	69	0.00	0	64	0.00
4/16/2010	0.0000	50	69	0.00	0	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		Rainwater harvesting, gal	HI	
			Imperviousness, 40%			Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
4/17/2010	0.0000	50	69	0.00	0	64	0.00
4/18/2010	0.0000	50	69	0.00	0	64	0.00
4/19/2010	0.0000	50	69	0.00	0	64	0.00
4/20/2010	0.0552	50	69	0.00	612	64	0.00
4/21/2010	0.1767	50	69	0.00	5,525	64	0.00
4/22/2010	0.0000	50	69	0.00	0	64	0.00
4/23/2010	0.0000	50	69	0.00	0	64	0.00
4/24/2010	0.3495	50	69	0.00	12,519	64	0.00
4/25/2010	1.3319	69	80	0.21	52,266	77	0.12
4/26/2010	0.0124	69	80	0.00	0	77	0.00
4/27/2010	0.0000	69	80	0.00	0	77	0.00
4/28/2010	0.0567	69	80	0.00	670	77	0.00
4/29/2010	0.0000	69	80	0.00	0	77	0.00
4/30/2010	0.0000	50	69	0.00	0	64	0.00
5/1/2010	0.0000	50	69	0.00	0	64	0.00
5/2/2010	0.0000	50	69	0.00	0	64	0.00
5/3/2010	3.9062	84	90	2.83	156,421	88	2.25
5/4/2010	0.4829	84	90	0.05	17,914	88	0.02
5/5/2010	0.0000	84	90	0.00	0	88	0.00
5/6/2010	0.0000	84	90	0.00	0	88	0.00
5/7/2010	0.0000	84	90	0.00	0	88	0.00
5/8/2010	0.0000	50	69	0.00	0	64	0.00
5/9/2010	0.0000	50	69	0.00	0	64	0.00
5/10/2010	0.0000	50	69	0.00	0	64	0.00
5/11/2010	0.2057	50	69	0.00	6,701	64	0.00
5/12/2010	0.0000	50	69	0.00	0	64	0.00
5/13/2010	0.0000	50	69	0.00	0	64	0.00
5/14/2010	0.0000	50	69	0.00	0	64	0.00
5/15/2010	0.1286	50	69	0.00	3,579	64	0.00
5/16/2010	0.0014	50	69	0.00	0	64	0.00
5/17/2010	0.0862	50	69	0.00	1,865	64	0.00
5/18/2010	0.0000	50	69	0.00	0	64	0.00
5/19/2010	0.0000	50	69	0.00	0	64	0.00
5/20/2010	0.0000	50	69	0.00	0	64	0.00
5/21/2010	1.0329	50	69	0.00	40,167	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
5/22/2010	0.4286	69	80	0.00	15,717	77	0.00
5/23/2010	0.0000	69	80	0.00	0	77	0.00
5/24/2010	0.0000	69	80	0.00	0	77	0.00
5/25/2010	0.0000	69	80	0.00	0	77	0.00
5/26/2010	0.0005	50	69	0.00	0	64	0.00
5/27/2010	0.1033	50	69	0.00	2,558	64	0.00
5/28/2010	0.0019	50	69	0.00	0	64	0.00
5/29/2010	0.7757	50	69	0.00	29,763	64	0.00
5/30/2010	0.1686	50	69	0.00	5,198	64	0.00
5/31/2010	0.1319	50	69	0.00	3,714	64	0.00
6/1/2010	0.1338	50	69	0.00	3,791	64	0.00
6/2/2010	0.2290	69	80	0.00	7,645	77	0.00
6/3/2010	0.3914	50	69	0.00	14,215	64	0.00
6/4/2010	0.0000	50	69	0.00	0	64	0.00
6/5/2010	0.3252	50	69	0.00	11,536	64	0.00
6/6/2010	0.0000	50	69	0.00	0	64	0.00
6/7/2010	0.0319	50	69	0.00	0	64	0.00
6/8/2010	0.0000	50	69	0.00	0	64	0.00
6/9/2010	0.0162	50	69	0.00	0	64	0.00
6/10/2010	0.0114	50	69	0.00	0	64	0.00
6/11/2010	0.0452	50	69	0.00	208	64	0.00
6/12/2010	0.0476	50	69	0.00	304	64	0.00
6/13/2010	0.0000	50	69	0.00	0	64	0.00
6/14/2010	0.0000	50	69	0.00	0	64	0.00
6/15/2010	0.0000	50	69	0.00	0	64	0.00
6/16/2010	0.6129	50	69	0.00	23,173	64	0.00
6/17/2010	0.0605	50	69	0.00	824	64	0.00
6/18/2010	0.0462	50	69	0.00	246	64	0.00
6/19/2010	0.0386	50	69	0.00	0	64	0.00
6/20/2010	0.0333	50	69	0.00	0	64	0.00
6/21/2010	0.0010	50	69	0.00	0	64	0.00
6/22/2010	0.0024	50	69	0.00	0	64	0.00
6/23/2010	0.0024	50	69	0.00	0	64	0.00
6/24/2010	0.0124	50	69	0.00	0	64	0.00
6/25/2010	0.0000	50	69	0.00	0	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		Rainwater harvesting, gal	HI	
			Imperviousness, 40%			Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
6/26/2010	0.0086	50	69	0.00	0	64	0.00
6/27/2010	0.0000	50	69	0.00	0	64	0.00
6/28/2010	0.0000	50	69	0.00	0	64	0.00
6/29/2010	0.0052	50	69	0.00	0	64	0.00
6/30/2010	0.3495	50	69	0.00	12,519	64	0.00
7/1/2010	0.0695	50	69	0.00	1,190	64	0.00
7/2/2010	0.0010	50	69	0.00	0	64	0.00
7/3/2010	0.0057	50	69	0.00	0	64	0.00
7/4/2010	0.0000	50	69	0.00	0	64	0.00
7/5/2010	0.0000	50	69	0.00	0	64	0.00
7/6/2010	0.0000	50	69	0.00	0	64	0.00
7/7/2010	0.0000	50	69	0.00	0	64	0.00
7/8/2010	0.0000	50	69	0.00	0	64	0.00
7/9/2010	0.0000	50	69	0.00	0	64	0.00
7/10/2010	0.2843	50	69	0.00	9,880	64	0.00
7/11/2010	0.0000	50	69	0.00	0	64	0.00
7/12/2010	0.0129	50	69	0.00	0	64	0.00
7/13/2010	0.7676	50	69	0.00	29,435	64	0.00
7/14/2010	0.6229	69	80	0.01	23,578	77	0.00
7/15/2010	0.0000	69	80	0.00	0	77	0.00
7/16/2010	0.0005	69	80	0.00	0	77	0.00
7/17/2010	0.0748	69	80	0.00	1,402	77	0.00
7/18/2010	0.1138	50	69	0.00	2,982	64	0.00
7/19/2010	0.4638	50	69	0.00	17,143	64	0.00
7/20/2010	0.0000	50	69	0.00	0	64	0.00
7/21/2010	0.0438	50	69	0.00	150	64	0.00
7/22/2010	0.0662	50	69	0.00	1,055	64	0.00
7/23/2010	0.0005	50	69	0.00	0	64	0.00
7/24/2010	0.0786	50	69	0.00	1,556	64	0.00
7/25/2010	0.0033	50	69	0.00	0	64	0.00
7/26/2010	0.0000	50	69	0.00	0	64	0.00
7/27/2010	0.5629	50	69	0.00	21,150	64	0.00
7/28/2010	0.0314	50	69	0.00	0	64	0.00
7/29/2010	0.0900	50	69	0.00	2,019	64	0.00
7/30/2010	0.0000	50	69	0.00	0	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		Rainwater harvesting, gal	HI	
			Imperviousness, 40%			Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
7/31/2010	0.0000	50	69	0.00	0	64	0.00
8/1/2010	0.3214	50	69	0.00	11,382	64	0.00
8/2/2010	0.5257	50	69	0.00	19,648	64	0.00
8/3/2010	0.0000	50	69	0.00	0	64	0.00
8/4/2010	0.0571	50	69	0.00	689	64	0.00
8/5/2010	0.0000	50	69	0.00	0	64	0.00
8/6/2010	0.0057	50	69	0.00	0	64	0.00
8/7/2010	0.4238	50	69	0.00	15,525	64	0.00
8/8/2010	0.0005	50	69	0.00	0	64	0.00
8/9/2010	0.0000	50	69	0.00	0	64	0.00
8/10/2010	0.0000	50	69	0.00	0	64	0.00
8/11/2010	0.0000	50	69	0.00	0	64	0.00
8/12/2010	0.0000	50	69	0.00	0	64	0.00
8/13/2010	0.0000	50	69	0.00	0	64	0.00
8/14/2010	0.1281	50	69	0.00	3,560	64	0.00
8/15/2010	0.1529	50	69	0.00	4,562	64	0.00
8/16/2010	0.0000	50	69	0.00	0	64	0.00
8/17/2010	0.0000	50	69	0.00	0	64	0.00
8/18/2010	0.0224	50	69	0.00	0	64	0.00
8/19/2010	0.0000	50	69	0.00	0	64	0.00
8/20/2010	0.0224	50	69	0.00	0	64	0.00
8/21/2010	1.1257	50	69	0.01	43,924	64	0.00
8/22/2010	0.1319	50	69	0.00	3,714	64	0.00
8/23/2010	0.0000	50	69	0.00	0	64	0.00
8/24/2010	0.0000	50	69	0.00	0	64	0.00
8/25/2010	0.0000	50	69	0.00	0	64	0.00
8/26/2010	0.9524	50	69	0.00	36,911	64	0.00
8/27/2010	0.3010	50	69	0.00	10,554	64	0.00
8/28/2010	0.0005	50	69	0.00	0	64	0.00
8/29/2010	0.0662	50	69	0.00	1,055	64	0.00
8/30/2010	0.0000	50	69	0.00	0	64	0.00
8/31/2010	0.0000	50	69	0.00	0	64	0.00
9/1/2010	0.0000	50	69	0.00	0	64	0.00
9/2/2010	0.0000	50	69	0.00	0	64	0.00
9/3/2010	0.0000	50	69	0.00	0	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		Rainwater harvesting, gal	HI	
			Imperviousness, 40%			Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
9/4/2010	0.0000	50	69	0.00	0	64	0.00
9/5/2010	0.0000	50	69	0.00	0	64	0.00
9/6/2010	0.0000	50	69	0.00	0	64	0.00
9/7/2010	0.0000	50	69	0.00	0	64	0.00
9/8/2010	0.0000	50	69	0.00	0	64	0.00
9/9/2010	0.0195	50	69	0.00	0	64	0.00
9/10/2010	0.0000	50	69	0.00	0	64	0.00
9/11/2010	0.0000	50	69	0.00	0	64	0.00
9/12/2010	0.3424	50	69	0.00	12,230	64	0.00
9/13/2010	0.0000	50	69	0.00	0	64	0.00
9/14/2010	0.0000	50	69	0.00	0	64	0.00
9/15/2010	0.0000	50	69	0.00	0	64	0.00
9/16/2010	0.0000	50	69	0.00	0	64	0.00
9/17/2010	0.0000	50	69	0.00	0	64	0.00
9/18/2010	0.0010	50	69	0.00	0	64	0.00
9/19/2010	0.0000	50	69	0.00	0	64	0.00
9/20/2010	0.0000	50	69	0.00	0	64	0.00
9/21/2010	0.0000	50	69	0.00	0	64	0.00
9/22/2010	0.0000	50	69	0.00	0	64	0.00
9/23/2010	0.0443	50	69	0.00	169	64	0.00
9/24/2010	0.0000	50	69	0.00	0	64	0.00
9/25/2010	0.0000	50	69	0.00	0	64	0.00
9/26/2010	0.0614	50	69	0.00	863	64	0.00
9/27/2010	0.9367	50	69	0.00	36,275	64	0.00
9/28/2010	0.2852	50	69	0.00	9,918	64	0.00
9/29/2010	0.0000	50	69	0.00	0	64	0.00
9/30/2010	0.5414	69	80	0.00	20,283	77	0.00
10/1/2010	0.0038	69	80	0.00	0	77	0.00
10/2/2010	0.0000	50	69	0.00	0	64	0.00
10/3/2010	0.0000	50	69	0.00	0	64	0.00
10/4/2010	0.0000	50	69	0.00	0	64	0.00
10/5/2010	0.0000	50	69	0.00	0	64	0.00
10/6/2010	0.0000	50	69	0.00	0	64	0.00
10/7/2010	0.0000	50	69	0.00	0	64	0.00
10/8/2010	0.0000	50	69	0.00	0	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
10/9/2010	0.0000	50	69	0.00	0	64	0.00
10/10/2010	0.0000	50	69	0.00	0	64	0.00
10/11/2010	0.0000	50	69	0.00	0	64	0.00
10/12/2010	0.0000	50	69	0.00	0	64	0.00
10/13/2010	0.0181	50	69	0.00	0	64	0.00
10/14/2010	0.0000	50	69	0.00	0	64	0.00
10/15/2010	0.0000	50	69	0.00	0	64	0.00
10/16/2010	0.0000	50	69	0.00	0	64	0.00
10/17/2010	0.0000	50	69	0.00	0	64	0.00
10/18/2010	0.0000	50	69	0.00	0	64	0.00
10/19/2010	0.0000	50	69	0.00	0	64	0.00
10/20/2010	0.0414	50	69	0.00	54	64	0.00
10/21/2010	0.0000	50	69	0.00	0	64	0.00
10/22/2010	0.0000	50	69	0.00	0	64	0.00
10/23/2010	0.0000	50	69	0.00	0	64	0.00
10/24/2010	0.0000	50	69	0.00	0	64	0.00
10/25/2010	0.0005	50	69	0.00	0	64	0.00
10/26/2010	0.1195	50	69	0.00	3,213	64	0.00
10/27/2010	0.0105	50	69	0.00	0	64	0.00
10/28/2010	1.6743	69	80	0.38	66,119	77	0.24
10/29/2010	0.0000	69	80	0.00	0	77	0.00
10/30/2010	0.0000	69	80	0.00	0	77	0.00
10/31/2010	0.0000	69	80	0.00	0	77	0.00
11/1/2010	0.0000	84	90	0.00	0	88	0.00
11/2/2010	0.0000	50	69	0.00	0	64	0.00
11/3/2010	0.1724	50	69	0.00	5,352	64	0.00
11/4/2010	0.4038	69	80	0.00	14,715	77	0.00
11/5/2010	0.0000	69	80	0.00	0	77	0.00
11/6/2010	0.0467	69	80	0.00	266	77	0.00
11/7/2010	0.0000	69	80	0.00	0	77	0.00
11/8/2010	0.0000	50	69	0.00	0	64	0.00
11/9/2010	0.0000	50	69	0.00	0	64	0.00
11/10/2010	0.0000	50	69	0.00	0	64	0.00
11/11/2010	0.0000	50	69	0.00	0	64	0.00
11/12/2010	0.0000	50	69	0.00	0	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
11/13/2010	0.0000	50	69	0.00	0	64	0.00
11/14/2010	0.0000	50	69	0.00	0	64	0.00
11/15/2010	0.4871	50	69	0.00	18,087	64	0.00
11/16/2010	1.2752	84	90	0.51	49,973	88	0.36
11/17/2010	0.0543	84	90	0.00	574	88	0.00
11/18/2010	0.0000	84	90	0.00	0	88	0.00
11/19/2010	0.0000	84	90	0.00	0	88	0.00
11/20/2010	0.0000	84	90	0.00	0	88	0.00
11/21/2010	0.0000	50	69	0.00	0	64	0.00
11/22/2010	0.0000	50	69	0.00	0	64	0.00
11/23/2010	0.0000	50	69	0.00	0	64	0.00
11/24/2010	0.1462	50	69	0.00	4,292	64	0.00
11/25/2010	0.0000	50	69	0.00	0	64	0.00
11/26/2010	0.0119	50	69	0.00	0	64	0.00
11/27/2010	0.1014	50	69	0.00	2,481	64	0.00
11/28/2010	0.0000	50	69	0.00	0	64	0.00
11/29/2010	0.0000	50	69	0.00	0	64	0.00
11/30/2010	0.5062	69	80	0.00	18,858	77	0.00
12/1/2010	2.2162	84	90	1.28	88,044	88	0.97
12/2/2010	0.0000	84	90	0.00	0	88	0.00
12/3/2010	0.0000	84	90	0.00	0	88	0.00
12/4/2010	0.0000	84	90	0.00	0	88	0.00
12/5/2010	0.0000	84	90	0.00	0	88	0.00
12/6/2010	0.0000	50	69	0.00	0	64	0.00
12/7/2010	0.0000	50	69	0.00	0	64	0.00
12/8/2010	0.0000	50	69	0.00	0	64	0.00
12/9/2010	0.0000	50	69	0.00	0	64	0.00
12/10/2010	0.0000	50	69	0.00	0	64	0.00
12/11/2010	0.0000	50	69	0.00	0	64	0.00
12/12/2010	0.5533	69	80	0.00	20,765	77	0.00
12/13/2010	0.0081	69	80	0.00	0	77	0.00
12/14/2010	0.0000	69	80	0.00	0	77	0.00
12/15/2010	0.0000	69	80	0.00	0	77	0.00
12/16/2010	0.0343	69	80	0.00	0	77	0.00
12/17/2010	0.1957	50	69	0.00	6,296	64	0.00

Table 53. Stormwater runoff and rainwater harvesting calculation for RG-4 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 40%		Rainwater harvesting, gal	Imperviousness, 29% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
12/18/2010	0.0610	50	69	0.00	844	64	0.00
12/19/2010	0.1176	50	69	0.00	3,136	64	0.00
12/20/2010	0.0000	50	69	0.00	0	64	0.00
12/21/2010	0.0000	50	69	0.00	0	64	0.00
12/22/2010	0.0076	50	69	0.00	0	64	0.00
12/23/2010	0.0000	50	69	0.00	0	64	0.00
12/24/2010	0.0000	50	69	0.00	0	64	0.00
12/25/2010	0.0000	50	69	0.00	0	64	0.00
12/26/2010	0.3929	50	69	0.00	14,272	64	0.00
12/27/2010	0.0162	50	69	0.00	0	64	0.00
12/28/2010	0.0000	50	69	0.00	0	64	0.00
12/29/2010	0.0000	50	69	0.00	0	64	0.00
12/30/2010	0.0000	50	69	0.00	0	64	0.00
12/31/2010	0.0043	50	69	0.00	0	64	0.00
Total	44.45			9.03	1,612,628		6.70

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
1/1/2010	0.0248	50	72	0.00	0	66	0.00
1/2/2010	0.0248	50	72	0.00	0	66	0.00
1/3/2010	0.0000	50	72	0.00	0	66	0.00
1/4/2010	0.0000	50	72	0.00	0	66	0.00
1/5/2010	0.0000	50	72	0.00	0	66	0.00
1/6/2010	0.0000	50	72	0.00	0	66	0.00
1/7/2010	0.0000	50	72	0.00	0	66	0.00
1/8/2010	0.1119	50	72	0.00	4,153	66	0.00
1/9/2010	0.0000	50	72	0.00	0	66	0.00
1/10/2010	0.0000	50	72	0.00	0	66	0.00
1/11/2010	0.0000	50	72	0.00	0	66	0.00
1/12/2010	0.0000	50	72	0.00	0	66	0.00
1/13/2010	0.0000	50	72	0.00	0	66	0.00
1/14/2010	0.0000	50	72	0.00	0	66	0.00
1/15/2010	0.0000	50	72	0.00	0	66	0.00
1/16/2010	0.0000	50	72	0.00	0	66	0.00
1/17/2010	1.2157	84	91	0.52	67,995	89	0.33
1/18/2010	0.0690	84	91	0.00	1,674	89	0.00
1/19/2010	0.0000	84	91	0.00	0	89	0.00
1/20/2010	0.0000	84	91	0.00	0	89	0.00
1/21/2010	0.0729	84	91	0.00	1,894	89	0.00
1/22/2010	0.6319	69	82	0.02	34,229	78	0.00
1/23/2010	0.0000	69	82	0.00	0	78	0.00
1/24/2010	0.0462	69	82	0.00	352	78	0.00
1/25/2010	1.9390	84	91	1.11	109,832	89	0.77
1/26/2010	0.0000	84	91	0.00	0	89	0.00
1/27/2010	0.0000	84	91	0.00	0	89	0.00
1/28/2010	0.0000	84	91	0.00	0	89	0.00
1/29/2010	0.0000	84	91	0.00	0	89	0.00
1/30/2010	0.5038	69	82	0.00	26,820	78	0.00
1/31/2010	0.0129	69	82	0.00	0	78	0.00
2/1/2010	0.0000	69	82	0.00	0	78	0.00
2/2/2010	0.3514	69	82	0.00	18,007	78	0.00
2/3/2010	0.0062	69	82	0.00	0	78	0.00
2/4/2010	0.0000	50	72	0.00	0	66	0.00
2/5/2010	1.7571	84	91	0.95	99,311	89	0.65

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
2/6/2010	0.6181	84	91	0.13	33,430	89	0.07
2/7/2010	0.0000	84	91	0.00	0	89	0.00
2/8/2010	0.0000	84	91	0.00	0	89	0.00
2/9/2010	0.0000	84	91	0.00	0	89	0.00
2/10/2010	0.1967	69	82	0.00	9,055	78	0.00
2/11/2010	0.0000	50	72	0.00	0	66	0.00
2/12/2010	0.0000	50	72	0.00	0	66	0.00
2/13/2010	0.2186	50	72	0.00	10,322	66	0.00
2/14/2010	0.0000	50	72	0.00	0	66	0.00
2/15/2010	0.2229	50	72	0.00	10,570	66	0.00
2/16/2010	0.0186	50	72	0.00	0	66	0.00
2/17/2010	0.0000	50	72	0.00	0	66	0.00
2/18/2010	0.0000	50	72	0.00	0	66	0.00
2/19/2010	0.0000	50	72	0.00	0	66	0.00
2/20/2010	0.0000	50	72	0.00	0	66	0.00
2/21/2010	0.0000	50	72	0.00	0	66	0.00
2/22/2010	0.6610	69	82	0.02	35,909	78	0.00
2/23/2010	0.0014	69	82	0.00	0	78	0.00
2/24/2010	0.0000	69	82	0.00	0	78	0.00
2/25/2010	0.0000	69	82	0.00	0	78	0.00
2/26/2010	0.0000	69	82	0.00	0	78	0.00
2/27/2010	0.0000	50	72	0.00	0	66	0.00
2/28/2010	0.0000	50	72	0.00	0	66	0.00
3/1/2010	0.0000	50	72	0.00	0	66	0.00
3/2/2010	0.3129	50	72	0.00	15,776	66	0.00
3/3/2010	0.4448	69	82	0.00	23,405	78	0.00
3/4/2010	0.0000	69	82	0.00	0	78	0.00
3/5/2010	0.0000	69	82	0.00	0	78	0.00
3/6/2010	0.0000	69	82	0.00	0	78	0.00
3/7/2010	0.0000	50	72	0.00	0	66	0.00
3/8/2010	0.0000	50	72	0.00	0	66	0.00
3/9/2010	0.0000	50	72	0.00	0	66	0.00
3/10/2010	0.2852	50	72	0.00	14,178	66	0.00
3/11/2010	1.9786	84	91	1.14	112,118	89	0.80
3/12/2010	0.0805	84	91	0.00	2,335	89	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
3/13/2010	0.7252	84	91	0.18	39,627	89	0.10
3/14/2010	0.0238	84	91	0.00	0	89	0.00
3/15/2010	0.0962	84	91	0.00	3,244	89	0.00
3/16/2010	0.0000	69	82	0.00	0	78	0.00
3/17/2010	0.0000	69	82	0.00	0	78	0.00
3/18/2010	0.1652	50	72	0.00	7,238	66	0.00
3/19/2010	0.0000	50	72	0.00	0	66	0.00
3/20/2010	0.0000	50	72	0.00	0	66	0.00
3/21/2010	0.0019	50	72	0.00	0	66	0.00
3/22/2010	0.4181	69	82	0.00	21,862	78	0.00
3/23/2010	0.1319	69	82	0.00	5,310	78	0.00
3/24/2010	0.0000	69	82	0.00	0	78	0.00
3/25/2010	0.0000	69	82	0.00	0	78	0.00
3/26/2010	0.0614	69	82	0.00	1,233	78	0.00
3/27/2010	0.0000	50	72	0.00	0	66	0.00
3/28/2010	0.0029	50	72	0.00	0	66	0.00
3/29/2010	0.1105	50	72	0.00	4,070	66	0.00
3/30/2010	0.0000	50	72	0.00	0	66	0.00
3/31/2010	0.0000	50	72	0.00	0	66	0.00
4/1/2010	0.0000	50	72	0.00	0	66	0.00
4/2/2010	0.0000	50	72	0.00	0	66	0.00
4/3/2010	0.0000	50	72	0.00	0	66	0.00
4/4/2010	0.0000	50	72	0.00	0	66	0.00
4/5/2010	0.0000	50	72	0.00	0	66	0.00
4/6/2010	0.0000	50	72	0.00	0	66	0.00
4/7/2010	0.0000	50	72	0.00	0	66	0.00
4/8/2010	0.0000	50	72	0.00	0	66	0.00
4/9/2010	0.6186	50	72	0.00	33,458	66	0.00
4/10/2010	0.0000	50	72	0.00	0	66	0.00
4/11/2010	0.0000	50	72	0.00	0	66	0.00
4/12/2010	0.0000	50	72	0.00	0	66	0.00
4/13/2010	0.0000	50	72	0.00	0	66	0.00
4/14/2010	0.0000	50	72	0.00	0	66	0.00
4/15/2010	0.0000	50	72	0.00	0	66	0.00
4/16/2010	0.0000	50	72	0.00	0	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
4/17/2010	0.0000	50	72	0.00	0	66	0.00
4/18/2010	0.0000	50	72	0.00	0	66	0.00
4/19/2010	0.0000	50	72	0.00	0	66	0.00
4/20/2010	0.0552	50	72	0.00	875	66	0.00
4/21/2010	0.1767	50	72	0.00	7,899	66	0.00
4/22/2010	0.0000	50	72	0.00	0	66	0.00
4/23/2010	0.0000	50	72	0.00	0	66	0.00
4/24/2010	0.3495	50	72	0.00	17,896	66	0.00
4/25/2010	1.3319	69	82	0.26	74,716	78	0.13
4/26/2010	0.0124	69	82	0.00	0	78	0.00
4/27/2010	0.0000	69	82	0.00	0	78	0.00
4/28/2010	0.0567	69	82	0.00	958	78	0.00
4/29/2010	0.0000	69	82	0.00	0	78	0.00
4/30/2010	0.0000	50	72	0.00	0	66	0.00
5/1/2010	0.0000	50	72	0.00	0	66	0.00
5/2/2010	0.0000	50	72	0.00	0	66	0.00
5/3/2010	3.9062	84	91	2.93	223,609	89	2.15
5/4/2010	0.4829	84	91	0.06	25,608	89	0.03
5/5/2010	0.0000	84	91	0.00	0	89	0.00
5/6/2010	0.0000	84	91	0.00	0	89	0.00
5/7/2010	0.0000	84	91	0.00	0	89	0.00
5/8/2010	0.0000	50	72	0.00	0	66	0.00
5/9/2010	0.0000	50	72	0.00	0	66	0.00
5/10/2010	0.0000	50	72	0.00	0	66	0.00
5/11/2010	0.2057	50	72	0.00	9,579	66	0.00
5/12/2010	0.0000	50	72	0.00	0	66	0.00
5/13/2010	0.0000	50	72	0.00	0	66	0.00
5/14/2010	0.0000	50	72	0.00	0	66	0.00
5/15/2010	0.1286	50	72	0.00	5,117	66	0.00
5/16/2010	0.0014	50	72	0.00	0	66	0.00
5/17/2010	0.0862	50	72	0.00	2,666	66	0.00
5/18/2010	0.0000	50	72	0.00	0	66	0.00
5/19/2010	0.0000	50	72	0.00	0	66	0.00
5/20/2010	0.0000	50	72	0.00	0	66	0.00
5/21/2010	1.0329	50	72	0.02	57,419	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
5/22/2010	0.4286	69	82	0.00	22,468	78	0.00
5/23/2010	0.0000	69	82	0.00	0	78	0.00
5/24/2010	0.0000	69	82	0.00	0	78	0.00
5/25/2010	0.0000	69	82	0.00	0	78	0.00
5/26/2010	0.0005	50	72	0.00	0	66	0.00
5/27/2010	0.1033	50	72	0.00	3,657	66	0.00
5/28/2010	0.0019	50	72	0.00	0	66	0.00
5/29/2010	0.7757	50	72	0.00	42,547	66	0.00
5/30/2010	0.1686	50	72	0.00	7,430	66	0.00
5/31/2010	0.1319	50	72	0.00	5,310	66	0.00
6/1/2010	0.1338	50	72	0.00	5,420	66	0.00
6/2/2010	0.2290	69	82	0.00	10,928	78	0.00
6/3/2010	0.3914	50	72	0.00	20,320	66	0.00
6/4/2010	0.0000	50	72	0.00	0	66	0.00
6/5/2010	0.3252	50	72	0.00	16,492	66	0.00
6/6/2010	0.0000	50	72	0.00	0	66	0.00
6/7/2010	0.0319	50	72	0.00	0	66	0.00
6/8/2010	0.0000	50	72	0.00	0	66	0.00
6/9/2010	0.0162	50	72	0.00	0	66	0.00
6/10/2010	0.0114	50	72	0.00	0	66	0.00
6/11/2010	0.0452	50	72	0.00	297	66	0.00
6/12/2010	0.0476	50	72	0.00	435	66	0.00
6/13/2010	0.0000	50	72	0.00	0	66	0.00
6/14/2010	0.0000	50	72	0.00	0	66	0.00
6/15/2010	0.0000	50	72	0.00	0	66	0.00
6/16/2010	0.6129	50	72	0.00	33,127	66	0.00
6/17/2010	0.0605	50	72	0.00	1,178	66	0.00
6/18/2010	0.0462	50	72	0.00	352	66	0.00
6/19/2010	0.0386	50	72	0.00	0	66	0.00
6/20/2010	0.0333	50	72	0.00	0	66	0.00
6/21/2010	0.0010	50	72	0.00	0	66	0.00
6/22/2010	0.0024	50	72	0.00	0	66	0.00
6/23/2010	0.0024	50	72	0.00	0	66	0.00
6/24/2010	0.0124	50	72	0.00	0	66	0.00
6/25/2010	0.0000	50	72	0.00	0	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
6/26/2010	0.0086	50	72	0.00	0	66	0.00
6/27/2010	0.0000	50	72	0.00	0	66	0.00
6/28/2010	0.0000	50	72	0.00	0	66	0.00
6/29/2010	0.0052	50	72	0.00	0	66	0.00
6/30/2010	0.3495	50	72	0.00	17,896	66	0.00
7/1/2010	0.0695	50	72	0.00	1,702	66	0.00
7/2/2010	0.0010	50	72	0.00	0	66	0.00
7/3/2010	0.0057	50	72	0.00	0	66	0.00
7/4/2010	0.0000	50	72	0.00	0	66	0.00
7/5/2010	0.0000	50	72	0.00	0	66	0.00
7/6/2010	0.0000	50	72	0.00	0	66	0.00
7/7/2010	0.0000	50	72	0.00	0	66	0.00
7/8/2010	0.0000	50	72	0.00	0	66	0.00
7/9/2010	0.0000	50	72	0.00	0	66	0.00
7/10/2010	0.2843	50	72	0.00	14,123	66	0.00
7/11/2010	0.0000	50	72	0.00	0	66	0.00
7/12/2010	0.0129	50	72	0.00	0	66	0.00
7/13/2010	0.7676	50	72	0.00	42,078	66	0.00
7/14/2010	0.6229	69	82	0.01	33,706	78	0.00
7/15/2010	0.0000	69	82	0.00	0	78	0.00
7/16/2010	0.0005	69	82	0.00	0	78	0.00
7/17/2010	0.0748	69	82	0.00	2,005	78	0.00
7/18/2010	0.1138	50	72	0.00	4,263	66	0.00
7/19/2010	0.4638	50	72	0.00	24,506	66	0.00
7/20/2010	0.0000	50	72	0.00	0	66	0.00
7/21/2010	0.0438	50	72	0.00	214	66	0.00
7/22/2010	0.0662	50	72	0.00	1,509	66	0.00
7/23/2010	0.0005	50	72	0.00	0	66	0.00
7/24/2010	0.0786	50	72	0.00	2,225	66	0.00
7/25/2010	0.0033	50	72	0.00	0	66	0.00
7/26/2010	0.0000	50	72	0.00	0	66	0.00
7/27/2010	0.5629	50	72	0.00	30,235	66	0.00
7/28/2010	0.0314	50	72	0.00	0	66	0.00
7/29/2010	0.0900	50	72	0.00	2,886	66	0.00
7/30/2010	0.0000	50	72	0.00	0	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
7/31/2010	0.0000	50	72	0.00	0	66	0.00
8/1/2010	0.3214	50	72	0.00	16,271	66	0.00
8/2/2010	0.5257	50	72	0.00	28,087	66	0.00
8/3/2010	0.0000	50	72	0.00	0	66	0.00
8/4/2010	0.0571	50	72	0.00	985	66	0.00
8/5/2010	0.0000	50	72	0.00	0	66	0.00
8/6/2010	0.0057	50	72	0.00	0	66	0.00
8/7/2010	0.4238	50	72	0.00	22,193	66	0.00
8/8/2010	0.0005	50	72	0.00	0	66	0.00
8/9/2010	0.0000	50	72	0.00	0	66	0.00
8/10/2010	0.0000	50	72	0.00	0	66	0.00
8/11/2010	0.0000	50	72	0.00	0	66	0.00
8/12/2010	0.0000	50	72	0.00	0	66	0.00
8/13/2010	0.0000	50	72	0.00	0	66	0.00
8/14/2010	0.1281	50	72	0.00	5,089	66	0.00
8/15/2010	0.1529	50	72	0.00	6,521	66	0.00
8/16/2010	0.0000	50	72	0.00	0	66	0.00
8/17/2010	0.0000	50	72	0.00	0	66	0.00
8/18/2010	0.0224	50	72	0.00	0	66	0.00
8/19/2010	0.0000	50	72	0.00	0	66	0.00
8/20/2010	0.0224	50	72	0.00	0	66	0.00
8/21/2010	1.1257	50	72	0.03	62,790	66	0.00
8/22/2010	0.1319	50	72	0.00	5,310	66	0.00
8/23/2010	0.0000	50	72	0.00	0	66	0.00
8/24/2010	0.0000	50	72	0.00	0	66	0.00
8/25/2010	0.0000	50	72	0.00	0	66	0.00
8/26/2010	0.9524	50	72	0.01	52,765	66	0.00
8/27/2010	0.3010	50	72	0.00	15,087	66	0.00
8/28/2010	0.0005	50	72	0.00	0	66	0.00
8/29/2010	0.0662	50	72	0.00	1,509	66	0.00
8/30/2010	0.0000	50	72	0.00	0	66	0.00
8/31/2010	0.0000	50	72	0.00	0	66	0.00
9/1/2010	0.0000	50	72	0.00	0	66	0.00
9/2/2010	0.0000	50	72	0.00	0	66	0.00
9/3/2010	0.0000	50	72	0.00	0	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
9/4/2010	0.0000	50	72	0.00	0	66	0.00
9/5/2010	0.0000	50	72	0.00	0	66	0.00
9/6/2010	0.0000	50	72	0.00	0	66	0.00
9/7/2010	0.0000	50	72	0.00	0	66	0.00
9/8/2010	0.0000	50	72	0.00	0	66	0.00
9/9/2010	0.0195	50	72	0.00	0	66	0.00
9/10/2010	0.0000	50	72	0.00	0	66	0.00
9/11/2010	0.0000	50	72	0.00	0	66	0.00
9/12/2010	0.3424	50	72	0.00	17,483	66	0.00
9/13/2010	0.0000	50	72	0.00	0	66	0.00
9/14/2010	0.0000	50	72	0.00	0	66	0.00
9/15/2010	0.0000	50	72	0.00	0	66	0.00
9/16/2010	0.0000	50	72	0.00	0	66	0.00
9/17/2010	0.0000	50	72	0.00	0	66	0.00
9/18/2010	0.0010	50	72	0.00	0	66	0.00
9/19/2010	0.0000	50	72	0.00	0	66	0.00
9/20/2010	0.0000	50	72	0.00	0	66	0.00
9/21/2010	0.0000	50	72	0.00	0	66	0.00
9/22/2010	0.0000	50	72	0.00	0	66	0.00
9/23/2010	0.0443	50	72	0.00	242	66	0.00
9/24/2010	0.0000	50	72	0.00	0	66	0.00
9/25/2010	0.0000	50	72	0.00	0	66	0.00
9/26/2010	0.0614	50	72	0.00	1,233	66	0.00
9/27/2010	0.9367	50	72	0.01	51,856	66	0.00
9/28/2010	0.2852	50	72	0.00	14,178	66	0.00
9/29/2010	0.0000	50	72	0.00	0	66	0.00
9/30/2010	0.5414	69	82	0.00	28,996	78	0.00
10/1/2010	0.0038	69	82	0.00	0	78	0.00
10/2/2010	0.0000	50	72	0.00	0	66	0.00
10/3/2010	0.0000	50	72	0.00	0	66	0.00
10/4/2010	0.0000	50	72	0.00	0	66	0.00
10/5/2010	0.0000	50	72	0.00	0	66	0.00
10/6/2010	0.0000	50	72	0.00	0	66	0.00
10/7/2010	0.0000	50	72	0.00	0	66	0.00
10/8/2010	0.0000	50	72	0.00	0	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
10/9/2010	0.0000	50	72	0.00	0	66	0.00
10/10/2010	0.0000	50	72	0.00	0	66	0.00
10/11/2010	0.0000	50	72	0.00	0	66	0.00
10/12/2010	0.0000	50	72	0.00	0	66	0.00
10/13/2010	0.0181	50	72	0.00	0	66	0.00
10/14/2010	0.0000	50	72	0.00	0	66	0.00
10/15/2010	0.0000	50	72	0.00	0	66	0.00
10/16/2010	0.0000	50	72	0.00	0	66	0.00
10/17/2010	0.0000	50	72	0.00	0	66	0.00
10/18/2010	0.0000	50	72	0.00	0	66	0.00
10/19/2010	0.0000	50	72	0.00	0	66	0.00
10/20/2010	0.0414	50	72	0.00	77	66	0.00
10/21/2010	0.0000	50	72	0.00	0	66	0.00
10/22/2010	0.0000	50	72	0.00	0	66	0.00
10/23/2010	0.0000	50	72	0.00	0	66	0.00
10/24/2010	0.0000	50	72	0.00	0	66	0.00
10/25/2010	0.0005	50	72	0.00	0	66	0.00
10/26/2010	0.1195	50	72	0.00	4,594	66	0.00
10/27/2010	0.0105	50	72	0.00	0	66	0.00
10/28/2010	1.6743	69	82	0.44	94,519	78	0.25
10/29/2010	0.0000	69	82	0.00	0	78	0.00
10/30/2010	0.0000	69	82	0.00	0	78	0.00
10/31/2010	0.0000	69	82	0.00	0	78	0.00
11/1/2010	0.0000	84	91	0.00	0	89	0.00
11/2/2010	0.0000	50	72	0.00	0	66	0.00
11/3/2010	0.1724	50	72	0.00	7,651	66	0.00
11/4/2010	0.4038	69	82	0.00	21,036	78	0.00
11/5/2010	0.0000	69	82	0.00	0	78	0.00
11/6/2010	0.0467	69	82	0.00	380	78	0.00
11/7/2010	0.0000	69	82	0.00	0	78	0.00
11/8/2010	0.0000	50	72	0.00	0	66	0.00
11/9/2010	0.0000	50	72	0.00	0	66	0.00
11/10/2010	0.0000	50	72	0.00	0	66	0.00
11/11/2010	0.0000	50	72	0.00	0	66	0.00
11/12/2010	0.0000	50	72	0.00	0	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
11/13/2010	0.0000	50	72	0.00	0	66	0.00
11/14/2010	0.0000	50	72	0.00	0	66	0.00
11/15/2010	0.4871	50	72	0.00	25,856	66	0.00
11/16/2010	1.2752	84	91	0.56	71,438	89	0.37
11/17/2010	0.0543	84	91	0.00	820	89	0.00
11/18/2010	0.0000	84	91	0.00	0	89	0.00
11/19/2010	0.0000	84	91	0.00	0	89	0.00
11/20/2010	0.0000	84	91	0.00	0	89	0.00
11/21/2010	0.0000	50	72	0.00	0	66	0.00
11/22/2010	0.0000	50	72	0.00	0	66	0.00
11/23/2010	0.0000	50	72	0.00	0	66	0.00
11/24/2010	0.1462	50	72	0.00	6,136	66	0.00
11/25/2010	0.0000	50	72	0.00	0	66	0.00
11/26/2010	0.0119	50	72	0.00	0	66	0.00
11/27/2010	0.1014	50	72	0.00	3,547	66	0.00
11/28/2010	0.0000	50	72	0.00	0	66	0.00
11/29/2010	0.0000	50	72	0.00	0	66	0.00
11/30/2010	0.5062	69	82	0.00	26,958	78	0.00
12/1/2010	2.2162	84	91	1.35	125,862	89	0.95
12/2/2010	0.0000	84	91	0.00	0	89	0.00
12/3/2010	0.0000	84	91	0.00	0	89	0.00
12/4/2010	0.0000	84	91	0.00	0	89	0.00
12/5/2010	0.0000	84	91	0.00	0	89	0.00
12/6/2010	0.0000	50	72	0.00	0	66	0.00
12/7/2010	0.0000	50	72	0.00	0	66	0.00
12/8/2010	0.0000	50	72	0.00	0	66	0.00
12/9/2010	0.0000	50	72	0.00	0	66	0.00
12/10/2010	0.0000	50	72	0.00	0	66	0.00
12/11/2010	0.0000	50	72	0.00	0	66	0.00
12/12/2010	0.5533	69	82	0.01	29,684	78	0.00
12/13/2010	0.0081	69	82	0.00	0	78	0.00
12/14/2010	0.0000	69	82	0.00	0	78	0.00
12/15/2010	0.0000	69	82	0.00	0	78	0.00
12/16/2010	0.0343	69	82	0.00	0	78	0.00
12/17/2010	0.1957	50	72	0.00	9,000	66	0.00

Table 54. Stormwater runoff and rainwater harvesting calculation for RG-5 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 46%		Rainwater harvesting, gal	Imperviousness, 32% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
12/18/2010	0.0610	50	72	0.00	1,206	66	0.00
12/19/2010	0.1176	50	72	0.00	4,483	66	0.00
12/20/2010	0.0000	50	72	0.00	0	66	0.00
12/21/2010	0.0000	50	72	0.00	0	66	0.00
12/22/2010	0.0076	50	72	0.00	0	66	0.00
12/23/2010	0.0000	50	72	0.00	0	66	0.00
12/24/2010	0.0000	50	72	0.00	0	66	0.00
12/25/2010	0.0000	50	72	0.00	0	66	0.00
12/26/2010	0.3929	50	72	0.00	20,403	66	0.00
12/27/2010	0.0162	50	72	0.00	0	66	0.00
12/28/2010	0.0000	50	72	0.00	0	66	0.00
12/29/2010	0.0000	50	72	0.00	0	66	0.00
12/30/2010	0.0000	50	72	0.00	0	66	0.00
12/31/2010	0.0043	50	72	0.00	0	66	0.00
Total	44.45			9.77	2,305,301		6.61

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
1/1/2010	0.0248	50	82	0.00	0	77	0.00
1/2/2010	0.0248	50	82	0.00	0	77	0.00
1/3/2010	0.0000	50	82	0.00	0	77	0.00
1/4/2010	0.0000	50	82	0.00	0	77	0.00
1/5/2010	0.0000	50	82	0.00	0	77	0.00
1/6/2010	0.0000	50	82	0.00	0	77	0.00
1/7/2010	0.0000	50	82	0.00	0	77	0.00
1/8/2010	0.1119	50	82	0.00	4,991	77	0.00
1/9/2010	0.0000	50	82	0.00	0	77	0.00
1/10/2010	0.0000	50	82	0.00	0	77	0.00
1/11/2010	0.0000	50	82	0.00	0	77	0.00
1/12/2010	0.0000	50	82	0.00	0	77	0.00
1/13/2010	0.0000	50	82	0.00	0	77	0.00
1/14/2010	0.0000	50	82	0.00	0	77	0.00
1/15/2010	0.0000	50	82	0.00	0	77	0.00
1/16/2010	0.0000	50	82	0.00	0	77	0.00
1/17/2010	1.2157	84	93	0.62	81,722	92	0.42
1/18/2010	0.0690	84	93	0.00	2,012	92	0.00
1/19/2010	0.0000	84	93	0.00	0	92	0.00
1/20/2010	0.0000	84	93	0.00	0	92	0.00
1/21/2010	0.0729	84	93	0.00	2,277	92	0.00
1/22/2010	0.6319	69	88	0.07	41,139	85	0.03
1/23/2010	0.0000	69	88	0.00	0	85	0.00
1/24/2010	0.0462	69	88	0.00	423	85	0.00
1/25/2010	1.9390	84	93	1.26	132,005	92	0.88
1/26/2010	0.0000	84	93	0.00	0	92	0.00
1/27/2010	0.0000	84	93	0.00	0	92	0.00
1/28/2010	0.0000	84	93	0.00	0	92	0.00
1/29/2010	0.0000	84	93	0.00	0	92	0.00
1/30/2010	0.5038	69	88	0.03	32,234	85	0.01
1/31/2010	0.0129	69	88	0.00	0	85	0.00
2/1/2010	0.0000	69	88	0.00	0	85	0.00
2/2/2010	0.3514	69	88	0.00	21,642	85	0.00
2/3/2010	0.0062	69	88	0.00	0	85	0.00
2/4/2010	0.0000	50	82	0.00	0	77	0.00
2/5/2010	1.7571	84	93	1.09	119,360	92	0.76

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
2/6/2010	0.6181	84	93	0.18	40,179	92	0.11
2/7/2010	0.0000	84	93	0.00	0	92	0.00
2/8/2010	0.0000	84	93	0.00	0	92	0.00
2/9/2010	0.0000	84	93	0.00	0	92	0.00
2/10/2010	0.1967	69	88	0.00	10,883	85	0.00
2/11/2010	0.0000	50	82	0.00	0	77	0.00
2/12/2010	0.0000	50	82	0.00	0	77	0.00
2/13/2010	0.2186	50	82	0.00	12,406	77	0.00
2/14/2010	0.0000	50	82	0.00	0	77	0.00
2/15/2010	0.2229	50	82	0.00	12,704	77	0.00
2/16/2010	0.0186	50	82	0.00	0	77	0.00
2/17/2010	0.0000	50	82	0.00	0	77	0.00
2/18/2010	0.0000	50	82	0.00	0	77	0.00
2/19/2010	0.0000	50	82	0.00	0	77	0.00
2/20/2010	0.0000	50	82	0.00	0	77	0.00
2/21/2010	0.0000	50	82	0.00	0	77	0.00
2/22/2010	0.6610	69	88	0.09	43,158	85	0.03
2/23/2010	0.0014	69	88	0.00	0	85	0.00
2/24/2010	0.0000	69	88	0.00	0	85	0.00
2/25/2010	0.0000	69	88	0.00	0	85	0.00
2/26/2010	0.0000	69	88	0.00	0	85	0.00
2/27/2010	0.0000	50	82	0.00	0	77	0.00
2/28/2010	0.0000	50	82	0.00	0	77	0.00
3/1/2010	0.0000	50	82	0.00	0	77	0.00
3/2/2010	0.3129	50	82	0.00	18,960	77	0.00
3/3/2010	0.4448	69	88	0.02	28,130	85	0.00
3/4/2010	0.0000	69	88	0.00	0	85	0.00
3/5/2010	0.0000	69	88	0.00	0	85	0.00
3/6/2010	0.0000	69	88	0.00	0	85	0.00
3/7/2010	0.0000	50	82	0.00	0	77	0.00
3/8/2010	0.0000	50	82	0.00	0	77	0.00
3/9/2010	0.0000	50	82	0.00	0	77	0.00
3/10/2010	0.2852	50	82	0.00	17,040	77	0.00
3/11/2010	1.9786	84	93	1.29	134,752	92	0.91
3/12/2010	0.0805	84	93	0.00	2,806	92	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
3/13/2010	0.7252	84	93	0.25	47,627	92	0.16
3/14/2010	0.0238	84	93	0.00	0	92	0.00
3/15/2010	0.0962	84	93	0.00	3,899	92	0.00
3/16/2010	0.0000	69	88	0.00	0	85	0.00
3/17/2010	0.0000	69	88	0.00	0	85	0.00
3/18/2010	0.1652	50	82	0.00	8,699	77	0.00
3/19/2010	0.0000	50	82	0.00	0	77	0.00
3/20/2010	0.0000	50	82	0.00	0	77	0.00
3/21/2010	0.0019	50	82	0.00	0	77	0.00
3/22/2010	0.4181	69	88	0.01	26,276	85	0.00
3/23/2010	0.1319	69	88	0.00	6,381	85	0.00
3/24/2010	0.0000	69	88	0.00	0	85	0.00
3/25/2010	0.0000	69	88	0.00	0	85	0.00
3/26/2010	0.0614	69	88	0.00	1,482	85	0.00
3/27/2010	0.0000	50	82	0.00	0	77	0.00
3/28/2010	0.0029	50	82	0.00	0	77	0.00
3/29/2010	0.1105	50	82	0.00	4,892	77	0.00
3/30/2010	0.0000	50	82	0.00	0	77	0.00
3/31/2010	0.0000	50	82	0.00	0	77	0.00
4/1/2010	0.0000	50	82	0.00	0	77	0.00
4/2/2010	0.0000	50	82	0.00	0	77	0.00
4/3/2010	0.0000	50	82	0.00	0	77	0.00
4/4/2010	0.0000	50	82	0.00	0	77	0.00
4/5/2010	0.0000	50	82	0.00	0	77	0.00
4/6/2010	0.0000	50	82	0.00	0	77	0.00
4/7/2010	0.0000	50	82	0.00	0	77	0.00
4/8/2010	0.0000	50	82	0.00	0	77	0.00
4/9/2010	0.6186	50	82	0.01	40,212	77	0.00
4/10/2010	0.0000	50	82	0.00	0	77	0.00
4/11/2010	0.0000	50	82	0.00	0	77	0.00
4/12/2010	0.0000	50	82	0.00	0	77	0.00
4/13/2010	0.0000	50	82	0.00	0	77	0.00
4/14/2010	0.0000	50	82	0.00	0	77	0.00
4/15/2010	0.0000	50	82	0.00	0	77	0.00
4/16/2010	0.0000	50	82	0.00	0	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
4/17/2010	0.0000	50	82	0.00	0	77	0.00
4/18/2010	0.0000	50	82	0.00	0	77	0.00
4/19/2010	0.0000	50	82	0.00	0	77	0.00
4/20/2010	0.0552	50	82	0.00	1,052	77	0.00
4/21/2010	0.1767	50	82	0.00	9,493	77	0.00
4/22/2010	0.0000	50	82	0.00	0	77	0.00
4/23/2010	0.0000	50	82	0.00	0	77	0.00
4/24/2010	0.3495	50	82	0.00	21,509	77	0.00
4/25/2010	1.3319	69	88	0.46	89,799	85	0.26
4/26/2010	0.0124	69	88	0.00	0	85	0.00
4/27/2010	0.0000	69	88	0.00	0	85	0.00
4/28/2010	0.0567	69	88	0.00	1,151	85	0.00
4/29/2010	0.0000	69	88	0.00	0	85	0.00
4/30/2010	0.0000	50	82	0.00	0	77	0.00
5/1/2010	0.0000	50	82	0.00	0	77	0.00
5/2/2010	0.0000	50	82	0.00	0	77	0.00
5/3/2010	3.9062	84	93	3.13	268,750	92	2.25
5/4/2010	0.4829	84	93	0.10	30,778	92	0.06
5/5/2010	0.0000	84	93	0.00	0	92	0.00
5/6/2010	0.0000	84	93	0.00	0	92	0.00
5/7/2010	0.0000	84	93	0.00	0	92	0.00
5/8/2010	0.0000	50	82	0.00	0	77	0.00
5/9/2010	0.0000	50	82	0.00	0	77	0.00
5/10/2010	0.0000	50	82	0.00	0	77	0.00
5/11/2010	0.2057	50	82	0.00	11,512	77	0.00
5/12/2010	0.0000	50	82	0.00	0	77	0.00
5/13/2010	0.0000	50	82	0.00	0	77	0.00
5/14/2010	0.0000	50	82	0.00	0	77	0.00
5/15/2010	0.1286	50	82	0.00	6,150	77	0.00
5/16/2010	0.0014	50	82	0.00	0	77	0.00
5/17/2010	0.0862	50	82	0.00	3,204	77	0.00
5/18/2010	0.0000	50	82	0.00	0	77	0.00
5/19/2010	0.0000	50	82	0.00	0	77	0.00
5/20/2010	0.0000	50	82	0.00	0	77	0.00
5/21/2010	1.0329	50	82	0.13	69,011	77	0.04

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
5/22/2010	0.4286	69	88	0.02	27,004	85	0.00
5/23/2010	0.0000	69	88	0.00	0	85	0.00
5/24/2010	0.0000	69	88	0.00	0	85	0.00
5/25/2010	0.0000	69	88	0.00	0	85	0.00
5/26/2010	0.0005	50	82	0.00	0	77	0.00
5/27/2010	0.1033	50	82	0.00	4,395	77	0.00
5/28/2010	0.0019	50	82	0.00	0	77	0.00
5/29/2010	0.7757	50	82	0.04	51,136	77	0.01
5/30/2010	0.1686	50	82	0.00	8,930	77	0.00
5/31/2010	0.1319	50	82	0.00	6,381	77	0.00
6/1/2010	0.1338	50	82	0.00	6,514	77	0.00
6/2/2010	0.2290	69	88	0.00	13,134	85	0.00
6/3/2010	0.3914	50	82	0.00	24,422	77	0.00
6/4/2010	0.0000	50	82	0.00	0	77	0.00
6/5/2010	0.3252	50	82	0.00	19,821	77	0.00
6/6/2010	0.0000	50	82	0.00	0	77	0.00
6/7/2010	0.0319	50	82	0.00	0	77	0.00
6/8/2010	0.0000	50	82	0.00	0	77	0.00
6/9/2010	0.0162	50	82	0.00	0	77	0.00
6/10/2010	0.0114	50	82	0.00	0	77	0.00
6/11/2010	0.0452	50	82	0.00	357	77	0.00
6/12/2010	0.0476	50	82	0.00	522	77	0.00
6/13/2010	0.0000	50	82	0.00	0	77	0.00
6/14/2010	0.0000	50	82	0.00	0	77	0.00
6/15/2010	0.0000	50	82	0.00	0	77	0.00
6/16/2010	0.6129	50	82	0.01	39,815	77	0.00
6/17/2010	0.0605	50	82	0.00	1,416	77	0.00
6/18/2010	0.0462	50	82	0.00	423	77	0.00
6/19/2010	0.0386	50	82	0.00	0	77	0.00
6/20/2010	0.0333	50	82	0.00	0	77	0.00
6/21/2010	0.0010	50	82	0.00	0	77	0.00
6/22/2010	0.0024	50	82	0.00	0	77	0.00
6/23/2010	0.0024	50	82	0.00	0	77	0.00
6/24/2010	0.0124	50	82	0.00	0	77	0.00
6/25/2010	0.0000	50	82	0.00	0	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
6/26/2010	0.0086	50	82	0.00	0	77	0.00
6/27/2010	0.0000	50	82	0.00	0	77	0.00
6/28/2010	0.0000	50	82	0.00	0	77	0.00
6/29/2010	0.0052	50	82	0.00	0	77	0.00
6/30/2010	0.3495	50	82	0.00	21,509	77	0.00
7/1/2010	0.0695	50	82	0.00	2,045	77	0.00
7/2/2010	0.0010	50	82	0.00	0	77	0.00
7/3/2010	0.0057	50	82	0.00	0	77	0.00
7/4/2010	0.0000	50	82	0.00	0	77	0.00
7/5/2010	0.0000	50	82	0.00	0	77	0.00
7/6/2010	0.0000	50	82	0.00	0	77	0.00
7/7/2010	0.0000	50	82	0.00	0	77	0.00
7/8/2010	0.0000	50	82	0.00	0	77	0.00
7/9/2010	0.0000	50	82	0.00	0	77	0.00
7/10/2010	0.2843	50	82	0.00	16,974	77	0.00
7/11/2010	0.0000	50	82	0.00	0	77	0.00
7/12/2010	0.0129	50	82	0.00	0	77	0.00
7/13/2010	0.7676	50	82	0.04	50,573	77	0.01
7/14/2010	0.6229	69	88	0.07	40,510	85	0.03
7/15/2010	0.0000	69	88	0.00	0	85	0.00
7/16/2010	0.0005	69	88	0.00	0	85	0.00
7/17/2010	0.0748	69	88	0.00	2,409	85	0.00
7/18/2010	0.1138	50	82	0.00	5,124	77	0.00
7/19/2010	0.4638	50	82	0.00	29,454	77	0.00
7/20/2010	0.0000	50	82	0.00	0	77	0.00
7/21/2010	0.0438	50	82	0.00	258	77	0.00
7/22/2010	0.0662	50	82	0.00	1,813	77	0.00
7/23/2010	0.0005	50	82	0.00	0	77	0.00
7/24/2010	0.0786	50	82	0.00	2,674	77	0.00
7/25/2010	0.0033	50	82	0.00	0	77	0.00
7/26/2010	0.0000	50	82	0.00	0	77	0.00
7/27/2010	0.5629	50	82	0.01	36,339	77	0.00
7/28/2010	0.0314	50	82	0.00	0	77	0.00
7/29/2010	0.0900	50	82	0.00	3,468	77	0.00
7/30/2010	0.0000	50	82	0.00	0	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
7/31/2010	0.0000	50	82	0.00	0	77	0.00
8/1/2010	0.3214	50	82	0.00	19,556	77	0.00
8/2/2010	0.5257	50	82	0.00	33,757	77	0.00
8/3/2010	0.0000	50	82	0.00	0	77	0.00
8/4/2010	0.0571	50	82	0.00	1,184	77	0.00
8/5/2010	0.0000	50	82	0.00	0	77	0.00
8/6/2010	0.0057	50	82	0.00	0	77	0.00
8/7/2010	0.4238	50	82	0.00	26,673	77	0.00
8/8/2010	0.0005	50	82	0.00	0	77	0.00
8/9/2010	0.0000	50	82	0.00	0	77	0.00
8/10/2010	0.0000	50	82	0.00	0	77	0.00
8/11/2010	0.0000	50	82	0.00	0	77	0.00
8/12/2010	0.0000	50	82	0.00	0	77	0.00
8/13/2010	0.0000	50	82	0.00	0	77	0.00
8/14/2010	0.1281	50	82	0.00	6,117	77	0.00
8/15/2010	0.1529	50	82	0.00	7,838	77	0.00
8/16/2010	0.0000	50	82	0.00	0	77	0.00
8/17/2010	0.0000	50	82	0.00	0	77	0.00
8/18/2010	0.0224	50	82	0.00	0	77	0.00
8/19/2010	0.0000	50	82	0.00	0	77	0.00
8/20/2010	0.0224	50	82	0.00	0	77	0.00
8/21/2010	1.1257	50	82	0.16	75,466	77	0.06
8/22/2010	0.1319	50	82	0.00	6,381	77	0.00
8/23/2010	0.0000	50	82	0.00	0	77	0.00
8/24/2010	0.0000	50	82	0.00	0	77	0.00
8/25/2010	0.0000	50	82	0.00	0	77	0.00
8/26/2010	0.9524	50	82	0.10	63,417	77	0.03
8/27/2010	0.3010	50	82	0.00	18,133	77	0.00
8/28/2010	0.0005	50	82	0.00	0	77	0.00
8/29/2010	0.0662	50	82	0.00	1,813	77	0.00
8/30/2010	0.0000	50	82	0.00	0	77	0.00
8/31/2010	0.0000	50	82	0.00	0	77	0.00
9/1/2010	0.0000	50	82	0.00	0	77	0.00
9/2/2010	0.0000	50	82	0.00	0	77	0.00
9/3/2010	0.0000	50	82	0.00	0	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
9/4/2010	0.0000	50	82	0.00	0	77	0.00
9/5/2010	0.0000	50	82	0.00	0	77	0.00
9/6/2010	0.0000	50	82	0.00	0	77	0.00
9/7/2010	0.0000	50	82	0.00	0	77	0.00
9/8/2010	0.0000	50	82	0.00	0	77	0.00
9/9/2010	0.0195	50	82	0.00	0	77	0.00
9/10/2010	0.0000	50	82	0.00	0	77	0.00
9/11/2010	0.0000	50	82	0.00	0	77	0.00
9/12/2010	0.3424	50	82	0.00	21,013	77	0.00
9/13/2010	0.0000	50	82	0.00	0	77	0.00
9/14/2010	0.0000	50	82	0.00	0	77	0.00
9/15/2010	0.0000	50	82	0.00	0	77	0.00
9/16/2010	0.0000	50	82	0.00	0	77	0.00
9/17/2010	0.0000	50	82	0.00	0	77	0.00
9/18/2010	0.0010	50	82	0.00	0	77	0.00
9/19/2010	0.0000	50	82	0.00	0	77	0.00
9/20/2010	0.0000	50	82	0.00	0	77	0.00
9/21/2010	0.0000	50	82	0.00	0	77	0.00
9/22/2010	0.0000	50	82	0.00	0	77	0.00
9/23/2010	0.0443	50	82	0.00	291	77	0.00
9/24/2010	0.0000	50	82	0.00	0	77	0.00
9/25/2010	0.0000	50	82	0.00	0	77	0.00
9/26/2010	0.0614	50	82	0.00	1,482	77	0.00
9/27/2010	0.9367	50	82	0.09	62,324	77	0.03
9/28/2010	0.2852	50	82	0.00	17,040	77	0.00
9/29/2010	0.0000	50	82	0.00	0	77	0.00
9/30/2010	0.5414	69	88	0.04	34,849	85	0.01
10/1/2010	0.0038	69	88	0.00	0	85	0.00
10/2/2010	0.0000	50	82	0.00	0	77	0.00
10/3/2010	0.0000	50	82	0.00	0	77	0.00
10/4/2010	0.0000	50	82	0.00	0	77	0.00
10/5/2010	0.0000	50	82	0.00	0	77	0.00
10/6/2010	0.0000	50	82	0.00	0	77	0.00
10/7/2010	0.0000	50	82	0.00	0	77	0.00
10/8/2010	0.0000	50	82	0.00	0	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
10/9/2010	0.0000	50	82	0.00	0	77	0.00
10/10/2010	0.0000	50	82	0.00	0	77	0.00
10/11/2010	0.0000	50	82	0.00	0	77	0.00
10/12/2010	0.0000	50	82	0.00	0	77	0.00
10/13/2010	0.0181	50	82	0.00	0	77	0.00
10/14/2010	0.0000	50	82	0.00	0	77	0.00
10/15/2010	0.0000	50	82	0.00	0	77	0.00
10/16/2010	0.0000	50	82	0.00	0	77	0.00
10/17/2010	0.0000	50	82	0.00	0	77	0.00
10/18/2010	0.0000	50	82	0.00	0	77	0.00
10/19/2010	0.0000	50	82	0.00	0	77	0.00
10/20/2010	0.0414	50	82	0.00	92	77	0.00
10/21/2010	0.0000	50	82	0.00	0	77	0.00
10/22/2010	0.0000	50	82	0.00	0	77	0.00
10/23/2010	0.0000	50	82	0.00	0	77	0.00
10/24/2010	0.0000	50	82	0.00	0	77	0.00
10/25/2010	0.0005	50	82	0.00	0	77	0.00
10/26/2010	0.1195	50	82	0.00	5,521	77	0.00
10/27/2010	0.0105	50	82	0.00	0	77	0.00
10/28/2010	1.6743	69	88	0.71	113,600	85	0.42
10/29/2010	0.0000	69	88	0.00	0	85	0.00
10/30/2010	0.0000	69	88	0.00	0	85	0.00
10/31/2010	0.0000	69	88	0.00	0	85	0.00
11/1/2010	0.0000	84	93	0.00	0	92	0.00
11/2/2010	0.0000	50	82	0.00	0	77	0.00
11/3/2010	0.1724	50	82	0.00	9,195	77	0.00
11/4/2010	0.4038	69	88	0.01	25,283	85	0.00
11/5/2010	0.0000	69	88	0.00	0	85	0.00
11/6/2010	0.0467	69	88	0.00	456	85	0.00
11/7/2010	0.0000	69	88	0.00	0	85	0.00
11/8/2010	0.0000	50	82	0.00	0	77	0.00
11/9/2010	0.0000	50	82	0.00	0	77	0.00
11/10/2010	0.0000	50	82	0.00	0	77	0.00
11/11/2010	0.0000	50	82	0.00	0	77	0.00
11/12/2010	0.0000	50	82	0.00	0	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
11/13/2010	0.0000	50	82	0.00	0	77	0.00
11/14/2010	0.0000	50	82	0.00	0	77	0.00
11/15/2010	0.4871	50	82	0.00	31,076	77	0.00
11/16/2010	1.2752	84	93	0.67	85,860	92	0.46
11/17/2010	0.0543	84	93	0.00	986	92	0.00
11/18/2010	0.0000	84	93	0.00	0	92	0.00
11/19/2010	0.0000	84	93	0.00	0	92	0.00
11/20/2010	0.0000	84	93	0.00	0	92	0.00
11/21/2010	0.0000	50	82	0.00	0	77	0.00
11/22/2010	0.0000	50	82	0.00	0	77	0.00
11/23/2010	0.0000	50	82	0.00	0	77	0.00
11/24/2010	0.1462	50	82	0.00	7,375	77	0.00
11/25/2010	0.0000	50	82	0.00	0	77	0.00
11/26/2010	0.0119	50	82	0.00	0	77	0.00
11/27/2010	0.1014	50	82	0.00	4,263	77	0.00
11/28/2010	0.0000	50	82	0.00	0	77	0.00
11/29/2010	0.0000	50	82	0.00	0	77	0.00
11/30/2010	0.5062	69	88	0.03	32,400	85	0.01
12/1/2010	2.2162	84	93	1.51	151,270	92	1.07
12/2/2010	0.0000	84	93	0.00	0	92	0.00
12/3/2010	0.0000	84	93	0.00	0	92	0.00
12/4/2010	0.0000	84	93	0.00	0	92	0.00
12/5/2010	0.0000	84	93	0.00	0	92	0.00
12/6/2010	0.0000	50	82	0.00	0	77	0.00
12/7/2010	0.0000	50	82	0.00	0	77	0.00
12/8/2010	0.0000	50	82	0.00	0	77	0.00
12/9/2010	0.0000	50	82	0.00	0	77	0.00
12/10/2010	0.0000	50	82	0.00	0	77	0.00
12/11/2010	0.0000	50	82	0.00	0	77	0.00
12/12/2010	0.5533	69	88	0.05	35,677	85	0.02
12/13/2010	0.0081	69	88	0.00	0	85	0.00
12/14/2010	0.0000	69	88	0.00	0	85	0.00
12/15/2010	0.0000	69	88	0.00	0	85	0.00
12/16/2010	0.0343	69	88	0.00	0	85	0.00
12/17/2010	0.1957	50	82	0.00	10,817	77	0.00

Table 55. Stormwater runoff and rainwater harvesting calculation for RG-6 in 2010 (continued)

Date	Precipitation (in./24-hr)	Pervious area CN (69)	CI		HI		
			Imperviousness, 67%		Rainwater harvesting, gal	Imperviousness, 55% (except rooftop)	
		with AMC	CN	Runoff, in./24-hr		CN	Runoff, in./24-hr
12/18/2010	0.0610	50	82	0.00	1,449	77	0.00
12/19/2010	0.1176	50	82	0.00	5,388	77	0.00
12/20/2010	0.0000	50	82	0.00	0	77	0.00
12/21/2010	0.0000	50	82	0.00	0	77	0.00
12/22/2010	0.0076	50	82	0.00	0	77	0.00
12/23/2010	0.0000	50	82	0.00	0	77	0.00
12/24/2010	0.0000	50	82	0.00	0	77	0.00
12/25/2010	0.0000	50	82	0.00	0	77	0.00
12/26/2010	0.3929	50	82	0.00	24,522	77	0.00
12/27/2010	0.0162	50	82	0.00	0	77	0.00
12/28/2010	0.0000	50	82	0.00	0	77	0.00
12/29/2010	0.0000	50	82	0.00	0	77	0.00
12/30/2010	0.0000	50	82	0.00	0	77	0.00
12/31/2010	0.0043	50	82	0.00	0	77	0.00
Total	44.45			12.35	2,770,690		8.07

APPENDIX H

2007 AND 2009 DAILY PRECIPITATION DATA

Table 56. Daily precipitation data of 2007 (34.54 in./yr) and 2009 (73.42 in./yr): January ~ March

	2007	2009		2007	2009		2007	2009
1-Jan	1.3738	0.0000	1-Feb	0.4676	0.0000	1-Mar	0.0776	0.0000
2-Jan	0.0000	0.0000	2-Feb	0.4743	0.0000	2-Mar	1.7200	0.3933
3-Jan	0.0000	0.1390	3-Feb	0.0000	0.1090	3-Mar	0.0000	1.0362
4-Jan	0.0000	0.1910	4-Feb	0.0000	0.0100	4-Mar	0.0000	0.0000
5-Jan	0.0195	0.0305	5-Feb	0.0000	0.0000	5-Mar	0.0000	0.0000
6-Jan	0.6886	0.7724	6-Feb	0.0000	0.0000	6-Mar	0.0000	0.0000
7-Jan	0.0210	1.0448	7-Feb	0.0000	0.0000	7-Mar	0.0000	0.0000
8-Jan	1.1257	0.0248	8-Feb	0.0000	0.0000	8-Mar	0.0000	0.0000
9-Jan	0.0000	0.0000	9-Feb	0.0000	0.0000	9-Mar	0.0000	0.0000
10-Jan	0.0000	0.0000	10-Feb	0.0076	0.0000	10-Mar	0.0100	0.0000
11-Jan	0.0000	0.3776	11-Feb	0.0000	0.0000	11-Mar	0.0100	0.0000
12-Jan	0.0000	0.0000	12-Feb	0.0000	0.0214	12-Mar	0.0000	0.0000
13-Jan	0.0000	0.0000	13-Feb	0.0000	0.0000	13-Mar	0.0000	0.0000
14-Jan	0.0000	0.0000	14-Feb	0.3957	0.0448	14-Mar	0.0000	0.0000
15-Jan	0.0000	0.0000	15-Feb	0.0000	0.0100	15-Mar	0.0000	0.0238
16-Jan	0.1690	0.0000	16-Feb	0.0000	0.0000	16-Mar	0.2662	1.3290
17-Jan	0.0050	0.0000	17-Feb	0.0000	0.0000	17-Mar	0.0552	0.5062
18-Jan	0.0657	0.0576	18-Feb	0.0000	0.2271	18-Mar	0.0000	0.3276
19-Jan	0.0862	0.0419	19-Feb	0.0000	0.6948	19-Mar	0.0000	0.0000
20-Jan	0.0000	0.0000	20-Feb	0.0167	0.0000	20-Mar	0.0000	0.0000
21-Jan	0.0000	0.0000	21-Feb	0.1152	0.0000	21-Mar	0.0000	0.0000
22-Jan	1.1224	0.0000	22-Feb	0.5324	0.0267	22-Mar	0.0000	0.0000
23-Jan	0.0000	0.0000	23-Feb	0.0000	0.0000	23-Mar	0.0000	0.0000
24-Jan	0.0000	0.0729	24-Feb	0.0000	0.0000	24-Mar	0.0000	0.0000
25-Jan	0.0000	0.0757	25-Feb	0.1633	0.0100	25-Mar	0.0000	0.0000
26-Jan	0.0000	0.0000	26-Feb	0.2481	0.0629	26-Mar	0.0000	0.0229
27-Jan	0.0000	0.0000	27-Feb	0.0000	0.0000	27-Mar	0.0000	0.2300
28-Jan	0.1195	0.0000	28-Feb	0.0000	2.1790	28-Mar	0.0000	1.0157
29-Jan	0.0000	0.1357	-	-	-	29-Mar	0.0000	1.4776
30-Jan	0.0000	0.0000	-	-	-	30-Mar	0.0000	1.0076
31-Jan	0.0000	0.0000	-	-	-	31-Mar	0.0769	0.0000
	4.7964	2.9638		2.4210	3.3957		2.2159	7.3700

Table 57. Daily precipitation data of 2007 (34.54 in./yr) and 2009 (73.42 in./yr): April ~ June

	2007	2009		2007	2009		2007	2009
1-Apr	0.0100	0.0000	1-May	0.0000	0.0000	1-Jun	0.1633	0.0000
2-Apr	0.1033	0.3090	2-May	0.0000	0.0000	2-Jun	0.0000	0.0000
3-Apr	0.0183	0.6257	3-May	0.0100	0.7100	3-Jun	0.0000	0.0000
4-Apr	0.3781	0.5952	4-May	0.0100	0.3200	4-Jun	0.0000	0.0000
5-Apr	0.0000	0.0000	5-May	0.0224	0.5143	5-Jun	0.0000	0.0400
6-Apr	0.0000	0.0000	6-May	0.2038	0.3286	6-Jun	0.1895	0.9824
7-Apr	0.0000	0.0552	7-May	0.0000	0.0000	7-Jun	0.0000	0.0000
8-Apr	0.0000	0.0000	8-May	0.0000	0.9186	8-Jun	0.0000	0.0000
9-Apr	0.0114	0.0000	9-May	0.0000	0.0200	9-Jun	0.1786	0.0000
10-Apr	0.0229	0.0000	10-May	0.0000	0.0000	10-Jun	0.0000	0.0000
11-Apr	0.0086	0.0000	11-May	0.0000	0.0285	11-Jun	0.0000	0.0000
12-Apr	0.0262	0.7729	12-May	0.3271	0.1200	12-Jun	0.3733	0.0440
13-Apr	0.0000	0.0000	13-May	0.1548	0.0000	13-Jun	0.2029	0.1971
14-Apr	0.0100	1.1324	14-May	0.0000	0.0000	14-Jun	0.0000	0.6843
15-Apr	1.1119	0.4171	15-May	0.0000	0.0121	15-Jun	0.0660	0.0000
16-Apr	0.0000	0.0205	16-May	0.0000	0.0557	16-Jun	0.0100	0.0000
17-Apr	0.0000	0.0000	17-May	0.1305	0.0233	17-Jun	0.0000	0.0100
18-Apr	0.0000	0.0000	18-May	0.0000	0.7957	18-Jun	0.1229	0.0000
19-Apr	0.0000	0.0000	19-May	0.0000	0.3033	19-Jun	0.1350	0.0792
20-Apr	0.0000	0.0000	20-May	0.0000	0.0000	20-Jun	0.6729	0.0433
21-Apr	0.0000	0.4962	21-May	0.0000	0.0000	21-Jun	0.0000	0.0000
22-Apr	0.0125	0.0000	22-May	0.0000	0.0000	22-Jun	0.0000	0.0000
23-Apr	0.0000	0.0000	23-May	0.0000	0.0180	23-Jun	0.0000	0.0000
24-Apr	0.0000	0.0000	24-May	0.0000	0.0647	24-Jun	0.0000	0.1862
25-Apr	0.0000	0.7119	25-May	0.0000	0.3129	25-Jun	0.0000	0.0000
26-Apr	0.0000	0.0000	26-May	0.0000	0.2657	26-Jun	0.0976	0.0133
27-Apr	0.2881	0.0000	27-May	0.0000	0.0367	27-Jun	0.0000	0.0233
28-Apr	0.0000	0.0000	28-May	0.0000	0.3900	28-Jun	0.0000	0.0000
29-Apr	0.0000	0.0000	29-May	0.0000	0.0225	29-Jun	1.2805	0.1400
30-Apr	0.0000	0.0000	30-May	0.0000	0.0367	30-Jun	0.1095	0.0150
	-	-	31-May	0.0000	0.0000		-	-
	2.0013	5.1362		0.8586	5.2973		3.6020	2.4582

Table 58. Daily precipitation data of 2007 (34.54 in./yr) and 2009 (73.42 in./yr): July ~ September

	2007	2009		2007	2009		2007	2009
1-Jul	0.0663	0.0000	1-Aug	0.0000	0.7862	1-Sep	0.1124	0.7333
2-Jul	0.2881	0.0000	2-Aug	0.0000	0.6957	2-Sep	0.0100	0.0167
3-Jul	0.0000	0.0000	3-Aug	0.0000	0.0995	3-Sep	0.0000	0.0200
4-Jul	0.0000	0.0000	4-Aug	0.0000	0.2167	4-Sep	0.0000	0.0148
5-Jul	0.0000	0.0000	5-Aug	0.0000	0.0100	5-Sep	0.0200	0.0219
6-Jul	0.0000	0.0000	6-Aug	0.0431	0.0000	6-Sep	0.0000	0.0000
7-Jul	0.0210	0.1300	7-Aug	0.0000	0.0000	7-Sep	0.0000	0.0100
8-Jul	0.2052	0.1195	8-Aug	0.0000	0.0000	8-Sep	0.0000	0.0000
9-Jul	0.3657	0.2195	9-Aug	0.0100	0.0100	9-Sep	0.0000	0.0000
10-Jul	0.0505	0.3424	10-Aug	0.0000	0.0000	10-Sep	0.0000	0.0000
11-Jul	0.3700	0.0300	11-Aug	0.0000	0.0000	11-Sep	0.0000	0.0000
12-Jul	0.4938	0.0000	12-Aug	0.0100	0.0000	12-Sep	0.3629	0.0000
13-Jul	0.0000	0.0000	13-Aug	0.0000	0.0100	13-Sep	0.0000	0.0200
14-Jul	0.0000	2.4695	14-Aug	0.0000	0.0269	14-Sep	1.1757	0.0000
15-Jul	0.5514	0.0100	15-Aug	0.0000	0.0100	15-Sep	0.9619	0.0000
16-Jul	0.2362	0.0000	16-Aug	0.0000	0.0000	16-Sep	0.0000	0.0000
17-Jul	0.0000	0.0450	17-Aug	0.0884	0.0593	17-Sep	0.0000	0.4757
18-Jul	0.1286	0.0000	18-Aug	0.0400	0.3038	18-Sep	0.0000	1.2814
19-Jul	0.0700	0.0510	19-Aug	0.1633	0.0550	19-Sep	0.0000	1.1733
20-Jul	0.1467	0.0000	20-Aug	0.0000	0.4300	20-Sep	0.0000	0.1743
21-Jul	0.4057	0.0000	21-Aug	0.0000	0.0400	21-Sep	0.0000	2.1952
22-Jul	0.0000	0.0000	22-Aug	0.0000	0.1571	22-Sep	0.0000	3.5671
23-Jul	0.2242	0.0000	23-Aug	0.0650	0.7610	23-Sep	0.0000	2.7481
24-Jul	0.0175	0.0815	24-Aug	0.4286	0.0000	24-Sep	0.0100	0.0000
25-Jul	0.0000	0.1816	25-Aug	0.3481	0.0000	25-Sep	0.0275	0.0000
26-Jul	0.7371	0.0000	26-Aug	0.3995	0.0000	26-Sep	0.0000	0.0000
27-Jul	0.0000	0.0000	27-Aug	0.6076	0.0000	27-Sep	0.0000	0.0325
28-Jul	0.0000	0.0260	28-Aug	0.0208	0.4510	28-Sep	0.0724	1.6905
29-Jul	0.1171	0.0180	29-Aug	0.0445	1.1943	29-Sep	0.0000	0.0000
30-Jul	0.2743	0.1386	30-Aug	0.7333	0.7143	30-Sep	0.0000	0.0000
31-Jul	0.0220	0.1295	31-Aug	0.5886	0.0000		-	-
	4.7915	3.9922		3.590972	6.0308		2.7527	14.1749

Table 59. Daily precipitation data of 2007 (34.54 in./yr) and 2009 (73.42 in./yr): October ~ December

	2007	2009		2007	2009		2007	2009
1-Oct	0.0000	0.0000	1-Nov	0.0000	0.0238	1-Dec	0.0000	0.0000
2-Oct	0.0000	0.0000	2-Nov	0.0000	0.3262	2-Dec	0.0000	0.0667
3-Oct	0.0000	0.0000	3-Nov	0.0000	0.0000	3-Dec	0.1586	0.9224
4-Oct	0.0500	0.0000	4-Nov	0.0000	0.0000	4-Dec	0.0000	1.4500
5-Oct	0.3629	0.0000	5-Nov	0.0000	0.0000	5-Dec	0.0000	0.0000
6-Oct	0.0133	1.5452	6-Nov	0.0000	0.0000	6-Dec	0.0000	0.0000
7-Oct	0.0000	0.1605	7-Nov	0.0000	0.0000	7-Dec	0.0000	0.0000
8-Oct	0.0000	0.3886	8-Nov	0.0000	0.0000	8-Dec	0.0000	0.0000
9-Oct	0.0000	0.0414	9-Nov	0.0000	0.0000	9-Dec	0.0000	0.0000
10-Oct	0.0843	0.0100	10-Nov	0.0000	0.0000	10-Dec	0.0000	1.1395
11-Oct	0.0000	0.2157	11-Nov	0.0000	0.4871	11-Dec	0.0000	0.0000
12-Oct	0.0000	0.0000	12-Nov	0.0000	4.4695	12-Dec	0.0000	0.0000
13-Oct	0.0000	1.4452	13-Nov	0.0000	0.1819	13-Dec	0.0000	0.0000
14-Oct	0.0000	1.4567	14-Nov	0.0000	0.0000	14-Dec	0.0120	0.1543
15-Oct	0.0000	0.4948	15-Nov	0.3424	0.0000	15-Dec	0.0000	0.1667
16-Oct	0.0000	0.1067	16-Nov	0.0000	0.0000	16-Dec	0.9905	0.1033
17-Oct	0.0000	0.1376	17-Nov	0.0000	0.0000	17-Dec	0.0200	0.0000
18-Oct	0.0100	0.0000	18-Nov	0.0120	0.0100	18-Dec	0.0000	0.0000
19-Oct	0.1281	0.0158	19-Nov	0.0000	0.0243	19-Dec	0.0310	0.0310
20-Oct	0.0100	0.0000	20-Nov	0.0000	0.0100	20-Dec	0.0000	2.0800
21-Oct	0.0000	0.0000	21-Nov	0.0000	0.0000	21-Dec	0.2229	0.0100
22-Oct	0.0495	0.0000	22-Nov	0.0886	0.0000	22-Dec	0.0000	0.0000
23-Oct	0.2790	0.0000	23-Nov	0.1614	0.1000	23-Dec	0.3110	0.0000
24-Oct	0.6667	0.0000	24-Nov	0.0000	0.6957	24-Dec	0.0976	0.0000
25-Oct	0.0467	0.1700	25-Nov	0.0000	0.0000	25-Dec	0.0000	0.0000
26-Oct	0.0000	0.0000	26-Nov	0.2486	0.0000	26-Dec	0.4110	1.9381
27-Oct	0.0000	0.0000	27-Nov	0.2881	0.0000	27-Dec	0.0000	0.0100
28-Oct	0.0000	0.0100	28-Nov	0.0000	0.0000	28-Dec	0.0381	0.0000
29-Oct	0.0000	2.0067	29-Nov	0.0000	0.0000	29-Dec	1.2571	0.0000
30-Oct	0.0000	0.0000	30-Nov	0.0000	0.0000	30-Dec	0.2467	0.0000
31-Oct	0.0000	0.0000		-	-	31-Dec	0.8719	0.0000
	1.7005	8.2048		1.1410	6.3286		4.6682	8.0719

REFERENCES

(1) *Water and sustainability (Volume 4): U.S. electricity consumption for water supply & treatment - The next half century, No. 1006787* Electric Power Research Institute (EPRI), Inc.: Palo Alto, California, 2002; http://www.circleofblue.org/waternews/wp-content/uploads/2010/08/EPRI-Volume-4.pdf.

(2) Lyons, E.; Zhang, P.; Benn, T.; Sharif, F.; Li, K.; Crittenden, J.; Costanza, M.; Chen, Y. S. Life cycle assessment of three water supply systems: Importation, reclamation and desalination. *Water Sci. Technol.* **2009,** *9* (4), 439-448; DOI 10.2166/ws.2009.534.

(3) eGRID2012 Version 1.0; http://www.epa.gov/cleanenergy/energy-resources/egrid/index.html.

(4) *2011 Comprehensive development plan community assessment executive summary*; Department of Planning and Community Development: Atlanta, Georgia (GA), 2010; http://www.atlantaga.gov/modules/showdocument.aspx?documentid=2835.

(5) *Water supply and water conservation management plan*; Metropolitan North Georgia Water Planning District: Atlanta, GA, 2009; http://www.northgeorgiawater.com/plans/water-supply-and-water-conservation-management-plan.

(6) *Climate change assessment for the ACF river basin* Water Resources Institute, Georgia Institute of Technology: May 11, 2009; http://waterinstitute.ufl.edu/events/downloads/GeorgakakosAbstractOct2k9.pdf.

(7) *Reallocation of water storage at federal water projects for municipal and industrial water supply*; 2012; http://www.fas.org/sgp/crs/misc/R42805.pdf.

(8) Lake Lanier Georgia Statistics; http://tinymicros.com/lanier/.

(9) Kohl, E. A. *Working the waters: the political ecologies of scale and Georgia's 100-year drought.* Proceedings of the 2009 Georgia Water Resources Conference, Athens, Georgia; 2009.

(10) Sharaai, A. H.; Mahmood, N. Z.; Sulaiman, A. H. Life Cycle Impact Assessment (LCIA) in Potable Water Production in Malaysia: Potential Impact Analysis Contributed from Production and Construction Phase Using Eco-indicator 99 Evaluation Method *World Applied Sciences Journal* [Online], 2010, p. 1230-1237.

(11) Stokes, J.; Horvath, A. Life-cycle assessment of urban water provision: tool and case study in California. *J. Infrastruct. Syst.* **2011,** *17* (1), 15-24; DOI 10.1061/(ASCE)IS.1943-555X.0000036.

(12) Friedrich, E.; Pillay, S.; Buckley, C. A. The use of LCA in the water industry and the case for an environmental performance indicator *Water SA* [Online], 2007, p. 443-452.

(13) Stokes, J. R.; Horvath, A. Energy and air emission effects of water supply. *Environ. Sci. Technol.* **2009,** *43* (8), 2680-2687; DOI 10.1021/es801802h.

(14) Pasqualino, J. C.; Meneses, M.; Castells, F. Life Cycle Assessment of Urban Wastewater Reclamation and Reuse Alternatives. *J. Ind. Ecol.* **2010,** *15* (1), 49-63; DOI 10.1111/j.1530-9290.2010.00293.x.

(15) Muñoz, I.; Milà-i-Canals, L.; Fernández-Alba, A. R. Life Cycle Assessment of Water Supply Plans in Mediterranean Spain. *J. Ind. Ecol.* **2010,** *14* (6), 902-918; DOI 10.1111/j.1530-9290.2010.00271.x.

(16) Roseen, R. M.; Ballestero, T. P.; Houle, J. J.; Briggs, J. F.; Houle, K. M. Water quality and hydrologic performance of a porous asphalt pavement as a stormwater treatment strategy in a cold climate. *J. Environ. Eng.* **2012,** *138* (1), 81-89; DOI 10.1061/(ASCE)EE.1943-7870.0000459.

(17) LeFevre, G. H.; Novak, P. J.; Hozalski, R. M. *Quantification of petroleum hydrocabon residual and biodegradation functional genes in rain garden field sites.* International low impact development San Francisco, California; American Society of Civil Engineering (ASCE), Ed. 2010.

(18) Ahiablame, L. M.; Engel, B. A.; Chaubey, I. Effectiveness of Low Impact Development Practices: Literature Review and Suggestions for Future Research. *Water, Air, Soil Pollut.* **2012,** *223* (7), 4253-4273; DOI 10.1007/s11270-012-1189-2.

(19) Davis, A. P. Green Engineering Principles Promote Low-impact Development. *Environ. Sci. Technol.* **2005,** *39* (16), 338A-344A; DOI 10.1021/es053327e.

(20) Ahn, J. H.; Grant, S. B.; Surbeck, C. Q.; DiGiacomo, P. M.; Nezlin, N. P.; Jiang, S. Coastal Water Quality Impact of Stormwater Runoff from an Urban Watershed in Southern California. *Environ. Sci. Technol.* **2005,** *39* (16), 5940-5953; DOI 10.1021/es0501464.

(21) Hatt, B. E.; Fletcher, T. D.; Deletic, A. Hydraulic and Pollutant Removal Performance of Fine Media Stormwater Filtration Systems. *Environ. Sci. Technol.* **2008,** *42* (7), 2535-2541; DOI 10.1021/es071264p.

(22) Hatt, B. E.; Deletic, A.; Fletcher, T. D. Integrated treatment and recycling of stormwater: a review of Australian practice. *J. Env. Manag.* **2006,** *79* (1), 102-113; DOI 10.1016/j.jenvman.2005.06.003.

(23) Stephens, D. B.; Miller, M.; Moore, S. J.; Umstot, T.; Salvato, D. J. Decentralized groundwater recharge systems using roofwater and stormwater runoff. *J. Am. Water. Resour. Assoc.* **2012,** *48* (1), 134-135; DOI 10.1111/j.1752-1688.2011.00600.x.

(24) Che-Ani, A. I.; Shaari, N.; Sairi, A.; Zain, M. F. M.; Tahir, M. M. Rainwater harvesting as an alternative water supply in the future. *Eur. J. Sci. Res.* **2009,** *34* (1), 132-140; DOI

(25) Taylor, S.; Apt, D.; Candaele, R. *Potential maximum use of harvested stormwater volume at a site level.* Proceedings of World Environmental and Water Resources Congress 2011: Bearing knowlege for sustainabily Palm Springs, California; May 22-26, 2011; Beighley, R. E.; Killgore, M. W., Eds. Environmental and Water Resources Institute, American Society of Civil and Engineers (ASCE): 2011; pp 457-466.

(26) Eroksuz, E.; Rahman, A. Rainwater tanks in multi-unit buildings: A case study for three Australian cities. *Resour. Conserv. Recycl.* **2010,** *54* (12), 1449-1452; DOI 10.1016/j.resconrec.2010.06.010.

(27) Ahammed, F.; Hewa, G. A.; Argue, J. R. Applying multi-criteria decision analysis to select WSUD and LID technologies. *Water Sci. Technol.: Water Supply* **2012,** *12* (6), 844; DOI 10.2166/ws.2012.060.

(28) Okeil, A. A holistic approach to energy efficient building forms. *Energy Build.* **2010,** *42* (9), 1437-1444; DOI 10.1016/j.enbuild.2010.03.013.

(29) Angrill, S.; Farreny, R.; Gasol, C. M.; Gabarrell, X.; Viñolas, B.; Josa, A.; Rieradevall, J. Environmental analysis of rainwater harvesting infrastructures in diffuse and compact urban models of Mediterranean climate. *Int. J. Life. Cycle. Assess.* **2012,** *17* (1), 25-42; DOI 10.1007/s11367-011-0330-6.

(30) Spatari, S.; Yu, Z.; Montalto, F. A. Life cycle implications of urban green infrastructure. *Environ. Pollut.* **2011,** *159* (8-9), 2174-2179; DOI 10.1016/j.envpol.2011.01.015.

(31) De Sousa, M. R. C.; Montalto, F. A.; Spatari, S. Using Life Cycle Assessment to Evaluate Green and Grey Combined Sewer Overflow Control Strategies. *J. Ind. Ecol.* **2012,** *16* (6), 901-913; DOI 10.1111/j.1530-9290.2012.00534.x.

(32) Domènech, L.; Saurí, D. A comparative appraisal of the use of rainwater harvesting in single and multi-family buildings of the Metropolitan Area of Barcelona (Spain): social experience, drinking water savings and economic costs. *J. Clean. Product.* **2011,** *19* (6-7), 598-608; DOI 10.1016/j.jclepro.2010.11.010.

(33) Dunivin, W.; Patel, M.; Clark, J. H. Expanding Orange County's Groundwater Replenishment System. *Water Environ. Technol.* **2011,** *23* (8), 56-59; DOI

(34) *Reclaimed water master plan*; City of Tampa - Water Department: Tampa, FL, 2009; http://www.tampagov.net/dept_water/files/Forms_Publications/RCWMP_Final_Version_Bookmarked_June_2009.pdf.

(35) Meneses, M.; Pasqualino, J. C.; Castells, F. Environmental assessment of urban wastewater reuse: Treatment alternatives and applications. *Chemosphere* **2010,** *81* (2), 266-272; DOI 10.1016/j.chemosphere.2010.05.053.

(36) Jefferson, B.; Laine, A.; Parsons, S.; Stephenson, T.; Judd, S. Technologies for domestic wastewater recycling. *Urban Water* **1999,** *1* (4), 285 ~ 292; DOI

(37) Jefferson, B.; Laine, A. L.; Stephenson, T.; Judd, S. J. Advanced biological unit processes for domestic water recycling. *Water Sci. Technol.* **2001,** *43* (10), 211~218; DOI

(38) Melin, T.; Jefferson, B.; Bixio, D.; Thoeye, C.; De Wilde, W.; De Koning, J.; van der Graaf, J.; Wintgens, T. Membrane bioreactor technology for wastewater treatment and reuse. *Desalination* **2006,** *187* (1-3), 271-282; DOI 10.1016/j.desal.2005.04.086.

(39) Pidou, M.; Stephenson, T.; Jefferson, B.; Jeffrey, P.; Memon, F. A. Greywater recycling: treatment options and applications. *Proc. ICE - Engineering Sustainability* **2007,** *160* (3), 119-131; DOI 10.1680/ensu.2007.160.3.119.

(40) Meuler, S.; Paris, S.; Hackner, T. Membrane bio-reactors for decentralized wastewater treatment and reuse. *Water Sci Technol* **2008,** *58* (2), 285-294; DOI 10.2166/wst.2008.356.

(41) Paris, S.; Schlapp, C. Greywater recycling in Vietnam — Application of the HUBER MBR process. *Desalination* **2010,** *250* (3), 1027-1030; DOI 10.1016/j.desal.2009.09.099.

(42) *2012 Guidelines for Water Reuse*; Washington, D.C., 2012; http://www.waterreuseguidelines.org/images/documents/2012epaguidelines.pdf.

(43) Hospido, A.; Sanchez, I.; Rodriguez-Garcia, G.; Iglesias, A.; Buntner, D.; Reif, R.; Moreira, M. T.; Feijoo, G. Are all membrane reactors equal from an environmental point of view? *Desalination* **2012,** *285,* 263-270; DOI 10.1016/j.desal.2011.10.011.

(44) Memon, F. A.; Zheng, Z.; Butler, D.; Shirley-Smith, C.; Lui, S.; Makropoulos, C.; Avery, L. Life Cycle Impact Assessment of Greywater Recycling Technologies for New Developments. *Environ. Monit. Assess.* **2007,** *129* (1-3), 27-35; DOI 10.1007/s10661-006-9422-3.

(45) Gil, J. A.; Túa, L.; Rueda, A.; Montaño, B.; Rodríguez, M.; Prats, D. Monitoring and analysis of the energy cost of an MBR. *Desalination* **2010,** *250* (3), 997-1001; DOI 10.1016/j.desal.2009.09.089.

(46) Krzeminski, P.; van der Graaf, J. H.; van Lier, J. B. Specific energy consumption of membrane bioreactor (MBR) for sewage treatment. *Water Sci Technol* **2012,** *65* (2), 380-92; DOI 10.2166/wst.2012.861.

(47) Boehler, M.; Joss, A.; Buetzer, S.; Holzapfel, M.; Mooser, H.; Siegrist, H. Treatment of toilet wastewater for reuse in a membrane bioreactor. *Water Sci Technol* **2007,** *56* (5), 63-70; DOI 10.2166/wst.2007.557.

(48) Fenu, A.; Roels, J.; Wambecq, T.; De Gussem, K.; Thoeye, C.; De Gueldre, G.; Van De Steene, B. Energy audit of a full scale MBR system. *Desalination* **2010,** *262* (1-3), 121-128; DOI 10.1016/j.desal.2010.05.057.

(49) Abegglen, C.; Siegrist, H. Domestic wastewater treatment with a small-scale membrane bioreactor. *Water Sci. Technol.* **2006,** *53* (3), 69; DOI 10.2166/wst.2006.077.

(50) *Summary of Zoning Regulations in R Districts*; Department of Planning & Community Development (DPCD): Atlanta, Georgia (GA), 2007; http://www.atlantaga.gov/modules/showdocument.aspx?documentid=2174.

(51) Part III. Land development code: Part 16. Zoning. Code of ordinances of the city of Atlanta, Georgia 1995; http://search.municode.com/html/10376/MCC_TOC.html

(52) Residential scale ordinance; http://www.atlantaga.gov/index.aspx?page=385.

(53) *Connect Atlanta Plan - Street Design Guide*; City of Atlanta: Atlanta, Georgia (GA),

http://web.atlantaga.gov/connectatlanta/connectatl09/AtlantaCTPStreetDesignGuidelines.pdf.

(54) *Residnetial Energy Consumption Survey - Energy consumption and expenditures tables*; Department of Energy (DOE) - Energy Information Administration: Washington, DC, 2005; http://www.eia.gov/consumption/residential/data/2005/c&e/summary/pdf/alltables1-15.pdf.

(55) *Wastewater management plan*; 2009; http://www.northgeorgiawater.com/plans/wastewater-management-plan.

(56) *Atlanta Strategic Action Plan*; Atlanta, 2008; http://sndsi.org/images/CDP_2009_areas.pdf.

(57) Horowitz, A. J.; Elrick, K. A.; Smith, J. J. Monitoring urban impacts on suspended sediment, trace element, and nutrient fluxes within the City of Atlanta, Georgia, USA: program design, methodological considerations, and initial results. *Hydrological Processes* **2008,** *22* (10), 1473-1496; DOI 10.1002/hyp.6699.

(58) Horowitz, A. J. Monitoring suspended sediments and associated chemical constituents in urban environments: lessons from the city of Atlanta, Georgia, USA Water Quality Monitoring Program. *Journal of Soils and Sediments* **2009,** *9* (4), 342-363; DOI 10.1007/s11368-009-0092-y.

(59) Rose, S.; Peters, N. E. Effects of urbanization on streamflow in the Atlanta area (Georgia, USA): a comparative hydrological approach. *Hydrological Processes* **2001,** *15* (8), 1441-1457; DOI 10.1002/hyp.218.

(60) National weather service, precipitation data of the year 2010; http://water.weather.gov/precip/.

(61) Vorosmarty, C. J. Global water resources: vulnerability from climate change and population growth. *Science* **2000,** *289* (5477), 284-288; DOI 10.1126/science.289.5477.284.

(62) *World water in 2025 - global modeling and scenario analysis for the world commission and water for the 21st century*; Center for environmental systems research, University of Kassel, Germany: 2000.

(63) *A review of water scarcity indices and methodologies*; The Sustainability Consortium -University of Arkansa: Fayetteville, AR, 2011; http://www.sustainabilityconsortium.org/wp-content/themes/sustainability/assets/pdf/whitepapers/2011_Brown_Matlock_Water-Availability-Assessment-Indices-and-Methodologies-Lit-Review.pdf.

(64) *Georgia Stormwater Management Manual - Volume 2. Technical Handbook*; Atlanta Regional Commission: Atlanta, Georgia (GA), 2001; http://documents.atlantaregional.com/gastormwater/GSMMVol2.pdf.

(65) Linsley, R. K., Kohler, M.A., Paulhus, J.L. *Hydrology for engineers*; McGraw-Hill: New York, 1986.

(66) *Part 630 Hydrology National Engineering Handbook - Chapter 10 Estimation of direct runoff storm rainfall*; 210-VI-NEH; Washington, DC, 2004; http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17752.wba.

(67) Hanemann, W. M. *Determinants of urban water use*; Mc Graw-Hill: Colorado, 1998.

(68) Schelich, J.; Hillenbrand, T. Determinants of residential water demand in Germany. *Ecol. Econ.* **2009,** *68* (6), 1756-1769; DOI 10.1016/j.ecolecon.2008.11.012.

(69) *Waste Not, Want Not: The potential for urban water conservation in California*; Pacific Institute: Oakland, CA, 2003; http://www.pacinst.org/wp-content/uploads/2013/02/waste_not_want_not_full_report3.pdf.

(70) *Guidelines for estimating unmetered landscaping water use*; U.S. Department of Energy: Washington, DC, 2010; http://www1.eere.energy.gov/femp/pdfs/est_unmetered_landscape_wtr.pdf.

(71) *Stormwater management manual: Chapter 2. Stormwater management facility design*; Eugene, Oregon (OR), 2008; http://www.eugene-or.gov/index.aspx?NID=477.

(72) *Rain garden design and constructure: a northern virginia homeowner's guide*; Fairfax, VA, http://www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf.

(73) Sovocool, K. A.; Morgan, M.; Bennett, D. An in-depth investigation of Xeriscape as a water conservation measure. *J. Am. Water Work. Assoc.* **2006,** *98* (2), 82-93; DOI

(74) Hilaire, R. S.; Arnold, M. A.; Wilkerson, D. C.; Devitt, D. A.; Hurd, B. H.; Lesikar, B. J.; Lohr, V. I.; Martin, C. A.; McDonald, G. V.; Morris, R. L.; Pittenger, D. R.; Shaw, D. A.; Zoldoske, D. F. Efficient water use in residential urban landscapes. *HortSci.* **2008,** *43* (7), 2081-2092; DOI

(75) Fewtrell, L.; Kay, D. Microbial quality of rainwater supplies in developed countries: a review. *Urban Water J.* **2007,** *4* (4), 253-260; DOI 10.1080/15730620701526097.

(76) Doyle, K. C.; Peter, S. Effect of first flush on storage-reliability-yield of rainwater harvesting. *J. Water Sanit. Hyg. Dev.* **2013,** *2* (1), 1-9; DOI 10.2166/washdev.2012.055.

(77) Despins, C.; Farahbakhsh, K.; Leidl, C. Assessment of rainwater quality from rainwater harvesting systems in Ontario, Canada. *Aqua* **2009,** *58* (2), 117-134; DOI 10.2166/aqua.2009.013.

(78) Jeong, H.; Crittenden, J. C.; Drew, B. Feasibility and life cycle assessment of low-impact development (LID) technologies for residential communities with a variety of population densities. *Environ. Sci. Technol.*, DOI under review.

(79) *ReCiPe 2008 Report I: Characterisation*; 2013; http://www.lcia-recipe.net/.

(80) *The Eco-indicator 99 A damage oriented method for life cycle impact assessment - Methodology Report*; PRe Consultants: The Netherlands, 2000; http://teclim.ufba.br/jsf/indicadores/holan%20ecoindic%2099%20annex.pdf.

(81) Frischknecht, R.; Jungbluth, N.; Althaus, H.-J.; Doka, G.; Dones, R.; Heck, T.; Hellweg, S.; Hischier, R.; Nemecek, T.; Rebitzer, G.; Spielmann, M. The ecoinvent Database: Overview and Methodological Framework. *Int. J. Life. Cycle. Assess.* **2004,** *10* (1), 3-9; DOI 10.1065/lca2004.10.181.1.

(82) *California's Water-Energy Relationship*; California Energy Commission: Sacramento, CA, 2005; http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF.

(83) *Cities and Towns - 2010 Yearbook of growth and change*; Atlanta Regional Commission: 2010; http://documents.atlantaregional.com/infocenter/Cities_And_Towns_Report_2010.pdf.

(84) Sun, G.; McNulty, S. G.; Myers, J. A. M.; Cohen, E. C. Impacts of Multiple Stresses on Water Demand and Supply Across the Southeastern United States. *J. Am.*

Water. Resour. Assoc. **2008,** *44* (6), 1441-1457; DOI 10.1111/j.1752-1688.2008.00250.x.

(85) State & County QuickFacts of the year 2010; http://quickfacts.census.gov/qfd/index.html.

(86) *2025 Comprehensive plan*; Atlanta, GA, 2005; http://wms.co.fulton.ga.us/focusfulton/plan-01-06/5comm-facil.pdf.

(87) *Official statement relating to City of Atlanta, Georgia - Water and Wastewater Revenue Bonds*; City of Atlanta: Atlanta, GA, 2009; http://www.fmsbonds.com/pdfs/047870KG4.pdf.

(88) Mines, R. O.; Behrend, G. R.; Holmes Bell, G. Assessment of AWT systems in the metro Atlanta area. *J. Env. Manag.* **2004,** *70* (4), 309-314; DOI 10.1016/j.jenvman.2003.12.010.

(89) Mines, R.; Lackey, L.; Behrend, G. Performance assessment of major wastewater treatment plants (WWTPs) in the state of Georgia. *Journal of Environmental Science and Health, Part A: Environmental Science and Engineering & Toxic and Hazardous Substance Control* **2006,** *41* (10), 2175-2198; DOI 10.1080/10934520600872607.

(90) U.S. Geology Survey Water-resources data for the United States of the year 2010; http://wdr.water.usgs.gov/wy2010/search.jsp.

(91) Lin, J. C. Determining the removal effectiveness of flame retardants from drinking water treatment processes. Massachusetts Institute of Technology, Boston, MA, 2003.

(92) *Annual report 2010*; Georgia power company: Atlanta, GA, 2010; http://www.georgiapower.com/docs/about-us/GPC%202010%20Annual%20Report.pdf.

(93) Korre, A.; Nie, Z.; Durucan, S. Life cycle modelling of fossil fuel power generation with post-combustion CO2 capture. *International Journal of Greenhouse Gas Control* **2010,** *4* (2), 289-300; DOI 10.1016/j.ijggc.2009.08.005.

(94) *Consumptive water use for U.S. power production*; NREL/TP-550-33905; Golden, CO, 2003; http://www.nrel.gov/docs/fy04osti/33905.pdf.

(95) Jeong, H.; Crittenden, J. C. Life cycle assessments of water, wastewaer and stormwater systems in the City of Atlanta. *Int. J. Life. Cycle. Assess.*, DOI under review.

(96) Pikorova, T.; Hlavinek, P.; Pagacova, P. Comparison of Two Flat Sheet Membrane Modules Used in a Real Domestic Wastewater Treatment Plant. *Adv. Water Supply Wastewater Treat.: A Road to Safer Society and Environment* **2011**, 303-312; DOI 10.1007/978-94-007-0280-6_29.

(97) Humeau, P.; Hourlier, F.; Bulteau, G.; Massé, A.; Jaouen, P.; Gérente, C.; Faur, C.; Le Cloirec, P. Estimated costs of implementation of membrane processes for on-site greywater recycling. *Water Sci. Technol.* **2011,** *63* (12), 2949; DOI 10.2166/wst.2011.617.

(98) Gnirss, R.; Lesjean, B. *Membrane technique in a freight container - the ENREM project.* International Water Conference (IWC) II, Berlin; 2007.

(99) Verrecht, B.; Maere, T.; Benedetti, L.; Nopens, I.; Judd, S. Model-based energy optimisation of a small-scale decentralised membrane bioreactor for urban reuse. *Water Res* **2010,** *44* (14), 4047-56; DOI 10.1016/j.watres.2010.05.015.

(100) Bolzonella, D.; Fatone, F.; Pavan, P.; Cecchi, F. Application of a membrane bioreactor for winery wastewater treatment. *Water Sci Technol* **2010,** *62* (12), 2754-9; DOI 10.2166/wst.2010.645.

(101) Le-Clech, P.; Chen, V.; Fane, T. A. G. Fouling in membrane bioreactors used in wastewater treatment. *J. Membr. Sci.* **2006,** *284* (1-2), 17-53; DOI 10.1016/j.memsci.2006.08.019.

(102) Ortiz, M.; Raluy, R. G.; Serra, L. Life cycle assessment of water treatment technologies: wastewater and water-reuse in a small town. *Desalination* **2007,** *204* (1-3), 121-131; DOI 10.1016/j.desal.2006.04.026.

(103) *Filling the water gap - conservation successes and missed opportunieis in Metro Atlanta*; Chattahoochee Riverkeeper: 2012; http://www.chattahoochee.org/enews/documents/FTWG12.pdf.

(104) Hardy, S. A. *Achieving economic and environmental sustainability objectives through on-site energy production from digester gas.* AWEA's 2011 Annual Conference, Orange Beach, Alabama; 2011.

(105) Mockus, V.; Hjelmfelt, A. T., Part 630 Hydrology - National Engineering Handbook; Chapter 10 Estimation of direct runoff from stormwater rainfall. USDA, Ed. Natural Resources Conservation Service: 2004.

(106) *Clean Water, Healthy sound - A life cycle analysis of alternative wastewater treatment strategies in the puget sound area*; Cascadia Green Building Council: Seattle, WA, 2011; https://ilbi.org/education/Resources-Documents/Reports-Docs/WaterDocs/clean-water-health-sound-report.

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