CASE STUDY 2

GRANDVIEW AVE

LEED PLATINUM HOME AND ARB SYSTEM

The installation of the ARB system into the backyard of a LEED Platinum home on Grandview Ave. was uncomplicated and well integrated into the landscape. The rain barrel was supplied by a large roof area almost 46.5 m^2 (500 sq. ft.) The collection capacity of this installation was high, demonstrated by a single month's collection of 2,272 L (figure 2.3). Susan and Tom were happy with their system, using it primarily as an environmental solution to local stormwater issues.

Figure 1.1: Shows a fully installed rain barrel

INSTALLATION OF ARB SYSTEM

Rain Barrel: The 500 L rain barrel was installed against the backyard fence about 7.5 m (25 ft.) from the back patio. The roof collection surface was estimated at 6 x 7.5 m (20 x 25 ft.), or 46.5 m^2 (500 sq. ft.). A custom 7.5 x 7.5 cm (3 x 3 in.) downspout, runs 9 m (30 ft.) from the house's back wall and along the fence to fit to our customized storm funnel, which connects to the diverter box. There is excellent drainage around the gravel base of the rain barrel. There is no tree coverage over the roof collection area and excellent overflow drainage to the backyard.

Overflow, Bypass, and Drainage: A 6 m (20 ft.) garden hose runs from the rain barrel discharge tap to the backyard and overflow/bypass capacity drains to backyard by a flexible 10 x 10 cm (4 x 4 in.) pipe. Soils are sandy loam and drain very quickly. No soaker hose was used.

Automated Controller, Plug-in Modem, and Solar Panel: The plug-in modem installed inside the house was located approximately 12 m (36 ft.) from the ARB. The solar power installation had good solar exposure (more than five hours a day) and was fitted directly to the rain barrel.

Operational Notes: Data collection ended on November 19 as opposed to December 1 due to the reoccurring issue of communications failure between the rain barrel controller and the modem. Due to the distance between the plugin modem (located in the basement) and the location of the rain barrel more than 12 meters (36 feet) internet connectivity was a issue especially during rain. We discovered that rain reduced reception distance and thus created communications failure at critical times.

Results: Had we been able to anticipate clogged-filter and storm-surge issues and ensured our installation was fully prepared we estimate we could have been able to collect an additional 2,000 L, bringing our ***anticipated collection total*** to approximately 9,200 L over the data collection period of June 23 to November 23.

Challenges

1) Clogged filters and storm-surge overflows resulted in missed collection opportunities.

2) In-storm ARB system communications failure.

Solutions

1) Storm-funnel installation and early-season filter maintenance notifications.

2) Improve internet connectivity by increasing range of the communication chip, decrease distance from the controller to the plug-in, and or use POI (power over internet)

2016 STORMWATER COLLECTION RESULTS

GRANDVIEW AVE. ARB SYSTEM INSTALLATION

Projected Annual Stormwater Collection, Storage and Diversion Estimate
(Based on 10-Month Season):
18,400 L

Data Collection Duration:
5 months, from June 23 to November 20

Average Verifiable Monthly Collection:
1,440 L
Average Estimated Monthly Collection:
1,840 L

Total Verifiable Stormwater Collected, Stored and Diverted from Storm Sewers:
7,200 L

Total Estimated Stormwater Collection, Storage and Diversion:

* *See Discussion in Figure 3.1*

9,200 L

Amount of Collected Water Intentionally Used on Garden:
0% / 0 L

Estimated Amount of Stormwater Infiltrated on Property

(Not including overflow or bypass volumes)

9,200 L

HOUSEHOLDER EXPERIENCE

Discussion of Householder Usage Patterns with 2016 Data from ARB Online Dashboard: Susan and Tom are engaged and active participants in the ARB system pilot project, despite being busy working parents. They were available and patient from the installation of the ARB system and during the ongoing issues around Internet connectivity. They regularly monitored the rain barrel and dashboard. Their roof area and 2016 rainfall collection patterns showed that we maximized collection capacity for this property.

Householder Satisfaction: Susan and Tom had a high level of satisfaction with the ARB system. They saw their primary value proposition as promoting the environmental benefits and the water for gardening. As discussed regular filter cleaning in the spring was needed to ensure maximum collection and to minimize overflow from the diverter box. This ARB system installation suffered from regular communications failures during rain events, which made in-storm control and monitoring by the system administrator difficult and also means some collection data were missed. The householders did not rely on the water for gardening as much as others so were not as affected by system downtime.

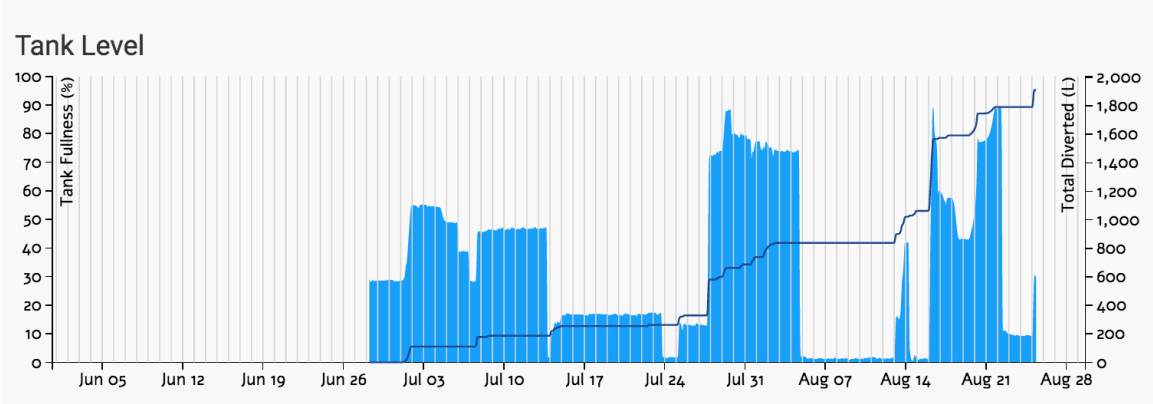

Figure 2.1: Rainfall-collection, tank-level, and water-use/drainage metrics for Grandview Ave., from June 28 to August 28.

During the first five storm events in June and July the system administrator identified relatively low capture rates of 80 to 150 L per storm event (see fig. 2.1). We investigated more closely and cleaned the filters of the winter and spring residue. However, even with clean filters the householder reported seeing storm-surge overflow. This happened when the initial volume and intensity of rainwater coming off the roof overwhelmed the chamber in the diverter valve (See figure 1.1) and resulted in water bypassing the rain barrel to the overflow drainage area. We rectified this issue on this rain barrel, and on all of the rain barrel installations in the pilot project by making and installing “storm funnels” (see Case Study 1: Hampton Ave., fig. 1.2). After these modifications and with regular cleaning of the filter, we saw the volumes of the July collection (20 to 30%) triple, to 70 to 90% of rain barrel storage capacity. Had we been able to anticipate clogged-filter and storm-surge issues and ensured our installation was fully prepared we estimate we could have been able to collect an additional 2,000 L, bringing our ***anticipated collection total*** to approximately 9,200 L over the data collection period of June 23 to November 23.

Recommendation: That the storm funnel and/or a diverter box redesign be added to the installation instructions and equipment for the rain barrel (a product of RainGrid Inc.).

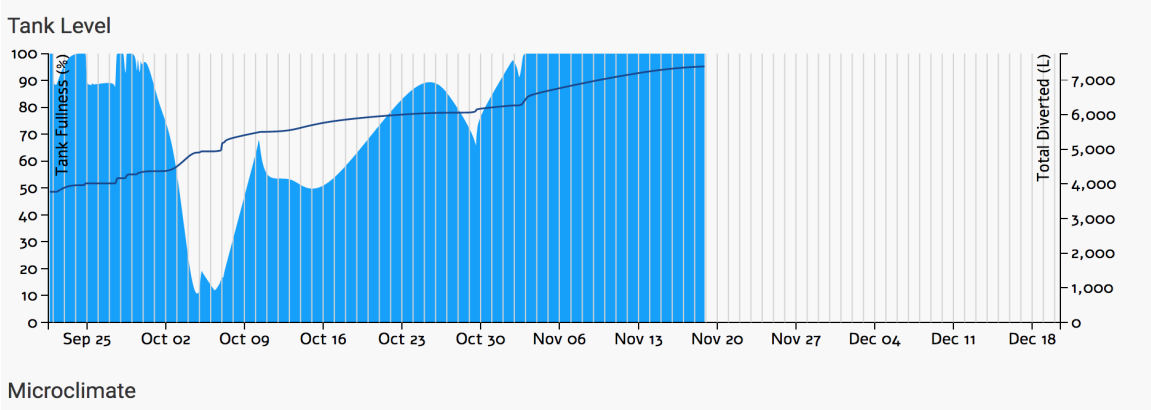

Figure 2.2: Rainfall-collection, tank-level, and water-use/drainage metrics for Grandview Ave., from August 28 to November 18.

Collection metrics described in the graph shown in fig. 2.2 and starting in October show how the data collection algorithm reacts when it is offline. It records the barrel level when connectivity is re-established and then “connect the dots” to fill in the missing data with the information it actually recorded. Because the in-storm flow data is collected but is not cached, it is lost.

Recommendation: Ensure connectivity of controller with modem, taking into account interference and reduced range due to rain and build in system capacity to cache data so in the case of connectivity issues data is not lost.

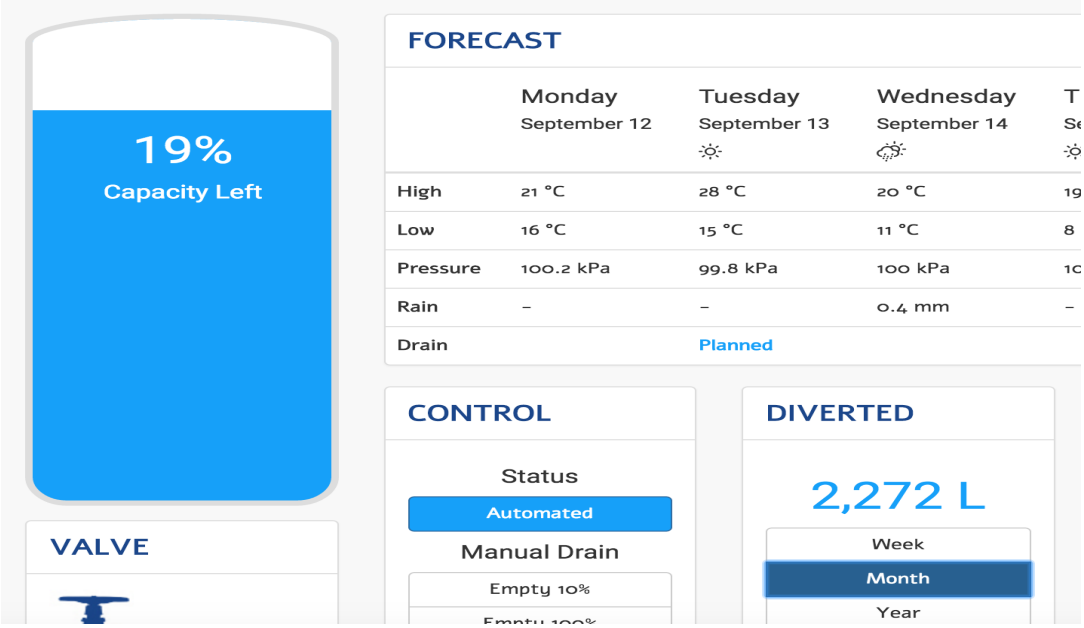

Figure 2.3: Dashboard showing Grandview Ave.'s monthly collection total of 2,272 L (bottom right).

As can be seen in fig. 2.3, between August 12 and September 12 the ARB system collected 2,272 L. This high collection volume indicates roof collection area is optimal and there are no filter clogging issues.

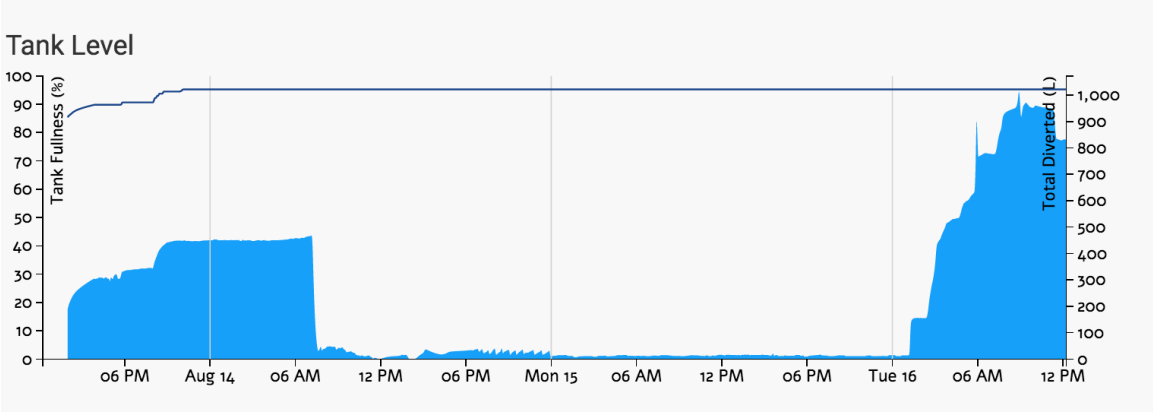

Figure 2.4

The graph shown in fig. 2.4 illustrates how on the August 14 at 7 a.m. the automated drain empties the barrel in anticipation of rain. The barrel begins to fill again on Tuesday August 16 at 2 a.m. Starting at that time, the first rain fills the barrel to about 15%. There is a short gap (about thirty minutes) before the rain continues to fill the barrel, now to 70% of its capacity. After another short pause in the rain, the barrel fills to 90% just before 12 p.m. The administrator does a 10% drain from the dashboard allow 25% capacity for future collection.