Rain Catchment and Adaptive Building Reuse: The Historic Seaholm Power Plant

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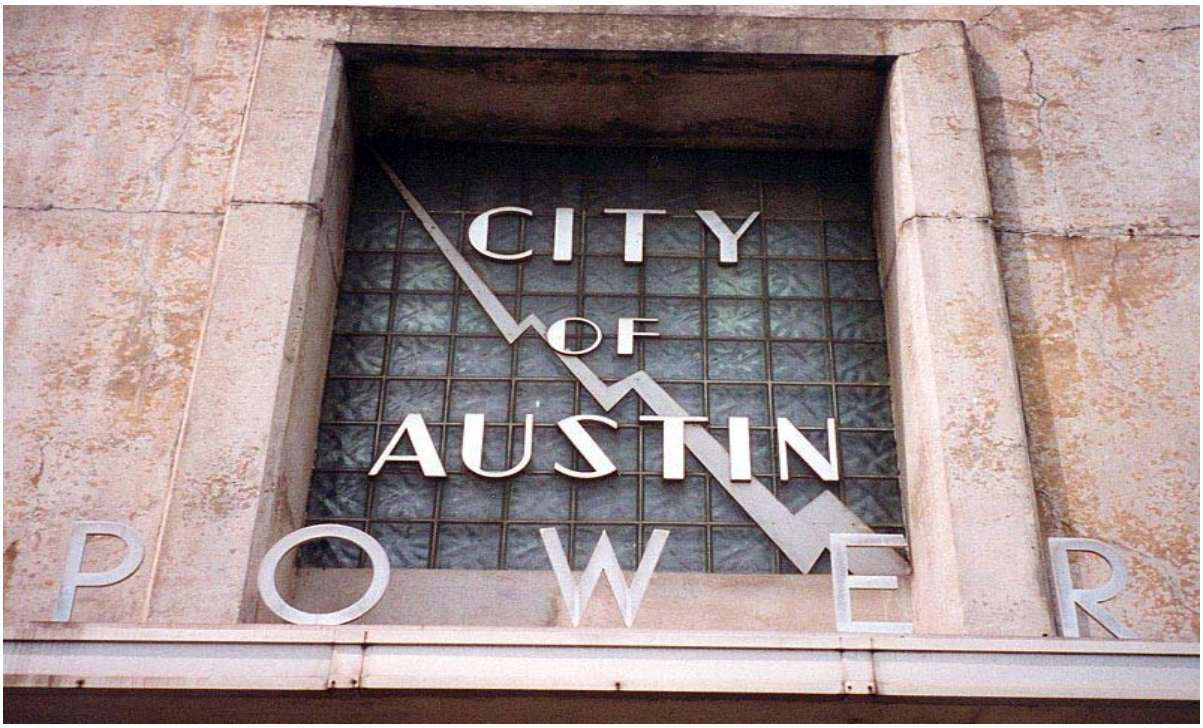
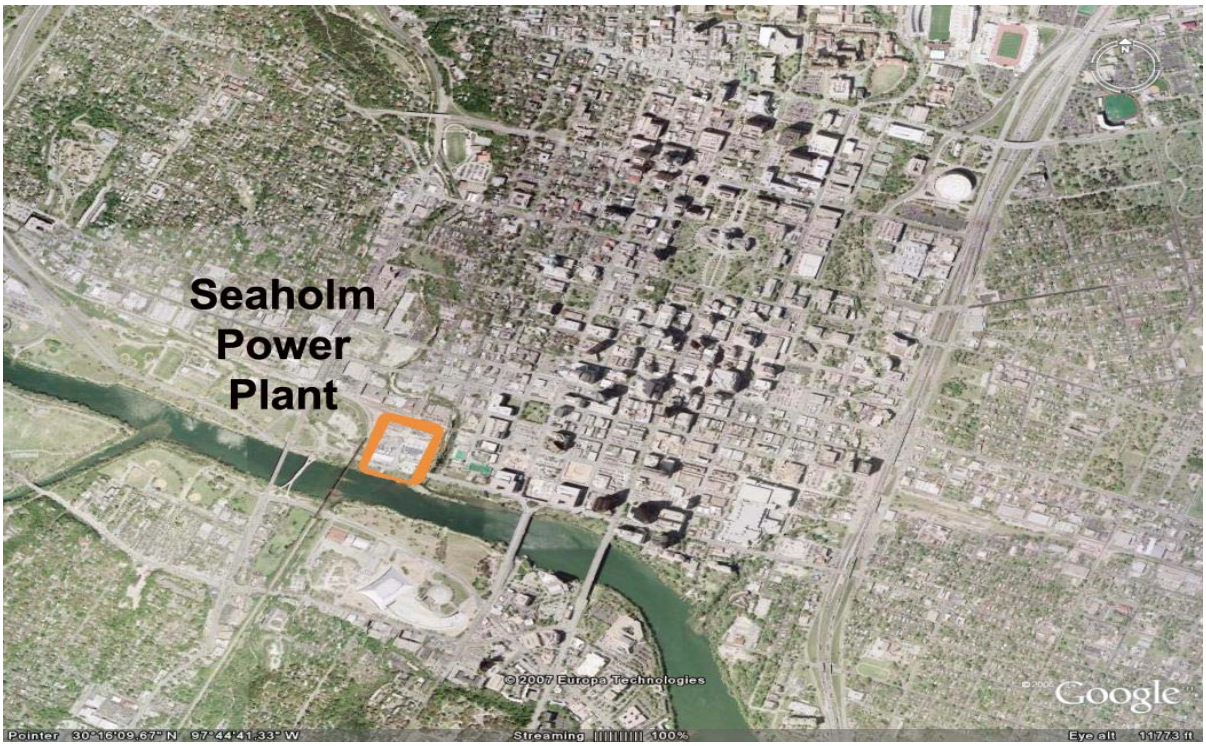
A center-city, decommissioned municipal power station site is being converted into a mixed-use cultural, civic, office, retail, and hotel/residential center. Landscaping, fountain make-up water, and stormwater runoff control will be served by a large-scale commercial rain catchment system, using several components of the old power plant infrastructure. Specifically, the historic turbine-generator building and its water circulation and cooling infrastructure will be adaptively reused to accomplish these objectives. This historic building reuse plan, in combination with sustainable design and construction principles applied to new construction and landscaping, promises to make the project a highly visible example of civic project planning.

The Seaholm Power Plant is located in downtown Austin, Texas on the shore of Town Lake, an impoundment of the Colorado River. Construction of the power station began in 1950. It was decommissioned in 1989. The main turbine-generator building is a notable example of civic architecture and is being considered for the National Register of Historic Places. The building and site were designated for preservation by the Austin City Council in 1996 for a major public use.



The station building contained five gas/oil generation units (100 megawatts total). The building features a towering turbine room 110 by 235 ft (34 by 72 m), with clerestory windows above flanking aisles, a 65-ft ceiling (20 m), and two floors below ground level. In

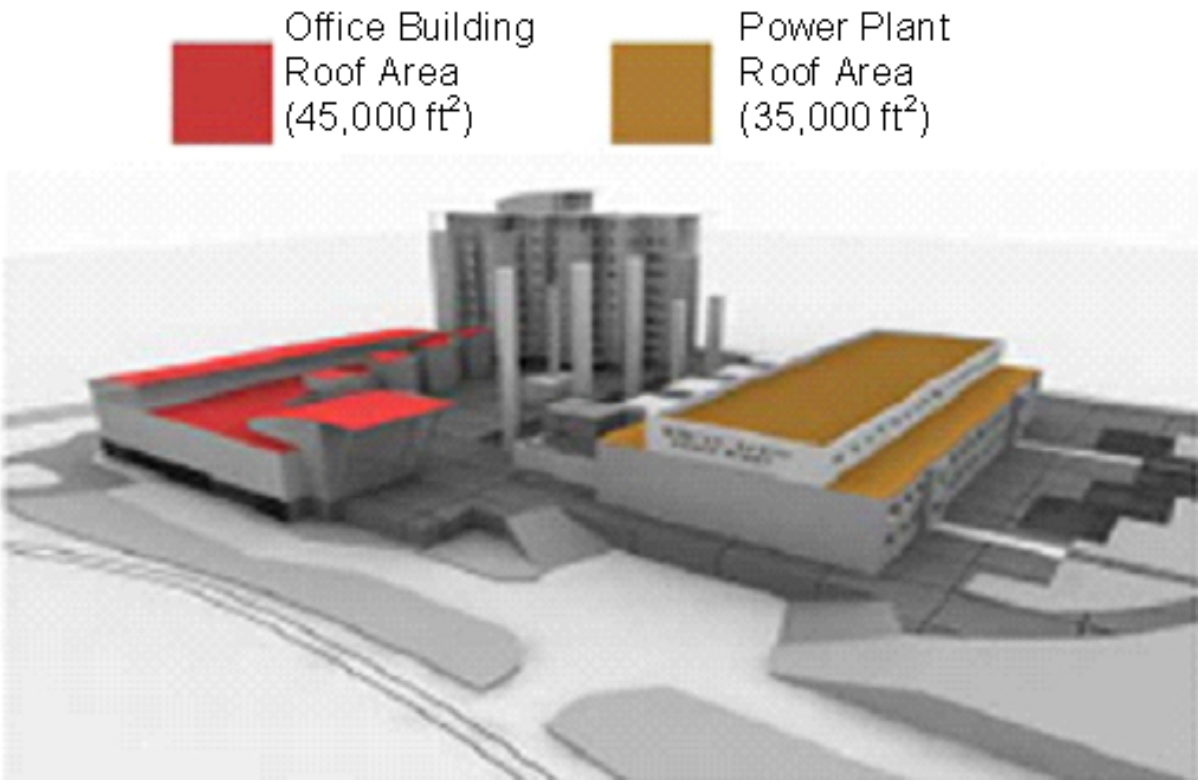
all, the building has more than 110,000 ft^2 (34,000 m^2) of useable floor area. A water intake building, water transmission, storage, circulation and discharge facilities are also located at Seaholm.



In the mid-1990s the City of Austin began to prepare the power station for an adaptive reuse. The Seaholm Master Plan, commissioned by the City and completed by Roma Design Group in 2001, was a significant urban design and public engagement project for downtown Austin. In 2005 the City began to solicit partners in a joint venture to redevelop the building and site and establish a major civic activity center, to be served by a light rail station, direct access to Town Lake and new street improvements to connect the site with the rest of downtown. A $13 million contaminant remediation program was completed last year. In 2006 a consortium of Southwest Strategies Group and other development firms involved in engineering, design, power plant reuse, and hotel-condominium development was selected by the City to develop the Seaholm site. The Seaholm Power, Ltd. development team is now undertaking design and end-use contract negotiations for the power plant building, a new 90,000 ft^2 (27,000 m^2) two-story office building, and a 22-story hotel-condominium tower.

The Center for Sustainable Development at The University of Texas at Austin is providing planning and technical assistance to the Seaholm Power, Ltd. team and City of Austin on the rain catchment system, landscaping and stormwater management. Faculty and students have completed conceptual studies and feasibility analysis to determine the optimal size of conveyance and storage as well as the various water demands to be served.

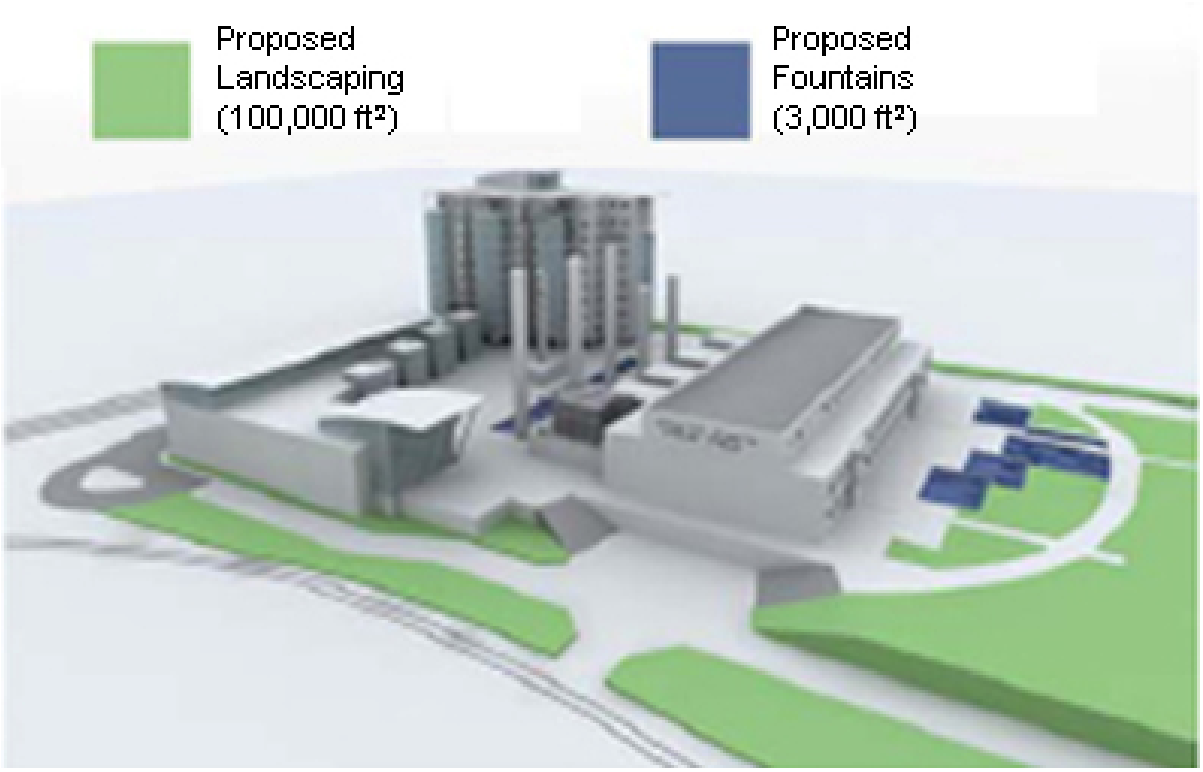
Approximately 80,000 ft^2 (7,400 m^2) of roof area will be used as catchment surface. The existing underground cooling water tanks comprise approximately 40,000 gal. (151,000 l). Two large-diameter (60-in. or 1.5 m) discharge pipes emanating from the cooling tanks will also be used for water storage, after being retrofitted with pumps and piping to direct stored water to the irrigation control system. The discharge pipes will provide an additional 60,000 gal. (227,000 l) of storage. Municipal water will also be connected as a backup supply during drought periods.



Rain catchment from the turbine-generator building will be achieved by adapting the roof, roof drains and sumps, water cooling tanks for the power plant condensers, and water discharge pipelines. The new two-story office building will also incorporate rain catchment and storage. Collectively, the rain catchment system on the two buildings should supply 100% of landscape irrigation and fountain makeup water demands, and mitigate a majority of the municipal requirements for stormwater runoff control.

Two large underground condenser water cooling tanks and weirs were previously constructed in the front yard of the Seaholm site. They received the heated condenser water, allowing it to cool to less than 10 degrees F. above the ambient lake water temperature before being discharged to Town Lake. The two large diameter discharge pipes extending from the cooling water tanks are to be retrofitted as secondary cistern storage. Collectively, the tanks and pipe storage will comprise in excess of 100,000 gal. (380,000 l) capacity. A smaller underground tank will be constructed adjacent to the new office building to receive initial roof runoff and then convey the water to the cooling water tanks.

The water demands include irrigation of approximately 100,000 ft.^{2} (9,300 m^2) of turf and garden landscape, as well as make-up water for several fountains on public plazas and terraces in front of the power station building. In addition to meeting landscape irrigation and fountain water make-up demand, the former power plant water circulation and cooling system will also be used to capture and reduce storm runoff into Town Lake. The City of Austin has aggressively adopted criteria for storm runoff control, requiring the first flush of approximately 0.8 in (2 cm) of runoff to be detained and filtered before being released to receiving waters. In this case, excess capacity in the water tanks and discharge pipes will be reserved for this purpose. An irrigation system consisting of underground pressure-drip lines will be designed to discharge into the landscape root zone even during wet periods, to provide ample reserve storage capacity to receive storm runoff from subsequent rain events.



Preliminary models of landscape and fountain water make-up demand were developed and run to create multiple scenarios of rain catchment systems. Additionally, preliminary economic evaluations were conducted to determine the optimal combination of water demands to be met as well as roof area and supplemental water storage to be constructed or retrofitted. In all, four scenarios were developed and evaluated. Scenario C, which included rain capture on both the power plant and office building roofs, and irrigation of all landscaped areas as well as fountain water make-up, was estimated to take 22 years to attain a 100% return on investment, relative to the alternative of using municipal water supplies and conventional irrigation and fountain system installation. The added benefit of reducing the construction and site costs of additional storm water detention and filtration should make this plan a very positive one, both in terms of economic value and net water demand reduction.

This project is notable for its integration of landscape irrigation, fountain water demand, and first-flush stormwater runoff detention, all to be achieved with the adaptive reuse of electric power plant infrastructure. While not the first building in downtown Austin to incorporate rain catchment to meet nonpotable water demands, the Seaholm Power Plant project should elevate the use of rain catchment and integrative water management, in concert with urban design and redevelopment, to a new level of recognition and merit.

Special acknowledgement is given to the following students at The University of Texas, who contributed to the evaluation of the Seaholm rain catchment system alternatives: Ahmed Abukhater, Ashley Francis, Jason Fryer, Kyle Irons, Andrew Judd, Wonsoo Lee, Nathan Meade, Vipin Nambiar, and Mary-Elaine Sotos.