PENNSTATE

Office of Physical Plant
ENGINEERING SERVICES
University Park, PA

Utility Fact Sheet
University Park Campus
OPP-UFS-UP: 2020

Steam Boiler Plants:

Steam is generated at high pressure (250 psi) from gas-fired boilers at two locations. Low-pressure steam is generated by steam turbines in the West Campus Steam Plant (WCSP). The turbines utilize high-pressure superheated steam and are set to exhaust at 13 psi. Summer plant operation yields a typical load of 80,000 lbs/hr @ 250 psi. A typical winter operation yields an average load of 250,000 lbs/hr @ 250 psi. In each case, approximately 60% of the steam generated is delivered to campus at 150 psi, after being reduced at the West Campus Steam Plant and also from the East Campus Steam Plant (ECSP), and 40% of the steam generated is delivered to campus at 13 psi is only being produced at the West Campus Steam Plant. The peak load on the steam plants to date of approximately 433,300 lbs/hr occurred on 02/20/2015 when air temperatures approached -7°F for approximately one hour.

Peak steam load served during FY19/20: **357,800 lbs/hr**
Peak steam during FY19/20 occurred on: **01/21/2020**
Total steam production for FY19/20: **1,195,502 lbs**
Total electric production for FY19/20: **67,744,425 kWh**

Steam Generation		Steam Flow, kpph		PSI/°F	BTU/Lb	Firm Capacity[1]	
WCSP	**Type**	Name Plate	Proven			minus 1 WCSP Boiler	minus 1 ECSP Boiler
Boiler 1	Gas	150,000	150,000	250/530	1,290	-	150,000
Boiler 2	Gas	150,000	150,000	250/530	-	150,000	150,000
Boiler 8	Gas	40,000	40,000	250/530	1,290	40,000	40,000
	-	-	-	-	-	-	-
		340,000	340,000			190,000	340,000
ECSP	-						
Boiler 1	Gas/Oil	100,000	75,000	250/406	1,202	75,000	75,000
Boiler 2	Gas/Oil	100,000	75,000	250/406	1,202	75,000	75,000
CT/HRSG[5]	Gas/Oil	117,000	117,000	250/406	1,202	117,000	-
		317,000	267,000			267,000	150,000
		657,000	**607,000**			**447,000**	**490,000**

[1] The Firm Capacity, by definition, is the total with the largest boiler off-line.

Electricity Generation	Qty.	Capacity/Type	Psi / °F in	Psi / °F out	lb/KWH Max
West Campus Steam Plant	1	2200 kw / Steam Turbine	250/530	13/246	27.0
West Campus Steam Plant	1	2800 kw / Steam Turbine	250/530	13/246	26.8
East Campus Steam Plant	1	7000 kw / Generator			
Peak Output	12,600 kw				
Average Summer Output*	8,000 kw				

* The electric output of the turbines is limited by the need for low-pressure steam or limitations in our heating equipment to utilize low-pressure steam and not by the production capacity of the turbines.

Steam Distribution:
Steam consumption is by 250, 150 and 13-psi distribution systems. The 250-psi system is used to drive the turbine generators that produce the 13-psi steam while also co-generating electricity. Steam driven turbine feed water pumps, induced draft fans and forced draft fans are used in the boiler plant at 250 psi and also exhaust at 13 psi. The 150-psi system is used for process and heating loads throughout the campus. Process loads include lab use, sterilizers, distilled water, laundry, dining hall use, etc. For heating purposes, this steam is reduced to low pressure at the individual buildings. The 13-psi system is used for space heating and domestic hot water throughout the campus. Due to system use and losses, the 13-psi system only delivers about 5 to 8 psi to the buildings during heavy load conditions in the winter months.

Steam Condensate System:
The steam condensate is gathered at the individual building level by a gravity return system to a building condensate pump. The building pump pushes the condensate into the campus return system. Most of the North and East areas of campus flow by gravity to the East View Condensate Pumping Station. From there the condensate is pumped to the West Campus Steam Plant. The Central campus area flows by gravity to Hammond Building, where it is pumped to the West Campus Steam Plant. The West campus is returned to the West Campus Steam Plant via a vacuum assisted pump. Approximately 25% of the campus condensate is now returned to the East Campus Steam Plant by gravity. Average return rate is 75%.

Other Power Plant Services Provided:
Control air to main campus (Lab Quality): 3,000 SCFM @ 70 psi with a duty, standby and emergency compressor located at each steam boiler plant. (East Campus Plant & West Campus Plant)

Natural Gas System
Natural Gas is distributed around the campus by an underground system of direct buried, coated steel pipes. Columbia Gas owns some of the piping and all of the billing meters, while the University owns some of the piping and some sub-meters for billing within the University operating units. The majority of the University owned lines are at 5 psi, with the exception of some high-pressure gas lines on West Campus and near Physical Plant on the Northern part of campus. All of the Columbia Gas owned lines are at 25 psi or higher.

Major Projects FY19/20

The two main 1970's era direct buried steam transmission lines leaving the ECSP were replaced with two new direct buried steam lines. Two old-prefabricated manholes were at end of life were also replaced with two new cast in place concrete steam manholes.

The WCSP is currently undergoing a project to install a new Solar Taurus T60 combustion turbine and an Air Power 2.1 MW backpressure steam turbine. This Combined Cycle unit will bring an additional 7MW (nominal) of onsite electrical generation and the Indeck Heat Recovery Steam Generator will give an additional 92,500 lbs of steam production capacity. The project is scheduled to be complete in Fall 2021.

Campus Electrical System:

Electricity for the Campus is supplied from four West Penn Power sub-stations at 12,470 volts. Each sub-station provides two dedicated feeders to the university with the exception of the Patterson Street substation which provides four feeders. The maximum import demand for the campus in FY19/20 was approximately 50.52 MW, an additional 0.4 MW being cogenerated. The maximum plant load was 53.3MW, with 45.1MW being imported and 8.2MW being cogenerated.

Substation ID	Voltage	# Feeders	Available Capacity
1	12,470	2 @ 18 MW	Auto switched, 20 MW total
2	12,470	2 @ 20 MW	Manual switched, 20 MW total
3	12,470	2 @ 18 MW	Auto switched, 20 MW total
4	12,470	2 @ 20 MW	Auto switched, 20 MW total
815	12,470	2 @ 16.5 MW	Auto switched, 20 MW total
Steam Turbine 1	12,470		3 MW
Steam Turbine 2	12,470		2 MW
Combustion Turbine	12,470		7 MW Air temperature dependent

Electrical Distribution System - Normal Power:

Electricity is distributed throughout campus at 12,470 volts. 23.5 MW of installed transformation reduces the 12,470 volts to 4,160 volts for an older part of the campus and certain chilled water production. All new facilities as well as newly renovated facilities are served from the 12,470-volt distribution system. The steam turbines at the West Campus Steam Plant generate power at 12,470 volts and operate in parallel with the utility power. The combustion turbine generator is located at the East Campus Steam Plant. The combustion turbine can operate in island mode if utility power is not available.

Electrical Distribution System - Emergency Power:

The emergency power is distributed at 4,160 volts to a significant number of campus facilities.
Automatic transfer switches at each building sense loss of normal power and transfer the building load life-safety load to the emergency system. The emergency systems are served from two 2,000 kW diesel generators.
Some buildings have a traditional emergency generator in lieu of a connection to the campus emergency circuit.
A second circuit, similar to the emergency system, provides power to the standby circuit on campus. That circuit serves critical research and legally required non-life safety backup power via transfer switching in buildings.

Chilled Water System:

A campus chilled water distribution system is relatively new compared with the other utility systems. The system has three chilled water production facilities connected to the distribution loop. The total system capacity when completed will be approximately 40,000 tons and will include an East Campus Chiller Plant, which is not yet into design. Some of the existing buildings still have their own chillers installed. An eventual connection to the campus distribution system will be made as selected building chiller plants are retired. There are approximately 80 air or water-cooled chillers installed and maintained at University Park for process and air conditioning purposes ranging in size from a few tons to 300 tons. These chillers represent approximately 10,000 tons of installed capacity. A second expansion of the North Campus Chiller Plant was completed in 2011 to bring the total number of chillers in the North Plant to 6. The final expansion of the North Plant was completed for summer 2018. This final expansion added two 2,800-ton chillers, bringing the total cooling capacity of the plant to approximately 14,200 tons. The second phase of expansions & modifications to the West Campus Chiller Plant were completed in 2014, which added a 300-ton, dual compressor chiller. A project was completed at the West Plant to add a used 900-ton chiller prior to summer 2018, bringing the total cooling capacity of the West Plant to approximately 7,200 tons. An expansion project is currently under construction at the West Plant which will add a 3,000-ton chiller and build-out the plant. This will bring the total cooling capacity of the West Plant to 10,200 tons.

Peak central chilled water load served during FY19/20: **18,851 tons**

Peak central chilled water load during FY19/20 occurred on: **07/19/2019**

Total central chilled water load production for FY19/20: **36,057,032 ton-hrs**

CHW Generation				Capacity
Plant	**Energy Source**	**Type**	**Refrigerant**	**Tons**
NCCP - North Campus Chiller Plant				
Chiller 1	Electric	Centrifugal	R134a	1,500
Chiller 2	Electric	Centrifugal	R134a	1,500
Chiller 3	Electric	Centrifugal	R134a	1,300
Chiller 4	Electric	Centrifugal	R134a	1,300
Chiller 5	Electric	Centrifugal	R134a	1,500
Chiller 6	Electric	Centrifugal	R134a	1,500
Chiller 7	Electric	Centrifugal	R134a	2,800
Chiller 8	Electric	Centrifugal	R134a	2,800
CHCP - Chemistry Chiller Plant				
Chiller 1	Electric	Centrifugal	R134a	1,350
Chiller 2	Electric	Centrifugal	R134a	1,350
Chiller 3	Electric	Centrifugal	R134a	1,350
WCCP - West Campus Chiller Plant**				
Chiller 1	Electric	Centrifugal	R123	1,000
Chiller 2	Electric	Centrifugal	R123	1,000
Chiller 3	Electric	Centrifugal	R134a	1,300
Chiller 4/5	Electric	Centrifugal	R134a	3,000
Chiller 6	Electric	Centrifugal	R134a	900
Total Capacity				**25,400**

Chilled Water Distribution:

Underground chilled water piping has been installed under the main road corridors that intersect campus including: Pollock Road, Shortlidge Road, Curtin Road, Bigler Road and McKean Road. Piping has also been installed from the West Campus Chiller Plant across Atherton Street. During FY06/07 loop additions were designed and installation was initiated in several areas. A branch was added to serve Reber, Hintz Alumni Center, EE East, EE West, Deike, Hammond, Sackett, Hosler, and Steidle. The branch serving Davey and Osmond was extended to Chandlee. A branch was added along Bigler Road, under Park Avenue to serve the Katz Building. A branch was added to serve Wartik, Althouse, and Buckhout. The extension of the main was added in the northwest corner of campus in summer of 2009 that connected Arts Building, Cedar Building, and Keller Building, Hort Woods Child Care Center, and the Moore Building Addition. These mains now also serve Ford, Mateer, Kern Rackley, Chambers, and Carpenter Buildings. Old Main and White Building were connected to the campus chilled water system in 2012. Piping was extended under Curtin Road in

2012 to connect the IM addition and Shields. Piping was also extended to McKean Road and connected Redifer Dining Hall, Haller/Lyons Dorm and the new dormitory building, Chace Hall. The HUB, Bookstore, Grange and Pegula Ice Arena were also added to the campus chilled water system in 2013. New 24" underground piping was added in 2014 between the mains near Pond Building and the Forum Building, creating a new "loop" in this part of the system. In the process, piping was taken into Mueller Building, and the existing underground piping between the Library and the Pasquirilla Spiritual Center was connected. Buildings that were added to the campus chilled water system in 2014 include Cooper/Hoyt and Ewing/Cross dormitories, the Water Tunnel, North Henderson Building, BioBehavoral Health Building, Ford Building and the main gym in Rec Hall. Buildings that were added in 2015 include Mateer, Hibbs/Stephens Dormitories, AG Science and Industries Building, Henning Building, Visual Arts Building, Burrows Building, and the Health and Human Development Building. Buildings that were added in 2016 include Hosler, Steidle, Kern, Whitmore Lab, Hammond and Sackett Buildings, Armsby, Patterson, Weaver Buildings, Findlay and Johnston Dining, Pollock Dining, and all dormitory buildings in Eastview Terrace. Buildings that were added in 2017 include Nursing Sciences Building, Research West Building, Applied Sciences Building, Pasquirilla Spiritual Center, and Earl Hall. In 2018 the piping in Curtin Road was extended under University Drive to connect the Bryce Jordan Center. Buildings that were added in 2018 also include Pattee/Paterno Library, Robinson Hall, Stuart Hall, McKean Hall, Pennypacker Hall, Carpenter, Ag Engineering, Martin Hall, Chemical and Biomedical Engineering Building. Buildings that were added in 2019 include Tener Hall, Brumbaugh Hall, Pinchot Hall, Fisher Hall, Rackley, Chambers, Pavilion Theatre, and Steam Services Building. Buildings connected in 2020 include Hallowell Building, Sproul Hall, and Geary Hall.

As of July 2020, the Campus Chilled Water System serves a total of 9.8 million square feet in 130 buildings an estimated peak cooling load of approximately 21,500 tons.

Water System

The potable water system on the University Park Campus is owned and operated by the University. There are nine production wells currently in service in two well fields; each well field has additional production capacity above the daily water demands. The University uses on average approximately 2.0 million gallons of water per day. Three above ground water storage tanks have a storage capacity of 3,250,000 gallons, which is over a day's supply. Treatment and monitoring are provided for all wells at a central water treatment plant to ensure that water delivered to customers meets all regulatory requirements. Two interconnections with the State College Water Authority (SCBWA) are maintained where water can be exchanged. An additional emergency interconnection is maintained with College Township Water Authority (CTWA) which the University could supply water to CTWA.

University Park has two main well fields: Big Hollow and Houserville. The Big Hollow Well Field has six permitted production wells: UN2, UN14, UN16, UN17, UN24, & UN26, of which all six wells are currently in use. The Houserville Well Field has three permitted production wells: UN33, UN34, & UN35, of which all three wells are currently in use. An additional permitted production well is UN28A, which is not in use.
The wells have the following permitted capacities:

Big Hollow	**gpm**	**mgd**	**Year Drill**
UN 2	400	0.576	1938
UN 14	720	1.037	1948
UN 16	250	0.360	1948
UN 17	400	0.576	1949
UN 24	450	0.648	1962
UN 26	800	1.152	1965
Total	3,020	4.349	
Houserville	**gpm**	**mgd**	**Year Drill**
UN 33	1,200	1.728	1981
UN 34	1,200	1.728	1981
UN35	1,200	1.728	1984
Total	3,600	5.184	

Well UN28A has a capacity of 300 gpm or 0.432 mgd (year drill – 1974). University Park's total well fields' production capacity is 6,920 gpm or 9.965 mgd. The 30-day rolling average water allocation from the University's Susquehanna River Basin Commission Docket is 7.080 mgd.

Geology and Hydrogeology

Both the Big Hollow and Houserville Well Fields are located in karst limestone terrain. The region's land surface contains many sinkholes, caves are common, and surface drainage is minimal. Big Hollow wells are installed in the Cambrian Gatesburg Formation. Houserville wells are over the Ordovician Nittany and Axeman Formations. The wells in both fields have relative high yields for the consolidated formations they are sited.

Water Quality

Both the Big Hollow and Houserville Well Fields' water is hard; Big Hollows water's hardness ranges from 150 to 300 mg/l as $CaCO_3$, and Houserville water's hardness ranges from 300 to 400 mg/l as $CaCO_3$. The water is high in alkalinity and total dissolved solids from the dissolved mineral content. Forty water quality samples are collected and analyzed each month from the distribution system. The treated water meets both primary and secondary US EPA drinking water standards. An annual water quality report is prepared each year in June, which is referred to as Consumer Confidence Report (CCR). The 2019 CCR is posted on the Office of Physical Plant's web site at https://www.opp.psu.edu/sites/opp/files/2019_water_quality_report.pdf.

Water Treatment

Water Treatment Facilities for University Park's potable water include Chlorine House #1, Chlorine House #2, Chlorine House #3 (inactive), Chlorine House #4 (inactive), Chlorine House #5, the Air Stripping, Water Treatment Plant, and the Advanced Water Treatment Plant.

Chlorine House #1 is in Big Hollow. The Big Hollow Wells flow through Chlorine House #1 to the Advanced Water Treatment Plant (AWTP) and the flow is metered. Existing equipment is in place should chemical addition be required prior to the entering the AWTP in the future.

Chlorine House #2 is in Big Hollow. There are two parallel treatment trains, one for "finished water" and the other for "raw water". The finished water train meters flow through the water distribution system. The raw water train is a back-up system to allow raw water from the Houserville Wells to be conveyed to the AWTP through the Big Hollow raw water line. It can also be used to convey Big Hollow Wells raw water to the AWTP through the Houserville raw water line.

Chlorine House #3 is on the Golf Course. The facility is inactive. It treated the water from Well UN28A. The treatment consisted of flow monitoring, chemical addition of a sequestering agent (phosphate compound), and chlorination for disinfection.

Chlorine House #4 is at the West Campus Steam Plant. The facility is inactive. It treated the water from Well UN12. The treatment consisted of flow monitoring, chemical addition of a sequestering agent (phosphate compound), and chlorination for disinfection.

Chlorine House # 5 is in Houserville. The Houserville Wells flow through Chlorine House #5 to the AWTP and the flow is metered. Existing equipment is in place should chemical addition be required prior to the entering the AWTP in the future.

Air Stripping Water Treatment Plant (ASWTP) is located north of the Physical Plant Building. Currently the facility is bypassed. The water for the Houserville Wells can be air stripped by this facility to remove volatile organic compounds prior to entering the AWTP.

The Advanced Water Treatment Plant (AWTP) went into operation in late April of 2017. It is located beside the Arboretum. The plant consists of parallel treatment trains for the Big Hollow and Houserville Well Fields. The Big Hollow process consists of microfiltration and granular activated carbon adsorption. The Houserville process consists of microfiltration, granular activated carbon adsorption, and nanofiltration. The flows from the two trains are blended together, disinfected with sodium hypochlorite, and the pH adjusted with sodium hydroxide prior to being pumped into the water distribution system. The AWTP is the regulated entry point to the distribution system and is permitted for 5,200,000 gallons per day. A number of on-line continuous analyzers monitor the water quality produced by the plant.

Water Distribution System

University Park's potable (drinking) water system consists of over 60 miles of pipe. The majority of the distribution system's piping is constructed of ductile iron. Three elevated storage tanks in the distribution system provide reserve storage capacity and fire protection for University Park.

Water Storage

University Park's potable water system has three elevated storage tanks. Water Tower #1 is inactive and is planned to be utilized in the future for reuse water. It is located near the Nittany Lion Inn. It was erected in 1937 and has a storage capacity of 500,000 gallons. Water Tower #2 was demolished and replaced with Water Tower #5. Water Tower #5 is located near the North Halls. It was erected in 2017 and has a storage capacity of 750,000 gallons. Water Tower #3 is located north of the Physical Plant Building. It was erected in 1962 and has a storage capacity of 1,000,000 gallons. In 2016, the tank was raised 16 feet in elevation. Water Tower #4 is located on the Golf Course. It was erected in 1992 and has a storage capacity of 1,500,000 gallons. In 2015, the tank was raised 16 feet in elevation.

Sanitary System

The University owns, operates and maintains a sanitary sewer system, which provides sanitary sewer service to a majority of the University Park Campus as well as a small portion of State College Borough in the College Heights neighborhood. The sanitary system consists of a sewer collection system, wastewater treatment plant and effluent disposal system.

The sanitary sewer collection generally consists of approximately 18 miles of gravity collection lines, over 900 manholes and five pumping stations. All pumping stations are currently operating well below their design capacity. A summary of the pumping stations and their design capacities is provided below.

Station Name	Type	Capacity, MGD
East Halls Pump Station	Dry Well/Wet Well	0.891
Fox Hollow Pump Station	Dry Well/Wet Well	0.713
Porter Road Pump Station	Submersible	0.357
Poultry Pump Station	Submersible	0.187
Softball Stadium	Submersible	0.0094

Requirements and limitations regarding the discharge of pollutants into the University's sanitary sewer collection system are provided in University Policy SY40, which is available online at https://policy.psu.edu/policies/sy40.

Flows from the collection system are conveyed to the University's wastewater treatment plant (WWTP), which is located along University Drive near the intersection with Route 26. The WWTP has a permitted hydraulic capacity of 4.0 million gallons per day (MGD), with a current annual average daily flow rate of 1.6 MGD. The WWTP has a permitted organic capacity of 9,500 pounds of biochemical oxygen demand (BOD5) per day, with a current organic loading of approximately 3,100 pounds BOD5 per day. The processes at the WWTP generally include screening, grit removal, primary clarification, trickling filters, activated sludge, secondary clarification, and chlorine disinfection. Solids treatment facilities at the WWTP generally include dissolved air flotation sludge thickening, primary anaerobic digestion, secondary anaerobic digestion and dewatering with a rotary press. Dewatered biosolids are disposed of at the landfill.

Treated effluent from the University's WWTP is land applied year-round at a spray irrigation system known as the Living Filter. There is no stream discharge of any treated effluent. The Living Filter consists of approximately 600 acres of agricultural land and forest land. An estimated 90% of the irrigated water recharges the region's water table—about 1.4 MGD, or over 500 million gallons per year. The land application of treated wastewater helps to maintain base flows in streams such as Spring Creek and reduces the impacts of drought conditions. The University's WWTP has not discharged to Thompson Run since 1983 and is thought to be one of the many reasons that the water quality of Spring Creek is considered to be better now than any time in the last 100 years. Oversight of the Living Filter operation is managed by the Waste Water Management Committee, a multi-disciplined committee made up of researchers from across the University. Research completed by this committee is transmitted via trade journals and research publications to advance the knowledge base on wastewater treatment plant and sprayfield operation.

The University has developed a master plan for a future reclaimed water system for the University Park Campus. It is estimated that this reclaimed water system could reduce groundwater withdrawals by 300,000 to 500,000 gallons per day. Sewage facilities planning and permitting has been completed for the system, and installation of portions of the reclaimed water distribution system has begun as opportunities present themselves. Targeted uses for the future reclaimed water system include toilet flushing, irrigation, vehicle washing, non-potable washdown water, laundry and make up water for cooling towers. When viable, interior plumbing systems of new or renovated buildings are being installed for future reclaimed water to facilitate the connection to the reclaimed water system when it becomes operational.

Storm System

The University Park Campus storm drain conveyance system owned by Utilities is currently a 100% gravity flow system consisting of approximately 73 linear miles of storm pipes varying from 6 inches to 72 inches in diameter, over 850 manholes, over 3,100 inlets and approximately 200 stormwater best management practice facilities. The University's entire system is mapped in GIS. The University owns large tracts of land in the Centre Region tributary to the Big Hollow (Chpt. 93, CWF, MF), Shavers Creek (Chpt. 93, HQ-CWF, MF), Thompson Run (Chpt. 93, HQ-CWF, MF), Spruce Creek (Chpt. 93, HQ-CWF, MF), Slab Cabin Run (Chpt. 93, CWF, MF sections), and the main stem of Spring Creek (Chpt. 93, HQ-CWF, MF).

The core campus portion of the University Park Campus is comprised of four primary drainage basins and several smaller drainage areas. The four are: 1) the Fox Hollow Drainage Basin, 2) the Bathgate Dam Basin, 3) the Main Campus Basin, and 4) the West Campus Drainage Basin. The Fox Hollow and West Campus Drainage Basins are tributary to the Big Hollow, the Bathgate Dam Basin is tributary to Slab Cabin Run/Thompson Run, and the Main Campus Basin is tributary to Thompson Run. Examples of the smaller basins include the Foods Building Detention Pond, the Parking Lot 43 Detention Pond, the Corl Drywell, Cato Park Pond, and the Grad Circle Parking Bio-swales. Additional information can be found at: https://opp.psu.edu/penn-state-stormwater-publications-and-training-documents

Peak runoff rate control, volume control, and water quality control are conducted in the University Park area to varying degrees in each of the four Basins. While minor structural stormwater management systems exist in each of the basins that were developed for specific land development projects, major systems have also been constructed to function at the basin scale. The Fox Hollow and West Campus Basins both are considered to effectively control peak runoff rates, volume, and water quality. The Bathgate Dam basin is considered to effectively control peak runoff rates and water quality. The Main Campus Basin at this time does not include any basin wide stormwater management facilities other than the effects seen due to the Duck Pond, which is located immediately downstream. The approximate drainage basin size and the amount of imperviousness (including gravel areas) based on the University's GIS data in each drainage basin can be seen in the table below. The University impervious area values include State roadways for simplicity.

Basin Name	Drainage Area (ac)	University Impervious Area (ac)	Non University Impervious Area (ac)	Total Impervious Area (ac)	Percent Impervious
Fox Hollow	453.4	123.2	10.7	133.9	29.5%
Bathgate Dam	232.9	91.3	0.0	91.3	38.5%
Main Campus	386.6	211.9	1.7	213.6	55.7%
West Campus	186.0	27.5	4.7	32.2	17.0%

Fox Hollow is defined at Basin V-notch Weir along Fox Hollow Road
Bathgate Dam defined as tributary area to Dam's abutment.
Main Campus defined as tributary area to the University Drive cloverleaf structure
West Campus defined as tributary area directly upslope of Teaburry Ridge Property line, not including Corl Drywell areas

The University owns five (5) ponds at University Park that are large enough to be regulated as dams by PaDEP under Chapter 105. The hazard classification (Cat-1 or Cat-2) dams require annual inspections and repairs in addition to an updated emergency action plan every five years. The dams are:

Dam Number	Dam Name	Class	Hazard Classification
14-121	University Park Airport Pond 1A	C	Cat-1
14-122	Bathgate Detention Pond	C	Cat-1
14-123	University Park Airport Pond 4A	C	Cat-3
31-072	Shavers Creek	B	Cat-1
14-092	Duck Pond	C	Cat-4

The University is in compliance with the requirements of the Municipal Separate Storm Sewer System (MS4) federal EPA and state PADEP programs for stormwater management and has held a MS4 permit at the University Park Campus since 2003. The University has also partnered with the surrounding municipalities on the program since 2004. The purpose of the MS4 program is to promote health, safety, and welfare within the University and its watershed by minimizing the harm to the environment by stormwater from the campus. The regulations require that advance planning be done to minimize run-off from activities occurring on University property. A program for illicit discharge detection and elimination of non-storm water discharges into the stormwater system is also required. Additional information regarding the University's MS4 permit and program can be found at:
https://opp.psu.edu/penn-states-ms4-program
http://ms4partners.org/index.html

The University currently has numerous types of structural stormwater management best management practices in use. These include, but are not limited to: wet and dry surface detention ponds, subsurface detention ponds, extended detention ponds, constructed and natural wetlands, water quality forebays, grass lined and armored swales, bio-swales, green roofs, infiltration basins, infiltration trenches, porous pavement, drywells, rain gardens, vegetated filter strips/swales, disconnected downspouts, grass parking systems, oil/water separators, water quality inlets and filters, and rain harvesting and use systems. The University also has street sweeping and inlet marking programs. The University also has several advanced experimental areas for stormwater management.

The University's preferred stormwater best management practice is the responsible use and protection of critical recharge areas that have deep and highly renovating in-situ soils. In 2007, the University established the Water Resource Preservation Area (WRPA) land use classification for 455 acres of its land, much of which consists of the critical recharge areas. Examples of these areas include the Mitchell Tract closed depressions, the flower garden recharge areas, the Big Hollow, and the cow pasture recharge area. In part because of these facilities, the University overall is a net-zero discharger of runoff in the Spring Creek watershed. In other words, more runoff from University and non-University impervious areas is recharged on the University's property than runoff from the University that is discharged off University impervious areas to surface waters in Spring Creek.

Purchased Utilities for Fiscal Year 19/20:

Utility	Quantity	Units	Unit Cost	Cost	Current Supplier
Natural Gas	1,944,380	MCF	$3.13**	$6,088,390	Columbia Gas – (LDC) BP Energy
Fuel Oil	17,870	Gal	$2.15***	$38,421	Nittany Oil, CS Meyer
Electricity	199,614,566	KWH	$0.061*	$15,649,332	West Penn Power (LDC)
	32,624	KW			American PowerNet

*Average cost. ** Blended rate at the burner tip. *** Tanks topped off, average cost.

Utility Contracts:

Natural Gas is contracted on a three-year basis from a third-party vendor. The current supplier for FY2021 is BP Energy. This contract was bid in May of 2019 and included the management of transportation of assets on DTI. The contract contains a fixed price for delivery to the city gate and DTI Southpoint based commodity pricing. Natural gas distribution is a tariff rate with Columbia Gas, the local distribution company. The projected cost at the burner tip for FY2021 is approximately $3.43 per mcf for the steam plant, and $4.84 per mcf for smaller campus accounts.

Fuel Oil is purchased as necessary to keep the oil fresh and the tanks full. The quantity of oil shown may not all be used in the year it was purchased since natural gas is preferred over fuel oil at the heating plants.

Electricity distribution service is purchased from West Penn Power. All ten incoming feeders are monitored concurrently by the utility company and billed as one service. The demand component is totaled each week and all four weeks are averaged for the month before billing, therefore low demand or load shedding in one week helps to reduce the overall demand charge. Electric generation for FY2021 is purchased at a wholesale supply rate for grid imported power, and the same supply rate is applied to cogeneration power produced on-campus. A wholesale contract began for calendar year 2010 and is in place till 2021. The rate for wholesale supply is variable; however, the projected average rate including local distribution for FY2021 is $0.0627 per kWh.

Utility Charge Rates

Some Departments pay the cost of their utility usage to OPP. These are Departments such as Housing and Food Service and Athletics. The following chart shows the billable rates charged as well as our avoidable costs that are used for Energy Savings Projects for FY 2021:

Utility	E&G Avoided Costs	E&G Billable Rate	Aux Billable Rate	Units
Electricity	$4.17	$4.17	$4.17	KW
	$0.06336	$0.08800	$0.0900	KWH
Natural Gas	$5.16	$6.58	$7.77	MCF
Steam	$17.73	$23.45	$25.62	1000 pounds
Water	$6.02	$12.07	$13.34	1000 gallons
Wastewater	$5.48	$12.47	$13.35	1000 gallons
Chilled Water	$0.077	$0.15	$0.17	Ton-Hour

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