

STEAM SYSTEM

INTRODUCTION

New Mexico State University currently uses a natural gas-fired steam production system and distributes steam to the main campus for the purposes of space heating, domestic hot water heating, food preparation and swimming pool heating to a total of 63 buildings on the main campus comprising nearly 4,000,000 square feet of conditioned space.

According to recent recorded historical data, approximately 163,000,000 lbs of steam is distributed campus annually at a peak delivery rate of roughly 65,000 lbs/hr. Without accounting for “free steam” attained from the heat recovery steam generator on the cogeneration turbine, annual steam distribution costs equate to approximately \$1,853,000 per year.

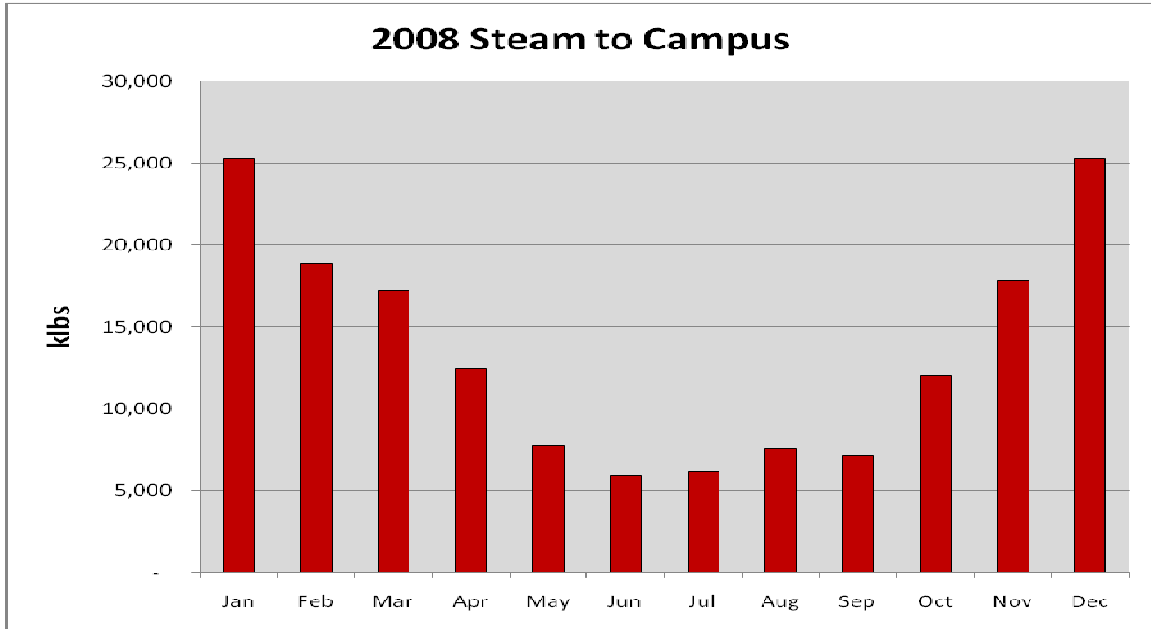
STEAM SYSTEM DESCRIPTION

The current steam production manifold for the NMSU campus consists of two 44,000 lb/hr Keeler water tube boilers, one 17,000 lb/hr Cleaver Brooks fire tube boiler and one 22,400 lb/hr Nebraska heat recovery steam generator operating in conjunction with the Solar Taurus-60 gas-fired turbine. The steam production manifold outputs steam to the campus distribution system at a pressure of 100 psi and temperature of about 337°F. The campus distribution is comprised of roughly 18,800 linear feet of both utility tunnel located and direct buried schedule 40 steel pipe. The associated condensate return system is comprised of roughly 18,800 linear feet of both utility tunnel located and direct buried schedule 40 steel pipe with the exception of a direct buried fiberglass line spanning Williams Hall (60) and the north end of the Kent loop. All steam delivered to campus is being used for the purposes of heating with the exception to the line feeding Dona Ana Community College. The Dona Ana Branch utilizes steam for the purposes of creating chilled water for cooling via an absorption chiller. The steam delivery system appears to be functioning adequately in regard to delivering the campus load demand with the exception of the Dona Ana absorption chiller, which is currently up for replacement by an electric compressor type chiller.

STEAM LOADS / NATURAL GAS CONSUMPTION

As stated above, recent annual records indicate an operational peak steam heating load of approximately 65,000 lbs/hr for an annual consumption of roughly 160,000 klbs of steam per annum. Known monthly data was retrieved from NMSU facilities personnel and is reflected below in Figure 1, representing usage from 2008.

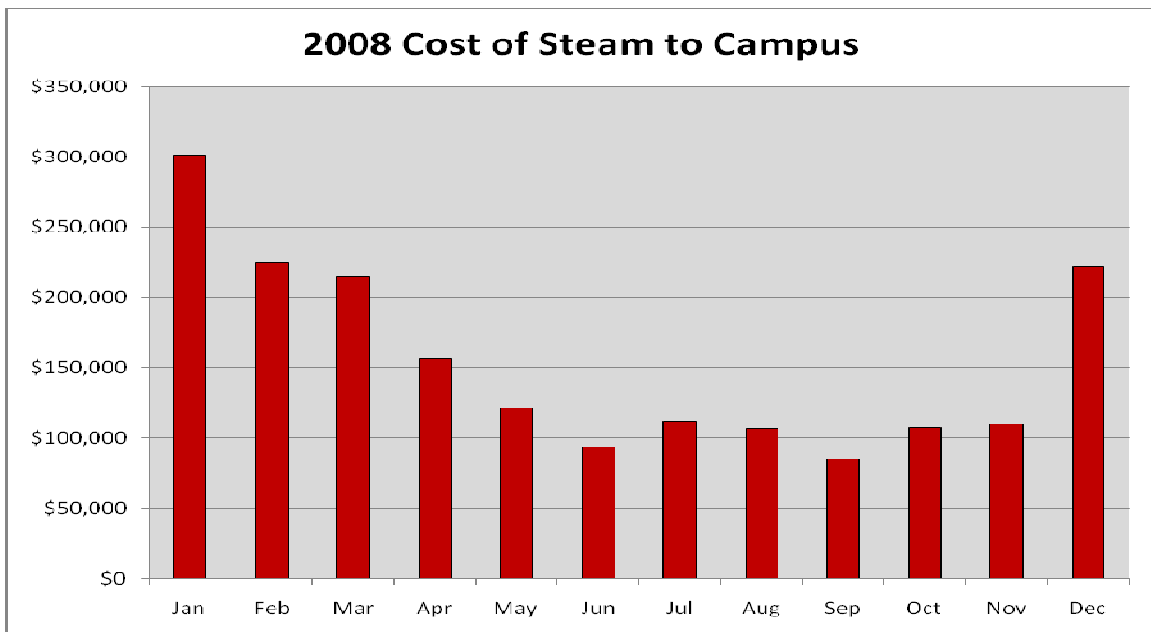
Figure 1 – 2008 Monthly Steam Usage



As seen in Figure 1, steam usage peaks in the winter due to space heating requirements and falls to a minimum in the summer for terminal unit reheat purposes.

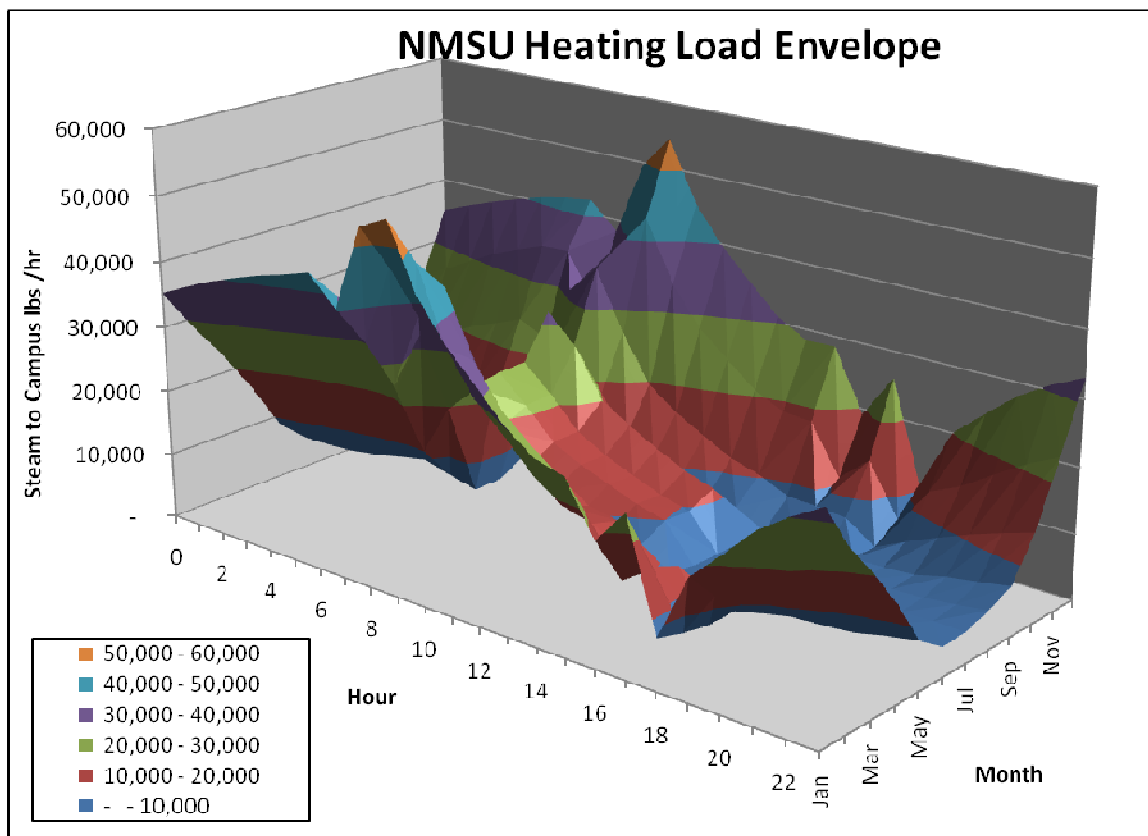
Figure 2 below reflects the associated costs of providing steam to campus, relative to the fluctuating price of natural gas in 2008, ranging from \$4/Dth in November to nearly \$13/Dth in July.

Figure 2 – 2008 Monthly Cost of Steam to Campus



Hourly campus steam loads are determined using both recorded monthly steam data from the central plant and by using an open source building energy modeling program called eQUEST, issued by the U.S Department of Energy. Using recorded annual flow data, peak flow data and a local hourly weather profile an annual hourly campus heating demand profile is generated using eQUEST and is checked at a monthly level using the recorded monthly data. Figure 3 below illustrates the averaged diurnal swing of campus steam demand by month to generate a heating load envelope, profiling the annual NMSU distributed steam consumption.

Figure 3 – 2008 NMSU Heating Load Envelope



As seen in Figure 3, during the winter months, peak steam delivery occurs early in the morning as classes are just getting started, as this is the coldest period in the working day. Steam delivery levels gradually decline throughout the day as the sun warms up the buildings and the air around them and bottoms out at about 5 or 6 pm. As the sun goes down in the evening, levels begin to rise to continue meet the unoccupied heating set points without the aid of the sun. Levels continue to rise all night long as the air continues to become colder until dawn breaks and levels die down slightly just before the unoccupied set points change over to occupied set points again. During the summer months the trend is similar, but rather to meet reheating needs while tempering buildings with cool air. This is a somewhat typical heating load envelope and is largely representative the actual steam delivery to the NMSU campus.

STEAM SYSTEM STRATEGIES FOR CAMPUS EXPANSION

New Mexico State University has developed an architectural master plan to aid in facilitating structured campus growth in five year phases out through the year 2034. A steam system development plan is a crucial counterpart of this equation. Not only are there a few deficiencies with the existing system, but it will need to change in configuration as well to match the progressing architectural build out of the main campus.

The development of the strategy for steam expansion has been contingent on the type of and distance of future buildings from the existing steam system. Any buildings or cluster of buildings accumulating significant load have been considered for a steam connection, whereas building areas with low load and requirements for significant piping additions to the existing system have been warranted non-candidates and will rely on natural gas or electricity for their heating needs.

SYSTEM EXPANSION FOR GROWTH OF CAMPUS

Following are brief descriptions of changes to the steam system through the set phases of campus development. Cost estimates are also provided with inflation factored in. Cost estimates for distributional piping are not included here and can be referenced in the Utility Tunnel System report. For phased distributional piping improvements, see the phased set of utility layout drawings in the back of this section.

Phase 1 – 2014

Most of the buildings in the first phase of development are candidates for steam connections and can be referenced in the included drawing sets. These additions to the system sum to about 7,000 lbs/hr of peak load. There are no costs other than distributional pipe for the additions of these buildings, however, one of the most notable deficiencies with the current steam system is the configuration of the plant header. It should be noted that steam is delivered to the campus distribution system via a single steam distribution header in the central utility plant. Although current peak steam delivery is on the order of 65,000 lb/hr, indicating the need for at least a 10” plant header, the actual plant header is sized at only 6”. The design flow of steam through a 6” header, not exceeding 10,000 ft/min, at 100 psi is less than a third of the actual flow. This configuration results in an extremely high flow velocity and tremendous initial pressure loss in the delivery system. According to the included flow model, steam leaves the boilers at 100 psi, but enters the distribution system at about 87 psi. The current arrangement of initial delivery could pose a huge problem in expansion of the steam distribution system and will likely need to change concurrently with the architectural build out of the campus. Since there are immediate and significant steam loads to be added to the system, it is recommended that the existing header is re-piped and re-sized from 6” to 18” in order to accommodate the full spatial production capacity of the existing utility plant. A proposed secondary utility plant can be seen in the drawing set, however, the need to connect to and use this facility for steam production will not be realized until Phase 5 of development. Estimates for this phase include only a re-piping of the existing plant steam header and come out to roughly \$518,000.

Phase 2 – 2019

Phase 2 also has significant additions to the steam system, summing about 9,000 lbs/hr of peak load, however only distributional improvements are foreseen and therefore no additional costs will be necessary at this point.

Phase 3 – 2024

In this phase there are enough new buildings on the steam system to sum to an addition of a 19,000 lbs/hr increase in peak load. It is also assumed at this time, since the original 17,000 lb/hr boiler will be 50+ years old, that a replacement boiler will be necessary. In order to most effectively retain an n+1 redundancy in steam production, it is suggested that an additional 44,000 lb/hr boiler be added at this time, prolonging the need to add an additional boiler for full campus build out to 2034. Estimates for this phase sum to roughly \$1,008,000.

Phase 4 – 2029

This phase includes the additions of buildings summing to an additive peak load of about 15,000 lbs/hr. There are only distributional piping improvements during this phase and no additional costs.

Phase 5 – 2034

In this phase, there are enough buildings to create an additional peak load of over 19,000 lbs/hr. Due to this additive load it is now required to upgrade production capacity to retain n+1 redundancy. Since Phase 3 included the addition of a 44,000 lb/hr boiler, there is now only a need to add a boiler on the order of 20,000 lb/hr. This will likely have to be part of the secondary utility plant and will require an additional module to be added to that facility. Costs for these system upgrades can be summed to roughly \$2,538,000.

STAGE 1 PRODUCTION DEFICIENCIES

There are no known current steam production deficiencies at the central utility plant.

STAGE 1 DISTRIBUTION DEFICIENCIES

Undersized Plant Header

See steam system strategies for campus expansion.

Undersized DACC line

Currently there is an open project to complete the installation of a redundant chiller for DACC, thus making the currently used steam fired absorber obsolete. Due to this decrease in steam load, the current 2 ½" line should have capacity for all other demands in the area.

Aging Piping Accessories

Most of the piping is still original and many of the fittings such as valves and expansion joints are likely nearing the end of their useful life. It is suggested that an audit be performed to pick up outdated accessories and replace them as necessary.

Missing Insulation

It has been noted by NMSU staff in an insulation audit and observed by GLHN staff that there are a significant number of areas in the steam piping distribution system where insulation has either been removed or worn off and has not been appropriately replaced. This sort of deficiency results in significant distributional heat loss, reducing the efficiency of the system and costing the University excess in utility expenditures. It is suggested that replacement of the insulation be performed according to the audit report.

Condensate Traps

It has been brought to attention by NMSU facilities personnel that there is a remarkably small number of condensate traps throughout the distribution system and many of the locations requiring traps such as bends and elbows are without them. This is a potential safety risk and could lead to serious damage and steam outages due to the nature of water hammer. It is recommended that an audit be performed and replacements and additions to the steam trap system be performed as necessary.

Summertime Operation

The steam production and distribution bottoms out in the summer to a fraction of the peak demand of the system. As the system stands, all mains remain active even for summer months. It is likely that due to this operation there are unnecessarily energized mains, increasing the parasitic losses of the system. It is recommended that a study be performed to accumulate individual building steam usage and determine if there are any significant portions of the system that can be shut down for summer operation.

EMCS

Finally, it has been observed that the existing data monitoring system for the steam system is grossly undersized and fails to capture a comprehensive view of the operation of the distribution system. Not only does the existing system have holes in data capture, processing and storing, there are many buildings that have incomplete monitoring capabilities as currently configured. This deficiency has already been picked up by the University and is currently being improved upon by a dedicated team of personnel.

**STEAM PLANT
ASSETS**

Boilers

Mark	Model	Type	Input MBH	Flow (lbs/hr)	PSI	°F
B-1	Keeler B0252FLG3UL	Nat-Gas Water Tube	62,800	44,000	100	337
B-2	Keeler B0252FLG3UL	Nat-Gas Water Tube	62,800	44,000	100	337
B-3	Cleaver Brooks CB1700500150	Nat-Gas Fire Tube	24,500	17,167	100	337
HRSB-1	Nebraska S2.5	Turbine Waste Heat Water Tube	31,960	22,400	100	337
Totals			182,060	127,567		

Pumps

Mark	Model	Duty	Flow (gpm)	Head (ft)	Motor		
					HP	Elect.	RPM
1	Grundfos A95740513- P10718038	Feedwater	53.27	436.7	10	460-3-60	3448
2	Grundfos A95740513- P10718039	Feedwater	53.27	436.7	10	460-3-60	3448
Totals			106.54		20		

New Mexico State University	Lab (Btu/h/SF)	31
Utility Development Plan	Acad (Btu/h/SF)	12
2009	Housing (Btu/h/SF)	8
Steam Distribution System	Admin (Btu/h/SF)	16

Bldg. #	Building Name	Year Built	Address	Category	2009			2014			2019			2024			2029			2034			DWG Area	Notes
					GSF	Peak Load (Btu/h)	Peak Load (Lb/h)	GSF	Peak Load (Btu/h)	Peak Load (Lb/h)	GSF	Peak Load (Btu/h)	Peak Load (Lb/h)	GSF	Peak Load (Btu/h)	Peak Load (Lb/h)	GSF	Peak Load (Btu/h)	Peak Load (Lb/h)	GSF	Peak Load (Btu/h)	Peak Load (Lb/h)		
EXISTING BUILDINGS																								
225	Astronomy Building	1959	1320 Frenger Mall	ACAD - LAB	15,486	473,717	398	15,486	473,717	398	15,486	473,717	398	15,486	473,717	398	15,486	473,717	398	15,486	473,717	398	7	
278	Branson Library	1951	1305 Frenger Mall	ACAD	159,696	1,928,329	1,622	159,696	1,928,329	1,622	159,696	1,928,329	1,622	159,696	1,928,329	1,622	159,696	1,928,329	1,622	159,696	1,928,329	1,622	6	
184	Breland Hall	1954	1525 Stewart St.	ACAD - LAB	95,313	2,915,625	2,452	95,313	2,915,625	2,452	95,313	2,915,625	2,452	31,771	971,875	817	31,771	971,875	817	31,771	971,875	817	7	
386	Business Complex Building	1983	1320 University Ave.	ACAD - CLASSROOM	54,992	664,028	558	54,992	664,028	558	54,992	664,028	558	54,992	664,028	558	54,992	664,028	558	54,992	664,028	558	3	
605	Chamisa Village	2006	1725 Stewart Street	HOUSING	114,056	918,151	772	114,056	918,151	772	114,056	918,151	772	114,056	918,151	772	114,056	918,151	772	114,056	918,151	772	7	
187	Chemistry Building	1957	1175 North Horseshoe	ACAD - LAB	115,878	3,544,708	2,981	115,878	3,544,708	2,981	115,878	3,544,708	2,981	115,878	3,544,708	2,981	115,878	3,544,708	2,981	115,878	3,544,708	2,981	2	
364	Clara Belle Williams Hall	1981	1395 International Mall	ACAD - LAB	24,671	754,686	635	24,671	754,686	635	24,671	754,686	635	24,671	754,686	635	24,671	754,686	635	24,671	754,686	635	3	
468	Coca Cola Weight Training Facility	1992	1800 Stewart St.	AUX	16,831	270,979	228	16,831	270,979	228	16,831	270,979	228	16,831	270,979	228	16,831	270,979	228	16,831	270,979	228	8	
126	Computer Center	1966	1275 Stewart St.	ACAD - LAB	40,288	1,232,410	1,036	40,288	1,232,410	1,036	40,288	1,232,410	1,036	40,288	1,232,410	1,036	40,288	1,232,410	1,036	40,288	1,232,410	1,036	6	
285	Corbett Center	1968	1600 International Mall	AUX	213,313	3,434,339	2,888	213,313	3,434,339	2,888	213,313	3,434,339	2,888	213,313	3,434,339	2,888	213,313	3,434,339	2,888	213,313	3,434,339	2,888	3	
60	Dan W. Williams Hall	1938	1390 E. University Ave.	ACAD - LAB	36,857	1,127,456	948	36,857	1,127,456	948	0	0	0	0	0	0	0	0	0	0	0	0	3	
60A	Dan W. Williams Hall Annex	1984	1390 E. University Ave.	ACAD - LAB	11,926	364,816	307	11,926	364,816	307	0	0	0	0	0	0	0	0	0	0	0	0	3	
341	Dona Ana Branch Community College			ACAD - CLASSROOM	182,000	2,197,650	1,848	182,000	2,197,650	1,848	182,000	2,197,650	1,848	182,000	2,197,650	1,848	182,000	2,197,650	1,848	182,000	2,197,650	1,848	6	
56	Dove Hall	1936	1305 North Horseshoe	ADMIN	13,476	216,964	182	13,476	216,964	182	13,476	216,964	182	13,476	216,964	182	13,476	216,964	182	13,476	216,964	182	2	
541	Ed and Harold Foreman Engineering Complex	1997	1060 Frenger Mall	ACAD - LAB	84,526	2,585,650	2,174	84,526	2,585,650	2,174	84,526	2,585,650	2,174	84,526	2,585,650	2,174	84,526	2,585,650	2,174	84,526	2,585,650	2,174	6	
338	Educational Services Center	1978	1780 East University Ave.	ADMIN	50,366	810,893	682	50,366	810,893	682	50,366	810,893	682	50,366	810,893	682	50,366	810,893	682	50,366	810,893	682	4	
363	Engineering Complex I	1980	1025 Stewart St.	ACAD - LAB	55,585	1,700,345	1,430	55,585	1,700,345	1,430	55,585	1,700,345	1,430	55,585	1,700,345	1,430	55,585	1,700,345	1,430	55,585	1,700,345	1,430	6	
34	Foster Hall	1930	1200 S. Horseshoe	ACAD - LAB	98,084	3,000,390	2,523	98,084	3,000,390	2,523	98,084	3,000,390	2,523	98,084	3,000,390	2,523	98,084	3,000,390	2,523	98,084	3,000,390	2,523	6	
275	Garcia Residence Hall	1968	1715 International Mall	HOUSING	208,371	1,677,387	1,411	208,371	1,677,387	1,411	208,371	1,677,387	1,411	208,371	1,677,387	1,411	208,371	1,677,387	1,411	208,371	1,677,387	1,411	3	
188	Gardiner Hall	1957	1255 North Horseshoe	ACAD - LAB	63,224	1,934,022	1,626	63,224	1,934,022	1,626	63,224	1,934,022	1,626	63,224	1,934,022	1,626	63,224	1,934,022	1,626	63,224	1,934,022	1,626	2	
244	Gerald Thomas Hall	1963	940 College Dr.	ACAD - LAB	139,950	4,281,071	3,600	139,950	4,281,071	3,600	139,950	4,281,071	3,600	139,950	4,281,071	3,600	139,950	4,281,071	3,600	139,950	4,281,071	3,600	2	
10	Goddard Hall	1913	1100 South Horseshoe	ACAD - LAB	31,942	977,106	822	31,942	977,106	822	31,942	977,106	822	31,942	977,106	822	31,942	977,106	822	31,942	977,106	822	2	
288	Guthrie Hall	1968	1325 International Mall	ACAD - CLASSROOM	41,531	501,487	422	41,531	501,487	422	41,531	501,487	422	41,531	501,487	422	41,531	501,487	422	41,531	501,487	422	3	
172	Hadley Hall	1953	2855 Weddell St.	ADMIN	38,199	615,004	517	38,199	615,004	517	38,199	615,004	517	38,199	615,004	517	38,199	615,004	517	38,199	615,004	517	2	
323	Hardman Hall	1974	2902 McFie Circle	ACAD - CLASSROOM	30,370	366,718	308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
590	Health and Social Services Building	2003	1335 International Mall	ACAD - CLASSROOM	64,663	780,806	657	64,663	780,806	657	64,663	780,806	657	64,663	780,806	657	64,663	780,806	657	64,663	780,806	657	3	
249	Herschell Zohn Theatre	1963	3014 McFie Circle	ACAD - CLASSROOM	23,572	284,632	239	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	
250	Jacobs Hall	1963	2908 McFie Circle	ACAD - LAB	22,433	686,225	577	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	
321	James B. Delamater Activity Center	1973	1600 Stewart St.	ACAD - GYMNASIUM	114,109	1,837,155	1,545	114,109	1,837,155	1,545	114,109	1,837,155	1,545	114,109	1,837,155	1,545	114,109	1,837,155	1,545	114,109	1,837,155	1,545	7	
190	Jett Annex	1957	1025 Frenger Mall	ACAD - LAB	6,529	199,722	168	6,529	199,722	168	6,529	199,722	168	6,529	199,722	168	6,529	199,722	168	6,529	199,722	168	6	
189	Jett Hall	1956	1040 South Horseshoe	ACAD - LAB	84,091	2,572,344	2,163	84,091	2,572,344	2,163	84,091	2,572,344	2,163	84,091	2,572,344	2,163	84,091	2,572,344	2,163	84,091	2,572,344	2,163	2	
397	John Whitlock Hernandez Hall	1988	3035 S. Espina St.	ACAD - LAB	44,107	1,349,233	1,135	44,107	1,349,233	1,135	44,107	1,349,233	1,135	44,107	1,349,233	1,135	44,107	1,349,233	1,135	44,107	1,349,233	1,135	6	
33	Kent Hall	1929	1280 E. University Ave.	ACAD - CLASSROOM	20,473	247,211	208	20,473	247,211	208	20,473	247,211	208	20,473	247,211	208	20,473	247,211	208	20,473	247,211	208	2	
368	Knox Hall	1981	2980 South Espina St.	ACAD - LAB	75,737	2,316,795	1,948	75,737	2,316,795	1,948	75,737	2,316,795	1,948	75,737	2,316,795	1,948	75,737	2,316,795	1,948	75,737	2,316,795	1,948	6	
342	Memorial Stadium Locker Rooms	1978	1810 Stewart St.	AUX	33,890	545,629	459	33,890	545,629	459	33,890	545,629	459	33,890	545,629	459	33,890	545,629	459	33,890	545,629	459	8	
83	Milton Hall	1941	2915 McFie Circle	ACAD - CLASSROOM	99,311	1,199,180	1,008	99,311	1,199,180	1,008	99,311	1,199,180	1,008	99,311	1,199,180	1,008	99,311	1,199,180	1,008	99,311	1,199,180	1,008	3	
260	Monagle Residence Hall	1965	1525 International Mall	HOUSING	121,457	977,729	822	121,457	977,729	822	0	0	0	0	0	0	0	0	0	0	0	0	3	
389	Music Building	1983	1075 North Horseshoe	ACAD - CLASSROOM	56,153	678,047	570	56,153	678,047	570	56,153	678,047	570	56,153	678,047	570	56,153	678,047	570	56,153	678,047	570	2	
251	Natorium	1962	1520 Stewart St.	AUX	15,421	471,728	397	15,421	471,728	397	15,421	471,728	397	15,421	471,728	397	15,421	471,728	397	15,421	471,728	397	7	
164	Neale Hall	1951	3080 South Espina St.	ACAD - LAB	15,868	485,402	408	15,868	485,402	408	0	0	0	0	0	0	0	0	0	0	0	0	6	
330	New Mexico Dept. of Agriculture	1975	3190 South Espina St.	IO	28,288	455,437	383	28,288	455,437	383	28,288	455,437	383	28,288	455,437	383	28,288	455,437	383	28,288	455,437	383	6	
287	O'Donnell Hall	1968	1220 Stewart St.	ACAD - LAB	93,858	2,871,116	2,414	93,858	2,871,116	2,414	93,858	2,871,116	2,414	93,858	2,871,116	2,414	93,858	2,871,116	2,414	93,858	2,871,116	2,414	6	
269	OFS Central Heating Plant	1966	3060 Sweet St.	POM	21,071	339,243	285	21,071	339,243	285	21,071	339,243												

FIVE-YEAR ADDITIONS																								
05-01	Arts Complex - Phase 1	2014	-	ACAD - CLASSROOM				234,000	2,825,550	2,376	234,000	2,825,550	2,376	234,000	2,825,550	2,376	234,000	2,825,550	2,376	234,000	2,825,550	2,376	2	
05-02	Institute for Public Policy (Domenici Center)	2014	-	ACAD - CLASSROOM			55,980	675,959	568	55,980	675,959	568	55,980	675,959	568	55,980	675,959	568	55,980	675,959	568	3		
05-03	Student Service Facility, Ph. 1	2014	-	ADMIN			37,500	603,750	508	37,500	603,750	508	37,500	603,750	508	37,500	603,750	508	37,500	603,750	508	3		
05-04	Native American Cultural Center	2014	-	ACAD - CLASSROOM			26,900	324,818	273	26,900	324,818	273	26,900	324,818	273	26,900	324,818	273	26,900	324,818	273	7		
05-05	Tech. Lab/Classroom Facility	2014	-	ACAD - CLASSROOM/LAB			60,000	1,835,400	1,543	60,000	1,835,400	1,543	60,000	1,835,400	1,543	60,000	1,835,400	1,543	60,000	1,835,400	1,543	3	1	
05-08	Bookstore	2014	-	AUX			35,000	563,500	474	35,000	563,500	474	35,000	563,500	474	35,000	563,500	474	35,000	563,500	474	3		
05-09	NMDA Building Renovations and Additions	2014	-	IO			60,000	966,000	812	60,000	966,000	812	60,000	966,000	812	60,000	966,000	812	60,000	966,000	812	6		
05-10	Addition to the Health and Social Services Building	2014	-	ACAD - CLASSROOM			7,387	89,198	75	7,387	89,198	75	7,387	89,198	75	7,387	89,198	75	7,387	89,198	75	3		
05-13	Chamisa Dorms, Ph. 2	2014	-	HOUSING			55,628	447,805	377	55,628	447,805	377	55,628	447,805	377	55,628	447,805	377	55,628	447,805	377	7	2	
Totals							0	0	0	572,395	8,331,979	7,006	572,395	8,331,979	7,006	572,395	8,331,979	7,006	572,395	8,331,979	7,006			

NOTES:
1 following demolition of Hardman Hall (323), Jacobs Hall (250), and the Zohn Theatre (249)
2 SF based on assumption that Ph. 2 will double the size of the facility

TEN-YEAR ADDITIONS																							
10-01	West Mixed Use/Graduate Housing	2019	-	HOUSING						64,800	521,640	439	64,800	521,640	439	64,800	521,640	439	64,800	521,640	439	3	1
10-02	East Mixed Use/Graduate Housing, Ph. 1	2019	-	HOUSING						116,100	934,605	786	116,100	934,605	786	116,100	934,605	786	116,100	934,605	786	3	1.2
10-03	Student Service Facility, Ph. 2	2019	-	ADMIN						37,500	603,750	508	37,500	603,750	508	37,500	603,750	508	37,500	603,750	508	3	3.4
10-04	New Undergraduate Housing	2019	-	HOUSING						56,520	454,986	383	56,520	454,986	383	56,520	454,986	383	56,520	454,986	383	3	3.5
10-06	New Married Student Housing	2019	-	HOUSING						165,660	1,333,563	1,121	165,660	1,333,563	1,121	165,660	1,333,563	1,121	165,660	1,333,563	1,121	7	5
10-07	Student Activities Expansion	2019	-	AUX						87,160	1,403,276	1,180	87,160	1,403,276	1,180	87,160	1,403,276	1,180	87,160	1,403,276	1,180	7	6.9
10-08	New Academic Buildings	2019	-	ACAD - CLASSROOM						263,250	3,178,744	2,673	263,250	3,178,744	2,673	263,250	3,178,744	2,673	263,250	3,178,744	2,673	6	1.7
10-14	Jordan Street Gateway	2019	-	AUX/Housing						190,000	1,529,500	1,286	190,000	1,529,500	1,286	190,000	1,529,500	1,286	190,000	1,529,500	1,286	3	8
10-16	Arts Complex - Phase II (Visual Arts)	2019	-	ACAD - CLASSROOM						71,500	863,363	726	71,500	863,363	726	71,500	863,363	726	71,500	863,363	726	2	
Totals							0	0	0	1,052,490	10,823,426	9,102	1,052,490	10,823,426	9,102	1,052,490	10,823,426	9,102	1,052,490	10,823,426	9,102		

NOTES:
1 SF based on building footprint for three stories
2 following demolition of Delta Zeta and Zeta Tau Alpha sorority houses (213, 163)
3 following demolition of Monagle Hall (260)
4 SF based on assumption that Ph. 2 will double the size of the facility
5 SF based on footprint for three stories
6 following demolition of Rentfrow Gymnasium (211)
7 following demolition of Animal Science (376, 241, 198), Tejada Extension Annex (245), Animal Husbandry Barn (162), Sheep Barns (194), Cattle Feed Barn (240), Small Animal Lab (246), Livestock Judging Pavillion (195) and Neale Hall (164)
8 following demolition of D.W. Williams Hall and Annex (60, 60A)
9 SF based on building footprint for single story

FIFTEEN-YEAR ADDITIONS																							
15-01	East Mixed Use/Graduate Housing, Ph. 2	2024	-	HOUSING						117,720	947,646	797	117,720	947,646	797	117,720	947,646	797	117,720	947,646	797	3	1.2
15-02	Zuhl Library Expansion	2024	-	ACAD						110,850	1,338,514	1,126	110,850	1,338,514	1,126	110,850	1,338,514	1,126	110,850	1,338,514	1,126	7	1.3
15-03	Academic/Lab Building	2024	-	ACAD - LAB						26,220	802,070	674	26,220	802,070	674	26,220	802,070	674	26,220	802,070	674	6	1
15-04	Academic Building	2024	-	ACAD - CLASSROOM						117,600	1,420,020	1,194	117,600	1,420,020	1,194	117,600	1,420,020	1,194	117,600	1,420,020	1,194	7	1
15-05	Academic/Lab Building	2024	-	ACAD - LAB						218,190	6,674,432	5,613	218,190	6,674,432	5,613	218,190	6,674,432	5,613	218,190	6,674,432	5,613	6	1.4
15-06	Research/Lab Building	2024	-	ACAD - LAB						233,250	7,135,118	6,000	233,250	7,135,118	6,000	233,250	7,135,118	6,000	233,250	7,135,118	6,000	6	1.5
15-07	Academic Lab Building	2024	-	ACAD - LAB						90,930	2,781,549	2,339	90,930	2,781,549	2,339	90,930	2,781,549	2,339	90,930	2,781,549	2,339	7	1
15-14	O'Donnell Hall - Phase II	2024	-	ACAD - CLASSROOM						35,000	422,625	355	35,000	422,625	355	35,000	422,625	355	35,000	422,625	355	6	
15-15	Arts Complex - Phase III (Performance Hall)	2024	-	ACAD - CLASSROOM						76,500	923,738	777	76,500	923,738	777	76,500	923,738	777	76,500	923,738	777	2	
Totals							0	0	0	1,026,260	22,445,710	18,875	1,026,260	22,445,710	18,875	1,026,260	22,445,710	18,875	1,026,260	22,445,710	18,875		

NOTES:
1 SF based on building footprint for three stories
2 following demolition of Chi Omega sorority houses (268)
3 following demolition of Breland Hall Addition (north part of 184)
4 following demolition of Bull Barn (193), Heardsmen Residence (199), Stucky Hall (282), Animal Husbandry (290), and the Feeding Research Building (303)
5 following demolition of PSL West Shop (280), Guardhouse (281), Machine Shop (216), Rocket Shop (243) and East Shop (279)
6 following demolition of East and West Greek Complexes (271, 272, 273, 274, 414), Wells Hall (355), Cosmic Ray Lab (398), Theatre Scene Shop (385), Housing Warehouse (467), Ag Service Storage (316) and Flammable Storage (320), SF based on building footprint for two stories
7 SF based on building footprint for two stories

TWENTY-YEAR ADDITIONS																								
20-01	Academic/Lab Building	2029	-	ACAD - LAB										118,260	3,617,573	3,042	118,260	3,617,573	3,042	118,260	3,617,573	3,042	7	1.2
20-02	Academic/Research Building	2029	-	ACAD - CLASSROOM						686,350	8,287,676	6,969	686,350	8,287,676	6,969	686,350	8,287,676	6,969	686,350	8,287,676	6,969	6	3.4	
20-03	Academic/Research Building	2029	-	ACAD - CLASSROOM						273,440	3,301,788	2,777	273,440	3,301,788	2,777	273,440	3,301,788	2,777	273,440	3,301,788	2,777	7	3.5	
20-04	Family Housing, Ph. 2	2029	-	HOUSING						255,064	2,053,265	1,727	255,064	2,053,265	1,727	255,064	2,053,265	1,727	255,064	2,053,265	1,727	7	3	
20-08	Arts Complex - Phase IV (Music, Dance, CMI)	2029	-	ACAD - CLASSROOM						36,000	434,700	366	36,000	434,700	366	36,000	434,700	366	36,000	434,700	366	2		
Totals							0	0	0	0	0	0	0	1,369,114	17,695,003	14,880	1,369,114	17,695,003	14,880	1,369,114	17,695,003	14,880		

NOTES:
1 SF based on building footprint for three stories
2 following demolition of Regent's Row Dorms (248)
3 SF based on building footprint for two stories
4 following demolition of Sutherland Village (206)
5 following demolition of Tombaugh Observatory (317, 318, 319) and PE Restroom (314)

BEYOND TWENTY-YEAR ADDITIONS																							
25-01	Academic/Research Buildings	2034	-	ACAD - CLASSROOMS																			
Totals							0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

25-02	Academic/Research Buildings	2034	-	ACAD - CLASSROOMS															439,110	5,302,253	4,459	10	2,4
25-03	Academic/Research Buildings	2034	-	ACAD - CLASSROOMS															338,655	4,089,259	3,439	10	3,4
25-04	Arts Complex - Phase V	2034	-	ACAD - CLASSROOMS															251,388	3,035,510	2,553	2	4
Totals					0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,893,519	22,864,242	19,227		
NOTES:																							
1 following demolition of Tom Fort Village and Cole Village																							
2 following demolition of Cervantes Housing																							
3 following demolition of Genesis Center (394, 395) and Academic Research Center (412)																							
4 SF based on building footprint for three stories																							
OVERALL TOTALS:					3,991,924	79,666,575	66,993	4,487,944	86,660,979	72,875	5,352,048	94,459,318	79,432	6,301,110	114,796,383	96,534	7,587,838	131,164,971	110,299	9,481,357	154,029,213	129,526	

POM - Productions and Operations Management
 IO - Independent Operation
 AUX - Auxiliary



**OPINION OF PROBABLE
CONSTRUCTION COST**

BASIS FOR ESTIMATE

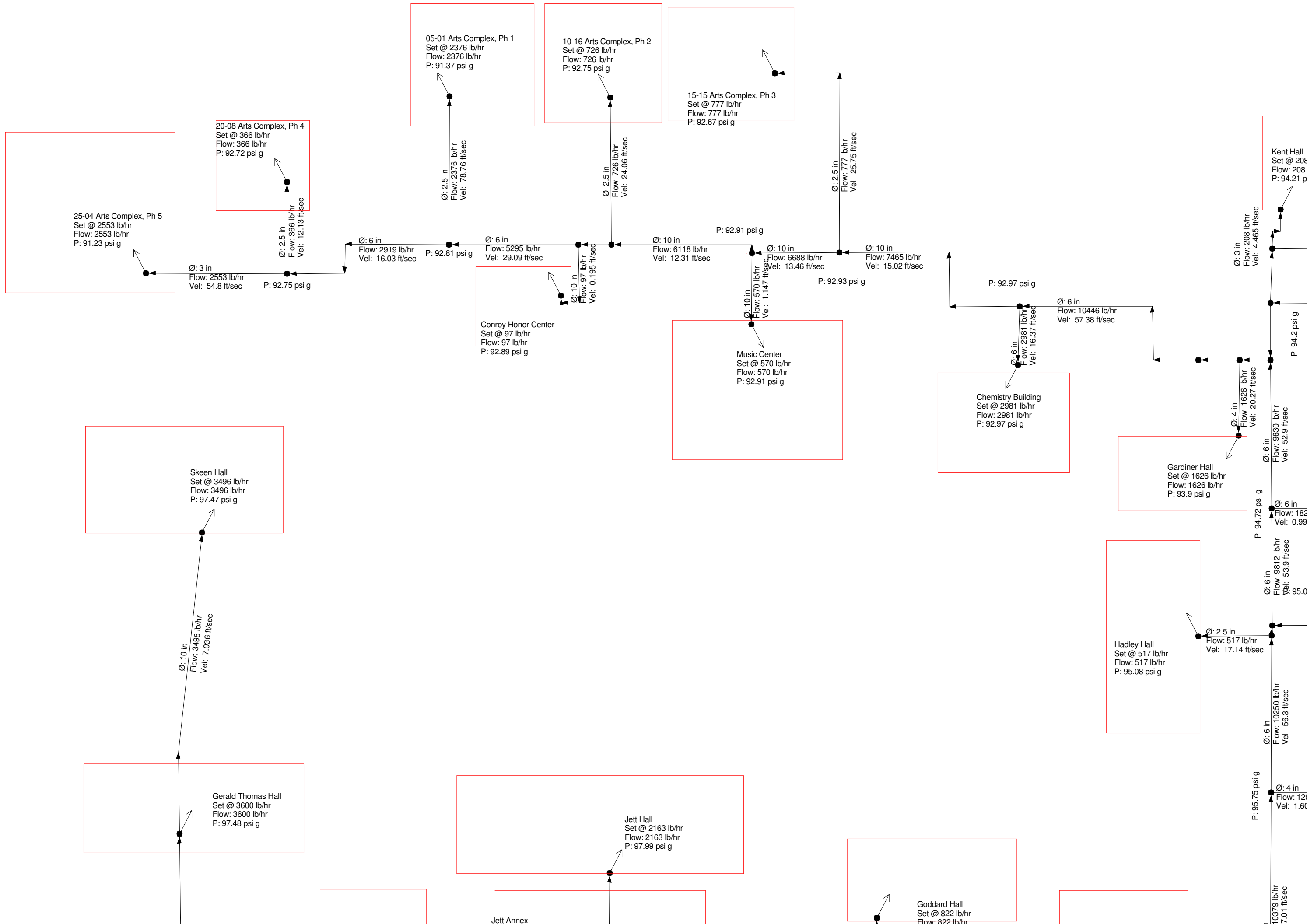
- CODE A (No design completed)
- CODE B (Preliminary design)
- CODE C (Finished design)

COMPUTED BY: DHW
 CHECKED BY: _____
 6/16/09

New Mexico State University
Utility Development Plan
2029 Steam Capital Costs

Proj. No. 0874.00
 Dept. Mechanical
 Sheet No. _____

SUMMARY	QUANTITY		MATERIAL		LABOR		EQUIP	TOTAL COST
	No. UNITS	UNIT MEAS.	PER UNIT	TOTAL	PER UNIT	TOTAL	PER UNIT	
boiler, 20,000 lb/hr	1	ea	\$170,000.00	\$170,000.00				\$170,000
piping	1	ea	\$85,000.00	\$85,000.00				\$85,000
secondary plant building	2500	sf	\$180.00	\$450,000.00				\$450,000
distribution piping (see utility tunnel system)								
Subtotal								\$705,000
Subcontractor Overhead, 10%								\$70,500
Subcontractor Profit, 10%								\$77,550
Subtotal								\$853,050
General Contractor Overhead, 10%								\$85,305
General Contractor Profit, 5%								\$46,918
Subtotal								\$985,273
General Contractor Liability, 1.5%								\$14,779
General Contractor Bond, 2.5%								\$24,632
General Contractor Tax, 5.5%								\$56,358
General Contractor Total								\$1,081,041
Soft Costs, 30%								\$324,312
Escalation, 3% per year	20	yrs						\$1,132,871
Total								\$2,538,225



25-04 Arts Complex, Ph 5
 Set @ 2553 lb/hr
 Flow: 2553 lb/hr
 P: 91.23 psi g

20-08 Arts Complex, Ph 4
 Set @ 366 lb/hr
 Flow: 366 lb/hr
 P: 92.72 psi g

05-01 Arts Complex, Ph 1
 Set @ 2376 lb/hr
 Flow: 2376 lb/hr
 P: 91.37 psi g

10-16 Arts Complex, Ph 2
 Set @ 726 lb/hr
 Flow: 726 lb/hr
 P: 92.75 psi g

15-15 Arts Complex, Ph 3
 Set @ 777 lb/hr
 Flow: 777 lb/hr
 P: 92.67 psi g

Kent Hall
 Set @ 208 lb/hr
 Flow: 208 lb/hr
 P: 94.21 psi g

Ø: 3 in
 Flow: 2553 lb/hr
 Vel: 54.8 ft/sec

Ø: 2.5 in
 Flow: 366 lb/hr
 Vel: 12.13 ft/sec

Ø: 6 in
 Flow: 2919 lb/hr
 Vel: 16.03 ft/sec

Ø: 2.5 in
 Flow: 2376 lb/hr
 Vel: 78.76 ft/sec

Ø: 6 in
 Flow: 5295 lb/hr
 Vel: 29.09 ft/sec

Ø: 2.5 in
 Flow: 726 lb/hr
 Vel: 24.06 ft/sec

Ø: 10 in
 Flow: 97 lb/hr
 Vel: 0.195 ft/sec

Ø: 10 in
 Flow: 6118 lb/hr
 Vel: 12.31 ft/sec

P: 92.91 psi g

Ø: 10 in
 Flow: 6688 lb/hr
 Vel: 13.46 ft/sec

Ø: 2.5 in
 Flow: 777 lb/hr
 Vel: 25.75 ft/sec

Ø: 10 in
 Flow: 7465 lb/hr
 Vel: 15.02 ft/sec

P: 92.93 psi g

P: 92.97 psi g

Ø: 6 in
 Flow: 10446 lb/hr
 Vel: 57.38 ft/sec

Ø: 3 in
 Flow: 208 lb/hr
 Vel: 4.465 ft/sec

P: 94.2 psi g

Conroy Honor Center
 Set @ 97 lb/hr
 Flow: 97 lb/hr
 P: 92.89 psi g

Music Center
 Set @ 570 lb/hr
 Flow: 570 lb/hr
 P: 92.91 psi g

Ø: 10 in
 Flow: 570 lb/hr
 Vel: 1.147 ft/sec

Ø: 6 in
 Flow: 2981 lb/hr
 Vel: 16.37 ft/sec

Chemistry Building
 Set @ 2981 lb/hr
 Flow: 2981 lb/hr
 P: 92.97 psi g

Ø: 4 in
 Flow: 1626 lb/hr
 Vel: 20.27 ft/sec

Ø: 6 in
 Flow: 9630 lb/hr
 Vel: 52.9 ft/sec

P: 94.72 psi g

Ø: 6 in
 Flow: 9812 lb/hr
 Vel: 53.9 ft/sec

Ø: 6 in
 Flow: 10250 lb/hr
 Vel: 56.3 ft/sec

P: 95.75 psi g

Ø: 4 in
 Flow: 1237 lb/hr
 Vel: 7.01 ft/sec

Skeen Hall
 Set @ 3496 lb/hr
 Flow: 3496 lb/hr
 P: 97.47 psi g

Ø: 10 in
 Flow: 3496 lb/hr
 Vel: 7.036 ft/sec

Gerald Thomas Hall
 Set @ 3600 lb/hr
 Flow: 3600 lb/hr
 P: 97.48 psi g

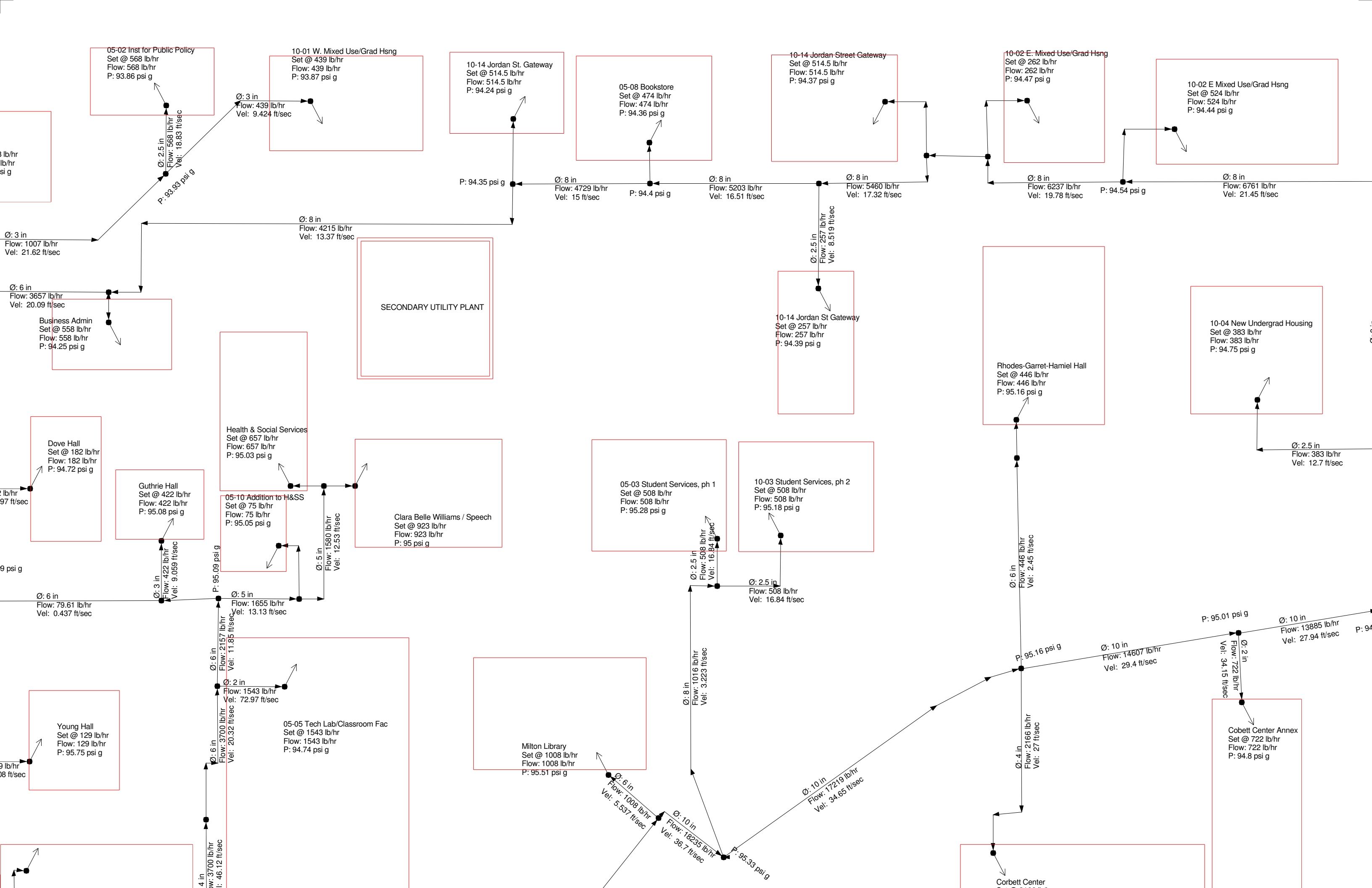
Jett Hall
 Set @ 2163 lb/hr
 Flow: 2163 lb/hr
 P: 97.99 psi g

Hadley Hall
 Set @ 517 lb/hr
 Flow: 517 lb/hr
 P: 95.08 psi g

Ø: 2.5 in
 Flow: 517 lb/hr
 Vel: 17.14 ft/sec

Goddard Hall
 Set @ 822 lb/hr
 Flow: 822 lb/hr

Jett Annex



05-02 Inst for Public Policy
Set @ 568 lb/hr
Flow: 568 lb/hr
P: 93.86 psi g

10-01 W. Mixed Use/Grad Hsng
Set @ 439 lb/hr
Flow: 439 lb/hr
P: 93.87 psi g

10-14 Jordan St. Gateway
Set @ 514.5 lb/hr
Flow: 514.5 lb/hr
P: 94.24 psi g

05-08 Bookstore
Set @ 474 lb/hr
Flow: 474 lb/hr
P: 94.36 psi g

10-14 Jordan Street Gateway
Set @ 514.5 lb/hr
Flow: 514.5 lb/hr
P: 94.37 psi g

10-02 E. Mixed Use/Grad Hsng
Set @ 262 lb/hr
Flow: 262 lb/hr
P: 94.47 psi g

10-02 E Mixed Use/Grad Hsng
Set @ 524 lb/hr
Flow: 524 lb/hr
P: 94.44 psi g

SECONDARY UTILITY PLANT

Business Admin
Set @ 558 lb/hr
Flow: 558 lb/hr
P: 94.25 psi g

10-14 Jordan St Gateway
Set @ 257 lb/hr
Flow: 257 lb/hr
P: 94.39 psi g

Rhodes-Garret-Hamiel Hall
Set @ 446 lb/hr
Flow: 446 lb/hr
P: 95.16 psi g

10-04 New Undergrad Housing
Set @ 383 lb/hr
Flow: 383 lb/hr
P: 94.75 psi g

Dove Hall
Set @ 182 lb/hr
Flow: 182 lb/hr
P: 94.72 psi g

Guthrie Hall
Set @ 422 lb/hr
Flow: 422 lb/hr
P: 95.08 psi g

Health & Social Services
Set @ 657 lb/hr
Flow: 657 lb/hr
P: 95.03 psi g

05-10 Addition to H&SS
Set @ 75 lb/hr
Flow: 75 lb/hr
P: 95.05 psi g

Clara Belle Williams / Speech
Set @ 923 lb/hr
Flow: 923 lb/hr
P: 95 psi g

05-03 Student Services, ph 1
Set @ 508 lb/hr
Flow: 508 lb/hr
P: 95.28 psi g

10-03 Student Services, ph 2
Set @ 508 lb/hr
Flow: 508 lb/hr
P: 95.18 psi g

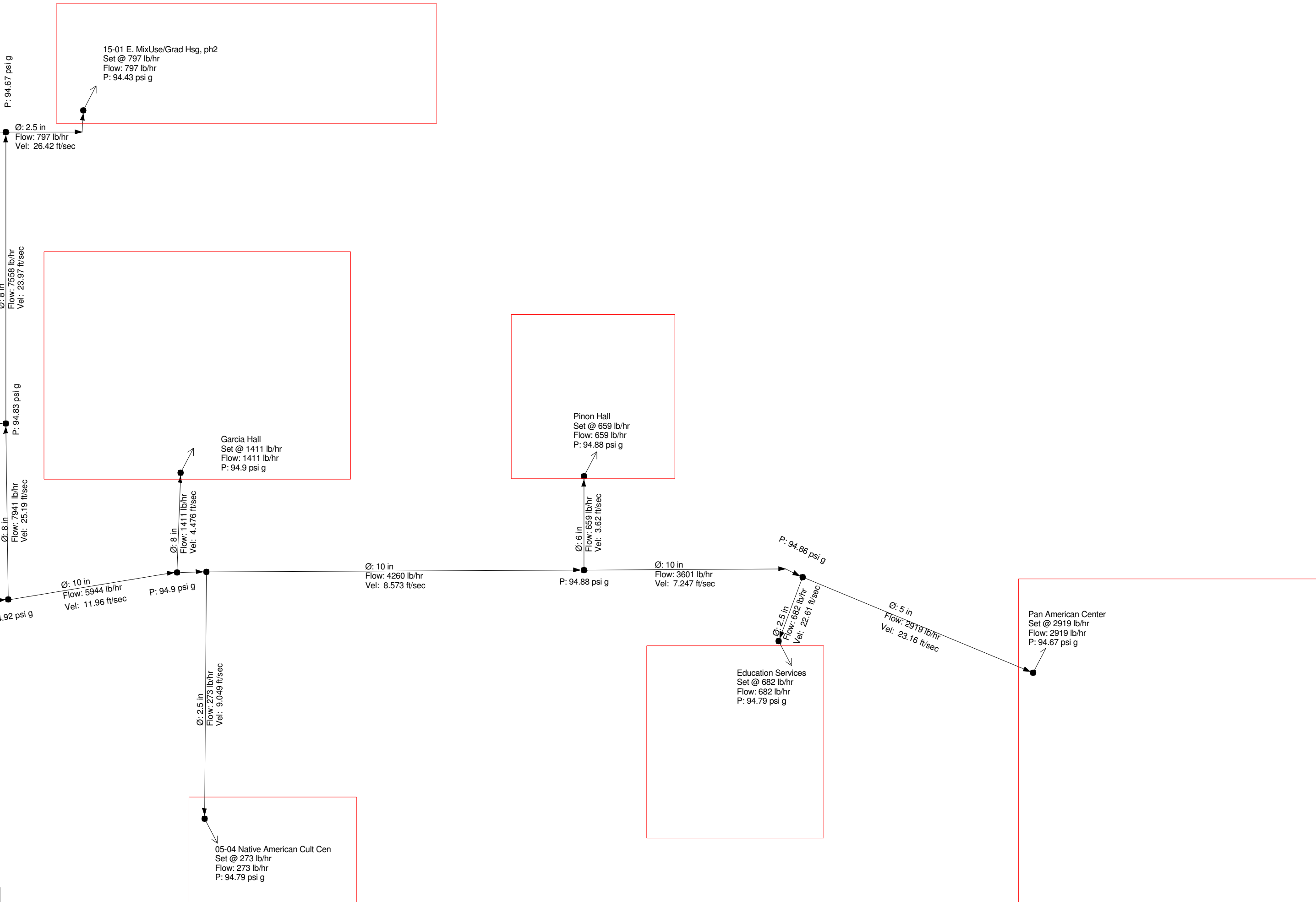
Young Hall
Set @ 129 lb/hr
Flow: 129 lb/hr
P: 95.75 psi g

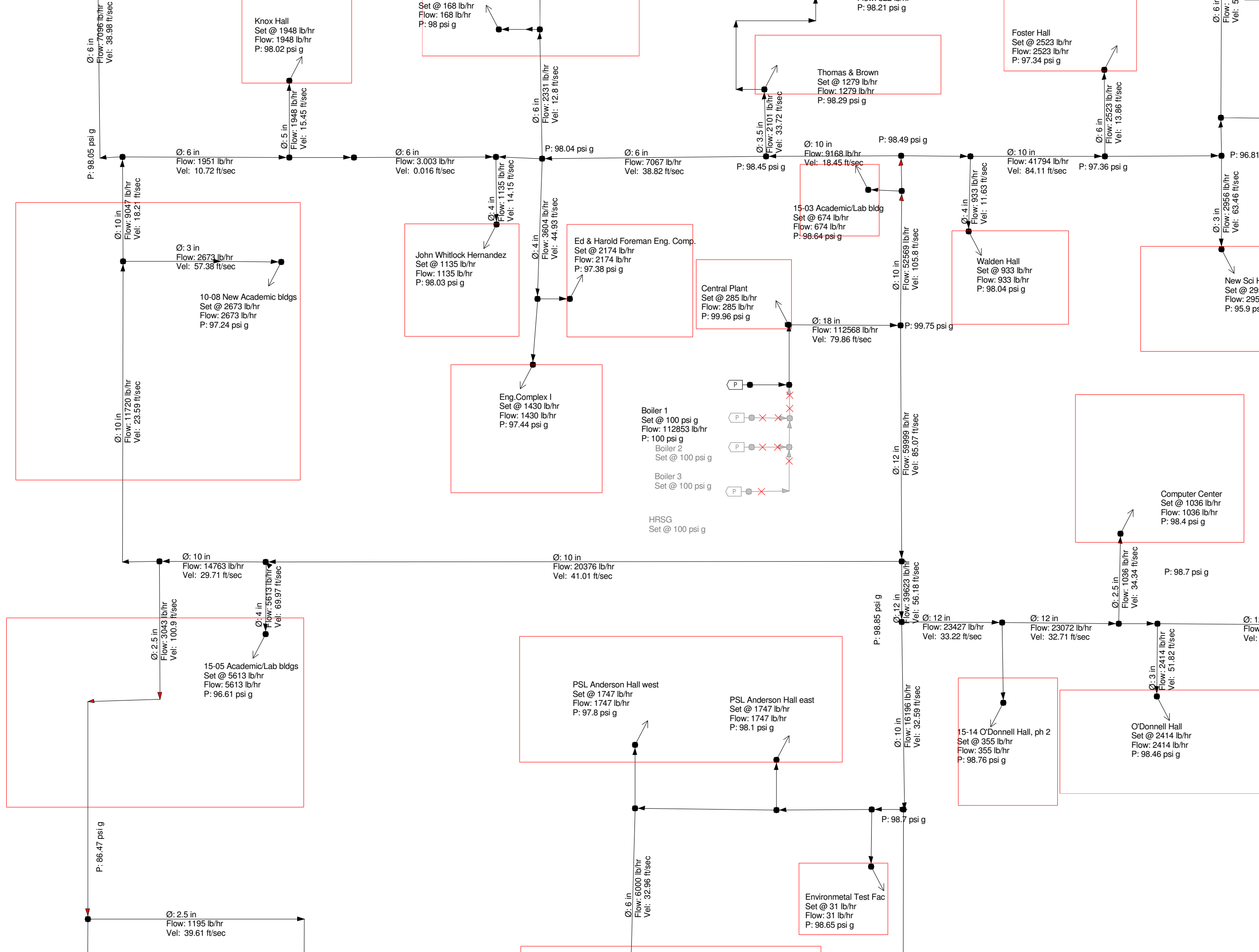
05-05 Tech Lab/Classroom Fac
Set @ 1543 lb/hr
Flow: 1543 lb/hr
P: 94.74 psi g

Milton Library
Set @ 1008 lb/hr
Flow: 1008 lb/hr
P: 95.51 psi g

Corbett Center Annex
Set @ 722 lb/hr
Flow: 722 lb/hr
P: 94.8 psi g

Corbett Center





Ø: 6 in
Flow: 7096 lb/hr
Vel: 38.98 ft/sec
P: 98.05 psi g

Ø: 10 in
Flow: 9047 lb/hr
Vel: 18.21 ft/sec
Ø: 3 in
Flow: 2673 lb/hr
Vel: 57.38 ft/sec
10-08 New Academic bldgs
Set @ 2673 lb/hr
Flow: 2673 lb/hr
P: 97.24 psi g
Ø: 10 in
Flow: 11720 lb/hr
Vel: 23.59 ft/sec

Ø: 10 in
Flow: 14763 lb/hr
Vel: 29.71 ft/sec
Ø: 2.5 in
Flow: 3043 lb/hr
Vel: 100.9 ft/sec
15-05 Academic/Lab bldgs
Set @ 5613 lb/hr
Flow: 5613 lb/hr
P: 96.61 psi g
Ø: 4 in
Flow: 5613 lb/hr
Vel: 69.97 ft/sec

Ø: 2.5 in
Flow: 1195 lb/hr
Vel: 39.61 ft/sec
P: 86.47 psi g

Knox Hall
Set @ 1948 lb/hr
Flow: 1948 lb/hr
P: 98.02 psi g
Ø: 5 in
Flow: 1948 lb/hr
Vel: 15.45 ft/sec

Ø: 6 in
Flow: 3.003 lb/hr
Vel: 0.016 ft/sec
P: 98.04 psi g

John Whitlock Hernandez
Set @ 1135 lb/hr
Flow: 1135 lb/hr
P: 98.03 psi g
Ø: 4 in
Flow: 1135 lb/hr
Vel: 14.15 ft/sec

Eng. Complex I
Set @ 1430 lb/hr
Flow: 1430 lb/hr
P: 97.44 psi g
Ø: 4 in
Flow: 3604 lb/hr
Vel: 44.93 ft/sec

Ø: 10 in
Flow: 20376 lb/hr
Vel: 41.01 ft/sec

PSL Anderson Hall west
Set @ 1747 lb/hr
Flow: 1747 lb/hr
P: 97.8 psi g

Ø: 6 in
Flow: 6000 lb/hr
Vel: 32.96 ft/sec

Ø: 6 in
Flow: 2331 lb/hr
Vel: 12.8 ft/sec
P: 98.04 psi g

Set @ 168 lb/hr
Flow: 168 lb/hr
P: 98 psi g

Ø: 6 in
Flow: 7067 lb/hr
Vel: 38.82 ft/sec
P: 98.45 psi g

Ed & Harold Foreman Eng. Comp.
Set @ 2174 lb/hr
Flow: 2174 lb/hr
P: 97.38 psi g
Ø: 4 in
Flow: 3604 lb/hr
Vel: 44.93 ft/sec

Central Plant
Set @ 285 lb/hr
Flow: 285 lb/hr
P: 99.96 psi g
Ø: 18 in
Flow: 112568 lb/hr
Vel: 79.86 ft/sec

Ø: 10 in
Flow: 23427 lb/hr
Vel: 33.22 ft/sec

PSL Anderson Hall east
Set @ 1747 lb/hr
Flow: 1747 lb/hr
P: 98.1 psi g

Ø: 10 in
Flow: 16196 lb/hr
Vel: 32.59 ft/sec

Ø: 6 in
Flow: 2101 lb/hr
Vel: 33.72 ft/sec
P: 98.29 psi g

Boiler 1
Set @ 100 psi g
Flow: 112853 lb/hr
P: 100 psi g
Boiler 2
Set @ 100 psi g
Boiler 3
Set @ 100 psi g
HRSG
Set @ 100 psi g

P: 98.21 psi g

Ø: 10 in
Flow: 9168 lb/hr
Vel: 18.45 ft/sec
P: 98.49 psi g

15-03 Academic/Lab bldg
Set @ 674 lb/hr
Flow: 674 lb/hr
P: 98.64 psi g
Ø: 3.5 in
Flow: 2101 lb/hr
Vel: 33.72 ft/sec

Ø: 10 in
Flow: 52569 lb/hr
Vel: 105.8 ft/sec

Ø: 12 in
Flow: 59999 lb/hr
Vel: 85.07 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 10 in
Flow: 39623 lb/hr
Vel: 56.18 ft/sec
P: 98.85 psi g

Ø: 12 in
Flow: 23427 lb/hr
Vel: 33.22 ft/sec
P: 98.7 psi g

Thomas & Brown
Set @ 1279 lb/hr
Flow: 1279 lb/hr
P: 98.29 psi g

Ø: 10 in
Flow: 41794 lb/hr
Vel: 84.11 ft/sec
P: 97.36 psi g

Walden Hall
Set @ 933 lb/hr
Flow: 933 lb/hr
P: 98.04 psi g
Ø: 4 in
Flow: 933 lb/hr
Vel: 11.63 ft/sec

Ø: 10 in
Flow: 1036 lb/hr
Vel: 34.34 ft/sec
P: 98.4 psi g

Ø: 2.5 in
Flow: 1036 lb/hr
Vel: 34.34 ft/sec
P: 98.7 psi g

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 39623 lb/hr
Vel: 56.18 ft/sec
P: 98.85 psi g

Foster Hall
Set @ 2523 lb/hr
Flow: 2523 lb/hr
P: 97.34 psi g

Ø: 10 in
Flow: 2956 lb/hr
Vel: 63.46 ft/sec
P: 96.81 psi g

New Sci H
Set @ 2956 lb/hr
Flow: 2956 lb/hr
P: 95.9 psi g
Ø: 3 in
Flow: 2956 lb/hr
Vel: 63.46 ft/sec

Ø: 12 in
Flow: 59999 lb/hr
Vel: 85.07 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 39623 lb/hr
Vel: 56.18 ft/sec
P: 98.85 psi g

15-14 O'Donnell Hall, ph 2
Set @ 355 lb/hr
Flow: 355 lb/hr
P: 98.76 psi g

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 39623 lb/hr
Vel: 56.18 ft/sec
P: 98.85 psi g

O'Donnell Hall
Set @ 2414 lb/hr
Flow: 2414 lb/hr
P: 98.46 psi g

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 39623 lb/hr
Vel: 56.18 ft/sec
P: 98.85 psi g

Environmental Test Fac
Set @ 31 lb/hr
Flow: 31 lb/hr
P: 98.65 psi g

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

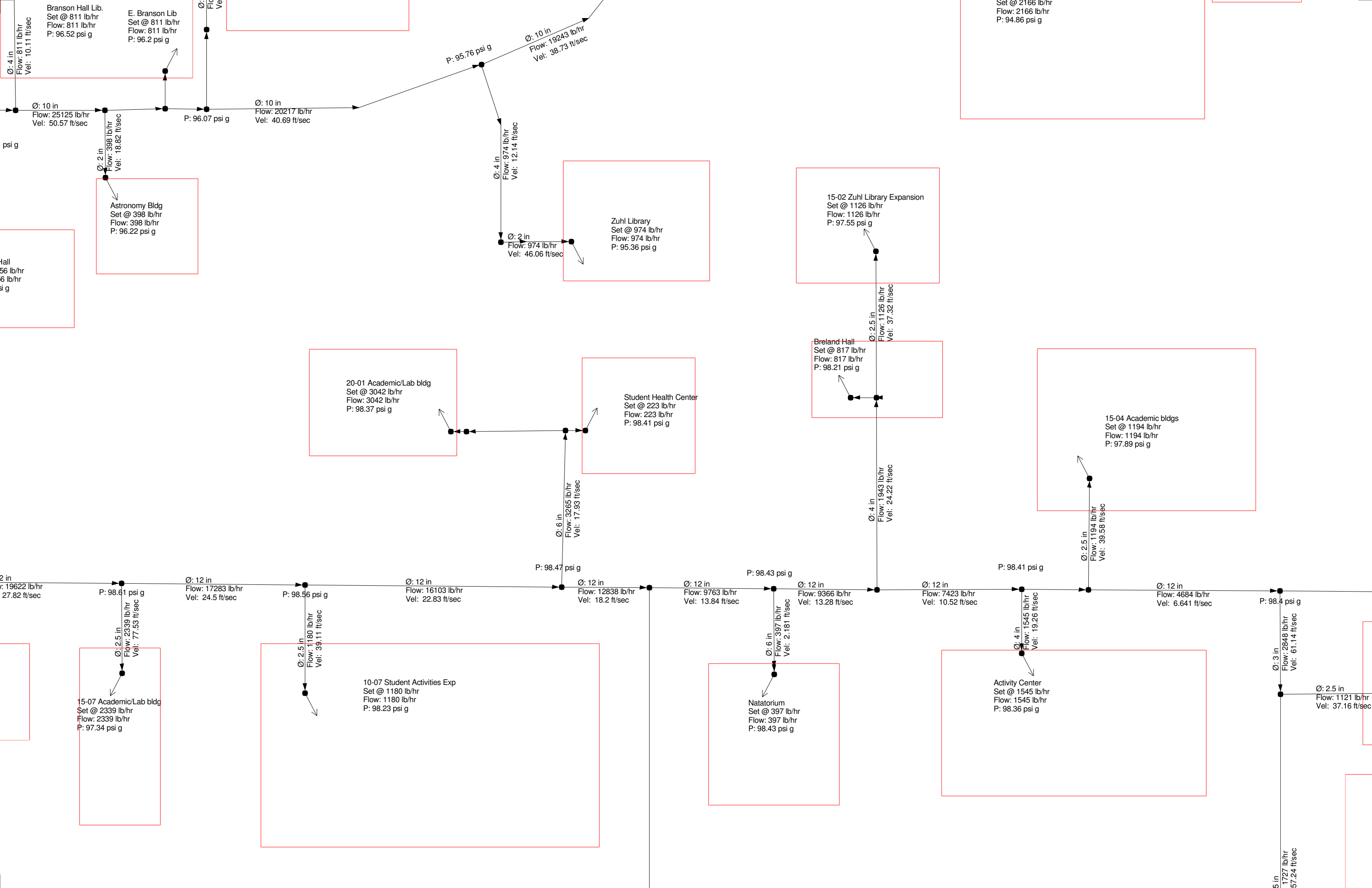
Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 23072 lb/hr
Vel: 32.71 ft/sec

Ø: 12 in
Flow: 39623 lb/hr
Vel: 56.18 ft/sec
P: 98.85 psi g



Branson Hall Lib.
Set @ 811 lb/hr
Flow: 811 lb/hr
P: 96.52 psi g

E. Branson Lib
Set @ 811 lb/hr
Flow: 811 lb/hr
P: 96.2 psi g

Set @ 2166 lb/hr
Flow: 2166 lb/hr
P: 94.86 psi g

Ø: 10 in
Flow: 25125 lb/hr
Vel: 50.57 ft/sec

Ø: 10 in
Flow: 20217 lb/hr
Vel: 40.69 ft/sec

Ø: 10 in
Flow: 19243 lb/hr
Vel: 38.73 ft/sec

Astronomy Bldg
Set @ 398 lb/hr
Flow: 398 lb/hr
P: 96.22 psi g

Ø: 4 in
Flow: 974 lb/hr
Vel: 12.14 ft/sec

Zuhl Library
Set @ 974 lb/hr
Flow: 974 lb/hr
P: 95.36 psi g

15-02 Zuhl Library Expansion
Set @ 1126 lb/hr
Flow: 1126 lb/hr
P: 97.55 psi g

Hall
Set @ 56 lb/hr
Flow: 56 lb/hr
P: 96.52 psi g

Ø: 2 in
Flow: 974 lb/hr
Vel: 46.06 ft/sec

20-01 Academic/Lab bldg
Set @ 3042 lb/hr
Flow: 3042 lb/hr
P: 98.37 psi g

Student Health Center
Set @ 223 lb/hr
Flow: 223 lb/hr
P: 98.41 psi g

Breland Hall
Set @ 817 lb/hr
Flow: 817 lb/hr
P: 98.21 psi g

15-04 Academic bldgs
Set @ 1194 lb/hr
Flow: 1194 lb/hr
P: 97.89 psi g

Ø: 12 in
Flow: 19622 lb/hr
Vel: 27.82 ft/sec

Ø: 2.5 in
Flow: 2339 lb/hr
Vel: 77.53 ft/sec

15-07 Academic/Lab bldg
Set @ 2339 lb/hr
Flow: 2339 lb/hr
P: 97.34 psi g

Ø: 12 in
Flow: 17283 lb/hr
Vel: 24.5 ft/sec

Ø: 2.5 in
Flow: 1180 lb/hr
Vel: 39.11 ft/sec

10-07 Student Activities Exp
Set @ 1180 lb/hr
Flow: 1180 lb/hr
P: 98.23 psi g

Ø: 12 in
Flow: 16103 lb/hr
Vel: 22.83 ft/sec

Ø: 6 in
Flow: 3265 lb/hr
Vel: 17.93 ft/sec

Ø: 12 in
Flow: 12838 lb/hr
Vel: 18.2 ft/sec

Ø: 12 in
Flow: 9763 lb/hr
Vel: 13.84 ft/sec

Ø: 6 in
Flow: 397 lb/hr
Vel: 2.181 ft/sec

Natorium
Set @ 397 lb/hr
Flow: 397 lb/hr
P: 98.43 psi g

Ø: 12 in
Flow: 9366 lb/hr
Vel: 13.28 ft/sec

Ø: 4 in
Flow: 1943 lb/hr
Vel: 24.22 ft/sec

Activity Center
Set @ 1545 lb/hr
Flow: 1545 lb/hr
P: 98.36 psi g

Ø: 12 in
Flow: 7423 lb/hr
Vel: 10.52 ft/sec

Ø: 4 in
Flow: 1545 lb/hr
Vel: 19.26 ft/sec

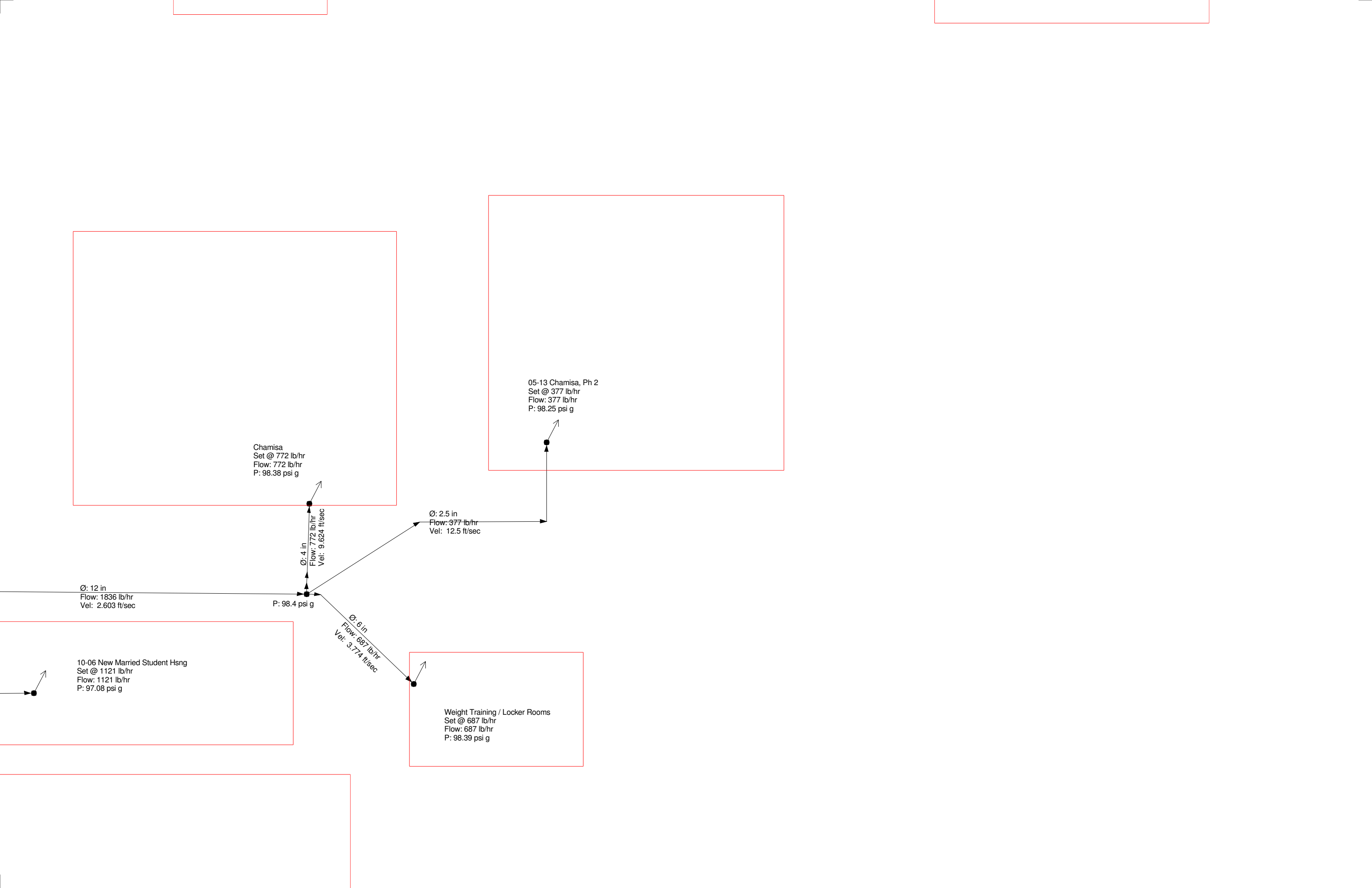
Ø: 2.5 in
Flow: 1194 lb/hr
Vel: 39.58 ft/sec

Ø: 12 in
Flow: 4684 lb/hr
Vel: 6.641 ft/sec

Ø: 3 in
Flow: 2848 lb/hr
Vel: 61.14 ft/sec

Ø: 2.5 in
Flow: 1121 lb/hr
Vel: 37.16 ft/sec

Ø: 5 in
Flow: 1727 lb/hr
Vel: 57.24 ft/sec



Chamisa
Set @ 772 lb/hr
Flow: 772 lb/hr
P: 98.38 psi g

05-13 Chamisa, Ph 2
Set @ 377 lb/hr
Flow: 377 lb/hr
P: 98.25 psi g

Ø: 12 in
Flow: 1836 lb/hr
Vel: 2.603 ft/sec

P: 98.4 psi g

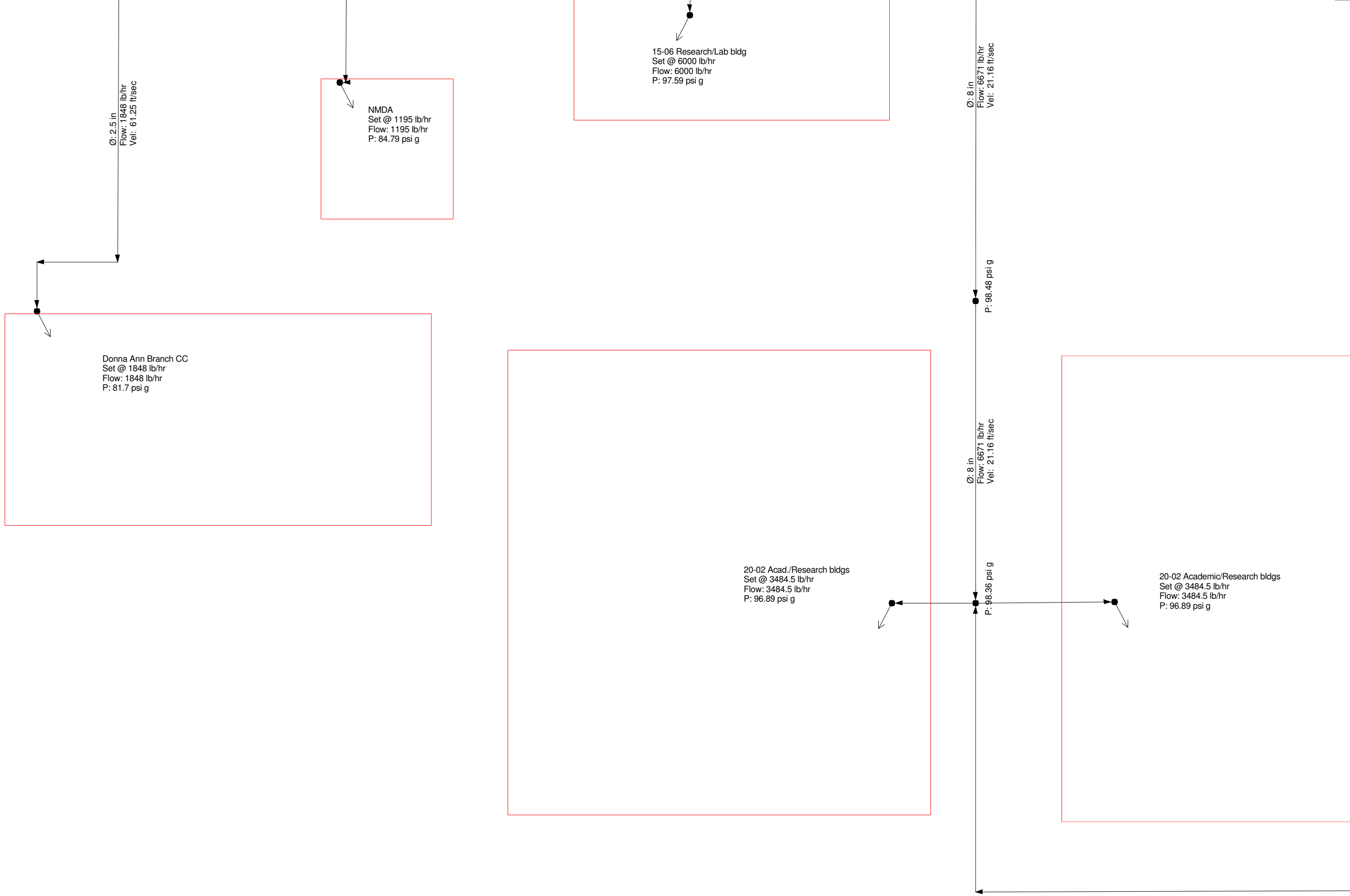
Ø: 4 in
Flow: 772 lb/hr
Vel: 9.624 ft/sec

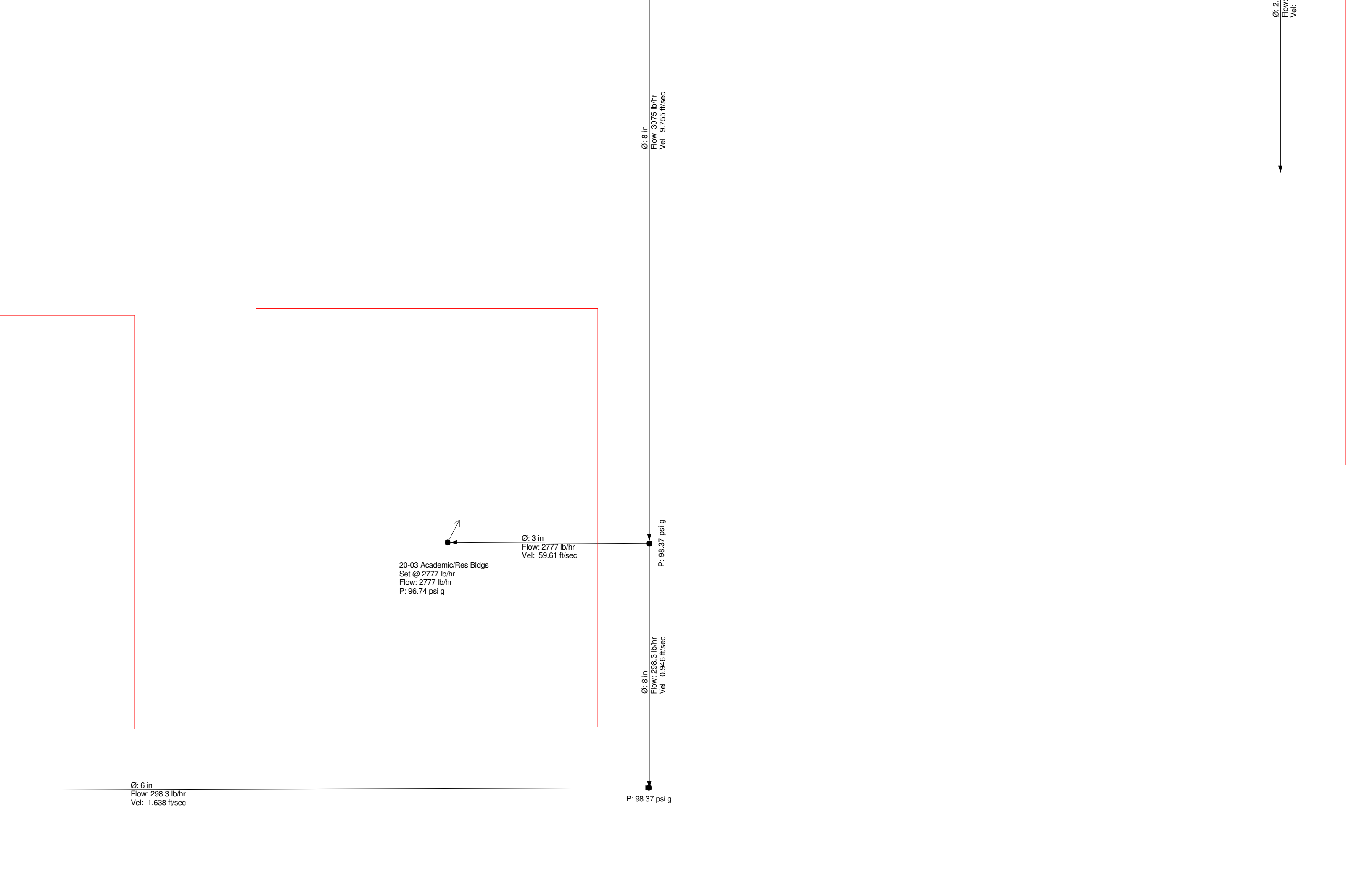
Ø: 2.5 in
Flow: 377 lb/hr
Vel: 12.5 ft/sec

Ø: 6 in
Flow: 687 lb/hr
Vel: 3.774 ft/sec

10-06 New Married Student Hsng
Set @ 1121 lb/hr
Flow: 1121 lb/hr
P: 97.08 psi g

Weight Training / Locker Rooms
Set @ 687 lb/hr
Flow: 687 lb/hr
P: 98.39 psi g





20-04 Family Housing, ph 2
Set @ 1727 lb/hr
Flow: 1727 lb/hr
P: 91.83 psi g



Lineup: <Design Case>	Darcy-Weisbach	PIPE-FLO 2007
System: 0874.00 NMSU Steam - 2034		Flow: lb/hr
Date: 06/09/09 5:59 pm		Pressure: psi g
Company: GLHN		Size: in
Project: 0874.00 NMSU UDP		Elevation: ft
by: DHW		Velocity: ft/sec
Steam - Stage 2 - Campus Build Out		Length: ft
		Volume: ft³