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Preliminary

Drainage Report

Prepared For:

Banner Behavioral Health Hospital- Inpatient Building

7575 East Earl Drive

Scottsdale, Arizona 85251

Plan #

Case # 51-DR-2015#2

Q-S #

☒ Accepted

☐ Corrections

DG 10/7/15

Reviewed By Date

Registered Professional Engineer (Civil) CERTIFICATE NO. 39286 JOHN C. TUTER Date Signed 9/24/15 ARIZONA, U.S.A.

Expires: 6/30/18

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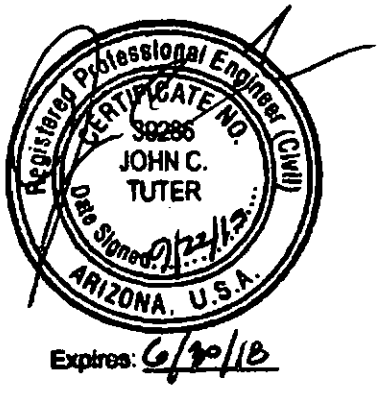


List of Appendices

1.0 REPORT OVERVIEW

The purpose of this report is to provide drainage information for the existing site of Banner Behavioral Health Hospital and proposed drainage improvements/requirements associated with the new 96 beds, 78,000 sf inpatient building.

2.0 PROJECT DESCRIPTION

The existing Banner Behavioral Health Hospital site is located at the southwest corner of Miller Road and Earl Drive. The location of the site is shown on the vicinity map, Appendix A.

The current project, new Hospital Inpatient Building will partially replace existing retention basin at northeast corner of the site and will be added further south within existing landscape areas. The existing site is shown on Existing Conditions Drainage Map, Appendix B. The proposed building and new improvements are shown on Proposed Conditions Drainage Map, Appendix C.

3.0 FEMA DESIGNATION

The subject parcels lie within flood zone "X" as delineated on the Federal Emergency Management Agency Firm Map No. 04013c2235 dated September 16, 2013.

Flood zone "X" is defined as areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

4.0 ON-SITE DRAINAGE

4.1 Existing Conditions

In existing conditions the entire site drains in the southeast direction via surface into four retention basins. The outfalls from basins and ultimate site outfall is located along Miller Road. This is shown in Appendix B.

All existing basins are shallow (maximum 1 foot deep) and drain through percolation into ground. Their outfalls are directed into Miller Road.

4.2 Proposed Conditions

The proposed drainage system is shown in Appendix C. The new building replaces existing retention basins within areas A1, A2 and B. The additional surface parking proposed at the northwest corner of the site replaces partially retention basin D.

The proposed drainage patterns of the site will remain the same. The volume of retention basins replaced by the new structure and surface parking was included in underground 10' diameter

underground pipes proposed at the northeast and southeast corners of the site. Additional storm water is proposed to retain in those pipes due to the increase of C value of improved site.

Proposed retention pipes will empty within 36 hours through drywells, (Maxwell Plus) connected into them. The outfalls from the improved site does not change the direction comparing to the existing conditions and are shown in Appendix C.

5.0 OFF-SITE DRAINAGE

There is no off-site drainage flowing into or crossing the proposed site.

6.0 RUN-OFF COEFFICIENT

The runoff coefficient for existing and proposed conditions is shown in following tables:

TABLE 1

EXISTING CONDITIONS - WEIGHTED COEFFICIENT CALCULATIONS								
AREA	TOTAL DRAINAGE AREA (SF)	ASPHALT OR CONCRETE (A1)	C1 (CI)	DESERT LANDSCAPE (A2)	C3 (C2)	ROOF (A3)	C4 (C3)	WEIGHTED COEFFICIENT (CW)
RETENTION A1	103,182	55,676	0.95	29,200	0.31	18306	0.95	**0.77**
RETENTION A2	35,048	0	0.95	32,652	0.31	2396	0.95	**0.35**
RETENTION B	70,969	4,493	0.95	38,986	0.31	27490	0.95	**0.60**
RETENTION C	60,682	29,053	0.95	22,379	0.31	9250	0.95	**0.71**
RETENTION D	107,619	27,063	0.95	48,811	0.31	31745	0.95	**0.66**
TOTAL	377,500							

TABLE 2

PROPOSED CONDITIONS - WEIGHTED COEFFICIENT CALCULATIONS								
AREA	TOTAL DRAINAGE AREA (SF)	ASPHALT OR CONCRETE (A1)	C1 (CI)	DESERT LANDSCAPE (A2)	C3 (C2)	ROOF (A3)	C4 (C3)	WEIGHTED COEFFICIENT (CW)
RETENTION A1	108,502	53,162	0.95	30,304	0.31	25036	0.95	**0.77**
RETENTION A2	66,258	26,359	0.95	14,506	0.31	25393	0.95	**0.81**
RETENTION B	45,373	10,040	0.95	12,301	0.31	23032	0.95	**0.78**
RETENTION C	51,053	22,564	0.95	22,379	0.31	6110	0.95	**0.67**
RETENTION D	106,314	41,783	0.95	32,786	0.31	31745	0.95	**0.75**

TOTAL	377,500							

FORMULA: CW=[(A1C1)+(A2C2)+(A3C3)+(A4C4)]/[(A1+A2+A3+A4)]

7.0 RETENTION REQUIRED

The on-site retention was established at the pre-application meeting and is required for the difference between Pre-development and Post-development stormwater runoff. The retention was proposed for the volume replaced by new building plus additional surface parking and the increase of Weighted Coefficient of improved site.

Volume of the storm water runoff contributed by the defined drainage area was calculated for 100-year, 2-hour storm event.

V required= CxP/12xA

V - Runoff volume from the drainage area to be retained
C - Coefficient representing the ratio of rainfall to runoff
P - Depth of water generated by the 100-year 2-hour storm
A - Size of drainage area

8.0 RETENTION PROVIDED

The summary of proposed retention provided is shown in following table:

RETENTION PROVIDED FOR NEW BASIN

RETENTION VOLUME						
PROPOSED AREA	DRAINAGE AREA INVOLVED	C	Contributing Area sf	P	V Required cft	Equivalent length of 10" pipe lf
AREA A1						
	NORTHEAST AREA ADDED	0.77	5,320	2.82	**961**	
	RETENTION REMOVED				**8,621**	
	TOTAL REQUIRED				**9,582**	122
AREA A2						
	SOUTHEAST INCREASE OF C	0.46	35,048	2.82	**3,757**	
	SOUTHEAST AREA ADDED	0.18	31,210	2.82	**1,306**	
	+INCREASE OF C					
	RETENTION REMOVED				**6,465**	
	TOTAL REQUIRED				**11,529**	147

AREA D						
	EXISTING RETENTION				**6,743**	
	NORTHEAST INCREACE OF C	0.09	46,263	2.82	**1,010**	
	RETENTION REMOVED				**917**	
	TOTAL REQUIRED				**8,670**	

9.0 SUMMARY OF EXISTING AND PROPOSED RETENTION

The summary of existing and proposed storm water storage volume is presented in following table:

TABLE 3

EXISTING AND PROPOSED RETENTION SUMMARY		
AREA	EXISTING CONDITIONS (CF)	PROPOSED CONDITIONS (CF)
RETENTION A1	8,621	9,582
RETENTION A2	736	11,529
RETENTION A2a	1,121	
RETENTION B1	4,101	592
RETENTION B2	1,099	
RETENTION C	1,121	1,121
RETENTION D	7,660	8,670
TOTAL	**24,459**	**31,494**

Retention A1 and A2 are proposed to be 10 ft. diameter CMP underground pipes with lining and coating to provide 75 years service life and smooth bottom. All proposed drainage pipes are designed with 1% slope with drywells connected at their lowest points. Lining, details and shop drawings of storage pipes will be provided along with construction plans

10.0 TIME TO DRAIN UNDERGROUND STORAGE PIPES

The calculation of retention pipes disposal time is presented in following table:

Retention Basin	RETENTION PIPE VOLUME TO DRAIN (cft)	No. of Drywells, D_W (ea)	Drywell Percolation Rate[2] (cfs)	Disposal Time[4] (hr)
A1	9582	1	0.10	26.6
A2	11529	1	0.10	32.0

[4] Disposal Time = {V / PR } / 3600 sec/hr

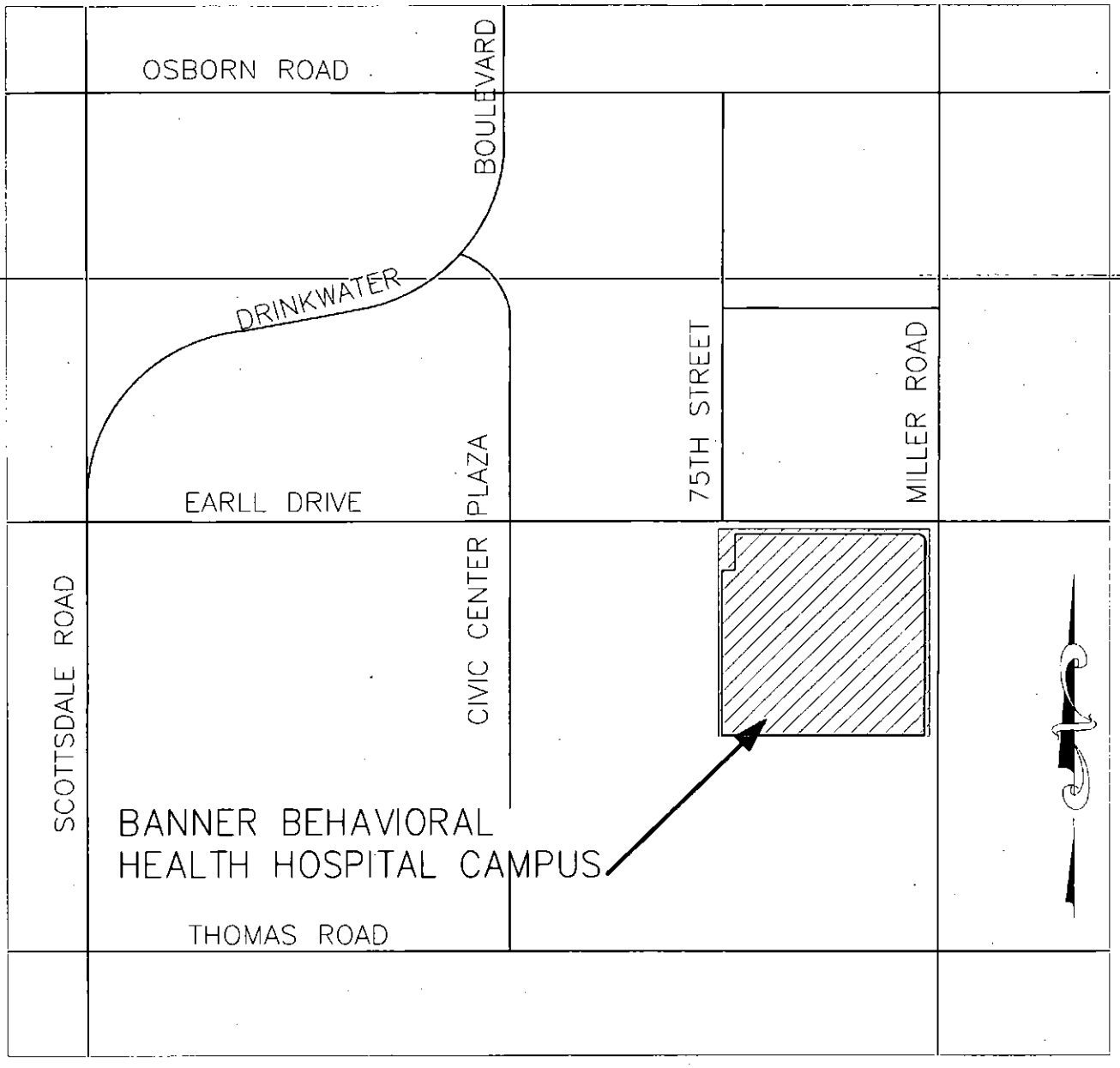
The percolation rate was assumed at 0.1cfs and will need to be evaluated after construction of each drywell. Contractor shall perform percolation test after installation of drywells and return results to civil engineer for dry up calculations and possible addition of drywells. The percolation rate of each drywell shall be multiplied by 0.5 for final estimation of disposal time. The maximum disposal time is 36 hours.

11.0 CONCLUSIONS

- The proposed development provides additional retention associated with the increase of C value and is compliant with city requirements set at the pre-application meeting.
- The on-site retention provided (31,494 cf) is greater than the existing (24,459 cf).
- The proposed improvements do not change the ultimate outfall direction of the storm water from the site.
- The estimated time of storm water disposal is less than 36 hours.
- The actual percolation rate of storm water disposal time from retention pipes shall be evaluated after installation of each drywell.

Appendix A

Vicinity Map



VICINITY MAP

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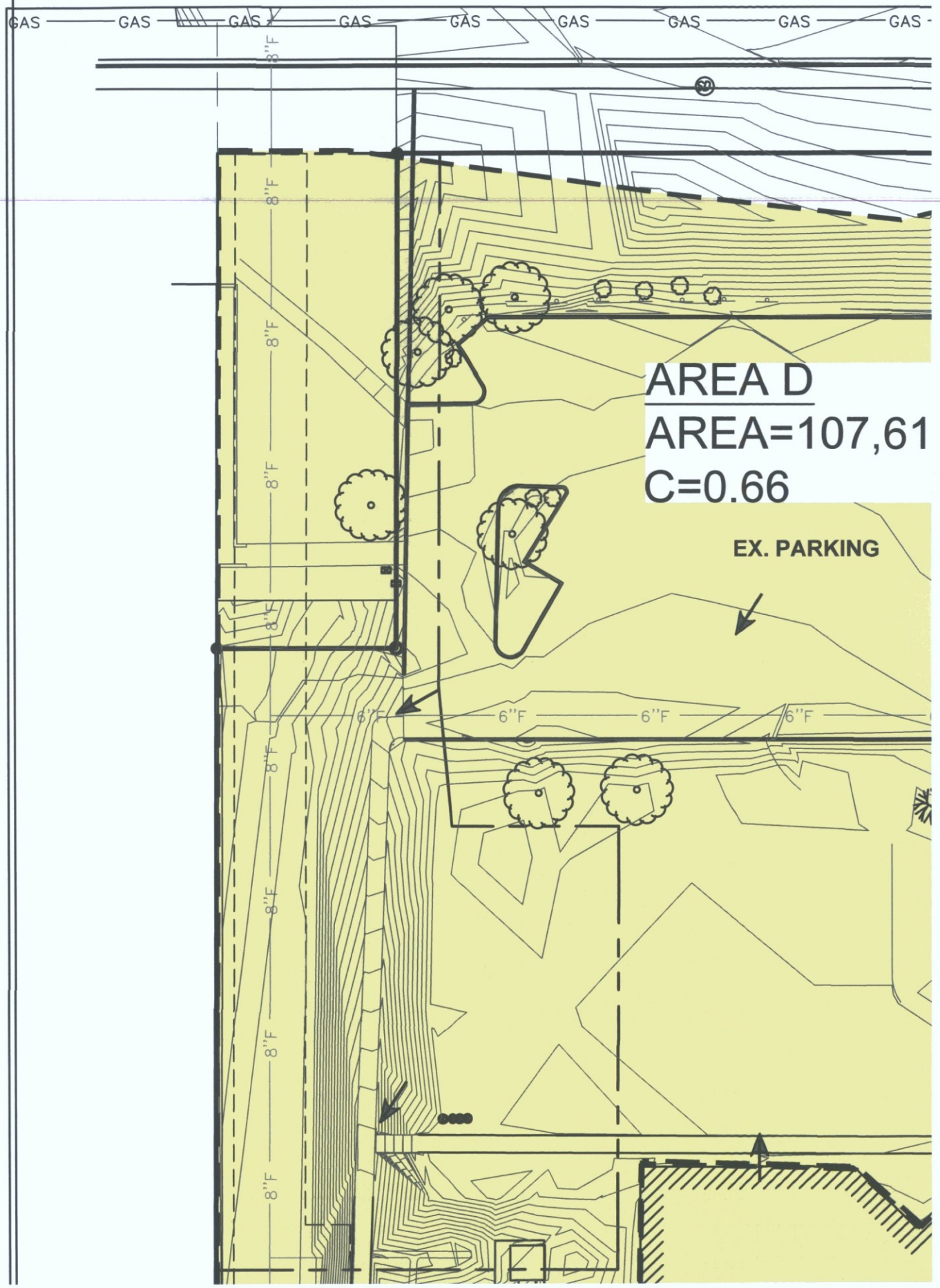
APPENDIX A

Appendix B

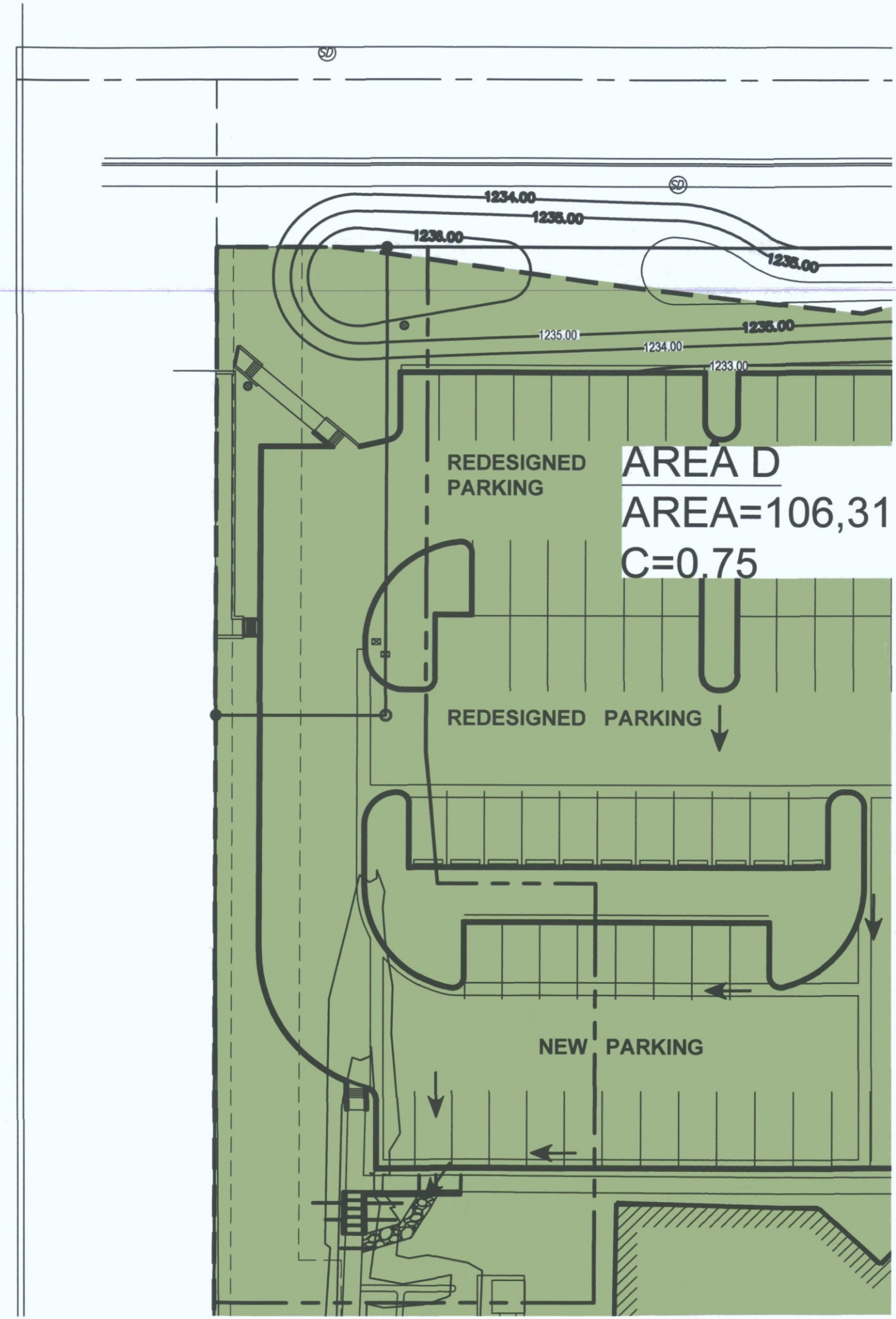
Existing Drainage Exhibit



/Health Care Studio/2015_043 BBHH Inpatient Building

Appendix C

Proposed Drainage Exhibit



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