Galloway
5500 Greenwood Plaza Blvd., Suite 200
Greenwood Village, CO 80111
303.770.8884 • GallowayUS.com

March 15, 2024

Andrew Samson, EIT
9220 Kimmer Drive, Suite 100
Lone Tree, CO 80124

RE: Drainage Compliance Letter in support of Ambleside School project located at 9941 Lone Tree Pkwy (Existing Cornerstone Church).

Mr. Samson,

This drainage conformance letter has been prepared for Ambleside School located at 9941 Lone Tree Pkwy in Lone Tree, CO. The objective of this letter is to show the proposed site improvements will result in a de minimis increase in flows from the site and will not require additional storm sewer infrastructure improvements.

The existing Site is approximately 7.39 acres and is located on the southwest corner of Lincoln Avenue and Lone Tree Pkwy. The lot borders Lone Tree Pkwy to the east, Lincoln Ave to the north, single-family homes on the west (Highlands Ranch No. 90A), and single-family homes on the south (Block 3, Centennial Ridge Subdivision Filing No. 1). The existing site is currently occupied by the Cornerstone Church.

The proposed improvements will include installing 3,040 square feet of sidewalk throughout the Site and 616 square feet of asphalt paving. These proposed improvements will not alter the existing drainage patterns. However, since these proposed impervious areas will replace landscaped areas, there will be a small increase in overall imperviousness (approximately 1%) and runoff from the site.

The existing drainage calculations are provided in the Phase III Drainage Report from CKE Engineering, approved May, 4, 2012. For a comparison of the existing drainage conditions to the proposed conditions, please refer to the table below:

Sub-Basin	*Existing Conditions*					*Proposed Conditions*				
	Imp [%]	C_5	C_{100}	Q_5 *[cfs]*	Q_{100} *[cfs]*	*Imp [%]*	C_5	C_{100}	Q_5 *[cfs]*	Q_{100} *[cfs]*
A	53	0.41	0.61	8.6	23.1	54	0.42	0.61	8.8	23.2
B	74	0.57	0.70	4.2	9.6	75	0.58	0.71	4.3	9.7
C	64	0.48	0.65	3.4	8.2	64	0.48	0.65	3.4	8.2

Based on the results of the Rational Calculations, the proposed improvements will result in a small increase in flows during the 5-year and 100-year events. During the 5-year and 100-year events it is anticipated that an additional 0.3 CFS and 0.2 CFS would be generated, respectively. Improvements as part of Sub-Basin A are all that contribute to the existing on-site pond infrastructure and result in approximately a 1% and 0.50% change in flow rate for the 5-year and 100-year storms, respectively.

Conclusions:
While the proposed improvements will result in a small increase in flows during the minor and major storm events, this small increase in flows would have a negligible impact on the existing infrastructure and will not result in a need for additional storm sewer improvements. Additional future improvements to this site may result in the need for additional storm sewer improvements and drainage analysis. Further calculation would there for be required at that time to determine what, if any improvements, would be required.

Sincerely,
GALLOWAY

Sid Biddle, PE
Civil Project Manager
SidBiddle@gallowayus.com

Appendices

A. Existing Drainage Map
B. Existing Rational Calculations
C. Proposed Site Exhibit
D. Proposed Rational Calculations

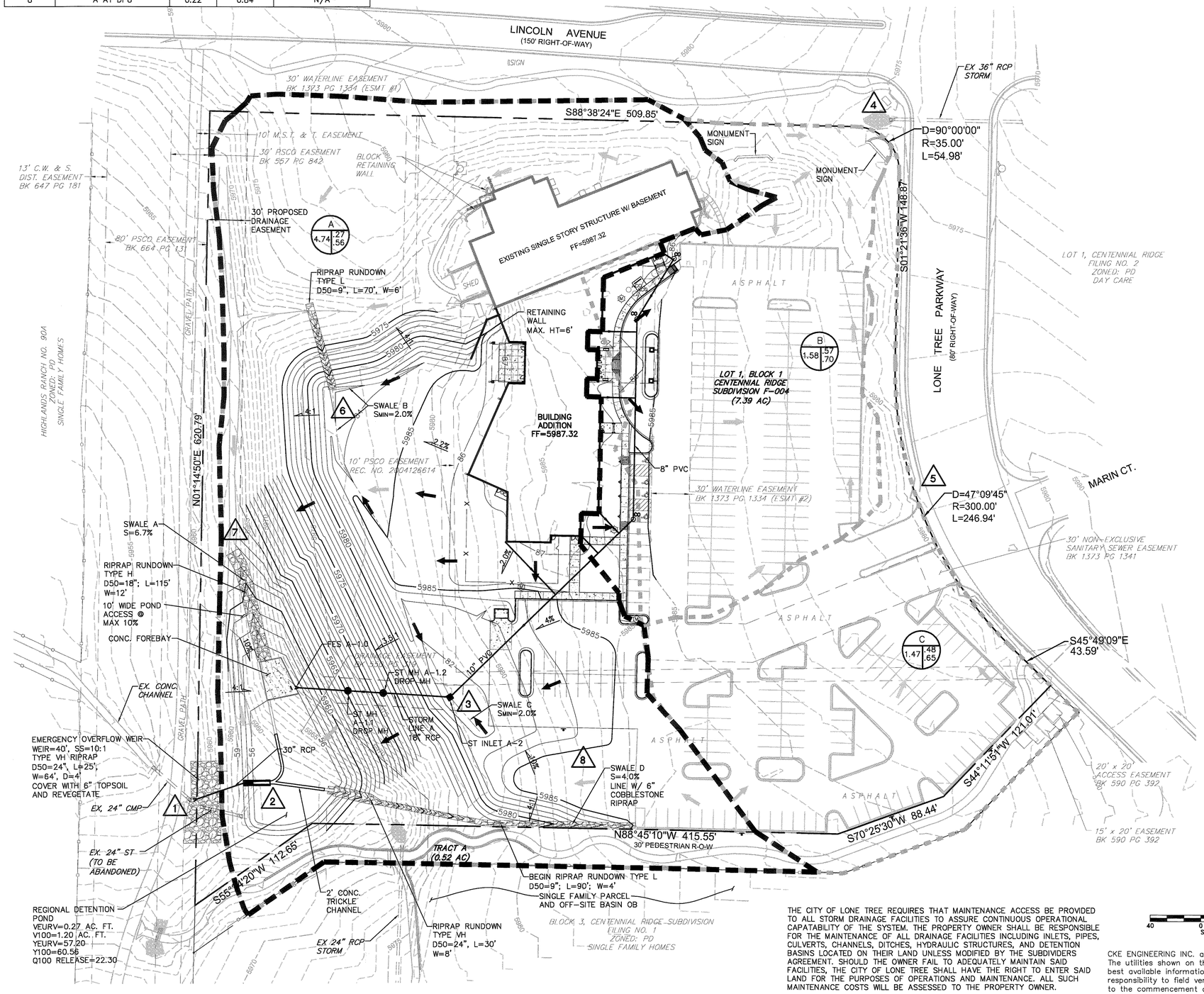
APPENDIX A

Existing Drainage Map

CORNERSTONE CHURCH
DRAINAGE MAP

DESIGN POINT SUMMARY				
DESIGN POINT	CONTRIBUTING BASINS	Q5(CFS)	Q100(CFS)	Q100(CFS) FULL BUILD-OUT
1	POND OUTFALL	–	22.30	22.30
2	A, SINGLE FAMILY PARCEL, OFF-SITE BASIN OB	–	64.04	66.34
3	A AT DP3	1.51	3.98	N/A
4	B	4.23	9.55	9.55
5	C	3.36	8.22	8.22
6	A AT DP6	0.49	1.78	N/A
7	A AT DP7	2.97	12.15	20.23
8	A AT DP8	0.22	0.84	N/A

BASIN SUMMARY						
BASIN		E(MIN)	C5	C100	Q5	Q100
A	CURRENT PHASE	7.3	.27	.56	5.59	20.83
A	FULL BUILD-OUT	7.0	.41	.61	8.62	23.13
B	DEVELOPED	5.5	.57	.70	4.23	9.55
C	DEVELOPED	5.5	.48	.65	3.36	8.22



THE CITY OF LONE TREE REQUIRES THAT MAINTENANCE ACCESS BE PROVIDED TO ALL STORM DRAINAGE FACILITIES TO ASSURE CONTINUOUS OPERATIONAL CAPATABILITY OF THE SYSTEM. THE PROPERTY OWNER SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL DRAINAGE FACILITIES INCLUDING INLETS, PIPES, CULVERTS, CHANNELS, DITCHES, HYDRAULIC STRUCTURES, AND DETENTION BASINS LOCATED ON THEIR LAND UNLESS MODIFIED BY THE SUBDIVIDERS AGREEMENT. SHOULD THE OWNER FAIL TO ADEQUATELY MAINTAIN SAID FACILITIES, THE CITY OF LONE TREE SHALL HAVE THE RIGHT TO ENTER SAID LAND FOR THE PURPOSES OF OPERATIONS AND MAINTENANCE. ALL SUCH MAINTENANCE COSTS WILL BE ASSESSED TO THE PROPERTY OWNER.

SCALE 1" = 40'

LEGEND

EXISTING		PROPOSED
	PROPERTY LINE	
	EASEMENT	
	CURB & GUTTER	
	TYPE I (CATCH) CURB & GUTTER	
	TYPE II (SPILL) CURB & GUTTER	
	HANDICAP RAMPS	
DRIVE	DESCRIPTIONS	DRIVE
5750	INDEX CONTOURS	5750
48	INTERMEDIATE CONTOURS	48
	DIRECTION OF FLOW	
	FUTURE PARKING	

BASIN LEGEND

EXISTING BASIN BOUNDARY

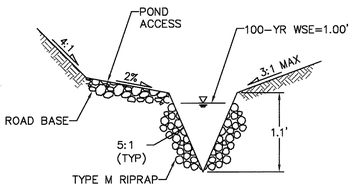
BASIN BOUNDARY

EMERGENCY OVERFLOW PATH

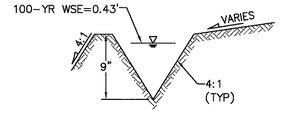
DESIGN POINT 1

BASIN B | C5 1.25 .88 .93 | C100 | AREA IN ACRES

EXISTING BASIN | BASIN 1 | C5 1.25 0.88 0.89 | C100 | AREA IN ACRES



SWALE A
N.T.S.



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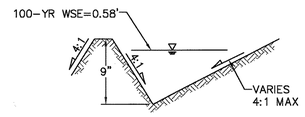
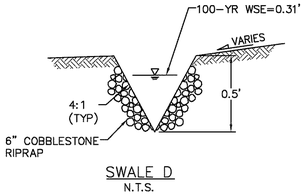
N.T.S.



SWALE C
N.T.S.



SWALE D
N.T.S.

CKE ENGINEERING INC. assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

CKE ENGINEERING INC
14257 W. EVANS CIRCLE
LAKEWOOD, CO. 80228
(303) 917-1757

CORNERSTONE CHURCH

DRAINAGE PLAN

DRAINAGE MAP

No.	Description of Revisions	Date	Name
1	SUBMITTED TO CITY OF LONE TREE	02/02/12	JCC
2	REVISED PER CITY COMMENTS	04/06/12	JCC

Date: DECEMBER 12, 2011
Job Number:
Design By: J. COCO
Drawn By: J. COCO
Checked By: J. COCO

Sheet Number: D1

CAD INFORMATION
Paper Space
Plot view: PLOT
Dwg. Name: D1.dwg
Other View:
Model Space
Plan view(s): PLAN
Profile View(s):
X References:
Plot Date:
Tab Name: Layout1
Project Manager: JCC
Designed By: JCC
Location: D:\Cornerstone Church\Drainage\
Drawn By: EVB
Job Number:
Sheet Number: C-0

APPENDIX B

Existing Rational Calculations

WEIGHTED C-VALUE CALCULATION - FULL BUILDOUT

JOB NO: Full Biuldout
PROJECT: Cornerstone Church
DATE: 3/30/2012

Soil Type (A-D): C

BASIN	TOTAL AREA (SF)	AREA LANDSCAPE (SF)	AREA PAVEMENT (SF)	AREA Roof Top (SF)	C2	C5	C10	C100	I (%)
ON-SITE BASINS									
A	206425	93146	71160	42119	0.36	0.41	0.47	0.61	53%
B	68626	17780	49531	1315	0.53	0.57	0.61	0.70	74%
C	63950	23257	40693	0	0.44	0.48	0.53	0.65	64%
DP7	170013	64875	71160	33978	0.41	0.46	0.51	0.63	60%
Total	509014	199058	232544	77412	0.40	0.45	0.51	0.63	59%

C Values are based on Urban Drainage Equations RO-6, RO-7 and Tables RO3 and RO-4.

Surface	i
landscape	0%
roof	90%
pavement	100%

STANSARD FORM SF-2
TIME OF CONCENTRATION
SUBDIVISION: Cornerstone Church
CALCULATED BY: JCC DATE: 3/30/2012

SUB-BASIN DATA			INITIAL/OVERLAND TIME (t_i)			TRAVEL TIME (t_t)				t_c CHECK (URBANIZED BASINS)			FINAL t_c	REMARKS
DESIG: (1)	C_5 (2)	AREA Ac (3)	LENGTH Ft (4)	SLOPE % (5)	t_i Min (6)	LENGTH Ft (7)	SLOPE % (8)	VEL. FPS (9)	t_t Min (10)	COMP. t_c (11)	TOT. LENGTH Ft (12)	tc=(L/180)+10 Min (13)	Min (14)	
A	0.41	4.74	5	4.0	1.7	1005	2.8	3.2	5.2	7.0	1010	15.6	7.0	
B	0.57	1.58	35	10.0	2.6	490	2.1	2.9	2.8	5.5	525	12.9	5.5	
C	0.48	1.47	37	4.3	4.2	255	2.4	3.1	1.4	5.5	292	11.6	5.5	
DP7	0.46	3.90	5	4.0	1.6	980	2.8	3.2	5.1	6.7	985	15.5	6.7	

CALCULATED BY : JCC
DATE: RE\ 3/30/2012
CHECKED BY: JCC

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

JOB NO: Full Biuldout
PROJECT: Cornerstone Church
DESIGN STORM: 5 Year

BASIN	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ (C * A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A	2		4.74	0.41	7.0	1.96	4.40	8.62					X	X	X	X	X	X	X	X	XXXXX
B	4		1.58	0.57	5.5	0.89	4.75	4.23													
C	5		1.47	0.48	5.5	0.71	4.75	3.36													
DP7	7		3.90	0.46	6.7	1.78	4.45	7.92													

B-10

CALCULATED BY : JCC
DATE: 3/30/2012
CHECKED BY: JCC

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

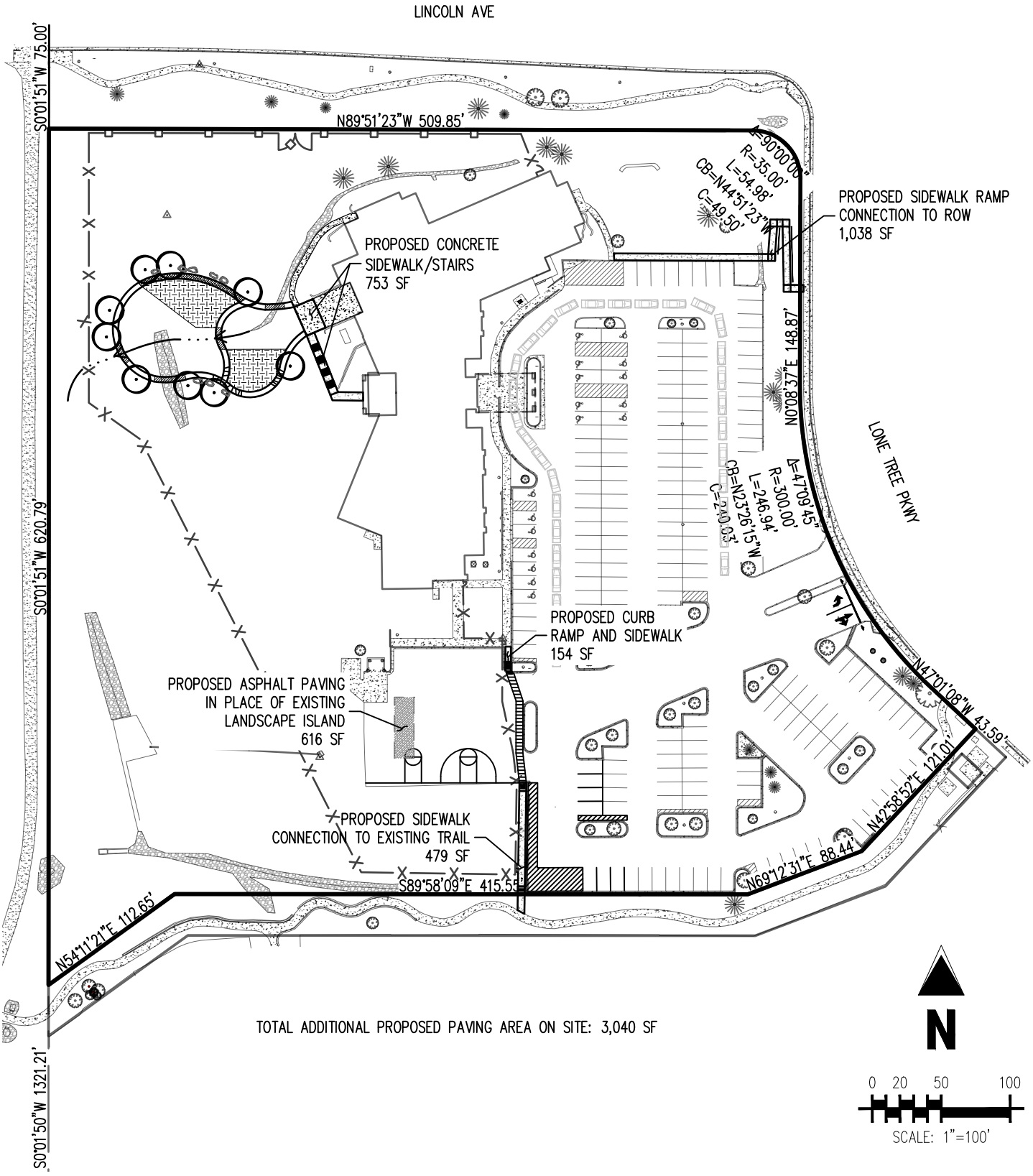
JOB NO: Full Biuldout
PROJECT: Cornerstone Church
DESIGN STORM: 100 Year

BASIN	DESIGN POINT	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		AREA DESIGN	AREA (AC)	RUNOFF COEFF	t_c (MIN)	C * A (AC)	I IN/HR	Q (CFS)	t_c (MIN)	Σ (C * A) (AC)	I (IN/HR)	Q (CFS)	SLOPE (%)	STREET FLOW (CFS)	DESIGN FLOW (CFS)	SLOPE (%)	PIPE SIZE	LENGTH (FT)	VELOCITY (FPS)	t_t (MIN)	
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
A	2		4.74	0.61	7.0	2.89	8.00	23.13					X	X	X	X	X	X	X	X	XXXXX
B	4		1.58	0.70	5.5	1.10	8.65	9.55													
C	5		1.47	0.65	5.5	0.95	8.65	8.22													
DP7	7		3.90	0.63	6.7	2.47	8.20	20.23													

B-11

APPENDIX C

Proposed Site Exhibit



AMBLESIDE SCHOOL

9941 LONE TREE PARKWAY
LONE TREE, CO 80124

SIDEWALK AREA EXHIBIT

Project No:	AMC000002
Drawn By:	DMH
Checked By:	JSB
Date:	03/13/2024

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APPENDIX D

Proposed Rational Calculations

BASIN SUMMARY TABLE						
Tributary Sub-basin	Area (acres)	C_5	C_{100}	t_c (min)	Q_5 (cfs)	Q_{100} (cfs)
A	4.74	0.42	0.61	6.99	8.8	23.2
B	1.58	0.58	0.71	5.50	4.3	9.7
C	1.47	0.48	0.65	5.50	3.3	8.2

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Centennial Rdige
Location: User Defined

Project Name: Ambleside School
Project No.: AMC002
Calculated By: ETA
Checked By: JSB
Date: 3/13/24

Basin ID	Total Area (ac)	Paved Roads/Sidewalks			Lawns			Roofs			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
A	4.74	100	1.68	35.4	0	2.09	0.0	90	0.97	18.40	53.8
B	1.58	100	1.16	73.7	0	0.38	0.0	90	0.03	1.70	75.4
C	1.47	100	0.93	63.6	0	0.53	0.0	90	0.00	0.00	63.6

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STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Centennial Rdige
Location: User Defined

Project Name: Ambleside School
Project No.: AMC002
Calculated By: ETA
Checked By: JSB
Date: 3/13/24

SUB-BASIN DATA						INITIAL/OVERLAND (Sheet Flow) (T_i)			Shallow Concentrated Flows (T_t)					Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C_{100}	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	Cv	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH (FT)	Urbanized T_c (MIN)	T_c (MIN)
A	4.74	C	53.8	0.61	0.42	5	4.0	1.8	1005	2.8	20.0	3.2	5.2	7.0	1010.0	15.6	7.0
B	1.58	C	75.4	0.71	0.58	35	10.0	2.6	490	2.1	20.0	2.9	2.8	5.5	525.0	12.9	5.5
C	1.47	C	63.6	0.65	0.48	37	4.3	4.2	255	2.4	20.0	3.1	1.4	5.5	292.0	11.6	5.5

NOTES:
$T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33)$, S in ft/ft
T_t=L/60V (Velocity From Fig. 501)
Velocity V=Cv*S^0.5, S in ft/ft
Tc Check = 10+L/180
For Urbanized basins a minimum T_c of 5.0 minutes is required.
For non-urbanized basins a minimum T_c of 10.0 minutes is required

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STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Centennial Rdige
Location: User Defined
Design Storm: 5-Year

Project Name: Ambleside School
Project No.: AMC002
Calculated By: ETA
Checked By: JSB
Date: 3/13/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
		A	4.74	0.42	7.0	1.99	4.41	8.8													
		B	1.58	0.58	5.5	0.91	4.74	4.3													
		C	1.47	0.48	5.5	0.70	4.74	3.3													

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STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision: Centennial Rdige
Location: User Defined
Design Storm: 100-Year

Project Name: Ambleside School
Project No.: AMC002
Calculated By: ETA
Checked By: JSB
Date: 3/13/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	
		A	4.74	0.61	7.0	2.89	8.03	23.2													
		B	1.58	0.71	5.5	1.12	8.63	9.7													
		C	1.47	0.65	5.5	0.95	8.63	8.2													