



CONSULTING ENGINEERS

MEMORANDUM

To: Marcus A. Wager
Box Elder County Planner

From: Dana Q. Shuler, P.E. *DQS*
Jones & Associates Consulting Engineers
Box Elder County Engineer and Surveyor

Date: September 7, 2016

Subject: **Willard's C-Store**

I've completed a review of the above mentioned Site Plan and Drainage Report and have the following comments:

1. The grading plan doesn't have proposed contours to show how the existing and proposed grading tie together.
2. ADA/safety concerns regarding the building ingress/egress and sidewalk ramp.
3. Detention pond questions – see redlined plans
4. Where is the replacement absorption bed location?
5. It appears the telephone line is off of this property and hence will require an easement.
6. The Keystone wall details are signed and sealed by a Missouri PE in 2002. Please update.
7. The Plans and the Drainage Report should be signed and sealed.
8. You must meet 0.2 cfs/ac, minimum. County Engineer can require a lower release rate.
9. What discharge rate will your proposed 4" pipe have? Have you considered an orifice plate instead?
10. See attached redlined report for additional minor comments/questions.

Please let me know if you have any questions regarding this review.

Name?

BECKSTEAD

PROJECT NOTES

Plans need to be signed and sealed

CONSTRUCTION NOTES:
 ALL CONSTRUCTION TO BE TO BOX ELDER COUNTY STANDARDS. IN THE EVENT THERE IS NO APPLICABLE STANDARD, CONTACT PROJECT ENGINEER / COUNTY ENGINEER. CONTRACTOR MUST ATTEND PRE-CONSTRUCTION CONFERENCE WITH COUNTY PRIOR TO COMMENCING WORK.
 PRIOR TO CONSTRUCTION, CONTRACTOR TO LOCATE ALL EXISTING UTILITIES. CONTRACTOR IS RESPONSIBLE FOR UNCOVERING AND VERIFICATION OF ALL EXISTING UTILITIES.
 SOILS TESTING TO BE PERFORMED ON PROJECT, ESPECIALLY FOR TRENCH RESTORATION. OWNER FUNDAMENTALLY WILL BE PAYING FOR SOILS TESTING BUT SUCH TO BE NEGOTIATED PRIOR TO START OF CONSTRUCTION (I.E. PERHAPS OWNER PAYS FOR ALL PASSING TESTS, CONTRACTOR FOR FAILING ONES, ETC.).

GRAZING NOTES:
 ALL WORK TO BE DONE TO SPECIFICATIONS OF GEOTECHNICAL REPORT WHERE/IF APPLICABLE.
 WATER: FIRE HYDRANTS ARE LOCATED NEARBY - CONTACT BEAR RIVER WATER CONSERVANCY DISTRICT. OBTAIN APPROPRIATE SHIPP PERMIT PRIOR TO COMMENCEMENT OF WORK.
 IMPORTANT: ALL UTILITY TRENCHES TO BE COMPACTED TO 95K; NOTE: ON-SITE EXPLORATION PIT TO A DEPTH OF 10 FEET REVEALED VERY FAVORABLE SOILS CONSISTING OF SANDY LOAMS. ACCORDINGLY, IT IS BELIEVED THAT IMPROVED STRUCTURAL FULL-DEPTH BARRIALL WILL NOT BE NECESSARY.

WATER:
 TWO WATER PROVIDERS ARE IN THE VICINITY OF THE SITE, THE BEAR RIVER WATER CONSERVANCY DISTRICT WITH A 12-INCH LINE ALONG HIGHWAY 89 AND THE SOUTH WILLARD WATER COMPANY WITH AN 8-INCH LINE ALONG HIGHWAY 89. THE SOUTH WILLARD WATER COMPANY HAS AGREED TO PERFORM THE WORK WITH WILLARD WATER COMPANY. UTILITY IS ASSUMED THAT THE EXISTING SERVICE IS 4-INCH - SUCH TO BE PERPETUATED WITH RELOCATED METER LOCATION AS SHOWN ON THE UTILITY PLAN.

FIRE PROTECTION:
 SEE SHEET 2 FOR EXISTING FIRE HYDRANT 175 FEET FROM THE NORTHWEST CORNER OF THE PROPOSED BUILDING. (SEE UTILITY LOCATION FOR LOCATION OF FIRE HYDRANT ON 8700 SOUTH STREET).

SEWER:
 THIS SITE WILL UTILIZE AN ON-SITE WASTEWATER DISPOSAL SYSTEM ("SEPTIC" SYSTEM). THE INITIAL LOOK INSTALLATION CONSISTS OF 70 LF OF DRAINFIELD LINE. RESERVE DRAINFIELD LINE TO BE INSTALLED PER ENVIRONMENTAL HEALTH DEPARTMENT GUIDELINES.

STORM DRAINAGE:
 SITE TO UTILIZE AN ON-SITE DRAINAGE POND AT THE SOUTHWEST CORNER OF THE SITE WHERE SURFACE FLOWS NATURALLY VEHUR. A TRENCH DRAIN IS TO BE INSTALLED TO CAPTURE A SMALL PORTION OF THE FLOWS AND DRAINAGE TO THE POND. THE TRENCH DRAIN IS TO BE INSTALLED ALONG THE NORTHWEST CORNER OF THE PROJECT WILL CAPTURE THE TRENCH DRAIN FLOW, THE PIPED ROOF DRAINS, AND THE NORTHERLY LANDSCAPE AREA.

MAINTENANCE:
 ALL UTILITIES TO BE PRIVATELY MAINTAINED BY OWNER.
 DRAINAGE SYSTEM: TO BE PRIVATELY MAINTAINED BY OWNER.

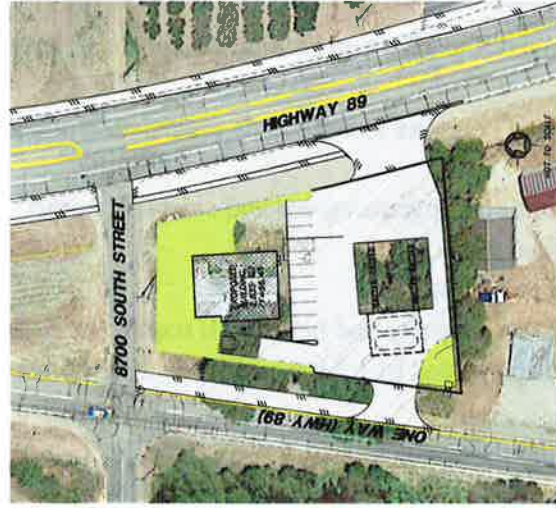
SECONDARY WATER:
 THERE IS NO PRESSURIZED SECONDARY WATER IN THE AREA. ON-SITE LANDSCAPING IS RATHER MINIMAL. SITE TO BE SERVED FROM CULINARY WATER SYSTEM - PROVIDE BACKFLOW PREVENTER.
 NOTE: SEE HIGHWAY PLANS FOR HIGHWAY WIDENING AND STRIPING IMPROVEMENTS

ELECTRICAL:
 NEW 3-PHASE POWER TO BE ROUTED FROM POLE ON EAST SIDE OF HIGHWAY 89 BY BORED INSTALLATION UNDER HIGHWAY.
TELEPHONE / CABLE:
 EXISTING OVERHEAD LINE ACROSS SITE TO BE ABANDONED. IT IS ANTICIPATED THAT NEW ON-SITE LINE WILL BE FROM ROUTED FROM SOUTHWEST CORNER OF SITE ALONG WEST BOUNDARY.

GAS:
 TESTING GAS SERVICE AT NORTHWEST CORNER OF SITE TO BE UPGRADED/ROUTED TO NORTHWEST PORTION OF BUILDING WHERE WATER WILL BE PLACED.

STRUCTURAL SECTION - ON-SITE:
 CONTRACTOR TO BID AN INITIAL MINIMUM STRUCTURAL SECTION OF 3 INCHES ASPHALT ON 8 INCHES BASECOURSE (95K COMPACTION) ON 8 INCHES OR 95K COMPACTED SUBGRADE. SUCH APPLIED TO ALL UTILITY CROSSINGS ALSO. STRUCTURAL SECTION TO BE UPDATED / CONFIRMED BY GEOTECHNICAL REPORT.
WATER:
 IMPROVEMENTS WITHIN THE HIGHWAY RIGHT-OF-WAY ARE SUBJECT TO A SUBSTANTIAL STRUCTURAL SECTION CONSISTING OF 6 INCHES ASPHALT ON 8 INCHES UTC ROADBASE (COMPACTED TO 95K) SCARRED AND COMPACTED SUBGRADE TO 95K.

UTILITY:
 SITE IS SANDWICHED BETWEEN TWO HIGHWAYS. SEE SEPARATE PLANS FOR HIGHWAY WIDENING AND STRIPING IMPROVEMENTS.



CONTACTS:
 PROJECT ARCHITECTS: GARY HUNT 801-725-1922
 PROJECT SURVEYOR: GREG HANSEN - MHI 435-721-4491
 FIRE PROTECTION: COREY BARTON - FIRE MARSHAL 435-734-3345
 CULINARY WATER: SOUTH WILLARD WATER COMPANY.
 PRES.: LANCE LEWIS 801-648-3790
 OPERATIONS: VAN GREATWOOD 801-841-6785
 FIRE HYDRANT USAGE: BRWCD - VONENE JORGENSEN 435-723-7034
 SEPTIC SYSTEM: CLAYNE SHAKESPEAR 435-695-2061; 435-750-5022
 COUNTY INSPECTOR: BRENT SLATER 801-476-9767; 801-591-1172

SHEET INDEX:
 1. PROJECT DATA
 2. GRADING & DRAINAGE PLAN
 3. UTILITY PLAN
 4. DETAIL SHEET
 5. DETAIL SHEET TRENCH DRAIN
 6. DESIGN CONTROL PLAN

BOX ELDER COUNTY SITE PLAN CHECKLIST:
 DEVELOPER: TRIGON GROUP
 4368 NORTH 175 WEST
 BRIGHAM CITY, UT 84414
 801-624-0628

AGENT: HANSEN & ASSOCIATES, INC.
 238 N. MAIN STREET
 BRIGHAM CITY, UTAH 84302
 435-723-3461

PROPOSED USE: CONVENIENCE STORE DEVELOPMENT PLANS. SEE PLANS

- SITE PLAN:**
 (1) EXISTING UTILITIES SHOWN ON PLANS
 (2) SITE DIMENSIONS AND LAYOUT SHOWN ON SHEET 2. EXISTING ROAD RIGHTS-OF-WAY SHOWN - NO EXPANSIONS OR DEDICATIONS THOUGH THERE WILL BE ROAD WIDENING IMPROVEMENTS IN EXISTING ROAD RIGHTS-OF-WAY
 (3) PROJECT NAME: WILLARD'S; NORTH AREA PROVIDED; TIE TO SECTION MONUMENT PROVIDED.
 (4) NO PROPOSED ADDITIONAL STREETS. BUILDING, PARKING AND LANDSCAPE AREAS SHOWN ON SITE PLAN ON SHEET 2
 (5) FEATURES: DIMENSION LOCATION SHOWN; PROPOSED SIGN IN NORTHEAST CORNER OF SITE. FUELING SOUTH SIDE TO HAVE 6-FOOT FENCE
 (6) INACTIVE EASTERLY IRRIGATION LINE SHOWN ON SHEET 4.
 (7) STREET RIGHT-OF-WAY: NONE 2835 SF
 (8) TOTAL GROSS AREA: 5019 SF
 (9) PARKING SPACES REQUIRED AT 1/100 SF OF USABLE RETAIL SPACE: 18 STALLS PROVIDED: 18 STALLS INCLUDING 1 ADA.
 (10) ENTIRE SITE TO BE DEVELOPED (NO OPEN SPACE OR REMAINDER)

- GRADING & DRAINAGE PLAN - SEE SHEET 3:**
 (1) NORTH ARROW & SCALE PROVIDED.
 (2) CONTOURS: 1-FOOT EXISTING CONTOURS PROVIDED.
 (3) SITE EARTHWORK REASONABLY CONFORM TO EXISTING SITE. EROSION CONTROL PLAN - SEE SHEET 6.
 (4) SEE SHEET 4 SITE. NO WATER COURSES OR DITCHES THROUGH SITE; INACTIVE EASTERLY IRRIGATION PIPE POND. NOTE: HIGHWAY WATER IS IMPORTANTLY MAINTAINED IN HIGHWAY RIGHT-OF-WAY.
 (5) NO FLOOD PLAIN OR WETLANDS MATTERS.
 (6) DRAINAGE POND TO HAVE MINOR 4-INCH LOW-FLOW UNDERDRAIN AND OVERFLOW SPILLWAY.

- UTILITY PLAN - SEE SHEET 4:**
 (1) NORTH ARROW & SCALE PROVIDED.
 (2) SEE SHEET 4: PROPOSED SEPTIC SYSTEM SHOWN EXISTING EASTERLY WATERLINES SHOWN AND WESTERLY FIRE HYDRANT; NO SECONDARY WATER; STORM DRAINAGE SHOWN ON SHEET 3 WITH EXISTING OVERHEAD POWER LINES SHOWN AND PROPOSED UNDERGROUND ROUTING; EXISTING OVERHEAD TELEPHONE LINE SHOWN WITH ANTICIPATED UNDERGROUND ROUTING. LIGHTING IS PERTINENT TO NEW BUILDING AND CAPTURED BY FIRE MARSHAL AND COUNTY ENGINEER. NO ANTICIPATED CHALLENGES WITH NEARBY BRWCD LINE AND FIRE HYDRANT.
 (3) NO KNOWN UTILITY EASEMENTS.
 (4) SITE HAS EXISTING WATER SERVICE - CONFIRMATION FROM SOUTH WILLARD WATER COMPANY. (5) NO KNOWN UTILITY EASEMENTS.
 (6) DECLARED FEASIBLE - DESIGN PARTICULARS FORTHCOMING.

- BUILDING ELEVATIONS:**
 (1) ALL FOUR ELEVATION VIEWS PROVIDED.
 (2) OUTDOOR LIGHTING WILL BE BUILDING-BASED AND DOWNWARD-DIRECTED.
 (3) PROPOSED SIGN WILL BE LOCATED IN NORTHEAST CORNER - TO BE COUNTY-CONFORMING.

- OTHER:**
 (H) NO KNOWN UNUSUAL SOIL CONDITIONS, ETC.
 (I) NO NECESSARY ALTERATIONS TO AGREEMENTS.
 (J) NO FURTHER TRAFFIC ANALYSIS NECESSARY - UDOT HAS REVIEWED AND APPROVED EXTENSIVE ROAD WIDENING AND STRIPING PLANS.
 (K) TITLE REPORT PROVIDED TO COUNTY.
 (L) TAX PARCEL MAP PROVIDED WITH SUBMISSION PACKAGE.
 (M) NO FURTHER TRAFFIC ANALYSIS NECESSARY - UDOT HAS REVIEWED AND APPROVED EXTENSIVE ROAD WIDENING AND STRIPING PLANS.

HANSEN & ASSOCIATES, INC.
 Consulting Engineers and Land Surveyors
 5500 North Street, Brigham City, Utah 84302
 (801) 733-3461
 Fax: (801) 488-1668
 Email: hansen@hanseninc.com

WILLARD'S
 COVER FOR
 8700 SOUTH HWY 89
 SOUTH WILLARD, UT

Drawn By: KE
 Checked By: KE
 Approved By: KE
 Scale: 1" = 20'
 Date: 8/15/2018
 Job Number: 18-5-2

No.	Date	By	Revisions

Sheet	1	of	7
Scale			

No.	Date	By	Revision

HANSSEN & ASSOCIATES, INC.
 Consulting Engineers and Land Surveyors
 538 North Main Street, Bingham, Utah 84802
 Bingham, UT 84805
 (435) 733-3441 (Fax) (435) 733-9072

WILLARDS
 8700 SOUTH HWY 89
 SOUTH WILKINS, UT
 Drawn By: KC Date: 6/19/2016
 Checked By: []
 Approved By: []
 Scale: 1" = 20'
 Drawing Title: 16-S-2016
 JOB NUMBER: 16-S-7

Sheet	2	7
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STIPPLED AREA

- Proposed 4" Solid Yellow Line
- Proposed 4" Broken Yellow Line
- Proposed 4" Solid White Line
- Proposed 4" Broken White Line
- Proposed 4" Dashed Yellow Line

Legend

- Proposed Building
- Proposed Dumpster Enclosure
- Proposed Storm Drainage Pond
- Proposed Sign Location
- Proposed Stop Sign Location
- Proposed 4" Solid Yellow Line
- Proposed 4" Broken Yellow Line
- Proposed 4" Solid White Line
- Proposed 4" Broken White Line
- Proposed 4" Dashed Yellow Line

Section Corner

HAI CALC
 SOUTH QUARTER CORNER OF SECTION 11, T7N, R2W, SLB&M USING UDOT 1940 R-O-W



8700 SOUTH STREET

HIGHWAY 89

ONE WAY (HWY 89)

B.E.C.D., R.R.
 SOUTH QUARTER
 CORNER OF SECTION
 11, T7N, R2W, SLB&M

8700 SOUTH STREET

PROPOSED SIGN LOCATION

PROPOSED STOP SIGN LOCATION

NEW 12' DECEL LANE

NEW 12' DECEL LANE

NEW 4' ASPHALT SHOULDER

NEW 4' ASPHALT SHOULDER

12' NORTH BOUND LANE

12' NORTH BOUND LANE

12' TURNING LANE

LANDSCAPE

DUMPSTER ENCLOSURE

PROPOSED BUILDING

STORM DRAINAGE POND

8 9 1 0

7

6

5

4

3

2

1

0

-1

-2

-3

-4

-5

-6

-7

-8

-9

-10

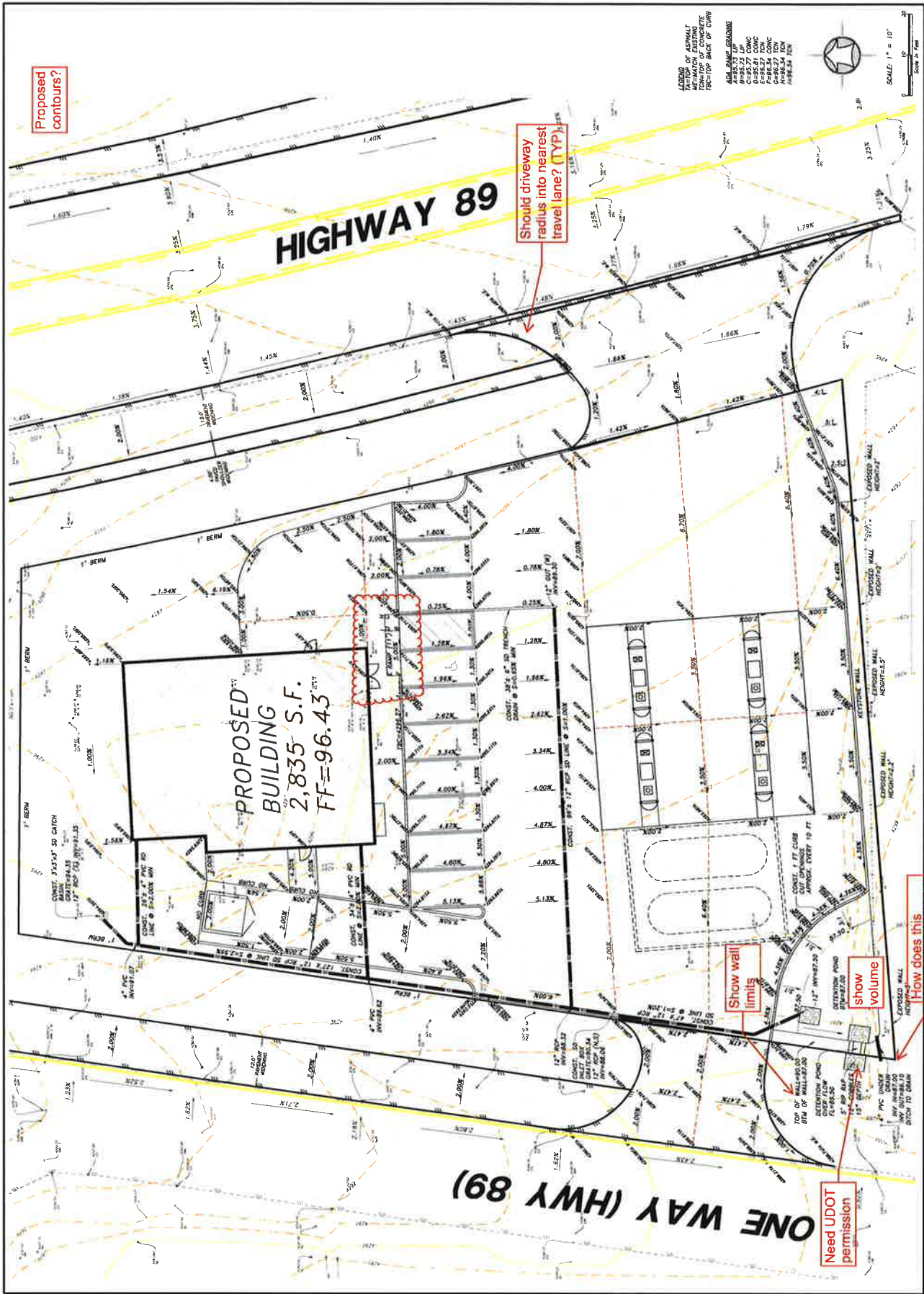
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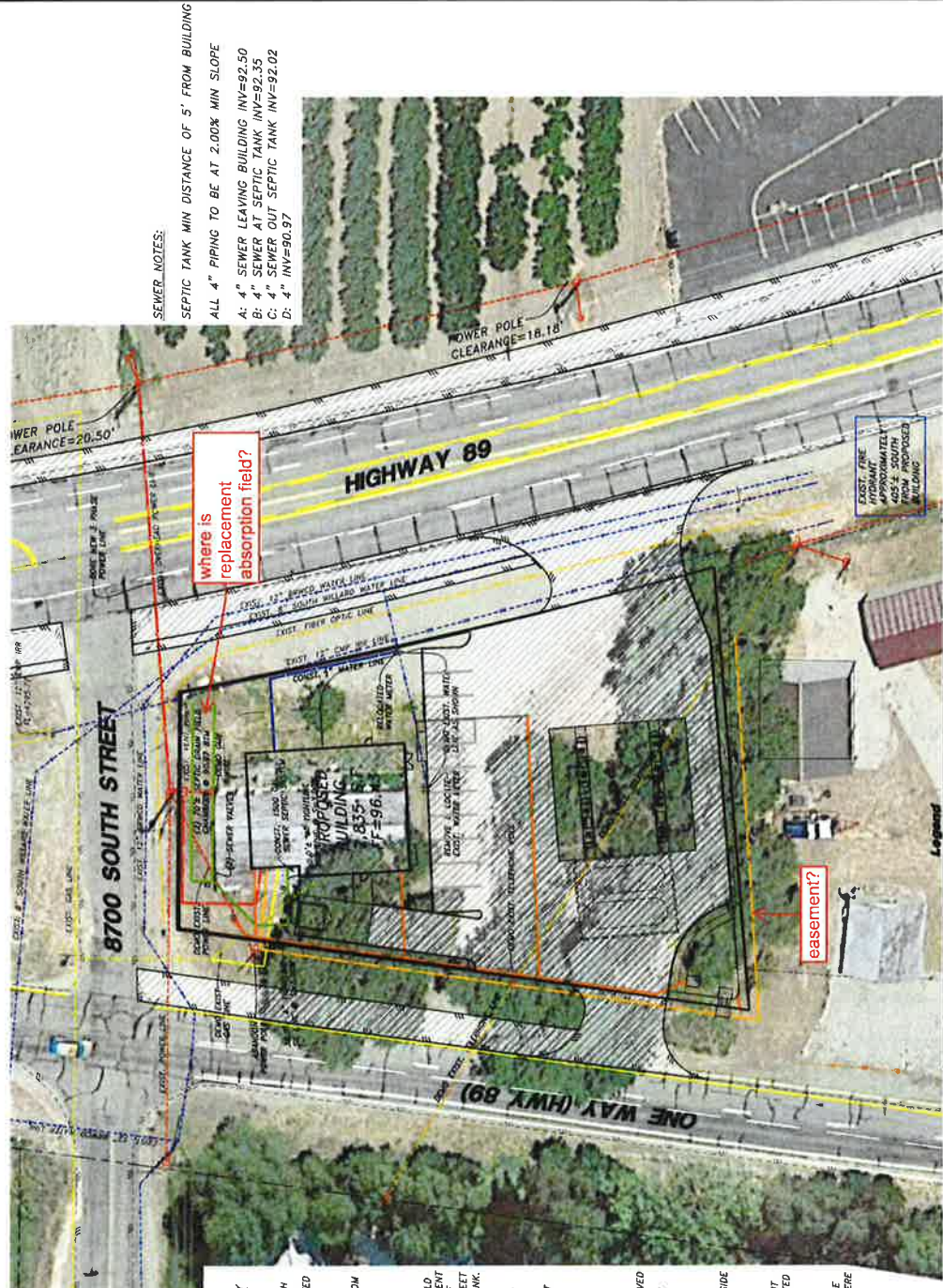
No.	Date	By	Revision

HANSEN & ASSOCIATES, INC.
 Consulting Engineers and Land Surveyors
 558 North Main Street, Englewood, CO 80152
 Englewood, CO 80152
 (303) 752-4955 (Fax) 752-8722

H&A
 JOB NUMBER: 18-03-01
 Drawing Title: 18-03-01-001
 Drawing Date: 11/12/2018
 Drawing By: [Redacted]
 Checked By: [Redacted]
 Approved By: [Redacted]

WILLARD'S
 UNITRY PLAN FOR
 8700 SOUTH HWY 89
 SOUTH WILLARD, UT
 Sheet 4 of 7
 Date: 11/12/2018

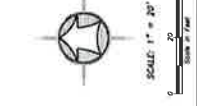
UTILITY PLAN



SEWER NOTES:
 SEPTIC TANK MIN DISTANCE OF 5' FROM BUILDING
 ALL 4" PIPING TO BE AT 2.00% MIN SLOPE
 A: 4" SEWER LEAVING BUILDING INV=92.50
 B: 4" SEWER AT SEPTIC TANK INV=92.35
 C: 4" SEWER OUT SEPTIC TANK INV=92.02
 D: 4" INV=90.97

where is replacement absorption field?

easement?



Legend

Symbol	Description
[Symbol]	Subject Property Line
[Symbol]	Common Boundary Line
[Symbol]	Utility Right-of-Way Line
[Symbol]	Service Line
[Symbol]	Gas Line
[Symbol]	Water Line
[Symbol]	Sanitary Sewer Line
[Symbol]	Storm Sewer Line
[Symbol]	Power Line
[Symbol]	Fire Line
[Symbol]	Optical Fiber Line
[Symbol]	Telephone Line
[Symbol]	Gas Line
[Symbol]	Edge of Asphalt Paving
[Symbol]	Drainage Ditch and Culvert
[Symbol]	Proposed Structure
[Symbol]	Fire Hydrant
[Symbol]	Water Meter
[Symbol]	Sanitary Sewer Manhole
[Symbol]	Storm Manhole
[Symbol]	Power Pole
[Symbol]	Fire Line Pole
[Symbol]	Optical Fiber Pole
[Symbol]	Telephone Pole
[Symbol]	Gas Line Pole
[Symbol]	Edge of Asphalt Paving
[Symbol]	Station Center

WATER:
 ALL CONSTRUCTION TO SOUTH WILLARD WATER COMPANY SPECIFICATIONS. TWO WATER PROVIDERS ARE IN THE VICINITY OF THE SITE, THE BEAR RIVER WATER CONSERVANCY DISTRICT ALONG HIGHWAY 89 AND THE SOUTH WILLARD WATER COMPANY ALONG HIGHWAY 89 AND SOUTH HIGHWAY 89. THE SITE HAS AN EXISTING WATER SERVICE WITH THE SOUTH WILLARD WATER COMPANY. IT IS ASSUMED THAT THE EXISTING WATER SERVICE IS TO BE PERPETUATED WITH RELOCATED WATER LOCATION AS SHOWN.

FIRE PROTECTION:
 FIRE IS SERVED BY AN EXISTING FIRE HYDRANT 175 FEET FROM THE NORTHWEST CORNER OF THE PROPOSED BUILDING.

SEWER:
 THIS SITE WILL UTILIZE AN ON-SITE WASTEWATER DISPOSAL SYSTEM ("SEPTIC SYSTEM"). THE INITIAL/ON-SITE INSTALLATION CONSISTS OF 70 LF OF 4" ABSORBENT FIELD WITH A 1500 GALLON SEPTIC TANK. THE SEPTIC SYSTEM IS SPECIFICALLY BASED ON A FLOW OF 300 GPD; SANDY LOAM LOADING RATE OF 0.55 CPD/25'; 4'-FEET OF EFFECTIVE TRENCH DEPTH. USE 1500 GALLON SEPTIC TANK.

STORM DRAINAGE:
 THE SITE IS TO UTILIZE AN ON-SITE DRAINAGE POND AT THE SOUTHWEST CORNER OF THE SITE WHERE SURFACE FLOWS NATURALLY VENTURE. A TRENCH DRAIN IS TO BE INSTALLED TO CAPTURE A SMALL PORTION OF THE NORTHEAST CORNER OF THE SITE. A SHALLOW TRENCH DRAIN IS TO BE INSTALLED ALONG THE WEST SIDE OF THE PROJECT WILL CAPTURE THE TRENCH DRAIN FLOW, THE PIPED ROOF DRAINS, AND THE NORTHERLY LANDSCAPE AREA.

SECONDARY WATER:
 THERE IS NO PRESSURIZED SECONDARY WATER IN THE AREA. ON-SITE LANDSCAPING IS RATHER MINIMAL. SITE TO BE SERVED BY A TRENCH DRAIN SYSTEM WITH A TRENCH DRAIN INSTALLED ALONG THE WEST SIDE OF THE PROJECT. EXISTING IRRIGATION PIPING CAN BE REMOVED/ABANDONED UPON CONFIRMATION OF IRRIGATION LINE INACTIVITY.

ELECTRICAL:
 NEW ELECTRICAL SERVICE TO BE Routed FROM POLE ON EAST SIDE OF HIGHWAY 89 BY BORED INSTALLATION UNDER HIGHWAY.

TELEPHONE / CABLE:
 EXISTING OVERHEAD LINE ACROSS SITE TO BE ABANDONED. IT IS TO BE Routed UNDER HIGHWAY 89 FROM THE SOUTHWEST CORNER OF SITE ALONG WEST BOUNDARY.

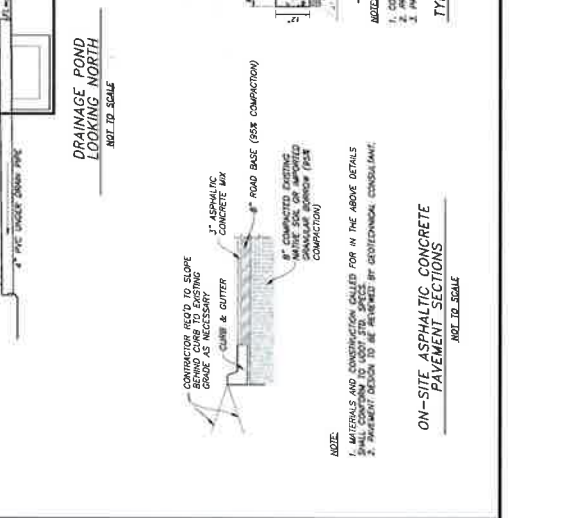
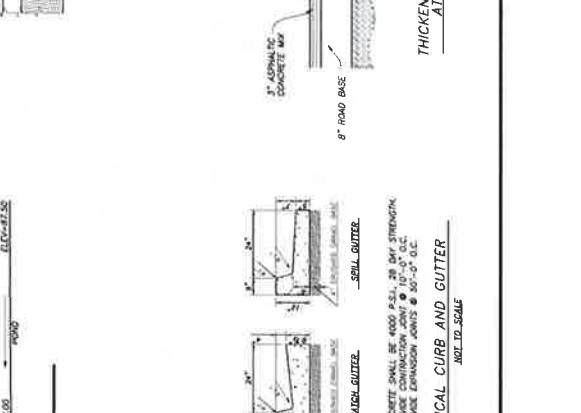
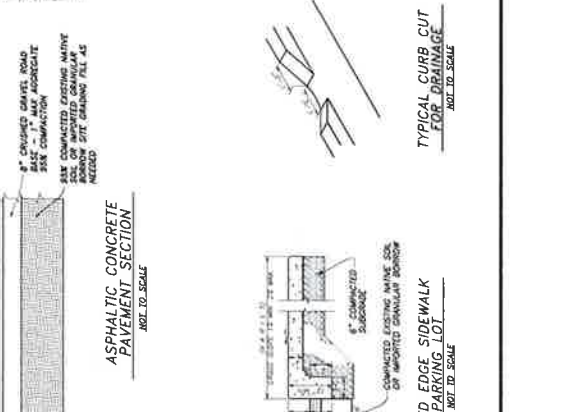
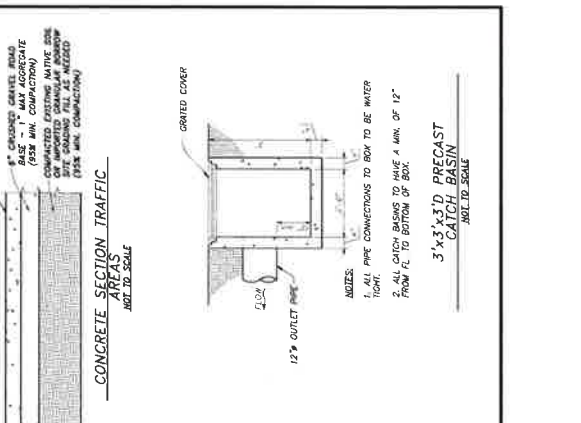
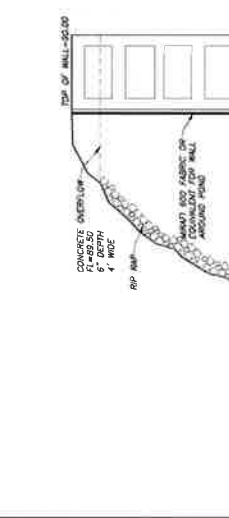
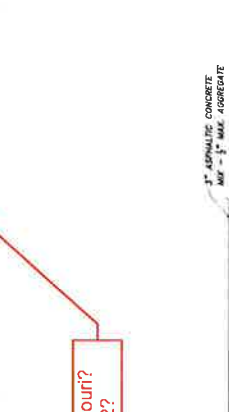
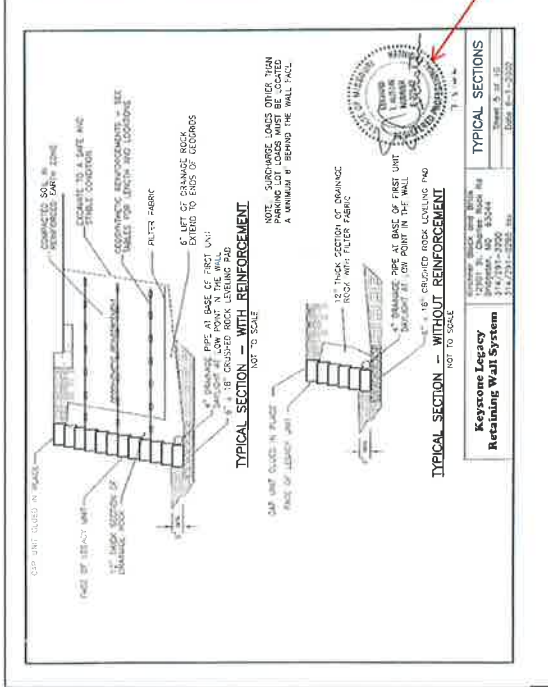
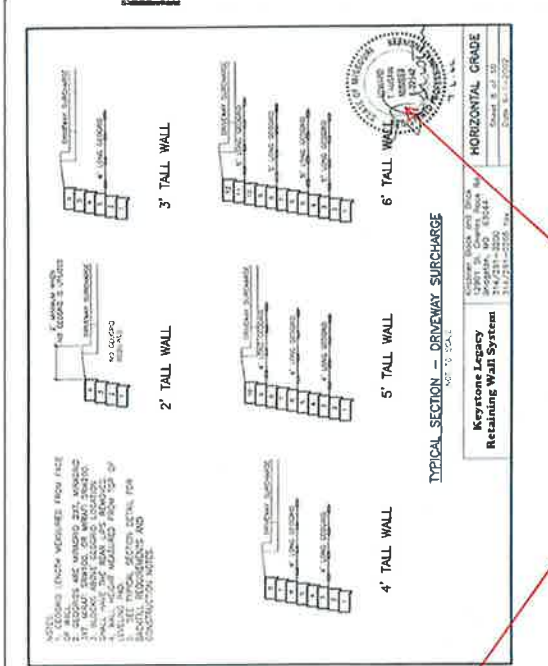
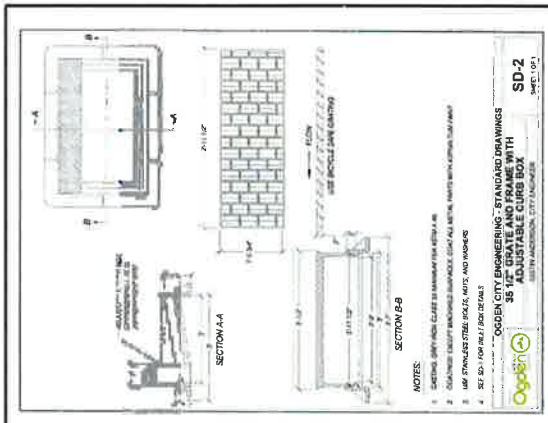
GAS:
 EXISTING GAS SERVICE AT NORTHWEST CORNER OF SITE TO BE UPGRADDED/ROUTED TO NORTHWEST PORTION OF BUILDING WHERE METER WILL BE PLACED.

No.	Date	By	Revisions

Drawn By: KE Date: 8/15/2016
 Checked By: Approved By: Scale: 1/8" = 1'-0"
 Job Number: 15-5-7
 SOUTH WILLARD, UT
WILLARD'S
 8700 SOUTH HWY 89

HANSEN & ASSOCIATES, INC.
 Consulting Engineers and Land Surveyors
 3208 North Macomber Street, Suite 100
 Provo, Utah 84601
 Phone: 801.733.5441
 Fax: 801.733.5442
 Website: www.hanseninc.com

SHEETS
 5 of 7



Missouri? 2002?

1-877-903-7246

TRENCHDRAIN SUPPLY

Series: TPC600
 Complete Kit
 6" Wide POLYCAST 600 Polymer Concrete French Drain Kit

POLYCAST.

Specifications:

- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets

1. 1" Normal End Cap, 3/4" or 4" Inlets

1-877-903-7246

TRENCHDRAIN SUPPLY

Series: D 01
 DP0670
 6" Wide POLYCAST 600 Polymer Concrete French Drain Kit

POLYCAST.

Specifications:

- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets

1-877-903-7246

TRENCHDRAIN SUPPLY

Series: DP0670
 DP0670
 6" Wide POLYCAST 600 Polymer Concrete French Drain Kit

POLYCAST.

Specifications:

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1-877-903-7246

TRENCHDRAIN SUPPLY

Series: DP0600
 DP0600
 6" Wide POLYCAST 600 Polymer Concrete French Drain Kit

POLYCAST.

Specifications:

- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets

1-877-903-7246

TRENCHDRAIN SUPPLY

Series: DA0670 & DA0670M
 Endcaps

POLYCAST.

Specifications:

- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets
- 1. 1" Normal End Cap, 3/4" or 4" Inlets

1-877-903-7246

TRENCHDRAIN SUPPLY

Series: DP0600
 DP0600
 6" Wide POLYCAST 600 Polymer Concrete French Drain Kit

POLYCAST.

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1-877-903-7246

TRENCHDRAIN SUPPLY

Series: DP0600
 DP0600
 6" Wide POLYCAST 600 Polymer Concrete French Drain Kit

POLYCAST.

Specifications:

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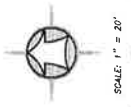
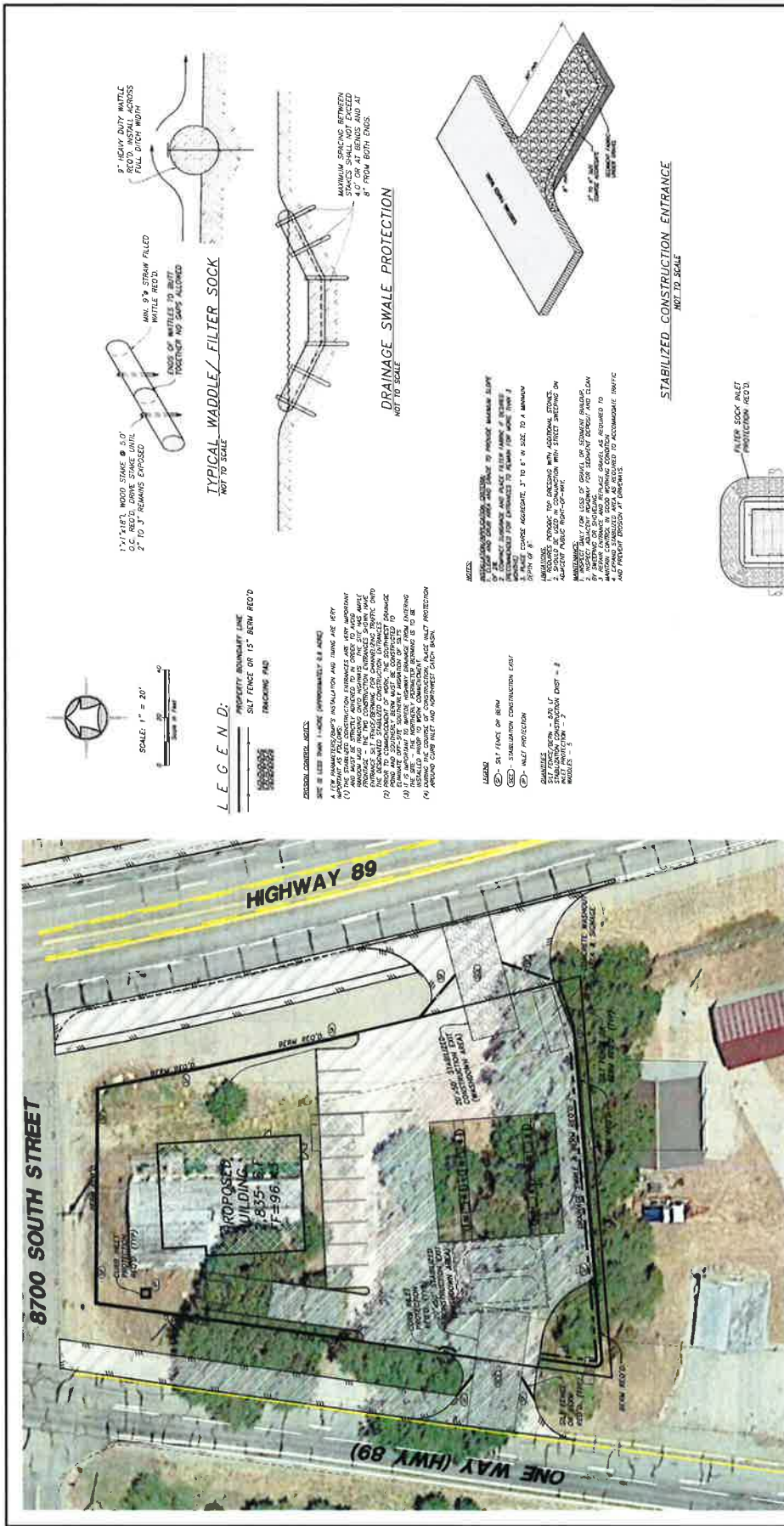
WILLARDS
 DETAILS FOR
 6700 SOUTH HWY 89
 SOUTH WILLARD, UT

Drawn By: AE Date: 8/15/2018
 Checked By: _____
 Approved By: _____
 Drawing Title: 15-2-DIMS
 Scale: 1/8" = 1'-0"

HANSEN & ASSOCIATES, INC.
 Consulting Engineers and Land Surveyors
 530 North Main Street, Ogden, Utah 84202
 Phone: (435) 744-2271 Fax: (435) 744-2272

MA. DATE	BY

Sheet: 6 of 7



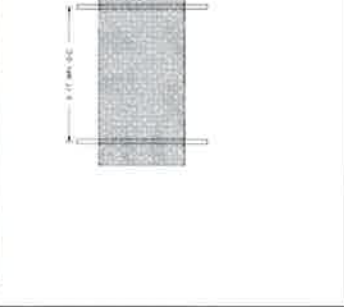
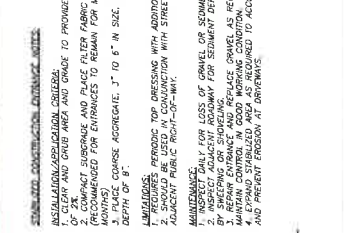
LEGEND:
 PROPERTY BOUNDARY LINE
 SILT FENCE OR 15" BERM (RED)
 TRACKING PAD

EROSION CONTROL NOTES:
 1. SEE PLAN FOR ALL EROSION CONTROL MEASURES.
 2. ALL EROSION CONTROL MEASURES SHALL BE INSTALLED PRIOR TO THE START OF CONSTRUCTION.
 3. ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION.
 4. ALL EROSION CONTROL MEASURES SHALL BE REMOVED UPON COMPLETION OF CONSTRUCTION.
 5. ALL EROSION CONTROL MEASURES SHALL BE REPAIRED IMMEDIATELY UPON DAMAGE.
 6. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED AND APPROVED BY THE LOCAL HEALTH DEPARTMENT.
 7. ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED AT ALL TIMES.
 8. ALL EROSION CONTROL MEASURES SHALL BE REPAIRED IMMEDIATELY UPON DAMAGE.
 9. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED AND APPROVED BY THE LOCAL HEALTH DEPARTMENT.
 10. ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED AT ALL TIMES.

STABILIZED CONSTRUCTION ENTRANCE NOTES:
 1. CLEAR AND GRADEN AREA AND GRADEN TO PROVIDE MAXIMUM SLOPE.
 2. COMPACT SUBGRADE AND PLACE FILTER FABRIC IF DESIRED.
 3. PLACE COURSE AGGREGATE, 3" TO 6" IN SIZE, TO A MINIMUM DEPTH OF 8".
 4. SHOULD BE USED IN CONJUNCTION WITH STREET SWEEPING ON ALLCITY PUBLIC RIGHT-OF-WAY.
MAINTENANCE:
 1. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.
 2. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.
 3. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.
 4. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.

STORM DRAIN INLET PROTECTION:
 1. INSTALL PROTECTION DEVICE AT ALL STORM DRAIN INLETS.
 2. PROTECTION DEVICE SHALL BE MAINTAINED AT ALL TIMES.
 3. PROTECTION DEVICE SHALL BE REPAIRED IMMEDIATELY UPON DAMAGE.
 4. PROTECTION DEVICE SHALL BE INSPECTED AND APPROVED BY THE LOCAL HEALTH DEPARTMENT.
 5. PROTECTION DEVICE SHALL BE MAINTAINED AT ALL TIMES.

STABILIZED CONSTRUCTION ENTRANCE:
 1. CLEAR AND GRADEN AREA AND GRADEN TO PROVIDE MAXIMUM SLOPE.
 2. COMPACT SUBGRADE AND PLACE FILTER FABRIC IF DESIRED.
 3. PLACE COURSE AGGREGATE, 3" TO 6" IN SIZE, TO A MINIMUM DEPTH OF 8".
 4. SHOULD BE USED IN CONJUNCTION WITH STREET SWEEPING ON ALLCITY PUBLIC RIGHT-OF-WAY.
MAINTENANCE:
 1. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.
 2. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.
 3. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.
 4. MAINTAIN ENTRANCE AND REPLACE CHAVEL AS REQUIRED TO MAINTAIN ENTRANCE IN GOOD WORKING CONDITION.



SILT FENCE DETAIL

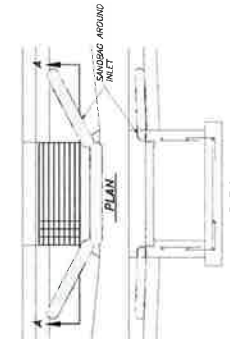
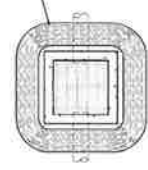
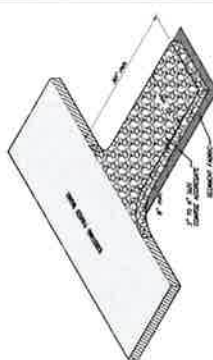
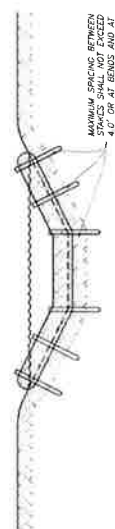
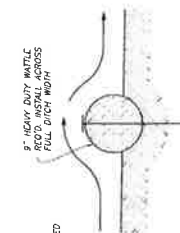
STORM DRAIN INLET PROTECTION

CURB INLET PROTECTION DETAIL

STABILIZED CONSTRUCTION ENTRANCE

TYPICAL WADDLE/FILTER SOCK

DRAINAGE SWALE PROTECTION



WILLARD'S **Convenience Store** **Drainage Narrative**

Introduction

The Willard's C-Store project is on a 0.61 acre parcel in the South Willard area of Box Elder County at 8720 Highway 89 (APN 01-045-0020). The site has historically been occupied by a church, a restaurant and other enterprises. It is currently vacant with no buildings. The parcel is sandwiched between Highway 89 on the east and southbound one-way Highway 89 on the west, with 8700 South bordering on the north and a commercial parcel on the south. Site gradient is moderate to the south/west. There is no current on-site detention pond nor dedicated storm drainage system in the area. The project will construct on-site detention to limit flows to historic levels.

Predominant Drainage Aspects

Visibly the site appears somewhat 'flat,' but has a surprising 8 foot drop from Highway 89 on the east to southbound Highway 89 on the west. The north-to-south gradient is uniform at a moderate slope. The low spot is the southwest corner where an on-site detention pond will be located.

Perhaps the primary drainage aspect is to assure that the on-site pond is only receiving on-site flows and not being overwhelmed by highway flows. The grading and drainage plan shows highway flows being channeled across the two project entrances. The northerly portion of the project has berming to assure highway flows channel around the site. On-site flows surface drain to the southwest corner into the on-site detention pond. There is curbing all along the south project boundary to capture and conduct surface flows westward to the pond. Flows enter the pond through curb cuts.

In order to have positive gradient away from the building, a northerly catch basin will be installed to capture flows north of the store where they are piped southward to pond. Roof drainage is collected en-route and a curb inlet is installed to capture flows prior to the west entrance.

Due to grading challenges, a trench drain will be installed to capture a small northeasterly portion of the parking lot. These flows will be conducted in positive fashion by trench drain underground conductance and piping to the westerly storm drainage line. The storm drainage piping is intuitively oversized as 12-inch piping

is specified so RCP piping can be installed. It is felt that the shallow piping cover mandates RCP piping.

Does not meet your
calculated 0.2 cfs/ac
detention volume.

Detention

Previous parcel activities had no on-site detention despite parcel imperviousness. Based on release rates of 0.10 cfs/acre, 0.15 and 0.20 cfs/acre, the respective detention pond quantities are 1408 cf, 1260 cf and 1150 cf (see attached spreadsheets). The southwesterly pond has a bottom elevation of 4287.0 and an overflow weir elevation of 4289.50 which affords 1053 cf of storage. Using the top of pond elevation of 4290 affords a capacity of 1268 cf. Given the fact that some of the site was previously impervious, this engineer feels that the pond fulfills the basic intent of limiting flows to historical levels. Further, on-site soils testing revealed very favorable/permeable sandy loams and loamy sands.

You are making 75% of the site 100% impervious.

Release

A 4-inch underdrain is shown at the bottom of pond to allow the pond to be a 'dry' pond versus 'wet' pond. The pipe can be reduced if desired, the concern is that 4-inch is about the minimum size that can handle small amounts of silt. An overflow weir is provided to conduct flows to the highway right-of-way where the current drainage pattern is along southbound highway roadside swales.

What is the discharge rate of a 4" pipe? Why not use an orifice plate on a larger pipe?

Conclusions

The Willard's convenience store can be appropriately developed drainage-wise with the following pre-cautionary measures and improvements:

- (1) North side berming and entrance construction that maintains highway flows in the highway right-of-way to not overwhelm the on-site detention pond.
- (2) A southwest detention pond to capture southerly surface flows and piped on-site northerly flows.
- (3) Underground piping to capture and conduct northerly flows, roof drains and a small portion of the parking lot collected by trench drains.
- (4) Pond outlet mechanisms (4-inch underdrain and overflow weir) to manage low flow and high flow events.

WILLARD'S

Drainage Calculations

August 22, 2016

BASIN A:

RAINFALL: 10-YR, 1-HOUR STORAGE REQUIREMENT FROM ENTITY
 BASIN AREA (SF): 0.886 INCHES SF
 BASIN AREA (AC): 26,463 AC
 100% IMPERVIOUSNESS: 0.61 AC
 BASIN WEIGHTED 'C': 1.00
 RAINFALL ON BASIN (100%): 0.82 CF
 RUNOFF FROM ON BASIN (PER 'C'): 1,954 CF
 RAINFALL PER IDF: 1,602 CF
 INTENSITY AT 24 HRS: 0.090 IN/HR
 VOLUME = I*(T=24 HRS)*A*C: 3,906 CF
 PREC. VS. IDF COMPARSON: -2304 CF

BASIN A (AREA): 26,463 SF
 SUMP ROCK PERIMETER (LF): 0 LF
 SUMP ROCK HEIGHT: 0 LF
 SUMP PERC SF: 0 SF
 PERCOLATION RATE (IN/HR): 0.00 IN/HR
 PERCOLATION (CFS): 0.0000 CFS
 PERCOLATION PER 5 MINUTES: 0.0 CF
 NUMBER OF SUMPS: 0

How is this determined?



Duration (min)	Storm Intensity (in/hr)	Weighted 'C'	Subbasin Area (sq.ft.)	Stormwater Flow (cfs)	Accumulated inflow (cf)	MH / Rock Storage (cf)	Metered Outflow Rate (cfs)	Total Outflow (cf)	Metered Outflow (cfs)	Other Outflow (cf)	Required Storage (cf)	Available Storage (cf)
5	3.38	0.82	26,463	1.68	505	-	0.0610	18	0.000	-	487	-
10	2.57	0.82	26,463	1.28	768	-	0.0610	37	0.000	-	732	-
15	2.13	0.82	26,463	1.06	955	-	0.0610	55	0.000	-	900	-
30	1.43	0.82	26,463	0.71	1,282	-	0.0610	110	0.000	-	1,172	-
60	0.89	0.82	26,463	0.44	1,589	-	0.0610	220	0.000	-	1,369	-
120	0.52	0.82	26,463	0.26	1,847	-	0.0610	439	0.000	-	1,408	-
180	0.37	0.82	26,463	0.18	1,991	-	0.0610	659	0.000	-	1,332	-
360	0.24	0.82	26,463	0.12	2,529	-	0.0610	1,318	0.000	-	1,211	-
720	0.15	0.82	26,463	0.07	3,228	-	0.0610	2,635	0.000	-	593	-
1440	0.090	0.82	26,463	0.045	3,906	-	0.0610	5,270	0.000	-	(1,364)	-

WILLARD'S

Drainage Calculations

August 22, 2016

BASIN A:

RAINFALL: 10-YR, 1-HOUR STORAGE REQUIREMENT FROM ENTITY
 BASIN AREA (SF): 0.886 SF
 BASIN AREA (AC): 26,463 AC
 100% IMPERVIOUSNESS 1.00
 BASIN WEIGHTED 'C': 0.82
 RAINFALL ON BASIN (100%): 1,954 CF
 RUNOFF FROM ON BASIN (PER 'C'): 1,602 CF
 RAINFALL PER IDF: 24-HR RATE FOR CHOSEN EVENT
 INTENSITY AT 24 HRS: 0.090 IN/HR
 VOLUME = I*(T=24 HRS)*A*C 3,906 CF
 PREC. VS. IDF COMPARSON -2304 CF
 24-HR RUNOFF - MIGHT NOT BE APPLIC.
 ONLY APPLIC. IF COMPARING 24-HR. EVENT

BASIN A (AREA): 26,463 SF
 SUMP ROCK PERIMETER (LF) 0 LF
 SUMP ROCK HEIGHT 0 LF
 SUMP PERC SF 0 SF
 PERCOLATION RATE (IN/HR) 0.00 IN/HR
 PERCOLATION (CFS) 0.0000 CFS
 PERCOLATION PER 5 MINUTES 0.0 CF
 NUMBER OF SUMPS 0

Duration (min)	Storm Intensity (in/hr)	Weighted 'C'	Subbasin Area (sq.ft.)	Stormwater Flow (cfs)	Accumulated inflow (cf)	MH / Rock Storage (cf)	Metered Outflow Rate (cfs)	Total Outflow (cf)	Metered Outflow (cfs)	Other Outflow (cf)	Required Storage (cf)	Available Storage (cf)
5	3.38	0.82	26,463	1.68	505	-	0.0915	27	0.000	-	478	-
10	2.57	0.82	26,463	1.28	768	-	0.0915	55	0.000	-	713	-
15	2.13	0.82	26,463	1.06	955	-	0.0915	82	0.000	-	873	-
30	1.43	0.82	26,463	0.71	1,282	-	0.0915	165	0.000	-	1,118	-
60	0.89	0.82	26,463	0.44	1,589	-	0.0915	329	0.000	-	1,260	-
120	0.52	0.82	26,463	0.26	1,847	-	0.0915	659	0.000	-	1,188	-
180	0.37	0.82	26,463	0.18	1,991	-	0.0915	988	0.000	-	1,002	-
360	0.24	0.82	26,463	0.12	2,529	-	0.0915	1,976	0.000	-	552	-
720	0.15	0.82	26,463	0.07	3,228	-	0.0915	3,953	0.000	-	(725)	-
1440	0.090	0.82	26,463	0.045	3,906	-	0.0915	7,906	0.000	-	(4,000)	-

WILLARD'S

Drainage Calculations

August 22, 2016

BASIN A:

RAINFALL: 10-YR, 1-HOUR STORAGE REQUIREMENT FROM ENTITY
 BASIN AREA (SF): 26,463
 BASIN AREA (AC): 0.61
 100% IMPERVIOUSNESS 1.00
 BASIN WEIGHTED 'C': 0.82
 RAINFALL ON BASIN (100%): 1,954
 RUNOFF FROM ON BASIN (PER 'C') 1,602
 RAINFALL PER IDF: 100% RAINFALL FOR STORAGE EVENT
 100% RUNOFF FOR STORAGE EVENT
 INTENSITY AT 24 HRS: 0.090
 VOLUME = I*(T=24 HRS)*A*C 3,906
 PREC. VS. IDF COMPARSON -2304
 24-HR RATE FOR CHOSEN EVENT
 24-HR RUNOFF - MIGHT NOT BE APPLIC.
 ONLY APPLIC. IF COMPARING 24-HR. EVENT

BASIN A (AREA): 26,463 SF
 SUMP ROCK PERIMETER (LF) 0 LF
 SUMP ROCK HEIGHT 0 LF
 SUMP PERC SF 0 SF
 PERCOLATION RATE (IN/HR) 0.00 IN/HR
 PERCOLATION (CFS) 0.0000 CFS
 PERCOLATION PER 5 MINUTES 0.0 CF
 NUMBER OF SUMPS 0

Duration (min)	Storm Intensity (in/hr)	Weighted "C"	Subbasin Area (sq.ft.)	Stormwater Flow (cfs)	Accumulated inflow (cf)	MH / Rock Storage (cf)	Metered Outflow Rate (cfs)	Total Outflow (cf)	Metered Outflow (cfs)	Other Outflow (cf)	Required Storage (cf)	Available Storage (cf)
5	3.38	0.82	26,463	1.68	505	-	0.1220	37	0.000	-	469	-
10	2.57	0.82	26,463	1.28	768	-	0.1220	73	0.000	-	695	-
15	2.13	0.82	26,463	1.06	955	-	0.1220	110	0.000	-	845	-
30	1.43	0.82	26,463	0.71	1,282	-	0.1220	220	0.000	-	1,063	-
60	0.89	0.82	26,463	0.44	1,589	-	0.1220	439	0.000	-	1,150	-
120	0.52	0.82	26,463	0.26	1,847	-	0.1220	878	0.000	-	969	-
180	0.37	0.82	26,463	0.18	1,991	-	0.1220	1,318	0.000	-	673	-
360	0.24	0.82	26,463	0.12	2,529	-	0.1220	2,635	0.000	-	(107)	-
720	0.15	0.82	26,463	0.07	3,228	-	0.1220	5,270	0.000	-	(2,042)	-
1440	0.090	0.82	26,463	0.045	3,906	-	0.1220	10,541	0.000	-	(6,635)	-

