MEMORANDUM

Date: January 29, 2014
To: Michael Sturdivant, P.E.
From: Brian Ruiz, P.E., CFM
Subject: 100% Drainage Technical Memorandum for Main Street Phase 1 Improvements
W.O.: Hansen #38420, WU8122 (VTN W.O. #7318)

This 100% Technical Memorandum is being submitted to address the comments from CLV dated December 10, 2013 regarding the 90% drainage design for the Main Street Phase 1 Improvements. Comment responses and all pertinent calculations and analysis are included in the Appendix of this submittal. The following bullet points summarize the major revisions to the storm drain system that have been incorporated into the analysis since the 90% submittal.

- HGL and flow values have been added to storm drain laterals.
- The storm drain exhibits have been revised to show flow values within the storm drain and storm drain sizes.
- Lateral 16 on the east side of Main Street at Lewis Avenue has been revised to utilize the existing drop inlet and lateral instead of replacing the inlet. This will minimize the construction effort in front of City Hall, minimize impact to existing pavers and light post at the intersection, and avoid conflicts with the existing fire hydrant and waterline valve located near the drop inlet.
- The previously proposed drop inlet located at the southwest corner of Main Street and Stewart Avenue has been removed due to conflicts with an existing telephone duct bank. The inlet was only provided to discharge nuisance flows and its removal will have no impact to the hydraulic analysis provided. Without the inlet, flows discharged to this location will be routed into Stewart Avenue in the same manner as the current condition.

The remaining portion of this Technical Memorandum incorporates responses to the CLV comments dated July 3, 2013 and technical information regarding the changes to the storm drain system since the 70% submittal. The Phase 1 street improvements for Main Street extend from Bonneville Avenue to Bonanza Road. The storm drain analysis included with this memorandum extends past the limits of the Phase 1 improvements to Coolidge Avenue in order to account for the flow splits to east and anticipated discharge into the storm drain for the Phase 2 portion of the storm drain. The CD included with this Technical Memorandum includes all text, calculations, analysis, and exhibits completed for the Main Street Phase 1 Drainage Study.

PROPOSED STORM DRAIN IMPROVMENENTS

The proposed storm drain system connects into the existing storm drain system in Main Street just upstream of the Ogden Road intersection. At this connection point, an existing junction structure is used to connect an existing 42" RCP at the upstream end into two existing 45"x29" HERCP at the downstream end. The existing 42" RCP is being removed and replaced with the proposed 42" RCP that is at a vertical alignment required for the proposed system. The proposed storm drain alignment has been revised since the last submittal to accommodate existing sanitary sewer and other existing utilities. Phase 1 improvements terminate just upstream of the Bonneville Avenue intersection. At the Bonneville intersection with Main Street, there is an existing 18"-24" storm drain line along the western edge of the Main Street alignment that is kept in place with the Phase 1 improvements. This system contains three existing drop inlets located south of Bonneville Avenue and two inlets north of Bonneville Avenue. The existing inlet on the northwest corner of the Bonneville Avenue intersection is being replaced with a 5' DM2 drop inlet that is aligned with the proposed curb and gutter alignment in Phase 1. The existing storm drain system extends approximately 350 feet downstream at which point it connects into the proposed storm drain through a drop inlet and 18" lateral connection.

REVISED FLOWSPLIT CALCULATIONS

The flow splits at each intersection with Main Street were re-evaluated to take into account the capacity of the west side of the road. The methodology used in the flow split calculations is as follows:

- Offsite flow from the west fills up the west half of Main Street.
- The drop inlet at the intersection intercepts a portion of west half street flow.
- Water in excess of the drop inlet capacity continues north in the west half of the street to the next reach of Main Street.
- Water above the half street capacity spills over to the east half of street.
- The drop inlet at the intersection intercepts a portion of the east half street flow.
- Water in excess of the drop inlet capacity, but less than street crown elevation diverts down the side street to the east.
- Water in excess of the street crown elevation splits to the north and to the east. Ratios for flows above this elevation are determined by the previously performed flow split calculations.

A flow split spreadsheet was completed to determine the flows discharged into the storm drain and the flow split at each intersection. The corresponding drop inlet calculations, HEC-1 analysis, and WSPGW analysis have been revised to correlate with the new flow split calculations. A Storm Drain and Flow Split exhibit has been prepared to show the flow discharges at each intersection. The exhibit and summary calculations for the storm drain and flow splits have been included as hard copies in the Appendix. All detailed calculations for the storm drain, flow split, and street flow calculations are within a CD supplied in the Appendix.

STORM DRAIN SYSTEM CAPACITY

The capacity of the existing storm drain system downstream of Ogden Avenue was determined in part by referencing the HGL on the Ogden Avenue Underpass and Roadway record drawings. The HGL from the record drawings was assumed to represent the 100-storm event on the reference drawings. No reference information was available for the 10-year storm event. The HGL for the existing storm system seems to be driven by the backwater from the existing 12'x8' RCB at the downstream end of the system. Two scenarios present themselves for the determination of starting HGL within the system.

1. The routing of storm flows within the existing 12'x8' RCB is offset sufficiently with the flow routing for the proposed storm drain that the backwater impact on the system is not a major factor in capacity.
2. The routing of storm flows within the existing 12'x8' RCB is lined up with the routing of flows within the proposed storm drain and creates significant backwater impacting the capacity of the storm drain.

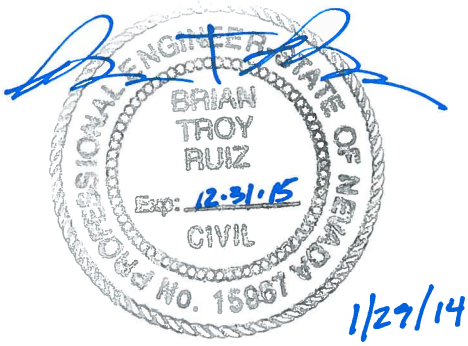
For scenario one, the starting HGL for the system was assumed to be at the top of pipe at the connection point with the existing storm drain at the Ogden intersection. This scenario was used to represent the 10-year storm event in the WSPGW analysis. The flows discharged into the storm drain at the proposed inlet locations are shown on the Flow split Calculation Spreadsheet included in the Appendix of this report. The discharges at each inlet were simulated in the HEC-1 analysis through the use of routing and diversion cards. The combination of routing and hydrograph addition reduces the flows within the storm drain system during the 10-year storm event from the 49 cfs determined through straight addition to the 45 cfs shown in the HEC-1 analysis output. The actual flows used in the WSPGW analysis were taken from the HEC-1 analysis completed.

For scenario two, the HGL was assumed to be approximately at the elevation as shown on the record drawings for the Ogden Avenue Underpass. This was used as the starting HGL for the 100-year WSPGW storm analysis. The HGL from the Ogden Avenue Underpass record drawings severely limits the available capacity for the proposed storm drain system. Drop inlet calculations using the 100-year street flow depths quickly created surcharge conditions in the storm drain system. Due to this the capacity of the system during the 100-year storm was estimated by reducing flows in the system until surcharge conditions no longer existed. A capacity of approximately 47 cfs was estimated using this method. Since this corresponds closely to the 10-year storm drain flows, the inlet capacities determined for the 10-year storm event were used to simulate the capacity of the storm drain in the 100-year event.

Flow split calculation at each intersection was computed for the 100-year event based on the inlet discharges from the 10-year storm in conjunction with 100-year street flow depth calculations. This provided the final estimate of discharge into the storm drain system, flows split off to the east at intersections, and flow continuing north in Main Street during the 100-year storm event.

VTN NEVADA

Brian T. Ruiz, P.E., CFM
Project Manager



1/29/14

APPENDIX A

FLOWSPLIT CALCULATION SPREADSHEET

FLOWSPLIT CALCULATION SPREADSHEET

STREET FLOW METHODOLOGY

1) Offsite flow from the west fills up west half of street
1b) Drop inlet at intersection intercepts portion of west half street water
1c) Water in excess of drop inlet capacity continues north in west half of street to next reach of Main St
2) Water above half street capacity spills over to east half of street
2b) Drop inlet at intersection intercepts portion of east half street water
2c) Water in excess of drop inlet capacity, but less than street crown elevation diverts down side street to the east
3) Water in excess of street crown elevation splits to the north and to the east. Ratio for flows above this elevation determined by previously performed flow split calculations.

Legend

Qwest - Flow on west side of Main street
Qeast - Flow on east side of Main street
Qdiw - Flow discharged into DI on west side of Main street
Qdiw - Flow discharged into DI on east side of Main street
Qnorth - Flow routed north on Main Street
Qesplit - Flow split off Main Street into side street

Main St at Coolidge

max half street capacity: 6 cfs
full street capacity: 12 cfs

HEC1 Basin MS2: Q100 = 13 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	6.5	Qeast (cfs):	6.5
Qdiw (cfs):	2.2	Qdie (cfs):	0.6
Qnorth (cfs):	4.3	Qesplit (cfs):	5.9
		Qnorth=	0

HEC1 Basin MS2: Q10 = 7 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	6	Qeast (cfs):	1
Qdiw (cfs):	2.2	Qdie (cfs):	0.6
Qnorth (cfs):	3.8	Qesplit (cfs):	0.4
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 4.3
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 3.8
East Side of Street (cfs): 0
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCOOLSD (cfs): 2.8
HEC-1 Diversion East Into Coolidge (Qesplit) DCOOLE (cfs): 5.9
10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCOOLSD (cfs): 2.8
HEC-1 Diversion East Into Coolidge (Qesplit) DCOOLE (cfs): 0.4

FLOWSPLIT CALCULATION SPREADSHEET

Main St at Hoover

max half street capacity: 5 cfs
full street capacity: 10 cfs

HEC1 Cpoint CMS3: Q100 = 11 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	5.5	Qeast (cfs):	5.5
Qdiw (cfs):	2.1	Qdie (cfs):	0.6
Qnorth (cfs):	3.4	Qesplit (cfs):	4.9
		Qnorth=	0

HEC1 Cpoint CMS3: Q10 = 6 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	5	Qeast (cfs):	1
Qdiw (cfs):	2.1	Qdie (cfs):	0.6
Qnorth (cfs):	2.9	Qesplit (cfs):	0.4
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 3.4
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 2.9
East Side of Street (cfs): 0
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DHOOVSD (cfs): 2.7
HEC-1 Diversion East Into Coolidge (Qesplit) DHOOVE (cfs): 4.9
10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DHOOVSD (cfs): 2.7
HEC-1 Diversion East Into Coolidge (Qesplit) DHOOVE (cfs): 0.4

Main St at Gass & Commerce

Low point at Gass directs all flows off of Main Street and east into Gass. The previously completed flowsplit and drop inlet calculation have been used for this segment of roadway.

Main St at Garces

max half street capacity: 15 cfs
full street capacity: 30 cfs

HEC1 Cpoint CMS6A: Q100 = 20 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	15	Qeast (cfs):	5
Qdiw (cfs):	3.3	Qdie (cfs):	0
Qnorth (cfs):	11.7	Qesplit (cfs):	5
		Qnorth=	0
Note: DI on East Side has no significant capacity			

HEC1 Cpoint CMS6A: Q10 = 8 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	8	Qeast (cfs):	0
Qdiw (cfs):	3.3	Qdie (cfs):	0
Qnorth (cfs):	4.7	Qesplit (cfs):	0
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 11.7
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 4.7
East Side of Street (cfs): 0

FLOWSPLIT CALCULATION SPREADSHEET

100 YR HEC-1 Diversions

HEC-1 Storm Drain Diversion (Qdiw + Qdie) DGARCSD (cfs):	3.3
HEC-1 Diversion East Into Garces (Qesplit) DGARCE (cfs):	5

10 YR HEC-1 Diversions

HEC-1 Storm Drain Diversion (Qdiw + Qdie) DGARCSD (cfs):	3.3
HEC-1 Diversion East Into Garces (Qesplit) DGARCE (cfs):	0

Main St at Bonneville

All surface flows routed off of Main street onto Bonneville.
Flow on west side of road route west in Bonnieville towards underpass.
Flow on east side of road route east in Bonnieville.
Inlet capacities based on HEC-22 used to determine the three inlets within this segment.

Main St at Clark

max half street capacity:	28	cfs	
full street capacity:	53	cfs	

HEC1 Basin MS9: Q100 = 12 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	12	Qeast (cfs):	0
Qdiw (cfs):	2.4	Qdie (cfs):	0
Qnorth (cfs):	9.6	Qesplit (cfs):	0
		Qnorth=	0

HEC1 Basin MS9: Q10 = 6 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	6	Qeast (cfs):	0
Qdiw (cfs):	2.4	Qdie (cfs):	0
Qnorth (cfs):	3.6	Qesplit (cfs):	0
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR

West Side of Street (cfs):	9.6
East Side of Street (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 10 YR

West Side of Street(cfs):	3.6
East Side of Street (cfs):	0

100 YR HEC-1 Diversions

HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCLKSD (cfs):	2.4
HEC-1 Diversion East Into Clark (Qesplit) DCLRKE (cfs):	0

10 YR HEC-1 Diversions

HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCLKSD (cfs):	2.4
HEC-1 Diversion East Into Clark (Qesplit) DCLRKE (cfs):	0

Main St at Lewis

max half street capacity:	6	cfs
full street capacity:	65	cfs

HEC1 CPoint CMS10: Q100 = 21 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	6	Qeast (cfs):	15

HEC1 Cpoint MS10: Q10 = 10 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	6	Qeast (cfs):	4

FLOWSPLIT CALCULATION SPREADSHEET

Qdiw (cfs):	2.1	Qdie (cfs):	2.5
Qnorth (cfs):	3.9	Qesplit (cfs):	12.5
		Qnorth=	0

Qdiw (cfs):	2.1	Qdie (cfs):	2.5
Qnorth (cfs):	3.9	Qesplit (cfs):	1.5
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 3.9
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 3.9
East Side of Street (cfs): 0
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DLWISSD (cfs): 4.6
HEC-1 Diversion East Into Lewis (Qesplit) DLWISE (cfs): 12.5
10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DLWISSD (cfs): 4.6
HEC-1 Diversion East Into Lewis (Qesplit) DLWISE (cfs): 1.5

Main St at Bridger

max half street capacity: 16 cfs
full street capacity: 27 cfs

HEC1 CPoint CMS11: Q100 = 18 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	16	Qeast (cfs):	2
Qdiw (cfs):	3.7	Qdie (cfs):	0
Qnorth (cfs):	12.3	Qesplit (cfs):	2
		Qnorth=	0

HEC1 Cpoint MS11: Q10 = 10 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	10	Qeast (cfs):	0
Qdiw (cfs):	3.7	Qdie (cfs):	0
Qnorth (cfs):	6.3	Qesplit (cfs):	0
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 12.3
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 6.3
East Side of Street (cfs): 0
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DBRDGSD (cfs): 3.7
HEC-1 Diversion East Into Bridger (Qesplit) DBRDGE (cfs): 2
10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DBRDGSD (cfs): 3.7
HEC-1 Diversion East Into Bridger (Qesplit) DBRDGE (cfs): 0

Main St at Carson

max half street capacity: 16 cfs
full street capacity: 34 cfs

FLOWSPLIT CALCULATION SPREADSHEET

HEC1 CPoint CMS12: Q100 = 26 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	16	Qeast (cfs):	10
Qdiw (cfs):	4.4	Qdie (cfs):	0
Qnorth (cfs):	11.6	Qesplit (cfs):	10
		Qnorth=	0

HEC1 Cpoint MS12: Q10 = 13 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	13	Qeast (cfs):	0
Qdiw (cfs):	4.4	Qdie (cfs):	0
Qnorth (cfs):	8.6	Qesplit (cfs):	0
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 11.6
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 8.6
East Side of Street (cfs): 0
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCRSNSD (cfs): 4.4
HEC-1 Diversion East Into Carson (Qesplit) DCRSNE (cfs): 10
10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCRSNSD (cfs): 4.4
HEC-1 Diversion East Into Carson (Qesplit) DCRSNE (cfs): 0

Main St at Fremont
max half street capacity:

Flow assumed to be equal on both side of street.

HEC1 Basin RDCRSNN: Q100 = 11 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	5.5	Qeast (cfs):	5.5
Qdiw (cfs):	2.1	Qdie (cfs):	2.1
Qnorth (cfs):	3.4	Qesplit (cfs):	0
		Qnorth=	3.4

HEC1 Basin RDCRSNN: Q10 = 8 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	4	Qeast (cfs):	4
Qdiw (cfs):	2.1	Qdie (cfs):	2.1
Qnorth (cfs):	1.9	Qesplit (cfs):	0
		Qnorth (cfs):	1.9

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 3.4
East Side of Street (cfs): 3.4
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 1.9
East Side of Street (cfs): 1.9
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCRSNSD (cfs): 4.2

10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DCRSNSD (cfs): 4.2

FLOWSPLIT CALCULATION SPREADSHEET

Main St at Ogden

max half street capacity: 69.6 cfs
full street capacity: 139.2 cfs

HEC1 CPoint CMS13: Q100 = 31 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	27.6	Qeast (cfs):	3.4
Qdiw (cfs):	0	Qdie (cfs):	0
Qnorth (cfs):	27.6	Qesplit (cfs):	3.4
		Qnorth=	0

HEC1 Cpoint CMS13: Q10 = 15 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	11.6	Qeast (cfs):	3.4
Qdiw (cfs):	0	Qdie (cfs):	0
Qnorth (cfs):	0	Qesplit (cfs):	3.4
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR
West Side of Street (cfs): 27.6
East Side of Street (cfs): 0
Final Routed North in Main Street Main Street Through Intersection 10 YR
West Side of Street(cfs): 0
East Side of Street (cfs): 0
100 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DOGDNSD (cfs): 0
HEC-1 Diversion East Into Ogden (Qesplit) DOGDNE (cfs): 3.4
10 YR HEC-1 Diversions
HEC-1 Storm Drain Diversion (Qdiw + Qdie) DOGDNSD (cfs): 0
HEC-1 Diversion East Into Ogden (Qesplit) DOGDNE (cfs): 3.4

FLOWSPLIT CALCULATION SPREADSHEET

Main St at Stewart

max half street capacity: 38.4 cfs

full street capacity: 76.8 cfs

HEC1 CPoint CMS14: Q100 = 40 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	38	Qeast (cfs):	2
Qdiw (cfs):	0	Qdie (cfs):	0
Qnorth (cfs):	38	Qesplit (cfs):	2
		Qnorth=	0

HEC1 Cpoint CMS14: Q10 = 18 cfs			
West Side Main St		East Side Main Street	
Qwest (cfs):	18	Qeast (cfs):	0
Qdiw (cfs):	0	Qdie (cfs):	0
Qnorth (cfs):	22	Qesplit (cfs):	0
		Qnorth (cfs):	0

Final Routed North in Main Street Main Street Through Intersection 100 YR

West Side of Street (cfs): 38

East Side of Street (cfs): 0

Final Routed North in Main Street Main Street Through Intersection 10 YR

West Side of Street(cfs): 22

East Side of Street (cfs): 0

100 YR HEC-1 Diversions

HEC-1 Diversion East Into Ogden (Qesplit) DSTEWE (cfs): 2

10 YR HEC-1 Diversions

HEC-1 Diversion East Into Ogden (Qesplit) DOGDNE (cfs): 0

APPENDIX B

STORM DRAIN & FLOW SPLIT EXHIBIT

H:\7318\Engineering Drawings\Exhibits\Subbasin\7318-SD-EXHIBIT.dwg 01/07/2014 14:54

MATCH LINE 68+00.00

MS2 (0.008 SQMI) 7/13 CFS

MS3 (0.004 SQMI) 3/7 CFS

CS8 (0.035 SQMI) 26 / 50 CFS

Qwest-6/6.5 Qdiw-2.2/2.2 Qeast-1/6.5 Qdie-0.6/0.6

Qesplit-0.4/5.9

COOLIDGE AVENUE

Qnorth-3.8/4.3

MAIN STREET

Qwest-5/5.5 Qdiw-2.1/2.1 Qeast-1/5.5 Qdie-0.6/0.6

Qesplit-0.4/4.9

HOOVER AVENUE

Qnorth-2.9/3.4

CMS3 6/11 CFS

FUTURE 24" RCP STORM DRAIN Q10=3 CFS

MS4 (0.004 SQMI) 4/7 CFS

FUTURE 30" RCP STORM DRAIN Q10=13 CFS

COMMERCE STREET

GASS AVENUE

CMS4 6/10 CFS

MS2 7/13 CFS

FUTURE 24" RCP STORM DRAIN Q10=2 CFS

Qnorth-0/0

Qdie-0/0

Qdiw-8/8

7+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00 25+00 26+00 27+00 28+00 29+00 30+00

54+00 55+00 56+00 57+00 58+00 59+00 60+00 61+00 62+00 63+00 64+00 65+00 66+00 67+00 68+00

MS6A (0.004 SQMI) 3/7 CFS

MS5 (0.001 SQMI) 1/2 CFS

Qwest-8/15 Qdiw-3.3/3.3 Qeast-0/5

FUTURE 36" RCP STORM DRAIN Q10=18 CFS

Qesplit-0/5

GARCES AVENUE

CMS6A 8/20 CFS

Qnorth-4.7/11.7

MS6B (0.008 SQMI) 7/13 CFS

Qdiw-3/3

MAIN STREET

Qdie-0/0

Qdiw-2/2

CMS6B 10/27 CFS

FUTURE 36" RCP STORM DRAIN Q10=21 CFS

BONNEVILLE AVENUE

NOT TRIBUTARY TO STREET FLOW ON MAIN

PROPOSED 36" RCP STORM DRAIN Q10=29 CFS

MS1 (0.0001 SQMI) 1/<1 CFS

Qeast-0/0

Qwest-6/12

MS9 (0.007 SQMI) 6/12 CFS

Qesplit-0/0

CLARK AVENUE

MS8 6/12 CFS

Qnorth-0/0

Qdiw-2.4/2.4

70+00 71+00 72+00 73+00 74+00 75+00 76+00 77+00 78+00 79+00 80+00 81+00 82+00

MATCH LINE 82+20.00

LEGEND

- BASIN BOUNDARY
- MS9 BASIN NAME
- FLOW ARROW
- MS9 COMBINATION POINT
- 6/12 CFS 10/100 YR FLOW
- Qwest FLOW ON WEST SIDE OF MAIN STREET
- Qeast FLOW ON EAST SIDE OF MAIN STREET
- Qdiw FLOW DISCHARGED INTO DI ON WEST SIDE OF MAIN STREET
- Qdie FLOW DISCHARGED INTO DI ON EAST SIDE OF MAIN STREET
- Qnorth FLOW ROUTED NORTH ON MAIN STREET
- Qesplit FLOW SPLIT OFF MAIN STREET INTO SIDE STREET

GRAPHIC SCALE

60 0 30 60 120

1" = 60'

Sheet SD1 1 of 2 DRAWING NO.

TITLE: MAIN STREET PHASE 1 IMPROVEMENTS

SHEET: STORM DRAIN AND FLOWSPLIT EXHIBIT
STA: 56+00.00 TO STA: 82+20.00

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT
CITY ENGINEER: DAVID N. BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MICHAEL STURDIVANT, P.E.

DESIGNED BY: LL
DRAWN BY: EM
CHECKED BY: CH
DATE: OCT 2013

vtn
2727 SOUTH RAINBOW BOULEVARD
LAS VEGAS, NEVADA 89146-5148
PH. (702) 873-7550
FAX (702) 362-2597
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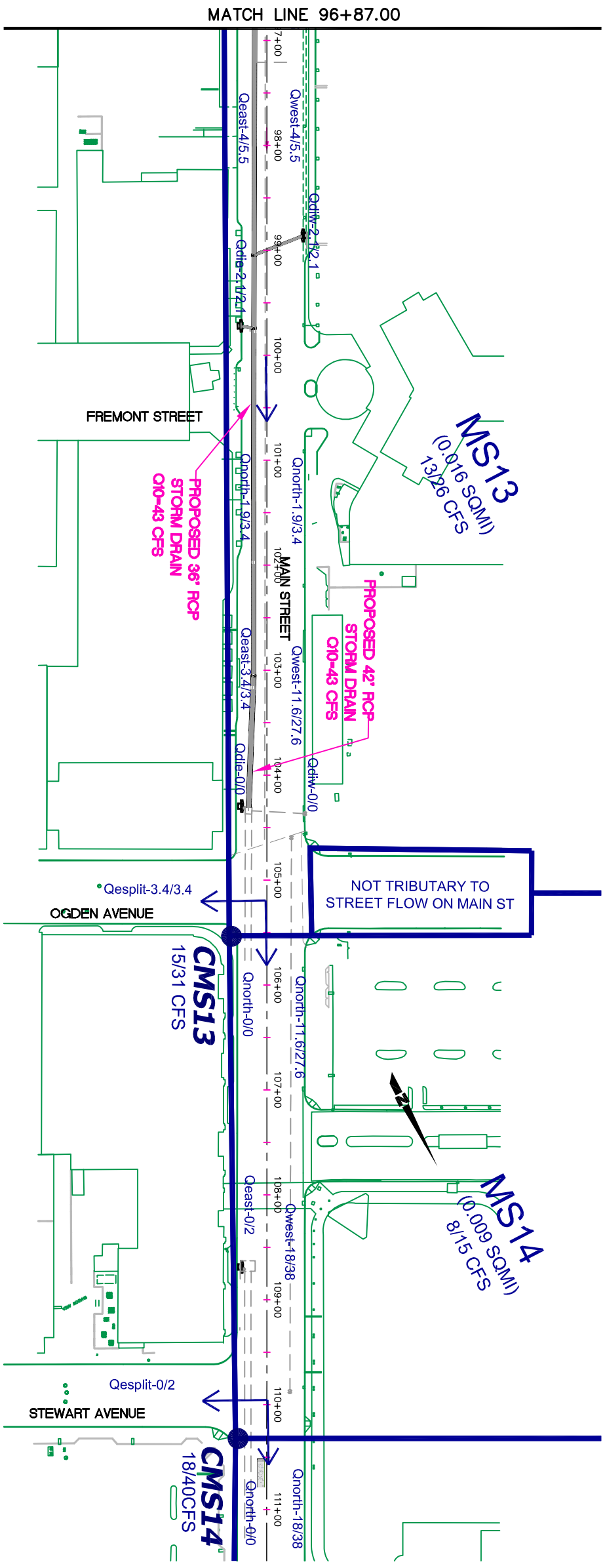
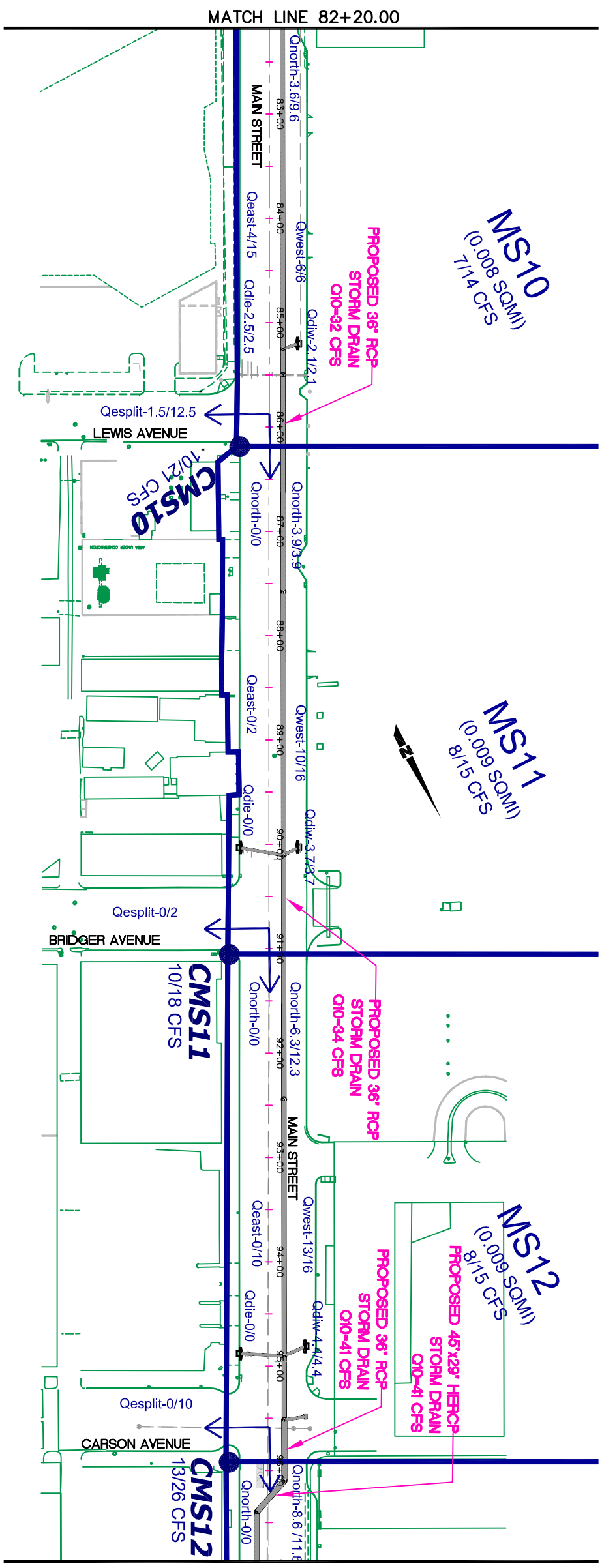
REVISIONS			
NO.	DATE	DESCRIPTION	APP'D





LEGEND

- BASIN BOUNDARY
- MS9 BASIN NAME
- FLOW ARROW
- MS9 COMBINATION POINT 6/12 CFS 10/100 YR FLOW
- Qwest FLOW ON WEST SIDE OF MAIN STREET
- Qeast FLOW ON EAST SIDE OF MAIN STREET
- Qdiw FLOW DISCHARGED INTO DI ON WEST SIDE OF MAIN STREET
- Qdie FLOW DISCHARGED INTO DI ON EAST SIDE OF MAIN STREET
- Qnorth FLOW ROUTED NORTH ON MAIN STREET
- Qesplit FLOW SPLIT OFF MAIN STREET INTO SIDE STREET

GRAPHIC SCALE
1" = 60'
60 0 30 60 120

TITLE: MAIN STREET PHASE 1 IMPROVEMENTS

SHEET: STORM DRAIN AND FLOWSPLIT EXHIBIT
STA: 82+20.00 TO STA: 111+00.00

Sheet SD2 2 of 2 DRAWING NO.

DEPARTMENT OF PUBLIC WORKS
CAPITAL PROJECT MANAGEMENT
CITY ENGINEER: DAVID N. BOWERS, P.E., P.T.O.E.
PROGRAM MANAGER: MICHAEL STURDIVANT, P.E.

DESIGNED BY: LL
DRAWN BY: EM
CHECKED BY: CH
DATE: OCT 2013

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APPENDIX C

CLV COMMENT MATRIX

Main St Commerce St One-Way Couplet Improvement Project
Las Vegas Boulevard to US-95
90% **REVIEW COMMENT SHEET**

PROJECT:
PROJECT NUMBER:
SUBMITTAL: **90%**
PACKAGE **Plan Submittal and Drainage**
PACKAGE RECEIVED:
CONTRACT:

CLIENT / PROJECT MANAGER:
CLV/Michael Sturdivant
DESIGNER /CONSULTANT PROJECT MANAGER:
CA Group/Jim Caviola

Reviewers/Initials
MJ - Mike Janssen, CLV Traffic
DP - Diane Phomninh, CLV Traffic
TT Thomas Theisen, FAST/RTC
MS Michael Sturdivant, CLV Project Manager
PJ Peter Jackson, CLV Drainage
TP Tim Parks, CLV Sanitation
FC Fidel Calixto
SW Steve Wyszomirski

LOCATION		REVIEW			CA Group / VTN - RESPONSE		
COMMENT NO.	PAGE NO.	REVIEWER COMMENTS	DATE	REVIEWER INFORMATION	REVIEW RESPONSE	DATE	RESPONDENT INFORMATION
1	Drainage	The engineer needs to submit stamped copies of the Drainage Memorandum.	12/10/2013	PJ	Acknowledged. Stamped copies of the 100% Drianage TM are included with this submittal.	1/9/2014	BTR
2	Drainage	The provided Storm Drain and Flow Split Exhibit does not show the system flows. The Drainage Design Report needs an Exhibit that shows the recommended storm drain system and labels the key concentration points with associated flows. The summary should include collected storm drain flows and the remaining street surface flows within the project area.	12/10/2013	PJ	Storm drain flows and size labels have been added to the Storm Drian exhibits included in Appendix B of this report.	1/9/2014	BTR
3	Drainage	Label the design Q on the storm drain lateral profile sheets. The lateral sheets (DP sheets) show all inlets as nuisance flow while the report memorandum talks about this being a 10-year system. Review and revise accordingly.	12/10/2013	PJ	Design flows and HGL's have been labled on the lateral profile sheets. Lateral Standard Form 6 calculations have been provided on the CD included in the Appendix of this submittal. Note that based on the drop inlet calculations provided, laterals 13,18A, 21, and 22 do not have quantified flows and are provided solely for nuisance flow purposes.	1/9/2014	BTR
4	Drainage	Review the street curb grade low points with the drop inlet locations. Currently the low points are not matching the proposed inlet locations or need added inlets are needed. See Sheets PP-2, PP-3, PP-4, D-2, D-3, and D-4.	12/10/2013	PJ	The low point street curb grades and the drop inlet locations have been revised to match on the 100% plans set included with this submittal.	1/9/2014	BTR
5	Drainage	Many of the proposed curb grades have proposed slopes less than 0.4%. We understand that the existing grading constraings are maximizing the slope where practical. How are the specifications dealing with these flat slopes? The curb construction will create bird baths and it is recommneded that the curb formwork be hand formed and surveyed prior to pouring. Flow testing should be required to minimize the ponding of water in the curb line of the street.	12/10/2013	PJ	The specification include requirements for flow testing to minimize ponding water for the proposed street improvments. Based on discussion at the 90% review comment meeting, Las Vegas Paving indicated that the constraints of the traffic control requirements would most likely require the length of the curb runs to be to short for use with slipform/extrusion machine equipment and will require hand formed construction methods consistent with the comments request.	1/9/2014	BTR
6	Drainage	The Phase 2 inlet at the southwest corner of Main and Bonneville will require special design. The inlet is shown adjacent to the Phase 1 SSMH. Coordinate design separation requirements and/or any SSMH modifications needed to protect the sewer from storm water impacts with Tim Parks, P.E., Collection System Planning.	12/10/2013	PJ	Acknowledged. The design will be coordinated with Mr. Tim Parks, P.E. with the Phase 2 portion of this project.	1/9/2014	BTR

Main St Commerce St One-Way Couplet Improvement Project
Las Vegas Boulevard to US-95
90% REVIEW COMMENT SHEET

LOCATION		REVIEW			CA Group / VTN - RESPONSE		
COMMENT NO.	PAGE NO.	REVIEWER COMMENTS	DATE	REVIEWER INFORMATION	REVIEW RESPONSE	DATE	RESPONDENT INFORMATION
7	Drainage	Provide an updated cost estimate for Phase 1 based upon the 90% review. The project's estimate will need to show those costs by funding source to make sure that the allocated funding has been addressed with each phase.	12/10/2013	PJ	An updated cost estimate is included with this submittal as requested.	1/9/2014	BTR
8	Drainage	The existing and proposed utility crossings of the storm drain must be shown on the storm drain plan and profiles sheets and on the lateral profiles based upon the pothole data. Show the relocated water lines needed for the storm drain on the storm drain profiles.	12/10/2013	PJ	Existing utility crossing are shown on each lateral profile. The plans referrence the Uniform Design and Construction Standards for Potable Water (UDACS) for construction of relocated water lines opposed to providing a design elevation. This has been done to provide the contractor flexablity in the construction due to field restraints while maintaining the standards of the UDACS.	1/9/2014	BTR
9	Drainage	Provide detail sheets showing typical details needed for the construction, connection and any special transition structure details. Structural details must be submitted for the proposed modifications to the junction structure. Complete the junction structure details on Sheet D-7.	12/10/2013	PJ	The structural connection of the new storm drain to the existing juction structure has been shown on Sheet D-7.	1/9/2014	BTR
10	Drainage	The plans need to clearly identify the size of the existing storm drains.	12/10/2013	PJ	The plans have been revised to make existing storm drian locations and size more visable with this submittal.	1/9/2014	BTR
11	Drainage	The Final Design Report needs to include an electronic copy of the entire report with the input and output files for the hydraulics and hydrology.	12/10/2013	PJ	Acknowledged. All drainage text, calculations, analysis and exhibits for the project are inlcuded in a CD provided in the Appendix of this submittal.	1/9/2014	BTR