DRAFT

Final Drainage Study and Stormwater Quality Plan

Base Camp Square Development Plan

Lots 2, 3, 4, 5 and 6 Worldwest Subdivision

Original Date: August 2, 2021
Resubmittal Date: March 31, 2022

Prepared by: Deborah Spaustat, P.E.

NOTE
City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and the City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

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CERTIFICATION

I hereby affirm that this Drainage Letter and Stormwater Quality Plan for the Development Plan for Basecamp Square was prepared by me (or under my direct supervision) for the owners thereof and is, to the best of my knowledge, in accordance with the provisions of the City of Steamboat Springs Storm Drainage Criteria and approved variances. I understand that the City of Steamboat Springs does not and will not assume liability for drainage facilities designed by others.

Deborah Spaustat, P.E.
State of Colorado No. 0041286

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INTRODUCTION AND LOCATION

The purpose of this report is to estimate peak stormwater runoff, evaluate existing infrastructure and design required infrastructure to manage the existing stormwater experienced onsite and the incremental stormwater generated by the proposed Basecamp Square (the Project). This report includes all the base data, methods, assumptions, and calculations used by Landmark Consultants, Inc. (Landmark) to design the stormwater management system for the project. It was prepared in concurrence with the Development Plan application and includes proof of compliance with assumptions made in the Steamboat Basecamp Development Plan and The Preliminary Plat.

The subject property, Lot's 1, 2 and 3 of the Worldwest Subdivision, area a total of 2.54-acres of land located on the west side of Steamboat Springs. The property is bordered by US Highway 40 (Lincoln Ave) to the west, Curve Court to the south, Lot 1 Worldwest Subdivision to the west and Elk River Road South to the north. It is currently undeveloped with only an access road running along the west property boundaries that is included with the development of the Steamboat Basecamp project in Lot 1.

The project proposes to construct condominiums and townhomes in Lots 2 and 3 with an ice rink, parking and food service building in Lot 1.

The property is zoned Commercial Services, EC, AO. There is no proposed change in zoning or use.

Landmark prepared this report in accordance with City of Steamboat Springs Drainage Criteria for the purpose of designing the storm water infrastructure required by the project at the time of this report. This report may not be used by other parties without the express written consent of Landmark.

The facts and opinions expressed in this report are based on Landmark's understanding of the project and data gathered from:

- Site visits
- FEMA FIRM Map Number 08107C0883D and FIS Study
- NRCS soil maps
- Field survey by Landmark Consultants, Inc.
- Citywide Stormwater Masterplan by SHE
- Final Drainage Study for Steamboat Basecamp
- Final Drainage Report for US 40 & Elk River Road Intersection Improvements
- References listed at the end of this report

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The location of the project is shown on Figure 1: Vicinity Map.

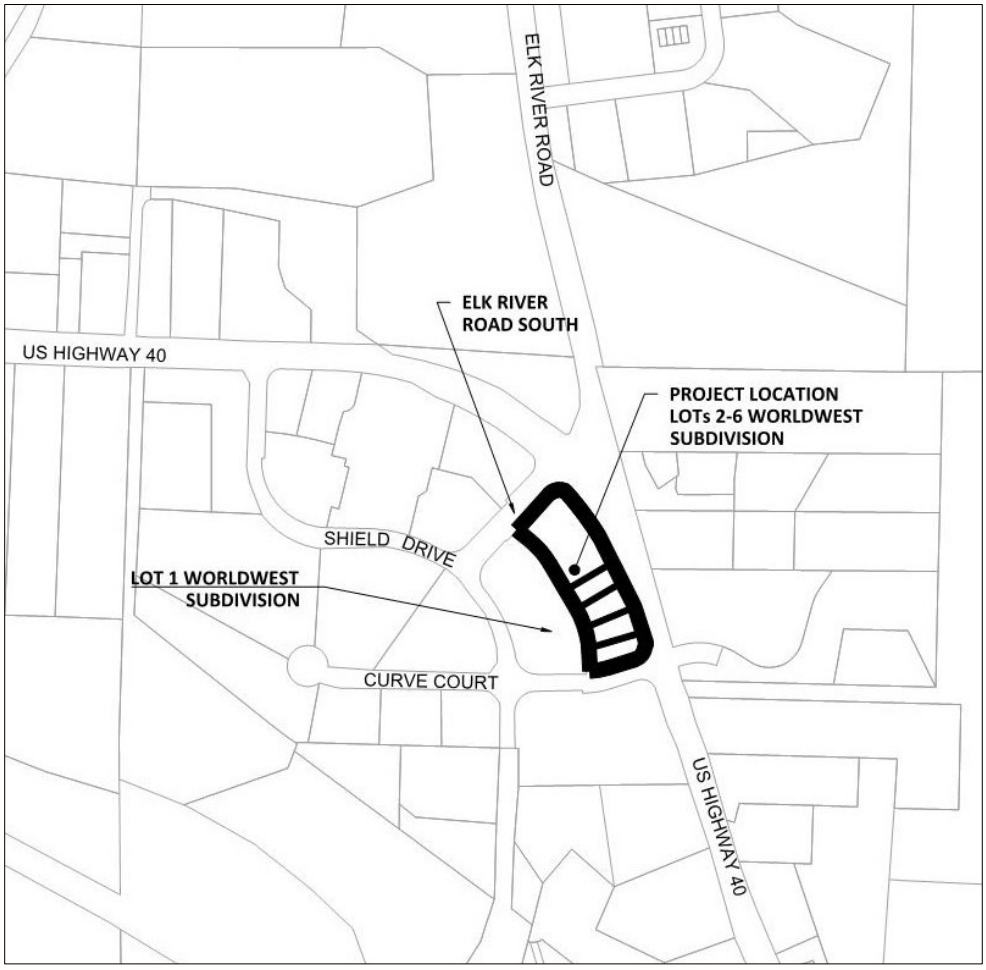

Figure 1- Vicinity Map

DRAINAGE CRITERIA AND METHODOLOGY

Landmark prepared this report in accordance with City of Steamboat Springs, Colorado Drainage Criteria, effective September 2007. The methods used by Landmark are described below and the actual calculations are presented in the Appendices. The scope of this report is limited to flow determinations related to the described hydrological storm event. This report does not attempt to model subsurface flows nor is it intended to be used in the design of structure features including foundation drains and roof drains.

Design Rainfall and Runoff Frequency

Landmark used the Rational Method to determine peak runoff of small basins to design the on-site storm water runoff infrastructure associated with this project. The 5-year, 24 hour storm was used to analyze the minor storm event and the 100-year, 24 hour storm was used to analyze the major storm event. The methods developed by the Mile High Flood District were used in calculating the water quality capture volume to evaluate the existing/designed BMP.

Storm Sewer Design

Autodesk Storm and Sanitary Sewer Analysis was used to design and analyze the proposed storm sewer systems. The storm sewers were designed so that the HGL of the minor storm does not exceed ground elevation.

Detention

Required detention volumes were determined using the FAA Method and storage is provided in a combined stormwater quality/detention sand filter basin previously included in the Steamboat Basecamp Development Plan submittal.

Stormwater Quality

The project will meet the WQCV standard using the methods outlined in USDCM Vol. 3. An extended detention basin was designed for the Steamboat Basecamp project to include future development in Lots' 2-6.

EXISTING SITE CONDITIONS

In this report the term "historic condition" refers to the conditions of the site assuming the completion of improvements to Lot 1 as proposed in the Steamboat Basecamp development. This includes a 22.120-square foot commercial building, parking areas and landscaping as well as the new access road on the east side of the existing building and an extended detention basin (EDB) located on the south side of the building.

A 12" Duraslot Drain is assumed to be installed on the west side of the access road connecting to an HDPE storm system that discharges to the EDB.

Runoff from the developed western portion of the site generally drains to the perimeter of the lot where it flows via roadside swale to an existing 21-inch x 27-inch CMP arch culvert at the corner of Shield Drive and Curve Court. The EDB discharges treated water to a swale that flows to this culvert as well. The culvert discharges to the ditch that runs east/west along Curve Court and makes its way to a large wetlands area west of the Combined Law Enforcement Facility and eventually the Yampa River. This culvert is shown in the Citywide Stormwater Masterplan by SEH (2013) and is not flagged as needing maintenance or replacement. In addition, none of the downstream culverts require immediate maintenance or replacement.

Analysis of the existing culvert using HY-8 indicates that this culvert has a capacity of approximately 15.3-cfs before overtopping the road. Overflow runoff will overtop Shield drive and make its way to the roadside ditch along Curve Court. This analysis is included in the Steamboat Basecamp Final Drainage Study.

The soils onsite are an Elkhead clay loam with a hydrologic soil group of D. The property is very flat with slopes of between 0 and 4%. No flows from offsite basins enter the site.

Drainage Basins

The "developed" drainage basins from the Steamboat Basecamp Final Drainage Study are considered the "existing" drainage basins for the purpose of this report. Figure 2: Existing Drainage Conditions show the "existing" basins and assumed improvements in Lot 1.

Consistent with the Steamboat Basecamp Final Drainage Study, design point "0" quantifies the total flow to the arch culvert exiting the site. Design point "off" quantifies the total flow to the storm system at the northeast corner of the lot intercepts runoff from basins P-203R and P-114R and carries it across Elk River Road. These two basins were included in the Final Drainage Report for US 40 & Elk River Road Intersection Improvements and the naming convention was carried over to this project for clarity.

Table 1 summarizes the "existing" hydrological conditions of Lots 2-6 and Table 2 summarizes the Design Point Hydrology:

	Table 1: "Existing" Conditions Hydrological Summary (D) *					
Basin	**Total Area (acres)**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**%Imp**
1	1.88	0.69	0.81	3.71	9.52	79%
2.1	0.85	0.86	0.89	2.81	6.41	100%
2.2	1.94	0.18	0.56	0.94	6.25	17%
2.3	0.26	0.17	0.55	0.17	1.20	16%
2.4	0.29	0.05	0.49	0.06	1.18	2%
2	NA	NA	NA	NA	NA	NA
3	0.74	0.66	0.80	1.42	3.74	75%
4	0.24	0.49	0.71	0.42	1.32	55%
P-203R	0.69	0.73	0.83	1.94	4.83	84%
P-114R	0.88	0.86	0.89	2.91	6.63	100%

*Assumes improvements proposed for Steamboat Basecamp are completed

Table 2: "Existing "Design Point Hydrology Summary						
Design Point	**Total Area (acres)**	**C_5**	**C_{100}**	**Q_5 (cfs)**	**Q_{100} (cfs)**	**%Imp**
0	6.20	0.49	0.71	7.74	24.40	55%
1	3.34	0.35	0.64	2.92	11.77	37%
off	1.57	0.81	0.87	4.88	11.49	93%
ud	2.86	0.67	0.80	4.93	12.92	76%

Easements

The existing EDB is located in a drainage easement as shown in Figure 2. There is a 34.3-foot-wide landscape, drainage and underground utility easement running along the east side of Lots 2-6.

FEMA Floodplain

FEMA FIRM Number 08107C0876D dated February 4, 2005, was reviewed and no portions of the property are within a Floodway or SFHA.

PROPOSED SITE CONDITIONS

The project proposes to construct condominiums and townhomes in lots 3-6 and a covered ice rink, parking and accessory building in lot 2. Valley pans will collect runoff in the paved driveways and parking in between the buildings and convey it to inlets that connect to laterals provided with the construction of the existing storm system in the access road. The Steamboat Basecamp Final Drainage Study assumed a full buildout imperviousness of 85% for the undeveloped portions of the property to design the storm system and EDB to accommodate future improvements.

Drainage Basins

Drainage basins D1, D2.1, D2.4, and D4 are not affected by this project. Basin D2.2 is further divided into eight subbasins, SQ2.2-SQ3.2. Basins D3, P-114R and P-203R are also affected by the proposed improvements. Table 3: Developed Basin Hydrology Summary shows the proposed hydrological conditions and compares them to the assumed conditions from the Steamboat Basecamp Final Drainage Study.

Table 3: Basin Hydrology Summary

	Assumed Future Development						Basecamp Square (SQ)						
Basin	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Basin	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
1	1.88	0.69	0.81	3.71	1.97	79%	1	1.88	0.69	0.81	3.71	9.52	79%
2.1	0.85	0.73	0.83	2.40	2.82	85%	2.1	0.85	0.86	0.89	2.81	6.41	100%
							SQ2.2	0.51	0.72	0.83	1.43	3.58	84%
							SQ2.3	0.11	0.86	0.89	0.37	0.85	100%
							SQ2.4	0.52	0.63	0.78	1.28	3.46	73%
							SQ2.5	0.29	0.71	0.82	0.77	1.96	81%
							SQ2.6	0.20	0.40	0.67	0.31	1.13	45%
							SQ2.7	0.26	0.74	0.84	0.73	1.81	86%
							SQ3.1	0.06	0.61	0.77	0.14	0.38	69%
							SQ3.2	0.12	0.49	0.71	0.23	0.72	56%
2.2	1.94	0.73	0.83	4.51	2.33	85%	2.2						
2.3	0.26	0.73	0.83	0.73	2.82	85%	2.3	NA	NA	NA	NA	NA	NA
2.4	0.29	0.73	0.83	0.81	2.82	85%	2.4	0.29	0.05	0.49	0.06	1.18	2%
2							2	NA	NA	NA	NA	NA	NA
3	0.74	0.66	0.80	1.42	1.93	75%	3	0.75	0.69	0.81	1.53	3.91	80%
4	0.24	0.49	0.71	0.42	1.72	55%	4	0.24	0.49	0.71	0.42	1.32	55%
P-203R	0.69	0.73	0.83	1.94	2.82	84%	P-203R	0.70	0.77	0.85	2.10	5.05	89%
P-114R	0.88	0.86	0.89	2.91	3.30	100%	P-114R	0.94	0.73	0.83	2.66	6.59	84%

Design point "0" represents the combined developed flow to the existing arch culvert exiting the site before accounting for detention. Design point 1 represents all flow to the EDB. Design point "off" quantifies the total flow to the storm system at the northeast corner of the lot intercepts runoff from basins P-203R and P-114R and carries it across Elk River Road. Design point "ud" represents all flow from basins D1, D3 and D4 that will be released from the site undetained. Table 4 summarizes the previously assumed future and developed design points:

Table 4: Design Point Hydrology Summary

	Assumed Future Development						Basecamp Square (SQ)						
Design Point	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Design Point	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
0	6.20	0.70	0.82	13.39	34.13	81%	0	6.10	0.67	0.80	11.58	30.35	77%
1	3.34	0.73	0.83	6.46	16.05	85%	1	3.22	0.66	0.80	7.88	20.80	76%
off	1.57	0.80	0.87	4.83	11.44	93%	off	1.64	0.75	0.84	4.74	11.64	86%
ud	2.86	0.66	0.80	4.76	12.57	76%	ud	2.88	0.67	0.80	5.03	13.07	77%

The project will result in an increase in imperviousness from 55% to 77%, which is below the 81% overall imperviousness assumed for future development.

Stormsewer

The stormsewer system in the access road was designed to accommodate future potential development. The system consists of 12" Duraslot Drain along the west side of the road, which is at a 0% slope but is crowned in the middle to provide positive drainage to the slot drain. The drain connects to a 24" HDPE storm system that discharges the existing EDB. Lateral storm lines were installed to provide future connections. The EDB and its outlet structure have been sized to provide water quality and detention for future development.

Valley pans and inlets will collect runoff from the driveways and parking and convey it to the existing storm system in the existing access drive. 12" Duraslot Drain's will be installed on the east side of the road to collect runoff from that half of the 0% sloped road and also connect to the existing storm system.

The stormsewer has capacity to pass the full buildout minor storm event without surcharging. The stormsewer will likely surcharge during the full buildout major storm event. In the event of flooding due to clogging, excess water will flow to the EDB/Detention pond via the new access road.

Detention

The EDB was designed to accommodate future development. Table 5 summarizes the detention requirements for Steamboat Basecamp, Assumed Future Conditions and Basecamp Square:

Table 5: EDB/Detention Pond Summary						
	WQCV (ft3)	Q_{A5}[1] (cfs)	Q_{A100}[1] (cfs)	V_5 (ft^3)	V_{100} (ft^3)	$V_{provided}$ (ft^3)
Basecamp	1,975	1.33	10.72	2,399	5,554	13,853
Future	4,161	1.50	11.08	5,643	8,831	13,853
Basecamp Square	3,364	1.24	10.58	2,366	3,641	13,853

The required detention volumes for Basecamp are smaller than the assumed future conditions. The outlet structure will continue to restrict flows to predevelopment conditions.

Easements

Areas outside of building envelopes will be designated by a blanket utility, snow removal and storage, drainage, pedestrian, landscaping, and parking easement.

STORMWATER QUALITY

Water quality in the Yampa River is degraded by the washing off of accumulated deposits on the urban landscape of Steamboat Springs. Metals, salts, sand, gravel, trash, debris, and organics (including oil and gasoline) all accumulate on the streets and in parking lots of Steamboat Springs over the course of time. During a rainstorm event, these pollutants are washed by the runoff into the Yampa River and its tributaries. Water quality problems caused by these pollutants include turbid water, nutrient enrichment, bacterial contamination, reduction in dissolved oxygen, and increased stress on aquatic life. The most prevalent pollutant in Steamboat Springs is sediment. BMP's included in this project are designed to minimize the amount of sediment leaving the site and entering the waterways.

Potential Pollutant Sources: The following are anticipated pollutant sources for this project:

1. Oil and sediment from vehicles
2. Landscaping maintenance
3. Snow removal and related transport of sand, dirt and oils;
4. Trash.

BMP Selection:

The existing EDB was sized per the MHFD's design manual to drain the required water quality capture volume for potential full buildout conditions in 40-hrs as well as provide storage for the estimated future full buildout minor and major storm detention. As shown in Table 5, the required WQCV is smaller than the assumed future conditions volume. The outlet structure design will be modified as needed to provide the 40-hour drain time for the smaller volume.

TEMPORARY EROSION AND SEDIMENT CONTROL

The primary source of storm water contaminants in the City of Steamboat Springs are suspended sediments and are most susceptible during construction activities. Temporary erosion and sediment control during construction is the responsibility of the permit holder (including NPDES permitting). Appropriate best management practices (BMP's) for construction activities are detailed in Erosion and Sediment Control During Construction by Routt County, Colorado. It is the responsibility of the permit holder to identify and properly handle all materials that are potential

pollution sources prior to mobilization. The following are some common examples of potential pollution sources:

- Stockpiling of materials that can be transported to receiving waterways
- Uncovered trash bins
- Exposed and stored soils, management of contaminated soils
- Off-site tracking of soils and sediment
- Loading and unloading operations
- Outdoor storage of building materials, chemicals, fertilizers, etc.
- Vehicle and equipment maintenance and fueling
- Significant dust or particulate generating processes
- Routine maintenance activities involving fertilizers, pesticides, detergents, fuels, solvents, oils, etc.
- On-site waste disposal practices (waste piles, dumpsters, etc.)
- Concrete truck/equipment washing.
- Non-industrial waste sources that may be significant, such as worker trash and portable toilets.

It is not possible to identify all materials that will be used or stored on the construction site. It is the sole responsibility of the permit holder to identify and properly handle all materials that are potential pollutant sources prior to mobilization.

Some temporary BMP's include, but are not limited to, straw bales, silt fences, ditch checks, berms, slope drains, seeding and mulching, pipes, and sediment basins. In order to prevent mud from being transported into public right of ways, vehicle tracking pads and wheel wash areas should be utilized. Temporary BMP's should be coordinated with the site's permanent erosion control measures to assure continuous and economical erosion control. Because different BMP's are required at different stages of construction, the site should be periodically reviewed by the permit holder to verify the proper BMP's are in place.

Temporary BMP's should be inspected at a minimum once every two weeks, after each significant storm event, and at 24 hour intervals during extended storm events. Repairs or reconstruction of temporary BMP's shall occur within two working days in order to ensure continued performance. It is the responsibility of the Construction Site Operator to conduct bi-weekly inspections, maintain BMP's, and keep records of site conditions and inspections.

Areas used for material storage which are exposed to precipitation, disturbed areas, the construction site perimeter, and all applicable/installed erosion and sediment control measures shall be inspected for evidence of, or the potential for, pollutants entering the drainage system.

Preventative maintenance of all temporary BMP's shall be provided in order to ensure continued performance. Maintenance activities and actions shall be noted and recorded during inspections. All temporary erosion control measures must be kept in place and maintained until the site has been sufficiently stabilized in accordance with permit requirements.

It is recommended that a Stormwater Management Plan (SWMP) be completed prior to commencement of any land disturbing activities. Additionally, all pertinent local, state, and federal permits should be obtained prior to construction.

CONCLUSIONS

The improvements proposed for Basecamp Square are the construction of condominiums and townhomes as well as a covered ice rink and accessory building. Valley pans, inlets, a duroslot drainage and storm sewer will connect into the existing storm sewer in the access road that was designed to accommodate future development. The existing Extended Detention Basin was also designed to accommodate future development. The proposed improvements for Basecamp Square result in an overall imperviousness of 77

%, which is less than what was assumed for the future full build out conditions of 81%.

The design contained herein complies with the criteria set forth in the City's Drainage Design Manual. The storm sewer system will require routine maintenance to maintain proper function.

LIMITATIONS

This study is intended to estimate and analyze peak stormwater runoff volumes generated by hydrologic events to evaluate existing drainage infrastructure and design new infrastructure needed to manage these flows. It does not account for groundwater, springs, or seeps and is not intended to be used for the evaluation or design of foundation drains or roof drains.

Basin delineations, areas, and soil characteristics are based on the best available information listed in the INTRODUCTION AND LOCATION section of the report. Actual conditions may vary. Landmark's assumptions, recommendations and opinions are based on this information and the proposed site plan. If any of the data is found to be inaccurate or the proposed site plan is changed, Landmark should be contacted to review this report and make any necessary revisions.

The 100-year event is defined as the rainfall, runoff, or flooding event which has a probability of 1-percent of occurring in any given year based on available data. The 100-year event could occur in successive years or even multiple times in a single year. Events greater than the 100-year event or lesser events combined with malfunctioning drainage works can occur on rare occasion and may cause flooding damage.

The data, opinions, and recommendations of this report are applicable to the specific design elements and location that is the subject of this report. The report is not applicable to any other design elements or to any other locations. Any and subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendation without the prior written consent of Landmark Consultants, Inc.

Landmark Consultants, Inc. has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the contractor, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the Final Construction Drawings and Specifications.

The only warranty or guarantee made by Landmark Consultants, Inc. in connection with the services performed for this project is that such services are performed with the care and skill ordinarily exercised by members of the profession practicing under similar conditions, at the same time, and in the same or similar locality. No other warranty, expressed or implied, is made or intended by rendering such services or by furnishing written reports of the findings.

This study is intended to estimate and analyze peak stormwater runoff volumes generated by hydrologic events in order to evaluate existing drainage infrastructure and design new infrastructure needed to manage these flows. It does not account for groundwater, springs, or seeps and is not intended to be used for the evaluation or design of foundation drains or roof drains.

REFERENCES

1. Section 5.0 Drainage Criteria, City of Steamboat Springs Department of Public Works, September 2007.

2. Drainage Criteria Manual (Volumes 1 – 3), Urban Drainage and Flood Control District, June 2001

3. Hydraulic Design of Highway Culverts (HDS-5), Federal Highway Administration, September 2001

4. Procedures for Determining Peak Flows in Colorado, Natural Resource Conservation Service, 1984

5. Urban Hydrology for Small Watersheds (TR-55), Natural Resource Conservation Service, June 1986

6. Final Drainage Report for Steamboat Base Area Redevelopment, Drexel, Barrell & Co., December 1, 2006.

7. Citywide Stormwater Master Plan for the City of Steamboat Spring, Colorado, SEH, March 2013.

FIGURES

LEGEND:

- EXISTING STORM SEWER
- PROPOSED STORM SEWER
- PROPOSED STORM INLET (CURB & AREA)
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED SWALE
- PROPOSED CURB & GUTTER
- PROPERTY BOUNDARY
- PROPOSED LOT LINE
- EXISTING RIGHT OF WAY
- EX DRAINAGE EASEMENT FOR EDB
- PROPOSED OVERLAND FLOW DIRECTION
- PROPOSED CHANNELIZED FLOW DIRECTION (2.0%)
- EXISTING CHANNELIZED FLOW DIRECTION

EXISTING BASIN HYDROLOGY SUMMERY

	Base Camp (D)					
Basin	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
1	1.88	0.69	0.81	3.71	9.52	79%
2.1	0.85	0.86	0.89	2.81	6.41	100%
2.2	1.94	0.18	0.56	0.94	6.25	17%
2.3	0.26	0.17	0.55	0.17	1.20	16%
2.4	0.29	0.05	0.49	0.06	1.18	2%
2	NA	NA	NA	NA	NA	NA
3	0.74	0.66	0.80	1.42	3.74	75%
4	0.24	0.49	0.71	0.42	1.32	55%
P-203R	0.69	0.73	0.83	1.94	4.83	84%
P-114R	0.88	0.86	0.89	2.91	6.63	100%

EXISTING DESIGN POINT HYDROLOGY SUMMERY

	Base Camp (D)					
Design Point	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
0	6.20	0.49	0.71	7.74	24.40	55%
1	3.34	0.35	0.64	2.92	11.77	37%
off	1.57	0.81	0.87	4.88	11.49	93%
ud	2.86	0.67	0.80	4.93	12.92	76%

NOTE: EXISTING CONDITIONS ASSUMES THE COMPLETION OF IMPROVEMENTS PROPOSED WITH THE STEAMBOAT BASECAMP DEVELOPMENT

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REVIEW SET
NOT FOR CONSTRUCTION XX/XX/XX

NO.	DATE:	BY:	DESCRIPTION:

PROJECT: 2387-004
DATE: 8/2/2021
DRAWN BY: DCS
CHECKED BY:

Base Camp Square Dev. Plan
Figure 2: Existing Drainage Plan

SHEET 1 Of 2 Sheets

LEGEND:

EXISTING STORM SEWER
PROPOSED STORM SEWER
PROPOSED STORM INLET (CURB & AREA)
PROPOSED MAJOR CONTOUR
PROPOSED MINOR CONTOUR
EXISTING MAJOR CONTOUR
EXISTING MINOR CONTOUR
PROPOSED SWALE
PROPOSED CURB & GUTTER
PROPERTY BOUNDARY
PROPOSED LOT LINE
EXISTING RIGHT OF WAY
PR BUILDING ENVELOPE
EX DRAINAGE EASEMENT

PROPOSED OVERLAND FLOW DIRECTION
PROPOSED CHANNELIZED FLOW DIRECTION
EXISTING CHANNELIZED FLOW DIRECTION

DEVELOPED BASIN HYDROLOGY SUMMARY

Basin Hydrology Summary						
Basecamp Square (SQ)						
Basin	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
1	1.88	0.69	0.81	3.71	9.52	79%
2.1	0.85	0.86	0.89	2.81	6.41	100%
SQ2.2	0.51	0.72	0.83	1.43	3.58	84%
SQ2.3	0.11	0.86	0.89	0.37	0.85	100%
SQ2.4	0.52	0.63	0.78	1.28	3.46	73%
SQ2.5	0.29	0.71	0.82	0.77	1.96	81%
SQ2.6	0.20	0.40	0.67	0.31	1.13	45%
SQ2.7	0.26	0.74	0.84	0.73	1.81	86%
SQ3.1	0.06	0.61	0.77	0.14	0.38	69%
SQ3.2	0.12	0.49	0.71	0.23	0.72	56%
2.2						
2.3	NA	NA	NA	NA	NA	NA
2.4	0.29	0.05	0.49	0.06	1.18	2%
2	NA	NA	NA	NA	NA	NA
3	0.75	0.69	0.81	1.53	3.91	80%
4	0.24	0.49	0.71	0.42	1.32	55%
P-203R	0.70	0.77	0.85	2.10	5.05	89%
P-114R	0.94	0.73	0.83	2.66	6.59	84%

DEVELOPED DESIGN POINT HYDROLOGY SUMMARY

Design Point Hydrology Summary						
Basecamp Square (SQ)						
Design Point	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
0	6.10	0.67	0.80	11.58	30.35	77%
1	3.22	0.66	0.80	7.88	20.80	76%
off	1.64	0.75	0.84	4.74	11.64	86%
ud	2.88	0.67	0.80	5.03	13.07	77%

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NO.	DATE:	BY:	DESCRIPTION:
1	3/31/2022	DCS	Resubmittal

REVIEW SET
NOT FOR CONSTRUCTION
XX/XX/XX

PROJECT: 2387-004
DATE: 8/2/2021
DRAWN BY: DCS
CHECKED BY:

Base Camp Square Dev. Plan
Figure 3: Proposed Drainage Plan

SHEET 1
Of 2 Sheets

APPENDIX A

HYDROLOGIC CALCULATIONS

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PROJECT:	Steamboat Base Camp Square
DESIGNER:	DCS
DATE:	3/31/2022

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Character of Surface	Percent Impervious
Asphalt Parking and Walkways	100%
Gravel	40%
Roof	90%
Lawns and Landscaping	2%
Future Development	85%

Basecamp Square (Phase II)

Basin ID	Basin Area (sq.ft.)	Basin Area (acres)	Area of Asphalt Parking and Walkways (sq.ft.)	Area of Asphalt Parking and Walkways (acres)	Area of Roof (sq.ft.)	Area of Roof (acres)	Area of Lawns and Landscaping (sq.ft.)	Area of Lawns and Landscaping (acres)	Percent Impervious	5-year Composite Runoff Coefficient	100-year Composite Runoff Coefficient
SQ2.2	22395.45	0.51	13408.75	0.31	5870.08	0.13	3116.62	0.07	84%	0.724	0.828
SQ2.3	4923.70	0.11	4911.62	0.11		0.00	12.08	0.00	100%	0.855	0.894
SQ2.4	22829.60	0.52	10350.16	0.24	6796.29	0.16	5683.15	0.13	73%	0.634	0.783
SQ2.5	12814.09	0.29	5732.40	0.13	5162.99	0.12	1918.70	0.04	81%	0.707	0.820
SQ2.6	8733.86	0.20	1485.51	0.03	2568.15	0.06	4680.20	0.11	45%	0.404	0.669
SQ2.7	11194.79	0.26	4914.54	0.11	5211.72	0.12	1068.53	0.02	86%	0.740	0.837
SQ3.1	2517.99	0.06	1729.25	0.04		0.00	788.74	0.02	69%	0.609	0.771
SQ3.2	5192.60	0.12	510.86	0.01	2610.41	0.06	2071.33	0.05	56%	0.494	0.714
D3	32861.35	0.75	26145.35	0.60		0.00	6716.00	0.15	80%	0.691	0.812
P-203R	**30644.42**	0.70	27352.15	0.63		0.00	3292.27	0.08	89%	0.773	0.853
P-114R	**40978.72**	0.94	34306.17	0.79		0.00	6672.55	0.15	84%	0.732	0.833

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PROJECT: Steamboat Base Camp Square
DESIGNER: DCS
DATE: 3/31/2022

TIME OF CONCENTRATION COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}} \quad \text{(Equation RO-3)}$$

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, i From Figures 3.3.1-2 (Area II)

Velocity (Gutter Flow), V = 20·S$^{1/2}$

Velocity (Swale Flow), V = 15·S$^{1/2}$

Rational Equation: Q = CiA (Equation RO-1)

Basecamp Square (Phase II)

	Overland Flow				Conveyance		Swale Flow 1				Conveyance		Swale Flow 2				Time of Concentration		
Basin	C_5	Length, L (ft)	Slope, S (%)	T_i (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)	Comp. T_c (min)	$\frac{L}{180}+10$	Actual T_c (min)
SQ2.2	0.86	103	3.10	3.06	Shallow Paved Swales	20	158	0.50	1.41	1.86	Grassed Waterway	15			N/A	N/A	4.92	11.45	5.00
SQ2.3	0.86	43	2.23	2.25	Shallow Paved Swales	20	100	2.85	3.38	0.49	Grassed Waterway	15			N/A	N/A	2.75	10.79	5.00
SQ2.4	0.86	100	2.05	3.46	Shallow Paved Swales	20	52	1.89	2.75	0.32	Shallow Paved Swales	20	7	0.87	1.87	0.07	3.84	10.89	5.00
SQ2.5	0.86	16	3.33	1.18	Shallow Paved Swales	20	134	1.00	2.00	1.12	Shallow Paved Swales	20		N/A	N/A	N/A	5.70	10.93	5.70
	0.05	17	12.60	3.41															
SQ2.6	0.40	23	4.00	3.88	Shallow Paved Swales	20	119	1.00	2.00	0.99	Shallow Paved Swales	20		N/A	N/A	N/A	4.87	10.79	5.00
SQ2.7	0.40	24	3.00	4.36	Shallow Paved Swales	20	123	1.00	2.00	1.03	Shallow Paved Swales	20		N/A	N/A	N/A	5.38	10.82	5.38
SQ3.1	0.61	19	6.50	2.08	Shallow Paved Swales	20	29	3.40	3.69	0.13	Shallow Paved Swales	20		N/A	N/A	N/A	2.21	10.26	5.00
SQ3.2	0.49	10	18.00	1.34	Shallow Paved Swales	20	67	1.00	2.00	0.56	Shallow Paved Swales	20		N/A	N/A	N/A	1.90	10.43	5.00
D3	0.69	97	3.00	5.12	Grassed Waterway	15	399	1.00	2.00	4.43	Shallow Paved Swales	20		N/A	N/A	N/A	9.55	12.76	9.55
P-203R	0.77	19	17.80	1.00	Grassed Waterway	15	19	17.80	8.44	0.05	Shallow Paved Swales	20		N/A	N/A	N/A	1.05	10.21	5.00
P-114R	0.73	19	17.80	1.13	Grassed Waterway	15	19	17.80	8.44	0.05	Shallow Paved Swales	20		N/A	N/A	N/A	1.18	10.21	5.00

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PROJECT:	Steamboat Base Camp Square
DESIGNER:	DCS
DATE:	3/31/2022

DIRECT RUNOFF COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$ (Equation RO-3)

Gutter/Swale Flow, Time of Concentration:

$T_t = L / 60V$

$T_c = T_i + T_t$ (Equation RO-2)

Intensity, I from Fig. RA-2 (Equation RO-4)

Velocity (Gutter Flow), $V = 20 \cdot S^{1/2}$

Velocity (Swale Flow), $V = 15 \cdot S^{1/2}$

Rational Equation: Q = CiA (Equation RO-1)

Basecamp Square (Phase II)

Basin(s)	Area, A (acres)	T_c (min)	C_5	C_{100}	Intensity, I_5 (in/hr)	Intensity, I_{100} (in/hr)	Flow, Q_5 (cfs)	Flow, Q_{100} (cfs)
SQ2.2	0.51	5.00	0.72	0.83	3.86	8.42	1.43	3.58
SQ2.3	0.11	5.00	0.86	0.89	3.86	8.42	0.37	0.85
SQ2.4	0.52	5.00	0.63	0.78	3.86	8.42	1.28	3.46
SQ2.5	0.29	5.70	0.71	0.82	3.72	8.13	0.77	1.96
SQ2.6	0.20	5.00	0.40	0.67	3.86	8.42	0.31	1.13
SQ2.7	0.26	5.38	0.74	0.84	3.86	8.42	0.73	1.81
SQ3.1	0.06	5.00	0.61	0.77	3.86	8.42	0.14	0.38
SQ3.2	0.12	5.00	0.49	0.71	3.86	8.42	0.23	0.72
D3	0.75	9.55	0.69	0.81	2.93	6.39	1.53	3.91
P-203R	0.70	5.00	0.77	0.85	3.86	8.42	2.10	5.05
P-114R	0.94	5.00	0.73	0.83	3.86	8.42	2.66	6.59

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PROJECT:	Steamboat Base Camp Square
DESIGNER:	DCS
DATE:	3/31/2022

COMBINED COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Character of Surface	Percent Impervious
Asphalt Parking and Walkways	100%
Gravel	40%
Roof	90%
Lawns and Landscaping	2%
Future Development	100%

Basecamp Square (Phase II)

Design Point	Combined Basin IDs	Basin Area (sq.ft.)	Basin Area (acres)	Area of Asphalt Parking and Walkways(sq.ft.)	Area of Asphalt Parking and Walkways (acres)	Area of Roof (sq.ft.)	Area of Roof (acres)	Area of Lawns and Landscaping (sq.ft.)	Area of Lawns and Landscaping (acres)	Percent Impervious	5-year Composite Runoff Coefficient	100-year Composite Runoff Coefficient
0	D1+D2.1+D2.4+D3+D4+SQ2.2+SQ2.3+SQ2.4+SQ2.5+SQ2.6+SQ2.7+SQ3.1+SQ3.2	265685.60	6.10	169263.36	3.89	36380.30	0.84	60041.94	1.38	77%	0.67	0.80
1	2.3+SQ2.4+SQ2.5+SQ2.6+SQ2.7+SQ3.1+SQ3.2	140154.78	3.22	80137.10	1.84	28219.64	0.65	31798.04	0.73	76%	0.66	0.80
off	P-230R+P-114R	71623.14	1.64	61658.32	1.42	0.00	0.00	9964.82	0.23	86%	0.75	0.84
ud	D1+D3+D4	125530.82	2.88	89126.26	2.05	8160.66	0.19	28243.90	0.65	77%	0.67	0.80

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PROJECT:	Steamboat Base Camp Square
DESIGNER:	DCS
DATE:	3/31/2022

COMBINED TIME OF CONCENTRATION COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$ (Equation RO-3)

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, i From Figures 3.3.1-2 (Area II)

Velocity (Gutter Flow), V = 20·S$^{1/2}$

Velocity (Swale Flow), V = 15·S$^{1/2}$

Rational Equation: Q = CiA (Equation RO-1)

Basecamp Square (Phase II)

		Overland Flow				Conveyance		Swale Flow 1				Conveyance		Swale Flow 2				Time of Concentration		
Design Point	Basin(s)	C_5	Length, L (ft)	Slope, S (%)	T_i (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)		K	Length, L (ft)	Slope, S (%)	Velocity, V (ft/s)	T_t (min)	Comp. T_c (min)	$\frac{L}{180}+10$	Actual T_c (min)
0	D1+D2.1+D2.4+D3 +D4+SQ2.2+SQ2.3 +SQ2.4+SQ2.5+S Q2.6+SQ2.7+SQ3. 1+SQ3.2	0.69	115	2.00	6.38	Grassed Waterway	15	488	2.00	2.83	3.83	Shallow Paved Swales	20		0.50	N/A	N/A	10.22	13.35	10.22
1	D2.1+D2.4+SQ2.2 +SQ2.3+SQ2.4+S Q2.5+SQ2.6+SQ2. 7+SQ3.1+SQ3.2	0.86	100	1.00	4.40	Shallow Paved Swales	20	184	1.00	2.00	1.53	Shallow Paved Swales	20		0.50	N/A	N/A	5.93	11.58	5.93
off	P-230R+P-114R	0.75	30	3.00	2.45	Grassed Waterway	15	132	1.00	2.00	1.47	Shallow Paved Swales	20		N/A	N/A	N/A	3.91	10.90	5.00
ud	D1+D3+D4	0.67	97	3.00	5.33	Grassed Waterway	15	399	1.00	2.00	4.43	Grassed Waterway	15	236	1.00	2.00	2.62	12.38	14.07	12.38

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PROJECT:	Steamboat Base Camp Square
DESIGNER:	DCS
DATE:	3/31/2022

COMBINED DIRECT RUNOFF COMPUTATIONS

Overland Flow, Time of Concentration:

$$T_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{1/3}}$$

Gutter/Swale Flow, Time of Concentration:

T_t = L / 60V

T_c = T_i + T_t (Equation RO-2)

Intensity, I from Fig. RA-2

Velocity (Gutter Flow), V = 20·S$^{1/2}$

Velocity (Swale Flow), V = 15·S$^{1/2}$

Rational Equation: Q = CiA (Equation RO-1)

Basecamp Square (Phase II)

Design Point	Basin(s)	Area, A (acres)	T_c (min)	C_5	C_{100}	Intensity I_5 (in/hr)	Intensity I_{100} (in/hr)	Flow Q_5 (cfs)	Q_5 per Acre (cfs/ac)	Flow Q_{100} (cfs)	Q_{100} per Acre (cfs/ac)
0	D1+D2.1+D2.4+D3+D4+SQ2.2+SQ2.3+SQ2.4+SQ2.5+SQ2.6+SQ2.7+SQ3.1+SQ3.2	6.10	10.22	0.67	0.80	2.85	6.22	11.58	1.90	30.35	4.98
1	D2.1+D2.4+SQ2.2+SQ2.3+SQ2.4+SQ2.5+SQ2.6+SQ2.7+SQ3.1+SQ3.2	3.22	5.93	0.66	0.80	3.72	8.13	7.88	2.45	20.80	6.47
off	P-230R+P-114R	1.64	5.00	0.75	0.84	3.86	8.42	4.74	2.89	11.64	7.08
ud	D1+D3+D4	2.88	12.38	0.67	0.80	2.58	5.64	5.03	1.74	13.07	4.54

APPENDIX B

HYDRAULIC CALCULATIONS

APPENDIX C

DETENTION/WATER QUALITY CALCULATIONS

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PROJECT:	Steamboat Base Camp Square (Pha
DESIGNER:	DCS
DATE:	3/31/2022
POND ID:	EDB/Detention Pond

FAA Method Detention Estimate - Basecamp Square

Per section 5.11.7.2 of the City of Steamboat Springs Drainage Criteria

$$V_i = (CiA)(T_c)(60\,\text{sec/min}) \qquad (5.11.1)$$

Where:

V_i = inflow volume (ft³)
C = Rational Method runoff coefficient for the major or minor storm
A = watershed area draining to the detention pond (acres)
T_c = Rational Method time of concentration (min)
i = design rainfall intensity (in/hr)

$$V_o = (Allowable\,Release Rate)(T_c)(60\,\text{sec/min}) \qquad (5.11.2)$$

Where:

V_o = outflow volume (ft³)
T_c = Rational Method time of concentration (min)
Allowable release rate shall be determined per this Section (cfs).

A (acres) =	3.22	<-- INPUT from impervious calcs
Tc (min) =	5.93	<-- INPUT from Tc calcs

Minor Storm (5-Year) Use Minor Storm for Detention only pond (No WQ)

C_5 =	0.66	<-- INPUT from impervious calcs
i (in/hr) =	3.72	<-- INPUT from runoff calcs
V_i (ft³) =	2807	
Q_{A5} =	1.24	<-- INPUT from historic runoff calcs
V_o (ft³) =	441	
V_{req} (ft³) =	2366	
	0.05	

Major Storm (100-Year)

C_{100}	0.80	<-- INPUT from impervious calcs
i (in/hr)	8.13	<-- INPUT from runoff calcs
V_i (ft³)	7,406	
Q_{A100}	10.58	<-- INPUT from historic runoff calcs
V_o (ft³)	3,765	
V_{req} (ft³)	3641	
	0.08	

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PROJECT: Steamboat Base Camp Square (Phase
DESIGNER: DCS
DATE: 3/31/2022
POND ID: EDB/Detention Pond

WQCV DESIGN CALCULATION - 40 HOUR DRAIN TIME

Extended Detention Basin - Basecamp Square

REQUIRED STORAGE:

BASIN AREA (AC) =	3.22	<-- INPUT from impervious calcs
BASIN IMPERVIOUSNESS PERCENT =	76%	<-- INPUT from impervious calcs
BASIN IMPERVIOUSNESS RATIO =	0.7575	<-- CALCULATED
d6 (in) =	0.34	<-- INPUT depth of average runoff producing storm
WQCV (watershed inches) =	0.24	<-- CALCULATED from USDCM Vol.3, Equation 3-1
V (ft^3) =	3,364	<-- CALCULATED from USDCM Vol.3, Equation B-1
	0.077231	

FOREBAY:

100-YEAR PEAK DISCHARGE (cfs) =	20.80	<-- INPUT from runoff calcs
RELEASE RATE (cfs) =	0.42	<-- CALCULATED from MHFD Vol. 3, Table EDB-4
MIN VOLUME (ft3) =	67	<-- CALCULATED from MHFD Vol. 3, Table EDB-4

TRICKLE CHANNEL

CAPACITY (cfs) =	0.42	<-- INPUT forebay release rate

INITIAL SURCHARGE VOLUME

MIN VOLUME (ft3) =	10.09	<-- CALCULATED from MHFD Vol. 3, Table EDB-4

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PROJECT: Steamboat Base Camp Square (Phase II)
DESIGNER: DCS
DATE: 3/31/2022
POND ID: EDB/Detention Pond

POND VOLUME PROVIDED - Basecamp Square

$$V = D^*\left(A_1 + A_2 + \sqrt{A_1 * A_2}\right)/3$$

D = Depth between contours (ft.)
A_1 = Surface Area lower contour (ft^2)
A_2 = Surface Area upper contour (ft^2)

Elevation	Surface Area	Incremental Depth	Incremental Vol.	Total Vol.	Total Vol.	Stage
(ft)	(ft^2)	(ft)	(ft^3)	(ft^3)	(ac-ft)	
6662.10	25	0.00	0	0.0	0.00	
6662.20	97	0.10	6	5.7	0.00	
6662.30	231	0.10	16	21.7	0.00	
6662.40	442	0.10	33	54.8	0.00	
6662.50	675	0.10	55	110.2	0.00	
6662.60	890	0.10	78	188.2	0.00	
6662.70	1093	0.10	99	287.2	0.01	
6662.80	1283	0.10	119	405.9	0.01	
6662.90	1461	0.10	137	543.0	0.01	
6663.00	1627	0.10	154	697.4	0.02	
6663.10	1728	0.10	168	865.1	0.02	
6663.20	1827	0.10	178	1042.8	0.02	
6663.30	1925	0.10	188	1230.4	0.03	
6663.40	2022	0.10	197	1427.8	0.03	
6663.50	2117	0.10	207	1634.7	0.04	
6663.60	2212	0.10	216	1851.2	0.04	
6663.70	2311	0.10	226	2077.3	0.05	
6663.80	2414	0.10	236	2313.6	0.05	
6663.90	2524	0.10	247	2560.5	0.06	
6664.00	2644	0.10	258	2818.9	0.06	
6664.10	2781	0.10	271	3090.2	0.07	
6664.20	2898	0.10	284	3374.1	0.08	WQCV
6664.30	3014	0.10	296	3669.7	0.08	
6664.40	3130	0.10	307	3976.9	0.09	
6664.50	3248	0.10	319	4295.8	0.10	
6664.60	3368	0.10	331	4626.7	0.11	
6664.70	3491	0.10	343	4969.6	0.11	
6664.80	3615	0.10	355	5324.9	0.12	
6664.90	3738	0.10	368	5692.5	0.13	5-Year Detention
6665.00	3860	0.10	380	6072.3	0.14	
6665.10	3983	0.10	392	6464.5	0.15	
6665.20	4108	0.10	405	6869.0	0.16	
6665.30	4235	0.10	417	7286.2	0.17	100-Year Detention
6665.40	4362	0.10	430	7716.0	0.18	
6665.50	4489	0.10	443	8158.5	0.19	
6665.60	4617	0.10	455	8613.8	0.20	
6665.70	4748	0.10	468	9082.0	0.21	
6665.80	4884	0.10	482	9563.7	0.22	
6665.90	5025	0.10	495	10059.1	0.23	
6666.00	5175	0.10	510	10569.1	0.24	
6666.10	5333	0.10	525	11094.5	0.25	
6666.20	5493	0.10	541	11635.8	0.27	
6666.30	5656	0.10	557	12193.2	0.28	
6666.40	5848	0.10	575	12768.3	0.29	

APPENDIX E

CITY CHECKLISTS

STANDARD FORM NO. 1 DRAINAGE LETTER CHECKLIST

Instructions:

1. The applicant shall identify with a "check mark" if information is provided with letter. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation.
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

✓ A. Typed and legible in 8½ x 11" format.
✓ B. Drawings that are 8½" x 11" or 11 x 17 bound within letter, larger drawings (up to 24 x 36) included in a pocket attached to the letter. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Title Page

✓ A. Type of Letter.
✓ B. Project Name, Subdivision, Original Date, Revision Date.
✓ C. Preparer's name, firm, address, and phone number.
✓ D. Certifications, PE stamp, signature and date from licensed Colorado PE (for FINAL letter).
✓ E. "DRAFT" for 1st Submittal and revisions; "FINAL" once approved.
✓ F. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and the City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

III. Introduction

✓ A. Description of site location, size in acres, existing and proposed land use, and any pertinent background info.
✓ B. Identify drainage reports for adjacent development.

IV. Drainage Criteria and Methodology Used

✓ A. Identify design rainfall and storm frequency.
✓ B. Identify runoff calculation method used.

V. Existing Conditions (Pre-Development/Historic)

✓ A. Indicate ground cover, imperviousness, topography, and size of site (acres).
✓ B. Describe existing stormwater system (sizes, materials, etc.).
✓ C. Describe other notable features (canals, major utilities, etc.).
✓ D. Note site outfall locations and ultimate outfall location (typically Yampa River).
✓ E. Note capacity of existing system and identify any constraints.
✓ F. Identify NRCS soil type.
✓ G. Identify the FEMA Map reviewed, if site is in floodplain/way, and zone designation.

VI. Proposed Conditions

- ✓ A. Indicate ground cover, imperviousness, topography, and disturbed area (acres).
- ✓ B. Describe proposed stormwater system (sizes, materials, etc.).
- ✓ C. Describe proposed outlets and indicate historic and proposed flow for each.
- ✓ D. Include calculations for all pipes, inlets, culverts, ditches, ponds, etc. in appendix.
- ✓ E. Include a summary table for the 5- and 100-year events showing historic flow and proposed flow for total site and each basin.
- ✓ F. Include a summary of proposed water quality measures to be constructed.

VII. Conclusions

- ✓ A. Provide general summary.
- ✓ B. Note if site does or does not comply with criteria and any variances to criteria.
- ✓ C. Indicate if peak proposed flow is less than, equal to, or greater than peak historic flow for each outfall, design point, and for the total site.
- ✓ D. Indicate proposed stormwater quality system.

VIII. References

- ✓ A. Provide a reference list of all criteria, master plans, drainage reports and technical information used.

IX. Figures

- ✓ A. Vicinity Map.
- NA B. Site Plan (include the horizontal and vertical datum used and all benchmarks).
- C. Existing conditions.
  - ✓ 1. Delineate existing basin boundaries.
  - ✓ 2. Show existing runoff flow arrows.
  - ✓ 3. Show existing topography.
  - ✓ 4. Show existing stormwater features (structures, sizes, materials, etc.).
  - NA 5. Show floodplain limits and information.
  - ✓ 6. For each basin, show bubble with basin number, acreage and percent impervious or provide information in summary table or figure.
  - ✓ 7. For each outlet show bubble with acreage and historic flow and proposed flow or provide information in summary table on figure.
- D. Proposed Conditions
  - ✓ 1. Delineate proposed basin boundaries.
  - ✓ 2. Show proposed runoff flow arrows.
  - ✓ 3. Show existing and proposed topography at an interval of at least 5-ft.
  - ✓ 4. For each basin show bubble with basin number, acreage and percent impervious or provide a summary table or figure.
  - ✓ 5. For each outlet show bubble with acreage, historic flow, and proposed flow or provide a summary table or figure.
  - NA 6. Show floodplain limits and information.
  - ✓ 7. Show proposed stormwater system (components, sizes, materials, & slopes).
  - ✓ 8. Show property lines and easements.
  - NA 9. Show any new easements required.

X. Appendices

- ✓ A. Runoff Calculations
- ✓ B. Culvert Calculations
- ✓ C. Pond Calculations.
- ✓ D. Other Calculations

Acknowledgements:

Standard Form No. 1 was prepared by: _____ 8/2/2021
Date

Include Attachment A – Scope Approval Form (see Standard Form No. 5)
Include Attachment B – Storm Water Quality Plan (see Standard Form No. 4)

Standard Form No. 5 Drainage and Stormwater Treatment Scope Approval Form

Prior to starting a development plan and before the first drainage submittal, a Drainage and Stormwater Treatment Scope Approval Form must be submitted for review and signed by the City Engineer. A signed form shall also be included in every drainage submittal as Attachment A. This Scope Approval Form is for City requirements only. Values may be approximate. The City encourages supporting calculations and figures to be attached.

Project Information	
Project name:	Basecamp Square
Project location:	1901 Curve Plaza, Steamboat Springs, CO 80487
Developer name/contact info:	May Reigler Properties
Drainage engineer name/contact info:	Deb Spaustat, debs@landmark-co.com, (970) 871-9494
Application Type:	Development Plan
Proposed Land Use:	Commercial / Mixed-Use

Project Site Parameters	
Total parcel area (acres):	5.12 acres
Disturbed area (acres):	2.9 acres
Existing impervious area (acres, if applicable):	3.63 acres - assumes completion of preliminary plat imrovements
Proposed new impervious area (acres):	1.63-acres
Proposed total impervious area (acres):	5.26-acres
Proposed number of project outfalls:	1
Number of additional parking spaces:	95
Description and site percentage of existing cover/land use(s):	42% asphalt parking lot & conc. walk 8% office building 49% landscaping and undeveloped
Description and site percentage of proposed cover/land use(s): (Denotes TOTAL post-project land uses, including existing totals)	59% asphalt parking lot & conc. walks 14% office building 27% landscaping & undeveloped
Expected maximum proposed conveyance gradient (%):	2%
Description of size (acres) and cover/land use(s) of offsite areas draining to the site	N/A

Type of Study Required:

☒ Drainage Letter
☐ Final Drainage Study
☐ Conceptual Drainage Study
☐ Stormwater Quality Plan

Hydrologic Evaluation:

☒ Rational Method ☐ CUHP/SWMM ☐ HEC-HMS ☐ Other_____

Project Drainage	
Number of subbasins to be evaluated:	7
Presence of pass through flow (circle):	YES (NO)
Description of proposed stormwater conveyance on site:	Runoff to be collected in curb & gutter/inlets and stormsewer and connect to existing main storm sewer.
Project includes roadway conveyance as part of design evaluation (circle):	YES (NO)
Description of conveyance of site runoff downstream of site, identify any infrastructure noted in Stormwater Master Plan noted as lacking capacity for minor or major storm event:	Runoff leaves the site via an ex. 21"x27" CMP arch culvert. It makes its way via roadside ditches and culverts to a large wetlands area west of the CLEF and eventually to the Yampa River. None of the existing culverts are lacking capacity per the Citywide Stormwater Masterplan.
Detention expected onsite (circle):	(YES) NO
Presence of Floodway or Floodplain on site (circle):	YES (NO)
Anticipated modification of Floodway or Floodplain proposed (circle):	YES (NO)
Describe culvert or storm sewer conveyance evaluative method:	HY-8, SSA

Permanent Stormwater Treatment Facility Design Standard (check all that apply with only one standard per tributary basin):

☒ WQCV Standard ☐ TSS Standard ☐ Infiltration Standard

☐ Constrained Redevelopment WQCV Standard

☐ Constrained Redevelopment TSS Standard

☐ Constrained Redevelopment Infiltration Standard

☐ Does not Require Permanent Stormwater Treatment (attach Exclusion Tracking Form)

Project Permanent Stormwater Treatment	
Justification of choice of proposed design standard, including how the site meets the constrained redevelopment standard, infiltration test results, etc.:	Proposed improvements require detention to maintain historic discharge rates. Water quality treatment is needed due to the increased impervious surface area. Both standards are met by the proposed extended detention basin
Concept-level permanent stormwater treatment facility design details (type, location of facilities, proprietary structure selection, treatment train concept, etc.):	The EDB installed with the Preliminary Plat improvements was designed to accommodate the increased WQCV and detention needs due to Basecamp Square. The design parameters will be reviewed for compliance and any required modifications to the flow control plate or outlet structure will be included with this Project.
Proposed LID measures to reduce runoff volume:	N/A
Will treatment evaluation include off-site, pass through flow (circle):	YES (NO)

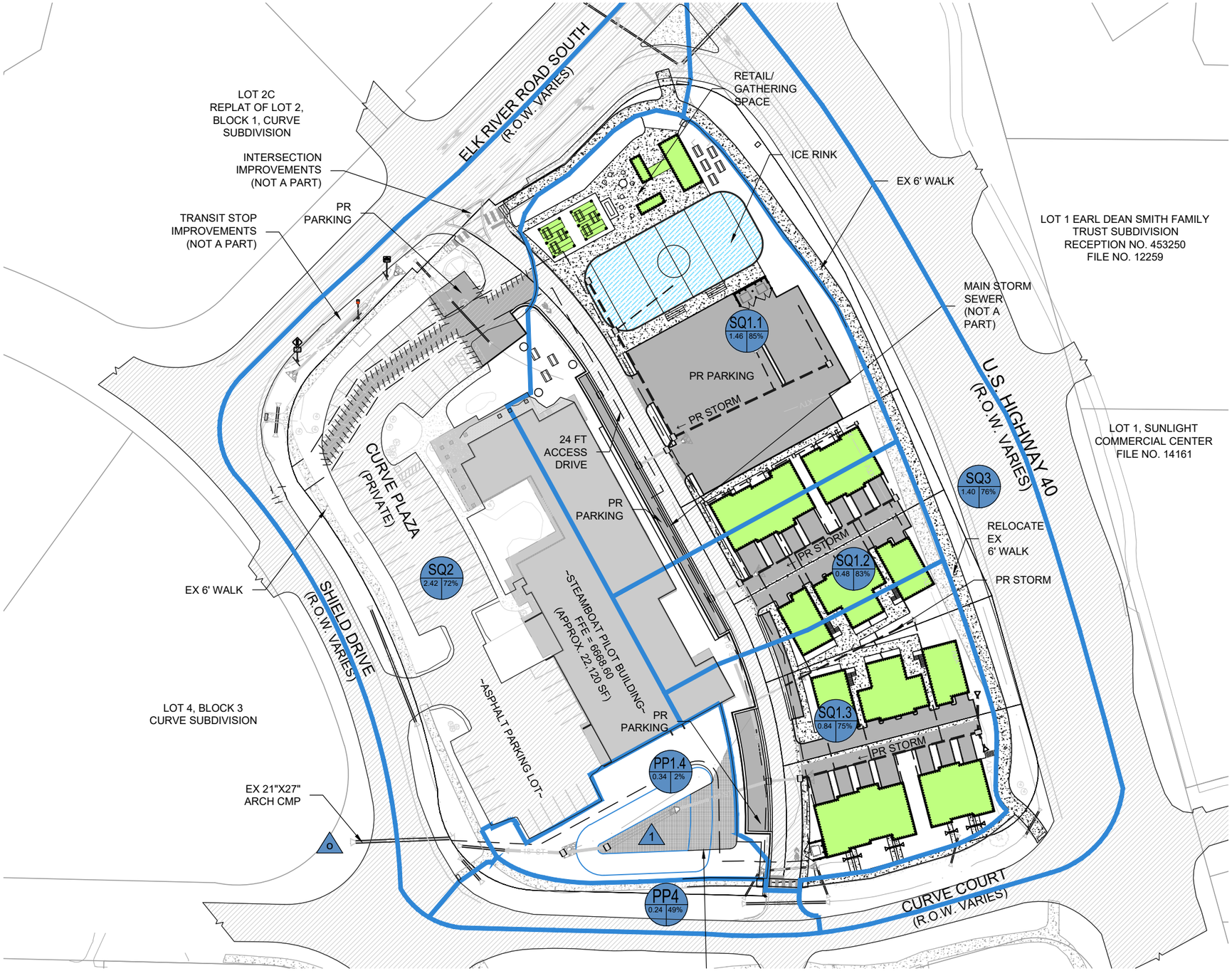
Approvals

Deb Spaustat	6/1/2021	(970) 871-9494
Prepared By: (Insert drainage engineer name & firm)	Date	Phone number

Approved By:

Printed Name:
City Engineer

Date



NORTH

40 0 40 80

1" = 80'

LEGEND:

- PROPERTY BOUNDARY
- ADJ. PROPERTY BOUNDARY
- EASEMENT
- CENTERLINE
- FOUND MONUMENT
- FOUND SECTION CORNER
- BUILDING
- ROOF LINE/OVERHANG
- FENCE
- MAJOR CONTOUR (6800)
- MINOR CONTOUR
- EX ASPHALT
- CONCRETE
- GRAVEL
- CONIF. AND DECID. TREE
- DEV DRAINAGE BASIN
- PR ASPHALT
- PR BUILDING
- PR ICE RINK

Basin Hydrology Summary

	Historic (H)		Preliminary Plat (PP)		Basecamp Square (SQ)	
Basin	Total Area (acres)	%Imp	Total Area (acres)	%Imp	Total Area (acres)	%Imp
1.1			1.45	30%	1.46	85%
1.2			0.45	41%	0.48	83%
1.3			0.83	27%	0.84	75%
1.4			0.34	2%		
1	3.05	9%				
2	2.42	69%	2.42	69%	2.42	72%
3	1.46	69%	1.46	69%	1.40	76%
4	0.25	50%	0.24	49%		

Design Point Hydrology Summary

	Historic (H)		Preliminary Plat (PP)		Basecamp Square (SQ)	
Design Point	Total Area (acres)	%Imp	Total Area (acres)	%Imp	Total Area (acres)	%Imp
o	7.18	43%	7.18	51%	7.18	72%
1	3.05	9%	3.06	28%	3.12	73%

PROJECT:	2387-004	NO.	DATE:	BY:	DESCRIPTION:
DATE:	5/31/2021				
DRAWN BY:	DCS				
CHECKED BY:	EG				

NOT FOR CONSTRUCTION
REVIEW SET
3/19/2021

LANDMARK CONSULTANTS, INC.
CIVIL ENGINEERS | SURVEYORS
141 9th Street ~ P.O. Box 774943
Steamboat Springs, Colorado 80477
(970) 871-9494 www.LANDMARK-CO.com

STEAMBOAT BASECAMP SQUARE
DEVELOPMENT PLAN
DRAINAGE SCOPE EXHIBIT

SHEET 1 Of 1 Sheets

DRAWING FILENAME: P:\2387-004\Engineering\Drainage\Modeling\2387-004 - DRAIN-SQUARE.dwg LAYOUT NAME: PR-SQUARE DP DATE: May 31, 2021 - 1:19pm CAD OPERATOR: deb
LIST OF XREFS: [2387-004-xBORDER-11x17] [2387-004-xExist] [2387-004-xBndy-PP] [2387-004-xSite-Ph2] [2387-004-xUtil-Ph2]

Standard Form No. 4 Stormwater Quality Plan Checklist

This list is not an exhaustive list of every possible item that may be required or requested in a Stormwater Quality Plan but provides a general guideline for preparation of the Stormwater Quality Plan.

Instructions:

1. The applicant shall identify with a "check mark" if information is provided within the Stormwater Quality Plan. If applicant believes information is not required, indicate with "N/A" and attach separate sheet with explanation. If information is included with the associated drainage letter or study, indicated with a "D."
2. The reviewer will determine if information labeled "N/A" is required and whether additional information must be submitted.

I. General

- ✓ A. Report typed and legible in 8½" x 11" format.
- ✓ B. Report bound (comb, spiral, or staple – no notebook) and in digital PDF format.
- ✓ C. Drawings that are 11" x 17" bound within letter, larger drawings (up to 24" x 36") included in a pocket attached to the letter, and a digital PDF copy. Drawings shall be at an appropriate size and scale to be legible and include project area.

II. Cover

- ✓ A. Report Type – Stormwater Quality Plan.
- ✓ B. Project Name, Subdivision or Development, Original Date, Revision Date.
- ✓ C. Preparer's name, firm, address, and phone number.
- ✓ D. "DRAFT" for 1st submittal and revisions; "FINAL" once approved.

III. Title Sheet

- ✓ A. Table of Contents.
- ✓ B. Certification, PE Stamp, signature and date from licensed Colorado PE (for Final).
- ✓ C. Note: City of Steamboat Springs plan review and approval is only for general conformance with City design criteria and City code. The City is not responsible for the accuracy and adequacy of the design, dimensions, and elevations that shall be confirmed and correlated at the job site. The City of Steamboat Springs assumes no responsibility for the completeness or accuracy of this document.

IV. Introduction and Background

- ✓ A. Description of site location, study limits, size in acres, existing and proposed land use, soil data, permeability of the site, drainage patterns, and any pertinent background info.
- ✓ B. State purpose and goal of Stormwater Quality Plan and report along with any special requirements of the desired outcome.
- ✓ C. List any project stakeholders and/or requestors.
- ✓ D. Describe the background of the flooding source and any previous studies.

V. Design Criteria and Methodology Used

- ✓ A. Identify design rainfall and storm frequency used to design permanent stormwater treatment facilities.
- ✓ B Identify the runoff calculation method used to design permanent stormwater treatment facilities.
- ✓ C. Identify the standard the design will meet and the means and methodologies by which it will use to meet the standard.
- ✓ D. Provide all details supporting the use of the selected design standard.

VI. Proposed Conditions

- ✓ A. Identify total site area, total site imperviousness, area to be treated, and impervious area to be treated. Include justification for treating less than the total site area.
- ✓ B. Describe potential site contaminant sources including sediment.
- ✓ C. Identify source and quantity of on-site and off-site stormwater flows that need to be managed and how they will be managed.
- ✓ D. For each permanent treatment facility, identify the design standard, MDCIA level (if applicable), area treated (& percentage of total), imperviousness of area treated, C values of area treated, soil types, and all pertinent data for design.
- ✓ E. Volume based facilities: Provide total storage pond volume, WQCV, drain time, release rate, sediment storage, outlet & overflow structures, area and depth of pond, micropool, forebays, etc. (include all calculations in the appendix).
- NA F. Flow based facilities: Provide design flow rate and all treatment calculations and how flows larger than the water quality design flow rate will be handled. If proprietary facilities are proposed, provide the justification and sizing requirements from manufacturer.
- ✓ G. If stormwater detention is provided, discuss how water quality is provided within the detention facility. No underground detention is allowed.

VII. Operation and Maintenance Plan Requirements

See template O&M plan and guidance document.

- NA A. Describe general project information, facility description, ROW and access information, vegetation management, hydraulic design parameters, environmental permitting, snow and ice control, and additional pertinent information in the notes.
- NA B. Indicate, describe, and detail the permanent stormwater treatment facilities.
- NA C Include section details where necessary of the permanent treatment facilities.
- NA D. Provide an inspection and maintenance schedule and procedure of permanent treatment facilities and who is responsible for them.
- NA E. Identify design specifications for construction.

Acknowledgements

Standard Form No. 4 prepared by: _____ 8/2/2021
Date

Include appropriate Project Sheet(s) and Design Checklist(s) (See Section 5.12)
Include this form as part of the Stormwater Quality Plan.

PROJECT SHEET – BASE DESIGN STANDARDS (Site is not constrained)

Complete a Project Sheet for each project that includes Permanent Stormwater Treatment Facilities.

SITE INFORMATION

Project Name:	Basecamp Square		
Project Location:	Lots 2-6 Worldwest Subdivision		
Submitted Date:	8/2/2021	Submitted By:	D. Spaustat, Landmark Consultants, Inc.
Acreage Disturbed:	2.33-acres		
Existing Impervious:	55%	New Net Impervious:	76%
Review Date:		Reviewed By:	

Preparer	City	Requirements
No, "Existing" Facility		Design Details are included for all Treatment Facilities
		List or include a description of any source controls or other non-structural practices: NONE

DESIGN STANDARDS

Multiple Design Standards may be used on a site, as necessary, to meet the requirements, but only one Design Standard may be used for each treatment facility's tributary area. Evaluation of suitability of permanent stormwater treatment facilities is based on meeting the specified Design Standard and ease of long-term maintenance. Facilities must be designed in accordance with the most current versions of the City's Engineering Standards and Volume 3 of the USDCM and meet the specific requirements for each Design Standard used.

1. Indicate below, which Design Standard(s) will be used for the project, and
2. Complete a separate, corresponding Design Standards checklist for each facility (e.g., WQCV)

Design Standard	*Quantity*	*Tributary Area*	*Location/Identifying information*
WQCV	3,470-CF	3.29-acres	EDB in Lot 1, Worldwest Subdivision
Pollutant Removal			
Runoff Reduction			

TABLES

LANDMARK CONSULTANTS, INC.
CIVIL ENGINEERS | SURVEYORS
141 9th Street ~ P.O. Box 774943
Steamboat Springs, Colorado 80477
(970) 871-9494
www.LANDMARK-CO.com

PROJECT:	Steamboat Base Camp Square
DESIGNER:	DCS
DATE:	3/31/2022

SUMMARY TABLES

EDB/Detention Pond Summary

	WQCV (ft3)	Q_{A5}[1] (cfs)	Q_{A100}[1] (cfs)	V_5 (ft^3)	V_{100} (ft^3)	$V_{provided}$ (ft^3)
Basecamp	1,975	1.33	10.72	2,399	5,554	13,853
Future	4,161	1.50	11.08	5,643	8,831	13,853
Basecamp Square	3,364	1.24	10.58	2,366	3,641	13,853

1. Allowable Flow (Q_A) = Historic Flow (h1) - Undetained Flow (ud)

Basin Hydrology Summary

	Historic (H)						Base Camp (D)						Assumed Future Development						Basecamp Square (SQ)						
Basin	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Basin	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
1	2.15	0.64	0.79	4.04	10.83	73%	1.88	0.69	0.81	3.71	9.52	79%	1.88	0.69	0.81	3.71	9.52	79%	1	1.88	0.69	0.81	3.71	9.52	79%
2.1	NA	NA	NA	NA	NA	NA	0.85	0.86	0.89	2.81	6.41	100%	0.85	0.73	0.83	2.40	5.97	85%	2.1	0.85	0.86	0.89	2.81	6.41	100%
																			SQ2.2	0.51	0.72	0.83	1.43	3.58	84%
																			SQ2.3	0.11	0.86	0.89	0.37	0.85	100%
																			SQ2.4	0.52	0.63	0.78	1.28	3.46	73%
																			SQ2.5	0.29	0.71	0.82	0.77	1.96	81%
																			SQ2.6	0.20	0.40	0.67	0.31	1.13	45%
																			SQ2.7	0.26	0.74	0.84	0.73	1.81	86%
																			SQ3.1	0.06	0.61	0.77	0.14	0.38	69%
																			SQ3.2	0.12	0.49	0.71	0.23	0.72	56%
2.2	NA	NA	NA	NA	NA	NA	1.94	0.18	0.56	0.94	6.25	17%	1.94	0.73	0.83	4.51	11.21	85%	2.2						
2.3	NA	NA	NA	NA	NA	NA	0.26	0.17	0.55	0.17	1.20	16%	0.26	0.73	0.83	0.73	1.82	85%	2.3	NA	NA	NA	NA	NA	NA
2.4	NA	NA	NA	NA	NA	NA	0.29	0.05	0.49	0.06	1.18	2%	0.29	0.73	0.83	0.81	2.00	85%	2.4	0.29	0.05	0.49	0.06	1.18	2%
2	2.88	0.15	0.54	1.11	8.80	14%	NA	NA	NA	NA	NA	NA							2	NA	NA	NA	NA	NA	NA
3	0.88	0.56	0.75	1.30	3.78	64%	0.74	0.66	0.80	1.42	3.74	75%	0.74	0.66	0.80	1.42	3.74	75%	3	0.75	0.69	0.81	1.53	3.91	80%
4	0.48	0.26	0.59	0.28	1.43	27%	0.24	0.49	0.71	0.42	1.32	55%	0.24	0.49	0.71	0.42	1.32	55%	4	0.24	0.49	0.71	0.42	1.32	55%
P-203R	0.50	0.81	0.87	1.56	3.65	95%	0.69	0.73	0.83	1.94	4.83	84%	0.69	0.73	0.83	1.94	4.83	84%	P-203R	0.70	0.77	0.85	2.10	5.05	89%
P-114R	0.89	0.77	0.85	2.65	6.39	89%	0.88	0.86	0.89	2.91	6.63	100%	0.88	0.86	0.89	2.91	6.63	100%	P-114R	0.94	0.73	0.83	2.66	6.59	84%

Design Point Hydrology Summary

	Historic (H)						Base Camp (D)						Assumed Future Development						Basecamp Square (SQ)						
Design Point	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp	Design Point	Total Area (acres)	C_5	C_{100}	Q_5 (cfs)	Q_{100} (cfs)	%Imp
0	6.39	0.38	0.66	6.26	23.65	42%	6.20	0.49	0.71	7.74	24.40	55%	6.20	0.70	0.82	13.39	34.13	81%	0	6.10	0.67	0.80	11.58	30.35	77%
1	NA	NA	NA	NA	NA	NA	3.34	0.35	0.64	2.92	11.77	37%	3.34	0.73	0.83	6.46	16.05	85%	1	3.22	0.66	0.80	7.88	20.80	76%
off	1.39	0.79	0.86	4.22	10.05	91%	1.57	0.81	0.87	4.88	11.49	93%	1.57	0.80	0.87	4.83	11.44	93%	off	1.64	0.75	0.84	4.74	11.64	86%
ud	NA	NA	NA	NA	NA	NA	2.86	0.67	0.80	4.93	12.92	76%	2.86	0.66	0.80	4.76	12.57	76%	ud	2.88	0.67	0.80	5.03	13.07	77%