DRAINAGE REPORT
WINSTON PARK SUBDIVISION
3701 W 1800 S
WEBER COUNTY, UTAH
PROJECT NO. 2006142

Prepared For

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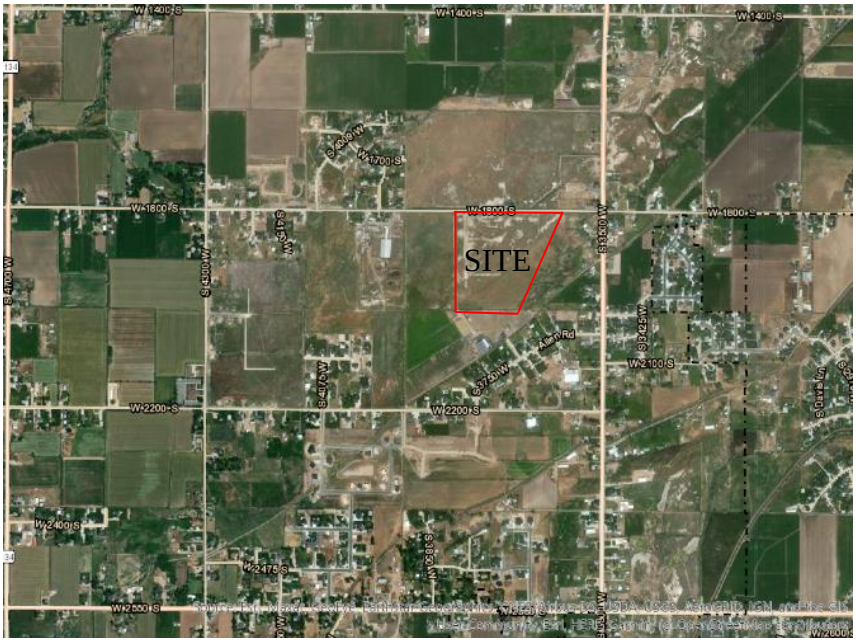
1. Introduction

1.1. Purpose of Studies:

The purpose of this report is to discuss the existing and proposed storm water detention requirements for the changed conditions being proposed for the site. The intent of this report is to accompany the proposed civil plans designed by Benchmark Civil Engineering for Weber County review and approval. This study will give an overall view of the existing drainage for the portion of the site being modified. It will also discuss the proposed improvements to the site and the proposed drainage improvements to capture and contain storm discharge.

1.2. Project Location:

The project is located at 3701 West 1800 South in Weber County, Utah. The objective site is 40.3 acres. 1800 South runs along the northern edge of the property, with mixed agricultural and residential properties to the north and east of the subject property. On the west it is adjacent to uncultivated agricultural land and cultivated agricultural land to the south.



Vicinity Map:

1.3. Site Description:

The existing site contains a relatively flat uncultivated agricultural lot with an existing public road (1800 South) along the northern property line. There is an existing storm drain system – owned and maintained by the County along the south side of 1800 South. This storm drain system will be protected during construction, and new infrastructure will be installed on the exiting storm drain line as needed to maintain positive flow of storm water.

A Geotechnical Engineering Investigation was conducted at the site by AGEC, and a report detailing the findings of the analysis was submitted on September 29, 2016. A water-soluble sulfate test was performed on site, and the results were included in a supplemental report dated October 12, 2016.

The Geotechnical investigation discovered groundwater at elevations between 4.5 and 7 feet below the existing ground. This was factored into the storm water system design, and no storm water infrastructure is designed to be constructed more than 4 feet below pre-construction elevations.

1.4. Project Description:

The proposed development is a 54-lot subdivision with two open areas that can be used as a community park and an agricultural lot for grazing animals. The development includes the roads, sidewalks, utilities, and other infrastructure needed to service the future residents. 1800 South will also be widened and dedicated to the County to accommodate increased traffic burden in the future.

2. Pre and Post Development Conditions

2.1. Existing Onsite Drainage

Overall, the site is relatively flat with an average 10 ft change from the southeast corner of the property to the northwest corner of the property. Storm water sheet-flows by following the existing slope pattern to the road (1800 South) where it collects in a roadside ditch. It continues to flow west along the road until it flows off-site. There is also a ditch along the south and west property lines that conveys water to 1800 South. All storm water flows to the northwest corner of the property.

2.2. Proposed Onsite Drainage:

Once developed, the subdivision will include a network of inlet boxes, combo boxes, manholes and storm drain pipes. All stormwater collected by this infrastructure will flow to a regional detention pond in one of the open areas on the property. The pond is designed to detain the 100-year storm event with a 0.10 cfs/acre release rate into the County's storm water system in 1800 South.

There will be three catch basins at the bottom of the pond, interconnected by pipes. The pipes converge at the north-most catch basin, where a single outflow pipe carries the stormwater to a SD Cleanout Box. This structure will treat the stormwater prior to entering the County system. An 8.5-inch orifice will control the release rate at the designated 0.10 cfs/acre. An in-line check valve will prevent water from the County system from backflowing into the pond.

The calculations for the storm drain system are based on the precipitation intensities provided by NOAA in multiple systems within the property limits.

The details of the stormwater infrastructure system are shown on the Civil Plans; CGD.01 & CGD.02.

3. Method Used for Storm Drainage Calculations

The site has been designed to detain a 100-year storm event with rainfall intensities provided by NOAA. The rainfall intensities generated from this process produced the maximum volume to be detained as shown on the table in Section 6.1.

3.1 Rational Method:

The Rational method was used in determining the peak discharge from the lots per the grading and drainage plan.

$$Q = CiA$$

Where:
Q = the peak discharge
C = the coefficient of runoff
i = rainfall intensity
A = tributary area

The maximum storm retention required for a 24-hour period is calculated by determining the time of concentration, which is the time it takes for runoff to travel from the hydraulically most distant part of the watershed sub-basin to its outfall point. It is computed by summing the time it takes water to travel through the different components of the drainage system. The soil type, ground cover, slope and flow lengths are used to determine the time of concentration for a specific detention basin area. Once the time of concentration is obtained, the rainfall intensity curves are used to determine the storm duration.

3.2 Detention Volume and Discharge:

Weber County requires the detention system to be sized in accordance with the 100-year, 24-hour storm event, with an allowable discharge of 0.10 cfs/acre. The required storage volume for the site is 74,462 cubic feet and the provided detention pond is designed to hold 74,487 cubic feet. The pipes within the subdivision may also be used for stormwater detention, should a storm event exceed the 100-year intensity. The storm drain pipes can hold an additional 6,269 cubic feet. The storage capacity of the entire system is 80,731 cubic feet.

See Appendix A; Section 6.1 for storm design calculations.

4. Utah Storm Water Rules

4.1 Utah Storm Water Rules:

The Utah Department of Environmental Quality (UTDEQ) is responsible for administering the state storm water management program. The Utah storm water program is closely modeled after the federal National Pollution Discharge Elimination System (NPDES) program, which requires storm water be treated to the maximum extent practicable (MEP). The UTDEQ water program establishes permitting requirements for construction sites disturbing more than one-acre, industrial sites, and Municipal Separate Storm Sewer Systems (MS4s). All MS4s should currently be permitted, or in the permit process. Each permitted MS4 will be responsible for establishing a Storm Water Management Program (SWMP). The storm water from this site will be treated with an approved best management practice to keep the storm water clean as it enters the public system. Please refer to the grading and drainage plan and storm water pollution prevention plan for additional details on this.

5. Summary

The final site will be stabilized with pavement and landscaping to ensure appropriate stormwater directional flow. The storm water drainage system designed for this site meets the requirements of Weber County.

Storm water will be collected via the on-site storm drain network and will be routed to a detention pond before a controlled discharge allows it into the County system.

6. Appendix A

6.1 Storm Drain System Calculations (Detention)

STORM DRAINAGE CALCULATIONS

Rational Method (Q=CIA)

Area Identification (A)		Rational Coefficient (C)		C*A
Roof =	162,000	0.9		145800 S.F.
Pavement =	237,126	0.9		213413 S.F.
Landscaping =	1,313,176	0.2		262635 S.F.
Sum:	1712302 S.F.		Sum:	621848 S.F.

NOAA ATLAS 14 (100 YEAR STORM)				**Allowable Discharge =**	.10cfs/acre
Time *(min)*	Intensity *(in/hr)*	Rainfall *(inches)*	Rainfall Excess *(cu.ft.)*	Allowed Discharge *(cu.ft)*	Volume to Detain *(cu.ft)*
15	4.10	1.025	53116	3538	49578
30	2.76	1.380	71513	7076	64437
60	1.71	1.710	88613	14151	**74462**
120	0.93	1.860	96387	28303	68084
180	0.64	1.905	98718	42454	56265
360	0.35	2.124	110067	84908	25160
720	0.22	2.604	134941	169815	0
1440	0.12	2.904	150487	339630	0

Detention Calculations

Pond Volume

Detention Pond Civil 3D = **74,487 cf**

Pipe Volume

12 in. Pipe	Length =	**393 lf**
	Volume =	**309 cf**
15 in. Pipe	Length =	**1,513 lf**
	Volume =	**1,857 cf**
21 in. Pipe	Length =	**1,189 lf**
	Volume =	**2,860 cf**
24 in. Pipe	Length =	**388 lf**
	Volume =	**1,219 cf**

Is there adequate storage?

Storage Provided = **80,731 cf**

Req. Storage = **74,462 cf** **YES**

6.2 Storm Drain System Calculations for Orifice Size

Orifice Design:
The storm runoff will be detained at 0.1 cfs/acre

$$Q = C_d A_0 \sqrt{2gh}$$

Total acreage of development:	39.31 acres
Allowable discharge:	0.1 cfs/acre
Max head:	4.13 ft
Design diameter for new orifice:	8.5 inch