

**Drainage Conformance Letter**  
**For**  
**SLIM CHICKENS**  
**LOT 3 OF PARKER AND PINE FILING NO. 1**  
**SWC OF S. PARKER ROAD AND E. PINE LANE, PARKER, COLORADO**

06/12/2020, **REV. 04/07/2021**

**Prepared For Developer:**

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**ENGINEERS STATEMENT**

This Drainage Conformance Letter for Lot 3 (Slim Chickens), of Parker and Pine Filing No. 1 Development, was prepared by me or under my direct supervision in accordance with the provisions of the Town of Parker Storm Drainage & Environmental Criteria Manual. I understand that the Town of Parker and its designated town authority do not and will not assume liability for drainage facilities designed by others.

Chris Mueller PE NCEES

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**Colorado P.E. License No. 5699**



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**Seal and Date**

### **Introduction**

This Drainage Conformance Letter has been prepared for the proposed Slim Chickens restaurant located at Lot 3 of Parker and Pine Filing No. 1. The purpose of this letter is to show that the proposed development conforms to the Storm Drainage and Environmental Criteria Manual for the Town of Parker, and the Parker & Pine Retail Final Drainage Report Version 1, prepared by Kimley Horn, and dated April, 2020, hereinafter called the “Master Drainage Report.” This is the underlying Master Plan for the overall development encompassing the site. All infrastructure will be installed prior to this project’s construction and is labeling “existing” for purposes of this report.

### **Location**

The project site located at the southwest corner of S. Parker Road and E. Pine Lane, Parker, Colorado. This development is in the Southeast Quarter of Section 9, and part of the Northeast Quarter of Section 16, Township 6 South, Range 66 West of the 6<sup>th</sup> Principal Meridian, Town of Parker, County of Douglas, State of Colorado. The site is bounded by South Parker Road (State Highway No. 83) to the east, Pine Lane to north, Twenty Mile Road to the west, and a vacant lot to the south.

### **Existing Conditions**

Lot 3 occupies approximately 0.87 acres of vacant land, covered with native grasses and weeds. The project site was studied in the Parker & Pine Final Drainage Report, Version 1, prepared by Kimley Horn, dated April 2020. Per this Report, this site lies within Basin 7.0.

The existing site generally slopes to the west. As part of the Parker and Pine master planned development, internal streets will be built north and west, adjacent to this Lot. The existing underground storm drain system will convey stormwater to a detention pond, then discharge into Baldwin Gulch.

### **Proposed Conditions**

An existing stormwater manhole is located along the west side of the Lot. This manhole will be converted to a street inlet in the Slim Chickens parking lot, and serve as the discharge from the site, in the proposed condition. The existing storm sewer system has been sized to receive flows from the developed Lot.

The impervious percentage assigned to this basin was 85%. The impervious percentage for the proposed Slim Chickens is calculated to be 50%. The allowed runoff is 7.35 cfs, which exceeds the proposed 2.85 cfs calculated for the Slim Chickens development. The proposed onsite inlet capacity is 6.3 cfs is greater

than the 2.85 cfs proposed 100-year runoff, and therefore the site complies with the Master Drainage Report.

**Conclusion**

Since the proposed development is lower in both imperviousness and runoff than allowed, by the Parker & Pine Master Drainage Report, the existing drainage facilities are sufficient to convey the runoff from the proposed Slim Chickens site, without onsite water quality or detention, and not negatively impact adjacent properties.

**Attachments**

1. Table 5.1 One-Hour Point Rainfall
2. Table 6-3. Recommended percentage impervious values
3. Table 6-5. Runoff coefficients, c
4. Hydrologic Soil Map Information
5. Runoff Coefficients spreadsheet
6. Standard Form SF-1. Time of Concentration
7. Standard Form SF-2. Storm Drainage System Design (Rational Method Procedure)
8. Inlet in a Sump or Sag Location spreadsheet
9. Parker & Pine Preliminary Drainage Area Map
10. Slim Chickens Proposed Drainage Area Map
11. 10' Type R Inlet Profile and Flex Tables

**TABLE 5.1**  
**ONE-HOUR POINT RAINFALL**

| Frequency of Design<br>Event<br>(yr) | One-hour Point<br>Rainfall, $P_1$<br>(in) |
|--------------------------------------|---|
| 2                                    | 0.99                                      |
| 5                                    | 1.39                                      |
| 10                                   | 1.64                                      |
| 25                                   | 1.98                                      |
| 50                                   | 2.31                                      |
| 100                                  | 2.60                                      |

## 5.3 FLOOD HYDROLOGY OVERVIEW

Various methods exist to determine appropriate flood peaks or hydrographs for storm drainage planning and design. Methods for determining flood peaks or hydrographs are the Rational Method, the Colorado Urban Hydrograph Procedure (CUHP), and Urban Drainage Stormwater Management (UDSWM) model. The Town of Parker discourages the use of computer models other than CUHP and UDSWM since these programs are preferred, if not required, by UDFCD for studies involving major drainageways where UDFCD approval is sought or where maintenance eligibility is requested.

The three methods are briefly described in this section, and a discussion of their applicability to the Town of Parker is discussed. UDSWM is mostly used to combine and route the hydrographs generated using CUHP.

In general, the Rational Method is the most widely used and accepted technique for determining peak flows in urban areas for small basins. Within the constraints outlined in the MANUAL, use of the Rational Method provides a relatively simple but effective way to analyze storm runoff.

CUHP is somewhat more complicated than the Rational Method. It allows a manual computation of a runoff hydrograph which may be used for further hydraulic routing through channels and/or detention ponds. Historically, CUHP is best used in urban areas for which runoff coefficients have been derived. However, recent improvements by UDFCD include consideration for different soil types, thus CUHP is now more applicable to rural areas. The reader is referred to UDFCD for the latest version of CUHP.

UDSWM is a computer model that generates runoff hydrographs and routes and combines these hydrographs. UDSWM is a modified version of the Runoff Block of the Environmental Protection Agency's Storm Water Management Model (SWMM). It has been modified to be used in conjunction with CUHP. Table 5.2 herein provides guidance on selecting the appropriate method for a given project.

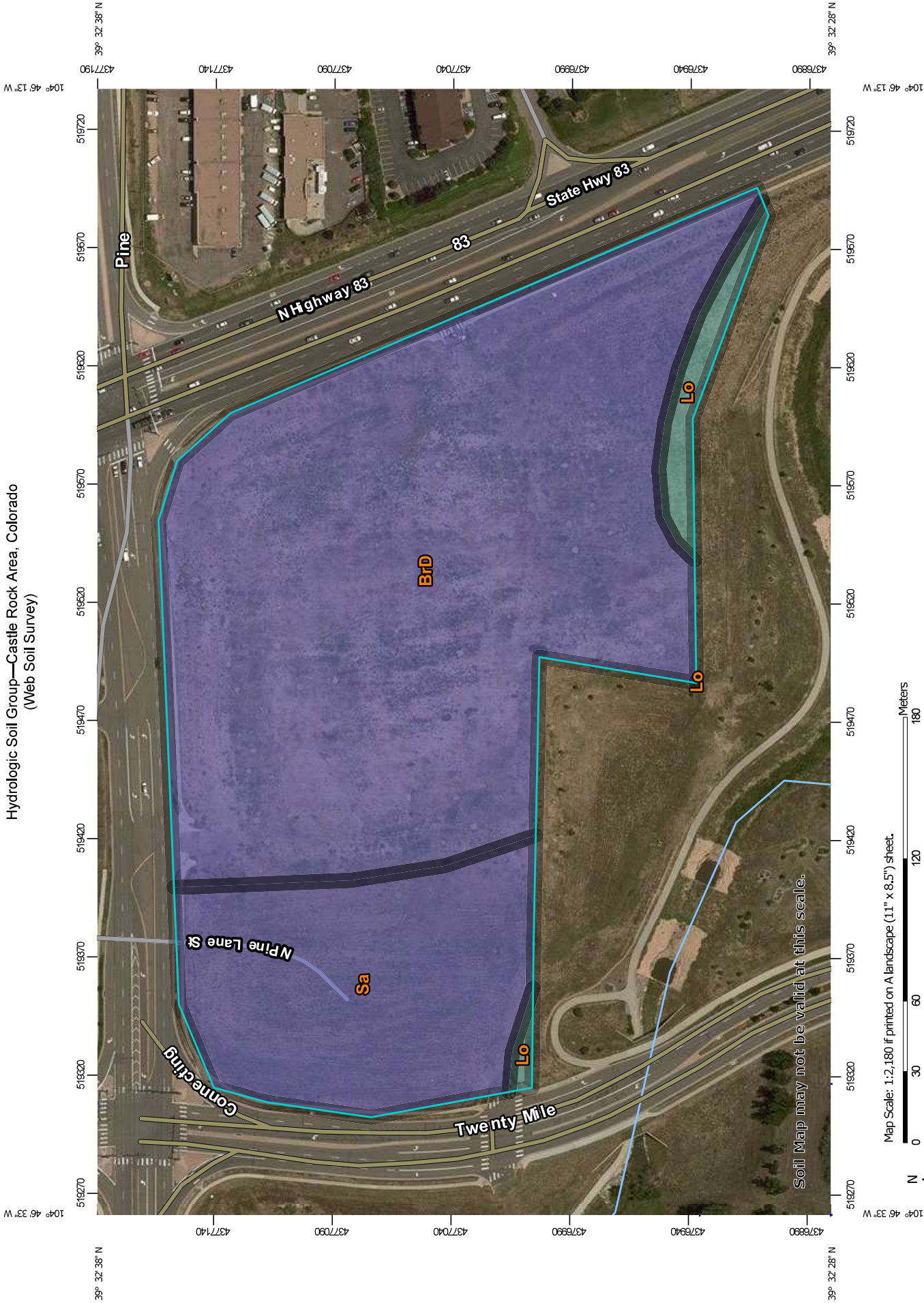
**Table 6-3. Recommended percentage imperviousness values**

| Land Use or<br>Surface Characteristics             | Percentage Imperviousness<br>(%) |
|--|----------------------------------|
| <b>Business:</b>                                   |                                  |
| Downtown Areas                                     | 95                               |
| Suburban Areas                                     | 75                               |
| <b>Residential lots (lot area only):</b>           |                                  |
| Single-family                                      |                                  |
| 2.5 acres or larger                                | 12                               |
| 0.75 – 2.5 acres                                   | 20                               |
| 0.25 – 0.75 acres                                  | 30                               |
| 0.25 acres or less                                 | 45                               |
| Apartments   | 75                               |
| <b>Industrial:</b>                                 |                                  |
| Light areas  | 80                               |
| Heavy areas  | 90                               |
| <b>Parks, cemeteries</b>                           | 10                               |
| <b>Playgrounds</b>                                 | 25                               |
| <b>Schools</b>                                     | 55                               |
| <b>Railroad yard areas</b>                         | 50                               |
| <b>Undeveloped Areas:</b>                          |                                  |
| Historic flow analysis                             | 2                                |
| Greenbelts, agricultural                           | 2                                |
| Off-site flow analysis (when land use not defined) | 45                               |
| <b>Streets:</b>                                    |                                  |
| Paved  | 100                              |
| Gravel (packed)                                    | 40                               |
| Drive and walks                                    | 90                               |
| Roofs  | 90                               |
| Lawns, sandy soil                                  | 2                                |
| Lawns, clayey soil                                 | 2                                |

Table 6-5. Runoff coefficients, *c*

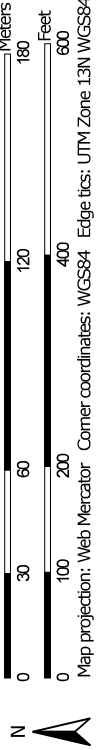
| Total or Effective<br>% Impervious | NRCS Hydrologic Soil Group A |        |         |         |         |          |          |
|------------------------------------|------------------------------|--------|---------|---------|---------|----------|----------|
|                                    | 2-Year                       | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year | 500-Year |
| 2%                                 | 0.01                         | 0.01   | 0.01    | 0.01    | 0.04    | 0.13     | 0.27     |
| 5%                                 | 0.02                         | 0.02   | 0.02    | 0.03    | 0.07    | 0.15     | 0.29     |
| 10%                                | 0.04                         | 0.05   | 0.05    | 0.07    | 0.11    | 0.19     | 0.32     |
| 15%                                | 0.07                         | 0.08   | 0.08    | 0.1     | 0.15    | 0.23     | 0.35     |
| 20%                                | 0.1                          | 0.11   | 0.12    | 0.14    | 0.2     | 0.27     | 0.38     |
| 25%                                | 0.14                         | 0.15   | 0.16    | 0.19    | 0.24    | 0.3      | 0.42     |
| 30%                                | 0.18                         | 0.19   | 0.2     | 0.23    | 0.28    | 0.34     | 0.45     |
| 35%                                | 0.21                         | 0.23   | 0.24    | 0.27    | 0.32    | 0.38     | 0.48     |
| 40%                                | 0.25                         | 0.27   | 0.28    | 0.32    | 0.37    | 0.42     | 0.51     |
| 45%                                | 0.3                          | 0.31   | 0.33    | 0.36    | 0.41    | 0.46     | 0.54     |
| 50%                                | 0.34                         | 0.36   | 0.37    | 0.41    | 0.45    | 0.5      | 0.58     |
| 55%                                | 0.39                         | 0.4    | 0.42    | 0.45    | 0.49    | 0.54     | 0.61     |
| 60%                                | 0.43                         | 0.45   | 0.47    | 0.5     | 0.54    | 0.58     | 0.64     |
| 65%                                | 0.48                         | 0.5    | 0.51    | 0.54    | 0.58    | 0.62     | 0.67     |
| 70%                                | 0.53                         | 0.55   | 0.56    | 0.59    | 0.62    | 0.65     | 0.71     |
| 75%                                | 0.58                         | 0.6    | 0.61    | 0.64    | 0.66    | 0.69     | 0.74     |
| 80%                                | 0.63                         | 0.65   | 0.66    | 0.69    | 0.71    | 0.73     | 0.77     |
| 85%                                | 0.68                         | 0.7    | 0.71    | 0.74    | 0.75    | 0.77     | 0.8      |
| 90%                                | 0.73                         | 0.75   | 0.77    | 0.79    | 0.79    | 0.81     | 0.84     |
| 95%                                | 0.79                         | 0.81   | 0.82    | 0.83    | 0.84    | 0.85     | 0.87     |
| 100%                               | 0.84                         | 0.86   | 0.87    | 0.88    | 0.88    | 0.89     | 0.9      |
| Total or Effective<br>% Impervious | NRCS Hydrologic Soil Group B |        |         |         |         |          |          |
|                                    | 2-Year                       | 5-Year | 10-Year | 25-Year | 50-Year | 100-Year | 500-Year |
| 2%                                 | 0.01                         | 0.01   | 0.07    | 0.26    | 0.34    | 0.44     | 0.54     |
| 5%                                 | 0.03                         | 0.03   | 0.1     | 0.28    | 0.36    | 0.45     | 0.55     |
| 10%                                | 0.06                         | 0.07   | 0.14    | 0.31    | 0.38    | 0.47     | 0.57     |
| 15%                                | 0.09                         | 0.11   | 0.18    | 0.34    | 0.41    | 0.5      | 0.59     |
| 20%                                | 0.13                         | 0.15   | 0.22    | 0.38    | 0.44    | 0.52     | 0.61     |
| 25%                                | 0.17                         | 0.19   | 0.26    | 0.41    | 0.47    | 0.54     | 0.63     |
| 30%                                | 0.2                          | 0.23   | 0.3     | 0.44    | 0.49    | 0.57     | 0.65     |
| 35%                                | 0.24                         | 0.27   | 0.34    | 0.47    | 0.52    | 0.59     | 0.66     |
| 40%                                | 0.29                         | 0.32   | 0.38    | 0.5     | 0.55    | 0.61     | 0.68     |
| 45%                                | 0.33                         | 0.36   | 0.42    | 0.53    | 0.58    | 0.64     | 0.7      |
| 50%                                | 0.37                         | 0.4    | 0.46    | 0.56    | 0.61    | 0.66     | 0.72     |
| 55%                                | 0.42                         | 0.45   | 0.5     | 0.6     | 0.63    | 0.68     | 0.74     |
| 60%                                | 0.46                         | 0.49   | 0.54    | 0.63    | 0.66    | 0.71     | 0.76     |
| 65%                                | 0.5                          | 0.54   | 0.58    | 0.66    | 0.69    | 0.73     | 0.77     |
| 70%                                | 0.55                         | 0.58   | 0.62    | 0.69    | 0.72    | 0.75     | 0.79     |
| 75%                                | 0.6                          | 0.63   | 0.66    | 0.72    | 0.75    | 0.78     | 0.81     |
| 80%                                | 0.64                         | 0.67   | 0.7     | 0.75    | 0.77    | 0.8      | 0.83     |
| 85%                                | 0.69                         | 0.72   | 0.74    | 0.78    | 0.8     | 0.82     | 0.85     |
| 90%                                | 0.74                         | 0.76   | 0.78    | 0.81    | 0.83    | 0.84     | 0.87     |
| 95%                                | 0.79                         | 0.81   | 0.82    | 0.85    | 0.86    | 0.87     | 0.88     |
| 100%                               | 0.84                         | 0.86   | 0.86    | 0.88    | 0.89    | 0.89     | 0.9      |

Hydrologic Soil Group—Castle Rock Area, Colorado  
(Web Soil Survey)



Soil Map may not be valid at this scale.

Map Scale: 1:2,180 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

## Hydrologic Soil Group

| Hydrologic Soil Group— Summary by Map Unit — Castle Rock Area, Colorado (CO622) |   |        |              |                |
|---|---|--------|--------------|----------------|
| Map unit symbol   | Map unit name                                   | Rating | Acres in AOI | Percent of AOI |
| BrD   | Bresser sandy loam, cool, 5 to 9 percent slopes | B      | 11.2         | 73.8%          |
| Lo  | Loamy alluvial land                             | C      | 0.5          | 3.3%           |
| Sa  | Sampson loam                                    | B      | 3.5          | 22.9%          |
| <b>Totals for Area of Interest</b>  |   |        | <b>15.2</b>  | <b>100.0%</b>  |

### Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

**Runoff Coefficients**

Project: SLIM CHICKENS - PARKER, CO  
Section: PROPOSED

Created by: JLG  
Checked by: CM

Date: 4/7/2021  
Date:

| Sub-Basin Data |                  |                 | *Composite C   |                |                  |       |
|----------------|------------------|-----------------|----------------|----------------|------------------|-------|
| Basin ID       | Description      | Total Area (ac) | C <sub>2</sub> | C <sub>5</sub> | C <sub>100</sub> | I (%) |
| A-1            | PAVEMENT, WALKS  | 0.55            | 0.74           | 0.76           | 0.84             | 90%   |
|                | ROOF             | 0.09            | 0.74           | 0.76           | 0.84             | 90%   |
|                | LANDSCAPED AREAS | 0.23            | 0.01           | 0.01           | 0.44             | 2%    |

**Standard Form SF-1 . Time of Concentration**

Project: SLIM CHICKENS - PARKER, CO  
 Section: PROPOSED

Created by: JLG Date: 4/7/2021  
 Checked by: CM Date:

Urban TOC<sub>min</sub> = 5 min  
 Rural TOC<sub>min</sub> = 10 min

| Basin ID | SUB-BASIN DATA                        |                |           | INITIAL/OVERLAND FLOW (t <sub>i</sub> ) |               |                      | TRAVEL TIME (t <sub>c</sub> ) |                        |      |                                      |                               |                 |                                  | T <sub>c</sub> CHECK (Urbanized basins)                      |             |             |                          | FINAL T <sub>c</sub> (min) |                                     |
|----------|---------------------------------------|----------------|-----------|---|---------------|----------------------|-------------------------------|------------------------|------|--------------------------------------|-------------------------------|-----------------|----------------------------------|--|-------------|-------------|--------------------------|----------------------------|-------------------------------------|
|          | Description                           | C <sub>s</sub> | Area (ac) | Length (ft)                             | Slope (ft/ft) | t <sub>i</sub> (min) | Length (ft)                   | S <sub>w</sub> (ft/ft) | Code | Type of Land Surface                 | Convey Coef (C <sub>c</sub> ) | Velocity (ft/s) | t <sub>c</sub> Travel Time (min) | TOTAL t <sub>c</sub> = t <sub>i</sub> + t <sub>c</sub> (min) | Urban (Yes) | Length (ft) | T <sub>c</sub> max (min) |                            | T <sub>c</sub> max > t <sub>c</sub> |
|          |                                       |                |           |   |               |                      |                               |                        |      |                                      |                               |                 |                                  |  |             |             |                          |                            |                                     |
| A-1      | To Proposed 5' Type R Inlet           | 0.49           | 0.862     | 244                                     | 0.05          | 10.18                | 0                             | 0                      | 6    | Paved areas and shallow paved swales | 20.00                         | 0.00            | 0.00                             | 10.18  | YES         | 244.00      | 11.36                    | Check                      | 10.18                               |
| OS-1     | North Tributary to Existing Inlet     | 0.003          | 0.013     | 206                                     | 0.01          | 28.43                | 0                             | 0                      | 6    | Paved areas and shallow paved swales | 20.00                         | 0.00            | 0.00                             | 28.43  | YES         | 206.00      | 11.14                    | Regional Tc                | 11.14                               |
| OS-2     | Southwest Tributary to Existing Inlet | 0.01           | 0.017     | 32                                      | 0.01          | 11.14                | 0                             | 0                      | 6    | Paved areas and shallow paved swales | 20.00                         | 0.00            | 0.00                             | 11.14  | YES         | 32.00       | 10.18                    | Regional Tc                | 10.18                               |
| OS-3     | South Tributary to Existing Inlet     | 0.01           | 0.052     | 93                                      | 0.05          | 11.42                | 0                             | 0                      | 6    | Paved areas and shallow paved swales | 20.00                         | 0.00            | 0.00                             | 11.42  | YES         | 93.00       | 10.52                    | Regional Tc                | 10.52                               |
|          |                                       |                |           |   |               |                      |                               |                        |      |                                      |                               |                 |                                  |  |             |             |                          |                            |                                     |

Notes:

- t<sub>i</sub> = (0.395\*(1.1-C<sub>s</sub>)\*(L^0.5))/(S^0.33), from UDFCD Eqn RO-3
- Velocity from V = C<sub>s</sub>\*S<sub>w</sub>^0.5, from UDFCD Eqn RO-4, C<sub>s</sub> from Table R0-2 (See Sheet Design Info)
- t<sub>c</sub> = L/60V
- t<sub>c</sub> max = 10+L/180, from COA SDDTC equation 5.4
- Final T<sub>c</sub> > 10 min for nonurban watersheds

| Code | Description                          |
|------|--------------------------------------|
| 1    | Heavy meadow                         |
| 2    | Tillage/field                        |
| 3    | Short pasture and lawns              |
| 4    | Nearly bare ground                   |
| 5    | Grassed waterway                     |
| 6    | Paved areas and shallow paved swales |
| 7    | Rail Ballast                         |

**Standard Form SF-2 . Storm Drainage System Design (Rational Method Procedure)**

Project: SLIM CHICKENS - PARKER, CO  
 Section: PROPOSED

Created by: JLG Date: 4/7/2021  
 Checked by: CM Date:

Design Storm: 5-yr P = 1.39 in

| LOCATION | DESIGN POINT | DIRECT RUNOFF        |           |              |                      |           |           |         | TOTAL RUNOFF         |                |             |         | STREET    |                   | PIPE              |           |           | TRAVEL TIME |                | REMARKS |                      |      |
|----------|--------------|----------------------|-----------|--------------|----------------------|-----------|-----------|---------|----------------------|----------------|-------------|---------|-----------|-------------------|-------------------|-----------|-----------|-------------|----------------|---------|----------------------|------|
|          |              | AREA DESIGN (name)   | AREA (AC) | RUNOFF COEFF | t <sub>c</sub> (MIN) | C-A. (AC) | I IN / HR | Q (CFS) | t <sub>c</sub> (MIN) | SUM (C*A) (AC) | I (IN / HR) | Q (CFS) | SLOPE (%) | STREET FLOW (CFS) | DESIGN FLOW (CFS) | SLOPE (%) | PIPE SIZE | LENGTH (FT) | VELOCITY (FPS) |         | t <sub>r</sub> (MIN) |      |
| DP       | (1)          | (2)                  | (3)       | (4)          | (5)                  | (6)       | (7)       | (8)     | (9)                  | (10)           | (11)        | (12)    | (13)      | (14)              | (15)              | (16)      | (17)      | (18)        | (19)           | (20)    | (21)                 | (22) |
|          | A-1          | STORM INLET          | A-1       | 0.86         | 0.47                 | 10.18     | 0.41      | 3.73    | 1.5228               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | OS-1         | EXISTING STORM INLET | OS-1      | 0.01         | 0.00                 | 11.14     | 0.00      | 3.60    | 0.0001               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | OS-2         | EXISTING STORM INLET | OS-2      | 0.02         | 0.01                 | 10.18     | 0.00      | 3.73    | 0.0006               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | OS-3         | EXISTING STORM INLET | OS-3      | 0.05         | 0.01                 | 10.52     | 0.00      | 3.69    | 0.0019               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | TOTAL =      |                      |           |              |                      |           |           |         | 1.53                 |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |

Design Storm: 100-yr P = 2.60 in

| LOCATION | DESIGN POINT | DIRECT RUNOFF        |           |              |                      |           |           |         | TOTAL RUNOFF         |                |             |         | STREET    |                   | PIPE              |           |           | TRAVEL TIME |                | REMARKS |                      |      |
|----------|--------------|----------------------|-----------|--------------|----------------------|-----------|-----------|---------|----------------------|----------------|-------------|---------|-----------|-------------------|-------------------|-----------|-----------|-------------|----------------|---------|----------------------|------|
|          |              | AREA DESIGN          | AREA (AC) | RUNOFF COEFF | t <sub>c</sub> (MIN) | C-A. (AC) | I IN / HR | Q (CFS) | t <sub>c</sub> (MIN) | SUM (C*A) (AC) | I (IN / HR) | Q (CFS) | SLOPE (%) | STREET FLOW (CFS) | DESIGN FLOW (CFS) | SLOPE (%) | PIPE SIZE | LENGTH (FT) | VELOCITY (FPS) |         | t <sub>r</sub> (MIN) |      |
| DP       | (1)          | (2)                  | (3)       | (4)          | (5)                  | (6)       | (7)       | (8)     | (9)                  | (10)           | (11)        | (12)    | (13)      | (14)              | (15)              | (16)      | (17)      | (18)        | (19)           | (20)    | (21)                 | (22) |
|          | A-1          | STORM INLET          | A-1       | 0.86         | 0.47                 | 10.18     | 0.41      | 6.98    | 2.8484               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | OS-1         | EXISTING STORM INLET | OS-1      | 0.01         | 0.00                 | 11.14     | 0.00      | 6.73    | 0.0002               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | OS-2         | EXISTING STORM INLET | OS-2      | 0.02         | 0.01                 | 10.18     | 0.00      | 6.99    | 0.0011               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | OS-3         | EXISTING STORM INLET | OS-3      | 0.05         | 0.01                 | 10.52     | 0.00      | 6.89    | 0.0036               |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |
|          | TOTAL =      |                      |           |              |                      |           |           |         | 2.85                 |                |             |         |           |                   |                   |           |           |             |                |         |                      |      |

- (1) Basin Description linked to C-Value Sheet
- (2) Basin Design Point
- (3) Enter the Basin Name from C Value Sheet
- (4) Basin Area linked to C-Value Sheet
- (5) Composite C linked to C-Value Sheet
- (6) Time of Concentration linked to C-Value Sheet

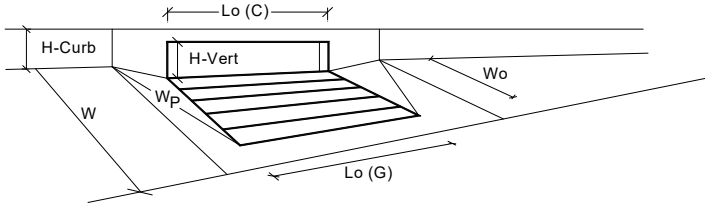
- (7) =Column 4 x Column 5
- (8) =28.5\*P/(10+Column 6)^0.786
- (9) =Column 7 x Column 8
- (10) =Column 6 x Column 21
- (11) Add the Basin Areas (7) to get the combined basin AC
- (12) =28.5\*P/(10+Column 10)^0.786

- (13) Sum of Qs
- (14) Additional Street Overland Flow
- (15) Additional Street Overland Flow
- (16) Additional Pipe Flow
- (17) Additional Pipe Flow
- (18) Additional Pipe Flow

- (19) Additional Flow Length
- (20) Overland Velocity
- (21) =Column 16 / Column 20 / 60

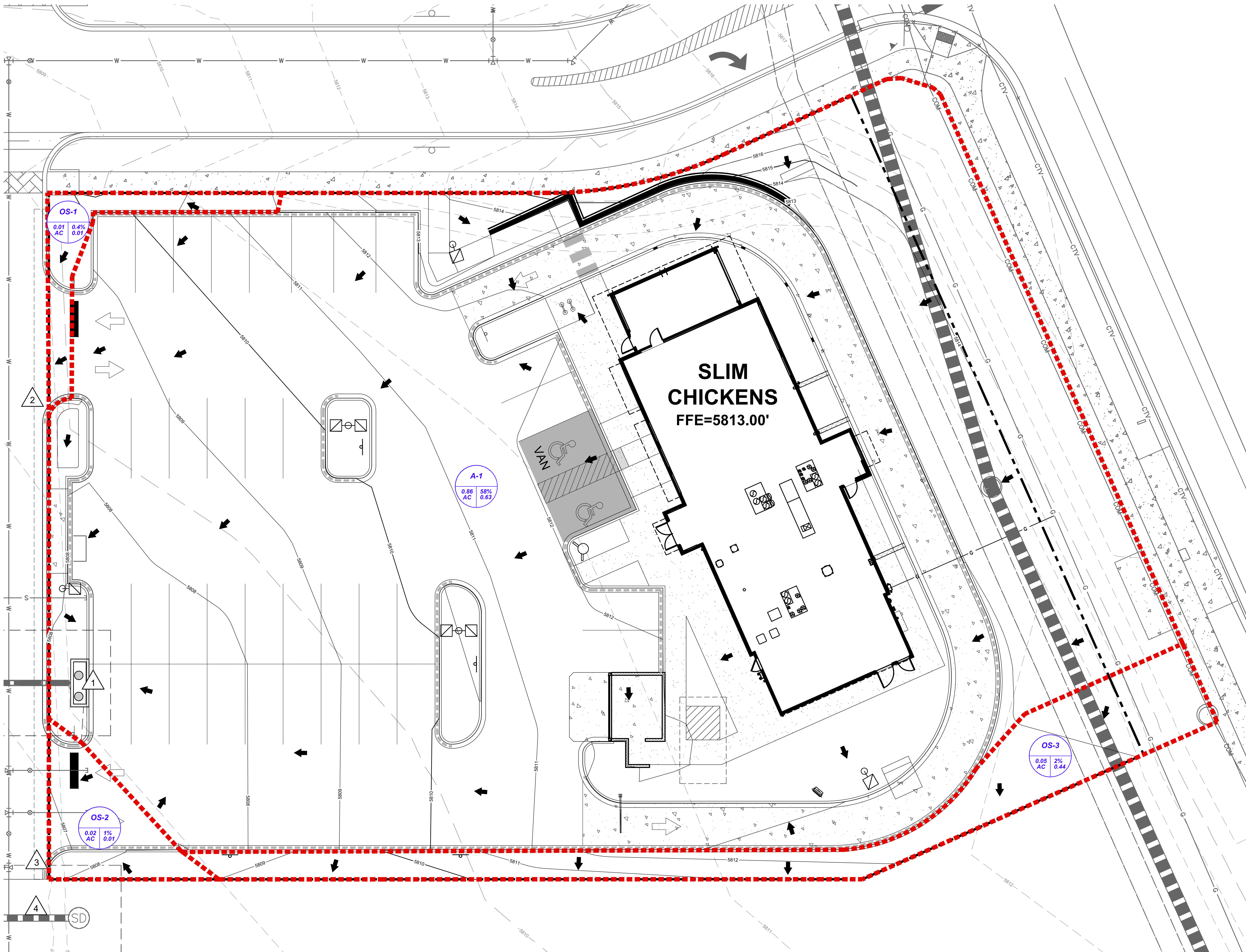
## INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



| Design Information (Input)   | MINOR                    | MAJOR |         |
|--|--------------------------|-------|---------|
| Type of Inlet  | CDOT Type R Curb Opening |       |         |
| Local Depression (additional to continuous gutter depression 'a' from above) |                          |       |         |
| Number of Unit Inlets (Grate or Curb Opening)                                |                          |       |         |
| Water Depth at Flowline (outside of local depression)                        |                          |       |         |
| <b>Grate Information</b>   |                          |       |         |
| Length of a Unit Grate   |                          |       |         |
| Width of a Unit Grate  |                          |       |         |
| Area Opening Ratio for a Grate (typical values 0.15-0.90)                    |                          |       |         |
| Clogging Factor for a Single Grate (typical value 0.50 - 0.70)               |                          |       |         |
| Grate Weir Coefficient (typical value 2.15 - 3.60)                           |                          |       |         |
| Grate Orifice Coefficient (typical value 0.60 - 0.80)                        |                          |       |         |
| <b>Curb Opening Information</b>  |                          |       |         |
| Length of a Unit Curb Opening  |                          |       |         |
| Height of Vertical Curb Opening in Inches                                    |                          |       |         |
| Height of Curb Orifice Throat in Inches                                      |                          |       |         |
| Angle of Throat (see USDCM Figure ST-5)                                      |                          |       |         |
| Side Width for Depression Pan (typically the gutter width of 2 feet)         |                          |       |         |
| Clogging Factor for a Single Curb Opening (typical value 0.10)               |                          |       |         |
| Curb Opening Weir Coefficient (typical value 2.3-3.7)                        |                          |       |         |
| Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)                 |                          |       |         |
| <b>Low Head Performance Reduction (Calculated)</b>                           |                          |       |         |
| Depth for Grate Midwidth   |                          |       |         |
| Depth for Curb Opening Weir Equation   |                          |       |         |
| Combination Inlet Performance Reduction Factor for Long Inlets               |                          |       |         |
| Curb Opening Performance Reduction Factor for Long Inlets                    |                          |       |         |
| Grated Inlet Performance Reduction Factor for Long Inlets                    |                          |       |         |
| <b>Total Inlet Interception Capacity (assumes clogged condition)</b>         |                          |       |         |
| Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)                   |                          |       |         |
| Type   | CDOT Type R Curb Opening |       |         |
| $a_{local}$ =  | 3.00                     | 3.00  | inches  |
| No =   | 2                        | 2     |         |
| Ponding Depth =  | 5.1                      | 5.1   | inches  |
| <input type="checkbox"/> Override Depths                                     |                          |       |         |
| $L_o(G)$ =   | N/A                      | N/A   | feet    |
| $W_o$ =  | N/A                      | N/A   | feet    |
| $A_{ratio}$ =  | N/A                      | N/A   |         |
| $C_f(G)$ =   | N/A                      | N/A   |         |
| $C_w(G)$ =   | N/A                      | N/A   |         |
| $C_o(G)$ =   | N/A                      | N/A   |         |
| <input type="checkbox"/> Override Depths                                     |                          |       |         |
| $L_o(C)$ =   | 5.00                     | 5.00  | feet    |
| $H_{vert}$ =   | 6.00                     | 6.00  | inches  |
| $H_{throat}$ =   | 6.00                     | 6.00  | inches  |
| Theta =  | 63.40                    | 63.40 | degrees |
| $W_p$ =  | 2.00                     | 2.00  | feet    |
| $C_f(C)$ =   | 0.20                     | 0.20  |         |
| $C_w(C)$ =   | 3.60                     | 3.60  |         |
| $C_o(C)$ =   | 0.67                     | 0.67  |         |
| <input type="checkbox"/> Override Depths                                     |                          |       |         |
| $d_{grate}$ =  | N/A                      | N/A   | ft      |
| $d_{curb}$ =   | 0.26                     | 0.26  | ft      |
| RF <sub>Combination</sub> =  | 0.48                     | 0.48  |         |
| RF <sub>Curb</sub> =   | 0.88                     | 0.88  |         |
| RF <sub>Grate</sub> =  | N/A                      | N/A   |         |
| <input type="checkbox"/> Override Depths                                     |                          |       |         |
| $Q_a$ =  | 6.3                      | 6.3   | cfs     |
| Q <sub>PEAK REQUIRED</sub> =   | 1.5                      | 2.9   | cfs     |





**LEGEND**

- BASIN BOUNDARY
- PROPERTY LINE
- FLOW ARROW
- # DESIGN POINT

P1 BASIN DESIGNATION  
XX PERCENT IMPERVIOUS  
XX 100-YEAR RUNOFF COEFFICIENT  
XX BASIN AREA IN ACRES

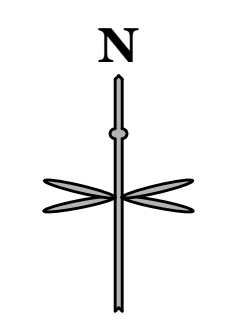
**SLIM CHICKENS**  
FFE=5813.00'

**A-1**  
0.86 AC 58%  
0.63

**OS-1**  
0.01 AC 0.4%  
0.01

**OS-3**  
0.05 AC 2%  
0.44

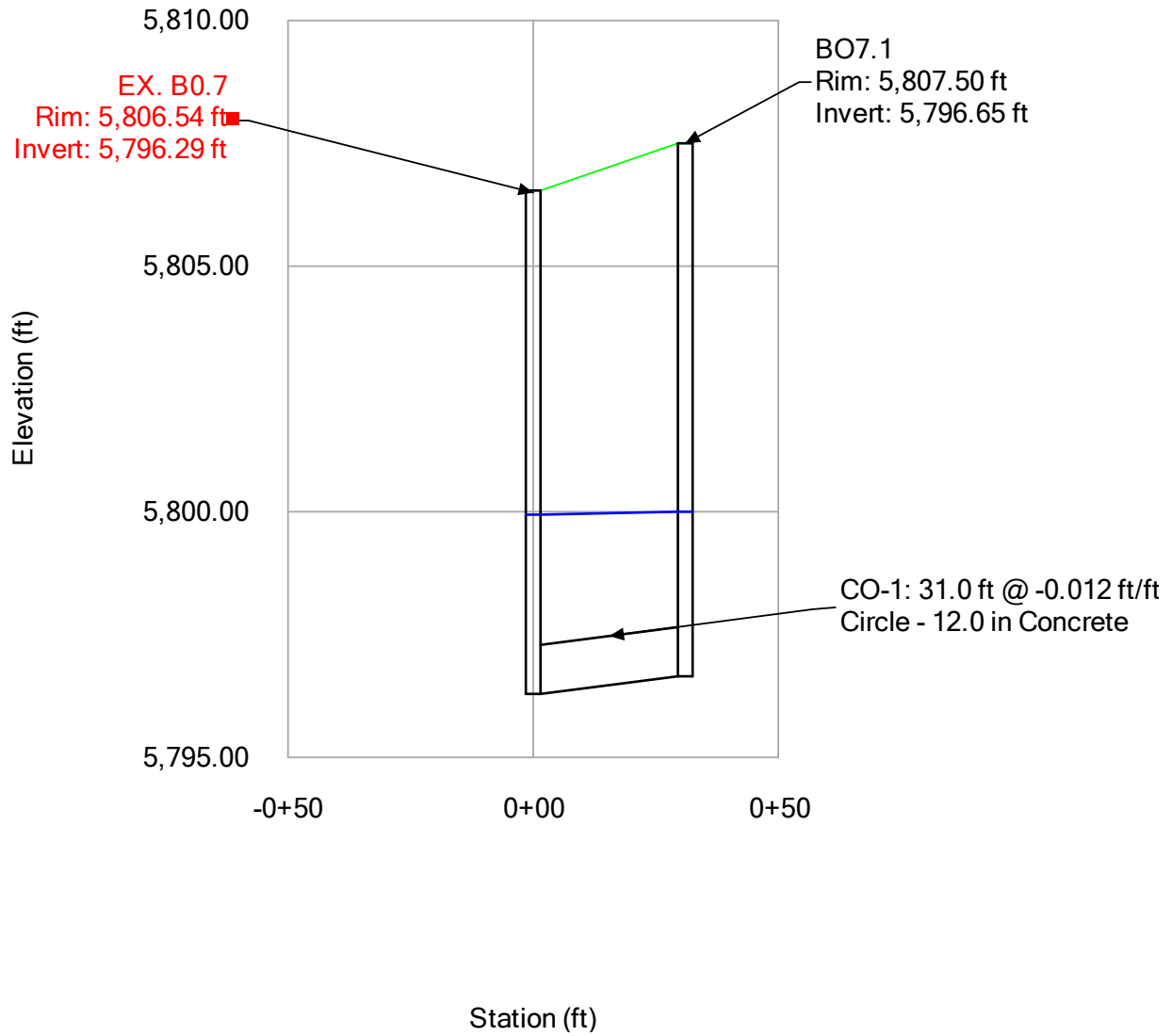
**OS-2**  
0.02 AC 1%  
0.01



SCALE IN FEET  
 0 20 40  
 IF BAR DOES NOT MEASURE 1 INCH  
 THEN DRAWING IS NOT TO SCALE

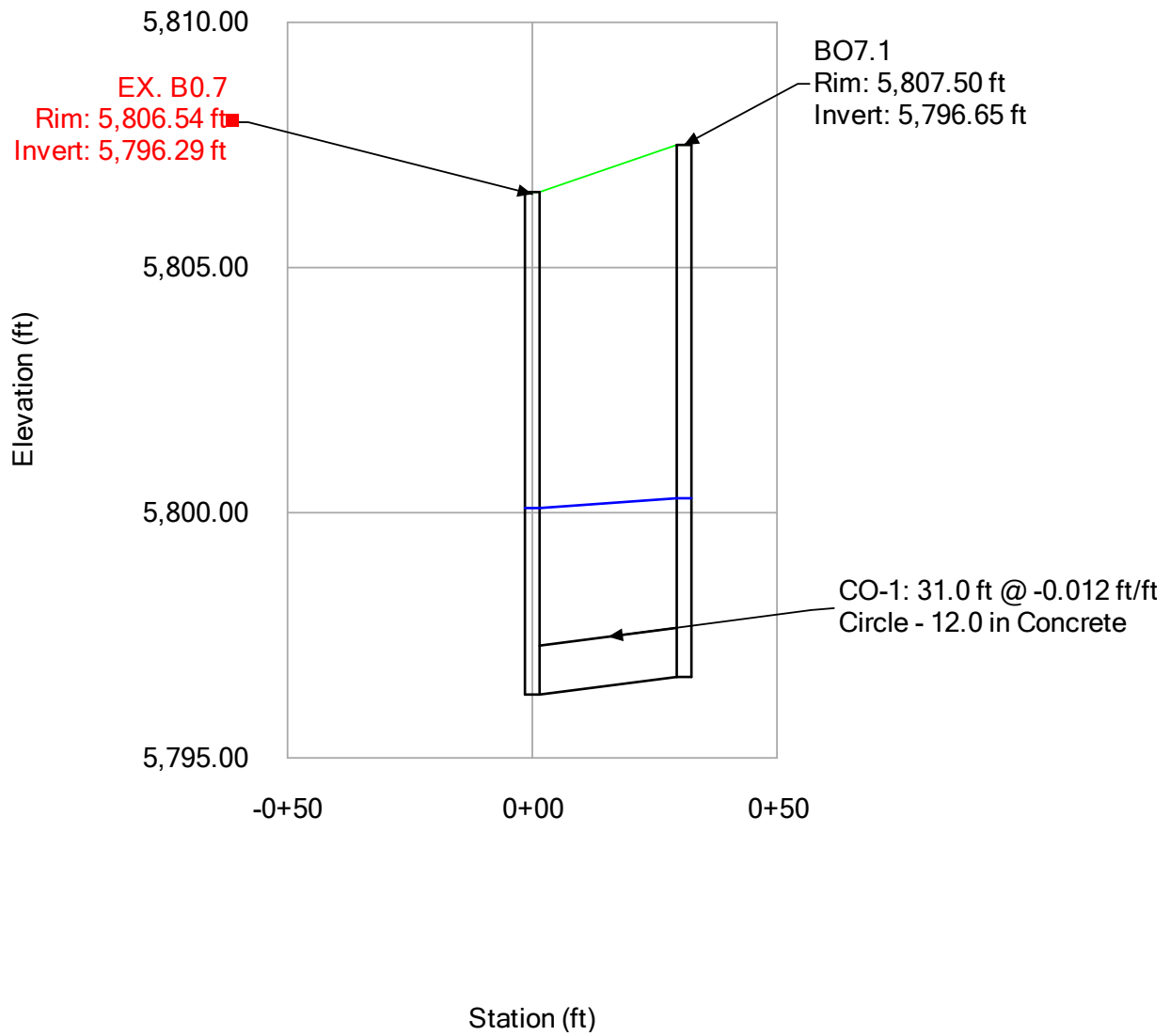
## Profile Report 5 Year

### Engineering Profile - B07.1 to EX. B0.7 (10' Type R Inlet.stsw)



## Profile Report 100 Year

### Engineering Profile - B07.1 to EX. B0.7 (10' Type R Inlet.stsw)



### FlexTable: Conduit Table

| ID                         | Label                        | Start Node                | Set Invert to Start?       | Invert (Start) (ft)            | Stop Node                       |
|----------------------------|------------------------------|---------------------------|----------------------------|--------------------------------|---------------------------------|
| 31                         | CO-1                         | EX. B0.7                  | True                       | 5,796.29                       | B07.1                           |
| 42                         | CO-3                         | EX. B0.7                  | True                       | 5,796.29                       | O-1                             |
| Set Invert to Stop?        | Invert (Stop) (ft)           | Has User Defined Length?  | Length (User Defined) (ft) | Length (Scaled) (ft)           | Slope (Calculated) (ft/ft)      |
| True                       | 5,796.65                     | True                      | 31.0                       | 44.2                           | -0.012                          |
| True                       | 0.00                         | False                     |                            | 33.5                           | 173.025                         |
| Section Type               | Diameter (in)                | Manning's n               | Flow (cfs)                 | Velocity (ft/s)                | Depth (Out) (ft)                |
| Circle                     | 12.0                         | 0.013                     | 5.20                       | 6.62                           | 3.80                            |
| Circle                     | 12.0                         | 0.013                     | 2.85                       | 3.63                           | 5,799.88                        |
| Capacity (Full Flow) (cfs) | Flow / Capacity (Design) (%) | Depth (Normal) / Rise (%) | Notes                      | Hydraulic Grade Line (In) (ft) | Hydraulic Grade Line (Out) (ft) |
| 3.84                       | 135.4                        | (N/A)                     |                            | 5,800.75                       | 5,800.09                        |
| 468.62                     | 0.6                          | 5.6                       |                            | 5,800.09                       | 5,799.88                        |

### Conduit FlexTable: DOT Report

| Label                                      | -Node-<br>Upstream<br>Downstream          | -Depth-<br>Upstream<br>Downstream<br>(ft) | -EGL- Upstream<br>Downstream<br>(ft) | -Ground-<br>Upstream<br>Downstream<br>(ft) | -HGL- Upstream<br>Downstream<br>(ft) |
|--|---|---|--------------------------------------|--|--------------------------------------|
| CO-1                                       | EX. B0.7                                  | 3.80                                      | 5,800.30                             | 5,806.54                                   | 5,800.75                             |
|  | B07.1                                     | 4.10                                      | 5,801.44                             | 5,807.50                                   | 5,800.09                             |
| CO-3                                       | EX. B0.7                                  | 3.80                                      | 5,800.30                             | 5,806.54                                   | 5,800.09                             |
|  | O-1                                       | (N/A)                                     | (N/A)                                | 0.00                                       | 5,799.88                             |
| -Invert-<br>Upstream<br>Downstream<br>(ft) | Section<br>Discharge<br>Capacity<br>(cfs) | -X- Upstream<br>Downstream<br>(ft)        | -Y- Upstream<br>Downstream<br>(ft)   |  |                                      |
| 5,796.29                                   | 5.20                                      | 89.54                                     | -12.00                               |  |                                      |
| 5,796.65                                   | 3.84                                      | 133.75                                    | -12.14                               |  |                                      |
| 5,796.29                                   | 2.85                                      | 89.54                                     | -12.00                               |  |                                      |
| 0.00                                       | 468.62                                    | 56.04                                     | -12.04                               |  |                                      |

### FlexTable: Network Elements Table

| Label                                     | Station<br>(Calculated)<br>(ft)              | Inlet                                | Inlet Location                    | Inlet C                                      | Inlet Drainage<br>Area<br>(acres)   |
|---|--|--------------------------------------|-----------------------------------|--|-------------------------------------|
| EX. B0.7<br>B07.1<br>O-1<br>CO-1<br>CO-3  | 0+33<br>0+64                                 |                                      |                                   |  |                                     |
| Total Inlet<br>Intensity<br>(in/h)        | Flow (Total In)                              | Flow (Captured)<br>(cfs)             | Flow (Total<br>Bypassed)<br>(cfs) | Bypass Target                                | Spread / Top<br>Width<br>(ft)       |
|   | 8.050000190734<br>86<br>5.199999809265<br>14 |                                      |                                   |  |                                     |
| System CA<br>(acres)                      | System Flow<br>Time<br>(min)                 | System Rational<br>Flow<br>(cfs)     | Flow<br>(cfs)                     | Start Node                                   | Stop Node                           |
| 0.000<br>0.000<br>0.000<br>0.000<br>0.000 | 0.078<br>0.000<br>0.232<br>0.000<br>0.078    | 0.00<br>0.00<br>0.00<br>0.00<br>0.00 | 5.20<br>2.85                      | EX. B0.7<br>EX. B0.7                         | B07.1<br>O-1                        |
| Number of<br>Barrels                      | Rise (Unified)<br>(ft)                       | Span<br>(ft)                         | Length (Unified)<br>(ft)          | Slope<br>(Calculated)<br>(ft/ft)             | Friction Slope<br>(ft/ft)           |
| 1<br>1                                    | 1.00<br>1.00                                 |                                      | 31.0<br>33.5                      | -0.012<br>173.025                            | 0.021<br>0.006                      |
| Headloss<br>(ft)                          | Velocity<br>(ft/s)                           | Depth (Normal)<br>(ft)               | Invert (Start)<br>(ft)            | Hydraulic Grade<br>Line (In)<br>(ft)         | Elevation Ground<br>(Start)<br>(ft) |
| 0.00<br>0.00<br>0.66<br>0.21              | 6.62<br>3.63                                 | (N/A)<br>0.06                        | 5,796.29<br>5,796.29              | 5,800.09<br>5,800.75<br>5,800.75<br>5,800.09 | 5,806.54<br>5,806.54                |
| Invert (Stop)<br>(ft)                     | Hydraulic Grade<br>Line (Out)<br>(ft)        | Elevation Ground<br>(Stop)<br>(ft)   |                                   |  |                                     |
| 5,796.65<br>0.00                          | 5,800.09<br>5,800.75<br>5,800.09<br>5,799.88 | 5,807.50<br>0.00                     |                                   |  |                                     |

### FlexTable: Outfall Table

| ID               | Label                                   | Elevation (Ground) (ft) | Set Rim to Ground Elevation? | Elevation (Invert) (ft) | Boundary Condition Type |
|------------------|---|-------------------------|------------------------------|-------------------------|-------------------------|
| 41               | O-1                                     | 0.00                    | True                         | 0.00                    | User Defined Tailwater  |
| Boundary Element | Elevation (User Defined Tailwater) (ft) | Hydraulic Grade (ft)    | Flow (Total Out) (cfs)       | Notes                   |                         |
| <None>           | 5,799.88                                | 5,799.88                | 2.85                         |                         |                         |

### Conduit FlexTable: Combined Pipe/Node Report

| Label                      | Start Node                 | Stop Node                   | Branch ID                                     | Branch Element ID | Length (Unified) (ft)   |
|----------------------------|----------------------------|-----------------------------|---|-------------------|-------------------------|
| CO-1                       | EX. B0.7                   | BO7.1                       | 1   | 1                 | 31.0                    |
| CO-3                       | EX. B0.7                   | O-1                         | 1   | 2                 | 33.5                    |
| Upstream Inlet C           | System Intensity (in/h)    | Upstream Inlet Area (acres) | Upstream Structure Flow (Total Surface) (cfs) | System CA (acres) | System Intensity (in/h) |
| (N/A)                      | 8.000                      | (N/A)                       | 0.00  | 0.000             | 8.000                   |
| (N/A)                      | 12.000                     | (N/A)                       | 0.00  | 0.000             | 12.000                  |
| System Rational Flow (cfs) | Flow (cfs)                 | Rise (Unified) (ft)         | Capacity (Full Flow) (cfs)                    | Velocity (ft/s)   | Invert (Start) (ft)     |
| 0.00                       | 5.20                       | 1.00                        | 3.84  | 6.62              | 5,796.29                |
| 0.00                       | 2.85                       | 1.00                        | 468.62  | 3.63              | 5,796.29                |
| Invert (Stop) (ft)         | Slope (Calculated) (ft/ft) | Notes                       |   |                   |                         |
| 5,796.65                   | -0.012                     |                             |   |                   |                         |
| 0.00                       | 173.025                    |                             |   |                   |                         |