

**Final Drainage Report  
For  
Asante' of Scottsdale  
17490 North 93<sup>rd</sup> Street  
Scottsdale, Arizona**

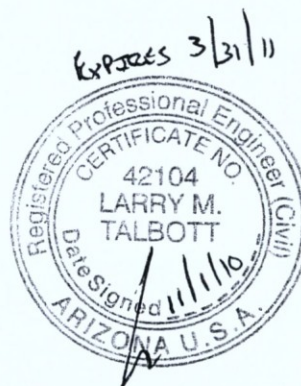
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Review Cycle \_\_\_\_\_ Date 11/4/10*Approved***November 2010**

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FINAL DRAINAGE REPORT  
FOR  
**ASANTE' OF SCOTTSDALE**  
**17490 NORTH 93<sup>RD</sup> STREET**  
**SCOTTSDALE, AZ.**

PREPARED FOR  
  
**TODD & ASSOCIATES**  
**4019 NORTH 44<sup>TH</sup> STREET**  
**PHOENIX, AZ 85018**

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H.E. PROJECT NO. TODD001

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## 1.0 INTRODUCTION

This final drainage report has been prepared under a contract from Todd & Associates architect of the Asante' of Scottsdale project. The purpose of this report is to provide a final drainage analysis, required by the City of Scottsdale, to support this development. Preparation of this report has been done according to the procedures detailed in the City of Scottsdale's *Design Standards and Policy Manual*, (Reference 1).

This development project is located in the northwest corner of 93<sup>rd</sup> Street and East Hidden Spur Trail in the City of Scottsdale, Maricopa County, Arizona. It encompasses Lot 16 of the Corporate Center at DC Ranch. The site is more generally located in a portion of the north half of the south half of section 31, Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian Maricopa County Arizona. Figure 1, in Appendix A, illustrates the location of the project site in relation to the City of Scottsdale street system. Access to the proposed lots is provided from the private 93<sup>rd</sup> Street, East Verde Grove View and East Hidden Spur Trail.

The subject development proposes improvements to lot 16 which is approximately 3.52 acres. The development will include a single building with associated parking, landscape and utility services. Exhibit A, located in the back pocket, illustrates the proposed improvements for the project.

## 2.0 EXISTING DRAINAGE CONDITIONS

In its current condition, the subject lot lies within an undeveloped parcel within the Corporate Center at DC Ranch. The existing terrain includes natural vegetation including cacti, shrubs and short grasses. The project site drains primarily from the northeast to the southwest at an average slope of 1.75%. See the Conceptual Grading and Drainage Plan within the pocket at the back of this report.

The site is included in the "*Master Drainage Plan for Corporate Center at DC Ranch*". Pursuant to the Corporate Center at DC Ranch report the majority of storm water runoff for Lot 16 shall be conveyed towards the existing channel along the west side of the property. Another portion of the site will overland flow into Hidden Spur Trail to the south. The remainder of the stormwater will outfall to an existing stub from the existing catch basin located at the southeast corner of the site. No on-site retention is required for this site. This project shall meet all of the requirements of the overall master drainage report.

The current FEMA Flood Insurance Rate Map (FIRM) for this area, map number 04013C1245H (Effective date Sept 30, 2005) shows the project site is in a flood hazard Zone AO. Zone AO is defined as, "*Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined*" (Depth = 1 ft. Velocity = 4 ft/sec). A copy of the current FIRM panel is provided in Figure 2, Appendix A.



### 3.0 PROPOSED DRAINAGE CONCEPT

The proposed drainage concept is presented in three parts: on-site drainage conveyance, off-site drainage conveyance, and storm water retention. These three sections make up sections 3.1, 3.2, and 3.3 respectively.

#### 3.1 On-site Drainage Conveyance

The majority of the on-site storm water runoff for this project will be conveyed via overland flow, curb openings, storm drain and a catch basin at the western corner of the property. The roof drainage will be collected into storm drains at each piped downspout location and conveyed to the same catch basin at the western corner of the site. This catch basin will be piped into the existing headwall on the existing channel located at the western corner of the property. Per the master drainage report this channel will convey the stormwater to the south through the existing culvert under hidden spur trail then south to its historic overall site outfall.

This area resulted in 1.42 acres of land which is 0.33 acres less than the 1.75 acres shown on the overall drainage report. This results in a  $Q_{100}$  flow of 14.8 cfs which is 3.5 cfs than the 18.3 cfs shown in the overall drainage report. Further investigation of the overall drainage report found that the overall report contained a typo and that the combined areas for this property added up to more acreage than the parcel.

Additional stormwater will be conveyed via overland flow to Hidden Spur Trail where it will continue within the roadway curb and gutter to the existing catch basin as originally intended. The roof drainage for the south eastern half of the roof will be conveyed via overland flow to Hidden Spur Trail. The roof drainage from the southwest half of the building will be collected into storm drains at each piped downspout location and conveyed to the existing roadway catch basin in Hidden Spur Trail. Per the master drainage report this stormwater will be further conveyed via storm drain and channels to its historic outfall.

This area resulted in 1.26 acres and a  $Q_{100}$  of 13.1 cfs which is 0.05 cfs less than the flow specified in the overall drainage report. Again further investigation of the overall drainage report found that the overall report contained a typo and that the combined areas for this property added up to more acreage than the parcel.

The remaining stormwater will be conveyed via overland flow, storm pipe and a catch basin at the southwestern corner of the parking area. The roof drainage will be collected into storm drains at each piped downspout location and conveyed to the same catch basin at the southeastern corner of the parking area. This catch basin is piped to an existing stub from the existing catch basin in 93<sup>rd</sup> Street. This stub was provided by the overall infrastructure improvements for this site. Per the master drainage report this stormwater will be further conveyed via storm drain and channels to its historic outfall.

This area resulted in 0.84 acres and a  $Q_{100}$  of 8.7 cfs which matches the approved overall drainage report.



No retention will be required for this development since provisions for retention and runoff have been accommodated within the Corporate Center at D.C. Ranch. The overall  $Q_{100}$  flow leaving the site is 36.6 cfs which is 3.55 cfs less than the 40.15 cfs shown in the overall drainage report. All of the calculated outfall flows for this project match or are less than the overall drainage report.

Flow calculations for the outfall areas and catch basin inlets are provided in Appendix B. Storm drain and roof leader sizing is also provided in Appendix B. Additional catch basins were required at the western and eastern collection areas to maintain weir depths less than 6".

It has been requested by the city during previous reviews of other projects within the Corporate Center at DC Ranch that the master drainage report not be included as an appendix to the individual project reports. The master report is on file at the city and that copy would be used for the review of the individual projects.

### **3.2 Off-site Drainage Conveyance**

There is an existing drainage channel that borders this project along the northwest property line. This channel was constructed with the overall infrastructure for the Corporate Center at DC Ranch project. The channel conveys the 100-yr flow of 130 cfs which is entirely contained within the existing channel and the drainage and multi use trail easement. No improvements are proposed within the channel and/or easement. The adjacent channel high water is a 1593.53, which is 1.72' below the proposed building finish floor.

The site is protected from additional off-site flows by East Verde Grove View to the north, 93<sup>rd</sup> Street to the east and the existing channel to the west of the subject development collect and convey water around the site per the master drainage report.

### **3.3 Storm Water Retention**

Per the Corporate Center at DC Ranch master drainage report all storm water shall be conveyed to the outfall locations at the existing channel, 93<sup>rd</sup> Street and Hidden Spur Trail. From there it will be conveyed per the master drainage report. No on-site retention is required for this project.

## **4.0 FLOOD ZONE**

As mentioned in the existing conditions section of this report the site is located in a Flood Hazard Zone AO. This required the established finish floor elevation of 1595.25 to be set at an elevation which is a minimum of 12-inches above the existing high point elevation within the building envelope area. Due to the site characteristics and flood zone requirements the building finish floor is considerably higher than the existing grades along the south side of the building. The southern portion of the site has been graded to accommodate these conditions. The wall footings have been extended as necessary to avoid retaining walls.



## 5.0 CONCLUSIONS

Based on the results of this study, it can be concluded that:

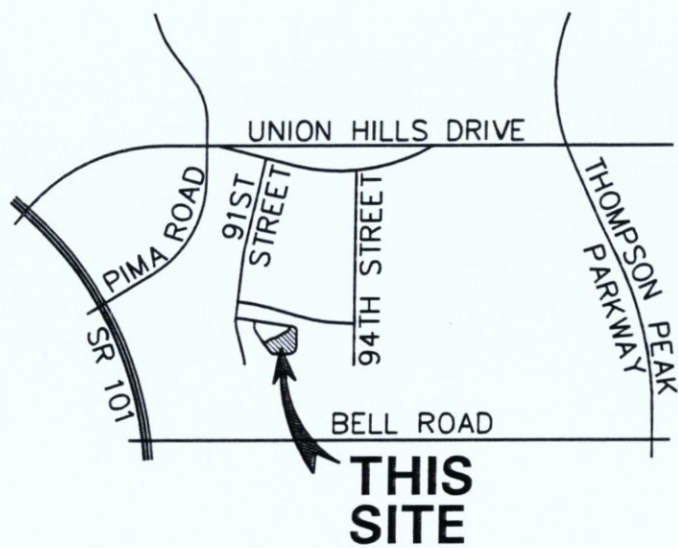
- The drainage improvements have been designed in accordance with requirements put forth in the Corporate Center at DC Ranch Drainage Report.
- The drainage improvements have been designed according to requirements put forth in the City of Scottsdale's *Design Standards and Policy Manual*.

## 6.0 REFERENCES

- 1) City of Scottsdale's *Design Standards and Policy Manual* as accessed from the City of Scottsdale website at <http://www.ci.scottsdale.az.us.dspm>.
- 2) Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, 1992.
- 3) Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, 1991.
- 4) Master Drainage Report for the Corporate Center at DC Ranch prepared by Hunter Engineering P.C. dated June 2007.

**APPENDIX A**  
**FIGURES**





VICINITY MAP  
FIGURE 1

## LEGEND



**SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.



### FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.



### OTHER FLOOD AREAS

- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.



### OTHER AREAS

- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.



### COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS



### OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- \_\_\_\_\_ 1% annual chance floodplain boundary
- \_\_\_\_\_ 0.2% annual chance floodplain boundary
- \_\_\_\_\_ Floodway boundary
- \_\_\_\_\_ Zone D boundary
- ..... CBRS and OPA boundary

## MAP LEGEND

**NFIP**

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 1245H**

## **FIRM FLOOD INSURANCE RATE MAP MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS**

**PANEL 1245 OF 4350**

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

### CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1245	H
PHOENIX, CITY OF	040051	1245	H
SCOTTSDALE, CITY OF	045012	1245	H

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



**MAP NUMBER  
04013C1245H  
MAP REVISED**

**SEPTEMBER 30, 2005**

Federal Emergency Management Agency

## FIRM PANEL







**APPENDIX B**  
**DRAINAGE AREA CALCULATIONS**



$$V = 2.65$$

# Hydrologic Design Data Record

## Rational Method

### LOCATION DATA

Project: Asante' of Scottsdale

Concentration Point: BA2

Contributory areas

### DESIGN DATA

Drainage Area (LF) 0.84 Acres

Drainage Length 140.00 Feet

Elevation

Top of Drainage Area 1597.75 Feet

At Structure 1593.25 Feet

Drainage Area Slope 3.214 Percent

Velocity (V) 2.65 Ft / Sec

### DESIGN COMPUTATIONS

Runoff Coefficient 0.90

Time of Concentration, Tc 5 Minutes

Frequency	2	5	10	25	50	100	Years
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	2.8		4.6		7.3	8.7	Ft <sup>3</sup> / Sec

Computed By: LMT

Date: 10/13/2010

Checked By: LMT

Date: 10/13/2010

### TIME OF CONCENTRATION

$$T_c = 0 + LF / (V * 60)$$

$$T_c = 0.8805$$

If < 5 minutes, use 5

$$LF = 140.00$$

$$V = 2.65$$



$V = 2.65$

HEC-12  
(3) MAG Detail 535



HEC-12  
(2) MAG Detail 535



# Hydrologic Design Data Record

## Rational Method

### LOCATION DATA

Project: Asante' of Scottsdale

Concentration Point: CB3

Contributory areas

### DESIGN DATA

Drainage Area (LF) 0.09 Acres

Drainage Length 45.00 Feet

Elevation

Top of Drainage Area 1594.50 Feet

At Structure 1592.00 Feet

Drainage Area Slope 5.556 Percent

Velocity (V) 2.65 Ft / Sec

### DESIGN COMPUTATIONS

Runoff Coefficient 0.90

Time of Concentration, Tc 5 Minutes

Frequency	2	5	10	25	50	100	Years
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.3		0.5		0.8	0.9	Ft <sup>3</sup> / Sec

Computed By: LMT

Date: 10/13/2010

Checked By: LMT

Date: 10/13/2010

### GRATE INLET CALCULATIONS

Calculated as an Orifice

$$Q = C_o \times A \times (2 \times g \times d)^{0.5} \text{ (80\%)}$$

C = 80%  
 Q100 = 0.94 cfs  
 C<sub>o</sub> = 0.67  
 A = 8.55 sqft  
 d = 0.00 ft

HEC-12  
 MAG Detail 535

Calculated as a Weir

$$Q = (C_w \times P \times d^{1.5}) \text{ (80\%)}$$

C = 80%  
 Q100 = 0.94 cfs  
 C<sub>w</sub> = 2.00  
 P = 11.3 ft  
 d = 0.14 ft

HEC-12  
 MAG Detail 535

HEC-12  
MAG Detail 535



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA1**DESIGN DATA**Drainage Area 701 Sq.FtDrainage Length        Feet

Elevation

Top of Drainage Area        FeetAt Exit Point        FeetDrainage Area Slope        - PercentVelocity        Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.05		0.09		0.14	0.16	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA2**DESIGN DATA**Drainage Area 628 Sq.FtDrainage Length          Feet

Elevation

Top of Drainage Area          FeetAt Exit Point          FeetDrainage Area Slope          PercentVelocity          Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.05		0.08		0.13	0.14	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA3**DESIGN DATA**Drainage Area 790 Sq.FtDrainage Length        Feet

Elevation

Top of Drainage Area        FeetAt Exit Point        FeetDrainage Area Slope        - PercentVelocity        Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.06		0.10		0.16	0.18	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA4**DESIGN DATA**Drainage Area 730 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.06		0.09		0.15	0.17	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA5**DESIGN DATA**Drainage Area 428 Sq.FtDrainage Length - Feet

Elevation

Top of Drainage Area - FeetAt Exit Point - FeetDrainage Area Slope - PercentVelocity - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.03		0.05		0.09	0.10	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA6**DESIGN DATA**Drainage Area 718 Sq.FtDrainage Length - Feet

Elevation

Top of Drainage Area - FeetAt Exit Point - FeetDrainage Area Slope - PercentVelocity - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.06		0.09		0.14	0.16	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA7**DESIGN DATA**Drainage Area 2333 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.18		0.29		0.47	0.54	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA8**DESIGN DATA**Drainage Area 565 Sq.FtDrainage Length      Feet

Elevation

Top of Drainage Area      FeetAt Exit Point      FeetDrainage Area Slope      - PercentVelocity      Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.04		0.07		0.11	0.13	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA9**DESIGN DATA**Drainage Area 730 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.06		0.09		0.15	0.17	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA10**DESIGN DATA**Drainage Area 637 Sq.FtDrainage Length          - Feet

Elevation

Top of Drainage Area          - FeetAt Exit Point          - FeetDrainage Area Slope          - PercentVelocity          - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.05		0.08		0.13	0.15	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA11**DESIGN DATA**Drainage Area 779 Sq.FtDrainage Length        Feet

Elevation

Top of Drainage Area        FeetAt Exit Point        FeetDrainage Area Slope        - PercentVelocity        Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.06		0.10		0.16	0.18	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA12**DESIGN DATA**Drainage Area 696 Sq.FtDrainage Length          - Feet

Elevation

Top of Drainage Area          - FeetAt Exit Point          - FeetDrainage Area Slope          - PercentVelocity          - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.05		0.09		0.14	0.16	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA13**DESIGN DATA**Drainage Area 256 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.02		0.03		0.05	0.06	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA14**DESIGN DATA**Drainage Area 250 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.02		0.03		0.05	0.06	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA15**DESIGN DATA**Drainage Area 948 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.07		0.12		0.19	0.22	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA16**DESIGN DATA**Drainage Area 1067 Sq.FtDrainage Length          - Feet

Elevation

Top of Drainage Area          - FeetAt Exit Point          - FeetDrainage Area Slope          - PercentVelocity          - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.08		0.13		0.21	0.24	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA17**DESIGN DATA**Drainage Area 884 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.07		0.11		0.18	0.20	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**

Project: Asante' of Scottsdale

Concentration Point: RA18

**DESIGN DATA**

Drainage Area 992 Sq.Ft

Drainage Length        - Feet

Elevation

Top of Drainage Area        - Feet

At Exit Point        - Feet

Drainage Area Slope        - Percent

Velocity        - Ft / Sec

**DESIGN COMPUTATIONS**

Runoff Coefficient 0.90

Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.08		0.13		0.20	0.23	Ft <sup>3</sup> / Sec

Computed By: LMT

Date: 8/11/2010

Checked By: LMT

Date: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA19**DESIGN DATA**Drainage Area 4488 Sq.FtDrainage Length          - Feet

Elevation

Top of Drainage Area          - FeetAt Exit Point          - FeetDrainage Area Slope          - PercentVelocity          - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.35		0.57		0.90	1.03	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA20**DESIGN DATA**Drainage Area 536 Sq.FtDrainage Length        - Feet

Elevation

Top of Drainage Area        - FeetAt Exit Point        - FeetDrainage Area Slope        - PercentVelocity        - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.04		0.07		0.11	0.12	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA21**DESIGN DATA**Drainage Area 1395 Sq.FtDrainage Length          - Feet

Elevation

Top of Drainage Area          - FeetAt Exit Point          - FeetDrainage Area Slope          - PercentVelocity          - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.11		0.18		0.28	0.32	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010

**LOCATION DATA**Project: Asante' of ScottsdaleConcentration Point: RA22**DESIGN DATA**Drainage Area 914 Sq.FtDrainage Length          - Feet

Elevation

Top of Drainage Area          - FeetAt Exit Point          - FeetDrainage Area Slope          - PercentVelocity          - Ft / Sec**DESIGN COMPUTATIONS**Runoff Coefficient 0.90Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.07		0.12		0.18	0.21	Ft <sup>3</sup> / Sec

Computed By: LMTDate: 8/11/2010Checked By: LMTDate: 8/11/2010



**LOCATION DATA**

Project: Asante' of Scottsdale

Concentration Point: RA23

**DESIGN DATA**

Drainage Area 491 Sq.Ft

Drainage Length        - Feet

Elevation

Top of Drainage Area        - Feet

At Exit Point        - Feet

Drainage Area Slope        - Percent

Velocity        - Ft / Sec

**DESIGN COMPUTATIONS**

Runoff Coefficient 0.90

Time of Concentration, Tc 5 Minutes

<b>Frequency</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>Years</b>
Rainfall Intensity	3.75		6.1		8.1	9.25	Inches/Hr
Peak Discharge	0.04		0.06		0.10	0.11	Ft <sup>3</sup> / Sec

Computed By: LMT

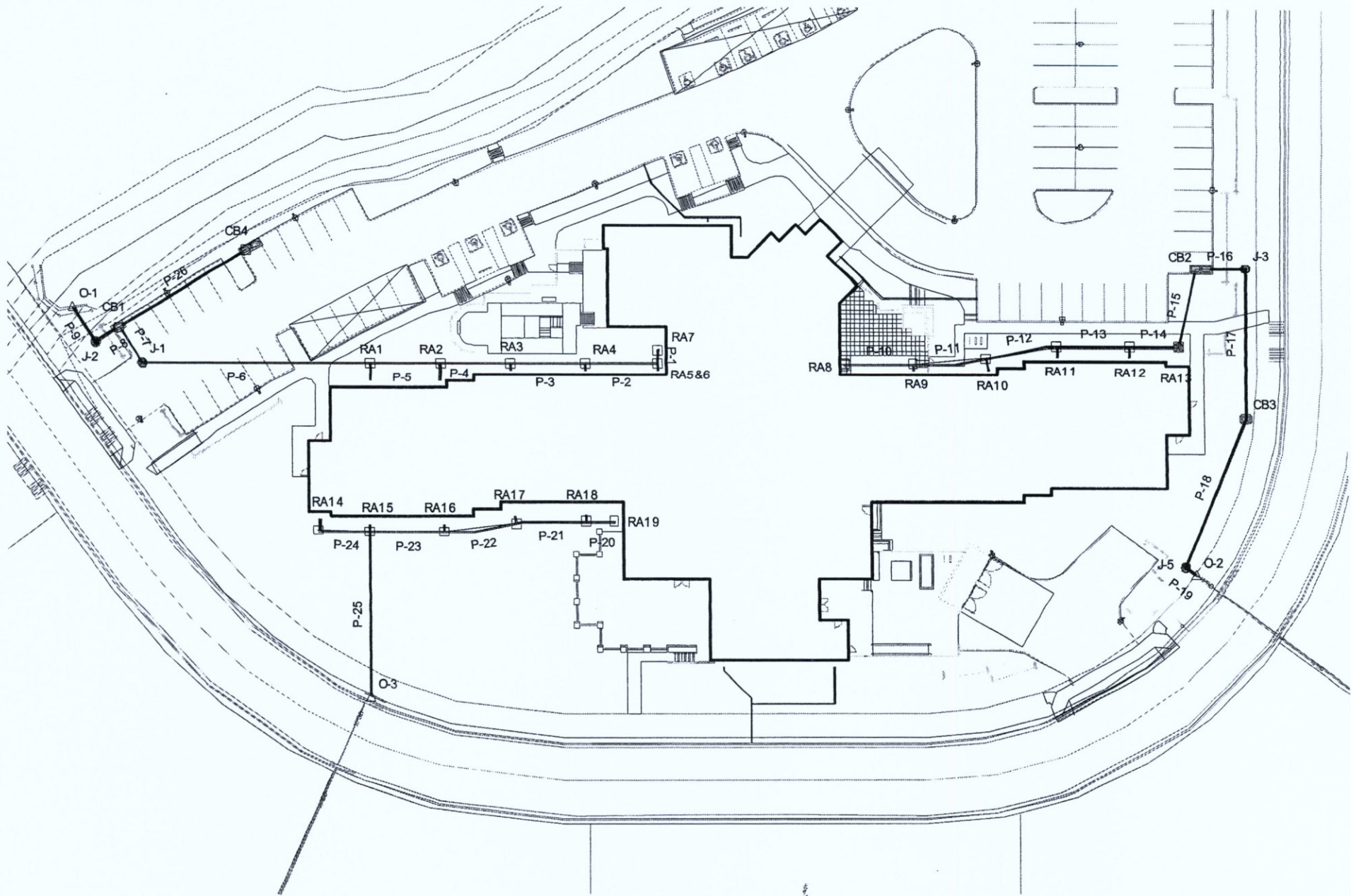
Date: 8/11/2010

Checked By: LMT

Date: 8/11/2010

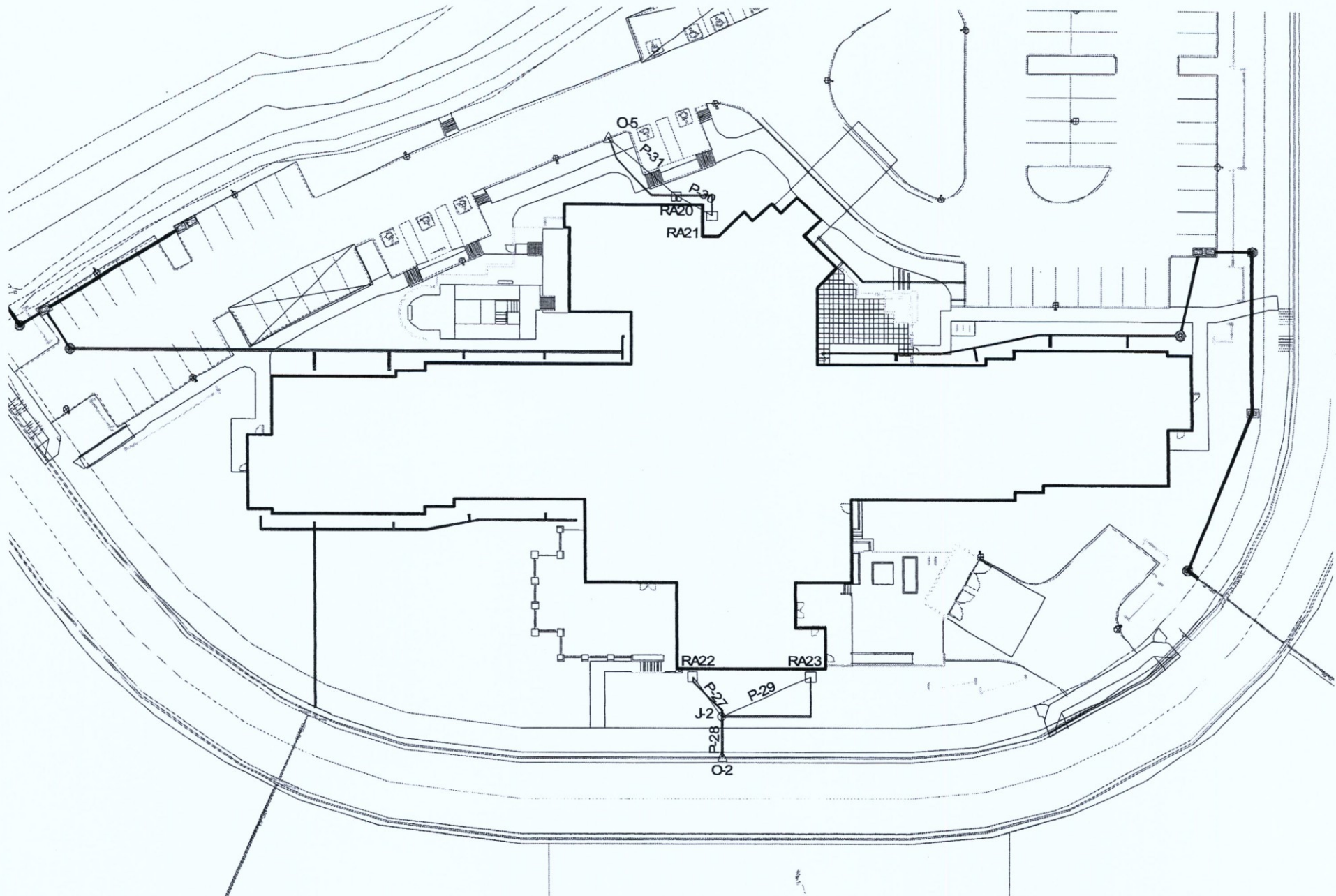
**APPENDIX C**  
**STORM DRAIN CALCULATIONS**

## Scenario: Base





## Scenario: Base

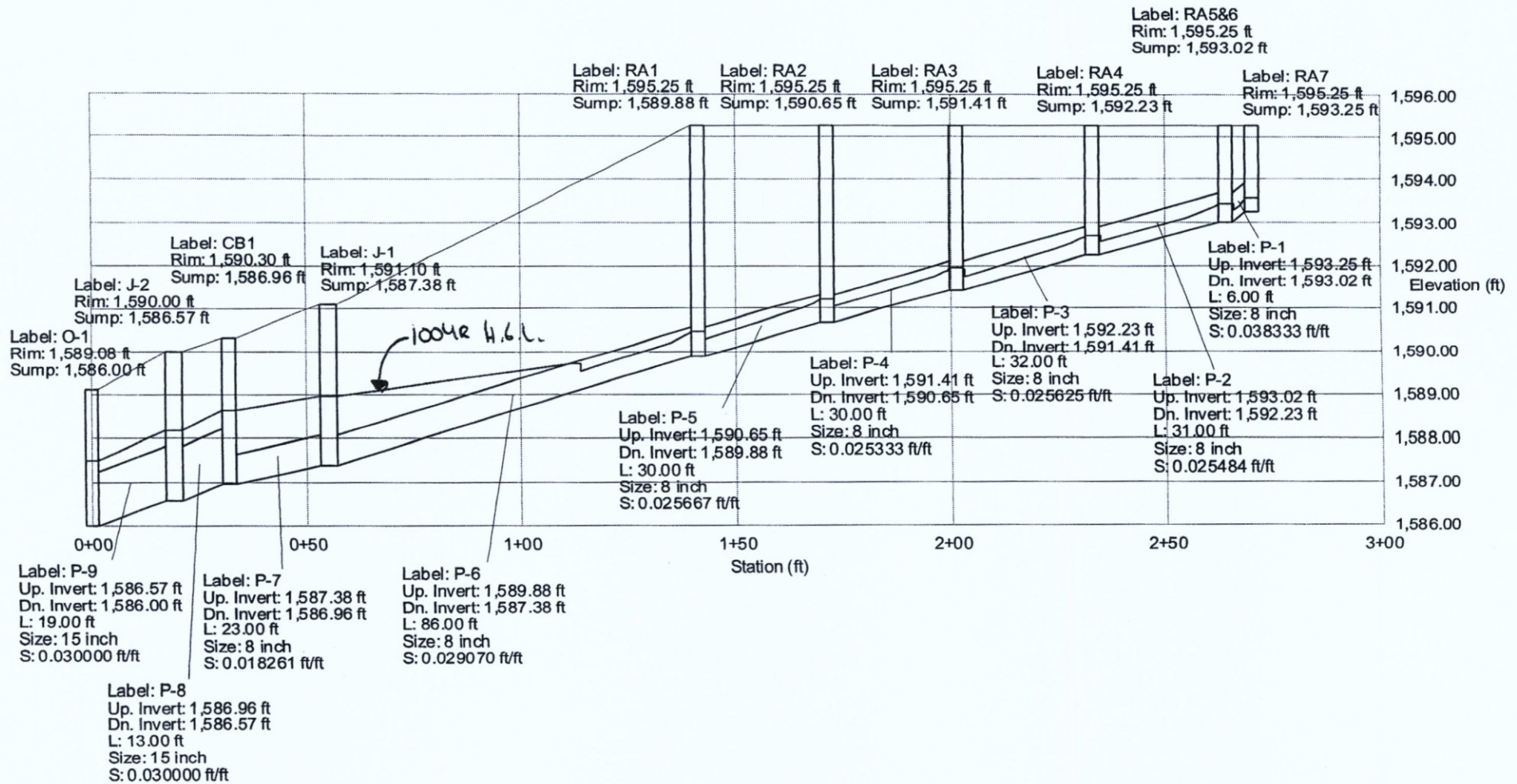


Title: Asante  
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( Hunter Engineering  
© Haestad Methods, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

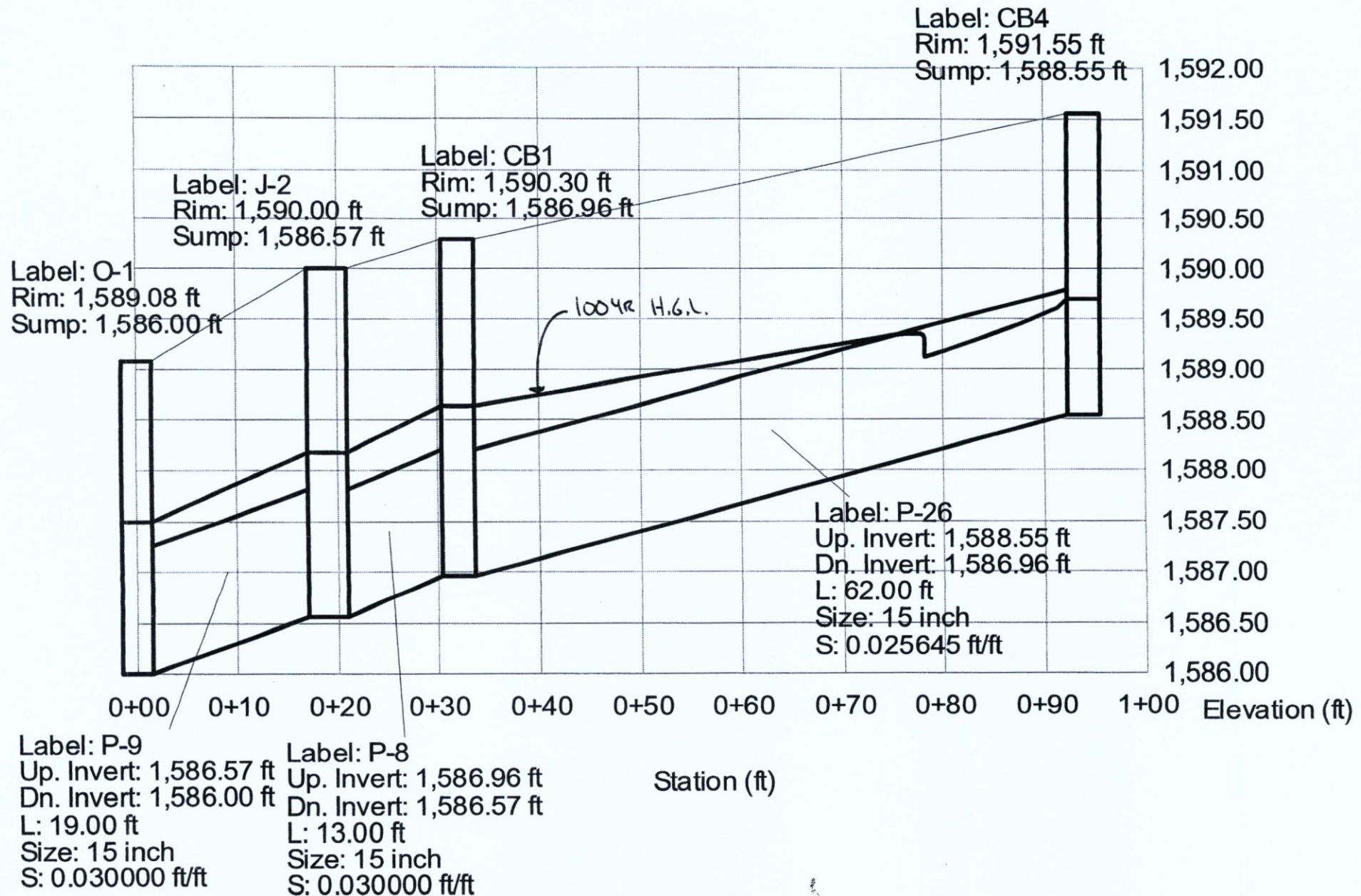
Project Engineer: Jeff Hunter  
StormCAD v4.1.1 [4.2014a]  
Page 1 of 1

# Profile Scenario: Base



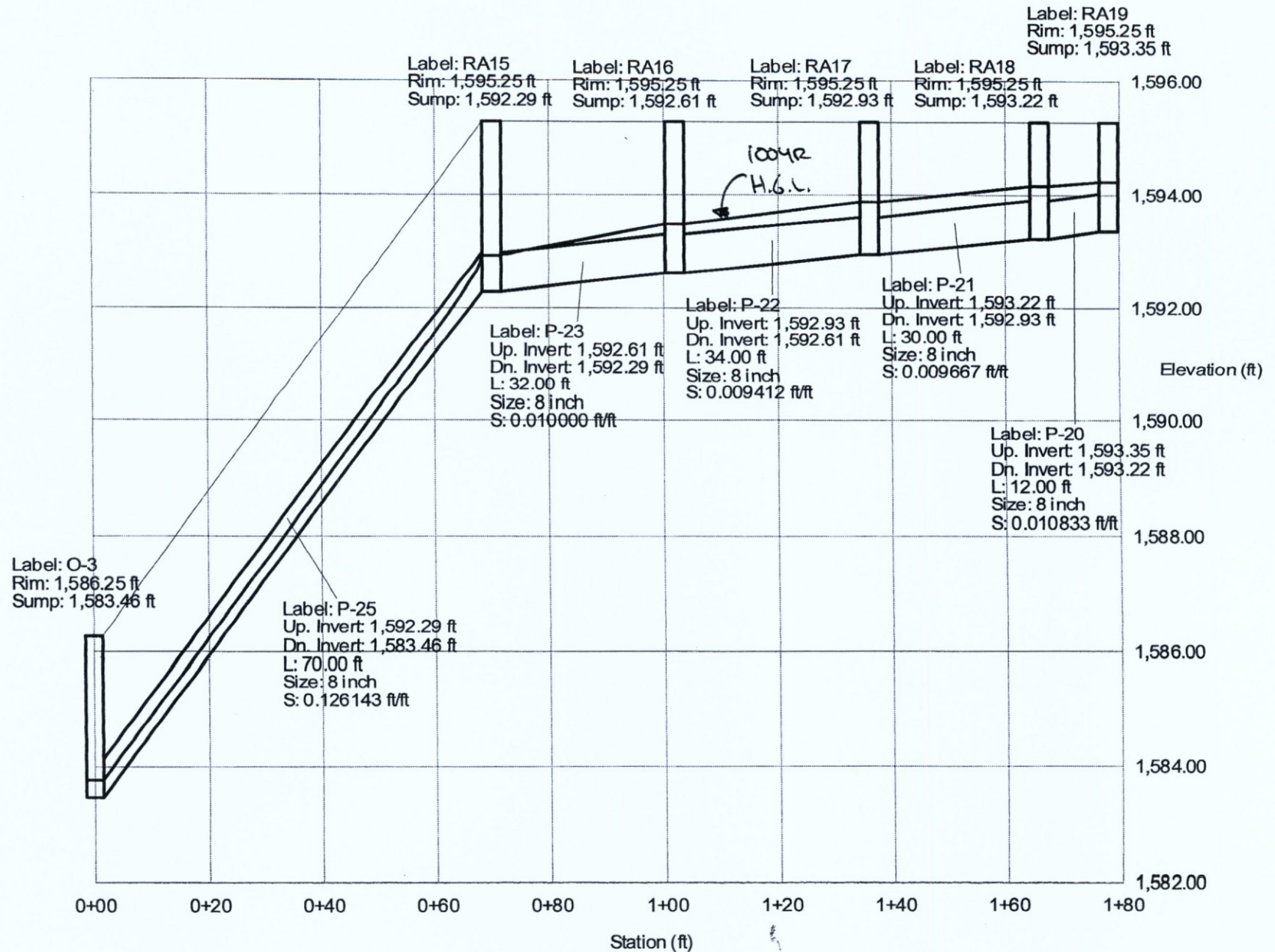


**Profile**  
**Scenario: Base**

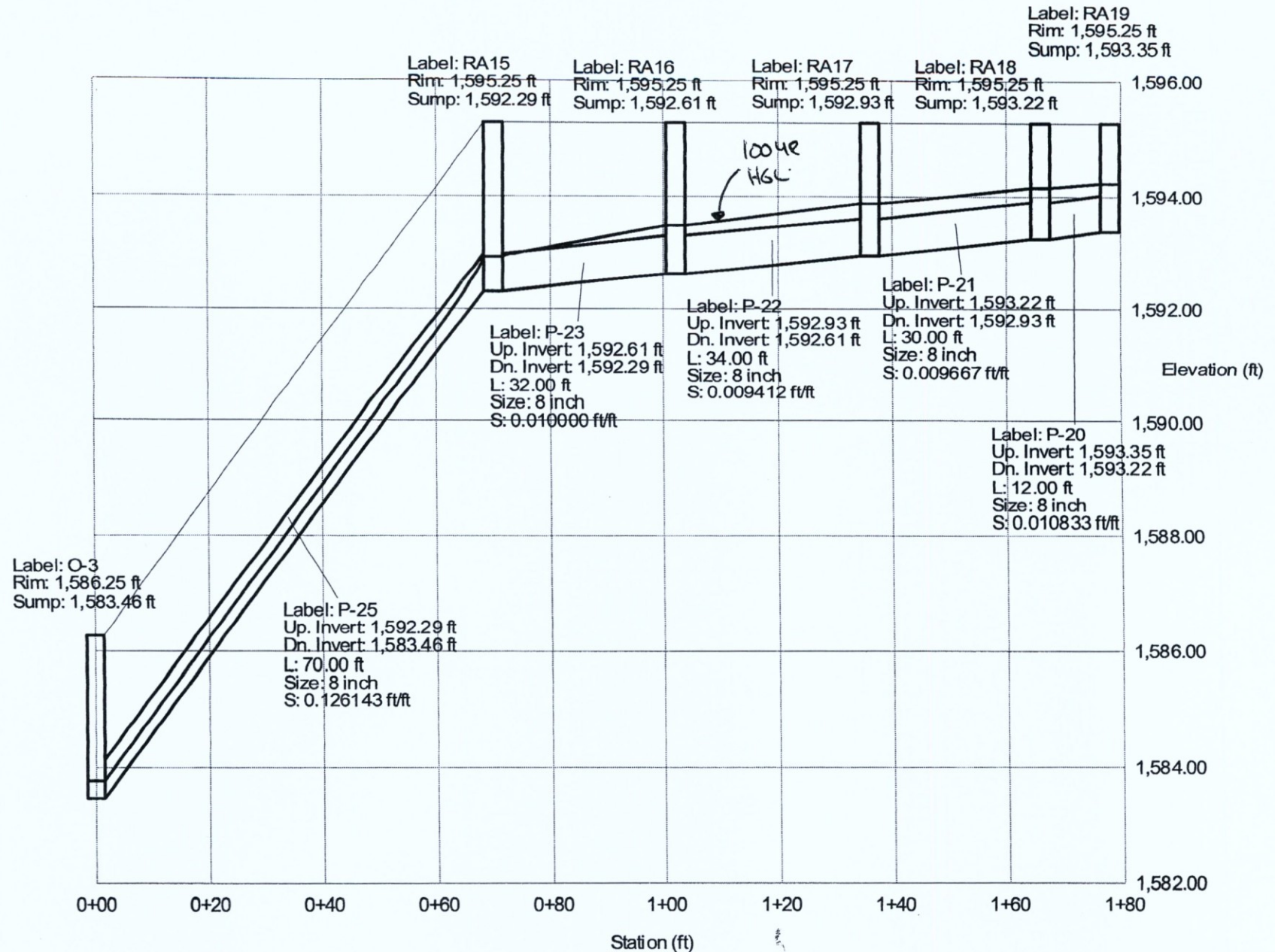




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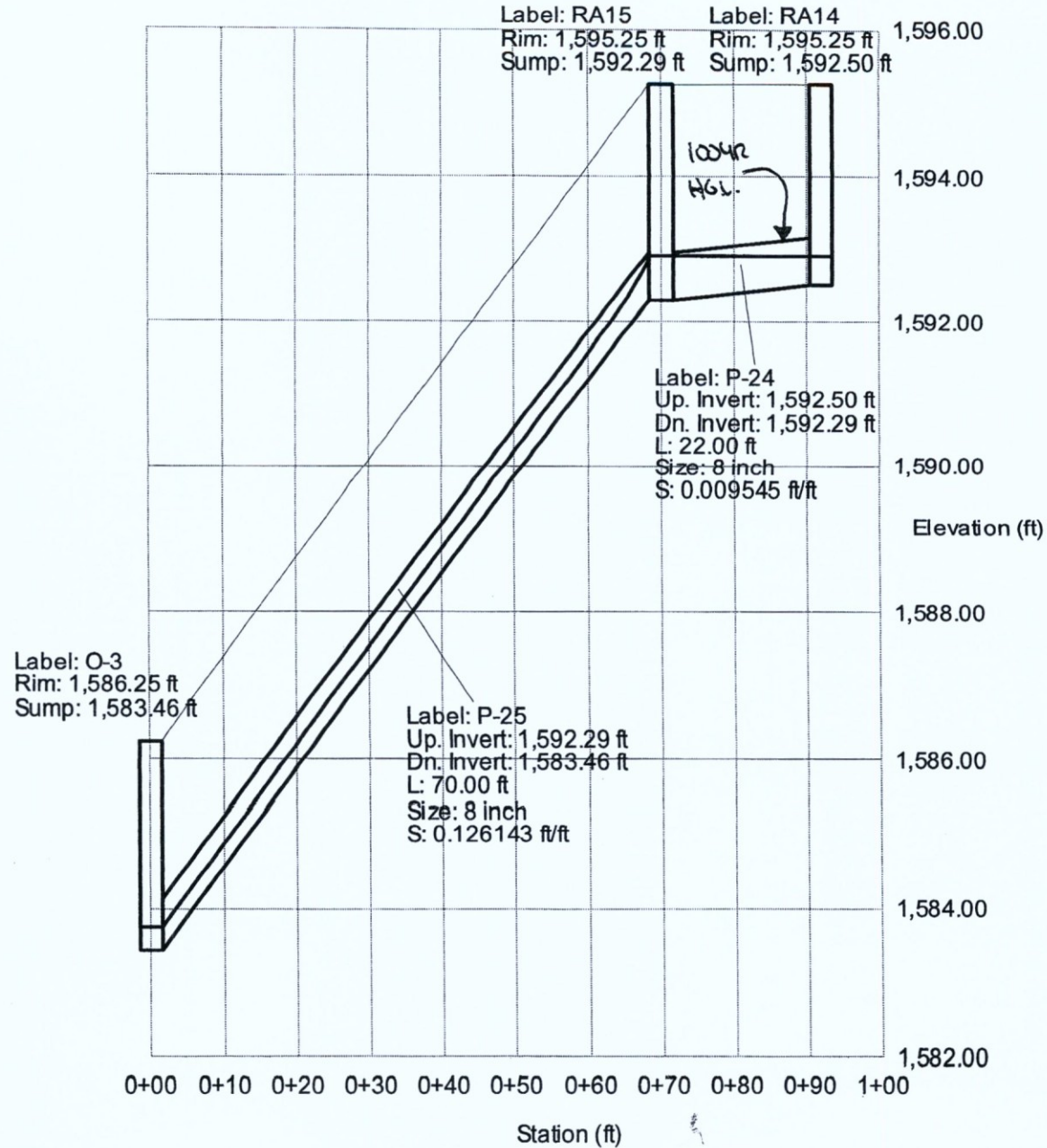


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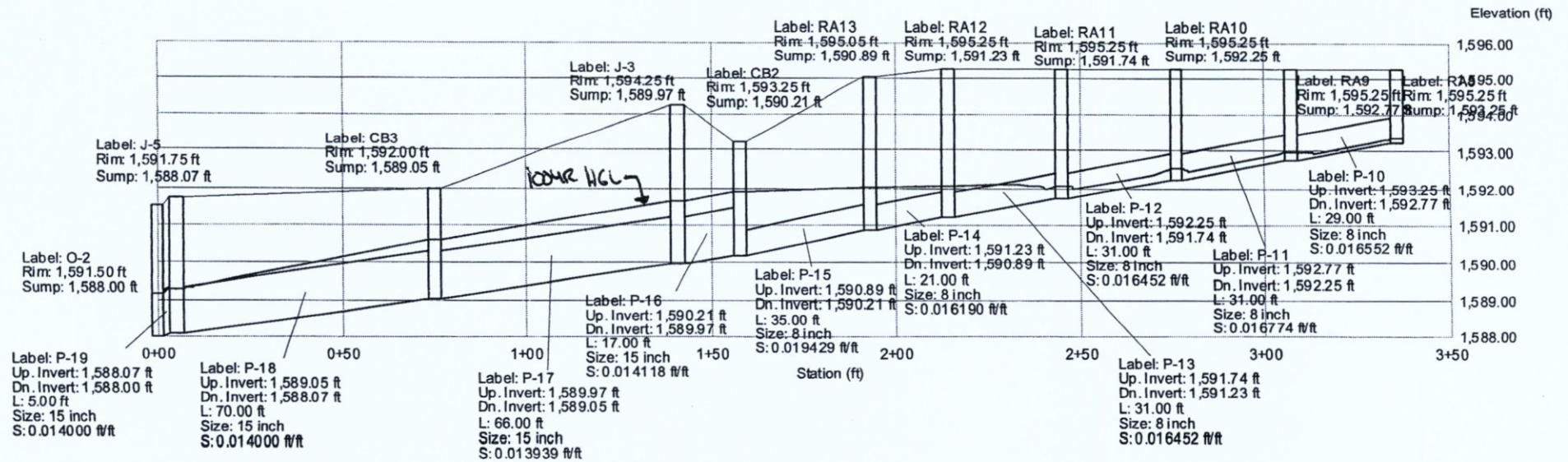




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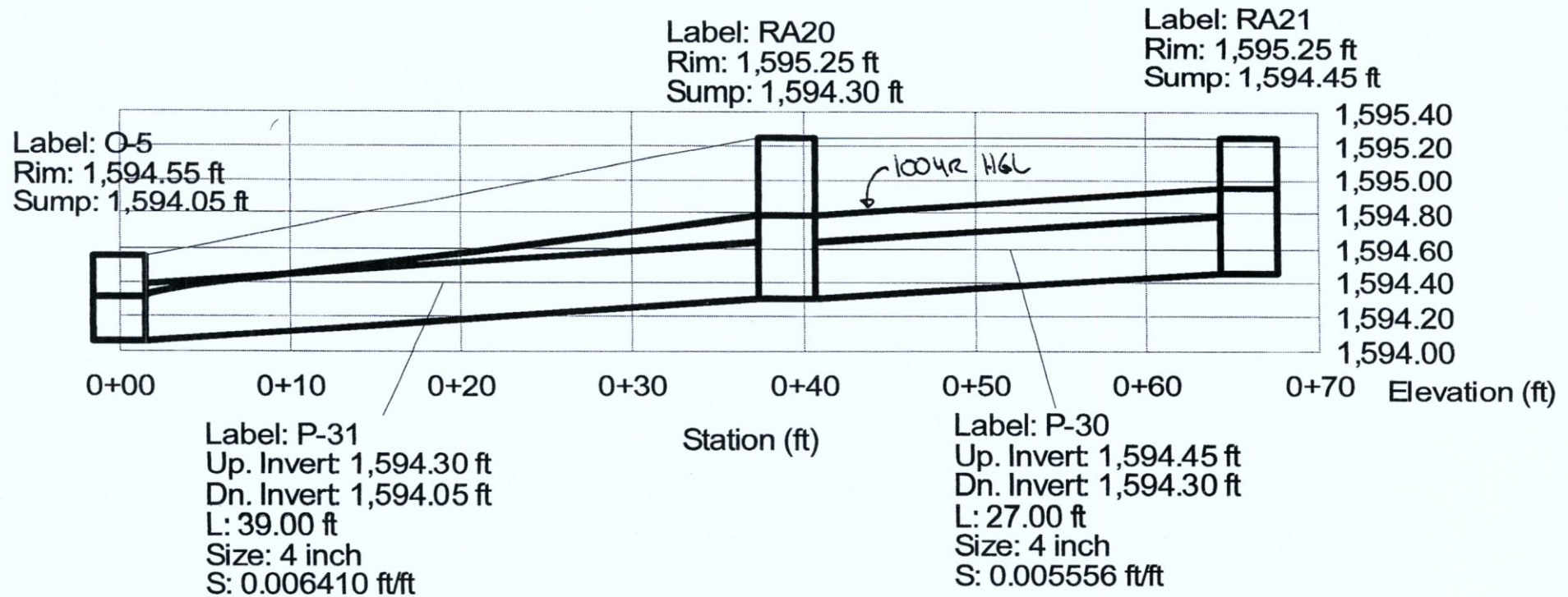


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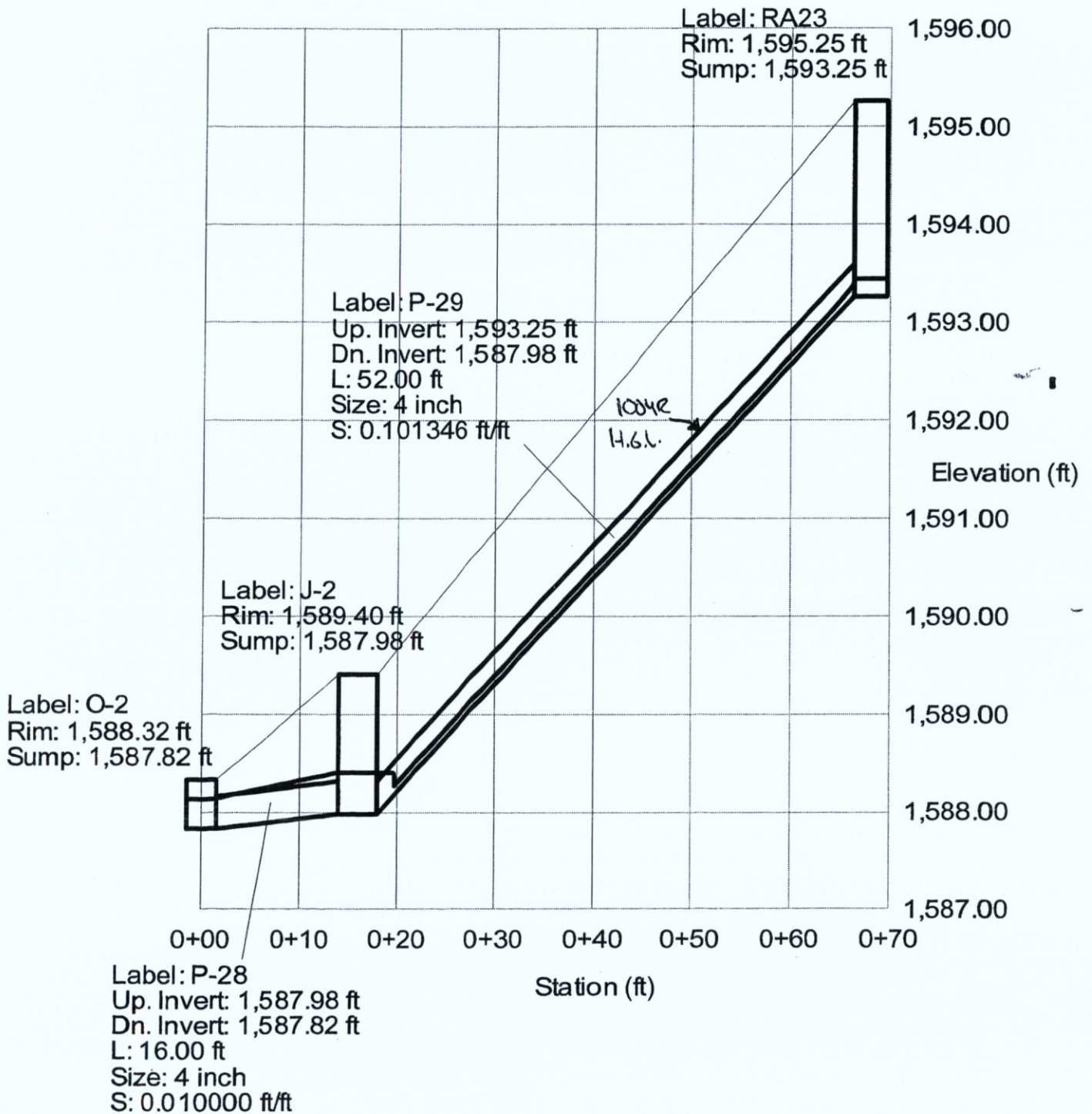




**Profile**  
**Scenario: Base**

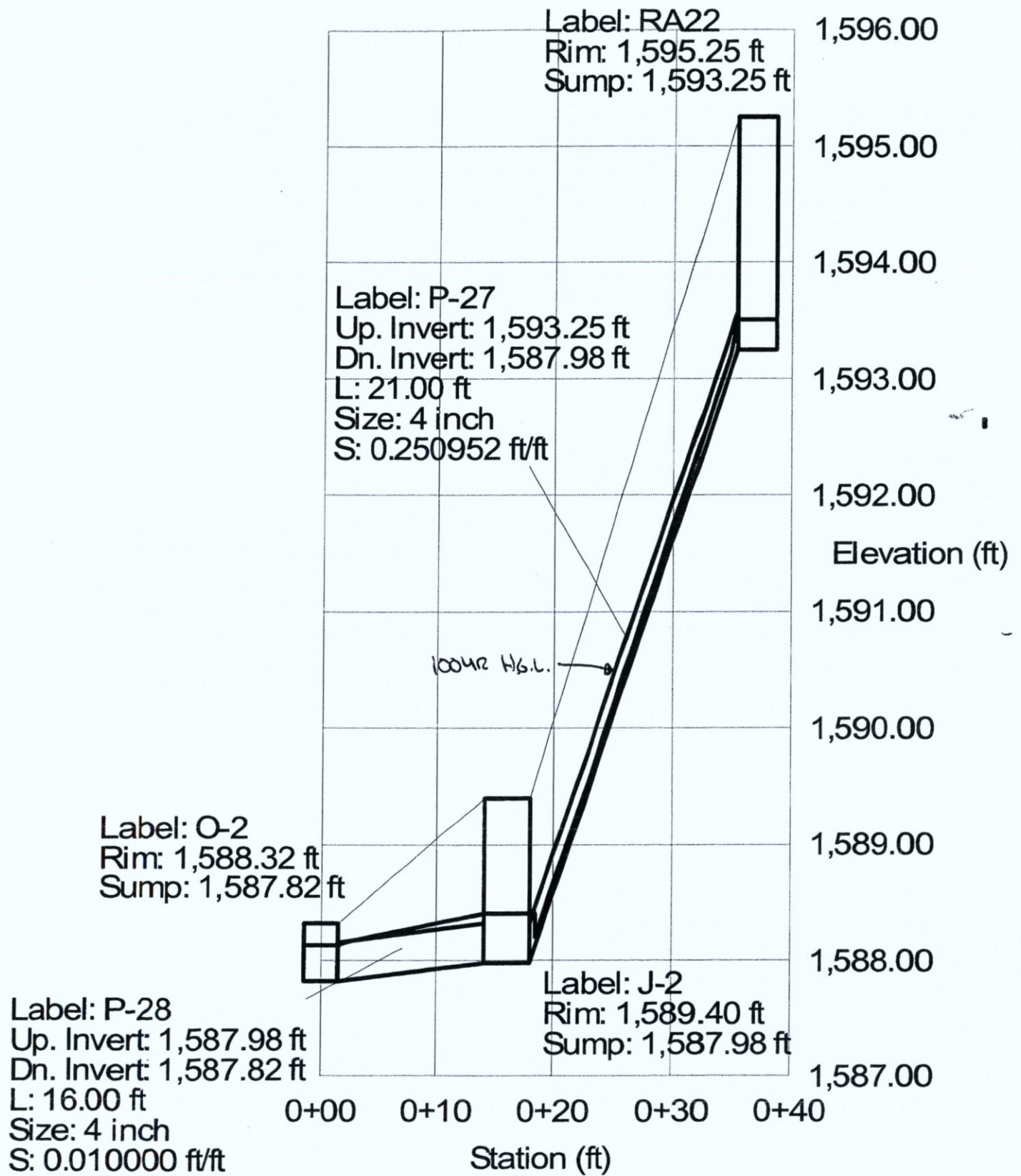


Profile  
Scenario: Base





**Profile**  
**Scenario: Base**



# Scenario: Base

## Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-1	RA7	RA5&6	0.54	6.00	0.038333	8 inch	0.012	2.56	1,593.25	1,593.02	1,595.25	1,595.25	1,593.59	1,593.46
P-2	RA5&6	RA4	0.86	31.00	0.025484	8 inch	0.012	2.09	1,593.02	1,592.23	1,595.25	1,595.25	1,593.46	1,592.71
P-3	RA4	RA3	1.03	32.00	0.025625	8 inch	0.012	2.10	1,592.23	1,591.41	1,595.25	1,595.25	1,592.71	1,591.93
P-4	RA3	RA2	1.21	30.00	0.025333	8 inch	0.012	2.08	1,591.41	1,590.65	1,595.25	1,595.25	1,591.93	1,591.20
P-5	RA2	RA1	1.35	30.00	0.025667	8 inch	0.012	2.10	1,590.65	1,589.88	1,595.25	1,595.25	1,591.20	1,590.45
P-6	RA1	J-1	1.51	86.00	0.029070	8 inch	0.012	2.23	1,589.88	1,587.38	1,595.25	1,591.10	1,590.45	1,588.95
P-26	CB4	CB1	8.80	62.00	0.025645	15 inch	0.012	11.21	1,588.55	1,586.96	1,591.55	1,590.30	1,589.70	1,588.64
P-7	J-1	CB1	1.51	23.00	0.018261	8 inch	0.012	1.77	1,587.38	1,586.96	1,591.10	1,590.30	1,588.95	1,588.64
P-8	CB1	J-2	13.21	13.00	0.030000	15 inch	0.012	12.12	1,586.96	1,586.57	1,590.30	1,590.00	1,588.64	1,588.18
P-9	J-2	O-1	13.21	19.00	0.030000	15 inch	0.012	12.12	1,586.57	1,586.00	1,590.00	1,589.08	1,588.18	1,587.50
P-10	RA8	RA9	0.06	29.00	0.016552	8 inch	0.012	1.68	1,593.25	1,592.77	1,595.25	1,595.25	1,593.36	1,592.99
P-11	RA9	RA10	0.23	31.00	0.016774	8 inch	0.012	1.70	1,592.77	1,592.25	1,595.25	1,595.25	1,592.99	1,592.54
P-12	RA10	RA11	0.38	31.00	0.016452	8 inch	0.012	1.68	1,592.25	1,591.74	1,595.25	1,595.25	1,592.54	1,592.09
P-13	RA11	RA12	0.56	31.00	0.016452	8 inch	0.012	1.68	1,591.74	1,591.23	1,595.25	1,595.25	1,592.09	1,592.08
P-14	RA12	RA13	0.72	21.00	0.016190	8 inch	0.012	1.67	1,591.23	1,590.89	1,595.25	1,595.05	1,592.08	1,592.01
P-15	RA13	CB2	0.78	35.00	0.019429	8 inch	0.012	1.82	1,590.89	1,590.21	1,595.05	1,593.25	1,592.01	1,591.89
P-16	CB2	J-3	8.68	17.00	0.014118	15 inch	0.012	8.31	1,590.21	1,589.97	1,593.25	1,594.25	1,591.89	1,591.63
P-17	J-3	CB3	8.68	66.00	0.013939	15 inch	0.012	8.26	1,589.97	1,589.05	1,594.25	1,592.00	1,591.63	1,590.61
P-18	CB3	J-5	9.58	70.00	0.014000	15 inch	0.012	8.28	1,589.05	1,588.07	1,592.00	1,591.75	1,590.61	1,589.30
P-19	J-5	O-2	9.58	5.00	0.014000	15 inch	0.012	8.28	1,588.07	1,588.00	1,591.75	1,591.50	1,589.30	1,589.17
P-20	RA19	RA18	1.03	12.00	0.010833	8 inch	0.012	1.36	1,593.35	1,593.22	1,595.25	1,595.25	1,594.23	1,594.15
P-21	RA18	RA17	1.26	30.00	0.009667	8 inch	0.012	1.29	1,593.22	1,592.93	1,595.25	1,595.25	1,594.15	1,593.88
P-22	RA17	RA16	1.46	34.00	0.009412	8 inch	0.012	1.27	1,592.93	1,592.61	1,595.25	1,595.25	1,593.88	1,593.45
P-24	RA14	RA15	0.06	22.00	0.009545	8 inch	0.012	1.28	1,592.50	1,592.29	1,595.25	1,595.25	1,592.91	1,592.91
P-23	RA16	RA15	1.68	32.00	0.010000	8 inch	0.012	1.31	1,592.61	1,592.29	1,595.25	1,595.25	1,593.45	1,592.91
P-25	RA15	O-3	1.96	70.00	0.126143	8 inch	0.012	4.65	1,592.29	1,583.46	1,595.25	1,586.25	1,592.91	1,583.76



# Scenario: Base

## Pipe Report

Label	Upstream Node	Downstream Node	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)
P-30	RA21	RA20	0.32	27.00	0.005556	4 inch	0.012	0.31	1,594.45	1,594.30	1,595.25	1,595.25	1,594.95	1,594.79
P-31	RA20	O-5	0.44	39.00	0.006410	4 inch	0.012	0.33	1,594.30	1,594.05	1,595.25	1,594.55	1,594.79	1,594.31
P-29	RA23	J-2	0.11	52.00	0.101346	4 inch	0.010	0.79	1,593.25	1,587.98	1,595.25	1,589.40	1,593.44	1,588.41
P-27	RA22	J-2	0.21	21.00	0.250952	4 inch	0.010	1.24	1,593.25	1,587.98	1,595.25	1,589.40	1,593.51	1,588.41
P-28	J-2	O-2	0.32	16.00	0.010000	4 inch	0.010	0.25	1,587.98	1,587.82	1,589.40	1,588.32	1,588.41	1,588.13

## Scenario: Base

### Inlet Report

Label	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Additional Flow (cfs)
RA7	1,595.25	1,595.25	1,593.25	0.54
RA5	1,595.25	1,595.25	1,593.02	0.32
RA4	1,595.25	1,595.25	1,592.23	0.17
RA3	1,595.25	1,595.25	1,591.41	0.18
RA2	1,595.25	1,595.25	1,590.65	0.14
RA1	1,595.25	1,595.25	1,589.88	0.16
CB4	1,591.55	1,591.55	1,588.55	8.80
CB1	1,590.30	1,590.30	1,586.96	2.90
RA8	1,595.25	1,595.25	1,593.25	0.06
RA9	1,595.25	1,595.25	1,592.77	0.17
RA10	1,595.25	1,595.25	1,592.25	0.15
RA11	1,595.25	1,595.25	1,591.74	0.18
RA12	1,595.25	1,595.25	1,591.23	0.16
RA13	1,595.05	1,595.05	1,590.89	0.06
CB2	1,593.25	1,593.25	1,590.21	7.90
CB3	1,592.00	1,592.00	1,589.05	0.90
RA19	1,595.25	1,595.25	1,593.35	1.03
RA18	1,595.25	1,595.25	1,593.22	0.23
RA17	1,595.25	1,595.25	1,592.93	0.20
RA14	1,595.25	1,595.25	1,592.50	0.06
RA16	1,595.25	1,595.25	1,592.61	0.22
RA15	1,595.25	1,595.25	1,592.29	0.22

Title: Asante

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Project Engineer: Jeff Hunter

StormCAD v4.1.1 [4.2014a]

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## Scenario: Base

### Inlet Report

Label	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Additional Flow (cfs)
RA21	1,595.25	1,595.25	1,594.45	0.32
RA20	1,595.25	1,595.25	1,594.30	0.12
RA23	1,595.25	1,595.25	1,593.25	0.11
RA22	1,595.25	1,595.25	1,593.25	0.21

## Scenario: Base

### Junction Report

Label	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Bolted Cover?	Structure Diameter (ft)
J-1	,591.1	,591.1	,587.3	false	4.00
J-2	,590.0	,590.0	,586.57	false	4.00
J-3	,594.2	,594.2	,589.97	false	4.00
J-5	,591.7	,591.7	,588.07	false	4.00