

PROJECT RIO PRELIMINARY DRAINAGE PLAN

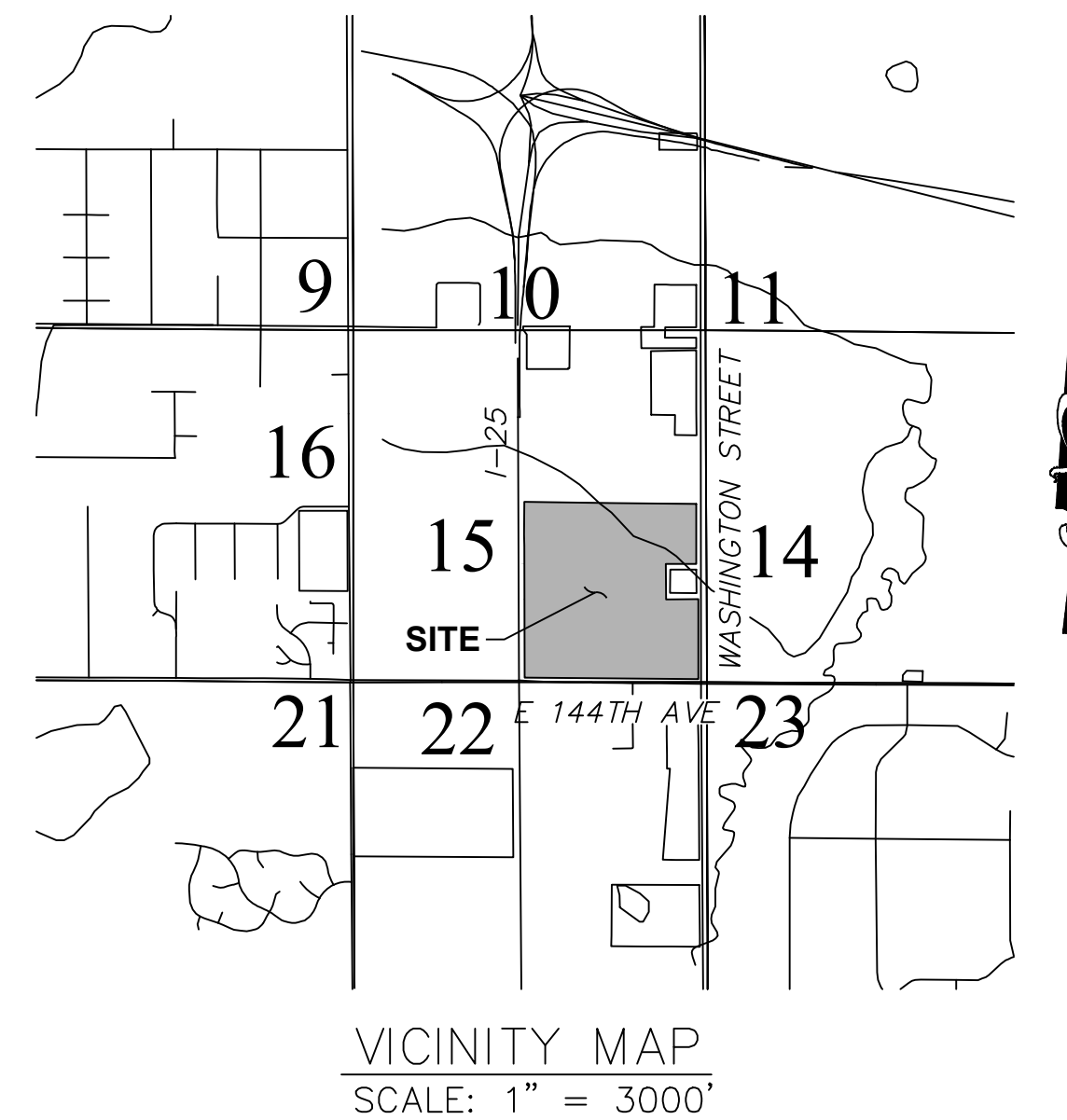
A PARCEL LOCATED IN THE SOUTHEAST QUARTER OF SECTION 15,
TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN,
CITY OF THORNTON, COUNTY OF ADAMS, STATE OF COLORADO

SHEET INDEX

SHEET No.	DRAWING No.	DESCRIPTION	LAST REVISED
1	CW100	COVER SHEET	5/1/2017
2	CW101	HISTORIC DRAINAGE PATTERNS	5/1/2017
3	CW102	PROPOSED DRAINAGE PATTERNS	5/1/2017

PLAN REFERENCES

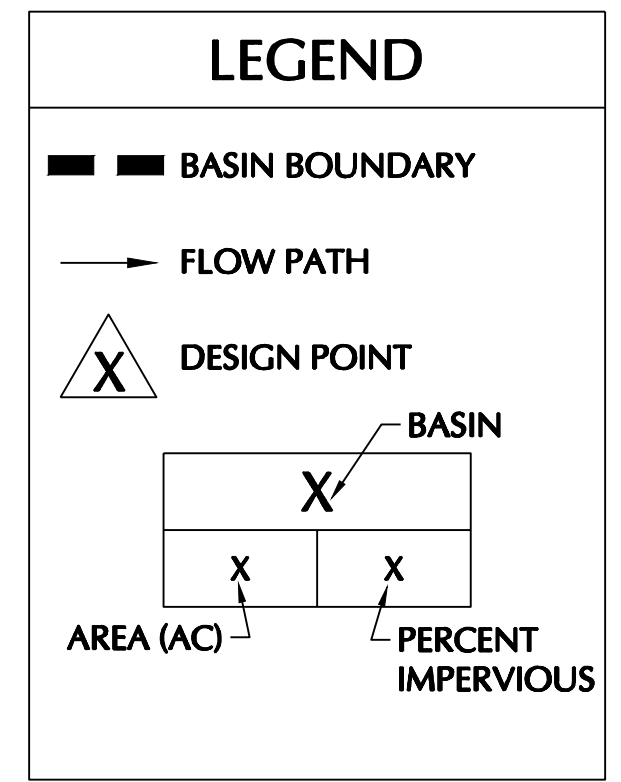
- BOUNDARY INFORMATION FROM:
 - A PLAN SET ENTITLED "ALTA/NSPS LAND TITLE SURVEY, SE 1/4 SEC 15, T1S, R68W, 6TH P.M. ADAMS COUNTY COLORADO" PREPARED BY AZTEC CONSULTANTS, INC. DATED 8/16/2016. (BULL CROSSING - PARCELS A & B).
 - A PLAN SET ENTITLED "ALTA/NSPS LAND TITLE SURVEY, SE 1/4 SEC 15, T1S, R68W, 6TH P.M. ADAMS COUNTY COLORADO" PREPARED BY AZTEC CONSULTANTS, INC. DATED 8/16/2016, LAST REVISED 9/16/2016. (THORNTON 40 - PARCELS C & D).
- TOPOGRAPHIC AND UTILITY INFORMATION FROM A CAD FILE RECEIVED ELECTRONICALLY FROM AZTEC CONSULTANTS, INC. ON 9/14/2016 AND 1/24/2017.
- FLOOD PLAIN INFORMATION FROM FEMA MAP NUMBER 08001C0303J (VERSION 2.3.2.2), REVISED TO REFLECT LOMR EFFECTIVE: NOVEMBER 25TH, 2016.
- WETLAND BOUNDARIES AS FIELD DELINEATED BY LANGAN ENGINEERING ON DECEMBER 8TH, 2016. PLANS SHOW APPROXIMATE LOCATION. DELINEATION PENDING JURISDICTIONAL DETERMINATION FROM USACE.
- ALL PROPOSED UTILITY CROSSINGS OF THE EXISTING CONCRETE CHANNEL SHALL BE INSTALLED BY OPEN CUT FOLLOWING THE ABANDONMENT OF THE EXISTING CHANNEL UNLESS OTHERWISE NOTED.



GENERAL NOTES

- STORM DRAINAGE SHALL NOT ENTER ANY EXISTING IRRIGATION CHANNELS. THE DEVELOPER WILL BE RESPONSIBLE FOR BYPASSING THESE FACILITIES AS REQUIRED BY THE CITY AND THE APPROPRIATE DITCH COMPANY.
- ALL OFF-SITE EASEMENTS REQUIRED TO CONVEY DEVELOPED DRAINAGE TO AN ACCEPTABLE OUTFALL LOCATION, AS DETERMINED BY THE CITY, SHALL BE ACQUIRED AND RECORDED BY THE DEVELOPER PRIOR TO APPROVAL OF THE SUBDIVISION PLAT. THE RECEPTION NUMBER(S) FOR THESE EASEMENTS SHALL BE SHOWN ON THE PLAT.
- INFRASTRUCTURE SHALL BE PROVIDED TO ALLOW ALL UPSTREAM PARCELS WHO HISTORICALLY CONVEY DRAINAGE THROUGH THE DEVELOPMENT.
- SEEPAGE ANALYSIS AND STRUCTURAL BANK INTEGRITY ANALYSIS FOR EACH EXISTING (IF IT IS UPSTREAM) AND EACH DRAINAGEWAY WITHIN THE DEVELOPMENT SHALL BE SUBMITTED TO THE CITY WITH THE FIRST SUBDIVISION PLAT FOR THE PROPERTY.
- SITE GRADING AND DRAINAGE SHALL BE DESIGNED AND CONSTRUCTED IN SUCH A MANNER TO PREVENT NUISANCE FLOWS DOWNSTREAM OF THE DEVELOPMENT.
- THE IMPROVEMENTS SHALL CONFORM TO THE CURRENT DRAINAGE MASTER PLAN AT THE TIME OF DEVELOPMENT. IF THERE IS NOT A MASTER PLAN AT THE TIME OF DEVELOPMENT, THE DEVELOPER WILL BE REQUIRED TO PREPARE A BASIN STUDY TO DETERMINE THE IMPACTS AND IDENTIFY MITIGATION MEASURE FOR THE PROPOSED PROJECT. APPROVAL IS REQUIRED FROM URBAN DRAINAGE AND FLOOD CONTROL DISTRICT (UDFCD) FOR THESE IMPROVEMENTS. STORM WATER QUALITY AND DETENTION ARE REQUIRED FOR ALL PORTIONS OF THE DEVELOPMENT INCLUDING THE ULTIMATE ROADWAY CONSTRUCTION.
- CLOMR'S/LOMR'S WILL BE REQUIRED WITH THIS DEVELOPMENT FOR ANY ADJUSTMENTS TO THE FLOODPLAIN.
- ALL WETLANDS AND BODIES OF WATER SHALL BE IDENTIFIED ON THE DRAINAGE PLAN. NO LOTS SHALL BE WITHIN A 50 FOOT RADIUS OF A DELINEATED WETLANDS AND 75 FOOT RADIUS OF ANY BODY OF WATER.
- DETENTION PONDS SHALL BE COMBINED WHEREVER POSSIBLE AND SHALL BE SIZED USING CUHP OR AN EQUIVALENT INFLOW HYDROGRAPH METHOD.
- ACCESS SHALL BE PROVIDED TO ALL DRAINAGEWAYS AND DETENTION PONDS FOR MAINTENANCE.

<table border="1"> <thead> <tr> <th>Date</th> <th>Description</th> <th>No.</th> </tr> </thead> <tbody> <tr> <td>5/01/17</td> <td>Revised per City comments</td> <td>1</td> </tr> </tbody> </table>			Date	Description	No.	5/01/17	Revised per City comments	1	SIGNATURE: RICHARD BURROW DATE SIGNED: _____ PROFESSIONAL ENGINEER CO Lic No. PE.0050315		300 Kimball Drive, Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901 www.langan.com Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A. Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. Langan Engineering and Environmental Services, Inc. Langan CT, Inc. Langan International LLC Collectively known as Langan		Project: PROJECT RIO A PARCEL LOCATED IN THE SOUTHEAST QUARTER OF SECTION 15, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN CITY OF THORNTON ADAMS COUNTY COLORADO		Drawing Title: PRELIMINARY DRAINAGE PLAN - COVER SHEET		Project No. 100612301 Date: 1/27/2017 Scale: N/A Drawn By: TLK Checked By: MRG		Drawing No. CSP CW100 Sheet 1 of 3	
Date	Description	No.																		
5/01/17	Revised per City comments	1																		



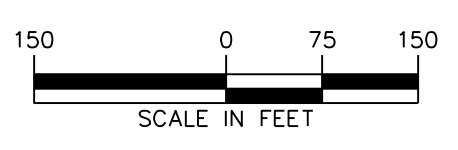
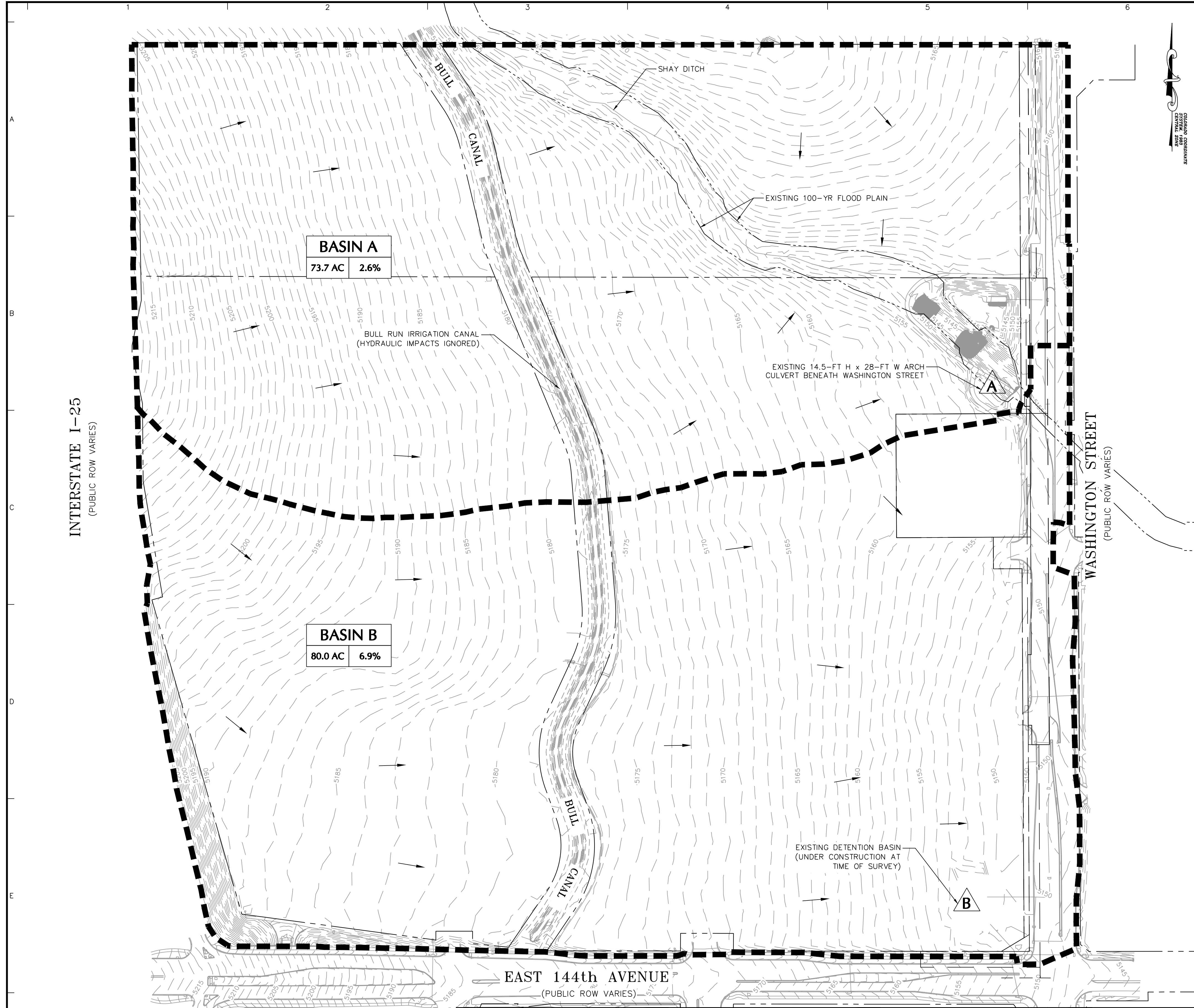
ANTICIPATED STORMWATER RUNOFF RATES
 $Q = CIA$
 $Q = \text{RUNOFF (CFS)}$
 $C = \text{RUNOFF COEFFICIENT}$
 $I = \text{INTENSITY (IN/HR)}$
 $A = \text{AREA (AC)}$

BASIN A
 $C = 0.52, I = 3.47 \text{ IN/HR}, A = 73.7 \text{ AC}$
 $Q_{100} = 132.96 \text{ CFS}$

BASIN B
 $C = 0.54, I = 3.12 \text{ IN/HR}, A = 80.0 \text{ AC}$
 $Q_{100} = 134.64 \text{ CFS}$

INTERSTATE I-25
(PUBLIC ROW VARIES)

WASHINGTON STREET
(PUBLIC ROW VARIES)



Date	Description	No.
5/01/17	Revised per City comments	1

REVISIONS

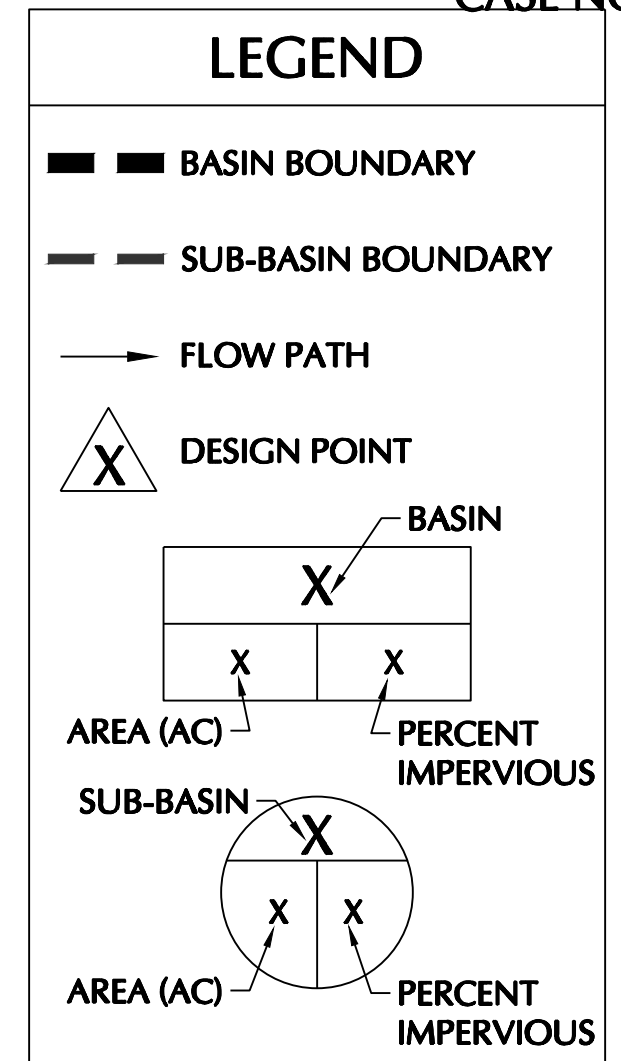
SIGNATURE: RICHARD BURROW
 DATE SIGNED: _____
 PROFESSIONAL ENGINEER CO Lic No. PE.0050315

LANGAN
 300 Kimball Drive, Parsippany, NJ 07054
 T: 973.560.4900 F: 973.560.4901 www.langan.com
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A.
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
 Langan Engineering and Environmental Services, Inc.
 Langan C.I., Inc.
 Langan International LLC
 Collectively known as Langan

Project: **PROJECT RIO**
 A PARCEL LOCATED IN THE SOUTHEAST QUARTER OF SECTION 15, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN
 CITY OF THORNTON
 ADAMS COUNTY COLORADO

Drawing Title: **PRELIMINARY DRAINAGE PLAN - HISTORIC DRAINAGE PATTERNS**

Project No.	100612301	Drawing No.	CSP CW101
Date	1/27/2017	Drawn By	TLK
Scale	1 INCH = 150 FEET	Checked By	MRG
Sheet 2 of 3			



CONTOUR NOTE:
 EXISTING CONTOURS SHOWN ON 1-FT CONTOUR INTERVAL
 PROPOSED CONTOURS SHOWN ON 2-FT CONTOUR INTERVAL

ANTICIPATED STORMWATER RUNOFF RATES

Q = CIA
 Q = RUNOFF (CFS)
 C = RUNOFF COEFFICIENT
 I = INTENSITY (IN/HR)
 A = AREA (AC.)

BASIN A
 C = 0.76, I = 4.06 IN/HR, A = 120.4 AC
 Q₁₀₀ = 371.61 CFS (EXCLUDING EFFECTS OF DETENTION BASIN)

BASIN B
 C = 0.58, I = 4.21 IN/HR, A = 33.3 AC
 Q₁₀₀ = 81.88 CFS (EXCLUDING EFFECTS OF DETENTION BASIN)

DRAINAGE CONCEPT

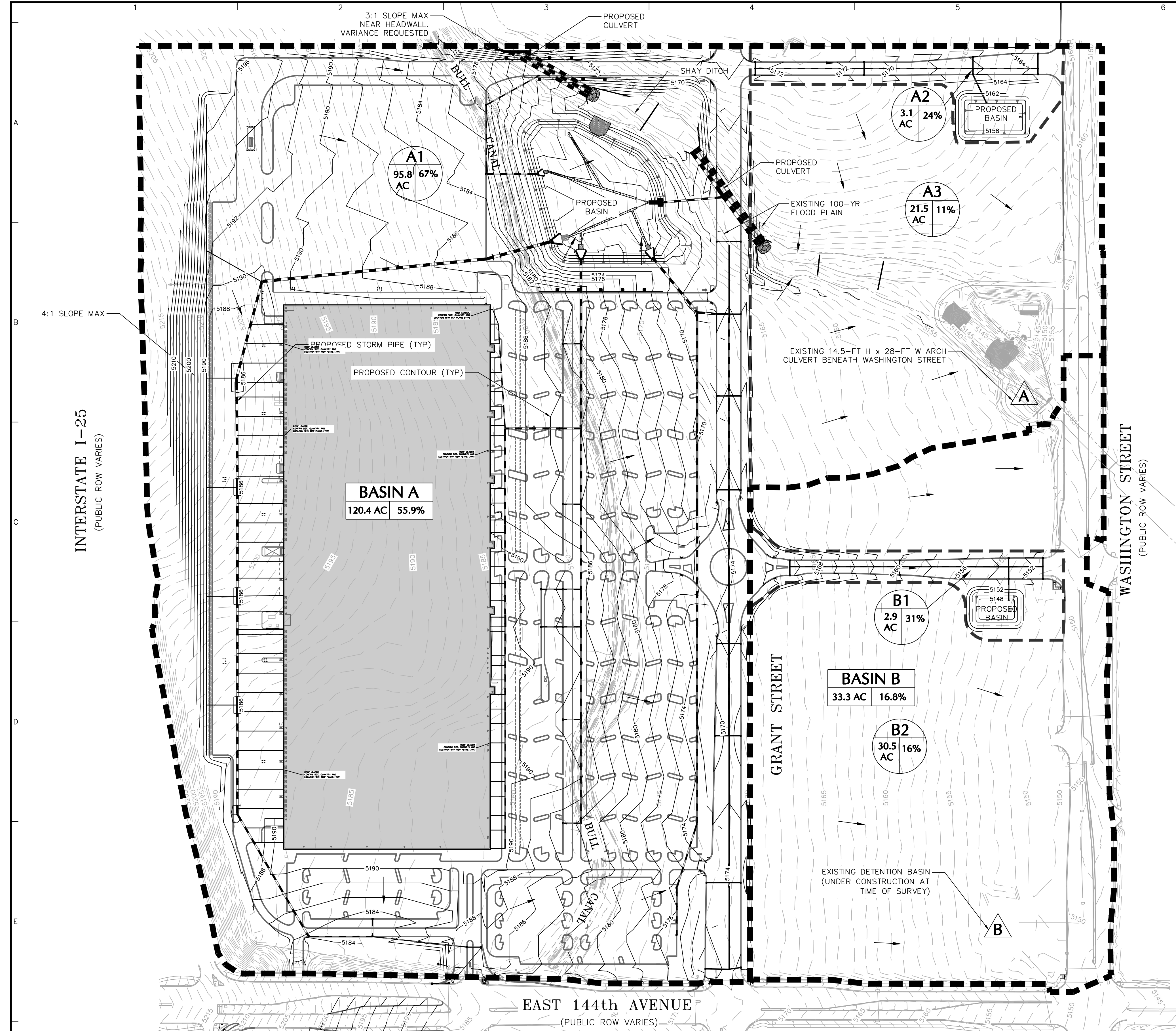
PROJECT RIO IS LOCATED IN THE SOUTHEAST QUARTER OF SECTION 15, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN IN THE CITY OF THORNTON, COUNTY OF ADAMS, COLORADO.

THE SITE IS BOUND ON THE WEST BY INTERSTATE 25, TO THE NORTH BY UNDEVELOPED LAND, TO THE EAST BY WASHINGTON STREET, AND TO THE SOUTH BY EAST 144TH AVENUE. A DISTRIBUTION FACILITY IS PROPOSED FOR THIS PROPERTY. THIS PROPERTY IS LOCATED WITHIN THE BIG DRY CREEK DRAINAGE BASIN.

ACCORDING TO THE FEMA FIRM MAP NUMBER 08001C0303J, REVISED TO REFLECT LOMR EFFECTIVE NOVEMBER 25, 2016, THE SITE IS OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD HAZARD AREA. EXISTING WETLANDS HAVE BEEN IDENTIFIED IN SHAY DITCH. AN EXISTING IRRIGATION DITCH, BULL CANAL, RUNS NORTH THROUGH THE CENTER OF THE PROPERTY. BULL CANAL IS PROPOSED TO BE CONVERTED TO AN UNDERGROUND CULVERT AS PART OF THIS PROJECT.

HISTORICALLY, THE SITE DRAINS FROM THE WEST TO THE EAST. THE EXISTING SHAY DITCH CONVEYS FLOWS FROM THE NORTHERN PORTION OF THE SITE TO BIG DRY CREEK. RUNOFF FROM THE SOUTHERN PORTION OF THE SITE FLOWS VIA OVERLAND FLOW TO A DETENTION BASIN AT THE SOUTHEAST CORNER OF THE SITE. THE FLOW IS THEN CONVEYED INTO THE EXISTING STORM SEWER SYSTEM IN EAST 144TH AVENUE.

RUNOFF FROM THE MAJORITY OF THE THE DEVELOPED SITE WILL DRAIN INTO A PROPOSED EXTENDED DETENTION BASIN VIA CURB AND GUTTER FLOW AND THE PROPOSED STORM SEWER SYSTEM. THE ONSITE DETENTION POND WILL PROVIDE WATER QUALITY AND DETENTION AND WILL RELEASE AT ALLOWABLE RATES TO SHAY DITCH.



INTERSTATE I-25
 (PUBLIC ROW VARIES)

WASHINGTON STREET
 (PUBLIC ROW VARIES)

GRANT STREET

EAST 144th AVENUE
 (PUBLIC ROW VARIES)



Date	Description	No.
5/01/17	Revised per City comments	1

REVISIONS

SIGNATURE	DATE SIGNED
RICHARD BURROW	

PROFESSIONAL ENGINEER CO Lic No. PE.0050315

LANGAN
 300 Kimball Drive, Parsippany, NJ 07054
 T: 973.560.4900 F: 973.560.4901 www.langan.com
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C. S.A.
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.
 Langan Engineering and Environmental Services, Inc.
 Langan C1, Inc.
 Langan International LLC
 Collectively known as Langan

Project
PROJECT RIO
 A PARCEL LOCATED IN THE SOUTHEAST QUARTER OF SECTION 15, TOWNSHIP 1 SOUTH, RANGE 68 WEST OF THE SIXTH PRINCIPAL MERIDIAN
 CITY OF THORNTON
 ADAMS COUNTY COLORADO

Drawing Title
PRELIMINARY DRAINAGE PLAN - PROPOSED DRAINAGE PATTERNS

Project No. 100612301	Drawing No. CSP CW102
Date 1/27/2017	
Scale 1 INCH = 150 FEET	
Drawn By TLK	Checked By MRG
Sheet 3 of 3	