



# COLORADO

## Department of Transportation

Region 2  
Traffic & Safety - Permits  
5615 Will Blvd.  
Pueblo, CO 81008

November 20, 2020

Lindsay Darden, Planner II  
El Paso County Planning and community Development  
2880 International Circle, Suite 110  
Colorado Springs, CO 80910-3127

**RESPONSE:** Previously completed response to comments have been provided below that were received in reviews from the PUDSP, Filing 1 and Filing 2 submittals. The Traffic Reports and MDDP/ Drainage Reports have been reviewed and approved by El Paso County.

RE: Trails at Aspen Ridge\_Legacy Hills Rd. / Bradley Rd. (Springs East at Waterview) - **SIGNAL**  
**review of construction drawings.**

Dear Lindsay,

I am in receipt of a referral request of the subject planned development to provide comments for the construction drawings for a signal to be located at Legacy Rd and Bradley Rd intersection just east of the intersection of Powers Blvd. and Bradley Rd intersection that is planned to be an interchange in the future.

I understand that the Trails at Aspen Ridge formerly known as Springs East at Waterview is located to the east of the development of Waterview East Preliminary Plan, but still within the existing boundary of that development. This mixed use development on 195.25-acres with 713 single-family residential lots on 166.89-acre and 28.36-acres of commercial parcels. The trails at Aspen Ridge proposed to amend the use of 117.98-acres of the original submittal for 180 single-family lots on the southeastern portion of 47-acres with the remaining to be commercial acreage. The development is located east of the Powers Blvd between Bradley Rd and Fontaine Blvd. on the southeast portion of the Waterview East Preliminary Plan area in El Paso County. Comments are as follows;

All previous comments are still valid and need to be addressed. Some of those comments are listed within this document.

### **Traffic Operations comments dated 11/18/2020**

- a. Over the past several years, CDOT has made multiple comments regarding the spacing between SH21 and this proposed signal - comments have essentially been dismissed. While I understand that this location of the proposed signal is barely beyond the minimum 550' from SH21, in the future Bradley and Powers will eventually become an interchange. It is highly likely that the proposed location will be within the functional area of the the interchange requiring modifications and possibly the removal of full movement access to Legacy Hills Rd north and south to this development. I do not see the need to push the spacing so tight as this is virgin ground. CDOT requests, again, that the signal be shifted east along Bradely (approximately 750') to avoid future access modifications.
- b. With this development it will be likely that intersection improvements ar the intersection of SH21/Powers Blvd. and Bradley Rd. that will be needed and addressed in an access permit.

Traffic Operations Comments 03/21/2020:



- a. Review of the updated Traffic Impact Study dated October 15, 2019 has been reviewed and comments are as follows. Some previous comments were not addressed from previous submittals or comments from 10/01/19. please update.
- b. Table 4 states that the southbound left turn lane on Powers Blvd can be restriped as dual left turn lanes, however there is no road surface for such restripe; a 150-ft long raised median exists at that location. **How is this to be corrected, this will be required as part of terms and conditions of the Access Permit. Please provide update in recommended improvements.**
- c. The existing mast arm will need to be lengthened for the second left turn.
- d. Bradley Road has been restriped for dual westbound to southbound left turn lanes when the signal was installed; **This will be required as part of the Access Permit, please update table 4.**
- e. Table 4 does not include the necessary lengthening of northbound right turn deceleration lane from Power Blvd to Bradley Rd. **This will be required as part of the Access Permit, please update in recommended improvements.**
- f. The 2040 Synchro reports for Powers Blvd. Interchange Northbound Ramp at Bradley Rd is missing the existing left turn traffic in both time periods from Figure 13. **Please update Figure 13.**
- g. The 2040 assumption of a six-lane Powers Blvd at Bradley overlooks the cost comparison of an interchange versus widening three miles of highway particularly with ADTs only at 40,000. The study should include an interchange alternative of 2040 traffic. **Please update.**
- h. Figure 19 depicts the long-term Bradley Road lane configuration east of Powers Blvd. It is clear from the drawing that the future eastbound left turn lanes for the future north side access will conflict with the future northbound ramp intersection. **Please update.**

**Previous comments dated 03/12/19 and 10/01/19 are still valid and were not addressed by the developer and require attention (see below).**

Hydraulics comments:

- a. Review of the Master Drainage Study dated June 2019.
- b. Please provide calculations that show the capacity of the culvert crossing Powers, and how the Pond outfall and basin that don't drain to the pond affect the capacity of this culvert.
- c. It looks like the southern portion of the Big Johnson Basin is draining south to the existing 48" culvert in the existing condition. Please verify that changing the drainage patterns by capturing and conveying runoff from this area to the detention pond and then to the 60" culvert doesn't cause issues downstream.
- d. Also, the 60" culvert needs to be checked that minor storm event flows will produce velocities high enough to provide self cleaning velocity, per CDOT requirements.
- e. Conversely, please check that the existing 48" culvert, south of the project will have sufficient cleansing velocity flows in the minor storm even after reducing flows at this culvert.
- f. **Previous comments on the Powers culvert capacities and minor flow cleansing velocity have not been addressed underlined above.** Please provide calculations showing that the CDOT drainage infrastructure is not affected by this development. Include hydrology showing existing vs. proposed overall basin area tributary to culverts crossing under Powers as well as hydraulic analysis of each culvert.

Access comments:



November 20, 2020

SH21A

Trails at Aspen Ridge\_Legacy Hills Rd. / Bradley Rd. (Springs East at Waterview) - SIGNAL review of construction drawings. El Paso County

- a. A State Highway Access Permit will be required for the connection of Bradley Road east to SH21A.
- b. State Highway Access Code, Vol 2, March 2002, Sec 2.13, Interchange Management Plan states; *any access in proximity to the interchange or potential interchange Access Rights should be obtained for a distance of 550-feet along the lesser street or crossroad measured from the radius point of the ramp touchdown curve.* It appears that the PUD Site Plan took this measurement from the centerline of existing SH21 to allow for the Legacy Hill Drive to obtain access from Bradley Rd. This does not comply with the State Highway Access Code and shall be revised.
- c. There will not be any allowance of direct access from the north-south section of SH21 to the westerly boundary of the subdivision. The only access points will be from local roadways on Bradley Rd. and possibly Fontaine Blvd. and by following the State Highway Access Code.
- d. Legacy Hill Drive access may be converted to RI/RO in the future if traffic issues arise or future traffic warrants are met to close this proposed full movement access crossing. Is it possible to pursue a roundabout at this location?
- e. Escrow funds will be required as a term and condition of Access Permit for a portion of the future SH21A(Powers Blvd.) / Bradley Rd. interchange based on a pro-rata share determined by the traffic impact.

Additionally,

- a. On-premise and off-premise signing shall comply with the current Colorado Outdoor Advertising Act, sections 43-1-401 to 421, C.R.S., and all rules and regulations pertaining to outdoor advertising. Please contact Mr. Todd Ausbun at (719) 696-1403 for any questions regarding advertising devices.
- b. Any utility work within the state highway right of way will require a utility permit from the CDOT. Information for obtaining a utility permit can also be obtained by contacting Mr. Ausbun.

Please contact me in Pueblo at (719) 248-0905 with any questions.

Sincerely,

Arthur Gonzales  
R2 - Access Manager

Xc: Jeff Hodson, LSC Transportation Consultants, Inc.  
Irvine/Rice/Ruiz  
Ferguson  
Stecklein/Lyons  
Whittlef/Biren  
Ausbun  
Sword/Regalado/file





LSC TRANSPORTATION CONSULTANTS, INC.  
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Website: <http://www.lscstrans.com>

## MEMORANDUM

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DATE: October 15, 2019

TO: Arthur Gonzalez, Access Manager – CDOT R2

FROM: Jeff Hodsdon - LSC Transportation Consultants, Inc.

SUBJECT: Trails at Aspen Ridge (Springs East at Waterview) - PUDSP-191  
RE: Revised TIS Review and Drainage Submittals  
Response to Comments Memorandum  
LSC #184362

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Following are the LSC Transportation Consultants, Inc. responses to the October 1, 2019 CDOT comment letter regarding the Trails at Aspen Ridge PUD.

**CDOT Comments:**

*Previous comments dated 03/12/19 are still valid and were not addressed by the developer and require attention (see below).*

**Traffic Operations Comments:**

a. *Review of the revised Traffic Impact Study July 5, 2019.*

**LSC Response:** No response necessary.

b. *Table 4 states that the southbound left turn lane on Powers Blvd can be restriped as dual left turn lanes, however there is no road surface for such restripe; a 150-ft long raised median exists at that location. In addition, the existing mast arm will need to be lengthened for the second left turn.*

**LSC Response:** This was previously addressed in the July 5, 2019 report.

c. *Bradley Road has been restriped for dual westbound left turn lanes when the signal was installed; Table 4 should be updated.*

**LSC Response:** This was previously addressed in the July 5, 2019 report.

- d. *Table 4 does not include the necessary lengthening of northbound right turn deceleration lane from Power Blvd to Bradley Rd.*

**LSC Response:** A recommendation to lengthen the existing northbound right-turn lane is included in the updated traffic impact study.

- e. *The 2040 Synchro reports for Powers Blvd. Interchange Northbound Ramp at Bradley Rd is missing the existing left turn traffic in both time periods from Figure 13.*

**LSC Response:** This is a quirk of the Synchro signalized report when there is a shared turn and through lane. The revised report includes an additional volume report including the volumes used in the analysis.

- f. *The 2040 assumption of a six-lane Powers Blvd at Bradley overlooks the cost comparison of an interchange versus widening three miles of highway particularly with ADTs only at 40,000. The study should include an interchange alternative of 2040 traffic.*

**LSC Response:** This was previously addressed in the July 5, 2019 report.

- g. *Figure 19 depicts the long-term Bradley Road lane configuration east of Powers Blvd. It is clear from the drawing that the future eastbound left turn lanes for the future north side access will conflict with the future northbound ramp intersection.*

**LSC Response:** The location of Legacy Hill Drive extending south from Bradley Road was previously approved by El Paso County. Although this study includes preliminary background traffic estimates associated with future development north of Bradley Road, future development north of Bradley Road will need to complete a traffic study and the eastbound left turn lanes would undoubtedly be addressed within that study.

**Access comments:**

- a. *A State Highway Access Permit will be required.*

**LSC Response:** Comment noted. An application will be sent to El Paso County for Permittee signature.

- b. *The State Highway Access code will require for Access rights to Bradley Rd. to follow the distance requirement for the Interchange Management Plan to be 550-feet away from or along the lesser street or cross road measured from the radius point of any ramp touch down curve.*

**LSC Response:** The access approved by EPC meets this requirement. This access location went through the deviation process a couple of years ago.

- c. *Access to this subdivision or Waterview East Preliminary Plan will not be granted to SH21/Powers Blvd. directly.*

**LSC Response:** Comment noted. No direct access to SH 21 is proposed.

- d. *Delivery of Escrow funds will need to be at the time of Access Permit Notice to Proceed.*

**LSC Response:** Comment noted. However, the comment does not indicate for what the escrow will be required.

- e. *It is recommended that the access from existing Bradley Blvd. into the development will be Right In/ Right Out.*

**LSC Response:** CDOT's recommendation is noted. However, the access has already been approved by El Paso County and is outside the "A Line." CDOT staff indicated at a prior joint meeting with EPC and the applicant that they would uphold the EPC approval.

**Hydraulics comments:**

a.-e.

**LSC Response:** Other project team members will address these comments.



LSC TRANSPORTATION CONSULTANTS, INC.  
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Colorado Springs, CO 80903  
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Website: <http://www.lsctrans.com>

## MEMORANDUM

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DATE: July 5, 2019

TO: Art Gonzalez  
719-546-5732

FROM: Jeffrey C. Hodsdon - LSC Transportation Consultants, Inc.

SUBJECT: Trails at Aspen Ridge (Springs East at Waterview) - PUDSP-191  
Response to Comments Memorandum  
LSC #194362

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Following are the LSC Transportation consultants, Inc. responses to the March 12, 2019 Comment Letter prepared by CDOT regarding the Trails at Aspen Ridge PUD.

### **Traffic Operations Comments:**

1. *Page 6 states that the southbound left turn lane on Powers Blvd can be restriped as dual left turn lanes, however there is no road surface for such restripe; a 150-ft long raised median exists at that location.*

**LSC Response:** This reference has been removed.

2. *Bradley Road has been restriped for dual westbound left turn lanes when the signal was installed; Table 4 should be updated.*

**LSC Response:** Table 4 has been updated accordingly.

3. *The 2040 assumption of a six-lane Powers Blvd at Bradley overlooks the cost comparison of an interchange versus widening three miles of highway particularly with ADTs only at 40,000. The study should include an interchange alternative of 2040 traffic.*

**LSC Response:** The report has been revised to show a future four lane facility instead of a six-lane facility; An analysis of 2040 traffic assuming an interchange has been added to the report per this comment.

4. *Figure 19 depicts the long-term Bradley Road lane configuration east of Powers Blvd. It is clear from the drawing that the future eastbound left turn lanes for the future north side access will conflict with the future northbound ramp intersection*

**LSC Response:** The eastbound left turn will be analyzed further at the time of development on the north side of Bradley Road. At that time, more will be known about the land uses, trip generation, and site circulation.

**SF 192 – Trails at Aspen Ridge\_Final Plat – Filing 1 March 12, 2019**

**Access comments:**

5. *A State Highway Access Permit will be required.*

**LSC Response:** An Access Permit Application form will be submitted to CDOT as required. The Waterview II Metro District would be the Permittee or the Applicant if the County is the Permittee.

6. *The State Highway Access code will require for Access rights to Bradley Rd. to follow the distance requirement for the Interchange Management [sic] Plan to be 550-feet away from or along the lesser street or cross road measured from the radius point of any ramp touch down curve.*

**LSC Response:** Comment Noted. This criteria was used to locate the access where it has been designed, and this location was confirmed in a County/CDOT meeting.

7. *Access to this subdivision or Waterview East Preliminary Plan will not be granted to SH21/Powers Blvd. directly.*

**LSC Response:** Comment noted.

8. *Deliverly [sic] of Escrow funds will need to be at the time of Access Permit Notice to Proceed.*

**LSC Response:** Comment noted.



**COLORADO**  
**Department of Transportation**

Region 2  
Traffic & Safety - Permits 5615  
Will Blvd.  
Pueblo, CO 81008

June 4, 2020

SH21A  
El Paso County

Nina Ruiz  
El Paso County Development Services Division  
2880 International Circle, Suite 110  
Colorado Springs, CO 80910-3127

RE: Trails at Aspen Ridge Filing #2 (Springs East at Waterview) - EA-SF1927

Dear Nina,

I am in receipt of a referral request for comment of the subject planned development. I understand that the Trails at Aspen Ridge Filing No. 2 is part of a previously submitted development formerly known as Springs East at Waterview and is located to the east of the development of Waterview East Preliminary Plan, but still within the existing boundary of that development now known as Trails at Aspen Ridge.

Filing No. 2 is a mixed use development on 175-acres with 98 single-family residential lots on with 24.03-acres of open spaces. This filing No. 2 is located within the existing filing of Trails at Aspen Ridge Filing No.1 which is east of the Powers Blvd between Bradley Rd and Fontaine Blvd. on the southeast portion of the Waterview East Preliminary Plan area in El Paso County. Comments are as follows;

**Traffic Operations comments:**

- a. Review of the updated Traffic Impact Analysis dated February 24, 2020 for filing no. 2 has been reviewed and the reviewers have no comments.
- b. **Previous comments from dated 03/31/20, 10/01/19 and 03/12/19 are still valid and were not addressed by the developer in this Traffic Impact Analysis or Drainage Report for Filing No.2. However, the previous comments still require updating and need to be addressed as a whole (please see the following).**
- c. Table 4 states that the southbound left turn lane on Powers Blvd can be restriped as dual left turn lanes, however there is no road surface for such restripe; a 150-ft long raised median exists at that location. How is this to be corrected, this will be required as part of terms and conditions of the Access Permit. Please provide update in recommended improvements.
- d. The existing mast arm will need to be lengthened for the second left turn.
- e. Bradley Road has been restriped for dual westbound to southbound left turn lanes when the signal was installed; This will be required as part of the Access Permit, please update table 4.
- f. Table 4 does not include the necessary lengthening of northbound right turn deceleration lane from Power Blvd to Bradley Rd. This will be required as part of the Access Permit, please update in recommended improvements.
- g. The 2040 Synchro reports for Powers Blvd. Interchange Northbound Ramp at Bradley Rd is missing the existing left turn traffic in both time periods from Figure 13. Please update Figure 13.



June 04, 2020  
SH21A

Trails at Aspen Ridge Filing #2 (Springs East at Waterview) – EA-SF1927  
Paso County

EI

- h. The 2040 assumption of a six-lane Powers Blvd at Bradley overlooks the cost comparison of an interchange versus widening three miles of highway particularly with ADTs only at 40,000. The study should include an interchange alternative of 2040 traffic. Please update.
- i. Figure 19 depicts the long-term Bradley Road lane configuration east of Powers Blvd. It is clear from the drawing that the future eastbound left turn lanes for the future north side access will conflict with the future northbound ramp intersection. Please update.

Hydraulics comments:

- a. Review of the Master Drainage Study dated June 2019.
- b. Please provide calculations that show the capacity of the culvert crossing Powers, and how the Pond outfall and basin that don't drain to the pond affect the capacity of this culvert.  
Capacity of 60" culvert calculated to be 291 cfs. Anticipated Q100 (Equal to or less than pre development value) is 54.26 cfs.
- c. It looks like the southern portion of the Big Johnson Basin is draining south to the existing 48" culvert in the existing condition. Please verify that changing the drainage patterns by capturing and conveying runoff from this area to the detention pond and then to the 60" culvert doesn't cause issues downstream.  
See below.
- d. Also, the 60" culvert needs to be checked that minor storm event flows will produce velocities high enough to provide self cleaning velocity, per CDOT requirements.  
Anticipated velocity of 6.4 ft/s for Minor Storm which complies with CDOT requirements.
- e. Conversely, please check that the existing 48" culvert, south of the project will have sufficient cleansing velocity flows in the minor storm even after reducing flows at this culvert.  
Anticipated velocity for Minor Storm is 5.67 ft/s which complies with CDOT requirements.
- f. Previous comments on the Powers culvert capacities and minor flow cleansing velocity have not been addressed underlined above. Please provide calculations showing that the CDOT drainage infrastructure is not affected by this development. Include hydrology showing existing vs. proposed overall basin area tributary to culverts crossing under Powers as well as hydraulic analysis of each culvert.

MDG Comment Responses:

The above items were addressed in the Trails at Aspen Ridge Filing No. 1 FDR. Please see excerpts from the report below:

**D. CDOT Culverts across Powers Boulevard**

The west side of the project drains to the Powers Boulevard Ditch. The flows cross Powers Boulevard at a 60-inch culvert adjacent to the West Pond and at a 48-inch culvert near the southwest corner of the site. Flows within these two culverts remain in compliance with CDOT requirements. See Table 8.5 Below:

Table 8.5 Powers Boulevard Crossroad Culvert Calculations					
Sub-Basin	Drainage Area (Acres)	Minor Storm (cfs)	Velocity (ft/s) <i>Req. min. 3 ft/s</i>	Major Storm Proposed (cfs)	Major Storm Existing (cfs)
OS-2	11.44	1.73		11.65	
West Pond Full Buildout Discharge	34.34	0.70		26.20	
Powers Boulevard Right of Way	4.96	7.01		16.40	
<b>60-Inch Culvert</b>	<b>50.74</b>	<b>9.45</b>	<b>6.40</b>	<b>54.26</b>	<b>59.6</b>
Q1	1.09	1.13		3.79	
Powers R/W and Adjacent Property	4.53	4.69		13.76	
<b>48-Inch Culvert</b>	<b>5.62</b>	<b>5.82</b>	<b>5.67</b>	<b>17.55</b>	<b>24.9</b>

Access comments:

- a. A State Highway Access Permit will be required for the connection of Bradley Road east to SH21A between El Paso County and CDOT. El Paso County will be the Permittee and the Development will be the Applicant. This need is to evaluate the traffic impacts and record any further roadway improvements or escrow needed at this location.
- b. State Highway Access Code, Vol 2, March 2002, Sec 2.13, Interchange Management Plan states; *any access in proximity to the interchange or potential interchange Access Rights should be obtained for a distance of 550-feet along the lesser street or crossroad meaasured from the radius point of the ramp touchdown curve.* It appears that the PUD Site Plan took this measurment from the centerline of existing SH21 to allow for the Legacy Hill Drive to obtain access from Bradley Rd. This does not comply with the State Highway Access Code and Will need to be revised.
- c. There will not be any allowance of direct access from the north/south traveling roadways section of SH21 to the westerly boundary of the subdivision. The only access points will be from local roadways on Bradley Rd. and possibly Fontaine Blvd. and by following the State Highway Access Code.
- d. Legacy Hill Drive access may be converted to RI/RO in the future if traffic issues arise or future traffic warrants are met to close this proposed full movement access crossing. A roudabout circle should be pursued at this location.
- e. Escrow funds will be required as a term and condition of Access Permit for a portion of the future SH21A(Powers Blvd.) / Bradley Rd. interchange based on a pro-rata share determined by the traffic impact study. Please add graph or chart.

Additionally,

- a. On-premise and off-premise signing shall comply with the current Colorado Outdoor Advertising Act, sections 43-1-401 to 421, C.R.S., and all rules and regulations pertaining to outdoor advertising. Please contact Mr. Todd Ausbun at (719) 696-1403 for any questions regarding advertising devices.
- b. Any utility work within the state highway right of way will require a utility permit from the CDOT. Information for obtaining a utility permit can also be obtained by contacting Mr. Ausbun.

Please contact me in Pueblo at (719) 248-0905 with any questions.

Sincerely,

Arthur Gonzales  
R2 - Access Manager

Xc: Irvine/Rice  
Ferguson

# Channel Report

## Powers Boulevard - 60-Inch Culvert

### Circular

Diameter (ft) = 5.00

Invert Elev (ft) = 1.00

Slope (%) = 2.56

N-Value = 0.020

### Calculations

Compute by: Q vs Depth

No. Increments = 20

### Highlighted

Depth (ft) = 4.75

Q (cfs) = 291.02

Area (sqft) = 19.28

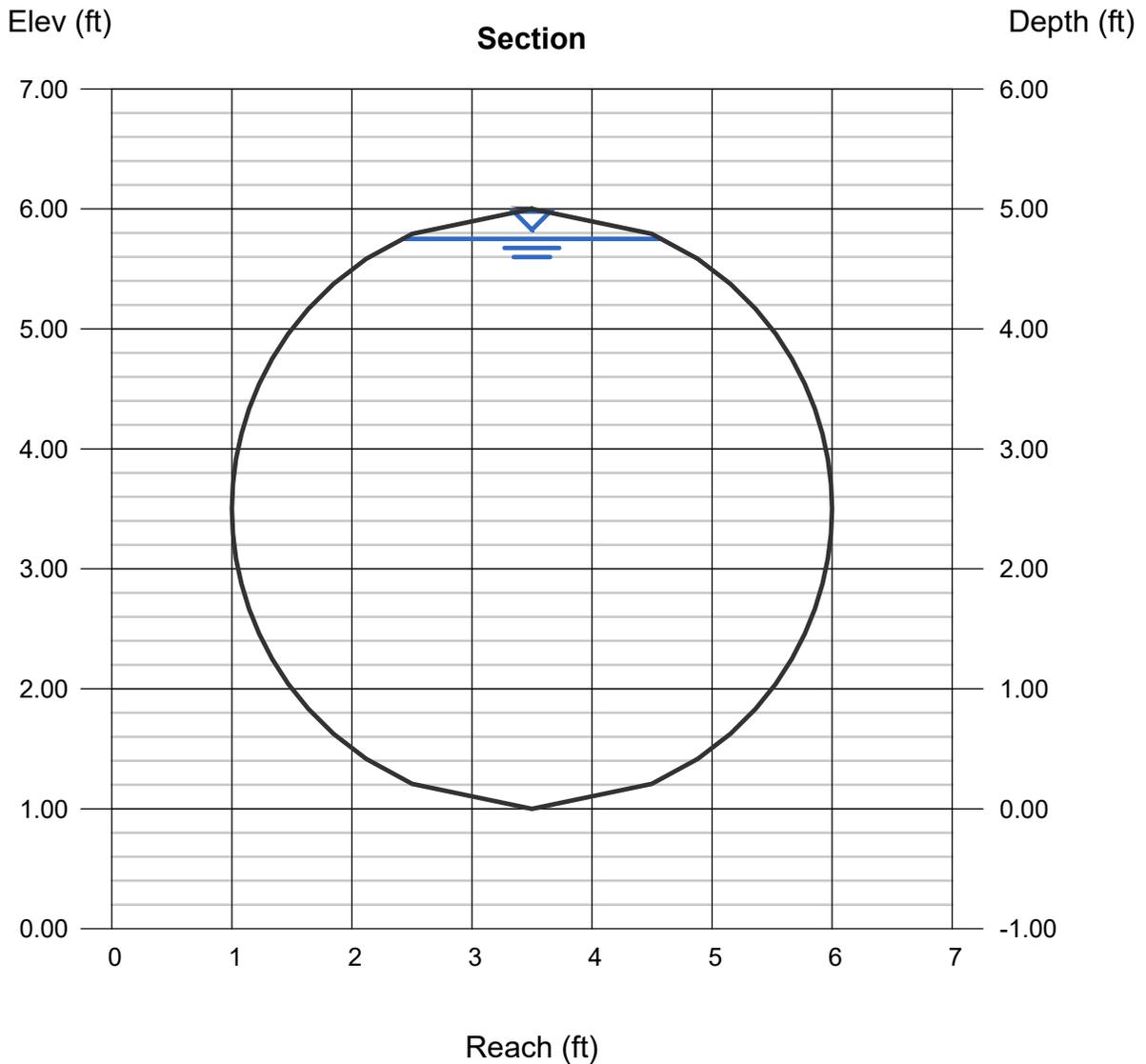
Velocity (ft/s) = 15.10

Wetted Perim (ft) = 13.48

Crit Depth,  $Y_c$  (ft) = 4.63

Top Width (ft) = 2.16

EGL (ft) = 8.29



# Channel Report

## Powers Ditch: Total flows including Ultimate West Pond Discharge

### User-defined

Invert Elev (ft) = 5866.90  
Slope (%) = 1.90  
N-Value = 0.025

### Highlighted

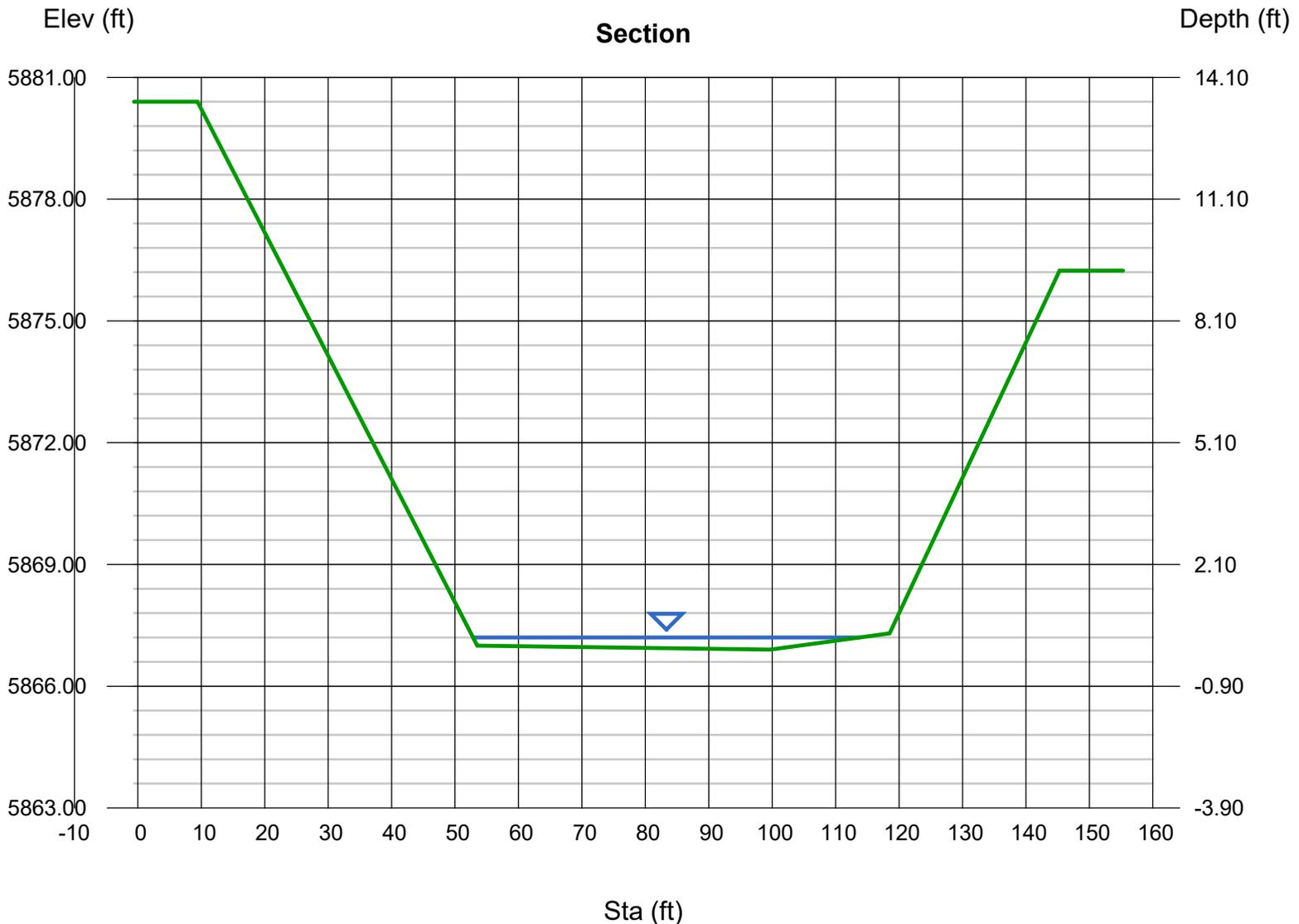
Depth (ft) = 0.30  
Q (cfs) = 41.10  
Area (sqft) = 13.72  
Velocity (ft/s) = 3.00  
Wetted Perim (ft) = 60.98  
Crit Depth, Yc (ft) = 0.32  
Top Width (ft) = 60.95  
EGL (ft) = 0.44

### Calculations

Compute by: Known Q  
Known Q (cfs) = 41.10

### (Sta, El, n)-(Sta, El, n)...

(9.40, 5880.40)-(53.50, 5867.00, 0.025)-(99.70, 5866.90, 0.025)-(118.50, 5867.30, 0.025)-(145.30, 5876.24, 0.025)



# Channel Report

## Powers 60-inch Culvert - Minor Storm Event

### Circular

Diameter (ft) = 5.00

Invert Elev (ft) = 5864.64

Slope (%) = 2.55

N-Value = 0.020

### Calculations

Compute by: Known Q

Known Q (cfs) = 9.45

### Highlighted

Depth (ft) = 0.64

Q (cfs) = 9.450

Area (sqft) = 1.48

Velocity (ft/s) = 6.37

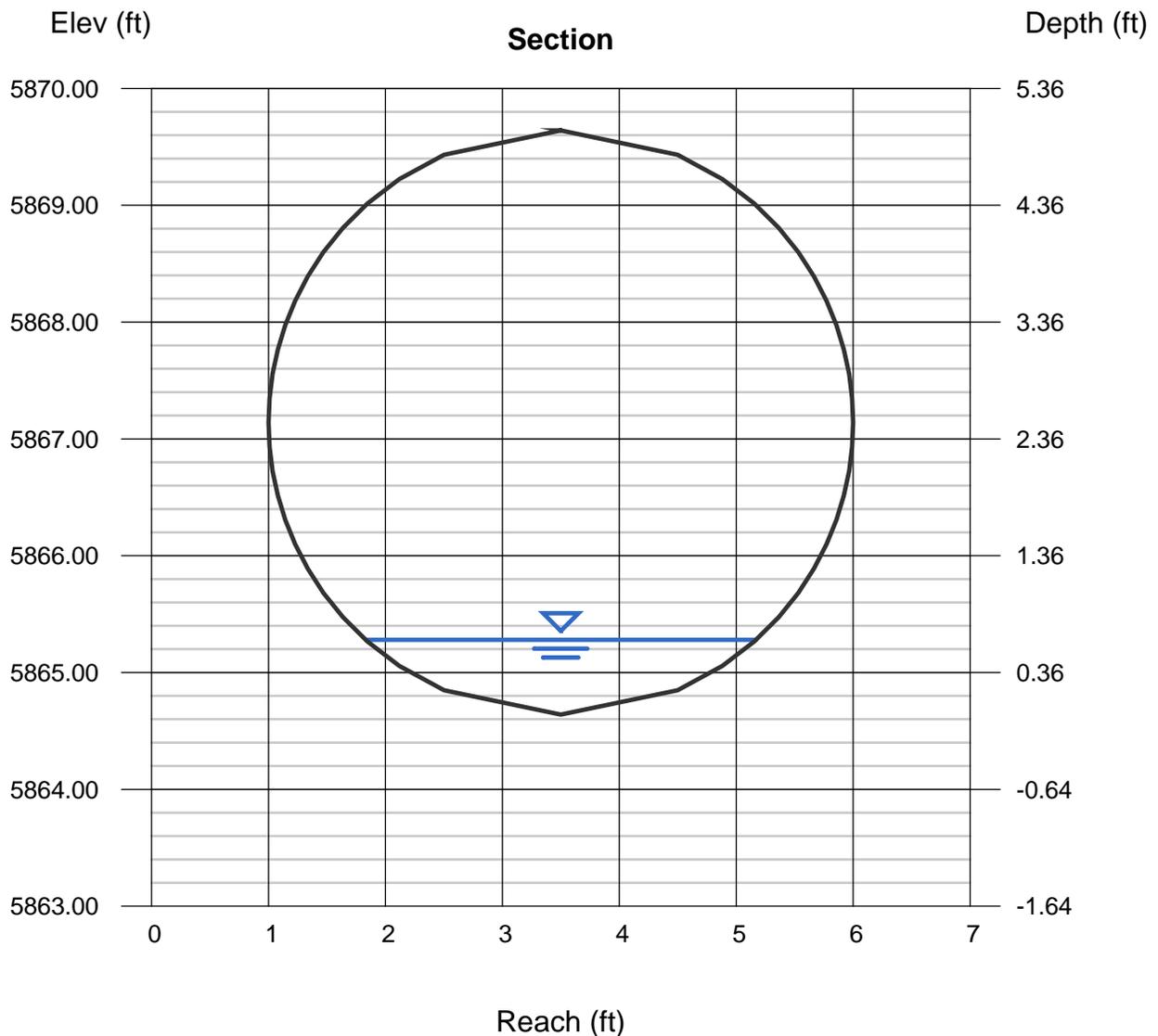
Wetted Perim (ft) = 3.67

Crit Depth, Yc (ft) = 0.85

Top Width (ft) = 3.35

EGL (ft) = 1.27

CDOT Drainage Design Manual, Page 9-20:  
Minimum Velocity for  
Minor Event = 3 ft/s



# Channel Report

## Powers 60-Inch Culvert - Major Storm Event

### Circular

Diameter (ft) = 5.00  
  
Invert Elev (ft) = 5864.64  
Slope (%) = 2.55  
N-Value = 0.020

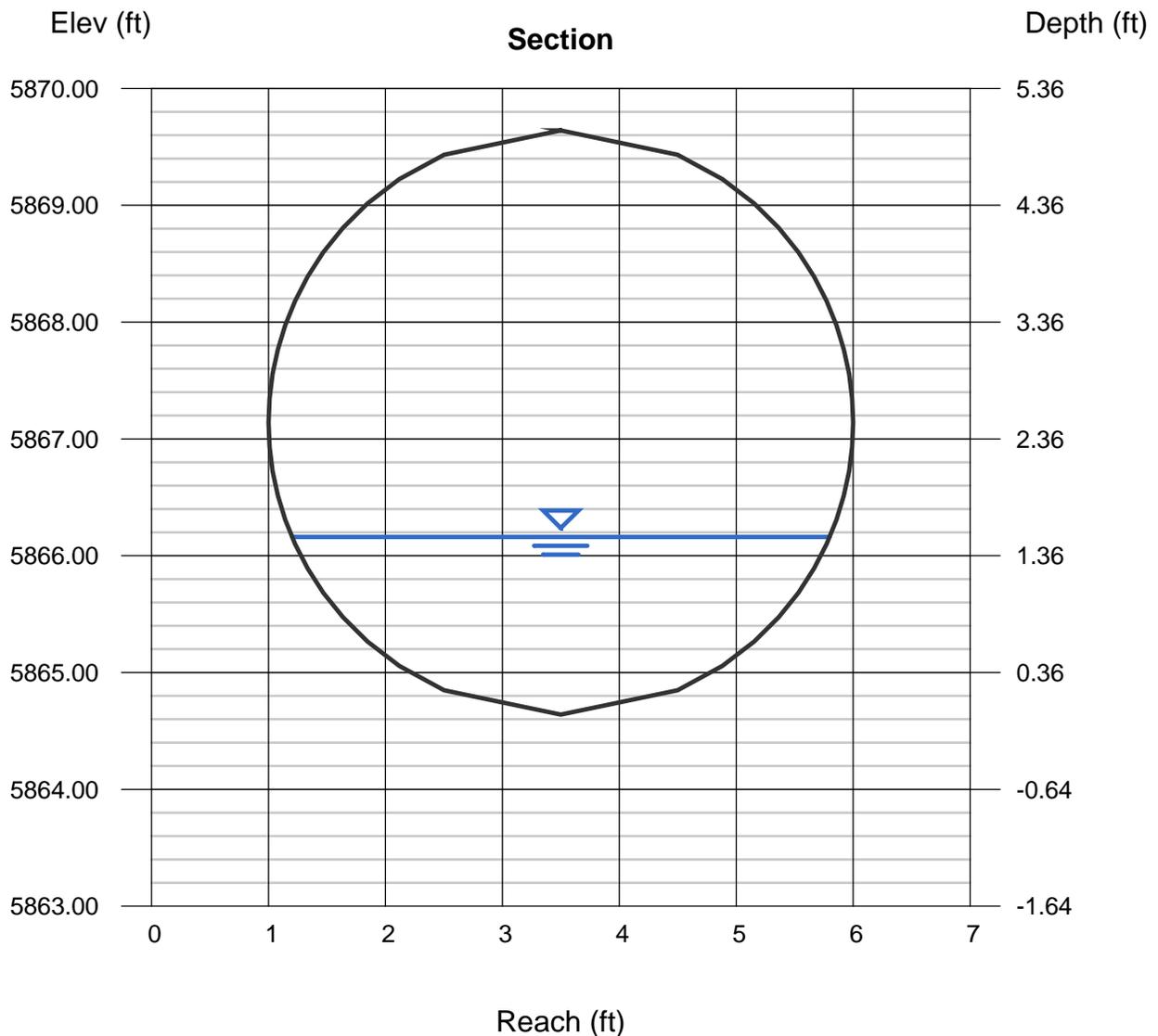
### Highlighted

Depth (ft) = 1.52  
Q (cfs) = 54.26  
Area (sqft) = 5.07  
Velocity (ft/s) = 10.71  
Wetted Perim (ft) = 5.85  
Crit Depth, Yc (ft) = 2.07  
Top Width (ft) = 4.60  
EGL (ft) = 3.30

### Calculations

Compute by: Known Q  
Known Q (cfs) = 54.26

Note: Maximum Discharge (54.26 cfs) to the Powers Ditch will be slightly lower than the estimated pre-project value of 59.6 cfs (Based on a 44.9 Acre Tributary Area). No downstream issues are anticipated.



# Channel Report

## 48-Inch Diameter Powers Boulevard Culvert Q5 Event

### Circular

Diameter (ft) = 4.00

Invert Elev (ft) = 5845.05

Slope (%) = 2.50

N-Value = 0.020

### Calculations

Compute by:

Known Q (cfs)

Known Q

= 5.80

### Highlighted

Depth (ft) = 0.54

Q (cfs) = 5.800

Area (sqft) = 1.02

Velocity (ft/s) = 5.67

Wetted Perim (ft) = 3.02

Crit Depth, Yc (ft) = 0.70

Top Width (ft) = 2.74

EGL (ft) = 1.04

CDOT Drainage Design Manual, Page 9-20: Minimum Velocity for Minor Event = 3 ft/s

