



September 22, 2023
AVO 37449

Ms. Ramie Hammonds
Development Services Director/Building Official
City of Sanger
201 Bolivar Street
P.O. Box 1729
Sanger, Texas 76266

Re: **Marley Meadows – Drainage Study in support of the Preliminary Plat**
Fourth Review

Dear Ms. Hammonds,

Halff Associates, Inc. was requested by the City of Sanger to provide a review of the drainage study and downstream assessment in support of the Preliminary Plat for the Marley Meadows development. The drainage study was prepared by iCivil Engineering and is dated January 2023. Comments were provided February 7, 2023. A second submittal was provided May 16, 2023 and comments were provided May 30, 2023. A third submittal was received June 28, 2023. A fourth submittal was received September 14, 2023. Please refer to the Denton County Subdivision Rules and Regulations dated July 2009 for drainage criteria; hereafter referred to as Criteria Manual.

We have completed our review. **The drainage study is acceptable for preliminary platting.** Please address the comments below with the drainage study in support of the final plat/construction plans.

General:

1. **1st – 4th Review Comment:** Plans and plat are reviewed separately. Please note an accepted drainage study is required prior to plat acceptance.
2. **1st – 4th Review Comment:** Please address comments on attached markups and provide **annotated responses on markups.** All the comments have been addressed and response is provided
3. Please provide minimum finished floor elevations 2' above fully developed 100-yr water surface elevation for lots adjacent to proposed channels/roadside ditches on the plat.
1st Review Response: No Response.
2nd Review Comment: Address comments on preliminary plat.
2nd Review Response: Noted
3rd Review Comment: It appears the Ultimate 100yr WSEL's used to determine the min FFE do not match the Ultimate Conditions RAS model at some locations.
 - a. Please reconcile WSEL's on Grading Sheets with the RAS model.
 - b. Please provide the reference cross section on the Grading Sheet.
 - c. Please show all RAS cross sections on the Hydraulic Workmap/s.**4th Review Comment:** Please update all relevant information based of any changes due to comments. All information has been updated based on changes.
4. **1st - 3rd Review Comment:** Please note, additional comments may result once models and additional info is provided.
4th Review Comment: Please note, additional comments may result once final drainage study/construction plans/ final plats are provided. Noted

Hydrology and Hydraulics:

5. Please apply the existing conditions C values to the proposed conditions runoff calculations for the offsite areas; for a pre- and post- development analysis, the offsite runoff stays constant. Please

update the outfall discharge summaries according to the changes in the calculated existing and proposed runoff. Verify any flow increases.

1st Review Response: Offsite modeled using UH method

2nd Review Comment: Addressed.

6. It appears proposed flow is increased at the south outfall (DP "C"), please extend the hydrologic and hydraulic analysis through the zone of influence per the 10% rule and demonstrate no adverse impacts to downstream properties (no significant increases in water surface elevation and velocities). A proposed development of 19.65 acres will require an overall analysis of 196.5 acres.

1st Review Response: With UH method, no increase in peak discharge at the d/s.

2nd Review Comment: Please include onsite drainage area maps showing the flowpaths in greater detail. Please include the time of concentration parameters, calculations, and assumptions. Reconcile with HMS model.

2nd Review Response: HMS Reconciled, Calculation added

3rd Review Comment: Noted.

7. Please provide a pre- and post- HEC-RAS analysis for receiving creek thru the zone of influence and demonstrate no significant increase in water surface elevation and velocity in existing channels. Also, verify no increases to the backwater at upstream culvert. Include RAS model with next submittal.

1st Review Response: With SCS UH method, no increase in peak discharge at the d/s. RAS model included

2nd Review Comment: Noted. Verify after addressing HMS comments.

2nd Review Response: Updated.

3rd Review Comment: Noted

8. Please provide an Ultimate Conditions Drainage Area Map. Provide calculated runoff for a fully developed condition and design the channel going through the site to contain the fully developed 100-year flow with 1-ft. freeboard. Provide an ultimate conditions RAS model as well.

1st Review Response: HEC-RAS model included for existing, proposed and ultimate condition

2nd Review Comment: It appears that only existing and proposed RAS models were included in the submittal. Please include Ultimate Conditions Flows with Proposed Geometry.

2nd Review Response: ULTIMATE CONDITION ADDED TO MODELS.

3rd Review Comment: Addressed. Address comments on the RAS workmaps and provide annotated responses.

4th Review Comment: Addressed

9. Please provide channel cross sections with hydraulic parameters for proposed channels. Please note, a HEC-RAS model is required to confirm water surface profiles in channels, roadside ditches and culverts. Please provide RAS model and verify proposed channels contain the fully developed 100-yr flow with 1' freeboard. Use $n=.04$ for earthen channel. Include a RAS workmap or add RAS cross sections to the grading plans.

1st Review Response: HEC RAS model included for channels, roadside ditch and culverts

2nd Review Comment: Noted.

10. Channels must be designed to standards. Please refer to criteria manual Section IV-B and section IV3.4 (trapezoidal, 4:1 SS, 1' freeboard from 100-yr fully developed water surface elevation to top of bank, etc). Provide drainage easements with adequate access; include 10' beyond top of bank on both sides.

1st Review Response: Revised the slopes to 4:1

2nd Review Comment: Please address comments on channel profile sheets and hydraulic workmap.

2nd Review Response: Addressed.

3rd Review Comment: Please address comments on hydraulic workmap and grading plan.

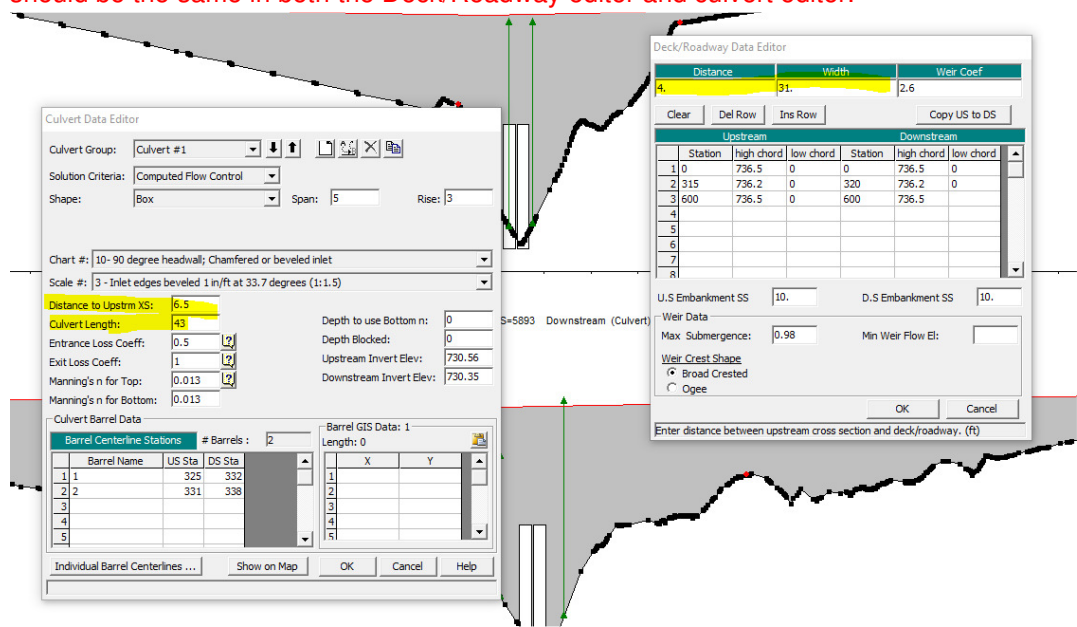
4th Review Comment: Please address comment on Sheet 12-8 Addressed

11. Provide RAS model for all proposed roadside ditches (Criteria Manual Section IV.3.4) including Sam Bass Road. Include proposed culverts and driveway culverts and verify the 100-yr fully developed flow is contained within the right of way. If not contained within ROW, additional DE must be dedicated to contain the fully developed 100-yr water surface elevation.
1st Review Response: HEC RAS model included for channels, roadside ditch and culverts
2nd Review Comment: Noted.
12. Please ensure side yard swales contain the 100yr WSEL and do not drain to the adjacent lots. Provide a typical section with hydraulic parameters. Ensure the typical section is feasible in each of the lots according to the grading plan.
1st Review Response: side ditch sized to contain 100 yr discharge
2nd Review Comment: Address side yard swales comment on grading sheets (sheet 8)
2nd Review Response:
3rd Review Comment: Addressed.
13. Verify the roadside ditch on Sam Bass Road does not drain to the proposed Street A roadside ditch.
1st Review Response: Samross culvert does not drain to the proposed street, flow is only 1.23 cfs
2nd Review Comment: Noted.
14. Show and label proposed culvert crossing on street plan and profile. Include 100-yr HGL. Please use a min of 18". Design culvert to pass the fully developed 100-yr flood event with 1' freeboard. Use RAS to evaluate backwater and tailwater at proposed culvert.
1st Review Response: culvert crossing is included in plan set
2nd Review Comment: Noted.
15. Provide Plan and profile for all proposed channels. Show and label the fully developed 100-yr water surface profile and left and right top of bank; verify 1' freeboard. Include culverts and verify 1' freeboard to top of road.
1st Review Response: Channel profile with 100 yr wse is included in plan set
2nd Review Comment: Please use the Ultimate 100yr flow to design the channels.
2nd Review Response: Ultimate Condition Utilized.
3rd Review Comment: (a) It appears the flow change at cross section 5551 does not match the HMS model. Please verify, reconcile and revise. (b) Address comments on sheet 9 and 13 and provide annotated responses.
4th Review Comment: a) Addressed b) Please address comments on Sheets 7, 9, 12-8, and 13B
All comments addressed
16. The proposed infrastructure (ie inlets, SD, swales, driveway culverts, channels, etc.) included in the drainage study to support the preliminary plat will be reviewed again once the construction plans are available. Update calculations as necessary to correspond to plans.
1st Review Response: All proposed infrastructure calculation are included in plan set
2nd Review Comment: Addressed.
17. 4th Review Comment: Please review and revise HEC-RAS models for the following comments
DCSRR IV.3.4: Channel bank station adjusted for all cross sections and all channels
 - a. Channel bank stations should be adjusted for all cross sections and all channels.
 - b. All cross sections must contain the computed water surface elevations. Verified
 - c. For Channel-A, why does the n-value decrease (0.04 to 0.035) when transitioning from engineered ditch to the natural, existing channel? Please review and revise as necessary for all HEC-RAS models. n-value for natural channel = 0.035 DCSRR TABLE IV.3-6
n-value for engineered channel = 0.040 recommended on earlier review

curved cross-sections
 are straightened

- d. Ineffective flow areas should not be located within the conveyance area of the proposed culverts (Channel-A structure cross section 5893). Culvert Ineffective flow area station are adjusted
- e. Flow profiles should not cross (Channel-A 6473 – 6601) Additional cross-sections were added to resolve crossing profiles
- f. Cross sections should not curve (Channel-A 5866 and 5922). Please revise.
- g. Please review and revise all structure data in the HEC-RAS models. Distance and width should be the same in both the Deck/Roadway editor and culvert editor.

Distance and width are now
 same on both Deck/Roadway
 editor and culvert editor



The Engineer shall revise the hydrologic study and/or plans in accordance with the above comments and/or provide a written response that addresses each comment. If you have any questions or need additional information, please do not hesitate to call me at (214) 937-3953.

Sincerely,
 HALFF
 TBPELS Firm No. 312

Parker C. Moore, P.E., CFM
 Project Manager

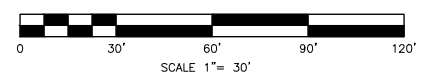
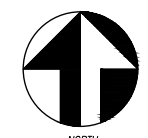
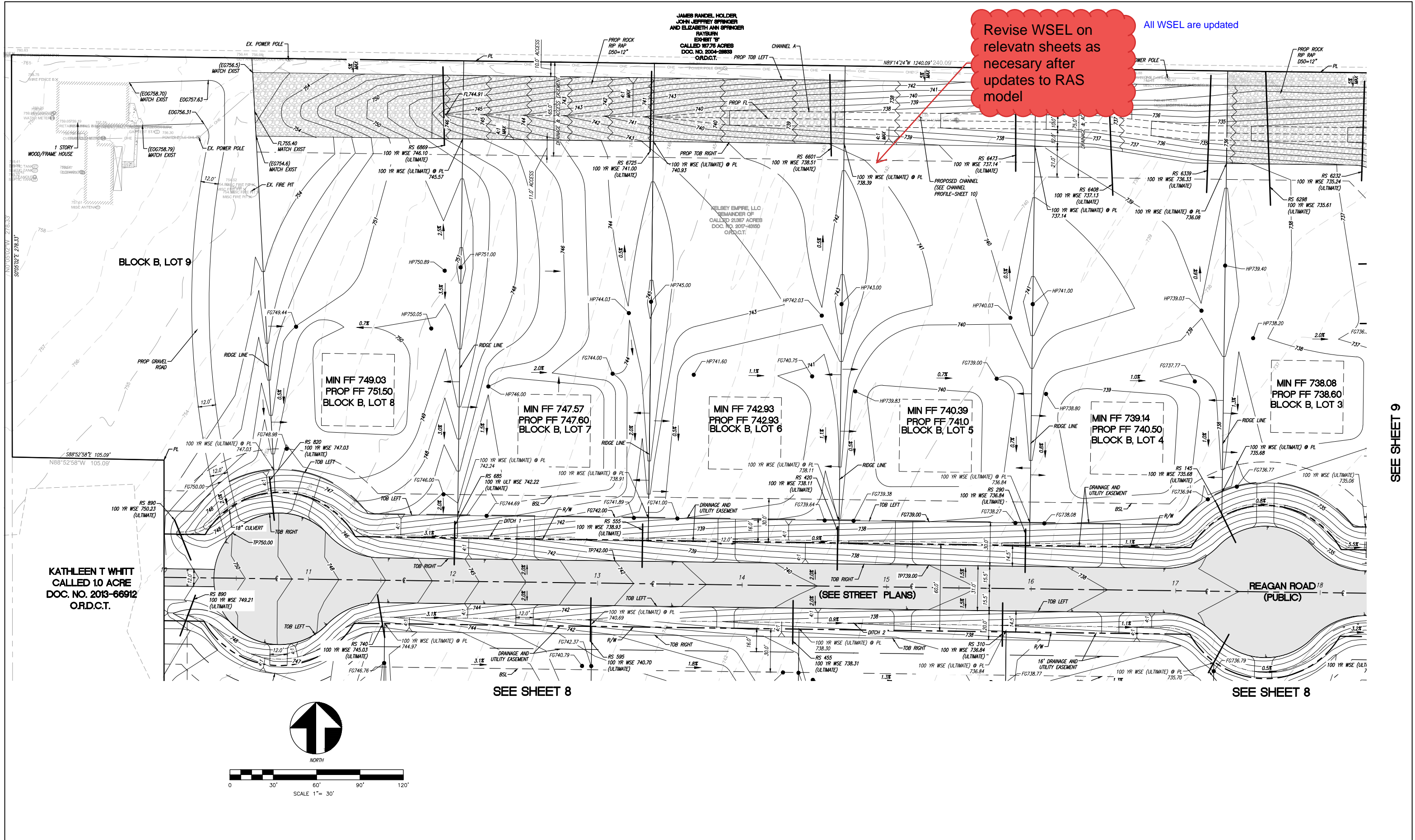
Attachment:

- Plan Markups

JAMES DANIEL HOLDER,
JOHN JEFFREY SPRINGER
AND ELIZABETH ANN SPRINGER
RAYBURN
EXHIBIT 'B'
CALLED 187.76 ACRES
DOC. NO. 2004-28893
O.R.D.C.T.

Revise WSEL on
relevatn sheets as
necessary after
updates to RAS
model

All WSEL are updated



SEE SHEET 9

SEE SHEET 8

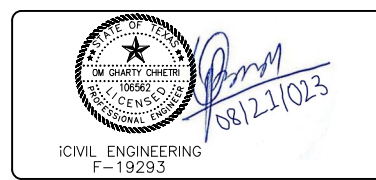
SEE SHEET 8



iCIVIL ENGINEERING
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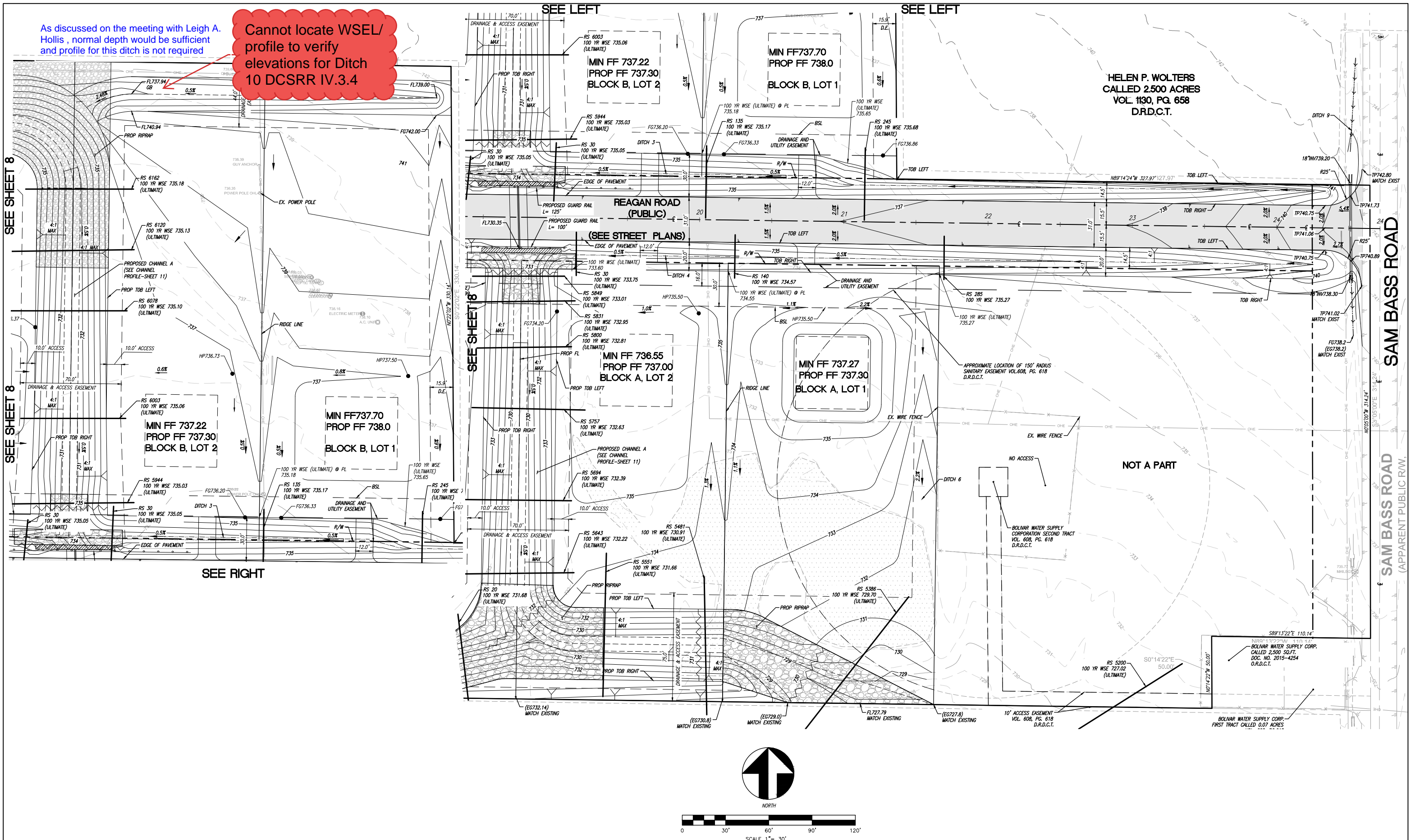


SANGER, TEXAS
GRADING PLAN
FOR
MARLEY MEADOWS

PROJECT NO.
sheet
7
of
23

As discussed on the meeting with Leigh A. Hollis, normal depth would be sufficient and profile for this ditch is not required

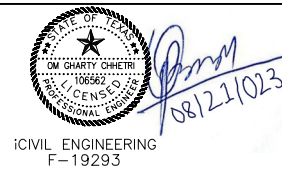
Cannot locate WSEL/
profile to verify
elevations for Ditch
10 DCSRR IV.3.4



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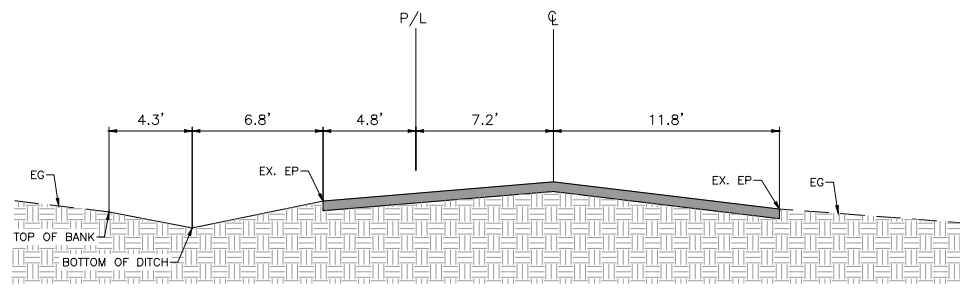
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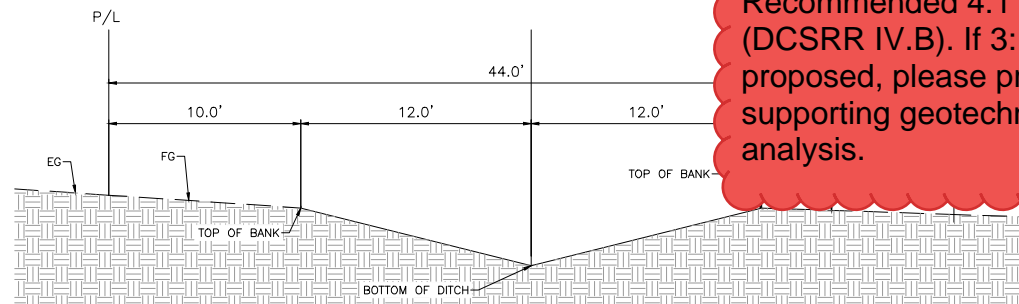
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F-19293

SANGER, TEXAS
GRADING PLAN
FOR
MARLEY MEADOWS

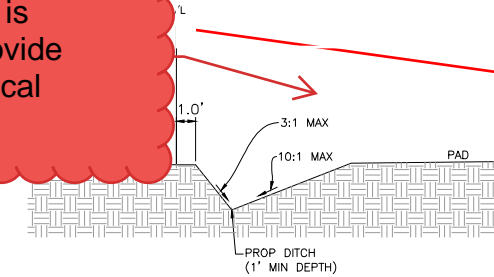
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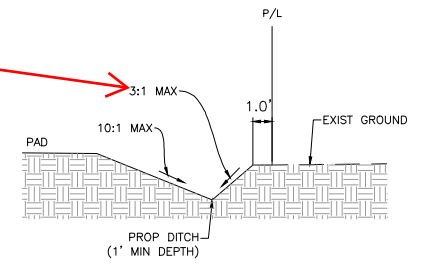
SECTION I-I
NTS



SECTION J-J
NTS



SECTION K-K
NTS



SECTION L-L
NTS

Recommended 4:1 max slope (DCSRR IV.B). If 3:1 is proposed, please provide supporting geotechnical analysis.

Revised to 4:1 max slope

| AREA CODE | TIME OF CONCENTRATION CALCULATION | | | | | | | | | | | | | | | | | | |
|-----------|-----------------------------------|-------------|----------|---------------|-----------|------------|---------------------------|----------|------------|--------------|-----------|---------|--------------|-----------|-------------|---------|-------------|----------|-------|
| | SHEET FLOW | | | | | | SHALLOW CONCENTRATED FLOW | | | | | | CHANNEL FLOW | | | | TOC (TOTAL) | TOC USED | |
| | LENGTH (ft) | MANNING'S N | P2 (in.) | SLOPE (ft/ft) | TIME(hr.) | TIME(Min.) | HIGH ELEV | LOW ELEV | LENGTH(ft) | SLOPE(ft/ft) | VEL.(fps) | TOC(hr) | TOC(Min.) | VEL.(fps) | LENGTH (ft) | TOC(hr) | TOC(Min.) | (Min.) | |
| A1a & A1b | 100 | 0.15 | 3.36 | 0.02 | 0.16 | 9.56 | 753.0 | 751.0 | 185 | 0.01 | 1.60 | 0.03 | 1.93 | 7.85 | 825 | 0.03 | 1.75 | 13.24 | 15.00 |

NOTE:
 1. VALUE OF MANNING'S N FOR SHEET FLOW = 0.15 (FROM DENTON COUNTY SUBDIVISION RULES & REGULATIONS, PAGE 56, TABLE IV.1-6)
 2. VELOCITY FOR SHALLOW CONCENTRATED FLOW IS TAKEN FROM TR 55 FIGURE 3-1
 3. P2 = 3.36 FROM DENTON COUNTY SUBDIVISION RULES & REGULATIONS TABLE IV.1-3

| AREA CODE | TIME OF CONCENTRATION CALCULATION | | | | | | | | | | | | | | | | |
|-----------|-----------------------------------|-------------|----------|---------------|-----------|------------|----------------|-------------|---------|-----------|-----------|-------------|----------------|-----------|--------|-------|-------------|
| | SHEET FLOW | | | | | | CHANNEL FLOW 1 | | | | | | CHANNEL FLOW 2 | | | | TOC (TOTAL) |
| | LENGTH (ft) | MANNING'S N | P2 (in.) | SLOPE (ft/ft) | TIME(hr.) | TIME(Min.) | VEL.(fps) | LENGTH (ft) | TOC(hr) | TOC(Min.) | VEL.(fps) | LENGTH (ft) | TOC(hr) | TOC(Min.) | (Min.) | | |
| A2 | 100 | 0.15 | 3.36 | 0.05 | 0.11 | 6.63 | 7.85 | 900.00 | 0.03 | 1.91 | 5.38 | 462 | 0.02 | 1.43 | 9.97 | 15.00 | |

NOTE:
 1. VALUE OF MANNING'S N FOR SHEET FLOW = 0.15 (FROM DENTON COUNTY SUBDIVISION RULES & REGULATIONS, PAGE 56, TABLE IV.1-6)
 2. VELOCITY FOR SHALLOW CONCENTRATED FLOW IS TAKEN FROM TR 55 FIGURE 3-1
 3. P2 = 3.36 FROM DENTON COUNTY SUBDIVISION RULES & REGULATIONS TABLE IV.1-3

| DRIVEWAY CULVERT DATA FOR BLK B LOT 3 TO 9 | | | | | | | |
|--|------------------------|------|------------|--------------------------|---------------|---------------|-----------------|
| STREET STATION | CORRESPONDING LOT AREA | Q100 | Q100 TOTAL | CONTRIBUTING LOTS/AREA | CULVERT SIZE* | UPSTREAM INV. | DOWNSTREAM INV. |
| 10+47.78 | 0.97 | 4.20 | 4.20 | LOT 9 | 18" | 746.78 | 746.03 |
| 10+95.82 | 0.81 | 3.51 | 7.71 | LOT 8 & 9 | 18" | 745.29 | 744.55 |
| 12+49.77 | 0.55 | 2.38 | 10.09 | LOT 7, 8 & 9 | 24" | 740.53 | 739.79 |
| 13+88.82 | 0.55 | 2.38 | 12.47 | LOT 6, 7, 8 & 9 | 24" | 736.92 | 736.76 |
| 15+11.52 | 0.55 | 2.38 | 14.85 | LOT 5, 6, 7, 8 & 9 | 27" | 736.08 | 735.85 |
| 16+55.07 | 0.55 | 2.38 | 17.23 | LOT 4, 5, 6, 7, 8 & 9 | 27" | 734.59 | 734.28 |
| 17+61.27 | 0.14 | 0.60 | 17.83 | LOT 3, 4, 5, 6, 7, 8 & 9 | 27" | 733.38 | 733.07 |

* CULVERT LENGTH=24', MATERIAL=RCP

| DRIVEWAY CULVERT DATA FOR BLK B LOT 1 & 2 CULVERTS | | | | | | | |
|--|------------------------|------|------------|----------------------------|---------------|---------------|-----------------|
| STREET STATION | CORRESPONDING LOT AREA | Q100 | Q100 TOTAL | CONTRIBUTING LOTS/AREA | CULVERT SIZE* | UPSTREAM INV. | DOWNSTREAM INV. |
| 20+74.17 | 2.55 | 9.00 | 9.00 | LOT 1, OA1a & OA1b | 18" | 734.11 | 734.01 |
| 19+65.12 | 1.74 | 6.16 | 15.16 | LOT 1, 2 & OA1a, OA1b & A3 | 24" | 733.58 | 733.46 |

* CULVERT LENGTH=24', MATERIAL=RCP

| DRIVEWAY CULVERT DATA FOR BLK A LOT 3 TO 8 CULVERTS | | | | | | | |
|---|------------------------|------|------------|------------------------|---------------|---------------|-----------------|
| STREET STATION | CORRESPONDING LOT AREA | Q100 | Q100 TOTAL | CONTRIBUTING LOTS/AREA | CULVERT SIZE* | UPSTREAM INV. | DOWNSTREAM INV. |
| 10+80.03 | 0.21 | 1.17 | 1.17 | LOT 9 | 18" | 746.82 | 746.08 |
| 12+49.73 | 0.21 | 1.17 | 2.34 | LOT 8 & 9 | 18" | 741.58 | 740.84 |
| 13+88.82 | 0.21 | 1.17 | 3.51 | LOT 7, 8 & 9 | 18" | 737.83 | 737.60 |
| 15+11.46 | 0.21 | 1.17 | 4.68 | LOT 6, 7, 8 & 9 | 18" | 736.59 | 736.34 |
| 16+55.08 | 0.21 | 1.17 | 5.85 | LOT 5, 6, 7, 8 & 9 | 18" | 735.12 | 734.88 |
| 17+59.72 | 0.23 | 1.23 | 7.08 | LOT 4, 5, 6, 7, 8 & 9 | 18" | 734.05 | 733.82 |

* CULVERT LENGTH=24', MATERIAL=RCP

| DRIVEWAY CULVERT DATA FOR BLK A LOT 1 & 2 CULVERTS | | | | | | | |
|--|------------------------|------|------------|------------------------|---------------|---------------|-----------------|
| STREET STATION | CORRESPONDING LOT AREA | Q100 | Q100 TOTAL | CONTRIBUTING LOTS/AREA | CULVERT SIZE* | UPSTREAM INV. | DOWNSTREAM INV. |
| 20+74.17 | 0.29 | 1.62 | 1.62 | A4 | 18" | 734.13 | 734.01 |
| 19+65.12 | 0.16 | 0.89 | 2.51 | A4 | 18" | 733.58 | 733.46 |

| Area ID | DITCH ID | Area (acres) | C | CA | TC (min.) | RUNOFF CALCULATION | | | | Q1 (cfs) | Q5 (cfs) | Q10 (cfs) | Q100 (cfs) | COM. |
|-----------------|----------|--------------|------|------|-----------|--------------------|--------------|---------------|----------------|----------|----------|-----------|------------|---|
| | | | | | | I1 (in./hr.) | I5 (in./hr.) | I10 (in./hr.) | I100 (in./hr.) | | | | | |
| SIDE YARD DITCH | DITCH 0 | 0.75 | 0.45 | 0.34 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 1.13 | 1.57 | 1.83 | 2.66 | DITCH BETWEEN ANY TWO LOTS (TYP.) |
| A1a & A1b | DITCH 1 | 4.12 | 0.55 | 2.27 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 1.13 | 1.57 | 1.83 | 2.66 | HALF OF THE LOT DRAINS TO CHANNEL 1 |
| A2 | DITCH 2 | 1.27 | 0.71 | 0.90 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 3.01 | 4.19 | 4.89 | 7.10 | COMPOSITE C=0.71 (CALCULATION PROVIDED ON THIS SHEET) |
| OA1a, OA1b & A3 | DITCH 3 | 4.29 | 0.45 | 1.93 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 6.45 | 8.98 | 10.46 | 15.19 | AREA A3+OA1a+OA1b DRAINS TO DITCH 3 |
| A4 | DITCH 4 | 0.45 | 0.75 | 0.34 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 1.13 | 1.57 | 1.83 | 2.66 | COMPOSITE C=0.71 (CALCULATION PROVIDED ON THIS SHEET) |
| OA1b | DITCH 5 | 1.12 | 0.45 | 0.50 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 1.68 | 2.34 | 2.73 | 3.97 | DITCH FOR OFFSITE AREA DRAINAGE |
| OA2 | DITCH 6 | 0.96 | 0.45 | 0.43 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 1.44 | 2.01 | 2.34 | 3.40 | DITCH FOR OFFSITE AREA DRAINAGE |
| OA3 | DITCH 7 | 0.50 | 0.55 | 0.28 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 0.92 | 1.28 | 1.49 | 2.16 | DITCH FOR OFFSITE AREA DRAINAGE |
| OA3 & A5 | DITCH 8 | 5.56 | 0.45 | 2.50 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 8.36 | 11.63 | 13.56 | 19.69 | 1 ACRE LOTS |
| OA2-a | DITCH 9 | 0.20 | 0.78 | 0.16 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 0.52 | 0.73 | 0.85 | 1.23 | ROADSIDE DITCH |
| OA1c | DITCH 10 | 1.57 | 0.30 | 0.47 | 15 | 3.34 | 4.65 | 5.42 | 7.87 | 1.57 | 2.19 | 2.55 | 3.71 | DITCH FOR OFFSITE AREA DRAINAGE |

NOTE:
 C VALUE FOR SINGLE FAMILY RESIDENTIAL 1 ACRE LOTS = 0.45 (DENTON COUNTY SUBDIVISION RULES & REGULATIONS TABLE IV.1-4)
 C VALUE FOR SINGLE FAMILY RESIDENTIAL 1/2 ACRE LOTS = 0.55 (DENTON COUNTY SUBDIVISION RULES & REGULATIONS TABLE IV.1-4)
 C VALUE FOR STREET = 0.95 (DENTON COUNTY SUBDIVISION RULES & REGULATIONS TABLE IV.1-4)
 C VALUE FOR CLAYEY SOIL, AVERAGE, 5-10% = 0.60 (DENTON COUNTY SUBDIVISION RULES & REGULATIONS TABLE IV.1-4)
 THE VALUE OF INTENSITY PER HOUR IS TAKEN FROM DENTON COUNTY SUBDIVISION RULES & REGULATIONS, PAGE 47-48-49, TABLE IV.1-3

Please double check intensity values vs DCSRR Table IV 1-3

revised

Ditches shall maintain 30" minimum depth (DCSRR IV.B)

These are not ditch but rather swales. Ditch/Swale depth revised

| V-DITCH CAPACITY CALCULATION | | | | | | |
|------------------------------|------------|-----------------------|-------------|-------------------|----------------|------------------------|
| DITCH ID | Q100 (cfs) | AVERAGE SLOPE (ft/ft) | MANNING'S N | WATER DEPTH (ft.) | VELOCITY (fps) | TOTAL DITCH DEPTH (ft) |
| DITCH 1 | 17.83 | 0.020 | 0.040 | 0.91 | 3.47 | 3.5 |
| DITCH 2 | 7.10 | 0.020 | 0.040 | 0.80 | 2.77 | 2.5 |
| DITCH 3 | 15.19 | 0.020 | 0.040 | 1.07 | 3.32 | 2.5 |
| DITCH 4 | 2.66 | 0.020 | 0.040 | 0.55 | 2.07 | 2.5 |
| DITCH 5 | 3.97 | 0.005 | 0.040 | 0.70 | 1.25 | 1.0 |
| DITCH 6 | 3.40 | 0.005 | 0.040 | 0.66 | 1.20 | 1.0 |
| DITCH 7 | 2.16 | 0.005 | 0.040 | 0.56 | 1.06 | 1.0 |
| DITCH 8 | 19.69 | 0.015 | 0.040 | 1.24 | 3.20 | 4.5 |
| DITCH 9 | 1.23 | 0.005 | 0.040 | 0.37 | 0.80 | 1.0 |
| DITCH 10 | 3.71 | 0.0068 | 0.040 | 0.77 | 1.56 | 3.0 |

| WEIGHTED RUNOFF COEFFICIENT (DITCH-2) | | | |
|---------------------------------------|-----------------|--------------|-----------------------|
| LAND USE | TOTAL LAND AREA | RUNOFF COEF. | WEIGHTED RUNOFF COEF. |
| ASPHALT/CONCRETE | 0.41 | 0.95 | 0.71 |
| CLAYEY SOIL 5-10% | 0.86 | 0.60 | |

| WEIGHTED RUNOFF COEFFICIENT (DITCH-4) | | | |
|---------------------------------------|-----------------|--------------|-----------------------|
| LAND USE | TOTAL LAND AREA | RUNOFF COEF. | WEIGHTED RUNOFF COEF. |
| ASPHALT/CONCRETE | 0.19 | 0.95 | 0.75 |
| CLAYEY SOIL 5-10% | 0.26 | 0.60 | |

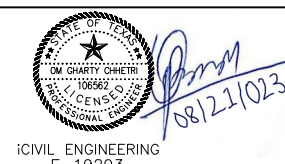
| WEIGHTED RUNOFF COEFFICIENT (DITCH-9) | | | |
|---------------------------------------|-----------------|--------------|-----------------------|
| LAND USE | TOTAL LAND AREA | RUNOFF COEF. | WEIGHTED RUNOFF COEF. |
| ASPHALT/CONCRETE | 0.10 | 0.95 | 0.78 |
| CLAYEY SOIL 5-10% | 0.10 | 0.60 | |



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 PH: (972) 523-5493
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| no. | revision | by | date |
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AUG 2023



SANGER, TEXAS
DITCH AND CULVERT CALCULATIONS
 FOR
MARLEY MEADOWS

PROJECT NO.
 sheet
 12-B
 of
 23

| HEC-RAS Plan | Channel A EXISTING CONDITION | River CHANNEL-A | Reach CHANNEL-A | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Ch W.S. Elev (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Ch (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Ch |
|--------------|------------------------------|-----------------|-----------------|---------|---------------|----------------|----------------|-------------------|----------------|--------------------|---------------|-------------------|----------------|-------------|
| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

Check to ensure no increases in water surface elevations for all storm events or crossing profiles for all channels/ditches

Verified

| HEC-RAS Plan | Channel A EXISTING CONDITION | River CHANNEL-A | Reach CHANNEL-A | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Ch W.S. Elev (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Ch (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Ch |
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| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

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|--------------|------------------------------|-----------------|-----------------|---------|---------------|----------------|----------------|-------------------|----------------|--------------------|---------------|-------------------|----------------|-------------|
| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

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|--------------|------------------------------|-----------------|-----------------|---------|---------------|----------------|----------------|-------------------|----------------|--------------------|---------------|-------------------|----------------|-------------|
| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

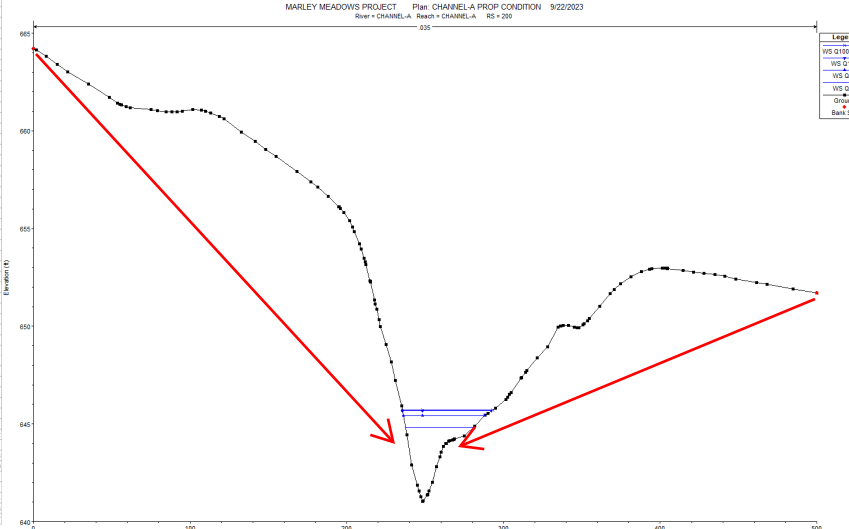
| HEC-RAS Plan | Channel A EXISTING CONDITION | River CHANNEL-A | Reach CHANNEL-A | Profile | Q Total (cfs) | Min Ch El (ft) | W.S. Elev (ft) | Ch W.S. Elev (ft) | E.G. Elev (ft) | E.G. Slope (ft/ft) | Vel Ch (ft/s) | Flow Area (sq ft) | Top Width (ft) | Froude # Ch |
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| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

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| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
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| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

Critical depth still exists

This section barely have any flow. Rip-Rap is provided



Channel bank stations should be adjusted for all cross sections and all channels. DCSR IV.3.4 Please see additional HEC-RAS comments in letter

All Channel all bank stations are updated

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|--------------|------------------------------|-----------------|-----------------|---------|---------------|----------------|----------------|-------------------|----------------|--------------------|---------------|-------------------|----------------|-------------|
| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q50 | 15.20 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
| CHANNEL-A | 6000 | Q100 | 15.30 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |

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|--------------|------------------------------|-----------------|-----------------|---------|---------------|----------------|----------------|-------------------|----------------|--------------------|---------------|-------------------|----------------|-------------|
| CHANNEL-A | 6000 | Q10 | 15.10 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 736.34 | 0.000000 | 1.45 | 88.50 | 182.60 | 0.48 |
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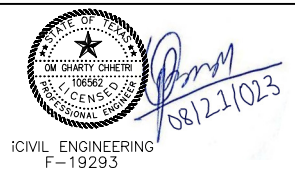
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HYDRAULIC WORK MAP
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