April 11, 2023
AVO 37449.004

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

Re: **Palomino Bay Addition – Drainage Study in support of the Preliminary Plat Second 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 Palomino Bay development. The drainage study prepared Eikon Architects and Engineers was received on September 27, 2022. First review comments were provided on October 24, 2022. A second submittal was received on November 28th, 2022 and comments were provide on December 14, 2022. A third submittal was received on March 29, 2023.

We have completed our 3rd review and offer the following comments. Please refer to the Denton County Subdivision Rules and Regulations dated July 2009 for drainage criteria; hereafter referred to as Criteria Manual.

General:

1. 1st /2nd /3rd Review Comment: Plans and plat are reviewed separately. Please note an accepted drainage study is required prior to plat acceptance.
   1st Review Response: An applicable drainage study as required per the current Denton County Subdivision Rules and Regulations as outlined in Section VII – Chapter IV will be provided prior to the final plat application.
   2nd Review Comment: A drainage study needs to be completed prior to plat acceptance.
   2nd Review Response: The proposed drainage analyses/plans are illustrated in the recently submitted civil engineering plans. The design has been coordinated with Denton County development services on the application and intent of the Denton County Drainage design standards. The County is available to meet to discuss their drainage design requirements, including intent and application. Please let us know if we can set up a meeting with the County.

2. 1st /2nd /3rd Review Comment: Please address comments on attached markups and provide annotated responses on markups.
   1st Review Response: Responses are on the markups
   2nd Review Comment: Please provide annotated responses with next submittal
   2nd Review Response: The responses are on the markups. Please see the final civil engineering plans.
   3rd Review Comment: It appears the annotated responses included are for review #1.

HALFF ASSOCIATES, INC.
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FORT WORTH, TX 76137-2720
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WWW.HALFF.COM

3. Development is located adjacent to the Lake Ray Roberts flowage easement (elevation 645.5). Please coordinate with USACE to obtain permission regarding runoff and velocities into the flowage easement.
   1st Review Response: A meeting with USACE occurred on 11/10/22. USACE acceptable with layout as long as velocities at or below 5 fps in final engineering plans.
   2nd /3rd Review Comment: Noted. Please ensure velocities reaching the flowage easements are less than 5cfs. Provide cross sections with hydraulic parameters to verify.
   2nd Review Response: On November 1 0th, 2022 an in-person meeting was held at the at the Lake Lewisville office of USACE to discuss this comment. Among the meeting attendees were by Rob Jordan (USACE), Kevin Ware, Gary Hazlewood (Westwood), and Clint Baker (Westwood). The USACE instructed that they are acceptable with the layout as long as the velocities are at or below 5 feet-per-second in the final engineering plans.
   3rd Review Comment: Provide RAS model for proposed channels. Include existing condition cross sections at and downstream of proposed channel to establish backwater and to analyze transition and transitional velocities. Include velocity analysis for the 2, 5, 10, 25, and 100-yr flood events and required by the Criteria manual Section IV.1.5.

4. 1st/ 2nd /3rd Review Comment: The FEMA floodplain appears shifted on exhibits and plat. Please verify and update as needed. Any activity within the FEMA floodplain will require an approved floodplain development permit.
   1st Review Response: No grading activities are planned to occur within 100-year FEMA floodplain or the USACE flowage easement.
   2nd Review Comment: Comment not addressed; it appears FEMA floodplain is drawn incorrectly on plans. A section of FEMA floodplain appears to reach development. Please note, any activity within the FEMA floodplain will required an FDP; provide prior to grading permit.
   2nd Review Response: The FEMA mapped floodplain limits do not always match the on the ground elevations. No grading activities are planned to occur within in the 100-year FEMA floodplain or the USACE flowage easements, which is illustrated on the final civil engineering plans.
   3rd Review Comment: (a) Verify FEMA floodplain, it appears shifted. Based on digital FEMA files, Zone AE is closer to contour shapes; see DA map markup. (b) Show and label USACE flowage easement or plat and grading sheets; typically, at a contour elevation (ie 645.5). (c)

5. 1st and 2nd Review Comment: Please include the following on the final plat: (a) Lake Ray Roberts flowage easement, (b) floodplain easement based on Lake Ray Roberts fully developed 100-yr elevation + 10', (c) provide minimum finished floor elevations 2' above fully developed 100-yr water surface elevation; base Min FFE on the higher 100-yr fully developed floodplain for lake or proposed channel. (d) update drainage easements based on comments (e) provide any additional drainage easement at roadside ditches to encompass the fully developed 100-yr floodplain.
   1st Review Response: Designers acknowledge these requirements for final plat.
   2nd Review Comments: Noted. Please address (a) and (b) and provide preliminary DE sizes for preliminary plat (comments d and e).
   2nd Review Response:
   (a) Please see final civil engineering plans/ final plat.

(b) The minimum finish floor elevations are 2' above (647.00) the verified (with the USACE) 100-yearwater surface elevation of Lake Ray Roberts, which is 645.00'.
20' drainage easements are provided in most places. Please provide the code requirements for 10' of additional easement past the channel banks. Per discussions with the City and City Engineer, normal depth calculations for water depth in channel is acceptable. The county does allow the HGL to extend past the ROW if a drainage easement is in place.
3rd Review Comment: (a) Show flowage easement; see markups.
(b) Please provide source of fully developed 100-yr elevation for the Lake.
For lots adjacent to channels, the Min FFE must be 2' above channels fully developed 100-yr water surface elevation. Use upstream cross section. The rest can be based on the Lake's fully developed 100-yr elevation.
(c) Access for maintenance is required for all channels; 10' on each side (Chapter 10 Section 10.105 (5) Easements.
(d) Update drainage easements based on comments
(e) Provide any additional drainage easement at roadside ditches to encompass the fully developed 100-yr floodplain.

6. 1st /2nd Review Comment: Please note, additional comments may result once additional info is provided.
   1st Review Response: Designers acknowledged.
   3rd Review Comment: Please address markups and provide annotated responses. Please note Please note, not all comments are provided on the letter since some comments are easier to show and explain on the markups.

Hydrology and Hydraulics:

7. 1st and 2nd Review Comment: Please provide a separate proposed drainage area map, show proposed development footprint, proposed contours and provide flow calculations. Include 100-yr fully developed flow calculations.
   1st Review Response: An incomplete drainage study with map was included.
   2nd Review Comments: Please addressed comments on proposed drainage area map and provide annotated responses.
   2nd Review Response: Please see final civil engineering plans. Grading is mostly limited to the right of way and drainage easements. These are 2 acre lots. Any grading on the lots will occur once the lots are purchased and the home sites are designed.
   3rd Review Comments: Please addressed comments on proposed drainage area map and provide annotated responses.

8. 1st/2nd /3rd Review Comment: Provide a comparison of existing and proposed flows, water surface elevations and velocities at each site outfall.
   1st Review Response: Designers stated that all detailed calculations with be provided with the detailed engineering plans.
   2nd Review Comments: There is insufficient information provided to review. Please provide with next submittal.
   2nd Review Response: Please see the final civil engineering plans. Per discussions with the City and City Engineer, normal depth calculations for water depth in channel is acceptable. Per discussions with the City and City Engineer using FWHA HDS-5 is an acceptable tool to

computer culvert hydraulics. The design has been coordinated with Denton County development services on application and intent of the Denton County Drainage design standards.
3rd Review Comment: Comment refers to existing and proposed flow comparison. Please provide. Address comments on DA maps and provide annotated responses.

9. 1st and 2nd Review Comment: What is the plan to mitigate increases on flow, water surface elevations and velocity? If obtaining permission for increases from adjacent owner, please provide documentation; include exhibits and calculations.
   1st Review Response: Designers stated that all detailed calculations with be provided with the detailed engineering plans.
   2nd Review Comments: There is insufficient information provided to review. Please address with next submittal. Adverse impact analysis must be addressed with drainage study in support of preliminary plat.
   2nd Review Response: Since the USCOE/Lake Ray Roberts is the majority adjacent landowner, on November 10th, 2022 an in-person meeting was held at the at the Lake Lewisville office of USACE to discuss this comment. Among the meeting attendees were by Rob Jordan (USACE), Kevin Ware, Gary Hazlewood (Westwood), and Clint Baker (Westwood). USACE instructed that they are acceptable with the layout as long as the velocities are at or below 5 feet-per-second, which is illustrated in the final engineering plans.
   3rd Review Comment: (a) Please provide documentation/permission regarding runoff and velocities into adjacent property (b) Please ensure velocities reaching the flowage easements and/or USACE property are less than 5cfs

10. 1st and 2nd Review Comment: Indicate landuse for selected runoff coefficients for existing, proposed, and ultimate conditions or provide a separate landuse map.
    1st Review Response: Designers stated that this information is provided on drainage map.
    2nd Review Comments: The drainage study and map are incomplete. There is insufficient information provided to review. Please provide with next submittal.
    2nd Review Response: Please see the final civil engineering plans for the landuse map.
    3rd Review Comment: Please use fully developed conditions for channel/ditches/ and culvert design. Update C values and indicate landuse or provide a separate landuse map.

11. 1st /2nd /3rd Review Comment: Show and label flowage easement on grading sheets and drainage area maps.
    1st Review Response: Designers stated the information is included.
    2nd /3rd Review Comments: The USACE flowage easement is not shown correctly (i.e., 645.5 msl). Please verify and update as needed.
    2nd Review Response: Please see the final civil engineering plans for these details.

12. 1st / 2nd /3rd Review Comment: Provide diversion channels to convey and direct offsite runoff to the streets. 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 diches and culverts.
    1st Review Response: Designers stated that all detailed calculations with be provided with the detailed engineering plans.

2nd Review Comments: There is insufficient information provided to review. Please provide with next submittal.
2nd Review Response: Please see the final civil engineering plans for the updated drainage details illustrating these requirements. Per discussions with the City and City Engineer, normal depth calculations for water depth in channel is acceptable. Per discussions with the City and City Engineer using FWHA HDS-5 is an acceptable tool to computer culvert hydraulics.
3rd Review Comment: Refer to comment 15.

13. 1st and 2nd Review Comment: Provide channels to convey offsite/onsite runoff thru site. 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: Designers stated that all detailed calculations with be provided with the detailed engineering plans.
2nd Review Comments: There is insufficient information provided to review. Please provide with next submittal.
2nd Review Response: Please see the final civil engineering plans/plat for the proposed designs.
3rd Review Comment: Address comments on attached markups and provide annotated responses.

14. 1st/ 2nd /3rd Review Comment: Provide preliminary size of proposed culverts. Please note, a RAS model will be required for culverts to confirm backwater, headwater and freeboard.
1st Review Response: Designers stated that preliminary culvert sizes have been added, and that all detailed calculations with be provided with the detailed engineering plans.
2nd Review Comments: There is insufficient information provided to review. Please provide with next submittal.
2nd Review Response: Please see the final civil engineering plans for these details. Per discussions with the City and City Engineer, normal depth calculations for water depth in channel is acceptable. Per discussions with the City and City Engineer using FWHA HDS-5 is an acceptable tool to computer culvert hydraulics.
3rd Review Comment: Address comments on attached markups and provide annotated responses.

Address the following comments with future drainage study to support final plat and construction plans:

15. 1st-3rd Review Comment: Provide RAS model for all proposed channels and culverts. 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. Extend RAS model downstream of property line to establish backwater.
2nd Review Response: Please see the final civil engineering plans for these details. Per discussions with the City and City Engineer, normal depth calculations for water depth in channel is acceptable. Per discussions with the City and City Engineer using FWHA HDS-5 is an acceptable tool to computer culvert hydraulics. The design has been coordinated with Denton County development services on application and intent of the Denton County Drainage design standards.

3rd Review Comments: Please provide RAS models per Criteria. RAS is needed to accurately model backwater, transitions, and velocities (ie. mixed flow regime for steep channels). This may be waived on a case by case basis; however, for this project this has not been discussed. It appears a RAS model will be needed for this case.
Please address comments on attached markups and provide annotated responses. Refer to sheet C-12 and 13.

16. 1st-3rd Review Comment: Provide RAS model for all proposed roadside ditches (Criteria Manual Section IV.3.4). 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.
2nd Review Response: Please see the final civil engineering plans for these details. Per discussions with the City and City Engineer, normal depth calculations for water depth in channel is acceptable. Per discussions with the City and City Engineer using FWHA HDS-5 is an acceptable tool to computer culvert hydraulics.
3rd Review Comments: Please provide RAS models per Criteria. RAS is needed to accurately model backwater caused by driveways. 100-yr HGL must reflect the effects of backwater from driveway culverts.

17. 1st-3rd Review Comment: Show and label proposed driveway culvert on street plan and profile. Include 100-yr HGL. Please use a min of 15". Design driveway culvert to pass the fully developed 100-yr flood event. Use RAS to evaluate backwater and tailwater at proposed culverts.
2nd Review Response: These are 2 acre lots where the driveway location will not be determined until the house location is sited. Denton County requires culvert calculations at the time of the building permit.
3rd Review Comments: Typically for all projects with rural streets, the location of driveway is unknown and must be assumed. Roadside ditches must convey the fully developed 100-yr flow. 100-yr HGL must reflect the effects of backwater from driveway culverts. A RAS model will be required to evaluate water surface profiles in ditches. Include driveway culverts and verify 100-yr HGL is contained within the ROW. (section IV.3.4). Once all backwater effect are analyzed, additional DE may be required to contain the fully developed 100-yr flows

18. 1st-3rd Review Comment: 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.
2nd Review Response: Please see the final civil engineering plans for these details.
3rd Review Comment: Address comments on attached markups and provide annotated responses.

19. 1st-3rd Review Comment: Provide side yard swales to direct lot flows to the roads. Directing flow to adjacent lots is not allowed.
2nd Review Response: Please see final civil engineering plans. Grading is mostly limited to the right of way and drainage easements. These are 2 acre lots. Any grading on the lots to occur once lot is purchased and home sites are designed.

3rd Review Comment: Provide a typical cross section for the side yard swales to direct flows to roads. Include dimensions, depth, lot line, hydraulic parameters, etc. (b) Include flow arrows for side yard swales on grading sheets.

20. Verify that a USACE Section 404 of Clean Water Act investigation was/will be conducted. Placement of fill or realignment of existing channels may require authorization by an appropriate Section 404 permit. Provide results of investigation. Show and label any wetlands and/or Water of the US on grading plans.
    2nd Review Response: Eikon has completed a larger sitewide wetlands/waters of the US evaluation on the entirety of the property, but for this first phase, there are no proposed grading areas that affect Wetlands/USCOE areas. Eikon is coordinating with the USCOE on these matters.
    3rd Review Comment: Please provide results of investigation and mark any WOUS on grading sheets.

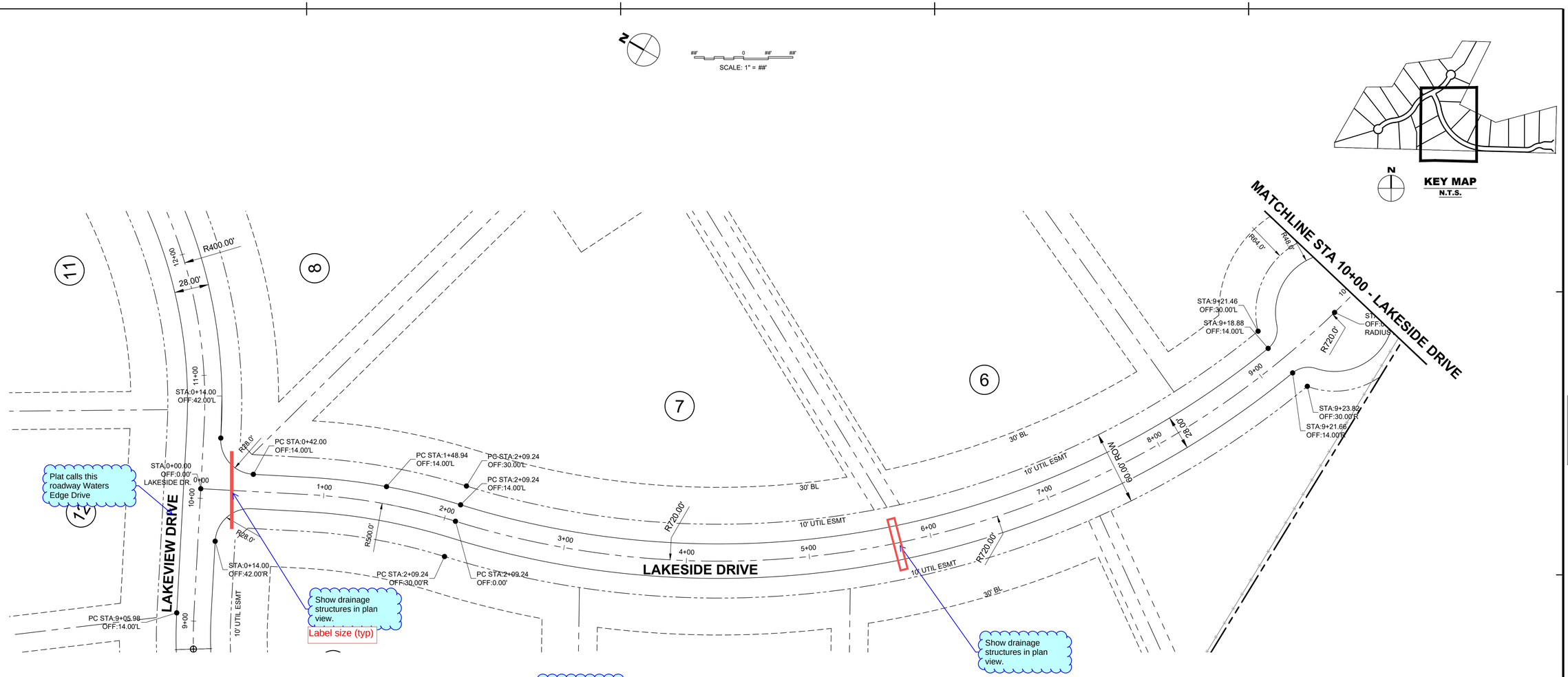
The Engineer shall revise the hydrologic study and/or plans in accordance with the above comments and/or provide a written response that addresses each comment. If you have any questions or need additional information, please do not hesitate to call me at (817) 764-7466.

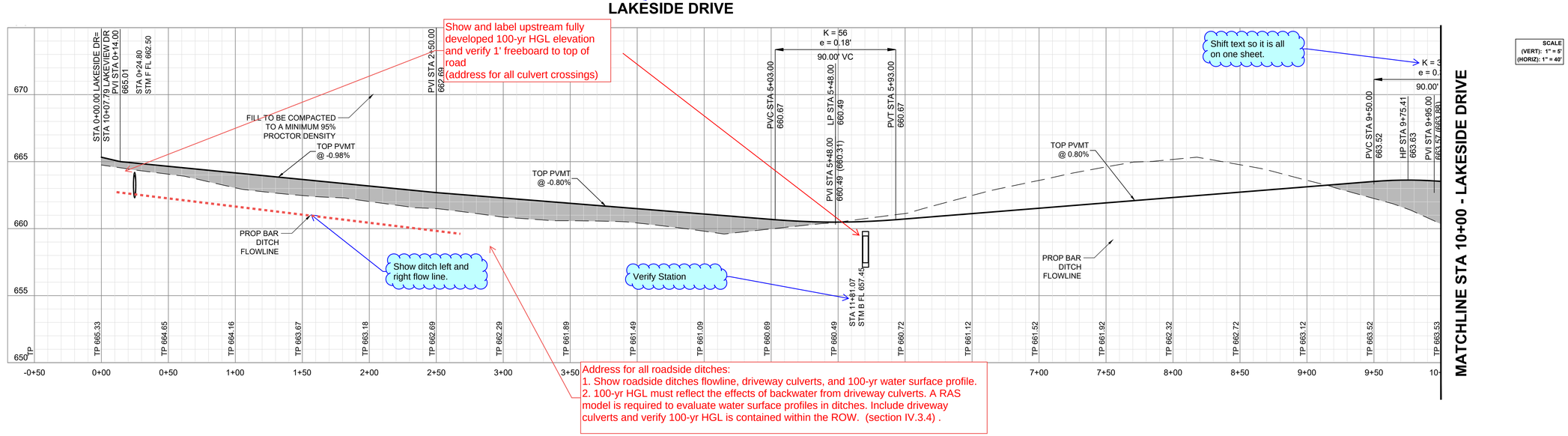
Sincerely,

HALFF ASSOCIATES, INC.
Firm No. 0312

Emilia Yanagi

Emilia Yanagi, P.E., CFM
Drainage Review Consultant for the City of Sanger





Address for all roadside ditches:
1. Show roadside ditches flowline, driveway culverts, and 100-yr water surface profile.
2. 100-yr HGL must reflect the effects of backwater from driveway culverts. A RAS model is required to evaluate water surface profiles in ditches. Include driveway culverts and verify 100-yr HGL is contained within the ROW. (section IV.3.4) .

SCALE
(VERT): 1" = 5'
(HORIZ): 1" = 40'

EIKON
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ARCHITECTS & ENGINEERS
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Sanger, Texas 76266
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THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF KEVIN J. WARE (TEXAS P.E. NO. 136599), ON 3/15/2023. IT IS NOT TO BE USED FOR CONSTRUCTION, BIDDING OR PERMIT PURPOSES.

TDLR #

PALOMINO BAY
PROFESSIONAL ENGINEERS
DENTON COUNTY, TEXAS

NOT FOR CONSTRUCTION
IN PROGRESS

Issued Date: 03-15-2023
Project No: EIK052622E-2

Drawn By: MP/MD
Checked By: SG
Designed By: MP/MD

Issue Record

#	Description	Date

DESIGN PHASE

PAVING PLAN I

C-06

EXISTING TIME OF CONCENTRATION CALCULATIONS

1		2 SHEET FLOW					3 SHALLOW CONCENTRATED FLOW				4 CHANNEL FLOW					5	7
Basin Area Designation	Sub-basins	Sheet Flow Length (ft)	P_2 (in)	Land Slope (ft/ft)	n	t_{sheet} (min)	Shallow Flow Length (ft)	Shallow Flow Slope (ft/ft)	Shallow Flow Velocity (ft/sec)	$t_{shallow}$ (min)	Channel Length (ft)	Channel Slope (ft/ft)	n	Average Velocity (ft/sec)	$t_{channel}$ (min)	Computed t_c (min)	Design* t_c (min)
Palomino Bay - EXISTING CONDITIONS																	
A		50	3.36	0.041	0.15	4.14	648	0.022	2.41	4.48		0.0085	0.03	4	0	8.62	15.00
B	B-1, B-2	50	3.36	0.010	0.15	7.25	737	0.018	2.17	5.66	470	0.0085	0.03	4	1.9583	14.87	15.00
C	C-1, C-2	50	3.36	0.005	0.15	9.56	1726	0.152	6.29	4.57	176	0.0085	0.03	4	0.7333	14.87	15.00
D		50	3.36	0.044	0.15	4.02	576	0.034	2.98	3.22		0.0085	0.03	4	0	7.24	15.00
E		50	3.36	0.056	0.15	3.64	810	0.033	2.93	4.61		0.0085	0.03	4	0	8.25	15.00
F		50	3.36	0.006	0.15	8.77	558	0.041	3.27	2.85		0.0085	0.03	4	0	11.62	15.00
G		50	3.36	0.004	0.15	10.25	376	0.036	3.06	2.05		0.0085	0.03	4	0	12.30	15.00

Palomino Bay Runoff Calculations

Pre Development Drainage Area Calculations (2, 5, 10, 25, 50and 100-Year Design Frequency)

1	2	3	4	5	6	7.0	8	9.0	10	11.0	12	13.0	14	15.0	16	17.0
Area Designation	Area (acres)	Runoff Coefficient C	CA	Total Tc* (Min)	I_2	Runoff Q_2 (cfs)	I_5	Runoff Q_5 (cfs)	I_{10}	Runoff Q_{10} (cfs)	I_{25}	Runoff Q_{25} (cfs)	I_{50}	Runoff Q_{50} (cfs)	I_{100}	Runoff Q_{100} (cfs)
ONSITE																
A	5.63	0.30	1.69	15.0	3.9	6.6	4.85	8.2	5.50	9.3	6.41	10.8	7.14	12.1	7.91	13.4
B-1	4.76	0.30	1.43	15.0	3.9	5.6	4.85	6.9	5.50	7.9	6.41	9.2	7.14	10.2	7.91	11.3
B-2	7.66	0.30	2.30	15.0	3.9	9.0	4.85	11.1	5.50	12.6	6.41	14.7	7.14	16.4	7.91	18.2
C-1	6.85	0.30	2.06	15.0	3.9	8.0	4.85	10.0	5.50	11.3	6.41	13.2	7.14	14.7	7.91	16.3
C-2	8.54	0.30	2.56	15.0	3.9	10.0	4.85	12.4	5.50	14.1	6.41	16.4	7.14	18.3	7.91	20.3
D	5.77	0.30	1.73	15.0	3.9	6.8	4.85	8.4	5.50	9.5	6.41	11.1	7.14	12.4	7.91	13.7
E	12.97	0.30	3.89	15.0	3.9	15.2	4.85	18.9	5.50	21.4	6.41	24.9	7.14	27.8	7.91	30.8
F	5.22	0.30	1.57	15.0	3.9	6.1	4.85	7.6	5.50	8.6	6.41	10.0	7.14	11.2	7.91	12.4
G	8.73	0.30	2.62	15.0	3.9	10.2	4.85	12.7	5.50	14.4	6.41	16.8	7.14	18.7	7.91	20.7
OS-1	3.67	0.30	1.10	15.0	3.9	4.3	4.85	5.3	5.50	6.1	6.41	7.1	7.14	7.9	7.91	8.7
OS-2	7.90	0.30	2.37	15.0	3.9	9.2	4.85	11.5	5.50	13.0	6.41	15.2	7.14	16.9	7.91	18.7

N

100' 0 50' 100'

SCALE: 1" = 100'

Show and label flowage easement (typically at contour elevation; ie 645.5)

Provide tc calculations. Update those larger than 15min

Appears shifted. Based on digital FEMA files, Zone AE is closer to contour shapes.

Show and label flowage easement (typically at contour elevation; ie 645.5)

FLOWAGE EASEMENT USA TRACT 521-2 VOLUME 6, PAGE 139 L.P.R.

SHADED ZONE "X" AS SCALED PER FEMA FIRM

FLOWAGE EASEMENT USA TRACT 521-1 VOLUME 6, PAGE 139 L.P.R.

ZONE "AE" AS SCALED PER FEMA FIRM BFE=646'

NON SHADED ZONE "X" AS SCALED PER FEMA FIRM

BLOCK A

LAKEVIEW DR

LAKESIDE DR

JONES RD (20' ASPHALT)

G 8.73 20.7

F 5.22 12.4

E 12.97 30.8

D 5.77 13.7

C-2 8.54 20.3

C-1 6.85 16.3

B-2 7.66 18.2

B-1 4.76 11.3

A 5.63 13.4

OS-1 3.67 8.7

OS-2 3.67 18.7

1X

2X

3+00

2+00

1+00

0+00

LEGEND

- EXISTING MINOR CONTOUR LINE
- EXISTING MAJOR CONTOUR LINE
- MAJOR DRAINAGE AREA
- MINOR DRAINAGE AREA
- TIME OF CONCENTRATION
- PROPERTY LINE
- DRAINAGE FLOW ARROW
- X — DRAINAGE AREA
- X.XX — BASIN AREA (AC.)
- X.X — Q100 (CFS)

NOTE: DRAINAGE BASIN DELINEATION AND FLOW PATHS DETERMINED WITH ON THE GROUND TOPOGRAPHIC DATA AND FIELD VISITS.

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Texas Firm F-12759
ARCHITECTS & ENGINEERS
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Phone 940.458.7503

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TDLR #

PALOMINO BAY
DENTON COUNTY, TEXAS

NOT FOR CONSTRUCTION IN PROGRESS

Issued Date: 03-15-2023
Project No: EIK052622E-2

Drawn By: MP/MD
Checked By: SG
Designed By: MP/MD

Issue Record

#	Description	Date

DESIGN PHASE

EXISTING DRAINAGE MAP

C-10

Palomino Bay Runoff Calculations

Post Development Drainage Area Calculations (2, 5, 10, 25, 50and 100-Year Design Frequency)

1	2	3	4	5	6	7.0	8	9.0	10	11.0	12	13.0	14	15.0	16	17.0	18
Area Designation	Area (acres)	Runoff Coefficient C	CA	Total Tc* (Min)	I_2	Runoff Q_2 (cfs)	I_5	Runoff Q_5 (cfs)	I_{10}	Runoff Q_{10} (cfs)	I_{25}	Runoff Q_{25} (cfs)	I_{50}	Runoff Q_{50} (cfs)	I_{100}	Runoff Q_{100} (cfs)	DESIGN POINT
ONSITE																	
A-1	0.89	0.45	0.40	15.0	3.9	1.6	4.85	1.9	5.50	2.2	6.41	2.6	7.14	2.9	7.91	3.2	Jones Rd (North)
A-2	0.59	0.45	0.27	15.0	3.9	1.0	4.85	1.3	5.50	1.5	6.41	1.7	7.14	1.9	7.91	2.1	Jones Rd (North)
A-3	4.17	0.45	1.88	15.0	3.9	7.3	4.85	9.1	5.50	10.3	6.41	12.0	7.14	13.4	7.91	14.8	Lake Ray Roberts
B-1	5.28	0.30	1.58	15.0	3.9	6.2	4.85	7.7	5.50	8.7	6.41	10.2	7.14	11.3	7.91	12.5	Culver B
B-2	0.80	0.45	0.36	15.0	3.9	1.4	4.85	1.7	5.50	2.0	6.41	2.3	7.14	2.6	7.91	2.8	Lake Ray Roberts
B-3	3.60	0.45	1.62	15.0	3.9	6.3	4.85	7.9	5.50	8.9	6.41	10.4	7.14	11.6	7.91	12.8	Lake Ray Roberts
C-1	6.85	0.30	2.06	15.0	3.9	8.0	4.85	10.0	5.50	11.3	6.41	13.2	7.14	14.7	7.91	16.3	Culvert C
C-2	6.52	0.45	2.93	15.0	3.9	11.4	4.85	14.2	5.50	16.1	6.41	18.8	7.14	20.9	7.91	23.2	Culvert C
C-3	1.08	0.45	0.49	15.0	3.9	1.9	4.85	2.4	5.50	2.7	6.41	3.1	7.14	3.5	7.91	3.8	Lake Ray Roberts
C-4	3.67	0.45	1.65	15.0	3.9	6.4	4.85	8.0	5.50	9.1	6.41	10.6	7.14	11.8	7.91	13.1	Lake Ray Roberts
D	7.87	0.45	3.54	15.0	3.9	13.8	4.85	17.2	5.50	19.5	6.41	22.7	7.14	25.3	7.91	28.0	Lake Ray Roberts
E-1	5.93	0.45	2.67	15.0	3.9	10.4	4.85	12.9	5.50	14.7	6.41	17.1	7.14	19.1	7.91	21.1	Culvert E
E-2	1.84	0.45	0.83	15.0	3.9	3.2	4.85	4.0	5.50	4.6	6.41	5.3	7.14	5.9	7.91	6.5	Lake Ray Roberts
E-3	2.80	0.45	1.26	15.0	3.9	4.9	4.85	6.1	5.50	6.9	6.41	8.1	7.14	9.0	7.91	10.0	Lake Ray Roberts
F-1	0.20	0.45	0.09	15.0	3.9	0.4	4.85	0.4	5.50	0.5	6.41	0.6	7.14	0.6	7.91	0.7	Culvert F
F-2	0.80	0.45	0.36	15.0	3.9	1.4	4.85	1.7	5.50	2.0	6.41	2.3	7.14	2.6	7.91	2.8	Lake Ray Roberts
F-3	0.34	0.45	0.15	15.0	3.9	0.6	4.85	0.7	5.50	0.8	6.41	1.0	7.14	1.1	7.91	1.2	Lake Ray Roberts
F-4	3.78	0.45	1.70	15.0	3.9	6.6	4.85	8.2	5.50	9.4	6.41	10.9	7.14	12.1	7.91	13.5	Lake Ray Roberts
G	9.03	0.45	4.06	15.0	3.9	15.8	4.85	19.7	5.50	22.3	6.41	26.0	7.14	29.0	7.91	32.1	Lake Ray Roberts
OS-1	3.67	0.30	1.10	15.0	3.9	4.3	4.85	5.3	5.50	6.1	6.41	7.1	7.14	7.9	7.91	8.7	Lake Ray Roberts
OS-2	7.90	0.30	2.37	15.0	3.9	9.2	4.85	11.5	5.50	13.0	6.41	15.2	7.14	16.9	7.91	18.7	Jones Rd (South)

Use fully developed C value
Document landuse on plan view, comment notes, or provide a separate landuse map

Show and label flowage easement (typically at contour elevation; ie 645.5)

Provide design points with a summary of discharge calculations for the design of channels, culverts, and roadside ditches.
Mark DP's on DA map and include DA identifiers for contributing DA on the summary table, include all parameters (A, C, I, Q etc)

Provide pre- and post- development flow comparison and if increases, provide hydraulic calculations demonstrating capacity of receiving ditch thru the zone of influence.

Flow from OS-2 enters here, Please provide a channel and DE
Provide hydraulic calculations (RAS model)

1. Is this an existing berm? Existing contours from Previous submittal (Dec 2022) did not include berm. Please explain.
2. If proposed please change contour symbology to proposed and design a diversion swale. Provide DE
3. Based on 2020 Lidar contours, offsite flow appears to drain directly north.
4. Update contributing drainage areas as needed.

NOTE: DRAINAGE BASIN DELINEATION AND FLOW PATHS DETERMINED WITH ON THE GROUND TOPOGRAPHIC DATA AND FIELD VISITS.

N

100' 0 50' 100'

SCALE: 1" = 100'

LEGEND

- EXISTING MINOR CONTOUR LINE
- EXISTING MAJOR CONTOUR LINE
- 690 PROPOSED MAJOR CONTOUR
- 689 PROPOSED MINOR CONTOUR
- MAJOR DRAINAGE AREA
- MINOR DRAINAGE AREA
- TIME OF CONCENTRATION
- PROPERTY LINE
- DRAINAGE FLOW ARROW
- X DRAINAGE AREA
- X.XX BASIN AREA (AC.)
- X.X Q100 (CFS)

MATCHLINE

MATCHLINE

CULVERT F

CULVERT E

CULVERT C

CULVERT B

JONES RD

BLOCK A

SHADED ZONE "X" AS SCALED PER FEMA FIRM

FLOWAGE EASEMENT USA TRACT 521-1 VOLUME 6, PAGE 139 L.P.R.

FLOWAGE EASEMENT USA TRACT 521-2 VOLUME 6, PAGE 139 L.P.R.

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TDLR #

PALOMINO BAY
DENTON COUNTY, TEXAS

NOT FOR CONSTRUCTION IN PROGRESS

Issued Date: 03-15-2023
Project No: EIK052622E-2

Drawn By: MP/MD
Checked By: SG
Designed By: MP/MD

Issue Record

#	Description	Date

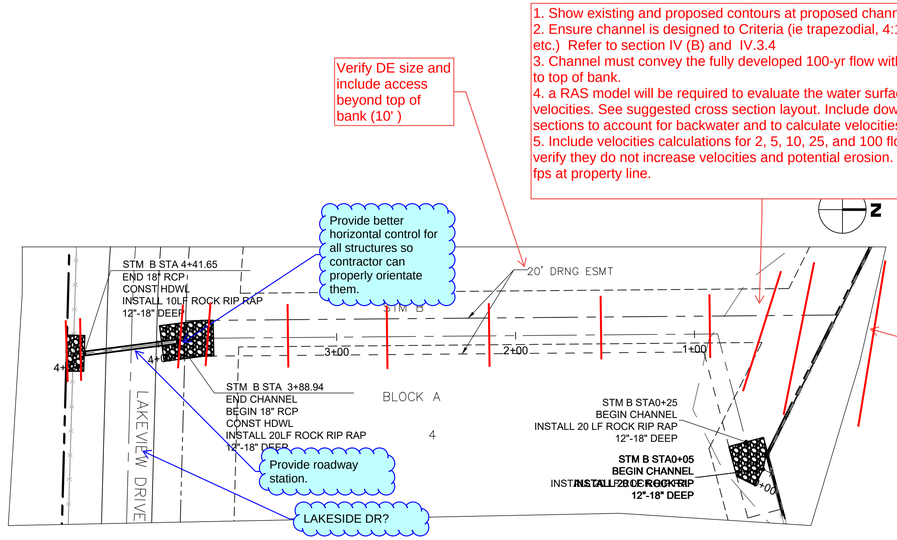
DESIGN PHASE

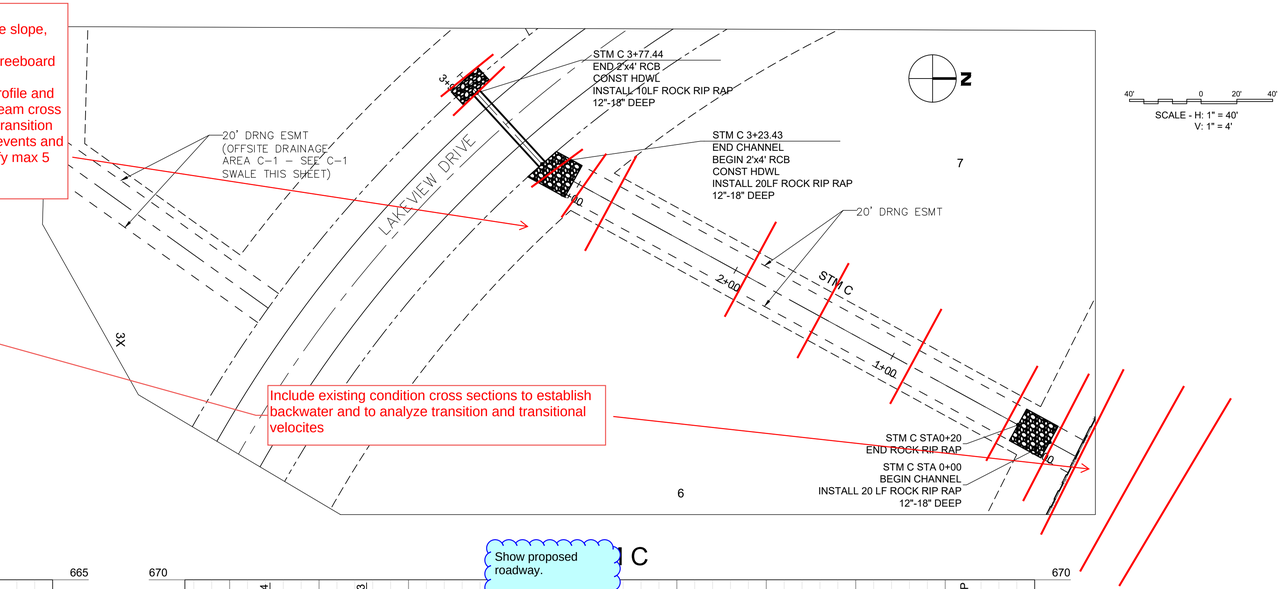
PROPOSED DRAINAGE AREA MAP

C-11

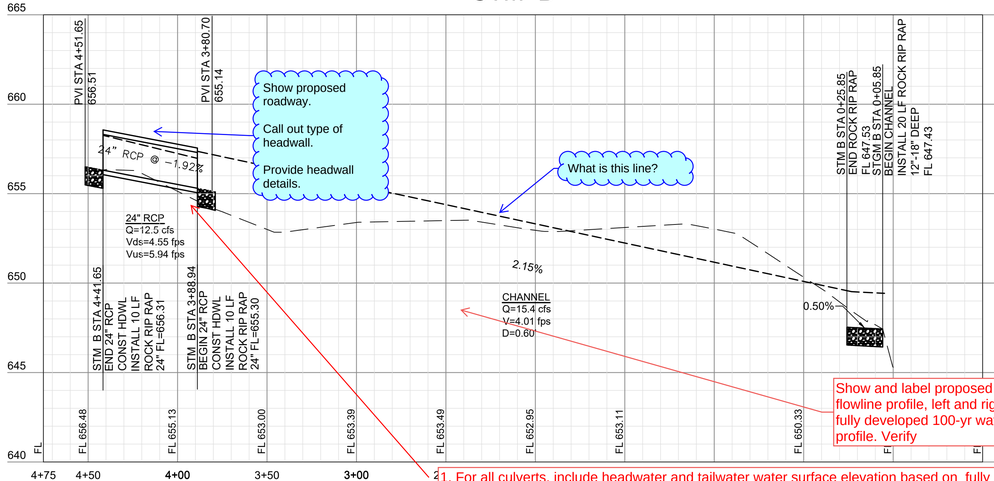
1. Show existing and proposed contours at proposed channels
2. Ensure channel is designed to Criteria (ie trapezodial, 4:1 side slope, etc.) Refer to section IV (B) and IV.3.4
3. Channel must convey the fully developed 100-yr flow with 1' freeboard to top of bank.
4. a RAS model will be required to evaluate the water surface profile and velocities. See suggested cross section layout. Include downstream cross sections to account for backwater and to calculate velocities at transition
5. Include velocities calculations for 2, 5, 10, 25, and 100 flood events and verify they do not increase velocities and potential erosion. Verify max 5 fps at property line.

Verify DE size and include access beyond top of bank (10')

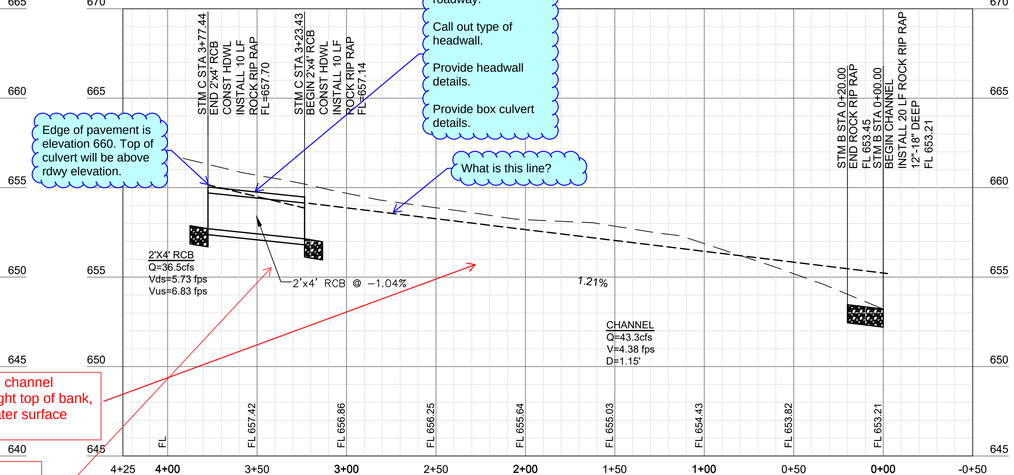




STM B



STM C



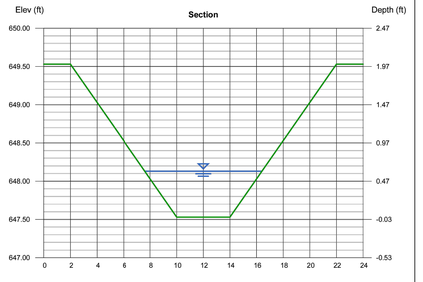
Show and label proposed channel flowline profile, left and right top of bank, fully developed 100-yr water surface profile. Verify

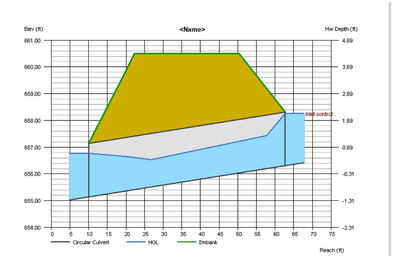
1. For all culverts, include headwater and tailwater water surface elevation based on fully developed 100-yr hydrology. Show/label elevations on profile
2. Verify 1' freeboard to top of road

STM B

Trapezoidal		**Highlighted**		**Calculations**	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.60	Qmin (cfs)	= 12.50
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 15.40	Qmax (cfs)	= 12.50
Total Depth (ft)	= 2.00	Area (sqft)	= 3.84	Tailwater Elev (ft)	= (dc+D)/2
Invert Elev (ft)	= 647.53	Velocity (ft/s)	= 4.01		
Slope (%)	= 2.15	Wetted Perim (ft)	= 8.95	**Highlighted**	
N-Value	= 0.030	Crit Depth, Yc (ft)	= 0.63	Qtotal (cfs)	= 12.50
		Top Width (ft)	= 8.80	Qpipe (cfs)	= 12.50
Calculations		EGL (ft)	= 0.85	Qovertop (cfs)	= 0.00
Compute by:	Known Q			Veloc Dn (ft/s)	= 4.55
Known Q (cfs)	= 15.40			Veloc Up (ft/s)	= 5.94
				HGL Dn (ft)	= 656.77
				HGL Up (ft)	= 657.58
				Hw Elev (ft)	= 658.26
				HwD (ft)	= 0.98
				Flow Regime	= Inlet Control

Invert Elev Dn (ft)	= 655.14	**Calculations**	
Pipe Length (ft)	= 52.72	Qmin (cfs)	= 12.50
Slope (%)	= 2.22	Qmax (cfs)	= 12.50
Invert Elev Up (ft)	= 656.31	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 24.0		
Shape	= Circular	**Highlighted**	
Span (in)	= 24.0	Qtotal (cfs)	= 12.50
No. Barrels	= 1	Qpipe (cfs)	= 12.50
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Concrete	Veloc Dn (ft/s)	= 4.55
Culvert Entrance	= Square edge w/headwall (C)	Veloc Up (ft/s)	= 5.94
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5	HGL Dn (ft)	= 656.77
		HGL Up (ft)	= 657.58
Embankment		Hw Elev (ft)	= 658.26
Top Elevation (ft)	= 660.50	HwD (ft)	= 0.98
Top Width (ft)	= 28.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 66.48		

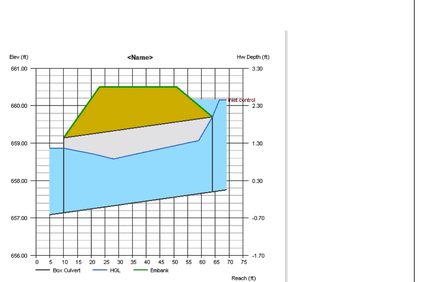




STM C

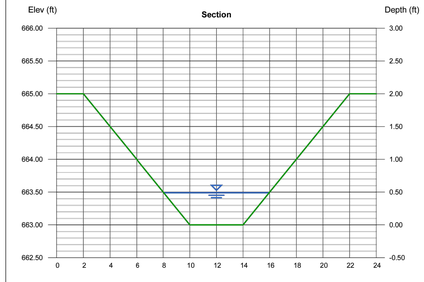
Invert Elev Dn (ft)	= 657.14	**Calculations**		**Trapezoidal**	
Pipe Length (ft)	= 54.00	Qmin (cfs)	= 39.50	Bottom Width (ft)	= 4.00
Slope (%)	= 1.04	Qmax (cfs)	= 39.50	Side Slopes (z:1)	= 4.00, 4.00
Invert Elev Up (ft)	= 657.70	Tailwater Elev (ft)	= (dc+D)/2	Total Depth (ft)	= 2.00
Rise (in)	= 24.0			Invert Elev (ft)	= 653.45
Shape	= Box	**Highlighted**		Slope (%)	= 1.21
Span (in)	= 48.0	Qtotal (cfs)	= 39.50	N-Value	= 0.030
No. Barrels	= 1	Qpipe (cfs)	= 39.50		
n-Value	= 0.013	Qovertop (cfs)	= 0.00	**Calculations**	
Culvert Type	= Flared Wingwalls	Veloc Dn (ft/s)	= 5.73	Compute by:	Known Q
Culvert Entrance	= 30D to 75D wingwall flares	Veloc Up (ft/s)	= 6.83	Known Q (cfs)	= 43.30
Coeff. K,M,c,Y,k	= 0.026, 1, 0.0347, 0.81, 0.4	HGL Dn (ft)	= 658.86		
		HGL Up (ft)	= 659.15		
Embankment		Hw Elev (ft)	= 660.16		
Top Elevation (ft)	= 660.50	HwD (ft)	= 1.23		
Top Width (ft)	= 28.00	Flow Regime	= Inlet Control		
Crest Width (ft)	= 66.48				

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 4.00	Depth (ft)	= 1.15
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 43.30
Total Depth (ft)	= 2.00	Area (sqft)	= 9.89
Invert Elev (ft)	= 653.45	Velocity (ft/s)	= 4.38
Slope (%)	= 1.21	Wetted Perim (ft)	= 13.48
N-Value	= 0.030	Crit Depth, Yc (ft)	= 1.09
		Top Width (ft)	= 13.20
Calculations		EGL (ft)	= 1.45
Compute by:	Known Q		
Known Q (cfs)	= 43.30		



SWALE C-1

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.49
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 16.30
Total Depth (ft)	= 2.00	Area (sqft)	= 2.92
Invert Elev (ft)	= 663.00	Velocity (ft/s)	= 5.58
Slope (%)	= 5.00	Wetted Perim (ft)	= 8.04
N-Value	= 0.030	Crit Depth, Yc (ft)	= 0.65
		Top Width (ft)	= 7.92
Calculations		EGL (ft)	= 0.97
Compute by:	Known Q		
Known Q (cfs)	= 16.30		



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TDLR #

PALOMINO BAY
DENTON COUNTY, TEXAS

NOT FOR CONSTRUCTION IN PROGRESS

Issued Date: 03-15-2023
Project No: EIK052622E-2

Drawn By: MP/MD
Checked By: SG
Designed By: MP/MD

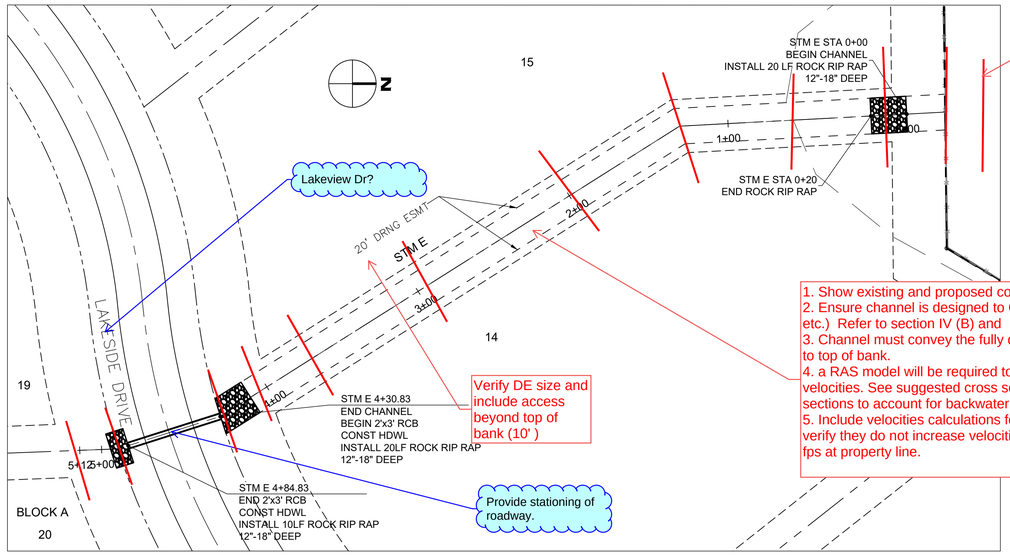
Issue Record

#	Description	Date

DESIGN PHASE

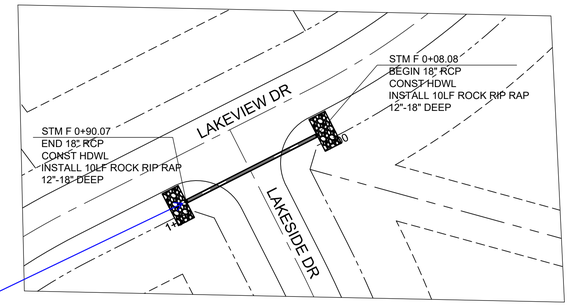
STORM PLAN I

C-12



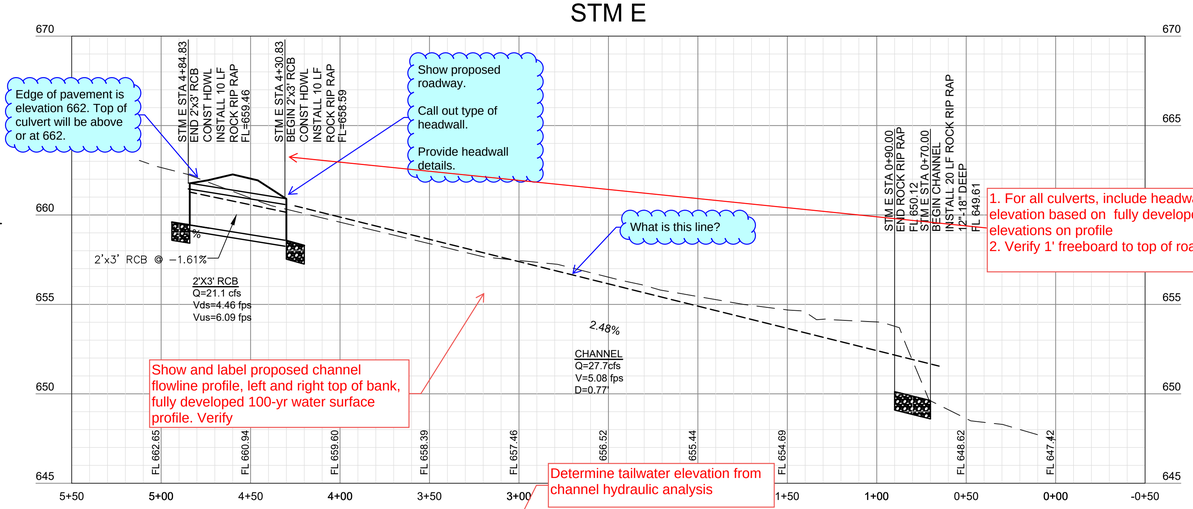
Include existing condition cross sections to establish backwater and to analyze transition and transitional velocites

1. Show existing and proposed contours at proposed channel E
2. Ensure channel is designed to Criteria (ie trapezodial, 4:1 side slope, etc.) Refer to section IV (B) and IV.3.4
3. Channel must convey the fully developed 100-yr flow with 1' freeboard to top of bank.
4. a RAS model will be required to evaluate the water surface profile and velocities. See suggested cross section layout. Include downstream cross sections to account for backwater and to calculate velocities at transition
5. Include velocities calculations for 2, 5, 10, 25, and 100 flood events and verify they do not increase velocities and potential erosion. Verify max 5 fps at property line.



What type of headwalls are being used?

Provide standard.



Edge of pavement is elevation 662. Top of culvert will be above or at 662.

Show proposed roadway.

Call out type of headwall.

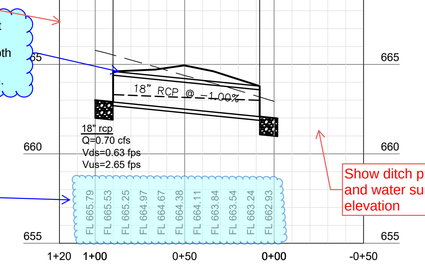
Provide headwall details.

What is this line?

1. For all culverts, include headwater and tailwater water surface elevation based on fully developed 100-yr hydrology. Show/label elevations on profile
2. Verify 1' freeboard to top of road

Show and label proposed channel flowline profile, left and right top of bank, fully developed 100-yr water surface profile. Verify

Determine tailwater elevation from channel hydraulic analysis



Show and call out type of headwall. Provide more depth of cover. Show pavement section.

Verify flow lines. Grading plan shows 663 contour.

Show ditch profile and water surface elevation

0% slope?

STM E

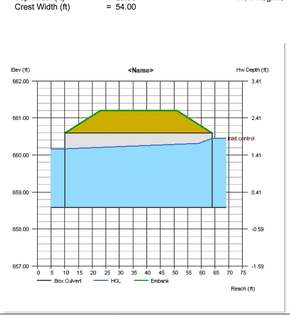
Box Culvert

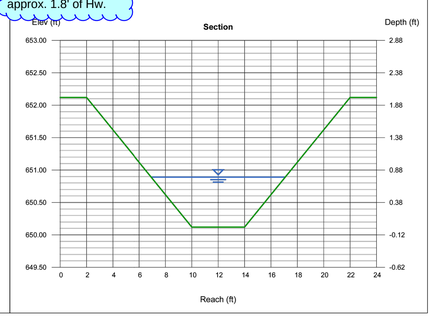
Invert Elev Dn (ft)	= 658.59	**Calculations**	
Pipe Length (ft)	= 54.00	Qmin (cfs)	= 21.10
Slope (%)	= 0.00	Qmax (cfs)	= 21.10
Invert Elev Up (ft)	= 658.59	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 24.0		
Shape	= Box	**Highlighted**	
Span (in)	= 36.0	Qtotal (cfs)	= 21.10
No. Barrels	= 1	Qpipe (cfs)	= 21.10
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Flared Wingwalls	Veloc Dn (ft/s)	= 4.46
Culvert Entrance	= 30D to 75D wingwall flares	Veloc Up (ft/s)	= 4.05
Coeff. K,M,c,Y,k	= 0.026, 1, 0.0347, 0.81, 0.4	HGL Dn (ft)	= 660.17
		HGL Up (ft)	= 660.33
Embankment		Hw Elev (ft)	= 660.45
Top Elevation (ft)	= 661.20	Hw/D (ft)	= 0.93
Top Width (ft)	= 28.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 54.00		

<Name>

Trapezoidal		**Highlighted**	
Bottom Width (ft)	= 4.00	Depth (ft)	= 0.77
Side Slopes (z:1)	= 4.00, 4.00	Q (cfs)	= 27.70
Total Depth (ft)	= 2.00	Area (sqft)	= 5.45
Invert Elev (ft)	= 650.12	Velocity (ft/s)	= 5.08
Slope (%)	= 2.48	Wetted Perim (ft)	= 10.35
N-Value	= 0.030	Crit Depth, Yc (ft)	= 0.86
		Top Width (ft)	= 10.16
Calculations		EGL (ft)	= 1.17
Compute by:	Known Q		
Known Q (cfs)	= 27.70		

Section shows approx. 1.8' of Hw.



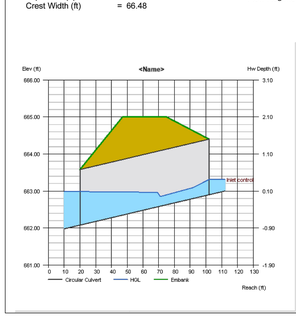


STM F

Circular Culvert

Invert Elev Dn (ft)	= 662.08	**Calculations**	
Pipe Length (ft)	= 82.00	Qmin (cfs)	= 0.70
Slope (%)	= 1.00	Qmax (cfs)	= 0.70
Invert Elev Up (ft)	= 662.90	Tailwater Elev (ft)	= (dc+D)/2
Rise (in)	= 18.0		
Shape	= Circular	**Highlighted**	
Span (in)	= 18.0	Qtotal (cfs)	= 0.70
No. Barrels	= 1	Qpipe (cfs)	= 0.70
n-Value	= 0.013	Qovertop (cfs)	= 0.00
Culvert Type	= Circular Concrete	Veloc Dn (ft/s)	= 0.63
Culvert Entrance	= Square edge w/headwall (C)	Veloc Up (ft/s)	= 2.65
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5	HGL Dn (ft)	= 662.99
		HGL Up (ft)	= 663.21
Embankment		Hw Elev (ft)	= 663.31
Top Elevation (ft)	= 665.00	Hw/D (ft)	= 0.28
Top Width (ft)	= 28.00	Flow Regime	= Inlet Control
Crest Width (ft)	= 66.48		

HGL is lower than the upstream invert.



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Phone 940.458.7503

SCALE - H: 1" = 40'
V: 1" = 4'

TDLR #

PALOMINO BAY
DENTON COUNTY, TEXAS

NOT FOR CONSTRUCTION
IN PROGRESS

Issued Date:	03-15-2023
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DESIGN PHASE

STORM PLAN II

C-13

Label line

Channel easement needs to include a buffer beyond top of bank for maintenance access (10')

20' DRAINAGE EASEMENT

1. Provide typical cross section for sideyard swales
2. Show proposed flow arrows (typical)

Label existing contours and show tie-ins. Show and label riprap

Complete all grading. Make sure proposed contours tie into existing contours.

Contours do not reflect an 8' flat bottom ditch

Show and maintain a minimum 30" depth for Barrow ditches Per Denton County subdivision rules and regulations.

Proposed contour elevation 664 tying into existing el 661?

Tie all proposed contours into existing.

Typical section shows an 8' flat bottom ditch but contours do not reflect the 8'.

Min FFE must be at least 2' above channels fully developed 100-yr water surface elevation. Use wsel from upstream cross section

MIN FFE = 647.00'

MATCH LINE SEE SHEET C.16

BLOCK A

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, LTD
128287

KEY MAP
N.T.S.

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- PROPOSED EASEMENT
- 580 EXISTING CONTOUR
- 580 PROPOSED CONTOUR
- FLOOD LINE

SCALE: 1" = 40'

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TDLR #

PALOMINO BAY
ROYAL RD
DENTON COUNTY, TEXAS

NOT FOR CONSTRUCTION IN PROGRESS

Issued Date: 03-15-2023
Project No: EIK052622E-2

Drawn By: MP/MD
Checked By: SG
Designed By: MP/MD

Issue Record

#	Description	Date

DESIGN PHASE

GRADING PLAN I

C-14

MATCH LINE SEE SHEET C-17

MATCH LINE SEE SHEET C-15

MATCH LINE SEE SHEET C-19

LAKEVIEW DR

LAKESIDE DR

BLOCK A

EP 664.37
TP 665.33
FL 662.93
FL 661.86
EP 666.04
FL 663.85
TP 666.68
FL 661.62
FL 661.71
FL 663.81
FL 663.83
FL 660.92
EX 646.84
EX 650.09
FL 662.93
EP 665.10
FL 662.67
FL 660.94
FL 659.94
FL 659.00
FL 652.42
FL 661.93
FL 661.90
FL 657.28
FL 659.92
EP 664.12
EP 661.84
FL 658.96
FL 658.99
FL 659.46
EP 661.94
FL 659.81
FL 654.44
FL 658.56
EP 661.94
FL 659.44
TP 662.29
FL 657.93
FL 656.42
FL 660.94
EP 660.18
EP 660.23
FL 657.98
FL 661.54
FL 658.90
EP 661.45
FL 663.34
EX 675.89
EX 667.60

5.17%
4.77%
4.47%
1.00%
1.22%
1.65%
1.08%
1.81%
0.80%
2.31%
3.47%
3.37%
4.45%
2.91%
3.17%
0.77%

30' BL
20.00'

MIN FFE = 647.00'

8
7
21
22
20
23

20' DRAINAGE EASEMENT

Is a high point needed to keep the drainage within the Lakeview Drive ditch and stop it from bypassing to Lakeside Drive ditch?

Show all culverts and provide invert elevations.

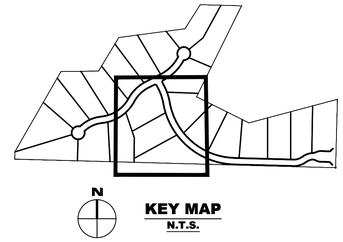
Show all culverts and provide invert elevations.

Show all culverts and provide invert elevations.

Show stationing on all roadways.

C-18?

Min FFE must be at least 2' above channels fully developed 100-yr water surface elevation. Use wsel from upstream cross section



N

KEY MAP
N.T.S.

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- PROPOSED EASEMENT
- 580 EXISTING CONTOUR
- 580 PROPOSED CONTOUR
- FLOOD LINE

N

40' 0 20' 40'
SCALE: 1" = 40'

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TDLR #

NOT FOR CONSTRUCTION IN PROGRESS

PALOMINO BAY
FM 428 RD
DENTON COUNTY, TEXAS

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Designed By:	MP/MD

Issue Record

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DESIGN PHASE

GRADING PLAN II

C-15

MATCH LINE SEE SHEET C-15

MATCH LINE SEE SHEET C-18

ZONE "AE"
AS SCALED PER FEMA FIRM
BFE=646'

SHADED ZONE "X"
AS SCALED PER FEMA FIRM

Label contorus
Label contour 646

Update based 2' above fully developed water surface of Lake.

BLOCK A

MIN FFE = 647.00'

MIN FFE = 647.00'

MIN FFE = 647.00'

MIN FFE = 647.00'

What existing contour is this tying into?

Proposed contours do not appear to be tying into the proper existing contour.

EI 657

20' DRAINAGE EASEMENT

EX 650.27
EX 655.74
EX 653.87
EX 656.72
EX 650.85
EX 652.07

EP 659.53
FL 657.79
EP 660.30
FL 658.57
EP 661.61
TP 661.82
EP 660.85
FL 657.28
FL 654.37
FL 656.56
EP 662.15
FL 659.79
FL 658.76
EP 661.61
EP 662.15
FL 660.86
FL 660.56
FL 661.82
FL 660.95

1.80%
3.56%
3.33%
5.22%
1.83%
4.88%
3.68%
2.28%
1.03%
1.00%
0.60%

30' BL

20.00'

MATCH LINE SEE SHEET C-16

KEY MAP
N.T.S.

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- PROPOSED EASEMENT
- 580 EXISTING CONTOUR
- 580 PROPOSED CONTOUR
- FLOOD LINE

SCALE: 1" = 40'

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DESIGN PHASE

GRADING PLAN III

C-16

MATCH LINE SEE SHEET C-17

EX 659.99

EX 654.90

Update

Update based on the higher: 2' above fully developed water surface elevation of adjacent channel or Lake.

0.52%

0.88%

9

MIN FFE = 647.00'

4.50%

Show and label Ray Robers Lake flowage easement Typically follows a elevation contours (ie 645.5)

FL 649.58

FL 650.59

FL 652.76

Make sure proposed contours tie into existing contours.

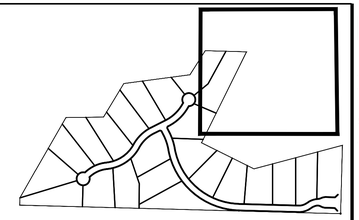
EX 649.46

20.00'

20' DRAINAGE EASEMENT

This outfall appears to not connect to a receiving natural swale/trib. Concentrated flow will need to be dispersed prior to entering USCOE property

MATCH LINE SEE SHEET C-19



N

KEY MAP
N.T.S.

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- PROPOSED EASEMENT
- 580 EXISTING CONTOUR
- 580 PROPOSED CONTOUR
- FLOOD LINE

N

40' 0 20' 40'

SCALE: 1" = 40'

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NOT FOR CONSTRUCTION IN PROGRESS

PALOMINO BAY
ROBERS RD
DENTON COUNTY, TEXAS

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Checked By: SG
Designed By: MP/MD

Issue Record

#	Description	Date

DESIGN PHASE

GRADING PLAN IV

C-17

MATCH LINE SEE SHEET C-18

MATCH LINE SEE SHEET C-16

MATCH LINE SEE SHEET C-20

ZONE "AE"
AS SCALED PER FEMA FIRM
BFE=646'

SHADED ZONE "X"
AS SCALED PER FEMA FIRM

NON SHADED ZONE "X"
AS SCALED PER FEMA FIRM

EX 652.00

C-15?

EX 656.64

EX 651.55

Grading is incomplete.

Label existing contours and show tie-ins. Show and label riprap

EX 658.10

BLOCK A

C-19

Update based 2' above fully developed water surface of Lake.

6

E = 647.00'

5

MIN FFE = 647.00'

Min FFE must be at least 2' above channels fully developed 100-yr water surface elevation. Use wsel from upstream cross section

20' DRAINAGE EASEMENT

20.00'

FL 649.75

FL 647.77

FL 647.52

FL 651.88

FL 653.73

4

MIN FFE = 647.00'

3

MIN FFE = 647.00'

2

MIN FFE = 647.00'

1.26%

2.11%

3.29%

2.53%

2.36%

1.78%

1.36%

3.73%

1.67%

5.80%

2.03%

2.12%

1.74%

1.71%

30' BL

EP 662.27
FL 659.94

FL 661.72

FL 661.73

FL 659.78

FL 656.55
EP 660.22

TP 663.60

FL 663.35

FL 661.55

FL 663.90

FL 661.19

FL 659.75

TP 660.60

FL 657.53

FL 659.62

FL 661.68

FL 659.75

FL 661.83
EP 664.03

FL 663.81

FL 664.14
EP 666.63

FL 663.88

FL 661.88

TP 666.95

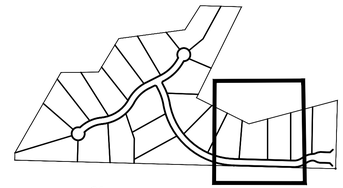
FL 662.48

FL 663.64

FL 663.80

LAKESIDE DR

Show all culverts and provide invert elevations.



N

KEY MAP
N.T.S.

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- PROPOSED EASEMENT
- 580 EXISTING CONTOUR
- 580 PROPOSED CONTOUR
- FLOOD LINE

N

40' 0 20' 40'
SCALE: 1" = 40'

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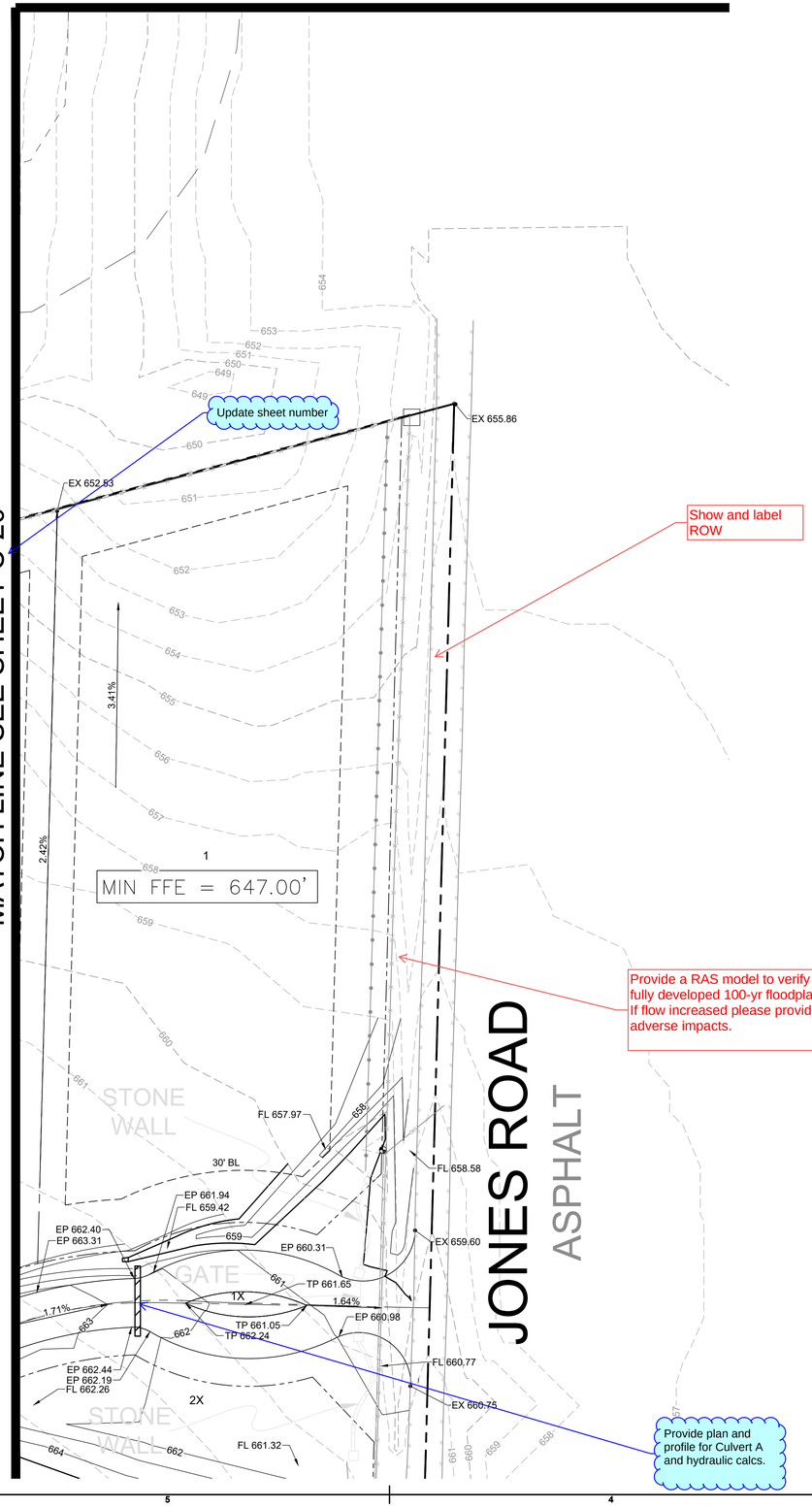
DESIGN PHASE

GRADING PLAN V

C-18

MATCH LINE SEE SHEET C-19

MATCH LINE SEE SHEET C-20

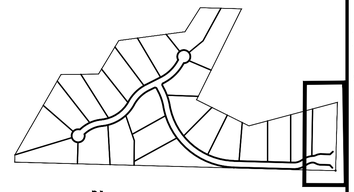


Update sheet number

Show and label ROW

Provide a RAS model to verify capacity of ditch. Roadside ditch must contain the fully developed 100-yr floodplain. Provide any additional DE as needed.
If flow increased please provide pre- and post- analysis and demonstrate no adverse impacts.

Provide plan and profile for Culvert A and hydraulic calcs.



N

KEY MAP
N.T.S.

LEGEND

- MATCH LINE
- PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- PROPOSED EASEMENT
- 580 EXISTING CONTOUR
- 580 PROPOSED CONTOUR
- FLOOD LINE

N

40' 0 20' 40'
SCALE: 1" = 40'

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DESIGN PHASE

GRADING PLAN VI

C-19

FLEXIBLE PAVEMENT DESIGN AND RECOMMENDATIONS:

THE HOT MIXED ASPHALTIC CONCRETE (HMAC) FOR THIS PROJECT SHOULD CONFORM TO TXDOT ITEM 340. FOR THE GIVEN SUBDIVISION LAYOUT, IT IS RECOMMENDED THAT A 20-YEAR DESIGN LIFE BE UTILIZED.

FULL DEPTH HMAC:
IF FULL DEPTH HMAC IS DESIRED, FOR A 20 YEAR DESIGN LIFE, THE DENTON COUNTY MINIMUM STANDARD FOR PAVEMENT DESIGN. PLEASE CONTACT THIS OFFICE IF A SHORTER DESIGN LIFE IS DESIRED. THE FULL-DEPTH HMAC SECTION SHOULD CONSIST OF **2 INCHES** OF TYPE "D" SURFACE COURSE OVER **4 INCHES** OF TYPE "B" BASE COURSE AS SPECIFIED IN TX DOT 340. THE FULL DEPTH ASPHALT SHOULD BE PLACED OVER **8 INCHES** OF LIME STABILIZED SUBGRADE PER THE RECOMMENDATIONS BELOW IN ORDER TO PROVIDE A STRUCTURAL NUMBER OF 3.32 MEETING THE RECOMMENDED SN DETERMINED TO BE NECESSARY BY AASHTO STANDARDS. HMAC SHOULD BE INSTALLED PER THE RECOMMENDATIONS BELOW.

ASPHALT OVER CRUSHED LIMESTONE BASE (FLEXBASE):
IF HMAC OVER CRUSHED LIMESTONE BASE IS DESIRED, OUR RECOMMENDED PARAMETERS FOR DESIGN ARE LISTED IN TABLE 2.0. THE FOLLOWING TABLE, TABLE 4.0, DETAILS THE RECOMMENDED PAVEMENT SECTION FOR ASPHALT OVER LIMESTONE BASE (FLEXBASE). IT IS OUR OPINION AND THE DENTON COUNTY MINIMUM, THAT A MINIMUM DESIGN LIFE OF 20 YEARS SHOULD BE USED; HOWEVER AS STATED ABOVE IF THE CLIENT IS WILLING TO ACCEPT MORE RISK OF POTENTIAL FUTURE MAINTENANCE AND/ OR FAILURE AREAS. A SHORTER DESIGN LIFE CAN BE USED. THE ASPHALT OVER CRUSHED LIMESTONE BASE SHOULD BE PLACED OVER 8 INCHES OF LIME STABILIZED SUBGRADE PER THE RECOMMENDATIONS BELOW.

HMAC INSTALLATION AND TESTING REQUIREMENTS:
THE FOLLOWING IS RECOMMENDED FOR HMAC:
1. SURFACE COURSE TO BE TXDOT ITEM340, TYPE C OR D
2. ASPHALTIC BASE COURSE TO BE TXDOT ITEM 340, TYPE
3. ASPHALT SHALL BE PLACED AND COMPACTED TO CONTAIN FROM 5 TO 9% AIR VOIDS.
4. THE TARGET DENSITY FOR ASPHALT LIFTS SHOULD BE 91 TO 95% OF MAXIMUM THEORETICAL SPECIFIC GRAVITY AS DETERMINED BY LABORATORY TESTING
5. THE FOLLOWING TESTS SHOULD BE RUN ON EACH DAY'S OPERATION:
   I. IN PLACE FIELD DENSITY TESTS TO ESTABLISH ROLLING PATTERN
   II. ONE EXTRACTION AND GRADATION TEST
   II. ONE LABORATORY DENSITY AND STABILITY TEST
   IV. TWO CORES TO VERIFY THICKNESS & DENSITY

CRUSHED LIMESTONE BASE:
1. CRUSHED LIMESTONE BASE TO BE TXDOT ITEM 247, TYPE A, GRADE 2 OR BETTER. THE MATERIAL SHALL BE COMPACTED IN MAXIMUM LIFTS OF 6 INCHES TO AT LEAST 98% OF ASTM D 1557 (MODIFIED PROCTOR) WITHIN +/-3 PERCENTAGE POINTS OF OPTIMUM.

RIGID PAVEMENT DESIGN AND MATERIAL RECOMMENDATIONS:
THE TYPICAL TYPES OF RIGID PAVEMENT FOR THIS TYPE OF PROJECT ARE AS FOLLOWS:
1. CONTINUOUSLY REINFORCED CONCRETE PAVEMENT (CRCP):
   I. THIS IS THE BEST TYPE OF PAVEMENT WITH LOWEST MAINTENANCE
   II. HEAVILY REINFORCED TO CONTROL CRACKING
   III. RECOMMENDED FOR HIGHER VOLUME TRAFFIC AREAS
2. JOINTED REINFORCED CONCRETE PAVEMENT (JRCP):
   I. THIS IS THE MOST COMMON TYPE OF PAVEMENT IN THE NORTH TEXAS.
   II. REINFORCED FOR TEMPERATURE AND SHRINKAGE AND FOR RESISTANCE DUE TO EXPANSIVE SOIL MOVEMENT
   III. JOINT PLACEMENT AND SAWCUT PLACEMENT IS CRITICAL FOR PERFORMANCE
   IV. GENERALLY USED FOR LOW VOLUME ROADWAYS AND PARKING LOTS
3. JOINTED PLAIN CONCRETE:
   I. BASIC UNREINFORCED PAVEMENT, AND IS NOT RECOMMENDED FOR ROADWAYS AND PARKING LOTS IN THIS AREA DUE TO EXPANSIVE SOIL.

RIGID PAVEMENT:
IT IS RECOMMENDED FOR THIS SITE THAT THE RIGID PORTLAND CEMENT CONCRETE FOR THIS SITE HAVE A **MINIMUM THICKNESS OF 6 INCHES** FOR ALL LANES OF TRAFFIC. THE CONCRETE SHOULD BE INSTALLED PER CURRENT TXDOT REGULATIONS AND SPECIFICATIONS. THE FOLLOWING MIX DESIGN RECOMMENDATIONS ARE AS FOLLOWS:

1. RECOMMENDED MINIMUM DESIGN COMPRESSIVE STRENGTH: 3,500 PSI
2. RECOMMENDED MINIMUM DESIGN TENSILE STRENGTH: 525 PSI
3. WELL GRADED OPTIMIZED AGGREGATE MEETING ASTM C-33 WITH NOMINAL AGGREGATE SIZE NO GREATER THAN ONE AND ONE HALF (1 ½") INCH
4. PORTLAND CEMENT LIMITED TO BETWEEN 520 AND 600 LBS PER CUBIC YARD.
5. 4 TO 6% AIR CONTENT USING AIR ENTRAINING AGENT
6. 15 TO 20% FLYASH MAY BE USED AT THE APPROVAL OF THE CIVIL ENGINEER OF RECORD
7. CURING COMPOUND SHOULD BE USED AND PLACED WITHIN ONE HOUR OF FINISHING OPERATIONS

PAVEMENT REINFORCING STEEL:
IT IS RECOMMENDED THAT A MINIMUM OF 0.2% OF STEEL BE USED FOR THE CONCRETE, WITH A MINIMUM OF #4'S @ 18" ON CENTER FOR 6 INCH CONCRETE PAVEMENT. REINFORCEMENT CHAIRS SHOULD BE USED BENEATH ALL PAVEMENT SUCH THAT THE REINFORCEMENT IS PLACED ONE-THIRD (T/3) OF THE PAVEMENT THICKNESS FROM THE TOP OF THE PAVEMENT USING METAL OR PLASTIC CHAIRS WITH SAND CUSHIONS AND NOT BRICK BATTS.

TABLE 4.0
HMAC OVER LIMESTONE BASE RECOMMENDATIONS

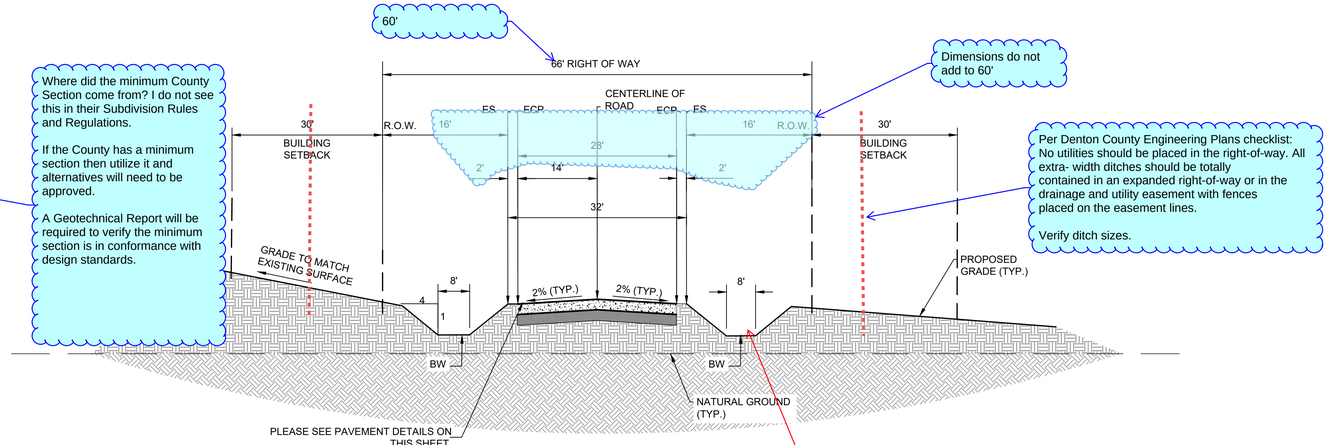
Maximum Design Life (years)	HMAC Surface Course (Type C or D) (Inches)	Limestone Base (Inches)
*20	4.5	12
10	4	10
5	3	10
Less than 2 years	2	8

***Denton County Design Standard Minimum Roadway Section**

SUBGRADE STRENGTH CHARACTERISTICS

d on the testing completed on site, it is recommended that a California Bearing Ratio (CBR) e of 3 was used in the design and a corresponding resilient modulus of 4,500 psi. Also, a

Fix so all text is readable.



RIGHT OF WAY TYPICAL SECTION
(OR APPROVED EQUAL)
NOT TO SCALE

NOTES:
1. PROPOSED ROAD GRADES ARE BASED ON CROWN /CENTERLINES OF ROADS

1. Please note, roadside ditch must convey the fully developed 100-yr flow. 100-yr HGL must reflect the effects of backwater from driveway culverts. A RAS model will be required to evaluate water surface profiles in ditches. Include driveway culverts and verify 100-yr HGL is contained within the ROW. (section IV.3.4)

2. Please note, once all backwater effect are analyzed, additional DE may be required to contain the fully developed 100-yr flows

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DENTON COUNTY, TEXAS

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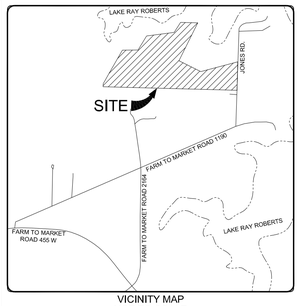
DESIGN PHASE

ROAD CROSS SECTIONS

C-20



VICINITY MAP
NOT TO SCALE

LOT INFORMATION			
LOT NO.	ACREAGE	SQUARE FOOTAGE	LOT WIDTH AT FRONT BUILDING LINE
1	2.001	87,175	176.74'
2	2.000	87,131	209.85'
3	2.000	87,123	212.62
4	2.002	87,193	244.00
5	2.002	87,188	322.43
6	2.000	87,134	250.99
7	2.003	87,243	476.51
8	2.006	87,403	349.30
9	2.386	103,923	131.53
10	2.012	87,664	136.52
11	2.006	87,375	306.19
12	2.006	88,373	172.49
13	2.019	87,966	209.96
14	2.109	91,857	256.22
15	2.367	103,114	181.77
16	2.038	88,759	182.36
17	2.499	108,874	130.99
18	2.114	92,077	125.24
19	2.071	90,198	372.35
20	2.124	92,530	192.09
21	2.012	87,640	601.16
22	2.010	87,566	220.73
23	2.022	88,092	225.01

CURVE TABLE					
CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE
C1	245.00'	135.87'	134.14'	S 72°01'16" W	31°46'33"
C2	150.00'	92.69'	91.22'	S 73°50'07" W	35°24'14"
C3	720.00'	951.62'	883.85'	N 50°35'56" W	75°43'40"
C4	500.00'	123.42'	123.10'	N 19°48'23" W	14°08'33"
C5	400.00'	229.07'	225.95'	N 46°43'00" E	32°48'41"
C6	350.00'	210.78'	207.61'	S 45°52'12" W	34°30'17"
C7	350.00'	341.00'	327.67'	S 56°31'44" W	55°49'21"
C8	300.00'	202.25'	198.44'	S 65°07'37" W	38°37'35"
C9	88.00'	71.90'	69.91'	S 88°54'23" E	46°48'41"
C10	88.00'	71.90'	69.91'	N 88°54'23" W	46°48'41"
C11	128.00'	108.52'	105.29'	N 85°01'15" E	48°34'27"
C12	128.00'	106.20'	103.18'	N 82°53'48" W	47°32'09"
C13	215.00'	177.18'	172.21'	S 64°18'01" W	47°13'02"

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N 88°03'09" W	40.82'
L2	N 89°37'29" W	30.30'
L3	N 26°52'40" W	85.83'
L4	N 30°18'40" E	72.38'
L5	S 45°27'17" W	51.96'
L6	S 71°52'40" E	14.14'
L7	N 16°42'42" E	13.81'
L8	N 46°33'21" E	51.05'
L9	S 43°26'39" E	51.50'
L10	N 75°11'29" E	96.02'
L11	N 14°48'31" W	19.05'

GENERAL NOTES:

1. ALL CORNERS ARE MARKED WITH CAPPED 1/2" IRON RODS STAMPED "KAZ" UNLESS OTHERWISE NOTED.

2. FLOOD STATEMENT: I HAVE REVIEWED THE F.E.M.A. FLOOD INSURANCE RATE MAP FOR DENTON COUNTY, COMMUNITY NUMBER 480774, EFFECTIVE DATE 4-18-2011, AND THAT MAP INDICATES AS SCALED, THAT A PORTION OF THIS PROPERTY IS WITHIN "NON-SHADED ZONE X" DEFINED AS "AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD (500-YEARY", AND A PORTION OF THIS PROPERTY IS WITHIN "SHADED ZONE "X" DEFINED AS "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" AS SHOWN ON PANEL 90 G OF SAID MAP.

3. THE PURPOSE OF THIS PLAT IS TO SUBDIVIDE AN UNPLATTED TRACT OF LAND INTO TWENTY-THREE (23) RESIDENTIAL LOTS, THREE (3) PRIVATE OPEN SPACE LOTS AND TWO 60' PRIVATE STREETS.

4. NOTE: BEARINGS SHOWN HEREON ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, NORTH CENTRAL ZONE (4202), AND ARE BASED ON THE NORTH AMERICAN DATUM OF 1983, 2011 ADJUSTMENT.

5. THE SUBJECT TRACT SHOWN IS WITHIN "SANGER EXTRATERRITORIAL JURISDICTION" (ETJ).

6. ALL LOTS COMPLY WITH THE MINIMUM SIZE REQUIREMENTS OF THE ZONING DISTRICT.

7. THIS PROPERTY MAY BE SUBJECT TO CHARGES RELATED TO IMPACT FEES IF THE APPLICANT SHOULD CONTACT THE CITY REGARDING ANY APPLICABLE FEES DUE.

8. ALL COMMON AREAS, DRAINAGE EASEMENTS, AND DETENTION FACILITIES WILL BE OWNED AND MAINTAINED BY THE HOA/POA. ANY COMMON AREA WITHIN THE CITY'S RIGHT-OF-WAY WILL REQUIRE A FACILITIES AGREEMENT, TO BE REVIEWED AND APPROVED BY THE CITY.

9. NOTICE - SELLING A PORTION OF THIS ADDITION BY METES & BOUNDS IS A VIOLATION OF CITY ORDINANCE AND STATE LAW AND IS SUBJECT TO FINES AND WITHHOLDING OF UTILITIES AND BUILDING PERMITS.

10. THIS PLAT DOES NOT ALTER OR REMOVE ANY EXISTING DEED RESTRICTIONS, IF ANY, ON THIS PROPERTY.

11. MINIMUM FINISHED FLOOR ELEVATIONS ARE AT LEAST 2 FEET ABOVE THE 100 YEAR FLOOD PLAIN.

12. ALL PRIVATE STREETS WILL BE OWNED AND MAINTAINED BY THE HOA/POA.

13. WATER IS TO BE PROVIDED BY INDIVIDUAL PRIVATE WELLS, AND SEWER IS TO BE PROVIDED BY INDIVIDUAL ON-SITE SEPTIC FACILITIES. BOTH ARE TO BE OWNED AND MAINTAINED BY THE INDIVIDUAL PROPERTY OWNER.

14. ELECTRIC SERVICE TO BE PROVIDED BY COSERV ELECTRIC, 7300 S. STEMMONS, CORINTH, TX 76210

15. NO NATURAL GAS SERVICE.

Update Min FFE for all lots based on the higher 2' above fully developed 100-yr wselev at Lake or at adjacent channel.

Provide floodplain easement 10' from fully developed lake water surface elevation

Label zone

Min FFE must be at least 2' above channels fully developed 100-yr water surface elevation. Use upstream cross section

Will need to coordinate width of all drainage easements once the Civil has finalized grading and confirmed width needed.

Show and label flowage easement

Call out Drainage Easement. Will need to coordinate width of all drainage easements once the Civil has finalized grading and confirmed width needed.

Will need to coordinate with Civil regarding potential need for drainage easement along roadway.

Min FFE must be at least 2' above channels fully developed 100-yr water surface elevation. Use upstream cross section

LEGEND

R.O.W. = RIGHT-OF-WAY
F.F.E. = FINISH FLOOR ELEVATION
POB = POINT OF BEGINNING
FIR = 1/2" IRON ROD FOUND
FIR/CAP = CAPPED IRON ROD FOUND
PSTW = WOOD POST
NLF = NAIL FOUND
MAG = MAG NAIL
CAP/IRS = CAPPED IRON ROD SET
R.P.R.D.C.T. = REAL PROPERTY RECORDS DENTON COUNTY TEXAS
L.P.R.D.C.T. = LIS PENDENS RECORDS DENTON COUNTY TEXAS
B.L. = BUILDING LINE
P.U.E. = PRIVATE UTILITY EASEMENT
D.E. = DRAINAGE EASEMENT
N: = NORTHING
E: = EASTING
NAD 83 = NORTH AMERICAN DATUM OF 1983
———— C ———— = CENTERLINE OF ROAD

N W E S

1" = 100'
0 50 100 150 200

SURVEYOR:
KAZ SURVEYING, INC.
1720 WESTMINSTER STREET
DENTON, TEXAS 76205
PHONE: (940) 382-3446
TBPLS FIRM #10002100

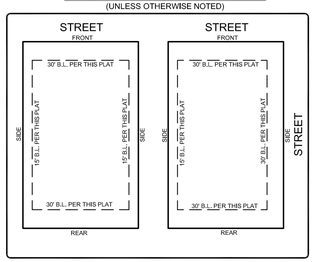
OWNER:
HWY 377 PARTNERS, LTD.
611 SOUTH MAIN ST.
GRAPEVINE, TEXAS 76051
PHONE: (817) 416-4843
CONTACT: GARY HAZLEWOOD

DEVELOPER:
WESTWOOD REAL ESTATE DEVELOPMENT
1000 TEXAN TRAIL, SUITE 200
GRAPEVINE, TEXAS 76051
PHONE: (817) 442-0000
CONTACT: CLINT BAKER

LAKE RAY ROBERTS LAND USE REGULATIONS
R-2 RESIDENTIAL ESTATE MEDIUM DENSITY DISTRICT

MIN. LOT AREA	2 ACRES/87,120 SQ. FT.
MIN. LOT WITH (@ FRONT BLDG. LINE)	125 FEET
MIN. LOT DEPTH	100 FEET
MIN. FRONT YARD	30 FEET
MIN. SIDE YARD	15 FEET/30 FEET FOR CORNER LOT ADJACENT TO STREETS
MIN. REAR YARD	30 FEET
MAX HEIGHT	35 FEET
REQUIRED PARKING	2 OFF-STREET PARKING SPACES PER DWELLING UNIT

STANDARD PROPOSED SET BACK LINES
(UNLESS OTHERWISE NOTED)



KAZ SURVEYING
TX FIRM REGISTRATION # 10002100
1720 WESTMINSTER
DENTON, TX 76205
(940)382-3446
JOB NUMBER: 220318
DRAWN BY: DJJ
DATE: 03-15-2023
R.P.L.S.
KENNETH A. ZOLLINGER

FINAL PLAT
LOTS 1-23 & LOTS 1X - 3X, BLOCK A
PALOMINO BAY ADDITION
23 RESIDENTIAL LOTS, 3 OPEN SPACE LOTS AND 5.638-ACRES OF RIGHT-OF-WAY DEDICATION

BEING 54.34 ACRES IN THE
JOHN MORTON SURVEY, ABSTRACT NUMBER 792
CITY OF SANGER EXTRATERRITORIAL JURISDICTION (ETJ),
DENTON COUNTY, TEXAS