AKEL
ENGINEERING GROUP, INC.

December 17, 2021

Land Development Engineering Division
17575 Peak Avenue,
Morgan Hill, CA 95037

Attention: Maria Angeles, P.E., CFM
Senior Civil Engineer

Subject: Manzanita Park Two-Dimensional (Grid Size: 5ft by 5 ft) Hydraulic Analysis Memorandum

Dear Maria:

We are pleased to submit this letter memorandum for the Manzanita Park Two-Dimensional (Grid Size: 5ft by 5 ft) Hydraulic Analysis. This letter memorandum includes the following sections:

- Background
- Modeling Methodology and Assumptions
- Evaluation Results
- Conclusions

1.0 BACKGROUND

The Manzanita Park residential development consists of 67 condominium units constructed on a 5.8-acre vacant parcel located east of Monterey Road at Tilton Avenue, as shown on **Figure 1**. City of Morgan Hill (City) staff requested Akel Engineering Group (Akel) review the existing overland flow characteristics of the project site and estimate the impact caused by the development, and during a 100-year 24-hour storm event.

Accordingly, Akel completed a hydrology and hydraulic analysis using the FLO-2D model, and using a grid size of 20'x20'. The analysis, which documented the results in a letter memorandum dated May 2021, indicated that the project was impacting the flooding levels along Monterey Road. The FLO-2D model indicated that the 100-year 24-hour maximum flood depths along Monterey Road were up to 0.8 ft along the centerline of Monterey Road, and the maximum flood depths may reach up to 1.2 ft along the edge of the roadway in a post project condition.

The model indicates the pre-project condition did not result with flood depths exceeding 1 foot along Monterey Road. Thus, the analysis concluded the project was impacting flood levels, and exceeding the 1-foot maximum criteria during the 100-year 24-hour storm event. Another

observation from that analysis included an observation of water accumulating along the eastern side of the development during the 100-year 24-hour storm event.

The team reviewed the recommendations and decided the following as the next steps:

- Re-do the analysis using a smaller grid size (5'x5'). Using a smaller grid size is very time consuming, however it allows taking full advantage of the existing topography, and results with less conservative values, yet they are considered realistic.
- Include the Manzanita Park on-site storm water piping along the Tilton Avenue extension, and intended to convey the pass-through waters that may accumulate during storm events along the east side of the development.
- Adjust Post-development elevations along Monterey Road.

This analysis proceeding accordingly, and using the FLO-2D model and the modified 5'x5' grid.

2.0 MODELING METHODOLOGY AND ASSUMPTIONS

This section documents background of the two-dimensional model as well as the hydrology and hydraulic modeling assumptions used in the analysis.

2.1 Model Background

FLO-2D is a comprehensive two-dimensional floodplain simulation model that has been approved by FEMA for flood study use. The model utilizes user-defined cells to store hydrologic information such as elevation, overland roughness, channels, building footprints, and streets. The also model incorporates existing gravity stormwater conveyance facilities within the City limits as well as overland flow characteristics based on land cover types. The two-dimensional hydraulic model was developed based on 1-foot contour elevation data prepared by Santa Clara Valley Water District (Valley Water).

2.2 Modeling Cell Grid

For the purposes of this analysis, a grid cell size of 5 ft by 5 ft was used, as this grid cell size provides greater detail in evaluating the upstream capacity of streets and other topography features. The analyzed basin is highlighted on **Figure 2**, and included approximately 1,308,000 grid cells used in this evaluation.

2.2.1 Development Pipeline Improvements

Drainage system infrastructure improvements planned as a part of the Project were incorporated into the hydraulic model. These improvements consist of a series of 18-inch, 24-inch and 36-inch storm drain pipes, inlets and manholes along the future Tilton Avenue extension and conveying stormwater runoff westward towards Monterey Road. These pipe segments are intended to

capture on-site stormwater, but also include extension along the eastern side of the development and intended to mitigate accumulation of floodwater during 100-year 24-hour storm events.

The captured stormwater continues northward on Monterey Road, and along the westerly side of the development, and bubbles up at an inlet where the stormwater returns to the ground surface and continues in a northwesterly direction. For the purpose of this analysis, all runoff from the Manzanita Park project were assumed retained on-site per MH Engineering.

In addition to these planned storm drainage system infrastructure improvements and project site regrade, the modeled elevations of the project site were adjusted for the existing plus project analysis, based on the revised preliminary grading plan and Digital Elevation Model (DEM) provided by MH Engineering Co. on December 1, 2021.

2.3 Rainfall, Land Use and Infiltration

The evaluation criteria used in the two-dimensional modeling evaluation were extracted from the City's 2018 Storm Drainage System Master Plan (SDSMP); additional criteria were used as necessary. The criteria used are documented as follows:

- **Land Use:** Land use information was used to determine the Manning's roughness values to apply to areas of overland flow. The roughness values are range between 0.04 to 0.15 for residential, non-residential, vacant, and open space land use types.
- **Rainfall Event:** The design rainfall volume used in the two-dimensional evaluation was consistent with the 2018 SDSMP, which are summarized below.
    - 100-Year 24-Hour Storm Event: This storm was quantified at 6.50 inches.
- **Effective Impervious Percentage and Runoff Curve Number:** In determining the quantity of rainfall runoff generated from a given land use type two factors are key in determining the volume of water that enters the storm drainage system: the effective percent impervious and the runoff curve number.

2.4 Storm Drainage System Conveyance

The two-dimensional model incorporates storm drain inlets, manholes and pipelines that comprise the City's existing storm drainage collection facilities. For modeling purposes FLO-2D utilizes the Environmental Protection Agency (EPA) stormwater management and maintenance model (SWMM) to evaluate pipeline hydraulics. This model uses an advanced hydraulic routing engine capable of simulating backwater conditions and flooding conditions with the piped system.

3.0 EVALUATION RESULTS

The evaluation consisted of two scenarios, which include: 1) the existing system conditions (Pre-Project), and 2) the existing system conditions plus the Manzanita Park project (Post-Project).

3.1 Existing System Conditions (Pre-Project)

The existing system analysis establishes a baseline condition for identifying the pre-project flood levels and for comparison purposes with the post-project conditions. In this analysis, the maximum observed flood depths ranged between 0.25 ft and 0.75 ft on the currently vacant project site. Maximum flood depths up to 0.3 ft were observed along the centerline of Monterey Road, while the maximum flood depths may reach up to 0.5 ft along the edges of the roadway. The maximum depths observed during the 100-year 24-hour simulations for this scenario are documented graphically on **Figure 3**.

3.2 Existing System Conditions Plus Manzanita Park Project (Post-Project)

This scenario included the updated finished grade surface elevations, and including the additional inlets located along the easterly boundary north and south of Tilton Avenue extension provided by MH Engineering Co. The analysis for this scenario indicates that the maximum flood depths at Monterey Road and the future Tilton Avenue extension ranged between 0.25 ft and 0.90 ft. This demonstrates that the proposed inlets along the easterly boundary of the project are effective at conveying pass-through stormwater from the eastern side of the property during the 100-year 24-hour event. The maximum depths observed during the 100-year 24-hour simulations for this scenario are documented graphically on **Figure 4**.

4.0 CONCLUSIONS

The two-dimensional FLO-2D stormwater model was used to estimate the impact of the Manzanita Park development during 100-year 24-hour storm events. The following conclusions were observed:

- The analysis indicates that the project regrading plan results with an increase in flood depths along Monterey Road, ranging between 0.1 ft and 0.4 ft. Nevertheless, the maximum observed flood depth along Monterey Road was at 0.9 ft, and less than the maximum criteria of 1.00 foot during 100-year 24-hour storm events.
- The analysis indicates that the planned future storm drainage pipes along Tilton Avenue extension and along Monterey Road effectively convey the pass-through stormwater runoff away from the easterly side of the project.
- Finally, this analysis indicates that the 5’x5’ grid cells in FLO-2D resulted with less flooding along Monterey Road during the post-project conditions, and due the smaller grid taking full advantage of the full upstream topography

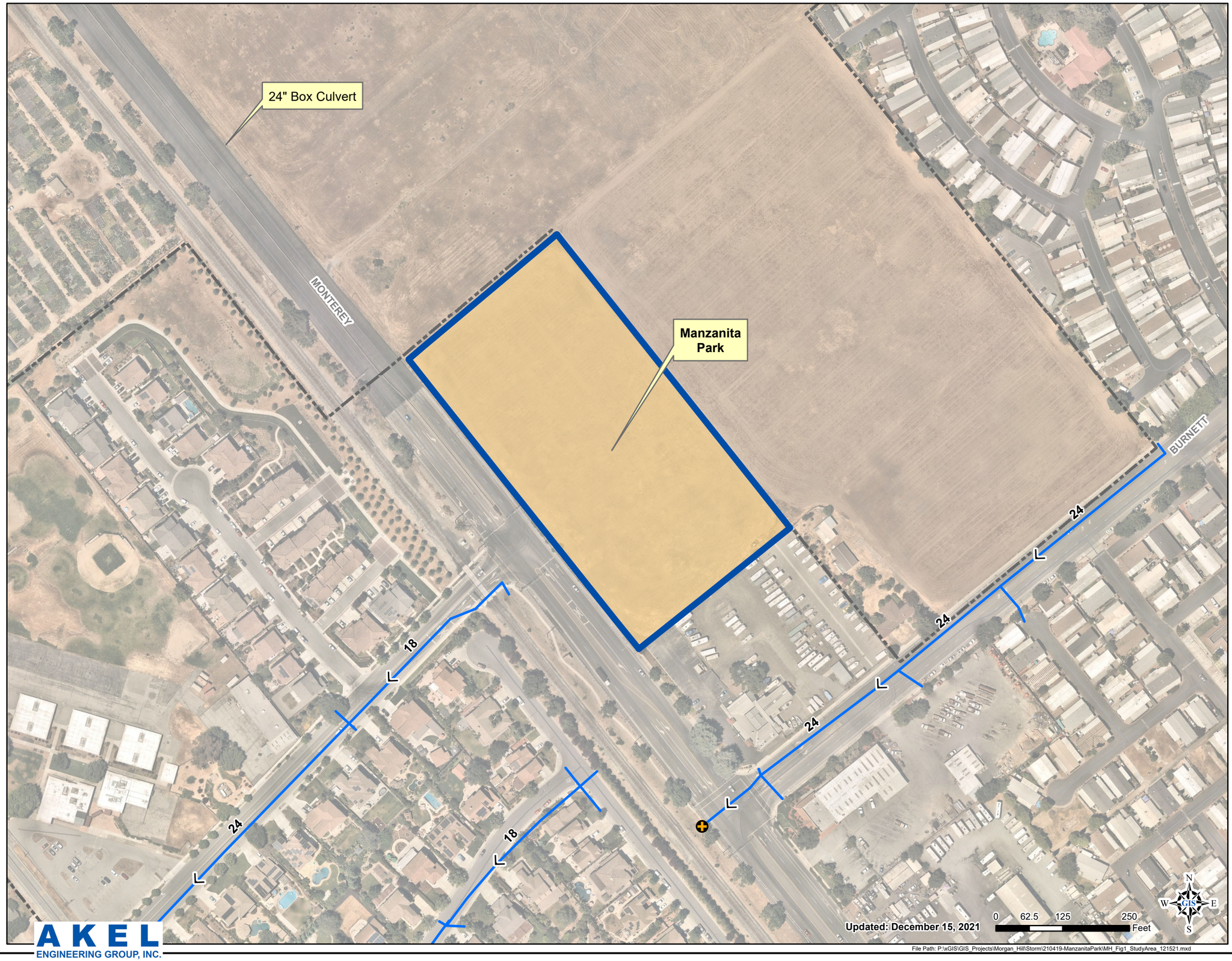
We are extending our thanks to you and other City of Morgan Hill staff whose courtesy and cooperation were valuable components in completing this study and producing this report.

Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel, P.E.
Senior Principal

FIGURES



Legend

- Manzanita Park Development

Existing Modeled System

- Pumps
- Outfalls
- Pipes
- Roads
- City Limits
- Lakes

PRELIMINARY

Figure 1
Location Map
Manzanita Park Analysis
City of Morgan Hill

CITY OF MORGAN HILL

AKEL ENGINEERING GROUP, INC.

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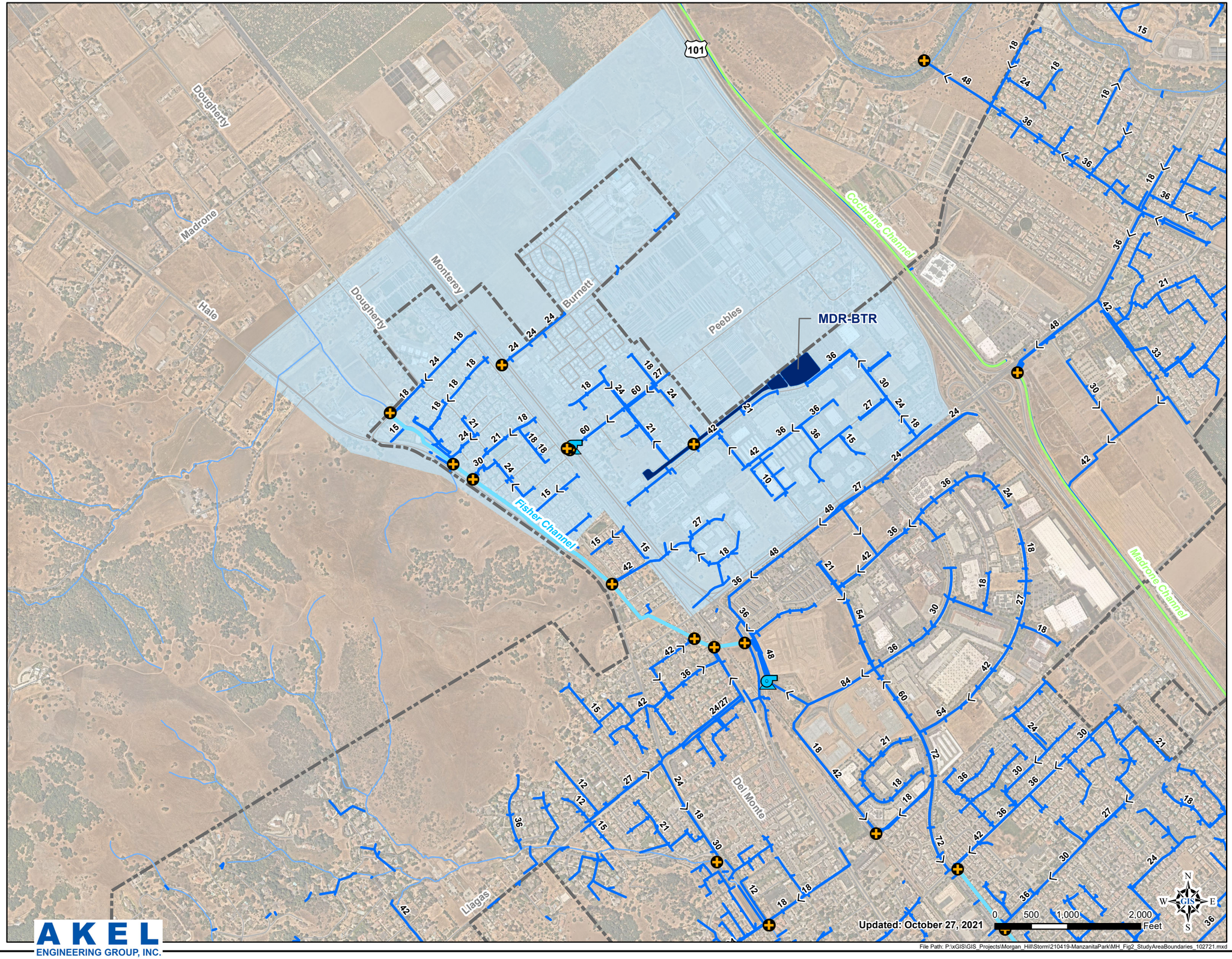

Legend

5' x 5' Analyzed Basin Grid

Existing System

- Pumps
- Outfalls
- Pipes
- Roads
- Storage Basin
- City Limits
- Lakes

PRELIMINARY

Figure 2
Analyzed Basin Boundary
Manzanita Park Analysis
City of Morgan Hill

CITY OF MORGAN HILL

AKEL ENGINEERING GROUP, INC.

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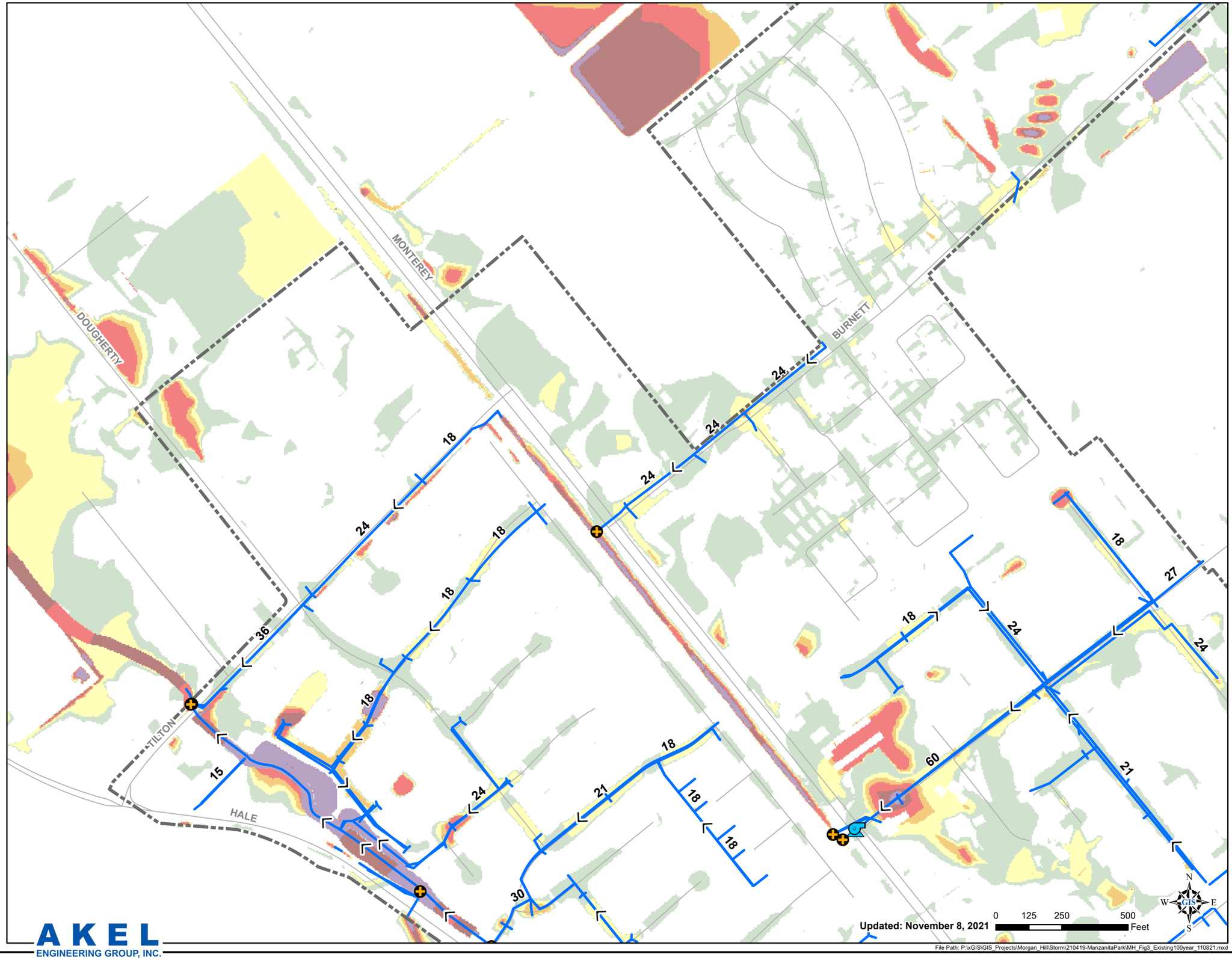

Legend

Maximum Channel and Floodplain Flow Depth (ft)

- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- Greater than 2

Existing Modeled System

- Pumps
- Outfalls
- Pipes
- Roads
- City Limits
- Lakes

PRELIMINARY

Figure 3
Existing Conditions
100-Year 24-Hour Evaluation
Manzanita Park Analysis
City of Morgan Hill

CITY OF MORGAN HILL

AKEL ENGINEERING GROUP, INC.

Updated: November 8, 2021

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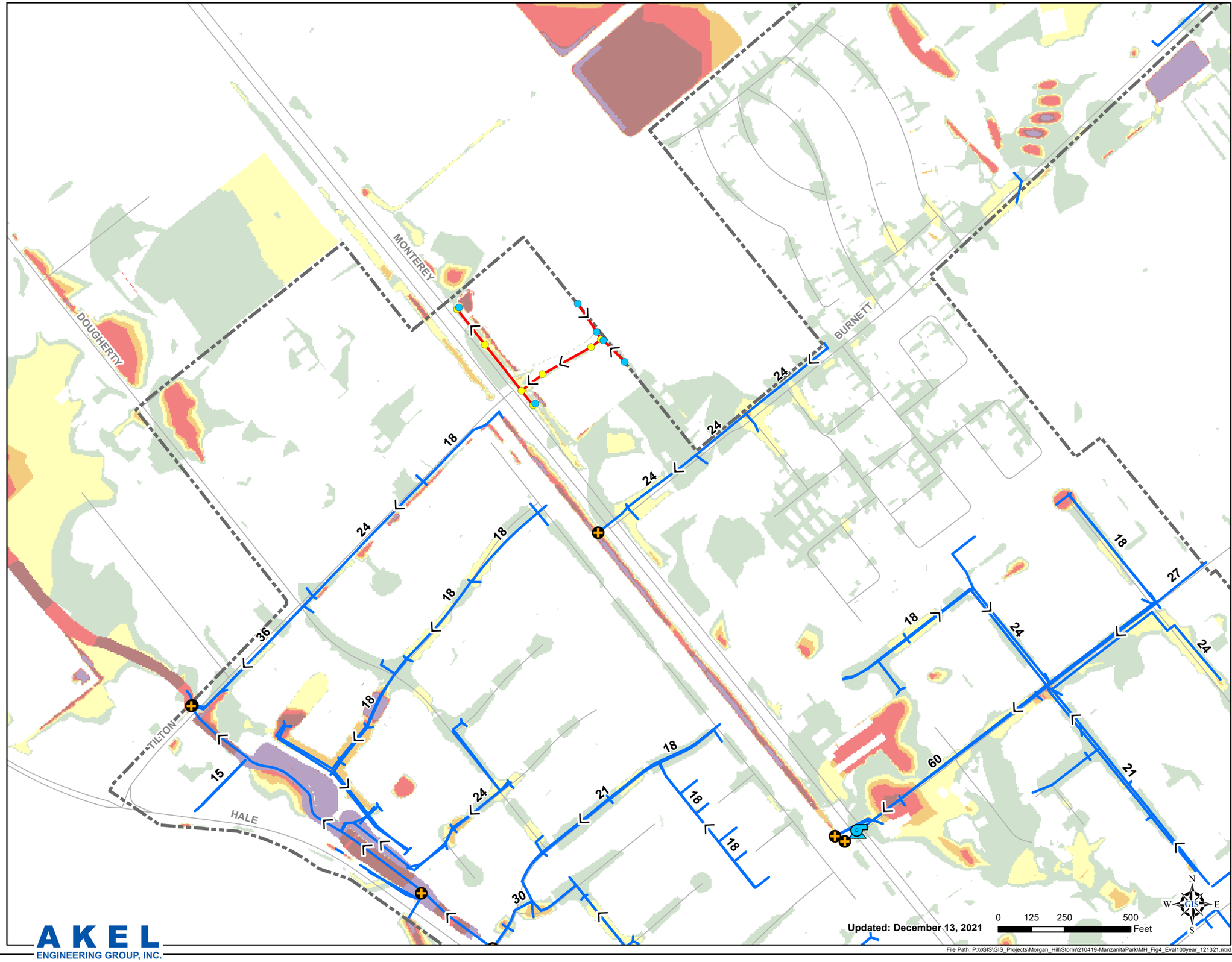

Legend

Planned System

- Inlet
- Manhole
- Pipes

Maximum Channel and Floodplain Flow Depth (ft)

- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.5
- 1.5 - 2
- Greater than 2

Existing Modeled System

- Pumps
- Outfalls
- Pipes
- Roads
- City Limits
- Lakes

PRELIMINARY

Figure 4
Existing and Project Conditions 100-Year 24-Hour Evaluation
Manzanita Park Analysis
City of Morgan Hill

CITY OF MORGAN HILL

AKEL ENGINEERING GROUP, INC.

Updated: December 13, 2021

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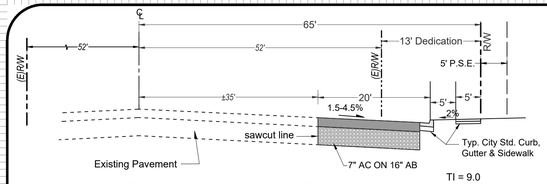
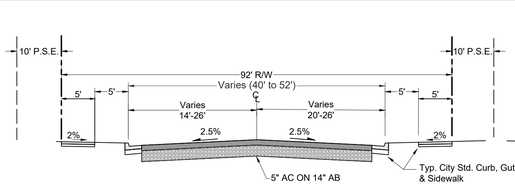
APPENDIX



Typical Street Section-Monterey Road Widening
Looking North Not to Scale

TI = 9.0
R=20



Tilton Avenue Street Section
Not to Scale

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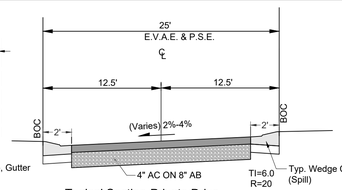

Typical Section-Private Drive
Fronting Buildings Not to Scale

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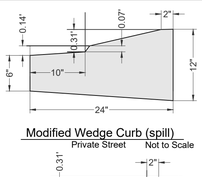
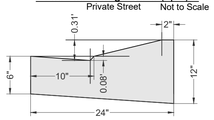
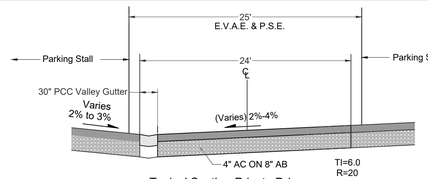


Modified Wedge Curb (spill)
Private Street Not to Scale



Modified Wedge Curb (catch)
Private Street Not to Scale



Typical Section-Private Drive
through Parking Areas Not to Scale

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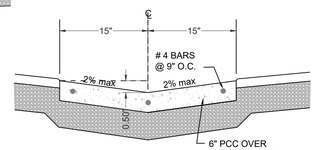
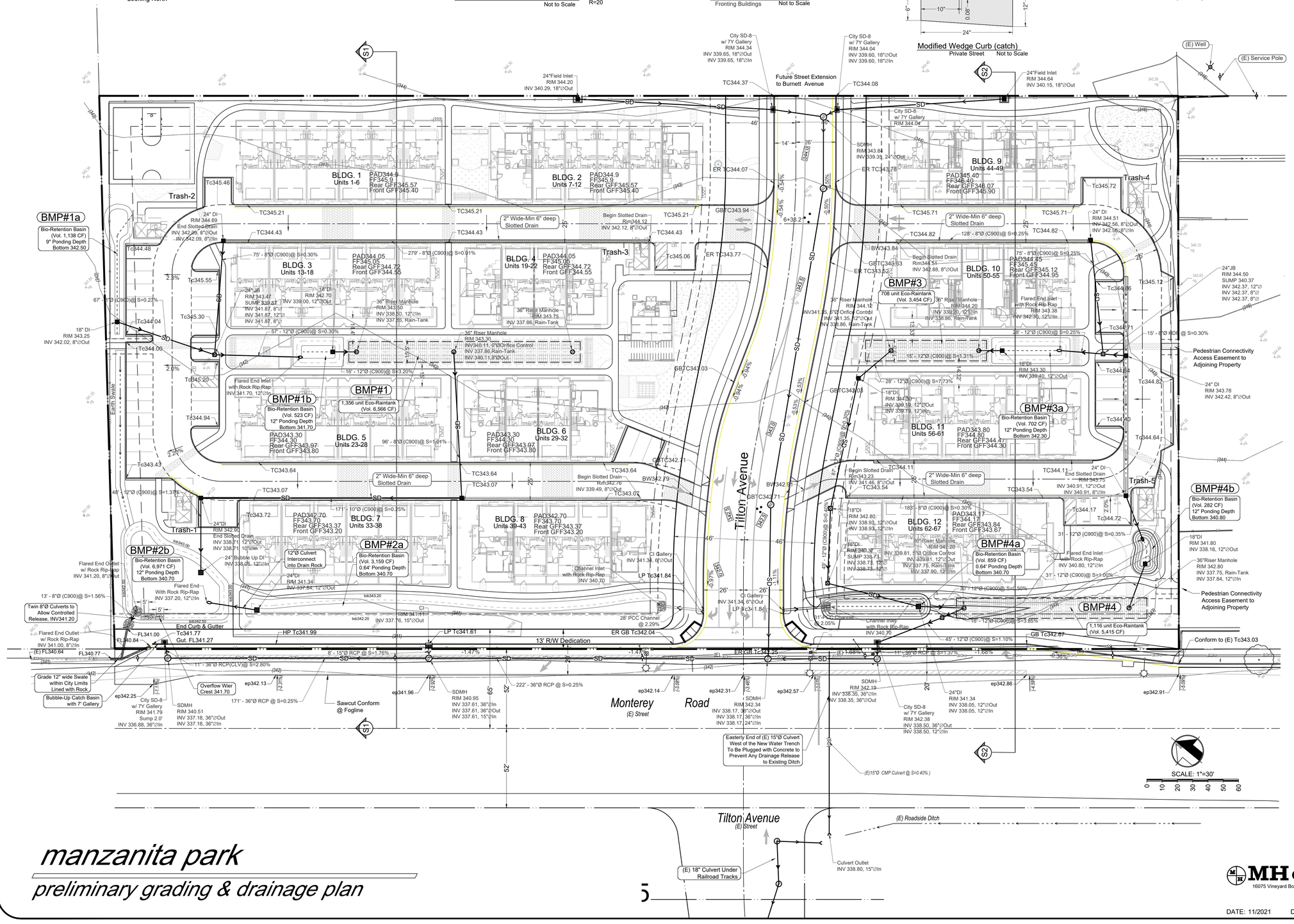
R=20



Detail-Typical PCC Valley Gutter
Not to Scale



grading quantities:

Max. Cut height 3.0'
Max. Fill height 2.2'

Description	Cut	Fill
Strippings Loss (2" depth) (5.83 ac)	Typically Absorbed Onsite	
Streets & Site Grading incl. basin excavation (w/ 10% compaction)	1,300	6,633
Underground Rain-Tank excavation spoils	910	
Trench spoils (wet & dry)	3,000	
Hardscape & fine grading	800	
Net volume	6,010	6,633
Material Shortage (Import)	623	

FEMA FLOOD NOTE :
Property is located in Flood Zone X with 0.2% Annual Chance Flood Hazard, 1% Annual Chancd Flood with average depth less than one foot. Therefore, all building pads are elevated at or above flood elevations at a minimum of one foot or higher above natural ground.

Bench Mark
Valley Water BM086 (NAVD88) Elev. 357.72
Bench mark brass disk (N1884624 E6220375) is located in the area of Kirby Avenue and Nicholas Avenue

applicant:

NORTH CORRIDOR INVESTORS, LLC
385 WOODVIEW AVENUE
MORGAN HILL, CA 95037
(408) 779-5900

manzanita park

preliminary grading & drainage plan

MH engineering Co.
16075 Vineyard Boulevard Morgan Hill, CA 95037

DATE: 11/2021 DRAWN:RS CHECKED: HS

Sheet 3 of 06
218149

L:\Projects\Harry\218149.FM Dividend Manzanita Park-Final Map & Engineering\DWG\218149 SDG-Prelim Grading Plan.dwg - 11/22/2021 6:55pm - Plotted:11/22/2021 6:58pm by harry