DS #: 5122

APN: 137-33-501-001

PROJECT: Summerlin V24A - Starling (Parcel 6)

SUBMITTAL: 1st

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

| CITY OF LAS VEGAS<br>INTER-OFFICE MEMORANDUM | | | | DATE:<br>April 30, 2019 |
|---|---|---|---|---|
| TO:<br>**Land Development Services**<br>Department of Building & Safety | | | | FROM:<br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| **SUBJECT:** | Drainage Study for:<br>**Summerlin V24A – Starling (Parcel O)** | | | **COPIES TO:**<br>GCW Engineers/Surveyors |
| **Cross Streets:** | NWC of Alta Drive & Sky Vista Drive | | | Howard Hughes Company /<br>Pulte Homes |
| **File Number:** | F:\Depot\DSMemos\DS5122A.doc | | | Bart Anderson, P.E., DevCo |
| **Parcel Number:** | 137-33-501-001 | | | CCRFCD |
| **Zoning Action:** | TMP-76125 | | | |
| **FEMA Flood Zone** | YES | NO | X | |
| **Proposed Storm Drain** | YES X | NO | | |

| HISTORY | DATE RECEIVED | DATE REVIEWED | COMMENTS | REVIEW FEES | FEES PAID Payment Trn # |
|---|---|---|---|---|---|
| 1st Submittal | 4/11/2019 | 4/30/2019 | See Comments Below | $400.00 | 3088760: $400 |
| | | | **TOTAL FEES (LDDRS):** | **$400.00** | **----** |

**REMARKS:**

The Drainage Study for the subject project has been reviewed and:

| | |
|---|---|
| | is approved subject to conformance to all City standards and the following conditions: |
| X | must be resubmitted or supplemented including the following: |
| | is conditionally approved subject to Clark County Regional Flood Control District concurrence. |
| | is conditionally approved subject to Clark County Public Works Department concurrence. |

1. Provide a copy of the zoning/planning conditions associated with this site (**TMP-76125**) with the next submittal to verify compliance with conditions. *Flood Control* will not issue conditional approval of the drainage study without the associated zoning/planning conditions (issued by the *City Council*). Any associated conditions of approval that revise the site drainage parameters will require that the drainage study be revised and resubmitted.

2. The site is adjacent to or crosses an existing or proposed *Clark County Regional Flood Control District* (CCRFCD) master planned facility. Therefore, CCRFCD concurrence is required prior to final approval of the drainage study.

   Please note that effective March 15, 2019, the CCRFCD adopted new requirements for drainage study concurrence submittal. Follow the link below for specific guidance.

   http://gustfront.ccrfcd.org/LandDev/LandDev.aspx

3. Sites with a grade difference of 2 feet above or below existing are required to have approval from the *City Planning and Development Department*. The engineer must submit copies of the grading plans and detail sheet with a letter justifying the grade difference to the *City Planning Department* (229-6301). The engineer must provide Planning approval with the next submittal.

4. The regional facility running along the south boundary of the subject development should be within a recorded public drainage easement. Identify as such and label with the recorded document number or map number on the pertinent grading plans in the next submittal.

5. **Sheet G1**: The proposed ***PARK*** (C.E. "A") appears to accept flow from offsite basin "OF1B". Provide a 10'-min public drainage easement (privately maintained by the HOA) from the proposed wall opening to the discharge point at *Springbough Lane*.

   The portion between the wall opening and the proposed inlet shall be concrete to reduce erosion potential.

   No vegetation shall be planted within the drainage easement.

6. **Sheet G1**: Provide nuisance inlets at SDMH #4 on both sides of *Starling Sun Avenue*. Revise all pertinent plans accordingly.

7. **Sheet G3**: Label an existing public drainage easement on the north side of Lot 54 with recorded document or map number.

8. **Sheet G6**: Provide a nuisance inlet at SDMH #20 on the west side of *Feather Bluff Street*.

9. *Section Detail N/D2* is titled as "60'-Drainage Easement". Is it 36' only? Revise the notion of *Private* Drainage Easement to "PUBLIC".

10. All drainage easements must be **PUBLIC** drainage easements to be privately maintained and common lots to be labeled on the grading plans and to be dedicated as such in the final map.

11. The engineer must provide a table on the grading plans that shows a quantity estimate of all drainage improvements within Public Drainage Easements. All drainage improvements within Public Drainage Easements must be bonded and inspected.

12. Private streets must be public drainage easements. Provide a note on the grading plans: "Note: All Private Streets are P.U.E., Public Sewer Easements and Public Drainage Easements to be Privately Maintained by the HOA".

13. Label all existing storm drains in the perimeter streets (*Sky Vista Drive and the regional facilities*) with *City of Las Vegas* recorded drawing numbers on the pertinent grading plans.

14. This drainage study assumes that the project will be constructed in one phase. If improvement plans are submitted to break the project into separate phases, a drainage study update will be required for each phase addressing the interim condition.

15. The proposed wrought iron fence must utilize RTC Uniform Standard Drawing 425.S1. Revise all details and construction note callout accordingly.

16. Add a note in all pertinent sheets for the construction of all storm drain drop inlets per a newly adopted USDCCA Drawing No. 421 (*Stormwater Quality Management Stamp and Sign Detail*).

**In an effort to increase administrative efficiency, for all original and re-submittal packages including updates and the addenda, the City of Las Vegas Public Works Department requires both a hardcopy and a digital copy (PDF) on CD for the drainage study.**

**A letter sealed and signed by a Nevada registered civil engineer must be included in every submittal certifying documents on the electronic CD matches 100% of the hardcopy submittal. The new submittal requirement is effective on May 1, 2019. If there are any questions regarding these new requirements, please contact Albert Sung in the City Flood Control Section at (702) 229-6541.**

Sample Letter to certify CD.pdf

**NOTE:** Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

**END OF REMARKS**

ays

T/R/S: T20S/R59E/33
AREA K-33

# TECHNICAL DRAINAGE STUDY
# STARLING
# SUMMERLIN VILLAGE 24A PARCEL O

**764-A150-001**

**April 2019**

**Prepared for:**
**Pulte Homes**
**7255 S Tenaya Way**
**Las Vegas, Nevada 89118**
**Phone: (702) 914-4800**
**Fax: (702) 914-3100**

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

# DRAINAGE STUDY INFORMATION FORM

Name of Development: Starling Summerlin Village 24A Parcel O Date: April 2019

Location of Development: a) Descriptive (Cross Streets) North/South: Sky Vista Drive

East/West: Alta Drive

b) Section: 28 & 33 Township: 20S Range: 59E

c) APN : 137-33-501-001, 137-28-000-003

Name of Owner: Howard Hughes Company, LLC / Pulte Homes (Developer)

Telephone No.: (702)791-4000 Fax No.: N/A E-Mail Address: Chris.Anderson@howardhughes.com

Address: 10801 W. Charleston Boulevard, 3rd Floor, Las Vegas, NV, 89135

**Contact Person-Name:** Cameron Bencini, P.E. **Telephone No.:** (702) 804-2000

* **E-Mail Address:** CBencini@gcwengineering.com **Fax No.:** (702) 804-2299

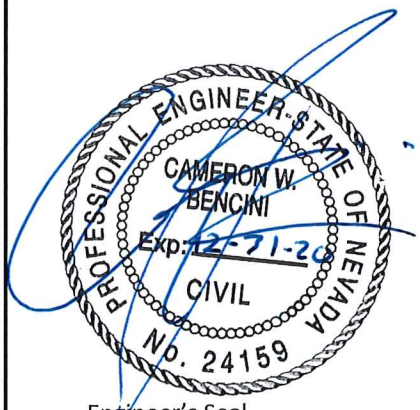
**Firm:** GCW, Inc.

**Address:** 1555 South Rainbow Blvd, Las Vegas, NV 89146

Type of Land Development/Land Disturbance Process:

| | | | | | |
|---|---|---|---|---|---|
| | Rezoning | | Subdivision Map | | Clearing and Grading Only |
| | Parcel Map | | Planned Unit Development | | Other (Please specify below) |
| | Large Parcel Map | X | Building Permit | | |

1. Total Owned Land Area: At Site: +/- 107 acres Being Developed/Disturbed: +/-27 acres
2. Is a portion or all of the subject property located in a designated FEMA Flood Hazard Area? ☐ **Yes**** ☒ **No**
3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ **Yes**** ☐ **No**
4. Proposed type of development (Residential, Commercial, Etc.): Residential
5. Approximate upstream land area which drains to the subject site: 4.7 acres
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: Technical Drainage Study for Village 23B Sky Vista Drive, Alta Drive to Far Hills Avenue, GCW Inc.; Technical Drainage Study for Summerlin Village 24A Parcel O Mass Grading
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Existing storm drain in Sky Vista Drive
8. Briefly describe your proposed schedule for the subject project: ASAP




Engineer's Seal

Submit this form as part of the required drainage study to the local entity which has jurisdiction over the subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

***New Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required.**

| Revision | Date |
|---|---|
| | |
| | |
| | |

Local Entity File No.

REFERENCE:

STANDARD FORM 1

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

# DRAINAGE SUBMITTAL CHECKLIST

| | | |
|---|---|---|
| Project Name: Starling<br>Summerlin Village 24A Parcel O | Map ID: | |
| Firm Name: GCW, Inc. | Engineer: Cameron Bencini | |
| Address: 1555 South Rainbow Blvd<br>City: Las Vegas | State: NV | Zip: 89146 |
| Phone Number: (702) 804-2000 | Fax Number: (702) 804-2299 | |
| Property Owner: Howard Hughes Company, LLC / Pulte Homes (Developer) | | |
| Address: 10801 W. Charleston Blvd, 3rd Floor<br>City: Las Vegas | State: NV | Zip: 89135 |
| Reviewed By: | Date Received: | Date Accepted for Review: |

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

**I. GENERAL REQUIREMENT**

| Yes | No | |
|---|---|---|
| X | | Design Manual **Standard Form 1** with the engineer's seal and signature. |
| X | | Design Manual **Standard Form 4**. |
| X | | 2 copies of the 24” x 36” Drainage Plan. |
| | NA | A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge. |

**II. MAPS AND EXHIBITS**

| Yes | No | |
|---|---|---|
| X | | A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated. |
| X | | A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated. |

| | |
|---|---|
| **REFERENCE:** | **STANDARD FORM 2** |

# DRAINAGE SUBMITTAL CHECKLIST

**II. MAPS AND EXHIBITS (Continued)**

| Yes | No | |
|---|---|---|
| X | | Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs. |
| X | | On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs. |
| X | | Vicinity Map with local and major cross streets identified and a north arrow. |

**III. DRAINAGE PLAN**

| Yes | No | |
|---|---|---|
| X | | Sheet size: 24” x 36” sealed by a registered engineer in the State of Nevada. |
| X | | Minimum scale: 1” = 60’. |
| X | | Project name. |
| X | | Vicinity Map with local and major cross streets. |
| X | | Revision box. |
| X | | North arrow and bar scale. |
| X | | Engineer’s/consultant’s address and phone number. |
| X | | Elevation datum and benchmark. |
| X | | Legend for symbols and abbreviations. |
| X | | Cut/fill scarps, where applicable. |
| X | | Street names, grades, widths. |
| X | | Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. |
| X | | Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate. |
| X | | Minimum finish floor elevations with top-of-curb elevations at upstream end of lot. |
| X | | Proposed typical street sections. |

| **REFERENCE:** | **STANDARD FORM 2** |
|---|---|

# DRAINAGE SUBMITTAL CHECKLIST

**III. DRAINAGE PLAN (Continued)**

| Yes | No | |
|---|---|---|
| _____ | NA | Streets with off-set crowns. |
| X | _____ | Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes. |
| X | _____ | Property lines. |
| X | _____ | Right-of-way lines and widths, existing and proposed. |
| X | _____ | Existing improvements and their elevations. |
| X | _____ | Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points. |
| X | _____ | Concentration points and drainage flow direction with Q100 and V100 and D100 in streets. |
| X | _____ | Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows. |
| X | _____ | Location and cross-section of street capacity calculations. |
| _____ | NA | Cross-sectional detail for channels, including cutoff wall locations. |
| X | _____ | Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations. |
| X | _____ | Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement. |
| _____ | NA | Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs. |
| _____ | NA | Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc. |
| X | _____ | Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit. |
| X | _____ | Building and/or lot numbers. |
| X | _____ | Alignment of all existing, proposed, or future Regional Facilities adjacent to the site. |
| X | _____ | Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information. |

| **REFERENCE:** | **STANDARD FORM 2** |
|---|---|

# DRAINAGE SUBMITTAL CHECKLIST

**III. DRAINAGE PLAN (Continued)**

| Yes | No | |
|---|---|---|
| _____ | NA | For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE. |
| _____ | NA | Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q100 flows. |
| X | _____ | Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent. |
| _____ | NA | Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required). |

**IV. HYDROLOGIC ANALYSIS**

| Yes | No | |
|---|---|---|
| X | _____ | Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated. |
| X | _____ | Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models. |
| X | _____ | Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models. |
| X | _____ | Use of correct precipitation values in and around the McCarran Airport rainfall area. |
| X | _____ | A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations. |
| X | _____ | A summary table of stormwater flows showing basin area, Q10 and Q100 for both individual basins and combined basin flows, where applicable. |
| X | _____ | Copies of supporting technical information referenced from a previously approved study and a statement accepting these results. |
| X | _____ | On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law. |
| _____ | NA | Calculation for impervious area for parking lots and LIDs (if required). |

| **REFERENCE:** | **STANDARD FORM 2** |
|---|---|

# DRAINAGE SUBMITTAL CHECKLIST

**V. HYDRAULIC ANALYSIS**

| Yes | No | |
|---|---|---|
| _____ | NA | Flow split calculations and supporting documentation or reference for the method of flow split calculations used. |
| X | _____ | Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q100 and Q10 flows representing the worst case for interior and all perimeter streets. Q100 d x v < 8. Q10 d x v < 6 and 12 foot dry lane for rights-of-way > 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan. |
| X | _____ | A summary table of interior and exterior street capacity calculations showing the street name, Q100 flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria. |
| _____ | NA | Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.) |
| X | _____ | Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate. |
| X | _____ | Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q100 weir height or flow depth, whichever is greater. |
| _____ | NA | A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones.<br>• Field survey data.<br>• Input and output information.<br>• Plotted cross-sections based on survey with proper encroachments.<br>• A map showing the location of the cross-sections.<br>• Analysis of both sub and super-critical flow segments.<br>• A summary table and a discussion of the results in the text of the report. |
| X | _____ | Provide a 50 percent clogging factor in the capacity calculation for drop inlets. |
| X | _____ | Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation. |
| X | _____ | The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed. |
| _____ | NA | Provide BMP type, size and supporting calculations for parking lots and LIDs (if required). |

| **REFERENCE:** | **STANDARD FORM 2** |
|---|---|

# CITY OF LAS VEGAS

## MINIMUM DRAINAGE STUDY CRITERIA
## STANDARD FORM 2 CHECKLIST SUPPLEMENT

**(Revised 5/18/11)**

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

**If items are not applicable for the subject site, provide N/A.**

| I. GENERAL REQUIREMENT | | |
|---|---|---|
| Yes | No | |
| | NA | A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.) |
| X | | Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions. |
| X | | An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file.<br>CB by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas. |

| II. GRADING PLAN INFORMATION | | |
|---|---|---|
| Yes | No | |
| X | | (1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer. |
| X | | Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required. |
| X | | Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet* around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.) |

| II. GRADING PLAN INFORMATION | | |
|---|---|---|
| Yes | No | |
| X | | Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains. |
| X | | All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property. |
| X | | Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met. |
| X | | Back of lot elevations and lot drainage pattern for all lots including common lots. |
| X | | Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study. |
| X | | On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.) |
| | NA | This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included. |
| | NA | Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW. |

| III. Local Entity Criteria - City of Las Vegas – Manual Section 1600 | | |
|---|---|---|
| Yes | No | |
| X | | Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac. |
| | NA | Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation. |
| | NA | The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc. |
| X | | Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections. |
| X | | Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater. |

| III. Local Entity Criteria - City of Las Vegas – Manual Section 1600 | | |
|---|---|---|
| Yes | No | |
| | NA | Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options. |
| | NA | Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided. |

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

# TECHNICAL DRAINAGE STUDY
# STARLING
# SUMMERLIN VILLAGE 24A PARCEL O

**764-A150-001**

**April 2019**

**Authored By:**

**Nelson Baggs, E.I.**

**Prepared by:**

**GCW, Inc.**
**1555 S. Rainbow Blvd.**
**Las Vegas, NV 89146**
**Phone: (702) 804-2000**
**Fax: (702) 804-2299**

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## I. INTRODUCTION

Pulte Homes is proposing a residential development on Parcel O within Summerlin Village 24A, in the City of Las Vegas. The project is identified as Starling Summerlin Village 24A Parcel O (hereafter referred to as the project), and is located on the west side of Sky Vista Drive north of the Alta Drive and Sky Vista Drive intersection. The purpose of this report is to accompany the improvement plans, to provide detailed hydrologic and hydraulic analyses for the site, and to determine adequate protection for the project from offsite and onsite flows. The following tasks were performed in the preparation of this report:

- Identify previous drainage studies for the project site and surrounding areas.
- Identify the FEMA floodplain designation for the project site.
- Identify existing and proposed regional drainage facilities adjacent to the site.
- Estimate runoff generated for the peak 10-year and 100-year return period storms for existing, interim, and ultimate conditions.
- Recommend drainage facilities required to allow for the future residential area to develop and meet CCRFCD criteria.

## II. LOCATION AND DESCRIPTION OF IMPROVEMENTS

The proposed site is located within Sections 28 and 33, Township 20 South, Range 59 East on APNs 137-33-501-001, and 137-28-000-003 within the jurisdictional limits of the City of Las Vegas (CLV). The site is bordered by future Parcel N to the south, Detention basin No. 5 to the West, undeveloped land to the north, and Sky Vista Drive to the east. Refer to Figure 1 in Appendix C for the location of the project. For this study, the proposed improvements consist of mass grading.

## III. FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOOD HAZARD ANALYSIS

Figure 2 in Appendix C shows the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) containing Community Panel 32003C2150E dated September 27, 2002. The project site lies within a Zone X. Areas designated as Zone X are described as being outside the 500-year floodplain. Therefore, this project is not located in a FEMA designated Special Flood Hazard Area (SFHA).

## IV. CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT (CCRFCD) HYDROLOGY AND FACILITIES

Figures 3 and 4, included in Appendix C are based on information provided in the CCRFCD 2018 Las Vegas Valley Master Plan Update (Reference 2, hereafter referred to as the 2018 MPU). Figure 3 shows the project site in relation to the 2018 MPU subbasins and land use for the area. Figure 4 shows the project site in relation to CCRFCD facilities in the area according to the 2018 MPU. As shown on Figure 4, the site is adjacent to proposed CCRFCD Facilities APM50000, APAD 0225 and APAD 0203. The 2018 MPU describes the CCRFCD Facility APM50000 as a 384 ac-ft detention basin, and APAD 0225 / APAD 0203 as two 7-ft by 5.5-ft RCB.

## V. REFERENCED STUDIES

In preparation of this study, the following approved drainage studies and improvement plans were referenced to complete hydrologic and hydraulic analyses. These studies have been reviewed and accepted as suitable for reference material. A brief synopsis of

the pertinence of each of the referenced items is as follows:

- *Technical Drainage Study for Village 23B Sky Vista Drive, Alta Drive to Far Hills Avenue* (Reference 3, hereinafter referred to as the Sky Vista Drive Study) was approved by the City of Las Vegas on February 13, 2019 and was referenced for its hydrology and the construction of downstream storm drain. More specifically, drainage basins modelled within this study were prorated to analyse onsite conditions. In addition, the 60" RCP located at the southeast corner of the site was the tie-in location for onsite storm drain.
- *Technical Drainage Study for Summerlin Village 24A Parcel O Mass Grading* (Reference 4, hereinafter referred to as the Grading Study) was approved by the City of Las Vegas on January 14, 2019. The existing condition for the project site was referenced from this study.
- *Update to the Technical Drainage Study for Village 24A Parcel N/O Entry Road Improvement Plan* (Reference 5, hereinafter referred to as the Entry Road Study) was approved by the City of Las Vegas on January 17, 2019. The Entry Road Study provides flow patterns and designed inlets for the southwest entry road.

## VI. HYDROLOGY

The methodology presented in this study is in compliance with the *CCRFCD Hydrologic Criteria and Drainage Design Manual* (Reference 3, hereinafter referred to as the Manual).

**Model Description**: The referenced watersheds were modeled using the SCS Unit Hydrograph method within the Army Corps of Engineers HEC-1 Flood Hydrograph package.

**Drainage Areas and Flow Patterns:** Flow patterns have been determined from 1-ft aerial topography for the project site, proposed grading, and reference material. Referenced basins were prorated to determine the flow rate at facilities designed with this study.

## VII. EXISTING CONDITION

The existing condition for the site was reference from the Grading Study, therefore a site specific existing condition hydrology analysis is not necessary for this study. In general, the site drains to the east where is it redirected south to an existing 60-inch RCP in sump.

## VIII. PROPOSED CONDITION

In the proposed condition, onsite runoff is collected via the proposed storm drain and discharges into the existing 60" RCP storm drain that extends from Sky Vista, thus matching the existing drainage patterns.

Since all surrounding areas are considered developed in the proposed conditions, a separate interim and ultimate condition analysis are not required for this project.

Offsite improvements are currently being coordinated with the Howard Hughes Corporation and will be constructed prior to or concurrently with this project. Coordination includes the management of offsite flow to the south and to the west of the project site. As previously stated, MPU Facility APAD0203/0225 and respective 50-ft drainage easement borders the southern boundary of the site. Surface runoff from the easement area will ultimately be collected locally and discharged into the existing 7'x5.5' RCB before reaching

Sky Vista Drive. Note that the proposed lots along the south side of the project site are much higher than the existing grade, therefore flood protection is not required. In addition, coordination is also ongoing to manage the offsite runoff approaching from the west (Basins OF1A and OF1B). Approaching flows will be redirected north and south via swale along the west wall of the proposed development. The runoff from OF1A will drain north around the site where ultimately flows will be intercepted by an inlet (being coordinated with HHC) that ties into the existing 60" RCP extending from Sky Vista Drive. The runoff from OF1B will drain south to a wall opening where it will spill into an inlet in sump that ties into the proposed onsite storm drain system. Eventually all runoff from these basins will get collected and conveyed into the storm drain system within Sky Vista Drive.

## IX. HYDRAULICS

### STREET HYDRAULICS

The resulting street flow data is based on proposed condition flow rates. A normal depth calculation for the typical street section has been provided using the highest flow rate along with the maximum and minimum slopes for the development. Street sections have also been provided at drop inlet locations. Hydraulic calculations have been included in Appendix B. Refer to Figure 5 in Appendix C for the flowrates used in the street normal depth calculations.

Based on the calculated street flow characteristics, the Manual criteria for depth (D) and velocity times depth (D*V) for the 100-year storm event will be met.

CCRFCD criteria requires that finished floor elevations are set a minimum vertical distance above the flow line of the gutter equal to twice the depth of the 100-year flow in the gutter up to a maximum of 18 inches above the depth of flow. CLV requires finished floor elevations be set at a minimum of 6-inches above the top of curb. All proposed lot finished floors meet these criteria or have been flood protected up to the minimum finished floor elevation.

### STORM DRAIN IMPROVEMENTS

Storm drain has been proposed extending from the existing 60" storm drain in Sky Vista Drive to collect onsite runoff. The starting water surface elevation used in the WSPG model was referenced from the Sky Vista Study. Hydraulic calculations have been provided in Appendix B. Pertinent reference material has been included in Appendix C.

All storm drain has been designed to meet the minimum CCRFCD requirements.

## X. CONCLUSIONS AND RECOMMENDATIONS

1. Methodology used in this report is in compliance with Clark County Regional Flood Control District (CCRFCD) criteria.

2. The project area lies within a designated FEMA Flood Zone X. Therefore, the project is not currently located in a FEMA-designated Special Flood Hazard Area.

3. The site is adjacent to CCRFCD facilities APM5 0000, APAD 0225 and APAD 0203. More specifically, Facilities APAD 0225 & APAD 0203 border the northern side of the site. Coordination of the development of this drainage easement is ongoing between the client and HHC.

4. Offsite improvements under coordination with HHC will be constructed prior to or concurrently with this project.

5. Onsite storm drain is proposed to collect onsite flow and convey them into an existing 60” RCP. The proposed storm drain is designed to meet the minimum CCRFCD drainage requirements.

6. The proposed drainage patterns in this report are generally consistent with the existing conditions. As such, the proposed development does not adversely impact the drainage patterns and downstream properties or facilities.

## XI. REFERENCES

1. Clark County Regional Flood Control District. *Hydrologic Criteria and Drainage Design Manual*. August 1999.

2. *CCRFCD 2018 Las Vegas Valley Master Plan Update*. 2018.

3. GCW, Inc. *Update to the Technical Drainage Study for Village 23B Sky Vista Drive Alta Drive to Far Hills Avenue*. December 2018.

4. GCW, Inc. *Technical Drainage Study for Summerlin Village 24A Parcel O Mass Grading.* December 2018.

5. GCW, Inc. *Update to the Technical Drainage Study for Village 24A Parcel N/O Entry Road Improvement Plan.* December 2018.

# STARLING SUMMERLIN VILLAGE 24A PARCEL O
# APPENDIX LAYOUT

Appendix A. Hydraulic Calculations and Information

1. Normal Depth Street Calculations
2. Specific Energy Street Calculation
3. Drop Inlet Calculations
4. Wall Opening Calculation
5. WSPG Calculations
6. Storm Drain Lateral Calculations
7. Inlet Control Calculations

Appendix B. Referenced Material

1. Update to the Technical Drainage Study for Village 23B Sky Vista Drive Alta Drive to Far Hills Avenue

    a. CLV Approval Letter
    b. Figure 6 – Ultimate Conditions Drainage Map
    c. Soil/ Curve Number Calculations
    d. Ultimate Conditions Standard Form 4
    e. Ultimate Conditions HEC-1 Model
    f. Sky Vista WSPG Model
    g. Sky Vista Inlet Text Excerpt
    h. Sky Vista Inlet Calculation
    i. Improvement Plan Sheets: 1, 14, 28

2. Technical Drainage Study for Summerlin Village 24A Parcel O Mass Grading

    a. CLV Approval Letter
    b. Figure 5 – Interim Condition Drainage Map
    c. Curve Number Calculations
    d. Interim Condition Standard Form 4
    e. Interim Condition HEC-1 Model

3. Update to the Technical Drainage Study for Village 24A Parcel N/O Entry Road Improvement Plan

    a. CLV Approval Letter
    b. WSPG model
    c. Figure 5 – Ultimate Condition Drainage Map
    d. Improvement Plan Sheets: 1, 7, 18, 11
    e. Inlet Calculations

Appendix C. Figures

    a. Figure 1 – Vicinity Map
    b. Figure 2 – FIRM Map
    c. Figure 3 – MPU Subbasin Map
    d. Figure 4 – MPU Facility Map
    e. Figure 5 – Proposed Condition Drainage Map

# APPENDIX A

Hydraulic Calculations and Information

# Worksheet for Section 1 Typical Interior Street Max

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 6.86 | % |
| Discharge | 33.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.39 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 4.77 | ft² |
| Wetted Perimeter | 31.53 | ft |

# Worksheet for Section 1 Typical Interior Street Max

## Results

| | | | |
|---|---|---|---|
| Hydraulic Radius | | 0.15 | ft |
| Top Width | | 31.29 | ft |
| Normal Depth | | 0.39 | ft |
| Critical Depth | | 0.56 | ft |
| Critical Slope | | 0.00571 | ft/ft |
| Velocity | | 6.92 | ft/s |
| Velocity Head | | 0.74 | ft |
| Specific Energy | | 1.14 | ft |
| Froude Number | | 3.12 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.39 | ft |
| Critical Depth | 0.56 | ft |
| Channel Slope | 6.86 | % |
| Critical Slope | 0.00571 | ft/ft |

# Cross Section for Section 1 Typical Interior Street Max

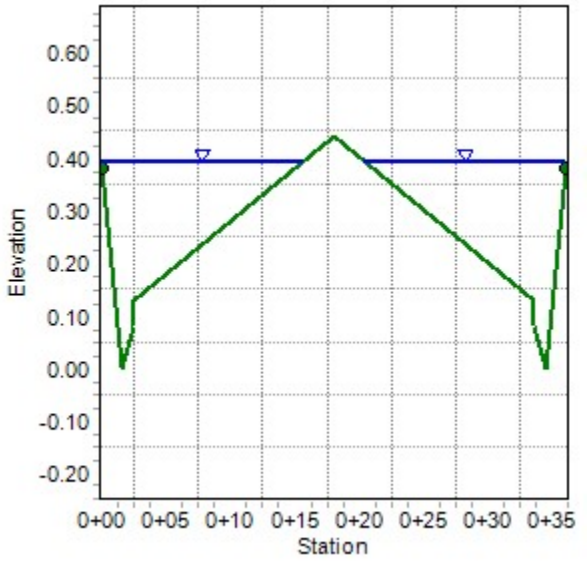
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 6.86 | % |
| Normal Depth | 0.39 | ft |
| Discharge | 33.00 | ft³/s |

## Cross Section Image



# Worksheet for Section 1 Typical Interior Street Min

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Discharge | 33.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.57 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 11.13 | ft² |
| Wetted Perimeter | 36.59 | ft |

# Worksheet for Section 1 Typical Interior Street Min

## Results

| | | | |
|---|---|---|---|
| Hydraulic Radius | | 0.30 | ft |
| Top Width | | 36.00 | ft |
| Normal Depth | | 0.57 | ft |
| Critical Depth | | 0.56 | ft |
| Critical Slope | | 0.00571 | ft/ft |
| Velocity | | 2.97 | ft/s |
| Velocity Head | | 0.14 | ft |
| Specific Energy | | 0.71 | ft |
| Froude Number | | 0.94 | |
| Flow Type | Subcritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.57 | ft |
| Critical Depth | 0.56 | ft |
| Channel Slope | 0.50 | % |
| Critical Slope | 0.00571 | ft/ft |

# Cross Section for Section 1 Typical Interior Street Min

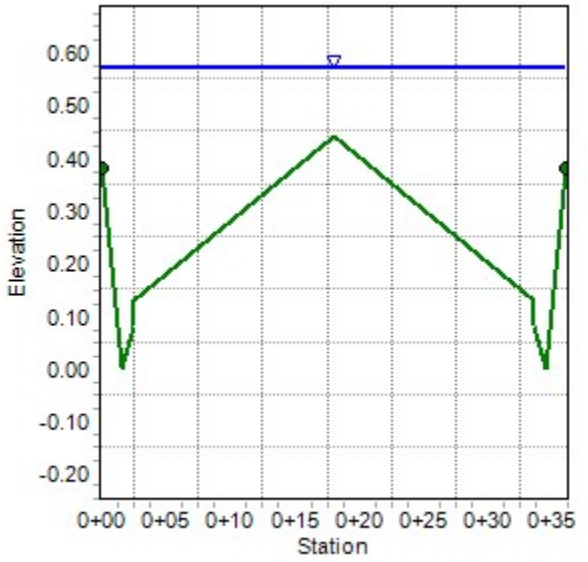
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Normal Depth | 0.57 | ft |
| Discharge | 33.00 | ft³/s |

## Cross Section Image



FACILITY 1

# Worksheet for SPRINGBOUGH LN EAST 7.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Discharge | 8.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+18.0, 0.44) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.46 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 3.59 | ft² |
| Wetted Perimeter | 18.21 | ft |
| Hydraulic Radius | 0.20 | ft |
| Top Width | 18.00 | ft |
| Normal Depth | 0.46 | ft |
| Critical Depth | 0.45 | ft |

# Worksheet for SPRINGBOUGH LN EAST 7.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00665 | ft/ft |
| Velocity | | 2.23 | ft/s |
| Velocity Head | | 0.08 | ft |
| Specific Energy | | 0.54 | ft |
| Froude Number | | 0.88 | |
| Flow Type | Subcritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.46 | ft |
| Critical Depth | 0.45 | ft |
| Channel Slope | 0.50 | % |
| Critical Slope | 0.00665 | ft/ft |

# Cross Section for SPRINGBOUGH LN EAST 7.5' DI

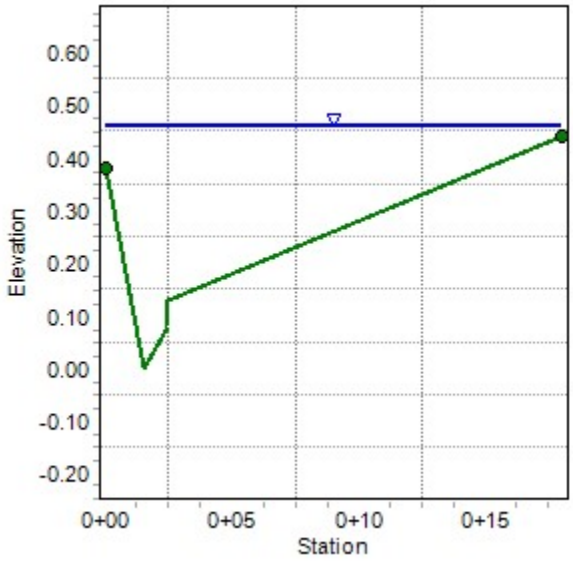
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Normal Depth | 0.46 | ft |
| Discharge | 8.00 | ft³/s |

## Cross Section Image



FACILITY 2

# Worksheet for SPRINGBOUGH LN WEST 7.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Discharge | 6.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+18.0, 0.44) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.43 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 2.98 | ft² |
| Wetted Perimeter | 17.60 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 17.45 | ft |
| Normal Depth | 0.43 | ft |
| Critical Depth | 0.41 | ft |

# Worksheet for SPRINGBOUGH LN WEST 7.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00694 | ft/ft |
| Velocity | | 2.01 | ft/s |
| Velocity Head | | 0.06 | ft |
| Specific Energy | | 0.49 | ft |
| Froude Number | | 0.86 | |
| Flow Type | Subcritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.43 | ft |
| Critical Depth | 0.41 | ft |
| Channel Slope | 0.50 | % |
| Critical Slope | 0.00694 | ft/ft |

# Cross Section for SPRINGBOUGH LN WEST 7.5' DI

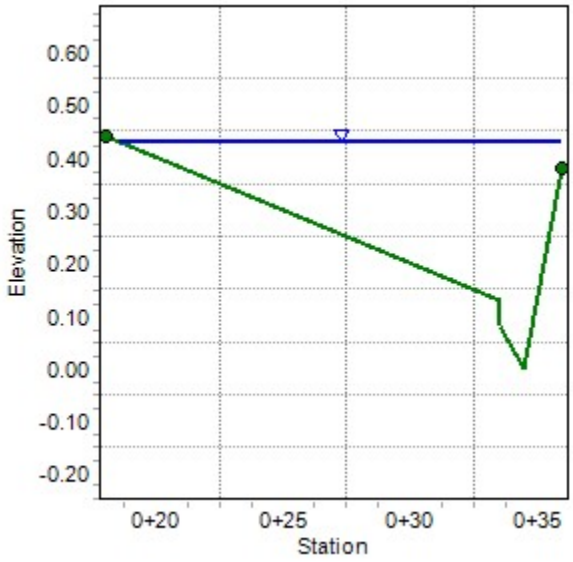
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Normal Depth | 0.43 | ft |
| Discharge | 6.00 | ft³/s |

## Cross Section Image



FACILITY 4

# Worksheet for SPRINGBOUGH/STARLING INTERSECTION WEST 10' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 1.41 | % |
| Discharge | 3.50 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+18.0, 0.44) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.32 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 1.34 | ft² |
| Wetted Perimeter | 11.67 | ft |
| Hydraulic Radius | 0.12 | ft |
| Top Width | 11.58 | ft |
| Normal Depth | 0.32 | ft |
| Critical Depth | 0.35 | ft |

# Worksheet for SPRINGBOUGH/STARLING INTERSECTION WEST 10' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00744 | ft/ft |
| Velocity | | 2.60 | ft/s |
| Velocity Head | | 0.11 | ft |
| Specific Energy | | 0.42 | ft |
| Froude Number | | 1.35 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.32 | ft |
| Critical Depth | 0.35 | ft |
| Channel Slope | 1.41 | % |
| Critical Slope | 0.00744 | ft/ft |

# Cross Section for SPRINGBOUGH/STARLING INTERSECTION WEST 10'

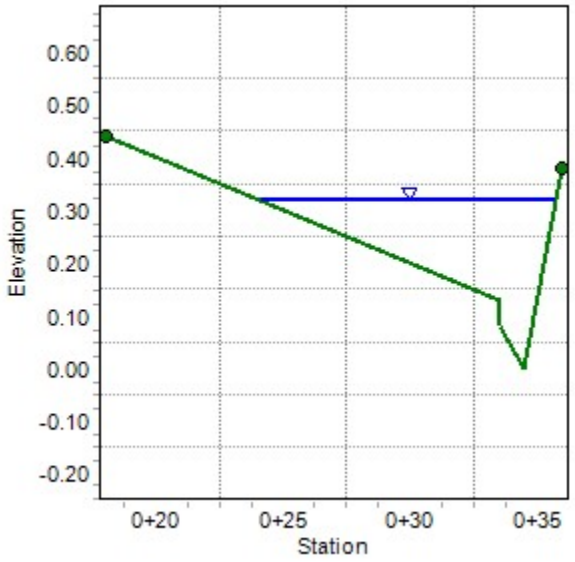
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 1.41 | % |
| Normal Depth | 0.32 | ft |
| Discharge | 3.50 | ft³/s |

## Cross Section Image



FACILITY 6

# Worksheet for STARLING SUN AVE NORTH 7.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 5.29 | % |
| Discharge | 11.50 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+18.0, 0.44) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.37 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 2.00 | ft² |
| Wetted Perimeter | 14.42 | ft |
| Hydraulic Radius | 0.14 | ft |
| Top Width | 14.32 | ft |
| Normal Depth | 0.37 | ft |
| Critical Depth | 0.50 | ft |

# Worksheet for STARLING SUN AVE NORTH 7.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00618 | ft/ft |
| Velocity | | 5.74 | ft/s |
| Velocity Head | | 0.51 | ft |
| Specific Energy | | 0.88 | ft |
| Froude Number | | 2.71 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.37 | ft |
| Critical Depth | 0.50 | ft |
| Channel Slope | 5.29 | % |
| Critical Slope | 0.00618 | ft/ft |

# Cross Section for STARLING SUN AVE NORTH 7.5' DI

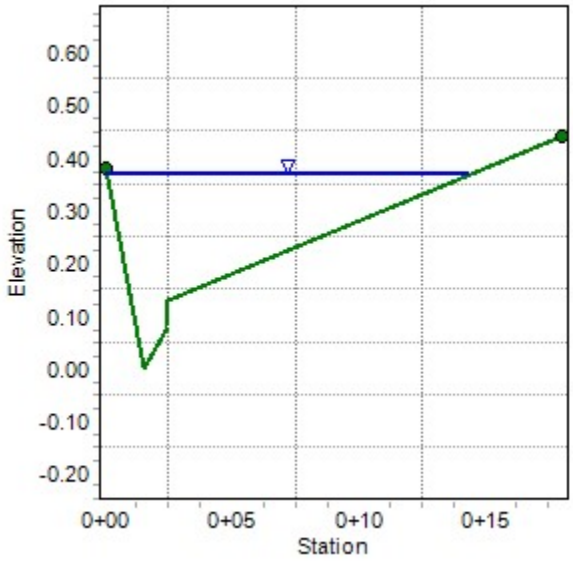
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 5.29 | % |
| Normal Depth | 0.37 | ft |
| Discharge | 11.50 | ft³/s |

## Cross Section Image



FACILITY 7

# Worksheet for STARLING SUN AVE SOUTH 7.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 5.29 | % |
| Discharge | 7.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+18.0, 0.44) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.32 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 1.38 | ft² |
| Wetted Perimeter | 11.83 | ft |
| Hydraulic Radius | 0.12 | ft |
| Top Width | 11.73 | ft |
| Normal Depth | 0.32 | ft |
| Critical Depth | 0.43 | ft |

# Worksheet for STARLING SUN AVE SOUTH 7.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00680 | ft/ft |
| Velocity | | 5.08 | ft/s |
| Velocity Head | | 0.40 | ft |
| Specific Energy | | 0.72 | ft |
| Froude Number | | 2.61 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.32 | ft |
| Critical Depth | 0.43 | ft |
| Channel Slope | 5.29 | % |
| Critical Slope | 0.00680 | ft/ft |

# Cross Section for STARLING SUN AVE SOUTH 7.5' DI

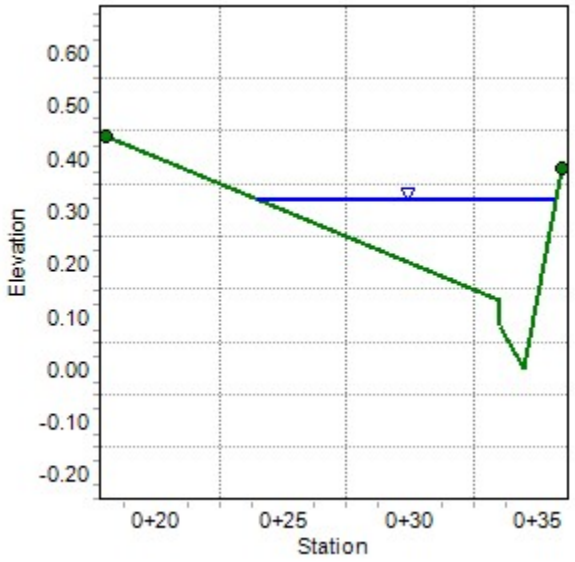
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 5.29 | % |
| Normal Depth | 0.32 | ft |
| Discharge | 7.00 | ft³/s |

## Cross Section Image



FACILITY 9

# Worksheet for FEATHER BLUFF ST EAST 12.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 2.40 | % |
| Discharge | 13.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+18.0, 0.44) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.43 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 2.96 | ft² |
| Wetted Perimeter | 17.53 | ft |
| Hydraulic Radius | 0.17 | ft |
| Top Width | 17.38 | ft |
| Normal Depth | 0.43 | ft |
| Critical Depth | 0.52 | ft |

# Worksheet for FEATHER BLUFF ST EAST 12.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00604 | ft/ft |
| Velocity | | 4.40 | ft/s |
| Velocity Head | | 0.30 | ft |
| Specific Energy | | 0.73 | ft |
| Froude Number | | 1.88 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.43 | ft |
| Critical Depth | 0.52 | ft |
| Channel Slope | 2.40 | % |
| Critical Slope | 0.00604 | ft/ft |

# Cross Section for FEATHER BLUFF ST EAST 12.5' DI

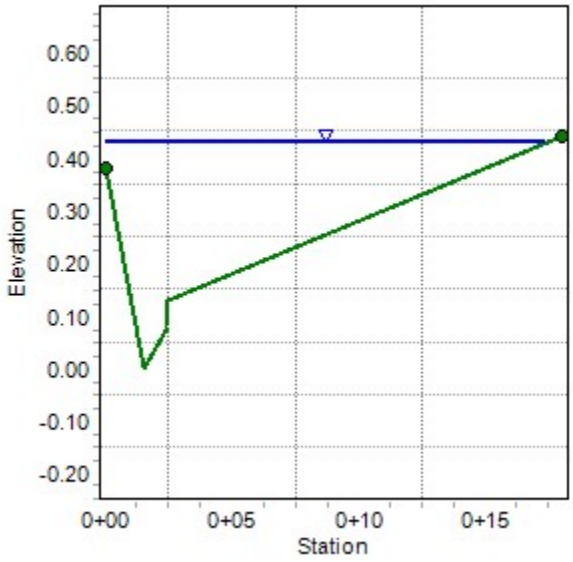
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 2.40 | % |
| Normal Depth | 0.43 | ft |
| Discharge | 13.00 | ft³/s |

## Cross Section Image



FACILITY 11

# Worksheet for FEATHER BLUFF ST EAST 7.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 3.34 | % |
| Discharge | 12.50 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+18.0, 0.44) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.40 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 2.54 | ft² |
| Wetted Perimeter | 16.25 | ft |
| Hydraulic Radius | 0.16 | ft |
| Top Width | 16.12 | ft |
| Normal Depth | 0.40 | ft |
| Critical Depth | 0.51 | ft |

# Worksheet for FEATHER BLUFF ST EAST 7.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00608 | ft/ft |
| Velocity | | 4.93 | ft/s |
| Velocity Head | | 0.38 | ft |
| Specific Energy | | 0.78 | ft |
| Froude Number | | 2.19 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.40 | ft |
| Critical Depth | 0.51 | ft |
| Channel Slope | 3.34 | % |
| Critical Slope | 0.00608 | ft/ft |

# Cross Section for FEATHER BLUFF ST EAST 7.5' DI

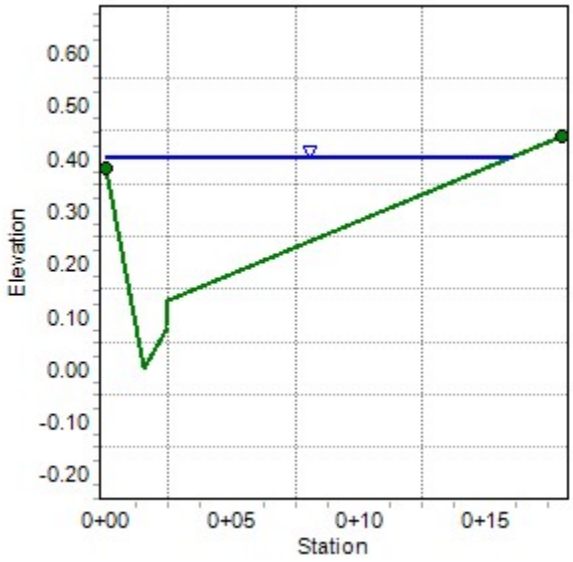
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 3.34 | % |
| Normal Depth | 0.40 | ft |
| Discharge | 12.50 | ft³/s |

## Cross Section Image



FACILITY 12

# Worksheet for FEATHER BLUFF ST WEST 7.5' DI

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 3.34 | % |
| Discharge | 9.00 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+18.0, 0.44) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.37 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 1.98 | ft² |
| Wetted Perimeter | 14.34 | ft |
| Hydraulic Radius | 0.14 | ft |
| Top Width | 14.24 | ft |
| Normal Depth | 0.37 | ft |
| Critical Depth | 0.46 | ft |

# Worksheet for FEATHER BLUFF ST WEST 7.5' DI

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00650 | ft/ft |
| Velocity | | 4.54 | ft/s |
| Velocity Head | | 0.32 | ft |
| Specific Energy | | 0.69 | ft |
| Froude Number | | 2.15 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.37 | ft |
| Critical Depth | 0.46 | ft |
| Channel Slope | 3.34 | % |
| Critical Slope | 0.00650 | ft/ft |

# Cross Section for FEATHER BLUFF ST WEST 7.5' DI

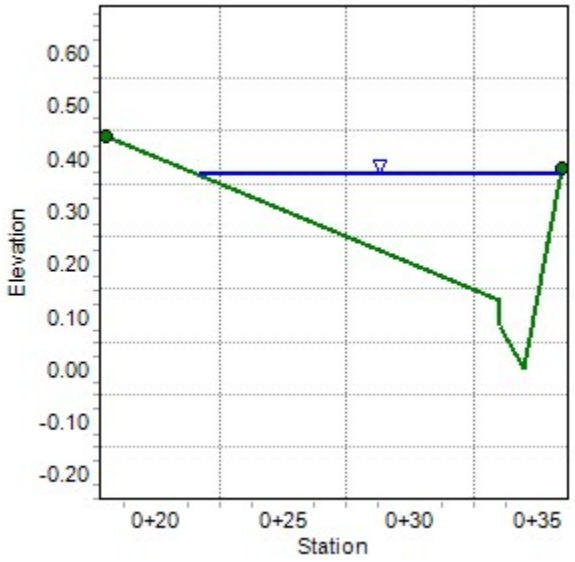
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 3.34 | % |
| Normal Depth | 0.37 | ft |
| Discharge | 9.00 | ft³/s |

## Cross Section Image



FACILITY 14

# Worksheet for FEATHER BLUFF ST WEST 7.5' DI (SOUTH OF RED CLIFF)

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 4.05 | % |
| Discharge | 14.50 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+18.0 | 0.44 |
| 0+33.5 | 0.13 |
| 0+33.5 | 0.08 |
| 0+34.5 | 0.00 |
| 0+36.0 | 0.38 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+18.0, 0.44) | (0+36.0, 0.38) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.41 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 2.64 | ft² |
| Wetted Perimeter | 16.56 | ft |
| Hydraulic Radius | 0.16 | ft |
| Top Width | 16.43 | ft |
| Normal Depth | 0.41 | ft |
| Critical Depth | 0.54 | ft |

# Worksheet for FEATHER BLUFF ST WEST 7.5' DI (SOUTH OF RED CLIFF)

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00591 | ft/ft |
| Velocity | | 5.50 | ft/s |
| Velocity Head | | 0.47 | ft |
| Specific Energy | | 0.88 | ft |
| Froude Number | | 2.42 | |
| Flow Type | Supercritical | | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.41 | ft |
| Critical Depth | 0.54 | ft |
| Channel Slope | 4.05 | % |
| Critical Slope | 0.00591 | ft/ft |

# Cross Section for FEATHER BLUFF ST WEST 7.5' DI (SOUTH OF RED CLIFF)

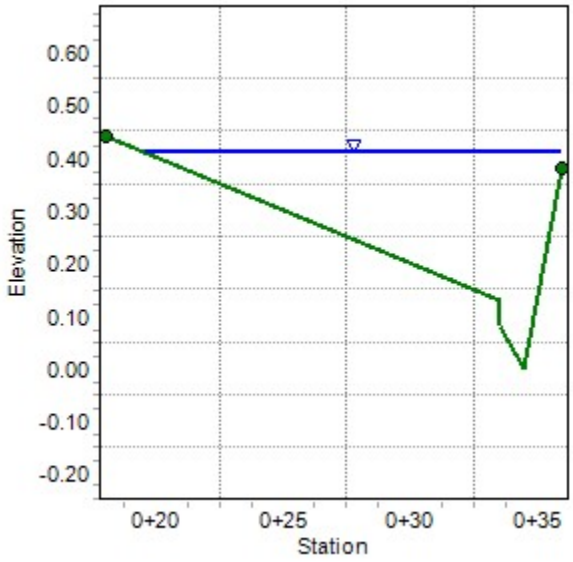
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 4.05 | % |
| Normal Depth | 0.41 | ft |
| Discharge | 14.50 | ft³/s |

## Cross Section Image



# Worksheet for SPEC. ENERGY AT SPRINGBOUGH AND STARLING

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Discharge | 4.50 | ft³/s |

Section Definitions

| Station (ft) | Elevation (ft) |
|---|---|
| 0+00.0 | 0.38 |
| 0+01.5 | 0.00 |
| 0+02.5 | 0.08 |
| 0+02.5 | 0.13 |
| 0+18.0 | 0.44 |

Roughness Segment Definitions

| Start Station | Ending Station | Roughness Coefficient |
|---|---|---|
| (0+00.0, 0.38) | (0+18.0, 0.44) | 0.016 |

## Options

| | |
|---|---|
| Current Roughness Weighted Method | Pavlovskii's Method |
| Open Channel Weighting Method | Pavlovskii's Method |
| Closed Channel Weighting Method | Pavlovskii's Method |

## Results

| | | |
|---|---|---|
| Normal Depth | 0.39 | ft |
| Elevation Range | 0.00 to 0.44 ft | |
| Flow Area | 2.40 | ft² |
| Wetted Perimeter | 15.82 | ft |
| Hydraulic Radius | 0.15 | ft |
| Top Width | 15.71 | ft |
| Normal Depth | 0.39 | ft |
| Critical Depth | 0.37 | ft |

# Worksheet for SPEC. ENERGY AT SPRINGBOUGH AND STARLING

## Results

| | | | |
|---|---|---|---|
| Critical Slope | | 0.00720 | ft/ft |
| Velocity | | 1.87 | ft/s |
| Velocity Head | | 0.05 | ft |
| Specific Energy | | 0.45 | ft |
| Froude Number | | 0.84 | |
| Flow Type | Subcritical | | |



CROWN AT 0.44
THEREFORE APPROX. ALL
FLOW TURNS DOWN
STARLING

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 0.39 | ft |
| Critical Depth | 0.37 | ft |
| Channel Slope | 0.50 | % |
| Critical Slope | 0.00720 | ft/ft |

# Cross Section for SPEC. ENERGY AT SPRINGBOUGH AND STARLING

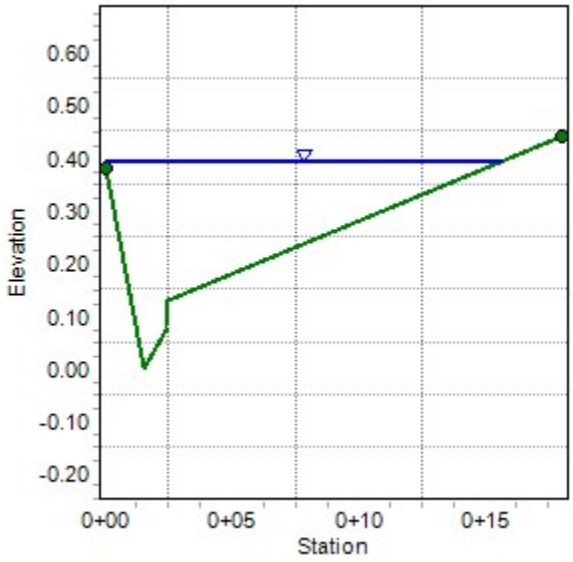
## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Normal Depth |

## Input Data

| | | |
|---|---|---|
| Channel Slope | 0.50 | % |
| Normal Depth | 0.39 | ft |
| Discharge | 4.50 | ft³/s |

## Cross Section Image



FACILITY 1

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

SPRINGBOUGH LN

7.5' EAST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 8.0 | cfs |
| $S_o$= | Longitudinal Slope | 0.005 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 2.23 | fps |
| D= | Flow Depth | 0.46 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.17 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 1.40 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 6.60 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.21 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 2.8 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.070 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 17.30 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.8 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **5.6** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **2.4** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.75 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 70 | % |

FACILITY 2

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

SPRINGBOUGH LN

7.5' WEST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 6.0 | cfs |
| $S_o$= | Longitudinal Slope | 0.005 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 2.01 | fps |
| D= | Flow Depth | 0.43 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.20 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 1.17 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 4.83 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.24 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 2.3 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.076 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 14.61 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.5 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **4.8** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **1.2** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.64 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 80 | % |

FACILITY 4

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

SPRINGBOUGH LN AND STARLING SUN AVE INTERSECTION

10' WEST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 3.5 | cfs |
| $S_o$= | Longitudinal Slope | 0.0141 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 2.60 | fps |
| D= | Flow Depth | 0.32 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 7.5 | ft |
| $L_c$= | Length of Curb Opening | 10.0 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 8.71 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.31 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 1.09 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 2.41 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.33 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 1.9 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.109 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 12.81 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.1 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **3.5** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **0.0** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.35 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 100 | % |

FACILITY 6

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

STARLING SUN AVE

7.5' NORTH DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 11.5 | cfs |
| $S_o$= | Longitudinal Slope | 0.0529 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 5.74 | fps |
| D= | Flow Depth | 0.37 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.25 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 2.83 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 8.67 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.05 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 3.2 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.090 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 35.09 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.1 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **5.3** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **6.2** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.71 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 46 | % |

FACILITY 7

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

STARLING SUN AVE

7.5' SOUTH DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 7.0 | cfs |
| $S_o$= | Longitudinal Slope | 0.0529 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 5.08 | fps |
| D= | Flow Depth | 0.32 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.30 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 2.12 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 4.88 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.06 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 2.4 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.106 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 25.78 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 1.7 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **4.1** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **2.9** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.55 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 59 | % |

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ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

FEATHER BLUFF ST

12.5' EAST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 13.0 | cfs |
| $S_o$= | Longitudinal Slope | 0.024 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 4.40 | fps |
| D= | Flow Depth | 0.43 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 10.0 | ft |
| $L_c$= | Length of Curb Opening | 12.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 9.86 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.20 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 2.56 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 10.44 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.27 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 5.4 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.076 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 32.23 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 4.2 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **9.6** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **3.4** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.77 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 74 | % |

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ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

FEATHER BLUFF ST

7.5' EAST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 12.5 | cfs |
| $S_o$= | Longitudinal Slope | 0.0334 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 4.93 | fps |
| D= | Flow Depth | 0.4 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.21 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 2.65 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 9.85 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.06 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 3.2 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.080 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 33.89 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.4 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **5.6** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **6.9** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.75 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 45 | % |

FACILITY 12

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

FEATHER BLUFF ST

7.5' WEST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 9.0 | cfs |
| $S_o$= | Longitudinal Slope | 0.0334 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 4.54 | fps |
| D= | Flow Depth | 0.37 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.25 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 2.24 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 6.76 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.07 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 2.7 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.091 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 27.44 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.1 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **4.8** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **4.2** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.64 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 53 | % |

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ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing on a Continuous Grade

FEATHER BLUFF ST (SOUTH OF REF CLIFF CT)

7.5' WEST DI

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 14.5 | cfs |
| $S_o$= | Longitudinal Slope | 0.0405 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 5.50 | fps |
| D= | Flow Depth | 0.41 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.21 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 3.04 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 11.46 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.05 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 3.6 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.080 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 38.41 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.4 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **6.0** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **8.5** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.81 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 42 | % |

FACILITY 17

ENGINEERS \ SURVEYORS

**Drop Inlet Sizing Calculation**

Project Name: STARLING SUMMERLIN VILLAGE 24A PARCEL O
By: NB
Date: 03/12/2019

## Drop Inlet Sizing in Sump

STARLING SUN AVE
12.5' SUMP

### Known:

| | | | |
|---|---|---|---|
| Q= | Design Flow | 33.0 | cfs |
| $D_p$= | Ponding Depth at Inlet | 0.83 | ft |
| W= | Grate Width | 1.5 | ft |
| $L_g$= | Length of Grate | 10.0 | ft |
| $L_c$= | Length of Curb Opening | 12.5 | ft |
| $H_c$= | Curb Opening Height | 0.5 | ft |
| $C_{wc}$= | Weir coefficient for curb opening | 2.3 | |
| $C_{wg}$= | Weir coefficient for grate | 3.0 | |
| $C_o$= | Orifice coefficient | 0.67 | |
| $R_o$= | Grate opening factor | 0.60 | |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $P_g$= | Active grate weir length (agwl) = 2*W+Lg | 13.00 | ft |
| $P_{agl}$ | Adjusted agwl = 2*(1-Cfg/100)*W+Lg | 11.50 | ft |
| $A_g$= | Grate area = W*$L_g$ | 15.00 | $ft^2$ |
| $A_{aga}$= | Adjusted open grate area = Ag*Ro*(1-Cfg/100) | 4.50 | $ft^2$ |
| | check - If Dp<1.792*Aaga/Pagl; weir; else orifice | orifice | |
| $Q_{ig}$= | Flow intercepted by grate<br>If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$<br>If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$ | 22.0 | cfs |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| Pc = | Active curb opening weir length (acowl) = Lc+1.8*W | 15.20 | ft |
| Pacl = | Adjusted acowl = Lc+1.8*(1-Cfc/100)*W | 13.85 | ft |
| Ac= | curb opening area (coa) = Lc*Hc | 6.25 | $ft^2$ |
| $A_{aca}$= | Adjusted coa = Ac*(1-Cfc/100) | 3.13 | $ft^2$ |
| | check - If Dp<Hc; weir; else orifice | orifice | |
| Qic= | Flow intercepted by curb opening<br>If "weir" controls Qic=Cwc*Pacl*Dp1.5<br>If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5 | 15.3 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| Qti = | Flow Interception Capacity = Qig+Qic | 37.3 | cfs |
| q = | Interception per unit ratio = $Q_{ti}/L_g$ | 2.99 | cfs/ft |

**Actual Flow Collected by Drop Inlet 33 cfs**

FACILITY 4A

GCW ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: Starling V24A Parcel O
By: NB
Date: 04/09/2019

## Grate Inlet Headwater Depth

| | | |
|---|---|---|
| | NDOT Drop Inlet Type | 2B |
| | Number of Grates | Double (Two Grates) |
| | SINGLE GRATE NDOT TYPE 2B | |
| | | |
| **Known:** | | |
| | | |
| Q= | Flow (cfs) | 9 |
| D= | RCP size (in) | 18 |
| Cf= | Clogging Factor (%) | 50 |
| | ID | 3 |
| | | |
| **Weir Conditions:** | | |
| | | |
| | $Hw=(Q/(Cw*P))^{2/3}$ | |
| | | |
| Cw= | Weir Coefficient | 3.0 |
| P= | Perimeter of open grate (ft) | 6.17 |
| Pc= | Perimeter (w/clogging) (ft) | 3.1 |
| Q= | Flow for single grate (cfs) | 4.5 |
| Hw= | Headwater depth (ft) | 0.62 |
| | | |
| **Orifice Conditions:** | | |
| | | |
| | $Hw=(Q/(Co*Ac))^2/2*g$ | |
| | | |
| Co= | Orifice Coefficient | 0.65 |
| Ag= | Grate Area ($ft^2$) | 5.00 |
| Gf= | Grate Opening Factor | 0.47 |
| Ac= | Grate Open Area (w/ clogging) ($ft^2$) | 1.2 |
| Hw= | Headwater depth (ft) | 0.54 |
| | | |
| | | |
| | **Worst Case Scenario Occurs Under Weir Conditions** | |
| | | |
| | **Headwater Depth (ft) =** | **0.62** |
| | | |
| | | |

ENGINEERS \ SURVEYORS

# Block Wall Opening Calculation

| | |
|---|---|
| **Project No.** | 764-A150-001 |
| **Date** | 04/09/2019 |
| **By** | NB |

**Block Wall Opening Size**

| | | |
|---|---|---|
| H = | Height of Opening (ft) | 2.00 |
| L = | Length of Opening (ft) | 4.00 |
| Cf = | Clogging Factor (%) | 50 |

**Weir Calculation**

$Q=Cw*L*H_{clg}^{3/2}$

| | | |
|---|---|---|
| Cw = | Weir Coefficient | 2.70 |
| $H_{clg}$ = | Height with clogging | 1.0 |
| Q = | Flow allowed through opening | 10.8 |

**Orifice Calculation**

$Q=Co*A_{clg}*(2gH_{clg})1/2$

| | | |
|---|---|---|
| Co = | Orifice Coefficient | 0.67 |
| $A_{clg}$ = | Area with clogging | 4.00 |
| Q = | Flow allowed through opening | 15.2 |

**Evaulation (Pick Worse Case)**

**Worst Case Scenario Occurs Under Orifice Conditions**

**Wall Opening Discharge (cfs)**

**11**

```
T1 STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
T2 GCW / NB / CLV
T3 MAIN1
SO   2975.8103473.160 60     0.013                3476.765
R    3000.0003474.610 60     0.013                                        13.00 1
JX   3000.0003474.610 36 36   .013    7.40          3474.610         90.0
R    3046.9803479.310 36     0.013                                        00.00 1
JX   3046.9803479.310 30 30   .013  033.00          3479.310         90.0
R    3112.1703484.530 30     0.013                                        15.12 1
R    3175.3503488.110 30     0.013                                        00.00 1
JX   3175.3503488.110 24 24   .013  025.50          3488.110         90.0
R    3234.9603491.990 24     0.013                                        00.00 1
JX   3234.9603491.990 24 18 18.013  005.00   004.00 3491.9903491.990 50.5 66.9
R    3495.3003506.760 24     0.013                                        17.75 1
R    3584.4703511.450 24     0.013                                        14.34 1
R    3637.0003514.180 24     0.013                                        15.57 1
R    3812.2403523.380 24     0.013                                        00.00 1
R    3984.9403527.570 24     0.013                                        90.00 1
JX   3984.9403527.570 18 18   .013   12.50          3527.570         00.0
R    4086.6703528.590 18     0.013                                        00.00 1
R    4201.5703529.170 18     0.013                                        53.53 1
JX   4201.5703529.170 18 18   .013  004.50          3529.170         69.2
R    4223.6903531.410 18     0.013                                        00.00 1
SH   4223.6903531.410 18     0.013
CD  18  4   1    .000   1.500   10.000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
CD  60  4   1    .000   5.000     .000  .000  .000   .00
Q           5.500
```

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 4-10-2019 Time: 8:28:33

STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019

GCW / NB / CLV

MAIN1

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 2975.810 | 3473.160 | 1.442 | 3474.602 | 97.40 | 20.77 | 6.70 | 3481.30 | .00 | 2.81 | 4.53 | 5.000 | .000 | .00 | 1 .0 |
| 24.190 | .0600 | | | | | .0403 | .97 | 1.44 | 3.60 | 1.32 | .013 | .00 | .00 | PIPE |
| 3000.000 | 3474.610 | 1.484 | 3476.094 | 97.40 | 19.95 | 6.18 | 3482.28 | .00 | 2.81 | 4.57 | 5.000 | .000 | .00 | 1 .0 |
| JUNCT STR | .0000 | | | | | .0414 | .00 | 1.48 | 3.40 | | .013 | .00 | .00 | PIPE |
| 3000.000 | 3474.610 | 1.740 | 3476.350 | 90.00 | 21.17 | 6.96 | 3483.31 | .00 | 2.85 | 2.96 | 3.000 | .000 | .00 | 1 .0 |
| 2.631 | .1000 | | | | | .0441 | .12 | 1.74 | 3.11 | 1.37 | .013 | .00 | .00 | PIPE |
| 3002.631 | 3474.873 | 1.757 | 3476.630 | 90.00 | 20.92 | 6.79 | 3483.42 | .00 | 2.85 | 2.96 | 3.000 | .000 | .00 | 1 .0 |
| 9.245 | .1000 | | | | | .0409 | .38 | 1.76 | 3.05 | 1.37 | .013 | .00 | .00 | PIPE |
| 3011.876 | 3475.798 | 1.828 | 3477.626 | 90.00 | 19.94 | 6.18 | 3483.80 | .00 | 2.85 | 2.93 | 3.000 | .000 | .00 | 1 .0 |
| 7.608 | .1000 | | | | | .0362 | .28 | 1.83 | 2.83 | 1.37 | .013 | .00 | .00 | PIPE |
| 3019.484 | 3476.559 | 1.904 | 3478.463 | 90.00 | 19.01 | 5.61 | 3484.08 | .00 | 2.85 | 2.89 | 3.000 | .000 | .00 | 1 .0 |
| 6.325 | .1000 | | | | | .0322 | .20 | 1.90 | 2.62 | 1.37 | .013 | .00 | .00 | PIPE |
| 3025.809 | 3477.192 | 1.985 | 3479.177 | 90.00 | 18.13 | 5.10 | 3484.28 | .00 | 2.85 | 2.84 | 3.000 | .000 | .00 | 1 .0 |
| 5.290 | .1000 | | | | | .0286 | .15 | 1.99 | 2.42 | 1.37 | .013 | .00 | .00 | PIPE |
| 3031.099 | 3477.721 | 2.071 | 3479.792 | 90.00 | 17.29 | 4.64 | 3484.43 | .00 | 2.85 | 2.77 | 3.000 | .000 | .00 | 1 .0 |
| 4.410 | .1000 | | | | | .0255 | .11 | 2.07 | 2.22 | 1.37 | .013 | .00 | .00 | PIPE |
| 3035.509 | 3478.163 | 2.164 | 3480.327 | 90.00 | 16.48 | 4.22 | 3484.54 | .00 | 2.85 | 2.69 | 3.000 | .000 | .00 | 1 .0 |
| 3.656 | .1000 | | | | | .0228 | .08 | 2.16 | 2.04 | 1.37 | .013 | .00 | .00 | PIPE |



Program Package Serial Number: 3074

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STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019

GCW / NB / CLV

MAIN1

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3039.166 | 3478.528 | 2.265 | 3480.793 | 90.00 | 15.71 | 3.83 | 3484.63 | .00 | 2.85 | 2.58 | 3.000 | .000 | .00 | 1 .0 |
| 2.974 | .1000 | | | | | .0205 | .06 | 2.27 | 1.86 | 1.37 | .013 | .00 | .00 | PIPE |
| 3042.140 | 3478.826 | 2.377 | 3481.203 | 90.00 | 14.98 | 3.49 | 3484.69 | .00 | 2.85 | 2.43 | 3.000 | .000 | .00 | 1 .0 |
| 2.355 | .1000 | | | | | .0185 | .04 | 2.38 | 1.68 | 1.37 | .013 | .00 | .00 | PIPE |
| 3044.495 | 3479.062 | 2.502 | 3481.564 | 90.00 | 14.29 | 3.17 | 3484.73 | .00 | 2.85 | 2.23 | 3.000 | .000 | .00 | 1 .0 |
| 1.699 | .1000 | | | | | .0170 | .03 | 2.50 | 1.50 | 1.37 | .013 | .00 | .00 | PIPE |
| 3046.194 | 3479.231 | 2.649 | 3481.881 | 90.00 | 13.62 | 2.88 | 3484.76 | .00 | 2.85 | 1.93 | 3.000 | .000 | .00 | 1 .0 |
| .786 | .1000 | | | | | .0160 | .01 | 2.65 | 1.30 | 1.37 | .013 | .00 | .00 | PIPE |
| 3046.980 | 3479.310 | 2.846 | 3482.156 | 90.00 | 12.98 | 2.62 | 3484.77 | .00 | 2.85 | 1.32 | 3.000 | .000 | .00 | 1 .0 |
| JUNCT STR | .0000 | | | | | .0175 | .00 | 2.85 | 1.00 | | .013 | .00 | .00 | PIPE |
| 3046.980 | 3479.310 | 5.504 | 3484.814 | 57.00 | 11.61 | 2.09 | 3486.91 | .00 | 2.37 | .00 | 2.500 | .000 | .00 | 1 .0 |
| 11.073 | .0801 | | | | | .0193 | .21 | 5.50 | .00 | 1.24 | .013 | .00 | .00 | PIPE |
| 3058.053 | 3480.197 | 4.871 | 3485.068 | 57.00 | 11.61 | 2.09 | 3487.16 | .00 | 2.37 | .00 | 2.500 | .000 | .00 | 1 .0 |
| HYDRAULIC JUMP | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3058.053 | 3480.197 | 1.366 | 3481.562 | 57.00 | 20.78 | 6.71 | 3488.27 | .00 | 2.37 | 2.49 | 2.500 | .000 | .00 | 1 | .0 | | |
| 12.995 | .0801 | | | | | .0556 | .72 | 1.37 | 3.49 | 1.24 | .013 | .00 | .00 | PIPE | | | |
| 3071.048 | 3481.237 | 1.395 | 3482.632 | 57.00 | 20.23 | 6.36 | 3488.99 | .00 | 2.37 | 2.48 | 2.500 | .000 | .00 | 1 | .0 | | |
| 17.706 | .0801 | | | | | .0505 | .89 | 1.40 | 3.35 | 1.24 | .013 | .00 | .00 | PIPE | | | |



Program Package Serial Number: 3074

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STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019

GCW / NB / CLV

MAIN1

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3088.754 | 3482.655 | 1.450 | 3484.105 | 57.00 | 19.29 | 5.78 | 3489.88 | .00 | 2.37 | 2.47 | 2.500 | .000 | .00 | 1 .0 |
| 13.175 | .0801 | | | | | .0447 | .59 | 1.45 | 3.11 | 1.24 | .013 | .00 | .00 | PIPE |
| 3101.929 | 3483.710 | 1.509 | 3485.219 | 57.00 | 18.39 | 5.25 | 3490.47 | .00 | 2.37 | 2.45 | 2.500 | .000 | .00 | 1 .0 |
| 10.241 | .0801 | | | | | .0396 | .41 | 1.51 | 2.88 | 1.24 | .013 | .00 | .00 | PIPE |
| 3112.170 | 3484.530 | 1.572 | 3486.102 | 57.00 | 17.54 | 4.78 | 3490.88 | .00 | 2.37 | 2.42 | 2.500 | .000 | .00 | 1 .0 |
| 4.584 | .0567 | | | | | .0367 | .17 | 1.57 | 2.66 | 1.37 | .013 | .00 | .00 | PIPE |
| 3116.753 | 3484.790 | 1.587 | 3486.377 | 57.00 | 17.34 | 4.67 | 3491.05 | .00 | 2.37 | 2.41 | 2.500 | .000 | .00 | 1 .0 |
| 15.856 | .0567 | | | | | .0341 | .54 | 1.59 | 2.62 | 1.37 | .013 | .00 | .00 | PIPE |
| 3132.610 | 3485.688 | 1.654 | 3487.342 | 57.00 | 16.54 | 4.25 | 3491.59 | .00 | 2.37 | 2.37 | 2.500 | .000 | .00 | 1 .0 |
| 11.921 | .0567 | | | | | .0303 | .36 | 1.65 | 2.41 | 1.37 | .013 | .00 | .00 | PIPE |
| 3144.531 | 3486.364 | 1.726 | 3488.090 | 57.00 | 15.77 | 3.86 | 3491.95 | .00 | 2.37 | 2.31 | 2.500 | .000 | .00 | 1 .0 |
| 9.242 | .0567 | | | | | .0270 | .25 | 1.73 | 2.22 | 1.37 | .013 | .00 | .00 | PIPE |
| 3153.773 | 3486.887 | 1.803 | 3488.690 | 57.00 | 15.03 | 3.51 | 3492.20 | .00 | 2.37 | 2.24 | 2.500 | .000 | .00 | 1 .0 |
| 7.232 | .0567 | | | | | .0242 | .17 | 1.80 | 2.04 | 1.37 | .013 | .00 | .00 | PIPE |
| 3161.006 | 3487.297 | 1.887 | 3489.184 | 57.00 | 14.33 | 3.19 | 3492.37 | .00 | 2.37 | 2.15 | 2.500 | .000 | .00 | 1 .0 |
| 5.638 | .0567 | | | | | .0217 | .12 | 1.89 | 1.86 | 1.37 | .013 | .00 | .00 | PIPE |
| 3166.644 | 3487.617 | 1.980 | 3489.597 | 57.00 | 13.67 | 2.90 | 3492.50 | .00 | 2.37 | 2.03 | 2.500 | .000 | .00 | 1 .0 |
| 4.288 | .0567 | | | | | .0197 | .08 | 1.98 | 1.68 | 1.37 | .013 | .00 | .00 | PIPE |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 4-10-2019 Time: 8:28:33

STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019

GCW / NB / CLV

MAIN1

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3170.931 | 3487.860 | 2.085 | 3489.945 | 57.00 | 13.03 | 2.64 | 3492.58 | .00 | 2.37 | 1.86 | 2.500 | .000 | .00 | 1 .0 |
| 3.019 | .0567 | | | | | .0180 | .05 | 2.09 | 1.50 | 1.37 | .013 | .00 | .00 | PIPE |
| 3173.950 | 3488.031 | 2.208 | 3490.239 | 57.00 | 12.42 | 2.40 | 3492.64 | .00 | 2.37 | 1.61 | 2.500 | .000 | .00 | 1 .0 |
| 1.400 | .0567 | | | | | .0170 | .02 | 2.21 | 1.30 | 1.37 | .013 | .00 | .00 | PIPE |
| 3175.350 | 3488.110 | 2.371 | 3490.482 | 57.00 | 11.84 | 2.18 | 3492.66 | .00 | 2.37 | 1.10 | 2.500 | .000 | .00 | 1 .0 |
| JUNCT STR | .0000 | | | | | .0181 | .00 | 2.37 | 1.00 | | .013 | .00 | .00 | PIPE |
| 3175.350 | 3488.110 | 5.176 | 3493.286 | 31.50 | 10.03 | 1.56 | 3494.85 | .00 | 1.88 | .00 | 2.000 | .000 | .00 | 1 .0 |
| 59.610 | .0651 | | | | | .0194 | 1.16 | 5.18 | .00 | 1.05 | .013 | .00 | .00 | PIPE |
| 3234.960 | 3491.990 | 2.530 | 3494.520 | 31.50 | 10.03 | 1.56 | 3496.08 | .00 | 1.88 | .00 | 2.000 | .000 | .00 | 1 .0 |
| JUNCT STR | .0000 | | | | | .0146 | .00 | 2.53 | .00 | | .013 | .00 | .00 | PIPE |
| 3234.960 | 3491.990 | 3.935 | 3495.925 | 22.50 | 7.16 | .80 | 3496.72 | .00 | 1.69 | .00 | 2.000 | .000 | .00 | 1 .0 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15.767 | .0567 | | | | | .0099 | .16 | 3.94 | .00 | .90 | .013 | .00 | .00 | PIPE | | | | | |
| 3250.727 | 3492.885 | 3.215 | 3496.100 | 22.50 | 7.16 | .80 | 3496.90 | .00 | 1.69 | .00 | 2.000 | .000 | .00 | 1 | .0 | | | | |
| HYDRAULIC JUMP | | | | | | | | | | | | | | | | | | | |
| 3250.727 | 3492.885 | .901 | 3493.786 | 22.50 | 16.38 | 4.17 | 3497.95 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 | .0 | | | | |
| 143.874 | .0567 | | | | | .0567 | 8.16 | .90 | 3.47 | .90 | .013 | .00 | .00 | PIPE | | | | | |
| 3394.600 | 3501.047 | .901 | 3501.948 | 22.50 | 16.38 | 4.17 | 3506.11 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 | .0 | | | | |
| 100.700 | .0567 | | | | | .0546 | 5.50 | .90 | 3.47 | .90 | .013 | .00 | .00 | PIPE | | | | | |



| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3495.300 | 3506.760 | .921 | 3507.681 | 22.50 | 15.92 | 3.94 | 3511.62 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 89.170 | .0526 | | | | | .0522 | 4.65 | .92 | 3.33 | .92 | .013 | .00 | .00 | PIPE |
| 3584.470 | 3511.450 | .925 | 3512.375 | 22.50 | 15.85 | 3.90 | 3516.27 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 52.530 | .0520 | | | | | .0518 | 2.72 | .92 | 3.31 | .92 | .013 | .00 | .00 | PIPE |
| 3637.000 | 3514.180 | .925 | 3515.105 | 22.50 | 15.83 | 3.89 | 3519.00 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 40.427 | .0525 | | | | | .0513 | 2.07 | .93 | 3.30 | .92 | .013 | .00 | .00 | PIPE |
| 3677.427 | 3516.302 | .929 | 3517.231 | 22.50 | 15.73 | 3.84 | 3521.07 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 66.104 | .0525 | | | | | .0477 | 3.16 | .93 | 3.27 | .92 | .013 | .00 | .00 | PIPE |
| 3743.531 | 3519.773 | .964 | 3520.737 | 22.50 | 15.00 | 3.49 | 3524.23 | .00 | 1.69 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 26.777 | .0525 | | | | | .0420 | 1.13 | .96 | 3.05 | .92 | .013 | .00 | .00 | PIPE |
| 3770.308 | 3521.178 | 1.001 | 3522.180 | 22.50 | 14.30 | 3.17 | 3525.35 | .00 | 1.69 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 16.179 | .0525 | | | | | .0370 | .60 | 1.00 | 2.84 | .92 | .013 | .00 | .00 | PIPE |
| 3786.488 | 3522.028 | 1.039 | 3523.067 | 22.50 | 13.63 | 2.89 | 3525.95 | .00 | 1.69 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 11.136 | .0525 | | | | | .0326 | .36 | 1.04 | 2.64 | .92 | .013 | .00 | .00 | PIPE |
| 3797.624 | 3522.613 | 1.080 | 3523.693 | 22.50 | 13.00 | 2.62 | 3526.32 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 8.285 | .0525 | | | | | .0288 | .24 | 1.08 | 2.46 | .92 | .013 | .00 | .00 | PIPE |
| 3805.910 | 3523.048 | 1.122 | 3524.170 | 22.50 | 12.39 | 2.38 | 3526.55 | .00 | 1.69 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 6.330 | .0525 | | | | | .0254 | .16 | 1.12 | 2.28 | .92 | .013 | .00 | .00 | PIPE |



| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3812.240 | 3523.380 | 1.167 | 3524.547 | 22.50 | 11.82 | 2.17 | 3526.72 | .00 | 1.69 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 58.483 | .0243 | | | | | .0234 | 1.37 | 1.17 | 2.12 | 1.16 | .013 | .00 | .00 | PIPE |
| 3870.723 | 3524.799 | 1.182 | 3525.981 | 22.50 | 11.63 | 2.10 | 3528.08 | .00 | 1.69 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 53.538 | .0243 | | | | | .0216 | 1.16 | 1.18 | 2.07 | 1.16 | .013 | .00 | .00 | PIPE |
| 3924.261 | 3526.098 | 1.230 | 3527.328 | 22.50 | 11.09 | 1.91 | 3529.24 | .00 | 1.69 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 23.712 | .0243 | | | | | .0191 | .45 | 1.23 | 1.91 | 1.16 | .013 | .00 | .00 | PIPE |
| 3947.973 | 3526.673 | 1.282 | 3527.955 | 22.50 | 10.58 | 1.74 | 3529.69 | .00 | 1.69 | 1.92 | 2.000 | .000 | .00 | 1 .0 |

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   14.268    .0243                                        .0170      .24     1.28    1.77    1.16    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 3962.241  3527.020    1.336  3528.356     22.50   10.08    1.58  3529.93     .00    1.69    1.88    2.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    9.230    .0243                                        .0151      .14     1.34    1.63    1.16    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 3971.471  3527.243    1.395  3528.638     22.50    9.61    1.44  3530.07     .00    1.69    1.84    2.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    6.256    .0243                                        .0135      .08     1.40    1.50    1.16    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 3977.727  3527.395    1.458  3528.853     22.50    9.17    1.30  3530.16     .00    1.69    1.78    2.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    4.068    .0243                                        .0121      .05     1.46    1.37    1.16    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 3981.795  3527.494    1.527  3529.021     22.50    8.74    1.19  3530.21     .00    1.69    1.70    2.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    2.375    .0243                                        .0109      .03     1.53    1.25    1.16    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 3984.170  3527.552    1.603  3529.155     22.50    8.33    1.08  3530.23     .00    1.69    1.60    2.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     .770    .0243                                        .0098      .01     1.60    1.13    1.16    .013       .00   .00  PIPE
```





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          | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
  Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
 ---------|---------|--------|---------|---------|-------|-------|---------|-------|--------|--------|-------|-------|------|-------
  L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
 ---------|---------|--------|---------|---------|-------|-------|---------|-------|--------|--------|-------|-------|------|-------
 3984.940  3527.570    1.691  3529.261     22.50    7.94     .98  3530.24     .00    1.69     1.45    2.000     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
 JUNCT STR   .0000                                        .0092      .00    1.69     1.00            .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 3984.940  3527.570    2.146  3529.716     10.00    5.66     .50  3530.21     .00    1.22      .00   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  101.730    .0100                                        .0091      .92     2.15     .00    1.17    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4086.670  3528.590    2.073  3530.663     10.00    5.66     .50  3531.16     .00    1.22      .00   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  114.900    .0050                                        .0091     1.04     2.07     .00    1.50    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4201.570  3529.170    2.647  3531.817     10.00    5.66     .50  3532.31     .00    1.22      .00   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
 JUNCT STR   .0000                                        .0059      .00    2.65     .00            .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4201.570  3529.170    3.269  3532.439      5.50    3.11     .15  3532.59     .00     .90      .00   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   18.016    .1013                                        .0027      .05     3.27     .00     .41    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4219.585  3530.994    1.500  3532.494      5.50    3.11     .15  3532.64     .00     .90      .00   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    1.254    .1013                                        .0025      .00     1.50     .00     .41    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4220.840  3531.121    1.360  3532.481      5.50    3.26     .17  3532.65     .00     .90      .87   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     .643    .1013                                        .0025      .00     1.36     .41     .41    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4221.482  3531.186    1.280  3532.466      5.50    3.42     .18  3532.65     .00     .90     1.06   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     .495    .1013                                        .0027      .00     1.28     .49     .41    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4221.978  3531.236    1.213  3532.449      5.50    3.59     .20  3532.65     .00     .90     1.18   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     .386    .1013                                        .0030      .00     1.21     .56     .41    .013       .00   .00  PIPE
```





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          | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|      |No Wth
  Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL  |Prs/Pip
 ---------|---------|--------|---------|---------|-------|-------|---------|-------|--------|--------|-------|-------|------|-------
  L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR  |Type Ch
 ---------|---------|--------|---------|---------|-------|-------|---------|-------|--------|--------|-------|-------|------|-------
 4222.364  3531.275    1.155  3532.430      5.50    3.77     .22  3532.65     .00     .90      1.26   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
     .194    .1013                                        .0033      .00     1.16     .62     .41    .013       .00   .00  PIPE
        |         |        |         |         |          |          |       |       |       |       |       |         |    |
 4222.558  3531.295    1.102  3532.397      5.50    3.95     .24  3532.64     .00     .90      1.32   1.500     .000   .00   1   .0
       -|-       -|-      -|-       -|-       -|-      -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
 HYDRAULIC JUMP
```

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4222.558 | 3531.295 | .717 | 3532.012 | 5.50 | 6.59 | .67 | 3532.69 | .00 | .90 | 1.50 | 1.500 | .000 | .00 | 1 | .0 | | |
| .336 | .1013 | | | | | .0120 | .00 | .72 | 1.56 | .41 | .013 | .00 | .00 | PIPE | | | |
| 4222.895 | 3531.329 | .744 | 3532.073 | 5.50 | 6.28 | .61 | 3532.69 | .00 | .90 | 1.50 | 1.500 | .000 | .00 | 1 | .0 | | |
| .294 | .1013 | | | | | .0106 | .00 | .74 | 1.45 | .41 | .013 | .00 | .00 | PIPE | | | |
| 4223.188 | 3531.359 | .773 | 3532.132 | 5.50 | 5.99 | .56 | 3532.69 | .00 | .90 | 1.50 | 1.500 | .000 | .00 | 1 | .0 | | |
| .224 | .1013 | | | | | .0093 | .00 | .77 | 1.35 | .41 | .013 | .00 | .00 | PIPE | | | |
| 4223.413 | 3531.382 | .803 | 3532.185 | 5.50 | 5.71 | .51 | 3532.69 | .00 | .90 | 1.50 | 1.500 | .000 | .00 | 1 | .0 | | |
| .161 | .1013 | | | | | .0082 | .00 | .80 | 1.25 | .41 | .013 | .00 | .00 | PIPE | | | |
| 4223.574 | 3531.398 | .834 | 3532.232 | 5.50 | 5.44 | .46 | 3532.69 | .00 | .90 | 1.49 | 1.500 | .000 | .00 | 1 | .0 | | |
| .094 | .1013 | | | | | .0072 | .00 | .83 | 1.17 | .41 | .013 | .00 | .00 | PIPE | | | |
| 4223.667 | 3531.408 | .867 | 3532.275 | 5.50 | 5.19 | .42 | 3532.69 | .00 | .90 | 1.48 | 1.500 | .000 | .00 | 1 | .0 | | |
| .022 | .1013 | | | | | .0064 | .00 | .87 | 1.08 | .41 | .013 | .00 | .00 | PIPE | | | |
| 4223.690 | 3531.410 | .904 | 3532.314 | 5.50 | 4.94 | .38 | 3532.69 | .00 | .90 | 1.47 | 1.500 | .000 | .00 | 1 | .0 | | |

FILE: V24A_Parcel_O_MAIN1.WSW  W S P G W - EDIT LISTING - Version 14.10  Date: 4-10-2019 Time: 8:28:32

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING  PAGE 1

| CARD CODE | SECT NO | CHN TYPE | NO OF PIER/PIP | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 18 | 4 | 1 | | 1.500 | | | | | | | | | | | | | | |
| CD | 24 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |
| CD | 30 | 4 | 1 | | 2.500 | | | | | | | | | | | | | | |
| CD | 36 | 4 | 1 | | 3.000 | | | | | | | | | | | | | | |
| CD | 42 | 4 | 1 | | 3.500 | | | | | | | | | | | | | | |
| CD | 60 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | |

W S P G W  PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
HEADING LINE NO 2 IS -
GCW / NB / CLV
HEADING LINE NO 3 IS -
MAIN1

W S P G W  PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

| U/S DATA | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| | 2975.810 | 3473.160 | 60 | 3476.765 |

ELEMENT NO 2 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3000.000 | 3474.610 | 60 | .013 | .000 | .000 | 13.000 | 1 |

ELEMENT NO 3 IS A JUNCTION * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3000.000 | 3474.610 | 36 | 36 | 0 | .013 | 7.400 | .000 | 3474.610 | .000 | 90.000 | .000 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 4 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3046.980 | 3479.310 | 36 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 5 IS A JUNCTION * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3046.980 | 3479.310 | 30 | 30 | 0 | .013 | 33.000 | .000 | 3479.310 | .000 | 90.000 | .000 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 6 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3112.170 | 3484.530 | 30 | .013 | .000 | .000 | 15.120 | 1 |

ELEMENT NO 7 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3175.350 | 3488.110 | 30 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 8 IS A JUNCTION * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3175.350 | 3488.110 | 24 | 24 | 0 | .013 | 25.500 | .000 | 3488.110 | .000 | 90.000 | .000 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

W S P G W  PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 9 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3234.960 | 3491.990 | 24 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 10 IS A JUNCTION * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3234.960 | 3491.990 | 24 | 18 | 18 | .013 | 5.000 | 4.000 | 3491.990 | 3491.990 | 50.500 | 66.900 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 11 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3495.300 | 3506.760 | 24 | .013 | .000 | .000 | 17.750 | 1 |

ELEMENT NO 12 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3584.470 | 3511.450 | 24 | .013 | .000 | .000 | 14.340 | 1 |

ELEMENT NO 13 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3637.000 | 3514.180 | 24 | .013 | .000 | .000 | 15.570 | 1 |

ELEMENT NO 14 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3812.240 | 3523.380 | 24 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 15 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3984.940 | 3527.570 | 24 | .013 | .000 | .000 | 90.000 | 1 |

ELEMENT NO 16 IS A JUNCTION * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3984.940 | 3527.570 | 18 | 18 | 0 | .013 | 12.500 | .000 | 3527.570 | .000 | .000 | .000 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

```
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO  17 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT               N                          RADIUS    ANGLE     ANG PT  MAN H
                               4086.670 3528.590   18              .013                           .000     .000      .000     1
                                                      W S P G W                                                              PAGE NO   4
                          WATER SURFACE PROFILE - ELEMENT CARD LISTING
 ELEMENT NO  18 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT               N                          RADIUS    ANGLE     ANG PT  MAN H
                               4201.570 3529.170   18              .013                           .000     .000    53.530     1
 ELEMENT NO  19 IS A JUNCTION         *         *     *     *                 *                    *                *
                    U/S DATA   STATION    INVERT  SECT LAT-1 LAT-2   N      Q3        Q4     INVERT-3 INVERT-4  PHI 3  PHI 4
                               4201.570 3529.170   18    18     0   .013     4.500      .000  3529.170      .000  69.200     .000
                                                                                                  RADIUS    ANGLE
                                                                                                    .000    .000
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
 ELEMENT NO  20 IS A REACH            *         *     *
                    U/S DATA   STATION    INVERT  SECT               N                          RADIUS    ANGLE     ANG PT  MAN H
                               4223.690 3531.410   18              .013                           .000     .000      .000     1
 ELEMENT NO  21 IS A SYSTEM HEADWORKS                 *                     *
                    U/S DATA   STATION    INVERT  SECT                                  W S ELEV
                               4223.690 3531.410   18                                      .000
```

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T1 STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
T2 GCW / NB / CLV
T3 MAIN2
SO   3000.0003488.110 24     0.013                3493.286
R    3053.4703489.880 24     0.013                                        00.00 1
R    3188.3803495.280 24     0.013                                        00.00 1
JX   3188.3803495.280 24 18   .013  006.00          3495.280         74.3
R    3299.0503499.710 24     0.013                                        00.00 1
R    3421.5603504.160 24     0.013                                        00.00 1
JX   3421.5603504.160 18 18 18.013  005.50   004.50 3504.1603504.160 67.6 71.5
R    3604.4603511.010 18     0.013                                        12.27 1
R    3691.0303513.880 18     0.013                                        00.00 1
R    3793.2303517.280 18     0.013                                        00.00 1
R    3967.0203523.050 18     0.013                                        00.00 1
R    4051.7203525.860 18     0.013                                        17.00 1
R    4113.9503527.920 18     0.013                                        36.68 1
R    4138.8203529.740 18     0.013                                        00.00 1
SH   4138.8203529.740 18     0.013
CD  18  4   1    .000   1.500     .000  .000  .000   .00
CD  24  4   1    .000   2.000     .000  .000  .000   .00
CD  30  4   1    .000   2.500     .000  .000  .000   .00
CD  36  4   1    .000   3.000     .000  .000  .000   .00
CD  42  4   1    .000   3.500     .000  .000  .000   .00
Q            9.500
```

Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date: 4-10-2019 Time: 8:42:50
STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
GCW / NB / CLV
MAIN2

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3000.000 | 3488.110 | 5.176 | 3493.286 | 25.50 | 8.12 | 1.02 | 3494.31 | .00 | 1.77 | .00 | 2.000 | .000 | .00 | 1 .0 |
| 53.470 | .0331 | | | | | .0127 | .68 | 5.18 | .00 | 1.14 | .013 | .00 | .00 | PIPE |
| 3053.470 | 3489.880 | 4.137 | 3494.016 | 25.50 | 8.12 | 1.02 | 3495.04 | .00 | 1.77 | .00 | 2.000 | .000 | .00 | 1 .0 |
| 51.954 | .0400 | | | | | .0127 | .66 | 4.14 | .00 | 1.07 | .013 | .00 | .00 | PIPE |
| 3105.424 | 3491.959 | 2.735 | 3494.695 | 25.50 | 8.12 | 1.02 | 3495.72 | .00 | 1.77 | .00 | 2.000 | .000 | .00 | 1 .0 |
| HYDRAULIC JUMP | | | | | | | | | | | | | | |
| 3105.424 | 3491.959 | 1.129 | 3493.089 | 25.50 | 13.95 | 3.02 | 3496.11 | .00 | 1.77 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 25.638 | .0400 | | | | | .0321 | .82 | 1.13 | 2.56 | 1.07 | .013 | .00 | .00 | PIPE |
| 3131.062 | 3492.986 | 1.174 | 3494.160 | 25.50 | 13.30 | 2.75 | 3496.91 | .00 | 1.77 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 17.274 | .0400 | | | | | .0284 | .49 | 1.17 | 2.37 | 1.07 | .013 | .00 | .00 | PIPE |
| 3148.336 | 3493.677 | 1.222 | 3494.899 | 25.50 | 12.68 | 2.50 | 3497.40 | .00 | 1.77 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 11.861 | .0400 | | | | | .0251 | .30 | 1.22 | 2.20 | 1.07 | .013 | .00 | .00 | PIPE |
| 3160.197 | 3494.152 | 1.272 | 3495.424 | 25.50 | 12.09 | 2.27 | 3497.69 | .00 | 1.77 | 1.92 | 2.000 | .000 | .00 | 1 .0 |
| 8.578 | .0400 | | | | | .0223 | .19 | 1.27 | 2.03 | 1.07 | .013 | .00 | .00 | PIPE |
| 3168.774 | 3494.495 | 1.326 | 3495.822 | 25.50 | 11.53 | 2.06 | 3497.88 | .00 | 1.77 | 1.89 | 2.000 | .000 | .00 | 1 .0 |
| 6.406 | .0400 | | | | | .0198 | .13 | 1.33 | 1.88 | 1.07 | .013 | .00 | .00 | PIPE |
| 3175.180 | 3494.752 | 1.384 | 3496.136 | 25.50 | 10.99 | 1.88 | 3498.01 | .00 | 1.77 | 1.85 | 2.000 | .000 | .00 | 1 .0 |
| 4.850 | .0400 | | | | | .0177 | .09 | 1.38 | 1.73 | 1.07 | .013 | .00 | .00 | PIPE |


Program Package Serial Number: 3074
WATER SURFACE PROFILE LISTING Date: 4-10-2019 Time: 8:42:50
STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
GCW / NB / CLV
MAIN2

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3180.030 | 3494.946 | 1.446 | 3496.392 | 25.50 | 10.48 | 1.70 | 3498.10 | .00 | 1.77 | 1.79 | 2.000 | .000 | .00 | 1 .0 |
| 3.590 | .0400 | | | | | .0158 | .06 | 1.45 | 1.58 | 1.07 | .013 | .00 | .00 | PIPE |
| 3183.620 | 3495.090 | 1.514 | 3496.604 | 25.50 | 9.99 | 1.55 | 3498.15 | .00 | 1.77 | 1.72 | 2.000 | .000 | .00 | 1 .0 |
| 2.552 | .0400 | | | | | .0142 | .04 | 1.51 | 1.44 | 1.07 | .013 | .00 | .00 | PIPE |
| 3186.171 | 3495.192 | 1.589 | 3496.781 | 25.50 | 9.53 | 1.41 | 3498.19 | .00 | 1.77 | 1.62 | 2.000 | .000 | .00 | 1 .0 |
| 1.623 | .0400 | | | | | .0129 | .02 | 1.59 | 1.30 | 1.07 | .013 | .00 | .00 | PIPE |
| 3187.794 | 3495.257 | 1.673 | 3496.930 | 25.50 | 9.08 | 1.28 | 3498.21 | .00 | 1.77 | 1.48 | 2.000 | .000 | .00 | 1 .0 |
| .585 | .0400 | | | | | .0118 | .01 | 1.67 | 1.16 | 1.07 | .013 | .00 | .00 | PIPE |
| 3188.380 | 3495.280 | 1.774 | 3497.054 | 25.50 | 8.66 | 1.16 | 3498.22 | .00 | 1.77 | 1.27 | 2.000 | .000 | .00 | 1 .0 |
| JUNCT STR | .0000 | | | | | .0094 | .00 | 1.77 | 1.00 | | .013 | .00 | .00 | PIPE |
| 3188.380 | 3495.280 | 2.735 | 3498.015 | 19.50 | 6.21 | .60 | 3498.61 | .00 | 1.59 | .00 | 2.000 | .000 | .00 | 1 .0 |
| 2.959 | .0400 | | | | | .0074 | .02 | 2.73 | .00 | .92 | .013 | .00 | .00 | PIPE |
| 3191.339 | 3495.398 | 2.633 | 3498.031 | 19.50 | 6.21 | .60 | 3498.63 | .00 | 1.59 | .00 | 2.000 | .000 | .00 | 1 .0 |
| HYDRAULIC JUMP | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3191.339 | 3495.398 | .920 | 3496.319 | 19.50 | 13.81 | 2.96 | 3499.28 | .00 | 1.59 | 1.99 | 2.000 | .000 | .00 | 1 | .0 | | |
| 41.698 | .0400 | | | | | .0392 | 1.64 | .92 | 2.89 | .92 | .013 | .00 | .00 | PIPE | | | |
| 3233.037 | 3497.068 | .925 | 3497.993 | 19.50 | 13.72 | 2.92 | 3500.92 | .00 | 1.59 | 1.99 | 2.000 | .000 | .00 | 1 | .0 | | |
| 66.013 | .0400 | | | | | .0365 | 2.41 | .93 | 2.86 | .92 | .013 | .00 | .00 | PIPE | | | |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 4-10-2019 Time: 8:42:50

STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
GCW / NB / CLV
MAIN2

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3299.050 | 3499.710 | .960 | 3500.670 | 19.50 | 13.08 | 2.66 | 3503.33 | .00 | 1.59 | 2.00 | 2.000 | .000 | .00 | 1 | .0 | | |
| 19.462 | .0363 | | | | | .0337 | .66 | .96 | 2.67 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3318.512 | 3500.417 | .968 | 3501.385 | 19.50 | 12.93 | 2.60 | 3503.98 | .00 | 1.59 | 2.00 | 2.000 | .000 | .00 | 1 | .0 | | |
| 38.413 | .0363 | | | | | .0311 | 1.20 | .97 | 2.62 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3356.925 | 3501.812 | 1.005 | 3502.817 | 19.50 | 12.33 | 2.36 | 3505.18 | .00 | 1.59 | 2.00 | 2.000 | .000 | .00 | 1 | .0 | | |
| 19.752 | .0363 | | | | | .0274 | .54 | 1.01 | 2.44 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3376.676 | 3502.530 | 1.044 | 3503.574 | 19.50 | 11.75 | 2.15 | 3505.72 | .00 | 1.59 | 2.00 | 2.000 | .000 | .00 | 1 | .0 | | |
| 12.771 | .0363 | | | | | .0242 | .31 | 1.04 | 2.27 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3389.447 | 3502.993 | 1.084 | 3504.077 | 19.50 | 11.21 | 1.95 | 3506.03 | .00 | 1.59 | 1.99 | 2.000 | .000 | .00 | 1 | .0 | | |
| 8.960 | .0363 | | | | | .0213 | .19 | 1.08 | 2.11 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3398.407 | 3503.319 | 1.127 | 3504.446 | 19.50 | 10.69 | 1.77 | 3506.22 | .00 | 1.59 | 1.98 | 2.000 | .000 | .00 | 1 | .0 | | |
| 6.647 | .0363 | | | | | .0188 | .13 | 1.13 | 1.96 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3405.054 | 3503.560 | 1.172 | 3504.732 | 19.50 | 10.19 | 1.61 | 3506.34 | .00 | 1.59 | 1.97 | 2.000 | .000 | .00 | 1 | .0 | | |
| 5.013 | .0363 | | | | | .0167 | .08 | 1.17 | 1.82 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3410.067 | 3503.742 | 1.220 | 3504.963 | 19.50 | 9.71 | 1.47 | 3506.43 | .00 | 1.59 | 1.95 | 2.000 | .000 | .00 | 1 | .0 | | |
| 3.859 | .0363 | | | | | .0148 | .06 | 1.22 | 1.69 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3413.926 | 3503.883 | 1.270 | 3505.153 | 19.50 | 9.26 | 1.33 | 3506.48 | .00 | 1.59 | 1.93 | 2.000 | .000 | .00 | 1 | .0 | | |
| 2.889 | .0363 | | | | | .0131 | .04 | 1.27 | 1.56 | .94 | .013 | .00 | .00 | PIPE | | | |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 4-10-2019 Time: 8:42:50

STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
GCW / NB / CLV
MAIN2

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3416.815 | 3503.988 | 1.324 | 3505.312 | 19.50 | 8.83 | 1.21 | 3506.52 | .00 | 1.59 | 1.89 | 2.000 | .000 | .00 | 1 | .0 | | |
| 2.111 | .0363 | | | | | .0116 | .02 | 1.32 | 1.44 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3418.926 | 3504.064 | 1.382 | 3505.446 | 19.50 | 8.42 | 1.10 | 3506.55 | .00 | 1.59 | 1.85 | 2.000 | .000 | .00 | 1 | .0 | | |
| 1.468 | .0363 | | | | | .0104 | .02 | 1.38 | 1.33 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3420.394 | 3504.117 | 1.444 | 3505.562 | 19.50 | 8.03 | 1.00 | 3506.56 | .00 | 1.59 | 1.79 | 2.000 | .000 | .00 | 1 | .0 | | |
| .887 | .0363 | | | | | .0093 | .01 | 1.44 | 1.22 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3421.281 | 3504.150 | 1.511 | 3505.661 | 19.50 | 7.65 | .91 | 3506.57 | .00 | 1.59 | 1.72 | 2.000 | .000 | .00 | 1 | .0 | | |
| .279 | .0363 | | | | | .0083 | .00 | 1.51 | 1.11 | .94 | .013 | .00 | .00 | PIPE | | | |
| 3421.560 | 3504.160 | 1.587 | 3505.747 | 19.50 | 7.29 | .83 | 3506.57 | .00 | 1.59 | 1.62 | 2.000 | .000 | .00 | 1 | .0 | | |
| JUNCT STR | .0000 | | | | | .0080 | .00 | 1.59 | 1.00 | | .013 | .00 | .00 | PIPE | | | |
| 3421.560 | 3504.160 | 2.720 | 3506.880 | 9.50 | 5.38 | .45 | 3507.33 | .00 | 1.19 | .00 | 1.500 | .000 | .00 | 1 | .0 | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29.050 | .0375 | | | | | | .0082 | .24 | 2.72 | .00 | .72 | .013 | .00 | .00 | PIPE | | | | |
| 3450.610 | 3505.248 | 1.886 | 3507.134 | 9.50 | 5.38 | .45 | 3507.58 | .00 | 1.19 | .00 | 1.500 | .000 | .00 | 1 | .0 | | | | |
| HYDRAULIC JUMP | | | | | | | | | | | | | | | | | | | |
| 3450.610 | 3505.248 | .721 | 3505.969 | 9.50 | 11.31 | 1.99 | 3507.95 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 | .0 | | | | |
| 85.348 | .0375 | | | | | | .0375 | 3.20 | .72 | 2.66 | .72 | .013 | .00 | .00 | PIPE | | | | |
| 3535.958 | 3508.444 | .721 | 3509.165 | 9.50 | 11.31 | 1.99 | 3511.15 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 | .0 | | | | |
| 68.501 | .0375 | | | | | | .0353 | 2.42 | .72 | 2.66 | .72 | .013 | .00 | .00 | PIPE | | | | |





| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 3604.460 | 3511.010 | .747 | 3511.757 | 9.50 | 10.81 | 1.81 | 3513.57 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 28.636 | .0332 | | | | | .0332 | .95 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3633.096 | 3511.959 | .747 | 3512.706 | 9.50 | 10.81 | 1.81 | 3514.52 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 57.934 | .0332 | | | | | .0332 | 1.92 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3691.030 | 3513.880 | .746 | 3514.626 | 9.50 | 10.82 | 1.82 | 3516.44 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 36.148 | .0333 | | | | | .0333 | 1.20 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3727.178 | 3515.083 | .746 | 3515.829 | 9.50 | 10.82 | 1.82 | 3517.65 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 66.052 | .0333 | | | | | .0332 | 2.20 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3793.230 | 3517.280 | .747 | 3518.027 | 9.50 | 10.81 | 1.82 | 3519.84 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 70.298 | .0332 | | | | | .0332 | 2.33 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3863.528 | 3519.614 | .747 | 3520.361 | 9.50 | 10.81 | 1.82 | 3522.18 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 103.492 | .0332 | | | | | .0332 | 3.44 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3967.020 | 3523.050 | .747 | 3523.797 | 9.50 | 10.81 | 1.81 | 3525.61 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 16.009 | .0332 | | | | | .0332 | .53 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 3983.029 | 3523.581 | .747 | 3524.328 | 9.50 | 10.81 | 1.81 | 3526.14 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 68.691 | .0332 | | | | | .0338 | 2.32 | .75 | 2.49 | .75 | .013 | .00 | .00 | PIPE |
| 4051.720 | 3525.860 | .739 | 3526.599 | 9.50 | 10.96 | 1.86 | 3528.46 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 39.199 | .0331 | | | | | .0363 | 1.42 | .74 | 2.54 | .75 | .013 | .00 | .00 | PIPE |





| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 4090.919 | 3527.157 | .717 | 3527.875 | 9.50 | 11.38 | 2.01 | 3529.89 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 23.031 | .0331 | | | | | .0407 | .94 | .72 | 2.69 | .75 | .013 | .00 | .00 | PIPE |
| 4113.951 | 3527.920 | .691 | 3528.612 | 9.50 | 11.94 | 2.21 | 3530.82 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 2.040 | .0732 | | | | | .0424 | .09 | .69 | 2.88 | .60 | .013 | .00 | .00 | PIPE |
| 4115.991 | 3528.069 | .700 | 3528.770 | 9.50 | 11.75 | 2.14 | 3530.91 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |
| 4.935 | .0732 | | | | | .0390 | .19 | .70 | 2.82 | .60 | .013 | .00 | .00 | PIPE |
| 4120.925 | 3528.430 | .726 | 3529.156 | 9.50 | 11.20 | 1.95 | 3531.10 | .00 | 1.19 | 1.50 | 1.500 | .000 | .00 | 1 .0 |

```
   3.834    .0732                                        .0343      .13      .73    2.62     .60    .013       .00   .00  PIPE
        |        |        |        |        |             |        |        |       |        |        |        |        |
 4124.760  3528.711     .754  3529.465     9.50   10.68    1.77  3531.24     .00    1.19     1.50    1.500     .000   .00   1   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
   3.094    .0732                                        .0302      .09      .75    2.44     .60    .013       .00   .00  PIPE
        |        |        |        |        |             |        |        |       |        |        |        |        |
 4127.854  3528.938     .782  3529.719     9.50   10.18    1.61  3531.33     .00    1.19     1.50    1.500     .000   .00   1   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
   2.477    .0732                                        .0266      .07      .78    2.27     .60    .013       .00   .00  PIPE
        |        |        |        |        |             |        |        |       |        |        |        |        |
 4130.331  3529.119     .813  3529.932     9.50    9.71    1.46  3531.40     .00    1.19     1.49    1.500     .000   .00   1   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
   2.034    .0732                                        .0235      .05      .81    2.11     .60    .013       .00   .00  PIPE
        |        |        |        |        |             |        |        |       |        |        |        |        |
 4132.365  3529.268     .845  3530.113     9.50    9.26    1.33  3531.44     .00    1.19     1.49    1.500     .000   .00   1   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
   1.658    .0732                                        .0208      .03      .85    1.96     .60    .013       .00   .00  PIPE
        |        |        |        |        |             |        |        |       |        |        |        |        |
 4134.023  3529.389     .879  3530.268     9.50    8.83    1.21  3531.48     .00    1.19     1.48    1.500     .000   .00   1   .0
       -|-      -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
   1.367    .0732                                        .0183      .03      .88    1.82     .60    .013       .00   .00  PIPE
```



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING  Date: 4-10-2019  Time: 8:42:50

STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019

GCW / NB / CLV

MAIN2

```
 ********************************************************************************************************************** ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel  |  Energy | Super |Critical|Flow Top|Height/|Base Wt|       |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head |  Grd.El.|  Elev | Depth  | Width  |Dia.-FT|or I.D.|  ZL   |Prs/Pip
        -|-      -|-      -|-      -|-      -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-    -|-
 L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR   |Type Ch
 ********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
         |         |        |         |         |       |       |         |       |        |        |       |       |       |
 4135.390  3529.489     .914  3530.403     9.50    8.41    1.10  3531.50     .00    1.19     1.46    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
    1.088    .0732                                        .0162      .02      .91    1.69     .60    .013       .00   .00  PIPE
         |        |        |        |        |             |        |        |       |        |        |        |        |
 4136.478  3529.569     .952  3530.521     9.50    8.02    1.00  3531.52     .00    1.19     1.44    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
     .849    .0732                                        .0144      .01      .95    1.56     .60    .013       .00   .00  PIPE
         |        |        |        |        |             |        |        |       |        |        |        |        |
 4137.327  3529.631     .993  3530.624     9.50    7.65     .91  3531.53     .00    1.19     1.42    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
     .656    .0732                                        .0128      .01      .99    1.44     .60    .013       .00   .00  PIPE
         |        |        |        |        |             |        |        |       |        |        |        |        |
 4137.983  3529.679    1.036  3530.715     9.50    7.29     .83  3531.54     .00    1.19     1.39    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
     .471    .0732                                        .0114      .01     1.04    1.33     .60    .013       .00   .00  PIPE
         |        |        |        |        |             |        |        |       |        |        |        |        |
 4138.454  3529.713    1.082  3530.795     9.50    6.95     .75  3531.55     .00    1.19     1.34    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
     .274    .0732                                        .0102      .00     1.08    1.22     .60    .013       .00   .00  PIPE
         |        |        |        |        |             |        |        |       |        |        |        |        |
 4138.729  3529.733    1.133  3530.866     9.50    6.63     .68  3531.55     .00    1.19     1.29    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
     .091    .0732                                        .0092      .00     1.13    1.11     .60    .013       .00   .00  PIPE
         |        |        |        |        |             |        |        |       |        |        |        |        |
 4138.820  3529.740    1.190  3530.930     9.50    6.32     .62  3531.55     .00    1.19     1.21    1.500     .000   .00   1   .0
        -|-      -|-      -|-      -|-      -|-     -|-     -|-      -|-     -|-      -|-      -|-     -|-      -|-     -|-
```

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

| CARD CODE | SECT NO | CHN TYPE | NO OF PIER/PIP | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 18 | 4 | 1 | | 1.500 | | | | | | | | | | | | | | |
| CD | 24 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |
| CD | 30 | 4 | 1 | | 2.500 | | | | | | | | | | | | | | |
| CD | 36 | 4 | 1 | | 3.000 | | | | | | | | | | | | | | |
| CD | 42 | 4 | 1 | | 3.500 | | | | | | | | | | | | | | |



WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -
STARLING SUMMERLIN VILLAGE 24A PARCEL O / 764.A150.001 / April 2019
HEADING LINE NO 2 IS -
GCW / NB / CLV
HEADING LINE NO 3 IS -
MAIN2



WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

| U/S DATA | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| | 3000.000 | 3488.110 | 24 | 3493.286 |

ELEMENT NO 2 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3053.470 | 3489.880 | 24 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 3 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3188.380 | 3495.280 | 24 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 4 IS A JUNCTION * * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3188.380 | 3495.280 | 24 | 18 | 0 | .013 | 6.000 | .000 | 3495.280 | .000 | 74.300 | .000 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 5 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3299.050 | 3499.710 | 24 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 6 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3421.560 | 3504.160 | 24 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 7 IS A JUNCTION * * * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3421.560 | 3504.160 | 18 | 18 | 18 | .013 | 5.500 | 4.500 | 3504.160 | 3504.160 | 67.600 | 71.500 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING

ELEMENT NO 8 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3604.460 | 3511.010 | 18 | .013 | .000 | .000 | 12.270 | 1 |

ELEMENT NO 9 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3691.030 | 3513.880 | 18 | .013 | .000 | .000 | .000 | 1 |



WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 10 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3793.230 | 3517.280 | 18 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 11 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 3967.020 | 3523.050 | 18 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 12 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 4051.720 | 3525.860 | 18 | .013 | .000 | .000 | 17.000 | 1 |

ELEMENT NO 13 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 4113.950 | 3527.920 | 18 | .013 | .000 | .000 | 36.680 | 1 |

ELEMENT NO 14 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 4138.820 | 3529.740 | 18 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 15 IS A SYSTEM HEADWORKS * *

| U/S DATA | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| | 4138.820 | 3529.740 | 18 | .000 |

GCW ENGINEERS \ SURVEYORS

## MINOR STORM DRAIN LATERAL - CCRFCD MANUAL FRICTION LOSS CALCULATION SHEET

| STORM DRAIN DESIGN | | | | | | PIPE HYDRAULIC CHARACTERISTICS | | | | | | LOSS | HGL | | | DESCRIPTION | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $Q_{DESIGN}$ | | | INVERTS | | | A | R | | V | $H_V$ = | $S_f$ | PIPE | PIPE | | | | |
| (CFS) | DIAMETER (FT) | MANNING'S 'n' | D / S ELEV. | U / S ELEV. | LENGTH | ($FT^2$) | (FT) | Φ | (FPS) | $V^2/2g$ (FT) | (FT/FT) | $H_f$ (FT) | TRUNK WSE (from Model) | LATERAL PIPE D/S HGL ELEV.[1] | LATERAL PIPE U/S HGL ELEV.[1] | PARTIAL FLOW? | LATERAL |
| 4.5 | 1.5 | 0.013 | 3529.17 | 3529.36 | 19.37 | 1.77 | 0.375 | 0.004925 | 2.55 | 0.100692 | 0.001827734 | 0.035 | 3532.44 | 3532.4 | 3532.4 | No | 18" LATERAL WEST SPRINGBOUGH LN |
| 3.5 | 1.5 | 0.013 | 3527.57 | 3527.72 | 29.53 | 1.77 | 0.375 | 0.004925 | 1.98 | 0.060912 | 0.001105666 | 0.033 | 3529.72 | 3529.7 | 3529.7 | No | 18" LATERAL WEST SPRINGBOUGH/ STARLING INTERSECTION |
| 5 | 1.5 | 0.013 | 3491.99 | 3495.05 | 23.32 | 1.77 | 0.375 | 0.004925 | 2.83 | 0.124311 | 0.002256462 | 0.053 | 3495.93 | 3495.9 | 3496.6 | No | 18" LATERAL NORTH STARLING SUN AVE |
| 4 | 1.5 | 0.013 | 3491.99 | 3492.09 | 19.57 | 1.77 | 0.375 | 0.004925 | 2.26 | 0.079559 | 0.001444136 | 0.028 | 3495.93 | 3495.9 | 3495.9 | No | 18" LATERAL SOUTH STARLING SUN AVE |
| 5.5 | 1.5 | 0.013 | 3504.16 | 3506.4 | 19.66 | 1.77 | 0.375 | 0.004925 | 3.11 | 0.150416 | 0.002730319 | 0.054 | 3506.88 | 3506.9 | 3507.9 | No | 18" LATERAL EAST FEATHERBLUFF ST |
| 4.5 | 1.5 | 0.013 | 3504.16 | 3504.25 | 18.85 | 1.77 | 0.375 | 0.004925 | 2.55 | 0.100692 | 0.001827734 | 0.034 | 3506.88 | 3506.9 | 3506.9 | No | 18" LATERAL WEST FEATHERBLUFF ST |
| 6 | 1.5 | 0.013 | 3495.28 | 3495.37 | 18.75 | 1.77 | 0.375 | 0.004925 | 3.40 | 0.179008 | 0.003249306 | 0.061 | 3498.02 | 3498.0 | 3498.0 | No | 18" LATERAL WEST FEATHERBLUFF ST (SOUTH OF RED CLIFF) |
| 9 | 1.5 | 0.013 | 3527.72 | 3532.15 | 88.12 | 1.767146 | 0.375 | 0.004925 | 5.092958 | 0.402767 | 0.007310938 | 0.64424 | 3529.72 | 3529.7 | 3533.7 | No | 18" LATERAL TO SUMP WEST OF SPRINGBOUGH LN |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

**Pipe Friction Loss Calculations per CCRFCD Manual 804.2.1**

$\Phi = 2g\,(n^2) / 2.21$

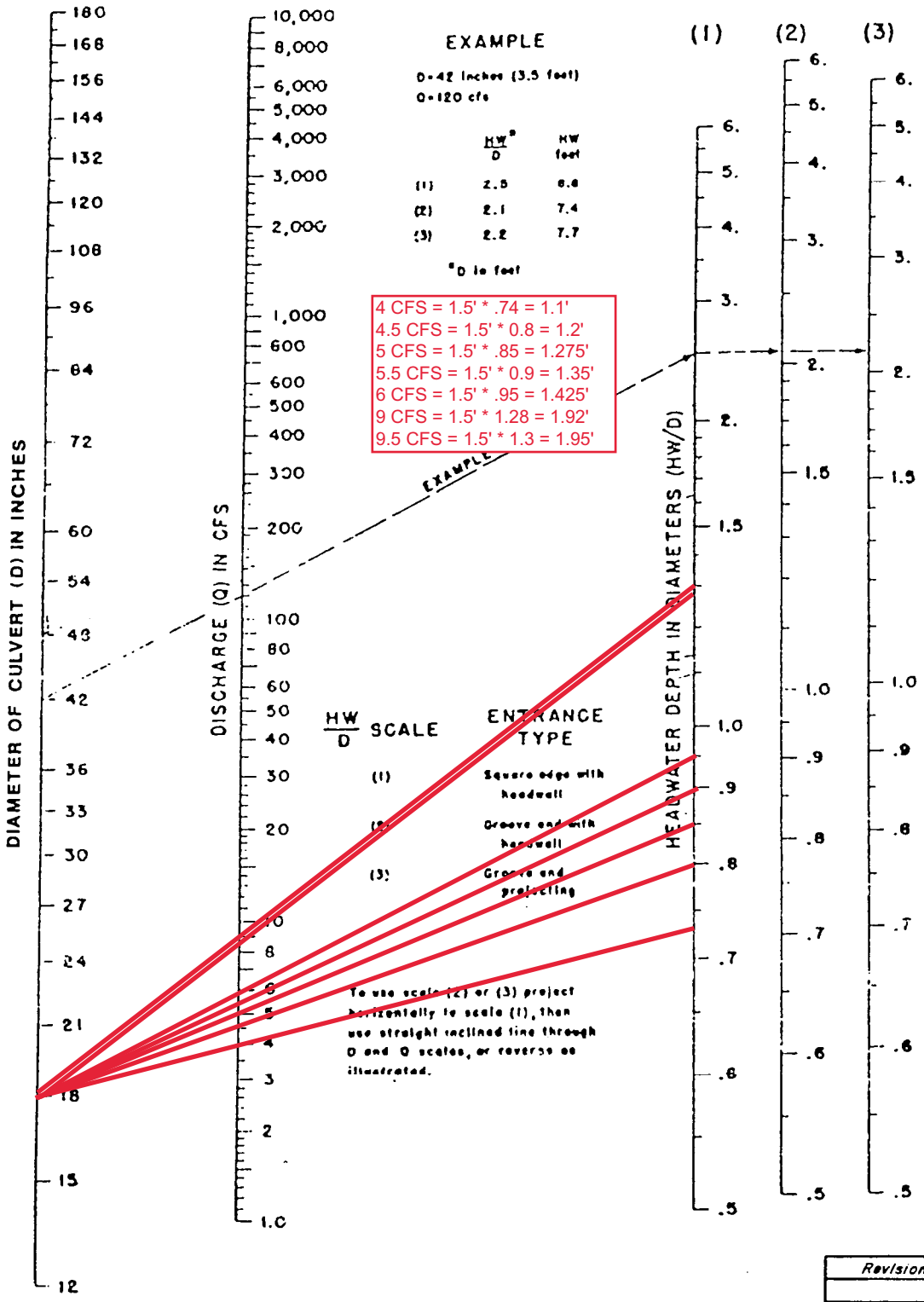
$Sf = \Phi\ Hv / R^{1.33}$

$H_f = \text{Length} \times S_f$

**1 - Where HGL in lateral is below top of pipe (PARTIAL FLOW), assume HGL is at top of pipe.**

# NOMOGRAPH – INLET CONTROL RCP

LATERAL INLET CONTROL CALCULATIONS




| Revision | Date |
|---|---|
| | |
| | |
| | |
| | |

WRC ENGINEERING

REFERENCE:
USDOT, FHWA, HDS, No. 5, 1985

FIGURE 1005

# APPENDIX B

Referenced Material and Supporting Documents

# UPDATE TO THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 23B SKY VISTA DRIVE ALTA DRIVE TO FAR HILLS AVENUE

**62023B-240**

**December 2018**

**Prepared For:**

**The Howard Hughes Company, LLC**
**10801 W. Charleston Blvd., 3Rd Floor**
**Las Vegas, Nevada 89135**
**Phone: (702) 791-4300**

GCW
ENGINEERS \ SURVEYORS

| CITY OF LAS VEGAS<br>INTER-OFFICE MEMORANDUM | | | | DATE:<br>February 13, 2019 |
|---|---|---|---|---|
| TO:<br>**Land Development Services**<br>Department of Building & Safety | | | | FROM:<br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| **SUBJECT:** | Drainage Study for:<br>**Summerlin V23B Sky Vista Drive - Alta to Far Hills - Update** | | | **COPIES TO:**<br>GCW, Inc. |
| **Cross Streets:** | Sky Vista Drive from Alta to Far Hills | | | The Howard Hughes Company, LLC |
| **File Number:** | F:\Depot\DSMemos\DS4980E.doc | | | Bart Anderson, P.E., DevCo |
| **Parcel Number:** | 137-22-000-017 | | | CCRFCD |
| **Zoning Action:** | MDR-72841 | | | |
| **FEMA Flood Zone** | YES | NO **X** | | |
| **Proposed Storm Drain** | YES **X** | NO | | |

| HISTORY | DATE RECEIVED | DATE REVIEWED | COMMENTS | REVIEW FEES | FEES PAID Payment Trn # |
|---|---|---|---|---|---|
| 1st Submittal | 4/11/2018 | 4/23/2018 & 5/3/2018 | Not Approved | $400.00 | 495088: $400 |
| 2nd Submittal | 7/3/2018 | 7/20/2018 & 7/24/2018 | Conditional Approval | $400.00 | 497102: $400 |
| CCRFCD | 8/20/2018 | 9/4/2018 | Concurrence Recv'd | N/C | N/C |
| 3rd Submittal | 12/20/2018 | 1/17/2019 | Not Approved | $100.00 | 501989: $100 |
| 4th Submittal | 1/30/2019 | 2/13/2019 | See Comments Below | N/C | N/C |
| | | | **TOTAL FEES (LDDRS):** | **$900.00** | **----** |

## REMARKS:

**3rd & 4th Submittals: Update & Supplement to connect the 2nd outfall pipe from DB5 to the Sky Vista Drive Storm Drain System and the Relocation of an existing stub**

The Drainage Study for the subject project has been reviewed and:

| | |
|---|---|
| **X** | is approved subject to conformance to all City standards and the following conditions: |
| | must be resubmitted or supplemented including the following: |
| | is conditionally approved subject to Clark County Regional Flood Control District concurrence. |

The following comments are repeated until they are complete:

1. The project proposed to build temporary drainage facilities including drainage berms/ditches along predominantly the west side of the proposed *Sky Vista Drive*. Prior to the final plans approval, the developer must complete a ***Maintenance & Liability Agreement*** for the interim drainage improvements and post a minimum maintenance bond of $50,000 or 50-percent of the construction cost for the improvements, whichever is greater. The engineer must submit an estimate of the quantities for constructing the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control Section* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact *City Land Development Section* (702-229-6371) to begin the agreement process.

   In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berms/ditches are no longer necessary and can be removed.

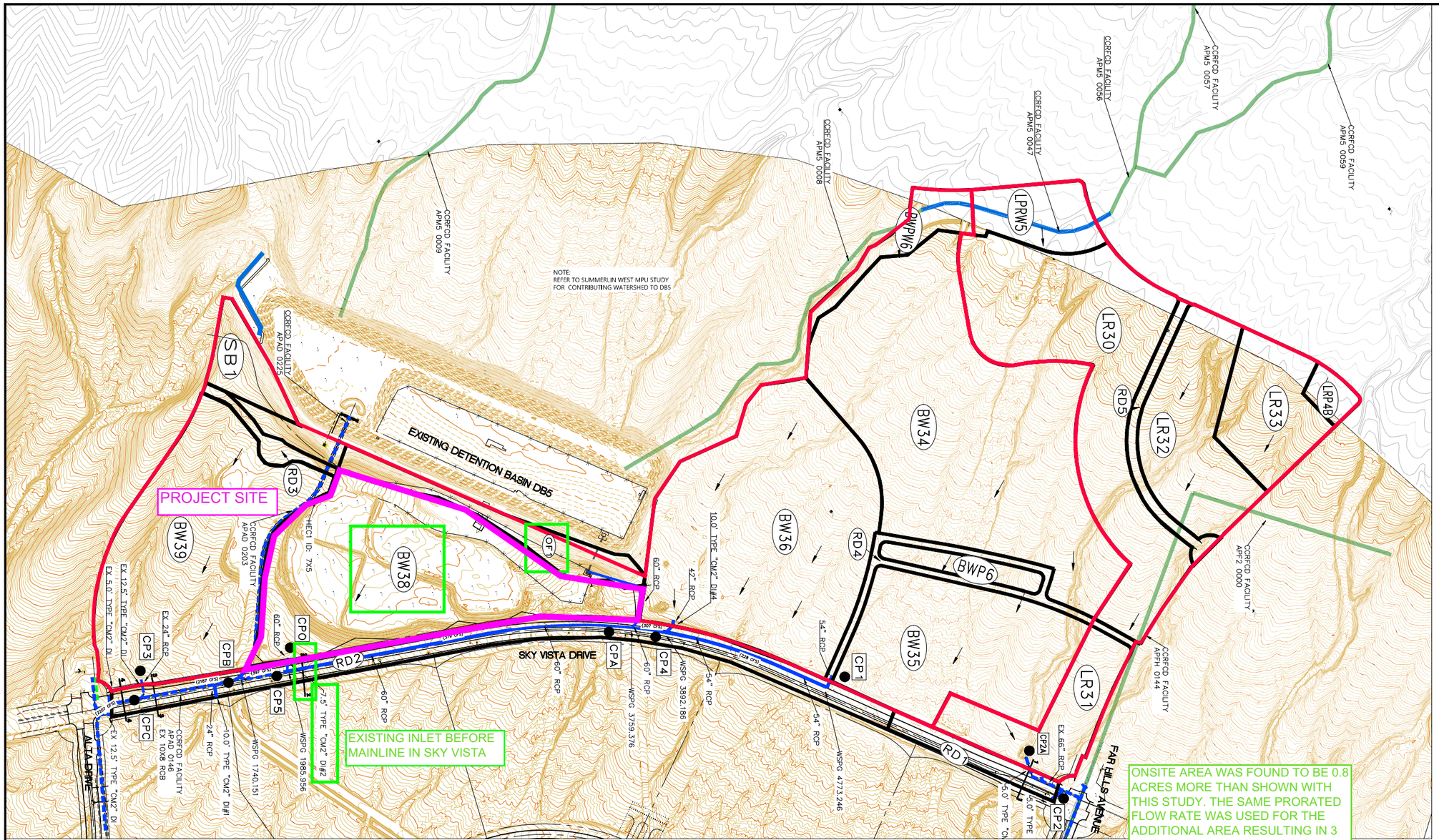
2. Since the street and the associated storm drain facilities will eventually be dedicated to the ***City of Las Vegas***, the engineer/developer must coordinate with *City of Las Vega Streets & Sanitation Department* for their review and approval for maintenance issues prior to the final acceptance of the subject improvement plans.
3. All offsite interim flood control facilities such as but not limited to berms / ditches and temporary sumps are privately owned and to be privately maintained by the *Howard Hughes Company*.

**NOTE:** Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

**NOTE:** Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

**END OF REMARKS**
WSP/AYS

T/R/S: T20S/R59E/22
AREA K-22




NOTE:
OFFSITE SUBBASIN DELINEATIONS AND LAND USES ARE BASED ON SUMMERLIN WEST MPU.

Referenced Basins

Referenced Street Section

**100-YEAR FLOW CHARACTERISTICS**
**ULTIMATE CONDITIONS**

| Location | Slope (%) | $Q_{100}$ (cfs) | Depth (ft) | Velocity (ft/s) | D*V | Tributary |
|---|---|---|---|---|---|---|
| 1-1 Half | 0.83 | 4.50 | 0.39 | 2.60 | 1.01 | RD1 |
| 2-2 | 4.32 | 36.00 | 0.46 | 6.52 | 3.00 | RD2 |
| 3-3 West Half | 3.00 | 10.60 | 0.42 | 5.10 | 2.14 | DI#2 Bypass |
| 4-4 East Half | 3.00 | 9.00 | 0.40 | 4.95 | 1.98 | DI#1 Bypass |
| 4-4 West Half | 3.00 | 2.00 | 0.28 | 3.2 | 0.9 | EX 12.5' CM2 DI Bypass |

**ULTIMATE CONDITION**
**CONCENTRATION POINT SUMMARY**

| Point ID | Tributary Sources | Area ($mi^2$) | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|---|
| CP1 | BWPW6, BW35, BWP6, BW34, & RD4 | 0.09 | 228 | 107 |
| CP2A | LR31, LR30, LR32, LR33, LRP4B, RD5 & LPRW5 | 0.09 | 199 | 90 |
| CP2 | CP2A & RD1 | 0.09 | 207 | 95 |
| CP3 | SB1, RD3, & BW39 | 0.04 | 100 | 48 |
| CP4 | CP1 & BW36 | 0.14 | 307 | 136 |
| CPO | OF1 & BW38 | 0.04 | 98 | 45 |
| CP5 | CPA & BW38 | 6.89 | 397 | 186 |
| CPA | CP4 & DB5 60RCP | 6.86 | 379 | 177 |
| CPB | CP5 & DB 7X5 RCBC | 6.69 | 2187 | 1491 |
| CPC | CP3, RD2, & CPB | 6.65 | 2207 | 1502 |

**ULTIMATE CONDITION**
**SUBBASIN FLOW RATE SUMMARY**

| Subbasin ID | Area (acres) | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|
| BW34 | 35.8 | 139 | 67 |
| BW35 | 15.8 | 61 | 30 |
| BWP6 | 1.9 | 6 | 2 |
| BWPW6 | 2.9 | 10 | 4 |
| BW36 | 28.4 | 78 | 31 |
| OF1 | 4.7 | 18 | 8 |
| BW38 | 22.2 | 80 | 37 |
| BW39 | 22.0 | 84 | 41 |
| LR30 | 25.0 | 80 | 37 |
| LR31 | 6.6 | 25 | 12 |
| LR32 | 10.3 | 39 | 19 |
| LR33 | 6.7 | 26 | 13 |
| LRP4B | 1.1 | 4 | 2 |
| LPRW5 | 4.2 | 16 | 7 |
| RD1 | 2.1 | 9 | 5 |
| RD2 | 10.1 | 36 | 19 |
| RD3 | 1.3 | 6 | 3 |
| RD4 | 2.8 | 12 | 6 |
| RD5 | 2.0 | 9 | 5 |
| SB1 | 2.9 | 10 | 4 |
| 60RCP | - | 332 | - |
| 7X5 | - | 1797 | - |

LEGEND

- (ST2) SUBBASIN NAME
- SUMMERLIN WEST MPU LARGE BASIN BOUNDARY
- SUBBASIN BOUNDARY
- CP1 CONCENTRATION POINT
- FLOW DIRECTION
- 12 12 CROSS SECTION
- PROP SD FACILITY
- EX SD FACILITY
- (XX CFS) STORM DRAIN FLOW RATE

NORTH

GRAPHIC SCALE
250 0 125 250
( IN FEET )
1 inch = 250 ft.

PROJECT NO. 62023B-240
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 12-18-18
PLOT TIME: 14:22:21

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | CCW APP | DATE: |
|---|---|---|---|---|---|---|---|

% COMPLETE

GCW ENGINEERS & SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\Projects\600\62023B-240\Division V\cti\Figures\Update\Fig6_ULT.dwg
Masih Edalat

THE HOWARD HUGHES PROPERTIES, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

FIGURE 6

ULTIMATE CONDITION DRAINAGE MAP

DRAWING
FIG6
1 OF 1 SHTS

LDP#:
HTE: 00-00000

**Curve Numbers for Project Site Soil Types**

| Soil# | Hydrologic Soil Group | | | Land Use Type | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | D | Commercial | Open Space | Natural Desert Landscaping | 7000 sq ft lots | Apartments/Condos | Desert Shrubs | Newly Graded Areas | Streets and Roads |
| 156 | 1.00% | 10.00% | 89.00% | 94.64 | 88 | 87 | 91 | 93 | 87 | 93 | 98 |
| 502 | 55.00% | 0.00% | 45.00% | 91.7 | 78 | 75 | 83 | 87 | 75 | 83.4 | 98 |
| 731 | 10.00% | 2.00% | 88.00% | 94.34 | 87 | 86 | 90 | 92 | 86 | 92.1 | 98 |

REFERENCED BASINS

**Summerlin Village 23B Sky Vista Drive**
**WEIGHTED CURVE NUMBERS**
Ultimate Conditions

| Basin | Soil | Percent | Land Use | WCN |
|---|---|---|---|---|
| **BW34** | 731 | 24.0% | Commercial | **93.3** |
| | 502 | 44.0% | | |
| | 156 | 32.0% | | |
| **BW35** | 502 | 52.0% | Commercial | **93.1** |
| | 156 | 48.0% | | |
| **BWP6** | 502 | 52.0% | Open Space (Poor) | **82.8** |
| | 156 | 48.0% | | |
| **BWPW6** | 731 | 100.0% | Open Space (Poor) | **87.0** |
| **BW36** | 731 | 42.0% | 7,000 sq ft lots | **85.9** |
| | 502 | 58.0% | | |
| **BW38** | 731 | 54.0% | Commercial | **93.0** |
| | 502 | 46.0% | | |
| **OF1** | 731 | 69.1% | Newly Graded | **89.5** |
| | 502 | 30.9% | | |
| **BW39** | 731 | 100.0% | Commercial | **94.3** |
| **LR30** | 502 | 30.0% | Apartment/ Condos | **91.2** |
| | 156 | 70.0% | | |
| **LR31** | 156 | 100.0% | Apartment/ Condos | **93.0** |
| **LR32** | 156 | 100.0% | Apartment/ Condos | **93.0** |
| **LR33** | 156 | 100.0% | Apartment/ Condos | **93.0** |
| **LRP4B** | 156 | 100.0% | Open Space (Poor) | **88.0** |
| **LPRW5** | 156 | 100.0% | Open Space (Poor) | **88.0** |
| **RD1** | 502 | 100.0% | Streets and Roads | **98.0** |
| **RD2** | 731 | 100.0% | Streets and Roads | **98.0** |
| **RD3** | 731 | 100.0% | Streets and Roads | **98.0** |
| **RD4** | 502 | 100.0% | Streets and Roads | **98.0** |
| **RD5** | 156 | 100.0% | Streets and Roads | **98.0** |
| **SB1** | 731 | 100.0% | Natural desert landscaping | **85.3** |

# HYDROLOGIC CRITERIA AND DESIGN MANUAL

## TIME OF CONCENTRATION

GCW ENGINEERS \ SURVEYORS

**HOWARD HUGHES PROPERTIES INC.**
**SUMMERLIN VILLAGE 23B SKY VISTA DRIVE (UPDATE)**
**ULTIMATE CONDITION**

Project No: 62023B-240
Date: 07-Dec-18
Calculated by: ME

| SUB-BASIN DATA | | | | | | INITIAL / OVERLAND TIME (Ti) | | | TRAVEL TIME (Tt) | | | | | Tc CHECK URBANIZED BASINS | | Tc | Tlag | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIG: (1) | DEV./EX. (D or E) | CN (16) | K (2) | AREA Ac (3) | AREA Sq Mi (4) | INITIAL LENGTH Feet (5) | SLOPE % (6) | Ti Min (7) | TRAVEL LENGTH Feet (8) | SLOPE % (9a) | V1 VELOCITY fps (9b) | V2 VELOCITY fps (10) | Tt Min (11) | TOTAL LENGTH Feet (12) | Tc = (L/180)+10 Min (13) | Min (14) | Tlag = 0.6Tc/60 Hours (15) | Remarks: |
| BW34 | D | 93.3 | 0.8416 | 35.8 | 0.0560 | 100 | 1.0 | 4.7 | 1000 | 5.6 | 4.8 | 7.2 | 2.9 | 1100 | 16.1 | 7.5 | 0.075 | 3.34 |
| BW35 | D | 93.1 | 0.8389 | 15.8 | 0.0247 | 100 | 1.0 | 4.7 | 750 | 4.8 | 4.4 | 6.7 | 2.5 | 850 | 14.7 | 7.2 | 0.072 | 3.34 |
| BWP6 | D | 82.8 | 0.7030 | 1.9 | 0.0030 | 50 | 7.3 | 2.6 | 220 | 7.3 | 5.4 | 8.3 | 0.7 | 270 | 11.5 | 3.3 | 0.050 | 3.34 |
| BWPW6 | D | 87.0 | 0.7584 | 2.9 | 0.0045 | 140 | 14.2 | 3.0 | 570 | 14.2 | 7.6 | 11.5 | 1.2 | 710 | 13.9 | 4.2 | 0.050 | 3.34 |
| BW36 | D | 85.9 | 0.7439 | 28.4 | 0.0444 | 100 | 1.0 | 6.4 | 1530 | 5.0 | 4.5 | 6.8 | 4.4 | 1630 | 19.1 | 10.8 | 0.108 | 3.34 |
| OF1 | D | 89.5 | 0.7914 | 4.7 | 0.0073 | 50 | 2.0 | 3.1 | 200 | 13.5 | 7.4 | 11.2 | 0.4 | 250 | 11.4 | 3.6 | 0.050 | 4.34 |
| BW38 | D | 93.0 | 0.8376 | 22.2 | 0.0346 | 100 | 1.0 | 4.7 | 1560 | 4.7 | 4.4 | 6.6 | 4.6 | 1660 | 19.2 | 9.3 | 0.093 | 3.34 |
| BW39 | D | 94.3 | 0.8548 | 23.2 | 0.0363 | 100 | 1.0 | 4.4 | 1550 | 6.0 | 4.9 | 7.5 | 4.0 | 1650 | 19.2 | 8.4 | 0.084 | 3.34 |
| LR30 | D | 91.2 | 0.8138 | 25.0 | 0.0391 | 100 | 1.0 | 5.2 | 1750 | 2.8 | 3.4 | 5.1 | 6.5 | 1850 | 20.3 | 11.7 | 0.117 | 3.34 |
| LR31 | D | 93.0 | 0.8376 | 6.6 | 0.0103 | 100 | 1.0 | 4.7 | 780 | 4.7 | 4.4 | 6.7 | 2.6 | 880 | 14.9 | 7.3 | 0.073 | 3.34 |
| LR32 | D | 93.0 | 0.8376 | 10.3 | 0.0161 | 100 | 1.0 | 4.7 | 1000 | 5.5 | 4.7 | 7.2 | 2.9 | 1100 | 16.1 | 7.6 | 0.076 | 3.34 |
| LR33 | D | 93.0 | 0.8376 | 6.7 | 0.0104 | 100 | 1.0 | 4.7 | 700 | 6.1 | 5.0 | 7.6 | 2.1 | 800 | 14.4 | 6.8 | 0.068 | 3.34 |
| LRP4B | D | 88.0 | 0.7716 | 1.1 | 0.0017 | 100 | 3.5 | 3.9 | 230 | 3.5 | 3.8 | 5.7 | 1.0 | 330 | 11.8 | 4.9 | 0.050 | 3.34 |
| LPRW5 | D | 88.0 | 0.7716 | 4.2 | 0.0066 | 50 | 3.5 | 2.8 | 400 | 3.5 | 3.8 | 5.7 | 1.8 | 450 | 12.5 | 4.5 | 0.050 | 3.34 |
| RD1 | D | 98.0 | 0.9036 | 2.1 | 0.0033 | 40 | 2.0 | 1.8 | 900 | 1.1 | 2.1 | 3.2 | 6.0 | 940 | 15.2 | 7.8 | 0.078 | 3.34 |
| RD2 | D | 98.0 | 0.9036 | 10.1 | 0.0158 | 40 | 2.0 | 1.8 | 4050 | 2.8 | 3.4 | 5.1 | 14.0 | 4090 | 32.7 | 15.8 | 0.158 | 3.34 |
| RD3 | D | 98.0 | 0.9036 | 1.3 | 0.0020 | 20 | 2.0 | 1.3 | 450 | 2.5 | 3.2 | 4.8 | 2.3 | 470 | 12.6 | 3.6 | 0.050 | 3.34 |
| RD4 | D | 98.0 | 0.9036 | 2.8 | 0.0043 | 20 | 2.0 | 1.3 | 1300 | 2.8 | 3.4 | 5.1 | 5.1 | 1320 | 17.3 | 6.3 | 0.063 | 3.34 |
| RD5 | D | 98.0 | 0.9036 | 2.0 | 0.0031 | 20 | 2.0 | 1.3 | 1250 | 3.0 | 3.5 | 5.3 | 4.7 | 1270 | 17.1 | 6.0 | 0.060 | 3.34 |
| SB1 | D | 85.3 | 0.7360 | 2.9 | 0.0045 | 70 | 12.0 | 2.4 | 300 | 6.0 | 4.9 | 7.5 | 1.0 | 370 | 12.1 | 3.4 | 0.050 | 3.34 |

REFERENCED BASINS

$Tc = Ti + Tt$ $Tlag = 0.6\ Tc$

$Ti = 1.8\ (1.1 - K)\ L^{1/2} / S^{1/3}$

$K = 0.0132\ (CN) - 0.39$

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing: $V1 = 14.8*(S/100)^{1/2}$ $V2 = 29.4*(S/100)^{1/2}$

Developed: $V1 = 20.2*(S/100)^{1/2}$ $V2 = 30.6*(S/100)^{1/2}$

**REFERENCE:** **STANDARD FORM 4**

```
1****************************************                                    ****************************************
 *                                      *                                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                   *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                                   *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                   *          609 SECOND STREET           *
 *                                      *                                   *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   07DEC18  TIME  11:24:47  *                                   *          (916) 756-1104              *
 *                                      *                                   *                                      *
 ****************************************                                    ****************************************

                                        X     X  XXXXXXX   XXXXX           X
                                        X     X  X       X     X         XX
                                        X     X  X       X               X
                                        XXXXXXX  XXXX    X       XXXXX   X
                                        X     X  X       X               X
                                        X     X  X       X     X         X
                                        X     X  XXXXXXX   XXXXX         XXX


          THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

          THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
          THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
          NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
          DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
          KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


1                                              HEC-1 INPUT                                                PAGE  1

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                        *DIAGRAM
 *** FREE ***
             1          ID   ************************************************************
             2          ID   * ........................................................ *
             3          ID   * :                  SUMMERLIN VILLAGE 23B                 : *
             4          ID   * :                 SKY VISTA DRIVE (UPDATE)               : *
             5          ID   * :                   ULTIMATE CONDITIONS                  : *
             6          ID   * :                    DEVELOPED ONSITE                    : *
             7          ID   * :                    DEVELOPED OFFSITE                   : *
             8          ID   * :....................................................... : *
             9          ID   * :              RETURN PERIOD_ _ _ _10 & 100-YEAR         : *
            10          ID   * :              DISTRIBUTION_ _ _ _ 6-HOUR SDN3           : *
            11          ID   * :              PROJECT NO_ _ _ _ _ 62023B-240            : *
            12          ID   * :              FILENAME_ _ _ _ _ _ UL.H1                 : *
            13          ID   * :              DATE_ _ _ _ _ _ _ _ 12/07/2018            : *
            14          ID   * :              MODELED BY_ _ _ _ _ ME                    : *
            15          ID   * :....................................................... : *
            16          ID   * :                                                       : *
            17          ID   * :....................................................... : *
            18          ID   ************************************************************
            19          ID
            20          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            21          ID
            22          ID                          AREA      DARF
            23          ID                        SQ.MI.
            24          ID
            25          ID                       0.0 - 0.5    1.00
            26          ID                       0.5 - 1.0    0.98
            27          ID                       1.0 - 2.0    0.95
            28          ID                       2.0 - 4.0    0.92
            29          ID                       4.0 - 6.0    0.91
            30          ID                       6.0 - 8.0    0.89
            31          ID
            32          IT       5       0       0     200
            33          IO       5       0
            34          IN       5       0       0
            35          JR    PREC     1.0    0.98    0.95    0.92    0.91    0.89    0.54
                        *

            36          KK   LPRW5
            37          BA  0.0066
            38          PB    3.43
            39          PC   0.000   .0200   .0570   .0700   .0870   .1080   .1240   .1300   .1300   .1300
            40          PC   .1300   .1300   .1300   .1330   .1400   .1420   .1480   .1580   .1720   .1810
            41          PC   .1900   .1970   .1990   .2000   .2010   .2040   .2140   .2290   .2410   .2490
            42          PC   .2510   .2560   .2700   .2780   .2810   .2830   .2950   .3220   .3520   .4090
            43          PC   .4990   .5900   .7100   .7440   .7810   .8120   .8190   .8350   .8510   .8560
            44          PC   .8600   .8680   .8760   .8880   .9100   .9260   .9370   .9500   .9700   .9760
            45          PC   .9820   .9850   .9870   .9890   .9900   .9930   .9930   .9940   .9950   .9980
            46          PC   .9980   .9990  1.000
            47          LS       0    88.0
```

```
              48          UD   0.050
                          *
1                                     HEC-1 INPUT                                          PAGE  2

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


              49          KK    LR31
              50          BA  0.0103
              51          LS       0    93.0
              52          UD    .073
                          *

              53          KK     RD5
              54          KM   ROADWAY
              55          BA  0.0031
              56          LS       0    98.0
              57          UD    .060
                          *

              58          KK   DUMMY
              59          KM   COMBINE RD5, LPRW5 & LR31
              60          HC       3
                          *

              61          KK    LR30
              62          BA  0.0391
              63          LS       0    91.2
              64          UD    .117
                          *

              65          KK    LR32
              66          BA  0.0161
              67          LS       0    93.0
              68          UD    .076
                          *

              69          KK    LR33
              70          BA  0.0104
              71          LS       0    93.0
              72          UD    .068
                          *

              73          KK   LRP4B
              74          BA  0.0017
              75          LS       0    88.0
              76          UD    .050
                          *

              77          KK    CP2A
              78          KM   COMBINE RD5, LR31, LPRW5, LR30, LR32, LR33 & LRP4B
              79          HC       5
                          *

              80          KK     RD1
              81          KM   ROADWAY
              82          BA  0.0033
              83          LS       0    98.0
              84          UD    .078
                          *
1                                     HEC-1 INPUT                                          PAGE  3

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


              85          KK     CP2
              86          HC       2
                          *

              87          KK    BW39
              88          BA  0.0344
              89          LS       0    94.3
              90          UD    .084
                          *

              91          KK     RD3
              92          BA  0.0020
              93          LS       0    98.0
              94          UD    .050
                          *

              95          KK     SB1
              96          BA  0.0045
              97          LS       0    85.3
              98          UD    .050
                          *

              99          KK     CP3
             100          KM   COMBINE BW39, RD3 & SB1
```

```
 101          HC       3
              *

 102          KK     OF1
 103          BA  0.0073
 104          LS       0    89.5
 105          UD    .050
              *

 106          KK    BW38
 107          BA  0.0346
 108          LS       0    93.0
 109          UD    .093
              *

 110          KK     CPO
 111          KM   COMBINE BW38, OF1
 112          HC       2
              *

 113          KK    BW36
 114          BA  0.0444
 115          LS       0    85.9
 116          UD    .108
              *
1                                      HEC-1 INPUT                                          PAGE  4

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 117          KK   BWPW6
 118          BA  0.0045
 119          LS       0    87.0
 120          UD    .050
              *

 121          KK    BW35
 122          BA  0.0247
 123          LS       0    93.1
 124          UD    .072
              *

 125          KK    BWP6
 126          BA  0.0030
 127          LS       0    82.8
 128          UD    .050
              *

 129          KK    BW34
 130          BA  0.0560
 131          LS       0    93.3
 132          UD    .075
              *

 133          KK     RD4
 134          BA  0.0043
 135          LS       0    98.0
 136          UD    .063
              *

 137          KK     CP1
 138          KM   COMBINE BWPW6, RD4, BW35, BWP6, AND BW34
 139          HC       5
              *

 140          KK     CP4
 141          KM   COMBINE CP1 & BW36
 142          HC       2
              *

 143          KK     3-1
 144          KM    COMPARE TO MPU BASIN DB54-1 (CURVE NUMBER CHANGED FROM 87.2)
 145          BA    2.22
 146          PB    3.75
 147          LS           0    87.0
 148          UD    0.582
              *

 149          KK   R3-1
 150          KM    ROUTE R3-1 THROUGH 3-2
 151          KM    EXISTING NATURAL WASH
 152          RD    3322   0.092   0.030       0    TRAP     125      0
              *
1                                      HEC-1 INPUT                                          PAGE  5

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 153          KK     3-2
```

```
 154          KM    COMPARE TO MPU BASIN DB54-5 (CURVE NUMBER CHANGED FROM 85. 2)
 155          BA    0.226
 156          PB    3.67
 157          LS            0    85.6
 158          UD    0.108
              *

 159          KK   CP3.1
 160          KM    COMBINE R3-1 AND 3-2
 161          HC            2
              *

 162          KK RCP3.1
 163          KM    ROUTE CP3.1 TO CP3.3 THROUGH 3-E VI A
 164          KM    (PORTION OF FACILITY APM50059)
 165          RD    7900   0.070   0.013       0    TRAP     125       2
              *

 166          KK     3-D
 167          KM    PORTION OF BASINS DB54-6R (PB=3. 56)
 168          BA    0.3329
 169          PB    3.59
 170          LS            0    84.6
 171          UD    0.223
              *

 172          KK   CP3.3
 173          KM    COMBI NE 3-D, RCP3.1,
 174          HC            2
              *

 175          KK RCP3.3
 176          KM    ROUTE CP3.3 TO CP3 . 4 THROUGH 3-E VIA A
 177          KM    (PORTION OF FACILITY APM50059)
 178          RD    1000   0.070   0.013       0    TRAP     125       2
              *

 179          KK     3-3
 180          KM    PORTION OF MPU BASIN DB54-3
 181          BA    0.1737
 182          PB    3.65
 183          LS            0    88.0
 184          UD    0.081
              *

 185          KK  R3-3
 186          KM    ROUTE R3 - 3 THROUGH A PORTIO N OF 3- E TO CP 3 . 2
 187          KM    NATURAL WASH
 188          RD    2233   0.054   0.030       0    TRAP     100       0
              *
1                                        HEC-1 INPUT                                          PAGE  6

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 189          KK     3-4
 190          KM    PORTIO N OF MPU BASI N DB54-3
 191          BA    0.3457
 192          PB    3.68
 193          LS            0    88.0
 194          UD    0.092
              *

 195          KK    R3-4
 196          KM    ROUTE R3 - 4 THROUGH A PORTIO N OF 3- E TO CP3 . 2
 197          KM    NATURAL WASH
 198          RD    3300   0.097   0.030       0    TRAP     100       0
              *

 199          KK     3-5
 200          KM    COMPARE TO MPU BASI N DB54- 2 (S LI GHTLY LARGER PORT IO N OF DB54 - 4)
 201          BA    0.2936
 202          PB    3.65
 203          LS            0    87.7
 204          UD    0.094
              *

 205          KK    R3-5
 206          KM    ROUTE R3 - 5 THROUGH A PORTIO N OF 3 - E TO CP 3 . 2
 207          KM    ( PORTI ON OF FACI LI TY APM5 00 57 )
 208          RD    4400   0.068   0.013       0    TRAP      50       2
              *

 209          KK   CP3.2
 210          KM    COMBINE  R3 - 5  ,   R3- 4  AND  R3 - 3
 211          HC            3
              *

 212          KK  RCP3.2
```

```
 213          KM    ROUTE RCP 3 . 2 THROUGH A PORTI ON OF 3- E TO CP 3. 4
 214          KM    ( PORTION OF FACI LIT Y APM500 57)
 215          RD    5500   0.068   0.013       0    TRAP      50       2
              *

 216          KK     3-E
 217          KM    PORTI ON OF BASI NS DB54-4 ( PB=3 . 60 ) AND DB54 - 6R ( PB=3. 56)
 218          BA    0.5442
 219          PB    3.57
 220          LS           0    85.8
 221          UD    0.238
              *

 222          KK   CP3.4
 223          KM    COMBI NE 3 - E, RCP3 . 2 AND RCP 3 . 3
 224          HC           3
              *
1                                    HEC-1 INPUT                                          PAGE  7

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 225          KK    RCP3.4
 226          KM    ROUTE RCP3 . 4 TO CPDBS
 227          KM    ( FACI LI TI ES APM50056, APM500 47 AND APM5 0 0 0 8 )
 228          RD    3365   0.052   0.013       0    TRAP      80       2
              *

 229          KK     3-6
 230          KM    PORTIO N OF MPU BASI N DBSS- 3 AND DBSS-4
 231          BA    0.0887
 232          PB    3.62
 233          LS           0    88.0
 234          UD    0.074
              *

 235          KK    R3-6
 236          KM    ROUTE 3 - 6 THROUGH A PORTION OF 3- J AND A PORTION OF 3 - K TO CP 3. 5
 237          KM    EXI STI NG NATURAL WASHES
 238          RD    4500   0.080   0.030       0    TRAP     100       0
              *

 239          KK     3-7
 240          KM    PORTION OF MPU BASI N DBSS- 3 AND DBSS-4
 241          BA    0.1714
 242          PB    3.61
 243          LS           0    87.2
 244          UD    0.048
              *

 245          KK    R3-7
 246          KM    ROUTE 3-7 THROUGH A PORTION OF 3-K TO CP3.5
 247          KM    PORTION OF FACILITY ID APM50213
 248          RD    4340   0.073   0.013       0    TRAP      50       2
              *

 249          KK     3-J
 250          KM    PORTION OF MPU BASIN DB55-4
 251          BA    0.1529
 252          PB    3.59
 253          LS           0    78.6
 254          UD    0.168
              *

 255          KK   R3-J
 256          KM    ROUTE 3-J THROUGH A PORTION OF 3-K TO CP3.5
 257          KM    NATURAL WASHES
 258          RD    2700   0.074   0.030       0    TRAP     100       0
              *

 259          KK   CP3.5
 260          KM    COMBINE R3-J , R3-7 AND R3-6
 261          HC           3
              *
1                                    HEC-1 INPUT                                          PAGE  8

            LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


 262          KK  RCP3.5
 263          KM    ROUTE CP3.5 THROUGH A PORTION OF 3-K TO CP3.6
 264          KM    PORTION OF FACILITY ID APM50213
 265          RD    2100   0.073   0.013       0    TRAP      50       2
              *

 266          KK     3-8
 267          KM    COMPARE TO MPU BASIN DB55-1
 268          BA    0.6386
 269          PB    3.70
```

```
 270          LS           0    87.8
 271          UD    0.196
              *

 272          KK    R3-8
 273          KM    ROUTE 3-8 THROUGH A PORTION OF 3-K TO CP3.6
 274          KM    FACILITY ID APM50212
 275          RD    6695   0.075   0.013       0    TRAP      30       2
              *

 276          KK     3-K
 277          KM    COMPARE TO MPU BASIN DB55-7
 278          BA    0.8890
 279          PB    3.54
 280          LS           0    87.6
 281          UD    0.296
              *

 282          KK   CP3.6
 283          KM    COMBI NE 3-K, R3-8 AND RCP3.5
 284          HC           3
              *

 285          KK RCP3.6
 286          KM    ROUTE CP3.6 TO CPDB5
 287          KM    FACILITY ID APM500009
 288          RD    4180   0.058   0.013       0    TRAP      50       2
              *

 289          KK     3-N
 290          KM    COMPARE TO MPU BASIN DB55-8
 291          BA    0.4532
 292          PB    3.46
 293          LS           0    88.9
 294          UD    0.269
              *

 295          KK     3-M
 296          KM    COMPARE TO MPU BASIN DB55-8
 297          BA    0.1924
 298          PB    3.48
 299          LS           0    88.8
 300          UD    0.147
              *
```



```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 301          KK    R3-M
 302          KM    ROUTE 3-M TO CPDB5
 303          KM    FACILITY ID PORTION OF APM500009
 304          RD    4500  0.0528   0.013       0    TRAP       7       0
              *

 305          KK   CPDB5
 306          KM    COMBINE 3-M, 3-N, RCP3.6 AND RCP3.4
 307          KM    TOTAL INFLOW TO SUMMERLIN #5 DETENTION BASIN
 308          KO           0
 309          HC           4
              *

 310          KK     DB5
 311          KM    SUMMERLIN DETENTION BASIN 5
 312          KO           0
 313          RS           1    STOR     -1
 314          SV           0    1.73    4.55    8.45   13.08    18.2   23.81   29.96   36.70   43.93
 315          SV   59.55    77.49   99.82  127.17  159.39  196.38  240.07  384.05  405.65  535.25
 316          SQ           0     192     276     391     505     616     725     813     900     982
 317          SQ    1176    1368    1534    1683    1804    1920    2033    2315    3725   23201
 318          SE    3532.5    3535    3536    3537    3538    3539    3540    3541    3542    3543
 319          SE    3545    3547    3549    3551    3553    3555    3557    3563    3564   3569
 320          SS    3563           435.6   3            1.5
              *

 321          KK   60RCP
 322          DT     7X5
 323          DI           0    1000    1600    2000    2400
 324          DQ           0    1000    1400    1700    2000
              *

 325          KK     CPA
 326          KM   CP4 & DB5 flow from 60" RCP
 327          HC       2
              *

 328          KK     CP5
 329          KM   COMBINE CP4 & BW38
 330          HC       2
```

```
                    *

          331       KK     7X5
          332       DR     7X5
                    *

          333       KK     CPB
          334       HC       2
                    *
1                                          HEC-1 INPUT                                          PAGE 10

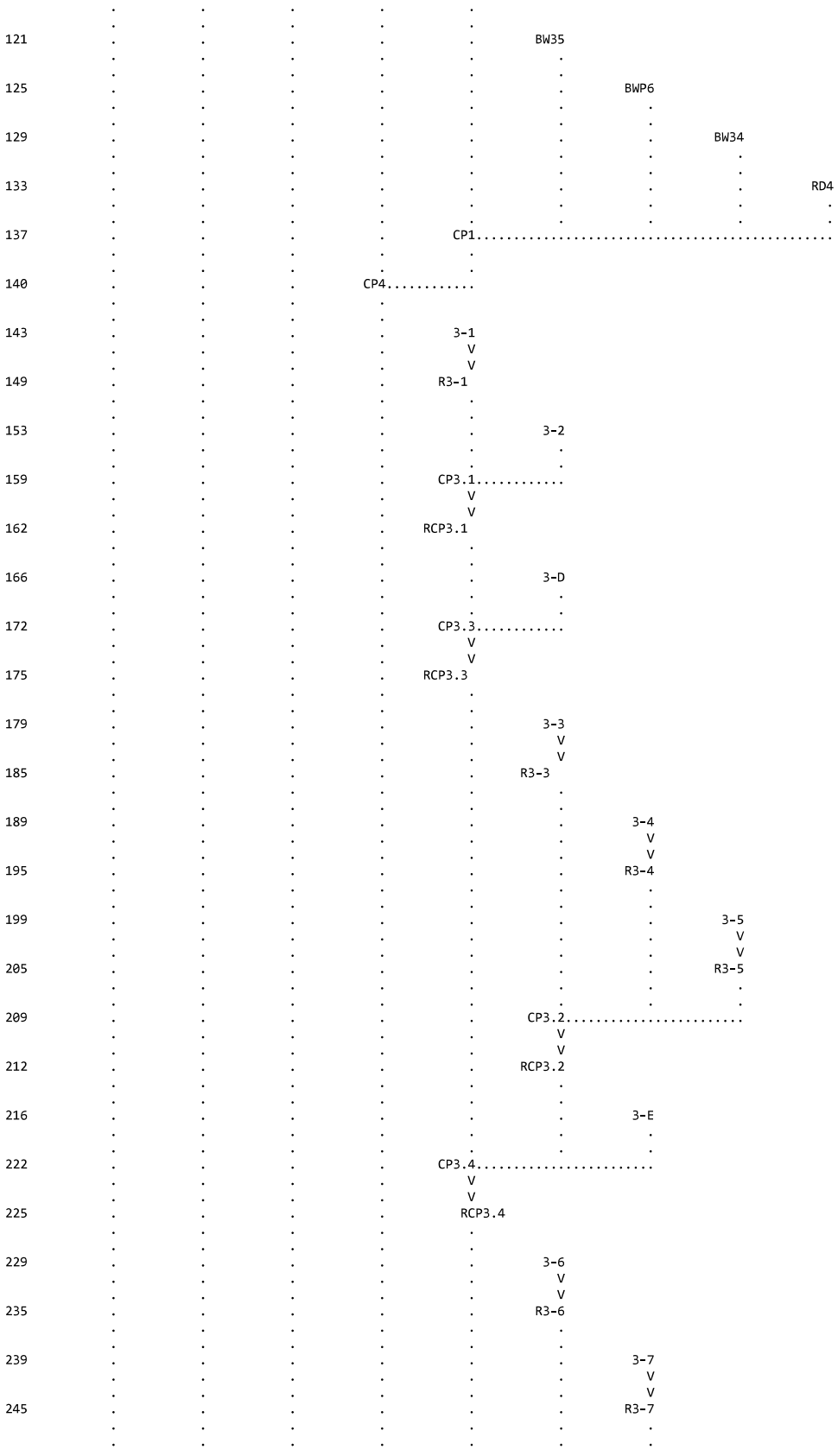
         LINE       ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

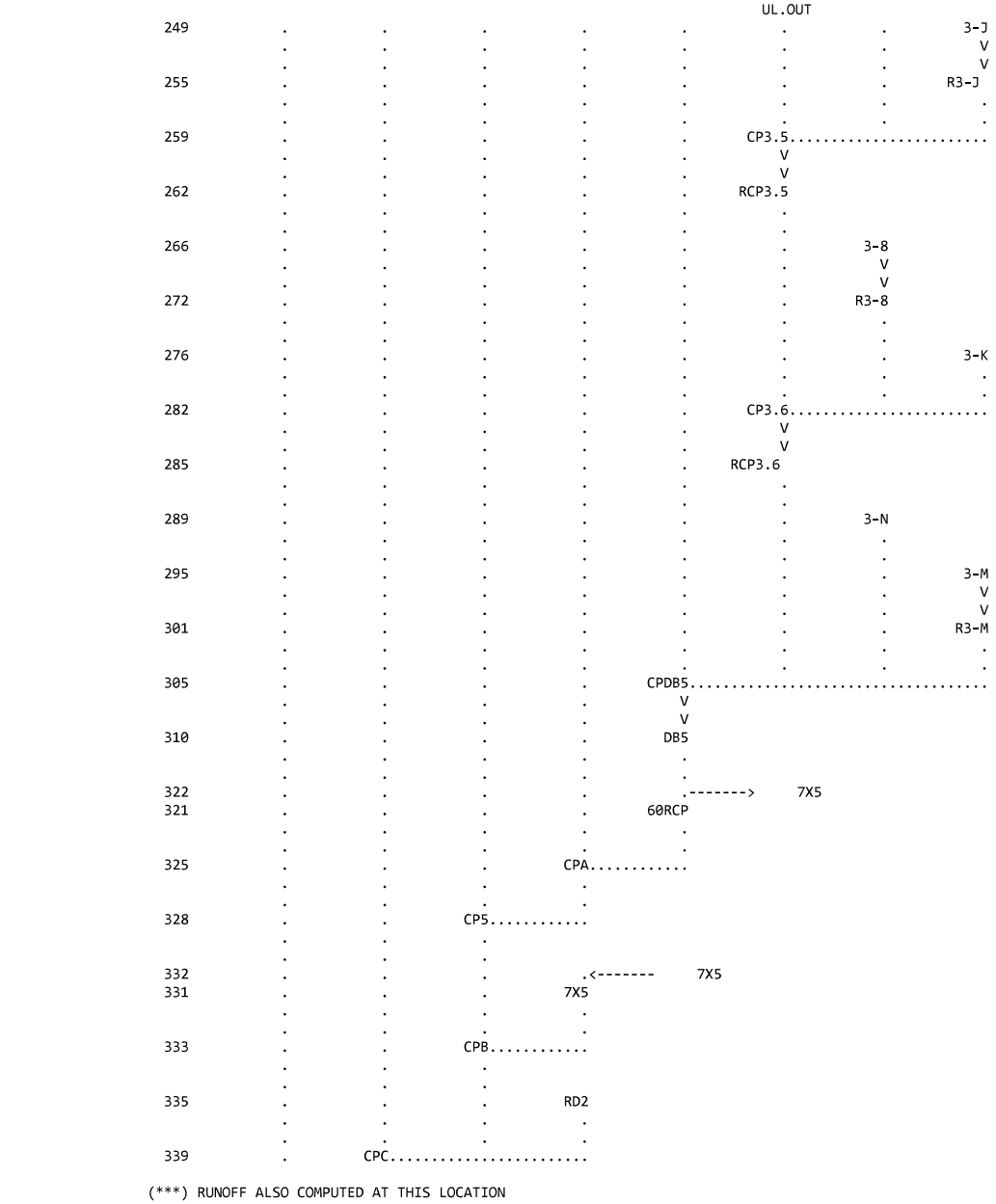

          335       KK     RD2
          336       BA  0.0158
          337       LS       0    98.0
          338       UD    .158
                    *

          339       KK     CPC
          340       HC       3
                    *
          341       ZZ
1
               SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    36       LPRW5
             .
             .
    49       .        LR31
             .          .
             .          .
    53       .          .         RD5
             .          .           .
             .          .           .
    58       DUMMY.....................
             .
             .
    61       .        LR30
             .          .
             .          .
    65       .          .       LR32
             .          .         .
             .          .         .
    69       .          .         .       LR33
             .          .         .         .
             .          .         .         .
    73       .          .         .         .      LRP4B
             .          .         .         .          .
             .          .         .         .          .
    77        CP2A.........................................
             .
             .
    80       .         RD1
             .          .
             .          .
    85        CP2............
             .
             .
    87       .        BW39
             .          .
             .          .
    91       .          .         RD3
             .          .           .
             .          .           .
    95       .          .           .        SB1
             .          .           .         .
             .          .           .         .
    99       .         CP3.........................
             .          .
             .          .
   102       .          .         OF1
             .          .           .
             .          .           .
   106       .          .           .       BW38
             .          .           .         .
             .          .           .         .
   110       .          .         CPO.............
             .          .           .
             .          .           .
   113       .          .           .       BW36
             .          .           .         .
             .          .           .         .
   117       .          .           .         .      BWPW6
```


121 BW35
125 BWP6
129 BW34
133 RD4
137 CP1
140 CP4
143 3-1
149 R3-1
153 3-2
159 CP3.1
162 RCP3.1
166 3-D
172 CP3.3
175 RCP3.3
179 3-3
185 R3-3
189 3-4
195 R3-4
199 3-5
205 R3-5
209 CP3.2
212 RCP3.2
216 3-E
222 CP3.4
225 RCP3.4
229 3-6
235 R3-6
239 3-7
245 R3-7




(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

1**********

*

* FLOOD HYDROGRAPH PACKAGE (HEC-1) *

* JUN 1998 *

* VERSION 4.1 *

*

* RUN DATE 07DEC18 TIME 11:24:47 *

*

**********

**********

*

* U.S. ARMY CORPS OF ENGINEERS *

* HYDROLOGIC ENGINEERING CENTER *

* 609 SECOND STREET *

* DAVIS, CALIFORNIA 95616 *

* (916) 756-1104 *

*

**********

**********

* *

* SUMMERLIN VILLAGE 23B *

* SKY VISTA DRIVE *

* ULTIMATE CONDITIONS *

* DEVELOPED ONSITE *

* DEVELOPED OFFSITE *

* *

* RETURN PERIOD_ _ _ _10 & 100-YEAR *

* DISTRIBUTION_ _ _ _ 6-HOUR SDN3 *

```
                        * :             PROJECT NO_ _ _ _ _ 62023B-240             : *
                        * :             FILENAME_ _ _ _ _ _ UL.H1                  : *
                        * :             DATE_ _ _ _ _ _ _ _ 03/15/2018             : *
                        * :             MODELED BY_ _ _ _ _ ME                     : *
                        * :.........................................................: *
                        * :                                                         : *
                        * :.........................................................: *
                        ************************************************************

                         JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

                                                AREA      DARF
                                              SQ.MI.

                                             0.0 - 0.5    1.00
                                             0.5 - 1.0    0.98
                                             1.0 - 2.0    0.95
                                             2.0 - 4.0    0.92
                                             4.0 - 6.0    0.91
                                             6.0 - 8.0    0.89


  33 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME        1635  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE   16.58 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

     JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00       .98       .95       .92       .91       .89       .54


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
 305 KK       *     CPDB5  *
              *            *
              **************

 308 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE



*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


              **************
              *            *
 310 KK       *       DB5  *
              *            *
              **************

 312 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
```

FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

| OPERATION | STATION | AREA | PLAN | | RATIOS APPLIED TO PRECIPITATION RATIO 1 | RATIO 2 | RATIO 3 | RATIO 4 | RATIO 5 | RATIO 6 | RATIO 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1.00 | .98 | .95 | .92 | .91 | .89 | .54 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | LPRW5 | .01 | 1 | FLOW | 16. | 15. | 15. | 14. | 14. | 13. | 6. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | LR31 | .01 | 1 | FLOW | 25. | 25. | 24. | 23. | 23. | 22. | 12. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | RD5 | .00 | 1 | FLOW | 9. | 9. | 8. | 8. | 8. | 8. | 5. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 3 COMBINED AT | | | | | | | | | | | |
| + | DUMMY | .02 | 1 | FLOW | 50. | 49. | 47. | 45. | 45. | 43. | 23. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | LR30 | .04 | 1 | FLOW | 80. | 78. | 75. | 72. | 71. | 69. | 36. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | LR32 | .02 | 1 | FLOW | 39. | 39. | 37. | 36. | 35. | 34. | 19. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | LR33 | .01 | 1 | FLOW | 26. | 26. | 25. | 24. | 23. | 23. | 12. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | LRP4B | .00 | 1 | FLOW | 4. | 4. | 4. | 4. | 4. | 3. | 2. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 5 COMBINED AT | | | | | | | | | | | |
| + | CP2A | .09 | 1 | FLOW | 199. | 194. | 187. | 180. | 177. | 173. | 90. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | RD1 | .00 | 1 | FLOW | 9. | 9. | 8. | 8. | 8. | 8. | 5. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 2 COMBINED AT | | | | | | | | | | | |
| + | CP2 | .09 | 1 | FLOW | 207. | 202. | 195. | 188. | 185. | 180. | 95. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | BW39 | .03 | 1 | FLOW | 84. | 82. | 80. | 77. | 76. | 74. | 41. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | RD3 | .00 | 1 | FLOW | 6. | 6. | 5. | 5. | 5. | 5. | 3. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | SB1 | .00 | 1 | FLOW | 10. | 10. | 9. | 9. | 9. | 8. | 4. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 3 COMBINED AT | | | | | | | | | | | |
| + | CP3 | .04 | 1 | FLOW | 100. | 98. | 94. | 91. | 90. | 88. | 48. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| ROGRAPH AT | OF1 | .01 | 1 | FLOW | 18. | 18. | 17. | 16. | 16. | 16. | 8. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | BW38 | .03 | 1 | FLOW | 80. | 78. | 75. | 73. | 72. | 70. | 37. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 2 COMBINED AT | | | | | | | | | | | |
| + | CPO | .04 | 1 | FLOW | 98. | 96. | 92. | 89. | 88. | 85. | 45. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | BW36 | .04 | 1 | FLOW | 78. | 76. | 73. | 70. | 68. | 66. | 30. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.58 |
| HYDROGRAPH AT | | | | | | | | | | | |
| + | BWPW6 | .00 | 1 | FLOW | 10. | 10. | 10. | 9. | 9. | 9. | 4. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| HYDROGRAPH AT | | | | | | | | | | | |

REFERENCED BASINS

UL.OUT

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| + | BW35 | .02 | 1 | FLOW | 61. | 60. | 58. | 56. | 55. | 54. | 29. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | BWP6 | .00 | 1 | FLOW | 6. | 6. | 6. | 5. | 5. | 5. | 2. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | BW34 | .06 | 1 | FLOW | 139. | 135. | 131. | 126. | 124. | 121. | 66. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | RD4 | .00 | 1 | FLOW | 12. | 12. | 11. | 11. | 11. | 11. | 6. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| 5 COMBINED AT | | | | | | | | | | | | |
| + | CP1 | .09 | 1 | FLOW | 228. | 223. | 215. | 207. | 205. | 200. | 107. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| 2 COMBINED AT | | | | | | | | | | | | |
| + | CP4 | .14 | 1 | FLOW | 307. | 299. | 288. | 277. | 273. | 266. | 136. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-1 | 2.22 | 1 | FLOW | 2356. | 2292. | 2196. | 2101. | 2069. | 2005. | 927. | |
| | | | | TIME | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.08 | |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-1 | 2.22 | 1 | FLOW | 2346. | 2282. | 2184. | 2094. | 2057. | 1994. | 924. | |
| | | | | TIME | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-2 | .23 | 1 | FLOW | 435. | 423. | 405. | 386. | 380. | 368. | 168. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.58 | |
| 2 COMBINED AT | | | | | | | | | | | | |
| + | CP3.1 | 2.45 | 1 | FLOW | 2421. | 2356. | 2255. | 2162. | 2124. | 2058. | 957. | |
| | | | | TIME | 4.08 | 4.08 | 4.00 | 4.08 | 4.08 | 4.08 | 4.08 | |
| ROUTED TO | | | | | | | | | | | | |
| + | RCP3.1 | 2.45 | 1 | FLOW | 2409. | 2357. | 2259. | 2154. | 2117. | 2055. | 960. | |
| | | | | TIME | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.17 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-D | .33 | 1 | FLOW | 495. | 481. | 459. | 438. | 431. | 417. | 180. | |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | |
| 2 COMBINED AT | | | | | | | | | | | | |
| + | CP3.3 | 2.78 | 1 | FLOW | 2582. | 2526. | 2421. | 2309. | 2270. | 2204. | 1015. | |
| | | | | TIME | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.17 | |
| ROUTED TO | | | | | | | | | | | | |
| + | RCP3.3 | 2.78 | 1 | FLOW | 2580. | 2522. | 2418. | 2306. | 2267. | 2201. | 1014. | |
| | | | | TIME | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.08 | 4.17 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-3 | .17 | 1 | FLOW | 397. | 387. | 371. | 356. | 351. | 340. | 163. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-3 | .17 | 1 | FLOW | 373. | 365. | 351. | 337. | 333. | 323. | 148. | |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-4 | .35 | 1 | FLOW | 767. | 747. | 717. | 687. | 677. | 657. | 314. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-4 | .35 | 1 | FLOW | 739. | 720. | 692. | 665. | 655. | 636. | 292. | |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-5 | .29 | 1 | FLOW | 634. | 617. | 592. | 567. | 559. | 542. | 256. | |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-5 | .29 | 1 | FLOW | 609. | 588. | 566. | 546. | 537. | 523. | 251. | |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | |
| 3 COMBINED AT | | | | | | | | | | | | |
| + | CP3.2 | .81 | 1 | FLOW | 1721. | 1674. | 1609. | 1548. | 1525. | 1483. | 692. | |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | |
| ROUTED TO | | | | | | | | | | | | |
| + | RCP3.2 | .81 | 1 | FLOW | 1650. | 1605. | 1539. | 1480. | 1459. | 1423. | 658. | |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.67 | |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-E | .54 | 1 | FLOW | 821. | 797. | 763. | 728. | 717. | 694. | 308. | |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| 3 COMBINED AT | | | | | | | | | | | | |
| + | CP3.4 | 4.14 | 1 | FLOW | 4121. | 4001. | 3832. | 3675. | 3609. | 3502. | 1501. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | |
| + | RCP3.4 | 4.14 | 1 | FLOW | 4066. | 3943. | 3767. | 3608. | 3542. | 3432. | 1493. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.75 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-6 | .09 | 1 | FLOW | 206. | 201. | 193. | 185. | 182. | 177. | 85. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-6 | .09 | 1 | FLOW | 185. | 185. | 179. | 172. | 169. | 162. | 76. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-7 | .17 | 1 | FLOW | 429. | 417. | 401. | 384. | 378. | 367. | 176. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-7 | .17 | 1 | FLOW | 365. | 351. | 334. | 321. | 317. | 308. | 156. |
| | | | | TIME | 3.50 | 3.50 | 3.50 | 3.58 | 3.58 | 3.58 | 3.58 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-J | .15 | 1 | FLOW | 203. | 197. | 186. | 176. | 172. | 166. | 57. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-J | .15 | 1 | FLOW | 197. | 190. | 178. | 168. | 164. | 158. | 58. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.75 |
| 3 COMBINED AT | | | | | | | | | | | | |
| + | CP3.5 | .41 | 1 | FLOW | 702. | 679. | 648. | 618. | 608. | 589. | 231. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| ROUTED TO | | | | | | | | | | | | |
| + | RCP3.5 | .41 | 1 | FLOW | 682. | 659. | 627. | 595. | 584. | 564. | 227. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-8 | .64 | 1 | FLOW | 1151. | 1121. | 1075. | 1029. | 1014. | 983. | 461. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-8 | .64 | 1 | FLOW | 1141. | 1112. | 1065. | 1019. | 1002. | 974. | 456. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-K | .89 | 1 | FLOW | 1269. | 1235. | 1184. | 1133. | 1116. | 1082. | 506. |
| | | | | TIME | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |
| 3 COMBINED AT | | | | | | | | | | | | |
| + | CP3.6 | 1.94 | 1 | FLOW | 2996. | 2929. | 2804. | 2682. | 2639. | 2557. | 1169. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| ROUTED TO | | | | | | | | | | | | |
| + | RCP3.6 | 1.94 | 1 | FLOW | 2931. | 2860. | 2738. | 2617. | 2571. | 2496. | 1167. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.75 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-N | .45 | 1 | FLOW | 687. | 669. | 642. | 615. | 606. | 588. | 279. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 |
| HYDROGRAPH AT | | | | | | | | | | | | |
| + | 3-M | .19 | 1 | FLOW | 367. | 358. | 344. | 329. | 325. | 315. | 152. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| ROUTED TO | | | | | | | | | | | | |
| + | R3-M | .19 | 1 | FLOW | 356. | 346. | 332. | 318. | 313. | 305. | 144. |
| | | | | TIME | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 | 3.58 |
| 4 COMBINED AT | | | | | | | | | | | | |
| + | CPDB5 | 6.72 | 1 | FLOW | 8005. | 7785. | 7447. | 7128. | 7005. | 6792. | 3049. |
| | | | | TIME | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.67 | 3.75 |
| ROUTED TO | | | | | | | | | | | | |
| + | DB5 | 6.72 | 1 | FLOW | 2286. | 2257. | 2214. | 2171. | 2156. | 2129. | 1469. |
| | | | | TIME | 5.08 | 5.08 | 5.08 | 5.08 | 5.08 | 5.00 | 4.33 |
| | | | ** PEAK STAGES IN FEET ** | | | | | | | | | |
| | | | 1 | STAGE | 3562.38 | 3561.77 | 3560.85 | 3559.95 | 3559.63 | 3559.05 | 3548.22 |
| | | | | TIME | 5.08 | 5.08 | 5.08 | 5.08 | 5.08 | 5.00 | 4.33 |
| DIVERSION TO | | | | | | | | | | | | |
| + | 7X5 | 6.72 | 1 | FLOW | 1915. | 1893. | 1860. | 1829. | 1817. | 1797. | 1313. |
| | | | | TIME | 5.08 | 5.08 | 5.08 | 5.08 | 5.08 | 5.00 | 4.33 |

```
 HYDROGRAPH AT
+                  60RCP      6.72     1   FLOW         372.     364.     353.     343.     339.     332.     156.
                                            TIME         5.08     5.08     5.08     5.08     5.08     5.00     4.33

  2 COMBINED AT
+                    CPA      6.86     1   FLOW         422.     414.     402.     391.     387.     379.     177.
                                            TIME         4.83     4.83     4.58     4.58     4.58     4.58     4.50

  2 COMBINED AT
+                    CP5      6.90     1   FLOW         496.     478.     451.     426.     416.     397.     186.
                                            TIME         3.58     3.58     3.58     3.58     3.58     3.58     4.58

 HYDROGRAPH AT
+                    7X5       .00     1   FLOW        1915.    1893.    1860.    1829.    1817.    1797.    1313.
                                            TIME         5.08     5.08     5.08     5.08     5.08     5.00     4.33

  2 COMBINED AT
+                    CPB      6.90     1   FLOW        2346.    2317.    2273.    2230.    2215.    2187.    1491.
                                            TIME         4.83     4.83     4.83     4.83     4.83     4.83     4.50

 HYDROGRAPH AT
+                    RD2       .02     1   FLOW          36.      35.      34.      33.      33.      32.      19.
                                            TIME         3.58     3.58     3.58     3.58     3.58     3.58     3.58

  3 COMBINED AT
+                    CPC      6.96     1   FLOW        2368.    2339.    2294.    2251.    2235.    2207.    1502.
                                            TIME         4.83     4.83     4.83     4.83     4.83     4.83     4.50
1
                                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                                            (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                  INTERPOLATED TO
                                                                                COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT       PEAK     TIME TO     VOLUME      DT       PEAK     TIME TO     VOLUME
                                                       PEAK                                     PEAK

                                  (MIN)     (CFS)      (MIN)     (IN)     (MIN)     (CFS)     (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         2.66   2349.13    244.73      2.41      5.00   2345.98    245.00        2.41


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2851E+03 EXCESS= .0000E+00 OUTFLOW= .2852E+03 BASIN STORAGE= .7278E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         2.69   2285.11    244.75      2.34      5.00   2282.43    245.00        2.34


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2771E+03 EXCESS= .0000E+00 OUTFLOW= .2771E+03 BASIN STORAGE= .6824E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         2.74   2185.83    243.50      2.24      5.00   2184.24    245.00        2.24


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2651E+03 EXCESS= .0000E+00 OUTFLOW= .2651E+03 BASIN STORAGE= .7911E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         2.79   2095.14    242.31      2.14      5.00   2094.17    245.00        2.14


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2531E+03 EXCESS= .0000E+00 OUTFLOW= .2531E+03 BASIN STORAGE= .6890E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         2.80   2059.18    243.79      2.10      5.00   2057.00    245.00        2.10


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2491E+03 EXCESS= .0000E+00 OUTFLOW= .2491E+03 BASIN STORAGE= .6543E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         2.84   1996.02    244.02      2.04      5.00   1993.62    245.00        2.04


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2412E+03 EXCESS= .0000E+00 OUTFLOW= .2412E+03 BASIN STORAGE= .7632E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             R3-1        MANE         3.86    924.57    247.23       .93      5.00    924.19    245.00         .93


 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1095E+03 EXCESS= .0000E+00 OUTFLOW= .1096E+03 BASIN STORAGE= .7590E-02 PERCENT ERROR=    .0


          FOR PLAN = 1  RATIO=  .00
             RCP3.1      MANE         4.25   2420.08    246.38      2.39      5.00   2408.70    245.00        2.39
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3118E+03 EXCESS= .0000E+00 OUTFLOW= .3118E+03 BASIN STORAGE= .1258E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.1 | MANE | 4.29 | 2357.23 | 244.70 | 2.32 | 5.00 | 2356.52 | 245.00 | 2.32 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3030E+03 EXCESS= .0000E+00 OUTFLOW= .3031E+03 BASIN STORAGE= .1132E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.1 | MANE | 4.37 | 2260.70 | 244.49 | 2.22 | 5.00 | 2259.16 | 245.00 | 2.22 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2899E+03 EXCESS= .0000E+00 OUTFLOW= .2899E+03 BASIN STORAGE= .1066E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.1 | MANE | 4.44 | 2154.59 | 248.48 | 2.12 | 5.00 | 2154.08 | 245.00 | 2.12 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2767E+03 EXCESS= .0000E+00 OUTFLOW= .2767E+03 BASIN STORAGE= .1079E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.1 | MANE | 4.47 | 2125.42 | 245.72 | 2.09 | 5.00 | 2117.13 | 245.00 | 2.09 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2723E+03 EXCESS= .0000E+00 OUTFLOW= .2724E+03 BASIN STORAGE= .1141E-01 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.1 | MANE | 4.52 | 2056.20 | 244.17 | 2.02 | 5.00 | 2055.43 | 245.00 | 2.02 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2636E+03 EXCESS= .0000E+00 OUTFLOW= .2637E+03 BASIN STORAGE= .9756E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.1 | MANE | 5.00 | 960.00 | 250.00 | .92 | 5.00 | 960.00 | 250.00 | .92 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1194E+03 EXCESS= .0000E+00 OUTFLOW= .1194E+03 BASIN STORAGE= .1037E-01 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.3 | MANE | .52 | 2581.07 | 245.48 | 2.35 | 5.00 | 2579.57 | 245.00 | 2.35 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3484E+03 EXCESS= .0000E+00 OUTFLOW= .3484E+03 BASIN STORAGE= .1140E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.3 | MANE | .53 | 2524.12 | 245.47 | 2.28 | 5.00 | 2522.32 | 245.00 | 2.29 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3386E+03 EXCESS= .0000E+00 OUTFLOW= .3386E+03 BASIN STORAGE= .1112E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.3 | MANE | .54 | 2419.10 | 245.19 | 2.18 | 5.00 | 2418.14 | 245.00 | 2.19 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3238E+03 EXCESS= .0000E+00 OUTFLOW= .3238E+03 BASIN STORAGE= .1172E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.3 | MANE | .55 | 2307.47 | 245.31 | 2.08 | 5.00 | 2305.95 | 245.00 | 2.08 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3089E+03 EXCESS= .0000E+00 OUTFLOW= .3089E+03 BASIN STORAGE= .1162E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.3 | MANE | .55 | 2268.14 | 245.28 | 2.05 | 5.00 | 2266.54 | 245.00 | 2.05 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3040E+03 EXCESS= .0000E+00 OUTFLOW= .3040E+03 BASIN STORAGE= .1162E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.3 | MANE | .56 | 2201.96 | 245.31 | 1.99 | 5.00 | 2200.56 | 245.00 | 1.99 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2943E+03 EXCESS= .0000E+00 OUTFLOW= .2943E+03 BASIN STORAGE= .1098E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
RCP3.3 MANE .75 1014.41 250.15 .89 5.00 1014.28 250.00 .89

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1324E+03 EXCESS= .0000E+00 OUTFLOW= .1324E+03 BASIN STORAGE= .1214E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00
R3-3 MANE 3.25 379.69 214.50 2.41 5.00 372.79 215.00 2.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2227E+02 EXCESS= .0000E+00 OUTFLOW= .2232E+02 BASIN STORAGE= .6444E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-3 MANE 3.50 378.94 213.50 2.35 5.00 365.45 215.00 2.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2171E+02 EXCESS= .0000E+00 OUTFLOW= .2176E+02 BASIN STORAGE= .5218E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-3 MANE 3.50 363.45 213.50 2.25 5.00 351.27 215.00 2.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2079E+02 EXCESS= .0000E+00 OUTFLOW= .2083E+02 BASIN STORAGE= .5137E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-3 MANE 3.75 348.62 213.75 2.15 5.00 337.44 215.00 2.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1987E+02 EXCESS= .0000E+00 OUTFLOW= .1992E+02 BASIN STORAGE= .6904E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-3 MANE 3.75 343.46 213.75 2.12 5.00 332.67 215.00 2.11

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1957E+02 EXCESS= .0000E+00 OUTFLOW= .1961E+02 BASIN STORAGE= .6866E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-3 MANE 3.75 333.16 213.75 2.05 5.00 323.11 215.00 2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1896E+02 EXCESS= .0000E+00 OUTFLOW= .1900E+02 BASIN STORAGE= .6790E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-3 MANE 4.25 152.47 216.75 .94 5.00 148.36 215.00 .94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8704E+01 EXCESS= .0000E+00 OUTFLOW= .8724E+01 BASIN STORAGE= .6768E-02 PERCENT ERROR= -.3

FOR PLAN = 1 RATIO= .00
R3-4 MANE 3.50 759.69 213.50 2.44 5.00 739.13 215.00 2.44

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4493E+02 EXCESS= .0000E+00 OUTFLOW= .4502E+02 BASIN STORAGE= .8519E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00
R3-4 MANE 3.50 739.47 213.50 2.37 5.00 720.32 215.00 2.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4368E+02 EXCESS= .0000E+00 OUTFLOW= .4377E+02 BASIN STORAGE= .8431E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00
R3-4 MANE 3.50 709.14 213.50 2.27 5.00 692.08 215.00 2.27

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4182E+02 EXCESS= .0000E+00 OUTFLOW= .4190E+02 BASIN STORAGE= .8298E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00
R3-4 MANE 3.75 681.60 213.75 2.17 5.00 664.90 215.00 2.17

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3998E+02 EXCESS= .0000E+00 OUTFLOW= .4005E+02 BASIN STORAGE= .6833E-02 PERCENT ERROR= -.2

FOR PLAN = 1 RATIO= .00
R3-4 MANE 3.75 671.49 213.75 2.14 5.00 655.40 215.00 2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3936E+02 EXCESS= .0000E+00 OUTFLOW= .3943E+02 BASIN STORAGE= .6797E-02 PERCENT ERROR= -.2

```
          FOR PLAN = 1  RATIO=  .00
              R3-4  MANE         3.75    651.25    213.75      2.07      5.00    636.39    215.00        2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3813E+02 EXCESS= .0000E+00 OUTFLOW= .3820E+02 BASIN STORAGE= .6722E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
              R3-4  MANE         4.25    301.93    216.75       .95      5.00    292.36    215.00         .95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1756E+02 EXCESS= .0000E+00 OUTFLOW= .1760E+02 BASIN STORAGE= .6986E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         2.90    613.70    214.79      2.38      5.00    609.16    215.00        2.38

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3725E+02 EXCESS= .0000E+00 OUTFLOW= .3729E+02 BASIN STORAGE= .2899E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         2.93    604.21    213.97      2.31      5.00    588.25    215.00        2.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3619E+02 EXCESS= .0000E+00 OUTFLOW= .3622E+02 BASIN STORAGE= .3969E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         2.98    577.94    214.27      2.21      5.00    566.11    215.00        2.22

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3460E+02 EXCESS= .0000E+00 OUTFLOW= .3464E+02 BASIN STORAGE= .3896E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         3.02    551.26    214.67      2.12      5.00    545.55    215.00        2.12

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3311E+02 EXCESS= .0000E+00 OUTFLOW= .3315E+02 BASIN STORAGE= .3747E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         3.04    550.21    212.80      2.09      5.00    537.03    215.00        2.08

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3262E+02 EXCESS= .0000E+00 OUTFLOW= .3265E+02 BASIN STORAGE= .4165E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         3.07    523.50    215.18      2.02      5.00    523.33    215.00        2.02

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3159E+02 EXCESS= .0000E+00 OUTFLOW= .3162E+02 BASIN STORAGE= .3534E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R3-5  MANE         3.75    254.05    213.75       .93      5.00    251.45    215.00         .92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1449E+02 EXCESS= .0000E+00 OUTFLOW= .1451E+02 BASIN STORAGE= .4266E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
            RCP3.2  MANE         2.52   1673.65    216.35      2.41      5.00   1650.24    215.00        2.41

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1046E+03 EXCESS= .0000E+00 OUTFLOW= .1046E+03 BASIN STORAGE= .3557E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
            RCP3.2  MANE         2.54   1627.94    216.02      2.34      5.00   1605.12    215.00        2.34

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1016E+03 EXCESS= .0000E+00 OUTFLOW= .1017E+03 BASIN STORAGE= .4466E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
            RCP3.2  MANE         2.58   1563.67    216.58      2.24      5.00   1538.95    215.00        2.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9727E+02 EXCESS= .0000E+00 OUTFLOW= .9734E+02 BASIN STORAGE= .3694E-02 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
            RCP3.2  MANE         2.62   1504.79    217.08      2.15      5.00   1479.90    215.00        2.15
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9307E+02 EXCESS= .0000E+00 OUTFLOW= .9312E+02 BASIN STORAGE= .4279E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.2 | MANE | 2.63 | 1478.97 | 215.63 | 2.11 | 5.00 | 1458.91 | 215.00 | 2.11 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9152E+02 EXCESS= .0000E+00 OUTFLOW= .9158E+02 BASIN STORAGE= .4427E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.2 | MANE | 2.66 | 1431.99 | 217.87 | 2.05 | 5.00 | 1422.82 | 215.00 | 2.05 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8882E+02 EXCESS= .0000E+00 OUTFLOW= .8887E+02 BASIN STORAGE= .5049E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.2 | MANE | 3.51 | 679.30 | 217.79 | .94 | 5.00 | 657.61 | 220.00 | .94 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4070E+02 EXCESS= .0000E+00 OUTFLOW= .4073E+02 BASIN STORAGE= .3590E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 1.39 | 4099.79 | 221.68 | 2.34 | 5.00 | 4065.74 | 220.00 | 2.34 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5154E+03 EXCESS= .0000E+00 OUTFLOW= .5154E+03 BASIN STORAGE= .3367E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 1.41 | 3993.52 | 221.35 | 2.27 | 5.00 | 3942.90 | 220.00 | 2.27 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5008E+03 EXCESS= .0000E+00 OUTFLOW= .5008E+03 BASIN STORAGE= .3434E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 1.43 | 3809.91 | 220.68 | 2.17 | 5.00 | 3766.97 | 220.00 | 2.17 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4787E+03 EXCESS= .0000E+00 OUTFLOW= .4787E+03 BASIN STORAGE= .3287E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 1.46 | 3667.51 | 221.30 | 2.07 | 5.00 | 3607.57 | 220.00 | 2.07 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4572E+03 EXCESS= .0000E+00 OUTFLOW= .4572E+03 BASIN STORAGE= .3352E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 1.47 | 3602.57 | 221.35 | 2.04 | 5.00 | 3541.72 | 220.00 | 2.04 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4496E+03 EXCESS= .0000E+00 OUTFLOW= .4496E+03 BASIN STORAGE= .3514E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 1.48 | 3486.18 | 220.92 | 1.97 | 5.00 | 3431.94 | 220.00 | 1.98 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4357E+03 EXCESS= .0000E+00 OUTFLOW= .4357E+03 BASIN STORAGE= .3736E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.4 | MANE | 2.04 | 1504.27 | 222.50 | .89 | 5.00 | 1493.14 | 225.00 | .89 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1959E+03 EXCESS= .0000E+00 OUTFLOW= .1959E+03 BASIN STORAGE= .3286E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| R3-6 | MANE | 3.25 | 190.55 | 217.75 | 2.39 | 5.00 | 184.79 | 220.00 | 2.39 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1124E+02 EXCESS= .0000E+00 OUTFLOW= .1130E+02 BASIN STORAGE= .9859E-02 PERCENT ERROR= -.6

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| R3-6 | MANE | 3.50 | 187.08 | 217.00 | 2.33 | 5.00 | 185.30 | 220.00 | 2.33 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1097E+02 EXCESS= .0000E+00 OUTFLOW= .1102E+02 BASIN STORAGE= .9474E-02 PERCENT ERROR= -.6

FOR PLAN = 1 RATIO= .00

```
     R3-6  MANE         3.50    179.09    217.00      2.23      5.00    178.51    220.00        2.23

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1050E+02 EXCESS= .0000E+00 OUTFLOW= .1056E+02 BASIN STORAGE= .9358E-02 PERCENT ERROR=   -.6


   FOR PLAN = 1  RATIO=  .00
     R3-6  MANE         3.50    171.74    220.50      2.13      5.00    171.65    220.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1003E+02 EXCESS= .0000E+00 OUTFLOW= .1009E+02 BASIN STORAGE= .9240E-02 PERCENT ERROR=   -.7


   FOR PLAN = 1  RATIO=  .00
     R3-6  MANE         3.50    169.50    220.50      2.10      5.00    169.35    220.00        2.10

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9874E+01 EXCESS= .0000E+00 OUTFLOW= .9932E+01 BASIN STORAGE= .9200E-02 PERCENT ERROR=   -.7


   FOR PLAN = 1  RATIO=  .00
     R3-6  MANE         3.75    163.66    217.50      2.04      5.00    161.96    220.00        2.03

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9573E+01 EXCESS= .0000E+00 OUTFLOW= .9628E+01 BASIN STORAGE= .1160E-01 PERCENT ERROR=   -.7


   FOR PLAN = 1  RATIO=  .00
     R3-6  MANE         4.25     78.32    221.00       .93      5.00     75.87    220.00         .93

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4384E+01 EXCESS= .0000E+00 OUTFLOW= .4414E+01 BASIN STORAGE= .1072E-01 PERCENT ERROR=   -.9


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.23    410.12    213.24      2.31      5.00    364.53    210.00        2.30

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2109E+02 EXCESS= .0000E+00 OUTFLOW= .2113E+02 BASIN STORAGE= .2918E-02 PERCENT ERROR=   -.2


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.25    370.48    211.25      2.23      5.00    350.70    210.00        2.24

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2038E+02 EXCESS= .0000E+00 OUTFLOW= .2042E+02 BASIN STORAGE= .3295E-02 PERCENT ERROR=   -.2


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.31    363.28    211.94      2.13      5.00    334.31    210.00        2.14

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1947E+02 EXCESS= .0000E+00 OUTFLOW= .1951E+02 BASIN STORAGE= .3053E-02 PERCENT ERROR=   -.2


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.25    339.01    211.25      2.04      5.00    320.90    215.00        2.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1860E+02 EXCESS= .0000E+00 OUTFLOW= .1864E+02 BASIN STORAGE= .3194E-02 PERCENT ERROR=   -.2


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.25    333.77    211.25      2.01      5.00    316.63    215.00        2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1831E+02 EXCESS= .0000E+00 OUTFLOW= .1834E+02 BASIN STORAGE= .3176E-02 PERCENT ERROR=   -.2


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.25    323.30    211.25      1.94      5.00    308.06    215.00        1.95

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1772E+02 EXCESS= .0000E+00 OUTFLOW= .1775E+02 BASIN STORAGE= .3141E-02 PERCENT ERROR=   -.2


   FOR PLAN = 1  RATIO=  .00
     R3-7  MANE         3.75    164.36    213.75       .89      5.00    156.15    215.00         .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8091E+01 EXCESS= .0000E+00 OUTFLOW= .8111E+01 BASIN STORAGE= .3049E-02 PERCENT ERROR=   -.3


   FOR PLAN = 1  RATIO=  .00
    R3-J        MANE         4.50    199.90    220.50      1.61      5.00    197.19    220.00        1.62

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1311E+02 EXCESS= .0000E+00 OUTFLOW= .1314E+02 BASIN STORAGE= .5881E-02 PERCENT ERROR=   -.2
```

```
          FOR PLAN = 1  RATIO=  .00
             R3-J        MANE         4.50    192.96    220.50      1.55      5.00    190.24    220.00        1.56

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1266E+02 EXCESS= .0000E+00 OUTFLOW= .1268E+02 BASIN STORAGE= .7226E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
             R3-J        MANE         4.25    181.58    221.00      1.47      5.00    177.64    220.00        1.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1197E+02 EXCESS= .0000E+00 OUTFLOW= .1198E+02 BASIN STORAGE= .5738E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
             R3-J        MANE         4.25    171.61    221.00      1.39      5.00    167.63    220.00        1.39

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1130E+02 EXCESS= .0000E+00 OUTFLOW= .1132E+02 BASIN STORAGE= .5623E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
             R3-J        MANE         4.25    168.30    221.00      1.36      5.00    164.30    220.00        1.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1108E+02 EXCESS= .0000E+00 OUTFLOW= .1110E+02 BASIN STORAGE= .5585E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
             R3-J        MANE         4.25    161.70    221.00      1.31      5.00    157.68    220.00        1.31

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1065E+02 EXCESS= .0000E+00 OUTFLOW= .1066E+02 BASIN STORAGE= .7355E-02 PERCENT ERROR=   -.2

          FOR PLAN = 1  RATIO=  .00
             R3-J        MANE         2.50     58.36    225.00       .47      5.00     58.36    225.00         .47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3850E+01 EXCESS= .0000E+00 OUTFLOW= .3861E+01 BASIN STORAGE= .6928E-02 PERCENT ERROR=   -.5

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.30    691.02    216.53      2.07      5.00    681.83    215.00        2.07

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4551E+02 EXCESS= .0000E+00 OUTFLOW= .4552E+02 BASIN STORAGE= .1608E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.32    670.61    216.54      2.01      5.00    658.89    215.00        2.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4424E+02 EXCESS= .0000E+00 OUTFLOW= .4424E+02 BASIN STORAGE= .1361E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.34    643.19    216.34      1.91      5.00    627.37    215.00        1.92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4213E+02 EXCESS= .0000E+00 OUTFLOW= .4213E+02 BASIN STORAGE= .1317E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.37    609.77    215.94      1.82      5.00    594.65    215.00        1.82

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4012E+02 EXCESS= .0000E+00 OUTFLOW= .4013E+02 BASIN STORAGE= .1406E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.38    598.94    215.88      1.79      5.00    584.20    215.00        1.79

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3946E+02 EXCESS= .0000E+00 OUTFLOW= .3946E+02 BASIN STORAGE= .1413E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.39    576.40    215.64      1.73      5.00    563.86    215.00        1.73

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3810E+02 EXCESS= .0000E+00 OUTFLOW= .3811E+02 BASIN STORAGE= .1590E-02 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            RCP3.5  MANE         1.96    231.25    217.58       .74      5.00    227.09    220.00         .74
```

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1636E+02 EXCESS= .0000E+00 OUTFLOW= .1637E+02 BASIN STORAGE= .1368E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 2.99 | 1146.42 | 218.06 | 2.44 | 5.00 | 1140.71 | 220.00 | 2.43 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8291E+02 EXCESS= .0000E+00 OUTFLOW= .8295E+02 BASIN STORAGE= .3930E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 3.02 | 1112.86 | 220.14 | 2.37 | 5.00 | 1111.91 | 220.00 | 2.37 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8059E+02 EXCESS= .0000E+00 OUTFLOW= .8062E+02 BASIN STORAGE= .3451E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 3.06 | 1066.78 | 220.33 | 2.27 | 5.00 | 1064.96 | 220.00 | 2.27 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7714E+02 EXCESS= .0000E+00 OUTFLOW= .7717E+02 BASIN STORAGE= .3354E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 3.11 | 1020.55 | 220.62 | 2.16 | 5.00 | 1018.52 | 220.00 | 2.16 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7370E+02 EXCESS= .0000E+00 OUTFLOW= .7373E+02 BASIN STORAGE= .3197E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 3.12 | 1008.27 | 218.65 | 2.13 | 5.00 | 1001.92 | 220.00 | 2.13 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7257E+02 EXCESS= .0000E+00 OUTFLOW= .7261E+02 BASIN STORAGE= .3516E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 3.16 | 974.22 | 221.01 | 2.06 | 5.00 | 973.86 | 220.00 | 2.06 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .7030E+02 EXCESS= .0000E+00 OUTFLOW= .7033E+02 BASIN STORAGE= .4242E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-8 | MANE | 4.12 | 459.85 | 222.32 | .95 | 5.00 | 455.52 | 220.00 | .95 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3241E+02 EXCESS= .0000E+00 OUTFLOW= .3243E+02 BASIN STORAGE= .3195E-02 PERCENT ERROR= -.1

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 1.64 | 2993.73 | 221.55 | 2.28 | 5.00 | 2930.53 | 220.00 | 2.28 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2362E+03 EXCESS= .0000E+00 OUTFLOW= .2362E+03 BASIN STORAGE= .3355E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 1.65 | 2926.24 | 221.73 | 2.22 | 5.00 | 2860.03 | 220.00 | 2.22 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2295E+03 EXCESS= .0000E+00 OUTFLOW= .2296E+03 BASIN STORAGE= .3270E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 1.68 | 2796.23 | 221.93 | 2.12 | 5.00 | 2737.54 | 220.00 | 2.12 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2194E+03 EXCESS= .0000E+00 OUTFLOW= .2194E+03 BASIN STORAGE= .2980E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 1.71 | 2667.41 | 222.18 | 2.02 | 5.00 | 2616.93 | 220.00 | 2.02 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2094E+03 EXCESS= .0000E+00 OUTFLOW= .2094E+03 BASIN STORAGE= .3387E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 1.72 | 2637.47 | 221.77 | 1.99 | 5.00 | 2571.40 | 220.00 | 1.99 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2062E+03 EXCESS= .0000E+00 OUTFLOW= .2062E+03 BASIN STORAGE= .2964E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 1.74 | 2532.53 | 222.61 | 1.93 | 5.00 | 2496.34 | 220.00 | 1.93 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1994E+03 EXCESS= .0000E+00 OUTFLOW= .1995E+03 BASIN STORAGE= .2862E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| RCP3.6 | MANE | 2.32 | 1171.05 | 224.78 | .87 | 5.00 | 1167.16 | 225.00 | .87 | |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9011E+02 EXCESS= .0000E+00 OUTFLOW= .9013E+02 BASIN STORAGE= .2992E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 1.71 | 358.75 | 215.64 | 2.32 | 5.00 | 355.58 | 215.00 | 2.32 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2381E+02 EXCESS= .0000E+00 OUTFLOW= .2381E+02 BASIN STORAGE= .2177E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 1.73 | 352.09 | 216.18 | 2.26 | 5.00 | 346.39 | 215.00 | 2.26 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2315E+02 EXCESS= .0000E+00 OUTFLOW= .2316E+02 BASIN STORAGE= .2503E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 1.76 | 337.84 | 216.20 | 2.16 | 5.00 | 332.40 | 215.00 | 2.16 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2217E+02 EXCESS= .0000E+00 OUTFLOW= .2218E+02 BASIN STORAGE= .2005E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 1.79 | 324.05 | 216.30 | 2.07 | 5.00 | 318.47 | 215.00 | 2.07 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2120E+02 EXCESS= .0000E+00 OUTFLOW= .2120E+02 BASIN STORAGE= .2026E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 1.80 | 316.53 | 215.76 | 2.03 | 5.00 | 313.41 | 215.00 | 2.03 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2087E+02 EXCESS= .0000E+00 OUTFLOW= .2088E+02 BASIN STORAGE= .2435E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 1.82 | 310.73 | 216.51 | 1.97 | 5.00 | 304.65 | 215.00 | 1.97 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2023E+02 EXCESS= .0000E+00 OUTFLOW= .2023E+02 BASIN STORAGE= .2004E-02 PERCENT ERROR= .0

FOR PLAN = 1 RATIO= .00

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| R3-M | MANE | 2.43 | 148.01 | 216.62 | .92 | 5.00 | 143.89 | 215.00 | .92 |

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9402E+01 EXCESS= .0000E+00 OUTFLOW= .9405E+01 BASIN STORAGE= .2331E-02 PERCENT ERROR= -.1

*** NORMAL END OF HEC-1 ***

```
                                                                    SV_SD.WSW
T1 Summerlin Village 23B                                                0
T2 Sky Vista Drive
T3 Mainline
SO   1740.1513462.800  9                          3470.000
R    1767.2053463.660  9      .013                                  .000  40.000 1
R    1791.5283464.520  9      .013                                  .000   5.000 0
R    1822.9443465.910  9      .013                                  .000   5.000 0
R    1985.9463473.121  9      .013                                  .000    .000 1
JX   1985.9563473.122 11 10   .013   18.000         3473.121         75.0         .000
R    2636.0963496.080 11      .013                                  .000    .000 2
R    3024.8363507.070 11      .013                                 9.860    .000 1
R    3414.8363519.090 11      .013                                 6.040    .000 2
R    3759.3663525.430 11      .013                                  .000    .000 1
JX   3759.3763525.440 11 12   .013   72.000         3525.380         45.0         .000
R    3892.1763528.730 11      .013                                 5.390    .000 1
JX   3892.1863528.930 13 14   .013   79.000         3528.900         45.0         .000
R    4192.8963538.490 13      .013                                 8.090    .000 1
R    4532.7563544.440 13      .013                                 5.730    .000 1
R    4773.2563548.650 13      .013                                  .000  90.000 1
R    4838.7563552.579 13      .013                                  .000    .000 0
SH   4838.7563552.579 13                          3552.579
CD   1  3   0    .000   8.000   10.000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  3   0    .000   8.000   10.000  .000  .000   .00
CD   4  4   1    .000   3.500     .000  .000  .000   .00
CD   5  3   0    .000   8.000   10.000  .000  .000   .00
CD   6  4   1    .000   2.000     .000  .000  .000   .00
CD   7  3   0    .000   8.000   10.000  .000  .000   .00
CD   8  3   0    .000   8.000   10.000  .000  .000   .00
CD   9  4   1    .000   5.000     .000  .000  .000   .00
CD  10  4   1    .000   5.000     .000  .000  .000   .00
CD  11  4   1    .000   5.000     .000  .000  .000   .00
CD  12  4   1    .000   5.000     .000  .000  .000   .00
CD  13  4   1    .000   4.500     .000  .000  .000   .00
CD  14  4   1    .000   3.500     .000  .000  .000   .00
CD  15  4   1    .000   3.500     .000  .000  .000   .00
Q           228.000   .0
```

FILE: SV_SD.WSW  W S P G W - EDIT LISTING - Version 14.10  Date:12- 7-2018 Time: 1: 8: 7

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING  PAGE 1

| CARD CODE | SECT NO | CHN TYPE | NO OF PIER/PIP | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 1 | 3 | 0 | .000 | 8.000 | 10.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 2 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |
| CD | 3 | 3 | 0 | .000 | 8.000 | 10.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 4 | 4 | 1 | | 3.500 | | | | | | | | | | | | | | |
| CD | 5 | 3 | 0 | .000 | 8.000 | 10.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 6 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |
| CD | 7 | 3 | 0 | .000 | 8.000 | 10.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 8 | 3 | 0 | .000 | 8.000 | 10.000 | .000 | .000 | .00 | | | | | | | | | | |
| CD | 9 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | |
| CD | 10 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | |
| CD | 11 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | |
| CD | 12 | 4 | 1 | | 5.000 | | | | | | | | | | | | | | |
| CD | 13 | 4 | 1 | | 4.500 | | | | | | | | | | | | | | |
| CD | 14 | 4 | 1 | | 3.500 | | | | | | | | | | | | | | |
| CD | 15 | 4 | 1 | | 3.500 | | | | | | | | | | | | | | |

W S P G W  PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

Summerlin Village 23B

HEADING LINE NO 2 IS -

Sky Vista Drive

HEADING LINE NO 3 IS -

Mainline

W S P G W  PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

| | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| U/S DATA | 1740.151 | 3462.800 | 9 | 3470.000 |

ELEMENT NO 2 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 1767.205 | 3463.660 | 9 | .013 | .000 | .000 | 40.000 | 1 |

ELEMENT NO 3 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 1791.528 | 3464.520 | 9 | .013 | .000 | .000 | 5.000 | 0 |

ELEMENT NO 4 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 1822.944 | 3465.910 | 9 | .013 | .000 | .000 | 5.000 | 0 |

ELEMENT NO 5 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 1985.946 | 3473.121 | 9 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 6 IS A JUNCTION * * * * * * *

| | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U/S DATA | 1985.956 | 3473.122 | 11 | 10 | 0 | .013 | 18.000 | .000 | 3473.121 | .000 | 75.000 | .000 |

| | RADIUS | ANGLE |
|---|---|---|
| | .000 | .000 |

ELEMENT NO 7 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 2636.096 | 3496.080 | 11 | .013 | .000 | .000 | .000 | 2 |

ELEMENT NO 8 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 3024.836 | 3507.070 | 11 | .013 | 2258.941 | 9.860 | .000 | 1 |

ELEMENT NO 9 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 3414.836 | 3519.090 | 11 | .013 | 3699.562 | 6.040 | .000 | 2 |

ELEMENT NO 10 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 3759.366 | 3525.430 | 11 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 11 IS A JUNCTION * * * * * * *

| | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U/S DATA | 3759.376 | 3525.440 | 11 | 12 | 0 | .013 | 72.000 | .000 | 3525.380 | .000 | 45.000 | .000 |

| | RADIUS | ANGLE |
|---|---|---|
| | .000 | .000 |

W S P G W  PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 12 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 3892.176 | 3528.730 | 11 | .013 | 1411.667 | 5.390 | .000 | 1 |

ELEMENT NO 13 IS A JUNCTION * * * * * * *

| | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U/S DATA | 3892.186 | 3528.930 | 13 | 14 | 0 | .013 | 79.000 | .000 | 3528.900 | .000 | 45.000 | .000 |

| | RADIUS | ANGLE |
|---|---|---|
| | .000 | .000 |

ELEMENT NO 14 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 4192.896 | 3538.490 | 13 | .013 | 2129.717 | 8.090 | .000 | 1 |

ELEMENT NO 15 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 4532.756 | 3544.440 | 13 | .013 | 3398.348 | 5.730 | .000 | 1 |

ELEMENT NO 16 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 4773.256 | 3548.650 | 13 | .013 | .000 | .000 | 90.000 | 1 |

ELEMENT NO 17 IS A REACH * * *

| | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| U/S DATA | 4838.756 | 3552.579 | 13 | .013 | .000 | .000 | .000 | 0 |

ELEMENT NO 18 IS A SYSTEM HEADWORKS * *

| | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| U/S DATA | 4838.756 | 3552.579 | 13 | 3552.579 |

Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12- 7-2018 Time: 1: 8:13

Summerlin Village 23B
Sky Vista Drive
Mainline

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1740.151 | 3462.800 | 3.362 | 3466.162 | 397.00 | 28.28 | 12.42 | 3478.58 | .00 | 4.88 | 4.69 | 5.000 | .000 | .00 | 1 .0 |
| 27.054 | .0318 | | | | | .0372 | 1.01 | 3.36 | 2.88 | 3.56 | .013 | .00 | .00 | PIPE |
| 1767.205 | 3463.660 | 3.342 | 3467.001 | 397.00 | 28.47 | 12.59 | 3479.59 | .00 | 4.88 | 4.71 | 5.000 | .000 | .00 | 1 .0 |
| 24.323 | .0354 | | | | | .0377 | .92 | 3.34 | 2.92 | 3.42 | .013 | .00 | .00 | PIPE |
| 1791.528 | 3464.520 | 3.333 | 3467.854 | 397.00 | 28.55 | 12.66 | 3480.51 | .00 | 4.88 | 4.71 | 5.000 | .000 | .00 | 1 .0 |
| 31.416 | .0442 | | | | | .0374 | 1.17 | 3.33 | 2.93 | 3.16 | .013 | .00 | .00 | PIPE |
| 1822.944 | 3465.910 | 3.362 | 3469.272 | 397.00 | 28.27 | 12.41 | 3481.68 | .00 | 4.88 | 4.69 | 5.000 | .000 | .00 | 1 .0 |
| 92.529 | .0442 | | | | | .0352 | 3.26 | 3.36 | 2.88 | 3.16 | .013 | .00 | .00 | PIPE |
| 1915.473 | 3470.003 | 3.486 | 3473.490 | 397.00 | 27.16 | 11.45 | 3484.94 | .00 | 4.88 | 4.59 | 5.000 | .000 | .00 | 1 .0 |
| 70.473 | .0442 | | | | | .0317 | 2.23 | 3.49 | 2.68 | 3.16 | .013 | .00 | .00 | PIPE |
| 1985.946 | 3473.121 | 3.644 | 3476.765 | 397.00 | 25.89 | 10.41 | 3487.18 | .00 | 4.88 | 4.45 | 5.000 | .000 | .00 | 1 .0 |
| JUNCT STR | .0976 | | | | | .0326 | .00 | 3.64 | 2.46 | | .013 | .00 | .00 | PIPE |
| 1985.956 | 3473.122 | 3.304 | 3476.427 | 379.00 | 27.53 | 11.77 | 3488.19 | .00 | 4.86 | 4.73 | 5.000 | .000 | .00 | 1 .0 |
| 19.285 | .0353 | | | | | .0353 | .68 | 3.30 | 2.84 | 3.30 | .013 | .00 | .00 | PIPE |
| 2005.241 | 3473.803 | 3.304 | 3477.108 | 379.00 | 27.53 | 11.77 | 3488.87 | .00 | 4.86 | 4.73 | 5.000 | .000 | .00 | 1 .0 |
| 477.367 | .0353 | | | | | .0335 | 15.98 | 3.30 | 2.84 | 3.30 | .013 | .00 | .00 | PIPE |
| 2482.608 | 3490.660 | 3.439 | 3494.099 | 379.00 | 26.32 | 10.76 | 3504.86 | .00 | 4.86 | 4.63 | 5.000 | .000 | .00 | 1 .0 |
| 153.488 | .0353 | | | | | .0299 | 4.60 | 3.44 | 2.63 | 3.30 | .013 | .00 | .00 | PIPE |

Starting WSE



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date:12- 7-2018 Time: 1: 8:13

Summerlin Village 23B
Sky Vista Drive
Mainline

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 2636.096 | 3496.080 | 3.593 | 3499.673 | 379.00 | 25.09 | 9.78 | 3509.45 | .04 | 4.86 | 4.50 | 5.000 | .000 | .00 | 1 .0 |
| 388.740 | .0283 | | | | | .0282 | 10.96 | 3.63 | 2.41 | 3.59 | .013 | .00 | .00 | PIPE |
| 3024.836 | 3507.070 | 3.598 | 3510.669 | 379.00 | 25.05 | 9.75 | 3520.42 | .02 | 4.86 | 4.49 | 5.000 | .000 | .00 | 1 .0 |
| 72.168 | .0308 | | | | | .0277 | 2.00 | 3.62 | 2.41 | 3.47 | .013 | .00 | .00 | PIPE |
| 3097.004 | 3509.295 | 3.647 | 3512.942 | 379.00 | 24.69 | 9.47 | 3522.41 | .02 | 4.86 | 4.44 | 5.000 | .000 | .00 | 1 .0 |
| 137.263 | .0308 | | | | | .0258 | 3.54 | 3.67 | 2.34 | 3.47 | .013 | .00 | .00 | PIPE |
| 3234.267 | 3513.525 | 3.820 | 3517.345 | 379.00 | 23.55 | 8.61 | 3525.95 | .02 | 4.86 | 4.25 | 5.000 | .000 | .00 | 1 .0 |
| 78.076 | .0308 | | | | | .0232 | 1.81 | 3.84 | 2.13 | 3.47 | .013 | .00 | .00 | PIPE |
| 3312.344 | 3515.931 | 4.010 | 3519.941 | 379.00 | 22.45 | 7.83 | 3527.77 | .02 | 4.86 | 3.98 | 5.000 | .000 | .00 | 1 .0 |
| 50.737 | .0308 | | | | | .0211 | 1.07 | 4.03 | 1.92 | 3.47 | .013 | .00 | .00 | PIPE |
| 3363.081 | 3517.495 | 4.227 | 3521.722 | 379.00 | 21.40 | 7.11 | 3528.84 | .01 | 4.86 | 3.62 | 5.000 | .000 | .00 | 1 .0 |
| 34.031 | .0308 | | | | | .0194 | .66 | 4.24 | 1.70 | 3.47 | .013 | .00 | .00 | PIPE |
| 3397.112 | 3518.544 | 4.485 | 3523.029 | 379.00 | 20.41 | 6.47 | 3529.50 | .01 | 4.86 | 3.04 | 5.000 | .000 | .00 | 1 .0 |
| 17.724 | .0308 | | | | | .0187 | .33 | 4.50 | 1.46 | 3.47 | .013 | .00 | .00 | PIPE |

```
 3414.836  3519.090    4.859  3523.949    379.00   19.46    5.88  3529.83     .00    4.86     1.66    5.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  344.530    .0184                                        .0185     6.37     4.86    1.00     4.59    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 3759.366  3525.430    4.717  3530.146    379.00   19.75    6.05  3536.20     .00    4.86     2.31    5.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
         |         |        |         |          |                |        |       |        |       |         |        |      |
 3759.366  3525.430    4.859  3530.289    379.00   19.46    5.88  3536.17     .00    4.86     1.66    5.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
JUNCT STR  1.0000                                        .0163      .00    4.87    1.00             .013       .00   .00  PIPE
 FILE: SV_SD.WSW                          W S P G W - CIVILDESIGN Version 14.08                                        PAGE    3
                            Program Package Serial Number: 3074
                                          WATER SURFACE PROFILE LISTING                  Date:12- 7-2018  Time: 1: 8:13
                          Summerlin Village 23B
                            Sky Vista Drive
                              Mainline
********************************************************************************************************************** ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel   |  Energy | Super |Critical|Flow Top|Height/|Base Wt|       |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head  |  Grd.El.|  Elev | Depth  |  Width |Dia.-FT|or I.D.|  ZL   |Prs/Pip
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-    -|
 L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR   |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
         |         |        |         |         |         |       |         |       |        |        |       |       |       |
 3759.376  3525.440    8.641  3534.081    307.00   15.64    3.80  3537.88     .00    4.69      .00    5.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  132.800    .0248                                        .0139     1.85      .00     .00     3.23    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 3892.176  3528.730    7.571  3536.302    307.00   15.64    3.80  3540.10     .00    4.69      .00    5.000     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
JUNCT STR 19.9756                                        .0137      .00     .00     .00             .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 3892.186  3528.930    9.247  3538.177    228.00   14.34    3.19  3541.37     .00    4.19      .00    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  182.108    .0318                                        .0134     2.45      .00     .00     2.64    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4074.294  3534.719    6.119  3540.839    228.00   14.34    3.19  3544.03     .00    4.19      .00    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
HYDRAULIC JUMP
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4074.294  3534.719    2.891  3537.611    228.00   21.12    6.92  3544.53     .03    4.19     4.31    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   45.474    .0318                                        .0233     1.06     2.92    2.35     2.64    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4119.768  3536.165    2.978  3539.143    228.00   20.41    6.47  3545.61     .03    4.19     4.26    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   42.761    .0318                                        .0211      .90     3.00    2.22     2.64    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4162.528  3537.525    3.108  3540.633    228.00   19.46    5.88  3546.51     .02    4.19     4.16    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   30.368    .0318                                        .0188      .57     3.13    2.04     2.64    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4192.896  3538.490    3.248  3541.738    228.00   18.55    5.34  3547.08     .01    4.19     4.03    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   45.551    .0175                                        .0178      .81     3.26    1.87     3.26    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4238.447  3539.287    3.243  3542.531    228.00   18.58    5.36  3547.89     .01    4.19     4.04    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  294.309    .0175                                        .0189     5.55     3.26    1.88     3.26    .013       .00   .00  PIPE
 FILE: SV_SD.WSW                          W S P G W - CIVILDESIGN Version 14.08                                        PAGE    4
                            Program Package Serial Number: 3074
                                          WATER SURFACE PROFILE LISTING                  Date:12- 7-2018  Time: 1: 8:13
                          Summerlin Village 23B
                            Sky Vista Drive
                              Mainline
********************************************************************************************************************** ********
         | Invert  |  Depth |  Water  |    Q    |  Vel     Vel   |  Energy | Super |Critical|Flow Top|Height/|Base Wt|       |No Wth
 Station |  Elev   |  (FT)  |  Elev   |  (CFS)  | (FPS)    Head  |  Grd.El.|  Elev | Depth  |  Width |Dia.-FT|or I.D.|  ZL   |Prs/Pip
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-    -|
 L/Elem  |Ch Slope |        |         |         |         SF Ave|    HF   |SE Dpth|Froude N|Norm Dp |  "N"  | X-Fall|  ZR   |Type Ch
*********|*********|********|*********|*********|*******|*******|*********|*******|********|********|*******|*******|*****  |*******
         |         |        |         |         |         |       |         |       |        |        |       |       |       |
 4532.756  3544.440    3.105  3547.544    228.00   19.48    5.89  3553.44     .00    4.19     4.16    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   61.512    .0175                                        .0204     1.25     3.10    2.05     3.26    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4594.268  3545.517    3.051  3548.568    228.00   19.86    6.12  3554.69     .00    4.19     4.21    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
  104.476    .0175                                        .0222     2.32     3.05    2.12     3.26    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4698.744  3547.345    2.926  3550.271    228.00   20.83    6.73  3557.01     .00    4.19     4.29    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
   74.512    .0175                                        .0250     1.86     2.93    2.30     3.26    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4773.256  3548.650    2.808  3551.458    228.00   21.84    7.41  3558.87     .00    4.19     4.36    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
    3.460    .0600                                        .0261      .09     2.81    2.49     2.18    .013       .00   .00  PIPE
         |         |        |         |          |                |        |       |        |       |         |        |      |
 4776.716  3548.858    2.831  3551.689    228.00   21.64    7.27  3558.96     .00    4.19     4.35    4.500     .000   .00   1   .0
        -|-       -|-      -|-       -|-       -|-     -|-     -|-       -|-     -|-      -|-      -|-     -|-     -|-     -|-
```

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15.217 | .0600 | | | | | .0244 | .37 | 2.83 | 2.45 | 2.18 | .013 | .00 | .00 | PIPE |
| 4791.933 | 3549.771 | 2.950 | 3552.721 | 228.00 | 20.63 | 6.61 | 3559.33 | .00 | 4.19 | 4.28 | 4.500 | .000 | .00 | 1 .0 |
| 12.361 | .0600 | | | | | .0217 | .27 | 2.95 | 2.26 | 2.18 | .013 | .00 | .00 | PIPE |
| 4804.294 | 3550.512 | 3.077 | 3553.589 | 228.00 | 19.67 | 6.01 | 3559.60 | .00 | 4.19 | 4.18 | 4.500 | .000 | .00 | 1 .0 |
| 10.054 | .0600 | | | | | .0193 | .19 | 3.08 | 2.08 | 2.18 | .013 | .00 | .00 | PIPE |
| 4814.348 | 3551.115 | 3.214 | 3554.329 | 228.00 | 18.75 | 5.46 | 3559.79 | .00 | 4.19 | 4.07 | 4.500 | .000 | .00 | 1 .0 |
| 8.130 | .0600 | | | | | .0172 | .14 | 3.21 | 1.91 | 2.18 | .013 | .00 | .00 | PIPE |
| 4822.478 | 3551.603 | 3.363 | 3554.966 | 228.00 | 17.88 | 4.97 | 3559.93 | .00 | 4.19 | 3.91 | 4.500 | .000 | .00 | 1 .0 |
| 6.479 | .0600 | | | | | .0155 | .10 | 3.36 | 1.75 | 2.18 | .013 | .00 | .00 | PIPE |



| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT "N" | Base Wt or I.D. X-Fall | ZL ZR | No Wth Prs/Pip Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | | | | |
| 4828.957 | 3551.991 | 3.526 | 3555.518 | 228.00 | 17.05 | 4.51 | 3560.03 | .00 | 4.19 | 3.71 | 4.500 | .000 | .00 | 1 .0 |
| 4.942 | .0600 | | | | | .0140 | .07 | 3.53 | 1.58 | 2.18 | .013 | .00 | .00 | PIPE |
| 4833.899 | 3552.288 | 3.709 | 3555.997 | 228.00 | 16.26 | 4.10 | 3560.10 | .00 | 4.19 | 3.43 | 4.500 | .000 | .00 | 1 .0 |
| 3.411 | .0600 | | | | | .0128 | .04 | 3.71 | 1.42 | 2.18 | .013 | .00 | .00 | PIPE |
| 4837.310 | 3552.492 | 3.921 | 3556.414 | 228.00 | 15.50 | 3.73 | 3560.14 | .00 | 4.19 | 3.01 | 4.500 | .000 | .00 | 1 .0 |
| 1.446 | .0600 | | | | | .0119 | .02 | 3.92 | 1.24 | 2.18 | .013 | .00 | .00 | PIPE |
| 4838.756 | 3552.579 | 4.192 | 3556.771 | 228.00 | 14.78 | 3.39 | 3560.16 | .00 | 4.19 | 2.27 | 4.500 | .000 | .00 | 1 .0 |

**Response:** A nominal drop inlet has been added on the west side of Sky Vista Drive at SDMH#9. In addition, another nominal drop inlet has been added on the east side at SDMH#10 that is located 240 ft upstream of SDMH#9.

**Comment:** "11. The 60" RCP shown on Sheet 14 was designed for 243 cfs, but the study is proposing a flow of 393 cfs, provide a discussion on the increase in flow, and how that will affect the downstream system."

**Response:** The increase in flow is occurring within an estimated 237-ft length of the existing 60" RCP and after that, the proposed flow is less than the designed flow. Moreover, the previously included WSPG model results show that water surface elevation is acceptable inside the 60" RCP, and no new hydraulic analysis is necessary. Therefore, the increase in flow does not negatively impact downstream areas. Note that the existing 60" pipe is proposed to be replaced with sacrificial concrete due to the high flow velocity (~28 ft/s).

Refer to the appendix for coordination between GCW and CLV regarding the increase in flow and the proposed mitigation.

**Comment:** "12. The calculated curve number for Soil# 502 Desert Shrubs is 75, but the value used in the weighted curve number calculations is 73. Review and revise accordingly."

**Response:** The weighted curve number table has been updated. In addition, Standard Form 4, HEC-1, Ditch characteristics table and Interim Conditions Drainage Map have been revised. Note that since the ditches are designed for twice depth of flow, the flow increase (less than 2 cfs in the 100-year event) is insignificant and the previous ditch sizes are acceptable.

**Comment:** "13. Figure 4: Provide all Flood Control Facilities maps that are interacting with the project site. For example, it appears that a facility just south of this map is the existing facility this design is connecting to. Provide this map and table as well."

**Response:** Figure F-29 has been added to show Regional Flood Control Facilities south of the project site.

EX. INLET IN SKY VISTA

**Comment:** "14. The Drop Inlet Sizing Calculation provided for DI#2 is for a 7.5' CM2 inlet, however Sheet 10 and Sheet 14 show a 10' CM2 inlet. Review and revise accordingly."

**Response:** DI#2 size was increased to 10' for the purpose of constructability. However, the calculation sheet is based off 7.5' CM2 inlet. For the conservative purposes, the inlet calculations have not been up-sized.

**Comment:** "15. Sheet 10 and Sheet 14 show DI#2 at station 363+05.60 while it is called out at 362+99 on the drop inlet sizing calculations."

ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: Village 23B Sky Vista Drive
By: Masih Edalat
Date: 03/30/2018

## Drop Inlet Sizing on a Continuous Grade

7.5' CM2

DI# 2 - 363+05.60

### Known:

| | | | |
|---|---|---|---|
| $Q_s$= | Street Flow | 18.0 | cfs |
| $S_o$= | Longitudinal Slope | 0.0432 | ft/ft |
| n= | Manning's Roughness Coefficient | 0.016 | |
| $V_s$= | Flow Velocity | 6.51 | fps |
| D= | Flow Depth | 0.46 | ft |
| $S_x$= | Street Transverse Slope | 0.02 | ft/ft |
| W= | Grate Width | 1.5 | ft |
| a= | Gutter Depression | 5.0 | in |
| $L_g$= | Length of Grate | 5.0 | ft |
| $L_c$= | Length of Curb Opening | 7.5 | ft |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $R_f$= | Frontal flow factor = 1-0.09*($V_s$-$V_o$) if $V_s$>$V_o$; else $R_f$=1 | 1.00 | |
| | $V_o$= Splash over velocity=p+q*($L_g$*(1-($C_{fg}$/100)))-r*($L_g$*(1-($C_{fg}$/100)))$^2$+s*($L_g$*(1-($C_{fg}$/100)))$^3$† | 7.22 | fps |
| $E_o$= | Grate flow ratio = $Q_w$/$Q_s$ | 0.23 | |
| | $Q_w$= Frontal flow=$A_w$*$V_s$ | 4.09 | cfs |
| | $Q_x$= Side flow = $Q_s$-$Q_w$ | 13.91 | cfs |
| $R_s$= | Side flow factor = 1/(1+(0.15*$V_s^{1.8}$)/($S_x$*($L_g$*(1-$C_{fg}$/100))$^{2.3}$)) | 0.04 | |
| $Q_{ig}$= | Flow intercepted = [$R_f$*$E_o$+$R_s$*(1-$E_o$)]*$Q_s$ | 4.6 | cfs |
| | †p=1.76;q=3.12;r=0.45;s=0.03 (based on Bar P 1-1/8 grate) | | |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| $S_e$= | Equivalent cross slope = Sx+Sw*Eo | 0.085 | ft/ft |
| $S_w$= | Gutter cross slope = (0.137+afeet)/W | 0.285 | ft/ft |
| $L_t$= | Total interception L = 0.60*$Q_s^{0.42}$*$So^{0.30}$*(1/n*$S_e$)$^{0.6}$ | 41.36 | ft |
| $Q_{ic}$= | Flow intercepted = (1-(1-($L_c$*(1-$C_{fc}$/100))/$L_t$)$^{1.8}$)*$Q_s$ | 2.8 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| **$Q_{ti}$=** | **Total flow intercepted = $Q_{ig}$+$Q_{ic}$** | **7.4** | **cfs** |
| **$Q_{tq}$=** | **Flow bypass = $Q_s$-$Q_{ti}$** | **10.6** | **cfs** |
| q= | Interception per unit ratio = $Q_{ti}$/$L_g$ | 0.99 | cfs/ft |
| $E_q$= | Efficiency = (Qti/Qs)*100 | 41 | % |

EX. INLET INTERCEPTION

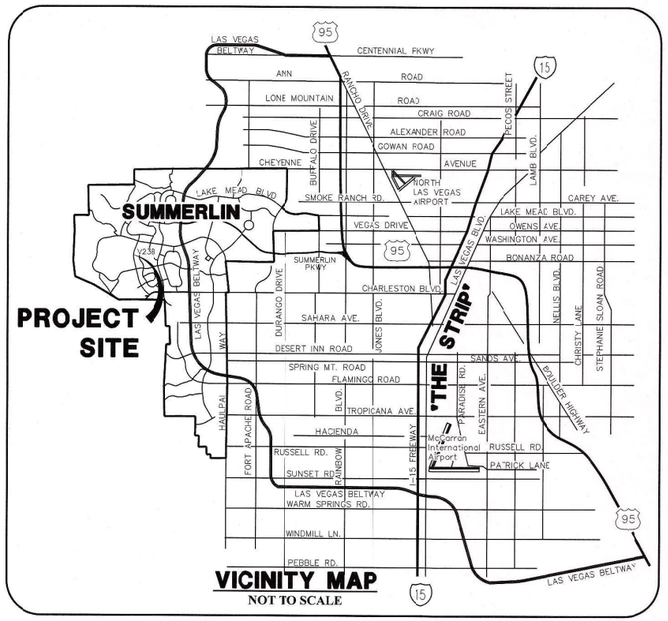
# SUMMERLIN

SM

# VILLAGE 23B
# SKY VISTA DRIVE IMPROVEMENTS
## ALTA DRIVE TO FAR HILLS AVENUE
## 2018

**A.P.N. 137-22-000-017 (PORTION), 137-34-111-010, 137-34-111-011, 137-27-410-002, 137-27-310-002, 137-27-210-004**

**SID NO. 810 PROJECTS 8A, 8B, AND 8C**




### DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

MICHAEL FANG, P.E. 24464 DATE

### APPROVED FOR CONSTRUCTION

CITY OF LAS VEGAS FIRE DEPARTMENT DATE

### CLV PLANNING DEPARTMENT

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CITY OF LAS VEGAS PLANNING DEPARTMENT DATE

THE HOWARD HUGHES COMPANY, LLC

KEVIN ORROCK DATE
TITLE: VICE PRESIDENT

ALLEN PAVELKA, PE, PE# 9029 DATE
CITY ENGINEER
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 126398 FIRST APPROVED DATE: 10/22/18
LVVWD APPROVED FIRE FLOW: TOTAL 1500 GPM / ON SITE N/A GPM
(SHEETS: 1-6, 9-23, 28-37, 44-46)

### UTILITY/AGENCY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. DATE

CENTRAL TELEPHONE CO. DBA CENTURYLINK DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY – TRANSMISSION ENGINEERING DATE

SOUTHWEST GAS CORPORATION DATE

CLV# 107V7418 L18-01503

### OWNER/DEVELOPER

**THE HOWARD HUGHES COMPANY, LLC**
**10801 W. CHARLESTON BLVD., 3RD FLOOR**
**LAS VEGAS, NEVADA 89135**
**OFFICE PHONE NO. (702) 791-4300**

### ENGINEER

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

Call before you Dig — avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600 and CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-6000

AVOID HITTING OVERHEAD POWER LINES IT'S COSTLY — CALL BEFORE YOU DO OVERHEAD — 1-702-227-2929

FAST — Call before you UnderGround — 1-702-432-5300 — FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA — VICKI D. MARGERRISON — No. 13078 — PROFESSIONAL ENGINEER — DATE: 12/19/18

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|---|
| 1 | 11/28/18 | REVISED SHEETS 2, 9-14, 17-18, 25, 26A, 28-29, 33, 38, 43-46 | | | | |

PROJECT NO. 62023B-240
DESIGN: LG/MB
DRAWN: LG/MB
CHECK: JL,JJ
PLOT DATE: 12-19-18
PLOT TIME: 11:04:15

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\62023B-240\DWG\Production\240-C01.dwg
Alexander Santiago

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

**COVER SHEET**

DRAWING
**1**
1 OF 46 SHTS

STORM DRAIN TIE-IN LOCATION

FOR EXISTING STORM PLANS, REFER TO THE FOLLOWING SET: "SUMMERLIN VILLAGE 23A/23B ALTA DRIVE RCB REGIONAL DRAINAGE IMPROVEMENTS." CLV #327/269

FOR EXISTING STORM PLANS, REFER TO THE FOLLOWING SET: "SUMMERLIN VILLAGE 23A/24 SKY VISTA IMPROVEMENT PLANS." DS H #57159

# FUTURE VILLAGE 24A
PARCEL O
APN 137-33-501-001
HOWARD HUGHES COMPANY, LLC

COS-8

COMMON LOT 8

COMMON LOT 9

COMMON LOT 14

APN 137-34-111-011
HOWARD HUGHES COMPANY, LLC

# VILLAGE 23B
PARCEL V

# SKY VISTA DRIVE (PUBLIC)

HORIZ SCALE: 1" = 20'
VERT SCALE: 1" = 5'

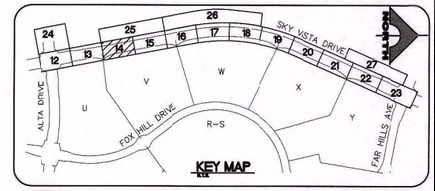
MATCH LINE 360+50 SEE SHEET 13

MATCH LINE 365+00 SEE SHEET 15

NORTH

SCALE 20 0 20 40 FEET

PROTECT IN PLACE AND ADJUST LVVWD EXISTING FACILITIES TO FINISHED GRADE PER UDACS. ALL LVVWD FACILITIES SHALL BE ACCESSIBLE AT ALL TIMES.




KEY MAP

## IMPROVEMENT NOTES:

1. ADJUST WATER VALVE BOX TO FINISHED GRADE PER UDACS PLATE NO. 39. VALVE SHALL BE ACCESSIBLE AT ALL TIMES.
2. EXISTING MASONRY WALL AND FENCE BY OTHERS. PROTECT IN PLACE.
3. EXISTING WATER 6" BLOW-OFF PROTECT IN PLACE. RAISE COVER TO FINAL PAVEMENT GRADE PER UDACS PLATE NO. 37.
4. EXISTING WATER TEST STATION PROTECT IN PLACE. RAISE TO FINAL CURB GRADE.
5. EXISTING WATER FIBER OPTC PULLBOX PROTECT IN PLACE. RAISE TO FINAL CURB GRADE.
6. EXISTING WATER ACCESS MANHOLE PROTECT IN PLACE. RAISE TO FINAL PAVEMENT GRADE PER DETAIL 8 SHEET 35 & DETAIL 9 SHEET 36
7. EXISTING WATER VALVE VAULT PROTECT IN PLACE.
8. EXISTING WATER AVAR PROTECT IN PLACE. ADJUST TO FINISH GRADE IF REQUIRED. PER UDACS PLATE NO. 38.
9. EXISTING MANHOLE PROTECT IN PLACE. RAISE COVER TO FINAL PAVEMENT GRADE IF IMPACTED BY PAVEMENT IMPROVEMENTS.
10. EXISTING DROP INLET PROTECT IN PLACE.
11. EXISTING WATER FIBER OPTC SPLICE PIT PROTECT IN PLACE. RAISE TO FINAL GRADE PER DETAIL 8 SHEET 35 & DETAIL 9, 10 SHEET 36

## ROADWAY IMPROVEMENTS NOTES:

1. INSTALL A.C. PAVEMENT PER STREET SECTIONS, SEE SHEET 37
2. INSTALL 6" "L" TYPE CURB & GUTTER, SEE SUMMERLIN STD DWG S-47
3. INSTALL "A" TYPE ISLAND CURB, SEE SUMMERLIN STD DWG S-50
4. INSTALL CONCRETE BUS TURNOUT PER USD DWG. NO. 234.1
2 R. CONSTRUCT DEPRESSED CURE FOR FUTURE SIDEWALK RAMP PER USD DWG NO. 235 (CASE II)

## WATER CONSTRUCTION NOTES:

1. INSTALL 1-½" WATER METER AND 1-½" RPPA PER UDACS PL. NO. 4 AND 8 (IRRIGATION) & PER DETAIL 7 SHEET 35
2. INSTALL CAP W/ 2" BLOW-OFF ASSEMBLY PER UDACS PL. NO. 36
3. INSTALL FIRE HYDRANT PER UDACS PL. NO. 30, 39 AND 40. FOR "DEEP" FIRE HYDRANTS SEE UDACS PL. NO. 41.
4. INSTALL GATE VALVE AND BOX PER UDACS PL. NO. 30 AND 39
5. INSTALL TEE PER UDACS PL. NO. 31
6. INSTALL HORIZONTAL BEND PER UDACS PL. NO. 31
7. REMOVE CAP AND BLOWOFF PER UDACS PL. NO. 36 AND CONNECT TO EX WATER LINE (CONTRACTOR TO VERFY SIZE, INVERT AND LOCATION OF EX WATER PRIOR TO CONSTRUCTION)
8. INSTALL VERTICAL BEND PER UDACS PL. NO. 31 UNLESS OTHERWISE IDENTIFIED. (SEE PLAN FOR ANGLE)
9. INSTALL REDUCER (SEE PLAN FOR SIZE)
10. INSTALL 12"X6" TAPPING SLEEVE AND 6" TAPPING VALVE PER UDACS PLT No. 30, 31, 34, 39 & SECTION 2.24.01B.
11. INSTALL 12"X12" TAPPING SLEEVE AND 12" TAPPING VALVE PER UDACS PLT No. 30, 31, 34, 39 & SECTION 2.24.01A.

## SEWER CONSTRUCTION NOTES:

1. INSTALL SEWER MANHOLE PER DCS STD. DWG. 1A AND 1B, WITH SINGLE 24" LID
2. STUB AND CAP SEWER PIPE PER DETAIL 2, DRAWING 35
3. REMOVE PLUG AND CONNECT TO EX SEWER LINE (CONTRACTOR TO VERIFY SIZE, INVERT AND LOCATION OF EX SEWER PRIOR TO CONSTRUCTION)
4. INSTALL STEEL CASING PER UDACS PL. NO. 23 WITH MECHANICALLY RESTRAINED JOINTS AND SPACERS AT 4' O.C. NO CLSM.

## STORM DRAIN CONSTRUCTION NOTES:

1. INSTALL TYPE I MANHOLE PER USD DWG. NO. 403
2. INSTALL TYPE II MANHOLE PER USD DWG. NO. 405.1
3. INSTALL TYPE II-SD MANHOLE PER USD DWG. NO. 405.2
4. INSTALL TYPE "CM2" DROP INLET PER USD DWG. NO. 412.1 AND 421
5. REMOVE PLUG AND CONNECT TO EX STORM DRAIN LINE (CONTRACTOR TO VERIFY SIZE, INVERT AND LOCATION OF EX STORM DRAIN PRIOR TO CONSTRUCTION)
6. BASE AND WALLS TO BE CAST-IN-PLACE MONOLITHIC POUR. SEAL BETWEEN WALLS AND ROOF TO BE KENT SEAL, OR APPROVED EQUAL.
7. INSTALL TYPE "C" DROP INLET PER USD DWG. NO. 413 AND 421
8. INSTALL TEMPORARY PLUG AND CAP

## IRRIGATION CONSTRUCTION NOTES:

1. BANK "A": 1-6" & 2-4" SCH 40 PVC. PER DETAIL 3 DRAWING 35
2. BANK "B": 2-4" SCH 40 PVC. PER DETAIL 4 DRAWING 35

## BENCHMARK

| BM # | DESCRIPTION | NAVD 88 DATUM (FEET) | NAVD 88 DATUM (METERS) |
|---|---|---|---|
| 5LVG9—34NE3 | RIVET AND PLATE IN TOF OF CURB @ NORTHEAST CORNER OF DESERT FOOTHILLS AND ALTA DRIVE | 3304.45 | 1007.197 |

## NOTE

THIS SET OF DRAWINGS IS BASED UPON NAVD 88 DATUM. PREVIOUS DRAWINGS MAY BE BASED ON OTHER DATUM. CARE SHOULD BE OBSERVED WHEN UTILIZING THIS SET OF DRAWINGS.

## BASIS OF BEARINGS

NORTH 89°45'05" EAST BEING THE SOUTH LINE OF THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 35, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., AS SHOWN BY MAP ON FILE IN FILE 91, PAGE 28 OF PARCEL MAPS IN THE CLARK COUNTY RECORDER'S OFFICE, CLARK COUNTY, NEVADA

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 126398 DATE:

Call before you Dig
Avoid injury, inconvenience, utility damage and costly.
Call 811 or 1-800-227-2600 AND CLARK COUNTY TRAFFIC OPERATIONS 1-702-455-6000

AVOID HITTING OVERHEAD POWER LINES IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FIREWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

CLV# 107V7418 L18-01503

ENGINEER'S STATEMENT — STATE OF NEVADA
VICKI D. MARJERRISON
No. 13078
PROFESSIONAL ENGINEER
DATE: 12/19/18

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|---|
| Δ | 11/29/18 | ADDED WATER LATERAL REVISED SD LATERAL LOCATION & CONNECTED TO DB OUTFALL REVISED CHANNEL GRADING, AND ADDED NEW SHEET 26A | | | | |

PROJECT NO. 62023B-240
DESIGN: LG/MB
DRAWN: LG/MB
CHECK: VDJ
PLOT DATE: 12-19-18
PLOT TIME: 11:11:16

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

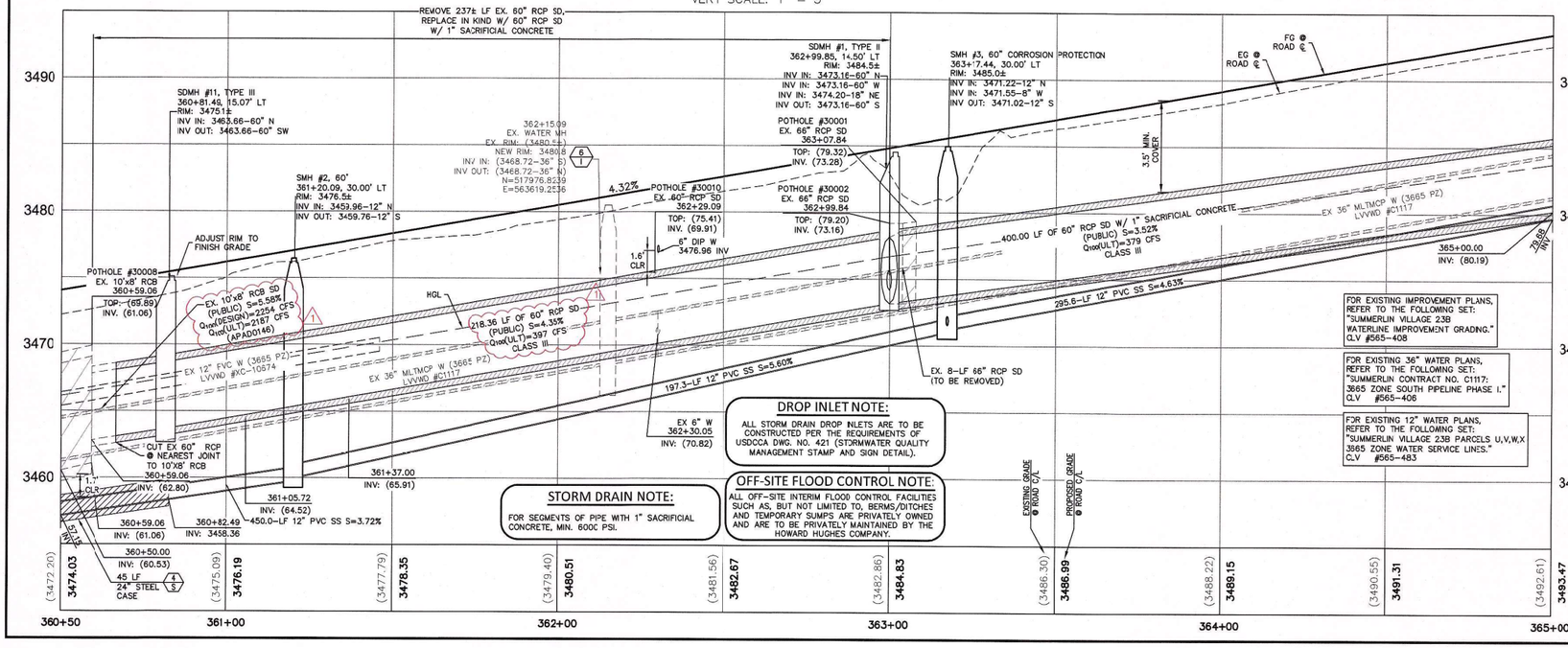
F:\Projects\6001\62023B-240\DWG\Production\240-PP.dwg
Alexander Santiago

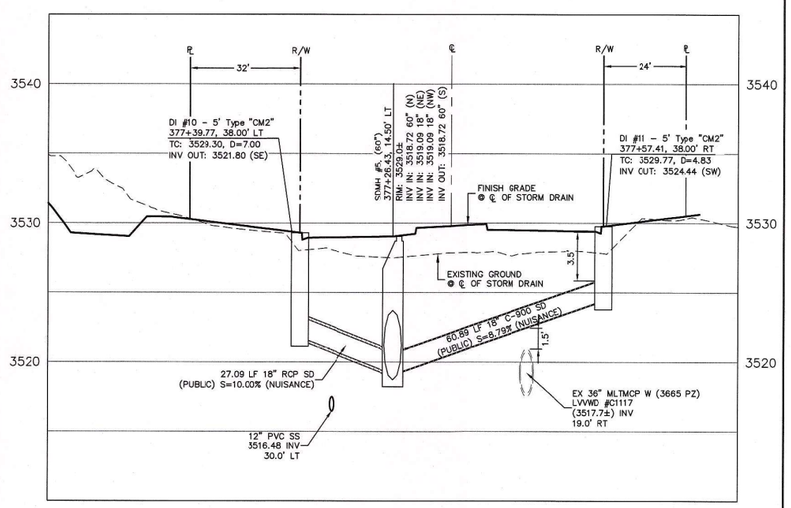
THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

**PLAN AND PROFILE 3**

DRAWING 14
14 OF 46 SHTS

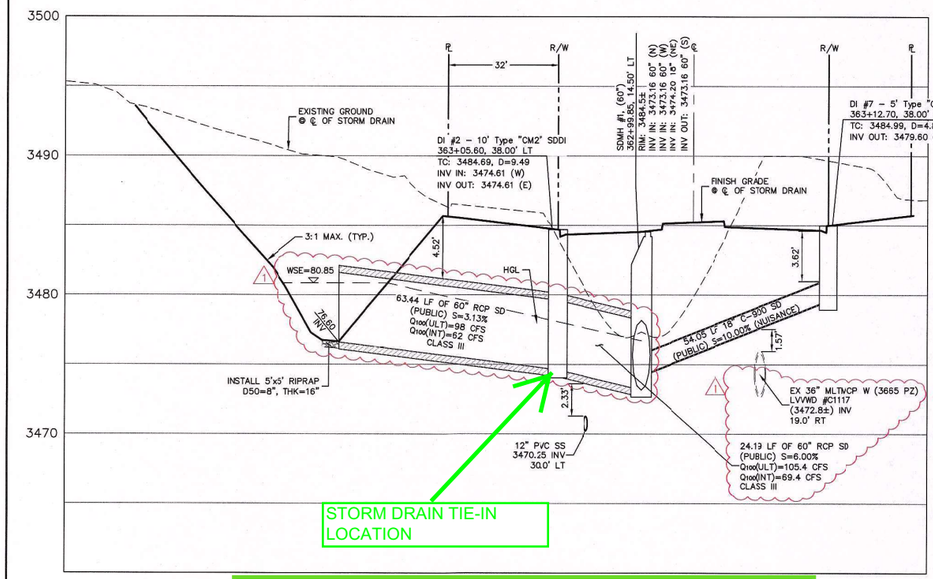





**SKY VISTA DRIVE**
**STORM DRAIN PROFILE @ 377+26.43**

SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING 17

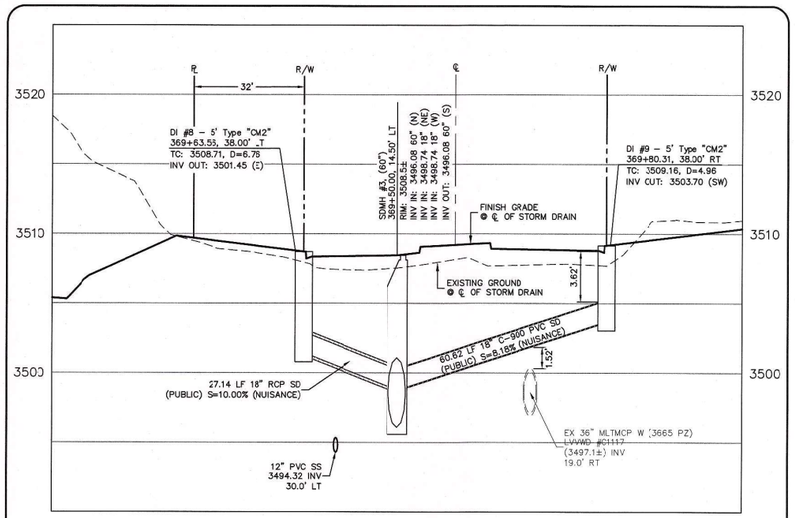
4
—




**SKY VISTA DRIVE**
**STORM DRAIN PROFILE @ 362+99.85**

SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING 14

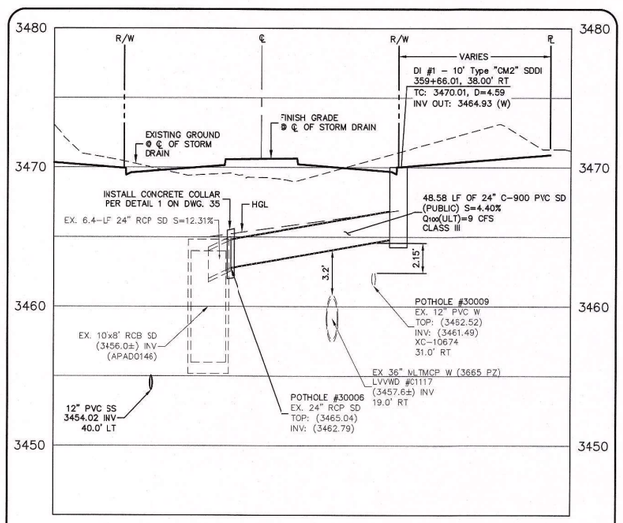
2
—




**SKY VISTA DRIVE**
**STORM DRAIN PROFILE @ 369+50.00**

SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING 15

3
—




**SKY VISTA DRIVE**
**STORM DRAIN PROFILE @ 359+66.01**

SCALE: HORIZ. 1"=20', VERT. 1"=5'
SEE DRAWING 13

1
—

**NOTE**

IN AREAS WHERE THE EXCAVATION OR GROUND ELEVATION IS LESS THAN THREE (3) FEET, FROM THE TOP OF THE LVVWD TRANSMISSION MAIN, NO EXCAVATION EQUIPMENT, OTHER THAN HAND HELD EQUIPMENT WILL BE ALLOWED WITHIN TEN (10) FEET OF THE PIPELINE IN THESE AREAS. THE CONTRACTOR IS TO PLACE A CONCRETE BARRIER; I.E. JERSEY RAIL, TO IDENTIFY AND PROTECT THE "NO EQUIPMENT ZONE".

**DROP INLET NOTE**

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE:

CAST-IN-PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE, WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS, CENTER BULB OR FLAT STRIP. (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL)

**DROP INLET NOTE:**

ALL STORM DRAIN DROP INLETS ARE TO BE CONSTRUCTED PER THE REQUIREMENTS OF USDCCA DWG. NO. 421 (STORMWATER QUALITY MANAGEMENT STAMP AND SIGN DETAIL).

**OFF-SITE FLOOD CONTROL NOTE:**

ALL OFF-SITE INTERIM FLOOD CONTROL FACILITIES SUCH AS, BUT NOT LIMITED TO, BERMS/DITCHES AND TEMPORARY SUMPS ARE PRIVATELY OWNED AND ARE TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 126398 FIRST APPROVED DATE: _____

C.V# 107V7418 L18-01503

STATE OF NEVADA
VICKI D. MAREVERSON
No. 13015
PROFESSIONAL ENGINEER
CIVIL
DATE: 12/19/18

| REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|---|
| 1 | 11/28/18 | ADDED WATER LATERAL, REVISED SD LATERAL LOCATION & CONNECTED TO DB OUTFALL, REVISED CHANNEL GRADING, AND ADDED NEW SHEET 26A | | | | |

PROJECT NO. 620238-240
DESIGN: LG/MB
DRAWN: LG/MB
CHECK: JLJ
PLOT DATE: 12-19-18
PLOT TIME: 11:16:47

GCW
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\620\620238-240\DWG Production\240-LAT.dwg
Alexander Santiago

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 23B SKY VISTA DRIVE
ALTA DRIVE TO FAR HILLS AVENUE

**LATERAL PROFILES 1**

DRAWING
**28**
28 OF 46 SHTS

# TECHNICAL DRAINAGE STUDY
# FOR
# SUMMERLIN VILLAGE 24A PARCEL O MASS GRADING

**62024-240**

**December 2018**

**Prepared for:**

**Hughes Howard Company, LLC**
**10801 Charleston Blvd., 3Rd Floor**
**Las Vegas, Nevada 89146**
**Phone: (702) 791-4300**

GCW
ENGINEERS \ SURVEYORS

| CITY OF LAS VEGAS<br>INTER-OFFICE MEMORANDUM | | | | DATE:<br>January 14, 2019 |
|---|---|---|---|---|
| TO:<br>**Land Development Services**<br>Department of Building & Safety | | | | FROM:<br>Albert Sung, P.E.<br>Flood Control Project Engineer<br>Department of Public Works |
| **SUBJECT:** | Drainage Study for:<br>**Summerlin V24A – Parcel O Mass Grading** | | | **COPIES TO:**<br>GCW Engineers / Surveyors |
| **Cross Streets:** | NWC of Sky Vista Drive & Alta Drive | | | Howard Hughes Company, LLC |
| **File Number:** | F:\Depot\DSMemos\DS5080A.doc | | | Bart Anderson, P.E., DevCo |
| **Parcel Number:** | 137-33-501-001 | | | |
| **Zoning Action:** | MOD-74043 | | | |
| **FEMA Flood Zone** | YES | NO | X | |
| **Proposed Storm Drain** | YES | NO | X | |

| HISTORY | DATE RECEIVED | DATE REVIEWED | COMMENTS | REVIEW FEES | FEES PAID Payment Trn # |
|---|---|---|---|---|---|
| 1st Submittal | 12/20/2018 | 1/14/2018 | See Comments Below | $400.00 | 501990: $400 |
| | | | **TOTAL FEES (LDDRS):** | **$400.00** | **----** |

**REMARKS:**

The Drainage Study for the subject project has been reviewed and:

| | |
|---|---|
| X | is approved subject to conformance to all City standards and the following conditions: |
| | must be resubmitted or supplemented including the following: |
| | is conditionally approved subject to Clark County Regional Flood Control District concurrence. |
| | is conditionally approved subject to Clark County Public Works Department concurrence. |

1. The proposed ditches are onsite drainage facilities and to be privatey owned and privately maintained by the owner/developer. Provide a note as such on the grading plans.

**NOTE:** Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the *Nevada Division of Environmental Protection* a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see http://ndep.nv.gov/bwpc/storm01.htm or call (775) 687-9429.

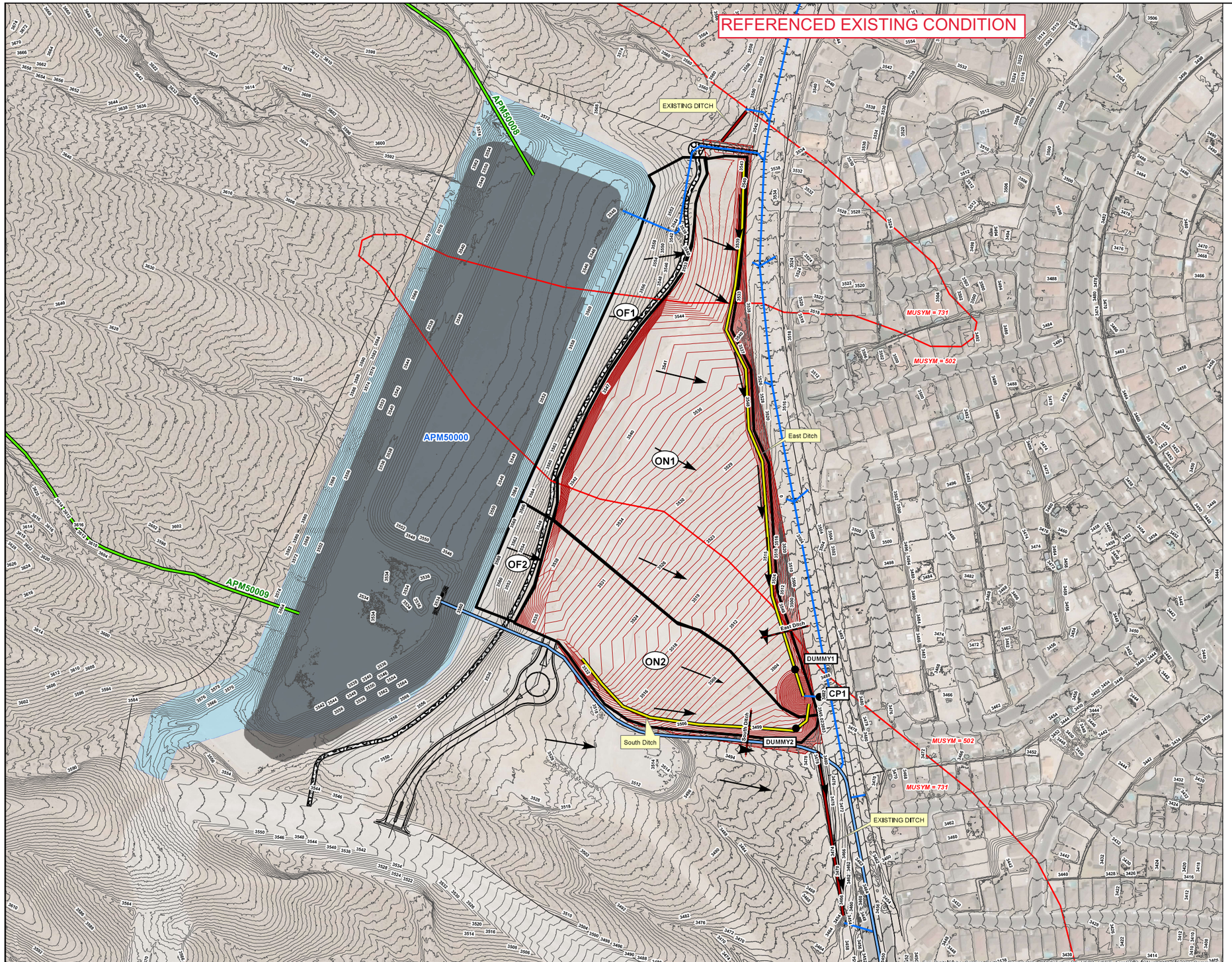
**NOTE:** Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

**END OF REMARKS**

ays

T/R/S: T20S/R59E/33

AREA K-33




NORTH

150 0 150 300 Feet

1 in = 150 ft

## Legend

- Concentration Point
- Cross Section
- Flow Direction
- SD Pipes
- Interim Condition Drainage Basin
- 2-ft Contour
- 1-ft Contour
- Soil Survey
- Current SFHA
- CCRFCD Basins

**Ditch**

**STATUS**

- EXISTING
- PROPOSED

**CCRFCD_Facilities**

**STATUS**

- COM
- CON
- PRO

**INTERIM CONDITIONS 100-YEAR DITCH CHARACTERISTICS**

| Section | Slope (%) | $Q_{100}$ (cfs) | Depth of flow (ft) | Left Side Slope (H:V) | Right Side Slope (H:V) | Velocity (ft/s) | Bottom Width (ft) |
|---|---|---|---|---|---|---|---|
| East Ditch | 1.8 | 59 | 0.88 | 3.0 | 30.0 | 4.60 | V-ditch |
| South Ditch | 3.3 | 29 | 0.33 | 23.0 | 2.0 | 4.54 | 15 |

**INTERIM CONDITION**
**SUBBASIN FLOW RATE SUMMARY**

| Subbasin ID | Area (Acres) | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|
| ON1 | 15.9 | 46 | 18 |
| ON2 | 6.6 | 24 | 11 |
| OF1 | 3.5 | 13 | 6 |
| OF2 | 1.1 | 4 | 2 |

**INTERIM CONDITION**
**CONCENTRATION POINT SUMMARY**

| Point ID | Area (Sq Mile) | Tributary Sources | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|---|
| CP1 | 0.04 | ON1 + ON2 + OF1 + OF2 | 88 | 37 |

REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP | DATE

PROJECT NO. 62024-240
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 12/17/2018
PLOT TIME: 8:06:18 AM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\600\62024-240\Division\Civil\Figures\GIS\Fig5-Int.mxd
mwillett

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24A PARCEL O MASS GRADING
INTERIM CONDITION DRAINAGE MAP

DRAWING
**FIG5**
1 OF 1 SHTS

| V24A Parcel O Mass Grading | | | | | | | |
|---|---|---|---|---|---|---|---|
| **WEIGHTED CURVE NUMBERS** | | | | | | | |
| INTERIM CONDITIONS | | | | | | | |
| Basin | Area (Ac) | MUSYM | Area (Ac) | Percent | CN | Land Use Index | WCN |
| ON1 | 15.9 | 731 | 7.0 | 44.0% | 92.1 | Newly Graded Areas | 87.4 |
| | | 502 | 8.9 | 56.0% | 83.8 | Newly Graded Areas | |
| ON2 | 6.6 | 731 | 6.6 | 100.0% | 92.1 | Newly Graded Areas | 92.1 |
| OF1 | 3.5 | 731 | 2.0 | 57.1% | 92.1 | Newly Graded Areas | 88.5 |
| | | 502 | 1.5 | 42.9% | 83.8 | Newly Graded Areas | |
| OF2 | 1.1 | 731 | 1.1 | 100.0% | 92.1 | Newly Graded Areas | 92.1 |

# HYDROLOGIC CRITERIA AND DESIGN MANUAL

## TIME OF CONCENTRATION

GCW ENGINEERS \ SURVEYORS

### V24A PARCEL O MASS GRADING
### INTERIM CONDITIONS

Project No: 62024-240
Date: 03-Dec-18
Calculated by: ME

| SUB-BASIN DATA | | | | | | INITIAL / OVERLAND TIME (Ti) | | | TRAVEL TIME (Tt) | | | | | Tc CHECK URBANIZED BASINS | | Tc | Tlag | REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DESIG: (1) | DEV./EX. (D or E) | CN (16) | K (2) | AREA Ac (3) | AREA Sq Mi (4) | INITIAL LENGTH Feet (5) | SLOPE % (6) | Ti Min (7) | TRAVEL LENGTH Feet (8) | SLOPE % (9a) | V1 VELOCITY fps (9b) | V2 VELOCITY fps (10) | Tt Min (11) | TOTAL LENGTH Feet (12) | Tc = (L/180)+10 Min (13) | Min (14) | Tlag = 0.6Tc/60 Hours (15) | Remarks: |
| | | | | | | | | | | | | | | | | | | |
| ON1 | D | 87.4 | 0.7637 | 15.9 | 0.0248 | 140 | 3.7 | 4.7 | 1900 | 3.80 | 3.9 | 6.0 | 6.0 | 2040 | 21.3 | 10.7 | **0.107** | |
| ON2 | D | 92.1 | 0.8257 | 6.6 | 0.0103 | 200 | 2.6 | 5.1 | 800 | 3.80 | 3.9 | 6.0 | 3.0 | 1000 | 15.6 | 8.0 | **0.080** | |
| OF1 | D | 88.5 | 0.7782 | 3.5 | 0.0055 | 50 | 2.0 | 3.3 | 200 | 13.50 | 7.4 | 11.2 | 0.4 | 250 | 11.4 | 3.7 | **0.050** | |
| OF2 | D | 92.1 | 0.8257 | 1.1 | 0.0017 | 50 | 2.0 | 2.8 | 200 | 13.50 | 7.4 | 11.2 | 0.4 | 250 | 11.4 | 3.2 | **0.050** | |
| | | | | | | | | | | | | | | | | | | |

$Tc = Ti + Tt$ $Tlag = 0.6\ Tc$

$Ti = 1.8\ (1.1 - K)\ L^{1/2} / S^{1/3}$

$K = 0.0132\ (CN) - 0.39$

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

Existing: $V1 = 14.8*(S/100)^{1/2}$ $V2 = 29.4*(S/100)^{1/2}$

Developed: $V1 = 20.2*(S/100)^{1/2}$ $V2 = 30.6*(S/100)^{1/2}$

**REFERENCE:** **STANDARD FORM 4**

```
1****************************************                                    ****************************************
 *                                      *                                    *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS OF ENGINEERS      *
 *             JUN   1998               *                                    *    HYDROLOGIC ENGINEERING CENTER     *
 *           VERSION 4.1                *                                    *          609 SECOND STREET           *
 *                                      *                                    *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   10DEC18  TIME  10:24:48  *                                    *          (916) 756-1104              *
 *                                      *                                    *                                      *
 ****************************************                                    ****************************************

                                        X     X  XXXXXXX   XXXXX           X
                                        X     X  X       X     X         XX
                                        X     X  X       X               X
                                        XXXXXXX  XXXX    X       XXXXX   X
                                        X     X  X       X               X
                                        X     X  X       X     X         X
                                        X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL   LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM



```
          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

                        *DIAGRAM
 *** FREE ***
             1          ID   ************************************************************
             2          ID   * ........................................................ *
             3          ID   * :               V24A PARCEL O MASS GRADING               : *
             4          ID   * :                   INTERIM CONDITIONS                   : *
             5          ID   * :                                                        : *
             6          ID   * :........................................................: *
             7          ID   * :             RETURN PERIOD_ _ _ _10 & 100-YEAR          : *
             8          ID   * :             DISTRIBUTION_ _ _ _ 6-HOUR SDN3            : *
             9          ID   * :             PROJECT NO_ _ _ _ _ 62024-240              : *
            10          ID   * :             FILENAME_ _ _ _ _ _ INT.H1                 : *
            11          ID   * :             DATE_ _ _ _ _ _ _ _ 12/03/2018             : *
            12          ID   * :             MODELED BY_ _ _ _ _ ME                     : *
            13          ID   * :........................................................: *
            14          ID   * :                                                        : *
            15          ID   * :........................................................: *
            16          ID   ************************************************************
            17          ID
            18          ID    JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            19          ID
            20          ID                          AREA      DARF
            21          ID                        SQ.MI.
            22          ID
            23          ID                       0.0 - 0.5    1.00
            24          ID                       0.5 - 1.0    0.98
            25          ID                       1.0 - 2.0    0.95
            26          ID                       2.0 - 4.0    0.92
            27          ID                       4.0 - 6.0    0.91
            28          ID                       6.0 - 8.0    0.89
            29          ID
            30          IT       5       0       0     200
            31          IO       5       0
            32          IN       5       0       0
            33          JR    PREC     1.0    0.54
                        *
                        *

            34          KK     ON1
            35          BA  0.0248
            36          PB    3.42
            37          PC   0.000   .0200   .0570   .0700   .0870   .1080   .1240   .1300   .1300   .1300
            38          PC   .1300   .1300   .1300   .1330   .1400   .1420   .1480   .1580   .1720   .1810
            39          PC   .1900   .1970   .1990   .2000   .2010   .2040   .2140   .2290   .2410   .2490
            40          PC   .2510   .2560   .2700   .2780   .2810   .2830   .2950   .3220   .3520   .4090
            41          PC   .4990   .5900   .7100   .7440   .7810   .8120   .8190   .8350   .8510   .8560
            42          PC   .8600   .8680   .8760   .8880   .9100   .9260   .9370   .9500   .9700   .9760
            43          PC   .9820   .9850   .9870   .9890   .9900   .9930   .9930   .9940   .9950   .9980
            44          PC   .9980   .9990  1.000
            45          LS       0    87.4
            46          UD   0.107
```

```
                    *
1                                          HEC-1 INPUT                                          PAGE  2

          LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10


             47          KK     OF1
             48          BA  0.0055
             49          LS       0    88.5
             50          UD    .050
                         *

             51          KK  DUMMY1
             52          KM   CONCENTRATION POINT
             53          HC       2
                         *

             54          KK     ON2
             55          BA  0.0103
             56          LS       0    92.1
             57          UD    .080
                         *

             58          KK     OF2
             59          BA  0.0017
             60          LS       0    92.1
             61          UD    .050
                         *

             62          KK  DUMMY2
             63          KM   CONCENTRATION POINT
             64          HC       2
                         *

             65          KK     CP1
             66          KM   CONCENTRATION POINT
             67          HC       2
                         *
             68          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

    NO.     (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     34         ON1
                  .
                  .
     47           .         OF1
                  .           .
                  .           .
     51       DUMMY1...........
                  .
                  .
     54           .         ON2
                  .           .
                  .           .
     58           .           .         OF2
                  .           .           .
                  .           .           .
     62           .      DUMMY2...........
                  .           .
                  .           .
     65         CP1...........

  (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************                                    ****************************************
 *                                      *                                   *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                   *    U.S. ARMY CORPS OF ENGINEERS      *
 *               JUN   1998             *                                   *    HYDROLOGIC ENGINEERING CENTER     *
 *            VERSION 4.1               *                                   *          609 SECOND STREET           *
 *                                      *                                   *       DAVIS, CALIFORNIA 95616        *
 *  RUN DATE   10DEC18  TIME  10:24:48  *                                   *           (916) 756-1104             *
 *                                      *                                   *                                      *
 ****************************************                                    ****************************************



                          ************************************************************
                          * ........................................................ *
                          * :              V24A PARCEL O MASS GRADING              : *
                          * :                  INTERIM CONDITIONS                  : *
                          * :                                                      : *
                          * :......................................................: *
                          * :             RETURN PERIOD_ _ _ _10 & 100-YEAR        : *
                          * :             DISTRIBUTION_ _ _ _ 6-HOUR SDN3          : *
```

```
* :             PROJECT NO_ _ _ _ _ 62024-240              : *
* :             FILENAME_ _ _ _ _ _ INT.H1                 : *
* :             DATE_ _ _ _ _ _ _ _ 12/03/2018             : *
* :             MODELED BY_ _ _ _ _ ME                     : *
* :........................................................: *
* :                                                        : *
* :........................................................: *
************************************************************

 JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:

                                AREA      DARF
                              SQ.MI.

                            0.0 - 0.5    1.00
                            0.5 - 1.0    0.98
                            1.0 - 2.0    0.95
                            2.0 - 4.0    0.92
                            4.0 - 6.0    0.91
                            6.0 - 8.0    0.89


   31 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                        NMIN           5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME        1635  ENDING TIME
                      ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL     .08 HOURS
                        TOTAL TIME BASE   16.58 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

      JP          MULTI-PLAN OPTION
                       NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00       .54
1


               PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                                FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                                TIME TO PEAK IN HOURS


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2
                                                        1.00      .54

 HYDROGRAPH AT
+                   ON1       .02     1   FLOW          46.      18.
                                          TIME         3.50     3.58

 HYDROGRAPH AT
+                   OF1       .01     1   FLOW          13.       6.
                                          TIME         3.50     3.50

   2 COMBINED AT
+                  DUMMY1     .03     1   FLOW          59.      23.
                                          TIME         3.50     3.50

 HYDROGRAPH AT
+                   ON2       .01     1   FLOW          24.      11.
                                          TIME         3.50     3.50

 HYDROGRAPH AT
+                   OF2       .00     1   FLOW           4.       2.
                                          TIME         3.50     3.50

   2 COMBINED AT
+                  DUMMY2     .01     1   FLOW          29.      13.
                                          TIME         3.50     3.50
```

EAST DITCH

SOUTH DITCH

```
  2 COMBINED AT
+                    CP1       .04     1   FLOW          88.      37.
                                           TIME        3.50     3.50


 *** NORMAL END OF HEC-1 ***
```

# UPDATE TO THE TECHNICAL DRAINAGE STUDY FOR VILLAGE 24A PARCEL N/O ENTRY ROAD IMPROVEMENT PLAN

**62024-238**

**December 2018**

**Prepared For:**

**The Howard Hughes Company, LLC**
**10801 W. Charleston Blvd., 3Rd Floor**
**Las Vegas, Nevada 89135**
**Phone: (702) 791-4300**

GCW
ENGINEERS \ SURVEYORS

| CITY OF LAS VEGAS<br>INTER-OFFICE MEMORANDUM | | | | DATE:<br>January 17, 2019 |
|---|---|---|---|---|
| TO:<br>**Land Development Services**<br>Department of Building & Safety | | | | FROM:<br>Jennifer Shinn, P.E.<br>Flood Control Engr. Associate<br>Department of Public Works |
| **SUBJECT:** | Drainage Study for:<br>**Update to Summerlin Village 24A – Parcel N/O Entry Road Improvement Plan** | | | **COPIES TO:**<br>GCW Engineers / Surveyors |
| **Cross Streets:** | Sky Vista Drive and Alta Drive | | | Howard Hughes Company, LLC |
| **File Number:** | F:\Depot\DSMemos\DS4993E.doc | | | Bart Anderson, P.E., DevCo |
| **Parcel Number:** | 137-33-501-001 | | | |
| **Zoning Action:** | PMP-72289 | | | |
| **FEMA Flood Zone** | YES | NO **X** | | |
| **Proposed Storm Drain** | YES **X** | NO | | |

| HISTORY | DATE RECEIVED | DATE REVIEWED | COMMENTS | REVIEW FEES | FEES PAID Payment Trn # |
|---|---|---|---|---|---|
| 1st Submittal | 5/17/2018 & 6/4/2018 | 6/13/2018 | Not Approved | $400.00 | 495918: $400 |
| 2nd Submittal | 7/17/2018 | 8/2/2018 | Conditional Approval | $400.00 | 497545: $400 |
| 3rd Submittal | 9/12/2018 | 9/26/2018 | Conditional Approval | N/C | N/C |
| CCRFCD | 10/23/2018 | 11/7/2018 | Concurrence Recv'd | N/C | N/C |
| 4th Submittal | 12/20/2018 | 1/17/2019 | Approved | $100.00 | 501988: $100 |
| | | | **TOTAL FEES (LDDRS):** | **$900.00** | **----** |

**REMARKS:**

**4th Submittal: Update to show the connection of 2nd outfall pipe to Sky Vista Storm Drain System**

3rd Submittal: Response to address CCRFCD comments

The Drainage Study for the subject project has been reviewed and:

| | |
|---|---|
| **X** | is approved subject to conformance to all City standards and the following conditions: |
| | must be resubmitted or supplemented including the following: |
| | is conditionally approved subject to Clark County Regional Flood Control District concurrence. |
| | is conditionally approved subject to Clark County Public Works Department concurrence. |

1. The "25' Public Access Easement" proposed at the toe of the embankment shall be dedicated as a "25' Public Drainage Easement".

**NOTE:** Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section.* Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

**NOTE:** Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

**END OF REMARKS**
**WSP/AYS/JKS**

**T/R/S: T20S/R59E/33**
**AREA: K-33**

WSPG MODEL FOR EXISTING STORM IN ENTRY ROAD

```
                                                                    NO.WSW
T1 Village 24A Parcel N/O Entry Road Improvement Plans                   0
T2 24 inch RCP
T3
SO   1000.0003516.750  1                          3518.350
R    1048.4203521.100  1      .013                                .000  30.000 1
JX   1048.4303521.102  3  2   .013    3.500         3521.102       90.0         .000
R    1117.2503524.540  3      .013                                .000  30.000 1
JX   1117.2603524.542  3  2   .013    3.500         3524.542       90.0         .000
R    1145.2903525.600  3      .013                                .000    .000 1
SH   1145.2903525.600  3                          3525.600
CD   1  4   1    .000   2.000     .000  .000  .000   .00
CD   2  4   1    .000   2.000     .000  .000  .000   .00
CD   3  4   1    .000   2.000     .000  .000  .000   .00
Q           11.000   .0
```

NOTE THE PIPE IS APPROX. HALF FULL WITH ADDTIONAL CAPACITY FOR 2 CFS.

NO.OUT



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING  Date: 7-11-2018 Time: 8:58:11

Village 24A Parcel N/O Entry Road Improvement Plans

24 inch RCP

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000.000 | 3516.750 | .771 | 3517.521 | 18.00 | 16.13 | 4.04 | 3521.56 | .00 | 1.53 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 3.833 | .0898 | | | | | .0627 | .24 | .77 | 3.75 | .70 | .013 | .00 | .00 | PIPE |
| 1003.833 | 3517.094 | .778 | 3517.872 | 18.00 | 15.90 | 3.93 | 3521.80 | .00 | 1.53 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 10.258 | .0898 | | | | | .0578 | .59 | .78 | 3.68 | .70 | .013 | .00 | .00 | PIPE |
| 1014.090 | 3518.016 | .806 | 3518.822 | 18.00 | 15.16 | 3.57 | 3522.39 | .00 | 1.53 | 1.96 | 2.000 | .000 | .00 | 1 .0 |
| 7.528 | .0898 | | | | | .0507 | .38 | .81 | 3.44 | .70 | .013 | .00 | .00 | PIPE |
| 1021.619 | 3518.692 | .836 | 3519.528 | 18.00 | 14.46 | 3.25 | 3522.77 | .00 | 1.53 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 5.831 | .0898 | | | | | .0445 | .26 | .84 | 3.21 | .70 | .013 | .00 | .00 | PIPE |
| 1027.449 | 3519.216 | .867 | 3520.083 | 18.00 | 13.79 | 2.95 | 3523.03 | .00 | 1.53 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 4.660 | .0898 | | | | | .0391 | .18 | .87 | 2.99 | .70 | .013 | .00 | .00 | PIPE |
| 1032.109 | 3519.635 | .899 | 3520.534 | 18.00 | 13.14 | 2.68 | 3523.22 | .00 | 1.53 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 3.803 | .0898 | | | | | .0344 | .13 | .90 | 2.79 | .70 | .013 | .00 | .00 | PIPE |
| 1035.913 | 3519.977 | .932 | 3520.909 | 18.00 | 12.53 | 2.44 | 3523.35 | .00 | 1.53 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 3.133 | .0898 | | | | | .0302 | .09 | .93 | 2.60 | .70 | .013 | .00 | .00 | PIPE |
| 1039.046 | 3520.258 | .967 | 3521.225 | 18.00 | 11.95 | 2.22 | 3523.44 | .00 | 1.53 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 2.603 | .0898 | | | | | .0266 | .07 | .97 | 2.43 | .70 | .013 | .00 | .00 | PIPE |
| 1041.649 | 3520.492 | 1.004 | 3521.496 | 18.00 | 11.39 | 2.02 | 3523.51 | .00 | 1.53 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 2.172 | .0898 | | | | | .0234 | .05 | 1.00 | 2.26 | .70 | .013 | .00 | .00 | PIPE |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING  Date: 7-11-2018 Time: 8:58:11

Village 24A Parcel N/O Entry Road Improvement Plans

24 inch RCP

| Station / L/Elem | Invert Elev / Ch Slope | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head / SF Ave | Energy Grd.El. / HF | Super Elev / SE Dpth | Critical Depth / Froude N | Flow Top Width / Norm Dp | Height/Dia.-FT / "N" | Base Wt or I.D. / X-Fall | ZL / ZR | No Wth Prs/Pip / Type Ch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1043.821 | 3520.687 | 1.043 | 3521.730 | 18.00 | 10.86 | 1.83 | 3523.56 | .00 | 1.53 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 1.830 | .0898 | | | | | .0207 | .04 | 1.04 | 2.10 | .70 | .013 | .00 | .00 | PIPE |
| 1045.651 | 3520.851 | 1.083 | 3521.934 | 18.00 | 10.36 | 1.67 | 3523.60 | .00 | 1.53 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 1.514 | .0898 | | | | | .0182 | .03 | 1.08 | 1.95 | .70 | .013 | .00 | .00 | PIPE |
| 1047.166 | 3520.987 | 1.126 | 3522.114 | 18.00 | 9.88 | 1.51 | 3523.63 | .00 | 1.53 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 1.255 | .0898 | | | | | .0161 | .02 | 1.13 | 1.82 | .70 | .013 | .00 | .00 | PIPE |
| 1048.420 | 3521.100 | 1.171 | 3522.271 | 18.00 | 9.42 | 1.38 | 3523.65 | .00 | 1.53 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| JUNCT STR | .1951 | | | | | .0285 | .00 | 1.17 | 1.68 | | .013 | .00 | .00 | PIPE |
| 1048.430 | 3521.102 | .769 | 3521.871 | 14.50 | 13.03 | 2.64 | 3524.51 | .00 | 1.37 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 5.394 | .0500 | | | | | .0413 | .22 | .77 | 3.04 | .73 | .013 | .00 | .00 | PIPE |
| 1053.823 | 3521.371 | .774 | 3522.146 | 14.50 | 12.91 | 2.59 | 3524.73 | .00 | 1.37 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 17.765 | .0500 | | | | | .0383 | .68 | .77 | 3.00 | .73 | .013 | .00 | .00 | PIPE |
| 1071.589 | 3522.259 | .802 | 3523.061 | 14.50 | 12.31 | 2.35 | 3525.41 | .00 | 1.37 | 1.96 | 2.000 | .000 | .00 | 1 .0 |
| 11.304 | .0500 | | | | | .0336 | .38 | .80 | 2.80 | .73 | .013 | .00 | .00 | PIPE |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1082.893 | 3522.823 | .831 | 3523.655 | 14.50 | 11.74 | 2.14 | 3525.79 | .00 | 1.37 | 1.97 | 2.000 | .000 | .00 | 1 | .0 |
| 7.992 | .0500 | | | | | .0295 | .24 | .83 | 2.61 | .73 | .013 | .00 | .00 | PIPE | |
| 1090.885 | 3523.223 | .862 | 3524.085 | 14.50 | 11.19 | 1.94 | 3526.03 | .00 | 1.37 | 1.98 | 2.000 | .000 | .00 | 1 | .0 |
| 6.064 | .0500 | | | | | .0259 | .16 | .86 | 2.44 | .73 | .013 | .00 | .00 | PIPE | |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 7-11-2018 Time: 8:58:11

Village 24A Parcel N/O Entry Road Improvement Plans

24 inch RCP

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1096.949 | 3523.526 | .893 | 3524.419 | 14.50 | 10.67 | 1.77 | 3526.19 | .00 | 1.37 | 1.99 | 2.000 | .000 | .00 | 1 | .0 |
| 4.661 | .0500 | | | | | .0228 | .11 | .89 | 2.27 | .73 | .013 | .00 | .00 | PIPE | |
| 1101.610 | 3523.759 | .927 | 3524.686 | 14.50 | 10.17 | 1.61 | 3526.29 | .00 | 1.37 | 1.99 | 2.000 | .000 | .00 | 1 | .0 |
| 3.713 | .0500 | | | | | .0200 | .07 | .93 | 2.12 | .73 | .013 | .00 | .00 | PIPE | |
| 1105.323 | 3523.944 | .962 | 3524.906 | 14.50 | 9.70 | 1.46 | 3526.37 | .00 | 1.37 | 2.00 | 2.000 | .000 | .00 | 1 | .0 |
| 2.995 | .0500 | | | | | .0176 | .05 | .96 | 1.98 | .73 | .013 | .00 | .00 | PIPE | |
| 1108.318 | 3524.094 | .998 | 3525.092 | 14.50 | 9.25 | 1.33 | 3526.42 | .00 | 1.37 | 2.00 | 2.000 | .000 | .00 | 1 | .0 |
| 2.403 | .0500 | | | | | .0155 | .04 | 1.00 | 1.84 | .73 | .013 | .00 | .00 | PIPE | |
| 1110.721 | 3524.214 | 1.036 | 3525.250 | 14.50 | 8.82 | 1.21 | 3526.46 | .00 | 1.37 | 2.00 | 2.000 | .000 | .00 | 1 | .0 |
| 1.896 | .0500 | | | | | .0137 | .03 | 1.04 | 1.71 | .73 | .013 | .00 | .00 | PIPE | |
| 1112.616 | 3524.309 | 1.077 | 3525.386 | 14.50 | 8.41 | 1.10 | 3526.48 | .00 | 1.37 | 1.99 | 2.000 | .000 | .00 | 1 | .0 |
| 1.525 | .0500 | | | | | .0121 | .02 | 1.08 | 1.59 | .73 | .013 | .00 | .00 | PIPE | |
| 1114.141 | 3524.385 | 1.119 | 3525.504 | 14.50 | 8.02 | 1.00 | 3526.50 | .00 | 1.37 | 1.99 | 2.000 | .000 | .00 | 1 | .0 |
| 1.188 | .0500 | | | | | .0107 | .01 | 1.12 | 1.48 | .73 | .013 | .00 | .00 | PIPE | |
| 1115.330 | 3524.444 | 1.163 | 3525.607 | 14.50 | 7.64 | .91 | 3526.51 | .00 | 1.37 | 1.97 | 2.000 | .000 | .00 | 1 | .0 |
| .850 | .0500 | | | | | .0094 | .01 | 1.16 | 1.37 | .73 | .013 | .00 | .00 | PIPE | |
| 1116.180 | 3524.487 | 1.211 | 3525.698 | 14.50 | 7.29 | .82 | 3526.52 | .00 | 1.37 | 1.95 | 2.000 | .000 | .00 | 1 | .0 |
| .600 | .0500 | | | | | .0083 | .01 | 1.21 | 1.27 | .73 | .013 | .00 | .00 | PIPE | |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 7-11-2018 Time: 8:58:11

Village 24A Parcel N/O Entry Road Improvement Plans

24 inch RCP

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1116.780 | 3524.517 | 1.261 | 3525.778 | 14.50 | 6.95 | .75 | 3526.53 | .00 | 1.37 | 1.93 | 2.000 | .000 | .00 | 1 | .0 |
| .356 | .0500 | | | | | .0074 | .00 | 1.26 | 1.18 | .73 | .013 | .00 | .00 | PIPE | |
| 1117.136 | 3524.534 | 1.314 | 3525.849 | 14.50 | 6.62 | .68 | 3526.53 | .00 | 1.37 | 1.90 | 2.000 | .000 | .00 | 1 | .0 |
| .114 | .0500 | | | | | .0066 | .00 | 1.31 | 1.09 | .73 | .013 | .00 | .00 | PIPE | |
| 1117.250 | 3524.540 | 1.372 | 3525.912 | 14.50 | 6.31 | .62 | 3526.53 | .00 | 1.37 | 1.86 | 2.000 | .000 | .00 | 1 | .0 |
| JUNCT STR | .1951 | | | | | .0042 | .00 | 1.37 | 1.00 | | .013 | .00 | .00 | PIPE | |
| 1117.260 | 3524.542 | 1.975 | 3526.517 | 11.00 | 3.51 | .19 | 3526.71 | .00 | 1.19 | .45 | 2.000 | .000 | .00 | 1 | .0 |
| 4.143 | .0377 | | | | | .0021 | .01 | 1.97 | .23 | .68 | .013 | .00 | .00 | PIPE | |
| 1121.403 | 3524.698 | 1.808 | 3526.507 | 11.00 | 3.68 | .21 | 3526.72 | .00 | 1.19 | 1.18 | 2.000 | .000 | .00 | 1 | .0 |
| 1.824 | .0377 | | | | | .0021 | .00 | 1.81 | .41 | .68 | .013 | .00 | .00 | PIPE | |
| 1123.227 | 3524.767 | 1.728 | 3526.495 | 11.00 | 3.81 | .23 | 3526.72 | .00 | 1.19 | 1.37 | 2.000 | .000 | .00 | 1 | .0 |

HYDRAULIC JUMP

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1123.227 | 3524.767 | .788 | 3525.555 | 11.00 | 9.56 | 1.42 | 3526.98 | .00 | 1.19 | 1.95 | 2.000 | .000 | .00 | 1 .0 |
| 4.497 | .0377 | | | | | .0206 | .09 | .79 | 2.20 | .68 | .013 | .00 | .00 | PIPE |
| 1127.724 | 3524.937 | .817 | 3525.754 | 11.00 | 9.11 | 1.29 | 3527.04 | .00 | 1.19 | 1.97 | 2.000 | .000 | .00 | 1 .0 |
| 4.425 | .0377 | | | | | .0181 | .08 | .82 | 2.05 | .68 | .013 | .00 | .00 | PIPE |
| 1132.149 | 3525.104 | .847 | 3525.951 | 11.00 | 8.68 | 1.17 | 3527.12 | .00 | 1.19 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| 3.448 | .0377 | | | | | .0159 | .05 | .85 | 1.91 | .68 | .013 | .00 | .00 | PIPE |



Program Package Serial Number: 3074

WATER SURFACE PROFILE LISTING Date: 7-11-2018 Time: 8:58:11

Village 24A Parcel N/O Entry Road Improvement Plans

24 inch RCP

| Station | Invert Elev | Depth (FT) | Water Elev | Q (CFS) | Vel (FPS) | Vel Head | Energy Grd.El. | Super Elev | Critical Depth | Flow Top Width | Height/ Dia.-FT | Base Wt or I.D. | ZL | No Wth Prs/Pip |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/Elem | Ch Slope | | | | | SF Ave | HF | SE Dpth | Froude N | Norm Dp | "N" | X-Fall | ZR | Type Ch |
| 1135.597 | 3525.234 | .878 | 3526.112 | 11.00 | 8.28 | 1.06 | 3527.18 | .00 | 1.19 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 2.679 | .0377 | | | | | .0139 | .04 | .88 | 1.78 | .68 | .013 | .00 | .00 | PIPE |
| 1138.276 | 3525.335 | .911 | 3526.246 | 11.00 | 7.89 | .97 | 3527.21 | .00 | 1.19 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| 2.118 | .0377 | | | | | .0123 | .03 | .91 | 1.66 | .68 | .013 | .00 | .00 | PIPE |
| 1140.394 | 3525.415 | .945 | 3526.360 | 11.00 | 7.53 | .88 | 3527.24 | .00 | 1.19 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 1.668 | .0377 | | | | | .0108 | .02 | .95 | 1.55 | .68 | .013 | .00 | .00 | PIPE |
| 1142.062 | 3525.478 | .980 | 3526.458 | 11.00 | 7.18 | .80 | 3527.26 | .00 | 1.19 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| 1.228 | .0377 | | | | | .0095 | .01 | .98 | 1.44 | .68 | .013 | .00 | .00 | PIPE |
| 1143.290 | 3525.524 | 1.018 | 3526.542 | 11.00 | 6.84 | .73 | 3527.27 | .00 | 1.19 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| .922 | .0377 | | | | | .0084 | .01 | 1.02 | 1.34 | .68 | .013 | .00 | .00 | PIPE |
| 1144.212 | 3525.559 | 1.057 | 3526.616 | 11.00 | 6.52 | .66 | 3527.28 | .00 | 1.19 | 2.00 | 2.000 | .000 | .00 | 1 .0 |
| .628 | .0377 | | | | | .0074 | .00 | 1.06 | 1.25 | .68 | .013 | .00 | .00 | PIPE |
| 1144.840 | 3525.583 | 1.098 | 3526.681 | 11.00 | 6.22 | .60 | 3527.28 | .00 | 1.19 | 1.99 | 2.000 | .000 | .00 | 1 .0 |
| .340 | .0377 | | | | | .0065 | .00 | 1.10 | 1.16 | .68 | .013 | .00 | .00 | PIPE |
| 1145.181 | 3525.596 | 1.142 | 3526.738 | 11.00 | 5.93 | .55 | 3527.28 | .00 | 1.19 | 1.98 | 2.000 | .000 | .00 | 1 .0 |
| .109 | .0377 | | | | | .0057 | .00 | 1.14 | 1.08 | .68 | .013 | .00 | .00 | PIPE |
| 1145.290 | 3525.600 | 1.189 | 3526.789 | 11.00 | 5.65 | .50 | 3527.28 | .00 | 1.19 | 1.96 | 2.000 | .000 | .00 | 1 .0 |

FILE: NO.WSW W S P G W - EDIT LISTING - Version 14.10 Date: 7-11-2018 Time: 8:58: 7

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING 

| CARD CODE | SECT NO | CHN TYPE | NO OF PIER/PIP | AVE PIER WIDTH | HEIGHT 1 DIAMETER | BASE WIDTH | ZL | ZR | INV DROP | Y(1) | Y(2) | Y(3) | Y(4) | Y(5) | Y(6) | Y(7) | Y(8) | Y(9) | Y(10) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD | 1 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |
| CD | 2 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |
| CD | 3 | 4 | 1 | | 2.000 | | | | | | | | | | | | | | |

W S P G W 

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

Village 24A Parcel N/O Entry Road Improvement Plans

HEADING LINE NO 2 IS -

24 inch RCP

HEADING LINE NO 3 IS -

W S P G W 

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

| U/S DATA | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| | 1000.000 | 3516.750 | 1 | 3518.350 |

ELEMENT NO 2 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 1048.420 | 3521.100 | 1 | .013 | .000 | .000 | 30.000 | 1 |

ELEMENT NO 3 IS A JUNCTION * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1048.430 | 3521.102 | 3 | 2 | 0 | .013 | 3.500 | .000 | 3521.102 | .000 | 90.000 | .000 |

| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

ELEMENT NO 4 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 1117.250 | 3524.540 | 3 | .013 | .000 | .000 | 30.000 | 1 |

ELEMENT NO 5 IS A JUNCTION * * * * * *

| U/S DATA | STATION | INVERT | SECT | LAT-1 | LAT-2 | N | Q3 | Q4 | INVERT-3 | INVERT-4 | PHI 3 | PHI 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1117.260 | 3524.542 | 3 | 2 | 0 | .013 | 3.500 | .000 | 3524.542 | .000 | 90.000 | .000 |

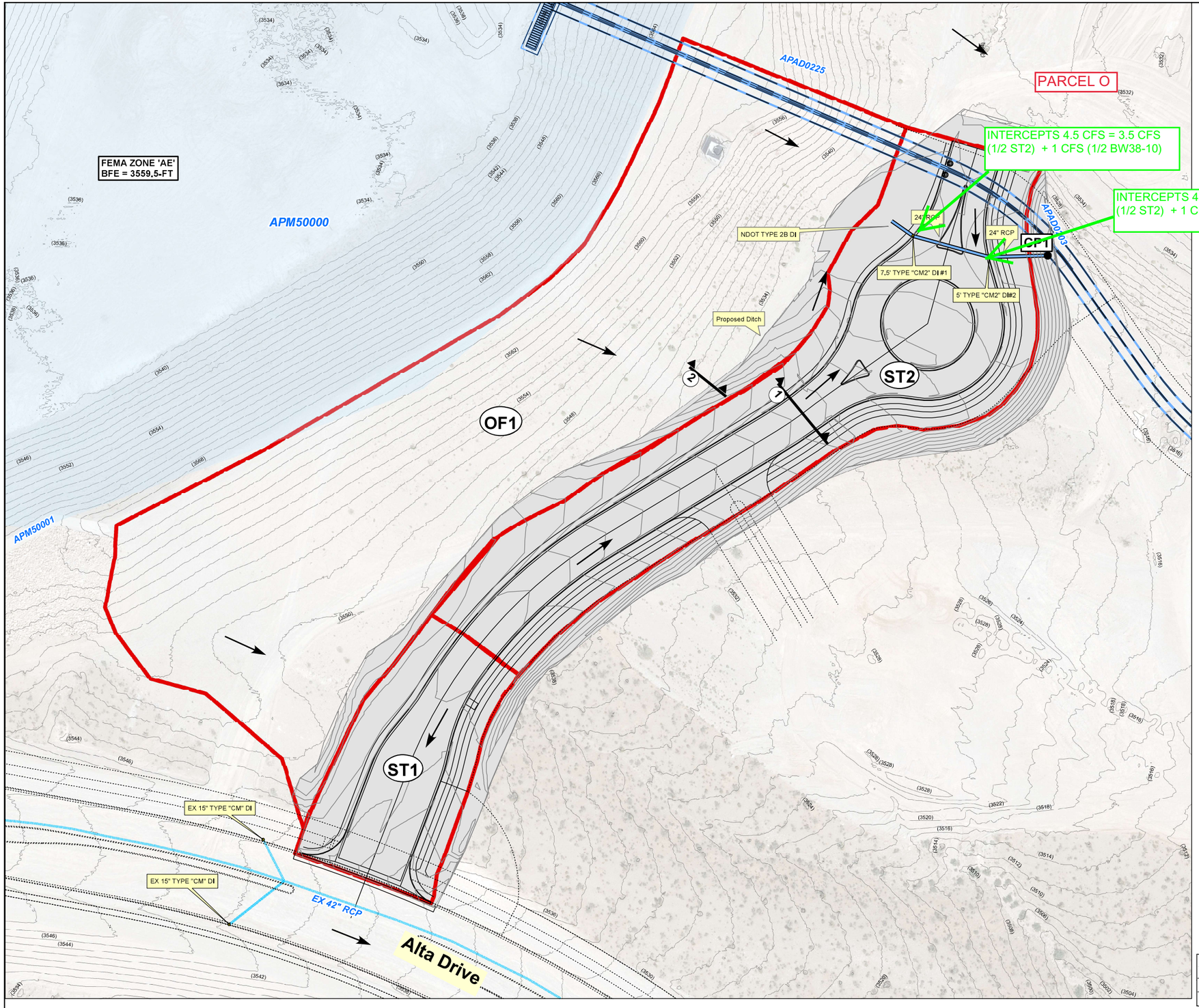
| RADIUS | ANGLE |
|---|---|
| .000 | .000 |

ELEMENT NO 6 IS A REACH * * *

| U/S DATA | STATION | INVERT | SECT | N | RADIUS | ANGLE | ANG PT | MAN H |
|---|---|---|---|---|---|---|---|---|
| | 1145.290 | 3525.600 | 3 | .013 | .000 | .000 | .000 | 1 |

ELEMENT NO 7 IS A SYSTEM HEADWORKS * *

| U/S DATA | STATION | INVERT | SECT | W S ELEV |
|---|---|---|---|---|
| | 1145.290 | 3525.600 | 3 | 3525.600 |




NORTH

60 0 60 Feet

1 in = 40 ft

## Legend

- Concentration Point
- Proposed SD
- Cross Section
- Regional Flood Control Facility
- Flow Direction
- Detention Basin No. 5
- Subbasin Boundary
- 2-ft Contours

**ULTIMATE CONDITION**
**SUBBASIN FLOW RATE SUMMARY**

| Subbasin ID | Area (Acres) | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|
| OF1 | 3.3 | 11 | 4 |
| ST1 | 0.5 | 2 | 1 |
| ST2 | 1.6 | 7 | 4 |

**ULTIMATE CONDITION**
**CONCENTRATION POINT SUMMARY**

| Point ID | Area (Sq Mile) | Tributary Sources | $Q_{100}$ (cfs) | $Q_{10}$ (cfs) |
|---|---|---|---|---|
| CP1 | 0.01 | OF1 + ST2 | 18 | 8 |

**100-YEAR FLOW CHARACTERISTICS**
**ULTIMATE CONDITIONS**

| Location | Slope (%) | $Q_{100}$ (cfs) | Depth (ft) | Velocity (ft/s) | D*V | Tributary |
|---|---|---|---|---|---|---|
| Section 1 | 2.71 | 7.00 | 0.33 | 3.48 | 1.15 | ST2 |

**ULTIMATE CONDITIONS 100-YEAR DITCH CHARACTERISTICS**

| Location | Slope (%) | Side Slopes | $Q_{100}$ (cfs) | Depth of flow (ft) | Freeboard (ft) | Total Depth (ft) | Velocity (ft/s) | Bottom Width (ft) |
|---|---|---|---|---|---|---|---|---|
| 2 | 2.6 | 3:1 | 11 | 0.39 | 0.61 | 1.0 | 4.52 | 5 |

DATE | GCW APP | DATE | AGENCY APP | DATE | DESCRIPTION | REV | DATE

PROJECT NO. 62024-238
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 07/11/2018
PLOT TIME: 11:55:15 AM

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\60006202\4-238\Division\Fdr\Figures\RTC\Ultimate.mxd
metslatt

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24A PARCEL N/O
ENTRY ROAD IMPROVEMENT PLANS

ULTIMATE CONDITIONS DRAINAGE MAP

DRAWING
**FIG5**
1 OF 1 SHTS

# SUMMERLIN

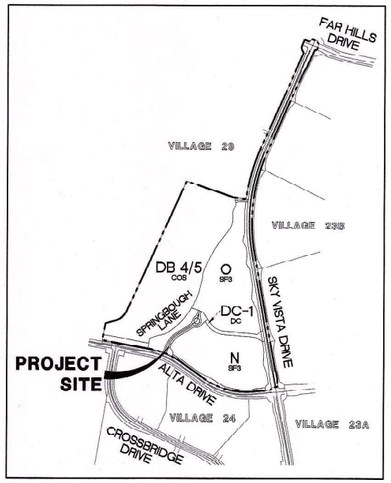
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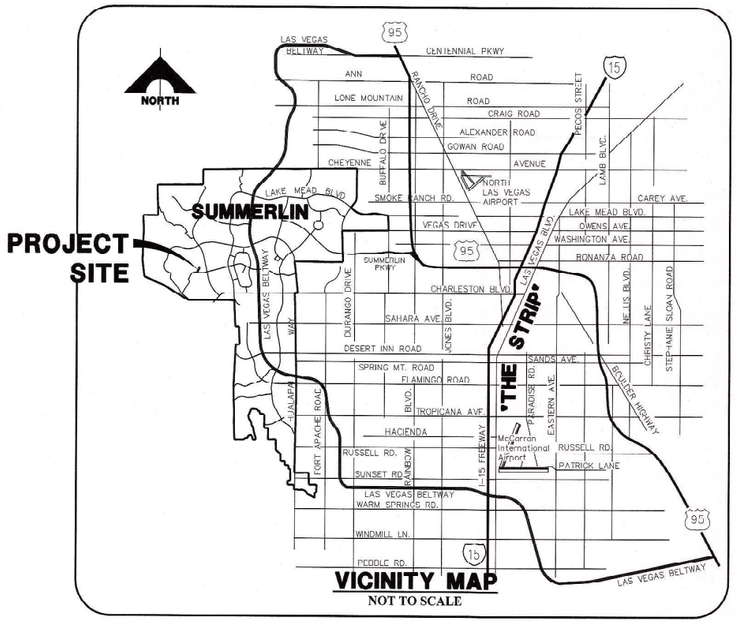
# VILLAGE 24A
# PARCEL N/O
# ENTRY ROAD IMPROVEMENT PLANS
# 2018

**A.P.N. 137-33-501-001**

**NON SID PROJECT**

| INDEX OF SHEETS | | |
|---|---|---|
| SHT. # | DWG. # | DESCRIPTION |
| 1 | 1 | COVER SHEET |
| 2 | 2 | PROJECT DATA SHEET |
| 3 | 3 | GENERAL NOTES |
| 4 | 4 | HORIZONTAL CONTROL PLAN 1 |
| 5 | 5 | HORIZONTAL CONTROL PLAN 2 |
| 6 | 6 | ENTRY ROAD PLAN & PROFILE 1 |
| 7 | 7 | ENTRY ROAD PLAN & PROFILE 2 |
| 8 | 8 | ROUNDABOUT PLAN & PROFILE |
| 9 | 9 | CONSTRUCTION DETAILS |
| 10 | 10 | WATER MAIN PROFILE |
| 11 | 11 | LATERAL PROFILES |
| 12 | 12 | ROADWAY SECTIONS AND DETAILS |
| 13 | 13 | ROADWAY SIGNAGE & STRIPING PLAN |
| 14 | 14 | STREETLIGHT, CONDUIT AND ELECTRICAL PLAN |
| 15 | 15 | STREETLIGHT DETAILS |
| 16 | 16 | 12' ACCESS ROAD OVERALL PLAN |
| 17 | 17 | 12' ACCESS ROAD PROFILE 1 |
| 18 | 18 | 12' ACCESS ROAD PROFILE 2 |
| 19 | 19 | 12' ACCESS ROAD SECTIONS |
| 20 | 20 | PIPE PENETRATION DETAILS |




## CAUTION TO CONTRACTOR

THE CONTRACTOR SHALL BE RESPONSIBLE TO INVESTIGATE AND VERIFY THE ACTUAL LOCATION AND DEPTH OF ALL EXISTING UNDERGROUND FACILITIES AT LEAST 48 HOURS IN ADVANCE OF THE PERFORMANCE OF ANY WORK.

## NOTE

PRE-DEVELOPMENT MEETING WITH DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW DIVISION, OFF-SITE INSPECTOR REQUIRED. CONTACT CIVIL ENGINEERING INSPECTOR AT (702) 455-4610.

## DRAINAGE CERTIFICATION

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

MICHAEL FANG, P.E. 24464 — DATE

THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

CITY OF LAS VEGAS PLANNING DEPARTMENT — DATE

## APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. 135222 FIRST APPROVED DATE:

LVVWD APPROVED FIRE FLOW: TOTAL 1500 GPM / ON SITE N/A GPM
(SHEETS: 1-3, 6-11)

## APPROVED FOR CONSTRUCTION

CITY OF LAS VEGAS FIRE DEPARTMENT — DATE

HOWARD HUGHES COMPANY, LLC

KEVIN ORROCK
VICE PRESIDENT — DATE

## UTILITY/AGENCY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

CENTRAL TELEPHONE CO, DBA CENTURYLINK — DATE

THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY — DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY - TRANSMISSION ENGINEERING — DATE

SOUTHWEST GAS CORPORATION — DATE

## OWNER/DEVELOPER

**THE HOWARD HUGHES COMPANY, LLC**
**10801 W. CHARLESTON BLVD., 3RD FLOOR**
**LAS VEGAS, NEVADA 89135**
**OFFICE PHONE NO. (702) 791-4300**

## ENGINEER

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

Call before you Dig
Avoid cutting underground utility lines, it's costly.
Call 811
OR
1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

AVOID HITTING UNDERGROUND STREET LIGHT CONDUIT AND STREET LIGHT CIRCUITS IT'S COSTLY
CALL BEFORE YOU DO UNDERGROUND
Call before you
UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)

L18-01682

STATE OF NEVADA — PROFESSIONAL ENGINEER — VICKI D. MARJERISON — No. 13079 — CIVIL
Vicki D. Marjerison Exp. 12/31/2019
DATE: 12/19/18

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|---|
| 1 | 12/04/18 | REVISED SHEETS 16-19 | | | | |

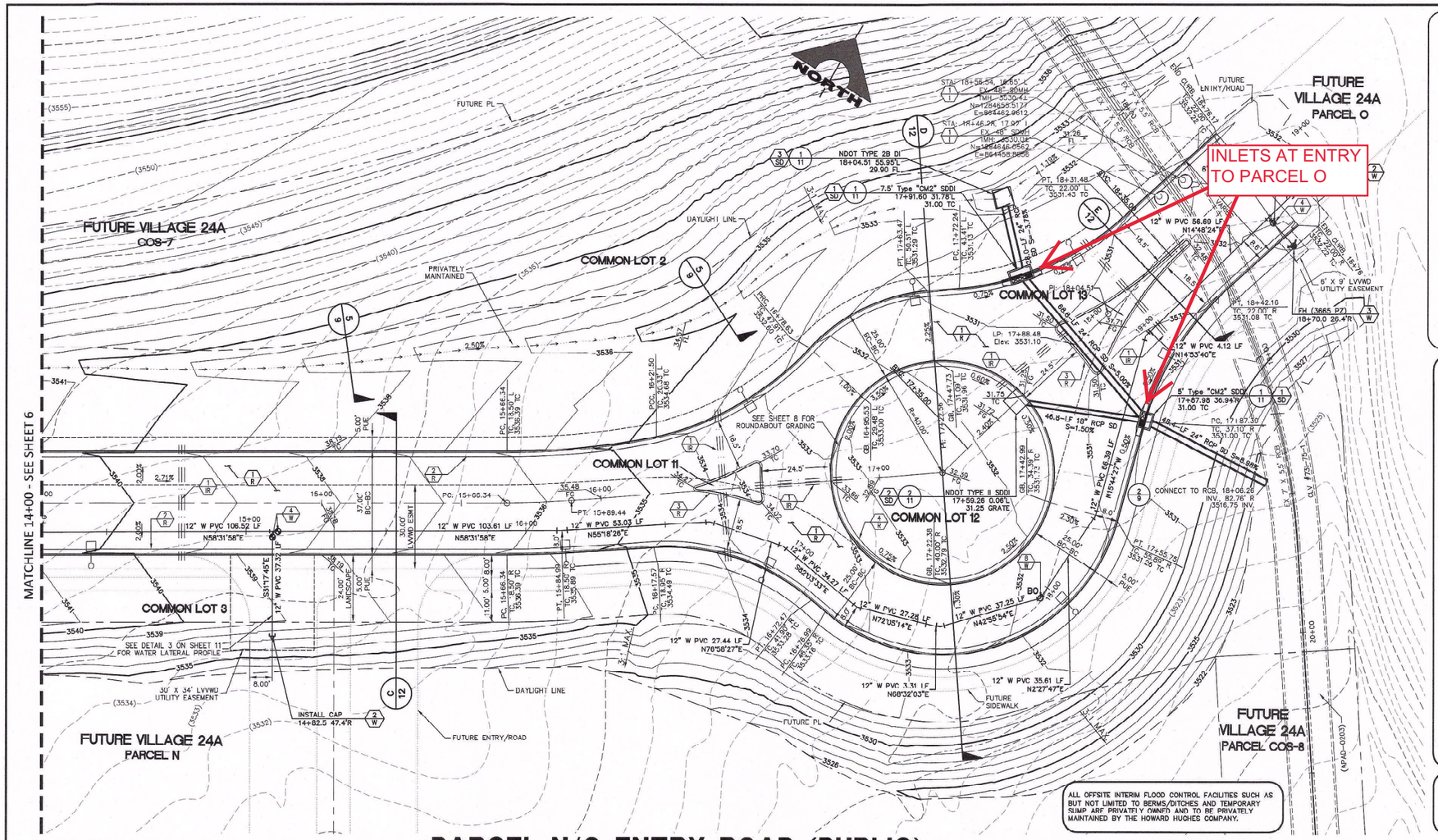
PROJECT NO. 62024-238
DESIGN: LG/MF
DRAWN: NFE/AS
CHECK: LG/MF
PLOT DATE: 12-19-18
PLOT TIME: 1:21:44

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\6D\62024-238\VMG\production\v238-General.dwg
Alexander Santiago

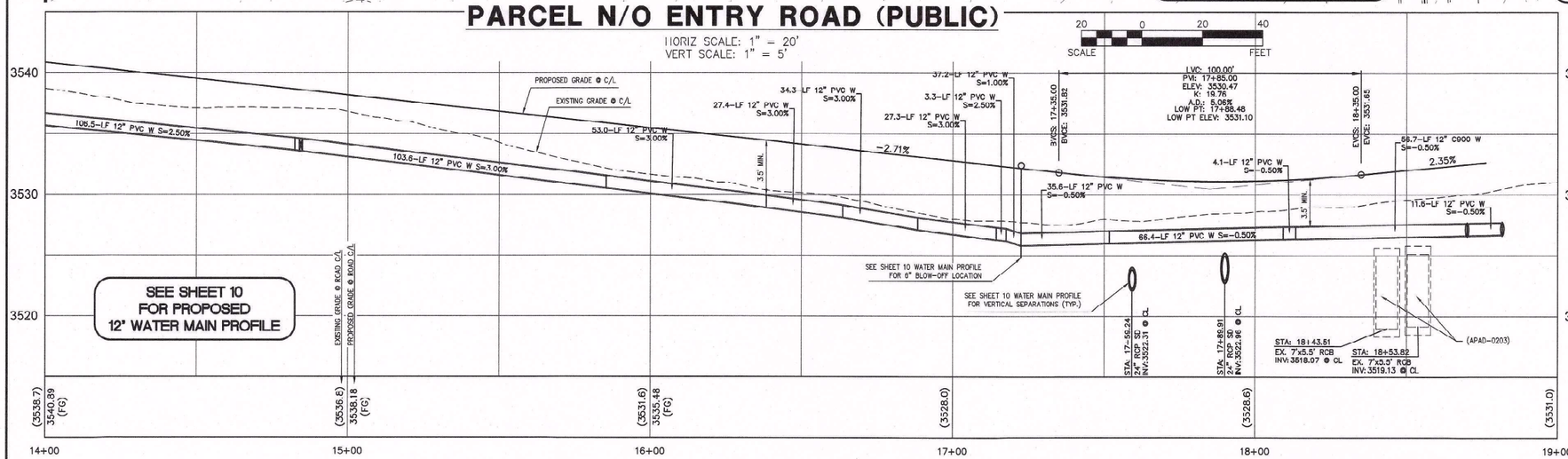
THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24A PARCEL N/O
ENTRY ROAD IMPROVEMENT PLANS
COVER SHEET

DRAWING 1
1 OF 20 SHTS




## PARCEL N/O ENTRY ROAD (PUBLIC)

HORIZ SCALE: 1" = 20'
VERT SCALE: 1" = 5'




### IMPROVEMENT NOTES:

1. VERIFY LOCATION AND ELEVATION OF EXISTING IMPROVEMENTS. PROTECT IN PLACE AND ADJUST TO GRADE AND BACK OF CURB AS REQUIRED. WATER VALVES TO REMAIN ACCESSIBLE AT ALL TIMES.

### CIVIL CONSTRUCTION NOTES:

1R. CONSTRUCT AC PAVEMENT SECTION PER STREET SECTION ON SHEET 12.
2R. CONSTRUCT "L" CURB AND GUTTER PER USD DWG NO. 216.
3R. CONSTRUCT "A" TYPE ISLAND CURB PER USD DWG NO. 219.
4R. CONSTRUCT REVERSED "L" CURB AND GUTTER PER USD DWG NO. 216.
5R. CONSTRUCT SIDEWALK RAMP PER USD DWG NO. 235 (CASE II) AND PER DETAIL 1 ON SHEET 12.
6R. INSTALL 8' CROSS GUTTER PER USD DWG NO. 228.

### WATER CONSTRUCTION NOTES:

1W. INSTALL 1-½" WATER METER AND 1-½" RPPA PER UDACS PL. NO. 4 AND 8
2W. INSTALL CAP W/ 2" BLOW-OFF ASSEMBLY PER UDACS PL. NO. 36
3W. INSTALL FIRE HYDRANT PER UDACS PL. NO. 39 AND 40
4W. INSTALL GATE VALVE AND BOX PER UDACS PL. NO. 30 AND 39
5W. INSTALL TEE PER UDACS PL. NO. 31
6W. INSTALL HORIZONTAL BEND PER UDACS PL. NO. 31 (SEE PLAN FOR ANGLE)
7W. CUT AND CONNECT TO EX WATER LINE (CONTRACTOR TO VERIFY SIZE, INVERT AND LOCATION OF EX WATER PRIOR TO CONSTRUCTION).
8W. INSTALL 6" BLOW-OFF PER UDACS PL. NO. 37 (SEE SHEET 10 WATER MAIN PROFILE)

### STORM DRAIN CONSTRUCTION NOTES:

1SD. CONSTRUCT TYPE "CM2" DROP INLET PER USD DWG NO. 412.1 AND 421
2SD. INSTALL NDOT TYPE II STORM DRAIN DROP INLET PER SHEET R-4.2.1 OF NDOT "STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION" LATEST EDITION OR APPROVED EQUAL (SEE DETAIL 4 ON SHEET 9).
3SD. INSTALL NDOT TYPE 2B STORM DRAIN DROP INLET PER SHEET R-4.2.2 OF NDOT "STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION" LATEST EDITION OR APPROVED EQUAL (SEE DETAIL 1 ON SHEET 19).

### IRRIGATION CONSTRUCTION NOTES:

1IR. INSTALL 1-6" & 2-4" SCH 40 PVC PER DETAIL 3 ON SHEET 9

ALL OFFSITE INTERIM FLOOD CONTROL FACILITIES SUCH AS BUT NOT LIMITED TO BERMS/DITCHES AND TEMPORARY RIMP ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOWARD HUGHES COMPANY.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. _____ FIRST APPROVED DATE: _____
LVVWD APPROVED FIRE FLOW: TOTAL 1500 GPM / ON SITE N/A GPM

### BASIS OF BEARINGS AND COORDINATES

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE:LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°50'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

### BENCHMARK

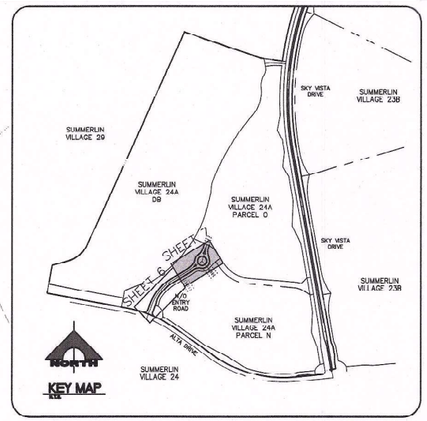
| BM # | DESCRIPTION | NAVD '88 DATUM | NAVD '88 DATUM |
|---|---|---|---|
| CLV BM No. 7LV093.4SW6 | FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R58E,S34 | 3318.31 (FEET) | 1,011.422 (METERS) |

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
or 1-800-227-2800
CLARK COUNTY, NEVADA RESIDENTS 1-702-455-6000

CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

CLV #




REGISTERED PROFESSIONAL ENGINEER — STATE OF NEVADA — MICHAEL FANG — No. 24486 — CIVIL — Date: 06/30/2018 — DATE: 7/17/18

FOR AGENCY REVIEW - NOT FOR CONSTRUCTION

| DESCRIPTION | DATE | AGENCY APP'D | DATE | SCW APP'D | DATE |
|---|---|---|---|---|---|

| REV | DATE |
|---|---|

PROJECT NO. 52024-238
DESIGN: LG/MF
DRAWN: NPD/AS
CHECK: LG/MF
PLOT DATE: 07-17-18
PLOT TIME: 10:45:00

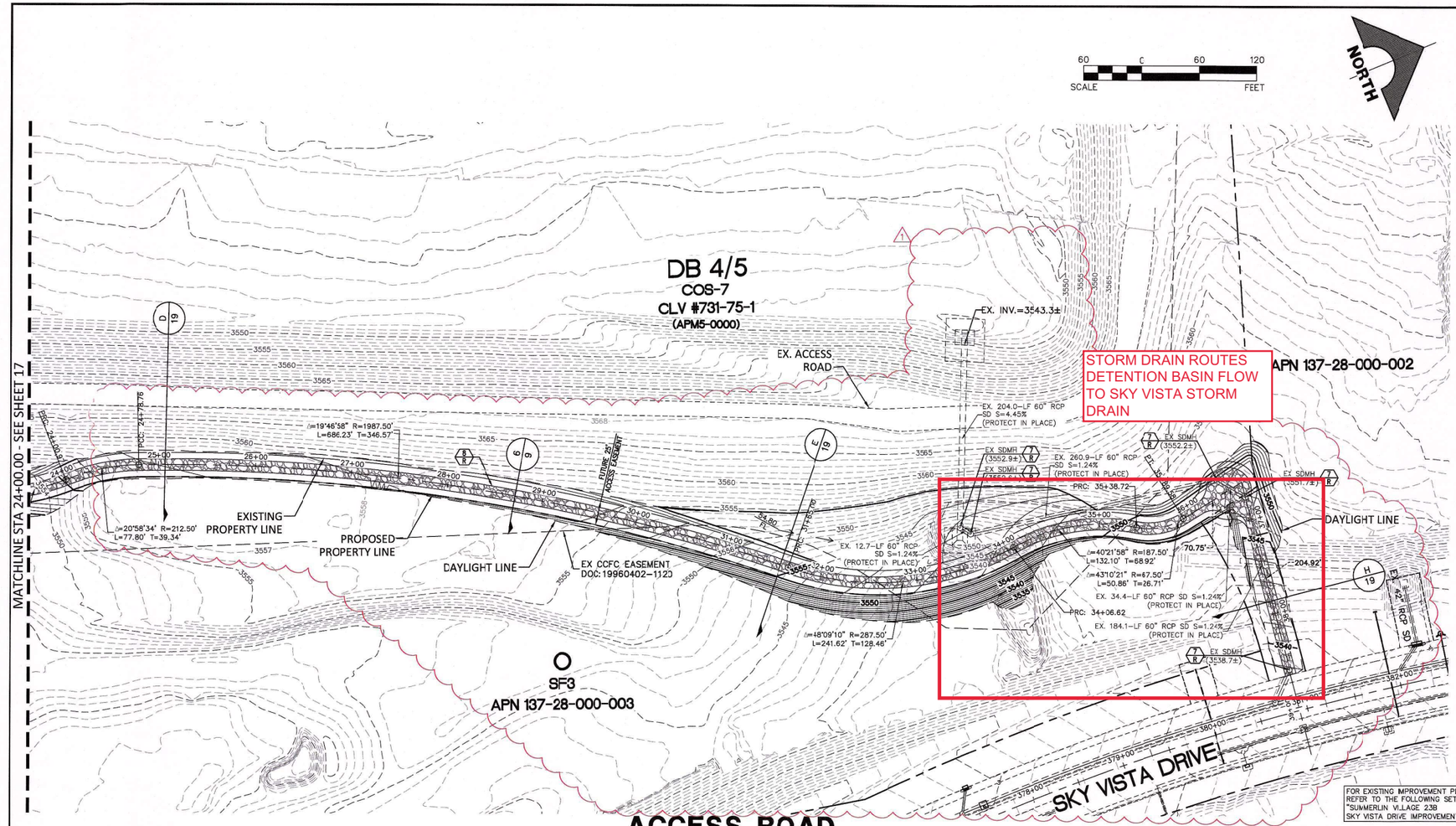

GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\Projects\6200\6202x-238\DWG\production\238-PP.dwg
Andres Parra-Murray

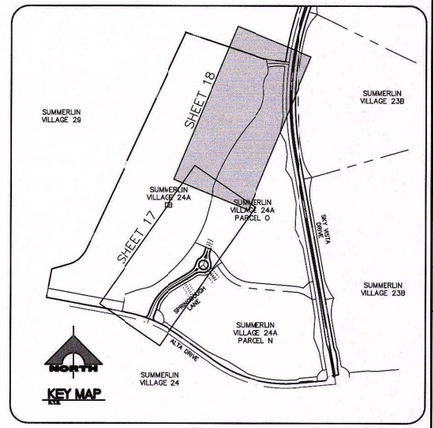

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24A PARCEL N/O
ENTRY ROAD IMPROVEMENT PLANS

ENTRY ROAD PLAN & PROFILE 2

DRAWING 7
7 OF 19 SHTS




**CIVIL CONSTRUCTION NOTES:**

1. (7/R) EXISTING STORM DRAIN MANHOLE PROTECT IN PLACE. RAISE COVER TO FINISH GRADE.
2. (8/R) CONSTRUCT ACCESS ROAD PER DETAIL 6 SHEET 9.
3. (9/R) CONSTRUCT 3' DEEP CONCRETE CUT-OFF WALL PER DETAIL G SHEET 19.

## BASIS OF BEARINGS AND COORDINATES

GRID NORTH AS DEFINED BY THE CENTRAL MERIDIAN OF THE NEVADA COORDINATE REFERENCE SYSTEM (NCRS), LAS VEGAS HIGH ELEVATION ZONE, NORTH AMERICAN DATUM OF 1983; SAID MERIDIAN BEING COINCIDENT WITH 114°58' WEST OF THE GREENWICH MERIDIAN.

LINEAR UNIT: US SURVEY FOOT (FTUS)
DATUM (REFERENCE FRAME): NAD 83 (2011) EPOCH 2010.00
SYSTEM: NEVADA COORDINATE REFERENCE SYSTEM (NCRS)
ZONE: LAS VEGAS HIGH ELEVATION ZONE

PROJECTION: TRANSVERSE MERCATOR
STANDARD PARALLEL (AND LATITUDE OF GRID ORIGIN): 36°15'00"N
LONGITUDE OF CENTRAL MERIDIAN: 114°58'00"W
NORTHING AT GRID ORIGIN: 400,000.00 M (1,312,333.3333 FTUS)
EASTING AT CENTRAL MERIDIAN: 300,000 M (984,250.0000 FTUS)
SCALE FACTOR ON CENTRAL MERIDIAN: 1.000135 (EXACT)

NOTES:
1. ALL DISTANCES AND BEARINGS SHOWN HEREON ARE PROJECTED (GRID) VALUES BASED ON THE PRECEDING PROJECTION DEFINITION. THE PROJECTION WAS DEFINED SUCH THAT PROJECTED (GRID) DISTANCES ARE EQUIVALENT TO "GROUND" DISTANCES IN THE PROJECT AREA.
2. GRID BEARINGS SHOWN HEREON (OR IMPLIED BY GRID COORDINATES) DO NOT EQUAL GEODETIC BEARINGS DUE TO MERIDIAN CONVERGENCE.

## BENCHMARK

| BM # | DESCRIPTION | NAVD 88 DATUM | NAVD 88 DATUM |
|---|---|---|---|
| CLV BM No. 7LV093454V6 | FND RIVET AND PLATE IN TOP OF CURB SE CORNER OF DESERT MOON RD. AND SKY VISTA DR. T20S,R59E,S34 | 3318.31 (FEET) | 1,011.422 (METERS) |

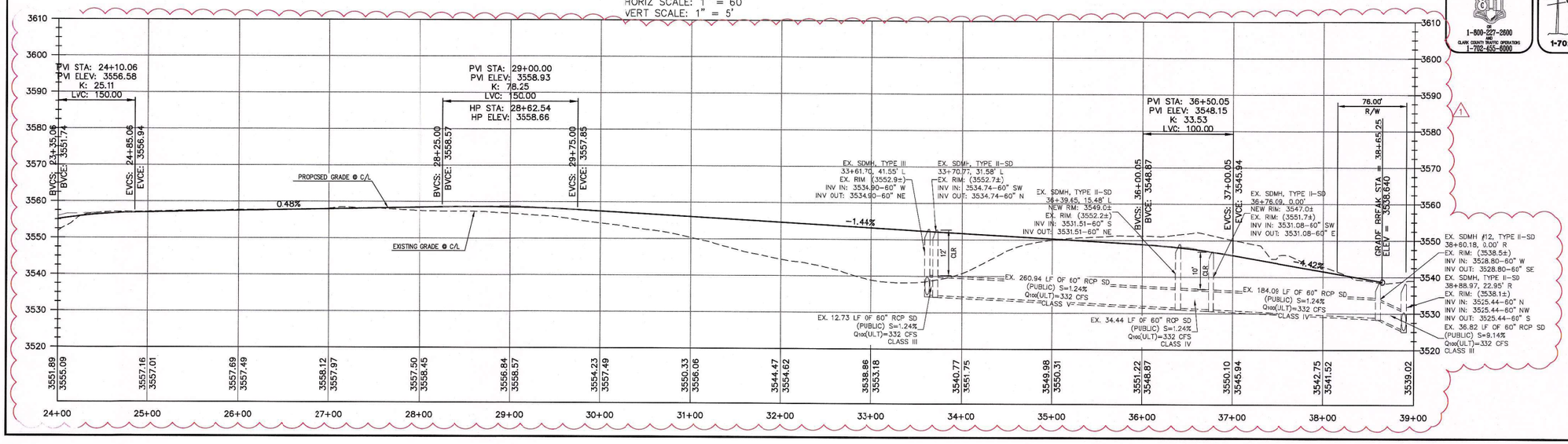
Call before you Dig — Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600 (CLARK COUNTY ONLY) 1-702-455-6000

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU TO OVERHEAD 1-702-227-2929

FAST — Call before you UnderGround 1-702-432-6300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

## ACCESS ROAD

HORIZ SCALE: 1" = 60'
VERT SCALE: 1" = 5'




L18-01682

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | CGW APP |
|---|---|---|---|---|---|---|
| 1 | 12/04/18 | REVISED GRADING AND DB OUTFALL STORM DRAIN, REMOVED ACCESS ROAD TO CHANNEL, AND ADDED HORIZ. INFORMATION FOR ACCESS ROAD C/L | | | | |

PROJECT NO. 62024-238
DESIGN: LG/MF
DRAWN: NPD/AS
CHECK: LG/MF
PLOT DATE: 12-19-18
PLOT TIME: 11:23:32

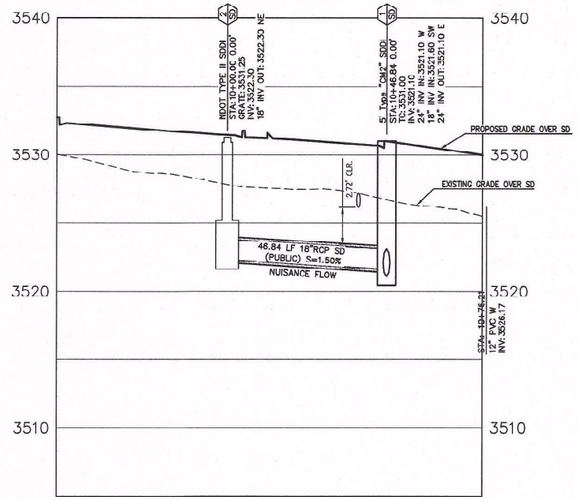
ENGINEER - STATE OF NEVADA — VICKI D. MARJERISON — No. 13078 — PROFESSIONAL ENGINEER — CIVIL — DATE: 12/19/18

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

I:\Projects\62024-238\DWG\production\238-08-ACCESS ROAD.dwg
Alexander Santiago

THE HOWARD HUGHES COMPANY, LLC
VILLAGE 24A PARCEL N/O
ENTRY ROAD IMPROVEMENT PLANS
12' ACCESS ROAD PROFILE 2

DRAWING 18
18 OF 20 SHTS

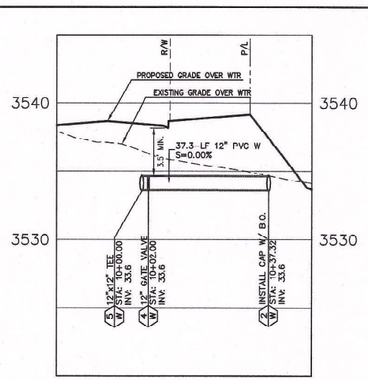



**PARCEL N/O ENTRY ROAD @ 17+59.24**
**STORM PROFILE #2**

SCALE: HORIZ. 1"=20', VERT. 1"=5' SHEET: 7

2
11

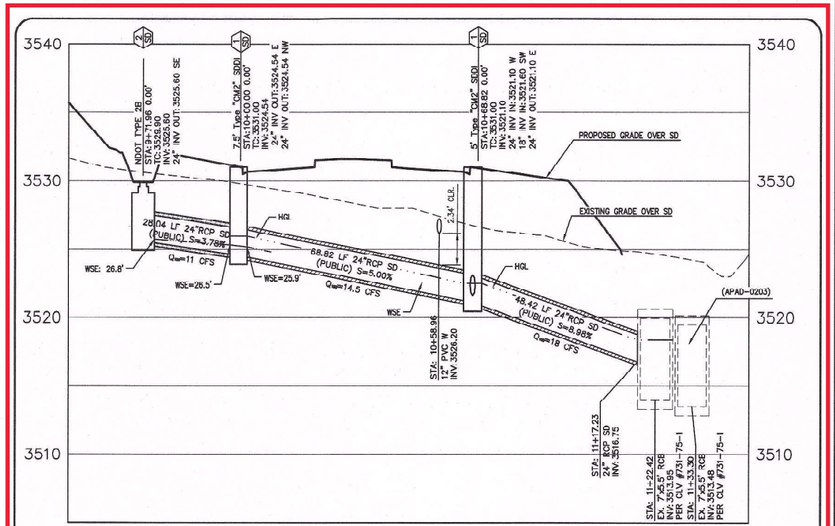
STORM DRAIN IN ENTRY ROAD




**PARCEL N/O ENTRY ROAD @ 14+82.50**
**WATER LATERAL PROFILE**

SCALE: HORIZ. 1"=20', VERT. 1"=5' SHEET: 7

3
11




**PARCEL N/O ENTRY ROAD @ 17+89.91**
**STORM PROFILE**

SCALE: HORIZ. 1"=20', VERT. 1"=5' SHEET: 7

1
11

**WATER CONSTRUCTION NOTES:**

4 W INSTALL CAP W/ 2" BLOW-OFF ASSEMBLY PER UDACS PL. NO. 36

4 W INSTALL GATE VALVE AND BOX PER UDACS PL. NO. 30 AND 39

5 W INSTALL TEE PER UDACS PL. NO. 31

**STORM DRAIN CONSTRUCTION NOTES:**

1 SD CONSTRUCT TYPE "CM2" DROP INLET PER USD DWG NO. 412.1 AND 421

2 SD INSTALL NDOT TYPE 2 STORM DRAIN DROP INLET PER SHEET R-4.2.1 OF NDOT "STANDARD PLANS FOR ROAD AND BRIDGE CONSTRUCTION" 2010 EDITION OR APPROVED EQUAL. (SEE SHEET 11)

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

AVOID HITTING UNDERGROUND TRAFFIC SIGNAL SYSTEMS AND STREET LIGHT SYSTEM CONDUITS
CALL BEFORE YOU DIG UNDERGROUND
Call before you
UnderGround
1-702-432-5300
HIGHWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (FAST)

**DRAINAGE CERTIFICATION**

I CERTIFY THAT THE GRADING PLANS ARE IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY ON FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT.

MICHAEL FANG. P.E. 24464 DATE

**APPROVED FOR CONSTRUCTION**

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. _____ FIRST APPROVED DATE: _____

CLV #

PROFESSIONAL ENGINEER STATE OF NEVADA MICHAEL FANG No. 24464 CIVIL Exp. 05/30/2019 7/17/18

FOR AGENCY REVIEW - NOT FOR CONSTRUCTION

| DESCRIPTION | DATE | ASEN APP | DATE | SCW APP | DATE |
|---|---|---|---|---|---|
| | | | | | |

PROJECT NO. 62024-238
DESIGN: LG/MF
DRAWN: NPD/AS
CHECK: LG/MF
PLOT DATE: 07-17-18
PLOT TIME: 10:42:03

GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\6200\62024-238\DWG\production\238-LATERAL PROFILES.dwg
Andrew Park-Murray

THE HOWARD HUGHES COMPANY, LLC

VILLAGE 24A PARCEL N/O
ENTRY ROAD IMPROVEMENT PLANS

LATERAL PROFILES

DRAWING
11
11 OF 19 SHTS

INLET IN ENTRY ROAD

ENGINEERS \ SURVEYORS

**Drop Inlet Sizing Calculation**

Project Name: Village 24A Parcel N/O
By: Masih Edalat
Date: 06/20/2018

## Drop Inlet Sizing in Sump

7.5' CM2

DI# 1

### Known:

| | | | |
|---|---|---|---|
| $Q=$ | Design Flow | 3.5 | cfs |
| $D_p=$ | Ponding Depth at Inlet | 0.83 | ft |
| $W=$ | Grate Width | 1.5 | ft |
| $L_g=$ | Length of Grate | 5.0 | ft |
| $L_c=$ | Length of Curb Opening | 7.5 | ft |
| $H_c=$ | Curb Opening Height | 0.5 | ft |
| $C_{wc}=$ | Weir coefficient for curb opening | 2.3 | |
| $C_{wg}=$ | Weir coefficient for grate | 3.0 | |
| $C_o=$ | Orifice coefficient | 0.67 | |
| $R_o=$ | Grate opening factor | 0.60 | |
| $C_{fg}=$ | Clogging Factor for Grate | 50 | % |
| $C_{fc}=$ | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | |
|---|---|---|
| $P_g=$ | Active grate weir length (agwl) = 2*W+Lg | 8.00 ft |
| $P_{agl}$ | Adjusted agwl = 2*(1-Cfg/100)*W+Lg | 6.50 ft |
| $A_g=$ | Grate area = W*$L_g$ | 7.50 $ft^2$ |
| $A_{aga}=$ | Adjusted open grate area = Ag*Ro*(1-Cfg/100) | 2.25 $ft^2$ |
| | check - If Dp<1.792*Aaga/Pagl; weir; else orifice | orifice |
| $Q_{ig}=$ | Flow intercepted by grate<br>If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$<br>If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$ | 11.0 cfs |

### Curb Opening Capacity Calculations

| | | |
|---|---|---|
| Pc = | Active curb opening weir length (acowl) = Lc+1.8*W | 10.20 ft |
| Pacl | Adjusted acowl = Lc+1.8*(1-Cfc/100)*W | 8.85 ft |
| Ac= | curb opening area (coa) = Lc*Hc | 3.75 $ft^2$ |
| $A_{aca}=$ | Adjusted coa = Ac*(1-Cfc/100) | 1.88 $ft^2$ |
| | check - If Dp<Hc; weir; else orifice | orifice |
| Qic= | Flow intercepted by curb opening<br>If "weir" controls Qic=Cwc*Pacl*Dp1.5<br>If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5 | 9.2 cfs |

### Total Inlet Calculations

| | | |
|---|---|---|
| Qti = | Flow Interception Capacity = Qig+Qic | 20.2 cfs |
| q = | Interception per unit ratio = $Q_{ti}/L_g$ | 2.69 cfs/ft |

**Actual Flow Collected by Drop Inlet 4 cfs**

MORE THAN ENOUGH CAPACITY FOR ADDITIONAL 10 CFS

INLET IN ENTRY ROAD

GCW
ENGINEERS \ SURVEYORS

# Drop Inlet Sizing Calculation

Project Name: Village 24A Parcel N/O
By: Masih Edalat
Date: 06/20/2018

## Drop Inlet Sizing in Sump

5' CM2
DI# 2

### Known:

| | | | |
|---|---|---|---|
| Q= | Design Flow | 3.5 | cfs |
| $D_p$= | Ponding Depth at Inlet | 0.83 | ft |
| W= | Grate Width | 1.5 | ft |
| $L_g$= | Length of Grate | 2.5 | ft |
| $L_c$= | Length of Curb Opening | 5.0 | ft |
| $H_c$= | Curb Opening Height | 0.5 | ft |
| $C_{wc}$= | Weir coefficient for curb opening | 2.3 | |
| $C_{wg}$= | Weir coefficient for grate | 3.0 | |
| $C_o$= | Orifice coefficient | 0.67 | |
| $R_o$= | Grate opening factor | 0.60 | |
| $C_{fg}$= | Clogging Factor for Grate | 50 | % |
| $C_{fc}$= | Clogging Factor for Curb Opening | 50 | % |

### Grate Capacity Calculations:

| | | | |
|---|---|---|---|
| $P_g$= | Active grate weir length (agwl) = 2*W+Lg | 5.50 | ft |
| $P_{agl}$ | Adjusted agwl = 2*(1-Cfg/100)*W+Lg | 4.00 | ft |
| $A_g$= | Grate area = W*$L_g$ | 3.75 | $ft^2$ |
| $A_{aga}$= | Adjusted open grate area = Ag*Ro*(1-Cfg/100) | 1.13 | $ft^2$ |
| | check - If Dp<1.792*Aaga/Pagl; weir; else orifice | orifice | |
| $Q_{ig}$= | Flow intercepted by grate<br>If "weir" controls Qig=Cwg*Pagl*$Dp^{1.5}$<br>If "orifice" controls Qig=Co*Aaga*$(64.4*Dp)^{0.5}$ | 5.5 | cfs |

### Curb Opening Capacity Calculations

| | | | |
|---|---|---|---|
| Pc = | Active curb opening weir length (acowl) = Lc+1.8*W | 7.70 | ft |
| Pacl | Adjusted acowl = Lc+1.8*(1-Cfc/100)*W | 6.35 | ft |
| Ac= | curb opening area (coa) = Lc*Hc | 2.50 | $ft^2$ |
| $A_{aca}$= | Adjusted coa = Ac*(1-Cfc/100) | 1.25 | $ft^2$ |
| | check - If Dp<Hc; weir; else orifice | orifice | |
| Qic= | Flow intercepted by curb opening<br>If "weir" controls Qic=Cwc*Pacl*Dp1.5<br>If "orifice" controls Qic=Co*Aaca*(64.4*Dp-Hc/2)0.5 | 6.1 | cfs |

### Total Inlet Calculations

| | | | |
|---|---|---|---|
| Qti = | Flow Interception Capacity = Qig+Qic | 11.6 | cfs |
| q = | Interception per unit ratio = $Q_{ti}/L_g$ | 2.32 | cfs/ft |

**Actual Flow Collected by Drop Inlet 4 cfs**

MORE THAN ENOUGH CAPACITY FOR ADDITIONAL 1 CFS

# APPENDIX C

FIGURES

# FIGURE 1; VICINITY MAP




03/04/2019 04:22:59 PM

1:12,000

0 0.07 0.15 0.3 mi

0 0.13 0.25 0.5 km

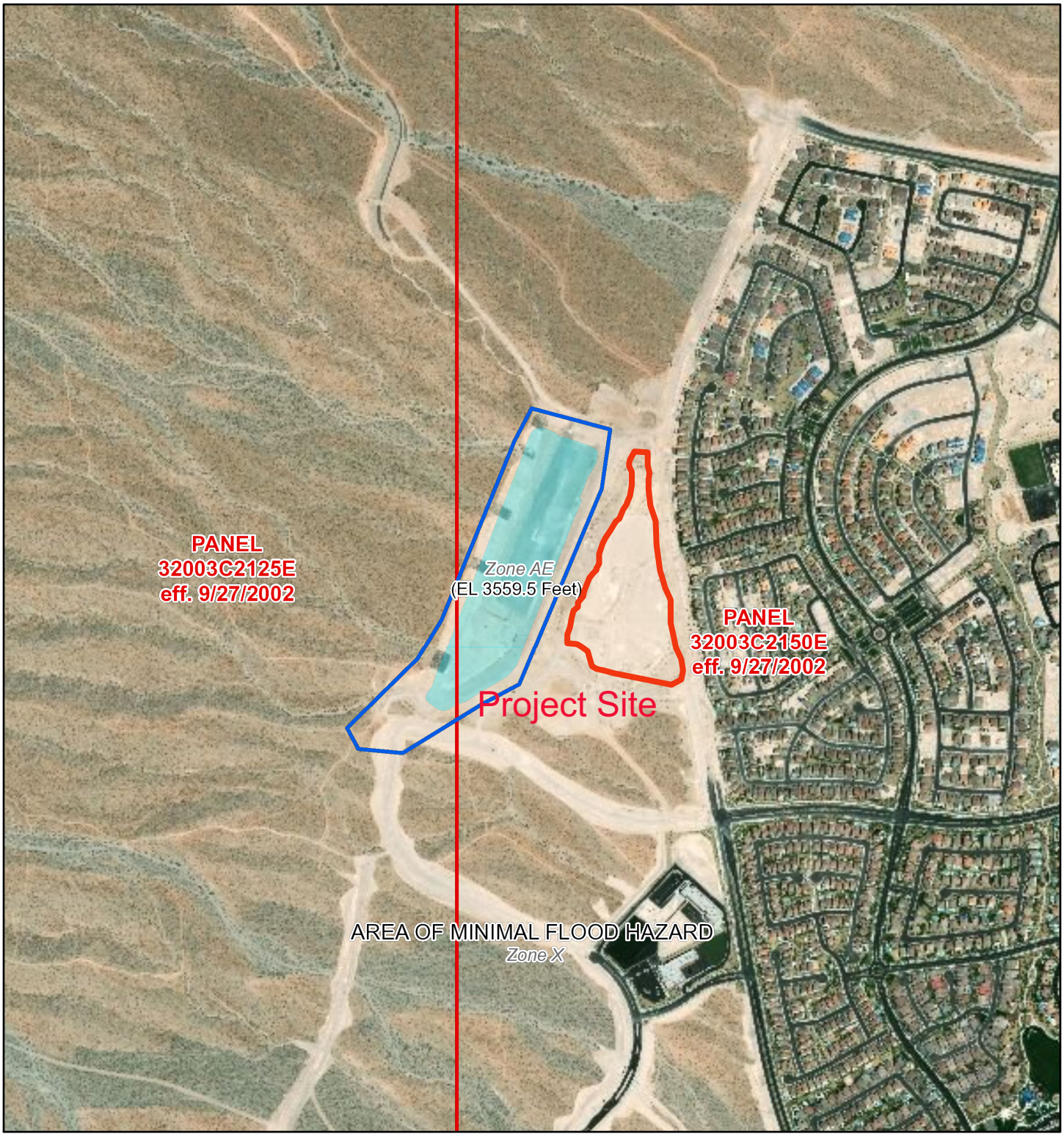
Streets

- Drive
- Avenue
- Way
- Street
- Other

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Tyler Hill
GCW, Inc.

# FIGURE 2; FIRM MAP




03/04/2019 04:21:31 PM

1:15,000

0 0.1 0.2 0.4 mi

0 0.15 0.3 0.6 km

Submittal Information

0.2% Annual Chance Flood Hazard

Flood Hazard Zones

1% Annual Chance Flood Hazard

Regulatory Floodway

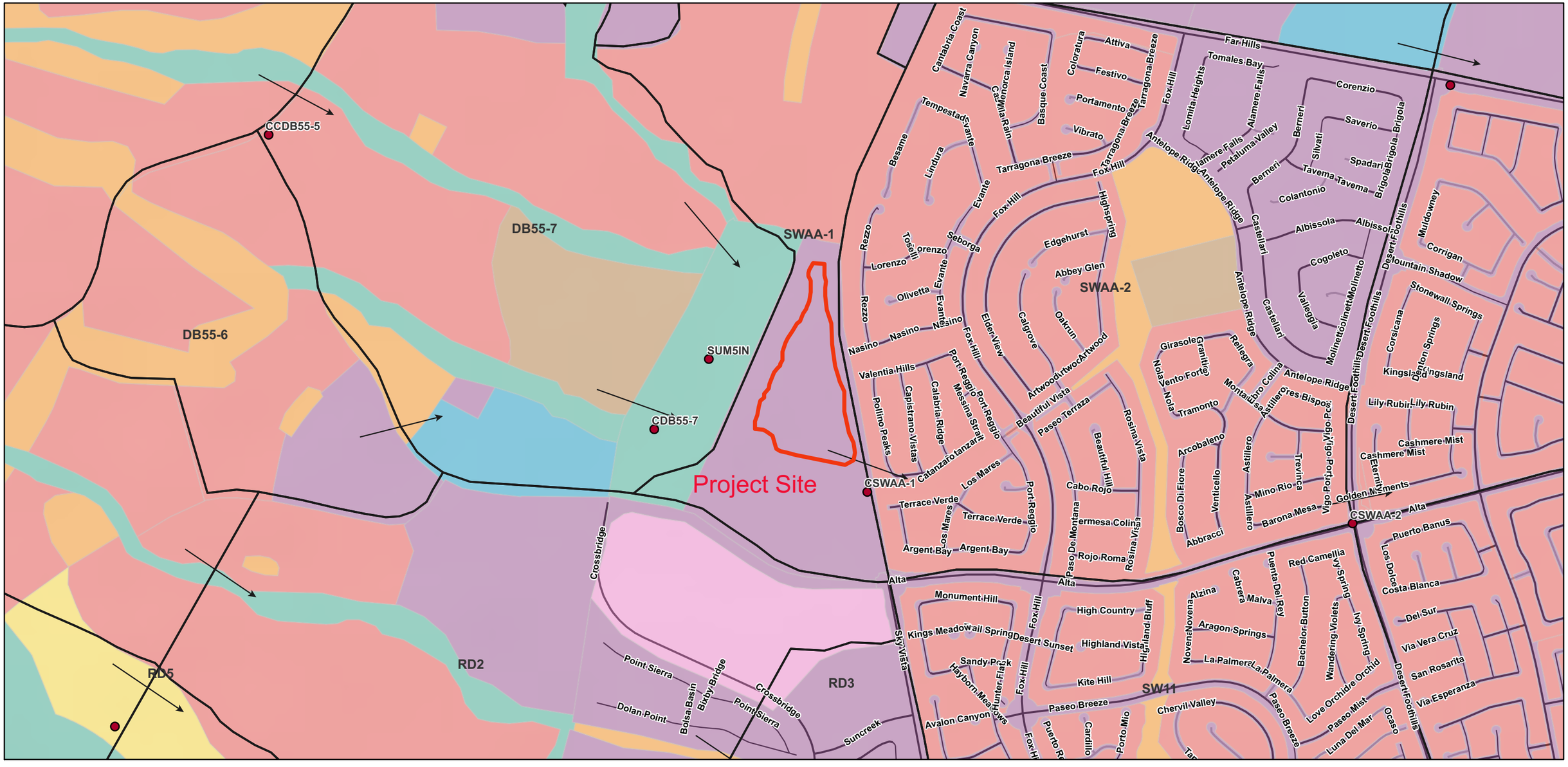
Special Floodway

Area of Undetermined Flood Hazard

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Tyler Hill
GCW, Inc.

# FIGURE 3; MPU 2018 SUBBASIN MAP




03/04/2019 04:19:32 PM

2018_MPU - LandUse
- 1
- 2
- 5
- 6
- 7
- 8
- 9
- 12

2018_MPU - ConcentrationPoints

2018_MPU - FlowDirectionArrows

2018_MPU - Subbasins

Streets
- Avenue
- Street
- Drive
- Road
- Way
- Other

1:12,000

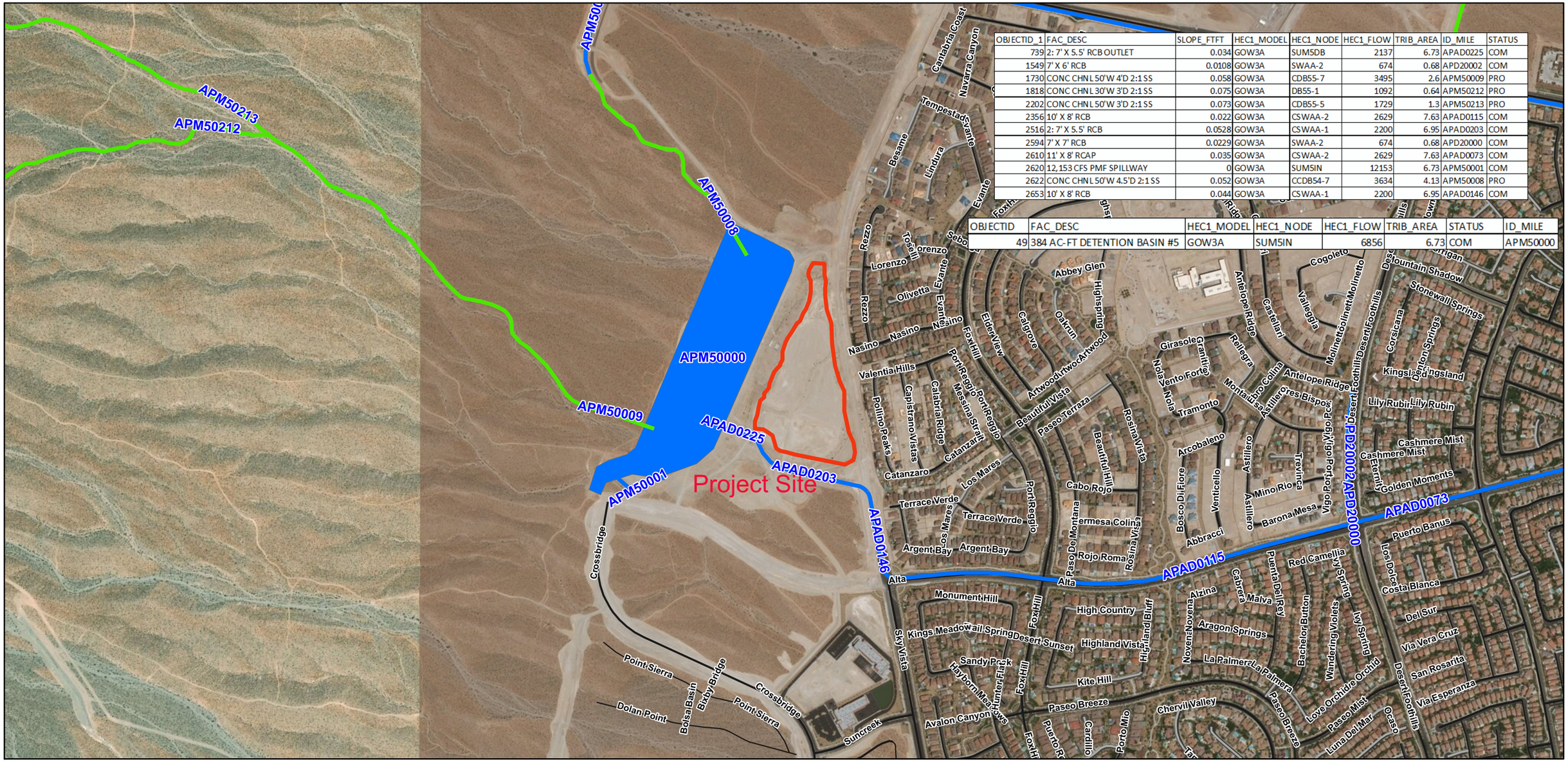
0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Tyler Hill
GCW, Inc.

# FIGURE 4; MPU 2018 SD FACILITY MAP




| OBJECTID_1 | FAC_DESC | SLOPE_FTFT | HEC1_MODEL | HEC1_NODE | HEC1_FLOW | TRIB_AREA | ID_MILE | STATUS |
|---|---|---|---|---|---|---|---|---|
| 739 | 2: 7' X 5.5' RCB OUTLET | 0.034 | GOW3A | SUM5DB | 2137 | 6.73 | APAD0225 | COM |
| 1549 | 7' X 6' RCB | 0.0108 | GOW3A | SWAA-2 | 674 | 0.68 | APD20002 | COM |
| 1730 | CONC CHNL 50'W 4'D 2:1 SS | 0.058 | GOW3A | CDB55-7 | 3495 | 2.6 | APM50009 | PRO |
| 1818 | CONC CHNL 30'W 3'D 2:1 SS | 0.075 | GOW3A | DB55-1 | 1092 | 0.64 | APM50212 | PRO |
| 2202 | CONC CHNL 50'W 3'D 2:1 SS | 0.073 | GOW3A | CDB55-5 | 1729 | 1.3 | APM50213 | PRO |
| 2356 | 10' X 8' RCB | 0.022 | GOW3A | CSWAA-2 | 2629 | 7.63 | APAD0115 | COM |
| 2516 | 2: 7' X 5.5' RCB | 0.0528 | GOW3A | CSWAA-1 | 2200 | 6.95 | APAD0203 | COM |
| 2594 | 7' X 7' RCB | 0.0229 | GOW3A | SWAA-2 | 674 | 0.68 | APD20000 | COM |
| 2610 | 11' X 8' RCAP | 0.035 | GOW3A | CSWAA-2 | 2629 | 7.63 | APAD0073 | COM |
| 2620 | 12,153 CFS PMF SPILLWAY | 0 | GOW3A | SUM5IN | 12153 | 6.73 | APM50001 | COM |
| 2622 | CONC CHNL 50'W 4.5'D 2:1 SS | 0.052 | GOW3A | CCDB54-7 | 3634 | 4.13 | APM50008 | PRO |
| 2653 | 10' X 8' RCB | 0.044 | GOW3A | CSWAA-1 | 2200 | 6.95 | APAD0146 | COM |

| OBJECTID | FAC_DESC | HEC1_MODEL | HEC1_NODE | HEC1_FLOW | TRIB_AREA | STATUS | ID_MILE |
|---|---|---|---|---|---|---|---|
| 49 | 384 AC-FT DETENTION BASIN #5 | GOW3A | SUM5IN | 6856 | 6.73 | COM | APM50000 |

03/04/2019 04:14:50 PM

CCRFCD Facilities
- COM
- PRO

CCRFCD_Basins
- COM

Streets
- Avenue
- Drive
- Road
- Street
- Way
- Other

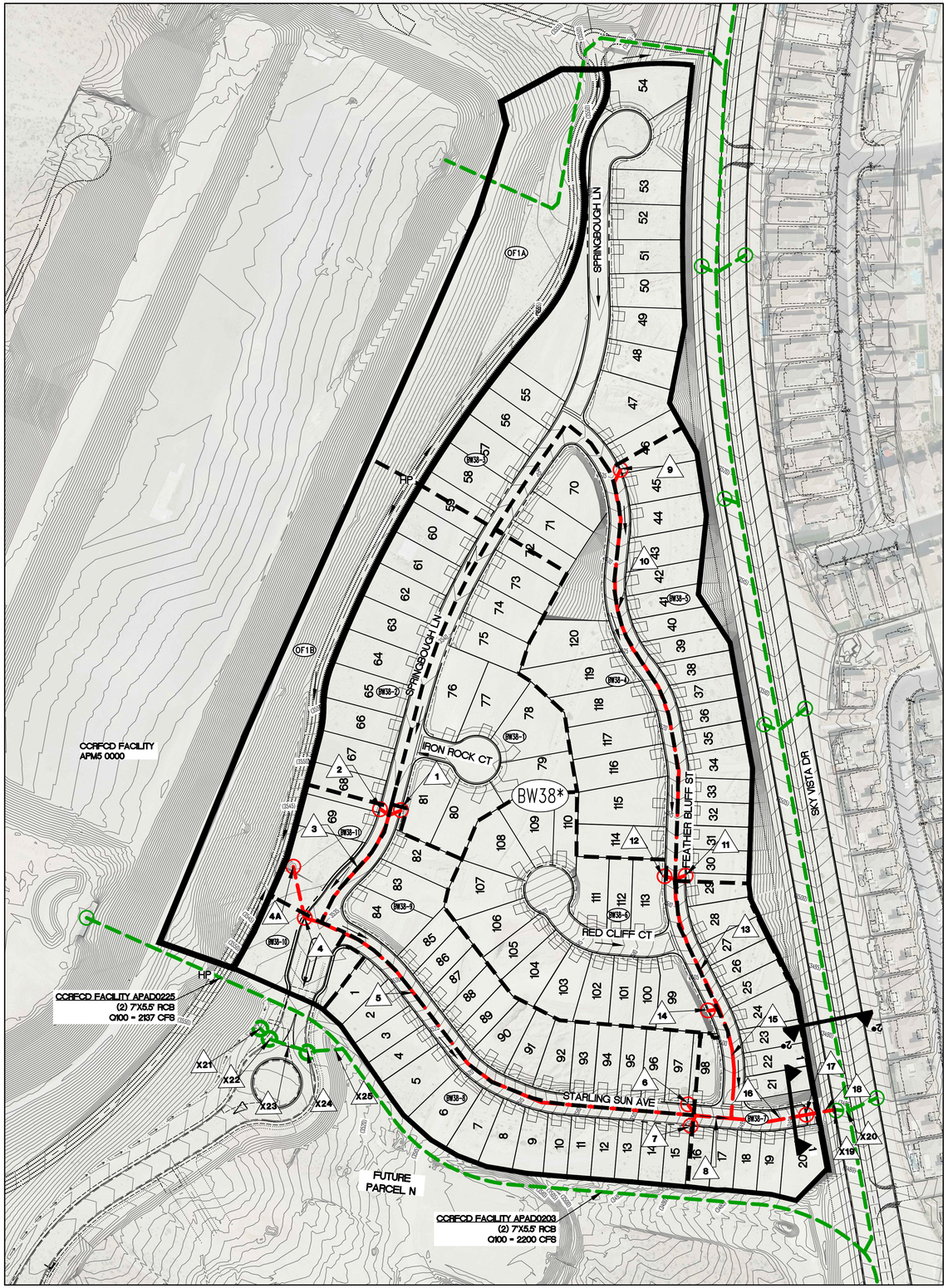
1:12,000

0 0.1 0.2 0.4 mi

0 0.17 0.35 0.7 km

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Tyler Hill
GCW, Inc.




## LEGEND

- BW39* — SUBBASIN NAME
- BW39-1 — PRORATED SUBBASIN NAME
- SUBBASIN BOUNDARY
- FLOW DIRECTION
- CROSS SECTION
- PRORATED SUBBASIN BOUNDARY
- PROPOSED FACILITY
- EXISTING FACILITY
- 18 — FACILITY ID

NORTH

100 0 100 200

SCALE FEET

**ULTIMATE CONDITIONS PRORATED FLOW SUMMARY**

| Basins | | | |
|---|---|---|---|
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | cfs/acre |
| BW38 | 80 | 22.2 | 3.60 |
| OF1 | 18 | 4.7 | 3.83 |
| **Prorated Basins** | | | |
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | cfs/acre |
| BW38-1 | 8 | 2.2 | 3.60 |
| BW38-2 | 6 | 1.8 | 3.60 |
| BW38-3 | 13 | 3.6 | 3.60 |
| BW38-4 | 9 | 2.6 | 3.60 |
| BW38-5 | 9 | 2.3 | 3.60 |
| BW38-6 | 10 | 2.7 | 3.60 |
| BW38-7 | 8 | 2.1 | 3.60 |
| BW38-8 | 7 | 2.1 | 3.60 |
| BW38-9 | 9 | 2.5 | 3.60 |
| BW38-10 | 2 | 0.5 | 3.60 |
| BW38-11 | 2 | 0.6 | 3.60 |
| **TOTAL** | **83** | **23.0** | **NA** |
| OF1A | 9 | 2.4 | 3.83 |
| OF1B | 9 | 2.3 | 3.83 |
| **TOTAL** | **18** | **4.7** | **NA** |

**100-YEAR STREET FLOW CHARACTERISTICS PROPOSED CONDITIONS**

| Location | Slope (%) | $Q_{100}$ (cfs) | Depth (ft) | Velocity (ft/s) | D*V |
|---|---|---|---|---|---|
| Section 1 Max Slope (Typical Interior Street) | 6.86 | 33.0 | 0.39 | 6.92 | 2.7 |
| Section 1 Min Slope (Typical Interior Street) | 0.50 | 33.0 | 0.57 | 2.97 | 1.7 |
| Section 2* | 4.32 | 36.0 | 0.46 | 6.52 | 3.0 |

*Referenced from the Sky Vista Study

**FLOOD PROTECTION FACILITIES**

| LOCATION | $Q_{100}$ (cfs) | $Q_{100\ Bypass}$ (cfs) | $Q_{Provide}$ | FACILITY |
|---|---|---|---|---|
| 1 | 5.5 | 2.5 | 5.5 | 7.5' TYPE D&I2 DROP INLET |
| 2 | 4.5 | 1.5 | 4.5 | 7.5' TYPE D&I2 DROP INLET |
| 3 | 10 | - | 10 | 18" RCP |
| 4A | 9 | 0 | 9 | NDOT TYPE 2 DOUBLE GRATE INLET |
| 4 | 3.5 | 0 | 3.5 | 10' TYPE CI&2 DROP INLET |
| 5 | 22.5 | - | 22.5 | 24" RCP |
| 6 | 5 | 6.5 | 5 | 7.5' TYPE D&I2 DROP INLET |
| 7 | 4 | 3 | 4 | 7.5' TYPE D&I2 DROP INLET |
| 8 | 31.5 | - | 31.5 | 24" RCP |
| 9 | 9.5 | 3.5 | 9.5 | 12.5' TYPE D&I2 DROP INLET |
| 10 | 9.5 | - | 9.5 | 18" RCP |
| 11 | 5.5 | 7 | 5.5 | 7.5' TYPE D&I2 DROP INLET |
| 12 | 4.5 | 4.5 | 4.5 | 7.5' TYPE D&I2 DROP INLET |
| 13 | 19.5 | - | 19.5 | 24" RCP |
| 14 | 6 | 8.5 | 6 | 7.5' TYPE D&I2 DROP INLET |
| 15 | 25.5 | - | 25.5 | 24" RCP |
| 16 | 57 | - | 57 | 30" RCP |
| 17 | 33 | 0 | 33 | 12.5' TYPE CI&2 DROP INLET |
| 18 | 90 | - | 90 | 36" RCP |
| 119 | 7.4 | - | 7.4 | EX. 10' TYPE CI&2 INLET |
| 120 | 97.4 | - | 105.4 | EX. 60" RCP |
| 121 | 11 | 9 | 11 | EX. SINGLE GRATE NDOT TYPE 2B |
| 122 | 4.5 | 0 | 3.5** | EX. 7.5' TYPE CI&2 DROP INLET |
| 123 | 15.5 | - | 14.5** | EX. 24" RCP |
| 124 | 4.5 | 0 | 3.5** | EX. 5' TYPE CI&2 DROP INLET |
| 125 | 20 | - | 18** | EX. 24" RCP |

** Facility has additional capacity. Reference material and hydraulic calculations have been provided.

* Referenced from the Sky Vista Drive Study

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LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PROJECT NO. 764-A150-001
DESIGN: NB
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 11:34:19
F:\PROJECTS\700\764-A150-001\DIVISION\FCTL\FIGURES\FIG5.DWG
NELSON BAGGS

REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP | DATE

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

PROPOSED CONDITION DRAINAGE MAP

DRAWING
FIG5
1 OF 1 SHTS

| | |
|---|---|
| GROSS ACREAGE: | 27.28 |
| NO. OF LOTS: | 120 |
| DENSITY(UNIT/AC): | 4.40 |

# IMPROVEMENT PLAN
# FOR
# STARLING
# SUMMERLIN VILLAGE 24A - PARCEL O
## APN # 137-33-501-001

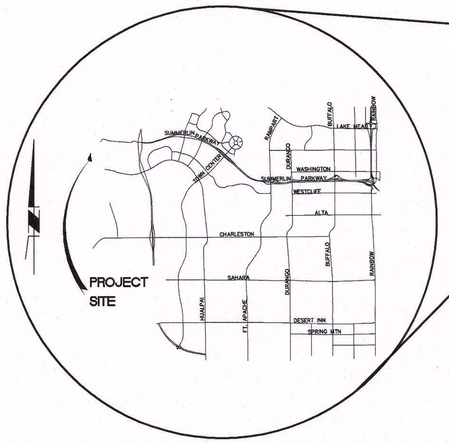
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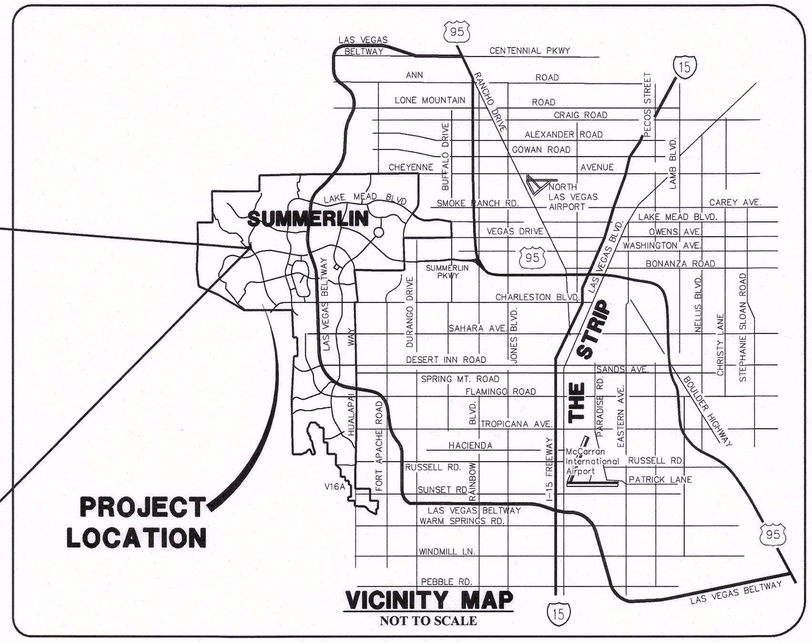
THAT PORTION OF LOT 3 AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS, ON FILE AT THE CLARK COUNTY, NEVADA RECORDER'S OFFICE, LYING WITHIN THE SOUTHWEST QUARTER (SW 1/4) OF SECTION 27, THE SOUTHEAST QUARTER (SE 1/4) OF SECTION 28 THE NORTHEAST QUARTER (NE 1/4) OF SECTION 33 AND THE NORTHWEST QUARTER (NW 1/4) OF SECTION 34, TOWNSHIP 20 SOUTH, RANGE 59 EAST, CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, DESCRIBED AS FOLLOWS:

COMMENCING AT THE NORTHEASTERLY CORNER OF SAID NORTHEAST QUARTER (NE 1/4) OF SECTION 33; THENCE ALONG THE EAST LINE THEREOF, SOUTH 05°38'08" EAST, 667.77 FEET TO THE POINT OF BEGINNING; THENCE DEPARTING SAID EAST LINE, NORTH 85°09'18" WEST, 241.85 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE NORTHEAST, HAVING A RADIUS OF 290.00 FEET; THENCE NORTHWESTERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 50°37'06", AN ARC LENGTH OF 256.20 FEET; THENCE NORTH 34°32'12" WEST, 136.57 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE TO THE SOUTHWEST, HAVING A RADIUS OF 154.23 FEET, FROM WHICH BEGINNING THE RADIUS BEARS SOUTH 55°13'01" WEST; THENCE NORTHWESTERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 34°59'29", AN ARC LENGTH OF 94.19 FEET TO A POINT TO WHICH A RADIAL LINE BEARS NORTH 20°13'32" EAST; THENCE NORTH 66°17'14" WEST, 125.07 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE TO THE NORTHWEST, HAVING A RADIUS OF 1,119.61 FEET, FROM WHICH BEGINNING THE RADIUS BEARS NORTH 58°52'16" WEST; THENCE NORTHEASTERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 10°37'04", AN ARC LENGTH OF 207.48 FEET TO THE BEGINNING OF A COMPOUND CURVE, CONCAVE TO THE WEST, HAVING A RADIUS OF 300.00 FROM WHICH BEGINNING THE RADIUS BEARS NORTH 69°29'20" WEST; THENCE NORTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 05°46'46", AN ARC LENGTH OF 30.26 FEET; THENCE NORTH 14°43'54" EAST, 179.60 FEET TO THE BEGINNING OF A CURVE, CONCAVE TO THE WEST, HAVING A RADIUS OF 200.00 FEET; THENCE NORTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 14°21'16", AN ARC LENGTH OF 50.11 FEET TO THE BEGINNING OF A REVERSE CURVE, CONCAVE TO THE EAST, HAVING A RADIUS OF 200.00 FEET, THROUGH WHICH A RADIAL LINE BEARS SOUTH 89°37'22" EAST; THENCE NORTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 20°58'34", AN ARC LENGTH OF 73.22 FEET TO THE BEGINNING OF A COMPOUND CURVE, CONCAVE TO THE SOUTHEAST, HAVING A RADIUS OF 1,975.00 FEET, FROM WHICH BEGINNING THE RADIUS BEARS SOUTH 68°38'48" EAST; THENCE NORTHEASTERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 19°46'58", AN ARC LENGTH OF 681.92 FEET TO THE BEGINNING OF A REVERSE CURVE, CONCAVE TO THE WEST, HAVING A RADIUS OF 300.00 FEET, THROUGH WHICH A RADIAL LINE BEARS NORTH 48°51'50" WEST; THENCE NORTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 48°09'10", AN ARC LENGTH OF 252.13 FEET TO THE BEGINNING OF A REVERSE CURVE, CONCAVE TO THE EAST, HAVING A RADIUS OF 175.00 FEET, THROUGH WHICH A RADIAL LINE BEARS NORTH 82°59'00" EAST; THENCE NORTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 40°21'58", AN ARC LENGTH OF 123.29 FEET TO THE BEGINNING OF A REVERSE CURVE, CONCAVE TO THE WEST, HAVING A RADIUS OF 80.00 FEET, THROUGH WHICH A RADIAL LINE BEARS NORTH 56°39'02" WEST; THENCE NORTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 43°10'21", AN ARC LENGTH OF 60.28 FEET; THENCE NORTH 09°49'23" WEST, 13.44 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 434.49 FEET, FROM WHICH BEGINNING THE RADIUS BEARS SOUTH 12°43'53" EAST; THENCE EASTERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 19°25'03", AN ARC LENGTH OF 147.25 FEET TO A POINT TO WHICH A RADIAL LINE BEARS NORTH 06°41 '11" EAST, ALSO BEING THE BEGINNING OF A NONTANGENT CURVE, CONCAVE TO THE EAST, HAVING A RADIUS OF 2,570.00 FEET, FROM WHICH BEGINNING THE RADIUS BEARS SOUTH 83°18'49" EAST; THENCE SOUTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 09°47'22", AN ARC LENGTH OF 439.11 FEET TO A POINT TO WHICH A RADIAL LINE BEARS SOUTH 86°53'48" WEST; THENCE SOUTH 11°05'58" WEST, 133.19 FEET; THENCE SOUTH 28°32'10" EAST, 97.49 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE TO THE EAST, HAVING A RADIUS OF 2,570.00 FEET, FROM WHICH BEGINNING THE RADIUS BEARS NORTH 82°02'59" EAST; THENCE SOUTHERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 02°19'28", AN ARC LENGTH OF 104.26 FEET TO A POINT TO WHICH A RADIAL LINE BEARS SOUTH 79°43'31" WEST; THENCE SOUTH 06°07'01" WEST, 134.37 FEET; THENCE SOUTH 33°15'00" EAST, 97.15 FEET; THENCE SOUTH 10°16'29" EAST, 214.91 FEET; THENCE
SOUTH 01°59'59" WEST, 223.03 FEET; THENCE SOUTH 26°04'08" EAST, 174.21 FEET; THENCE SOUTH 10°16'29" EAST, 302.84 FEET; THENCE SOUTH 44°43'57" WEST, 70.57 FEET TO THE BEGINNING OF A NON-TANGENT CURVE, CONCAVE TO THE SOUTH, HAVING A RADIUS OF 313.37 FEET, FROM WHICH BEGINNING THE RADIUS BEARS SOUTH 17°17'01" WEST; THENCE WESTERLY ALONG SAID CURVE, THROUGH A CENTRAL ANGLE OF 12°26'18", AN ARC LENGTH OF 68.03 FEET; THENCE NORTH 85°09'18" WEST, 160.08 FEET TO THE POINT OF BEGINNING.

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## VICINITY MAP
NOT TO SCALE

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Avoid cutting underground utility lines. It's costly.
Call 811
OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

### BASIS OF BEARING:
NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

### BENCHMARK:
CITY OF LAS VEGAS BENCHMARK NO. DJ68, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

### OWNER
HUGHES HOWARD COMPANY LLC
10801 W.CHARLESTON BLVD 3RD FLOOR
LAS VEGAS, NV 89135
(702) 791-4000

### DEVELOPER
PULTE HOMES
7255 S. TENAYA WAY #200
LAS VEGAS, NV 89113
(702) 914-4800

### ENGINEER
GCW, INC.
1555 SOUTH RAINBOW BLVD.
LAS VEGAS, NEVADA 89146
(702) 804-2000
(702) 804-2299 (FAX)

### UTILITY/AGENCY APPROVALS

COX COMMUNICATIONS LAS VEGAS, INC. — DATE

CENTRAL TELEPHONE COMPANY, DBA CENTURY LINK — DATE

THE AFFIXED CENTRAL TELEPHONE COMPANY, DBA CENTURY LINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

NV ENERGY — DATE

NEVADA POWER COMPANY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NEVADA POWER COMPANY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC UTILITY COMMISSION'S RULES AND REGULATIONS.

NV ENERGY – TRANSMISSION ENGINEERING — DATE

SOUTHWEST GAS CORP. — DATE

ALLEN PAVELKA, PE# 9029 — DATE
CITY ENGINEER/ACTING
CITY OF LAS VEGAS, NEVADA

APPROVAL OF THESE PLANS IS LIMITED TO THOSE IMPROVEMENTS CONSTRUCTED IN THE DEDICATED RIGHTS-OF-WAY AND/OR DEDICATED EASEMENTS. THIS APPROVAL DOES NOT AUTHORIZE THE CONSTRUCTION OF ANY IMPROVEMENTS THAT DEVIATE FROM ADOPTED STANDARDS AND/OR SPECIFICATIONS, EXCEPT THOSE SPECIFICALLY LISTED UNDER "DEVIATIONS FROM STANDARDS". THE ENGINEER SHALL RESOLVE ANY DEVIATION OTHER THAN THOSE LISTED IN "DEVIATIONS FROM STANDARDS" IN FAVOR OF THE UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS CLARK COUNTY AREA NEVADA.

### CLV PLANNING DEPARTMENT
THIS PLAN MEETS THE APPLICABLE STANDARDS OF THE CITY OF LAS VEGAS PLANNING DEPARTMENT

PLANNING DEPARTMENT — DATE

### APPROVED FOR CONSTRUCTION
LAS VEGAS FIRE AND RESCUE, FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL — DATE

SUMMERLIN DESIGN REVIEW COMMITTEE — DATE

### APPROVED FOR CONSTRUCTION
LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL
MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM
SHEETS: C1-C3, DT3, MU, U1-U6, P1-P12, LAT1 AND LAT2

| L# | CLV DWG# |
|---|---|

STATE OF NEVADA — PROFESSIONAL ENGINEER — HAO A. NGUYEN — No. 19599 — DATE: 04-10-19

| REV | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:23:37

GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

f:\Projects\700\764-a150-001\DWG\production\764-A150-001cC.dwg
Quangvinh Nguyen

PULTE HOMES
STARLING
SUMMERLIN VILLAGE 24A PARCEL O
COVER SHEET

DRAWING
C1
1 OF 39 SHTS

## CITY OF LAS VEGAS GRADING NOTES

1. IN THE EVENT THAT ANY UNFORESEEN CONDITIONS NOT COVERED BY THESE NOTES ARE ENCOUNTERED DURING GRADING OPERATIONS, THE OWNER/ENGINEER SHALL BE IMMEDIATELY NOTIFIED FOR DIRECTION.
2. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PERFORM ALL NECESSARY CUTS AND FILLS WITHIN THE LIMITS OF THIS PROJECT AND THE RELATED OFF-SITE WORK, SO AS TO GENERATE THE DESIRED SUBGRADE, FINISH GRADES AND SLOPES SHOWN.
3. CONTRACTOR SHALL TAKE FULL RESPONSIBILITY FOR ALL EXCAVATION. ADEQUATE SHORING SHALL BE DESIGNED AND PROVIDED BY THE CONTRACTOR TO PREVENT UNDERMINING OF ANY ADJACENT FEATURES OR FACILITIES AND/OR CAVING OF THE EXCAVATION.
4. THE CONTRACTOR IS WARNED THAT AN EARTHWORK BALANCE WAS NOT NECESSARILY THE INTENT OF THIS PROJECT. ANY ADDITIONAL MATERIAL REQUIRED OR LEFTOVER MATERIAL FOLLOWING EARTHWORK OPERATIONS BECOMES THE RESPONSIBILITY OF THE CONTRACTOR.
5. THE GRADING CONTRACTOR IS RESPONSIBLE TO COORDINATE WITH THE OWNER TO PROVIDE FOR THE REQUIREMENTS OF THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) AND ASSOCIATED PERMIT.
6. CONTRACTOR SHALL GRADE TO THE LINES AND ELEVATIONS SHOWN ON THE PLANS WITHIN THE FOLLOWING HORIZONTAL AND VERTICAL TOLERANCES AND DEGREES OF COMPACTION, IN THE AREAS INDICATED:

| | HORIZONTAL | VERTICAL | COMPACTION |
|---|---|---|---|
| A. PAVEMENT AREA SUBGRADE | 0.1'± | +0.0' TO –0.1' | SEE SOILS REPORT |
| B. ENGINEERED FILL | 0.5'± | +0.1' TO –0.1' | SEE SOILS REPORT |

   COMPACTION TESTING WILL BE PERFORMED BY THE OWNER OR HIS REPRESENTATIVE. COMPACTION SHALL COMPLY WITH THE REQUIREMENTS OF THE ENGINEER.
7. ALL CUT AND FILL SLOPES SHALL BE PROTECTED UNTIL EFFECTIVE EROSION CONTROL HAS BEEN ESTABLISHED.
8. THE USE OF POTABLE WATER WITHOUT A SPECIAL PERMIT FOR BUILDING OR CONSTRUCTION PURPOSES INCLUDING CONSOLIDATION OF BACKFILL OR DUST CONTROL IS PROHIBITED. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS FOR CONSTRUCTION WATER.
9. THE CONTRACTOR SHALL MAINTAIN THE STREETS, SIDEWALKS AND ALL OTHER PUBLIC RIGHT– OF–WAY IN A CLEAN, SAFE AND USABLE CONDITION. ALL SPILLS OF SOIL, ROCK OR CONSTRUCTION DEBRIS SHALL BE PROMPTLY REMOVED FROM THE PUBLICLY OWNED PROPERTY DURING CONSTRUCTION AND UPON COMPLETION OF THE PROJECT. ALL ADJACENT PROPERTY, PRIVATE OR PUBLIC SHALL BE MAINTAINED IN A CLEAN, SAFE AND USABLE CONDITION.
10. IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED THAT IS NOT SHOWN ON THESE DRAWINGS, SUCH ITEM SHALL BE PROVIDED, AS DIRECTED BY THE CITY ENGINEER, AT NO EXPENSE TO THE CITY OF LAS VEGAS. TEMPORARY CONSTRUCTION INCLUDES DITCHES, BERMS, ROAD SIGNS AND BARRICADES, ETC.

REVISED 4/15/10

## STORMWATER RUNOFF MANAGEMENT

1. THE OWNER, SITE DEVELOPER, CONTRACTOR AND/OR THEIR AUTHORIZED AGENTS SHALL EACH DAY REMOVE ALL SEDIMENT, MUD, CONSTRUCTION DEBRIS, OR OTHER POTENTIAL POLLUTANTS THAT MAY HAVE BEEN DISCHARGED TO, OR ACCUMULATE IN, THE PUBLIC RIGHTS OF WAYS OF THE CITY OF LAS VEGAS AS A RESULT OF CONSTRUCTION ACTIVITIES ASSOCIATED WITH THIS SITE DEVELOPMENT OR CONSTRUCTION PROJECT. SUCH MATERIALS SHALL BE PREVENTED FROM ENTERING THE STORM SEWER SYSTEM.
2. ADDITIONAL CONSTRUCTION SITE DISCHARGE BEST MANAGEMENT PRACTICES MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE SUBMITTED PLAN DOES NOT MEET THE PERFORMANCE STANDARDS SPECIFIED IN THE CITY OF LAS VEGAS AND THE LAS VEGAS VALLEY CONSTRUCTION SITE BEST MANAGEMENT PRACTICES MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY ACTUAL RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

## CITY OF LAS VEGAS SEWER NOTES

1. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF–SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA, AS AMENDED. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO BE AWARE OF THE CONTENTS OF THE ABOVE SPECIFICATIONS.
2. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO PERFORM CONSTRUCTION AS PER PLANS. ANY ADDITIONS, DELETIONS, OR CHANGES SHALL FIRST MEET WITH THE APPROVAL OF THE CITY ENGINEER.
3. CHISEL "S" OR "G" IN CURBS WHERE SEWER OR GAS LATERALS PASS UNDER THE CURB.
4. POLYVINYL (PVC) SEWER PIPE SHALL MEET ASTM D–3034 SDR 35 SPECIFICATIONS, INSTALLED WITH SAND BEDDING AND BACKFILL OF TYPE II AGGREGATE BASE.
5. ALL MANHOLES PAVED IN STREETS EIGHTY (80') FOOT R/W AND LARGER SHALL HAVE CONCRETE COLLARS. STREETS LESS THAN EIGHTY (80') FOOT R/W WILL REQUIRE RETROFIT IF PAVING DOES NOT CONFORM TO CITY STANDARDS AT THE MANHOLE.
6. TEE SADDLES SHALL BE USED TO CONNECT SEWER LATERALS TO EXISTING MAIN LINES UP TO TWELVE INCH (12") DIAMETER. CONNECTIONS TO FIFTEEN INCH (15") OR LARGER MAINS SHALL REQUIRE SPECIAL PROCEDURES. IN LINE "Y" 'S SHALL BE USED ON LINES TWELVE INCHES (12") OR ABOVE.
7. WATER MAINS SHALL BE PROTECTED IN ACCORDANCE WITH LVVWD STANDARDS WHENEVER A SEWER MAIN CROSSES OVER A WATER MAIN OR THE SEWER IS LESS THAN EIGHTEEN INCH (18") UNDER A WATER MAIN.
8. ALL CONTRACTORS INSTALLING SEWER MAINS THAT WILL BE UNDER THE JURISDICTION OF THE CITY OF LAS VEGAS MUST BE STATE OF NEVADA CLASS "A" CONTRACTORS.
9. THE CITY OF LAS VEGAS WILL NOT ACCEPT ANY SEWER MAINS WHICH HAVE A VERTICAL DEFLECTION OF MORE THAN ONE TENTH (0.1) OF A FOOT FROM THE APPROVED CONSTRUCTION PLANS AT ANY LOCATION. SEWER MAINS FOUND TO EXCEED THIS TOLERANCE WILL HAVE TO BE REPAIRED OR REMOVED OR REPLACED TO THE SATISFACTION OF THE CITY ENGINEER PRIOR TO ACCEPTANCE BY THE CITY OF LAS VEGAS.
10. INSTALLATION OF CURVED SEWER REQUIRES THE USE OF C–900 PIPE WHICH ALLOWS FOR PIPE DEFLECTION AT THE JOINTS.

REVISED 04/15/10

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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

## LAS VEGAS FIRE AND RESCUE GENERAL NOTES

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE LAS VEGAS FIRE AND RESCUE ADOPTED FIRE CODE ORDINANCE #6325 FOR HYDRANT SPECIFICATIONS AND HYDRANT INSTALLATION SPECIFICATIONS.
2. ONLY FIRE HYDRANTS THAT ARE ON THE LAS VEGAS VALLEY WATER DISTRICT'S – APPROVED PRODUCTS LIST ARE ALLOWED TO BE INSTALLED.
3. A PERMIT IS REQUIRED FROM LAS VEGAS FIRE AND RESCUE FOR THE INSTALLATION OF ON–SITE WATER LINES AND FIRE HYDRANTS. THE PERMIT AND CONTRACTORS MATERIAL TEST CERTIFICATE FOR UNDERGROUND PIPING FORM SHALL BE OBTAINED FROM THE FIRE PROTECTION ENGINEER BEFORE COMMENCEMENT OF WORK. [IFC SECTION 105.7.12]
4. ON ANY RESIDENTIAL OR COMMERCIAL INSTALLATIONS, FIRE HYDRANTS SHALL BE INSTALLED AND FIRE APPARATUS ACCESS ROADS SHALL BE MAINTAINED BEFORE COMMENCEMENT OF ANY COMBUSTIBLE CONSTRUCTION. ALL FIRE HYDRANTS SHALL BE IN GOOD WORKING ORDER AND SHALL BE CAPABLE OF DELIVERING THE REQUIRED FIRE FLOW. [IFC SECTION 3310, SECTION 3312]
5. TO IDENTIFY FIRE HYDRANT LOCATIONS, CONTRACTOR SHALL PLACE A BLUE REFLECTIVE MARKER AT THE CENTER LINE OF STREET ADJACENT TO THE FIRE HYDRANTS [IFC SECTION 507.5.7.3].
6. ALL UNDERGROUND INSPECTIONS, PRESSURE AND FLUSH VERIFICATIONS OF ALL FIRE HYDRANTS AND FIRE LINES, SHALL BE CONDUCTED BEFORE COVERING THE LINES. CENTER LOADING IS ACCEPTABLE FOR THE HYDRO TESTS WITH PRIOR FIRE PREVENTION APPROVAL. [IFC SECTION 106.3]
7. ALL ON–SITE UNDERGROUND WATER MAINS AND MATERIALS SHALL BE U.L. LISTED, A.W.W.A. APPROVED AND SHALL BE RATED FOR THE APPROPRIATE WORKING PRESSURE. [IFC SECTION 507.2.1]
8. PAINTING OF CURBS, FIRE HYDRANTS, PADS, PROTECTION OF FIRE HYDRANTS FROM PHYSICAL DAMAGE, AND ALL OTHER WORK NECESSARY PER PLANS SHALL BE COMPLETED BEFORE APPROVAL BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION. [IFC SECTION 507]
9. PRIVATE FIRE HYDRANTS SHALL BE PAINTED RED. [IFC SECTION 507]
10. PRIOR TO THE FINAL OCCUPANCY, A FIRE FLOW TEST SHALL BE WITNESSED BY LAS VEGAS FIRE AND RESCUE, FIRE PREVENTION DIVISION TO VERIFY AVAILABILITY OF THE REQUIRED FIRE FLOW. [IFC SECTION 507]
11. FIRE HYDRANTS SPACING SHALL BE AS FOLLOWS: [IFC SECTION C102]
    RESIDENTIAL – 500 FT UNSPRINKLERED; 600 FT SPRINKLERED.
    COMMERCIAL – 300 FT UNSPRINKLERED; 400 FT SPRINKLERED.
12. WHERE NEW WATER MAINS ARE EXTENDED ALONG STREETS OR NEW STREETS ARE INSTALLED WHERE FIRE HYDRANTS ARE NOT NEEDED FOR PROTECTION OF THE STRUCTURES, FIRE HYDRANTS SHALL BE INSTALLED AT A MAXIMUM 1,000 FOOT SPACING, TO PROVIDE FOR TRANSPORTATION HAZARDS. WHERE STREETS ARE PROVIDED WITH MEDIAN DIVIDERS OR HAVE FOUR (4) OR MORE TRAFFIC LANES AND HAVE A TRAFFIC COUNT OF MORE THAN 30,000 PER DAY, HYDRANTS ARE REQUIRED ON EACH SIDE OF THE STREET SPACED AT 500 FEET ON AN ALTERNATING BASIS. [IFC SECTION C102.8]
13. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN THE RADIUS OF A CUL–DE–SAC OR WITHIN 20 FEET OF THE PERIMETER OF THE RADIUS OF THE CUL–DE–SAC.
14. NO FIRE HYDRANTS SHALL BE LOCATED WITHIN 6 FEET OF ANY CURB RETURN, DRIVEWAY, POWER POLE, STREETLIGHT OR ANY OTHER OBSTRUCTION. [IFC SECTION C102.12]
15. A MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A ONE–TWO FAMILY DWELLING SHALL NOT EXCEED 300 FT, AS MEASURED BY AN APPROVED ROUTE. [IFC SECTION C102.4]
16. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO A FIRE DEPARTMENT CONNECTION (FDC) SHALL NOT EXCEED 100 FEET, AS MEASURED BY AN APPROVED ROUTE. [IFC SECTION C102.7]
17. THE MAXIMUM DISTANCE FROM A FIRE HYDRANT TO THE END OF A DEAD–END STREET SHALL NOT EXCEED 200 FT. [IFC SECTION C102.6]
18. TWO (2) SOURCES OF SUPPLY ARE REQUIRED WHENEVER THERE IS 4 OR MORE FIRE HYDRANTS/SPRINKLER LEAD–INS ARE INSTALLED ON A SINGLE SYSTEM. SECTIONAL CONTROL VALVES SHALL BE INSTALLED SO THAT NO MORE THAN 2 FIRE HYDRANTS CAN BE OUT OF SERVICE DUE TO A BREAK IN A WATER MAIN. [IFC SECTION C104]
19. ALL FIRE APPARATUS ACCESS ROADS SHALL BE PAVED TO PROVIDE ALL–WEATHER DRIVING CAPABILITIES, AND SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF THE FIRE APPARATUS. [IFC SECTION 503.2.3]
20. THE GRADIENT FOR THE FIRE APPARATUS ACCESS ROADS SHALL NOT EXCEED 12% ANGLES OF APPROACH AND ANGLES OF DEPARTURE SHALL NOT EXCEED 6% FOR 25 FEET PRIOR TO OR AFTER THE GRADE CHANGE. ADJACENT TO THE STRUCTURES GRADIENT SHALL NOT EXCEED 6%. [IFC SECTION 503.2.7, SECTION 503.2.8]
21. THE TURNING RADIUS OF THE FIRE APPARATUS ACCESS ROADS SHALL BE NO LESS THAN 52 FEET OUTSIDE AND 28 FEET INSIDE TURNING RADIUS. [IFC 503.2.4]
22. VERTICAL CLEARANCE OF ALL FIRE APPARATUS ACCESS ROADS SHALL NOT BE LESS THAN 13 FEET 6 INCHES. [IFC SECTION 503.2.1]
23. FIRE DEPARTMENT ACCESS ROADS SHALL HAVE A MINIMUM UNOBSTRUCTED WIDTH OF NOT LESS THAN 40FT FLOW LINE TO FLOW LINE WITH PARALLEL PARKING PERMITTED ON BOTH SIDES. NOT LESS THAN 32 FT WIDE, FLOW LINE TO FLOW LINE, WHERE PARKING IS PERMITTED ONLY ON ONE SIDE OF THE FIRE APPARATUS ACCESS ROAD. NOT LESS THAN 24 FT WIDE, FLOW LINE TO FLOW LINE, WHERE NO PARKING IS PERMITTED ON EITHER SIDE. FIRE LANES THROUGH PARKING LOTS SHALL NOT BE LESS THAN 24 FT. [IFC SECTION 503.2.1.1]
24. A FIRE APPARATUS ACCESS ROAD SHALL BE REQUIRED WHEN ANY PORTION OF AN EXTERIOR WALL FO THE FIRST STORY IS LOCATED MORE THAN 150 FT FROM A FIRE DEPARTMENT VEHICLE ACCESS. THIS DISTANCE COULD BE INCREASED TO 250 FT IF THE BUILDING IIS SPRINKLERED. [IFC SECTION 503.1.1]
25. APPROVED SECONDARY FIRE APPARATUS ACCESS SHALL BE PROVIDED FOR 100 OR MORE DWELLING UNITS, ROAD(S) WITH DEAD–ENDS OR WITH A SINGLE POINT OF ACCESS IN EXCESS OF 600 FT. COMMERCIAL AND INDUSTRIAL DEVELOPMENTS WHERE BUILDINGS EXCEED 2 STORIES OR 30 FEET IN HEIGHT, OR EXCEEDING 62,000 SQUARE FEET IN AREA. [IFC SECTION 503.1.2]
26. ALL DEAD–END FIRE APPARATUS ROADS AND/OR FIRE LANES, PUBLIC OR PRIVATE, IN EXCESS OF 150 FT IN LENGTH SHALL BE PROVIDED WITH AN APPROVED TURN AROUND HAVING A MINIMUM DIAMETER OF 81 FT. [IFC SECTION 503.2.5]
27. ALL FIRE APPARATUS ACCESS ROADS SHALL BE MARKED BY PLACING APPROVED SIGNS AT THE START OF THE DESIGNATED FIRE LANE, ONE SIGN AT THE END OF THE FIRE LANE AND WITH SIGNS AT INTERVALS OF 100 FT ALONG THE DESIGNATED FIRE LANES. SIGNS TO BE PLACED ON BOTH SIDES OF AN ACCESS ROADWAY IF NEEDED TO PREVENT PARKING ON EITHER SIDE. SIGNS TO BE IN STALLED NO HIGHER THAN 10 FT OR LESS THAN 6 FT FROM THE ROADWAY LEVEL. THE CURB ALONG OR ON THE PAVEMENT OR CEMENT (IF NO CURB IS PROVIDED) SHALL BE PAINTED WITH A RED WEATHER RESISTANT PAINT IN ADDITION TO THE SIGNS. [IFC SECTION 503.3]
28. ELECTRICALLY CONTROLLED ACCESS GATES SHALL BE PROVIDED WITH AN APPROVED EMERGENCY VEHICLE DETECTOR/RECEIVER SYSTEM. SAID SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE IFC SECTION 503.6 AND IFC APPENDIX M.

LAS VEGAS FIRE DEPARTMENT — DATE

REVISED MARCH 1, 2016

## FLOOD ZONE NOTE

FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAP, COMMUNITY PANEL 32003C2150E, MAP REVISED SEPTEMBER 27, 2002 INDICATED THAT THE SUBJECT PROPERTY LIES IN ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN)

## DEVIATION FROM STANDARDS

1. NONE

## CITY OF LAS VEGAS TRAFFIC NOTES

1. ALL CONSTRUCTION SIGNING, BARRICADING, AND TRAFFIC DELINEATION SHALL CONFORM TO THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", LATEST EDITION.
2. THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE PLANNING DEPARTMENT PRIOR TO CONSTRUCTION.
3. BEFORE ANY WORK IS STARTED IN THE RIGHT–OF–WAY, THE CONTRACTOR SHALL INSTALL ALL ADVANCED WARNING SIGNS FOR THE CONSTRUCTION ZONE. THE CONTRACTOR SHALL INSTALL TEMPORARY STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING CITY STREETS WHERE WARRANTED IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED, AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
4. WHEN A DESIGNATED "SAFE ROUTE TO SCHOOL" IS ENCROACHED UPON BY A CONSTRUCTION WORK ZONE AND PUBLIC WORKS STAFF IDENTIFIES A NEED FOR STUDENTS TO BE ASSISTED IN THE SAFE CROSSING THROUGH THAT WORK ZONE, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE A QUALIFIED "CROSSING GUARD". THE GUARD SHALL BE PRESENT FOR THE FULL DURATION OF TIME THAT CHILDREN ARE LIKELY TO BE PRESENT.
5. IF THE IMPROVEMENTS NECESSITATE THE OBLITERATION, TEMPORARY OBSTRUCTION, TEMPORARY REMOVAL OR RELOCATION OF ANY EXISTING TRAFFIC PAVEMENT MARKING, SUCH PAVEMENT MARKING SHALL BE RESTORED OR REPLACED WITH LIKE MATERIALS TO THE SATISFACTION OF THE CITY TRAFFIC ENGINEER.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING ALL PERMANENT SIGNS SHOWN ON THE PLANS. SIGNS SHALL BE FABRICATED WITH DIAMOND GRADE VIP CLASS 6 REFLECTIVE SHEETING OR APPROVED EQUAL. ALL NEW TRAFFIC SIGNS, EXCEPT STREET NAME AND SCHOOL SPEED LIMIT SIGNS, SHALL HAVE 3M SERIES 1160 OR APPROVED EQUIVALENT ANTI–GRAFFITI PROTECTIVE OVERLAY FILM; SCHOOL ZONE SIGNS SHALL HAVE 3M SERIES 1150 ANTI–GRAFFITI PROTECTIVE OVERLAY FILM. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CURRENT CITY STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGN POSTS SHALL BE INSTALLED IN ACCORDANCE WITH THE CURRENT CITY STANDARDS.
7. WHEN A PROPOSED STREET LIGHT STANDARD IS LOCATED WITHIN FIVE (5') FEET OF ANY PROPOSED SIGN SHOWN ON THE PLANS TO BE MOUNTED ON A SIGNPOST, THE SIGN SHALL BE MOUNTED ON THE STREET LIGHT STANDARD AND THE SIGNPOST SHALL BE ELIMINATED.
8. ALL PERMANENT TRAFFIC CONTROL DEVICES CALLED FOR HEREON SHALL BE IN PLACE AND IN FINAL POSITION PRIOR TO ALLOWING ANY PUBLIC TRAFFIC ONTO THE PORTIONS OF THE ROAD(S) BEING IMPROVED HERE UNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF–SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
9. STREET SIGNS AND STOP SIGNS SHALL BE INSTALLED PER CITY STANDARD SPECIFICATIONS FOR PLACEMENT OF STREET NAME SIGNS.
10. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TRAFFIC CONTROL DEVICES AND FLAGGERS TO INSURE THE SAFETY OF THE PUBLIC IN OR AROUND THE WORK AREA. THE CONTRACTOR SHALL HAVE A CERTIFIED ATSSA TRAFFIC CONTROL TECHNICIAN OR IMSA WORK ZONE SAFETY SPECIALIST SET UP, MAINTAIN AND/OR REMOVE ALL TRAFFIC CONTROL DEVICES IN THE CITY OF LAS VEGAS RIGHT–OF–WAY.
11. WORK IN PUBLIC STREETS, ONCE BEGUN, SHALL BE EXPEDITED TO COMPLETION SO AS TO PROVIDE MINIMUM INCONVENIENCE TO ADJACENT PROPERTY OWNERS AND TO TO THE TRAVELING PUBLIC.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING CITIZENS AREA TRANSIT (C.A.T.) IF THE CONSTRUCTION INTERRUPTS OR RELOCATES A BUS STOP OR HAS AN ADVERSE EFFECT ON BUS SERVICE ON THAT STREET TO ARRANGE FOR TEMPORARY RELOCATION OF STOP.
13. GUARDS SHALL BE OBTAINED BY CONTACTING THE METROPOLITAN POLICE DEPARTMENT SPECIAL EVENTS UNIT (PHONE # 828–3442) WHO WILL PROVIDE OFFICERS PROPERLY TRAINED IN TRAFFIC CONTROL. FEES FOR THE USE OF THESE OFFICERS SHALL BE SET BY METRO AND WILL BE PAID BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR ALL ARRANGEMENTS WITH METRO.
14. ANY WORK WITHIN 300' OF A SIGNALIZED INTERSECTION WILL BE NIGHT WORK, UNLESS DIRECTED BY THE CITY OF LAS VEGAS TRAFFIC ENGINEER.
15. CONTRACTOR SHALL CONTACT THE TRAFFIC ENGINEERING DIVISION (TRANSPORTATION SECTION) THROUGH THE PROJECT'S OFFSITE INSPECTOR PRIOR TO INITIATING PAVING TO RECEIVE DIRECTION FOR ANY PERMANENT OR TEMPORARY MODIFICATIONS TO THE APPROVED DRAWINGS REGARDING FINAL PAVEMENT TRANSITIONS, MARKINGS AND SIGNING THAT ARE REQUIRED TO MATCH ADJACENT ROADWAY SEGMENTS. THE CONTRACTOR SHALL PROVIDE A DRAWING FOR APPROVAL BY THE TRAFFIC ENGINEERING DIVISION DEPICTING ANY ADJUSTMENTS TO THE FINAL PAVEMENT MARKINGS AND SIGNAGE, WHICH MAY INCLUDE OMITTING, ADDING OR MODIFYING PAVEMENT MARKINGS AND TRAFFIC CONTROL SIGNS SUCH THAT ADEQUATE TRANSITIONS AND LANE TERMINATIONS BETWEEN ADJACENT ROADWAY SEGMENTS ARE CONSTRUCTED.

REVISED 4/15/10

## CITY OF LAS VEGAS STREETLIGHT NOTES

1. ALL STREET LIGHTING INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE STREET LIGHTING PLANS, THE "UNIFORM STANDARD SPECIFICATION FOR PUBLIC WORKS CONSTRUCTION OFF–SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA", LATEST REVISION (USS), AND THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION OFF–SITE IMPROVEMENTS, CLARK COUNTY AREA, NEVADA" (USD), LATEST REVISION.
2. NO DEVIATION OF STREET LIGHT, PULL BOX, CONDUITS, ETC., LOCATIONS SHALL BE PERMITTED WITHOUT WRITTEN APPROVAL OF THE TRAFFIC AND CITY ENGINEER. ANY DEVIATION FROM THE PLAN LOCATION WILL REQUIRE COMPLIANCE WITH SECTION 623 OF THE USS.
3. ALL EXISTING STREET LIGHTING SHALL REMAIN OPERATIONAL DURING CONSTRUCTION IN ACCORDANCE WITH SECTION 623 G.03.01 OF THE USS.
4. ALL EMPTY CONDUIT SHALL HAVE AT LEAST ONE GREEN NO. #8 AWG WIRE INSTALLED AS TRACER WIRE IN ACCORDANCE WITH SECTION 623 G.02.01 OF THE USS PRIOR TO BACKFILLING AND FINAL INSPECTION.
5. ANY STRUCTURE SUCH AS BLOCK WALLS, CHAIN LINK FENCES, RETAINING WALLS, ETC., SHALL LEAVE A MINIMUM CLEARANCE IN COMPLIANCE WITH USD NO. 320A WHEN POLE IS INSTALLED BEHIND SIDEWALK, AND SHALL AT NO TIME COMPLETELY ENCLOSE THE STREET LIGHTING POLE.
6. AS–BUILT DRAWINGS SHALL BE SUPPLIED TO THE TRAFFIC ENGINEERING DIVISION PRIOR TO ANY PRE–FINAL INSPECTION. THE AS–BUILT DRAWING NEEDS TO BE STAMPED AS–BUILT AND SIGNED BY THE PREPARER..
7. SERVICE POINTS SHALL BE COORDINATED WITH NV ENERGY, AND WHEREVER POSSIBLE, BE LOCATED NEAR THE CENTER OF THE CIRCUIT. SERVICEPOINTS SHALL BE SHOWN ON THE PLANS.
8. WHEREVER THERE IS AN OVERHEAD UTILITY THAT MAY CONFLICT WITH THE INSTALLATION OF STREETLIGHTING CIRCUITS AND/OR POLES, THESE CONFLICTS MUST BE RESOLVED BETWEEN THE DEVELOPER AND THE UTILITIES INVOLVED BEFORE STREETLIGHT BASES ARE INSTALLED. AT NO EXPENSE TO THE CITY OF LAS VEGAS.
9. THE CONTRACTOR SHALL FURNISH COMPLETE CONDUIT, WIRE, ETC. FROM SERVICE TO TRANSFORMERS AND CONTROL SYSTEMS IF REQUIRED ON THE PLANS.

REVISED JUNE 28, 2016 (LD VERSION)

## LAS VEGAS VALLEY WATER DISTRICT (LVVWD) STANDARD NOTES

### LVVWD PROJECT # XXXXXX

REVISED 08/01/17

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258–7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE 2010 EDITION OF THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS). THE LATEST EDITION OF UDACS SHALL SUPERSEDE ANY CONFLICTS CONTAINED IN THE APPROVED DRAWINGS AND/OR SPECIFICATIONS.
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE 2010 EDITION OF THE UDACS
9. ALL WATER FACILITIES AND APPURTENANCES SHALL BE DISINFECTED, PRESSURE TESTED, AND HAVE AN ACCEPTABLE PASSING HEALTH WATER SAMPLE OBTAINED, PRIOR TO OPERATION AND USE.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258–3152 OR 258–3802. TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01, AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE LISTED ON THE LVVWD APPROVED PRODUCTS' LIST FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS BY SUBMITTING SHOP DRAWINGS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT 811 OR 1–800–227–2600
14. THE INSTALLATION OF LVVWD MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARDS, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

    ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE AGENCY HAVING JURISDICTION. DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED

# ABBREVIATIONS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | AIR | DR | DRIVE | P.A.E. | PEDESTRIAN ACCESS EASEMENT | STRUCT | STRUCTURE |
| AB | AGGREGATE BASE | DS | DOWNSPOUT | PB | PULL BOX | SVZ | SIGHT VISIBILITY ZONE |
| AC | ASPHALT CONCRETE, ACRE | DTL | DETAIL | PC | POINT OF CURVE, PRESSURE CLASS | SW | SIDEWALK |
| ACP | ASBESTOS CEMENT PIPE | DW | DRIVEWAY | | | SWG | SOUTHWEST GAS |
| ADD'L | ADDITIONAL | DWG | DRAWING | PCC | POINT OF COMPOUND CURVE | T | TELEPHONE OR TOP |
| A.E. | ACCESS EASEMENT | E | EAST | P.D.E. | PUBLIC DRAINAGE EASEMENT | TAN | TANGENT |
| AP | ANGLE POINT | E.A.E. | EMERGENCY ACCESS EASEMENT | PE | PROJECT ENGINEER OR POLYETHYLENE | TB | TOP OF BERM |
| APN | ASSESSOR'S PARCEL NUMBER | ECR | END CURB RETURN | | | TC | TOP OF CURB |
| APPROX | APPROXIMATELY | ELE,ELEC | ELECTRICAL | PED | PEDESTRIAN | TCE | TEMPORARY CONSTRUCTION ESMT |
| AASHTO | AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS | ELEV | ELEVATION | PGL | PROFILE GRADE LINE | TEL,TELE | TELEPHONE |
| | | EP, EOP | EDGE OF PAVEMENT | PH | POTHOLE | TEMP | TEMPORARY |
| | | ESMT | EASEMENT | PI | POINT OF INTERSECTION | TF | TOP OF FOOTING |
| ASTM | AMERICAN SOCIETY FOR TESTING AND MATERIALS | EVC | END VERTICAL CURVE | PIV | POST INDICATOR VALVE | TG | TOP OF GRATE |
| | | EXIST,EX | EXISTING | P/L | PROPERTY LINE | TMH | TOP OF MANHOLE |
| AVE | AVENUE | EXP | EXPANSION JOINT | PLCP | POLYURETHANE LINED AND COATED STEEL PIPE | TOP | TOP OF PIPE |
| AVAR | AIR VALVE, AIR RELEASE ASSEMBLY | FC | FACE OF CURB | | | TP | TELEPHONE POLE |
| | | FF, FFE | FINISH FLOOR ELEVATION | PMF | PAVEMENT MARKING FILM | TRANS | TRANSITION |
| AWWA | AMERICAN WATER WORKS ASSOCIATION | FG | FINISH GRADE | POB | POINT OF BEGINNING | TS | TRAFFIC SIGNAL |
| | | FH | FIRE HYDRANT | POC | POINT ON CURVE | TW | TOP OF RETAINING WALL |
| BC | BACK OF CURB | FL | FLOW LINE | P.O.C. | POINT OF CONNECTION | TYP,(TYP) | TYPICAL |
| BCR | BEGIN CURB RETURN | FO | FIBER OPTIC | POT | POINT ON TANGENT | UDACS | UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS (LATEST EDITION) |
| BLM | BUREAU OF LAND MANAGEMENT | FRP | FIBERGLASS REINFORCED PLASTIC | PP | POWER POLE | | |
| BLVD | BOULEVARD | FS | FINISH SURFACE | PROP | PROPOSED | | |
| BM | BENCHMARK | FT | FOOT/FEET | PRC | POINT OF REVERSE CURVE | | |
| BO | BLOW-OFF | FTG | FOOTING | P.S.E. | PUBLIC SEWER EASEMENT TO BE PRIVATELY MAINTAINED BY HOA | UG | UNDERGROUND |
| BVCE | BEGIN VERTICAL CURVE ELEVATION | FUT | FUTURE | | | ULT | ULTIMATE |
| BVCS | BEGIN VERTICAL CURVE STATION | G | GAS | PSI | POUNDS PER SQUARE INCH | USDCCA | UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA, NEVADA (LATEST EDITION) |
| BW | BACK OF SIDEWALK | GA | GAGE, GUY ANCHOR | PT | POINT OF TANGENCY | | |
| BWV | BACK WATER VALVE | GB | GRADE BREAK | P.U.E. | PUBLIC UTILITY EASEMENT | | |
| C, ℄ | CENTERLINE | GND | GROUND | PVC | POLYVINYL CHLORIDE | | |
| C&G | CURB AND GUTTER | GRD | GRADE, GROUND | PVI | POINT OF VERTICAL INTERSECTION | | |
| CATV | UNDERGROUND CABLE TV | H, HGT | HEIGHT | PVMT | PAVEMENT | UT | UNDERGROUND TELEPHONE |
| CCBM | CLARK COUNTY BENCH MARK | HDWL | HEADWALL | PVT | PRIVATE | VAR | VARIABLE/VARIES |
| CCPW | CLARK COUNTY PUBLIC WORKS | HGL | HYDRAULIC GRADE LINE | PZ | PRESSURE ZONE | VC | VERTICAL CURVE |
| CCTV | CLOSED-CIRCUIT TELEVISION | HOA | HOME OWNERS ASSOCIATION | R, RAD | RADIAL, RADIUS | VCP | VITRIFIED CLAY PIPE |
| CCWRD | CLARK COUNTY WATER RECLAMATION DISTRICT | HORIZ | HORIZONTAL | R, RT | RIGHT | VERT | VERTICAL |
| | | HP | HIGH POINT, HIGH PRESSURE | RCB | REINFORCED CONCRETE BOX | VG | VALLEY GUTTER |
| C.E. | COMMON ELEMENT | HPS | HIGH PRESSURE SODIUM | RCP | REINFORCED CONCRETE PIPE | VOL | VOLUME |
| CFS | CUBIC FEET PER SECOND | IBC | INTERNATIONAL BUILDING CODE | RD | ROAD | W | WATER, WEST, WATT |
| CIP | CAPITAL IMPROVEMENTS PROJECT, CORRUGATED IRON PIPE | INV | INVERT | RDWY | ROADWAY | W/ | WITH |
| | | INT | INTERIM | REC | RECTANGULAR | W.I. | WROUGHT IRON |
| CIPM | CURED-IN-PLACE MANHOLE | JT | JOINT | REF | REFERENCE | WS | WATER SUPPLY |
| CIPP | CURED-IN-PLACE PIPE | L | LENGTH | REINF | REINFORCED | WT | WEIGHT |
| CIR | CIRCLE | L, LT | LEFT | REQD | REQUIRED | WTR | WATER |
| CLR | CLEAR OR CLEARANCE | LF | LINEAR FEET | RIM | TOP OF RIM ELEVATION | XING | CROSSING |
| CLSM | CONTROLLED LOW STRENGTH MATERIAL | LIP | LIP OF GUTTER | RND | ROUND | YD | YARD, YARD DRAIN |
| | | LN | LANE | ROW,R/W | RIGHT OF WAY | Z | PRESSURE ZONE |
| CLV | CITY OF LAS VEGAS | LP | LIGHT POLE | RP | RADIUS POINT | | |
| CMP | CORRUGATED METAL PIPE | LSCP | LANDSCAPE | RPM | RAISED PAVEMENT MARKERS | | |
| CMU | CONCRETE MASONRY UNIT | LVVWD | LAS VEGAS VALLEY WATER DISTRICT | RPPA | REDUCED PRESSURE PRINCIPAL ASSEMBLY | | |
| CNLV | CITY OF NORTH LAS VEGAS | MAX | MAXIMUM | | | | |
| CO | CLEANOUT | MH | MANHOLE | RSGV | RESILIENT SEAT GATE VALVE | | |
| CONC | CONCRETE | MIN | MINIMUM | S | SEWER, SOUTH | | |
| COND | CONDUIT | MLCP | MORTAR LINED AND COATED PIPE | SCH | SCHEDULE | | |
| CONST | CONSTRUCT OR CONSTRUCTION | MOD | MODIFY/MODIFIED | SD | STORM DRAIN | | |
| COORD | COORDINATE | MON | MONUMENT | SDMH | STORM DRAIN MANHOLE | | |
| COR | CORNER | MPH | MILES PER HOUR | SECT | SECTION | | |
| CPEP | CORRUGATED POLYETHELYNE PIPE | N | NORTH | SF | SQUARE FOOT/FEET | | |
| CT | COURT | NDOT | NEVADA DEPARTMENT OF TRANSPORTATION | SHLDR | SHOULDER | | |
| CY | CUBIC YARD(S) | | | SHT | SHEET | | |
| Δ | DELTA | NO | NUMBER | SL | STREET LIGHT | | |
| DCS | DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEM (LATEST EDITION) | NOSHA | STATE OF NEVADA OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION | SP | SERVICE POINT | | |
| | | | | SQ | SQUARE | | |
| | | | | SR | SEWER RECLAIM MAIN | | |
| | | NPC | NEVADA POWER COMPANY | SS | SANITARY SEWER | | |
| D.E. | DRAINAGE EASEMENT | NTS | NOT TO SCALE | SSMH | SANITARY SEWER MANHOLE | | |
| DEFL | DEFLECTION | OC | ON CENTER | STA | STATION | | |
| DG | DESIGNED GRADE | OHC | OVERHEAD COX COMMUNICATION | ST | STREET | | |
| D.I. | DROP INLET | OHP | OVERHEAD POWER LINE | STD | STANDARD | | |
| DIA, ø | DIAMETER | | | STL | STEEL | | |
| DIP | DUCTILE IRON PIPE | | | | | | |

## LEGEND

| | |
|---|---|
| (1) LOT NUMBER | [54.10] FUTURE ELEVATION |
| 1 BLOCK NUMBER | 59.33 TC or FG GRADE BREAK ELEVATION |
| F.F. = 00.0 PAD= 00.0 PAD ELEVATION FINISH FLOOR ELEVATION | 56.22 TC or FG PROPOSED ELEVATION |
| F.F. = (00.0) PAD= (00.0) EXISTING PAD ELEVATION EXIST. FINISH FLOOR ELEV. | (56.21) EXISTING ELEVATION |
| SCARP | RIGHT-OF-WAY |
| | PROPERTY LINE |
| 4510 EXISTING CONTOUR (5' INTERVAL) | CENTER LINE |
| EXISTING CONTOUR (1' INTERVAL) | RETAINING WALL |
| | KNEE WALL |
| CONCRETE DRIVEWAY | PERIMETER WALL |
| TF TOP OF FOOTING | STORM DRAIN LINE |
| TW TOP OF RETAINING WALL | SIDEWALK |
| SDMH STORM DRAIN MANHOLE | DITCH OR SWALE |
| SVZ - SIGHT VISIBILITY ZONE, NO STRUCTURES/ LANDSCAPING TALLER THAN 24" | CURB TRANSITION AT SIDEWALK RAMP (ROLL CURB TO "L" CURB) |

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR 1-800-227-2800

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

# QUANTITY ESTIMATE

**NOTE: CONTRACTOR TO VERIFY QUANTITIES FOR BIDDING PURPOSES**

## STREET IMPROVEMENT - PRIVATE

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| 2" AC PAVEMENT | SY | – |
| 3" AC PAVEMENT | SY | – |
| TYPE II AGGREGATE BASE MATERIAL | CY | – |
| "L" TYPE CURB | LF | – |
| 30" ROLL CURB | LF | – |
| "A" TYPE CURB | LF | – |
| SIDEWALK RAMP | EA | – |
| CONCRETE CROSS GUTTER | SF | – |
| 4' WIDE CONCRETE SIDEWALK | SF | – |
| 5' WIDE CONCRETE SIDEWALK | SF | – |
| SIDEWALK UNDERDRAIN | EA | – |
| TYPE III MONUMENT | EA | – |

## DRAINAGE - PRIVATE

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| 18" RCP | LF | 1,195 |
| 24" RCP | LF | 1,231 |
| 30" RCP | LF | 128 |
| 36" RCP | LF | 47 |
| 48" TYPE I MANHOLE | EA | 7 |
| 60" TYPE I MANHOLE | EA | 7 |
| 60" TYPE III MANHOLE | EA | 6 |
| 7.5' TYPE "DM2" MODIFIED DROP INLET | EA | 7 |
| 10' TYPE "CM2" MODIFIED DROP INLET | EA | 1 |
| 12.5' TYPE "DM2" MODIFIED DROP INLET | EA | 1 |
| 12.5' TYPE "CM2" MODIFIED DROP INLET | EA | 1 |
| NDOT TYPE 2 DROP INLET | EA | 1 |

## WATER - PUBLIC

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| 10" PVC WATERLINE | LF | – |
| 5° BEND PER UDACS PLATE NO. 31 | EA | – |
| 11.25° BEND PER UDACS PLATE NO. 31 | EA | – |
| 22.5° BEND PER UDACS PLATE NO. 31 | EA | – |
| 45° BEND PER UDACS PLATE NO. 31 | EA | – |
| CAP & 2" BLOW-OFF PER UDACS PLATE NO. 36 | EA | – |
| 12" GATE VALVE, BOX, AND COVER PER UDACS PLATE NO. 30 & 39 | EA | – |
| 10" GATE VALVE, BOX, AND COVER PER UDACS PLATE NO. 30 & 39 | EA | – |
| 10" TEE PER UDACS PLATE NO. 31 | EA | – |
| 8" TEE PER UDACS PLATE NO. 31 | EA | – |
| FIRE HYDRANT, VALVES, TEE, & 6" WATERLINE PER UDACS PLATES NO. 40 | EA | – |
| 10" CROSS PER UDACS PLATE NO. 31 | EA | – |
| 8" X 6" REDUCER PER UDACS PLATE NO. 30. | EA | – |
| 10" X 8" REDUCER PER UDACS PLATE NO. 30. | EA | – |
| 12" X 10" REDUCER PER UDACS PLATE NO. 30. | EA | – |
| 1" WATER SERVICE WITH 3/4" WATER METER PER UDACS PLATE NO. 1 | EA | – |
| 1 1/2" WATER SERVICE WITH 1 1/2" IRR. METER PER UDACS PLATE NO. 4 & 8 – PUBLIC | EA | – |
| 1" WATER SERVICE WITH 3/4" WATER METER PER UDACS PLATE 3. | EA | – |
| COPPER LATERAL | LF | – |
| 1 1/2" WATER SERVICE WITH 3/4" WATER METER PER UDACS PLATE 3. | EA | – |

## WATER - PRIVATE

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| PRESSURE REDUCING VALVE | EA | – |
| WATER LATERAL | LF | – |

## SEWER - PUBLIC

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| 8" PVC SANITARY SEWER PIPE | LF | – |
| 48" DIA. SANITARY SEWER MANHOLE | EA | – |
| CORROSION PROTECTION AT EX. SSMH | EA | – |

## SEWER - PRIVATE

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| 4" PVC SANITARY SEWER LATERAL (PRIVATE) | LF | – |
| BACK WATER VALVE (PRIVATE) | EA | – |

## TRAFFIC-PRIVATE

| DESCRIPTION | UNIT | TOTAL |
|---|---|---|
| STOP SIGN | EA | – |
| STREET SIGN | EA | – |

## UTILITY APPROVAL

SOUTHWEST GAS CORP. DATE:

## APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL
MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM
SHEETS: C1-C3, D13, MU, U1-U6, P1-P11, LAT

L# | CLV DWG#

PROFESSIONAL ENGINEER - STATE OF NEVADA - HAO A. NGUYEN - No. 19396 - Exp. 12/31/2019 - CIVIL
DATE: 04-10-19

| DESCRIPTION | DATE | APP |
|---|---|---|
| | | GCW |
| | DATE | APP |
| | | AGEN |
| | DATE | APP |
| | | DESCRIPTION |
| | DATE | REV |

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:32:04

GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

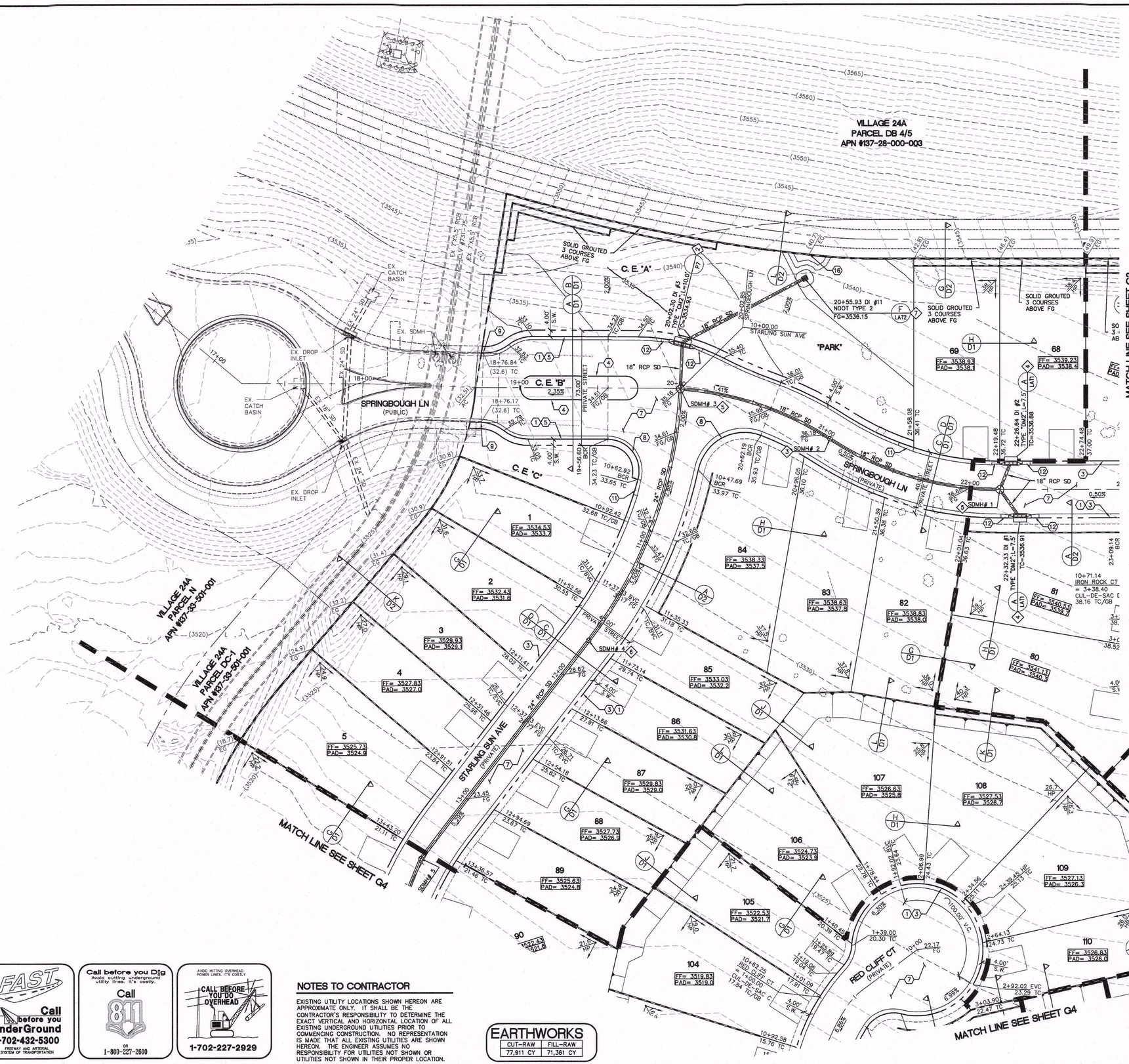
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Quangvinh Nguyen

PULTE HOMES

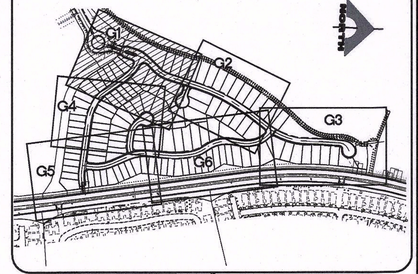
STARLING
SUMMERLIN VILLAGE 24A PARCEL O

**LEGEND, ABBREVIATIONS, AND QUANTITIES**

DRAWING
C3
3 OF 39 SHTS




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "M" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
5. CONSTRUCT 60" TYPE III STORM DRAIN MANHOLE PER STD. DWG 406.1.
6. CONSTRUCT 60" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE, SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. D368, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

## DRAINAGE STUDY COMPLIANCE

I CERTIFY THAT THIS GRADING PLAN ARE CONFORMANCE WITH THE APPROVED DRAINAGE STUDY DSXXXXX ON THE FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT

04-10-19

HAO A. NGUYEN, P.E.
NEVADA PE #19396

DATE

## NOTES TO CONTRACTOR

EXISTING UTILITY SOCATION LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

## EARTHWORKS

| CUT-RAW | FILL-RAW |
|---|---|
| 77,911 CY | 71,361 CY |

FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

L#

CLV DWG#

HAO A. NGUYEN
No. 19396
PROFESSIONAL ENGINEER - STATE OF NEVADA
DATE: 04-10-19

| DESCRIPTION | DATE | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|
| | | | | | |

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:23:24


GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com


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Quangvinh Nguyen

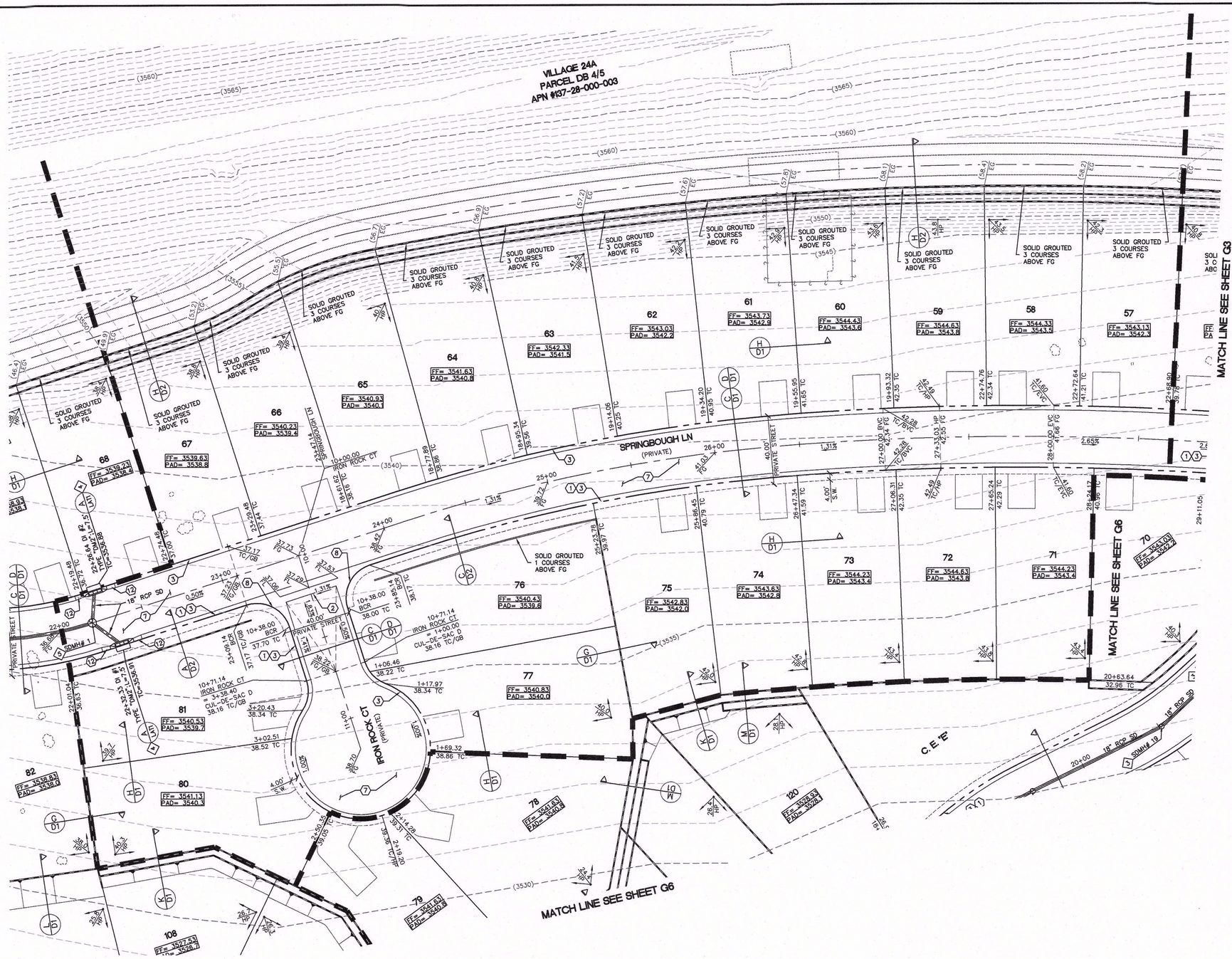
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SUMMERLIN VILLAGE 24A PARCEL O

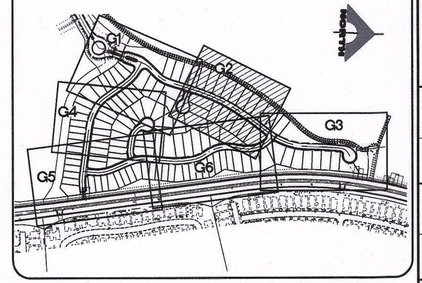
# GRADING PLAN 1

DRAWING G1

4 OF 39 SHTS




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "M" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
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## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. D368, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

## DRAINAGE STUDY COMPLIANCE

I CERTIFY THAT THIS GRADING PLAN ARE CONFORMANCE WITH THE APPROVED DRAINAGE STUDY DSXXXXX ON THE FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT

04-10-19
DATE

HAO A. NGUYEN, P.E.
NEVADA PE #19396

FAST
Call before you UnderGround
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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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Call 811
OR
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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
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1-702-227-2929

## NOTES TO CONTRACTOR

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## EARTHWORKS

| CUT-RAW | FILL-RAW |
|---|---|
| 77,911 CY | 71,361 CY |

L# | CLV DWG#

ENGINEER - STATE OF NEVADA
HAO A. NGUYEN
No. 19396
PROFESSIONAL
Exp. 12/31/2019
DATE: 04-10-19

| REV | DESCRIPTION | DATE | AGEN APP | DATE | GOV APP |
|---|---|---|---|---|---|
| | | | | | |

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:23:19

GCV
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

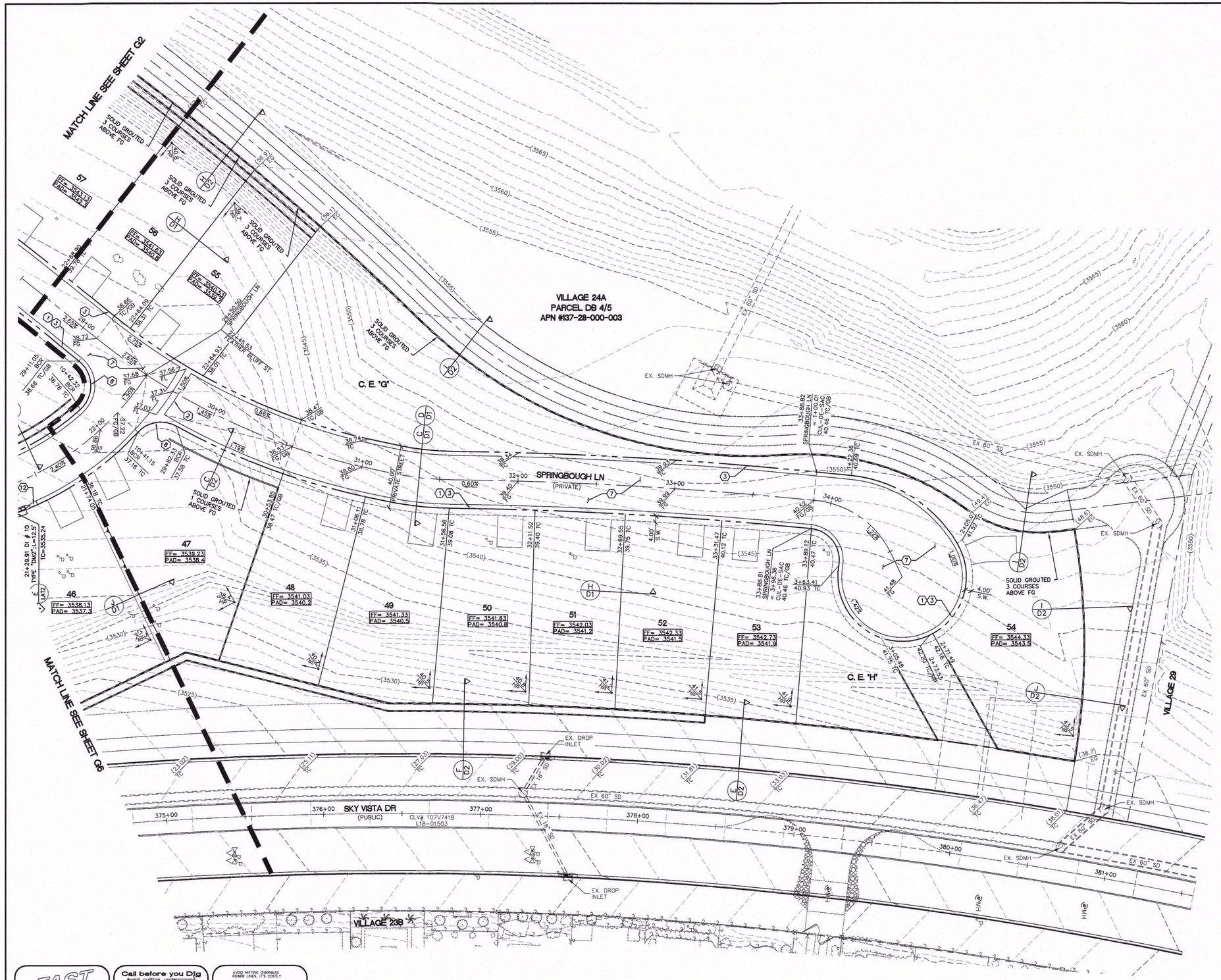
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Quangvinh Nguyen

PULTE HOMES

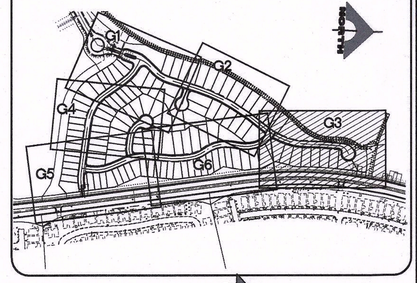
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SUMMERLIN VILLAGE 24A PARCEL O

GRADING PLAN

DRAWING
G2
5 OF 39 SHTS




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
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## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
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7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE, SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
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ELEVATION: 3246.63 (FEET)
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BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

## DRAINAGE STUDY COMPLIANCE

I CERTIFY THAT THIS GRADING PLAN ARE CONFORMANCE WITH THE APPROVED DRAINAGE STUDY DSXXXXX ON THE FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT

04-10-19
HAO A. NGUYEN, P.E. — DATE
NEVADA PE #19396

FAST — Call before you UnderGround 1-702-432-5300 — FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY — CALL BEFORE YOU DO OVERHEAD — 1-702-227-2929

## NOTES TO CONTRACTOR

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## EARTHWORKS

| CUT-RAW | FILL-RAW |
|---|---|
| 77,911 CY | 71,361 CY |

L# | CLV DWG#

ENGINEER - STATE OF NEVADA — HAO A. NGUYEN — No. 19396 — PROFESSIONAL — DATE: 04-10-19

| REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|
| | | | | | |

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:23:14

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

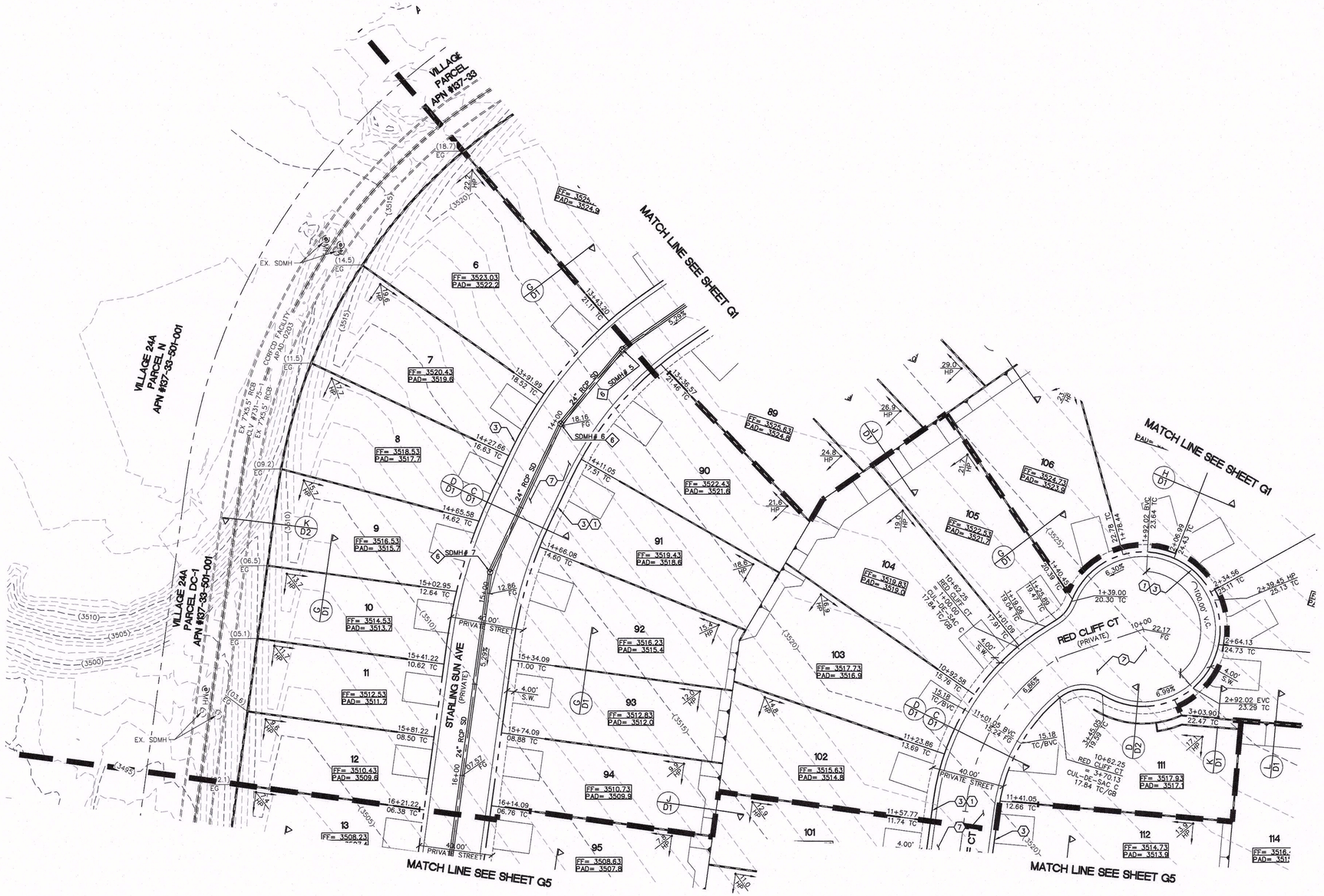
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Quangvinh Nguyen

PULTE HOMES

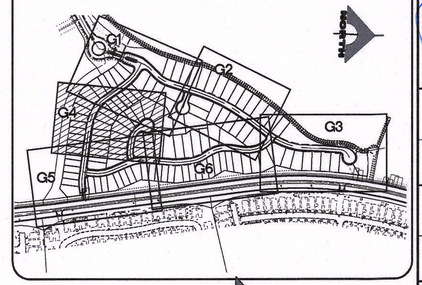
STARLING
SUMMERLIN VILLAGE 24A PARCEL O

# GRADING PLAN 3

DRAWING G3
5 OF 39 SHTS




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "M" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
5. CONSTRUCT 60" TYPE III STORM DRAIN MANHOLE PER STD. DWG 406.1.
6. CONSTRUCT 60" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE, SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. D368, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

## DRAINAGE STUDY COMPLIANCE

I CERTIFY THAT THIS GRADING PLAN ARE CONFORMANCE WITH THE APPROVED DRAINAGE STUDY DSXXXXX ON THE FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT

04-10-19

HAO A. NGUYEN, P.E. — DATE
NEVADA PE #19396

## NOTES TO CONTRACTOR

EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

## EARTHWORKS

| CUT–RAW | FILL–RAW |
|---|---|
| 77,911 CY | 71,361 CY |

FAST — Call before you UnderGround 1-702-432-5300 — FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig — Avoid cutting underground utility lines. It's costly. Call 811 or 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

HAO A. NGUYEN No. 19396 PROFESSIONAL ENGINEER – STATE OF NEVADA — DATE: 04-10-19

| REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:23:09

GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

F:\Projects\700\764-a150-001\DWG\production\764-A150-001c5.dwg
Quangvinh Nguyen

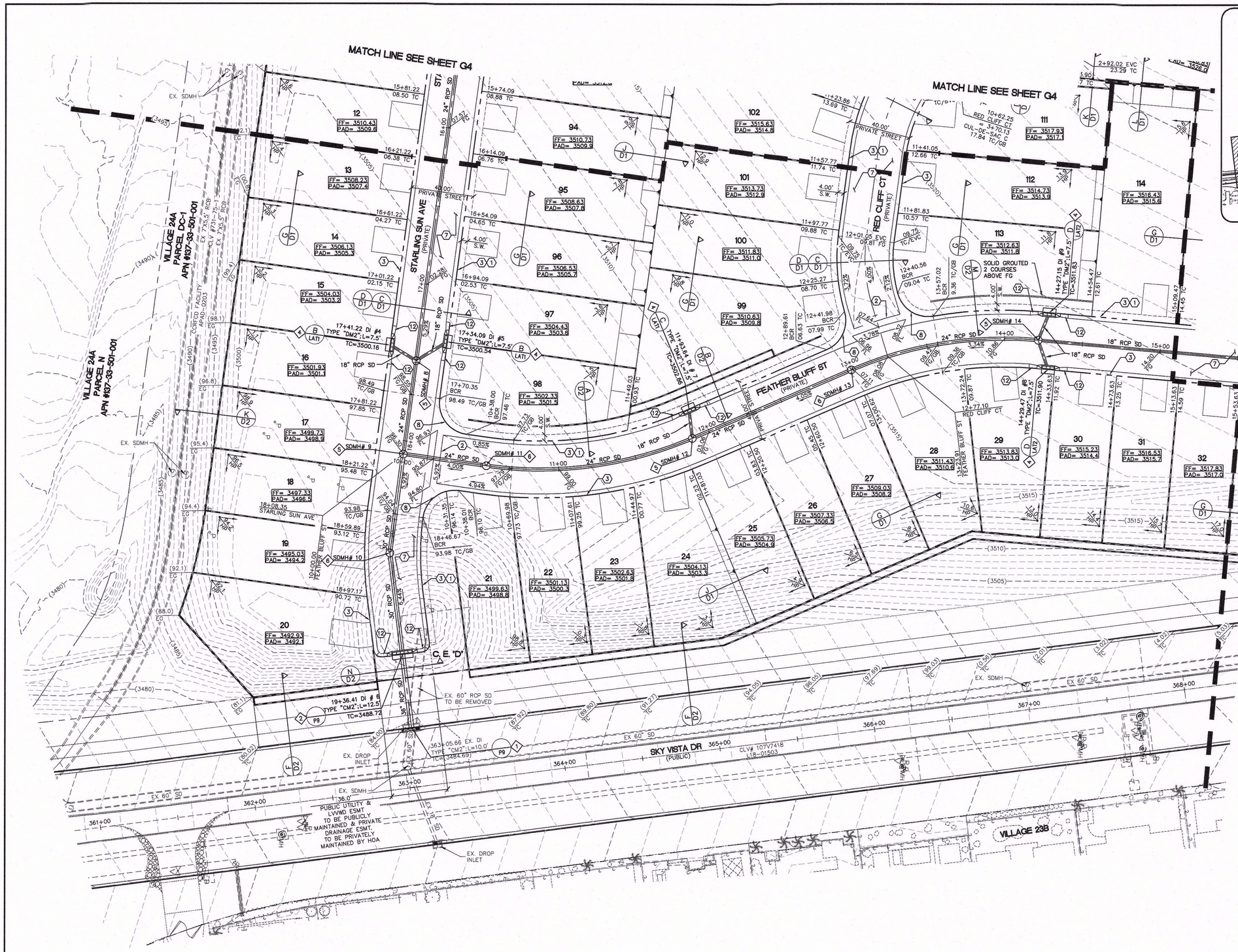
PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

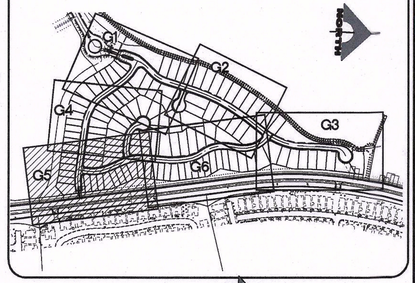
**GRADING PLAN 4**

DRAWING
**G4**
6 OF 39 SHTS

L# | CLV DWG#




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "M" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
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## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. D368, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

## DRAINAGE STUDY COMPLIANCE

I CERTIFY THAT THIS GRADING PLAN ARE CONFORMANCE WITH THE APPROVED DRAINAGE STUDY DSXXXXX ON THE FILE AT THE CITY OF LAS VEGAS FOR THIS PROJECT

04-10-19

HAO A. NGUYEN, P.E. NEVADA PE #19396 — DATE

FAST. Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

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AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

## NOTES TO CONTRACTOR

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## EARTHWORKS

| CUT-RAW | FILL-RAW |
|---|---|
| 77,911 CY | 71,361 CY |

L# | CLV DWG#

ENGINEER – STATE OF NEVADA – HAO A. NGUYEN No. 19396 – PROFESSIONAL – DATE 04-10-19

| REV | DATE | DESCRIPTION | DATE AGEN APP | DATE | GOW APP | DATE |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT NO. 764-A150-001
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CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:23:04

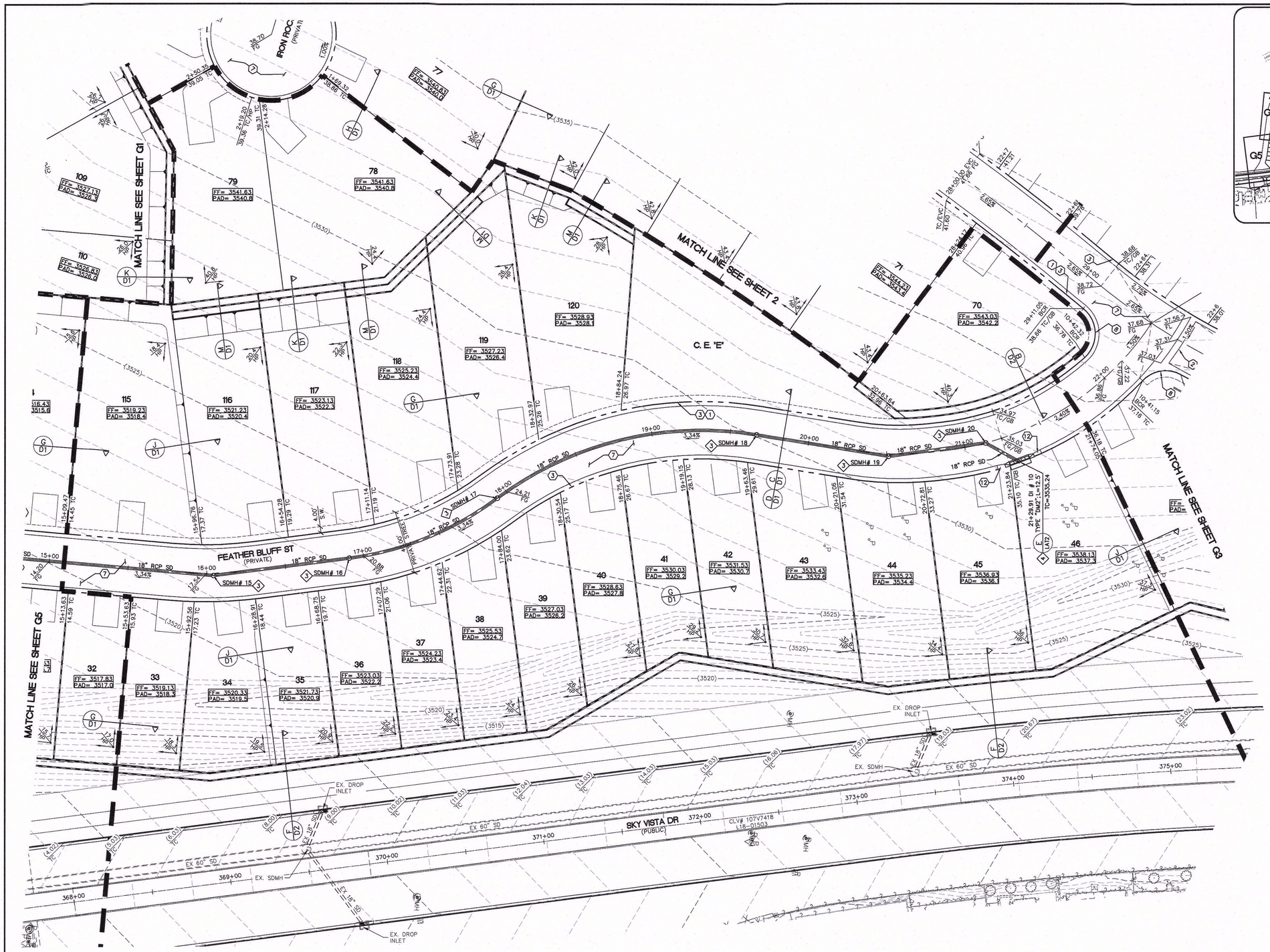
GCV ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcvengineering.com
f:\Projects\700\764-a150-001\DWG\production\764-A150-001c0.dwg
Quangvinh Nguyen

PULTE HOMES

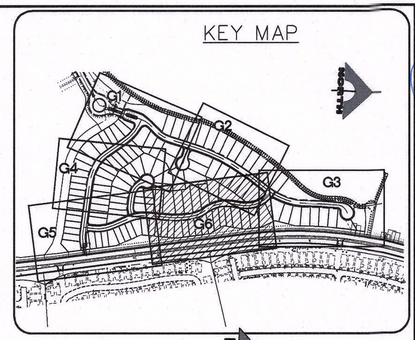
STARLING
SUMMERLIN VILLAGE 24A PARCEL O

**GRADING PLAN 5**

DRAWING G5
7 OF 39 SHTS




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
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## STORM DRAIN CONSTRUCTION NOTES

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04-10-19

HAO A. NGUYEN, P.E. — DATE
NEVADA PE #19396

FAST
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OR
1-800-227-2600
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig
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|---|---|
| 77,911 CY | 71,361 CY |

L# | CLV DWG#

STATE OF NEVADA — PROFESSIONAL ENGINEER — HAO A. NGUYEN — No. 19396 — exp. 12/31/2019 — CIVIL
DATE: 04-10-19

| REV | DATE | DESCRIPTION | DATE AGEN APP | DATE GCW APP |
|---|---|---|---|---|
| | | | | |

PROJECT NO. 764-A150-001
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PLOT TIME: 09:22:57

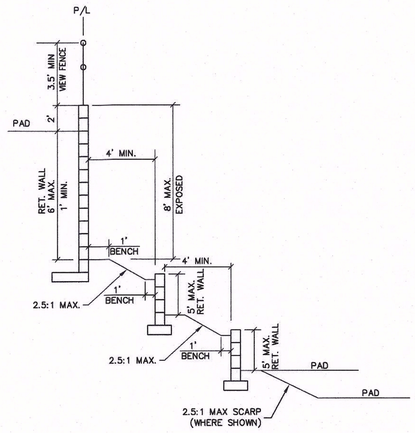
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ENGINEERS \ SURVEYORS
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T: 702.804.2000
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gcwengineering.com

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Quangminh Nguyen

PULTE HOMES
STARLING
SUMMERLIN VILLAGE 24A PARCEL O

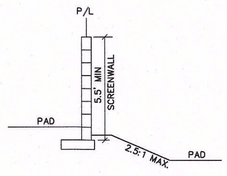
# GRADING PLAN 6

DRAWING
G6
8 OF 39 SHTS



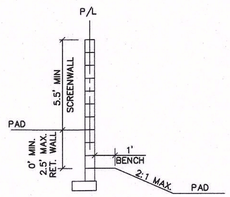

## TYPICAL SECTION — M

SCALE: NTS (SHEETS G1 THRU G6)



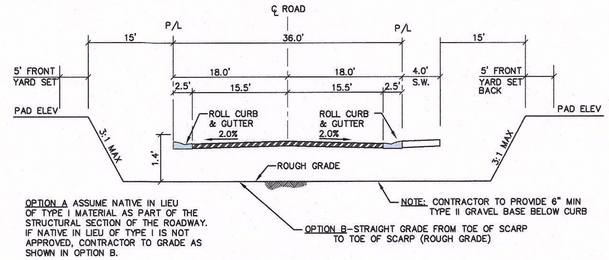

## TYPICAL SECTION — J

SCALE: NTS (SHEETS G1 THRU G3)



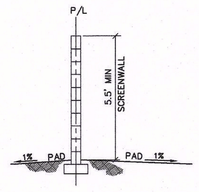

## TYPICAL SECTION (SIDE YARD) — I

SCALE: NTS (SHEETS G1 THRU G6)



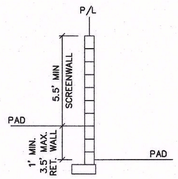

## TYPICAL ROUGH GRADING SECTION — D

SCALE: NTS (SHEETS G1 THRU G6)




## TYPICAL SECTION (SIDE YARD) — H

SCALE: NTS (SHEETS G1 THRU G6)

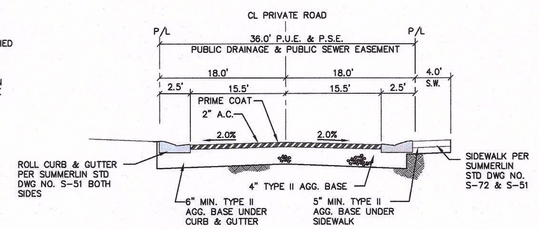



## TYPICAL SECTION (SIDE YARD) — G

SCALE: NTS (SHEETS G1 THRU G6)

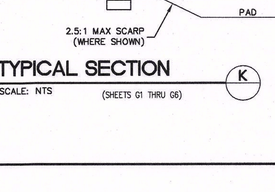
PER STONEBRIDGE RESIDENTIAL DESIGN CRITERIA RESIDED APRIL 28, 2017, EXHIBIT 7-I.2

NOTE: ALL AGGREGATE BASES SHALL BE COMPACTED PER SOILS REPORT PREPARED BY NOVA GEOTECHNICAL PROJECT #G-18-066. PRELIMINARY PAVEMENT SECTIONS SHALL BE VERIFIED WITH THE FINAL PAVEMENT SECTION RECOMMENDATION REPORT PRIOR TO CONSTRUCTION. IF FINAL PAVEMENT SECTIONS ARE DIFFERENT, A REVISION TO THE IMPROVEMENT PLANS WILL BE REQUIRED.



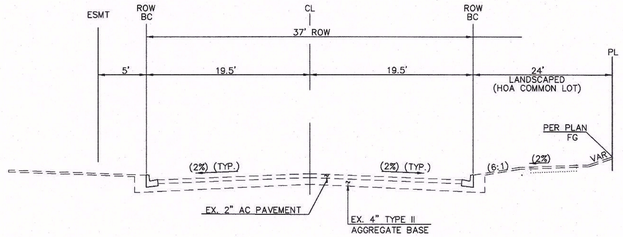

## 36' PRIVATE STREET SECTION — C

SCALE: NTS (SHEETS G1 THRU G6)



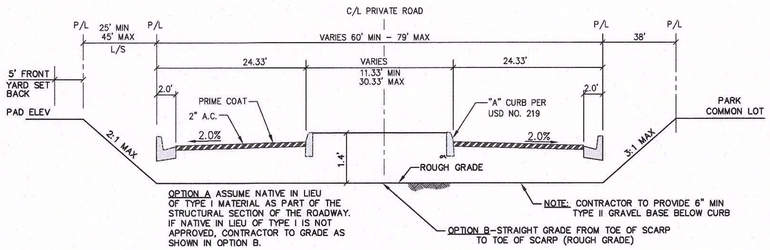

## TYPICAL SECTION — L

SCALE: NTS (SHEETS G1 THRU G6)



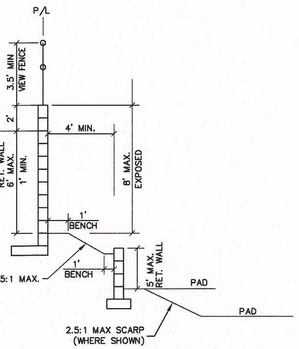

## SPRINGBOUGH LANE (PUBLIC) — F

SCALE: NTS (SHEETS G1, G4-G5)



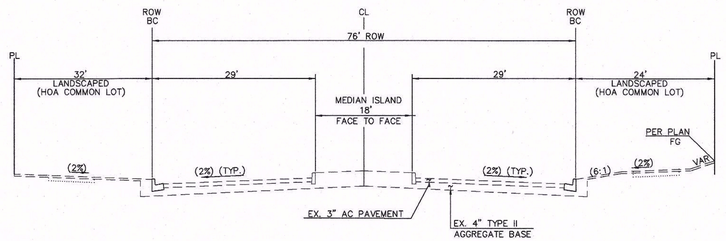

## TYPICAL ROUGH GRADING SECTION — B

SCALE: NTS (SHEETS G1)




## TYPICAL SECTION — K

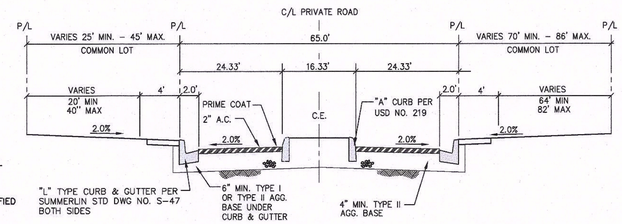
SCALE: NTS (SHEETS G1 THRU G6)




## SKY VISTA DRIVE (PUBLIC) — E

SCALE: NTS (SHEETS G4 THRU G6)

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## 65' PRIVATE ENTRY — A

SCALE: NTS (SHEETS G1)

| L# | CLV DWG# |
|---|---|


ENGINEER - STATE OF NEVADA
HAO A. NGUYEN
No. 19396
PROFESSIONAL
Exp. 11/31/2019
CIVIL
DATE: 04-10-19

GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEER'S SURVEYORS


| DESCRIPTION | REV | DATE |
|---|---|---|
| | AGEN APP | DATE |
| | GCW APP | DATE |

PROJECT NO. 764-A150-001
DESIGN:
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PLOT DATE: 04-10-19
PLOT TIME: 09:22:12

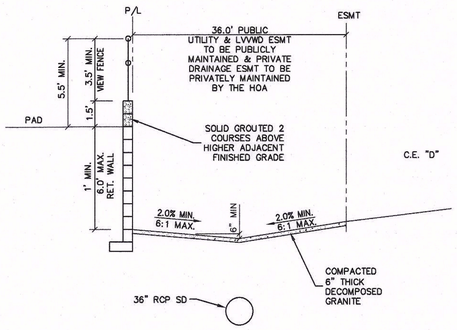
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Quangvinh Nguyen

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

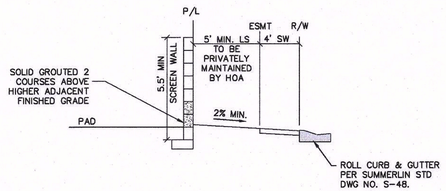
# GRADING SECTIONS AND DETAILS 1

DRAWING
D1
9 OF 39 SHTS



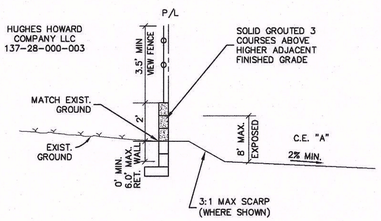

## 60' DRAINAGE ESMT. (N)

SCALE: NTS (SHEETS G5)



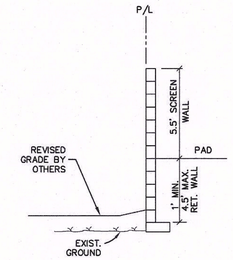

## TYPICAL SECTION (M)

SCALE: NTS (SHEETS G5)



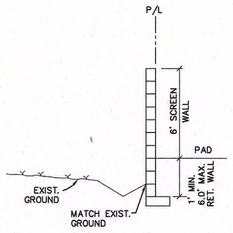

## TYPICAL SECTION (L)

SCALE: NTS (SHEETS G1 & G3)



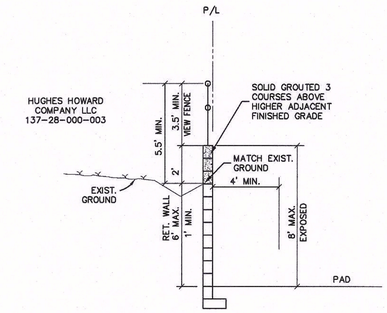

## TYPICAL SECTION (K)

SCALE: NTS (SHEETS G1, G3)



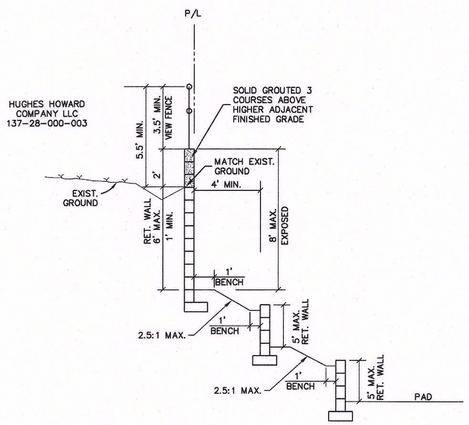

## TYPICAL SECTION (J)

SCALE: NTS (SHEETS G3)



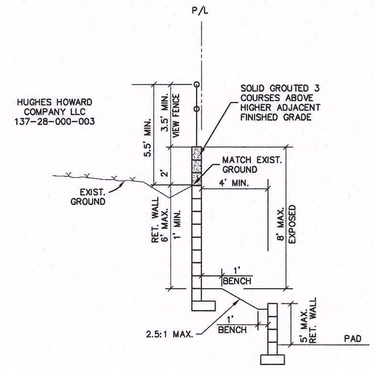

## TYPICAL SECTION (I)

SCALE: NTS (SHEETS G1-G3)



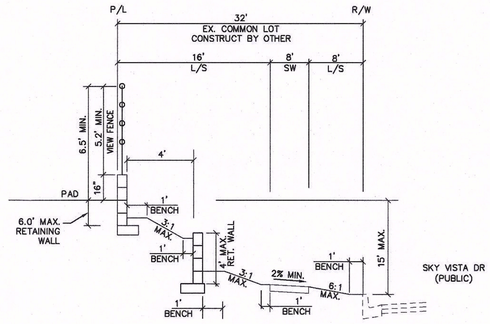

## TYPICAL SECTION (H)

SCALE: NTS (SHEETS G1-G3)



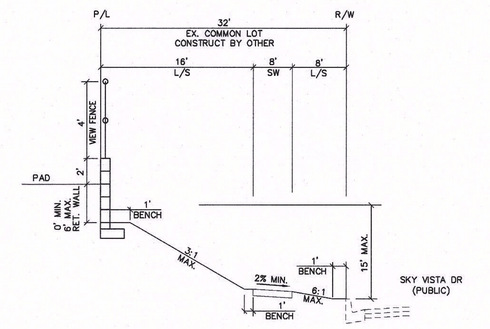

## TYPICAL SECTION (G)

SCALE: NTS (SHEETS G1-G3)



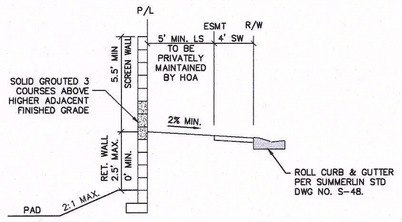

## TYPICAL SECTION (F)

SCALE: NTS (SHEETS G2-G3)



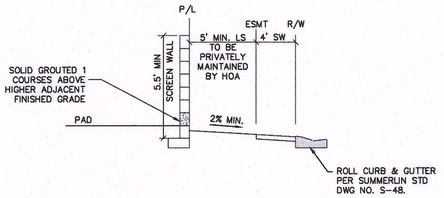

## TYPICAL SECTION (E)

SCALE: NTS (SHEETS G2-G3)



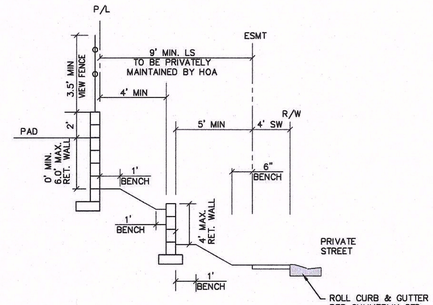

## TYPICAL SECTION (D)

SCALE: NTS (SHEETS G1 THRU G6)



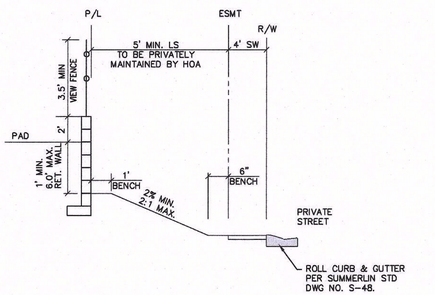

## TYPICAL SECTION (C)

SCALE: NTS (SHEETS G2 & G3)




## TYPICAL SECTION (B)

SCALE: NTS (SHEETS G1 THRU G6)




## TYPICAL SECTION (A)

SCALE: NTS (SHEETS G1 THRU G6)

L# | CLV DWG#

STATE OF NEVADA — PROFESSIONAL ENGINEER — HAO A. NGUYEN — No. 19398 — DATE: 04-10-19

| DESCRIPTION | DATE | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|
| REV | | | | | |

PROJECT NO. 764-A150-001

DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:22:07

GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
F:\Projects\700\764-a150-001\DWG\production\764-A150-001cD.dwg
Quangvinh Nguyen

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

# GRADING SECTIONS AND DETAILS 2

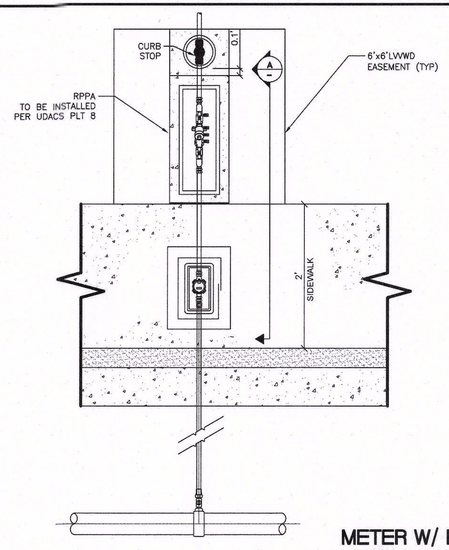
DRAWING D2

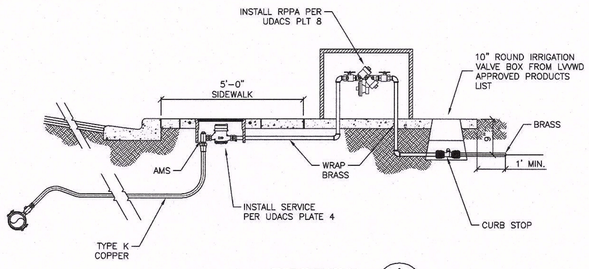
11 OF 39 SHTS

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO._____FIRST APPROVED DATE:_____

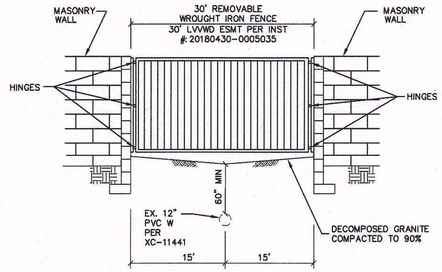



SECTION A

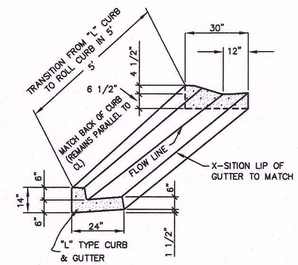
## METER W/ RPPA PER UDACS PLATE NO. 4 AND 8 WITH CURB STOP G

SCALE: NTS




## WROUGHT IRON FENCE D

SCALE: NTS




## 5' TRANSITION FROM "L" CURB TO ROLL CURB C

SCALE: NTS

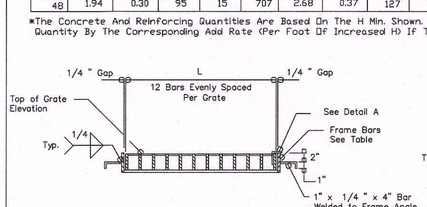
### BILL OF MATERIALS (RCP HDPE CMP)

| PIPE SIZE (INCH) | SINGLE (ONE GRATE) | | | | | DOUBLE (TWO GRATES) | | | | | TRIPLE (THREE GRATES) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | * CONCRETE (CY) | | * REINF. (LB.) | | | * CONCRETE (CY) | | * REINF. (LB.) | | | * CONCRETE (CY) | | * REINF. (LB.) | | |
| | BASE QUAN. (H MIN.) | ADD RATE (CY/FT) | BASE QUAN. (H MIN.) | ADD RATE (CY/FT) | STR STEEL (LB) | BASE QUAN. (H MIN.) | ADD RATE (CY/FT) | BASE QUAN. (H MIN.) | ADD RATE (CY/FT) | STR STEEL (LB) | BASE QUAN. (H MIN.) | ADD RATE (CY/FT) | BASE QUAN. (H MIN.) | ADD RATE (CY/FT) | STR STEEL (LB) |
| ≤ 15 | 0.71 | 0.19 | 36 | 10 | 211 | 1.06 | 0.26 | 50 | 13 | 397 | 1.41 | 0.33 | 70 | 17 | 583 |
| 18 | 0.89 | 0.20 | 40 | 10 | 306 | 1.31 | 0.28 | 56 | 13 | 574 | 1.72 | 0.35 | 77 | 18 | 842 |
| 24 | 1.08 | 0.22 | 58 | 12 | 349 | 1.56 | 0.30 | 80 | 15 | 652 | 2.04 | 0.37 | 105 | 20 | 956 |
| 30 | 1.28 | 0.24 | 63 | 12 | 390 | 1.83 | 0.31 | 86 | 16 | 729 | 2.38 | 0.39 | 113 | 20 | 1068 |
| 36 | 1.50 | 0.26 | 67 | 13 | 524 | 2.11 | 0.33 | 92 | 16 | 980 | 2.72 | 0.41 | 120 | 21 | 1435 |
| 42 | 1.71 | 0.28 | 90 | 15 | 575 | 2.39 | 0.35 | 120 | 18 | 1073 | 3.07 | 0.43 | 154 | 22 | 1571 |
| 48 | 1.94 | 0.30 | 95 | 15 | 707 | 2.68 | 0.37 | 127 | 18 | 1329 | 3.42 | 0.44 | 163 | 23 | 1951 |

*The Concrete And Reinforcing Quantities Are Based On The H Min. Shown. Increase The Concrete And Reinforcing Base Quantity By The Corresponding Add Rate (Per Foot Of Increased H) If The H Specified Is Larger Than H Min.

### TABLE OF DIMENSIONS (RCP HDPE CMP)

| PIPE SIZE (INCH) | A | H Min. (FT) | MAIN BARS (INCH) | FRAME ANGLES (INCH) | FRAME BARS (INCH) | L (FT) SINGLE GRATE | L (FT) DOUBLE GRATE | L (FT) TRIPLE GRATE |
|---|---|---|---|---|---|---|---|---|
| ≤15 | 2' | 2.50 | 3 1/2 X 3/8 | 4 X 3 X 3/8 | 4 X 3/8 | 2 | 4 | 6 |
| 18 | 2' 6" | 3.00 | 4 1/2 X 3/8 | 5 X 3 X 3/8 | 5 X 3/8 | 2 | 4 | 6 |
| 24 | 3' | 3.50 | 4 1/2 X 3/8 | 5 X 3 X 3/8 | 5 X 3/8 | 2 | 4 | 6 |
| 30 | 4' | 4.00 | 4 1/2 X 3/8 | 5 X 3 X 3/8 | 5 X 3/8 | 2 | 4 | 6 |
| 36 | 4' | 4.50 | 5 1/2 X 3/8 | 6 X 3 1/2 X 3/8 | 6 X 3/8 | 2 | 4 | 6 |
| 42 | 5' | 5.00 | 5 1/2 X 3/8 | 6 X 3 1/2 X 3/8 | 6 X 3/8 | 2 | 4 | 6 |
| 48 | 5' | 5.50 | 5 1/2 X 7/16 | 6 X 3 1/2 X 3/8 | 6 X 3/8 | 2 | 4 | 6 |

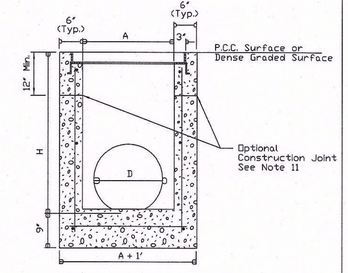



SECTION C-C

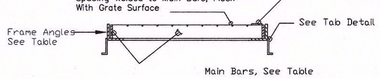



DETAIL A

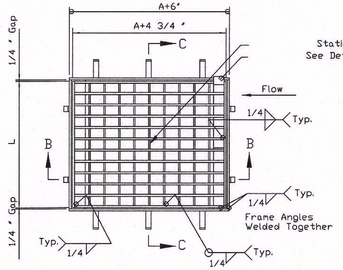
TAB DETAIL




SECTION A-A




SECTION B-B




GRATE AND FRAME

### NOTES:

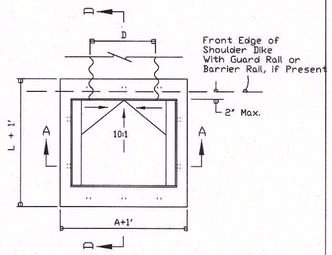
See Detail A

1. ALL CONCRETE SHALL BE CLASS A OR AA.
2. REINFORCING STEEL SHALL BE NO.4 BARS WITH MAXIMUM SPACING AT 18" CENTERS, WIRED TIGHTLY AT ALL INTERSECTIONS AND EMBEDDED 2" CLEAR OF ALL CONCRETE SURFACES.
3. EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 1".
4. DIMENSIONS MAY BE VARIED TO FIT LOCAL CONDITIONS IF ORDERED BY THE ENGINEER.
5. COMMERCIAL PREFABRICATED GRATINGS APPROVED BY THE BRIDGE DIVISION MAY BE USED IN LIEU OF THE FIELD-WELDED GRATING SHOWN ABOVE.
6. EXTREME LOW COVER SITUATIONS TO BE REVIEWED BY HYDRAULICS ENGINEER.
7. SLOPE CATCH BASIN FLOORS 10:1 FROM ALL DIRECTIONS TOWARD OUTLET PIPE. IF BASIN IS USED AS A JUNCTION, SHAPE FLOW LINE(S) TO OUTLET PIPE AND PROVIDE A 10:1 SLOPE TO FLOW LINE(S).
8. SEE SHEET R-2.9.1 FOR DETAILS IF CONNECTING HDPE PIPE.
9. A SINGLE TYPE 2 DROP INLET SHALL BE CONSTRUCTED UNLESS A DOUBLE OR TRIPLE IS SPECIFIED.
10. SINGLE GRATE CONFIGURATION SHOWN FOR CLARITY. OUTSIDE DIMENSIONS OF EACH GRATE SHALL MEASURE 2' BY A+4 3/4 ".
11. RUN REBAR CONTINUOUS THRU CONSTRUCTION JOINT. JOINT MUST BE A MINIMUM OF 3" FROM HORIZONTAL BARS.
12. WELD ONE TAB ON ℄ OF GRATE AND REMAINING TWO TABS 6" FROM EDGE OF FRAME. SIX TABS PER INLET, THREE TABS ON EACH SIDE
13. WELD TABS 6" FROM EDGE OF FRAME. FOUR TABS PER GRATE, TWO ON EACH SIDE.

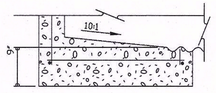
Station/Offset See Detail A

### DESIGN NOTES:

D1. ADDITIONAL PIPE PENETRATIONS MAY BE PLACED IN ANY WALL.




PLAN




SECTION D-D

NEVADA DEPARTMENT OF TRANSPORTATION

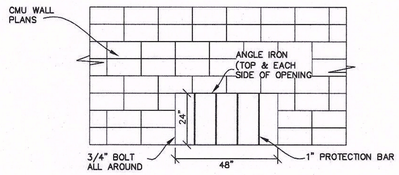
TYPE 2 DROP INLET

Signed Original On File | R-4.2.1 | (609)

CHIEF HYDRAULICS ENGINEER | ADOPTED 11/70 | REVISION 5/09

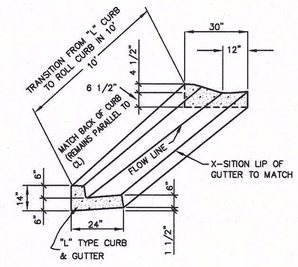
## NDOT TYPE 2 DROP INLET F

SCALE: NTS



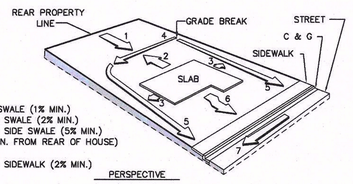

## 48" X 24" BLOCK WALL OPENING E

SCALE: NTS




## 10' TRANSITION FROM "L" CURB TO ROLL CURB B

SCALE: NTS




NOTES:
1. SLOPE FROM REAR TO SWALE (1% MIN.)
2. SLOPE FROM HOUSE TO SWALE (2% MIN.)
3. SLOPE FROM HOUSE TO SIDE SWALE (5% MIN.)
4. REAR SWALE 1% (10' MIN. FROM REAR OF HOUSE)
5. SIDE SWALE 1%
6. SLOPE FROM HOUSE TO SIDEWALK (2% MIN.)
7. SLOPE OF STREET

PERSPECTIVE

F.H.A. TYPE "A" DRAINAGE

## TYPICAL TYPE "A" DRAINAGE DETAIL A

SCALE: NTS

HAO A. NGUYEN — STATE OF NEVADA — PROFESSIONAL ENGINEER — No. 19396 — exp. 12/31/2019 — DATE: 04-10-19

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|---|
| | | | | | | |

PROJECT NO. 764-A150-001

DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:22:06


GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com


I:\Projects\700\764-a150-001\DWG\production\764-A150-001d.dwg
Quangvinh Nguyen

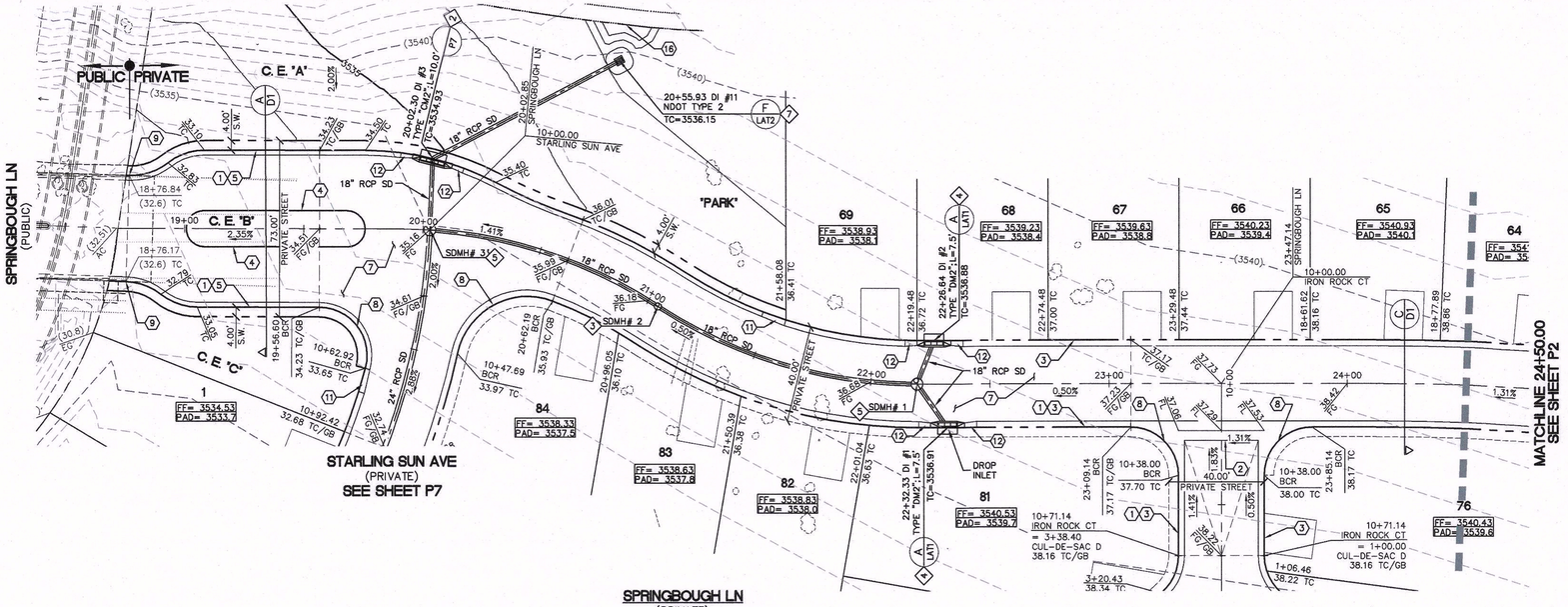
PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

GRADING SECTIONS AND DETAILS 3

L# | CLV DWG#

DRAWING D3
12 OF 39 SHTS



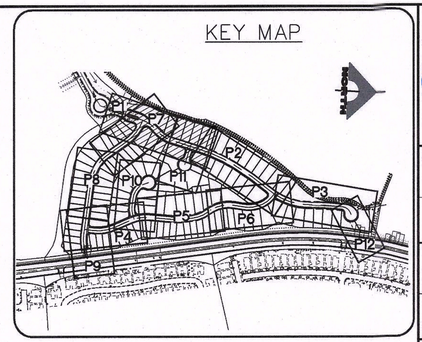

## SPRINGBOUGH LN
(PRIVATE)

## PLAN AND PROFILE

VERT.: 1" = 3'
HOR. : 1" = 30'




## KEY MAP




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "D" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
5. CONSTRUCT 60" TYPE III STORM DRAIN MANHOLE PER STD. DWG 406.1.
6. CONSTRUCT 60" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE, SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

## NOTE

ALL ONSITE STORM DRAINS AND ASSOCIATED STORM FACILITIES ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOA.

ALL PRIVATE STREETS ARE P.U.E., PUBLIC DRAINAGE EASEMENT AND PUBLIC SEWER EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.

## NOTES TO CONTRACTOR

EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. DJ68, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL
MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM

L# | CLV DWG#

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY.
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

STATE OF NEVADA — ENGINEER — HAO A. NGUYEN No. 19399 — PROFESSIONAL — DATE: 04-10-19

| REV | DESCRIPTION | DATE | AGEN. APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|---|

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:21:56

GCW
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com
ENGINEERS \ SURVEYORS

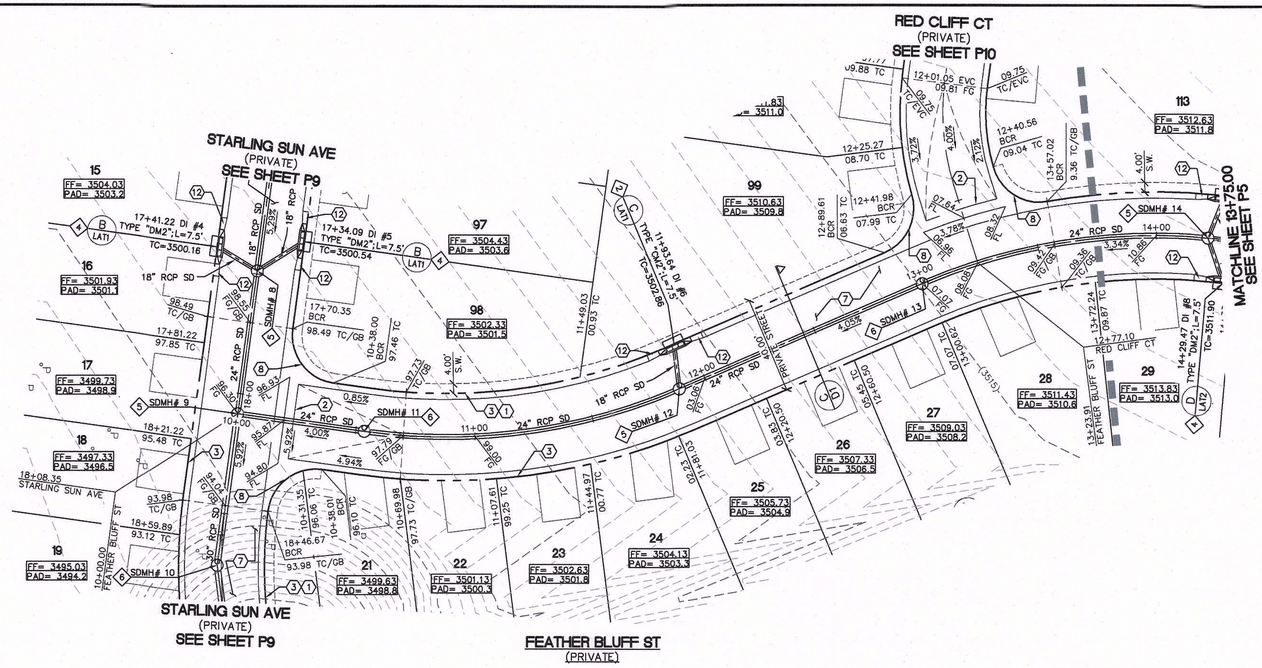
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Quangvinh Nguyen

PULTE HOMES

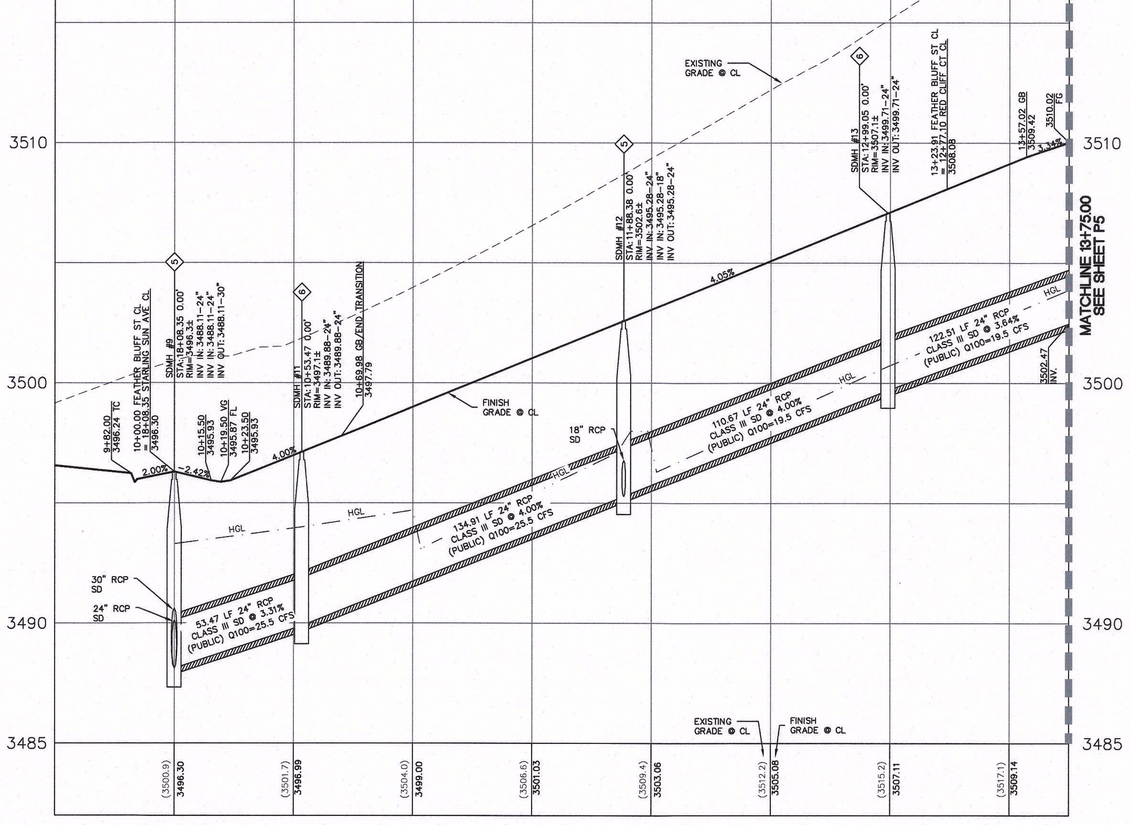
STARLING
SUMMERLIN VILLAGE 24A PARCEL O

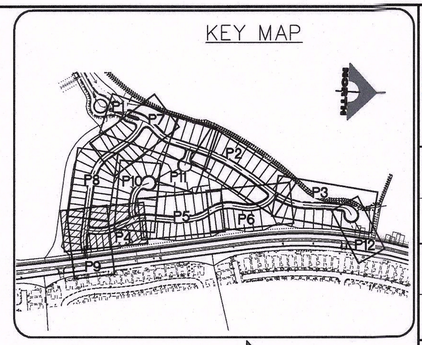
**SPRINGBOUGH LN**
**STA. 19+76.17 TO STA. 24+50.00**
**PLAN AND PROFILE**

DRAWING
**P1**
13 OF 39 SHTS




## PLAN AND PROFILE




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
2. CONSTRUCT 8' WIDE VALLEY GUTTER PER SUMMERLIN STD DWG NO. S-64.
3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "D" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

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3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
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7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE. SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

## NOTE

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## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. D368, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

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989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

## APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
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MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM

L# | CLV DWG#

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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

STATE OF NEVADA
PROFESSIONAL ENGINEER
HAO A. NGUYEN
No. 19396
DATE: 04-10-19

| REV | DESCRIPTION | DATE | AGEN APP | DATE | GOW APP | DATE |
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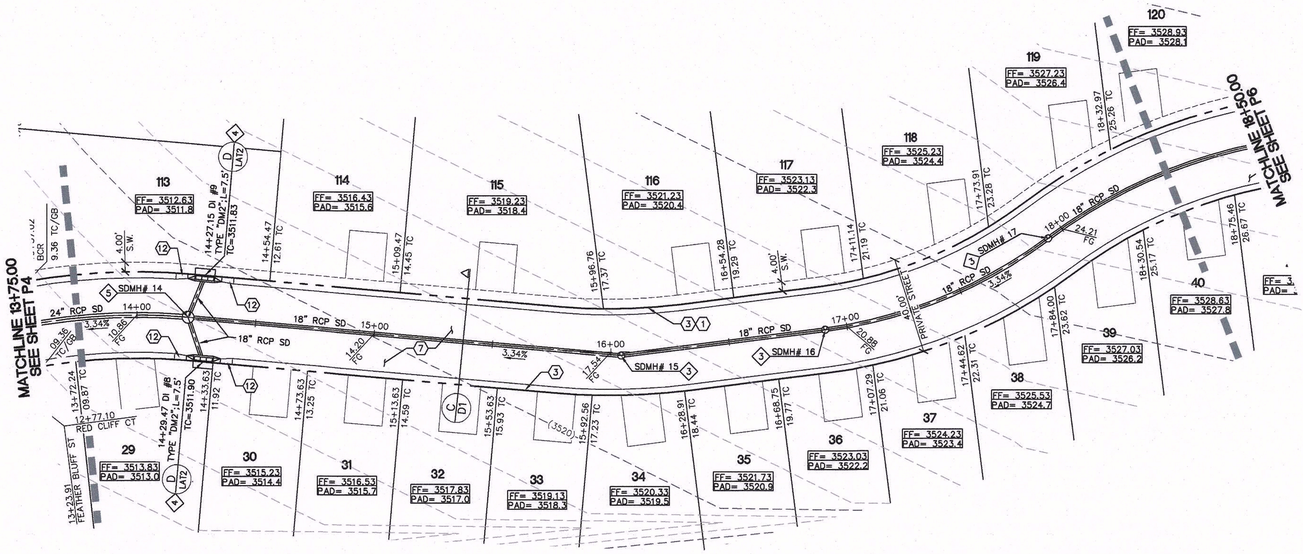
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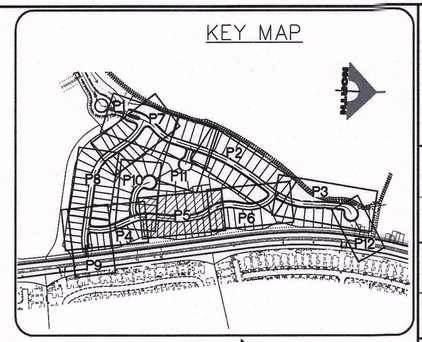
GCW ENGINEERS\SURVEYORS
1555 S. RAINBOW BLVD.
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F: 702.804.2299
gcwengineering.com

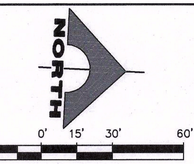
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Qianyinh Nguyen

PULTE HOMES
STARLING
SUMMERLIN VILLAGE 24A PARCEL O
FEATHER BLUFF ST
STA. 10+00.00 TO STA. 13+75.00
PLAN AND PROFILE

DRAWING
P4
16 OF 39 SHTS




## CONSTRUCTION NOTES

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15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "D" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

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## NOTE

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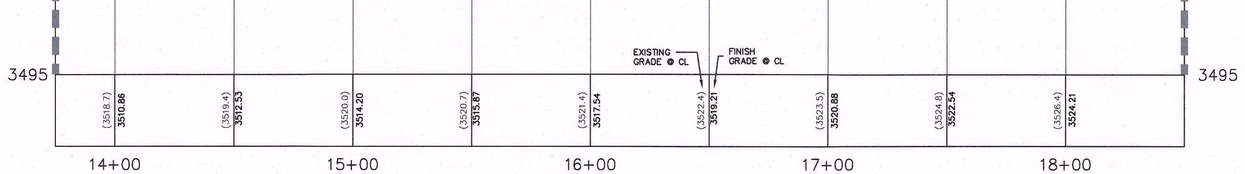
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L# | CLV DWG#

## FEATHER BLUFF ST
(PRIVATE)

## PLAN AND PROFILE

VERT.: 1" = 3'
HOR. : 1" = 30'




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FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
HAO A. NGUYEN
No. 19396
PROFESSIONAL
Exp. 12/31/2019
DATE: 04-10-19

GCV
ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcvengineering.com

| REV | DATE | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|---|
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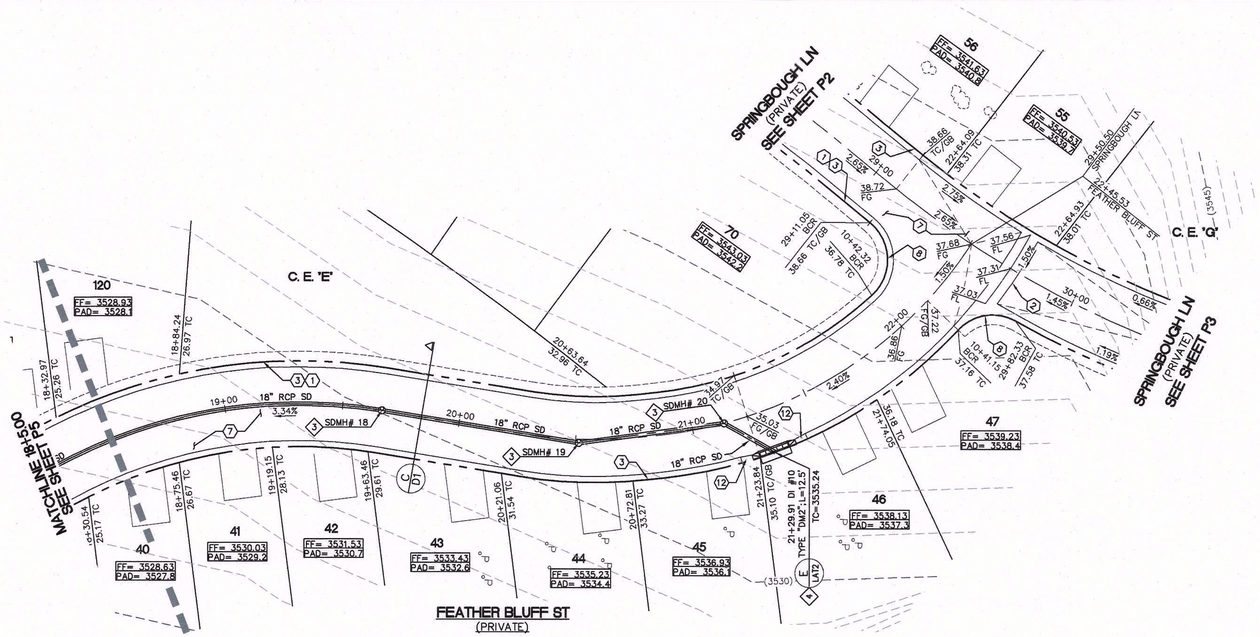
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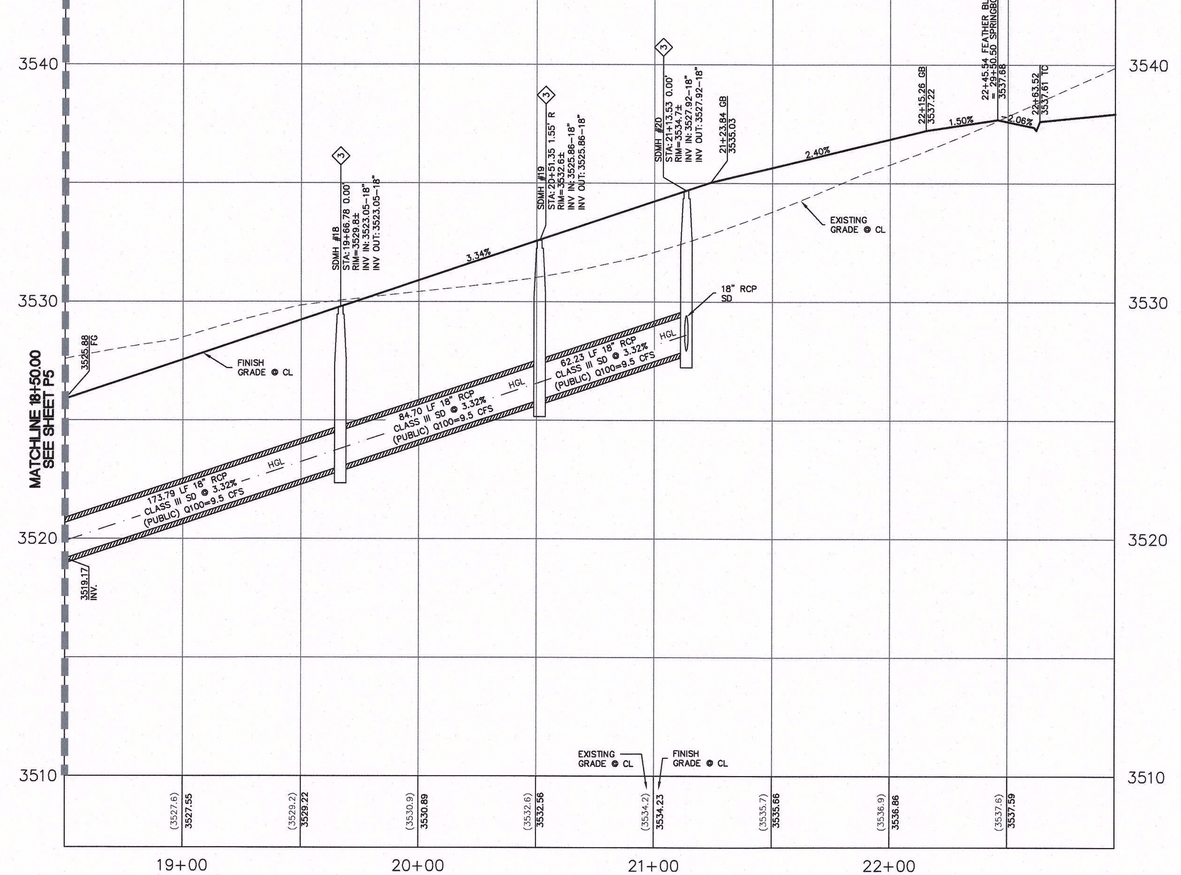
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Quangvinh Nguyen

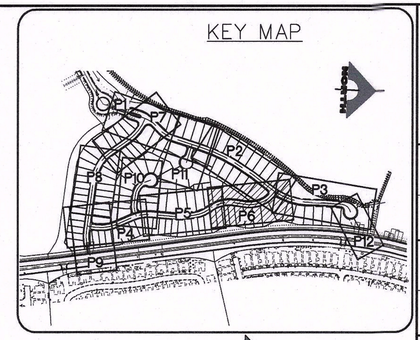
PULTE HOMES
STARLING
SUMMERLIN VILLAGE 24A PARCEL O

**FEATHER BLUFF ST**
**STA. 13+75.00 TO STA. 18+50.00**
**PLAN AND PROFILE**

DRAWING
**P5**
17 OF 39 SHTS




NORTH

30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

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ENGINEER - STATE OF NEVADA
HAO A. NGUYEN
No. 19398
PROFESSIONAL
DATE: 04-10-19

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PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
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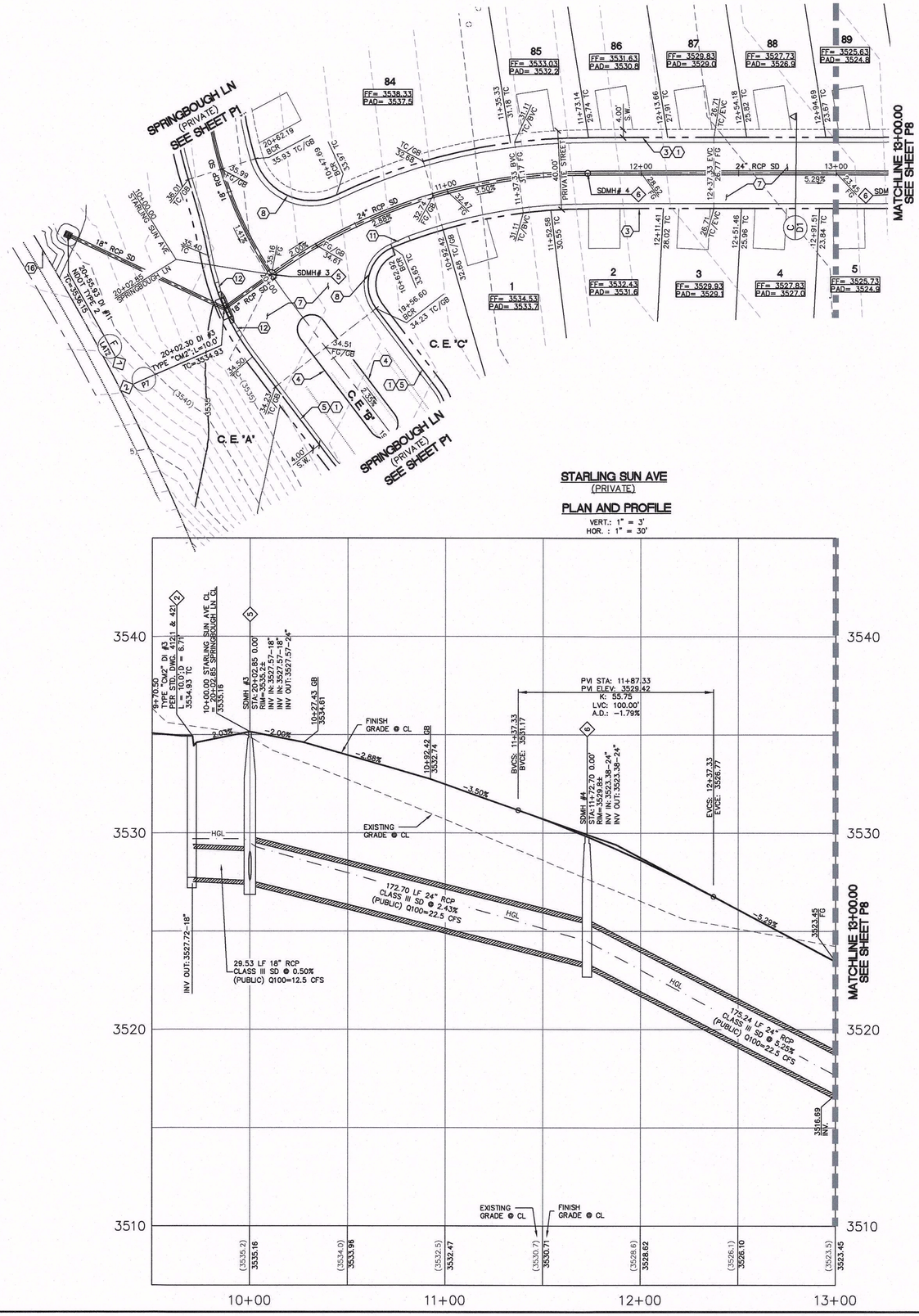
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Quangvinh Nguyen

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

FEATHER BLUFF ST
STA. 18+50.0 TO STA. 22+45.54
PLAN AND PROFILE

DRAWING
P6
18 OF 39 SHTS

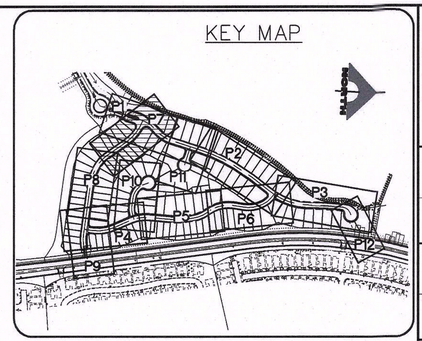


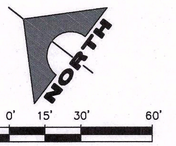

## STARLING SUN AVE
(PRIVATE)

## PLAN AND PROFILE

VERT.: 1" = 3'
HOR. : 1" = 30'




30' 0' 15' 30' 60'

SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
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16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
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6. CONSTRUCT 60" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE, SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

## NOTE

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## BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. DJ68, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.83 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL
MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM

L# | CLV DWG#

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
CALL BEFORE YOU DO OVERHEAD
1-702-227-2929

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2800

FAST
Call before you UnderGround
1-702-432-5300
FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

ENGINEER - STATE OF NEVADA
HAO A. NGUYEN
No. 19396
PROFESSIONAL
DATE: 04-10-19

| REV | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|---|

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:20:40


GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

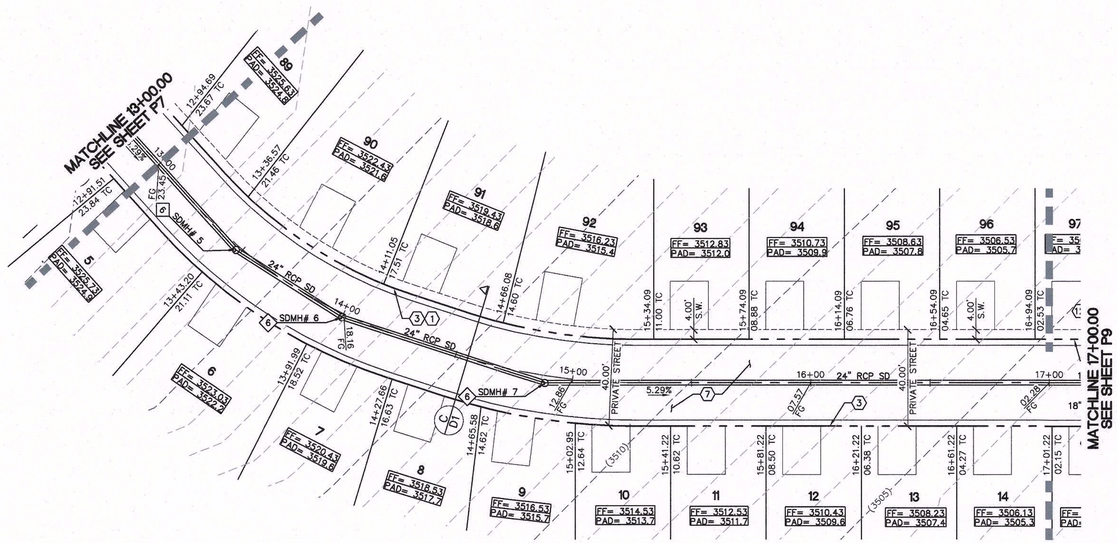

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Quangvinh Nguyen

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

**STARLING SUN AVE**
**STA. 10+00.00 TO STA. 13+00.00**
**PLAN AND PROFILE**

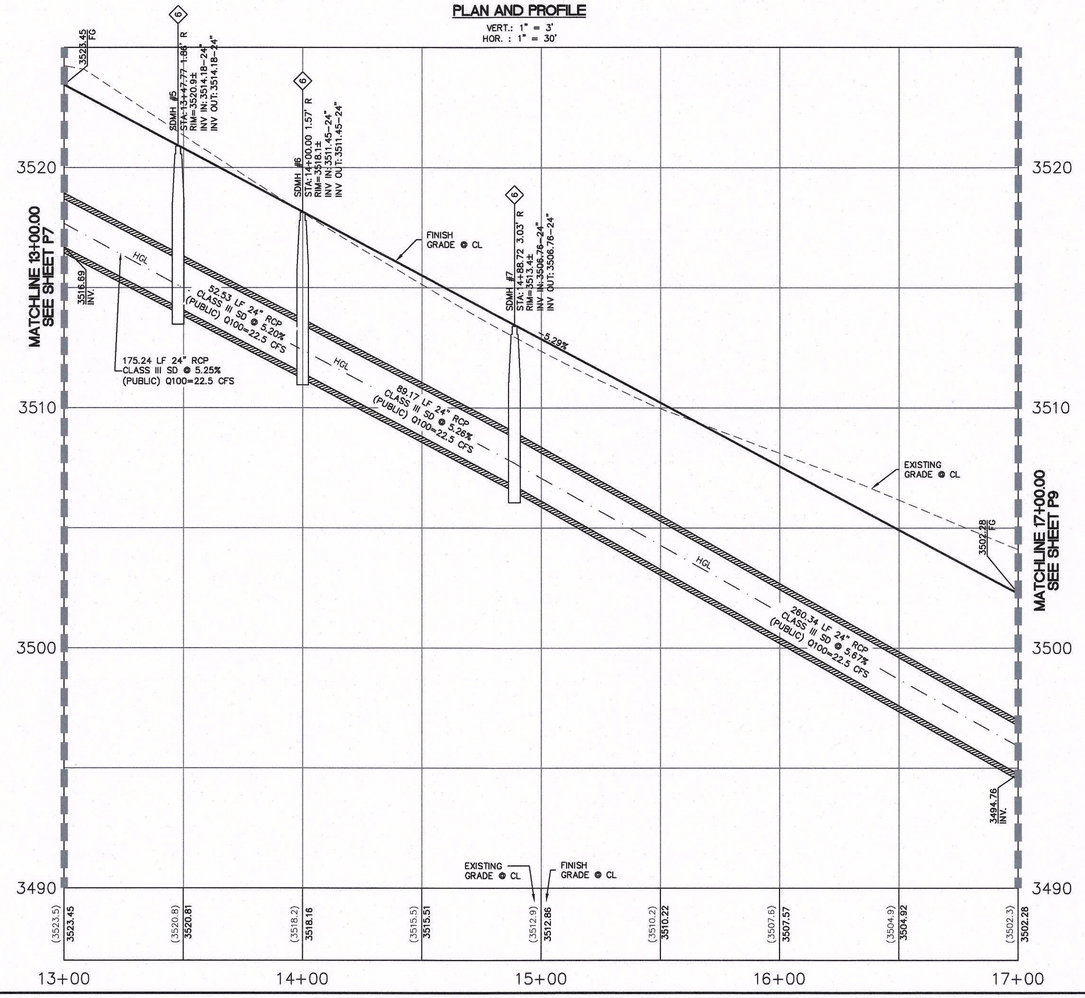
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**P7**
19 OF 39 SHTS

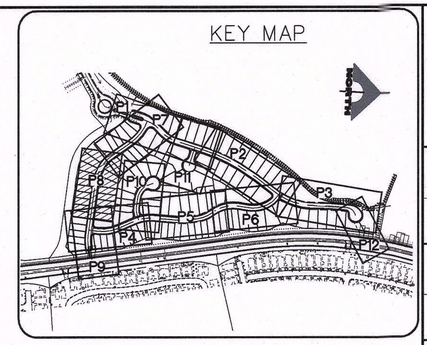


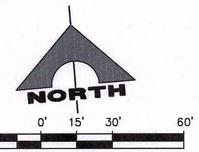

## STARLING SUN AVE
(PRIVATE)

## PLAN AND PROFILE

VERT.: 1" = 3'
HOR. : 1" = 30'




SCALE: 1" = 30'

## CONSTRUCTION NOTES

1. CONSTRUCT CONCRETE SIDEWALK PER SUMMERLIN STD DWG NO. S-72 & S-48.
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3. CONSTRUCT ROLL CURB PER SUMMERLIN STD DWG NO. S-48.
4. CONSTRUCT MEDIAN "A" TYPE PER SUMMERLIN STD DWG NO. S-50.
5. CONSTRUCT "L" CURB PER SUMMERLIN STD DWG NO. S-47.
6. INSTALL GATE – SEE LANDSCAPE.
7. CONSTRUCT 2" AC OVER 4" TYPE II BASE.SEE SOIL REPORT PREPARED BY NOVA GEOTECHNICAL PROJ. #G-18-066 FOR MORE DETAIL.
8. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 1. SEE PLAN FOR "A" & "B" DIMENSION.
9. SAWCUT & MATCH TO EXISTING CURB & SIDEWALK. CONTRACTOR SHALL VERIFY EX. LOCATION & PAVEMENT PRIOR TO CONSTRUCTION.
10. EXISTING CURB TO BE REMOVED
11. CONSTRUCT 10' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "B" SHEET DT3.
12. CONSTRUCT 5' TRANSITION FROM "L" CURB TO ROLL CURB PER DETAIL "C" SHEET DT3.
13. CONSTRUCT SIDEWALK UNDERDRAIN PER USDCCA NO. 236.
14. CONSTRUCT HANDICAP RAMP PER USDCCA NO. 235 CASE 2. SEE PLAN FOR "A" & "B" DIMENSION.
15. CONSTRUCT REMOVABLE WROUGHT IRON FENCE PER DETAIL "D" SHEET DT3.
16. CONSTRUCT BLOCK WALL OPENING PER DETAIL "E" SHEET D3

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
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## NOTE

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AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

## BENCHMARK:

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ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
LVVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL
MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM

L# | CLV DWG#

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY
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GCV ENGINEERS \ SURVEYORS
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T: 702.804.2000
F: 702.804.2299
gcvengineering.com


PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

STARLING SUN AVE
STA. 13+00.00 TO STA. 17+00.00
PLAN AND PROFILE

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:20:35

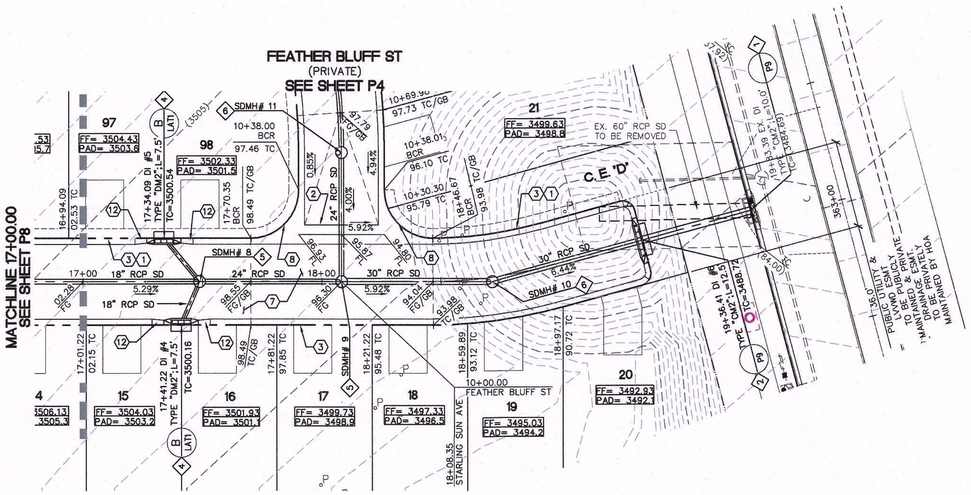
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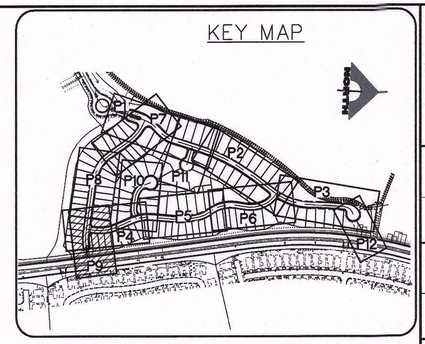
DATE: 04-10-19


ENGINEER: STATE OF NEVADA
HAO A. NGUYEN
No. 19396
PROFESSIONAL
Exp. 12/31/2020


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Quangvinh Nguyen

DRAWING
P8
20 OF 39 SHTS




NORTH

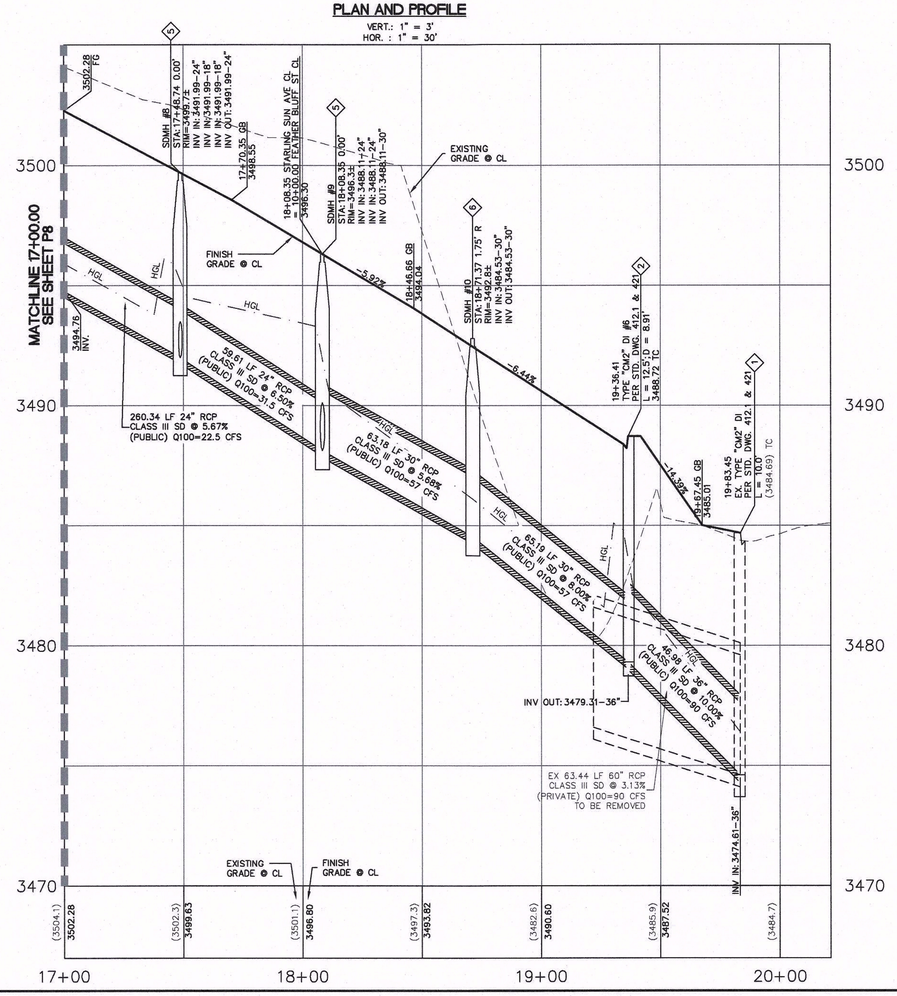
30' 0' 15' 30' 60'

SCALE: 1" = 30'

## STARLING SUN AVE
(PRIVATE)

## PLAN AND PROFILE

VERT.: 1" = 3'
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APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. XXXXXX FIRST APPROVED DATE:
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MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 30 GPM

L# | CLV DWG#

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gcvengineering.com


PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:20:30

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

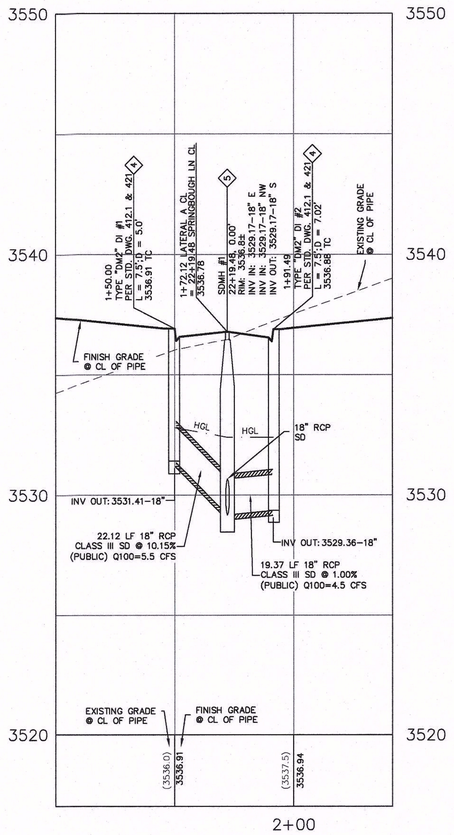
STARLING SUN AVE
STA. 17+00.00 TO STA. 19+36.41
PLAN AND PROFILE

DRAWING
P9
21 OF 39 SHTS

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Quangvinh Nguyen

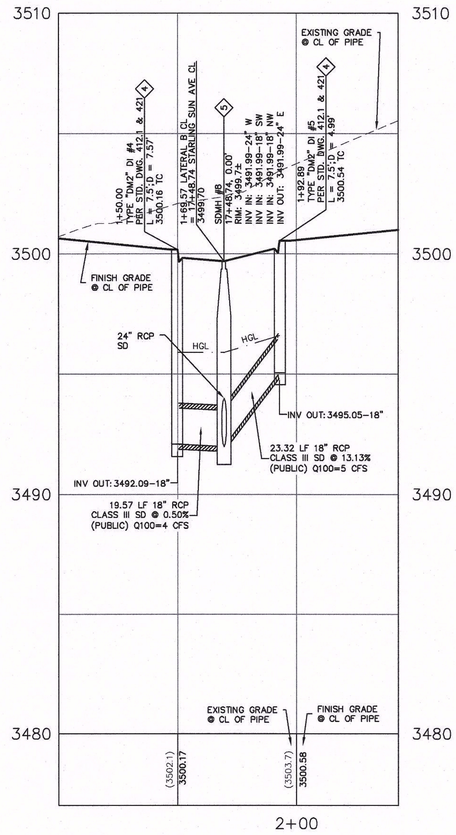
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ENGINEER - STATE OF NEVADA
HAO A. NGUYEN
No. 19398
PROFESSIONAL
DATE: 04-10-19



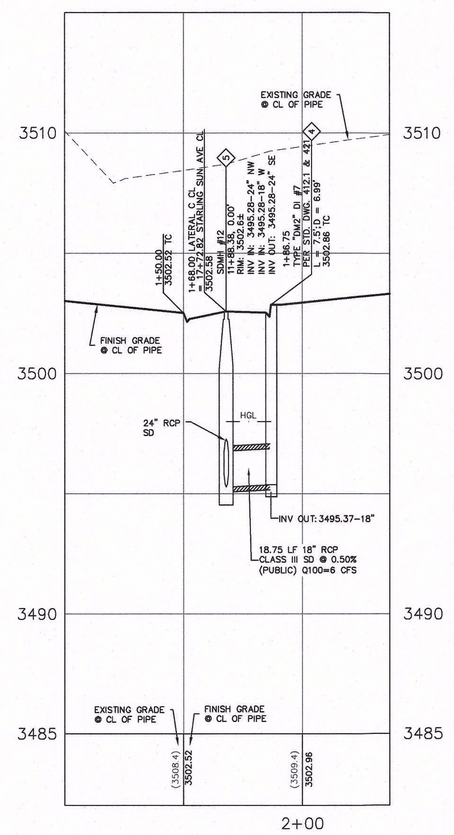

## LATERAL A (A)

VERT.: 1" = 3'
HOR. : 1" = 30'




## LATERAL B (B)

VERT.: 1" = 3'
HOR. : 1" = 30'




## LATERAL C (C)

VERT.: 1" = 3'
HOR. : 1" = 30'

**DEPTH OF COVER DURING CONSTRUCTION**

MAINTAIN MINIMUM TWENTY-FOUR (24) INCH COVER PER UDACS SECTION 2.08.04. GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION.

## STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
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989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

**DROP INLET NOTE**

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE:

CAST IN PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS. CENTER BULB, OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL.)

## NOTE

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**CONTROLLED LOW STRENGTH MATERIAL (CLSM)**

PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS ABOVE A STORM DRAIN OR SEWER WHERE COMPACTION REQUIREMENTS UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CLASS II CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY. ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.22.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. _____ FIRST APPROVED DATE: _____

L# | CLV DWG#


FAST Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig Avoid cutting underground utility lines. It's costly. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929



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gcwengineering.com


HAO A. NGUYEN — STATE OF NEVADA — PROFESSIONAL ENGINEER — No. 19395 — DATE: 04-10-19

| REV | DESCRIPTION | DATE | AGEN APP | DATE | GCW APP |
|---|---|---|---|---|---|

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:19:33

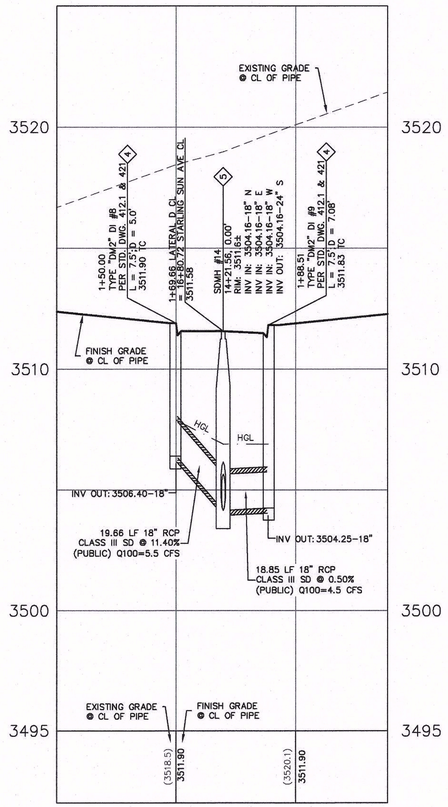
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Quangvinh Nguyen

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

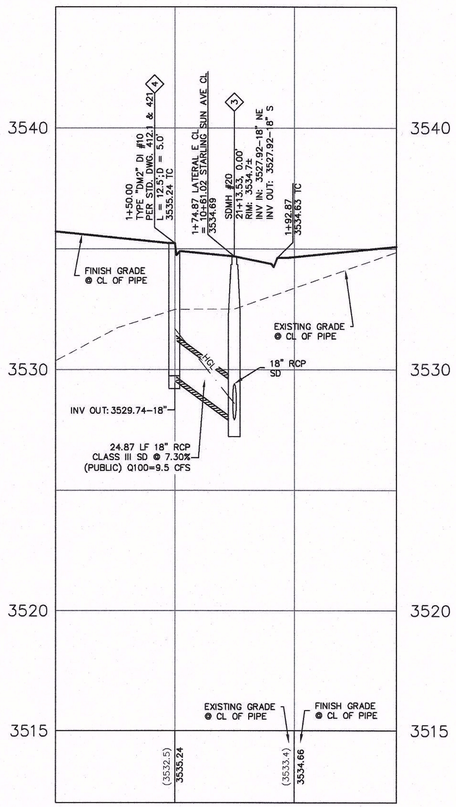
**STORM DRAIN LATERALS 1**

DRAWING
LAT1
25 OF 39 SHTS



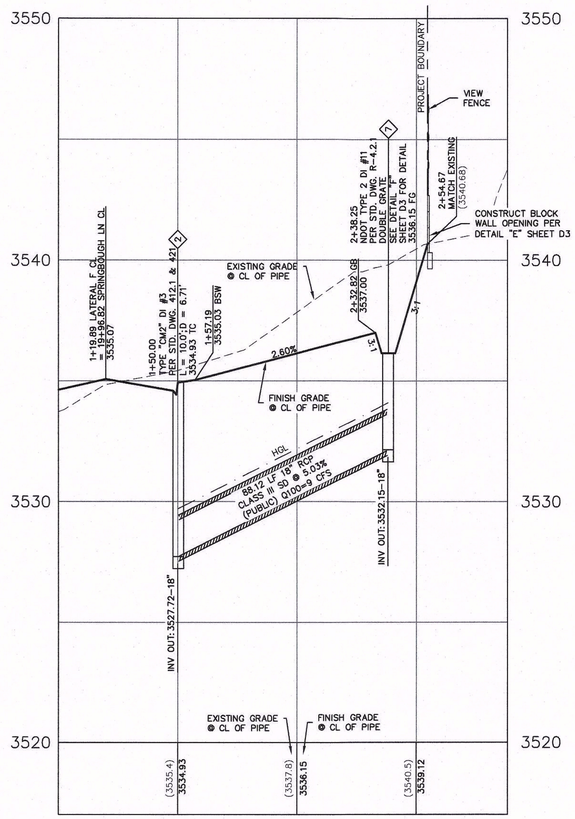

## LATERAL D (D)

VERT.: 1" = 3'
HOR. : 1" = 30'




## LATERAL E (E)

VERT.: 1" = 3'
HOR. : 1" = 30'




## LATERAL F (F)

VERT.: 1" = 3'
HOR. : 1" = 30'

### DEPTH OF COVER DURING CONSTRUCTION

MAINTAIN MINIMUM TWENTY–FOUR (24) INCH COVER PER UDACS SECTION 2.08.04. GRADING MUST BE COMPLETED PRIOR TO WATERLINE INSTALLATION.

### STORM DRAIN CONSTRUCTION NOTES

1. CONNECT TO EXSITING DROP INLET.
2. CONSTRUCT MODIFIED TYPE "CM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
3. CONSTRUCT 48" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
4. CONSTRUCT MODIFIED TYPE "DM2" PER STD DWG 412.1 & 421. SEE PLAN PER SIZE.
5. CONSTRUCT 60" TYPE III STORM DRAIN MANHOLE PER STD. DWG 406.1.
6. CONSTRUCT 60" TYPE I STORM DRAIN MANHOLE PER STD. DWG 403.
7. CONSTRUCT NDOT TYPE 2 DROP INLET – FRAME & GRATE, SEE DETAIL "F" SHEET D3 AND PER STD. DWG 421.

### BASIS OF BEARING:

NORTH 05°14'46" WEST, BEING THE BEARING OF THE WEST LINE OF THE NORTHWEST QUARTER (NW 1/4) OF SECTION 33, TOWNSHIP 20 SOUTH, RANGE 59 EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA
AS SHOWN IN FILE 123, PAGE 36 OF PARCEL MAPS.

### BENCHMARK:

CITY OF LAS VEGAS BENCHMARK NO. D368, U.S.C. & G.S. DISC SET IN ROCK RIDGE 150' SOUTH OF CHARLESTON BLVD & WEST OF DETENTION BASIN.

ELEVATION: 3246.63 (FEET)
989.574 (METERS)

BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD'88).

### DROP INLET NOTE

WHERE 10 FEET PARALLEL SEPARATION IS NOT PRACTICABLE:

CAST IN PLACE MONOLITHIC POUR WITH WATERSTOP BETWEEN SLAB AND WALLS. BASE WALLS AND TOP TO BE CONSTRUCTED WITH WATERSTOPS. CENTER BULB, OR FLAT STRIP (VINYLEX, GREENSTREAK PLASTIC PRODUCTS OR APPROVED EQUAL.)

### NOTE

ALL ONSITE STORM DRAINS AND ASSOCIATED STORM FACILITIES ARE PRIVATELY OWNED AND TO BE PRIVATELY MAINTAINED BY THE HOA.

ALL PRIVATE STREETS ARE P.U.E., PUBLIC DRAINAGE EASEMENT AND PUBLIC SEWER EASEMENTS TO BE PRIVATELY MAINTAINED BY HOA.

### NOTES TO CONTRACTOR

EXISTING UTILITY LOCATIONS SHOWN HEREON ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATION.

### CONTROLLED LOW STRENGTH MATERIAL (CLSM)

PROTECT WATERLINES IN PLACE. WHEREVER A WATERLINE IS ABOVE A STORM DRAIN OR SEWER WHERE COMPACTION REQUIREMENTS UNDER A WATERLINE CANNOT BE MET, BACKFILL TRENCH WITH CLASS II CONTROLLED LOW STRENGTH MATERIAL (CLSM) TO THE SPRINGLINE OF THE WATERLINE. THIS REQUIREMENT IS FOR STRUCTURAL SUPPORT ONLY. ADDITIONAL HEALTH REGULATIONS MAY APPLY PER UDACS 2.22.

### APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES

PROJECT NO. xxxxxx FIRST APPROVED DATE: _____

L# | CLV DWG#

FAST — Call before you UnderGround 1-702-432-5300 FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION

Call before you Dig — Avoid cutting underground utility lines. It's costly. Call 811 OR 1-800-227-2600

AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DO OVERHEAD 1-702-227-2929

ENGINEER – STATE OF NEVADA — HAO A. NGUYEN — Exp. 12/31/2019 — No. 19396 — PROFESSIONAL — DATE: 04-10-19

| REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP | DATE |
|---|---|---|---|---|---|---|

PROJECT NO. 764-A150-001
DESIGN:
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 09:19:26


GCW ENGINEERS \ SURVEYORS
1555 S. RAINBOW BLVD.
LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

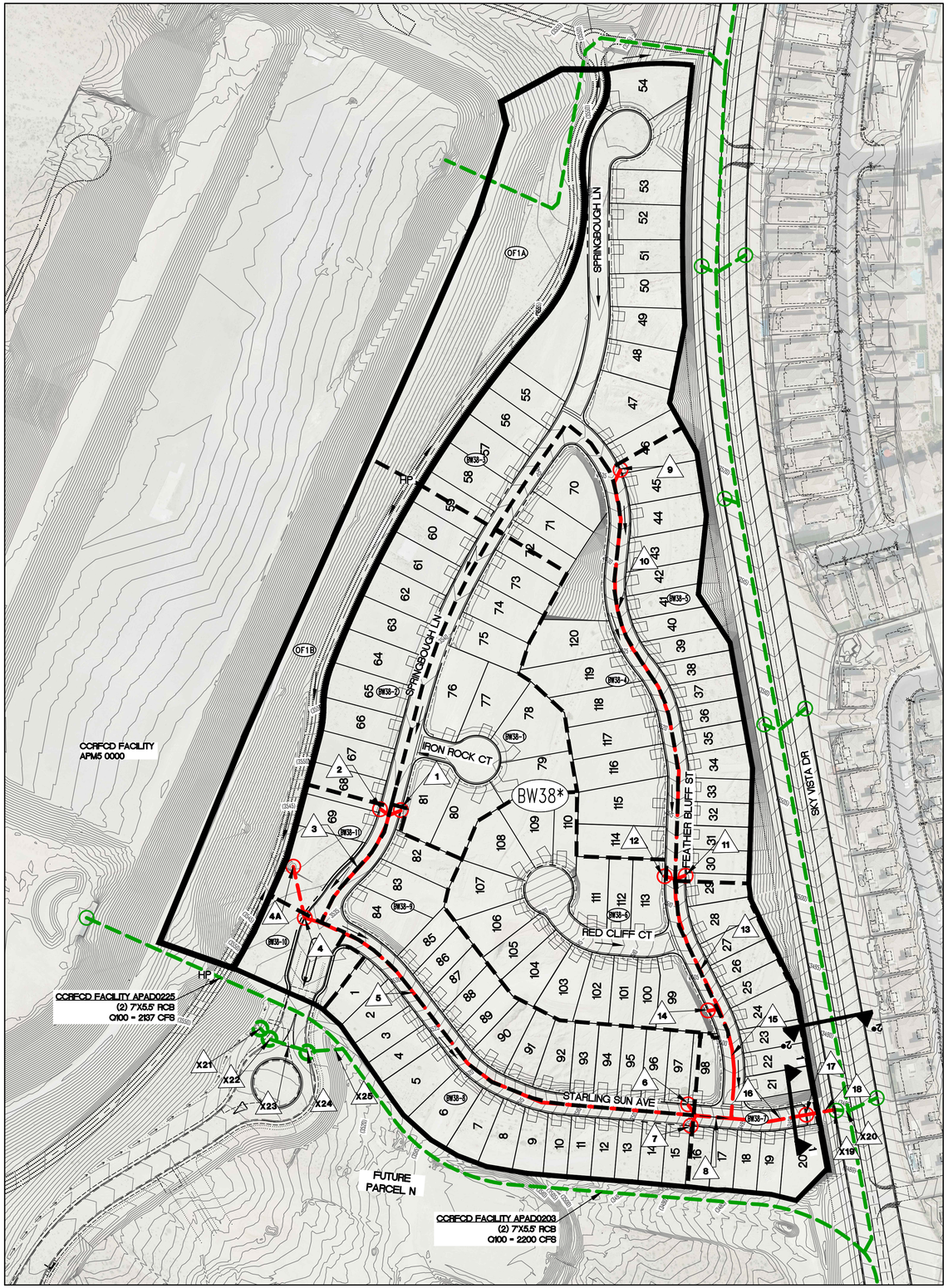

f:\Projects\700\764-a150-001\DWG\production\764-A150-001cLAT.dwg
Quongvinh Nguyen

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

# STORM DRAIN LATERALS 2

DRAWING
LAT2
26 OF 39 SHTS




## LEGEND

- BW39* — SUBBASIN NAME
- BW39-1 — PRORATED SUBBASIN NAME
- SUBBASIN BOUNDARY
- FLOW DIRECTION
- CROSS SECTION
- PRORATED SUBBASIN BOUNDARY
- PROPOSED FACILITY
- EXISTING FACILITY
- 18 — FACILITY ID

NORTH

100 0 100 200

SCALE FEET

**ULTIMATE CONDITIONS PRORATED FLOW SUMMARY**

| Basins | | | |
|---|---|---|---|
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | cfs/acre |
| BW38 | 80 | 22.2 | 3.60 |
| OF1 | 18 | 4.7 | 3.83 |
| **Prorated Basins** | | | |
| Subbasin | $Q_{100}$ (cfs) | Area (acres) | cfs/acre |
| BW38-1 | 8 | 2.2 | 3.60 |
| BW38-2 | 6 | 1.8 | 3.60 |
| BW38-3 | 13 | 3.6 | 3.60 |
| BW38-4 | 9 | 2.6 | 3.60 |
| BW38-5 | 9 | 2.3 | 3.60 |
| BW38-6 | 10 | 2.7 | 3.60 |
| BW38-7 | 8 | 2.1 | 3.60 |
| BW38-8 | 7 | 2.1 | 3.60 |
| BW38-9 | 9 | 2.5 | 3.60 |
| BW38-10 | 2 | 0.5 | 3.60 |
| BW38-11 | 2 | 0.6 | 3.60 |
| **TOTAL** | **83** | **23.0** | **NA** |
| OF1A | 9 | 2.4 | 3.83 |
| OF1B | 9 | 2.3 | 3.83 |
| **TOTAL** | **18** | **4.7** | **NA** |

**100-YEAR STREET FLOW CHARACTERISTICS PROPOSED CONDITIONS**

| Location | Slope (%) | $Q_{100}$ (cfs) | Depth (ft) | Velocity (ft/s) | D*V |
|---|---|---|---|---|---|
| Section 1 Max Slope (Typical Interior Street) | 6.86 | 33.0 | 0.39 | 6.92 | 2.7 |
| Section 1 Min Slope (Typical Interior Street) | 0.50 | 33.0 | 0.57 | 2.97 | 1.7 |
| Section 2* | 4.32 | 36.0 | 0.46 | 6.52 | 3.0 |

*Referenced from the Sky Vista Study

**FLOOD PROTECTION FACILITIES**

| LOCATION | $Q_{100}$ (cfs) | $Q_{100\ Bypass}$ (cfs) | $Q_{Provide}$ | FACILITY |
|---|---|---|---|---|
| 1 | 5.5 | 2.5 | 5.5 | 7.5' TYPE D&I2 DROP INLET |
| 2 | 4.5 | 1.5 | 4.5 | 7.5' TYPE D&I2 DROP INLET |
| 3 | 10 | - | 10 | 18" RCP |
| 4A | 9 | 0 | 9 | NDOT TYPE 2 DOUBLE GRATE INLET |
| 4 | 3.5 | 0 | 3.5 | 10' TYPE CI&2 DROP INLET |
| 5 | 22.5 | - | 22.5 | 24" RCP |
| 6 | 5 | 6.5 | 5 | 7.5' TYPE D&I2 DROP INLET |
| 7 | 4 | 3 | 4 | 7.5' TYPE D&I2 DROP INLET |
| 8 | 31.5 | - | 31.5 | 24" RCP |
| 9 | 9.5 | 3.5 | 9.5 | 12.5' TYPE D&I2 DROP INLET |
| 10 | 9.5 | - | 9.5 | 18" RCP |
| 11 | 5.5 | 7 | 5.5 | 7.5' TYPE D&I2 DROP INLET |
| 12 | 4.5 | 4.5 | 4.5 | 7.5' TYPE D&I2 DROP INLET |
| 13 | 19.5 | - | 19.5 | 24" RCP |
| 14 | 6 | 8.5 | 6 | 7.5' TYPE D&I2 DROP INLET |
| 15 | 25.5 | - | 25.5 | 24" RCP |
| 16 | 57 | - | 57 | 30" RCP |
| 17 | 33 | 0 | 33 | 12.5' TYPE CI&2 DROP INLET |
| 18 | 90 | - | 90 | 36" RCP |
| 119 | 7.4 | - | 7.4 | EX. 10' TYPE CI&2 INLET |
| 120 | 97.4 | - | 105.4 | EX. 60" RCP |
| 121 | 11 | 9 | 11 | EX. SINGLE GRATE NDOT TYPE 2B |
| 122 | 4.5 | 0 | 3.5** | EX. 7.5' TYPE CI&2 DROP INLET |
| 123 | 15.5 | - | 14.5** | EX. 24" RCP |
| 124 | 4.5 | 0 | 3.5** | EX. 5' TYPE CI&2 DROP INLET |
| 125 | 20 | - | 18** | EX. 24" RCP |

** Facility has additional capacity. Reference material and hydraulic calculations have been provided.

* Referenced from the Sky Vista Drive Study

GCW ENGINEERS \ SURVEYORS
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LAS VEGAS, NV 89146
T: 702.804.2000
F: 702.804.2299
gcwengineering.com

PROJECT NO. 764-A150-001
DESIGN: NB
DRAWN:
CHECK:
PLOT DATE: 04-10-19
PLOT TIME: 11:34:19
F:\PROJECTS\700\764-A150-001\DIVISION\FCTL\FIGURES\FIG5.DWG
NELSON BAGGS

REV | DATE | DESCRIPTION | AGEN APP | DATE | GCW APP | DATE

PULTE HOMES

STARLING
SUMMERLIN VILLAGE 24A PARCEL O

PROPOSED CONDITION DRAINAGE MAP

DRAWING
FIG5
1 OF 1 SHTS