

**Drainage Memo
Fountain Valley School**

El Paso County, Colorado

Prepared for:
Fountain Valley School
6155 Fountain Valley School Road
Colorado Springs, Colorado 80911



1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342

PCD File No. PPR1917

Kiowa Project No. 19006

May 23, 2019

	<u>Page</u>
Table of Contents	ii
Engineer’s Statement.....	iii
I. General Location and Description.....	4
II. Previous Reports.....	4
III. Existing Drainage Patterns.....	5
IV. Site Drainage Plan.....	5
V. Floodplain Statement.....	6
VI. Grading and Erosion Control.....	6
VII. Drainage and Bridge Fees.....	7
VIII. Four Step Process	7

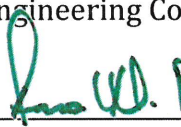
LIST OF FIGURES

- Figure 1 Vicinity Map
- Figure 2 Proposed Improvements

ENGINEER'S STATEMENT:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Kiowa Engineering Corporation, 1604 1/2 South 21st Street, Colorado Springs, Colorado 80904



 COLORADO LICENSED
 ANDREW W. MCCORD
 25057
 CIVIL ENGINEER

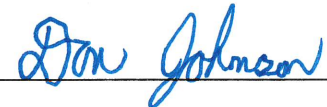
 Andrew W. McCord, P.E.
 Registered Engineer #25057
 For and on Behalf of Kiowa Engineering Corporation

 May 23, 2019
 Date

DEVELOPER'S STATEMENT:

I, the Developer, have read and will comply with all of the requirements specified in this drainage report and plan.

BUSINESS NAME: iiCON Construction Group

BY:  _____
 Date 5/23/2019


PRINT NAME: Don Johnson

ADDRESS: 76 South Sierra Madre Street Suite L
Colorado Springs, Colorado 80903

EL PASO COUNTY:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 & 2, El Paso County Engineering Criteria Manual and Land Development code, as amended.

 Jennifer Irvine, P.E.
 County Engineer/ECM Administrator

Approved
 by Elizabeth Nijkamp
 El Paso County Planning and Community Development
 on behalf of Jennifer Irvine, County Engineer, ECM Administrator

 06/06/2019 6:46:14 AM

Conditions: _____

I. General Location and Description

Fountain Valley School is an existing preparatory school located east of Security in the south central portion of El Paso County, Colorado. The developed portion of the school property is located in the central portion of the property. The campus is currently developed with administrative buildings, dining hall, library, student center, classrooms, dormitories, faculty residences, health center, gymnasium, athletic field and track, tennis courts, maintenance buildings, barns, stables, equestrian arenas, and storage sheds. Numerous driveways and parking areas provide access to the main campus area. Hay fields comprise the area to the east and south of the campus. The remainder of the property to the west is undeveloped.

The Fountain Valley School property encompasses approximately 989.4 acres and is roughly bounded by Grinnell Street to the west, Bradley Road to the north, Goldfield Drive to the east, and Fontaine Boulevard to the south. The campus area of the site is located in Section 18, Township 15 South, Range 65 West of the 6th P.M. A vicinity map showing the location of the site is presented on Figure 1, which can be found at the end of this memo.

This memo is presented as part of a Minor Site Development Plan and addresses improvements to the Fountain Valley School property which consists of the construction of two new faculty residences, with footprints of approximately 2600 square feet, just north of the main campus area. Construction of these new faculty residences will have no significant impact on the overall drainage of the site. Construction of the new faculty residences will disturb approximately 0.94 acres of an area that generally slopes from the north to the south at a slope of approximately 7.5%%.

II. Previous Reports

- 1) *Master Development Drainage Plan*, prepared by Kiowa Engineering Corp., dated August 19, 2010.
- 2) *Drainage Letter, Fountain Valley School Maintenance Facility*, prepared by Kiowa Engineering Corp., dated May 18, 2017
- 3) *Drainage Letter and Erosion Control Plan for Fountain Valley School Strategic Development Plan*, prepared by URS, dated July 31, 2000.
- 4) *Drainage Letter and Erosion Control Plan for Fountain Valley School Dormitory Expansion*, prepared by Kiowa Engineering Corp., filed October 29, 1998.
- 5) *Big Johnson Reservoir/Crews Gulch Drainage Basin Planning Study*, prepared by Kiowa Engineering Corporation, dated June 1991.
- 6) *Procedures for Determining Peak Flows in Colorado*, prepared by Soil Conservation Service, USDA, dated March 1980.
- 7) *El Paso County Drainage Criteria Manual, Volumes 1 and 2*.
- 8) *El Paso County, Engineering Criteria Manual*, dated December 12, 2014 and revised July 29, 2015.
- 9) *Soil Survey of El Paso County Area, Colorado*, prepared by United States Department of Agriculture Soil Conservation Service, dated June 1981.

The *Master Development Drainage Plan* (MDDP, reference 1) was prepared as part of a Special Use and Site Development Plan, and to identify stormwater management to satisfy existing and future needs within the Fountain Valley School property. Drainage and bridge fees were established in the *Big Johnson Reservoir/Crews Gulch Drainage Basin Planning Study* (DBPS, reference 5). Fountain Valley School is located within Reach 4 per the DBPS. The DBPS assumed that Fountain Valley School peak discharge rates are to be limited to historic rates and that detention may be required with any new development at Fountain Valley School. The MDDP indicates that the increase in peak discharges based upon the proposed Master Plan would increase by 5.4% in the 100-year storm. This increase can be considered insignificant especially in light of the site conditions at Fountain Valley School which limit the amount of runoff that leaves the site.

III. Existing Drainage Patterns

According to the DBPS, the new faculty residences are located in sub-basin 36, which sheet flows generally from the northwest to the southeast, across fields and undeveloped ground, into a system of irrigation ditches running through the site. Minimal runoff generated from the development site ultimately discharges into Crews Gulch and Carp Lake south of the school property. From Carp Lake, runoff drains to the south under Fontaine Boulevard to Widefield Park, to the southwest into Crews Gulch, and ultimately into Fountain Creek.

The Fountain Valley School of Colorado campus is just under 1,000 acres in size. The core campus area is located roughly in the center of the site and is at least a quarter mile from any boundary. The remainder of the site is either native ground (generally north and west) or irrigated hay fields (generally south and east). The site is irrigated with water from the FMIC ditch with a private irrigation ditch system that is managed by the school with a full-time groundskeeper. The private irrigation system is contained entirely within the school's property and is over 19,000 feet in length. The irrigation ditches are designed to flood irrigate the campus. There are almost 175 acres of hay fields on the site.

Storm runoff from the core campus area flows to the irrigation ditch system either by existing stormsewer systems or sheet flow. The irrigation ditches capture the runoff. Should the runoff overwhelm the irrigation ditches either due to the volume of runoff or the fact that the ditches are currently irrigating, the runoff is then sheet flowed across the many hay fields on the site as the system is designed to flood irrigate these fields. The irrigation ditches and hay fields provide detention and water quality for the site. This routing, through relatively flat ditches, slows the runoff and increases the time of concentration which results in much lower peak flows reaching Carp Lake.

IV. Site Drainage Plan

As stated previously, the Fountain Valley School site in its existing condition provides detention and water quality for the site. Based upon our knowledge of the site and its operation along with inspection, the site produces very little runoff compared to historical

conditions. The entire Fountain Valley School property is well vegetated in general and portions of the site are irrigated with a private irrigation ditch system. This ditch system allows for the flood irrigation of the many hay fields on site. There are no visible locations where runoff from the site is concentrated.

Based upon a full spectrum analysis of the currently developed portion of the site, 2.35 acre-feet of total detention storage is required. With the development of the new faculty residences, an additional 0.05 acre-feet (see Figure 3) is required. There are over 6,000 lineal feet of private irrigation ditches on the property that have a storage capacity of 1.11 acre-feet. The hay fields will provide for the detention and water quality for the site. The excess 1.29 acre-feet will be handled by the fields. 1.29 acre-feet equates to approximately 0.29-inches of depth over the tributary hay fields. Using a typical curve number of 58 for a meadow with continuous grass, protected from grazing and generally mowed for hay with B hydrologic soil, and according to the *Procedures for Determining Peak Flows in Colorado*, there would be no runoff generated from the fields for 0.29 inches.

There are no proposed private or public storm sewer facilities associated with the Minor Site Development Plan for Fountain Valley School. The proposed improvements for the site are shown on Figure 2 at the end of this report and will not adversely affect any existing downstream storm sewer facilities or adjacent properties. Proposed improvements are also in conformance with all previously approved drainage studies and reports.

V. Flood Plain Statement

According to the Federal Emergency Management Agency (FEMA), the faculty residence site does not lie within a designated floodplain. The Floodplain Insurance Rate Map (FIRM) 08041C0952 G, dated December 7, 2018 was reviewed to determine any potential floodplain delineation.

VI. Grading and Erosion Control

Earth disturbing activities will result from the construction of the proposed faculty residences and associated drives. It is the developer's responsibility to monitor the condition of the temporary erosion control features. Should any of the erosion control facilities come into disrepair prior to the establishment of the native or natural erosion control measures, the developer is responsible for the maintenance and any associated costs. The developer is also responsible for the clean-up of offsite areas affected by any excessive erosion that may leave the site. All erosion control measures shall be installed and maintained in accordance with the *El Paso County Drainage Criteria Manuals*. Final grading and erosion control plans will be provided within the design plans to be prepared for this project.

The primary erosion control measures to be utilized in this project will include seeding and mulching of all the disturbed areas with the native seed mix. All areas disturbed by

construction shall be seeded and mulched within 21 days after the rough grading has occurred. Cut and fill slopes will be reseeded and the slopes equal to or greater than three-to-one will be protected with erosion control fabric. Silt fences will be placed along the site at the bottom of the re-vegetated and rough graded slopes.

VII. Drainage and Bridge Fees

According to the DBPS, the Fountain Valley School was not included in establishing the drainage and bridge fees for the Big Johnson / Crews Gulch Basin. As the site is not being platted, no drainage or bridge fees are due with the Fountain Valley School Minor Site Development Plan.

VIII. Four Step Process

The site will be developed to minimize wherever possible the rate of developed runoff that will leave the site and to provide water quality management for the runoff produced by the site as proposed on the Minor Site Development Plan. The following steps should be considered when the storm water collection and storage facilities are designed:

Step 1: Employ Runoff Reduction Practices

Gravel has been used as an alternative to concrete or asphalt for the drive areas of the site. Runoff is reduced when gravel is used compared to a concrete or asphalt surfaces. Additionally, the gravel will be able to absorb leakage that might occur from stored vehicles and reduce the amount of greases and oils that could be carried off by runoff.

Step 2: Stabilize Drainageways

No major drainageways cross through the faculty residence site. Runoff from the site will ultimately be collected by existing stabilized irrigation ditches on the Fountain Valley School Property.

Step 3: Implement BMP's That Provide a Water Quality Capture Volume with Slow Release

The minimal increase in impervious area for the overall site and increase in runoff from the proposed improvements will be handled with the existing private irrigation ditch system and hay fields. The irrigation ditches will capture and slow down runoff allowing sediment to settle out and storage to occur. The hay fields effectively act as a grass buffer and provide water quality and flood storage through percolation.

Step 4: Implement Site Specific and Other Source Control BMP's

The school will provide proper spill prevention, containment and control for any potentially hazardous wastes associated with the faculty residence site. During construction source control will be provided with the proper installation of erosion control BMPs to limit erosion and transport of sediment. Areas disturbed by construction will be seeded and mulched. Cut and fill slopes will be reseeded, and the slopes equal to or greater than three-to-one will be protected with erosion control fabric. Silt fences will be placed at the bottom of re-vegetated and rough graded slopes.

Figures

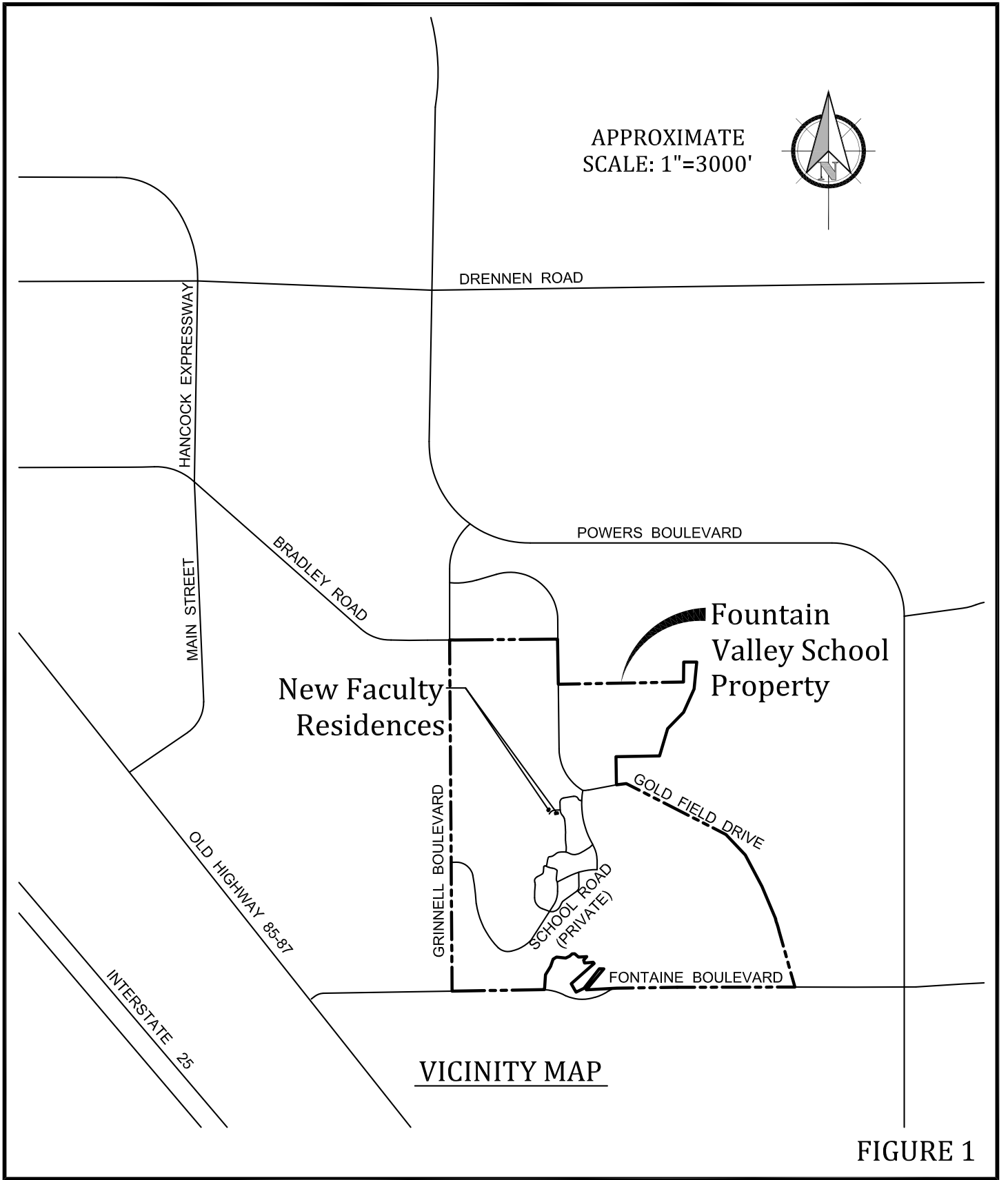


FIGURE 1

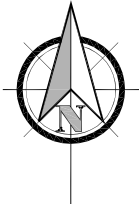
Figures 1-3.dwg/Mar. 28, 2019

Fountain Valley School of Colorado
Minor Site Development Plan

6155 Fountain Valley School Road, Colorado Springs, Colorado 80911

Celebrating 30 years
Kiowa
Engineering Corporation

1604 South 21st Street
Colorado Springs, Colorado 80904
(719) 630-7342



SCALE: 1"=60'

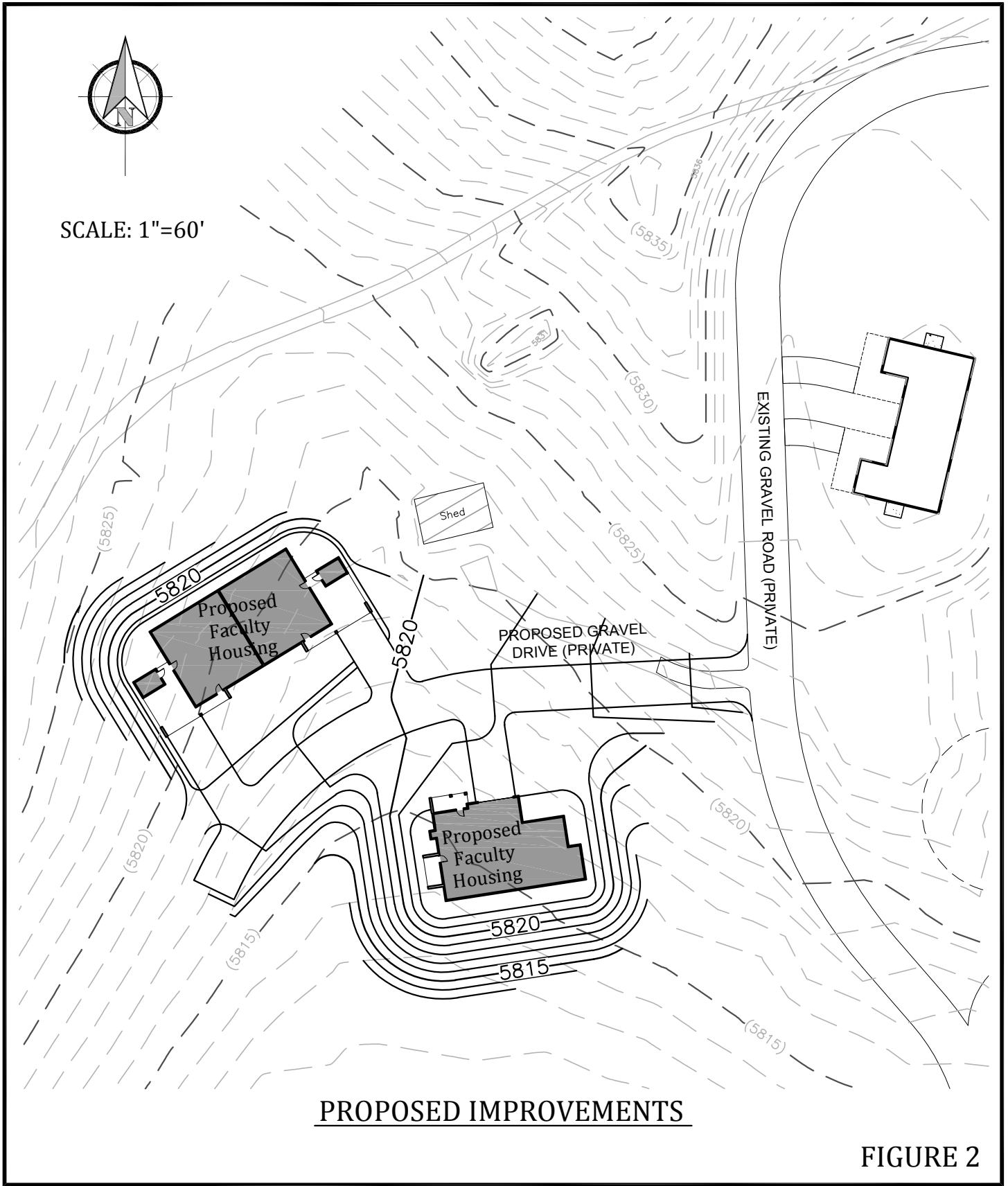


FIGURE 2

Figures 1-3.dwg/May 02, 2019

Fountain Valley School of Colorado Minor Site Development Plan

6155 Fountain Valley School Road, Colorado Springs, Colorado 80911

Celebrating 39 years
Kiowa
Engineering Corporation

1604 South 21st Street
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