CE 3354 Engineering Hydrology
Exercise Set 2

Exercises

Figure **??** is a map of Harden Branch Creek area in Concho County, Texas. The **Assessment Point** on the map, conicides with the red circle below on Figure **??**, which is centered on the bridge on US 87 just west of Eden Texas.[1]

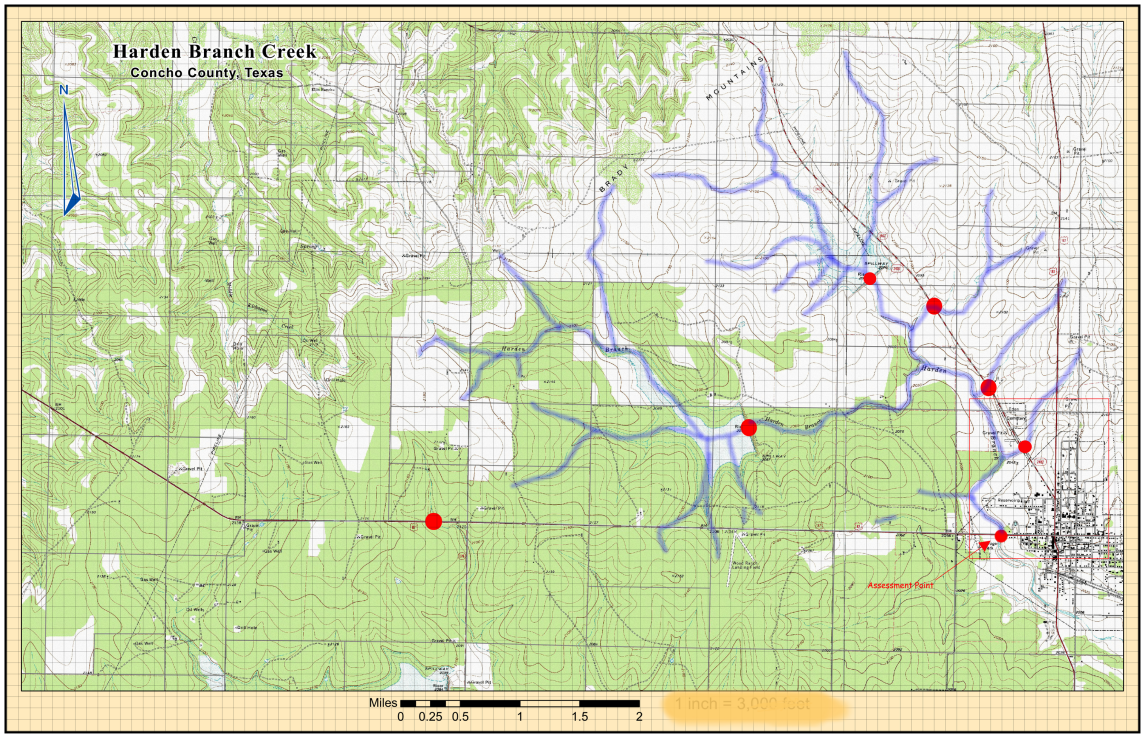

Figure 1: Texas Training Watershed Map (annotated)

[1]This watershed is the subject of the semester design project, PR-1.

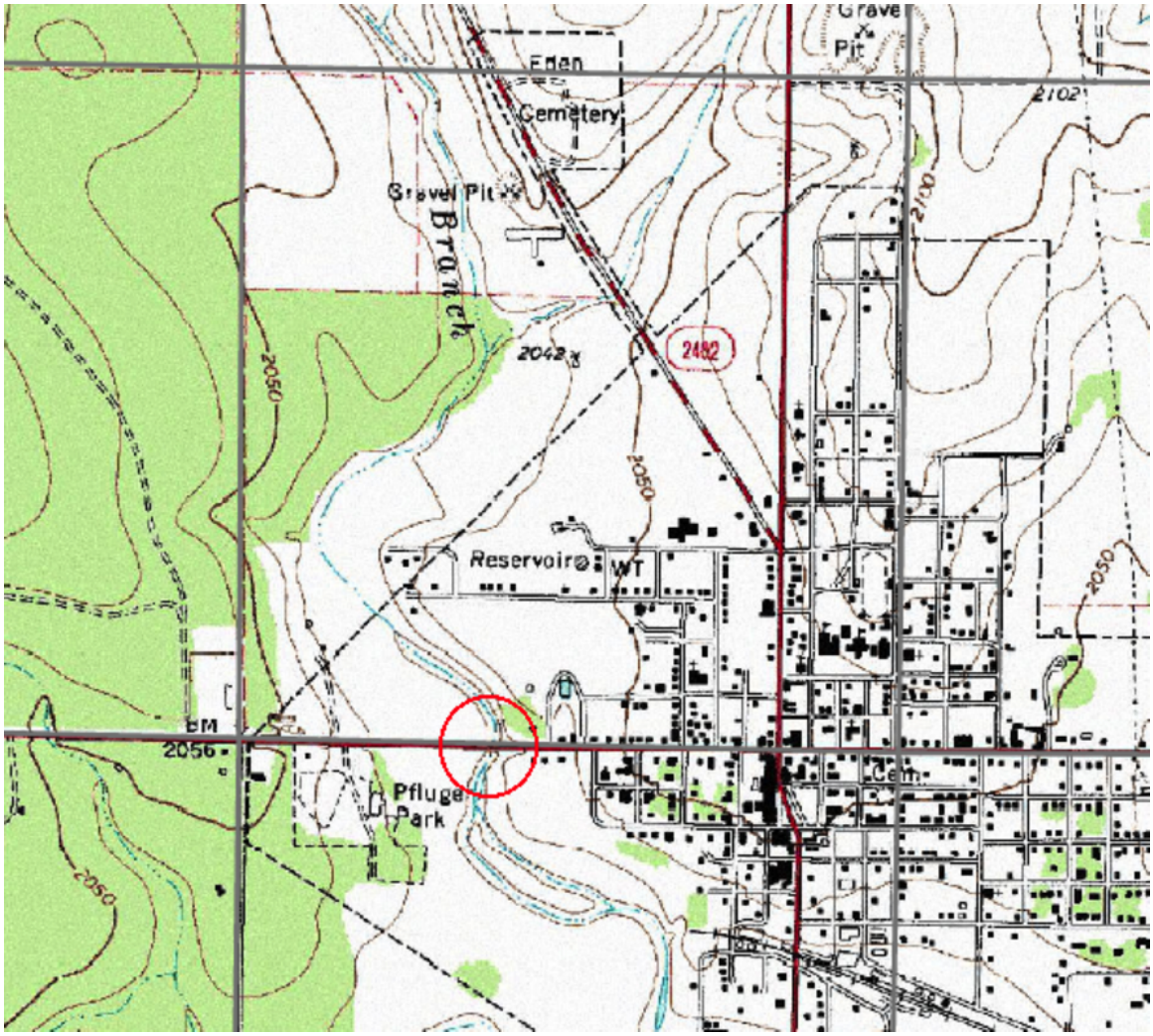

Figure 2: Close-up of map West of Eden, Texas

1. Using a GIS (i.e. QGIS) load an OpenStreetMap layer and locate the “Assessment Point” in the GIS. ... For a by-hand approach this is kind of meaningless, but a ”free” approach is to find the location on Google Earth, then convert to UT¡ coordinates if later on going to employ a GIS.

   Figure **??** is a screen capture of using Google Earth to capture Lat-Lon location coordinates.

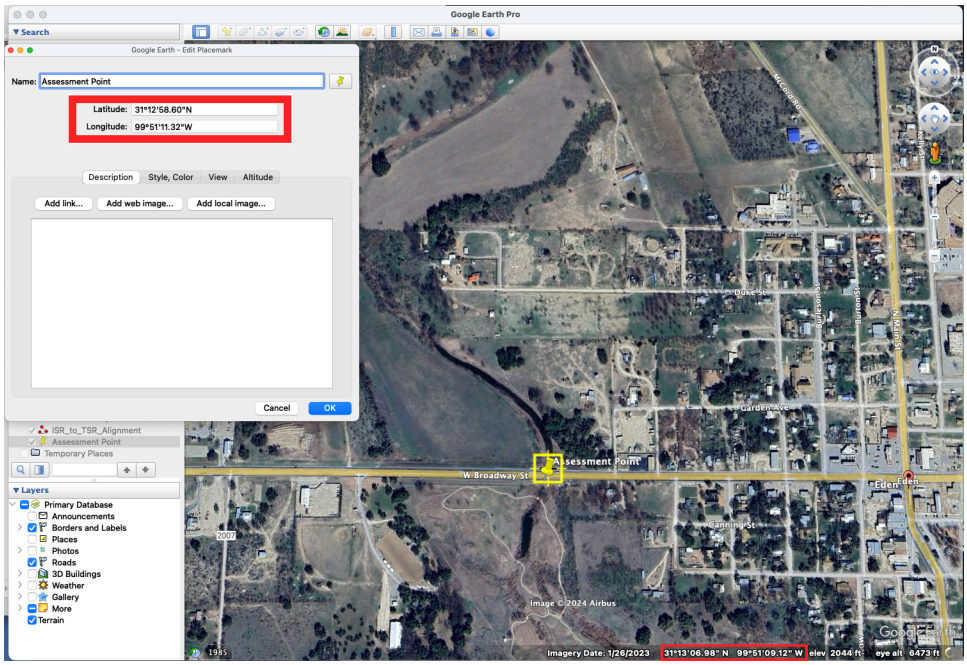

Figure 3: Assessment point coordinates (in DDDMMSS.SS)

Figure **??** is a screen capture showing conversion from DMS coordinates into UTM (Zone 14 Texas).

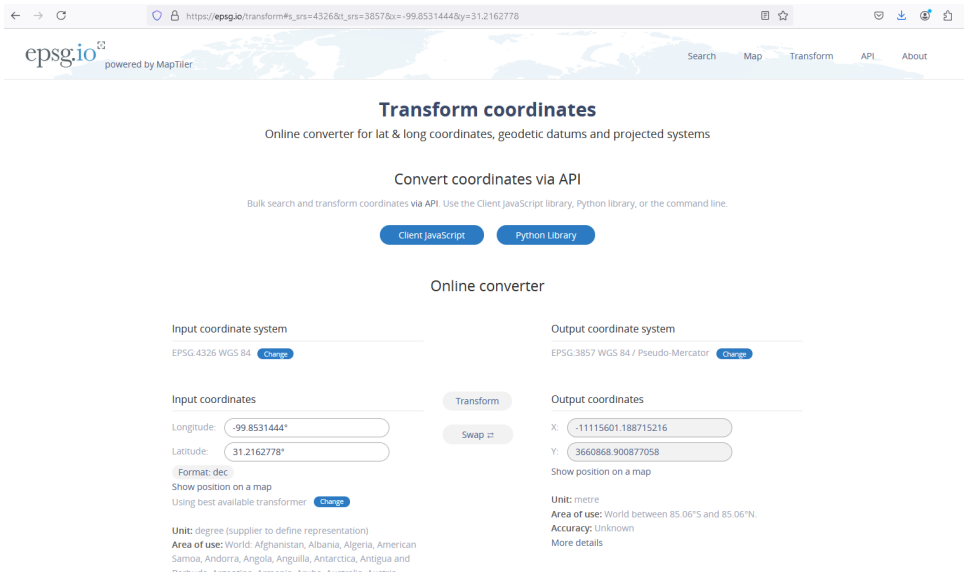

Figure 4: Assessment point coordinate transformation for GIS use (in UTM Zone 14) (Read the USAF excerpt on topographic maps to learn about UTM coordinate system)

2. Draw the boundary of the entire watershed area (i.e delineate the watershed)

   By-Hand Approach

   Figure **??** shows the result of watershed delineation using a combination of a grid and topographic interpretation. The entire system is divided into three subcatchments based on the presence of the two regulating structures (earth berms with riser pipe outlets) - the intial GIS analysis will not be able to select out the two regulating structures automatically, and the analyst has to intervene - hence a crude by-hand approach is allways useful.

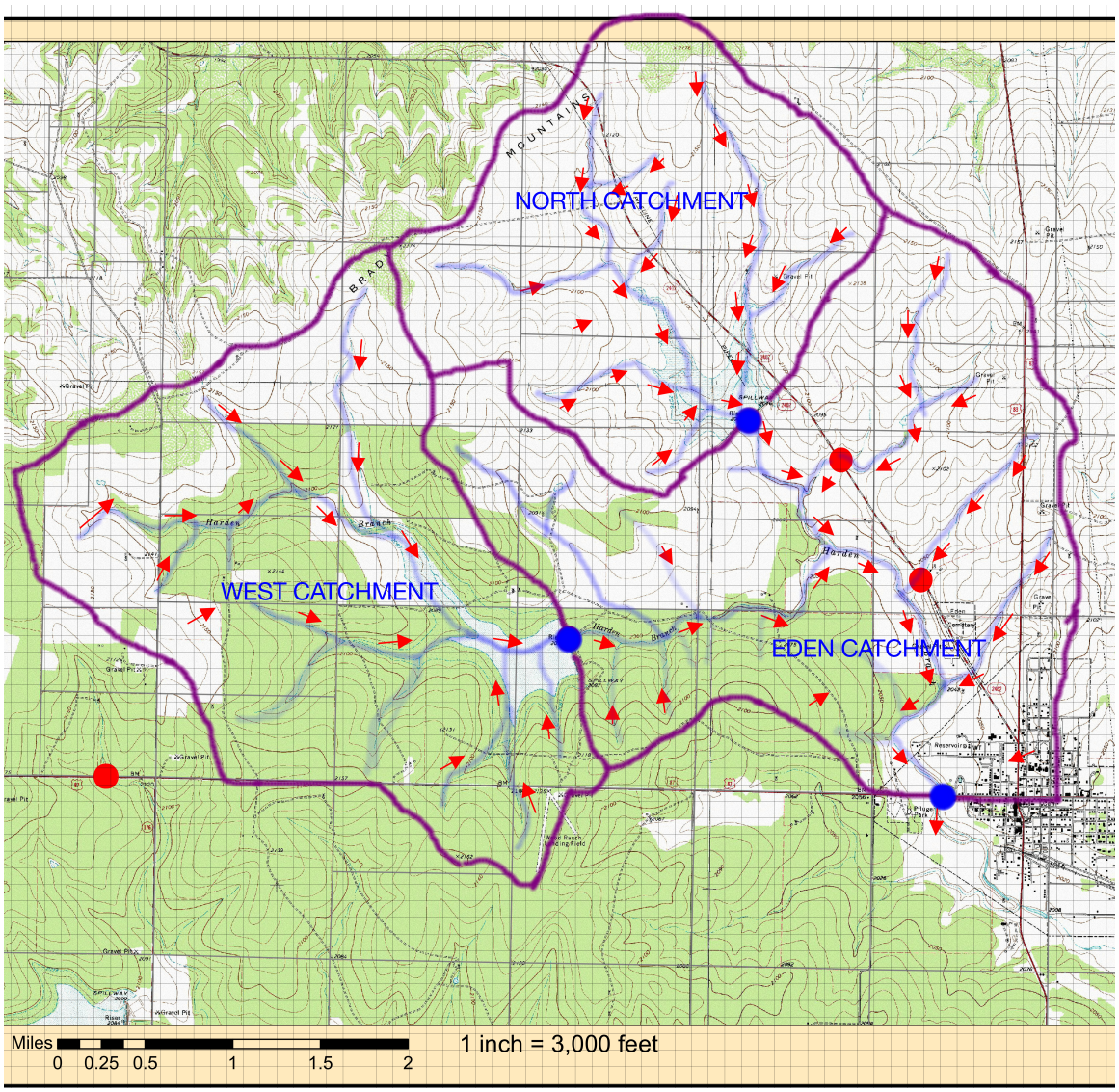

Figure 5: Study Area – with grid overlay, outlet (Blue Dot), and subcatchments identified. Various flow paths are indicted in transparent blue. Red arrows indicate downslope directions.

GIS Analysis

sdlkdajdg;lkjgsa;lkjgaskldj a;gk;sdljg;jasg;sjg

3. Determine the drainage area of the watershed in square miles.

   By-Hand Approach The entire watershed area can be computed by manual or numerical planimetry, or counting the squares contained within the watershed. Each square on the figure represents an area of approximately 0.01 mi^2.

   Figure **??** is a scanned image of the watershed with various square counts. The estimated area is 16.93 square miles. This is the total drainage area including all catchments. The sub-catchment area determinations portions are not shown on this exhibit.

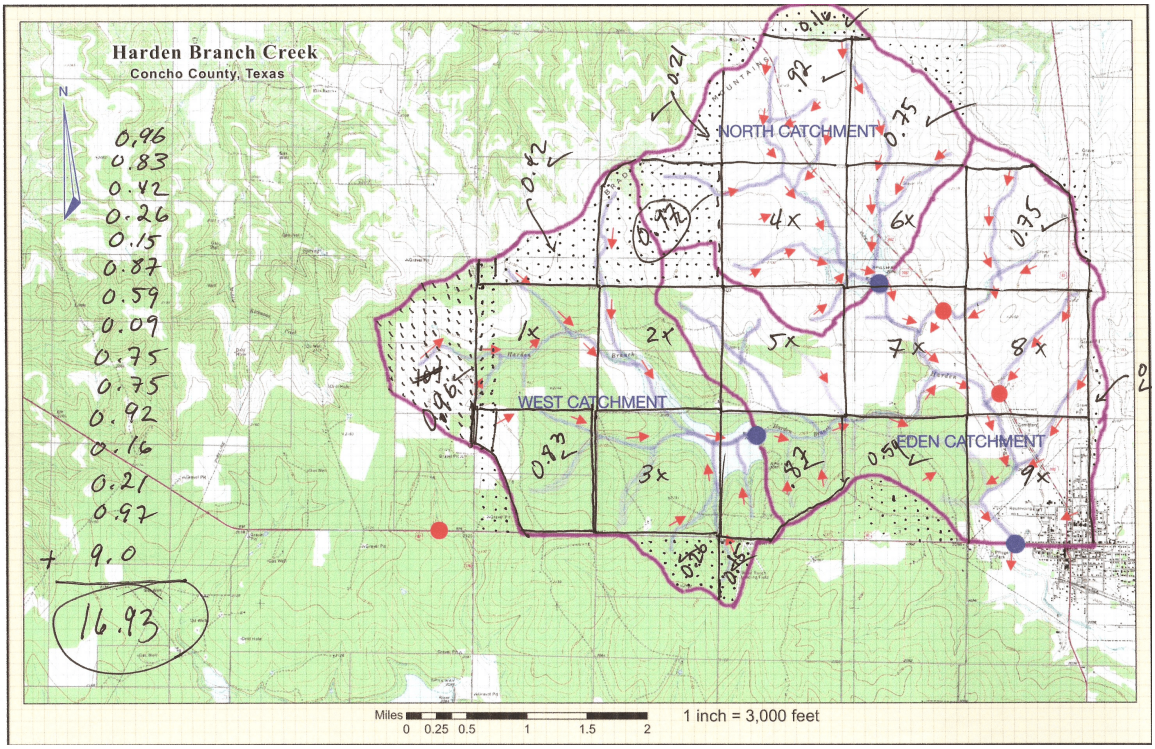

Figure 6: Study Area – with grid overlay, outlet (Blue Dot), and subcatchments identified. Various flow paths are indicted in transparent blue. 1,693 Squares counted to estimate watershed area.

GIS Analysis

sdlkdajdg;lkjgsa;lkjgaskldj a;gk;sdljg;jasg;sjg

4. Find the coordinates of the two outlet risers for the two SCS impoundments in the area; GoogleEarth might be helpful; a proper USGS Topographic map would also be helpful. You will need these coordinates for future homework/project.

   GIS Analysis This step can be accomplished using Google Earth (or similar tool) as illustrated

   For the West reservoir the location is found in Google Earth as shown in Figure **??**. The elevations are taken from the USGS 7.5 minute Topographic Map (the supplied basemap) and confirmed in Google Earth - the Google Earth are within a foot or two of the paper map values.

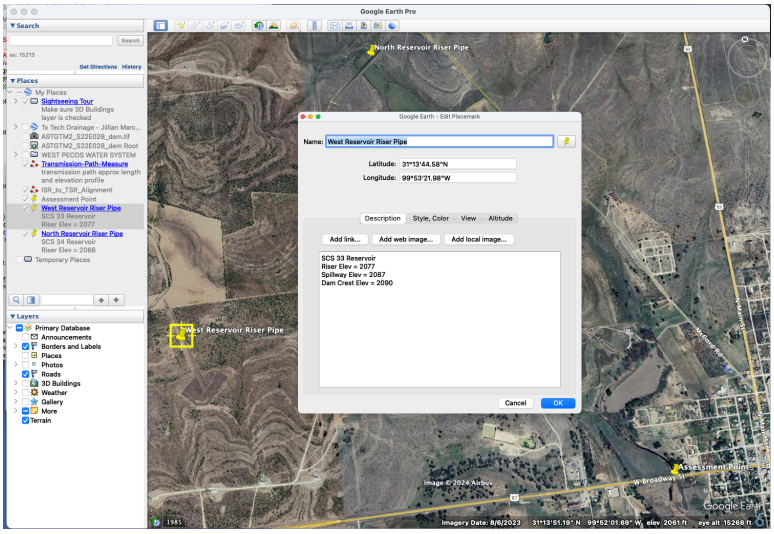

Figure 7: West Reservoir riser pipe location, elevations from USGS 7.5 minute basemap, verfied on Google Earth as "close enough"

Then a coordinate transformation as shown in Figure **??**

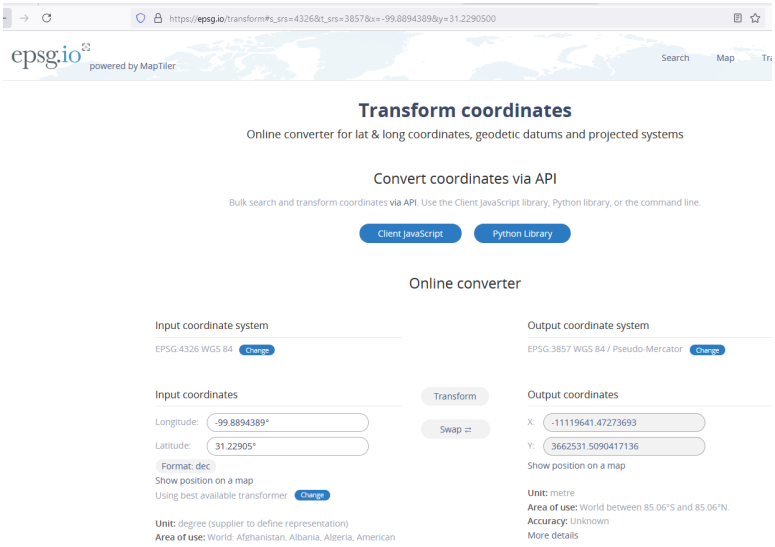

Figure 8: West Reservoir DMS to UTM conversion

For the North reservoir the location is found in Google Earth as shown in Figure **??**. The elevations are taken from the USGS 7.5 minute Topographic Map (the supplied basemap) and confirmed in Google Earth - the Google Earth are within a foot or two of the paper map values.

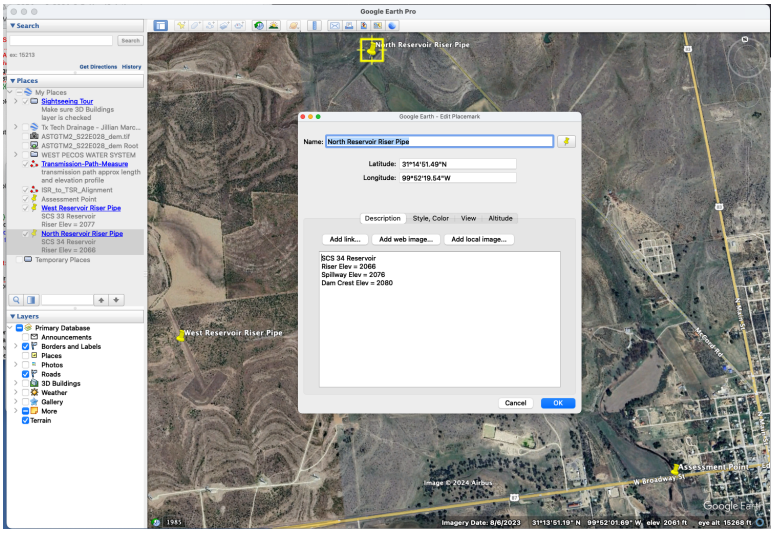

Figure 9: North Reservoir riser pipe location, elevations from USGS 7.5 minute basemap, verfied on Google Earth as "close enough"

Then a coordinate transformation as shown in Figure **??**

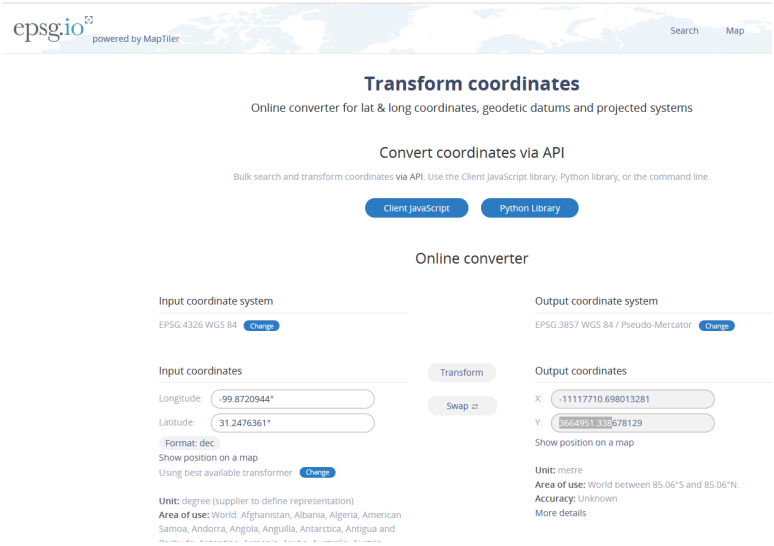

Figure 10: North Reservoir DMS to UTM conversion

Because much of the work is likely to be conducted using a GIS, Table **??** summarizes the information so far.

Table 1: Location Summary

Location	Latitude (Northing Meters)	Longitude (Easting Meters)	Elevation (feet)
Assessment Point	3660868.901	-11115601.188	2024
West Riser Pipe	3662531.509	-11119641.472	2077
North Riser Pipe	3664951.338	-11117710.698	2066

5. Determine the channel lengths from the watershed boundary to the SCS impoundments outlets.

By Hand Approach

Figure **??** is a scanned image of the watershed with two possible main channel paths identified. The longer path would be selected in most instances. For later work in the project we will need lengths of intermediate channel parts to build the hydrologic model.

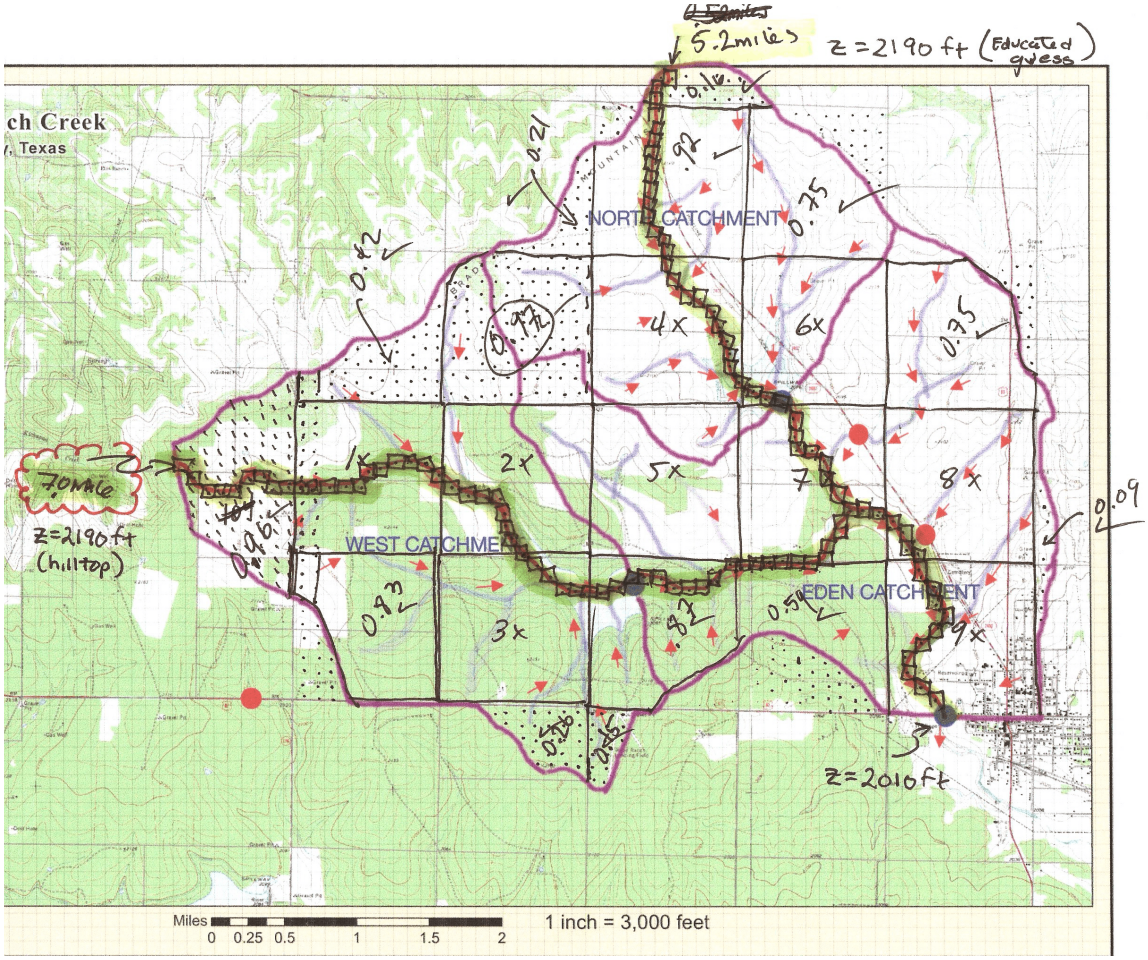

Figure 11: Study Area – with grid overlay, outlet (Blue Dot), and subcatchments identified. Various flow paths are indicted in transparent blue. 1,693 Squares counted to estimate watershed area. Two long channel paths identified. Main channel is the longer path (assuming flow passes through the dam).

GIS Analysis

6. Determine the channel lengths from the SCS impoundment outlets to the junction where the two separate streams combine into the single stream (Hardin Branch).

   By Hand Approach Figure **??** is a scanned image of the watershed with two possible main channel paths identified. Measure the portion from the riser(s) to the junction, and report the result(s). In this case the distance from the West riser pipe to the junction is about 19 cells, each cell has a diagonal of about 0.14 miles, so the distance is roughly 2.66 miles along the creek path.

   For the North riser, the distance to the junction is about 9 cells, each cell has a diagonal of about 0.14 miles, so the distance is roughly 1.26 miles along the creek path.

   GIS Analysis

7. Determine the channel length from the junction to the Bridge/culvert on US 87.

   By Hand Approach Figure **??** is a scanned image of the watershed with two possible main channel paths identified. Measure the portion from the junction to the outlet, and report the result. In this case about 18 cells from junction to outlet, each cell has a diagonal of about 0.14 miles, so the distance is roughly 2.52 miles along the creek path.

   GIS Analysis

8. Determine elevation profiles along the two longest paths.

   By Hand Approach

   GIS Analysis

Save the GIS project so you can use the tool(s) for additional terrain analysis. If you do the exercise by-hand, save your original work; you will need it later on.