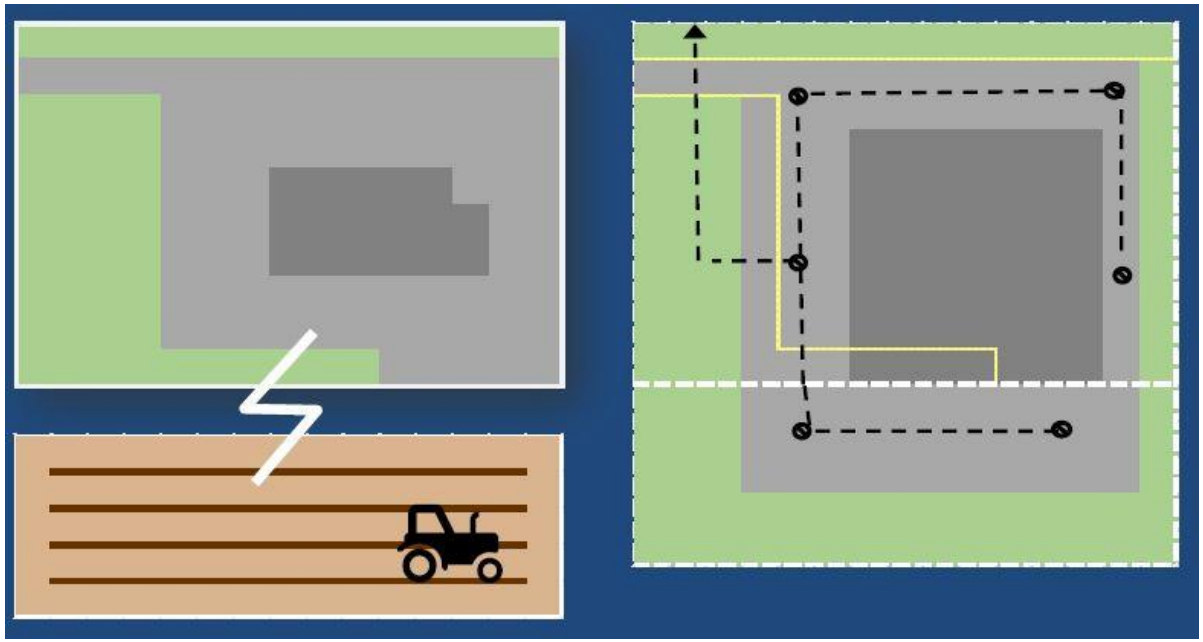
NPDES PROCESS ON A REAL WORLD REDEVELOPMENT SITE

ROBERT W. BAILEY, PE, LEED AP BD+C

INTRODUCTION

OHIO EPA'S NPDES PERMIT

REDEVELOPMENT



REDEVELOPMENT

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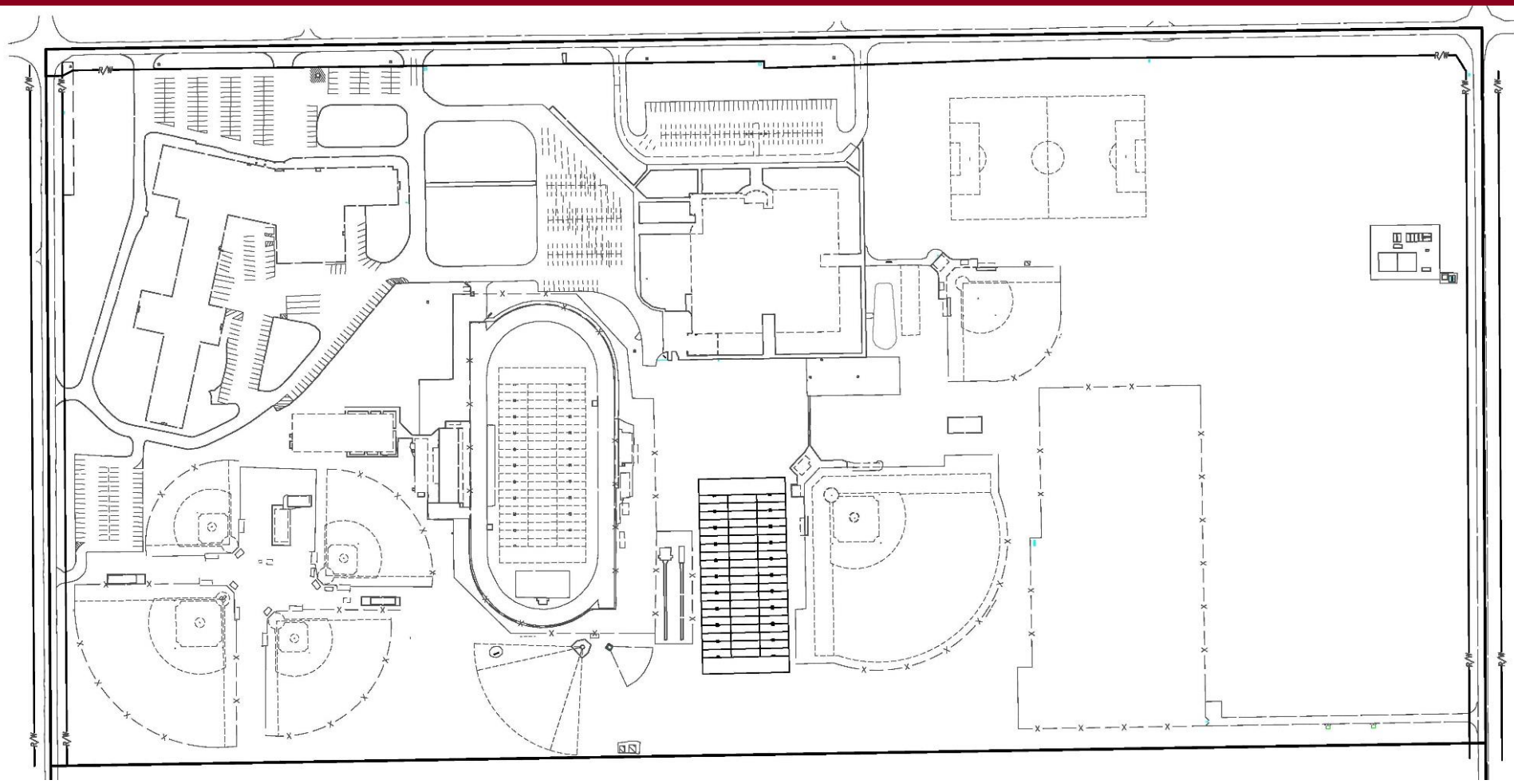
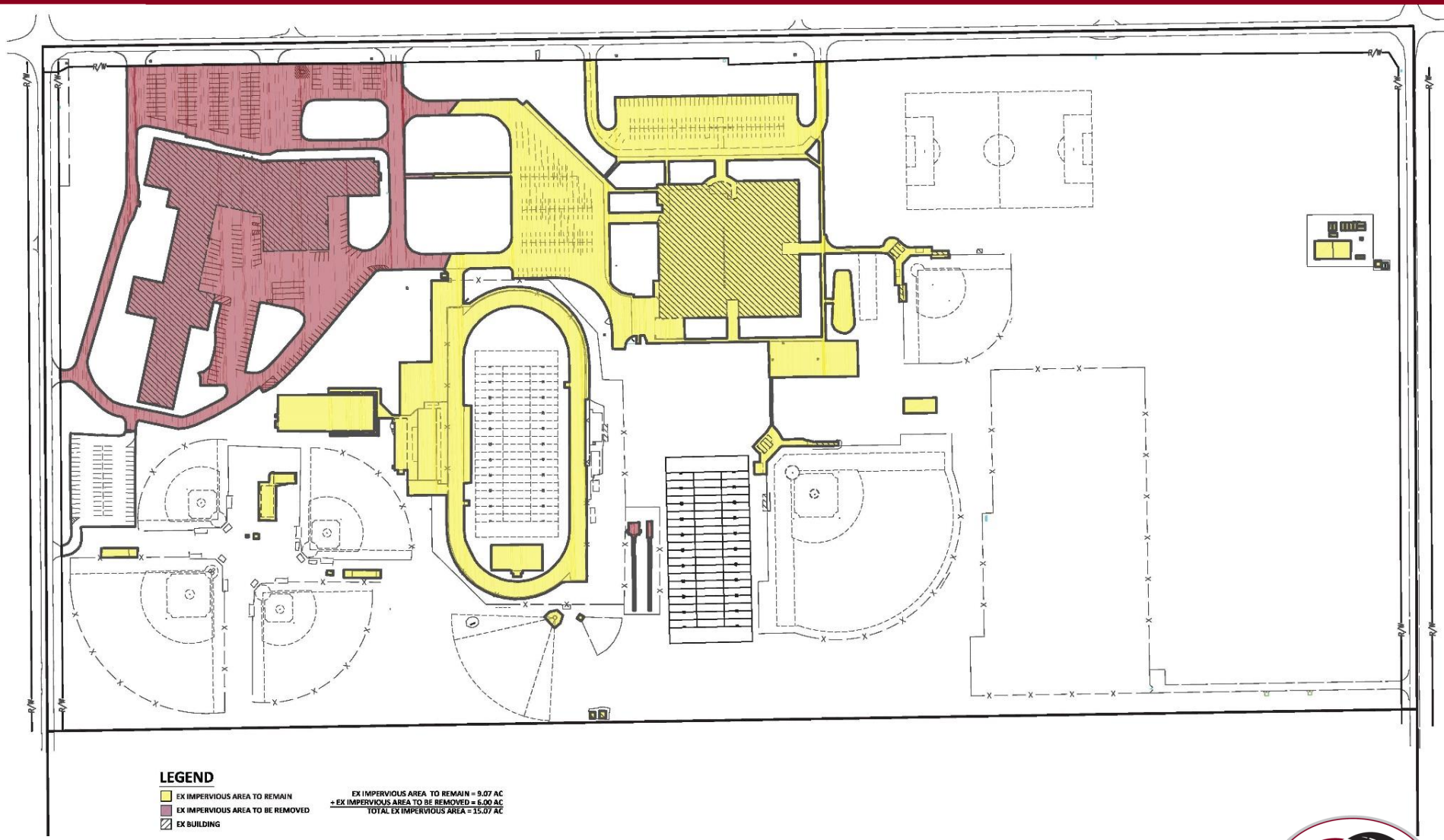


76.06 AC SITE

REDEVELOPMENT



EXISTING IMPERVIOUS AREA = 15.07 AC

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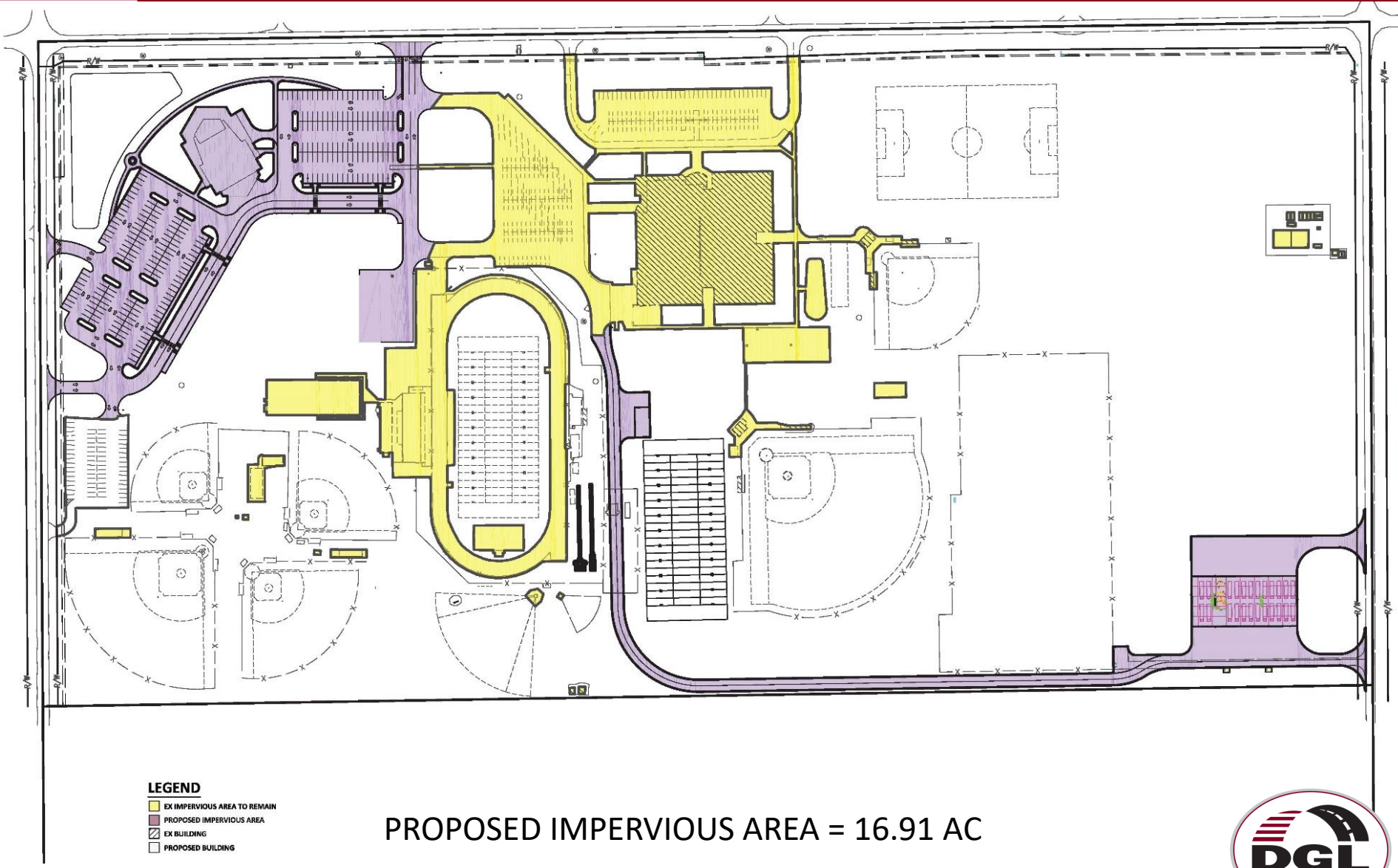
REDEVELOPMENT



PROPOSED IMPERVIOUS AREA = 16.91 AC

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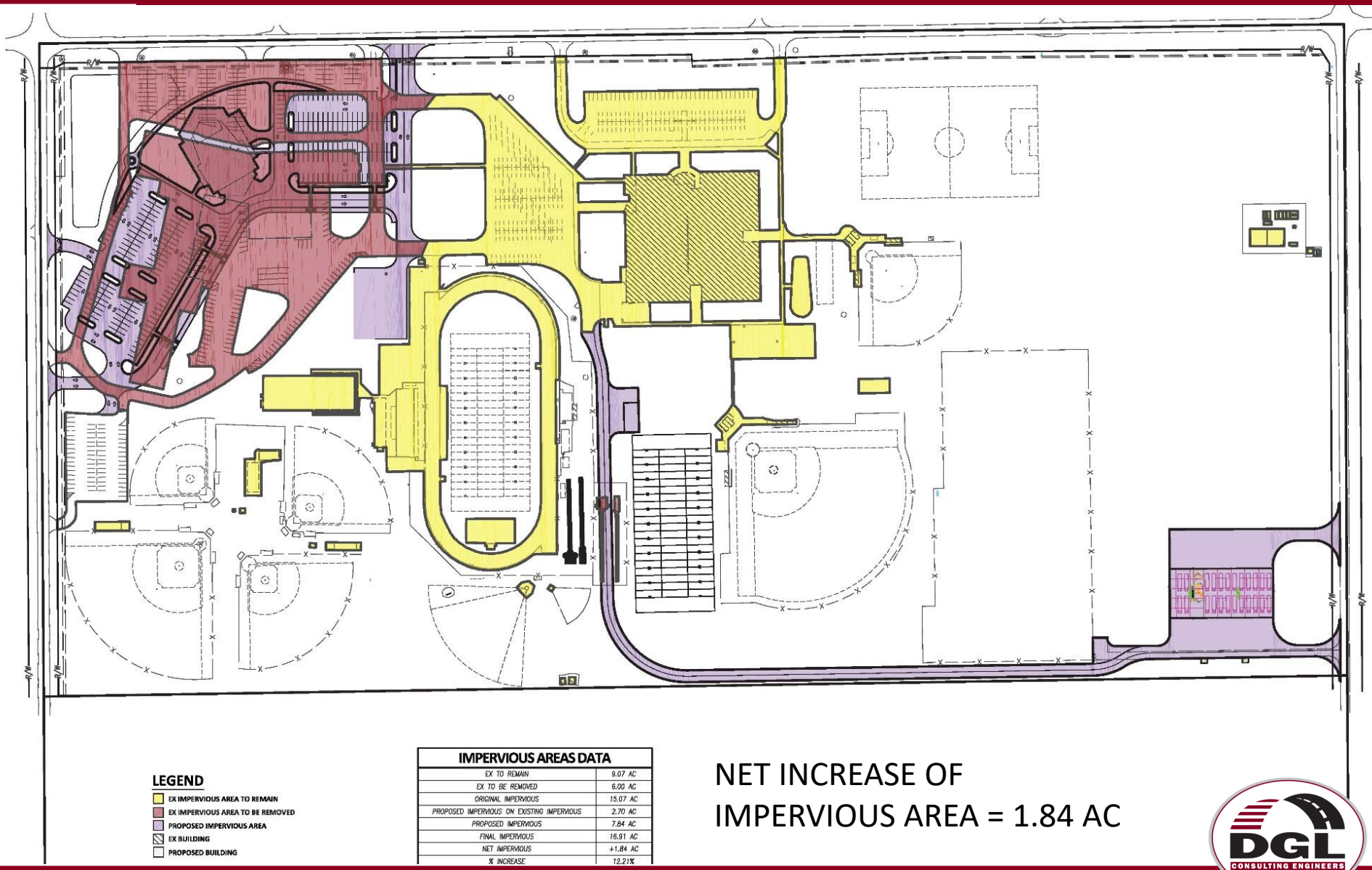
REDEVELOPMENT



IMPERVIOUS AREAS DATA	
EX TO REMAIN	9.07 AC
EX TO BE REMOVED	6.00 AC
ORIGINAL IMPERVIOUS	15.07 AC
PROPOSED IMPERVIOUS ON EXISTING IMPERVIOUS	2.70 AC
PROPOSED IMPERVIOUS	7.84 AC
FINAL IMPERVIOUS	16.91 AC
NET IMPERVIOUS	+1.84 AC
% INCREASE	12.21%

NET INCREASE OF
IMPERVIOUS AREA = 1.84 AC

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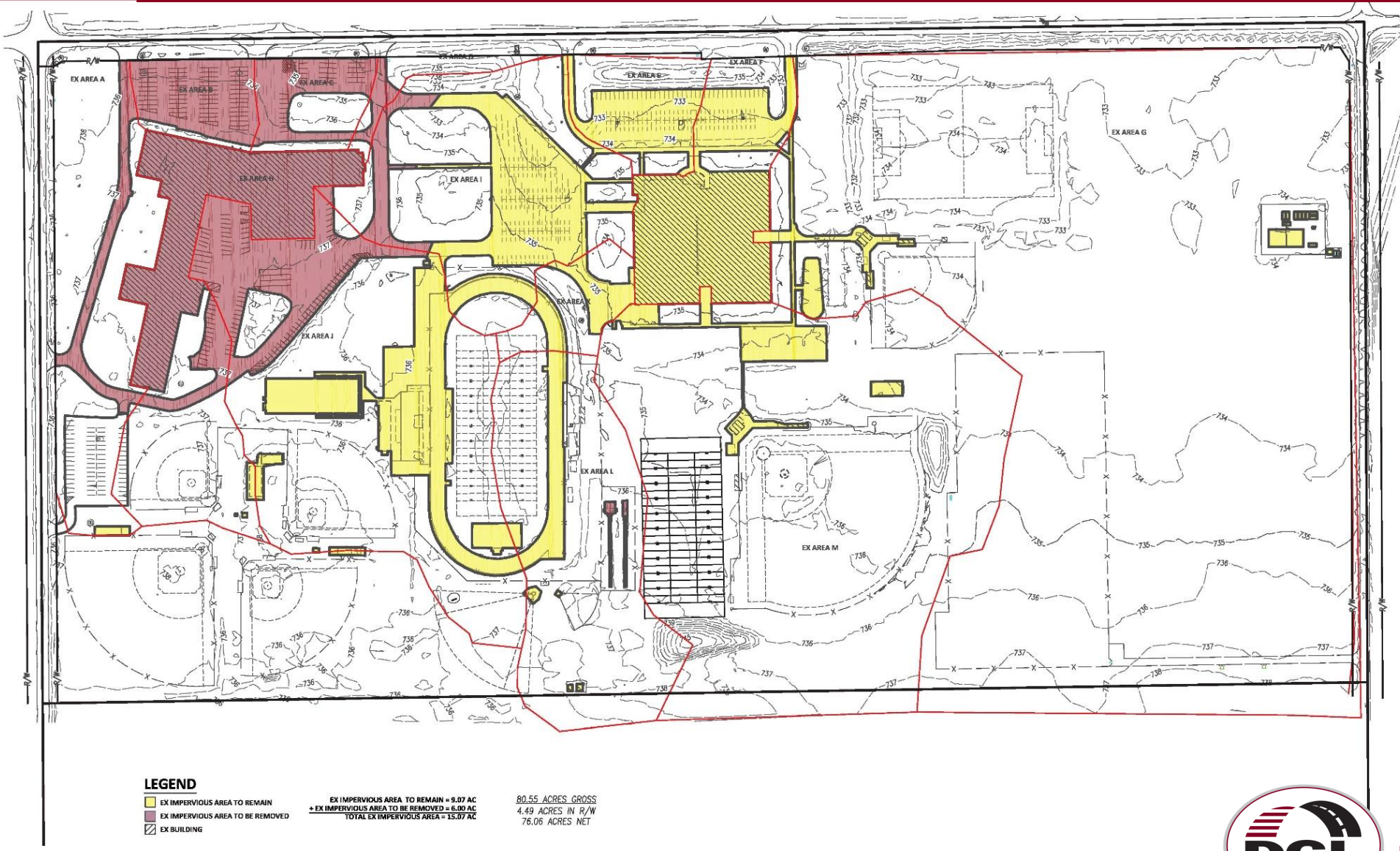
REDEVELOPMENT



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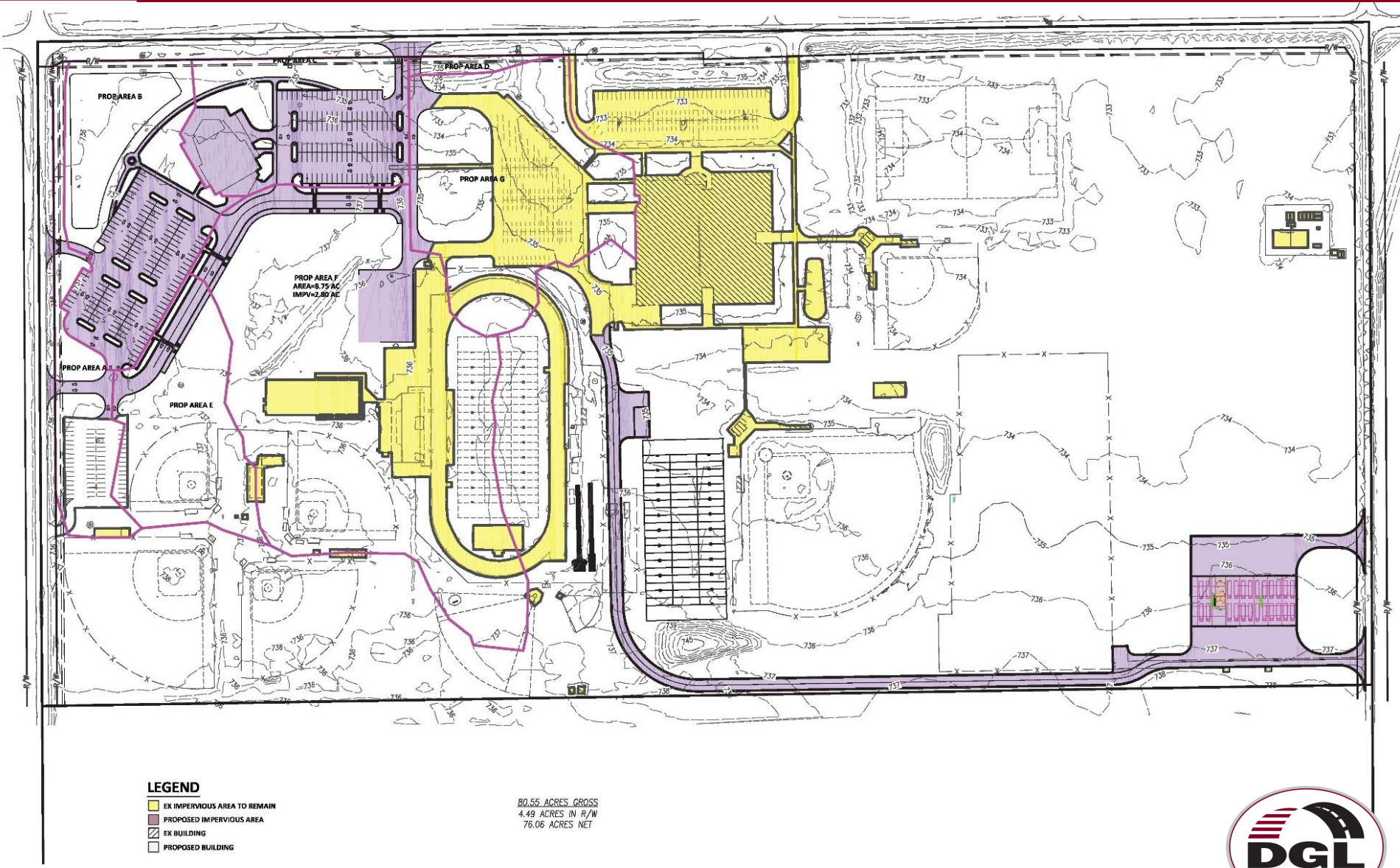
REDEVELOPMENT



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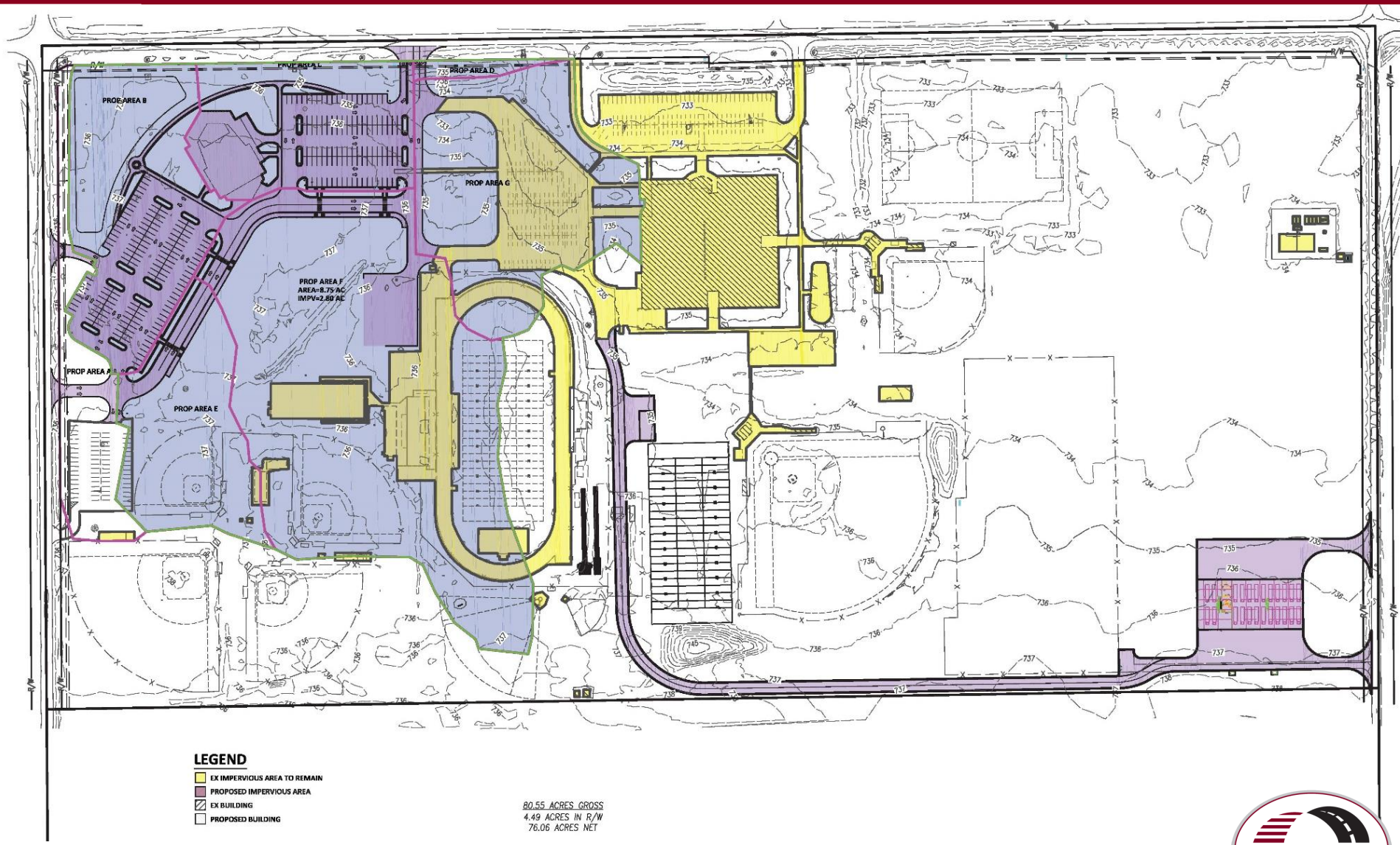

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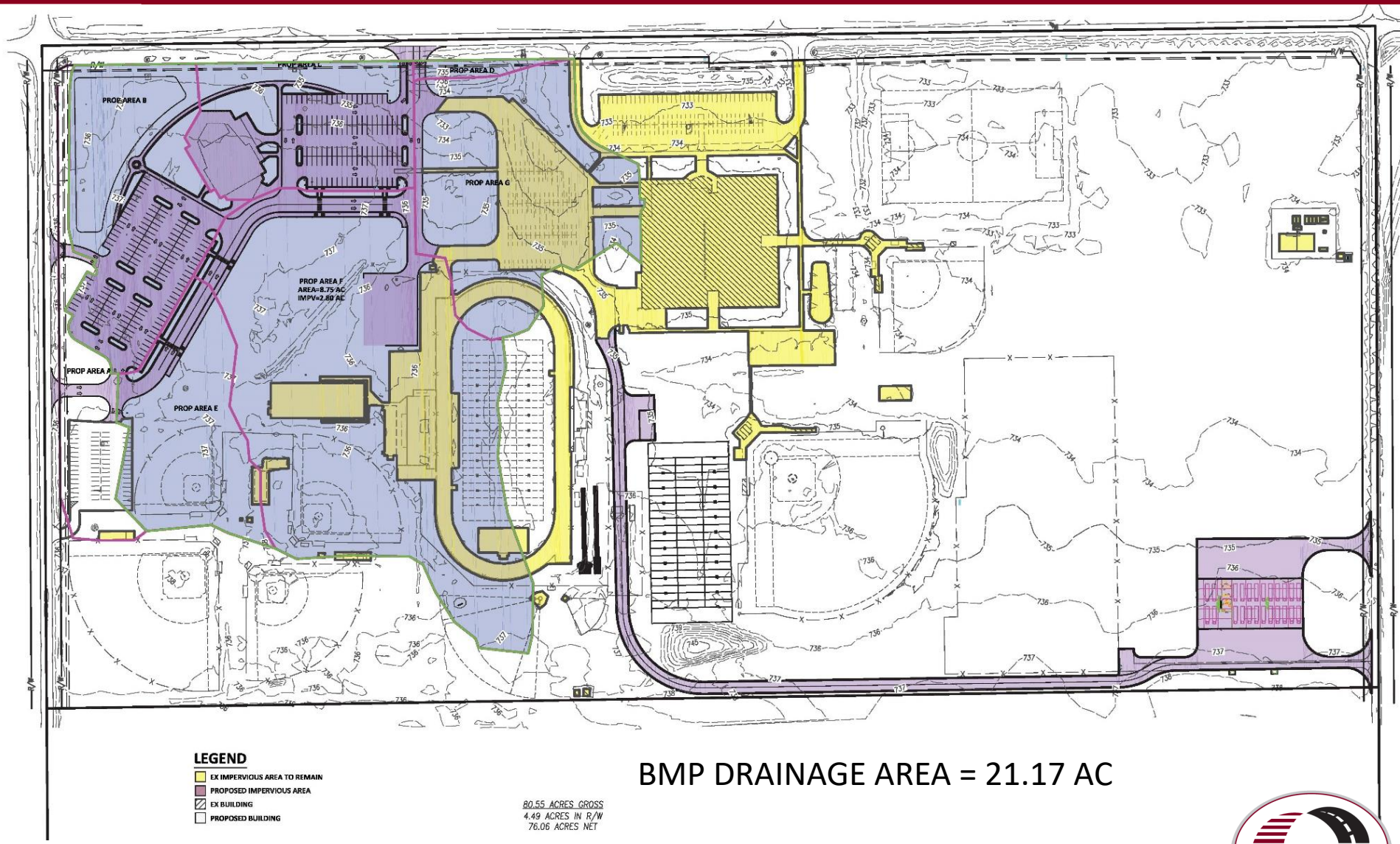
REDEVELOPMENT



BMP DRAINAGE AREA = 21.17 AC

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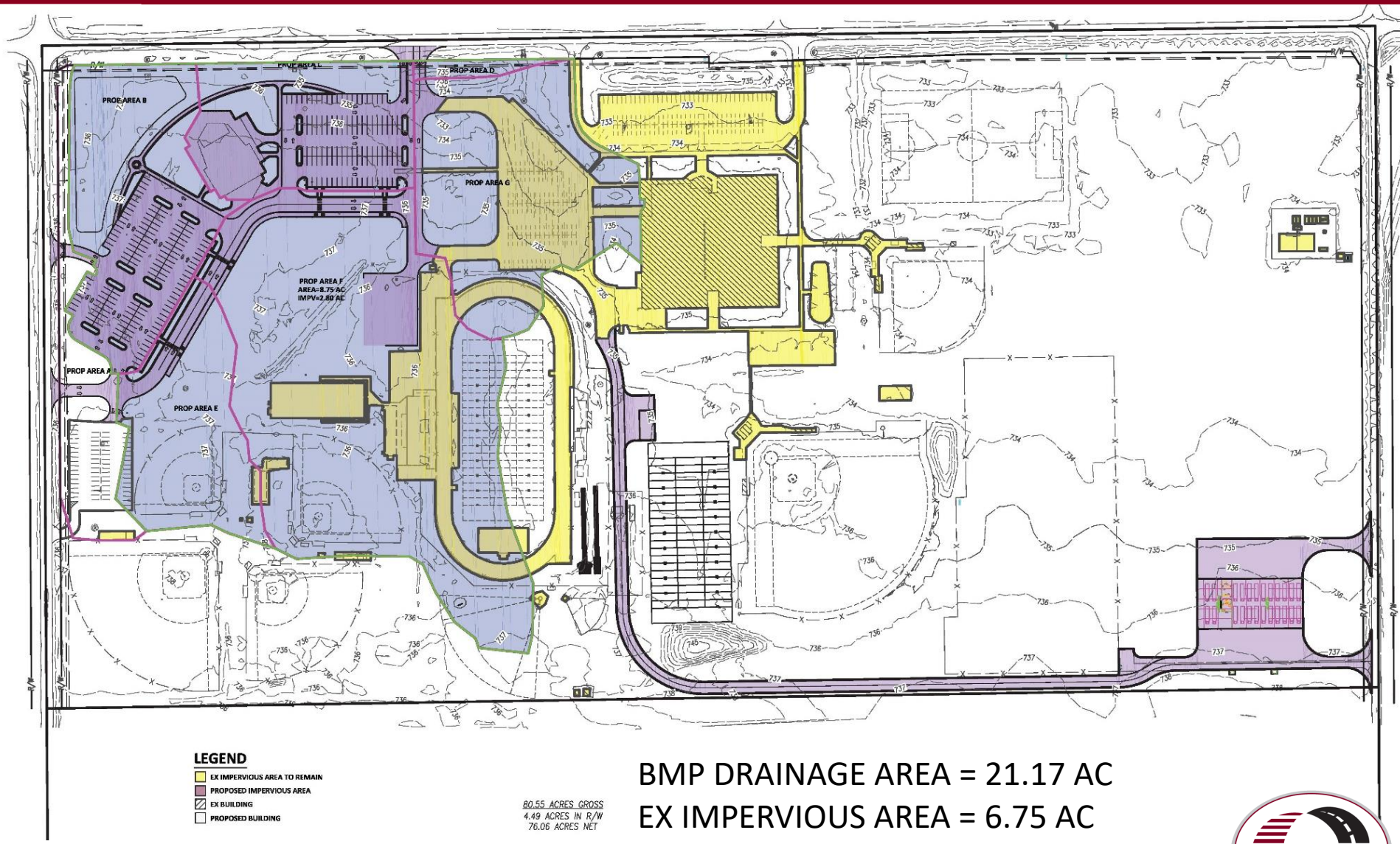
REDEVELOPMENT



BMP DRAINAGE AREA = 21.17 AC

EX IMPERVIOUS AREA = 6.75 AC

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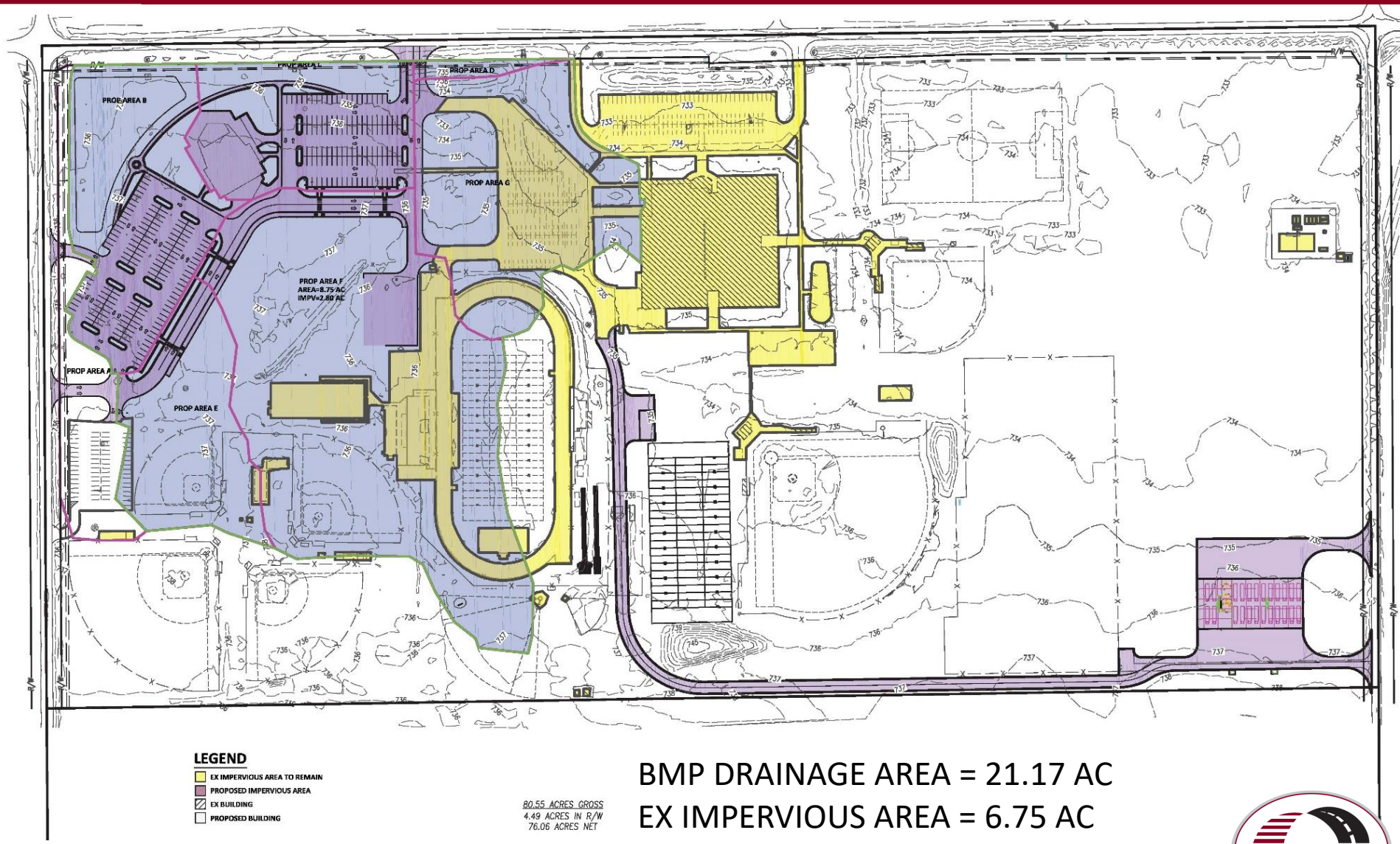
REDEVELOPMENT



BMP DRAINAGE AREA = 21.17 AC

EX IMPERVIOUS AREA = 6.75 AC

PROPOSED IMPERVIOUS AREA = 8.59 AC

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REDEVELOPMENT

- Existing Impervious Ratio

  I1 = 6.75/21.17 = 0.32 = 32%

  Rv1 = 0.05 + 0.90(0.32) = 0.34

- Proposed Impervious Ratio

  I2 = 8.59/21.17 = 0.41 = 41%

  Rv2 = 0.05 + 0.90(0.41) = 0.42

REDEVELOPMENT

- Water Quality Volume

  $WQv = P\ A\ Rv/12$

- For Redevelopment

  $WQv = P\ A\ [0.2*Rv1 + Rv2 – Rv1]/12$

  $= P\ A\ [Rv2 – 0.8\ Rv1]/12$

  $= 0.90(21.17)(0.42 – 0.8*0.34)/12$

  $= 0.23$ Ac-ft

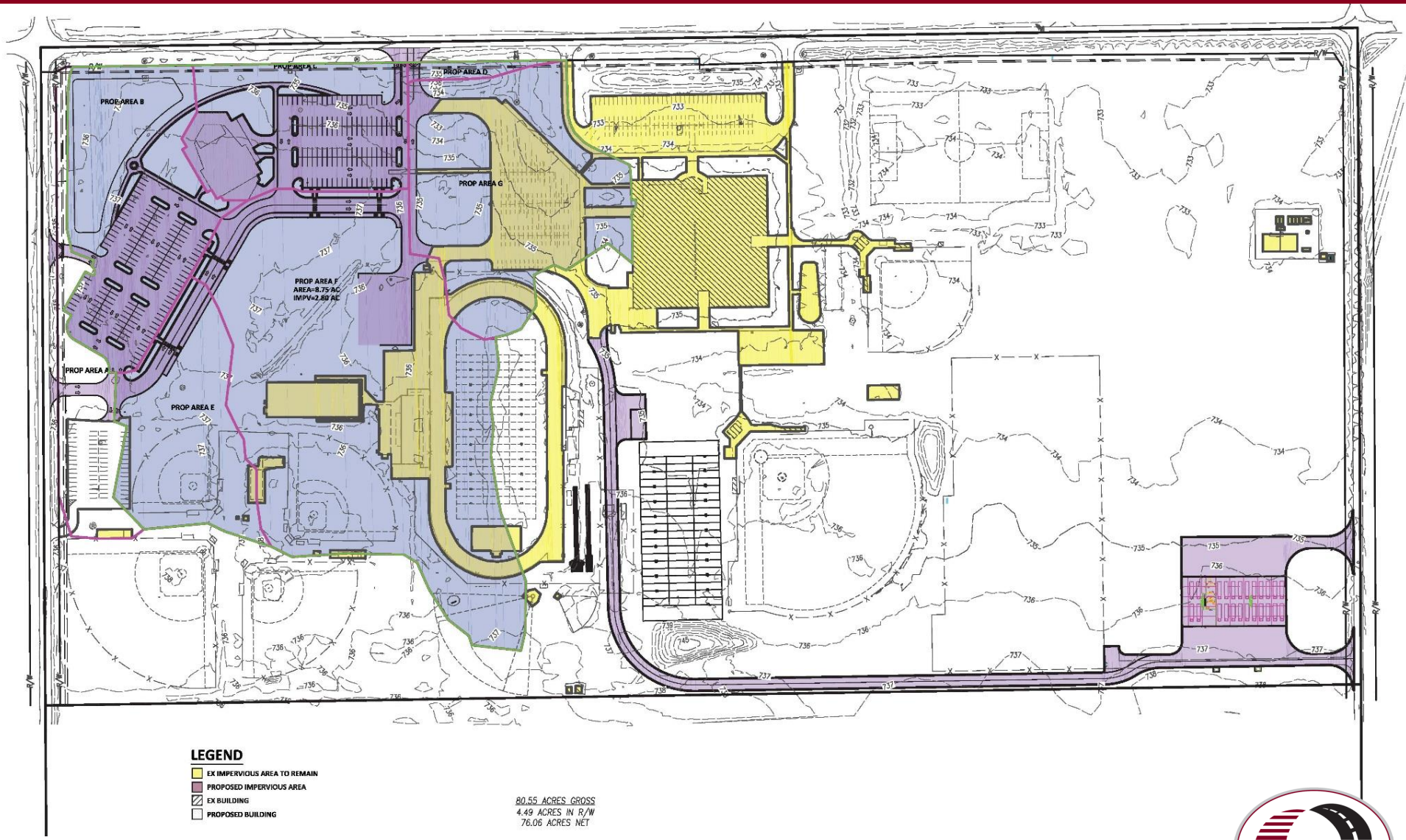
  $= 10{,}236$ cu ft

REDEVELOPMENT

…BUT WAIT

THE BASIN HAS TO TREAT 100% OF THE WATER QUALITY VOLUME GOING TO IT

REDEVELOPMENT



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REDEVELOPMENT

Water Quality Volume

Rv = Rv2 = 0.42

A = 21.17 Ac

P = 0.90

➔ WQv = 0.90 * 21.17 * 0.42/12

= 0.67 Ac-ft

= 29,048 cu ft

>> 10,236 cu ft calculated before

REDEVELOPMENT

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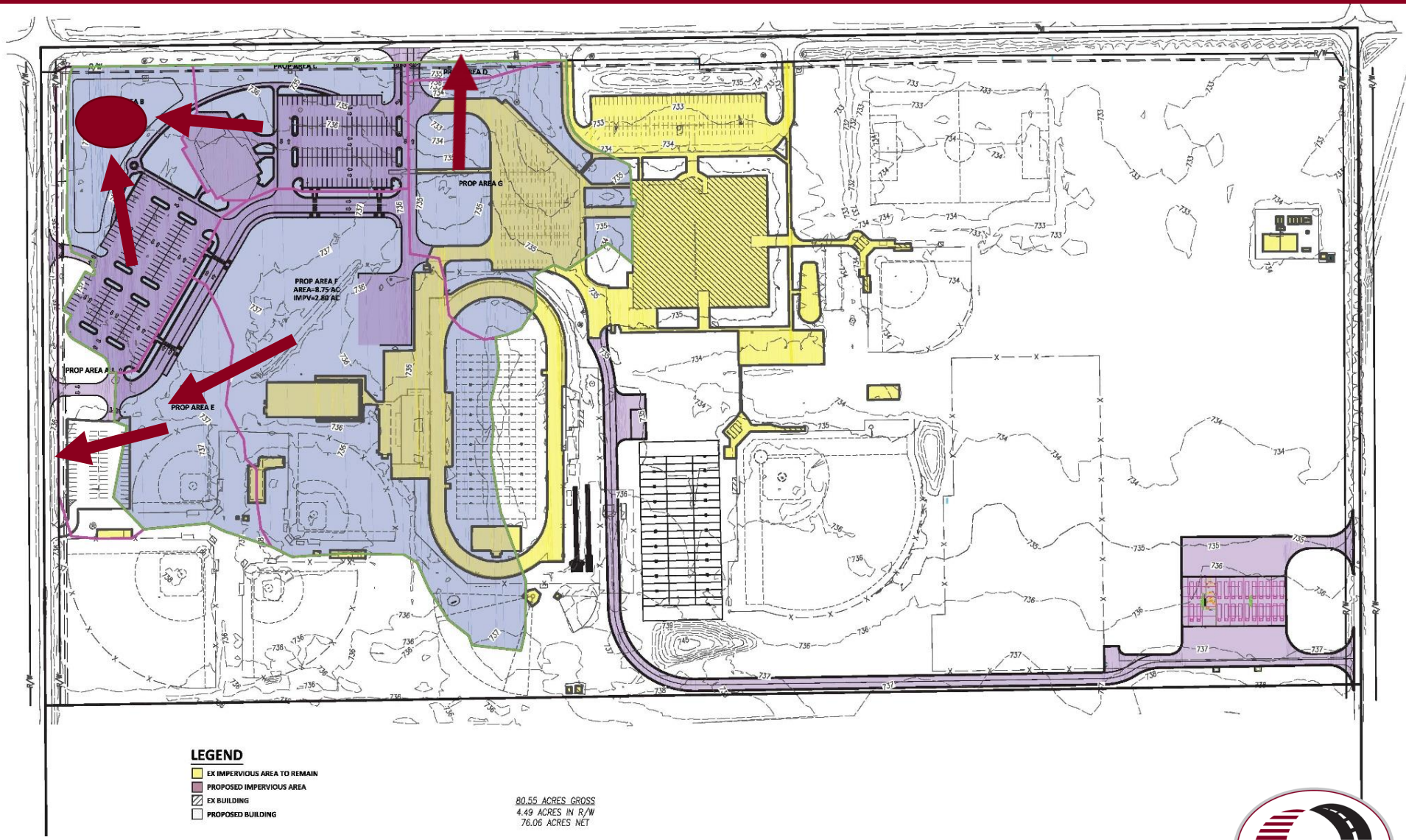

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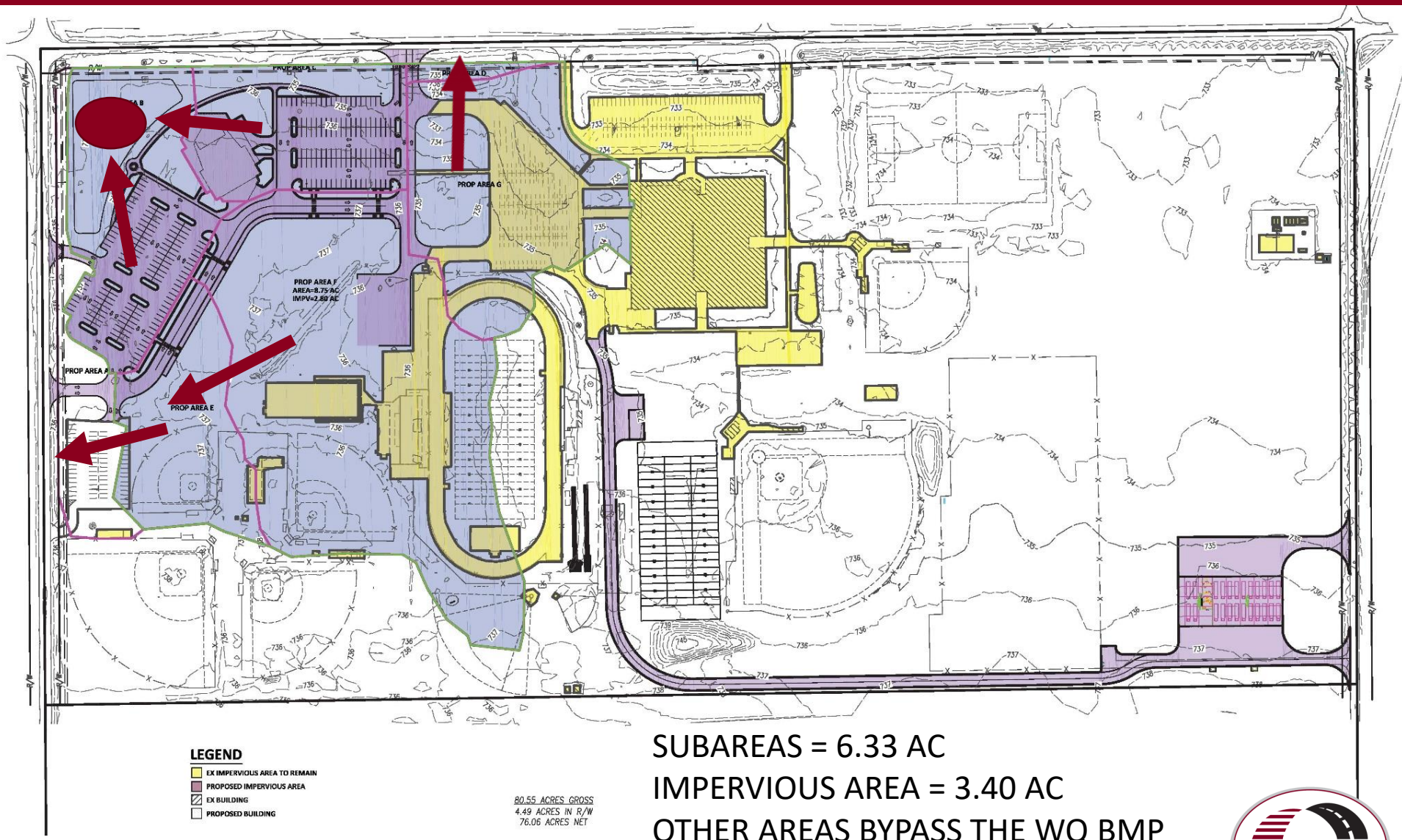
REDEVELOPMENT



SUBAREAS = 6.33 AC

IMPERVIOUS AREA = 3.40 AC

OTHER AREAS BYPASS THE WQ BMP

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REDEVELOPMENT

- Impervious Ratio

  I = 3.40/6.33 = 0.54 = 54%

  Rv = 0.05 + 0.90(0.54) = 0.53

- Back calculate the area based on the water quality volume

  A = WQv *12/(P * Rv * 43,560)

  = 10,236 * 12/(0.9 * 0.53 * 43,560)

  = 5.91 Ac

REDEVELOPMENT

5.91 Ac < Provided Area of 6.33 Acres

➔ Good

If calculated acreage required is greater than the provided area, direct more area to the BMP and recalculate

REDEVELOPMENT

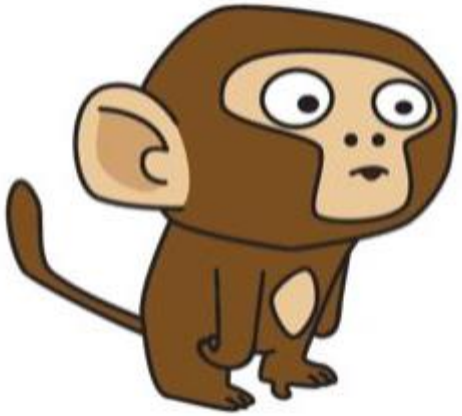
Actual required Water Quality Volume

WQv = 0.9 * 6.33 * 0.53/12
= 0.25 Ac-ft
= 10,960 cu ft > 10,236 cu ft
(required for redevelopment)

10,960 is the design volume for the BMP

REDEVELOPMENT

BUT WAIT…THERE'S MORE



REDEVELOPMENT

WHAT ABOUT MY DETENTION REQUIREMENT??

I CAN’T LET THAT MUCH WATER RUN STRAIGHT OFF THE SITE WITHOUT DETENTION!!

REDEVELOPMENT

If we include all of the drainage area, we have to hold 100% of the water quality volume.

REDEVELOPMENT

If we include all of the drainage area, we have to hold 100% of the water quality volume.

$$WQv = 0.9 * 21.17 * 0.42/12$$

$$= 0.67 \text{ Ac-ft}$$

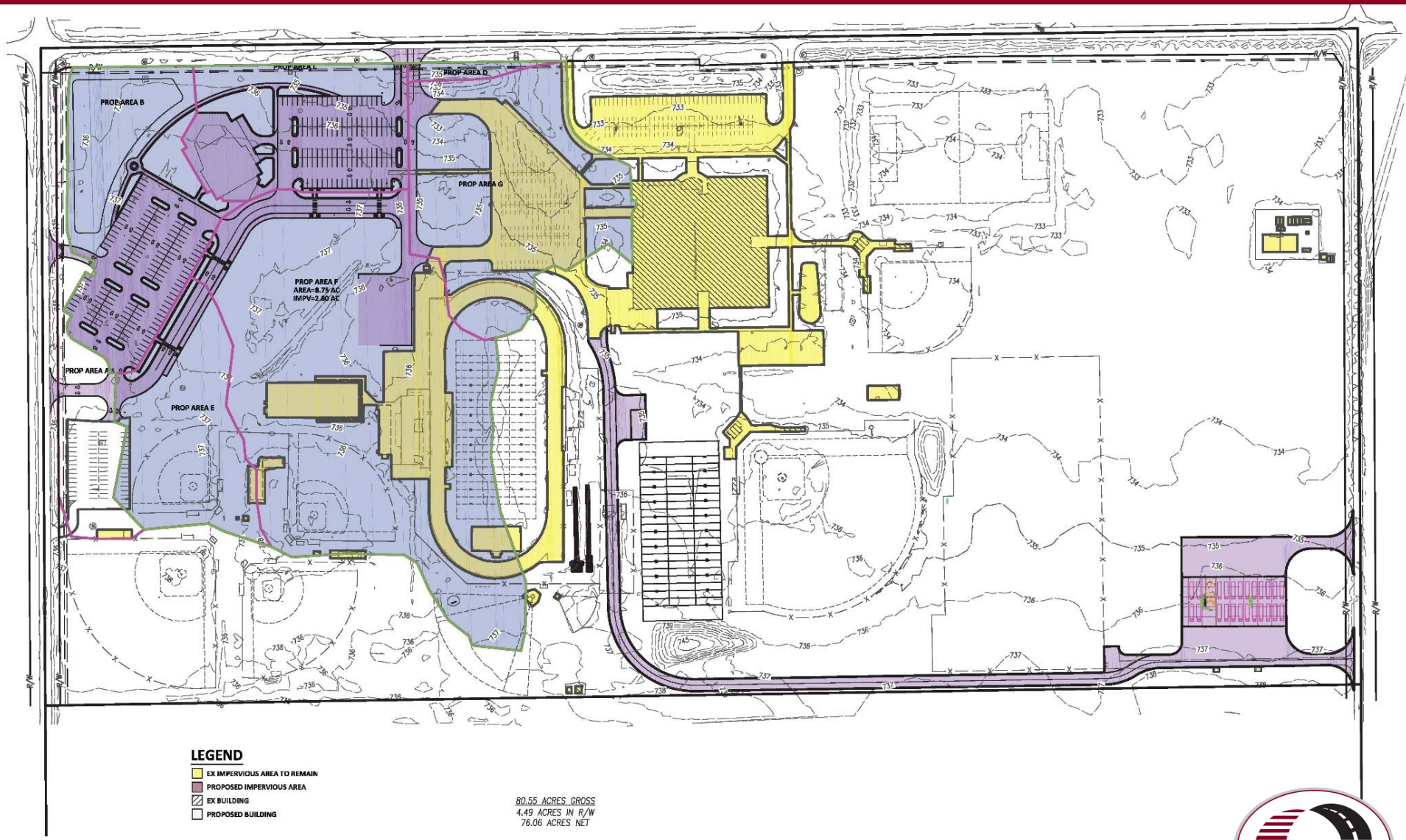
$$= 29{,}048 \text{ cu ft}$$

$$>> 10{,}960 \text{ cu ft}$$

REDEVELOPMENT

…or do we?

REDEVELOPMENT



DGL CONSULTING ENGINEERS

RUNOFF REDUCTION

		1-year storm	2-year storm	10-year storm		
Target Rainfall Event (in)		2.52	2.60	4.15		
Drainage Area A						
Drainage Area (acres)	38.00					
Storage Volume Provided By Runoff Reduction Practices (cf)	26,174					
Drainage Area B						
Drainage Area (acres)	0.00					
Storage Volume Provided By Runoff Reduction Practices (cf)	0					
Drainage Area C						
Drainage Area (acres)	0.00					
Storage Volume Provided By Runoff Reduction Practices (cf)	0					
Drainage Area D						
Drainage Area (acres)	0.00					
Storage Volume Provided By Runoff Reduction Practices (cf)	0					
Drainage Area E						
Drainage Area (acres)	0.00					
Storage Volume Provided By Runoff Reduction Practices (cf)	0					

Based on the use of Runoff Reduction practices in the various drainage areas, the spreadsheet calculates an adjusted $RV_{Developed}$ and adjusted Curve Number.

Drainage Area A		A soils	B Soils	C Soils	D Soils	
Forest/Preserved Open Space	Area (acres)	4.0	1.0	2.0	0.0	
	CN	30	55	70	77	
Managed Turf - Natural Profile	Area (acres)	2.0	2.0	4.0	0.0	
	CN	39	61	74	80	
Managed Turf - Graded	Area (acres)	0.0	3.0	6.0	0.0	
	CN	39	61	74	80	
Impervious Cover	Area (acres)	0.0	6.0	8.0	0.0	
	CN	98	98	98	98	
					Weighted CN	S
					61	6.42
		1-year storm	2-year storm	10-year storm		
Runoff $Volume_{Developed}$ (in) with no Runoff Reduction		0.20	0.22	0.88		
Runoff $Volume_{Developed}$ (in) with Runoff Reduction		0.01	0.03	0.69		
Adjusted CN for D.A. A		48	50	57		

Using similar procedure – the runoff coefficient/curve number can be reduced to reduce the volume of detention required.

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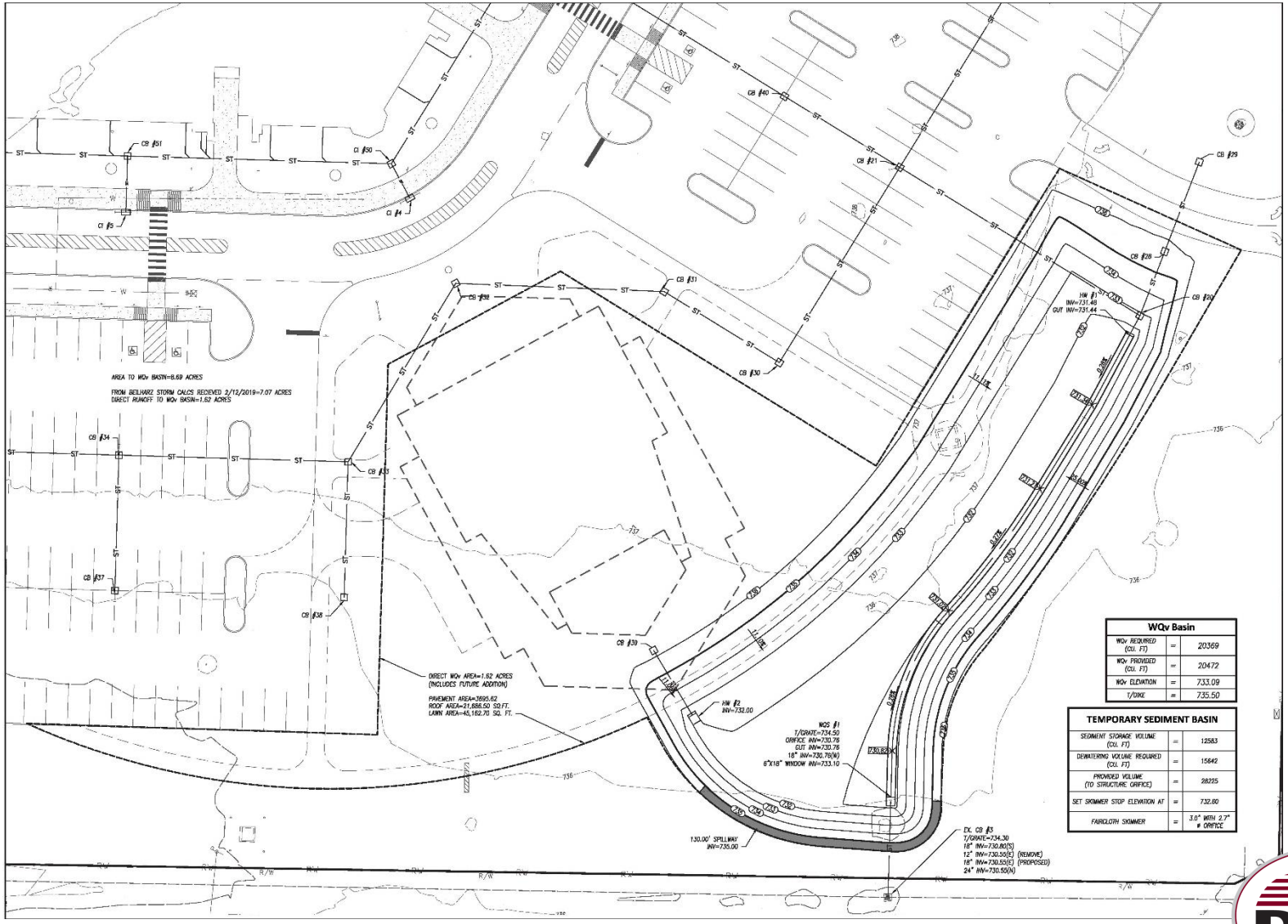
REDEVELOPMENT