CHANGING RESTORATION COSTS

Prepared for Coast Builders Coalition
Fall 2016

THE WATER INSTITUTE
OF THE GULF®

OUTLINE

METHODS

- Five different combinations of subsidence/sea-level rise
- Selected 2,000 acre areas across the coast with similar initial conditions
- Estimated fill needed to implement marsh creation in each area under initial conditions and at future 10 year intervals
- Assumed open water up to 2.5ft and 5ft would be filled
- Used project cost analysis based on 2012 MP and MP designated borrow areas to estimate unit costs per mile
- For each area/fill depth converted 2010 costs to 2015 costs
- Estimated future costs of marsh creation in areas using 1% & 2% annual inflation for each future decade
- Estimated savings based on selling 10, 20, 30 year bonds to construct now instead of in the future
- Estimated potential increase in cost if construction is delayed 10 years but funds are in hand

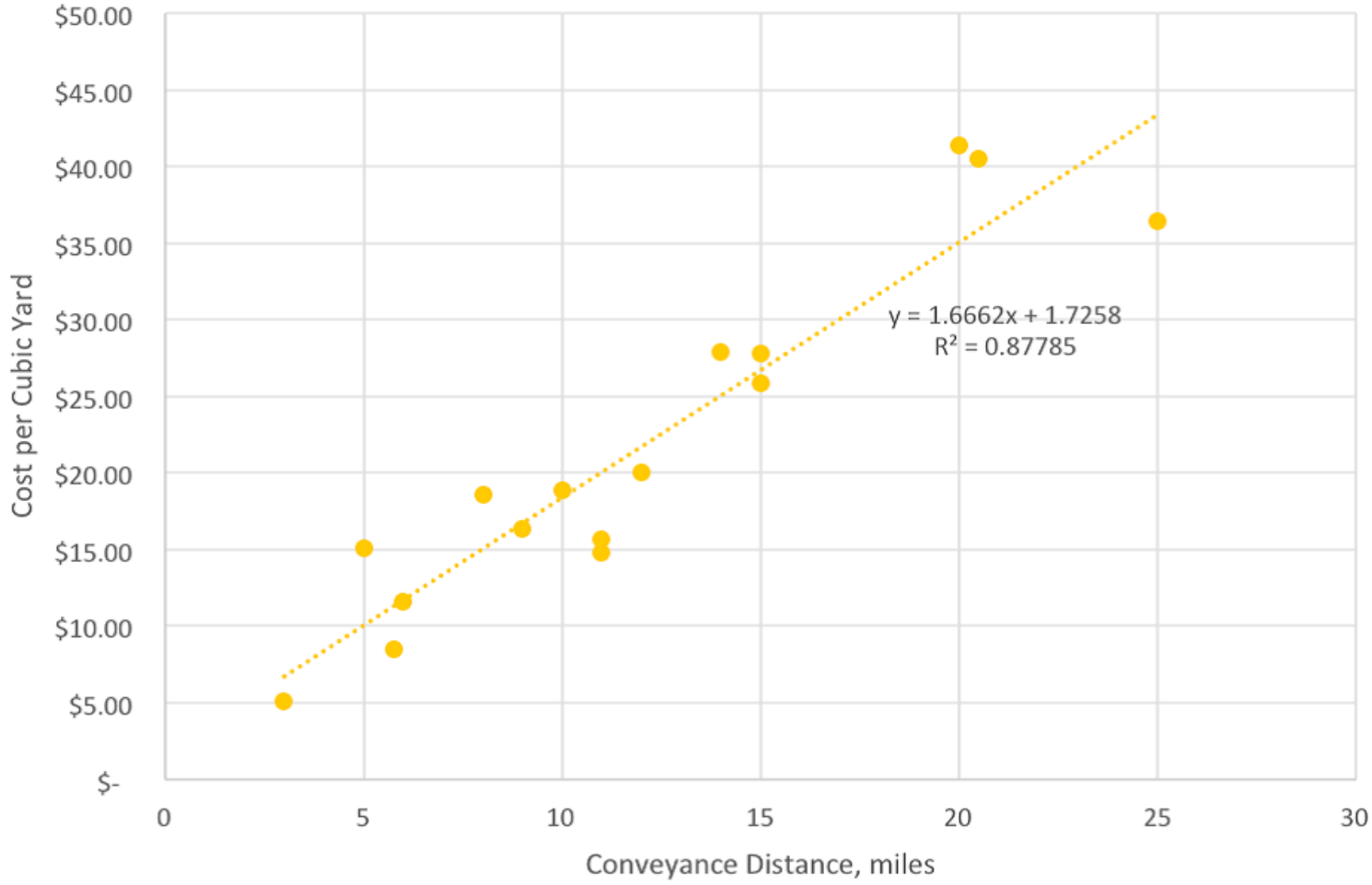
MAIN FINDINGS – FILL REQUIREMENTS/LAND BUILT

- Filling only shallow areas to create marsh reduces volume (and costs) but as water gets deeper less area meets the criteria
- Filling deeper depths to create marsh increases volumes (and costs) but enables more land to be built in future years
- Assumptions about sea-level rise dramatically influence future fill volumes (and costs)
  - Greater increases in SW Louisiana (lower subsidence areas)
  - Lower increases in SE Louisiana but less land is built

MAIN FINDINGS – COST OF DELAY

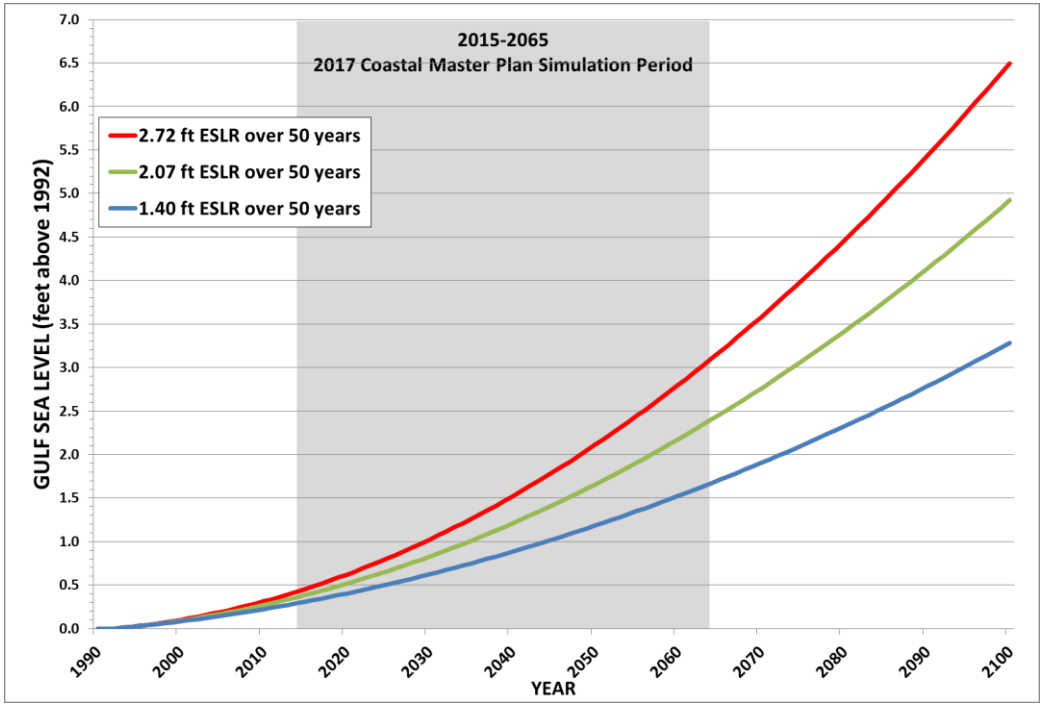
- Cost per acre created for even the lowest scenario more than doubles in 20 years
- For the medium scenario cost per acre created increases almost 200% in 20 years and more than 600% in 40 years at 2% inflation
- Finding ways to build projects sooner (e.g., selling bonds) decreases total costs
- For the medium scenario savings can be as much as 30% vs waiting 10 years to build – and benefits are realized sooner
- Delays in construction make projects more expensive as water gets deeper, land degrades – cost increase is not compensated for by interest earnings even in low subsidence areas

DISTANCE-COST ASSUMPTIONS BASED ON 2012 MASTER PLAN PROJECT COSTS

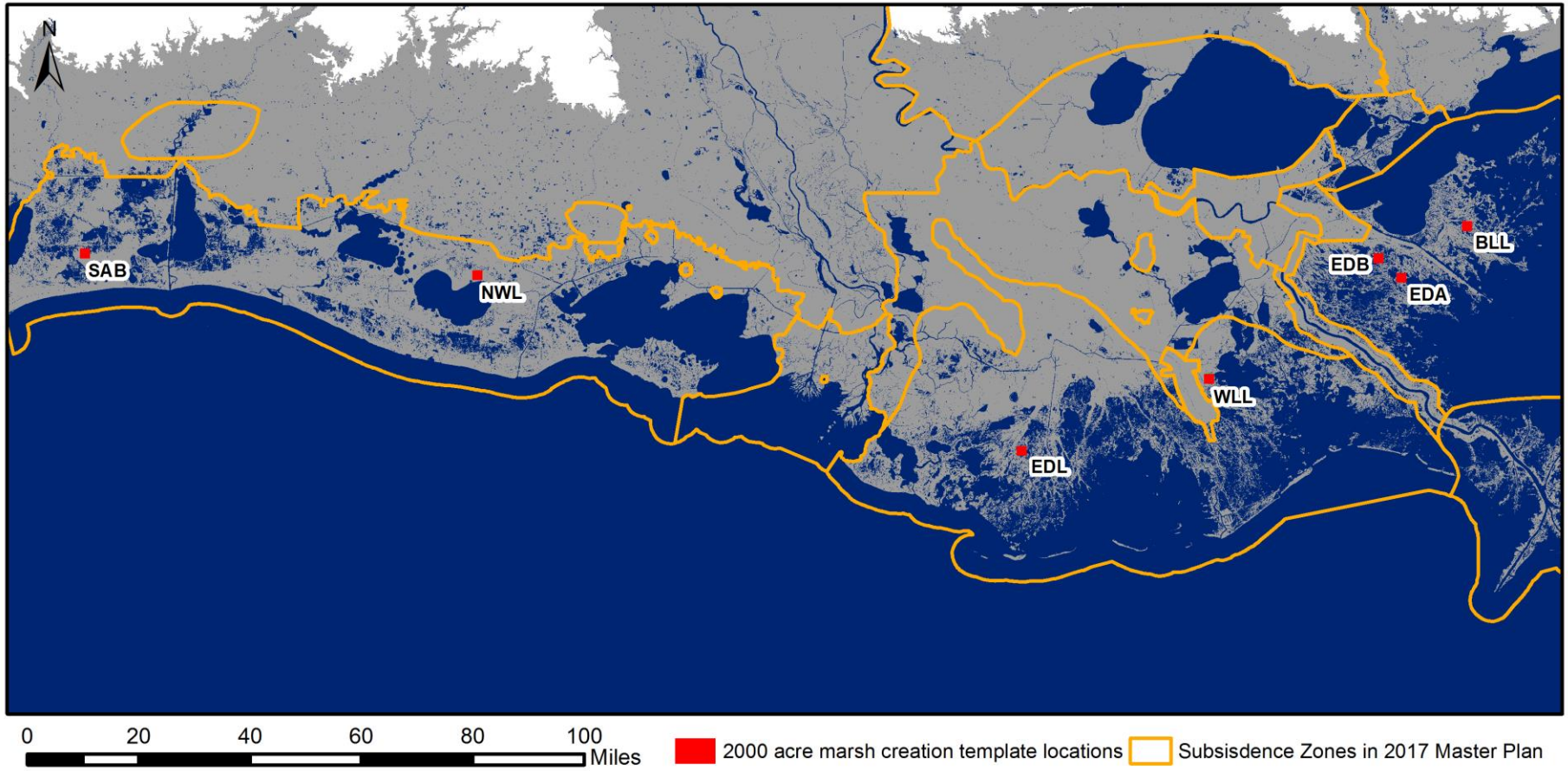


SUBSIDENCE AND SEA LEVEL RISE ASSUMPTIONS

Scenario	2017 MP Scenarios	ESLR (ft/50yr)	Subsidence
A	Low	1.40	Low
B	Med	2.07	Low
C	N/A	2.07	Medium
D	N/A	2.07	High
E	High	2.72	High

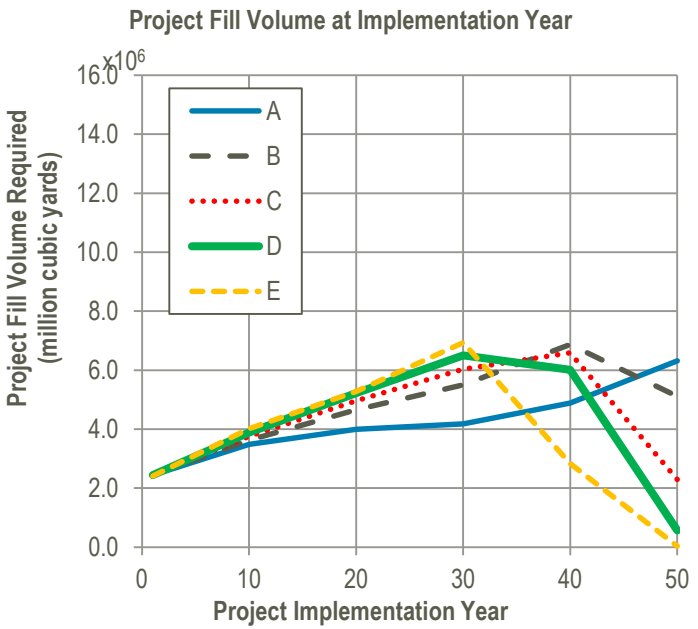


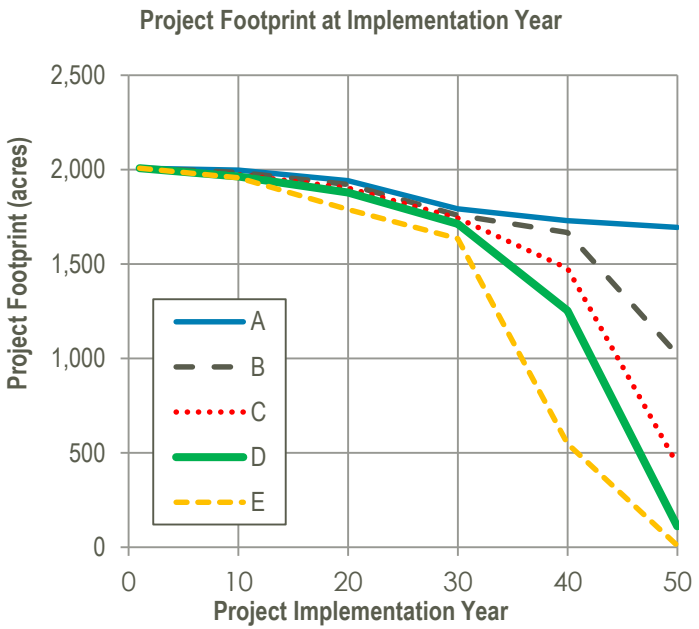
AREAS CONSIDERED



Analysis conducted for all areas.
Discussion focuses on WLL (higher subsidence) and SAB (lower subsidence)

CHANGE IN FILL VOLUME OVER TIME
W. LITTLE LAKE



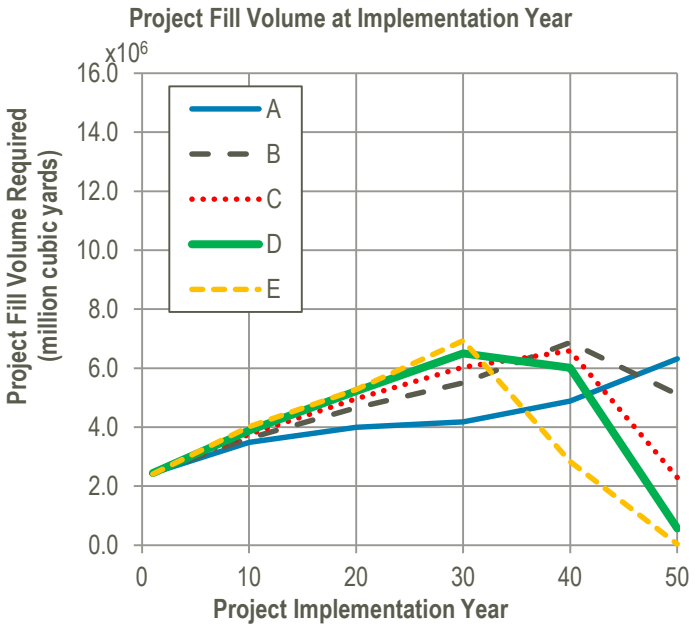


2.5 ft fill depth

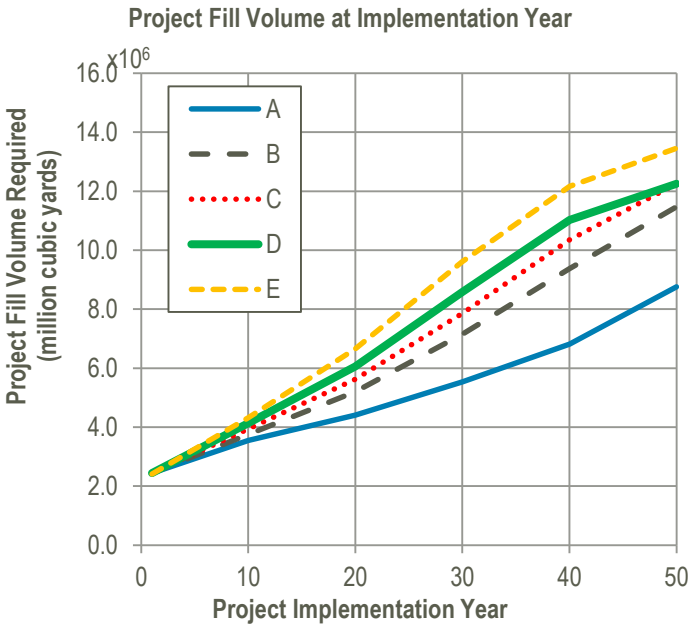
For higher relative sea-level rise rates, in later years water is too deep for the shallow fill criteria. By year 50 in Scenario E hardly any land can be built using the 2.5ft depth criteria.

CHANGE IN FILL VOLUME OVER TIME – EFFECT OF FILL DEPTH

W. LITTLE LAKE



2.5 ft fill depth

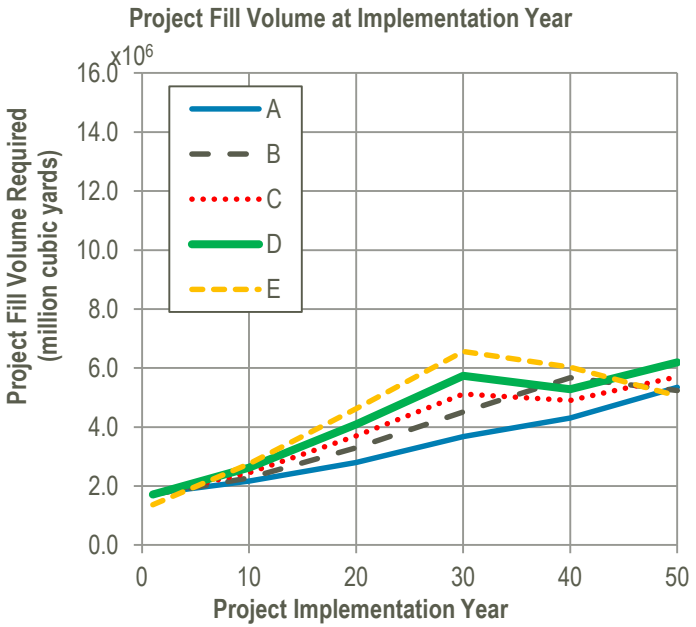


5 ft fill depth

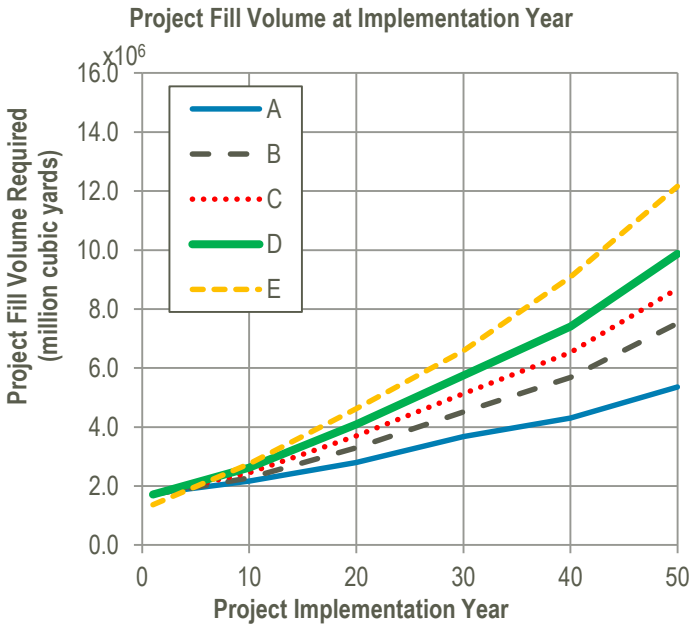
For deeper fill criteria, volumes continue to increase over time.

CHANGE IN FILL VOLUME OVER TIME – EFFECT OF FILL DEPTH

SABINE



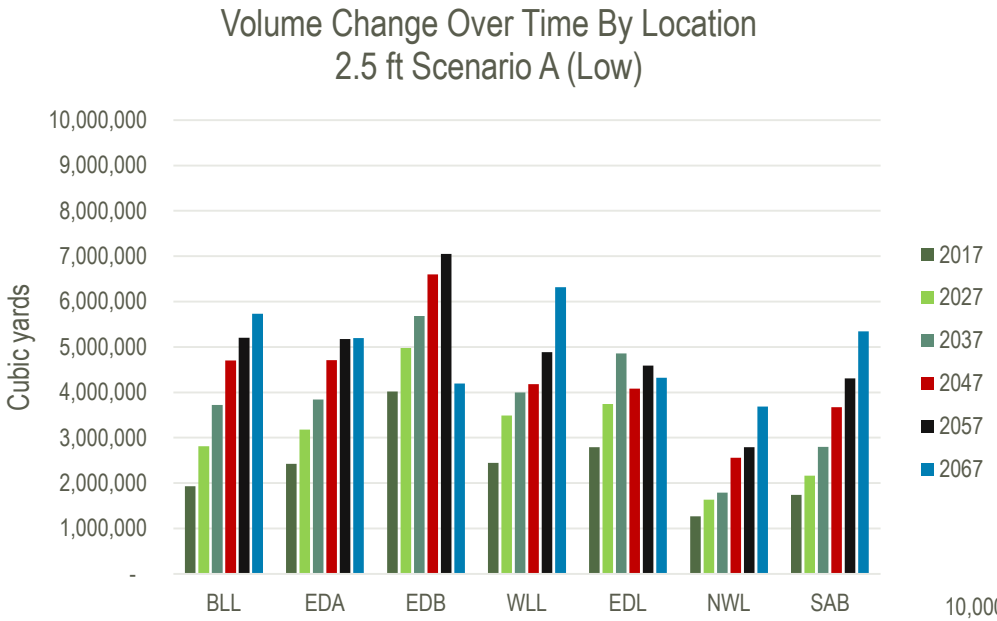
2.5 ft fill depth



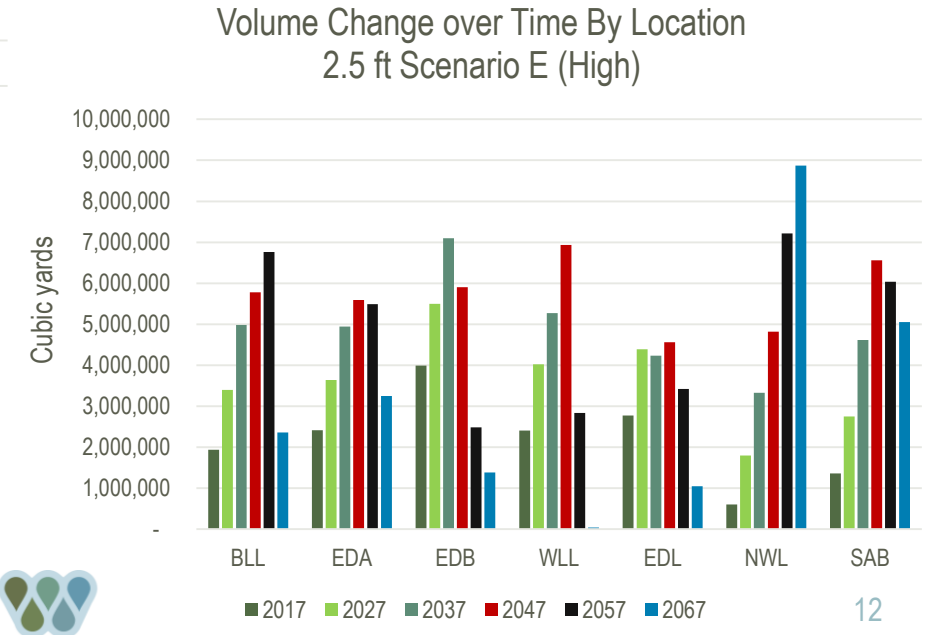
5 ft fill depth

In lower subsidence areas the decrease in volume in later years is less pronounced.

CHANGE BY LOCATION
FILL VOLUME

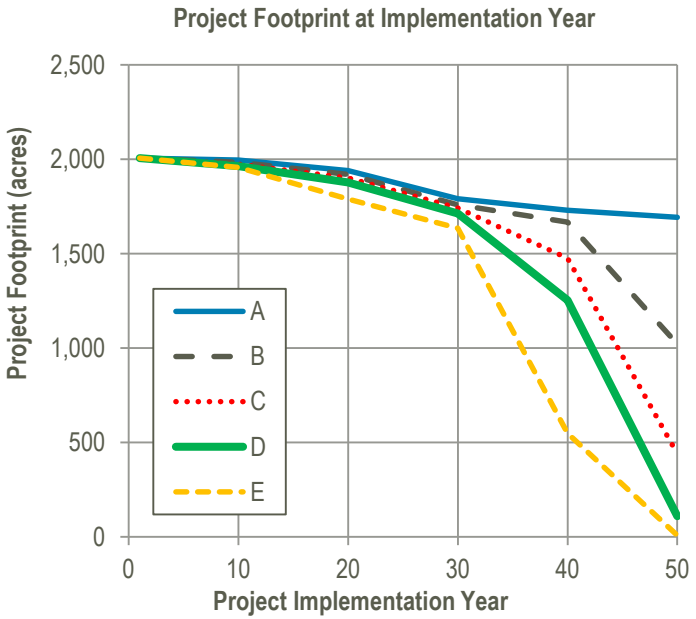


Volumes needed increase over time in all locations until water depths become too deep for the shallow fill criteria to be met. When this occurs varies by location/ subsidence and scenario.

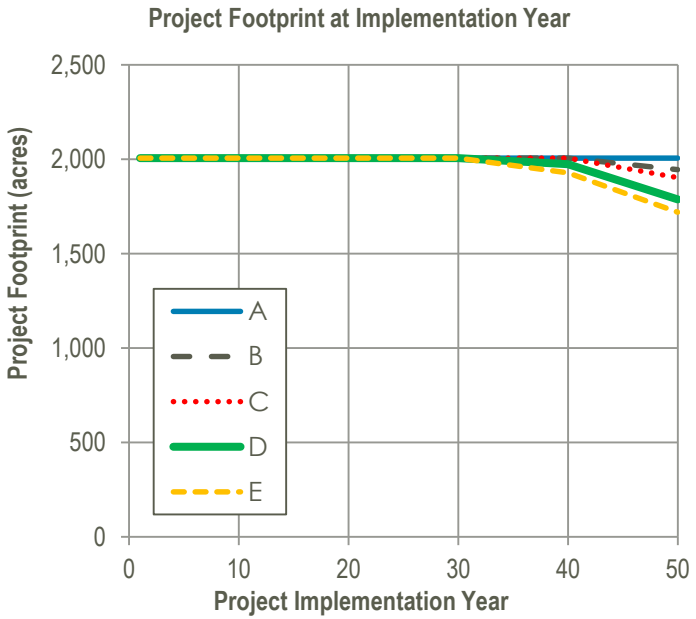


CHANGE IN AREA CREATED AND EFFECT OF FILL DEPTH

WEST LITTLE LAKE



2.5 ft fill depth

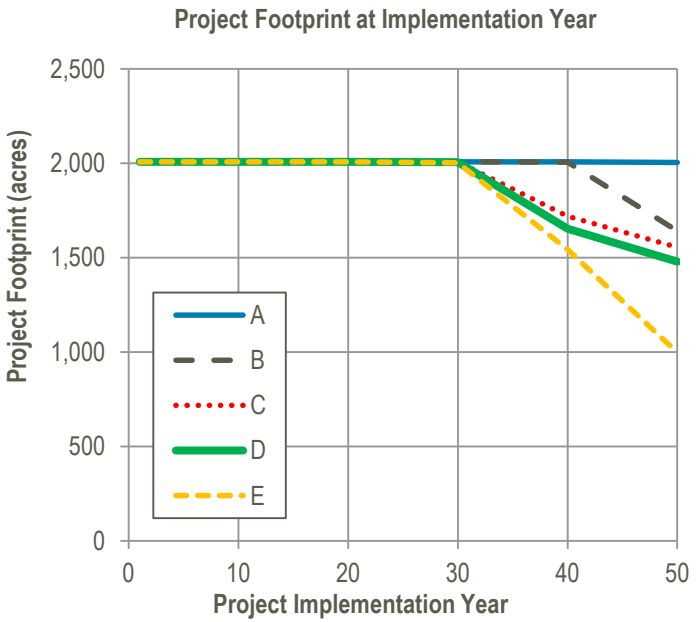


5 ft fill depth

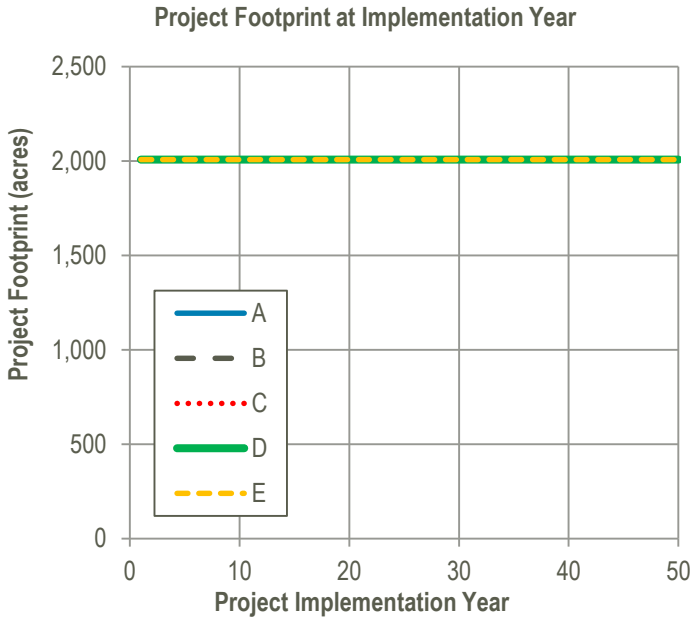
In later years for higher scenarios, less land is built within the 2000 acre area as water depths begin to exceed the fill criteria depth. Less of an effect with the 5ft fill depth.

CHANGE IN AREA CREATED AND EFFECT OF FILL DEPTH

SABINE



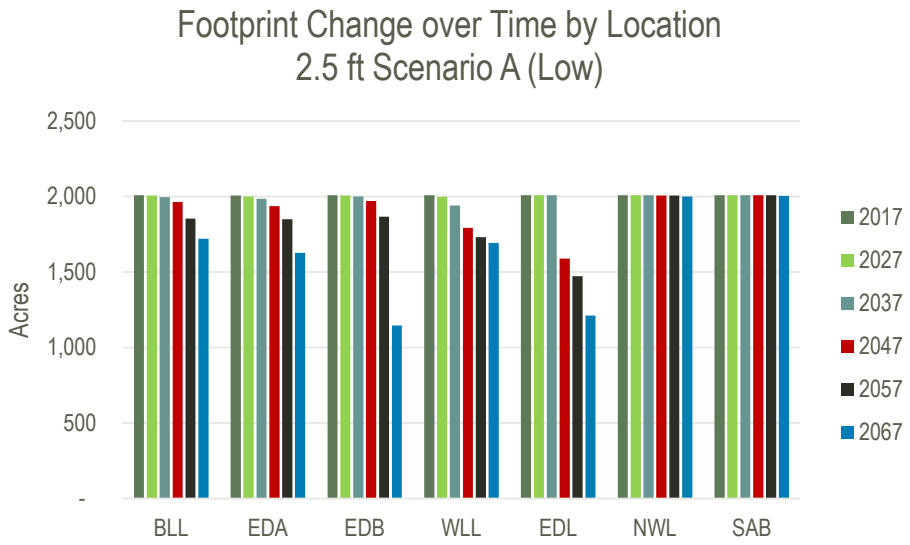
2.5 ft fill depth



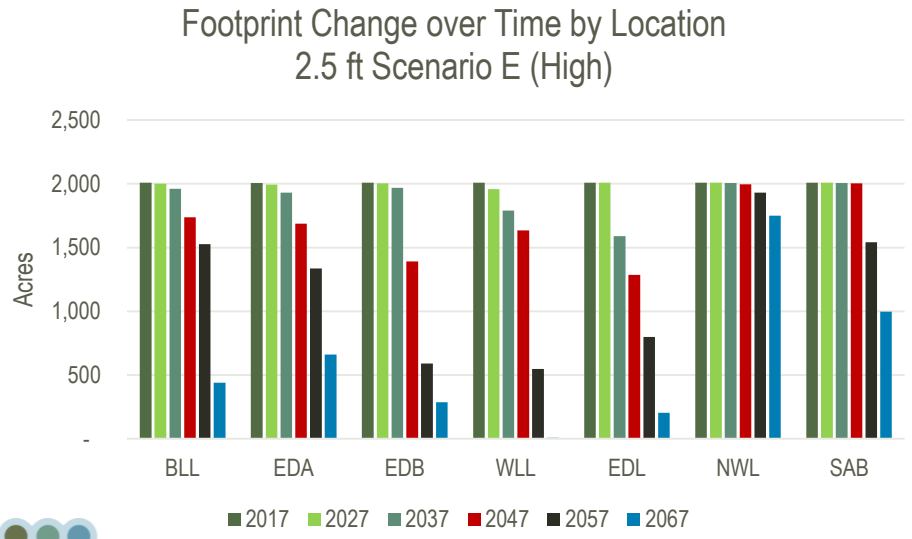
5 ft fill depth

In lower subsidence areas, marsh creation remains viable for decades even for shallow fill criteria

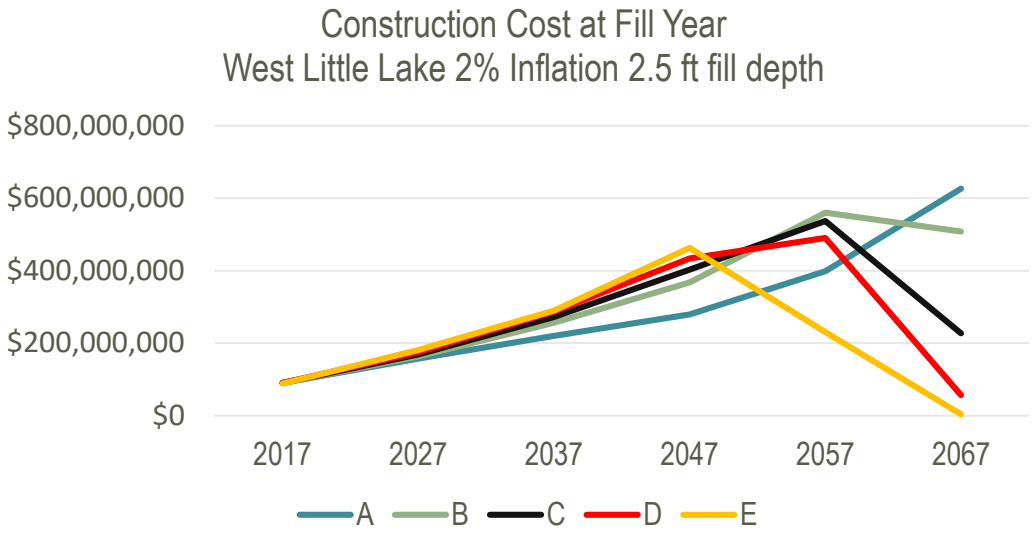
CHANGE BY LOCATION FOOTPRINT CONSTRUCTED

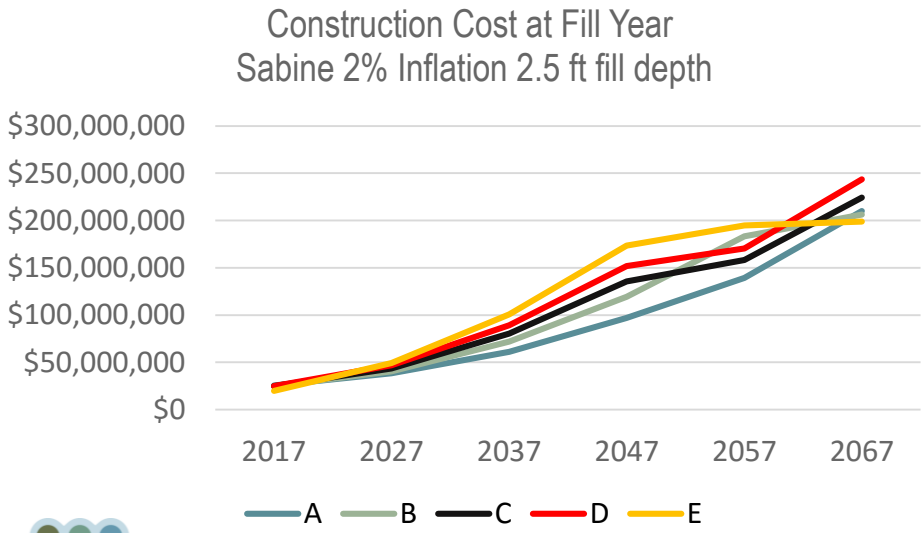


Increasing water depths over time, especially in higher scenarios, limit the ability to built land within the areas. For the 2.5ft fill criteria there is less of an effect in the Chenier Plain due to lower subsidence rates



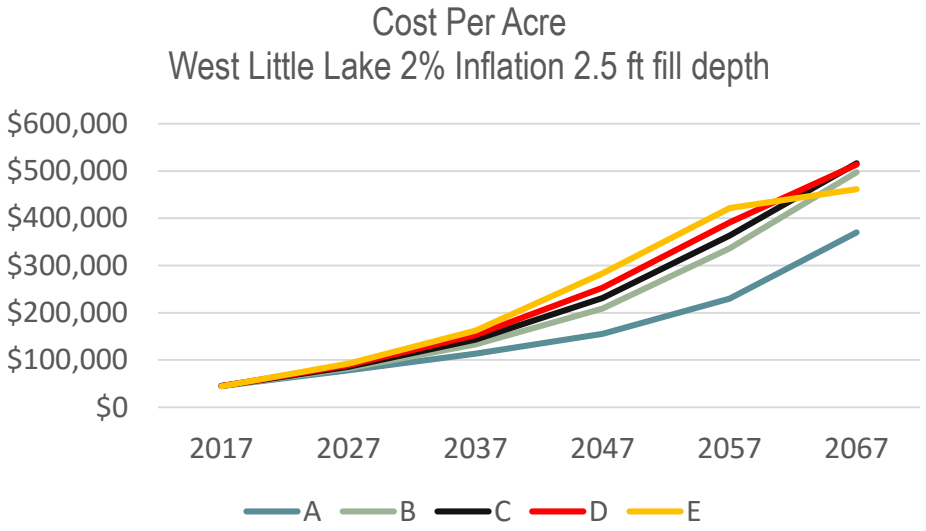
FUTURE CHANGES IN CONSTRUCTION COST

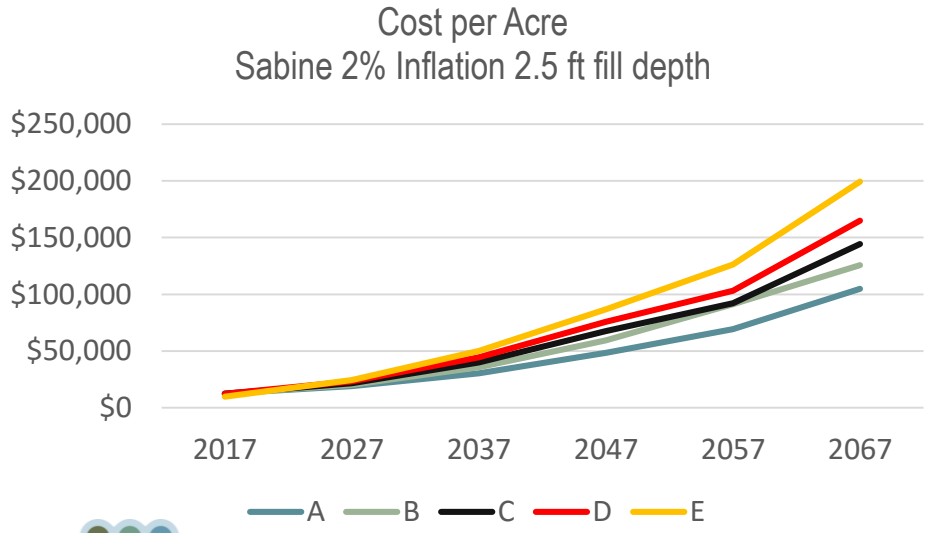




- Inflation influences future project costs.
- Increases still occur even for 1% inflation.

FUTURE CHANGES IN COST PER ACRE





- Cost per acre increases even when area built begins to decline.
- Increase greater in higher subsidence area.
- Increase still occurs even for 1% inflation.

EFFECT OF SUBSIDENCE RATE AND TIME ON CONSTRUCTION COSTS

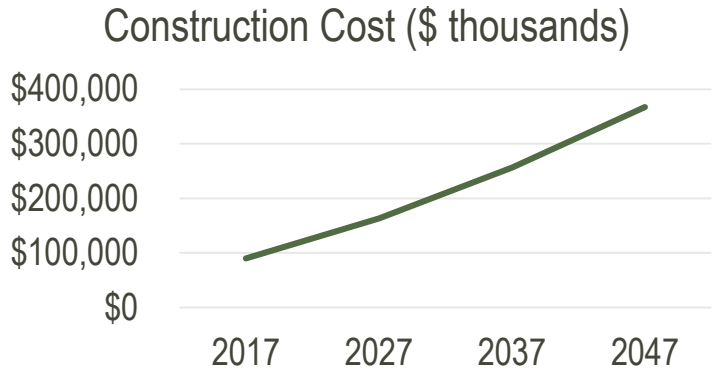
2.5 ft fill depth - Scenario B (Medium) - 2% Inflation

Year	West Little Lake			Sabine		
	Cost ($k)	Area Created (acres)	Cost ($k)/acre	Cost ($k)	Area Created (acres)	Cost($k)/acre
2017	$89,981	2007	$44.8	$25,032	2007	$12.4
2037	$256,140	1921	$133.3	$40,630	2007	$35.8
2057	$560,076	1667	$335.8	$71,886	2005	$91.4

SELLING BONDS TO IMPLEMENT SOONER

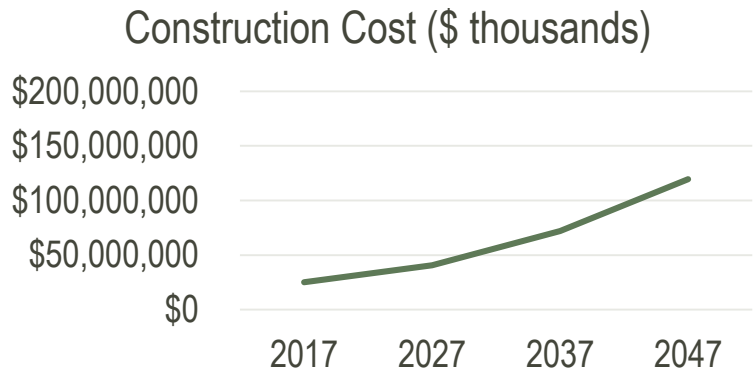
Scenario B (Medium) 2% Inflation Bond Rates as of 8/8/16

West Little Lake



Bond Until	Bond Cost ($k)	Savings by borrowing to build now ($k)
2027	$105,584	$57,470
2037	$131,553	$124,587
2047	$179,279	$187,899

Sabine



Bond Until	Bond Cost ($k)	Savings by borrowing to build now ($k)
2027	$29,373	$11,257
2037	$36,597	$35,288
2047	$49,875	$69,524

10 YEAR DELAY IN IMPLEMENTATION

Scenario B (Medium) 2% inflation Interest Rates as of 8/8/16

West Little Lake	$ Thousands
Construction Cost in 2017	$89,981
Interest earnings by year 10	$15,602
Deficit due to 10 year delay in construction	($57,470)

Sabine	$ Thousands
Construction Cost in 2017	$25,032
Interest earnings by year 10	$4,340
Deficit due to 10 year delay in construction	($11,257)

THE WATER INSTITUTE
OF THE GULF®

THANK YOU

Denise Reed, Ph.D. – dreed@thewaterinstitute.org
Eric White, P.E. – The Water Institute of the Gulf
Len Shabman, Ph.D. – Resources for the Future

@THEH2OINSTITUTE

301 NORTH MAIN STREET, SUITE 2000
BATON ROUGE, LA 70825

(225) 448-2813
WWW.THEWATERINSTITUTE.ORG