Long-term Integrity of Canals Lined with Geosynthetics

Adam K. Maskal, P.E., *Solmax Geosynthetics*, U.S.A.
Catrin Tarnowski, Dipl.-Ing., *Solmax Geosynthetics*, GmbH

1

1

Agenda

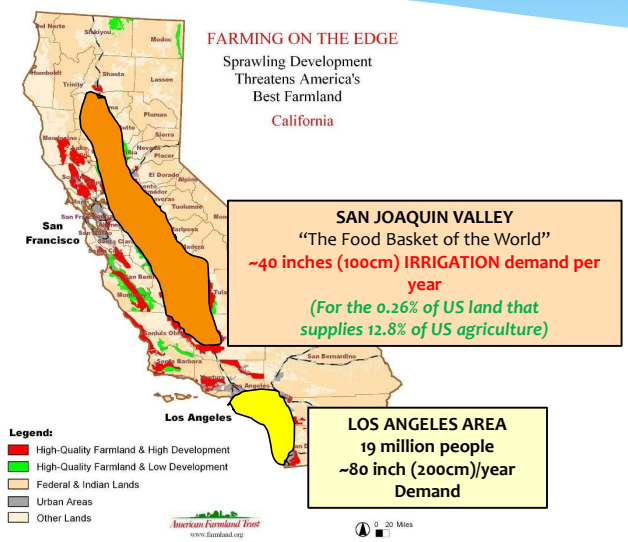
- Water in California
- Solano Irrigation District
- Putah South Canal
- Canal Liner Design Details
- The Putah Canal Today
- The Current Generation of Canals

2

Long Term Integrity of Canals Lined with Geosynthetics

WATER IN CALIFORNIA
(A CHALLENGING BALANCE)

3

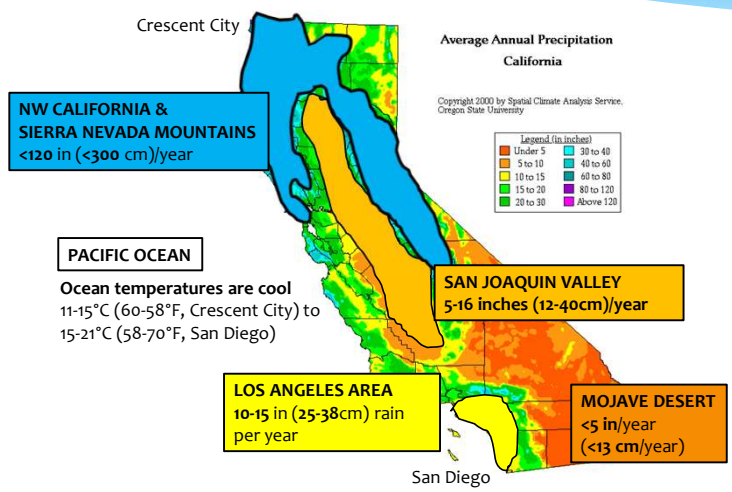


SAN JOAQUIN VALLEY
"The Food Basket of the World"
~40 inches (100cm) IRRIGATION demand per year
(For the 0.26% of US land that supplies 12.8% of US agriculture)

LOS ANGELES AREA
19 million people
~80 inch (200cm)/year Demand

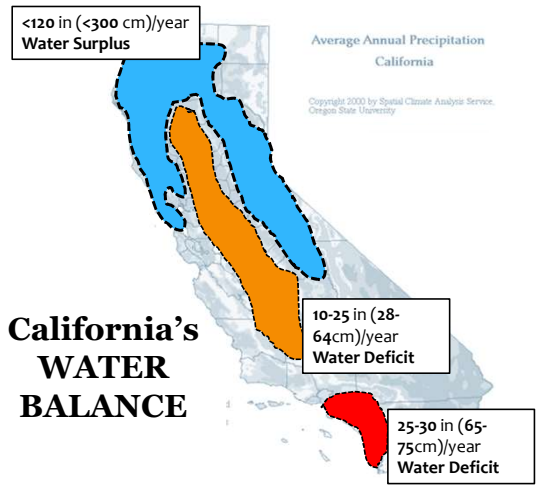
California WATER DEMAND

4

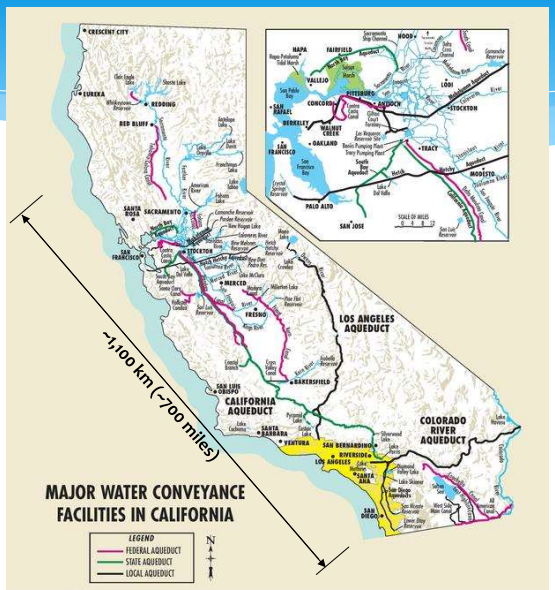


California PRECIPITATION

5



California's WATER BALANCE



California Water Conveyance

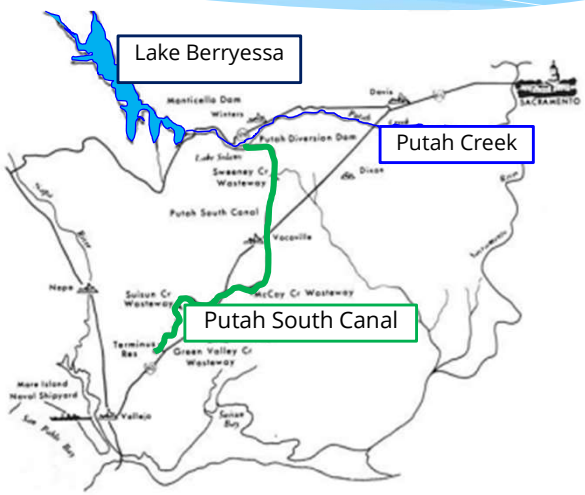
6

Long Term Integrity of Canals Lined with Geosynthetics

THE SOLANO PROJECT

7

The Solano Project



8

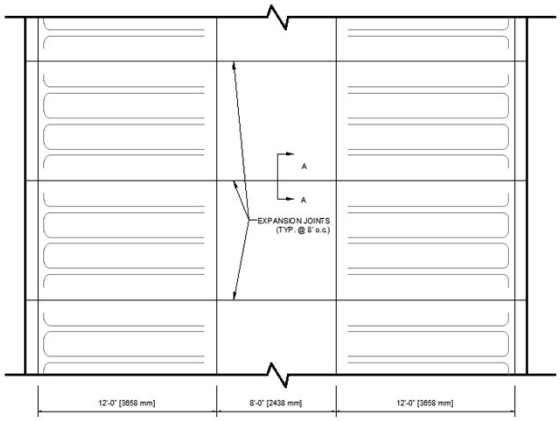
Long Term Integrity of Canals Lined with Geosynthetics

PUTAH CANAL DESIGN DETAILS

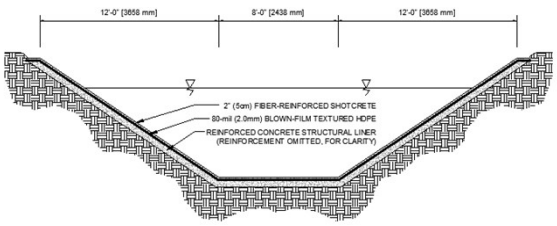
9

CANAL DESIGN

PLAN VIEW



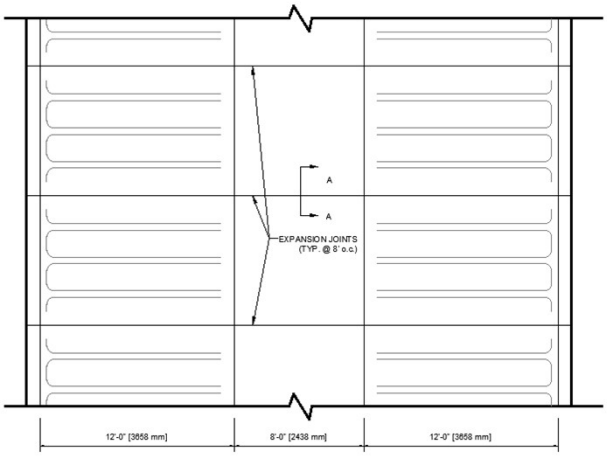
CROSS-SECTION VIEW



10

California Putah South Canal after 25 Years in Service

PLAN VIEW

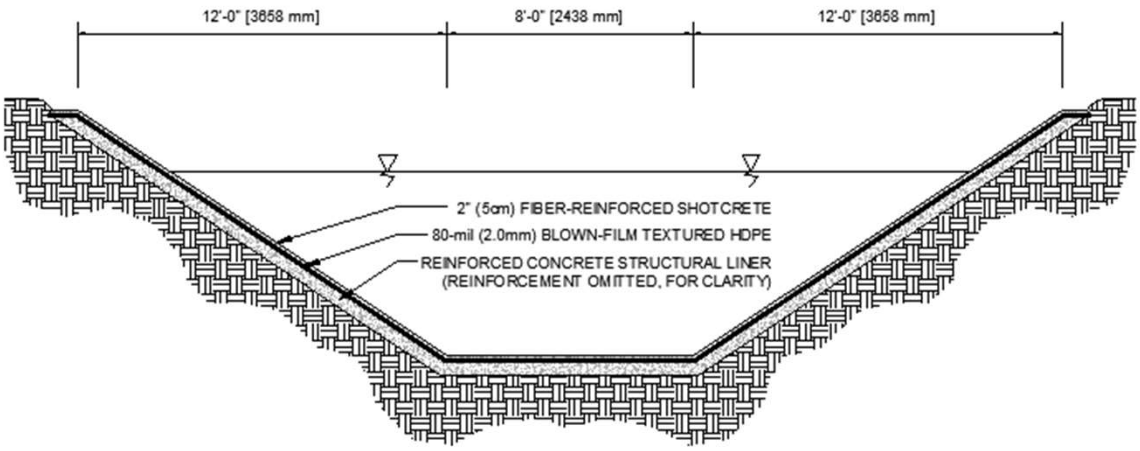


Improving the Performance of Canals with Geosynthetics – IGS Technical Committee on Hydraulics – November 15-17, 2021

11

California Putah South Canal after 25 Years in Service

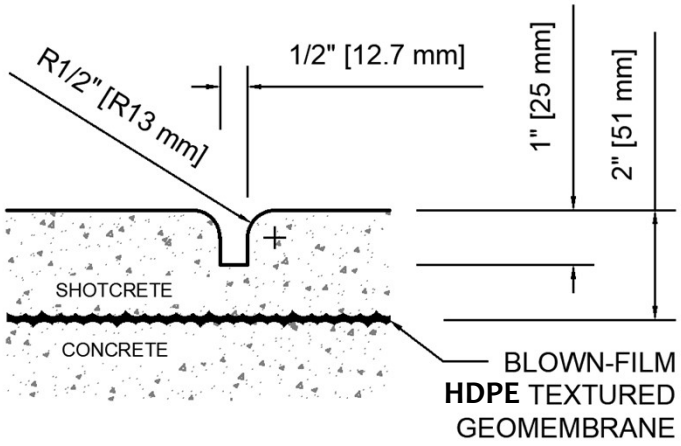
CROSS-SECTION VIEW



Improving the Performance of Canals with Geosynthetics – IGS Technical Committee on Hydraulics – November 15-17, 2021

12

EXPANSION JOINT DETAIL



13

Installation

* Installation of blown-film textured 80-mil (2.0mm HDPE) ca. 1993

14

Long Term Integrity of Canals Lined with Geosynthetics

THE PUTAH CANAL TODAY

15

Present Day

Putah South Canal Today

Expansion Joint

Panoramic View

16

Long Term Integrity of Canals Lined with Geosynthetics

LESSONS LEARNED

17

LESSONS LEARNED

1. HDPE encased in concrete has proven to be a cost-effective and lasting canal lining system;
2. A 2-inch (5cm) fiber-reinforced shotcrete
   a. Was applied directly to an HDPE geomembrane with blown-film texture on 1.5H:1V side slopes;
   b. Has withstood environmental exposure and canal flows;
3. ½-inch-wide x 1-inch deep (1cm x 2.5 cm) wet-formed expansion joints at 2.5m (8') o.c. across the width of the canal contained cracks in the shotcrete, so panels remained intact.
4. No dislodgement of the shotcrete layer was observed, and the canal remains in very serviceable condition without significant damage after 28 years in service.

18

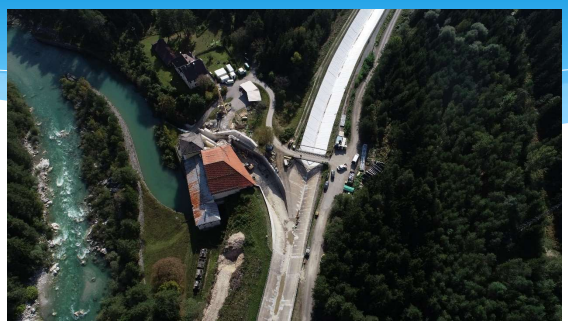
Modern Day Project

19

Modern Day Project

20

Modern Day Project



Linear Low-density Polyethylene (LLDPE) Geomembranes

- Elongation capacity to protect against punctures
- Flexibility decreases wrinkle spacing and size

Reflective White Geomembranes

- Cost-effective control of temperature changes that drive thermal expansion
- Mitigates risk of damage during concrete installation
- Ideal for challenging desert conditions
- Can be used exposed or covered

Improving the Performance of Canals with Geosynthetics – IGS Technical Committee on Hydraulics – November 15-17, 2021

21

Improving the Performance of Canals with Geosynthetics – IGS Technical Committee on Hydraulics – November 15-17, 2021

Long-term Integrity of Canals Lined with Geosynthetics

Adam K. Maskal, P.E., *Solmax Geosynthetics*, U.S.A. – amaskal@solmax.com
Catrin Tarnowski, Dipl.-Ing., *Solmax Geosynthetics*, GmbH – ctarnowski@solmax.com

22

22