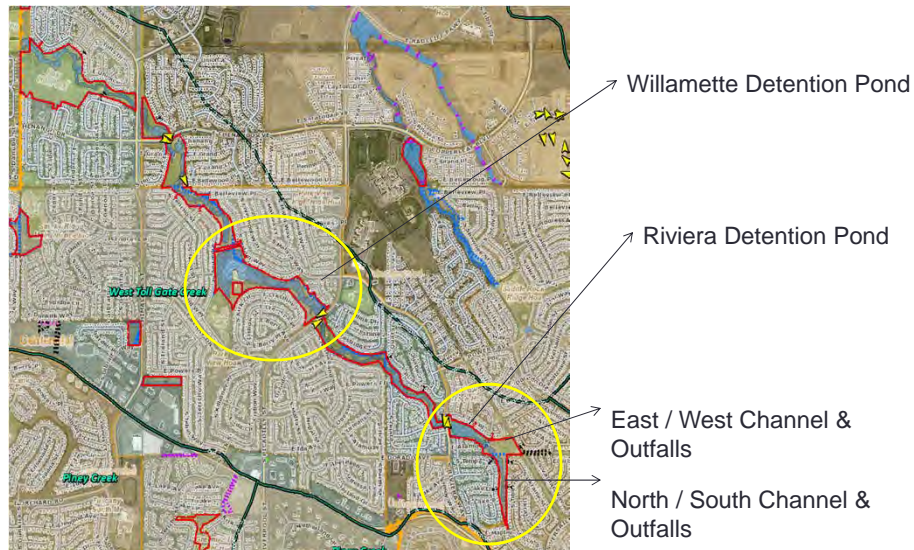


## Outfall and Channel Restoration



## West Tollgate- GIS Mapping



## West Tollgate- Google Earth History

- Channel Section from East / West

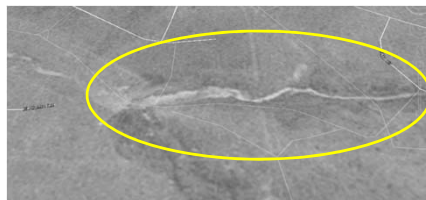


- Channel Section from North / South



## Channel Section- East to West

Channel in 1993



Channel in 1999



Channel in 2002

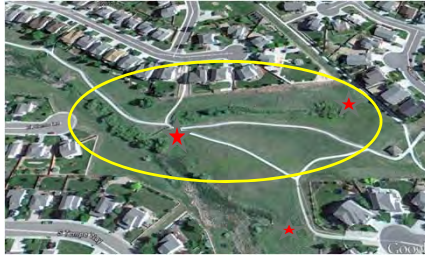


Channel in 2006



## Channel Section- East to West

Channel in 2010- trees and wetlands expanding, outfalls becoming blocked



Channel in 2015- trees continue to grow, cattails grow/die and add to biomass in channel- outfalls blocked

## Summary of Progression

- Start of development  
2002



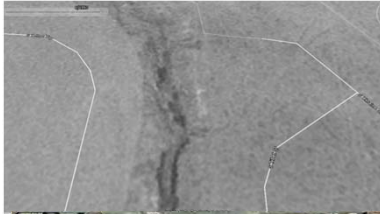
- Post  
development  
2015





## Channel Section- North / South

Channel in 1993

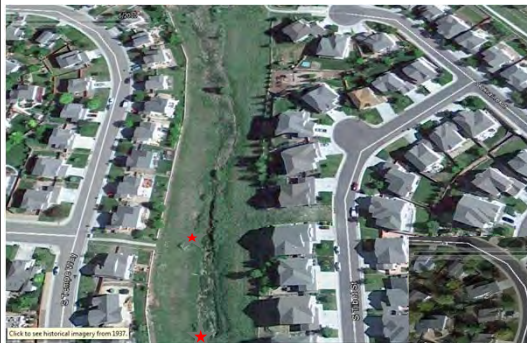


Channel in 2002



Channel in 2006- Cattails adding to bio-mass in channel, outfalls becoming blocked

## Channel- North / South



Channel in 2010- new cattails growing through last year's batch, trees becoming established

Channel in 2015- outfalls blocked, trees established, cattails expanding, capacity being compromised



## Channel Section- North / South

Access to outfalls to perform maintenance does not exist- needs to be constructed



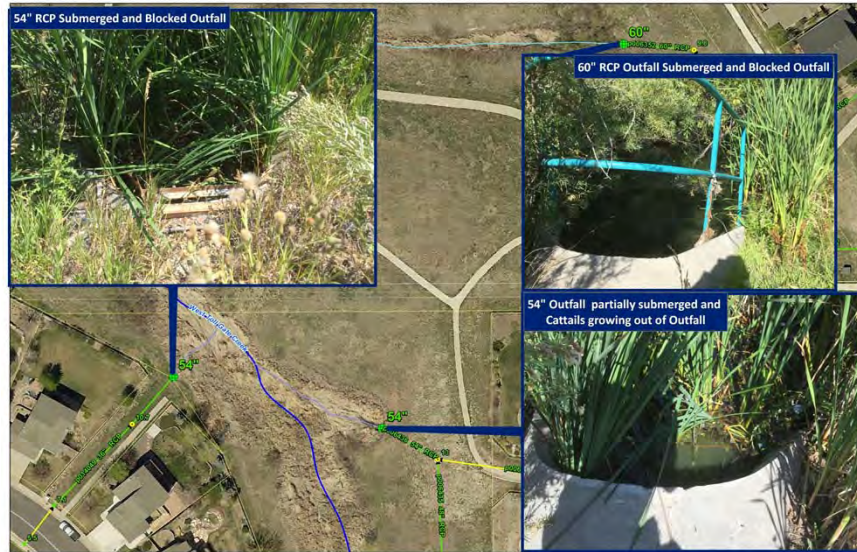
Outfalls blocked, trees and vegetation continue to expand

## West Tollgate- outfall and channel photos

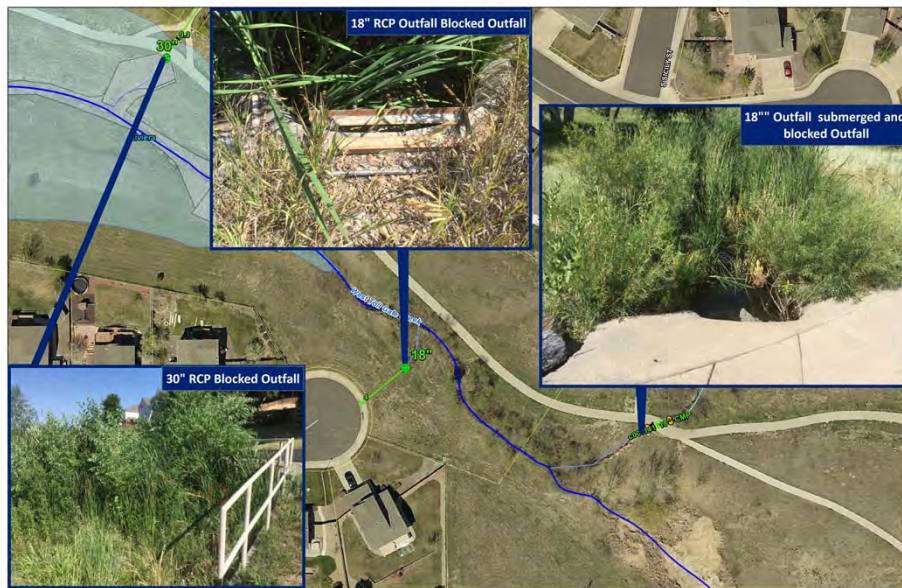




## West Tollgate- outfalls and channel photos



## West Tollgate outfalls and channel photos



## Willamette Detention Pond



Pond outlet structure

Trees adding to dense vegetation- but not yet blocking 54" outfall into pond



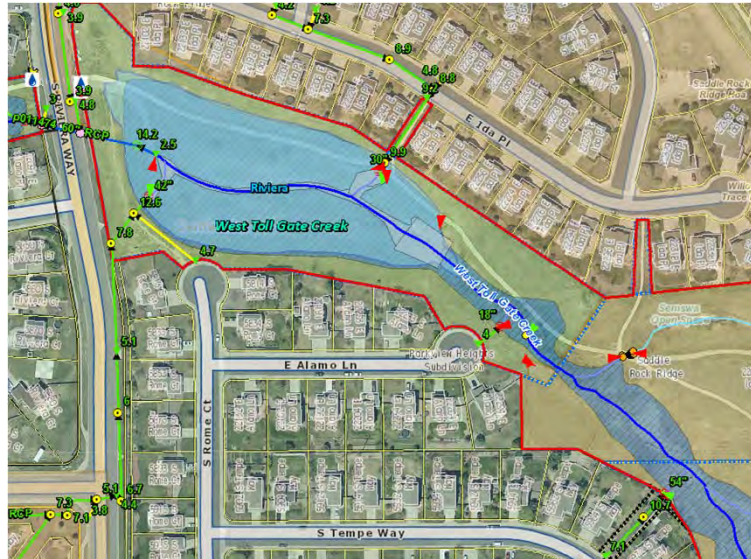
## Willamette Detention Pond- outfall



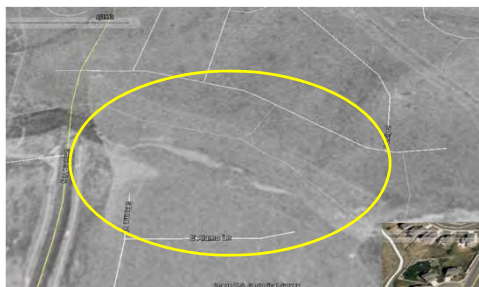
Outfall located here- railing and Russian Olive tree



## Riviera Detention Pond



## Riviera Detention Pond- Google Earth History



Future location of Riviera Detention Pond- 1993

Riviera Detention Pond- 2002  
West Toll Gate still visible,  
wetlands beginning to grow in pond





## Riviera Detention Pond- Google Earth History



2006- wetlands die off in winter, trees beginning to grow upstream

2010- growth of new cattails during the month of June, bio-mass cycle in action- new growth comes up through previous year's "crop"



## Riviera Detention Pond- Google Earth History

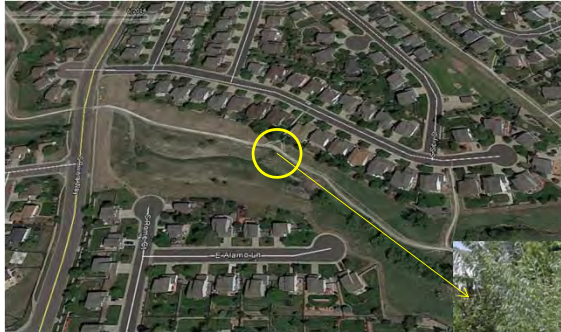


2011- SEMSWA crews remove sediment and cattails from channel- can once again see the main channel

2012- Channel is visible, but new cattails growing along banks- vegetation management- mowing and debris removal is becoming necessary



## Riviera Detention Pond- Google Earth History



2014- Continued growth of cattails in pond, outfall becoming blocked



## Riviera Detention Pond- Google Earth History




2014- One outfall is still visible, has an existing maintenance point with access, and functions as designed






# Riviera Detention Pond- outfall to West Toll Gate

Outfall draining into West Toll Gate- dense cattails with potential capacity issues



Pond outlet structure- needs some work- access is available, Nationwide Permitting under NWP 43



Pond outlet structure- needs some work- access is available, Nationwide Permitting under NWP 43

# Unnamed Creek- GIS Mapping

## Unnamed Creek- Google Earth History



Unnamed Creek 1993

Unnamed Creek- 2002,  
channel is open, no trees,  
very little wetlands

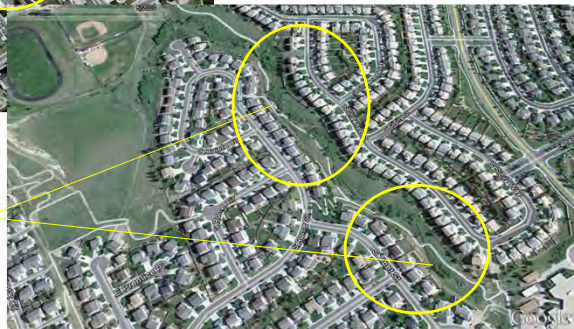


## Unnamed Creek- Google Earth History



2007- Wetlands growing and  
expanding across channel  
bottom

Trees expanding, wetlands  
expanding, can no longer see  
creek due to vegetation  
growth, outfalls becoming  
blocked





## Unnamed Creek- Google Earth History



2014- dense vegetation, well established trees in channel and out, wetlands located from top of basin to bottom

## Unnamed Creek- outfall and channel photos



## Unnamed Creek- outfall and channel photos



Dense vegetation in channel bottom, causing a debris catch at numerous locations

## Unnamed Creek- outfall and channel photos



24" outfall completely grown over and cannot be located- or can it?

24" outfall located after knocking down vegetation. Channel invert is higher than top of pipe- 30" of sediment and vegetation to be removed





## Outfall and Channel Restoration

- Questions?