Tidelands Pipeline Corridor Projects
California Resources Corporation
Prevention First 2014 • Long Beach, CA • Oct. 8, 2014 • Rick Cassinis, Sr. Facility Engineering Advisor
1960’s:
- Wells drilled vertically without regard for land use

Current:
- Wells drilled from centralized oil set aside areas
- Set aside areas connected by utility corridors
3 Directional Drills
1 Proposed
Open Cut Utility Corridor
Jack & Bore

Approx. 40 oil set aside areas
PROJECTS IMPACTING OILFIELD

- GD Bridge ($238MM)
- Middle Harbor ($193MM)
- LA Berth 200 ($7MM)
- Heim Bridge ($3MM)
CONNECTING OIL SET ASIDE AREAS

Methods:
• Horizontal Directional Drill
• Jack & Bore
• Traditional Open Cut Utility Corridors
From oil set aside area to tank farm:
• Oil gathering (corrosive)
• Water injection (corrosive)
• Wet gas (corrosive)
• Storm water
• Power
• Communications
• Road access

From tank farm to sales:
• Oil shipping (DOT)
• Dry gas distribution

Typical open cut utility corridor
Design considerations:

- No future easements
- Avoid underground obstructions
- No impact to on-going or future surface operations
- Spare casing
- Cased line for secondary containment
- HDPE lined pipe for internal corrosion protection
- Bundle must be balanced
HDPE INTERNALLY LINED PIPE

Benefits:
• Holiday free inner liner for guaranteed corrosion protection
• Cost effective option over other coatings
• Only requires standard welding and no inserts

Limitation:
• Require flange to flange pipe design
Benefits:
• Inner and outer corrosion protection
• No welding

Limitation:
• Susceptible to 3rd party damage if not encased (non-metallic)
HORIZONTAL DIRECTIONAL DRILL

<table>
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<tr>
<th>Typical drill rig</th>
<th>Pull back of pipe string</th>
<th>2,100' of 50&quot; Steel Pipe</th>
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<td>Pull head surfacing</td>
<td>Pipe bundle pullback</td>
<td>Pipe bundle arrangement</td>
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HORIZONTAL DIRECTIONAL DRILL

Environmental benefits:
- Full containment
- Avoid 3rd party line damage risk
  - During installation
  - Future construction projects

Constraints:
- Long runs w/single pipe
  - Ex. 15,000’ with 6” pipe
  - Ex. 3,000’ with 50” bundle
- Requires laydown area for pipe string
JACK & BORE INSTALLATION

Design considerations:
- DigAlert required
- 24” or larger bore diameter
- Guided directional bore
- Avoid bore pit if possible (slope)
- Mandatory for rail crossings

Environmental benefits:
- Secondary containment
- Protected against construction activities
JACK & BORE USING HDD CONCEPT

Open Cut

Jack & Bore

Casing Surfaces at B-1

Casing Surfaces at Z-1
OPEN CUT UTILITY CORRIDORS

Design considerations:

- Use Dig Alert to identify 3rd party obstructions
- Pothole to verify obstruction depth
- Internal and external coatings
- Cathodic protection
- Red concrete for conduit
- Warning tape above lines
UTILITY CORRIDORS
PREVENTION FIRST IN CONSTRUCTION

Considerations:

- Dedicated fire watch
- Welder qualification
- Qualified welding procedure
- Certified welding inspection
- Non-destructive testing (ultrasonic or X-ray)
  > Ultrasonic preferred in Port terminals
- ASME B31.4 / B31.8 design and construction
- Pressure testing in accordance with ASME standards
Pipe corrosion and leak protection

- Internal
  - Lining: FBE, cement, HDPE
  - Non-metallic pipe: Fiberspar
- External
  - Coating: FBE, 3-layer polyethylene, 3-layer polypropylene
  - Cathodic Protection:
    - Sacrificial anodes
    - Impressed current
  - Jeep testing prior to backfill
Company culture in projects

- Safety and environmental over schedule and budget

Implementation:

- Environmental and safety training for all contractors
- Daily job safety analysis
- Daily construction supervisor inspection
- Job specific safety plans
- Management audits
- Management of change process
LESSONS LEARNED - DIGALERT

Use DigAlert for engineering phase

No response does not equal no conflict

Responses do not include line depth; potholing required

Company line finders may not be aware of recently installed utilities

Approach non-steel lines with additional care

Prepare contingency plans in the event lines are damaged

LA Flood District Culvert

Long Beach Gas Dept. Line
TAKEAWAYS

Evaluate utility corridor options:
  • HDD, Jack & Bore, Open Cut

Consider:
  • Secondary containment using casings
  • HDPE liners with carbon steel pipe
  • Non-metallic pipe such as Fiberspar
  • Combine communications and power conduit
  • Utilize storm water, zero discharge

Use DigAlert aggressively
  • During engineering and construction phases
  • Potholing investigation follows DigAlert