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**Newport Beach Back Bay Storm Drain Rehabilitation
using PVC Spiral Wound Liners**

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1. ABSTRACT

The Back Bay Storm Drain Rehabilitation project is located in a pristine ecological preserve along the Newport Coast. The project required the structural repair of over 50 culverts, including preliminary exploratory condition assessment to verify the structural condition of the culverts and that the scope of work could be executed as specified.

Based on the design and constructability requirements, Sekisui's SPR EX Liners were approved for use post bid by the City of Newport Beach. SPR EX is a tight fitting lining system and does not require annular space grouting. The installation was performed by Sekisui's licensed contractor Burtech/Nuline Technologies of Encinitas, CA in conjunction with Heitkamp, Inc. of Watertown, CT.

Spiral Wound liners offered the City of Newport Beach numerous advantages for this environmentally sensitive project location. For example, Spiral Wound liners are mechanically installed and do not contain any styrene or chemicals as part of the installation process. Additionally, Spiral Wound liners can be installed in live flow conditions typically without the need for by-passing.

Most of the culvert segments had excessive ovality and deformation with some culverts having up to 20% deflection. Approximately half of the 53 culverts ranging in diameter from 12" to 24" used the Spiral Wound lining process. Further evaluation and repair methods were used on the remaining pipe segments due to hydraulic constraints.

The biggest construction challenge involved addressing tidal flows. The excess flows were diverted to maintain workable flow levels but the installation process still continued under live flow. Despite construction challenges and unusual rain events, the project was completed on schedule and under budget.

2. INTRODUCTION

After several years of extensive planning, the City of Newport Beach, CA advertised the "Back Bay Storm Drain Rehabilitation" Project in September 2014.

The Back Bay Storm Drain Rehabilitation project is located in Upper Newport Bay in the County of Orange, California in a pristine ecological reserve (see Figure 1.). This project required the structural repair and rehabilitation of 2260 feet of Corrugated Metal Pipe (CMP) storm drains ranging from 12" to 24" diameter. The project also included preliminary exploratory condition assessment to verify the structural condition of the CMP storm drains and that the

scope of work could be executed as specified. The project specifications were in accordance with “Standard Specifications for Public Works Construction”, more commonly known as the “Green Book, a regional standards publication which includes a section on trenchless pipeline rehabilitation products and methods.



Figure 1. Newport Coast Ecological Reserve

The project was competitively bid with Burtech Construction of Encinitas, California being the lowest responsive bidder. Due to the environmental and regulatory requirements involved on this project, Burtech approached the City of Newport Beach post bid with a value engineering proposal recommending the use of SPR EX PVC Spiral Wound Liners. Spiral Wound liners are manufactured by Sekisui Rib Loc of Australia, Pt. (SRLA). SPR EX is a tight fitting lining system for 8” – 42” diameter gravity pipelines. Spiral Wound liners are installed in accordance with ASTM F1741 Standard Practice for Installation of Machine Spiral Wound Poly (Vinyl Chloride) (PVC) Liner Pipe for Rehabilitation of Existing Sewers and Conduits.

Spiral Wound liners offered the City of Newport Beach numerous constructability advantages for this high visibility project. For example, Spiral Wound liners are mechanically installed and do not contain harmful chemicals or styrene as part of the installation process. Additionally, Spiral Wound liners can be installed in live flow typically without the need for bypassing. This was considered a major advantage as many of the storm drains were located in tidal areas where by-passing flows were either prohibited or were site restrictive.

With these significant advantages, the City of Newport Beach approved the use of Spiral Wound liners for the Back Bay project. Once approved, Sekisui’s construction division, Heitkamp, Inc., partnered with Burtech’s Pipeline Rehabilitation Division Nuline Technologies to perform the lining work.

3. PRE-CONSTRUCTION

Prior to commencing work, the City of Newport Beach required a detailed Water Pollution Control Plan. The report included the contractors WPCP Certification which required approval by the City Project Engineer before construction could begin. Other key Best Management Practice (BMP’s) submittals in this plan included:

1. Pollution Sources and Control Measures:
 - a. Soil Stabilization BMP’s
 - b. Water Sediment control BMP’s
 - c. Tracking Control BMP’s
 - d. Wind Erosion Control BMP’s
2. Construction Site Management:
 - a. Non-Storm Water Management BMP’s

- b. Waste Management and Materials Pollution BMP's
- 3. Water Pollution Control Drawings
- 4. Construction BMP Maintenance, Inspection and Repair
- 5. Training
- 6. Amendments
- 7. Reporting:
 - a. Discharge Reporting
- 8. WPCP Attachments:
 - a. Water Pollution Control Documents
 - b. Maintenance, Inspection, and Repair of Construction Site BMP's
 - c. Storm Water Quality Construction Site Inspection Checklist
 - d. Amendments
 - e. Notice of Discharge

4. REGULATORY

Existing drainage facilities consisted of gutters, cross gutters, curbs, inlets and drop inlets. Existing drainage facilities directly discharged into a body of water that is listed as impaired due to sediment/siltation pursuant to Clean Water Act, Section 303(d).

Additionally, there were stringent requirements by the State of California, Department of Fish and Game as per Notification 1600-2005-0562-R5 – Lake or Streambed Alteration, an agreement between the City of Newport Beach, CA and regulatory agency. Based on the proposed scope of work, the Department of Fish and Game determined that any construction operations may adversely affect the existing fish and wildlife with thin the San Diego Creek/Upper Newport Bay including numerous birds such as the great blue heron, common egret, mallard duck; mammals as well as riparian vegetation which provides habitats for these species in the area. The permit summarized in detail the project description including allowable and restricted site access alterations in order to perform work, restrictions on site access due to biological surveys, other time restrictions and site mitigation requirements including vegetation removal, habitat protection and equipment access restrictions. The agreement also covered pollution, sedimentation and litter disposal requirements and procedures. All these restrictions and regulatory guidelines had a significant impact on the contractor's construction schedule, project sequencing and rehabilitation/repair method selection.

5. PROJECT SITE CONDITIONS

The Back Bay project presented numerous mobilization challenges. Site access was limited due to regulatory restrictions as well as narrow roadways and limited off road parking and staging areas. During the day, the preserve is active with sport enthusiasts, school and scouting groups as well as environmentalists conducting a variety of tests and evaluations. All work in the tidal areas had to be done during day light hours when the park was open to the public so construction site safety was critical to the success of this project (see Figure 2.).



Figure 2. Project Site Conditions

Additionally, the construction work was scheduled from December 1st, 2014 to May 7th, 2015. As the rainy season is from October 1st to April 30th, selected BMP's were employed accordingly. Furthermore, scheduling of construction activities had to take into consideration daily tidal flows as per the graph below (see Figure 3).

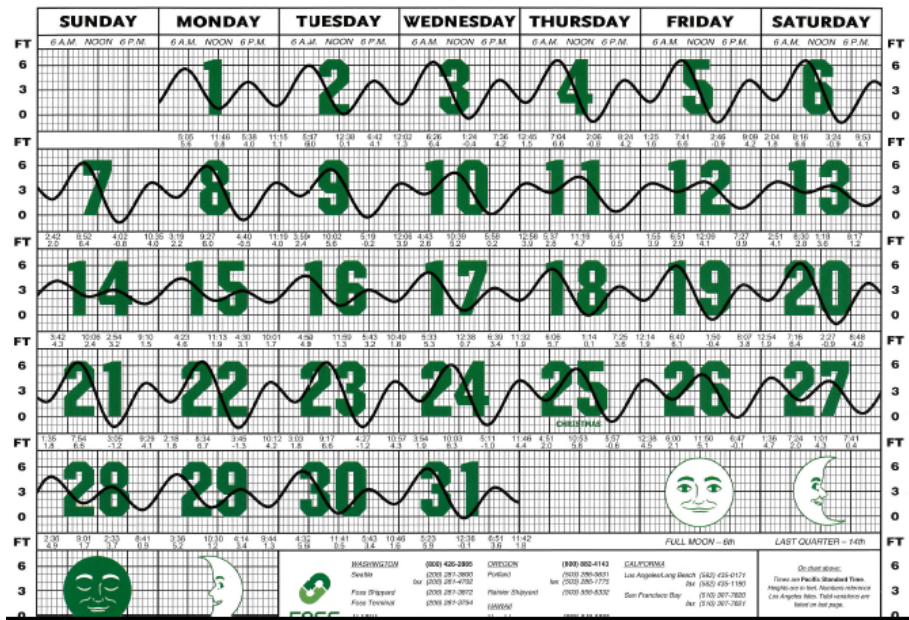


Figure 3. Tidal Flow Chart – Newport Back Bay – Provided by the City of Newport Beach, CA

6. CONSTRUCTION CHALLENGES

One of the major challenges the contractor faced on this project was the majority of the storm system was under constant tidal flows. However, protecting the environment was also a key concern. From the contractor's perspective, it was important to express their concerns about the use of rehabilitation methods containing styrene due to their potential for site contamination and long term impact on the environment and wildlife. By offering a value engineering proposal to the city, not only was the contractor able to save the City of Newport Beach money, they were also able to execute the scope of work on this extremely difficult project with "zero" environmental impact (see Figure 4).



Figure 4 – Tidal Condition

7. PROJECT EXECUTION

Further evaluation and exploratory site investigation determined which repair or rehabilitation methods were used for specific locations. By approaching this project to cause “zero” negative environmental impact to the natural habitat, the contractor chose those specific segments that were going to have an immediate impact.

Due to the constant tidal influences, the contractor found that utilizing the Spiral Wound lining system in the tidal areas gave them greater control within the allowable working time frames (see Figure 5). The remaining culvert segments utilized a combination of spot repairs, CIPP and dig and replace methods. By utilizing Spiral Wound liners, the contractor could work through the tidal changes, improve construction efficiencies and in the end prevent any contaminants from entering the Newport Back Bay (see Figures 6 and 7).



Figure 5 - Project Execution



Figure 6. Pre-Rehabilitation – Arizona Crossing - Severe Pipe Deformation



Figure 7. Post Installation Using Spiral Wound Liners

8. CONCLUSION

Despite construction challenges and unusual rain events in December 2014 and January 2015, the project finished on schedule and under budget. Peter Tauscher, PE, City of Newport Beach said, "...after checking references and meeting with Sekisui we decided to give it a try. It worked well and saved the City money".

By having a greater selection of approved trenchless rehabilitation methods, the contractor was able to utilize the lining method that best met the design and constructability challenges of the project. As a result, the contractor was able to deliver the project in a timely manner and limit exposure in these highly sensitive work areas as well as save the city money.

9. REFERENCES

Tauscher, Peter – City of Newport Beach, CA – “Back Bay Drive Storm Drain Rehabilitation Project” Standard Specifications and Plans - Project C-5284”

Burtech/Nuline Technologies - “Water Pollution Control Plan – Back Bay Drive Rehabilitation Project Contract 5284”

California Department of Fish and Game – South Coast Region San Diego, CA – Lake or Streambed Alteration Agreement Notification No. 1600-2005-0562-R5

Building News Inc. - “Standard Specifications for Public Works Construction” “Green Book”

Building News Inc. “W.A.T.C.H. Manual

ASTM F1741-08(2016), Standard Practice for Installation of Machine Spiral Wound Poly (Vinyl Chloride) (PVC) Liner Pipe for Rehabilitation of Existing Sewers and Conduits, ASTM International, West Conshohocken, PA, 2016, www.astm.org