

# Janney Run Remedial Feasibility Analysis - ExxonMobil, Baltimore Maryland

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Category	Technology	General Description of Technology	Site-Specific Benefits	Site-Specific Concerns	Useful Life	Will Technology Remediate LNAPL Source Areas?	Will Technology Improve Structural Strength?	Project Area Technology May be Feasible?				Recommend Pilot Test Technology to Site Specific Conditions?		
								JR Floor/Sides	JR Step	JR RR Track Area	54"			
Interior	"Insituform" Cured in Place (CIPP)	A resin-saturated felt tube made of polyester is inverted or pulled into a damaged pipe. Next, hot water or steam is used to cure the resin and form a tight-fitting, joint less and corrosion-resistant replacement pipe.	<ul style="list-style-type: none"> <li>No joints for infiltration of seeps</li> <li>Allows for an increase in flow capacity (minimizes friction losses)</li> <li>Addresses bottom LNAPL seeps</li> <li>High short term effectiveness</li> <li>Can manually apply coating to manholes and for minor repairs</li> <li>Resin material meets ASTM F1216 standard</li> </ul>	<ul style="list-style-type: none"> <li>Implementation difficulties - typically used on round pipes, installation difficulties associated with square installations</li> <li>Leading CIPP manufacturer does not recommend their product on box culverts or pipes with diameter greater than 96", therefore the technology will not be feasible for Janney Run</li> <li>Potential bonding issues</li> <li>Long term effectiveness unknown ( technology has only been used for ~15 yrs)</li> <li>Potentially requires a point excavation of an area</li> <li>Safety issues associated with hot water and steam in a confined space</li> <li>Would require a temporary bypass of storm water</li> <li>Confined space entry</li> <li>Water used for hardening will need to be collected and disposed of if the City will not accept it as storm water</li> <li>Debris may have an effect on coating / could possibly cause damage</li> <li>Would require replacement of manholes with concrete or HDPE (coating does not adhere to brick)</li> </ul>	0-5 yrs none; 5-10 yrs annual inspections; 10-20 yrs minor repairs; 20-30 yrs may need to reinstall. Assumes 10 yr warranty from installer.	No	Yes	No	No	No	Yes	No - it's a Presumptive Remedy		
	Interior Panel	Sectional pieces of PVC are used for flat sections and spiral sections are used for circular profiles to create a pipe in place. The interstitial space is sealed with cement/flash grout. Fiberglass panels are also available.	<ul style="list-style-type: none"> <li>No excavation required</li> <li>Addresses bottom seeps</li> <li>Can be used on large pipes</li> <li>May be applicable to Janney Run</li> </ul>	<ul style="list-style-type: none"> <li>Seeps may need to be sealed prior to initiating work</li> <li>Unsealed seeps likely to create voids which may become potential leak pathways</li> <li>Small voids (&lt;6" diameter) are difficult to find and therefore may become future seeps</li> <li>Would need to be reinforced to stand up to 15' of head</li> </ul>	0-5 years none; 5-10 yrs annual inspections; 10-20 yrs minor repairs; 20-30 yrs may need to reinstall panels. Assumes 10 year warranty from installer.	No	No	Yes	Yes	Yes	No	May pilot test in a specific location if applicable		
	Coating (interior)	Physically spray a coating onto the interior surface of the pipe. New polyurea coatings have greater flexibility and are odorless compared to traditional polyurethane coatings.	<ul style="list-style-type: none"> <li>No excavation required</li> <li>Addresses bottom seepage into the structure</li> <li>Can be used on large pipes (up to 21" in diameter), may be applicable to Janney Run</li> <li>Flexibility of the coating provides greater resistance to cracking</li> <li>Are available in coatings that cure quickly with full protective capacity within 24 hours</li> <li>Odorless coatings are available that do not contain VOC's</li> </ul>	<ul style="list-style-type: none"> <li>Spray lining materials have the potential for releasing solvents and residues</li> <li>Requires correct surface preparation and cleaning in advance of application</li> <li>Confined space entry</li> <li>Would require a temporary bypass of storm water</li> <li>Safety issues associated with confined space while using cleaning agents for surface preparation and while spray applying coating</li> <li>Would likely have to modify the floor of Janney Run to get the coating to adhere</li> <li>Would probably not adhere to the step area due to structural issues</li> <li>Structural conditions (condition of concrete) need to be addressed throughout Janney Run for the coating to adhere</li> </ul>	0-5 yrs annual inspections; 5-10 yrs minor repairs; 10-20 years reapply coating. Assumes 10 yr warranty from installer.	No	No	Yes	No	Yes	Yes	Yes		
	Pipe sleeves	Insert a round pipe into the existing culvert and grout ancillary space.	<ul style="list-style-type: none"> <li>Grout between original pipe and new pipe will serve as a barrier to seepage</li> <li>Will provide long term effectiveness similar to or greater than a full replacement</li> <li>Can be used on pipes up to 158"</li> <li>Little maintenance required</li> <li>Addresses bottom seepage into the structure</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable due to reduction in flow capacity of culvert</li> <li>Would have to cut multiple access points for insertion pit</li> <li>Will result in decreased flow capacity of entire system due to decrease in pipe size</li> <li>Would require a pump around during installation</li> <li>Would need to excavate and remove top of existing box culvert to insert pipe</li> </ul>	If replace in a contaminated area with an impermeable barrier, lifespan of 30 years with annual inspections.	No	No	No	No	No	No	No	No	
	Flood grouting	A pipe is flooded with one component of a two part grout, pressurized to force the material into the voids, and then vacuumed out. The process is repeated with the second component of the two part grout to harden that grout in the voids.	<ul style="list-style-type: none"> <li>No decrease in pipe capacity</li> <li>Addresses bottom seepage into the structure</li> </ul>	<ul style="list-style-type: none"> <li>Not used on pipes of this size; may not be feasible due to volume of grout required</li> <li>Would require on going maintenance</li> </ul>	20+ years, no maintenance, annual inspections after 5 years	No	No	No	No	No	No	No	No	No
	Grouting inside of pipe	Identified infiltration locations are manually grouted from inside the pipe.	<ul style="list-style-type: none"> <li>Addresses bottom seepage into the structure</li> <li>Easy to implement compared to other alternatives</li> <li>No decrease in pipe capacity</li> </ul>	<ul style="list-style-type: none"> <li>Confined space entry</li> <li>Not effective short term or long term</li> <li>Requires constant repairs</li> </ul>	Required annually - not a permanent solution	No	No	No	No	No	No	No	No	No
Exterior	Jet Grouting	Jet Grouting injects grout at high pressure and velocity, destroying the soil structure and mixing grout and soil to form a homogeneous mass.	<ul style="list-style-type: none"> <li>Restricts groundwater flow around exterior of pipe</li> <li>May address soils between the bottom of Janney Run and the Arundel formation.</li> </ul>	<ul style="list-style-type: none"> <li>Potential installation difficulties associated with Janney Run due to proximity of RR tracks</li> <li>Proximity of RR tracks may shorten life span due to the force of the RR contributing to cracking</li> <li>Defects in barrier are difficult to determine during installation</li> <li>A large amount of wastes are generated</li> <li>Pressure injection could damage culvert and / or the railroad tracks, and could push seeps and contamination into the culvert</li> <li>May not be able to seal small voids between the Janney Run and Arundel.</li> </ul>	20+ years, no maintenance, annual inspections after 5 years	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	Coating (exterior)	Expose exterior surface of pipe and physically spray a coating onto the exterior surface of the pipe.	<ul style="list-style-type: none"> <li>Would not require confined space entry</li> <li>Could apply a thick coating without reducing flow capacity</li> <li>No short term maintenance</li> <li>Would allow for excavation of contaminated soil around the top and sides of the culvert but only the top half of the 54"</li> </ul>	<ul style="list-style-type: none"> <li>Extremely difficult / impossible to access all exterior surfaces of pipe</li> <li>Coating the exterior will not address bottom seepage since coating the underside of pipe is not technically feasible</li> <li>Would need to bypass system during installation</li> <li>Would need to prepare the surface of the pipe for coating to adhere</li> <li>Unknown how the coating would hold up to LNAPL</li> <li>Excavation required</li> <li>May require sheeting on RR side if not enough room to lay back sidewall of excavation</li> <li>Need to dewater and handle / treat water during excavation</li> <li>Not cost effective for the 54" since would only be able to uncover the top half without jeopardizing the integrity of the pipe</li> </ul>	20+ years, no maintenance	No	No	No	No	No	No	No	No	
	Slurry Wall, Sheet Pile	Individual external approaches which may be applicable to the sides of the culvert or the 54-inch. Slurry wall involves digging a trench and replacing soils with cement/bentonite slurry. Sheet pile is completed by driving steel sheets into the subsurface to create a barrier	<ul style="list-style-type: none"> <li>Each approach may have individual benefits for a specific location</li> </ul>	<ul style="list-style-type: none"> <li>Each approach has its own site-specific concerns and may be hindered by obstructions. Each approach will not address the floor seeps.</li> </ul>	Both technologies would likely require minor repairs at 10 years	No	No	No	No	No	No	No	No	May pilot test in a specific location if applicable
Other	Replacement	Complete replacement of Janney Run and the 54" storm sewer. There are several options for the replacement: Option 1a - replace in the same area with standard piping; Option 1b - replace in the same area with sealed or impermeable coated piping; Option 2a - replace in adjacent area with standard piping; Option 2b - replace in adjacent area with sealed or impermeable coated piping. Would likely have to split the flow into multiple pipes to replace the section under the railroad.	<ul style="list-style-type: none"> <li>Majority of work can be completed while the existing system remains operational if installed in an adjacent parallel location</li> <li>Could move location to a less contaminated area to increase life and to decrease maintenance</li> <li>Minimizes leaks for the longest period of time if imbedded in an impermeable material</li> <li>Low initial maintenance</li> <li>Addresses bottom seepage into the structure</li> <li>Proven track record with current well accepted technology</li> <li>Could excavate source material depending on location of replacement pipe</li> </ul>	<ul style="list-style-type: none"> <li>Need to abandon existing system if do not install in place</li> <li>Obstructions along new alignment will be significant</li> <li>Excavation required; will generate large amounts of contaminated soils</li> <li>Effectiveness may decrease as pipe deteriorates, with seepage eventually becoming a problem</li> <li>Safety issues associated with trenching for installation</li> <li>May require long term agreements depending on location of sewer and agreement with the City</li> <li>Land issues associated with installation, will require most disruption to properties</li> <li>Would require pump around if installed in place</li> <li>Could require an increase in pipe size and would potentially require resizing of the rest of the sewer system down gradient</li> <li>Will likely have to jack &amp; bore under CSX. If replace step area, will likely require multiple new pipes installed under the RR to get the equivalent flow</li> <li>Need to dewater and handle / treat water during excavation</li> </ul>	If replace in a contaminated area with no impermeable barrier, lifespan of 10 years before annual sealing of cracks is required. If replace in a none contaminated area with no impermeable barrier, lifespan of 30 years with no maintenance. If replace in a contaminated area with an impermeable barrier, lifespan of 30 years with annual inspections.	Yes - if excavation is feasible	Yes - can be engineered	Yes	Yes	Yes - can be engineered	Yes	No - it's a Presumptive Remedy		
	Drawdown and Treat	Install pumping wells and a biological treatment system to treat contaminated groundwater.	<ul style="list-style-type: none"> <li>Long term solution</li> <li>Addresses the contamination and minimizes seepage</li> <li>Would not need to handle the flow during installation (no pump around required)</li> <li>Addresses bottom seepage into the structure</li> </ul>	<ul style="list-style-type: none"> <li>Treatment process is very expensive to maintain and operate</li> <li>Requires land for treatment system operations</li> <li>High flow rate will require a large treatment system (deeper you go more water)</li> <li>LNAPL will require biological treatment which requires high maintenance</li> <li>Will require pumping long term with no end point</li> <li>Pump test to determine radius of influence (ROI) and a hydrogeological study required to design recovery system</li> <li>Would generate large amounts of waste due to sludge generation</li> <li>Extreme variation of conditions could complicate operations</li> <li>Would have to meet other parameters for water discharge in addition to treatment of LNAPL</li> </ul>	High maintenance required to operate treatment plant, required indefinitely	No	No	Yes	Yes	Yes	Yes	No		
	Open Lined Trench	Trapezoidal lined open trench with rip rap. Liner would be HDPE or similar material. The trench could be installed in the current Janney Run location or in an adjacent location.	<ul style="list-style-type: none"> <li>Easily accessed for maintenance and visual inspection</li> <li>High resistance to seeps</li> <li>Could be relocated onto ExxonMobil property to minimize access and property issues.</li> <li>Low maintenance</li> <li>Could allow for excavation of contaminated soils</li> </ul>	<ul style="list-style-type: none"> <li>May not be accepted by the City (safety/liability issue)</li> <li>May need additional land to lay back slope, may not be able to install in current location due to proximity of RR tracks</li> <li>Would require permanent abandonment of existing system or collect product if not abandoned</li> <li>Would require pump around if replaced in place, need to dewater and handle / treat water during excavation</li> <li>Only applicable south of railroad tracks</li> <li>Would generate large amount of soil if installed in new area</li> <li>Would likely only be feasible on ExxonMobil owned property - would need City approval on City owned land.</li> <li>Would not be applicable for the 54" sewer</li> </ul>	30 years, visual inspections for sheens, minor repairs of rip rap	No	No	Yes (South of RR Tracks only)	No	No	No	No	No	
	Pump Around	Installation of a wet well and storm water conveyance pumping system to pump storm water from an upstream location, around the segment of Janney Run to bypass storm water, to a downstream location.	<ul style="list-style-type: none"> <li>By-pass contaminated area all together by abandoning existing system</li> <li>Recontamination is unlikely due to abandonment of the system</li> <li>Addresses bottom seepage into the structure</li> <li>High long term effectiveness</li> </ul>	<ul style="list-style-type: none"> <li>Will require a long term maintenance agreement with the City and long term maintenance fees</li> <li>Will require land upstream that XOM doesn't own for the pump station, the land will ultimately need to be taken over by the City</li> <li>Difficult to implement, requires agreements with the City</li> <li>In the event of flooding, emergency back-up will be required</li> <li>System will require back up power</li> <li>Requires debris handling and disposal system</li> <li>Greatest liability of alternatives because of exposure to flooding, equipment failure, debris, etc</li> <li>Would need to maintain the existing system for flood protection which would require collection and treatment in the current system</li> <li>Would need to abandon existing system if did not maintain it for back up</li> </ul>	N/A	No	No	Yes	Yes	Yes	Yes	No		