Berks County Pennsylvania
Colebrookdale Railroad

Feasibility of Rail Transportation of Landfill Ash

Final Report

Submitted by:

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May 8, 2018

Executive Summary

Stone Consulting, Inc., was retained by the Redevelopment Authority of the County of Berks and the Colebrookdale Railroad Preservation Trust to examine the feasibility of hauling ash via rail from the Covanta generating plant in Chester, Delaware County, to Delaware County's Rolling Hills Landfill in Earl Township, Berks County. Currently the ash is shipped via open-top dump truck.

The quantity of ash shipped from Covanta to the Rolling Hills Landfill is significant; in 2017, Delaware County alone shipped 414,159.82 tons--representing 18,426 truck loads--from Covanta to the landfill. That equates to 70 truck trips per day, Monday through Saturday. Currently the shipping route uses local roads in the City of Chester, I-95, I-476, I-76, US-422, PA-100, PA-73, and local roads in Earl Township. As of April 2018, the cost to ship per truck is approximately $13.39-$14 per ton depending on monthly fuel surcharge rates.

Our study determined that rail is a viable option to transport ash from Covanta. The Colebrookdale Railroad, owned by the Berks County Redevelopment Authority and operated as the common-carrier Eastern Berks Gateway Railroad, is the most viable rail routing on the Berks County end. Norfolk Southern serves Covanta and interchanges with the Colebrookdale Railroad in Pottstown. Importantly, Norfolk Southern is willing to modify its service patterns to make the move at a more efficient process than would otherwise be possible using its current method of serving the Colebrookdale Railroad.

Infrastructure investments required by the move include siding tracks at both origin and destination points, upgrading of the Colebrookdale's physical plant to accommodate 286-ton carloads, a transload site to move the containers from the train to trucks for the last small portion of their trip to the landfill, and modest facilities for railcar and locomotive maintenance. The aforementioned improvements have the incidental public policy benefits of (1) giving Covanta rail access for any and all of its moves (even beyond those destined for Berks County) and (2) connecting the Colebrookdale with PA-100 to eliminate the need for the railroad's freight customers to bring trucks into downtown Boyertown for transloading.

The economic impact of bringing the ash into Berks County by rail are large in scale and duration. The environmental benefits of switching to rail will ameliorate concerns raised by those living along current truck routes in both counties. The move will utilize sealed containers, meaning the ash will not be exposed to the environment until it reaches its destination at the landfill, eliminating the pollution concerns posed by the open-top truck transport currently in place. Rail routing will remove the trucks from populated centers in Chester and downtown Boyertown. Rail routing also fits nearly with PennDOT and USDOT policy to alleviate congestion and wear from the most important corridors in the region. This is significant because it means both federal and state money is likely to be available to cover infrastructure investments required for the rail move.

In their absence, the cost to ship via rail will be at least $24.28 per ton, which is approximately $11. more per ton than the truck rate. We suspect the cost will be slightly higher because of certain roadway improvements that may be needed along the route from the transload site to the landfill. However, there may be some malleably in Norfolk Southern's portion of the rate, meaning costs could be reduced slightly.

A rather substantial loan will be required to finance needed infrastructure improvements. We believe it is likely that infrastructure grants could be obtained over time to eliminate that loan. While grant funding is never guaranteed, the amount of grant money available is substantial. Grant monies require a match and will take time to get. Logical next steps include conversations with PennDOT and the USDOT to assess timeline for seeking grant funding and the Federal Railroad Administration and other lenders to assess viability for loan funding. Our experience indicates the lead time required for such funding, and the process of implementing the infrastructure and service improvements required for this move, mean that it will take at least 24-36 months to switch from the current service model to rail.

Study Approach

Stone Consulting was requested to revisit the potential of moving the incinerator ash generated from the Covanta facility in Chester (Marcus Hook) destined for the Rolling Hills Landfill by rail, instead of an all-truck routing that currently operates directly through Boyertown.

This potential was initially investigated in 2008-2010 during the purchase of the railroad by Berks County. Since that time, various attempts have been made to use a rail approach instead of trucking. These initial attempts did not result in any substantive progress from Covanta. At that time this was regarded as the single largest revenue opportunity for the railroad, and also the largest potential benefit to the Boyertown community if the rail line could be used to reduce truck traffic.

In 2014, the County of Berks transferred the Colebrookdale Spur Railroad to the Berks County Redevelopment Authority (BCRA). Subsequent to the transfer, the Authority entered into a lease and operating agreement with the Eastern Berks Gateway Railroad Company (EBGR). The company is a common carrier railroad wholly owned by the Colebrookdale Railroad Preservation Trust.

While the destination landfill is only six miles from the railhead in Boyertown via the Colebrookdale Railroad, that rail link only covers the first eight rail miles to Pottstown. The majority of the distance (Pottstown to Chester) is owned or controlled by Norfolk Southern, which also has freight operating rights over portions of the Amtrak Northeast Corridor. This section totals over 55 miles for an approximate rail distance of 62 miles. That is critically important as it demonstrates that rates and operational efficiency are controlled by Norfolk Southern, not the Colebrookdale railroad.

Finally, within Chester itself, NS has operating rights to, but does not own, the Marcus Hook rail yard nearly adjacent to the Covanta facility. The joint ownership ("Conrail Shared Assets") railroad between NS and CSX owns the yard, and the local industrial tracks feeding north and south. This is actually a legally-separate entity just like another railroad, and in this case, may mean a third legal railroad is involved depending on the exact loading location of the cars. That can directly impact cost.

Current Situation

The activity and volume of the Covanta ash disposal contract into the Rolling Hills Landfill is significant, to say the least. In December 2017, data supplied to Stone Consulting showed the following:

- Total Delaware County Ash: 35,868.77 tons
- Avg./day 1574.75 tons (includes Saturday)
- Avg. loads / day 70
- Year to date 414,159.82 tons
- Total loads 18,426

- Average tons per ash load 22.47

Equipment used to move the ash appears to be tri-axle dump trucks with covers; 17 foot x 8 foot bed, approximately 5 foot depth (although that is the most subject dimension); maximum 25 cu. Yd. of volume. Actual ash density figures have not been supplied.

The 70 loads per day are routed to the landfill via PA Rt. 100 to Rt. 73, and Rt. 73 west to the landfill. This places the 70 loads (and the 70 empties) through downtown Boyertown for 140 truck moves per day.

The sheer volume of material and truck counts elevates this to a rail solution, and also has enough benefit for truck traffic removal to qualify the project for Pennsylvania Rail Freight assistance grants for capital improvements.

Previous approach

The 2008-10 investigation made some basic assumptions about the transportation of ash by rail:

Covanta end:

- Construction of either a direct conveyor, or a pit/conveyor for hopper car loading.
- Construction of an additional rail siding near or on the conveyor site
- Use of either NS-supplied covered hoppers or specialized dirt hoppers; with roofs, but bottom hopper discharge
- Rail transport via NS/Colebrookdale; interchange at Colebrookdale

Boyertown end:

- Construction of a dump pit and conveyor to transfer ash from railcar to truck
- Construction of additional rail siding and car storage track near Boyertown
- Final truck transport to Rolling Hills Landfill over existing routes

Rates were requested from NS, and evaluated. While total rates were 'close' to the trucking cost at that time, they were not marginally less. At that time, total volumes were not completely known; the actual volumes have proven to be significantly higher.

The significant problem with this approach, from a community and Covanta standpoint, was the handling of the ash four times – loading at Covanta (or a new conveyor), loading loose ash to a railcar. None of these were included in their DEP permit. At Boyertown, the prospect of loose material transfer from railcar to truck automatically raised dust and contamination concerns.

In addition, the Boyertown community raised concerns about the location of the transload site, and the potential traffic impacts. Simply moving the activity to Boyertown, and still trucking it through the center of town, was not a marginal improvement. Given this situation, and no dramatic decrease in cost, the concept was shelved.

What has changed?

Since 2010, several significant developments have happened that make the concept worth reinvestigating.

- Traffic complaints within Boyertown have significantly increased due to truck traffic, leading to local TV and news reports over the region.
- The Eastern Berks Gateway is a functioning and operational shortline/excursion railroad, with available diesel locomotives capable of moving a longer train of cars. However, it needs more freight traffic to justify its long-term sustainability.
- The Berks County Redevelopment Authority obtained a Rail Freight Capital Grant for additional freight improvements, including, but not limited to, additional track construction.
- Norfolk Southern's "Waste Line Express" for Roanoke – a 30-miles run that had required the construction of a 4.5 mile new branch for direct delivery of trash to the landfill – finished several years of operation but NS increases rates – primarily due to increased equipment supply disputes.
- Third-party logistics suppliers now have available cars and containers available for lease with features and capabilities that were unavailable ten years ago. The successful intermodal movement of contaminated earth for construction and environmental remediation sites has created an entirely new service industry.

A new approach?

While the original concept of using rail covered hoppers plus conveyor loading and unloading has not been abandoned and deserves to be reinvestigated, there are now alternatives that can address many of the issues that emerged in the original investigation.

Covanta issues and update:

Costs and issues to Covanta are primary. As they are absorbing the existing costs of ash transportation to the Rolling Hills Landfill, they are focused on that issue. While they are willing to at least discuss alternative transportation options to address the truck traffic concerns, they have another significant issue in the fact that the DEP permitting process for the ash handling is very specific – particularly in the Delaware County end. Initial discussions in 2018 revealed that changing the ash handling procedure at the incinerator would constitute reopening the DEP permit process for the entire facility. That would include using a conveyor to move material to a rail site, or re-dumping ash into a nearby conveyor site for loading hopper-style cars. In general, the reaction from Covanta was that they were not against using rail, but they had to make it look like the current truck handling as much as possible to avoid them having to reopen their entire operating permit.

We had investigated the use of disposable bags transported in gondola cars or high-sided cars, which would not require the re-transport of empty containers. This was deemed as impractical

on two counts; one that the ash was loaded hot and would melt any plastic-material bag, and that modifying the bag house to load bags instead of trucks would again reopen the permit.

Overall, Covanta's costs and projected volumes have remained relatively constant over the prior investigation. The trucking price has reportedly changed since December 2010 from $12.00 to $13 per ton plus an estimated $.39 fuel surcharge for a total of $13.39 per ton, subject to further fuel price adjustments . They have a contract to ship 450,000 tons per year. 2018 they will ship 420,000 from Chester and up to 80,000 tons from Conshohocton.

Their trucking contracts are tied to the terms of their ash contracts. A new one just began and runs for three years.

As for the transportation method, the filling of totes with ash would be time consuming and would probably require a modification of their transfer permit. Same with the bulk pneumatic transfer to covered hopper cars. Only the loading of containers in the ash house would avoid that process.

Room for a siding?

While the Covanta facility is directly adjacent to the Conrail Shared Assets Marcus Hook yard (which is also served by NS) it was constructed without direct rail access or a siding of its own to load railcars.

The Marcus Hook yard would be accessible via truck without even crossing the track or a public highway. However, loading cars in any manner inside the yard is hampered by narrow 14' track centers. There is an access road, and some available open space on the northwest side of the yard that could conceivably be used. This is only mentioned because it may be a factor in determining if the Conrail Shared Assets area must be included in the rate calculation, or if NS is allowed to directly originate traffic from inside the yard.

This was a significant issue in the first investigation. Property had been identified adjacent to Covanta that would allow construction of a siding as long as 1700 feet, to the southwest, and curving to the south. Since the original analysis Covanta acquired the properties between their facility and the rail lines.

Traffic rerouting requested by Rolling Hills Landfill

As of March 9, the Delaware County Solid Waste Authority asked that Covanta develop a new route that would bypass running through Boyertown. Covanta reported that they are just beginning that evaluation but that it might cost a $1 or more than the current costs, and that would expect the landfill Authority to pick up any increases as a result of changed routing.

Intermodal concepts

Two facts immediately emerged about working with ash transfer by rail for the Berks County – Covanta concept – there is virtually no feasible way for direct material transfer to the landfill itself, as it is on top of a hill, and only vehicle accessible – and that Covanta is already built for dump-truck style ash loading at Chester and doesn't really want to change as it would require significant permitting changes of the site.

So for practical purposes , the assumption is that absolutely at the destination, and more than likely at the origin – the final material handling is done by wheeled vehicle.

In the previous investigation of ash movement via rail, the methodology was assumed to be some kind of conveyor loading of loose material to hopper-style railroad cars, and unloading loose material in a dump pit to another conveyor for final truck delivery at the destination. Those situations, while typical for aggregates, grains, sand, and even some plastics – have great disadvantage when the material is at all hazardous in nature or can be windblown. The transfer points have at least the potential to create loose material and airborne dust, and residual site contamination in the future. It can certainly be anticipated that site selection and permitting would be much more difficult to achieve.

CSX flyash hopper car with removable top

Flyash transfer from barge to truck

That hopper-and-pit handling assumption also greatly impacts capital cost and transportation cost assumptions. The capital investment in conveyors, pits, and an enclosed transfer facility is completely fixed in nature. The asset investment is only slightly transferrable once the project is finished, and the site itself may have low-level residual contamination resulting from use. The second issue is how the product is moved – in the original assumption it is being priced as a loose commodity in a railroad car, which is typically priced by the ton, rather than the carload or other unit. The railroad would supply the equipment, and price that equipment into the per-ton transportation cost. The originating railroad (NS) would own and maintain the cars, as well as move the cars. Additional trucking costs would be applied at least at the destination (landfill) end as a contracted cost.

Another approach?

One of the fastest-growing areas in rail transportation has been the rapid growth of hazardous materials transportation in large quantities. This is particularly true on the east coast, where

contaminated soils and building sites have to be removed as hazardous waste in high volumes. This can even include low-level radioactive wastes, oil-contaminated soils, and asbestos-contaminated building debris. The second wave of emerging rail traffic was to move conventional municipal waste to interior landfills for disposal.

To move this low-level contaminated waste in such high volumes, railroads turned to typical open-top gondolas as they were readily available in surplus and often near-retirement. As can be imagined, for obvious reasons, this led to unprecedented levels of community resistance wherever a transfer occurred. Even if the railroad controlled the site, and the trucking operation, the STB made an exception to federal preemption and required that the transfer sites be locally permitted.

The result of that was that the movement of such material became a much more sophisticated venture. Contaminated material and solid waste was transferred to sealed cars, and then, sealed containers. As the equipment was more specialized, and more expensive, third-party logistics and railcar firms moved into provide equipment on a lease basis. Service could expand into the entire logistics chain from loading to disposal.

Stone Consulting has worked on a previous project with the high-volume disposal of contaminated demolition debris from a nuclear fuels processing facility. This is transported by rail from the east to a secure contaminated disposal facility in Nevada. In that field, up to three vendors were qualified for the proposed move, including logistics, rate planning and car supply:

- MHF Services http://www.mhfservices.com
- ICE Service group https://www.iceservicegroup.com/index.php
- Environmental Rail Solutions http://www.envrail.com/

MHF 8-container ABC spine flatcar hauling contaminated dirt

The common thread that all of these vendors have is an integrated transportation function that focuses on the containerized movement of waste, be it raw landfill trash, industrial waste commodities including flyash, or contaminated soils and demolition debris.

Along with the containers, the rail equipment may be specialized. Depending on the weight per yard, different sized containers may be utilized. However, for general purposes and assumptions, the 'unit of choice' has become a relatively standard 20' ISO-style container that essentially fits nearly any

equipment used to handle a 20' shipping container. In order to better utilize equipment, specialized spine flatcars have been developed that can carry up to eight containers for 136 tons per car (on 3 trucks).

Depending on the commodity, the containers can vary from a standard 20' shipping container (used for waste recycled paper) to lead-lined, water and air-tight certified containers for radioactive dirt. The features necessary for safe material transport vary by container. Understanding the weight to cubic volume ratios of the material is also critical, as total car and container weight can reach a maximum.

The need for both Covanta and the Rolling Hills Landfill is to have a loading and unloading cycle that fits their existing design – it leaves the incinerator as a 'truck', and arrives as a 'truck'. The benefit of rail is that the truck movements can be greatly reduced or diverted, and in some cases, isolated to local on-site moves.

The key is the container design. MHF, for one, has a series of container designs that feature both a sliding steel lid for product containment, and also lockable end doors for dumping like a dump truck.

Combined with standard ISO posts and lockdowns, any container handler or railcar can handle these units, and they can be both top-loaded at Covanta and end-dumped at the landfill – identical to a dump truck. The degree to which leakage or contamination needs to be addressed can be scaled up to a container that is fully watertight and certified as not even leaking light.

Many of the existing ash trucks under contract to Covanta are tri-axle trucks with similar loading capacities as a container, according to the MHF data sheet. One alternative is also to load the containers on a skeleton container trailer equipped with a hydraulic dump lift cylinder. This puts all the dumping technology on a trailer, rather than on a tri-axle, allowing any conventional tractor to move the trailer with a container on it.

ACE 20' ISO skeleton dump trailer

Units of measure issue

An important point in this alternative is that previous discussions have been based on 'cost per ton' as a comparative value, based on loose material transfer to hoppers. When working with containers and leased equipment, railroads can also price either by the carload, or by the

container. This is one of the rare cases where pricing may actually be done by all three, as you are looking at weight, containers, and cars.

To properly convert units, you must be aware of the capacity of the containers (in weight and cubic feet), the number of containers a car could hold (articulated spine flatcars from MHF could hold up to 8, conventional 89' container flats only 3 or 4), and the maximum weight in both container tare and lading. Getting these units resolved directly impacts pricing. NS will potentially steer this issue on how pricing is to be done. From the NS standpoint, it is most likely to be a carload basis, for all truck costs, per container.

Cost comparison issue

With the previous method of a loose-material transfer vs. containers, NS supplied the cars and based on their analysis of turnaround time, factored equipment into the move as well as direct transportation cost. A final 'price per ton' included transportation and equipment and could be directly compared to truck cost per ton.

When pricing by the car or the container, it must be clearly understood who is paying for the equipment, as private leased equipment is far more likely to be used. NS may or may not have their own container-handling cars, but they will not own containers. The cars are far more likely to be leased by the quantity and term of the contract from a third party such as MHF, and be an additional cost to the pure transportation cost of the containers in this situation. While it is possible for NS and MHF to determine a combined price and recalculate that back to a tonnage-based direct cost, it is unlikely. That means additional analysis will be needed with a third party for equipment cost, based upon capacity and turnaround time in a projection by NS.

Other ideas?

MHF had suggested, and we investigated, the use of disposable 'bags' for the ash, where both the bags and the ash were disposed of – keeping the product sealed from load to disposal. The advantage to this approach is that no specialized rail equipment is necessary as it can be handled in conventional gondolas, and that unspecialized lifting equipment can be used to transfer the bags from railcar to dump vehicle at the destination transload. Containers would not have to be leased, but bags would be permanently discarded.

This was deemed impractical when it was discovered that the ash emerges from Covanta in a hot, uncooled state – potentially hot enough (or containing particle metals) that would be heated sufficiently hot to melt holes in a plastic bag container. Covanta also felt this would complicate the loading process and reopen the permitting issue.

Capital Cost tradeoffs and analysis

The use of containers to handle the material completely restructures how capital cost analysis may be handled and considered.

1) Track space is relatively unchanged. Whether it is in hopper cars or containers, the cars need to be out of the way of the 'main line' to be loaded.
2) Total track space must accommodate space for unloaded cars to be pushed past the unloading area, so track distance for equipment parking may be 2X the actual car length distance.
3) In the original assumption, significant capital cost would involve permanent, conveyor-and-pit construction, as well as building and site containment. With containers, that would not be necessary.
4) With containers, additional cost is involved in handling equipment – cranes, or overgrown forklifts called container handlers – that can pick and load ISO-sized containers and full weight. This equipment is now widely available through industrial equipment dealers and lessors. Unlike conveyors or buildings, this is a cost than can be easily liquidated at the close of a contract term if necessary.
5) Container handlers and container use will need a loading and unloading area adjacent and generally parallel to the railroad track, sufficiently wide enough to allow turning and alignment at right angles to the railcars. Any site acquisition must include these factors
6) Special environmental factors for site handling may be waived if the containers are certified to be closed and sealed throughout.
7) Railcars and containers may be purchased, but are far more likely to be leased, either as equipment only, or as part of a total logistics package

Synagro container handler at work

At the Marcus Hook/Chester end, Covanta reportedly has secured additional land for rail loading space. Capital improvements would be, at least, construction of as much as 1700' of track and a parallel loading road and access area. While it is possible that containers could be loaded directly at one of the tracks in the Marcus Hook yard, it should not be assumed for initial costing purposes.

At the Boyertown end, storage tracks for rail equipment can be fitted within the existing right-of-way, even if the existing main track has to be relocated. Two tracks will be necessary so that incoming and outgoing cars can be swapped. Linear distance of tracks must be sufficiently long on the inbound loads to allow cars to either be pushed past a limited-distance unloading area, or the unloading area has to be as long as the maximum car length of an inbound cut to allow the container handler to access every car.

Property depth in Boyertown will also need space for incoming and outgoing trucks to enter and exit property, and efficiently swap loaded for empty containers. Empty containers will have to be reloaded back on railcars for the return trip.

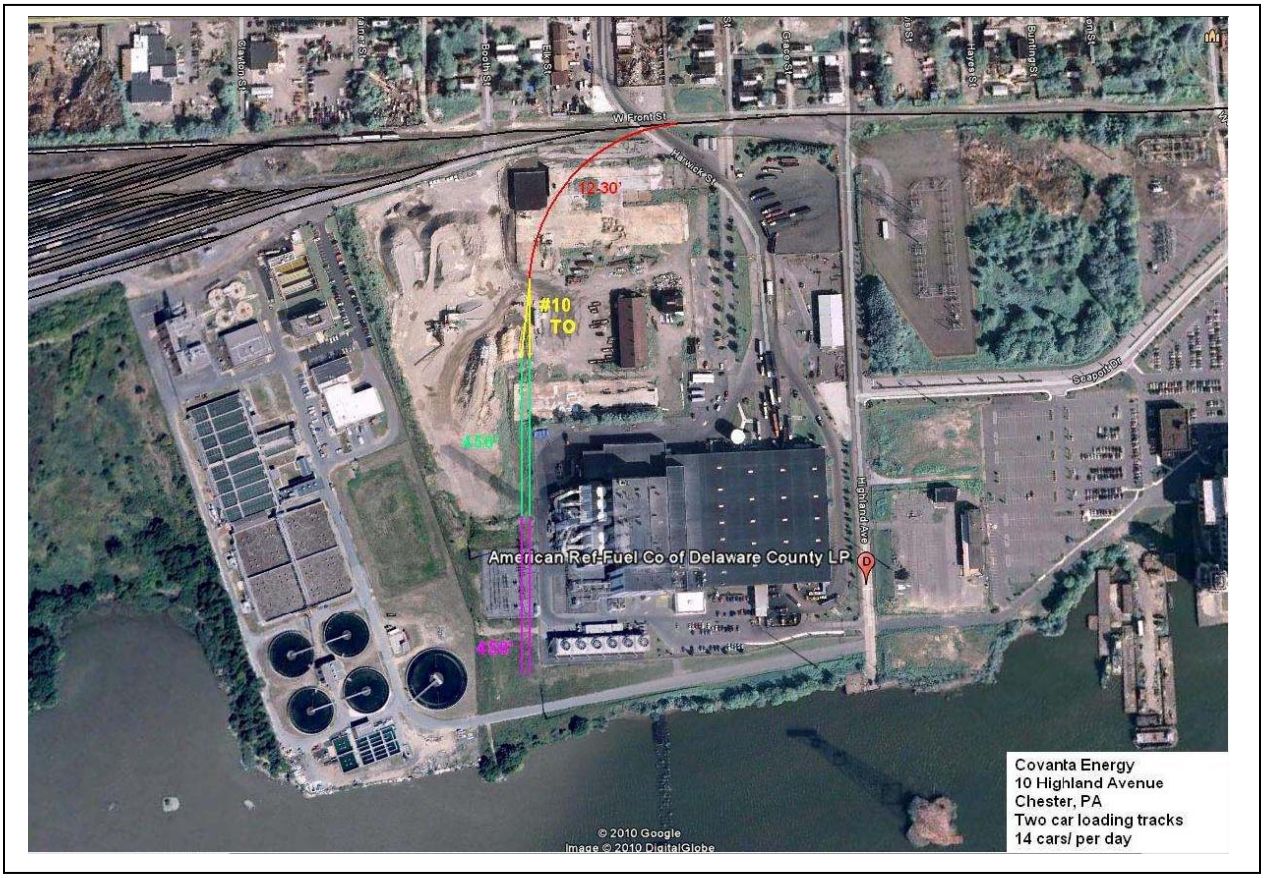
Containers vs. loose material ***Capital vs. Operational Cost comparison issues***		
	Hoppers (loose)	***Containers***
Measurement	*Tons*	*tons, cars, containers*
Loading	*conveyor to car* *high construction $*	*existing load* *to roofed container* *load nearby*
Unloading	*Conveyor to truck* *high construction $*	*sealed container* *transfer low $$*
Containment	*Both ends - dust control*	*No further containment*
Handling tracks	*based on tons per car*	*based on containers* *per car and car length*
Equipment cost	*RR supplied in rate* *paid with rail rate* *older, lower cost*	*Third party lease* *additional cost to rate* *specialized, higher cost* *equipment likely*
Handling equipment	*Capital cost fixed*	*capital or leased containers* *cars, transfer equipment*
Contract life	*early construction* *investment, lower* *cost over a longer term*	*Lower initial cost* *with likely higher* *equipment cost, variable*
Utilization	*RR at risk for poor* *utilzation and turnaround*	*Customer at risk for* *poor turnaround*

Covanta

The Covanta end of the project is located on the Delaware River, on the border between Chester and Marcus Hook. The location is somewhat misleading in railroad terms, as it is directly adjacent to the Marcus Hook railroad yard. Marcus Hook is a Conrail Shared Assets yard that has daily Norfolk Southern service back to the Philadelphia/Allentown rail centers.

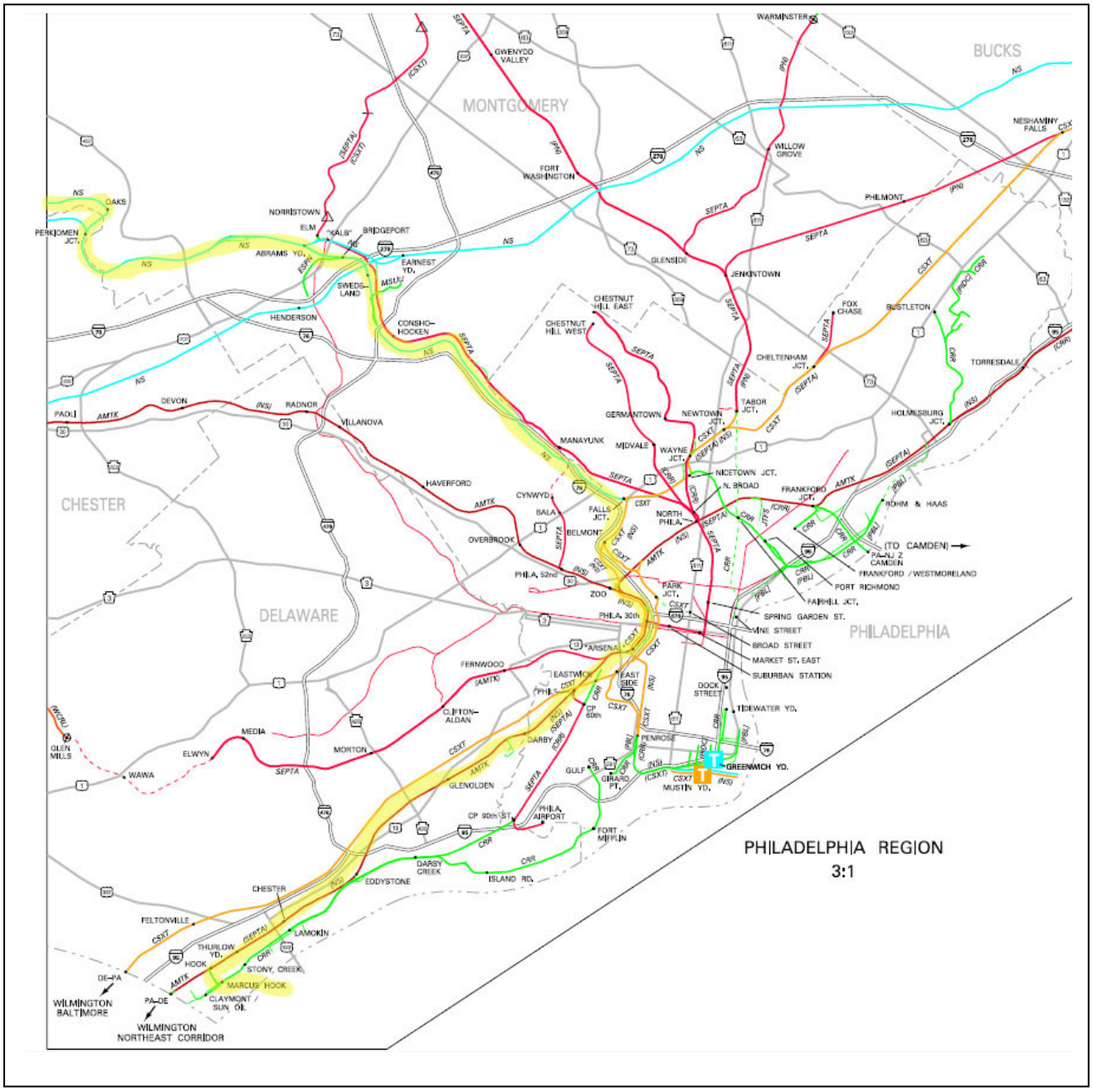
The most important part of this relationship is understanding the following:

1) Covanta is directly adjacent to existing rail lines and removes truck traffic if used.
2) The Marcus Hook rail yard, although served by NS, is still subject to Conrail Shared Assets ownership, and presumably has to be involved in the rate structure as Covanta is technically 'their customer'.
3) While the Marcus Hook rail yard has trackage and possible space to load, it is still relatively tight on space and track centers and is unlikely to be available for container loading despite the physical proximity to Covanta
4) Covanta has purchased the vacant property between the wastewater treatment plant and their facility, which creates up to 1700' of available space for a new rail siding to load on.



Rail Routes to Boyertown

Understanding the feasibility also involves understanding of the rail route to 'get there from here'. The routing would be an all NS routing – Marcus Hook via Philadelphia, and up the Reading railroad route to Pottstown. This would likely involve using the existing daily train out of Marcus Hook, a transfer to an Allentown/Reading local, and also run over a portion of the Northeast Corridor. Doing this move efficiently will directly impact transit time, which in turn impacts equipment needs and cost.

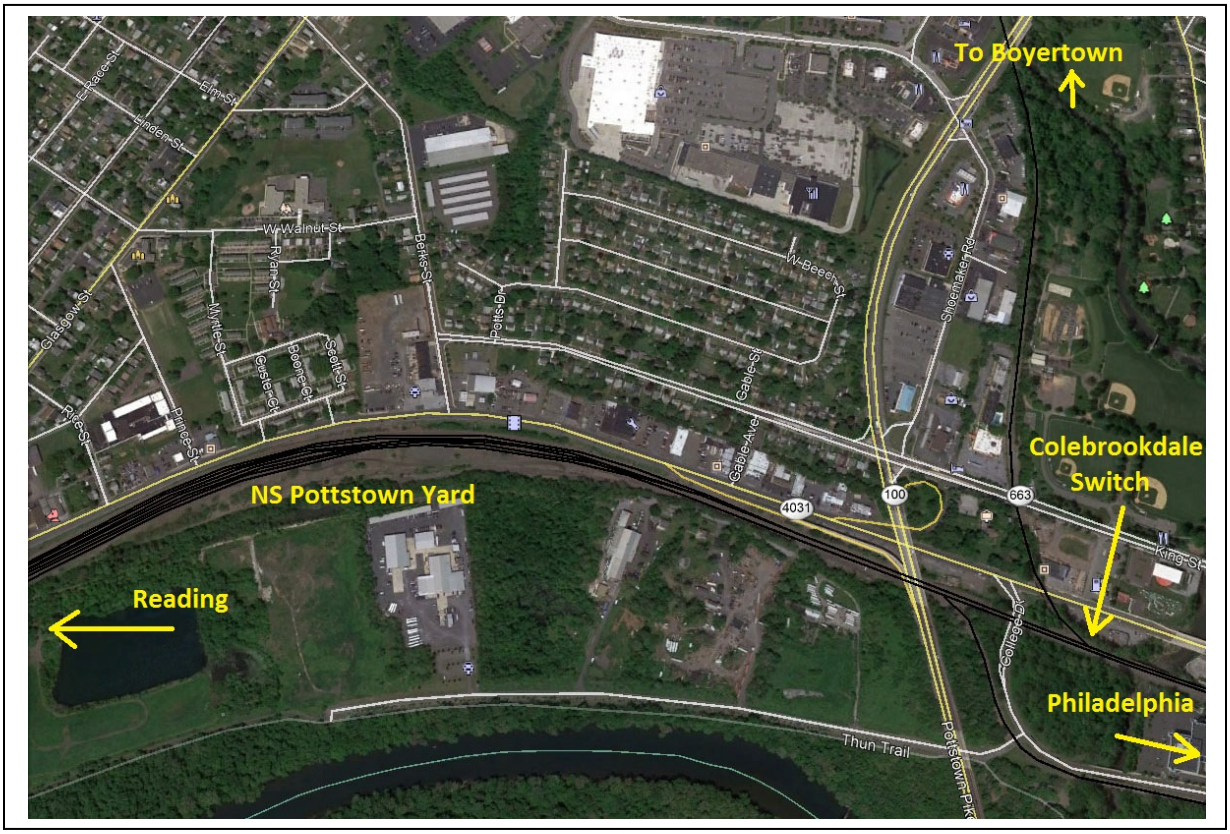


While this remains an all-NS route through Philadelphia, and appears to be an existing 'two train' move that will minimize yard and service complexity, it still is going through a congested area that has the potential to introduce delays. Perhaps the most critical issue to understand is that this is not creating a new NS service plan, only adding additional cars to existing trains and crews. This is completely unlike the situation that was previously explored in Berks County for potential aggregate moves.

Pottstown

The issue at Pottstown is rail car storage and access for interchange. The Colebrookdale railroad comes through Pottstown from the north, and directly switches into the NS Allentown main line. There is not enough track or siding room to store or swap up to a 1000' cut of cars between NS and Colebrookdale on railroad property.

There is an existing yard on the south side of NS just west and south of the NS track switch. Accessing this yard for car swaps will be necessary instead of a direct 'drop' on the siding in Pottstown as that would block road crossings. This will necessitate EBGR crews to cross the main line and pick up their cars at the NS yard. This introduces the necessity of training and qualification for the EBGR crews, and may even require the locomotive to be equipped for PTC, based upon FRA and NS review of the situation.



Boyertown

The existing rail route into Boyertown follows the creek into the town, and places the railroad either on the side of an embankment or on a relatively narrow right-of-way until Boyertown itself is reached. One unusual feature of the track south of Boyertown is that it is almost entirely grade-separated from the roads – any train movement would not block traffic for the last two miles into town. That is an issue that makes a southern-side transfer less disruptive to traffic.

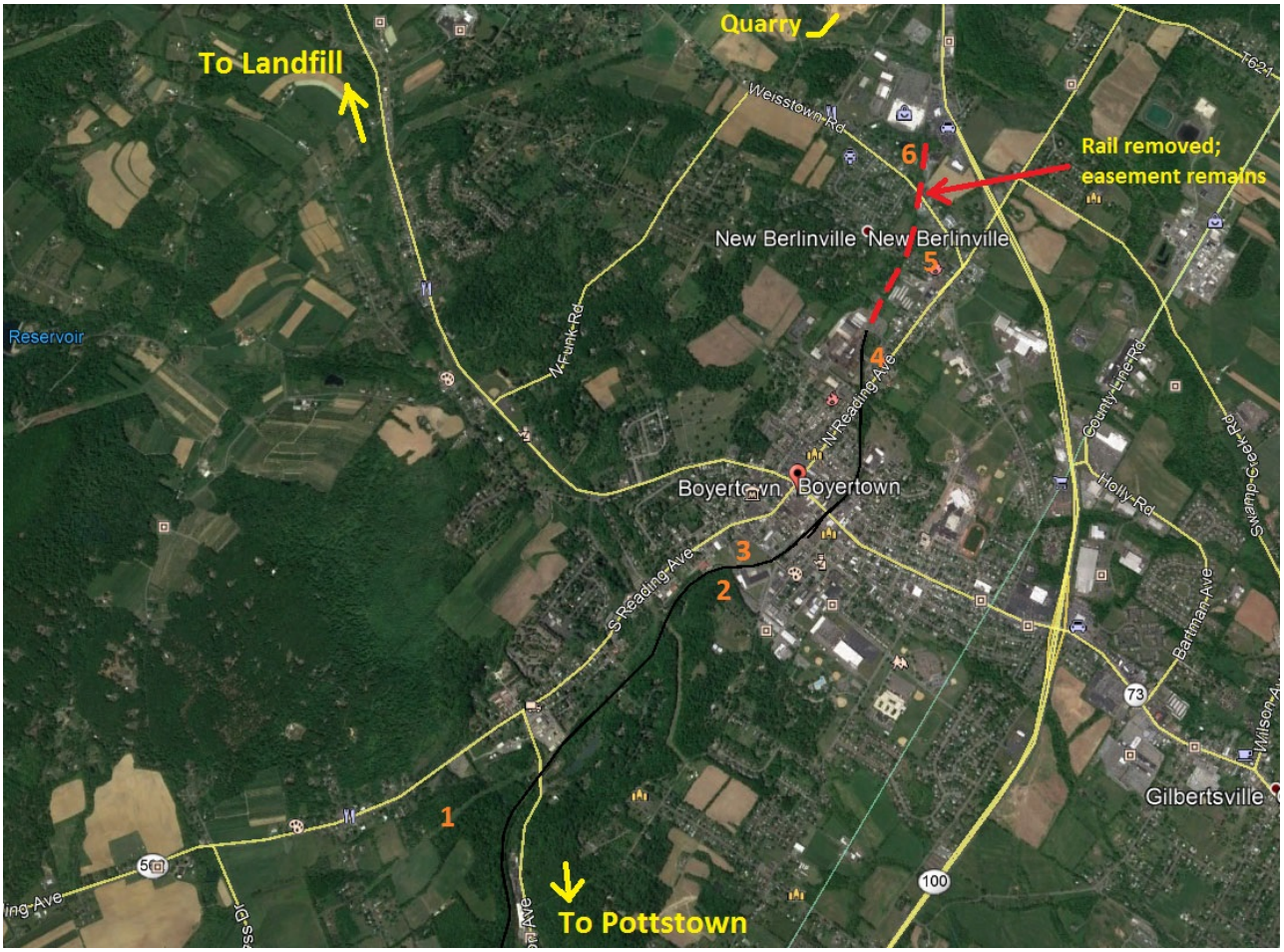
Direct rail routes to the landfill were examined. Even if rail was constructed to the site, material transfer to a truck would have to be performed to do the final disposal. The landfill is on a hill that has a steep access grade.

The distance from Boyertown to the landfill is 5.7 miles from the center of Boyertown to the landfill site itself, via Pa. Rt. 73. This is the current route of the landfill ash truck moves from Covanta.

The geography of the Boyertown area is such that the 'water level' route that the railroad followed from Pottstown changes abruptly at Boyertown – the creek (and Rt. 73) turn northwest; the railroad heads due north. Rt. 73 follows the creek bottom. All other routes, in one form or another, have to climb out of the bottom of the valley at Boyertown and cross a hilltop to reach any point near the landfill. The Ironstone creek valley along Rt. 73 is developed with residences and farmland, and the first two miles out of Boyertown are relatively constricted with open space. Any connecting branch to the landfill would be forced to follow this waterway path to minimize grades. It does not appear feasible to squeeze in a railroad right-of-way without expensive construction and extensive condemnation, and the material would still need to be transloaded at the destination.

Several potential zones and locations were examined around and within Boyertown for a container transfer site, and to perform a truck route analysis:

1) "Old Quarry", along Rt. 562. This would require construction of a new siding off of the railroad, and up a 3% grade, behind the existing oil company, to reach an open, ex-quarry site.
2) "Coal Trestle", a site previously examined for a locomotive shop, south of town, and just off of Route 562
3) "Warwick", in the open field area(s) beside the railroad track southwest of 2nd St.
4) "Foundries", in the general areas of the two remaining foundries on the north side of town, in and around some locations of previous industrial sidings
5) "Henry", in the general area of the (now removed) rail at the intersection with Henry Ave.
6) "North Reading", in the general area of the (now removed) rail at the intersection with North Reading.



These locations were identified to also perform initial research and analysis on how the rail-to-truck transfer could be done for potential routes that would remove truck traffic from downtown Boyertown. Each potential location has not only the issues of rail access, site issues, and community impacts, but how truck traffic could be routed from these sites to the landfill and minimize overall community impacts.

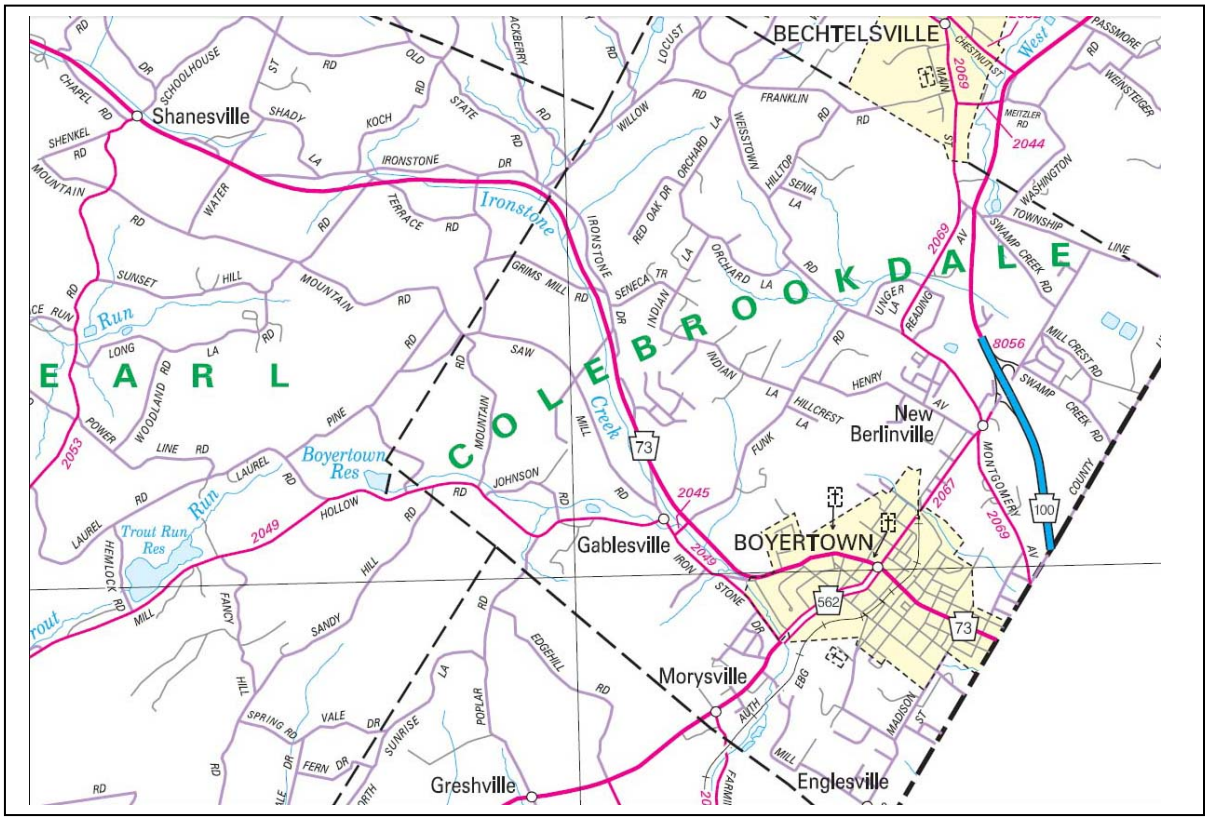
Road Route Analysis

Given the location of the landfill west of Boyertown, and the railroad coming from the south into Boyertown, extensive review was done of the highway ownership, layout, and characteristics in the Boyertown area.

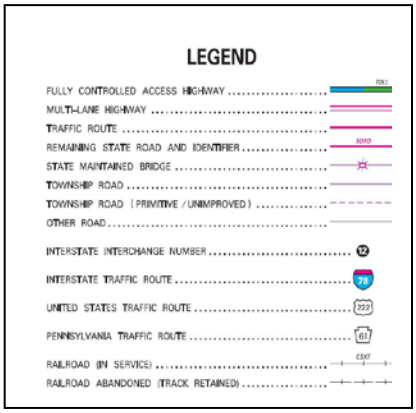
Geographically, the railroad followed the Ironstone Creek into Boyertown – so that it is generally a mild uphill grade following the creek valley. While the branch was never a through route, it should be noted that the main product was able to be shipped downhill, so grades on the line were never much of an issue in its history. This continues to place the railroad at or near the lowest point in any elevation, so it's generally an uphill climb away from it on the highway as well.

The current truck route from Covanta to the landfill is up Route 100, and then due west on Route 73, through downtown Boyertown. Moving to a rail transload may succeed in removing truck traffic through Boyertown, but it will still result in virtually the same number of short-distance moves from some point to the landfill.

The first issue is the control of the highways – and understanding which ones are unrestricted state routes, vs. in-Borough and in-Township roads. A current Pennsylvania Department of



Transportation map was located to clearly identify those issues.



This PADOT political/geographic map clearly identified state vs. Borough vs. Township roads. The only major state highways are Route 100 and Route 73, but a surprise was obtained by closely examining the map – Ironstone Road from Route 562 northwest to Route 73, and a short connecting portion of Funk Drive (2045) are actually state highways.

Boyertown Routes

A comparison was done with any potential route to the landfill from a variety of potential sites and routes. Each route was investigated for ownership, weight limits, bridges, grades, lane width, vertical climb, and distance. Profiles of each of these routes are presented for comparison as attachments. Remember that the loaded trucks are moving right-to-left (west) on the maps and profiles. One common theme is that all are uphill, the only difference is how far and how steep.

Existing

The existing transportation route of the Covanta ash in Berks County is north on Route 100, then west on Route 73 through Boyertown. This is an all-state, no-restriction truck route that goes directly through the center of town. Other than one section of multi-lane on the east side of Boyertown from 100 to Montgomery Ave., this is entirely a two-lane routing. There are also no separate turning lanes at intersections on this route, so a left turn by a vehicle in front of a truck effectively stops traffic as well as a red light.

From Route 100 through the center of town is a steady uphill grade that is actually steepest at the four stoplight intersections closest to downtown – compounding the grade issue with restarting loaded trucks on a hill and the resulting noise. The steepest part of the hill is actually on the west side for empties returning on the same route, but the east side has been the focus of most complaints.

This is an entirely Pennsylvania state traffic route, and does not include any weight limits or weight-restricted bridges. As a state route, it is not subject to local restrictions or weight limits.

A profile is generated of this existing route so it can be compared against alternatives. All alternative routes still come together at the intersection of Funk Rd. and Rt. 73 and work west to the landfill, as that is the only viable main road from either highway access or railway transload activity from Boyertown, or from any other identified state main route.

Boyertown – south

Locations 1 through 3 have been identified as potential transload areas on the southern half of Boyertown. Most have been considered purely due to availability, size, and/or highway access, but any area south of Boyertown encounters significant issues from railroad access and necessary car storage on the single track. Without additional storage/siding track, loading and unloading in this area would block excursion operations. Car storage areas would have to be developed even if these were not immediately adjacent to the unloading area.

Any areas south of 3rd St. in Boyertown would not create grade crossing blocking, as the railroad is fully grade-separated with overpasses for a distance of two miles – as far down to Greshville Rd.

Several routes to the landfill from this general area were evaluated, in an attempt to avoid as much of this area as possible. Each one of these routes have an attached plan/profile in this report to show comparative distances and grades.

1) Boyertown South – PA Route

This alternative looks at heading either south or north on PA 562 from any point south of 3rd street to points entirely out of town. But instead of driving through-town to Rt. 73, to head east, the alternative route of Water St. to S. Ironstone Rd. was evaluated. This reconnects to the Funk Road intersection at Gabelsville. It generally runs on the southwest side of Ironstone Creek.

Surprisingly, this is actually a PA state route, rather than a City or township road. This is the only alternative other that Rt. 100/73 that completely utilizes an existing state route.

This route has some surprising features, good and bad. The first feature is that it has very mild grades on it; actually less than on the current downtown routing. The low point is actually the bridge over Ironstone Creek on PA 562, meaning that within Boyertown, any location would result in loaded trucks going downhill, not uphill, within the Borough itself. The grade going up Ironstone Creek is relatively slight, and the number of residences on the steepest part of the hill is fewer than on other alternatives.

Oddly enough, the state route diverges due northeast to the Funk Road intersection – and on that short section of highway is a notable impediment – a one-lane 40' bridge over Ironstone Creek at S. Funk Road. While this section of highway is only 450 feet long, this bridge barrier would have to be addressed at the state level for safer traffic flow. If this route were selected, either bridge widening or traffic signals would be recommended to increase safety.

A similar route to this is on the northwest side of the Ironstone Creek – Walker Drive. It is shorter, heavily residential, and features a reverse intersection at the stop that would have to be redesigned to safely allow truck traffic.

2) Boyertown South – Local Roads

This alternative takes the most direct route between points south of 3rd St. to Rt. 73, using 2nd St. directly to the intersection with Rt. 73.

This is a borough street, and is currently signed for no trucks except local deliveries. It is heavily residential. The route presents a relatively steep grade between 562 and Rt. 73 right in the middle of the residential district. The street has residential parking on both sides, and has a curb-to-curb pavement distance of 36 feet.

The intersection at Rt. 73 is located on a sharp downhill drop, currently with a stop sign only. This intersection would provide a particularly hazardous stop situation for loaded trucks turning on to 73 under winter conditions.

While this is a very short route and generally avoids the entire downtown, the combination of hills, residential district, intersection design, and pavement width rates it less favorably than virtually any other alternative.

3) Boyertown north #1

This route assumes a transload location along the existing railroad grade north of the downtown, with or without construction of additional unloading facilities.

There are no state routes in this area. There are two local township roads that travel northwest and intersect with Funk Road; rejoining Rt. 73 northwest of Boyertown.

Route #1 is via Henry Ave., basically going uphill to the intersection with Funk Rd. and back down Funk Rd. These are all Colebrookdale Township local roads.

The area is almost entirely residential – with homes on both sides of the route. Uphill loaded grades are moderate, with one significant climb area between Fortress Dr. and the top of the intersection. There are no bridges on the route, and it is a full two-lane width with 10' lanes. Funk road is similar, and has generally paved shoulders. Speed limits are 35mph on Henry and 40mph on Funk. Funk road is currently posted to a 10-ton weight limit at the intersection of Rt. 73 and at the intersection of Weistown Ave (N. Reading ext.).

4) Boyertown North #2

This route is essentially identical to route #2 except that the access road to Funk is via N. Reading Ave. (which transitions to Weistown Rd.) and then onto Funk Road.

As route #1, it is all on township roads; well-paved, residential and mixed farmland districts. This route has generally lower grades than the Henry Ave. route, and has a 35mph speed limit.

There is a stop sign at the intersection of N. Reading and Weistown Road (straight traffic has to stop). This signage would stop any uphill truck movements at this intersection.

The intersection of this route also coincides with some open land parcels at or near the railroad grade, and is also the location closest to the quarry.

While this route has flaws, it remains worthy of additional study as a primary route for rerouted traffic for any site on the north side of town.

Split the route?

One alternative to lessen community impacts might be to recommend that empty trucks (which are generally quieter and far lighter, but would still be carrying an empty container) could be put on a different route than the loads. The difficulty here is twofold; vehicle count and the loaded trucks climbing uphill. If a locally-controlled route can be adopted, some control could be exercised over the traffic flow – particularly if a third-party, local firm was retained to perform the final drayage activity to the landfill.

Recommendations

Initial review of the local Colebrookdale Township highway routes would indicate that any site south of town would consider Ironstone Road (with appropriate traffic upgrades), and that any site north of town would consider N. Reading Rd., with an intersection change necessary as well as a review of the existing reason for the posted weight limits, other than to prevent current truck traffic on township roads.

Rate and Economics Calculations

The Industrial Development Process and Norfolk Southern

Developing the rail interface at the Covanta Chester, PA facility will require the coordination of several departments both within Norfolk Southern (NS) and without. Adding to the complexity at this location is the location of this facility actually on Conrail which is a jointly owned operation of both Norfolk Southern and CSX Transportation. Fortunately, all these interfaces can be coordinated by the regional Norfolk Southern Industrial Development Manager Pete Fontana.

Since the Covanta site is adjacent to the Marcus Hook Rail Yard, which is the connection point between NS and Conrail, the physical and accounting transfer of cars to the NS trains may have operating options. The Industrial Development department will work on getting an acceptable origin site plan approved. They will concurrently work with the NS Operations Department to develop an operating plan for the flow of the traffic and the return of empty equipment.

All of the above steps need reasonable lead timing for implementation. Subject to funding being available, the process from concept to traffic flowing usually takes nine to twelve months depending on complexity and construction seasons.

Discussions with NS on the rates are not final, and at this point of required report completion are based on the most current estimates, not a firm contractual rate proposal.

Truck Rate Assumptions

The 2010 per-ton truck rate of $12.00 per ton is now effectively $13.00 plus another fuel surcharge that is only triggered when prices jump in .20 increments, and then as a percentage factor. The exact current number was not disclosed by Covanta, but for the purposes of this report is $13 plus a 3% surcharge, or $13.39. That was as of March, 2018,

Patrick Sedler of Covanta explained that "*The actual rate entered into agreement was at 2.50 p/gallon. There is a .20 variance either way which allows for no change in surcharge. So it is a range of 2.30 to 2.70 p/gallon. "*

"For each .10 of fuel either way outside of the variance allowance, it is .5% surcharge or credit. Right now fuel is about 3.35 p/gallon so we (Covanta) are paying about a 3% fuel surcharge. That will change again beginning of May based upon what fuel costs at the beginning of month".

Capital Cost Factors

With the cooperation of the EBGR, BCRA, and our own estimates, a summary of all potential capital costs that are associated with this move were assembled.

This examines all costs, including those costs that would not necessarily be required at initial startup. Because the cars are not predicted to require 286,000 lb. weight loading, the bridge repairs are not critical to start – but day-in, day-out use of this far heavier train will require bridge repairs to be done during the period of service.

This also applies to the track rehabilitation and maintenance program. The current track is serviceable for the existing light passenger service, but daily container moves over it will quickly impact the track condition. Additional cost factors are included for that additional repair and improvement that is basically inevitable.

The parts of the improvements that are necessary from the start are the handling facilities at both ends. As this is envisioned to essentially be a sealed container handling facility, rather than a loose commodity transfer facility, no buildings are needed, but it will require sufficient space to park, unload, and reload the containers, as well as to handle two full strings of cars – one loaded and one empty. Unlike previous transload concepts, this does not necessarily required switching out of individual cars, but instead, having linear access to a far longer cut in a narrower envelope.

Improvements at the Covanta end are also predicted to at least include the construction of one new siding on their property.

The estimate includes the purchase of four, used container handlers suitable to lift 20' ISO containers. This would be two at each end (Covanta and Boyertown) assuring that even if one was down for repairs, the other unit could continue processing the loading and unloading. The smaller 20' ISO units are widely available on used equipment websites as the current equipment requires handling 53' containers and is much larger.

Costs also include the equipment to handle the containers between the transload in Boyertown and the landfill. As this is a much shorter haul (six miles), multiple circuits can be done per unit per day, and both drivers and equipment can be handled locally.

The increased traffic on the railroad would also justify the construction of a proper maintenance shed for both locomotive and equipment. While not necessary at startup, servicing locomotives in the winter months does require someplace under cover to perform maintenance in a situation where daily reliability is critical. This has been a long goal of the railroad from the beginning and was recommended in the initial feasibility study.

Berks County RDA has also requested the inclusion of the payback of the original Sec. 108 loan as part of the capital cost of this project, and it is included as a line item. Total capital costs are then factored into a new loan and the payback calculated into the operational costs.

Berks County / Covanta Ash Moves
Capital Budget Calculations

OPTION 1: FULLY COLEBROOKDALE-RUN OPERATION

Capital Costs:					
Existing bridge restoration, including re-opening Reading Avenue bridge				$4,650,000	$4,650,000
Track restoration (8.6 miles)					
	Drainage			$50,000	
	Ballast	4500	$40	$180,000	
	Ties	9000	$120	$1,080,000	
	Surfacing	47520	$3	$142,560	
	Replacement rail @.035 NT/TF	1663.2	$350	$582,120	
	Rail installation	95040	$15	$1,425,600	
	Crossing rebuilding	60	$500	$30,000	
					$3,490,280
Transload yard: $7M, including track to extend current line to transload site, and additional yard tracks					
	ROW acquisition			$160,000	
	ROW clearing & grading			$50,000	
	Track extension	5000	$150	$750,000	
	Track extension crossings	60	$500	$30,000	
	site acquisition			$400,000	
	site preparation			$250,000	
	trackage	2000	$150	$300,000	
	switches	3	$60,000	$180,000	
	paving			$100,000	
					$2,220,000
Section 108 debt repayment: $2 M				$2,000,000	$2,000,000
Enginehouse and other equipment upgrades:					
	Enginehouse insulated w pit			$500,000	
	Passenger car shed			$250,000	
Reach Stackers (4 used)				$860,000	
Ten used roll off trucks				$800,000	
Covanta improvments?					
	siding	1100	$150	$165,000	
	switch	1	$150,000	$150,000	
	grading & paving			$200,000	
Legal fees & BCRA time				$50,000	
					$2,975,000
	Capital costs				**$15,335,280**
Estimate					**$15,500,000**
Grant				**$0**	
Loan	**4% for 35 years**			**$15,500,000**	
	$68,630 monthly	$504,763.20		**$823,560**	
				To operating cost	

Operating Cost Analysis

The first steps in the operational costs analysis was to convert all the various volume data that currently exists into three conversion factors – carloads, tons, and containers. Assuming that the standard method will be some manner of closed-container transfer rather than loose material, the pricing may be quoted in all three ways from various sources. Therefore, the units and costs may be expressed all three ways – either by the car, the ton, or the container, depending on the particular cost factor under discussion.

The number of containers, weight, tare, and car statistics can even be converted to the length of a normal train, in this case, about 1000' less locomotive.

No matter how it is calculated, the average daily tonnage assumes at least a five-day per week dedicated cut of cars delivered from NS to the Colebrookdale Railroad. As there is no interchange track currently long enough to handle those cars at Pottstown, the assumption remains that Colebrookdale would likely have to pick up the cars from the setout yard tracks at Pottstown south and west of their current track.

How and when NS delivers the cars from Marcus Hook, and whether they insist on routing them through Allentown Yard to re-drop them back at Pottstown, has been a major cost factor issue debated within NS. We have determined that unless the cars are dropped directly at Pottstown – rather than being re-routed through Allentown yard and back east absorbing additional terminal cost as well as requiring another entire set of equipment and containers due to handling delays, this project is not likely feasible purely due to NS rate estimates. With the assumption of dropping the cars directly off at Pottstown, it can at least be explored.

The object of the cost analysis on the Colebrookdale end is completely independent of what NS is likely to have as a rate, but NS also requests a rate charge from the Colebrookdale to determine their total rate – and then Colebrookdale gets that allowance back through billing. So the higher the costs that are given to NS, the higher the NS costs work as well.

Colebrookdale and Berks RDA have assisted in the review of all operational costs as well as the assumptions about which party will bear the costs. In some cases – particularly on the Boyertown end – there may be some discussion as to what, if any costs, are absorbed by the Delaware County Solid Waste Authority rather than be captured by the railroad rate of transportation.

Each major operational cost component area is individually captured to see the impact on the rate calculations on a per container and per car basis, as no grants are assumed.

Initial responses from NS have indicated a rate of roughly $16.40/ton, including a an allowance of roughly $1.50/ton to Colebrookdale as the shortline settlement, with a net to NS of $14.90. As can be seen, adding that NS net to the existing cost predictions for Colebrookdale – including capital, equipment and debt – results in a substantially higher cost per ton to the landfill.

Berks County / Covanta Ash Moves
Rail Car and Rate Calculations

1. Based on target cost per ton

Existing Per ton	Annual Tons		Cost	Tons/ truck	Total trucks		Cost truck
$ 13.00							
3% Surcharge							
$ 13.39	**414160**	$	5,545,602	22.48	18426	**$**	**300.97**

2. Based on matched railcar pricing (original hopper plan)

per ton				Tons/ railcar	Total cars		Cost rail	
$ 13.39	**414160**	$	5,545,602	100	4142	**$**	**1,339**	per car

THIS PLAN WOULD INCLUDE NS PROVIDING EQUIPMENT

3. Based on matching existing pricing

per ton				Tons/ container	Total cont.		per container		per car (6)
$ 13.39	414160	$	5,545,602	21.17	19567	**$**	**283.42**	**$**	**1,701**
LESS: OPERATING COST - DIRECT		$	1,595,720			**$**	**(81.55)**	**$**	**(489)**
LESS: EQUIPMENT LEASING		$	1,341,462			**$**	**(68.56)**	**$**	**(411)**
GROSS MARGIN						**$**	**133.31**	**$**	**799.86**
LESS: TRACK MAINTENANCE		$	76,000			**$**	**(3.88)**	**$**	**(23)**
LESS: DEBT + INSURANCE		$	873,560			**$**	**(44.65)**	**$**	**(268)**
NET:						**$**	**85**	**$**	**509**

4. Recalculation based on NS projections + breakeven

NS rate margin quoted (their portion)								
$ 14.90 ton	414160	$	6,170,984	21.17	19567	**$**	**315**	**$**	**1,892**
Breakeven rate - direct cost						$	82	$	489
Breakeven rate - equipment						$	69	$	411
Breakeven rate - maintenance						$	4	$	23
Breakeven rate - capital debt + insurance						$	45	$	268
NS rate + Colebrookdale costs						**$**	**514**	**$**	**3,084**
Converted to cost/ton						**$**	**24.28**		
Existing truck rate (including surcharge)						**$**	**13.39**		
Increase						**$**	**10.89**		

WEIGHT RECALCULATION		loaded cont	Cont/car		Total		
		24.9	8		**199**	tons per car exceeds max	
ABC flat	Car maximum loaded evenly		6		**149**	tons per car	
	(could go to 7 but just barely makes it)						
	Assumed material per carload	21.2	6		**127**	tons per car payload	
	converted to carloads based on tonnage		414160		**3261**	cars per year	
	Per train on same service plan		260		**13**	cars per day	
					75	containers per day	
	Lineal length of train		89		**1116**	feet	

TRAIN CREW OPERATING COSTS				
	Train crew hourly cost			
	Benefit ratio	0.5	$30	
	Hourly Crew member cost burdened		$15	
	Number of crew members	2	$45	
	Crew Cost per hour			
	Crew hours per year	2080	**$90**	
	Total annual crew cost			**$187,200**

TRUCK OPERATING COSTS					
	Truck Driver/ Stack Loader hourly cost		$25		
	Benefit ratio	0.35	$9		
	Hourly member cost burdened		$34		
	Number of employees	14			
	Cost per hour		$473		
	Hours per year	2080			
	Total annual labor cost			**$982,800**	
	Truck Fuel and Repairs $35.5K/trck	10 trucks		**$355,000**	

RAIL OPERATING COSTS					
	Locomotive costs per day - fuel				
	Locomotive gal p/h	4			
	Cost per gallon	3			
	Number locomotives	2			
	Cost per hour	24			
	Cost per year			**$49,920**	
	Locomotive costs per day - maintenance				
	Per hour	10			
	Per year			**$20,800**	
Direct operating costs					*$ 1,595,720*

RAIL MAINTENANCE COSTS						
Track maintenance cost per year						
	Ties per mile	100				
	Cost per tie	100				
	Tie cost p/y		$10,000			
	Crossing costs per foot	700				
	Crossing feet per year	30				
	Crossing costs p/y		$21,000			
	Signal maintenance		$5,000			
	Weed & Brush control		$10,000			
	Ditching & embackment		$10,000			
	Bridge costs p/y		$20,000			
	Track per year			**$76,000**		
Total operating costs per year				**$1,671,720**		
Rail maintenance costs						$76,000
ADMINISTRATIVE AND OTHER COSTS						
	Insurance		$50,000		Freight share of total costs	
	Debt repayment (no grants)		$823,560		RIFF and/or other loans	
Insurance and debt				**$873,560**		$873,560
RENTAL OF RAIL CARS 4 trains of 13 cars = 52 cars						
	52		$1,042	**$650,208**	**$1,042** per car per mo.	
RENTAL OF CONTAINERS						
4 sets 75 +	320		$180	**$691,254**	**$ 180.00** per container per mor	
					6.00 /day	
Equipment rental costs						$1,341,462
TOTAL ANNUAL COSTS				**$3,886,742**	*$*	*3,886,742*
NUMBER OF CONTAINERS PER YEAR			*19567*			
ANNUAL COST PER TON PER CONTAINER				***$198.64***		
4 container car			*$794.57*			
6 container car			*$1,191.85*			
TOTAL COST PER TON						
414,160				***$9.38***		
TOTAL COST PER CAR						
3,261				***$1,192***		
Debt repayment per ton	*$*	*823,560*	***$ 1.99***			

Berks County / Covanta Ash Moves
Rail Car and Rate Calculations

1. Based on target cost per ton

Per ton	Annual Tons		Cost	Tons/ truck	Total trucks		Cost truck
$ 12.75	**414160**	$	5,280,540	22.48	18426	**$**	**286.58**

NOTE DOES NOT INCLUDE FUEL SURCHARGE

2. Based on matched railcar pricing (original hopper plan)

per ton				Tons/ railcar	Total cars		Cost rail	
$ 12.75	**414160**	$	5,280,540	100	4142	**$**	**1,275**	per car

THIS PLAN WOULD INCLUDE NS PROVIDING EQUIPMENT

3. Based on matching existing pricing

per ton				Tons/ container	Total cont.		per container		per car (6)
$ 12.75	414160	$	5,280,540	21.17	19567	**$**	**269.88**	**$**	**1,619**
LESS: OPERATING COST - DIRECT		$	1,595,720			**$**	**(81.55)**	**$**	**(489)**
LESS: EQUIPMENT LEASING		$	1,341,462			**$**	**(68.56)**	**$**	**(411)**
GROSS MARGIN						**$**	**119.76**	**$**	**718.58**
LESS: TRACK MAINTENANCE		$	76,000			**$**	**(3.88)**	**$**	**(23)**
LESS: DEBT + INSURANCE		$	873,560			**$**	**(44.65)**	**$**	**(268)**
NET:						**$**	**71**	**$**	**427**

4. Recalculation based on NS projections + breakeven

NS rate margin quoted (their portion)									
$ 14.90 ton	414160	$	6,170,984	21.17	19567	**$**	**315**	**$**	**1,892**
Breakeven rate - direct cost						$	82	$	489
Breakeven rate - equipment						$	69	$	411
Breakeven rate - maintenance						$	4	$	23
Breakeven rate - capital debt + insurance						$	45	$	268
NS rate + Colebrookdale costs						**$**	**514**	**$**	**3,084**
Converted to cost/ton						**$**	**24.28**		
Increase						**$**	**11.53**		