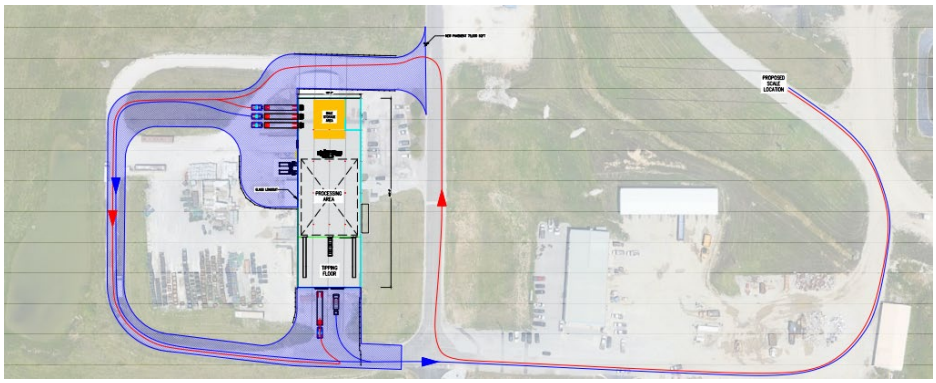


ADDITIONAL ANALYSIS OF MRF OPTIONS

UPDATED 2025

SUBMITTED TO

city of Columbia

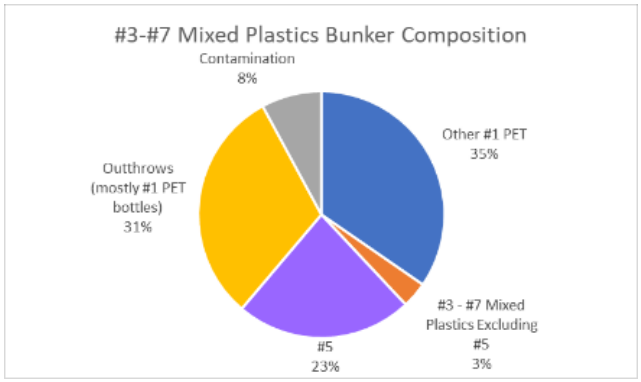
Table of Contents

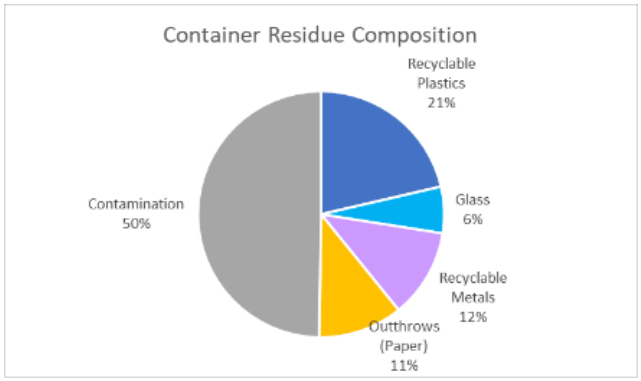
Executive Summary

Background

In 2022 and 2023, RRT worked with the City of Columbia to complete several tasks related to evaluating the residential and commercial recycling collection programs and the Recycling Drop-off Centers. The scope of the study included the evaluation of the Columbia Material Recovery Facility (MRF). The evaluation of the MRF confirmed:

- The MRF is determined to be in poor/fair condition. Excluding the baler, the MRF has a remaining useful life of less than five years. This MRF will require a capital improvement within the next five years to reliably process the City's recyclable materials, based on the current generation rates.
- The equipment is not performing as designed and valuable materials are not being recovered. As originally reported in 2023 report and shown in the charts in Figure 1, 31% of the material in the "mixed plastics" bunker was #1 PET bottles; 33% of the container line "residue" was recyclable plastics or metals; and 40% of the fiber line "residue" was recyclable paper.
- Performance is impacted by the high levels of contamination originating from the Recycling Drop-off Centers.
- There were safety concerns related to the deterioration of the system.





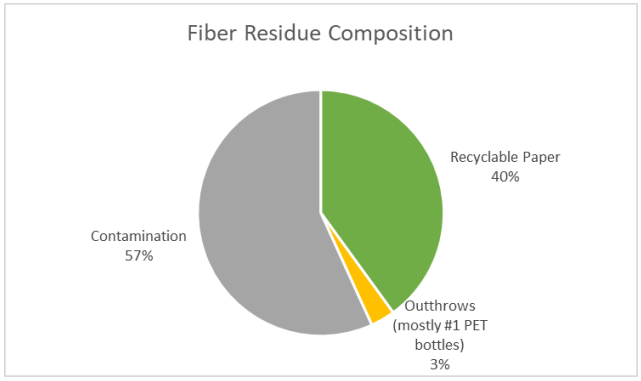


Figure 1: Findings of MRF inspection and Contamination Study

RRT prepared and analyzed several options for Columbia to replace the end-of-life MRF. On January 22, 2024, City Council directed SWU staff to pursue the feasibility of building a new MRF on one of three locations at the Landfill complex. In the final report dated October 2023, these were labelled as "Option 3" and "Option 4" and

described therein[1]. In the work detailed in this report, RRT has further analyzed and scored, or ranked, those two options. In the interest of clarity, the options will now be referred to thusly:

> Scenario A: Build a new MRF on the existing MRF site, salvaging as much of the existing structure, foundation, etc., as possible.
>
> Scenario B: Build a new MRF on the current Landfill Operations Center (LOC) site.
>
> Scenario C: Build a new MRF on the open gravel lot due west of the Administration building.

Parameters of the Analysis

In addition to estimation of the capital costs to develop a new MRF on the landfill campus, RRT applied the following assumptions and requirements, per the direction of the City:

- **Avoid transferring recyclables out of town for any period of time.** As described in the report, Scenario A posited that recyclables would need to be transferred out of town for a period of one to two years, possibly more, during construction. At the outset of the analysis in this report, the Solid Waste Utility directed RRT that the City Council will not accept transfer of material to another MRF.
- **Changes will be made to the layout of the campus when the future South Landfill cell opens.** As described in a January 5, 2018, memorandum issued to the City from engineering consultant Burns & McDonnell, the changes will include re-location of the scale house, re-orientation of the landfill operations center, and other changes when the next cell opens.
- **There are considerations other than costs in the evaluation of the Scenarios.** These include the impact on customers and the community, permitting issues, time spent preparing or improving a site, interference with MRF operations, and timeline to completion.

In the RRT October 2023 report, there is a roadmap for implementing all of the recommendations over time. Figure 2 isolates the elements of that timeline related to development of a new MRF includes dates corresponding to the timeline.

[1] Option 1 was to permanently cease local MRF operations and transfer recyclables to another MRF in another facility; Option 2 called for upgrades and retrofits to create a new MRF of the same size and footprint as the current MRF.

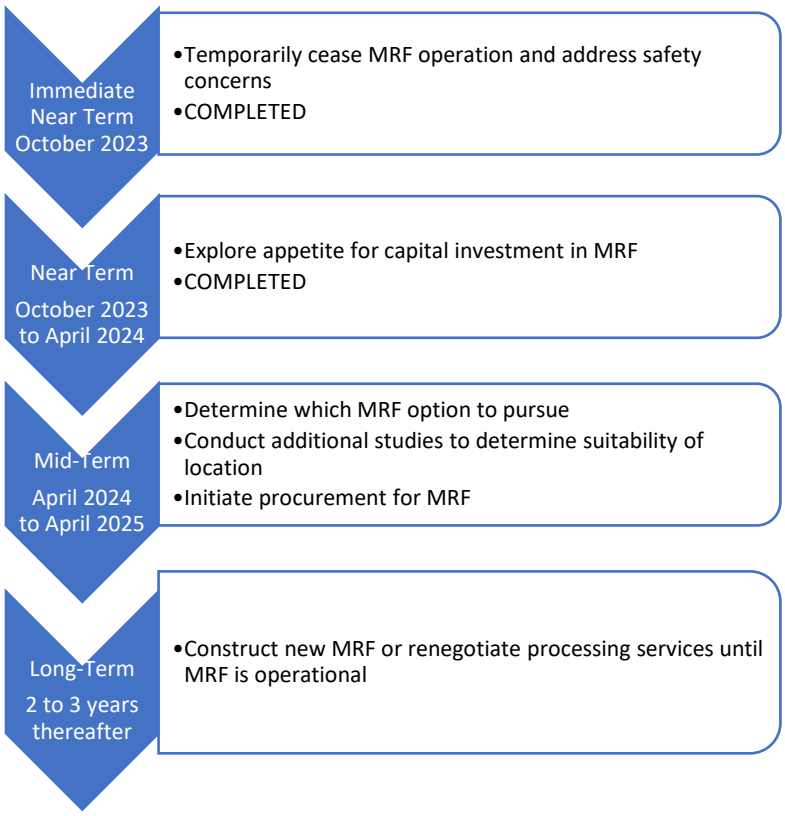


Figure 2: Timeline of Recommendations

The analysis herein expands upon the roadmap, providing decision-making information via discussion an outline of the benefits, risks, and limitations of each Scenario, and an outline of construction plans, including conceptual sketches, refined budgetary costs, and definition of the available construction window with preliminary timeframes and high-level schedules. Development of Scenario B is RRT's recommendation to proceed from the current MRF to renewed local, high-performance processing of recyclables.

1 Benefits, Risks, and Limitations

As shown in Table 1, each of the Scenarios as benefits, risks, and limitations associated with developing a new MRF on that site. They are summarized in the table and discussed more fully in the following subsections.

Table 1 Summary of Benefits, Risks, and Limitations

	Benefits	Risks	Limitations
Scenario A	Cost savings due to salvage of building, largest available footprint	Possible little or nothing can be salvaged	Gap in access to processing capability during construction
Scenario B	Reserves MRF building for future use, coincides with South LF plans	Stormwater complications	Smaller footprint, adjacent uses, need to relocate parking
Scenario C	Reserves MRF building for future use, largest footprint	Many unknowns, considerable stormwater complications	Results in loss of a lay-down and storage area, intersects heavily with traffic to South LF

1.1 Scenario A: Build a new MRF on the existing MRF site[2]

The primary benefits of building a new MRF on the existing site are the potential for reducing construction costs by salvaging some of the existing building structure and the certainties of the geotechnical features of the site, having been an active heavy operation for decades. However, there is a risk that little or none of the existing structure can be reused, or that there are issues with the site not currently apparent. Neither of these will be fully evident until pre-construction begins, and costs will increase accordingly.

This site offers the greatest square footage, both for present construction and for possible future expansion. A limitation of using it for a MRF is the commitment of that considerably large space to recyclables processing for another twenty years or so, making it unavailable for other uses which may be needed as the activity on the campus shifts to the South Landfill Cell.

Another factor to be considered is that while certain repairs to the building and construction of the addition can be done while the MRF equipment continues operating, eventually it will be necessary to demolish the existing MRF equipment in order to erect and start-up the new equipment. Given the condition of the existing processing equipment, it might be prudent to take the equipment offline sooner rather than later. As described above, City Council does not want to transfer recyclables out of town. There is available on the market a small-scale “mini MRF” that is sold as modular units, but it has limitations and would cost approximately $5 million to purchase, plus operations costs. After the new MRF is online, the City might be able sell the equipment, but potential recoup of costs is not knowable at this time.

1.2 Scenario B: Build a new MRF on the current Landfill Operations Center (LOC) site

A major benefit of building on the current LOC site is that it matches best with the plan to relocate the scale house and the LOC as the South Landfill Cell opens. Importantly, in this design traffic to the MRF can

[2] This report, its contents, and analyses do not reflect the tornado hit of April 20, 2025.

go to and from the scales without interacting with traffic to and from the landfill, the truck yard, or the Administration Building. Additionally, building on this site allows the current MRF to continue running until the new one opens, and it leaves the existing MRF building and/or its site available for other uses. For example, the maintenance activity currently located next to the LOC and a new Community Environmental Center[3] could be located there. There is a risk that development of this site will require significant civil work as there is a large stormwater culvert along the northern edge of the footprint. Overall, however, the risks associated with this site are relatively low.

As presently occupied, the primary limitation is the size of the site. Within the current site constraints, it is the smallest area of the three Scenarios and is somewhat irregularly shaped. In addition, after the south landfill capital improvements, the site would be "hemmed in" by other uses on all sides. This would make future expansion complicated, though not impossible, if the road currently running north-south between the existing MRF and the existing LOC can be relocated. In addition, the capital improvement plans show some of the footprint as designated for employee parking, which would need to be located elsewhere. This is an example of how the need to integrate building a MRF on this site with the capital improvement plans for the campus and how they will influence the development of the facility and potentially the development schedule.

1.3 Scenario C: Build a new MRF on the open gravel lot due west of the Administration building

The benefit of developing a new MRF on this site is that it is currently not occupied by any other use, and it is not designated for such in the capital improvement plan. As in Scenario B, building here allows the MRF to continue operating during construction and leaves the existing MRF building available for other uses. The unknowns regarding this site provide both the most significant risk and limitations to developing a MRF there. The land has never been developed for permanent structures. It was previously used as compost pad, and is now used as overflow storage, parking, and lay-down. These uses would need to be relocated elsewhere. In particular, if the site is envisioned as being used for lay-down during capital improvements related to the new South Landfill, that use might need to be relocated.

Importantly, aerial photography and topographical information show that this site is down-grade from most of the other activities on the landfill campus. To the immediate west there are stormwater management ponds, and beyond that Hinkson Creek. Without knowing the characteristics of the subsoil and the magnitude of needed stormwater management improvements, development of this site will require the greatest degree of geotechnical work, and an unpredictable level of civil and stormwater engineering. Both have the risk of greatly increasing the projected cost to develop the site.

2 Conceptual Drawings

The following pages contain conceptual drawings for the three options. These designs illustrate the concepts and also informed the capital cost modeling (e.g., square footage of buildings, paved areas, etc.). Brief descriptions are provided here, with drawings succeeding.

[3] See Section 4.2.2 and Section 7.2 of the October 2023 report for details about a Community Environmental Center.

2.1 Scenario A: Build a new MRF on the existing MRF site[4]

(Figure 3) Incoming traffic would enter through the scales, and travel along the primary west-east roadway across the front of the truck yard and the administrative building. Both delivery and off-loading trucks would turn northward, and enter the site at the northern end of the area and travel in a counter-clockwise route around the building, with traffic commingling as needed. The process flow would be similar to the present, with trucks delivering recyclables through the south end of the building and finished bales leaving from the northwest end of the building. All trucks would exit the site at the southern end, and travel back along the same route to return to the scales and exit.

2.2 Scenario B: Build a new MRF on the current Landfill Operations Center (LOC) site

(Figure 4) In Scenario B, incoming traffic would make an immediate right-hand turn from the scales into the MRF area. Both delivering and off-loading trucks would enter the area, tip or take on material, and then exit again over the scales. There is relatively little commingling of the two traffic flows. Process flow is south to north, with collection vehicles tipping at the southeastern end of the building and material leaving via loading docks at the north end of the building. Delivering trucks would exit quickly, making a left-hand turn to return to the scales. Offtake trucks would circumnavigate the building to exit through the same driveway as delivering truck, also making a left-hand turn to return to the scales. This design requires adjustment to a stormwater ditch which transects the area, but due both to the location and the increase volume of runoff from additional paved surfaces.

2.3 Scenario C: Build a new MRF on the open gravel lot due west of the Administration building

(Figure 5) Similar to Scenario A, incoming traffic would enter through the scales, travel along the primary west-east roadway across the front of the truck yard and the administrative building. Both delivery and off-loading trucks would turn southward, and enter the site just past the administrative building. Delivery vehicles would enter, make a 3-point turn (pausing to tip) and then exit without circumnavigating the building. The process flow would be east to west. Off-take vehicles would enter the site and proceed in a counter-clockwise manner, stopping midway to load bales at the western end of the building. All trucks would leave the site as they entered, and travel back along the same route to return to the scales and exit.

[4] As stated above, this report, its contents, and analyses do not reflect the tornado hit of April 20, 2025.

Figure 3: Scenario A, Build new MRF on existing MRF site

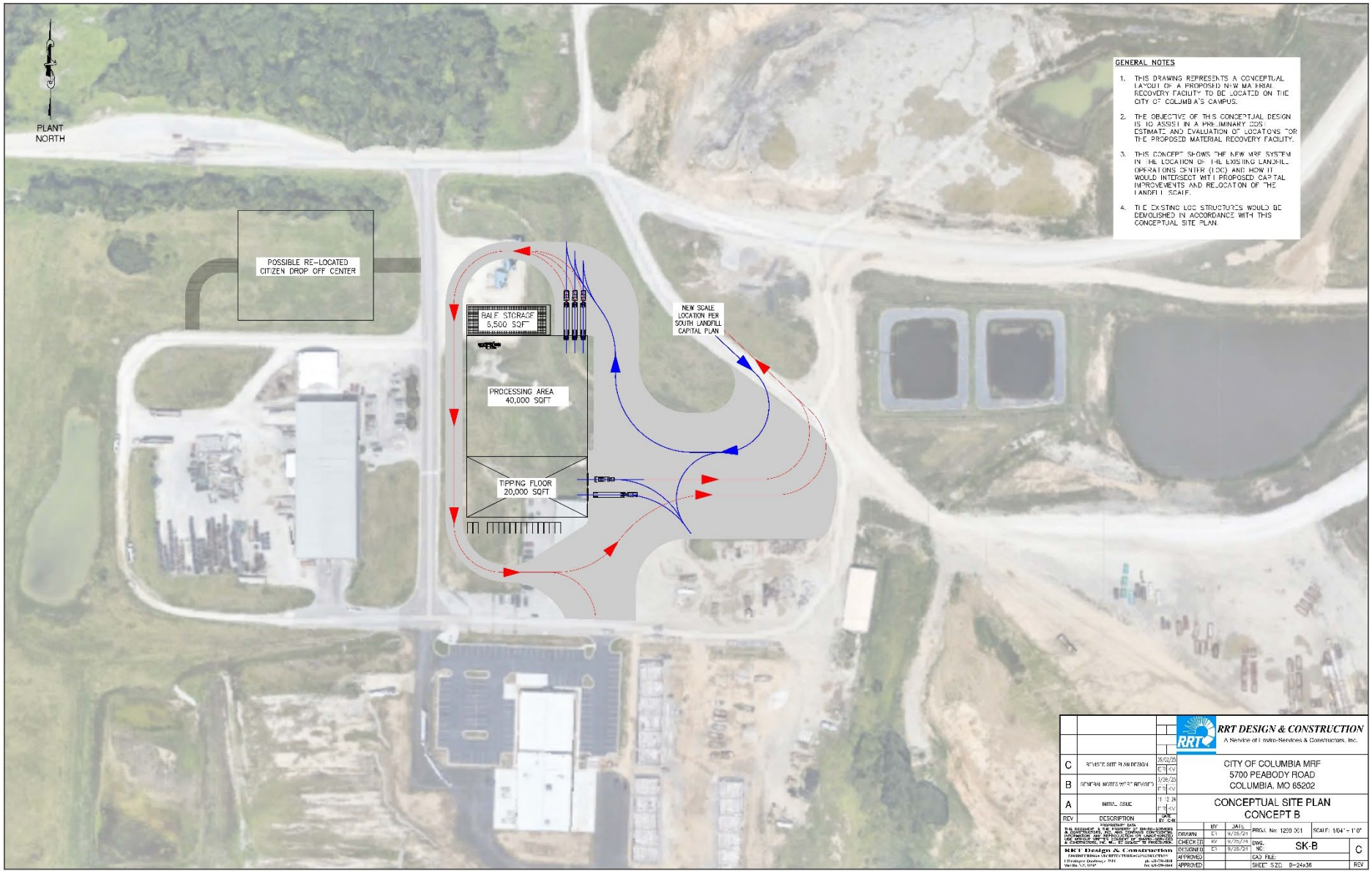


Figure 4: Scenario B, Build new MRF on existing Landfill Operations Site

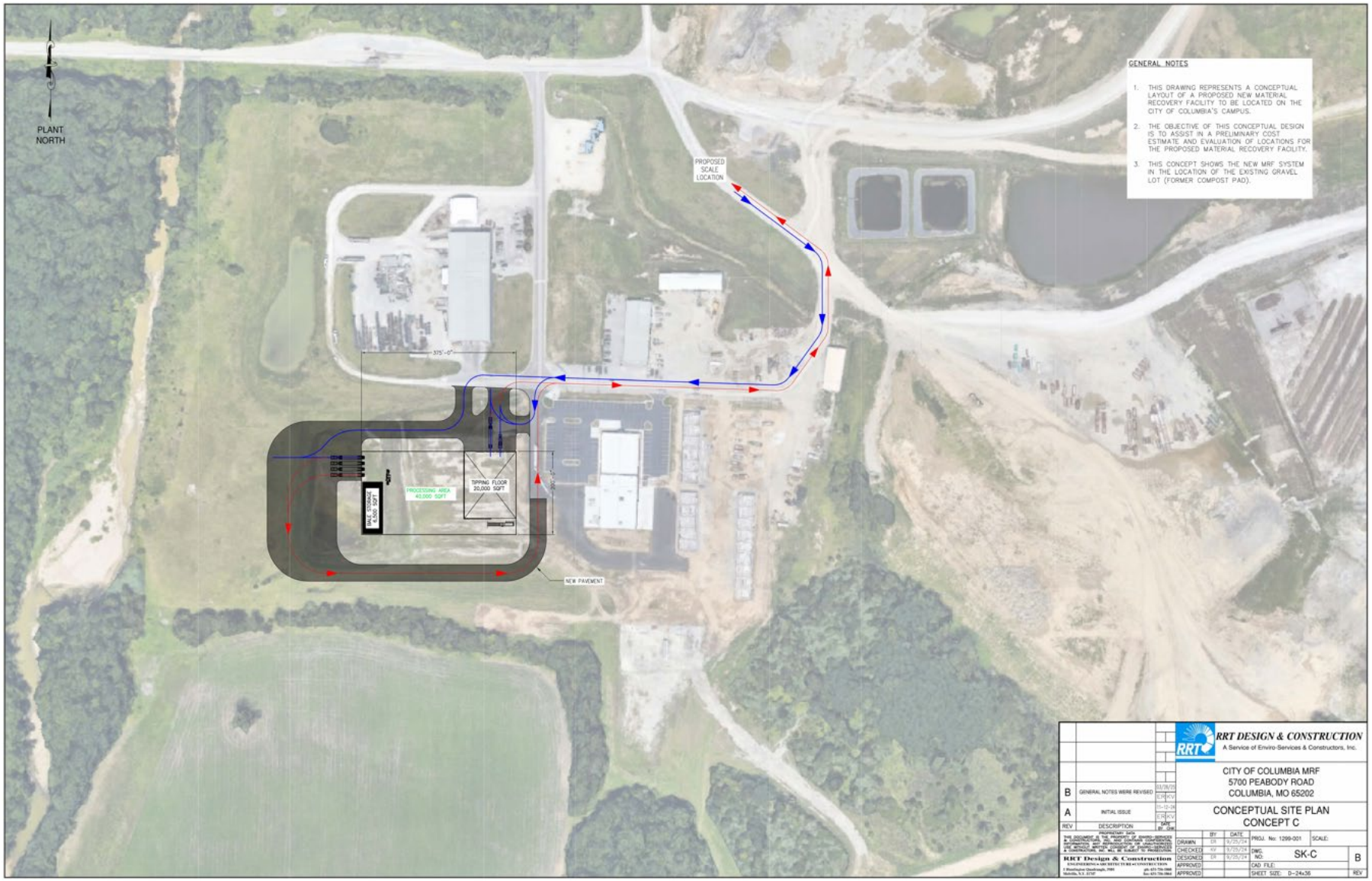


Figure 5: Scenario C, Build new MRF on Gravel Lot (former Compost Pad)

3 Refined Cost Modeling

3.1 Assumptions

The cost model assumes the following:

- A MRF is a permitted use of each site.
- The processing equipment design and fabrication n will be the same regardless of the site.
- The Owner's Engineer and construction management for the processing equipment will be the same regardless of the site.
- Geotechnical investigation is based on past work; estimation does not account for unforeseeable complications which would result in higher costs.
- Time and costs for relocation of any current use are not included and would be additional.
- Financing, interest, and other capitalization costs are not included and would be additional.
- Time and costs for demolition are only included if they are essential for completion of the project.

3.2 Cost Model

LINE ITEM / DESCRIPTION	Scenario A Construct a New MRF on the current footprint	Scenario B Construct a New MRF on the current LOC site	Scenario C Construct a New MRF on the current gravel lot
	Cost Estimate	Cost Estimate	Cost Estimate
New Dual Stream Equipment System	$12,000,000.00	$12,000,000.00	$12,000,000.00
Temporary processing (service or equipment)	$5,000,000.00	$0	$0
Repair existing building damage	$379,562.00	$0	$0
Repair existing site/pavement (approximately 75,000 sq ft)	$1,675,500.00	$0	$0
Construct new 4,000 sq ft building addition	$423,880.00	$0	$0
Construct new 30,000 sq ft PEMB (Pre-engineered metal building)	$0	$7,295,504.65	$7,947,750.00
New sitework (approximately 38,000 sq ft)	$0	$3,814,919.00	$3,737,116.00
Geotechnical site inspection	$0	$25,000.00	$25,000.00
New Asphalt Paving	$762,499.65	$336,719.24	$954,419.40
New Sidewalk Paving	$41,140.00	$40,392.00	$53,766.24
New Concrete Curbs	$334,323.00	$36,526.86	$389,306.70
Demolition of Existing LOC	$0	$1,322,217.95	$0

LINE ITEM / DESCRIPTION	Scenario A Construct a New MRF on the current footprint	Scenario B Construct a New MRF on the current LOC site	Scenario C Construct a New MRF on the current gravel lot
Demolition on Existing MRF Site	$284,877.19	$0	$0
Demolition of MRF Equipment	$230,500.00	$0	$0
Equipment Systems OEM Engineering and Design	$ 300,000.00	$300,000.00	$300,000.00
Owner's Engineer & CM (equipment demo)	$80,000.00	$0	$0
Owner's Engineer & CM (equipment)	$300,000.00	$300,000.00	$300,000.00
Owner's Engineer & CM (building)	$400,000.00	$1,000,000.00	$1,000,000.00
COST ESTIMATE SUMMARY			
PROCESSING EQUIPMENT	$17,000,000.00	$12,000,000.00	$12,000,000.00
BUILDING & SITE IMPROVEMENT	$3,616,904.65	$11,549,061.75	$13,107,358.34
DEMOLITION	$515,377.19	$1,322,217.95	$0
ENGINEERING	$1,080,000.00	$1,600,000.00	$1,600,000.00
TOTAL	**$22,212,281.84**	**$26,471,279.70**	**$26,707,358.34**

The difference between the estimated capital costs for Scenario B and Scenario C is marginal. As discussed in Section 1 and shown in Section 5, however, Scenario B is greatly preferable to Scenario C. The cost model projects some potential cost savings with Scenario A, with the projection for Scenario B at about $4.25 million, or 19%, more than Scenario A. However, as shown in Section 5, again Scenario B is greatly preferable and in an estimate at this point in pre-engineering, the cost difference is not of a significant magnitude.

4 Outlines for Construction Plans

4.1 Assumptions

The construction plans hold the same assumptions as the cost model, as described in Section 3.1.

4.2 High-level Schedule

4.2.1 New MRF on New Site (Scenarios B and C)

1. Pre-engineering: Timing depends on City processes
    - Finalize strategy and identify funding
    - Procure Engineering and Design services
    - Issue NTP to Owner's Engineer

2. Engineering work: Duration 12 to 18 months following NTP
    - Permit submittals, as applicable
    - Prepare and approve site plan
    - Electrical service study, and necessary modifications
    - Engineering and Design
    - Site civil, including stormwater and geotechnical
    - Architectural, Structural, Electrical
    - Finalize construction documents
    - Appropriate funding
    - Obtain building permits
3. MRF equipment procurement: Duration 9 months following NTP
    - Develop and issue RFP
    - Evaluate proposals
    - Award Contract
4. MRF Equipment: Duration 18 to 20 months following contract award (concurrent with MRF equipment)
    - Engineering: 2 months from contract award
    - Manufacturing and shipping: 12 months from contract award (concurrent with Engineering)
    - Erection: 6 months following receipt
    - Start-up and testing: 3 months following erection
5. Construction of building: Duration 18 months following award of equipment contract (concurrent with MRF equipment)
    - Develop and issue RFP
    - Evaluate proposals
    - Award General Construction Contract
    - General Construction, with building ready for equipment approximately 3 months into construction
6. Commence recyclables processing: Approximately 30 months from NTP

4.2.2 New MRF on existing site (Scenario A)

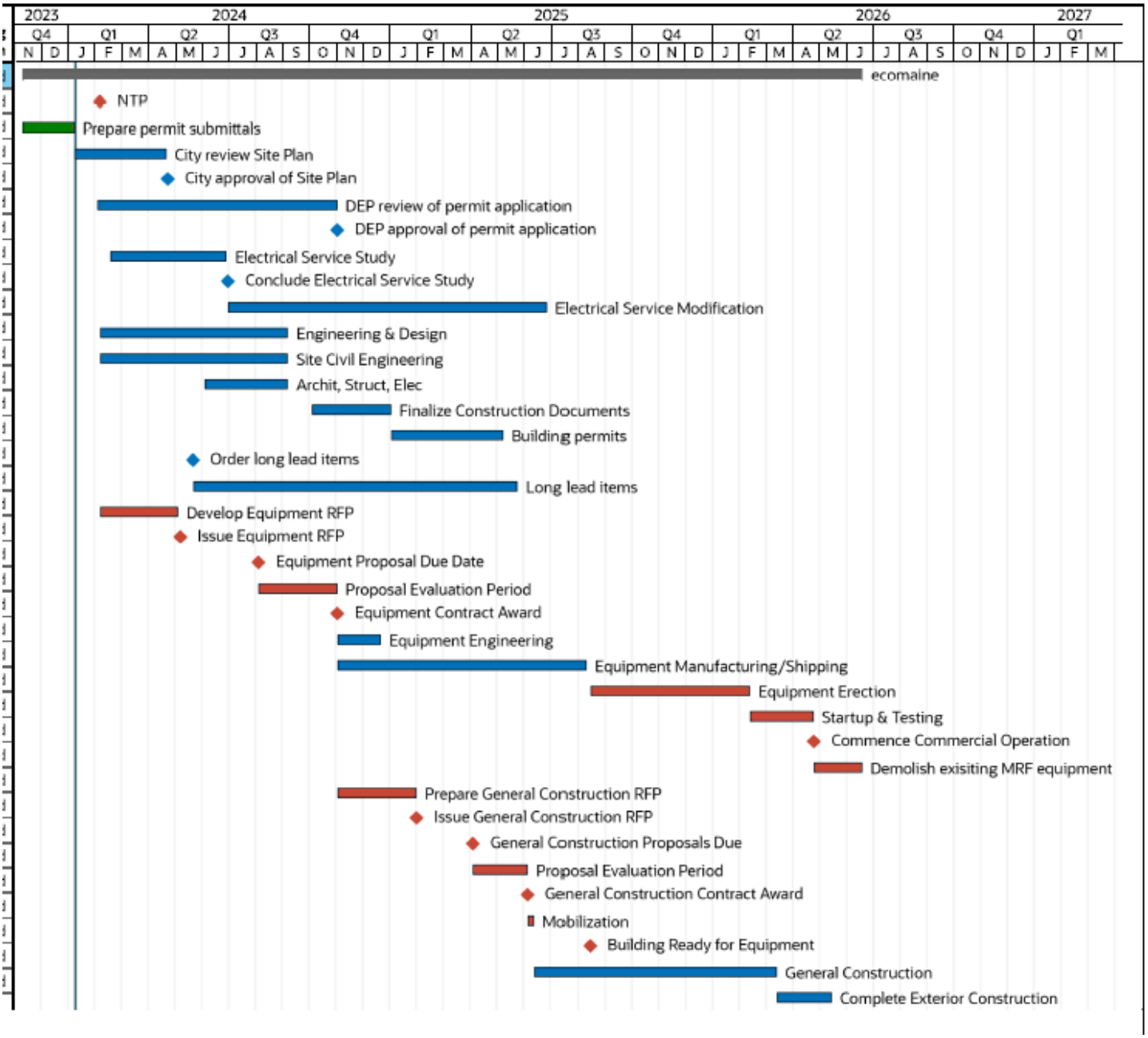
This scenario will require the following additional tasks before Engineering can proceed.

- Demolition of existing MRF equipment
    - Obtain demolition permit
    - Award demolition contract as appropriate
    - Removal of MRF equipment
- Assessment of existing building and other infrastructure

These tasks could require an additional 3 to 6 months in addition to the high-level schedule above.

4.3 Sample Detailed Schedule

This schedule is from an active project similar in complexity to Columbia.


2023
2024
2025
2026
2027
Q4
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Q1
Q2
Q3
Q4
Q1
N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M
ecomaine
NTP
Prepare permit submittals
City review Site Plan
City approval of Site Plan
DEP review of permit application
DEP approval of permit application
Electrical Service Study
Conclude Electrical Service Study
Electrical Service Modification
Engineering & Design
Site Civil Engineering
Archit, Struct, Elec
Finalize Construction Documents
Building permits
Order long lead items
Long lead items
Develop Equipment RFP
Issue Equipment RFP
Equipment Proposal Due Date
Proposal Evaluation Period
Equipment Contract Award
Equipment Engineering
Equipment Manufacturing/Shipping
Equipment Erection
Startup & Testing
Commence Commercial Operation
Demolish exisiting MRF equipment
Prepare General Construction RFP
Issue General Construction RFP
General Construction Proposals Due
Proposal Evaluation Period
General Construction Contract Award
Mobilization
Building Ready for Equipment
General Construction
Complete Exterior Construction

5 Scoring and Ranking

Scoring of qualities: 1 to 5 for Least Good to Best; higher score is better.

	Benefits	Risks	Limitations	Construction Timeframe	Capital Costs	Total Score
Scenario A	3	3	3	1	5	**14**
Scenario B	5	3	4	4	3	**19**
Scenario C	3	1	3	4	3	**14**

Ranking of options: 1 is best or first, 3 is worst or last; lower score is better.

	Benefits	Risks	Limitations	Construction Timeframe	Capital Costs	Total Ranking
Scenario A	3	1	3	3	1	**11**
Scenario B	1	2	2	1	2	**8**
Scenario C	2	3	1	1	3	**10**

6 Recommendation

Considering all of the above analysis, and adding on to the analysis in the initial tasks in project, RRT recommends that the best option is Scenario B – to build a new MRF on the current LOC site. It provides a site that meets all of the needs of the new MRF, with safer traffic flows and clear congruence with already-planned capital improvements. It also avoids complications related to temporary processing and taking away lay-down for other capital projects. The primary limitation of the site—the displacement and relocation of the LOC—is within the City's discretion and control.