TO: IHLS Executive Committee  
FROM: Leslie Bednar  
DATE: April 10, 2024  
RE: FY2025 IHLS Automated Materials Handling System (AMHS) Proposal

Background

Illinois Heartland Library System (IHLS) staff have been discussing the potential benefits of an Automated Materials Handling System (AMHS) since January 2019, when previous IHLS Operations Director, Susan Palmer, visited the King County (WA) Library System and later the Chicago Public Library facility. With the increasing number of items circulated through delivery, concerns regarding material handling and staff shortages due to COVID-19, high turnover in part-time positions, and the challenge in rehiring these positions, an analysis was conducted to determine if an AMHS should be incorporated into IHLS operations. IHLS finance and operations staff met to determine the number of staff, what daily operations would look like, and what potential savings we would see in the future.

Automated Materials Handling System Review

An Automated Materials Handling System (AMHS) is a tool, or system of tools, that removes the need for manual interaction to check in, check out, move, or sort materials. Approximately 97% of materials sorted by IHLS Delivery staff are Sharing Heartland’s Available Resources Equally (SHARE) member materials (See chart 1.) When libraries use a shared ILS (SHARE) instead of a handwritten label (Standalone) in delivery, IHLS can use the information in our shared ILS (Polaris) to automatically sort those materials. That happens by scanning the barcode on the outside of the materials or the RFID tag.

Chart 1. IHLS Materials Sorted by Consortia Type

- SHARE 97%
- Standalone 3%
There are many potential benefits to member libraries if IHLS were to implement an AMHS:

- **Long-term cost savings for SHARE member libraries.** AMHS will route items with barcodes instead of labels, thus saving libraries miles of receipt paper tape annually. Our [website](#) has a receipt paper savings calculator for libraries to calculate their savings.

- **Faster delivery turnaround time after weekends and holidays.** With the AMHS sorting 97% of IHLS member materials, IHLS sorting staff can sort heavy loads, such as those due to holidays or weekends, in a single day, eliminating backlogs.

- **More accurate sorting.** While sorting mistakes are not common every day, it does happen. When an item is sent to the wrong library in another hub, it could be over a week before the item ends up in the hands of the patron. The AMHS would further reduce this occurrence.

- **Pandemic-resistant sorting.** The low-touch nature of the AMHS would make disruption to future pandemics or similar emergencies far less likely.

- **More accurate data tracking and statistics.** The AMHS will automatically update the item’s status in Polaris. This lets the library know precisely where their item is in the transit journey.

- **Potential for branch-level sorting for SHARE member libraries.** IHLS is currently exploring the feasibility of a feature that could potentially benefit SHARE members. The idea is that SHARE members could choose to have IHLS sort their incoming materials at the branch level, which would reduce the amount of time required for member library staff.

There are also potential benefits to IHLS if an AMHS were implemented:

- **Reduced long-term operating costs to IHLS.** Personnel costs would be reduced through decreased total staff hours needed. Attrition-related staff reductions will likely accomplish this. Our biggest concern is the staff turnover. We need to hire replacement sorters frequently; over the last 12 months (approx.), of the 12 sorter positions across IHLS hubs, we had to hire and onboard one sorter on average every two months. There is a definite cost to IHLS for that—about $1,000/sorter for onboarding costs and the administration costs of onboarding and training. This does not include any termination costs.

- **Faster delivery turnaround time after weekends and holidays.** With the AMHS sorting 97% of IHLS member materials, IHLS sorting staff can sort heavy loads, such as those due to holidays or weekends, in a single day, eliminating backlogs.

- **Increased efficiency through increased speed.** The number of items sorted per hour would be much higher, helping staff ensure that all items are sorted daily. The typical AMHS can sort, on average, 2,500 items per hour with multiple operators and 1,200 items per hour with a single operator, and current IHLS manual sorting can average 350-450 items per hour per sorter.

- **Reduced likelihood of chronic injury.** Sorting bins attached to an AMHS can be adjusted to employees’ physical needs. This provides a safer, ergonomically adjustable workstation for staff, preventing injuries and worker compensation claims.

- **No major changes to current infrastructure.** The machines that we are considering
require one single electrical outlet and 1 data cable. IHLS will not need to undergo any major changes to install these machines. One vendor reports that their machine at peak operation uses less than the energy a typical hair dryer uses.

AMHS vendors have reported an average life span of 10 years, but many users have indicated that machines' lives are nearing 15-20 years with no current plans for replacement.

**Current Delivery and Funding Challenges**

In central and southern Illinois, IHLS is the heart of interlibrary delivery, providing pickup, sorting, and delivery of library items at no cost to our 520+ member libraries. We also facilitate the transport of interlibrary loan items from IHLS member agencies to RAILS (Reaching Across Illinois Library System) and CARLI (Consortium of Academic and Research Libraries in Illinois) members and back again. IHLS delivery drivers are on the road Monday-Friday, 5:00 a.m. to 2:00 a.m., to get items to patrons as soon as possible.

Delivery service is provided free of charge to IHLS Members by the IHLS General Fund. Delivery is a component of the Illinois Statute ([75 ILCS 10/) Illinois Library System Act](#), which funds the IHLS General Fund. General Fund annual revenue is determined after each 10-year census, with the next review anticipated in 2031. This means that IHLS’ current funding will remain flat until FY2031, and IHLS cannot tax levy for additional revenue.

IHLS-member libraries do not pay fees to be members of IHLS. Therefore, members would not see any expenses related to purchasing or operating the AMHS. We do not plan for any portion of the costs of the AMHS to be passed along to SHARE-member libraries either, as SHARE would not be paying for the AMHS; IHLS would.

**Projected Delivery Volume Estimated Using IHLS Historical Data**

IHLS determined the historical average change in delivery volume by analyzing the last 12 fiscal years, FY2013 to FY2024 (this year). The COVID-19 pandemic outlier years (FY2020, FY2021, and FY2024) were removed, and the average increase was 7%. The current year, FY2024, has shown unprecedented growth in delivery volume, at 28% (accurate through Feb. 2024 and estimated through June 2024). Under the assumption that FY2024 is the year patrons are finally back in libraries at pre-pandemic levels, the growth data from this year was also excluded.

**Delivery Volume (Item Count) Is Projected to Grow 7% Each Year**

*Chart 2. IHLS Estimated Item Counts (Delivery Volume) FY2024-FY2035*
Over the next eleven fiscal years, delivery volume is projected to grow 7% year after year, resulting in a projected rise in delivery volume from 3.5 million items to around 7.4 million by FY2035. (See chart 2.)

**Alternate Projections.** Projections are also provided for a more conservative 3% and 5% item volume increase and a 10% increase. A 10% increase is the average with the COVID-19 pandemic decreases removed while leaving in the 28% increase growth in FY2024. (See chart 2.)

**Delivery Sorting Personnel Costs Are Projected to Increase, and an AMHS Greatly Impacts That Increase**

*Chart 3. IHLS Estimated 10-Year Sorting Personnel Costs FY2026-FY2035*
IHLS also projected costs for IHLS Delivery sorting personnel for the same period, using the 7% volume growth plus considering factors such as inflation and minimum wage rates. Estimated costs of IHLS Delivery sorting personnel are expected to increase between approximately $1.6 million and $3.4 million over the next ten years following implementation, FY2026 to FY2035. (See chart 3.)

Alternate Projections. Projections are also provided for a more conservative 3% and 5% item volume increase and a 10% increase. Projections were also calculated using a 0% item volume increase, demonstrating the cost increase not associated with item volume. (See chart 3.)

Projected Savings in Sorting Personnel Costs Under the Condition of an AMHS

Finally, IHLS graphed the difference in the IHLS delivery sorting personnel costs under an assumption that an AMHS was to be required—differences that became apparent during the 10-Year Sorting Personnel Costs projections analysis. The 7% historical average delivery item volume increase was used for the projection, as were the additional conservative estimates of 0%, 3%, and 5%, and a high estimate of 10%. The projections were made under the secondary assumption that savings would not be seen during the first year of the installation of the AMHS. (See chart 4.)

Should IHLS acquire an Automated Material Handling System, estimated savings in IHLS delivery sorting personnel costs are expected to be between approximately $1.3 million and $1.9 million over the next ten years, FY2026 to FY2035. (See chart 4.)
Automated Materials Handling System Acquisition Costs

IHLS will bear the expenses related to the one-time purchase, implementation, and maintenance of the machines. The IHLS General Fund Reserve balance and the possibility of future grants will fund the project. The one-time purchase includes bid price and add-on features at an estimated $725,000, while implementation costs cover barcode duplication, legal review, and electrical and data work estimated at $127,990. The projected expenses for maintenance outsourced to the AMHS vendor are anticipated at $519,377 over the next ten years. (See chart 5.)

**Chart 5. IHLS Projected Costs and Savings with AMHS Purchase FY2026-FY2035 with Vendor-Purchased Maintenance agreements**

IHLS Projected Costs and Savings with AMHS Purchase FY2026-FY2035

**Numbers listed in the chart above include vendor-purchased maintenance contracts. IHLS staff estimate in-house maintenance to cost approximately $200,000 over the next ten years, and maintenance costs would decrease by approximately $319,377.**

**Member Library Costs**

The only possible costs that we anticipate for libraries are the materials and labor involved in barcode duplication of items if (and only if) libraries:

- Are SHARE members
  - and have item barcodes on the inside of the item,
  - and do not have an RFID (Radio Frequency Identification) tag. (To take advantage of an AMHS, barcodes must be on the outside of the item if they do not have RFID tags.),
  - and those items are circulated outside SHARE member libraries (we will only need to duplicate barcode items as they are circulated outside of a SHARE library)

IHLS staff are currently evaluating how many libraries this will affect. Some libraries have indicated that they would like the help of IHLS staff to duplicate barcodes on their items using
barcode duplicator equipment. And other libraries have indicated they would like to borrow the barcode duplicators for their staff to accomplish this task. Of the libraries that replied to the duplication survey, the largest percentage of members indicated that they would like IHLS to complete this for them. We have included these estimated costs for the barcode duplication project in the one-time implementation costs above.

Chart 6. IHLS Survey Results on Barcode Duplication Preferences.

What would be your library’s preference regarding barcode duplication?

Option 1: Have IHLS duplicate all eligible barcodes for us as they pass through an IHLS hub

Option 2: Borrow a barcode duplicator from IHLS and duplicate the necessary barcodes ourselves

Option 3: Some of both of the above

Return on Investment (ROI)
The projected return on investment will vary based on how item volume count growth continues for IHLS delivery staff. At a 0% volume growth over a current fiscal year, a return on investment would be seen in 9.81 years; if volume growth continues at 7%, as historically shown, a return on investment would be seen in 7.82 years. (See chart 7.)

Chart 7. IHLS Projected ROI on AMHS purchase with Vendor-purchased maintenance

IHLS Projected Number of Years Return on Investment on AMHS Purchase Vendor Purchased Maintenance

*Historical average cost increase (excluding COVID-related outlier years)
If IHLS staff determine that maintenance should be completed in-house versus the vendor-purchased maintenance contracts, the ROI projections would be sooner than eight years. (See chart 8.)

**Chart 8. IHLS Projected ROI on AMHS purchase with in-house maintenance**

<table>
<thead>
<tr>
<th>% INCREASE USED FOR PROJECTION</th>
<th>IHLS Projected Number of Years Return on Investment on AMHS Purchase In-House Maintenance</th>
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<tr>
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*Historical average cost increase (excluding COVID-related outlier years)

**FY2024 Request for Proposal (RFP) Responses**

IHLS Automated Materials Handling System costs are currently included in the proposed FY2025 General and Capital Projects fund budgets for $852,990. The RFP for this project was posted in January, and we received three total bids at the bid opening on Tuesday, March 19, 2024. The bid results are listed below:

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<th>Vendor Name</th>
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<th>Edwardsville</th>
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**Recommendation**

Above, please find the detailed list of bidders and their proposed pricing for your review. IHLS staff recommends awarding Lyngsoe Systems for the Automated Materials Handling System project as they were the lowest responsible bidder. **The one-time purchase includes bid price and add-on features at an estimated total of $725,000.** Please consider this recommendation to present to the Executive Committee at their April 2024 meeting. The awarded bid will need final approval at the May 2024 board meeting.

Thank you for your careful review of our project proposal, and please let me know if you have any comments or questions.