

# **Methodology for identifying suitable parcels for new affordable homes**

A GIS analysis of metro Clackamas County

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## Client background

Our project was prepared for Clackamas Community Land Trust (CCLT), the only non-profit organization providing affordable homeownership opportunities and related educational resources to Clackamas County's metro area since 1999. CCLT has created 31 homes, which have served 38 households since its founding using its "buy the house, lease the land" dual-ownership model.

CCLT makes homes available by either acquiring existing properties and performing rehabilitation construction, or by developing new housing stock on land that was either unimproved or underutilized. It sets the sale prices of its homes at levels affordable to people of lower incomes,

following guidelines set by the federal government to determine eligibility. Affordability is achieved

because buyers do not pay for the cost of land, in effect. They lease it at a nominal cost from CCLT through a renewable, 99-year agreement that does not restrict the leaseholder to any legal uses of the land. If leaseholders decide to sell they must sell the home to another qualified low-income buyer. The seller will receive a proportional share of any gains in the home's value based on a resale formula that includes a market appraisal and length of ownership.

Like many real estate markets, the Portland metro area recently experienced a housing boom that placed market-rate homes in urban areas out of reach for many median income households. Clackamas County's home values have climbed at a dizzying pace since 1999. CCLT's work helps to provide local communities with control over their neighborhood's economic, social and environmental resources as



**This 3 bedroom, 1.5 bath home is one of the first homes built by CCLT. It is currently for sale for \$135,000.**

land values escalate. Affordable housing is a critical urban planning issue because of the cycle of negative impacts that a shortage creates:

- People look for affordable housing further from urban centers
- To reach the urban centers from more remote areas not well-served by transit, people drive more, trip lengths stay high or grow, and traffic congestion persists
- Air and water quality suffers from increased auto trips
- Expanding infrastructure out to sprawling developments carries a higher cost to the public that governments cannot afford
- People of lower incomes experience equity impacts on a wide social and economic scale as they relocate to areas they would not normally choose to live save for the inexpensive housing.

Sandra Newman conducted a study reported in the Center for Housing Policy review about the well-being of low income children and found that households may trade certain necessities such as food, clothing, or health care in order to manage housing or utility payments, causing hardships and stress that will influence families' wellbeing. Another study cited in the review was conducted by the Economic Policy Institute and looked at how living in affordable housing affects the quality of life of working families. The study found that households paying more than half of their income on housing costs spend substantially less than other families on other important necessities like food, clothing and health care. Families with high housing costs spend much less on transportation and vice-versa.

The study also found that renters were more likely to experience material hardships than homeowners. All of these findings support the need to develop more affordable home ownership opportunities in close-in neighborhoods where people have access to community amenities like transit, employment and child care. A shortage of affordable housing perpetuates inequity in our society by forcing low and moderate income families to make choices between goods and services that are necessities; goods and services that should not be sacrificed.

Traditional housing developers need to receive a certain level of return on investment (ROI) when

building a new project which often creates a situation where affordable housing projects just don't make financial sense on their own. Public subsidy often has to fill the gap that traditional financing leaves when projects are evaluated for profitability. Arranging bundles of public subsidy and traditional financing to produce affordable housing can be a special challenge in urban areas where land values have increased because of desirable community attributes and market forces. Many cities have turned to Community Land Trusts (CLTs) to form partnerships that address this problem.

According to an article from the Lincoln Institute of Land Policy entitled The City–CLT Partnership, municipal support for CLTs may come in a variety of forms, from administrative staffing at startup, to donations of city-owned land and grants or loans for project development, to capacity grants to help support operations. Local jurisdictions may also assist CLTs by revising their tax assessment practices to ensure fair treatment of resale-restricted homes.

## **The Problem**

Like many non-profits, CCLT is doing important work with limited resources. When funding for a new housing development becomes available they have to move quickly and efficiently to reduce administrative costs while maximizing the amount of funding that goes into the housing development itself.

CCLT prefers to develop housing near community amenities like transit, schools, parks and employment centers. Improving properties that are under-utilized like brownfields or government surplus land is also appealing because they may be able to get it for a reduced cost.

The normal procedure for finding ideal properties involves working with either a member of the Community Development department or a real estate agent to find properties based on attributes such

as size, location and price. Information is gathered about individual properties and then the tedious process of sifting through each one and evaluating whether it meets the basic criteria is completed. Once the list has been narrowed down, a windshield survey allows the agency to consider other factors such as what is located near the site, and further elimination can be done.

This process can be cumbersome and time consuming for an agency that is working with limited time and money. If there were a methodology for incorporating spatial analysis into the process, identifying parcels that would be ideal development sites for CCLT would become a much more efficient process. Therefore, we defined our problem:

**A non-profit affordable homes provider in metro Clackamas County needs to be able to spatially analyze properties that are suitable for new developments.**

GIS allowed us to develop such a methodology. We are hopeful that the methodological approach we have developed to spatially analyze land suitable for development by CCLT is generalizable to any other community land trust, other non-governmental organizations, and municipal and county bodies alike that want to apply a shared equity affordable homeownership strategy that resembles CCLT's.

## **Raw data**

Collecting primary data beyond the scope of Metro's RLIS dataset, which is made available to Portland State University, was a vital part of this project. (For a *metadata* summary see Appendix.) The primary data that provided the initial concept for the project is a spreadsheet of government surplus property under the control of various administrative levels of Clackamas County. This data includes county, state, and federal land, but the focus here is on the county-controlled land.

Other primary data we gathered:

- a table on brownfields downloaded from DEQ's public web site;
- a shapefile for the NCRA boundary;
- a table containing 2008 estimates for household demographic data was downloaded from iXPRESS, a rich market research system administered by Claritas;
- a table we made by browsing RMLS data on vacant land for sale, presented on a commercial realtor's web site.

From RLIS, which is administered by the Data Resource Center at Metro, we used data in the following shapefiles, which are described in full in the metadata appendix:

- Tax lots
- Urban Growth Boundary
- TriMet bus lines
- Light rail lines and stations
- Streets
- Census block groups
- Parks and green spaces
- Rivers
- Major arterials
- Freeways

The project's client has had the surplus property data since 2006 and some of its staff, board of directors members and volunteers had inventoried a few dozen parcels over time to determine if any were suitable for development. It was a hit-and-miss effort. Many parcels appear to be on land that cannot be improved or is too steep, or is outside the UGB and of less importance for affordable housing. A few rudimentary maps had been made for CCLT by someone using what appears to be a GIS, but they show little more than whether road access exists and what shape the lot is, with no neighboring features of the road network or other orientation, much less attributes of the land and its surroundings.

The data's appeal for CCLT is to find a suitable parcel and work with the Community Development department at the county to attempt a transfer of land at whatever cost the government entity in control paid for it. It's hard to pass up an opportunity to get cheap land, but CCLT doesn't have the capacity to

investigate the data spatially while considering a range of attributes. While it's probably accurate to expect a lot of this data to be a wash, it's also compelling because a .75 acre parcel in Oregon City on which CCLT is planning to construct 12 new green-certified attached homes is actually listed in this data. Before CCLT bought it, the county was in control of it. Vacant/surplus or otherwise underutilized land is always an intriguing topic for planners to analyze. This reinforces the way to think about applying a GIS to solve issues around data collection, retrieval, and management.

We knew from the start of the project that one of the main challenges would be integrating data without geographic coordinates and using it in a GIS. Once we understood how non-spatially referenced data without coordinates such as the surplus properties and the tables on brownfields could be used, we were able to move ahead in developing our methodology.

### **Methodology overview**

Once we had our most important primary data, we dug into the process of defining our methodology. The objective was to perform a suitability analysis, which is a predictive process on the continuum of GIS applications. To learn how to provide a spatial analysis of the suitability of land for new affordable housing development, we designed a framework to geographically reference the non-spatial data from our tables on surplus properties and brownfields so it could be displayed. We discussed whether to collect data on other factors that contribute to consideration of what makes land suitable for housing development, but in the end decided data on schools, retail services, employment, and environmental attributes such as solar exposure were beyond the scope of our project's timeline and main objectives. We thought the data we had would allow us to accomplish our basic methodology.

We moved on to tackling which attributes in the data we would focus on, particularly the tax lot property information. When we mastered the geoprocessing steps required, we extracted the main study

area we defined in our research question. As the project’s timeline neared its conclusion, we were able to execute geoprocessing tasks to create overlays of suitable land parcels that allowed for analysis of findings and reflection on ways to improve the methodology. We are satisfied that this methodology provides the basis for doing both a fine-grained, parcel-by-parcel analysis and a comprehensive, bird’s-eye view of the study area to examine feasibility and suitability for developing housing that is affordable to people at or below median income levels. With added experience in GIS and better data, it is realistic to expect more overlays can be added to reveal more about housing demand, environmental factors, and how desirable community amenities can be made accessible to the new housing development.

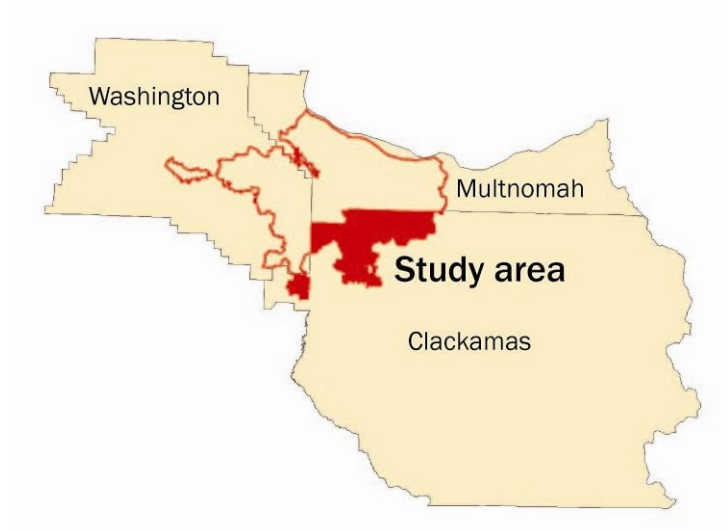
### **Study area description**

Clackamas County encompasses 1,879 square miles, in north central Oregon. Portions of the county were added to the Portland metropolitan area's urban growth boundary (UGB) in 2002. We limited our analysis to the intersection of Clackamas

County and the UGB because this area is where the pressure for affordable housing is greatest.

After defining our study area, we chose the North Clackamas Revitalization Area (NCRA) as one of our sub-areas. The NCRA was formed in 2006 and includes

over 1,000 acres of property used mostly as low-income residential property in the northern part of the county. It has been identified as an area in need of redevelopment and public subsidy may be available for projects that will improve the livability of the area. Many of the problems that exist in the NCRA



are infrastructure related. For example, extending sanitary sewers to areas that are currently on septic tanks was identified as a project of great need in the Fuller Road Station Area Plan created in 2006.

The NCRA will benefit from improved transportation infrastructure in the fall of 2009 when the I-205 light rail will open. This new line will connect Clackamas Town Center with Gateway Town Center. Developing affordable housing near this new line would make commuting easier for those without personal vehicles, so we wanted to consider it in our spatial analysis.

The City of Wilsonville is another sub-area we chose to investigate because of the new Westside Express Service (WES) commuter rail line that opened there this winter. This line connects Wilsonville, Tualatin, Tigard and Beaverton. Although Wilsonville is closer in proximity to Washington County, it is part of Clackamas County and acts as an employment center that needs more housing for the workforce it hosts.

In addition to areas that are being served by light rail or commuter rail lines, we chose four other sub-areas to narrow our research. Those included Oregon City, Clackamas-Sunnyside, McLoughlin Boulevard and Milwaukie. These areas were chosen after our initial analysis revealed the most potential for suitable parcels.

### **Outline of GIS processes**

To describe our GIS decision-making in further detail, here is a summary description of the major GIS data processing steps we took and comment on how some steps were rationalized.

*Extraction:* Because the project team is either completely new to GIS or new and inexperienced, it was not easy at first to prepare our project's tax lots shapefile from the massive metro-wide RLIS tax lots

file. But once we mastered the technique of properly extracting the data that intersected with Clackamas County it was a snap. Our new tax lots file was then selected for intersection with the UGB boundary line and clipped to create a main study area. From there, the same extraction process was used on streets and block groups to provide the framework on which to hang our non-spatially referenced primary data on surplus properties, brownfields, for-sale properties and demographics that did not have any coordinates. For orientation and reference, the remaining data was added.

Address geocoding and joining: The following processes were key to producing our overlays.

- The address data in the brownfields table was cleaned and successfully geocoded on the streets, then joined to the tax lots polygons.
- What few properties for sale we collected by hand from browsing a Web site were also address geocoded and joined.
- The parcel identification numbers on the government surplus table were cleaned and joined to the tax lot attribute table, and by keeping only matching records, a new shapefile was created showing the results.
- The iXPRESS 2008 demographic data on households for an overlay demonstrating demand for affordable housing was easily joined to the RLIS Census block groups.

Overlays: The objective is to display parcels that meet the parameters set in the research problem. We made a set of assumptions based on our limited understanding of our data.

- Acreage is important to determine for suitability, but we were having trouble with this attribute in the selection dialogs. We substituted the Area field and calculated square footage equivalents to the range between .5 acre and 1.5 acre, which represents parcel sizes CCLT has experience handling in development. We successfully exported a new tax lot shapefile with just the RLIS parcels that met this criteria.
- Land use and property coding is a detailed question that we could not afford devoting too much time to. We had information on what three property codes mean to the client, so we used them to select by attribute and build on the overlay we were creating. (See table below showing the property codes.)
- Selecting by distance of .5 mile from bus lines and the three light rail stations in our study area was simple and was the last step in making our final tax lots overlay. We noted the network analysis methods discussed in class and used by other student groups and believe finer-grained studies related to our methodology would be interesting, but since we are doing a macro-level study, and buffering all the bus lines that run through our study area would complicate presentation of what is already a busy map, we felt this simple step was sufficient.

- We normalized the demographic data to show the percentage of potentially qualifying households in the study area, making a choropleth overlay for the map’s background.

With a limited timeline, we could not do a lot of detailed research to rationalize most of the decisions informing the steps described above. We drew on the project team’s background and experience (Stacey has LEED AP designation, which helped us understand the importance of including brownfields in the analysis and locating housing near transit, and Dan works at Clackamas Community Land Trust, which gave us insider knowledge of the client’s needs and its overall housing development strategy).

	Description
100	Residential land, vacant
400	Tract land, vacant
700	Multi-Family vacant

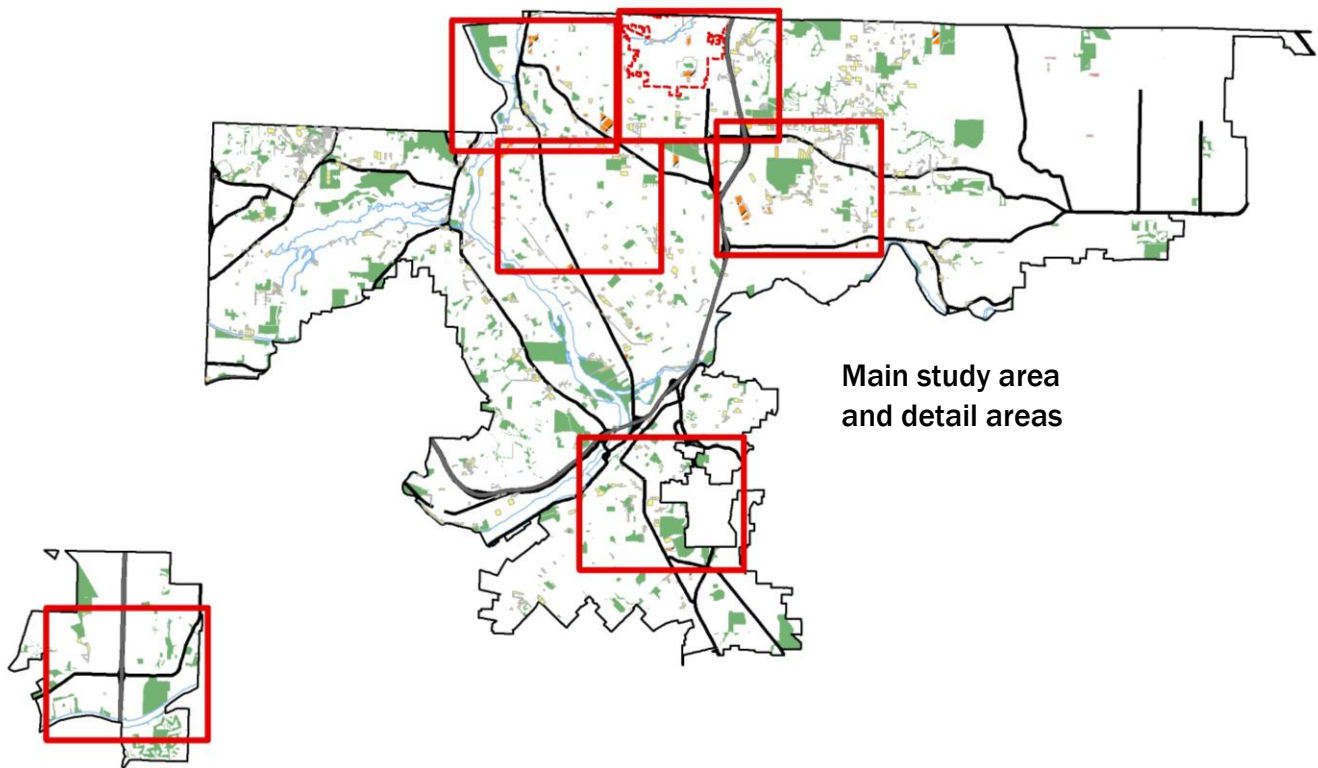
Dan knew that CCLT had paid particular attention to parcels in the government surplus database with the property codes shown in the table here. Since this field is also on the tax lots file, we

decided to use these three codes when we made the overlays of the RLIS tax lots by proximity to transit. As we moved forward in the project, we became excited about applying our knowledge of GIS later in MURP courses such as Site Planning, where we can apply greater knowledge of land use to make more informed decisions with this data and improve on the results achieved in this project.

### **Analysis of findings**

Once the non-spatial data was processed and all our thematic overlays were ready, we could look at the map and analyze the results. It should be noted here that no more than two iterations of the overlays were made once we discovered how to make our processing steps work. For example, with more time spent repeating the selection and extraction processes that went into the tax lot overlays, and time to research the tax lots attribute table, we think the results would be improved.

Affordable housing developers regularly assess demand as they make decisions in the development



cycle, starting with data on households and income. In this analysis an indicator was created from the quotient of households with three persons or fewer and households with incomes at or below \$49,999. This income break value, used by the U.S. Census and the iXPRESS market research dataset, comes close to the maximum income of \$48,900 for a household of three people used by CCLT to determine eligibility. This data was used to make a choropleth map overlay by joining on Census block groups. For the 123 block groups in the study area,  $M=42.2\%$ ,  $\text{median}=40.2\%$ , and  $SD=16.6\%$ . The range is 12.4%-85.6%. We symbolized the data to show demand for affordable housing is strong in the study area, in terms of number of eligible households.

To resolve scale, we decided to break the main study area up into subsections to show detail once our map was assembled, because at the approximately 1:150,000 level to show the macro view it is possible to see the parcels we located, but you can't analyze or determine anything more about them.

*See the map section in the appendix to see the results.* Each subset detail area is shown on its own plate with analysis summarized on the layout. At the deadline for the final project, after seeing the other student groups' presentations, we realized a useful map we could have made would be a point map for this purpose, so a viewer could immediately see how many parcels were produced.

We chose the subsets for either a high number of parcels to come out of the methodology, or a noteworthy small amount. These are also areas with demonstrated affordable housing need and strategic opportunities for new development.

### **Limitations and opportunities for further study**

Although our project produced good results that will be helpful to our client, there are limitations.

One limitation includes having a compressed amount of time to produce the project. There were many other opportunities for analysis of interesting datasets but because we had to produce a quality product in only 10 weeks we had to limit the variables we included. Some interesting variables we wanted to consider include solar exposure, slope, wetland location and quality, socioeconomic equity data and spatial analysis of employment centers.

Additionally, we wanted to identify parcels that were actually available for the client to purchase if they met their criteria. Although they could approach a property owner about purchasing their land whether or not the parcel was even on the market, we felt it would be more helpful to spatially identify parcels that were already for sale. We browsed the MLS listings in our study area using a commercial realtor's web site and created a database (.dbf) file by hand that included the address, parcel size and price. We geo-coded that .dbf on the study area's streets file and then joined it with our tax lots file so that we could display them on the map. However, the join did not successfully work for all the parcels in the dbf. The result was only a small number of for sale parcels on the map. Should this project be

expanded or continued, it would be better to work with a real estate agent who could provide an Excel sheet containing valid addresses that might be easier to geo-code.

Another limitation of the for-sale parcels we were able to geo-code includes the time frame of analysis. These properties are for sale right now, so our results are only valid for a limited period of time. This snapshot can be useful today but does expire as properties sell and are no longer available.

Brownfield sites also presented a challenge when it came to geo-coding. The Department of Environmental Quality maintains the records of parcels that are contaminated or are perceived to be contaminated and regulate clean-up and monitoring of these sites. The sites are in varying stages of clean up. Some are only perceived to be contaminated but have not yet had an inspection done to verify the extent of damage and don't yet have a plan of action assigned to them. Others have been cleaned and are under long-term monitoring by DEQ. We had to determine which of the status codes we wanted to include in our analysis and then remove the others. Several of the remaining sites had two addresses associated with them; a site address and an owner address. Still others only had an owner address. These varying address types made it difficult to geo-code and join with the tax lot table. We were successful and have shown a total of 50 sites on our maps but the age of the data also presented a problem. The DEQ data was from 2007 so some of the sites have already been cleaned and redeveloped. This validates the fact that this project is a starting point for further analysis.

Parcel sizes also presented us with some challenges. We extracted properties that were between .5 acre and 1.5 acres. These parameters were chosen based on the densities that CCLT prefers to build in their communities. The result was a collection of properties that, according to the tax records, were within the size guidelines but on the map appeared to be very thin, long, curved lots that didn't have road access. Upon further investigation it appeared that some of these vacant lots were actually just

right-of-ways within existing developments or other scraps of undevelopable land. If further research was done, GIS should be used to select properties by shape in addition to size so that sites that cannot actually support housing could be eliminated.

The government surplus data was also not fully spatially represented because some of its parcel numbers were posing trouble in the join to the RLIS tax lot parcel ID field. Our join attempts in the beginning were failing, and we decided the tax parcel field's format needed to be consistent. It has several patterns of alphanumeric formats, with 10-13 digits including spaces. So we chose a format that appeared often in the primary surplus dataset and jettisoned the cases that didn't match, and this ended up decreasing the dataset's spatial references by about a third.

## **Conclusions**

A GIS can be used to create a very effective spatial analysis of the suitability of land for new affordable housing development. At the lowest level of the GIS application continuum, thanks to the RLIS database accessible to everyone in the Metro area, much of the data required is already digitized, attributed, and topologically valid and reliable. An experienced analyst or researcher can quickly move up the GIS application ladder to the descriptive and predictive rungs where there are many uses for assisting the real estate development process. At the land record management level, however, the data needs to be closely scrutinized and considered for how spatial reference will affect the final outcome. Data without geographic coordinates, such as brownfield tables with common tax lot attributes that come from DEQ and real estate market information, is critical to the methodology but it won't be topologically prepared by an organization with GIS capacity when the researcher gets it. We learned that students in a beginning class can figure out how to represent data spatially, so an experienced GIS user could do it quickly and move ahead with their own variation on the analysis method.

We would like to keep in mind three recommendations as we go forward in our studies and careers.

- A GIS analyst at a municipal or county entity in Clackamas County should reproduce this project after interviewing the client and hearing its needs, improve on the results, and deliver it to CCLT as soon as it's feasible. Especially in this economic climate, CCLT is urgently pressing forward to develop new sources of affordable home ownership opportunities and it needs all the help it can get.
- We feel strongly that brownfields data need to be more easily georeferenced. If this could be accomplished at a regional or even state level, it will be very useful to analysis like this going forward. Clark Henry at the Bureau of Environmental Services is involved with the Portland Brownfield Program. When we asked him for direction on our project, he directed us to DEQ and commented about using the data in GIS. "Mapping the sites from each of these databases is extremely challenging. (The data) don't like to geocode. This issue is being addressed by the City of Portland but only for those sites in Portland."
- As an overall recommendation to the affordable housing community, GIS analysis should be considered more often by organizations to include in their pre-development cycle. If real market data can be collected and analyzed so this methodology is given a temporal element, it would become even more practical. Even better, someone might be thinking of doing a suitability study of existing housing in foreclosure using RealtyTrac and data from Fannie Mae. Over the next 12 months or longer, affordable housing providers will be using federal stimulus money to acquire these properties.

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