Business & Innovation

THE BOSTON GLOBE MONDAY, FEBRUARY 21, 2

Columbus Center will make an impact on Boston's skyline.

And under ground.

Developers aim to collect acres of runoff to help recharge the water table in a part of the city where unstable landfill threatens buildings

By Thomas C. Palmer Jr.
GLOBE STAFF

Columbus Center, a half-billion-dollar residential and commercial complex slated for a four-block stretch over the Massachusetts Turnpike in the Back Bay and South End, drew more sustained criticism than any other recent development project in Boston.

But no one is complaining about the effect it will have on the city's critical groundwater problem.

The 1.3-million-square-foot complex, including a 35-story tower, won't contribute to the lowering of the water table, which protects the thousands of vital wood piles that support buildings in the South End, Back Bay, and lower Beacon Hill.

In fact, Columbus Center will be the first big project in Boston to incorporate an extensive rainwater collection and groundwater replenishment system, according to project and city officials.

Water that for years has been running off of paved surfaces into storm drains and sewers — much of it eventually to Boston Harbor — will instead be directed into the ground. Engineers hope it will raise the groundwater level and help maintain the wood pilings' durability by keeping them submerged, unexposed to air, and free of rot.

"We'll be looking at this as a model

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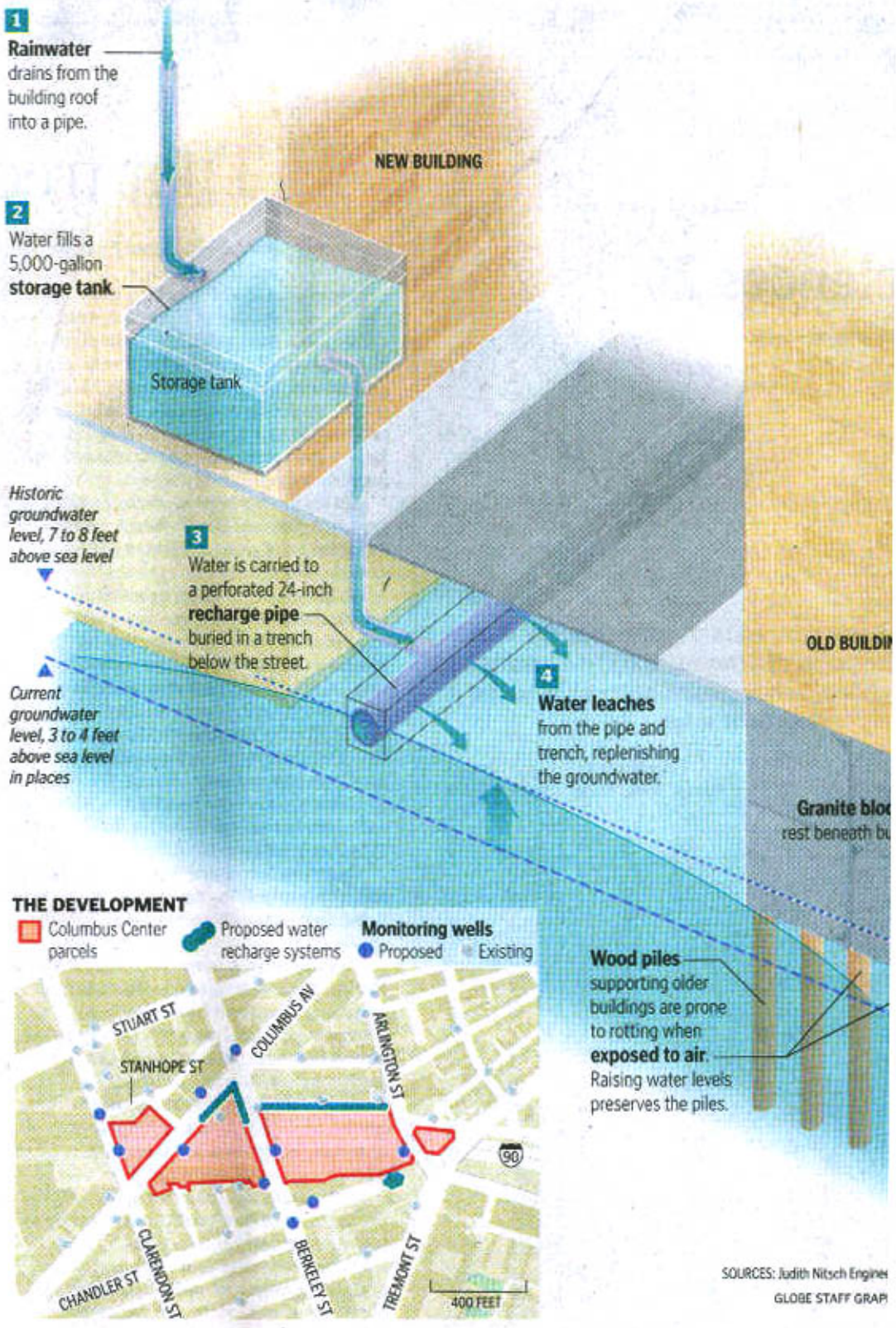
BUILT ON WATER

Putting the water back

Developers of Columbus Center are planning a system to capture rainwater and use it to replenish Back Bay's water table.



SOURCES: Judith Nitsch Engine
GLOBE STAFF GRAP

Developers aim to aid water table

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as we are reviewing other turnpike proposals," said Harry R. Collings, secretary of the Boston Redevelopment Authority board. "We look at it as a community benefit."

Columbus Center developer Roger M. Cassin emphasizes the elaborate water reclamation system is not "mitigation." That is, it isn't repayment to the community for damage or congestion that will be inflicted by the addition of a large project: 451 condominiums, a hotel, 917 parking spaces, and almost 40,000 square feet of retail space.

"We have no negative effect on groundwater," Cassin said.

But criticism persisted through more than 100 public meetings that Columbus Center would be too tall and too dense. So Cassin, codeveloper with Arthur Winn and partner in charge of WinnDevelopment, was looking for as many ways as possible to make the project more neighborhood-friendly.

And what better way than to help keep buildings in the area from sinking?

Structures in the area along the turnpike are endangered.

"It's a big sinkhole," said Peter Pogorski, a South End resident and a member of the Citizens Advisory Committee that reviewed the plans for Columbus Center before it won city approval in 2003.

Pogorski, a critic of the project, now says it has been scaled back to fit in better with the rest of the neighborhood. And he's enthusiastic about plans for groundwater replacement.

"I think that's excellent," Pogorski said. "In the confined groundwater areas — and we know where they are — really all projects should be doing that."

Construction on Columbus Center is not expected to begin before summer. But utilities relocation work is scheduled to start in the spring, and along with it the first phase of the program for groundwater enhancement.

The developers will be adding 10 groundwater monitoring wells to the Boston Groundwater Trust's existing system of about 470 wells under areas of Boston that are filled land, where structures rest predominantly on wood pilings. They include about 100 wells remaining from the 1930s, installed by the Works Progress Administration.

Monitoring wells are read six times a year and indicate when water levels become dangerously low for too long. Wood pilings support the granite-block foundations of brick buildings in the city. When the piles are exposed to air, they begin to rot, and the buildings they support can crack or sink.

Boston's groundwater level, once tied closely to tidal changes, is measured on a scale of 0 to 10 feet, from low to high. Historically, the typical level under the city's filled neighborhoods was at 7 to 8 feet. But as development, subway tunnels, below-ground-level highways, and sewer systems were constructed, water levels have fallen. Water has drained away, and underground structures have blocked the normal movement of groundwater.

The tops of pilings used to be cut off, and were believed to be safely submerged, at 7 feet. But water levels in certain areas now fall well below that, exposing the top several feet of the pilings to rot.

To fix the problem, the buildings are "underpinned." The rotted portions are cut off, and the pilings are capped with concrete that extends down to the lowest anticipated groundwater level.

Repairs for rotted piles are expensive. For a typical single building, 20 by 40 feet, it costs about

Developers of Columbus Center (rendering above) say it will improve groundwater levels.

$250,000 to put concrete caps on deteriorating wood piles.

Columbus Center's planned wells run along the development corridor above the Interstate 90 lanes, from the intersection of Clarendon and Stanhope streets to Arlington and Tremont streets. Four of the 10 wells will be installed at turnpike roadway level, below the surface streets and new buildings. The rest will be at street level.

But the unusual part of the water system is a series of roof collection troughs, 5,000-gallon tanks, pumping systems, and large perforated pipes and boxes. The pipes and boxes, to be constructed underground near the buildings, will deliver rainwater into the ground.

Most of Columbus Center will be built on concrete platforms above the turnpike, similar to the slabs under Copley Place and the Prudential Center that cover the roadway just to the west. Hundreds of feet of 24-inch-diameter water-recharge pipes will be buried along Columbus Avenue, Berkeley Street, and Cortes Street, sending rainwater that has been collected into the ground.

In addition, a cluster of four-foot-square boxes, called recharge galley chambers and located on the other side of the turnpike at Arlington and Chandler streets, will hold up to 10,000 gallons of rainwater and gradually release it to the earth.

Columbus Center's holding capacity will accommodate a half-inch rainfall; engineers say 90 percent of Boston's storms fall into that category. The result will be that about 36 inches of an average annual rainfall of 43 inches will be captured and used, either for watering parks or bolstering groundwater levels.

The system is being drawn up by Haley & Aldrich Inc. and Judith Nitsch Engineering Inc. "It's designed to bring it back up to historical groundwater level," said Stephen M. Benz, chief engineer at Judith Nitsch Engineering.

Boston is not the only city with filled land and water-table problems, but they are particularly serious issues here because so of much of the topography is man-made. Boston's Back Bay and South End are mostly filled tidelands. Lower Beacon Hill and much of downtown also was built on fill, as the city grew out on both sides from the original Shawmut Peninsula — roughly the Washington Street corridor up to Beacon Hill.

East Boston and Cambridge also have extensive filled areas and could suffer consequences from lowered groundwater levels.

"There is now a general recognition on all levels of government that the problem is real," said Elliott Laffer, executive director of the Boston Groundwater Trust. "It took awhile for people to buy into the reality and difficulty of the problem."

The Massachusetts Bay Transportation Authority has also hired an engineering firm to study what is affecting groundwater levels.

The Boston City Council established the trust in 1986, but it only became active under the administration of Mayor Thomas M. Menino in the mid-1990s. The city and state have both contributed funds.

For the buildings around Columbus Center that are endangered by changing water levels, the replenishment system may help keep their foundations strong for decades.

"If wood piles remain submerged below ground and not exposed to air, they function pretty much forever," said Mark X. Haley, principal of Haley and Aldrich, the engineering firm.

"The biggest thing Columbus Center did is raise the level of visibility for this whole groundwater issue, especially in the South End," he said.

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