

Meeting Summary

Keller Beach Sanitary Sewer Project Community Technical Meeting (Hybrid Format)

Monday, November 17, 2025
1:30 – 3:00 pm

Point Richmond Community Center and via Zoom

Overview

On November 17, 2025, the City of Richmond hosted a Community Technical Meeting for the Keller Beach Sanitary Sewer (KBSS) Project at the Point Richmond Community Center, with an option for community members to join virtually via Zoom. The purpose of the meeting was to provide an update on the KBSS Feasibility Study, review the alternatives currently under consideration by BKF Engineers, and create a focused space for participants to offer technical recommendations and propose additional concepts to inform the Study. The meeting also outlined upcoming engagement opportunities, including the January public workshop.

In total, 32 individuals attended the meeting, including staff from the City of Richmond and consultants Kearns & West and BKF. The list of attendees is provided in Appendix A.

Welcome and Agenda Review

Ben Gettleman, facilitator from Kearns & West, opened the meeting by welcoming participants and briefly reviewing the agenda and format for the session. He also provided a short overview of Zoom participation guidelines and emphasized that both in-person and virtual participants would have equal opportunities to contribute throughout the discussion.

Overview of KBSS Feasibility Study

Adam Brown, BKF Engineers, opened by sharing an overview of the Feasibility Study which the City – with support from BKF Engineers – is conducting to address critical issues with the aging Keller Beach Sanitary Sewer, whose 65-year-old interceptor is at risk of failure. Adam reviewed an existing conditions map (see Figure 1 below) which was created using county parcel boundaries and City-provided GIS data. The map highlights parcels believed

to drain to the Keller Beach pipeline and pump station. While the shaded area represents the broader sewer shed, not all parcels will be impacted, and some are undeveloped. This baseline assessment identifies roughly 340 parcels contributing to the system and serves as the starting point for the feasibility analysis.

Fig 1. Map of Existing Conditions



Adam provided a brief orientation to the alternatives under review. Maps of the alternatives that were shared during the meeting are provided in Appendix B. Adam noted that Final Alternative 4, which evaluates replacing or rehabilitating the pipeline along the shoreline, has been of particular interest to community members and will be fully analyzed for feasibility.

He then introduced the three interim alternatives; each focused on reducing flows to the Keller Beach line by redirecting wastewater to other parts of the City’s system. Relieving capacity pressure may support both near-term reliability and long-term solution development.

Overview of Interim Alternatives

Adam summarized the three interim alternatives designed to divert wastewater away from the Keller Beach sewer:

Interim Alternative 1

A gravity-only approach. New gravity pipes in Areas A and B would reroute flows away from the Keller Beach line and toward the pump station or the backside of the hill. This option could divert approximately 52 parcels and is the least costly and least invasive.

Interim Alternative 2

Follows the same concept Alternative 1 but uses pump stations where gravity is insufficient. This significantly increases the number of parcels that could be redirected—potentially tripling Alternative 1 to 154 parcels.

Interim Alternative 3

A hybrid gravity-and-pumping option. In Area B, flow would move by gravity to a junction point, then be pumped over the hill to bypass both the Keller Beach sewer line and pump station. This approach provides additional flexibility for managing topographic constraints.

Discussion and Q&A for Interim Alternatives

What follows is a summary of questions posed and comments provided by meeting participants regarding the interim alternatives, and responses provided by the BKF and City of Richmond staff.

- **Question (Q):** Could any part of the project result in sewage entering the Bay?
 - **Response (R):** No, sewage would not be discharged to the Bay under any circumstances.
- **Q:** Which streets would be affected by the alternatives shown? Including street names on the maps would be helpful.
 - **R:** The team can work on confirming the streets that will be impacted. Some street labels on the figures are difficult to read but can be identified by reviewing the maps.
- **Comment (C):** I am concerned that ideas shared by community members in the past have not been fully considered.
 - **R:** The focus of the current phase of work is specifically intended to ensure that community-generated concepts are identified and considered. Very little engineering analysis has been completed to date, and there is no predetermined plan.
- **C:** The community's earlier concept—now referred to as Interim Alternative 1—was originally presented to the City as a diversion strategy that could remove roughly 20% of the flow from the Keller Beach line.

- **Q:** Will the feasibility study evaluate the risk of increased hydrogen sulfide generation if flow in the Keller Beach sewer line were reduced?
 - **R:** It is possible that increasing airspace in a sewer pipe can also increase the potential for hydrogen sulfide gas formation, but whether it would actually occur is difficult to confirm. Considering that the existing pipeline has no capacity constraints and already operates with headroom, any change in corrosion rate is expected to be minimal and comparable to current conditions.
- **Q:** When problems on the Keller Beach sewer line typically occur, are the issues related to inflow and infiltration, wet-weather conditions, or continuous operational problems?
 - **R:** BKF does not have a full history of past failures, but the City’s understanding is that the original incident involved a defective private sewer lateral discharging into the main line.
- **C:** When the City’s contractor, Veolia, repaired the private lateral, Baykeeper considered that lateral to be part of the public sewer system, which contributed to the enforcement action.
- **Q:** How is the City expected to comply with the Baykeeper consent decree? Does the settlement require installing an entirely new sewer line or simply ensuring that the existing line is protected from leaks?
 - **R:** Based on the 2018 agreement, the settlement addresses citywide overflow, inspection, and maintenance requirements and is not limited to the Keller Beach line. BayKeeper is using the courts to ensure that the City complies with existing State laws related to sewer collection system management and spill prevention. If a line cannot be inspected or maintained appropriately, it will not satisfy BayKeeper because it will not comply with current State/industry regulations and practices. *(Note: Since the meeting was held, the City has confirmed it does not plan to ask the State to relax current laws/regulations.)*
- **C:** I suggest evaluating how the Keller Beach sewer line could be more easily accessed, inspected, and maintained if it remains in its current shoreline alignment. Additional or upgraded access points—such as manholes suitable for CCTV inspection—might be needed along the alignment.
 - **R:** If any alternative involves keeping the pipe in its existing location—whether through replacement, repair, or rehabilitation—the study will need to evaluate the number and type of access structures required. Many existing cleanouts are too small for CCTV entry, and the current alignment includes several sharp bends where additional access points would be

necessary. These requirements would be considered as part of the cost and feasibility evaluation.

- **Q:** What information does the project team currently have about the condition of the Keller Beach sewer line, including what portions have been inspected, what records exist, and whether the study has a complete understanding of the pipe’s condition? Some sections have never been inspected; does the team truly know how extensive the deterioration may be?
 - **R:** BKF’s current study is relying on the City’s 2018 CCTV inspection videos and reports, which document the condition of most—but not all—of the pipeline. Certain segments could not be inspected previously due to access limitations, and those limitations remain. While the team does not have a complete inspection of every segment, the majority of the line has been assessed, and judgments will be based on available data.

The inspected segments show varying degrees of corrosion, sediment, sagging, and deterioration, with no portions appearing to be in notably good condition. Using partial inspection data is common for older, difficult-to-access pipelines, and the feasibility study will incorporate all available inspection information. Gaining visual access to uninspected sections—particularly those located in the Bay—would require additional access structures and permits, which is also a factor the study must evaluate.

- **Q:** Can the feasibility study recommend more than one interim measure? While the final solution will ultimately be a single approach, there may be value in selecting and implementing multiple interim actions. Also, will the evaluation treat these interim concepts individually or determine whether some combination of interim measures could move forward?
 - **R:** The study will evaluate up to three interim and three final alternatives using a full scoring and weighting process. The first step is determining whether any interim option provides enough benefit to justify near-term implementation. Interim measures are being considered separately from the final solutions because they are not expected to satisfy the Baykeeper settlement on their own, given the persistent access and inspection limitations of the Keller Beach line. If an interim measure shows sufficient benefit and aligns with, or “dovetails” into, the eventual long-term solution, it could be carried forward.

The alternatives under review may expand as additional ideas emerge during outreach, and any broader set of concepts would later be narrowed to those that are technically feasible.

- **Q:** How will the study compare Interim Alternative 1 to Interim Alternatives 2 and 3? Alternatives 2 and 3 would require CEQA review because of proposed pump stations, while Alternative 1 is a gravity-only option that could potentially be implemented much more quickly. Also, the timing differences between alternatives could affect how much flow is diverted over time. I recommend that the evaluation account for cumulative diversion rather than only the immediate number of parcels affected.
 - **R:** There are differences in implementation complexity and timing among the interim options. The study will use a structured scoring and weighting process to compare alternatives. Each alternative will be evaluated against criteria such as schedule, permitting requirements, environmental review needs, construction disruption, capacity impacts, and other project objectives. The weighting process will allow both the City and the community to prioritize criteria differently, and the results will be shared back with the community once developed.

Also, the concept of diversion over time can be incorporated into the evaluation, particularly since Alternative 1 could be implemented sooner while Alternatives 2 and 3 may take several years to advance through permitting and CEQA review.

- **C:** An additional interim measure could focus on improving access for ongoing maintenance and inspection of the existing Keller Beach sewer line. This would include upgrading manholes—such as replacing corroded covers with non-metallic versions and improving access points—to support more routine cleaning and inspection, including activities required under the Baykeeper settlement. Even if a final solution were still years away, such upgrades could provide meaningful interim benefit, though I also appreciate that work on aging structures could risk additional damage.
 - **R:** To clarify, upgrading manholes would not resolve all inspection limitations, as certain shoreline segments would still remain inaccessible. And while some improvements could support interim maintenance, the City is limited in what portions of the line it can reach under current conditions. Modifying older structures always carries some risk and these considerations—along with permitting, constructability, and inspection needs—will be included in the evaluation criteria for potential interim measures.
- **C:** I am concerned that the Keller Beach sewer line has not been inspected in seven years and BKF is relying solely on 2018 CCTV data which may limit the accuracy of

developing alternatives. A full inspection should be required to support effective planning.

- **C:** CEQA demands a thorough alternatives analysis rather than focusing on a preferred option and briefly acknowledging others. Also, environmental regulators typically do not consider project cost when determining feasibility. Also, for some projects 100% inspection or full replacement is practically infeasible, and inspection data from accessible segments can sometimes be used to infer conditions in hard-to-reach areas. Cypress Point is an example where direct inspection may not be possible but conditions could potentially be inferred from upstream and downstream segments.
- **Q:** When will Baykeeper get involved in reviewing or approving potential solutions? I'm concerned that the project team might reach the end of the process only to find Baykeeper does not accept the selected alternative.
 - **R:** In general, the team understands the types of solutions that would meet the settlement's standards since Baykeeper is focused on requiring the City to comply with current industry laws and regulations. Baykeeper's direct involvement would likely become important if the City seeks to pursue an approach that somehow seeks a relaxing of those law and regulations, which the City has determined (after the meeting) it will not do.
- **Q:** "Alternative 2, Area B" appears functionally similar to the earliest, simpler interim alternatives. It should be categorized with those earlier options rather than with larger, more complex alternatives. Also, Area B could potentially be implemented regardless of whether the final solution keeps the sewer on the beach alignment or relocates it uphill.
 - **R:** The interim alternatives can potentially be mixed and matched, and the categories shown in the meeting materials are not rigid or exclusive; an interim measure that conceptually fits within another category can still be evaluated that way. The purpose of the discussion is to understand whether community members have strong preferences or concerns about specific combinations of interim measures.
- **Q:** Was Bayhawk removed from the project?
 - **R:** Bayhawk was not terminated. They inspected all areas that were physically accessible, met their obligations, and submitted their findings to the City for review.
- **Q:** Can you provide an overview of pump stations, including their appearance, noise, odor, construction process, maintenance needs, and the possibility of failure?

- **R:** More information about the pump stations (both public and private) will be made available in the analysis.
- **Q:** How many utilities run beneath Western Avenue?
 - **R:** All existing “dry” utilities (i.e. communications, telephone, CATV, electrical) appear to be overhead on poles. Early indications suggest that the only buried utilities in the project vicinity are water, sewer, storm drain, and gas. A more detailed evaluation will be performed later in the study.

Overview of Final Alternatives

Adam presented four final alternatives for long-term replacement or rehabilitation of the Keller Beach sewer line—noting that functionally these fall into three main categories.

Final Alternatives 1 and 2

Both alternatives involve relocating the existing shoreline pipeline into the roadway. In each concept, sewage would continue to flow by gravity where possible, with pump stations used where the pipe becomes too deep and flow must be lifted back toward the system. The primary distinction between the two alternatives is the number of pump stations required: Final Alternative 1 looks for opportunities to reduce the number of pump stations using trenchless installation methods for certain segments, while Final Alternative 2 assumes a more conventional open-cut approach that results in additional pump stations. These differences affect construction complexity, long-term maintenance needs, and operating costs, and will be examined further during the feasibility analysis.

Final Alternative 3

An all-pumping concept that would route flows over the hill instead of sending them to the Keller Beach Pump Station. This approach relies entirely on a series of pump stations and pressurized pipes, with little to no gravity flow. Because each pumped segment could function independently, this alternative could be implemented in phases, allowing portions of the Keller Beach sewer shed to be redirected over time. While this option would progressively remove flow from the existing line, it introduces higher operational and maintenance needs due to the reliance on pumps similar to Final Alternative 2.

Final Alternative 4

An in-place option that keeps the sewer in its current shoreline alignment while evaluating replacement or rehabilitation methods. This alternative would require new access structures, such as additional manholes or cleanouts to allow inspection and maintenance where the existing pipe cannot currently be reached.

Previous video inspections showed varying degrees of deterioration, including corrosion, tuberculation, sags, and sand accumulation, and these conditions would guide feasibility analysis. Although this option preserves the existing alignment, it would still require extensive permitting to work in the Bay environment as required to improve access structures and gain access to the pipeline in the tidal zone..

Discussion and Q&A for Final Alternatives

What follows is a summary of questions posed and comments provided by meeting participants regarding the final alternatives, and responses provided by the BKF and City of Richmond staff.

- **Q:** Will the option of rehabilitating the existing shoreline pipeline using an interior lining be evaluated as part of the final alternatives?
 - **R:** This type of repair is included within Final Alternative 4, which covers any approach that leaves the pipe in its current shoreline alignment—whether through repair, rehabilitation, lining, or full replacement. Detailed analysis of those methods has not yet been completed but will be part of the feasibility evaluation.
- **C/Q:** I would like for BKF to study a concept that involves constructing a microtunnel beneath Cypress Point and slip-lining the entire Keller Beach pipeline with HDPE pipe. This approach may be significantly cheaper than constructing multiple pump stations and could be considered a variation of Final Alternative 4.
 - I also have the following questions:
 - Whether this option could be prioritized or studied first, given perceived cost and community support.
 - Whether the stability of the existing pipeline around Cypress Point is sufficient to support a long-term slip-lining solution.
 - Whether it is feasible to pull a new HDPE pipe through the existing tuberculated pipeline, or whether a parallel replacement pipe in the Bay could be considered instead.
 - Whether the project team could focus solely on this option rather than studying multiple alternatives.
 - **R:** This concept would fall under Final Alternative 4 and will be evaluated. This option would still require substantial access work and environmental permitting, including at Cypress Point. Also, feasibility concerns remain—including heavy tuberculation, sags, and access constraints—which could affect whether slip-lining is technically viable. The stability of the existing pipeline and the feasibility of inserting a new pipe through it are open

questions that would require engineering analysis. Installing a parallel pipe would also trigger the same access and permitting requirements. While the option is worth studying, the project must evaluate all reasonable alternatives and cannot commit to studying only one approach.

- **C:** I have concerns about the difficulty of maintaining and inspecting the existing shoreline manholes, some of which are located at the base of small cliffs. Improved access—such as providing new camera entry points—might allow the City to evaluate the slip-lining and microtunneling concept more quickly.
 - **R:** Improved access points would be necessary regardless and would require the same environmental permitting, including potential beach access and temporary cofferdams.
- **Q:** Can the project team pause other studies and instead focus first on determining whether this microtunnel/slip-lining option is viable, and whether the project could be limited to that approach if it appears workable?
 - **R:** While the concept is technically worth evaluating, major uncertainties remain. Murphy Pipeline’s assumptions are based on not having seen the CCTV footage which shows severe tuberculation, sags (“bellies”), and sections that do not drain—conditions that make slip-lining challenging. Reducing flows through interim measures might allow a smaller pipe to be pulled through, but localized spot repairs would still be required before any slip-lining could occur. While the solution may be cost-effective, it would still involve significant cost and permitting challenges and therefore cannot be advanced as the only option; the project must continue evaluating all feasible alternatives.
- **Q:** Instead of slip-lining the deteriorated shoreline pipe, could the City install a new durable pipe parallel to the existing pipeline in the same shoreline corridor?
 - **R:** This is a valid concept and it aligns with considerations already associated with Final Alternative 4. Since crews would need to access the shoreline for slip-lining, the same environmental permits and access requirements would already be triggered. At that point, it may be reasonable to evaluate whether installing a new, armored pipeline could provide better long-term reliability, especially given uncertainties about the lifespan of the existing concrete encasement. The feasibility study will not develop detailed engineering designs but will identify which solutions—potentially including a new parallel pipe—that are viable for long-term implementation.
- **C:** Diverting households under Interim Alternative 1 would reduce the number of properties affected if Final Alternative 4 were pursued. Also, Cypress Point consists of solid bedrock which could allow for direct drilling rather than following the

existing shoreline alignment. A new HDPE pipe would offer smoother flow characteristics than the deteriorated existing pipe.

R: Reducing flows through interim diversions could allow the feasibility study to consider smaller pipe diameters and potentially additional construction methods. Major obstructions in the existing pipe are caused not only by fats and greases but also by significant tuberculation in the old cast-iron segments, which remained even after chain-cutter cleaning during the previous inspection. A new HDPE pipe would provide smoother flow and some capacity benefit, but the feasibility analysis must still account for the existing sags, access constraints, and environmental permitting requirements, regardless of whether slip-lining or a new installation method is used.

- **Q:** How many other utilities are located in the street?
 - **R:** The team does not yet have a full inventory of utilities but will complete that work as part of the feasibility study. The scope includes obtaining utility maps, performing utility locating using non-destructive methods, and conducting potholing where necessary to confirm depth and location. Adam added that this work will be focused on areas relevant to specific alternatives rather than surveying the entire neighborhood.
- **Q:** Why did the company that performed the 2018 CCTV inspection not video the entire pipeline?
 - **R:** The incomplete footage was due to a combination of factors, including limited access points and sections of the pipe that the camera equipment could not physically navigate. Certain segments simply could not be reached or traversed with the available inspection tools at the time.
- **Q:** Why are Interim Alternatives 2 and 3 being considered at all if they appear to have no long-term value? If the final solution ends up being a gravity system in the roadway or a fully pumped solution over the hill, these interim options seem temporary and not useful in the final buildout.
 - **R:** Final Alternative 3—a fully pumped over-the-hill system—does retain portions of the existing configuration, which is one reason similar interim configurations were examined. This concern ties directly into the evaluation criteria that will be developed and reviewed with the group. Before recommendations are made, the project team will clearly outline upcoming steps, clarify what information will be provided next, and ensure additional opportunities for community review and input.
- **Q:** When and how will the criteria, scoring, and weighting for the alternatives be developed, and will regulatory feasibility—including agencies that may reject

certain approaches—be included in that evaluation? Also, I have concerns about alternatives being removed before community review.

- **R:** Criteria and weights will first be developed with the City, then brought to the community for discussion before any preferred alternatives are selected. Regulatory issues will be screened by the environmental consultant, and no alternatives are being removed at this stage.
- **Q:** Has the City decided how to approach the Regional Water Board, either through a generic discussion or a project-specific discussion? I would encourage direct, project-specific engagement to reduce uncertainty.
 - **R:** The environmental consultant is now engaged but will fully begin once the evaluation set is defined. At that point, the team will determine the most appropriate engagement approach with the Regional Water Board. The intention is to consult with regulators once enough project details exist to have a meaningful conversation.
- **Q:** Can the interim and final alternatives evaluations be integrated into a more unified structure so that the final solutions memo incorporates findings from the interim memo?
 - **R:** The team will produce two separate memos—one for interim and one for final alternatives—but the City will make the final selection. The final alternatives memo will draw from and reference the interim evaluation, and the analyses will not be siloed.
- **C:** I would like to request that no major decisions be made before the next community meeting. The community should not show up to find that alternatives have already been removed.
 - **R:** No decisions will be made before the next community meeting. Next steps will be explained so the community knows when input opportunities occur and how decisions will be sequenced.
- **C:** I would like to hold another technical meeting – there is ongoing community interest in deeper engineering review.
 - **R:** The facilitation team will plan to schedule another technical session. Coordination will occur through the neighborhood technical liaison, Rod Satre.
- **Q:** The community responds much better when the City and consultant team clearly explain why certain alternatives are not feasible.
 - **R:** Agreed, and we are committed to including an upfront section in each evaluation memo explaining this.

- **Q:** What typical slope is needed for gravity sewer service, how deep a gravity line would need to be on Ocean Avenue, and is that depth realistically constructible given space constraints and neighborhood impacts?
 - **R:** Gravity service for all Bay-side properties would likely be extremely deep, disruptive, and costly. Exact impacts would vary house-by-house based on distances, elevations, and available easement space. Some properties might avoid the need for a pump if the main could be installed deep enough, but others would still likely face significant construction challenges. The team hopes to develop preliminary ballpark cost ranges by the January workshop, though estimates will remain very high-level to avoid unnecessary alarm until more analysis is complete.
- **Q:** How does the project team plan to assess which individual parcels might require private grinder/ejector pumps if the sewer is relocated to the street? Will the team be evaluating parcel-specific plumbing constraints? How will the team meaningfully estimate impacts without examining real household conditions?
 - **R:** Parcel-level analysis is not included in BKF's current scope. Instead, the evaluation of potential private pump requirements will be done using high-level assumptions, broad elevation data, and mapping tools (e.g., LiDAR, city GIS, archival plans). The team can estimate general ranges of impacts, but we will not be conducting onsite inspections or individual household assessments during this feasibility phase. We will provide average expected costs and impacts rather than parcel-specific conclusions.
- **C:** Mary Phelps, a long-time city staff member with critical institutional knowledge is retiring soon. I urge the City and project team to connect with her.

Next Steps and Action Items

The project team will schedule another technical meeting to continue detailed discussions with interested community members. In addition, a community workshop is being planned for January (date TBD), where the team will share preliminary findings and outline upcoming decision points.

More information on both meetings will be provided once dates are confirmed.

Closing and Next Steps

Ben Gettleman thanked community members for attending the meeting.

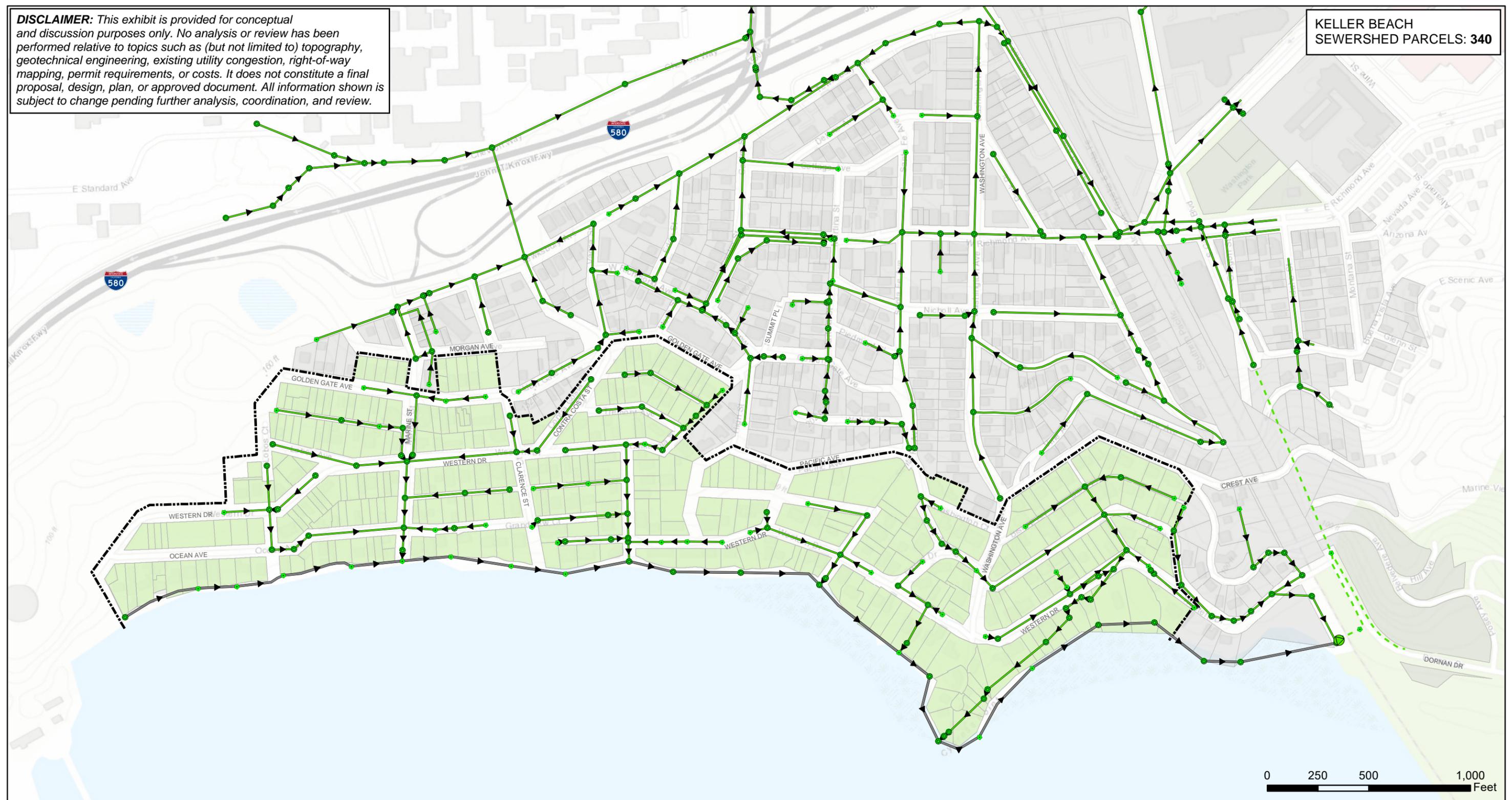
Appendix A: Meeting Attendance List

Name	Affiliation
Adam Brown	BKF Engineers
Alex Dunning	BKF Engineers
Anna Froker	Community Member
Ben Gettleman	Kearns & West
Beth Miller	Community Member
Carolina De Barros	Community Member
Charmain Tyler	Community Member
Deb Castellana	Community Member
Don Miller	Community Member
Doug Williams	Community Member
Eric Greenwood	Community Member
Fadi Alabbas	Community Member
Graham Leggett	Community Member
Hillal Hamdan	City of Richmond Public Works
Ilza Lewis	Community Member
JJ Thorp	Community Member
Josef Munoc	Community Member
Joseph John	Community Member
Julee Alexander	Community Member
Katy Kennedy	Kearns & West
Lary Hanshaw	Community Member
Lesli Handmacher	Community Member
Maria Katznelson	Community Member
Mark Adams	Community Member
Marvin Collins	Community Member
Matt Barrett	Community Member
Michael Ding	Kearns & West
Norman Hantsze	Community Member
Philip Rosenthal	PRNC Chair and Community Member
Richard Katz	Community Member
Robert Lee	Community Member
Rod Satre	Land Use and Design Review Committee (PRNC)

Appendix B: Draft Alternatives Presented During Meeting

DISCLAIMER: This exhibit is provided for conceptual and discussion purposes only. No analysis or review has been performed relative to topics such as (but not limited to) topography, geotechnical engineering, existing utility congestion, right-of-way mapping, permit requirements, or costs. It does not constitute a final proposal, design, plan, or approved document. All information shown is subject to change pending further analysis, coordination, and review.

KELLER BEACH SEWERSHED PARCELS: 340

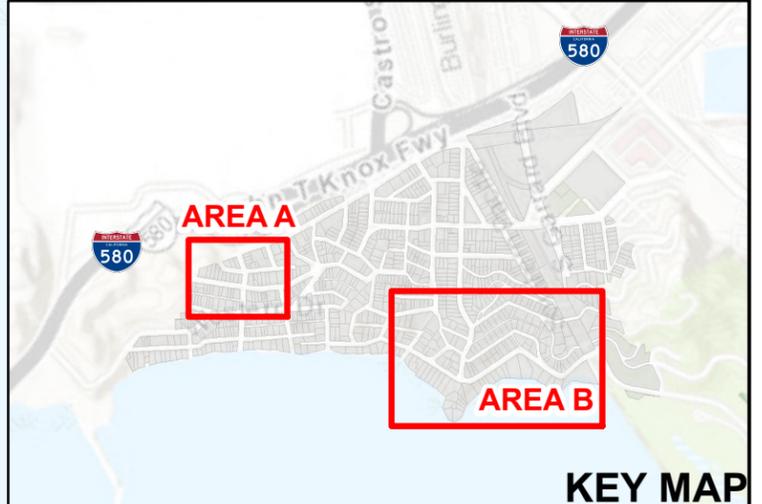
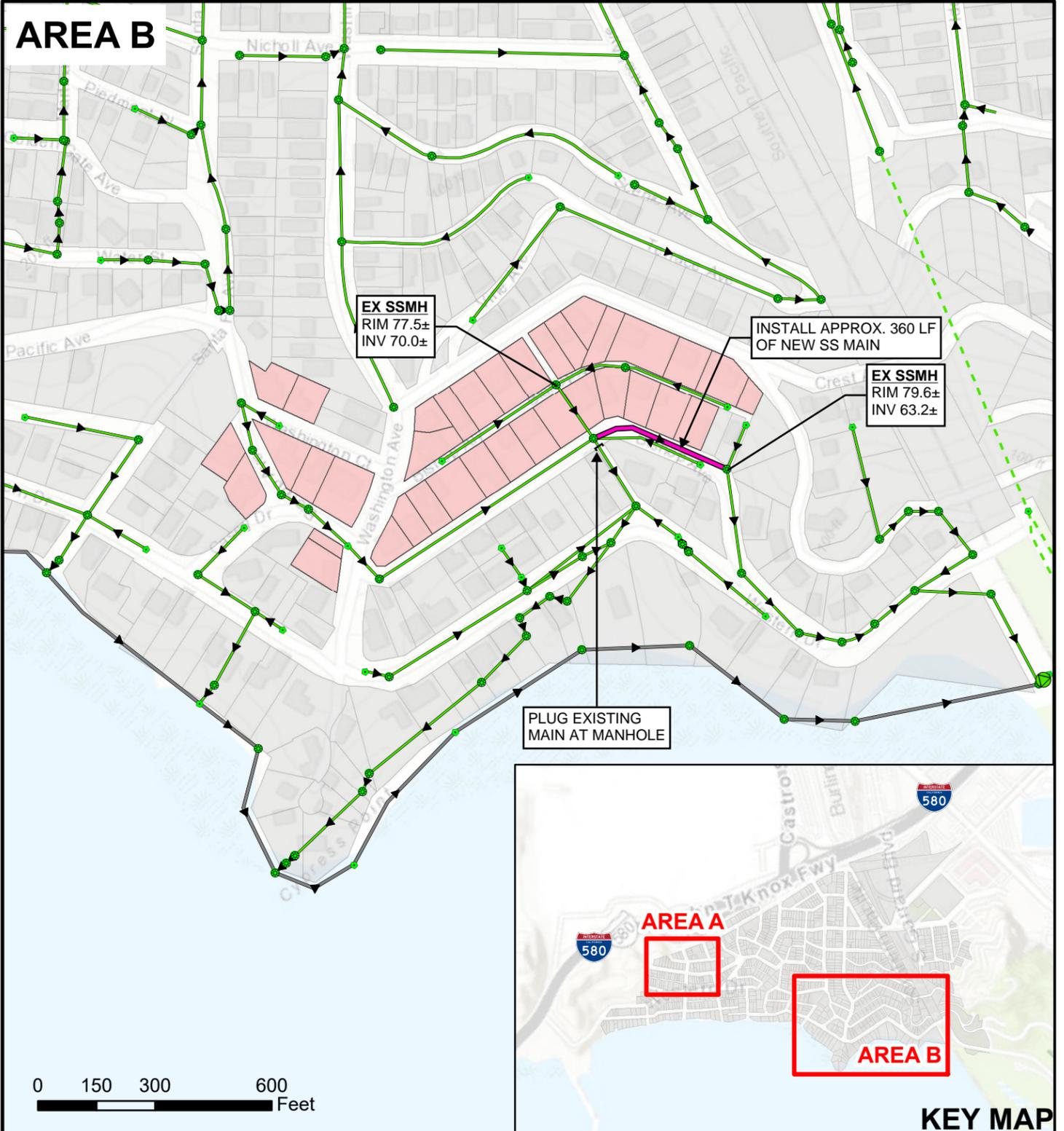
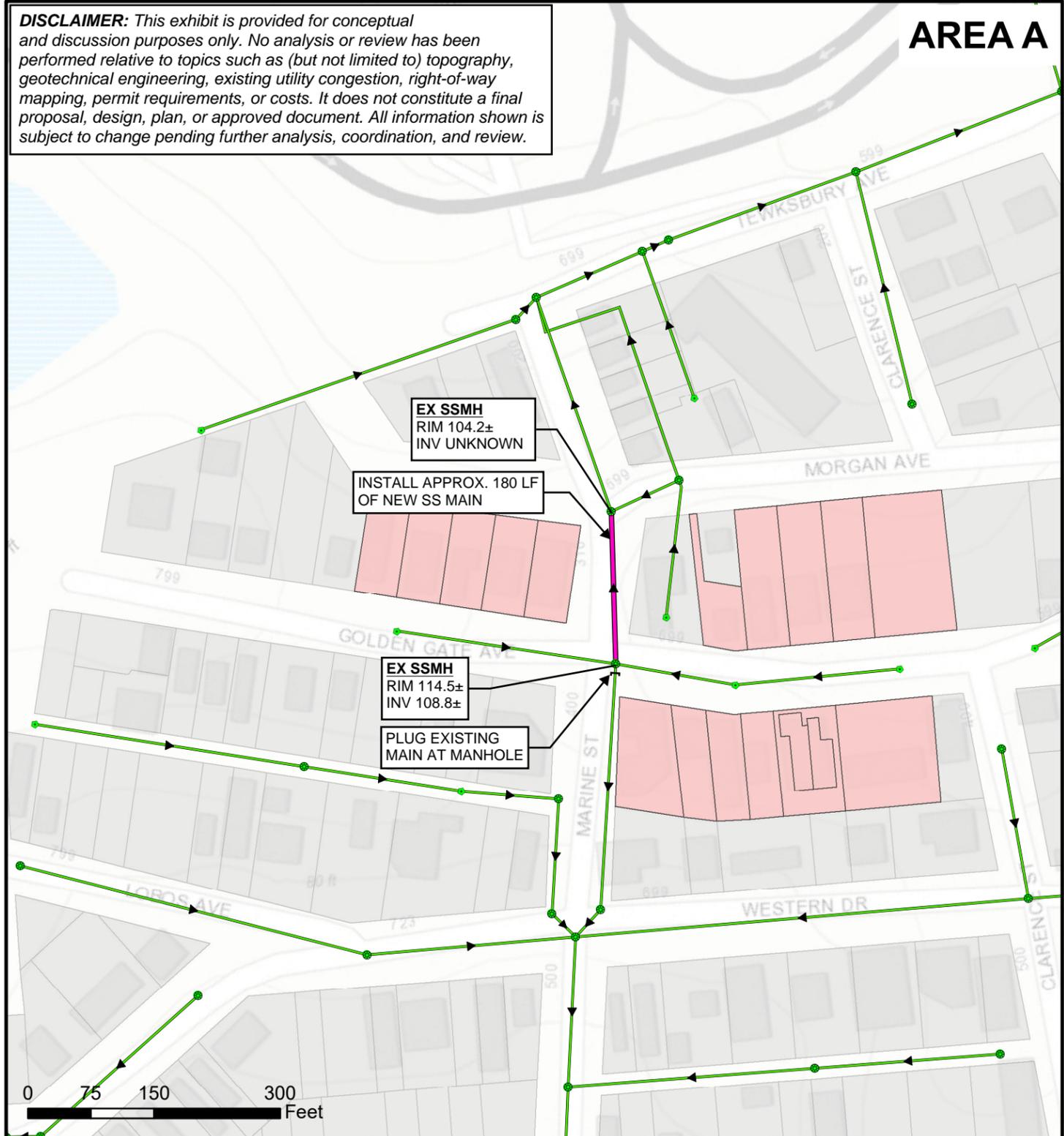


**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
EXISTING CONDITIONS**

- EXISTING SEWER SYSTEM**
- Pump Station
 - Manhole
 - Lamphole
 - Gravity Main
 - Keller Beach Interceptor
 - Keller Beach Sewershed
 - Keller Beach Sewershed Parcel
 - Parcel



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**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
INTERIM ALTERNATIVE 1**

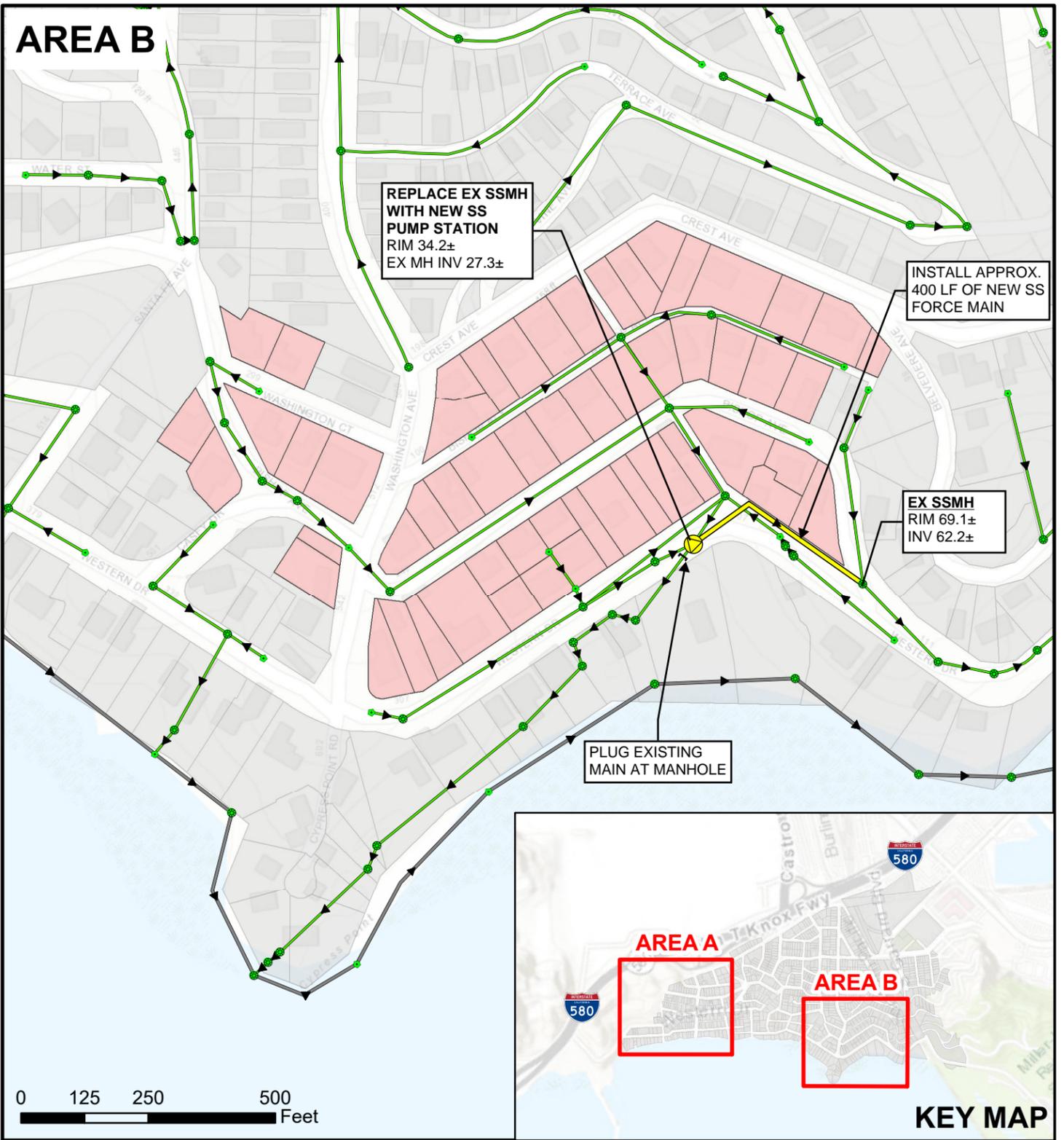
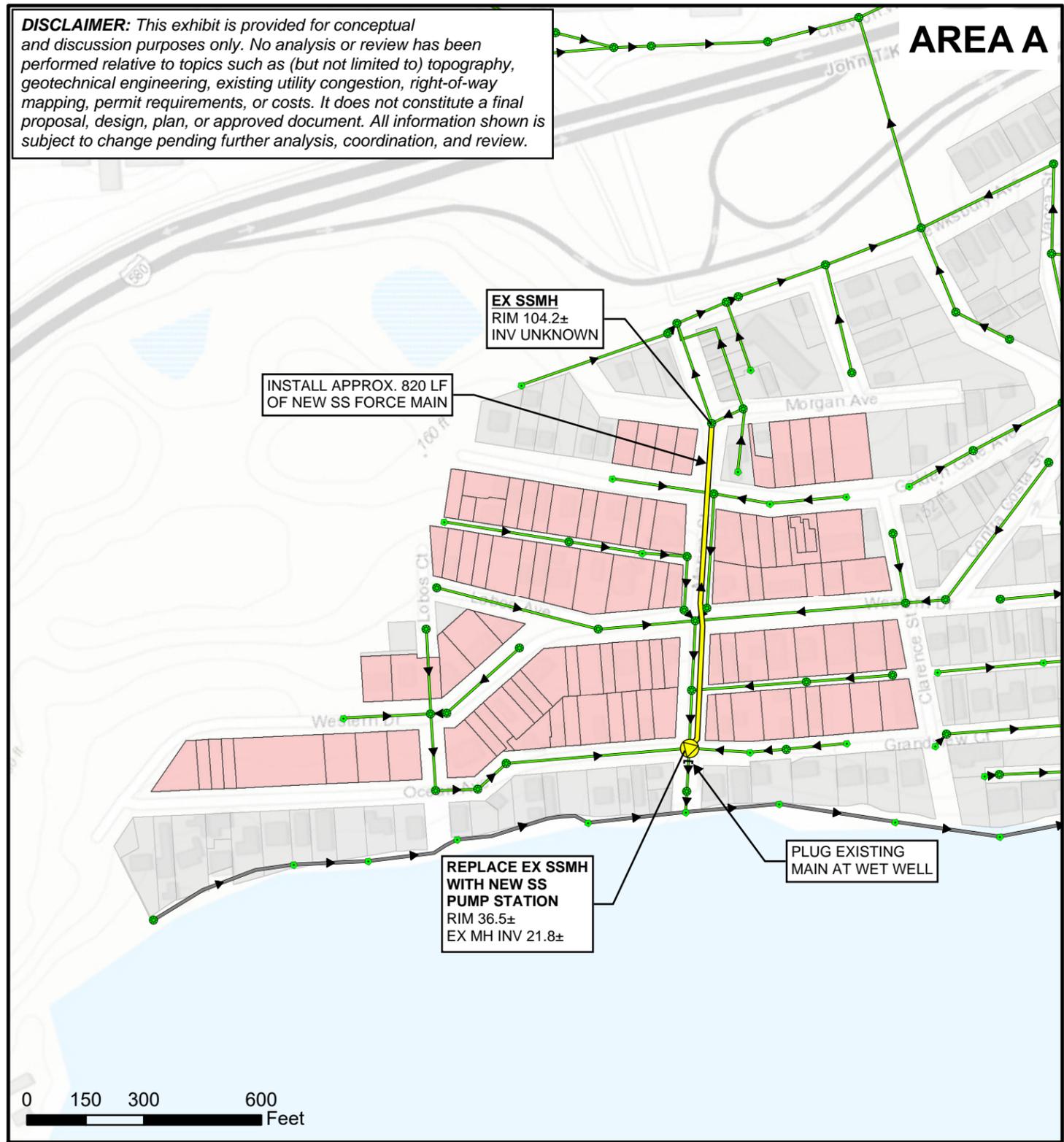
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|------------------------------|------------------------------|
| EXISTING SEWER SYSTEM | PROPOSED SEWER SYSTEM |
| Pump Station | New Gravity Main |
| Manhole | Rerouted Parcel* (52 Total) |
| Lamphole | |
| Gravity Main | |
| Keller Beach Interceptor | |
| Parcel | |

NOTE: All elevations shown are per City-provided GIS, where available.

* Indicates a parcel that is currently estimated to have its sewer flow directed away from the Keller Beach Sewer Line if the alternative was implemented



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**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
INTERIM ALTERNATIVE 2**

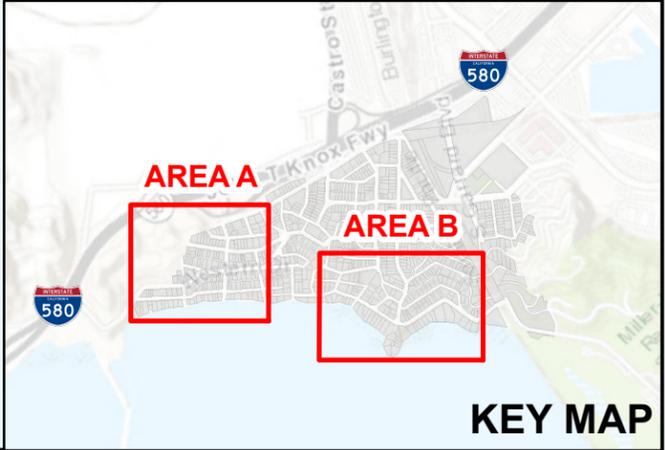
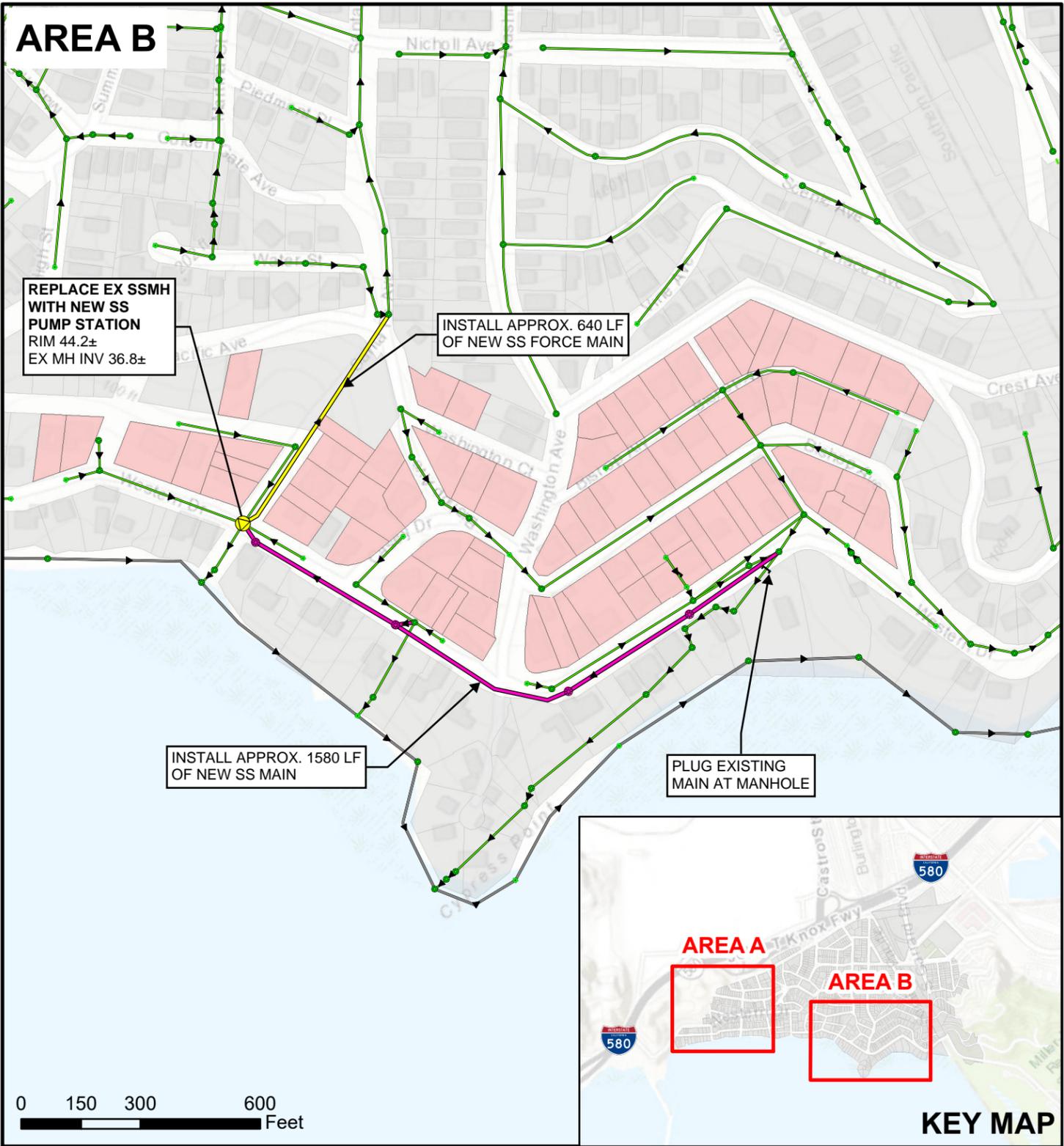
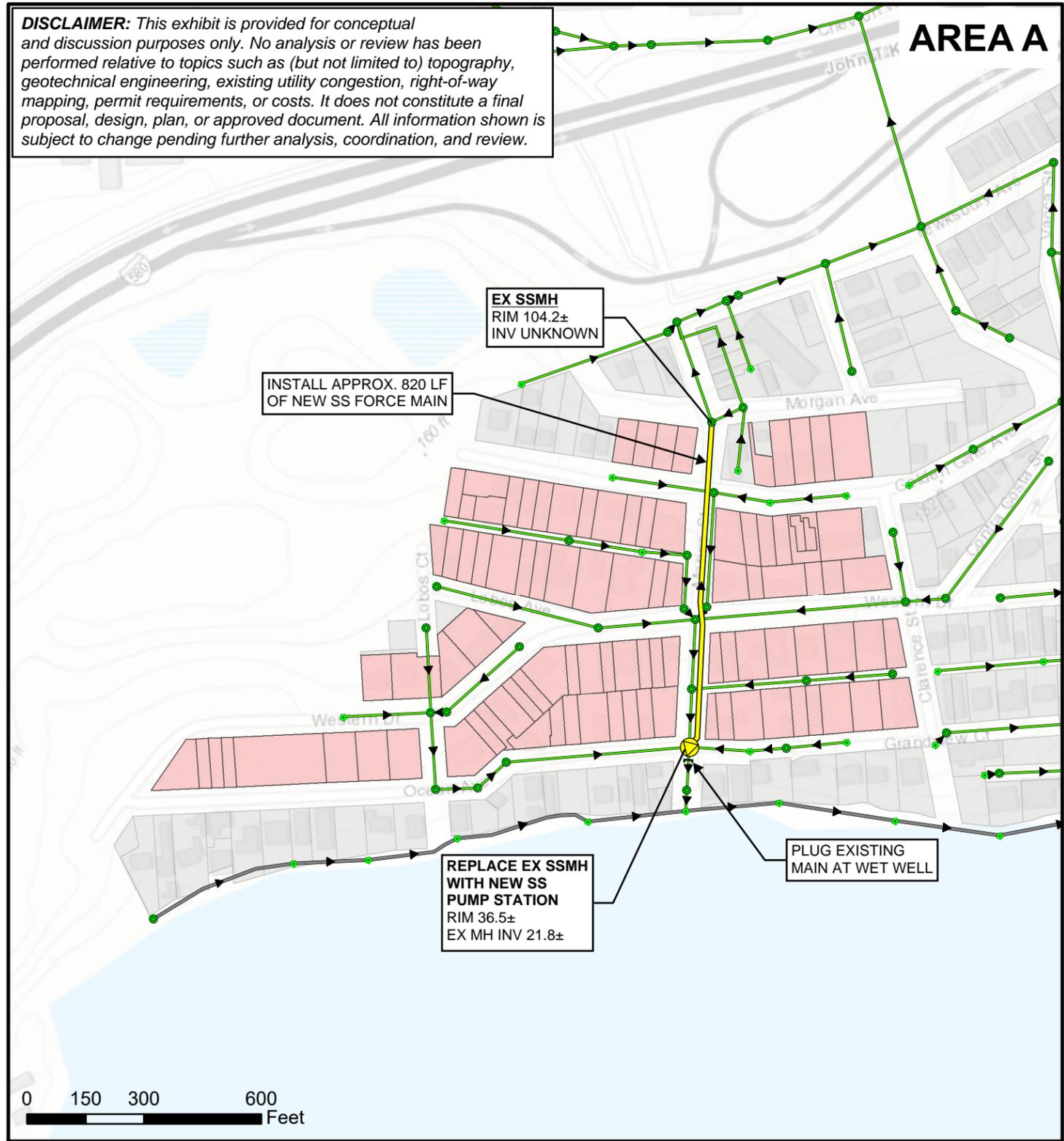
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|------------------------------|------------------------------|
| EXISTING SEWER SYSTEM | PROPOSED SEWER SYSTEM |
| Pump Station | New Pump Station |
| Manhole | New Force Main |
| Lamphole | Rerouted Parcel* (154 Total) |
| Gravity Main | |
| Keller Beach Interceptor | |
| Parcel | |

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**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
INTERIM ALTERNATIVE 3**

EXISTING SEWER SYSTEM

- Pump Station
- Manhole
- Lamphole
- Gravity Main
- Keller Beach Interceptor
- Parcel

PROPOSED SEWER SYSTEM

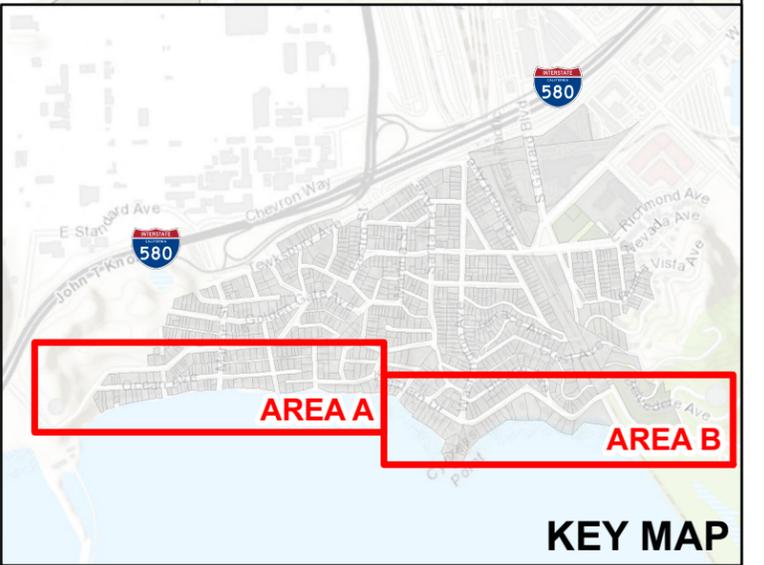
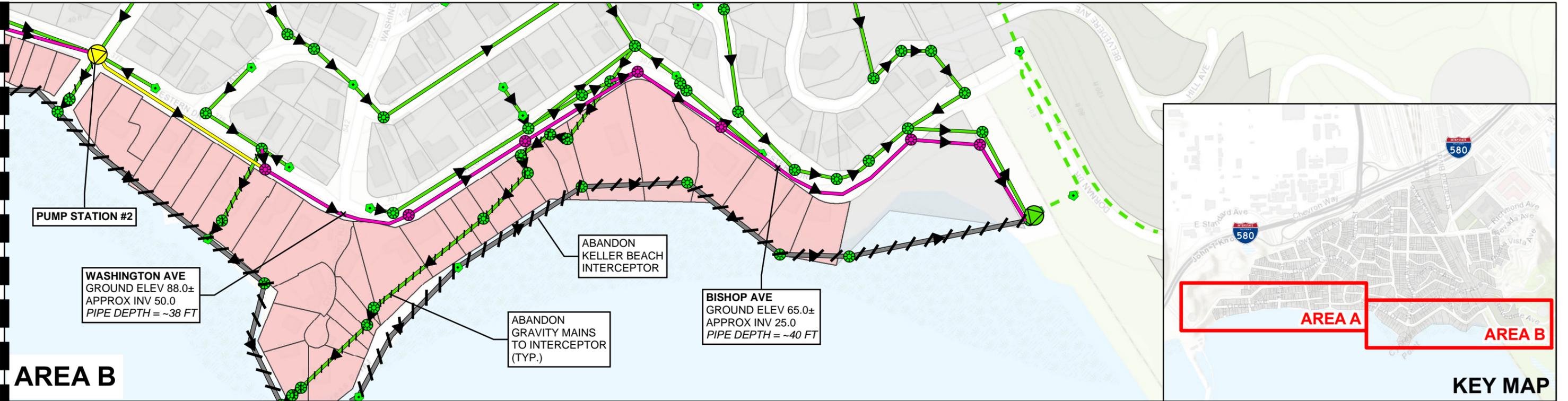
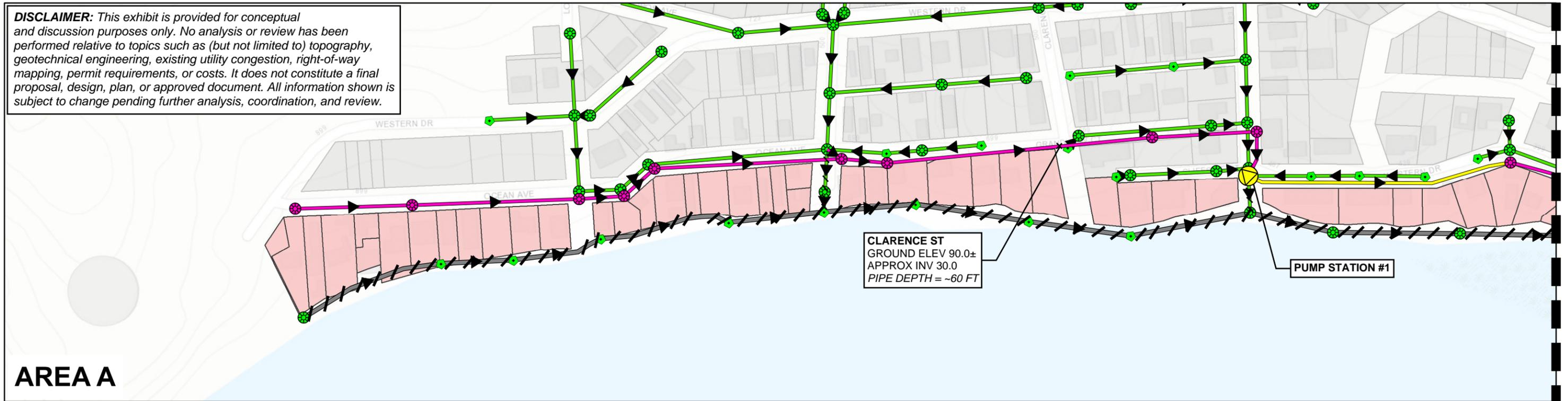
- New Pump Station
- New Manhole
- New Gravity Main
- New Force Main
- Rerouted Parcel* (177 Total)

NOTE: All elevations shown are per City-provided GIS, where available.

* Indicates a parcel that is currently estimated to have its sewer flow directed away from the Keller Beach Sewer Line if the alternative was implemented



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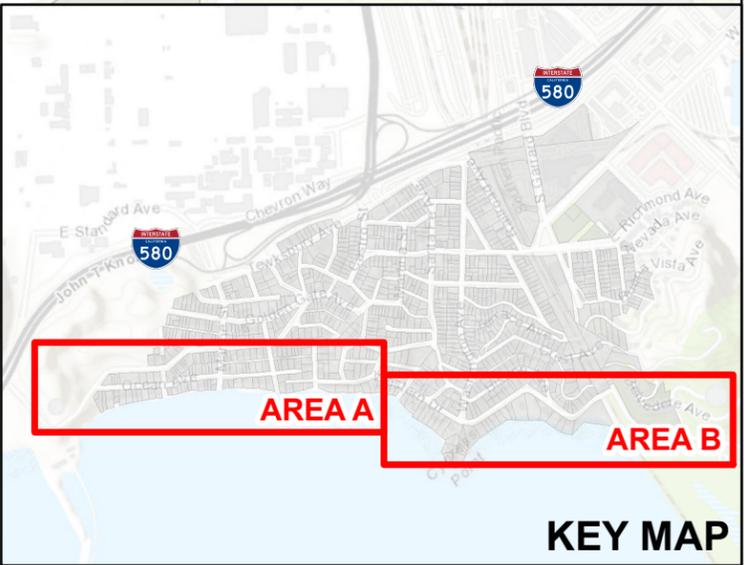
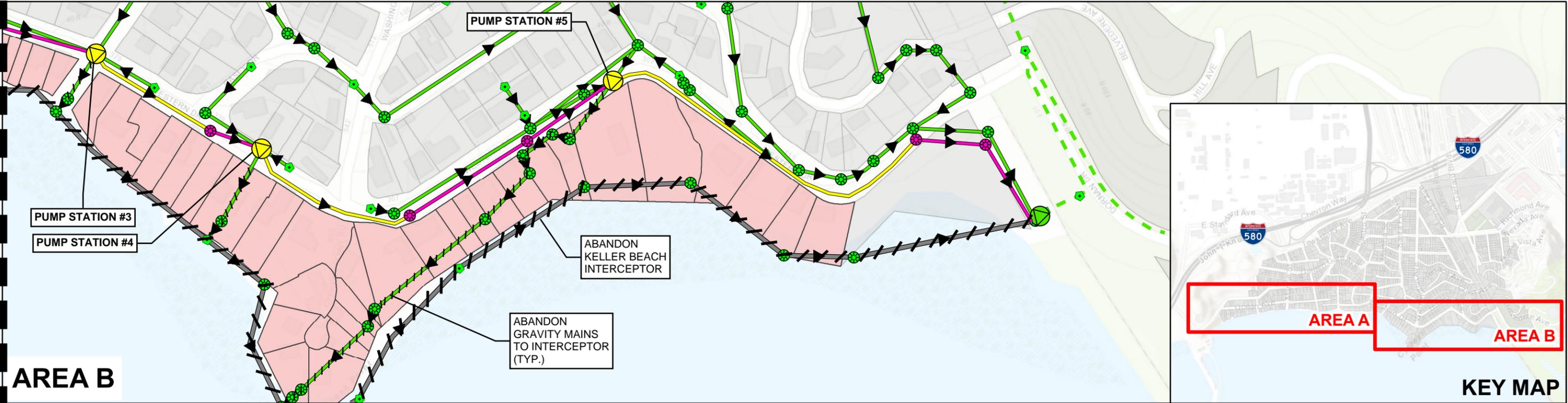
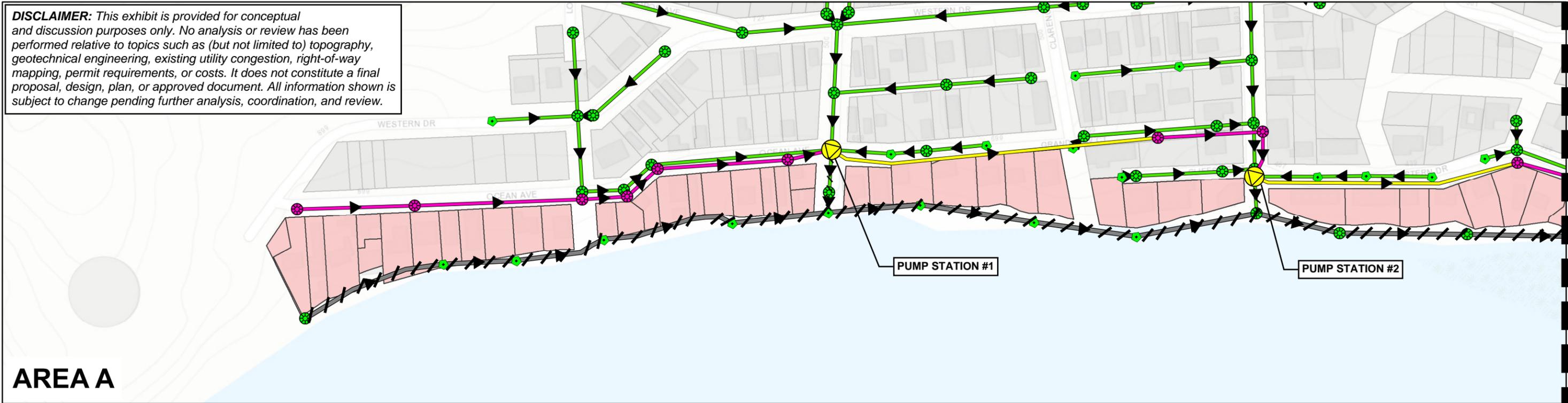
**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
FINAL ALTERNATIVE 1**

- | EXISTING SEWER SYSTEM | PROPOSED SEWER SYSTEM |
|------------------------------|---|
| Pump Station | New Pump Station |
| Manhole | New Manhole |
| Lamphole | New Gravity Main |
| Keller Beach Interceptor | New Force Main |
| Gravity Main | Parcel May Require Private Lift Station |

NOTE: Ground elevations based on Google Earth. Invert elevations are approximated.

SCALE: 1" = 200'

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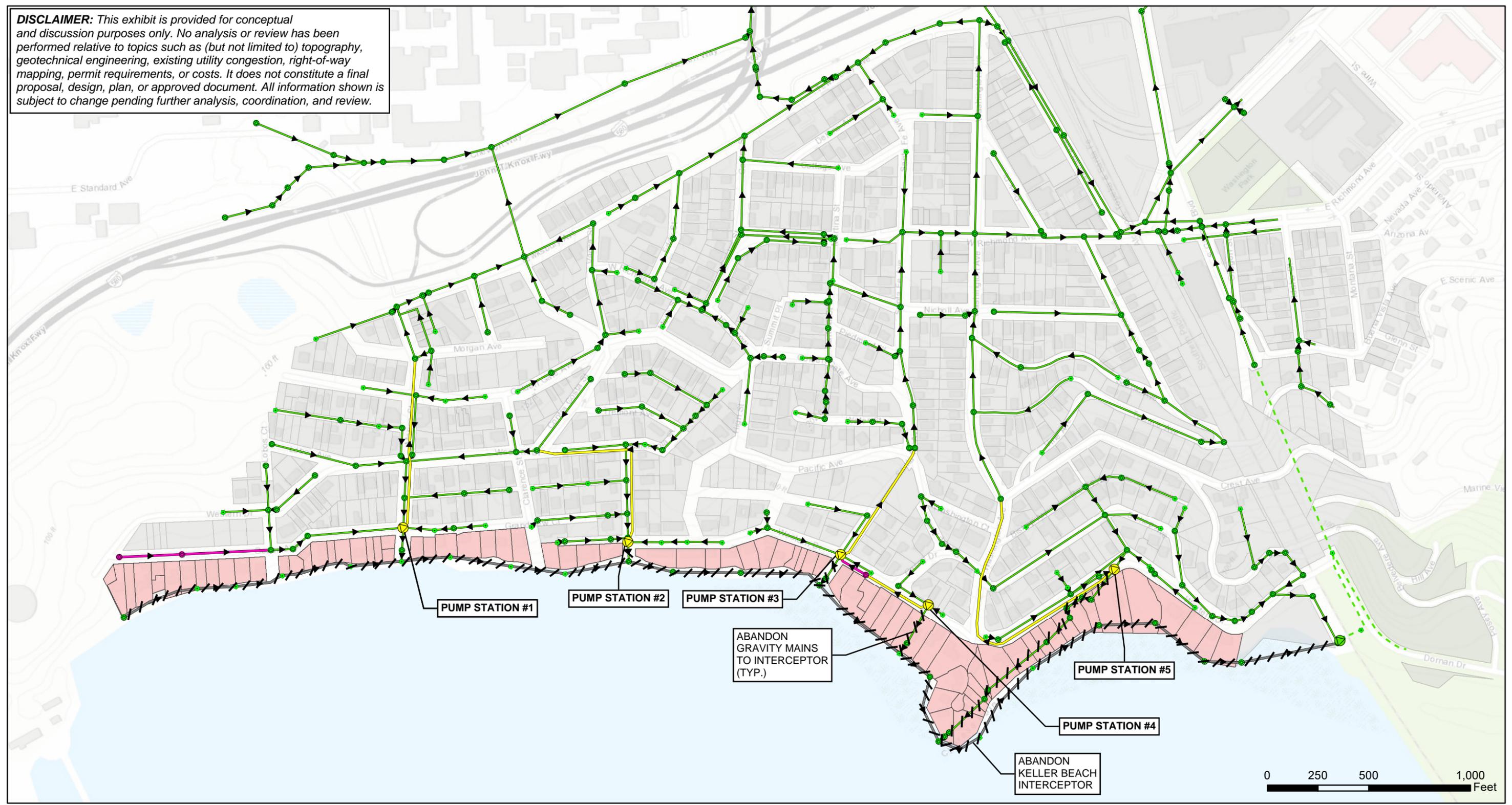


**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
FINAL ALTERNATIVE 2**

- | EXISTING SEWER SYSTEM | PROPOSED SEWER SYSTEM |
|------------------------------|---|
| Pump Station | New Pump Station |
| Manhole | New Manhole |
| Lamphole | New Gravity Main |
| Keller Beach Interceptor | New Force Main |
| Gravity Main | Parcel May Require Private Lift Station |

SCALE: 1" = 200'

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**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
FINAL ALTERNATIVE 3**

- | EXISTING SEWER SYSTEM | PROPOSED SEWER SYSTEM |
|------------------------------|---|
| Pump Station | New Pump Station |
| Manhole | New Manhole |
| Lamphole | New Force Main |
| Keller Beach Interceptor | New Gravity Main |
| Gravity Main | Parcel May Require Private Lift Station |



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**CITY OF RICHMOND
KBSS REALIGNMENT STUDY
FINAL ALTERNATIVE 4**

EXISTING SEWER SYSTEM

- Pump Station
- Manhole
- Lamphole
- Gravity Main

PROPOSED SEWER SYSTEM

- New Manhole
- New Interceptor

