KELLER ASSOCIATES

CITY OF LEWISTON

Stormwater Master Plan Update

SEPTEMBER 2019

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CITY OF LEWISTON, IDAHO

Lewiston Stormwater Master Plan Update

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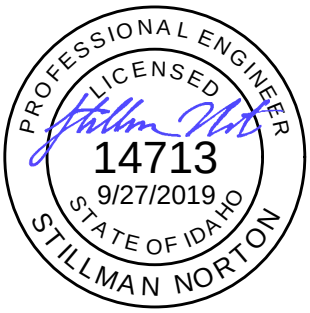

Signed by:
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Project Manager

TABLE OF CONTENTS

Page

1. Overview 1
2. CCTV Inspection and Condition Scoring 4
3. Observations 6
4. Replacement Recommendations 10
5. Replacement Budget 10
6. Capital Improvement Plan Update 11

List of Figures:

Figure 1.1 – Existing System Pipe Size
Figure 1.2 – Existing System Pipe Material
Figure 1.3 – Existing System Pipe Ownership
Figure 2.1 – Existing System Pipe Condition Scores
Figure 3.1 – Comparison of Extrapolated Condition Scores by Material Length
Figure 3.2 – Comparison of Extrapolated Condition Scores by Material

List of Tables:

Table 3.1 – Condition Scores of Examined Pipeline by Material
Table 3.2 – Combined Condition Scores of Examined Pipeline by Material Groups
Table 3.3 – Extrapolated Condition Scores of System Pipeline by Material Groups
Table 6.1 – Capital Improvement Plan Update: Projects to be Completed within 20 Years
Table 6.2 – Capital Improvement Plan Update Timetable
Table 6.3 – Recommended Annual CIP and Repair/Replacement Reserve

Appendices:

Appendix A – Full Size Figures
Appendix B – System Replacement Cost Calculations
Appendix C – City Planning Projects
Appendix D – Seepage Bed and Retention Pond Sizing Calculations
Appendix E – Stormwater System Age Analysis
Appendix F – Lewiston Stormwater Rating Chart
Appendix G – Basin 7 Update

EXISTING STORMWATER SYSTEM CONDITION ASSESSMENT

The City of Lewiston (City) owns and operates its own stormwater system. In 2001, JUB Engineers, Inc. (JUB) completed a stormwater master plan with the stated purpose of assisting the City in making decisions toward a comprehensive storm system that met the needs of the community. Specific goals of the document included:

- To provide storm drainage layouts for areas with little or no storm drainage.
- To provide tools to identify and inform capital projects, development, local improvement districts, and system operation.
- To provide preliminary assessments of the existing system capacities to target priority locations for analysis or remediation.
- To provide a general understanding of the operation and maintenance needs of the stormwater system.

This document created a framework for identifying future priority improvements and established a Capital Improvement Plan (CIP) with five (5) capital improvement projects for the City to accomplish.

In 2017, JUB completed a Basin 7 Stormwater System update for the stormwater master plan. The purpose of this document was to establish improvement projects for the stormwater system within the City's largest stormwater basin. These projects aimed to repair or remediate the aging and undersized system. The study used pipe sizes and computer modeling to assess which pipes and stormwater accessories were most likely the cause of improper stormwater drainage. The analysis was used to identify twelve (12) capital improvement projects and provide cost estimates for their completion.

With these efforts, the City has taken steps to improve stormwater drainage in the City of Lewiston. However, portions of the City still experience minor flooding during periods of heavy rainfall. Both the 2001 Master Plan and the 2017 Basin 7 Update recommended supplementary investigation into the condition of stormwater pipes to further assist in identifying improvement projects. As such, the City began tracking the condition of their stormwater pipelines after implementation of the master plan.

This document provides an overview and analysis of the stormwater system condition recorded since 2001, provides additional system improvement recommendations based off the pipeline condition assessment, and serves as an update to the Capital Improvement Plan (CIP) established in the original 2001 stormwater master plan.

1. OVERVIEW

The Lewiston area contains approximately 91 miles of stormwater pipelines. Of this, the City of Lewiston owns and maintains approximately 59 miles of pipelines and the balance is maintained by other public and private entities. The City of Lewiston is only responsible for handling repair and replacement needs of the pipelines and storm structures under its jurisdiction. As such, all analyses performed within this report excludes pipelines not owned by the City.

Storm pipeline sizes in the City's system range from less than 8-inch to 108-inches in diameter. Figure 1.1 (see next page) illustrates the existing stormwater system and pipeline diameters. Figure 1.2 (see next page) illustrates the types of pipe material in the City's collection system. Figure 1.3 (see page 3) illustrates the pipelines by ownership. (See Appendix A for full-size figures)

FIGURE 1.1: EXISTING SYSTEM PIPE SIZE

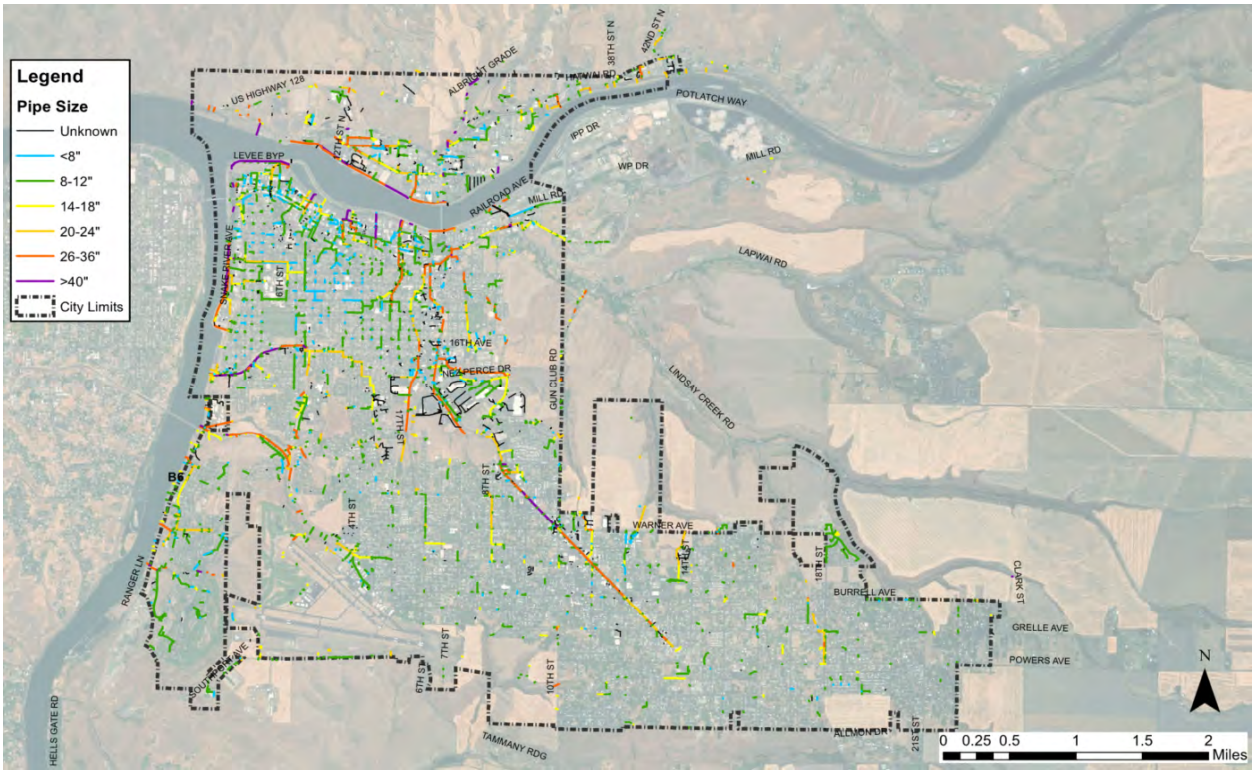


FIGURE 1.2: EXISTING SYSTEM PIPE MATERIAL

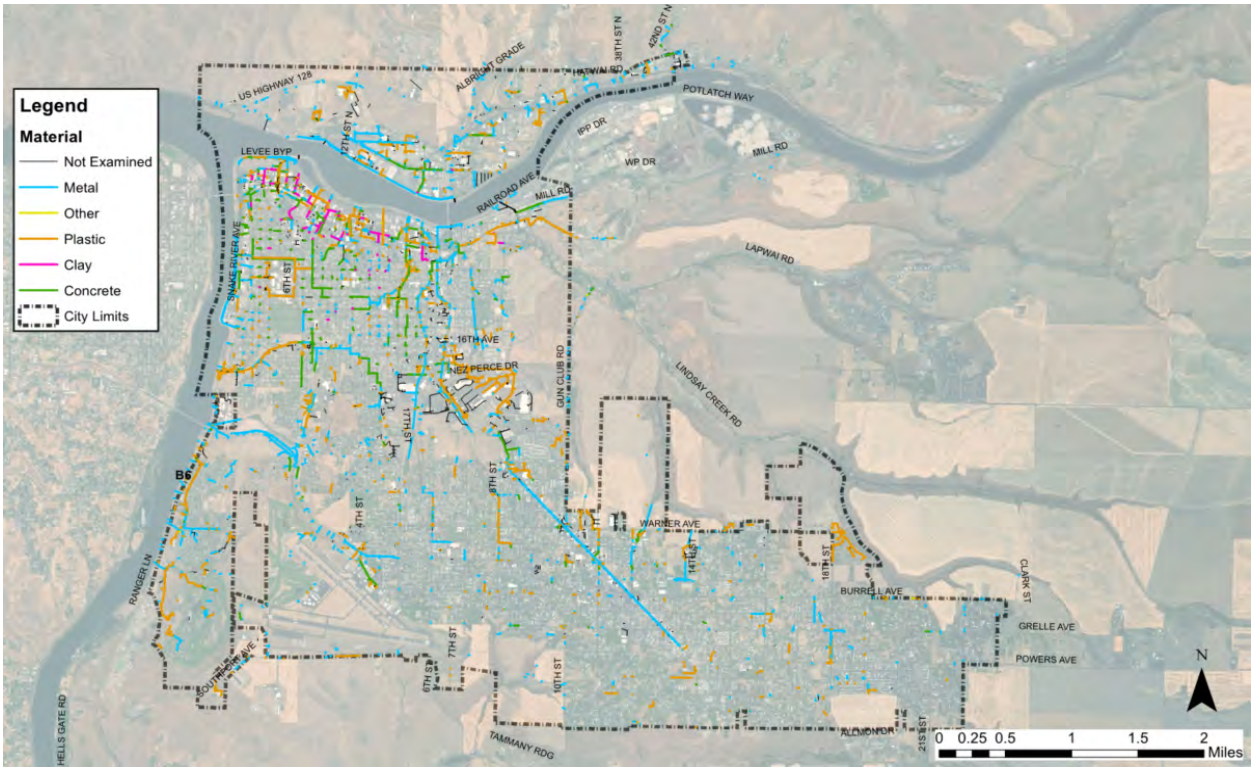
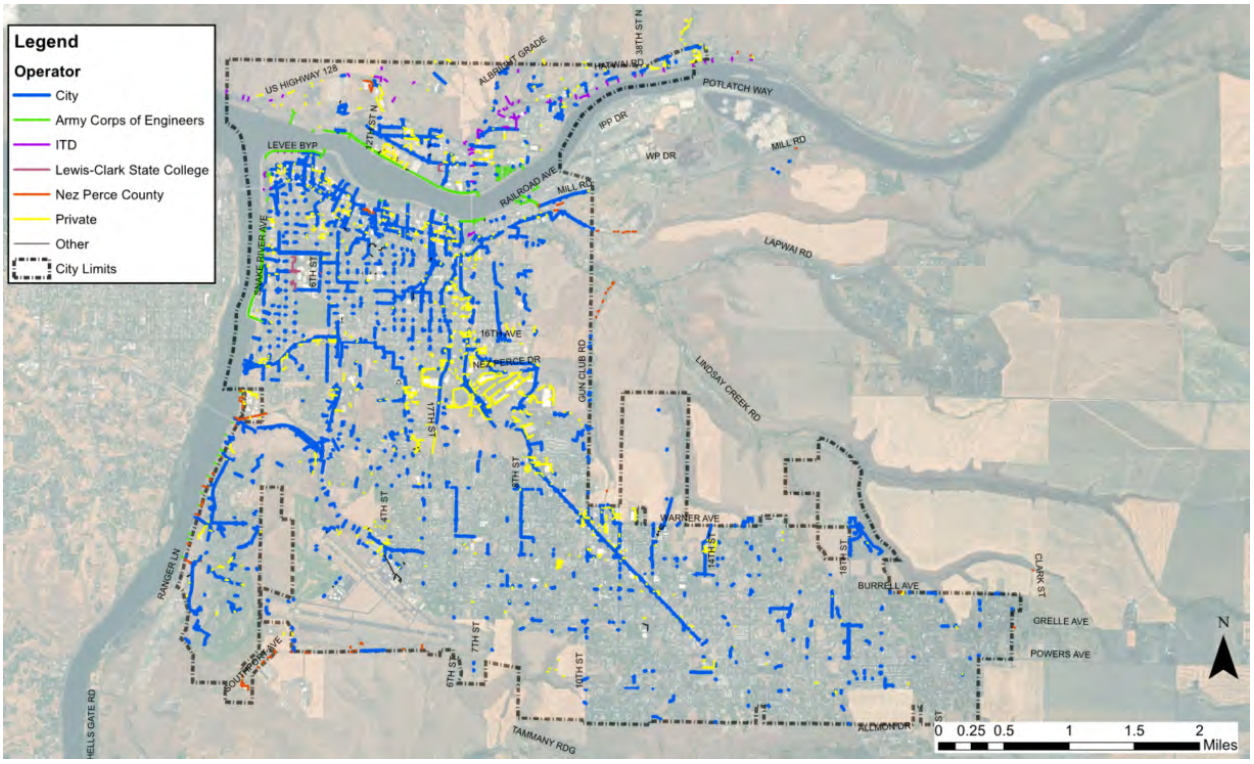


FIGURE 1.3: EXISTING SYSTEM PIPE OWNERSHIP



Approximately 21% of the City's existing system's total length is smaller than 12-inch diameter pipe. It is generally recommended that stormwater pipelines are a minimum of 12-inches in diameter wherever possible, as stormwater pipelines can be prone to clogging by debris. As these pipelines approach the end of their useful life, it is recommended that they be replaced with pipelines that are at least 12-inches in diameter.

Clay and concrete pipelines generally are found in the downtown and surrounding area. These are the oldest parts of town, so it is not unreasonable to assume that the clay and many of the existing concrete pipelines are the oldest in the system. In addition, the City provided Keller Associates with age estimations based on pipe material. According to the City, the majority of clay and concrete pipes were installed starting in 1900 up until the late 1950s. From 1960 to the late 1990s, primarily metal pipes were installed. Subsequently, plastic Polyvinyl Chloride (PVC) or High-Density Polyethylene (HDPE) pipes have been used until present day. Pipeline length estimates based on age provided by the City are included in Appendix D.

Approximately 2% (about 1.3 miles) of the pipe material in the City of Lewiston system is unknown. Pipe material records are important in defining future pipeline replacement and rehabilitation needs. If the unknown pipe material were to be older materials, problems such as root intrusion, cracking, structural failure, infiltration, and exfiltration could persist because of the materials' higher vulnerability to deterioration. As additional field work and pipeline inspections are completed in the future, it is recommended that the City identify missing pipe material information and update the City's GIS accordingly.

The majority (42.6%) of pipeline in the City's stormwater system is metal, which is more susceptible to rusting and corrosion from environmental factors than plastic pipe. Clay pipe material usually indicates the oldest pipe in the system, as clay is not installed in modern stormwater systems, and comprises approximately 4.0% of Lewiston's system.

Expected service life will play a role in this analysis, as pipelines are generally in poorer condition as they approach their service life. Table 1.1 below depicts the expected service life of various pipe materials. Note that these values are not considered conservative; it is possible for pipe material to deteriorate or require replacement earlier than the listed service life. However, it is also possible that pipelines remain in working condition longer than the listed service life. In fact, some of the 100-year old clay pipe in Lewiston is reportedly still in FAIR condition. Conversely, the shorter material life for metal pipe reflects observations of City staff for Lewiston's stormwater system. Observable condition of the pipe should be considered when determining replacement needs. Keller Associates recommends that future stormwater pipeline improvements be plastic (i.e. SDR 35 PVC or HDPE) or concrete piping to maximize the life of the asset.

TABLE 1.1: EXPECTED SERVICE LIFE OF VARIOUS STORMWATER PIPE MATERIALS

Pipe Material	Service Life (years)
Vitrified Clay	100
Concrete	100
Corrugated Metal Pipe (CMP)	50
Steel/Aluminum	50
Prestressed Concrete Cylinder Pipe	50
PVC	100
HDPE	100

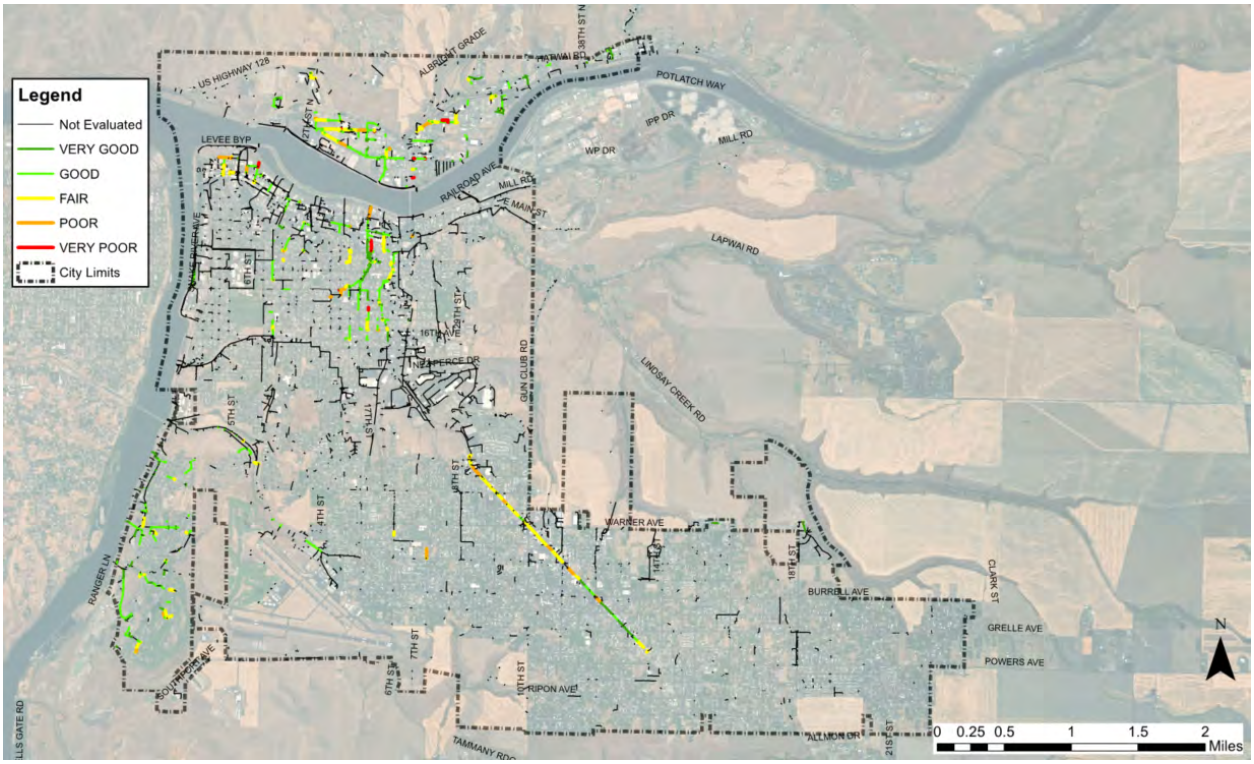
2. CCTV INSPECTION AND CONDITION SCORING

Prior to 2015, the City visually examined pipe condition via visual manhole inspection and recorded conditions as POOR, AVERAGE, or GOOD for approximately 72.7 miles of pipelines. This method was not ideal as it does not capture the complete condition of the pipeline length; only the ends of pipelines are visible from the manhole. In 2015, the City switched to using closed-circuit television (CCTV) inspection technology to capture the condition of the full length of pipelines. To rate the condition of the system, the City adopted the National Association of Sewer Service Companies' (NASSCO) Pipeline Assessment and Certification Program (PACP).

Since beginning CCTV inspection, the City has inspected and rated the condition of approximately 15.3 miles of pipeline. This includes approximately 26% of the City's total stormwater system. It is recommended that the City continue to concentrate its efforts on examining the remaining 74% of their system and update the City's GIS data accordingly.

The City has established a system which arranges the PACP ratings into simplified categories. After CCTV inspection, the system classifies pipes into five categories: VERY POOR, POOR, FAIR, GOOD, and VERY GOOD. The scores for each pipeline segment evaluated with the simplified five category scoring are represented on Figure 2.1 (see next page). (See Appendix A for full-size figure)

FIGURE 2.1: EXISTING SYSTEM PIPE CONDITION SCORES



As a check to the City's classification system, Keller Associates examined CCTV data provided by the City. Observations of this examination are as follows:

- Pipelines that fell into the VERY POOR category contained either major defects or major blockages that prevented the pipe from conveying stormwater. Examples include collapsed pipes, excessive sagging or deformations creating pooling of water, or buildup of excessive debris which cannot be removed by conventional means, such as hardened ash.
- Pipelines categorized as POOR also contained major defects such as deformation of pipes, hole voids with soil visible, and separations at joints. In addition, many of the metal pipelines in this category have severe corrosion, some resulting in compromises to the pipe's integrity. While stormwater could still be conveyed by these pipelines, the defects, if not repaired, will likely render these pipelines unusable in the future.
- Pipelines in the FAIR category contained more moderate defects and operations/maintenance issues. Defects such as separation at joints, root intrusion, debris buildup, and structural fractures were present. These defects do not have as large an impact on conveying stormwater as defects listed in the POOR or VERY POOR category. However, these defects may become more pronounced over time, if not accounted for properly.
- Pipelines categorized as GOOD or VERY GOOD had either minimal or no defects present. Defects that were found included minor cracks and root intrusion. The defects in these pipelines do not prevent the conveyance of stormwater.
- The current simplified system generally depicts the condition of the examined pipelines. Additional review of pipelines classified as VERY POOR, POOR, or FAIR is recommended to further prioritize future rehabilitation and replacement efforts. This review could take the form of PACP scoring of these segments, better assessing of remaining asset life, and identifying the

appropriate corrective measures. This additional review can also reveal alternative corrective measures for individual pipes, such as clearing excessive debris or spot repairs.

3. OBSERVATIONS

In evaluating the pipeline segments most in need of repair, Keller Associates used the City's GIS database to match pipe materials with their respective condition score. Table 3.1 represents a comprehensive breakdown of each material's pipe condition by length, as well as what percentage of each material fall into the VERY POOR, POOR, FAIR, GOOD, and VERY GOOD condition scores.

TABLE 3.1: CONDITION SCORES OF EXAMINED PIPELINE BY MATERIAL

Pipe Material	Pipe Material Lengths (ft)					Percentages					Total by Material (ft)	% of Total
	VERY POOR	POOR	FAIR	GOOD	VERY GOOD	%VERY POOR	% POOR	%FAIR	%GOOD	%VERY GOOD		
WHITE POLY	-	-	378	4,122	2,547	0%	0%	5%	58%	36%	7,047	8.7%
WHITE FLEX	-	-	-	-	-	-	-	-	-	-	-	0.0%
STEEL CMP	529	4,585	10,066	15,843	1,756	2%	14%	31%	48%	5%	32,781	40.6%
STEEL	105	404	458	417	-	8%	29%	33%	30%	0%	1,384	1.7%
HDPE SOLID	-	-	-	-	-	-	-	-	-	-	-	0.0%
HDPE CPP	26	-	376	4,988	6,146	0%	0%	3%	43%	53%	11,536	14.3%
GREY POLY	-	-	-	-	-	-	-	-	-	-	-	0.0%
GREEN POLY	-	88	212	723	2,040	0%	3%	7%	24%	67%	3,062	3.8%
GREEN CPP	-	-	-	-	610	0%	0%	0%	0%	100%	610	0.8%
GALVANIZED	-	-	-	-	-	-	-	-	-	-	-	0.0%
FIBERGLASS	-	-	-	-	-	-	-	-	-	-	-	0.0%
CONCRETE	105	104	1,684	10,580	1,967	1%	1%	12%	73%	14%	14,441	17.9%
CMP SQUASH	-	-	-	941	-	0%	0%	0%	100%	0%	941	1.2%
CMP	-	-	163	-	-	0%	0%	100%	0%	0%	163	0.2%
CLAY	186	660	1,416	3,999	-	3%	11%	23%	64%	0%	6,262	7.7%
CAST IRON	-	-	-	95	-	0%	0%	0%	100%	0%	95	0.1%
C900 PVC	-	-	-	11	103	0%	0%	0%	10%	90%	115	0.1%
BLACK POLY	-	-	-	-	-	-	-	-	-	-	-	0.0%
BLACK FLEX	-	-	-	22	3	0%	0%	0%	88%	12%	26	0.0%
ASBESTOS	-	-	-	-	-	-	-	-	-	-	-	0.0%
ALUM CMP	-	44	990	1,018	294	0%	2%	42%	43%	13%	2,346	2.9%
Total by Condition (ft)	952	5,885	15,743	42,761	15,466						80,807	100.0%
% of Total	1.2%	7.3%	19.5%	52.9%	19.1%						15.30	Miles

To simplify the analysis, the inspected pipes were separated out by material into five categories: plastic, clay, metal, concrete, and other. Polyethylene, HDPE, PVC, flexible tubing, and corrugated plastic pipe were included in the plastic material category. Steel, galvanized steel, cast iron, aluminum, and all forms of corrugated metal pipe were included in the metal category. Pipes that did not fall into the four categories, such as fiberglass and asbestos, were placed in the other category. The results of combining pipe materials into these categories yields the results in Table 3.2.

TABLE 3.2: COMBINED CONDITION SCORES OF EXAMINED PIPELINE BY MATERIAL GROUPS

Pipe Material	Pipe Material Lengths (ft)					Percentages					Total by Material (ft)	% of Total
	VERY POOR	POOR	FAIR	GOOD	VERY GOOD	%VERY POOR	% POOR	%FAIR	%GOOD	%VERY GOOD		
PLASTIC	26	88	965	9,867	11,449	0%	0%	4%	44%	51%	22,395	27.7%
CLAY	186	660	1,416	3,999	-	3%	11%	23%	64%	0%	6,262	7.7%
METAL	634	5,034	11,678	18,315	2,050	2%	13%	31%	49%	5%	37,710	46.7%
CONCRETE	105	104	1,684	10,580	1,967	1%	1%	12%	73%	14%	14,441	17.9%
OTHER	-	-	-	-	-	0%	0%	0%	0%	0%	-	0.0%
Total by Condition (ft)	952	5,885	15,743	42,761	15,466						80,807	100.0%
% of Total	1.2%	7.3%	19.5%	52.9%	19.1%						15.30	Miles

The data presented in Tables 3.1 and 3.2 only capture the condition of the pipelines examined. As stated previously, this is approximately 26% of the total system. Of pipe materials that are known, the City has examined approximately 20% of plastic pipelines, 50% of clay pipelines, 29% of metal pipelines, and 28% of concrete pipelines. The City has yet to inspect pipelines that fall into the Other material category.

Percentages of the examined pipelines that fell into each condition category were used to extrapolate the data to the entire system. It is important to note this extrapolation assumes that the pipelines CCTV'd is representative of all City-owned pipes. The extrapolated numbers are represented in Table 3.3. Figure 3.1 provides a visual comparison of the total system condition based on lengths of pipeline material. Figure 3.2 depicts a comparison of condition scores between pipelines of the same material. This extrapolation only applies to pipelines with known material and does not include any pipe with other material. As stated, it is recommended that the City continue to make efforts to inspect the remaining 1.3 miles of its unknown pipe material and update the database and GIS tables accordingly.

TABLE 3.3: EXTRAPOLATED CONDITION SCORES OF SYSTEM PIPELINE BY MATERIAL GROUPS

Pipe Material	Pipe Material Lengths (ft)					Percentages					Total by Material (ft)	% of Total
	VERY POOR	POOR	FAIR	GOOD	VERY GOOD	%VERY POOR	% POOR	%FAIR	%GOOD	%VERY GOOD		
PLASTIC	131	441	4,848	49,545	57,487	0%	0%	4%	44%	51%	112,452	36.6%
CLAY	370	1,310	2,810	7,936	-	3%	11%	23%	64%	0%	12,426	4.0%
METAL	2,202	17,474	40,538	63,579	7,116	2%	13%	31%	49%	5%	130,909	42.6%
CONCRETE	372	367	5,966	37,479	6,969	1%	1%	12%	73%	14%	51,153	16.7%
OTHER	-	-	-	-	-	0%	0%	0%	0%	0%	-	0.0%
Total by Condition (ft)	3,074	19,593	54,162	158,538	71,572						306,939	100.0%
% of Total	1.0%	6.4%	17.6%	51.7%	23.3%						58.13	Miles

FIGURE 3.1: COMPARISON OF EXTRAPOLATED CONDITION SCORES BY MATERIAL LENGTH

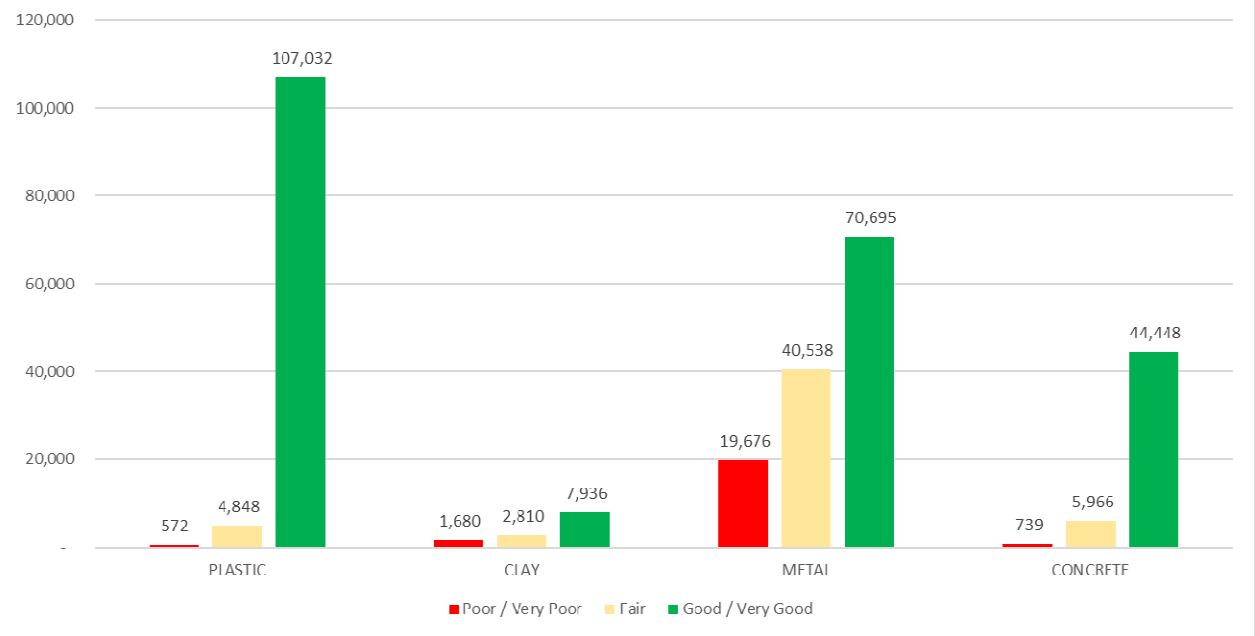
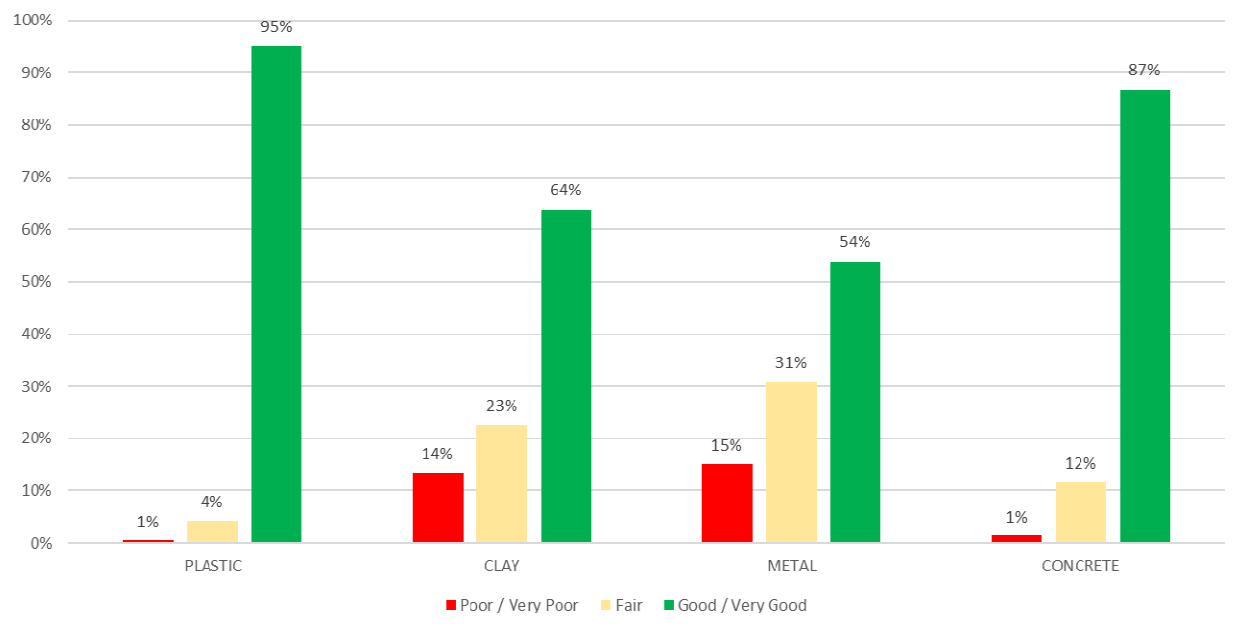


FIGURE 3.2: COMPARISON OF EXTRAPOLATED CONDITION SCORES BY MATERIAL



Metal pipes contain the largest amount of pipe by percentage in POOR and VERY POOR conditions. As metal pipelines make up about 43% of the overall system, and 15% of metal pipes are in POOR or VERY POOR condition, the metal pipelines effectively comprise over 85% of the POOR and VERY POOR category. Metal also makes up the majority (~75%) of FAIR scores, as 31% of all metal piping examined is in FAIR condition. Because metal pipelines have a larger percentage of overall length in the VERY POOR, POOR, and FAIR condition scores, it is recommended that metal pipes be high priority for repair and replacement efforts.

The clay pipelines examined had the next highest rate of defects. Similar to metal pipelines, approximately 14% of the clay pipelines examined fall into the POOR and VERY POOR categories. The clay pipeline defects are likely from their old age, as clay is generally the oldest pipe material in stormwater systems. In addition, none of the clay pipelines examined fell into the VERY GOOD category, which is indicative of overall poorer condition. Because of this, it is recommended that clay pipes be high priority for replacement in the future.

Both concrete and plastic pipes examined have over 85% of their overall lengths in the GOOD or VERY GOOD category, with less than 2% in the POOR or VERY POOR category. This is indicative of the overall newer and better condition of these materials. Plastic and concrete pipelines should not be prioritized for repair, unless CCTV data reveals the pipe is in POOR or VERY POOR condition.

It should be noted that this analysis assumes that the pipeline conditions examined to date can be extrapolated to reflect the condition of the entire system. This assumption may not reflect reality, as many of the pipelines downtown were not examined. As downtown is the oldest part of the city, and contains the most concentrated area of stormwater pipes, it is anticipated that a greater amount of clay and concrete pipes, which are prevalent downtown, will be found in poorer conditions after the entire system has been inspected using CCTV. If this is the case, improvements in the downtown area should be prioritized for repair, as the consequence of failure is typically much greater in developed commercial areas than non-commercial areas.

3.1. SPECIAL STORMWATER REQUIREMENTS FOR AREAS OF THE CITY OF LEWISTON THAT DISCHARGE STORMWATER RUNOFF TO LINDSAY CREEK OR TAMMANY CREEK

The City of Lewiston has been designated for coverage under a federal National Pollutant Discharge Elimination System (NPDES) Municipal Stormwater Permit. Since the draft permit has been through the formal public comment period (comment period ended March 22, 2019), the effective date of permit coverage may be imminent. Upon coverage, the City will be required to implement an array of enhanced and new stormwater management activities aimed at preventing and reducing the discharge of stormwater related pollution to local receiving waters including the Snake River, Lower Granite Dam Pool, Lindsay Creek, Tammany Creek, and other associated waters of the United States.

Under the NPDES Permit, the City will be required to conduct additional special stormwater management activities within areas that drain to waterways that have documented water quality impairments – specifically Lindsay Creek and Tammany Creek. The additional stormwater management activities will create extra area-specific costs to the City.

Per Section 4 of the draft NPDES Permit, the City must meet the **Special Conditions for Discharges to Impaired Waters** and "*must conduct quantitative monitoring/assessment and pollutant reduction activities to assess and control pollutants of concern"* for City discharges to Lindsay Creek and Tammany Creek. The City must prepare and implement a Monitoring and Assessment Plan to quantify pollutant loadings from the City's stormwater system to Lindsay Creek and Tammany Creek. During the first five-year permit term, the City must also plan and implement at least one Pollutant Reduction Activity to reduce pollutant loading to each creek. The types of pollutant reduction activities that will be implemented by the City will be defined after

further study, but they may include construction of facilities to retain and treat stormwater, which would be an additional stormwater capital project expense. Recommended improvements to address these requirements and their associated costs are presented in Section 6 of this report.

4. REPLACEMENT RECOMMENDATIONS

Keller Associates recommends developing an annual pipeline replacement plan. This plan should prioritize pipelines that fall into the VERY POOR and POOR condition category.

For poor condition pipelines, it is recommended that CCTV records be reviewed to prioritize rehabilitation and repair efforts. As Keller generally recommends replacing connecting pipelines to reduce overall impact and save money, there is not enough available data for Keller Associates to recommend specific pipeline replacement projects. However, the City has identified several replacement projects in previously completed planning efforts. Project descriptions can be found in Appendix C, and descriptions of costs can be found in Section 6 of this report.

In cases where only a few defects exist along a run of pipe, the pipe may be suitable for a spot repair. Keller Associates reviewed additional CCTV data of pipelines with FAIR, POOR, and VERY POOR condition scores, but did not identify any pipelines that would be suitable for spot repair. Prior to replacing any pipe in the future, the CCTV data of that pipe should be reviewed to determine if a spot repair is appropriate. Spot repairs are less intrusive and less expensive than full length pipeline replacement.

As clay pipe is generally the oldest in the system, and City staff have reported many issues concerning the system's metal piping, it is recommended that these two pipeline materials take precedent when evaluating repair and replacement needs.

In addition, it is highly recommended that the City continue the use of CCTV inspection to discover the size, material, and defects of the remaining 44.1 miles of pipeline that has yet to be inspected. The PACP system gives the City the ability to more accurately assess their stormwater infrastructure using tools recognized as industry standard and can be used to prioritize pipe replacement needs based on defects. The PACP data obtained will allow the City to quickly identify defective pipe segments and create a prioritized repair and replacement schedule.

5. REPLACEMENT BUDGET

Keller Associates evaluated two approaches to establishing an annual replacement budget for the collection system. These included: 1) a replacement budget based on pipe life regardless of age or condition (assuming a 100-year life for all non-metal pipelines, and a 50-year life for all metal pipelines), and 2) replacing all pipelines in poor condition or anticipated to be in poor condition based on exceeded useful life in the next 20 years. As the City collects additional data on the system and monitors actual degradation of assets over time, projected replacement budgets can be refined.

Approach 1

By assuming a 50-year life for all metal pipes and a 100-year life for all pipelines, the City would replace about 4,475 feet of pipe per year with sizes varying from less than 8-inch diameter to 108-inch diameter. All existing pipelines smaller than 12-inches in diameter would be replaced with 12-inch pipe. The estimated total annual cost for this approach would be approximately $1,308,000, at an average unit project cost (including manholes, surface restoration, and engineering) of approximately $292 per foot of pipeline replacement. See Appendix B for calculations.

Approach 2

The second approach considered assumes all pipes in the VERY POOR and POOR condition category, all metal pipes in the FAIR category, 83.3% of clay or concrete pipes in the FAIR category, and 20% of metal pipes in the GOOD condition category be replaced by 2040. These delineations were made after reviewing assumed age of the pipe materials provided by the City. If City assumptions about age are correct, and an average useful life of 50 years for metal and 100 years for all other pipe types is assumed, then all metal pipes and 5/6ths of concrete and clay pipes

will be beyond their useful life by 2040. For the next 20 years, this would involve replacing about 4,280 feet of pipe per year with an estimated cost of approximately $1,372,000, at an average unit project cost of approximately $321 per foot of pipeline replacement. This higher average unit cost is based on the actual pipeline sizes for the pipelines CCTV'd. See Appendix B for calculations.

Recommendation

Keller Associates recommends that the City expand their existing infrastructure repair and replacement program (IRRP) with a target budget of approximately $1,372,000 per year. For those pipeline segments with FAIR, POOR, or VERY POOR conditions scores, further prioritization of rehabilitation activities should be completed in a subsequent pre-design phase as each of these CCTV records are reviewed in more detail and the appropriate rehabilitation techniques are identified. Because risks can be dependent on a number of factors not captured by the City's rating system, the City should retain flexibility to adjust priority based on observed conditions, potential environmental/social damages that would result from a pipe failure, and other factors such as service area. Many communities choose to ramp up their replacement budget over several years to allow the program to be developed, and budgets to be refined with additional CCTV and predesign.

Additionally, this prioritization of improvements should be continually updated as additional CCTV records are gathered for the other portions of the system. As the City continues to complete additional CCTV inspections, the actual system-wide rehabilitation needs will become better identified and prioritized, and annual budgets should be updated accordingly. Over time, as additional data is gathered and the replacement program matures, it may be appropriate to adjust this budget, based on actual needs.

In conjunction with this planning effort, it is recommended that the City of Lewiston continue to perform CCTV inspection on the remaining stormwater pipe segments. Keller Associates recommends that the City continue to update the pipeline conditions database as part of an ongoing pipeline preservation/rehabilitation program. Linking this system to the City's GIS further allows the City to graphically review pipeline conditions over time. Pipelines should be inspected every 5-10 years, and the GIS database updated accordingly. This time period is a general guideline and should be updated for sections of pipe as more information becomes available. Monitoring conditions over time will allow the City staff to optimize the appropriate frequencies for the City of Lewiston.

Lastly, Keller Associates recommends that the City CCTV pipelines and future projects ahead of any roadway work. If the pipelines below the road are in poor condition, pipeline repair and replacement efforts can occur concurrently with roadway projects. Doing so will reduce surface repair costs associated with pipeline projects.

6. CAPITAL IMPROVEMENT PLAN UPDATE

The City has an existing Capital Improvement Plan (CIP) which was established in the 2001 Lewiston Stormwater Master Plan. The City has been using the CIP to identify stormwater projects and allocate necessary funds. Of the CIP projects recommended in the original master plan, one project has not been completed to date. In addition, the 2001 master plan suggested that monies be set aside annually to cover the costs of Phase II stormwater improvements, which includes action items like public outreach, education, and involvement as well as illicit discharge detection, runoff control and pollution prevention. Money for these annual improvements has already been set aside by the City. Table 6.1 includes the annual recommended stormwater pipeline replacement budget established in section 5 of this report.

6.1. BENGAL FIELD (CIP PROJECT #1.1)

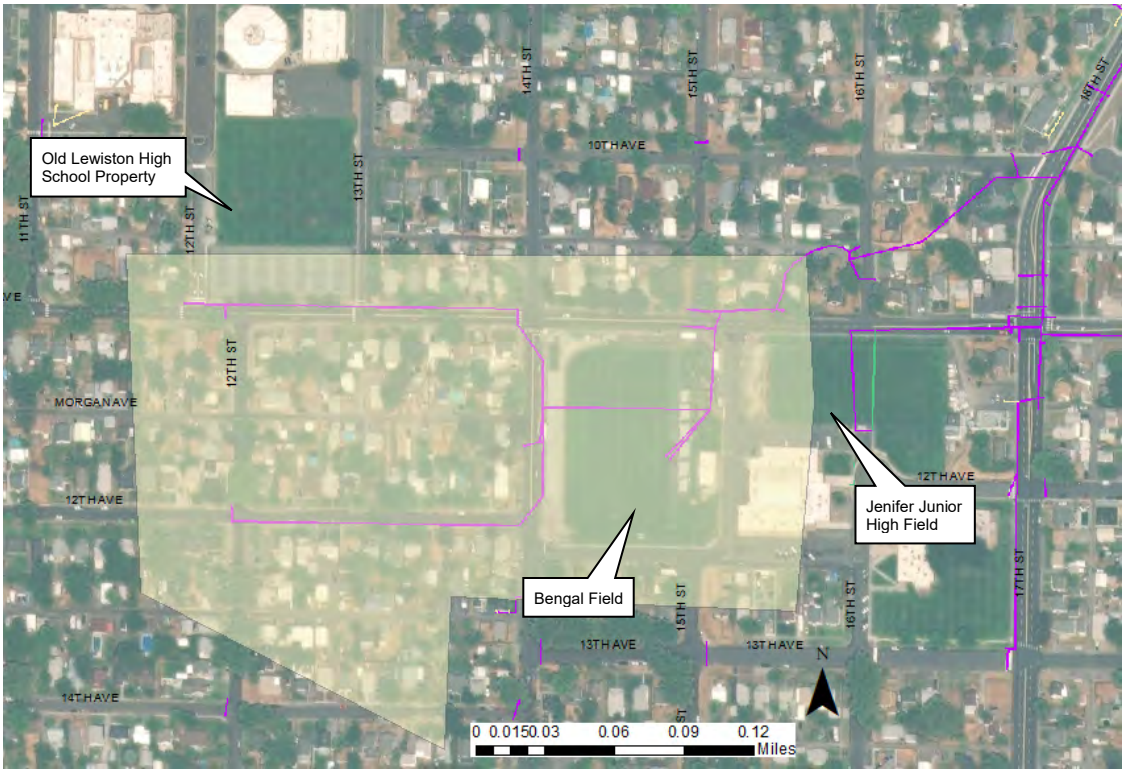
To date, there is only one CIP project from the 2001 master plan that has not been completed, the Bengal Field upgrades. It was requested by the City that alternatives to construction of additional stormwater pipe be examined. Keller Associates performed sizing calculations for both a seepage bed and retention pond for the area, assuming a rainfall event of 1.2 inches and a runoff area of approximately 30.5 acres. 1.2 inches of rainfall is the 2-year, 24-hour design for

stormwater systems in Lewiston (re: Lewiston Stormwater Policy and Design Manual). The Bengal Field capture area was estimated by overlaying contours and tracking the direction of water flow around the area that contributes flow to the existing pipelines beneath Bengal Field. See Appendix D for the sizing calculations performed. Figure 6.1 depicts the area of rainfall that will be captured by the Bengal Field upgrades, shown in yellow, and the existing undersized pipes, shown in purple.

Four locations were evaluated for possible placement of either a subgrade seepage facility or above grade retention/detention pond. See Figure 6.1 below for these approximate locations.

- Location 1 – Existing Right-of Way
- Location 2 – Old Lewiston High School Property (north of tennis courts)
- Location 3 – Bengal Field
- Location 4 – Jenifer Junior High North Field

FIGURE 6.1: BENGAL FIELD RAINFALL CAPTURE AREA



6.1.1 LOCATION 1 – EXISTING RIGHT OF WAY

If located within existing right-of-way, the likeliest option for this area would be to construct a subgrade seepage bed facility. Much of this area is developed and urbanized which is not conducive to roadside swales. Assuming a seepage bed width of approximately 8-feet and an approximate depth of 5-feet, approximately 3,400 lineal feet of seepage bed would be required to contain storm runoff for a 2-year, 24-hour storm event. The most ideal place for this would be beneath the roadways in this area. However, due to the size of road that would need to be excavated and replaced, and the likelihood of various utility conflicts, this option is not recommended.

6.1.2 LOCATION 2 – OLD LEWISTON HIGH SCHOOL PROPERTY

Alternatively, a 5-foot deep retention pond could be contained in an approximately 18,300 square foot area. There are three nearby fields which have the required area, one south of the old Lewiston High School and north of the tennis courts, Bengal Field, and one north of Jenifer Junior High School.

The Lewiston High School Field is upstream of the existing flow path for stormwater in this area. New pipelines would need to be constructed in order to capture stormwater and deliver it to the retention pond. Additionally, existing grades may not allow gravity flow of stormwater to this location. Due to the higher costs and inaccessibility of this option, it is not recommended.

6.1.3 LOCATION 3 – BENGAL FIELD

Bengal Field is ideally located at the lower end of this stormwater subbasinThe field has over 100,000 square feet of space and the ability to orient a retention basin in several ways. However, this field is currently used for recreation and sporting events by the high school and junior high and will likely be unavailable for implementation of a retention pond. As such, this option is not recommended.

6.1.4 LOCATION 4 – JENIFER JUNIOR HIGH NORTH FIELD

The field north of Jenifer Junior High sits downstream of the anticipated capture area and would require a small pipeline to connect the existing stormwater system to a retention pond on the field. This field is currently used for recreation by Jenifer Junior High. The field is elevated above the surrounding roadways, and as such would require the retention pond to be further depressed. If this option is not disruptive to activities performed by the Junior High, then this location is preferred for a retention/detention pond. However, due to its current use, it is unlikely that the space would be available for construction of a retention pond.

If the City desires to pursue this alternative, further investigation in property acquisition and cost estimates needs to be performed. Otherwise, the updated estimate from the 2001 Master Plan, which reflects construction of new stormwater pipelines, will remain as the recommended improvement for the Bengal Field area in the CIP table.

6.2. BASIN 7 UPDATE (CIP PROJECTS 2.1 – 2.12)

In 2017, JUB Engineers, Inc. completed a stormwater master plan update for Basin 7, the City's largest stormwater basin. With this update, twelve additional capital improvements were recommended to improve the City's stormwater infrastructure. These projects were reviewed with City staff and prioritized based off Public Works Department assessments, frequency of flooding events, magnitude of flooding (peak flow and total volume), extent of flooding (number of people affected), and reports of property damage. These improvements include repair/replacement of existing pipes and implementation/upsizing of detention basins.

All original CIP projects, and projects recommended in the 2017 report, have been incorporated into a single updated CIP, as depicted by Table 6.1. Original costs for these projects have been updated to 2018 dollars using the Engineering News-Record construction cost index.

6.3. DECANT FACILITY (CIP PROJECT #3.1)

The City has also expressed interest in construction of a decant facility with drying beds to properly dispose of stormwater waste. The City anticipates the design, permitting, and

construction of this facility will cost approximately $300,000 over the next two years, with construction anticipated in the fall of 2020. As such, these costs have been included in the updated CIP list presented in Table 6.1.

6.4. SERVICE AREA 2 CIP (CIP PROJECTS #3.2 – 3.5)

The majority of the CIP projects identified in the original master plan and the basin 7 update are located in the City's Service Area 1, where stormwater is primarily conveyed and disposed of using pipes that discharge to surface waters. However, Service Area 2, where stormwater is primarily conveyed and disposed of through infiltration in road-side swales and open spaces (with flows to Lindsay and Tammany creeks during large runoff events), was largely ignored in these analyses. The City desired to further explore options for addressing drainage issues caused by stormwater runoff within this area. As such, the CIP reflects a budget of $60,000 to perform a stormwater master plan study for Service Area 2, which will recommend stormwater improvements for Service Area 2.

In order to address the Tammany Creek and Lindsey Creek special requirements, it is recommended that the following three actions be taken:

1. The City stormwater program budget include funding to cover the City labor, training, equipment, and laboratory analysis costs associated with special monitoring/assessment related to Lindsay Creek and Tammany Creek. This has been done in a separate City Stormwater Program Plan (Aspect, 2018).
2. The City budget include $250,000 in funding to cover the cost to plan, design, and construct at least two generic stormwater retention and treatment projects to be further defined later (one within the watershed of each creek). It is recommended that the funding for this project accrue over several years, culminating with construction in year five of the first permit term (approximately 2024).
3. The City's stormwater capital improvement budget include approximately $75,000 per year in funding for Year 6 and beyond to cover additional stormwater retention and treatment projects within areas draining to Lindsay Creek and Tammany Creek. It is expected that these projects will be better defined through the City's monitoring/assessment work along with additional stormwater master planning work within the City's portion of the Lindsay Creek and Tammany Creek watersheds. It is assumed that funding for these additional improvements would cease in 2040, resulting in a total of $1,200,000 in funding for these improvements over a 15-year period. As 2040 approaches, it is recommended that the City re-examine the budget for these improvements and determine if continued funding is needed.

These recommended improvements are reflected in Table 6.1.

Additionally, the City is aware of several known locations within Service Area 2, also known as the Orchards area, where routine flooding is an issue in areas that are not properly serviced by stormwater infrastructure. These areas will need to have stormwater infrastructure constructed to rectify the issues identified in these locations. As such, it is recommended that $150,000 be budgeted to perform a design study for specific improvements at these identified locations.

6.5. CITY IDENTIFIED PROJECTS (CIP PROJECTS 4.1 – 4.18)

Lastly, the City has outlined stormwater projects discovered from drainage problems and assessment of risks in internal planning documents. These projects include continued CCTV efforts and completion of the Stormwater Master Plan. Several of the projects examined by the City in planning documents overlap with CIP projects identified in the 2001 Master Plan and the Basin 7 Update. Projects re-examined from the Master Plan and Basin 7 Update in more recent City planning documents have had their associated costs updated to the most recent City

planning estimate. The remainder of these projects are unique only to the planning documents and should be considered for completion in the future. These projects have also been included in Table 6.1. Project descriptions and planning cost breakdowns completed by the City can be found in Appendix C.

TABLE 6.1: CAPITAL IMPROVEMENT PLAN UPDATE: PROJECTS TO BE COMPLETED WITHIN 20 YEARS

Stormwater Capital Improvement Projects Cost Estimate				
ID#	**Item**	**Primary Purpose(s)**	**Original Estimated Cost**	**Total Estimated Cost (2018)**
2001 Master Plan Improvements				
1.1	14th Street & 12th Avenue (Bengal Field)	Correct Flooding	$ 290,000	$ 506,000
1.2	16th Street & G Street	Correct Flooding	$ 350,000	Completed as part of FEMA project
1.3	9th Avenue & Prospect	Correct Flooding, Mitigate Erosion	$ 330,000	Completed
1.4	Idaho Street & 14th Street	Correct Flooding, Pipe Replacement	$ 300,000	Completed as part of FEMA project
1.5	Annual Phase II Stormwater Rule	Monitoring, Public Outreach, O&M Development, Compliance	$ 90,000	Replaced by MS4 Permit
Total Master Plan Improvements (rounded)				**$ 510,000**
2017 Basin 7 Evaluation Improvements				
2.1	ITD Intersection	Pipe Replacement	$ 1,017,965	In Progress
2.2	Lower 20th Street System	Completing Drainage System	$ 991,460	$ 1,061,400
2.3	Upper 20th Street System	Completing Drainage System	$ 1,937,510	$ 2,074,200
2.4	Hall Ford Dealership Rehabilitation	Pipe Repair	$ 1,128,075	$ 1,207,600
2.5	Thain Grade Crossing	Pipe Replacement	$ 104,813	$ 112,200
2.6	Lower Thain Road Rehabilitation	Pipe Replacement	$ 1,257,790	$ 1,346,500
2.7	Upper Thain Road Rehabilitation	Pipe Replacement	$ 1,385,623	$ 1,483,300
2.8	Stewart Avenue Basin Expansion	Detention Basin Expansion	$ 291,000	$ 311,500
2.9	Cable One Basin	Detention Basin	$ 72,500	$ 77,600
2.10	Toyota Dealership Basin	Detention Basin	$ 65,500	$ 70,100
2.11	Thain Grade - East Basin	Detention Basin	$ 94,500	$ 101,200
2.12	Thain Grade - West Basin	Detention Basin	$ 114,000	$ 122,000
Total Basin 7 Improvements (rounded)				**$ 7,970,000**
2020 Recommended Improvements				
3.1	Decant & Drying Bed Facility Reserve	Design, Permitting, and Construction of Decant Facilities		$ 300,000
3.2	Service Area 2 Stormwater Master Plan Study	Planning Study identifying need for future projects		$ 150,000
3.3	Lindsay and Tammany Creek Retention and Treatment Improvements	Mitigate stormwater pollution to local receiving waters		$ 250,000
3.4	Future Lindsay and Tammany Creek Improvements	Additional improvements to mitigate stormwater pollution		$ 1,200,000
3.5	Orchards Stormwater Design Study	Identify improvements for known problem areas in the Orchards area		$ 80,000
Total 2020 Recommended Improvements (rounded)				**$ 1,980,000**
City Identified Future Projects (2016)				
4.1	Annual Storm Drainage Improvements	Funds for Emergency and Opportunity Infrastructure (3-years)	$ 150,000	Replaced by Annual R&R Budget
4.3	21st Street & Thain Road Drainage Improvements	Detention Ponds, Trenchless Pipe Repair, General Improvements	$ 925,000	Replaced by Basin 7 Update
4.4	14th St 12th Ave (Bengal Field Area)	New Storm Drainage System	$ 450,000	Replaced by Master Plan Improvements Estimate
4.5	Miller Grade & Rigby Lane	Pipe Replacement/Upsizing	$ 302,500	$ 323,800
4.6	20th Street System Rebuild	Completing Drainage System	$ 1,679,590	Replaced by Basin 7 Update
4.7	14th Street & Power Avenue	Pipe or Detention Pond Installation	$ 1,207,860	$ 1,293,000
4.8	McSorley School Area to Southway	New Storm Drainage System	$ 807,630	$ 864,600
4.9	18th Street & Grelle Avenue	New Storm Drainage System	$ 277,410	$ 297,000
4.10	6th St, Linden Ave to Preston Ave/Nez Perce Grade	New Storm Drainage System	$ 713,470	$ 381,900
4.11	Drainage at 19th Street and Cedar Avenue	New Storm Drainage System	$ 203,200	$ 217,500
4.12	8th Avenue Blvd. and 14th Street Storm Drainage	New Storm Drainage System	$ 172,980	$ 185,200
4.13	Country Club Area Drainage	New Storm Drainage System	$ 229,350	$ 245,500
4.14	21st Street Drainage System Rebuild	New Storm Drainage System	$ 2,559,260	Replaced by Basin 7 Update
4.15	Stormwater Rapid Assessment Project (TV)	CCTV Inspection of Pipelines, Record Defects	---	$ 190,600
4.16	Stormwater Capital Master Plan	Update Master Plan, Record Defects, Track CIP Projects	$ 100,000	$ 250,000
4.17	21st Street & Hwy 12 Storm Outfall	New Stormwater outfall, Pipe Replacement	$ 434,800	Replaced by Basin 7 Update
4.18	Hall Ford Stormwater Rehab	Pipeline Repair	$ 100,000	Replaced by Basin 7 Update
Total City Planning Improvements (rounded)				**$ 4,250,000**
		TOTAL STORMWATER CIP COSTS (rounded)		**$ 14,710,000**
Annual Pipeline Repair and Replacement Budget				
ID#	**Item**	**Primary Purpose(s)**	**Annual Cost**	**Total Estimated Cost**
Annual Pipeline Recommended Replacement				
5.1	Recommended Pipe Replacement	Annual Pipe Replacement Budget	$ 1,372,000	**$ 27,440,000**
		TOTAL STORMWATER IMPROVEMENTS COSTS (rounded)		**$ 42,150,000**

This CIP table serves to update the existing CIP established in Section 6 of the 2001 Lewiston Stormwater Master Plan. It is recommended the City use this updated CIP in identifying future projects and allocating money appropriately based on budget limitations and internal priorities. It is recommended that the City work diligently and budget money to complete all these projects within the next 20 years.

The timetable shown in Table 6.2 shows the projects anticipated to be completed by the City within the next five years. This timeline of completion reflects the prioritized schedule provided in City planning documents, including prioritization from the Basin 7 Update, plus the added cost associated with the annual recommended pipe replacement budget and the cost of the decant and drying bed facility.

TABLE 6.2: CAPITAL IMPROVEMENT PLAN UPDATE TIMETABLE

CIP Priority Number	CIP Project #	PROJECT	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6-20	TOTALS
Priorty 1 Improvements (Year 1 - Year 5)									
1	2.4	Hall Ford Dealership Rehabilitation	$ 295,000	$ 304,200	$ 304,200	$ 304,200			$ 1,207,600
2	4.15	Stormwater Rapid Assessment Project (TV)	$ 51,000	$ 52,000	$ 53,200	$ 34,400			$ 190,600
3	3.1	Decant & Drying Bed Facility Reserve	$ 150,000	$ 150,000					$ 300,000
4	3.2	Service Area 2 Storm Master Plan Study	$ 100,000	$ 50,000					$ 150,000
5	1.10	14th Street & 12th Avenue (Bengal Field)		$ 61,000	$ 222,500	$ 222,500			$ 506,000
6	3.3	Lindsay and Tammany Creek Treatment and Retention	$ 70,000	$ 60,000	$ 60,000	$ 60,000			$ 250,000
7	3.5	Orchards Stormwater Design Study			$ 40,000	$ 40,000			$ 80,000
8	2.10	Toyota Dealership Basin				$ 8,500	$ 61,600		$ 70,100
9	2.8	Stewart Avenue Basin Expansion				$ 36,000	$ 275,500		$ 311,500
10	2.11	Thain Grade - East Basin					$ 101,200		$ 101,200
11	2.12	Thain Grade - West Basin				$ 14,700	$ 107,300		$ 122,000
12	2.9	Cable One Basin				$ 9,400	$ 68,200		$ 77,600
13	4.16	Stormwater Capital Master Plan	$ 50,000	$ 50,000	$ 50,000	$ 50,000	$ 50,000		$ 250,000
14	3.4	Lindsay and Tammany Creek Improvements Reserve (through Year 20)					$ 75,000	$ 1,125,000	$ 1,200,000
		Priority 1 Improvements Total	$ 716,000	$ 727,200	$ 729,900	$ 779,700	$ 738,800	$ 1,125,000	$ 4,816,600
Priority 2 Improvements (Beyond Year 5)									
15	2.6	Lower Thain Road Rehabilitation						$ 1,346,500	$ 1,346,500
16	2.2	Lower 20th Street System						$ 1,061,400	$ 1,061,400
17	4.8	McSorley School Area to Southway						$ 864,600	$ 864,600
18	2.3	Upper 20th Street System						$ 2,074,200	$ 2,074,200
19	4.13	Country Club Area Drainage						$ 245,500	$ 245,500
20	4.9	18th Street & Grelle Avenue						$ 297,000	$ 297,000
21	2.7	Upper Thain Road Rehabilitation						$ 1,483,300	$ 1,483,300
22	4.7	14th Street & Power Avenue						$ 1,293,000	$ 1,293,000
23	2.5	Thain Grade Crossing						$ 112,200	$ 112,200
24	4.5	Miller Grade & Rigby Lane						$ 323,800	$ 323,800
25	4.10	6th St, Linden Ave to Preston Ave/Nez Perce Grade						$ 381,900	$ 381,900
26	4.11	Drainage at 19th Street and Cedar Avenue						$ 217,500	$ 217,500
27	4.12	8th Avenue Blvd. and 14th Street Storm Drainage						$ 185,200	$ 185,200
		Priority 2 Improvements Total						$ 9,886,100	$ 9,886,100
		CIP PROJECT TOTALS [a]	**$ 716,000**	**$ 727,200**	**$ 729,900**	**$ 779,700**	**$ 738,800**	**$ 11,011,100**	**$ 14,710,000**
Annual Pipeline Repair and Replacement Budget (through Year 20)			$ 1,372,000	$ 1,372,000	$ 1,372,000	$ 1,372,000	$ 1,372,000	$ 20,580,000	$ 27,440,000
Less Repair and Replacement performed by CIP Projects			$ (295,000)	$ (304,200)	$ (304,200)	$ (304,200)	$ -	$ (4,759,500)	$ (5,967,100)
Unassigned Annual Pipeline Repair and Replacement Budget			$ 1,077,000	$ 1,067,800	$ 1,067,800	$ 1,067,800	$ 1,372,000	$ 15,820,500	$ 21,472,900
Total CIP + Annual RR Budget			$ 1,793,000	$ 1,795,000	$ 1,797,700	$ 1,847,500	$ 2,110,800	$ 26,831,600	$ 36,182,900
TOTAL STORMWATER IMPROVEMENTS COSTS (rounded)[b]									**$ 36,182,900**

a - Yearly totals determined by summation of all projects
b - Grand Total determined by summation of all non-replacement CIP projects and Annual Pipe Replacement line item
All costs are in 2018 dollars

The CIP timetable assumes an initial starting budget of $1,372,000 for the annual recommended pipe replacement efforts. As discussed in Section 5 of this report, the City may wish to phase this program in over several years, starting at a lower budget and then increasing over time as the project scope and budget become better defined.

The locations of the CIP projects identified can be found in Figure 6.1 – Capital Improvement Projects in Appendix A. The CCTV video inspection project was not given as a location, as it is assumed that the remaining unexamined stormwater pipes in the system will be targeted for examination, and the Lindsey and Tammany Creek improvements were not given locations as these projects have yet to be fully defined.

It is worth noting that several of the identified capital improvement projects above could be considered in poor condition and thus overlap with pipe repair and replacement needs based on pipe condition. After CCTV inspection is completed on all the City's pipelines, it is recommended that the City cross-reference these identified projects with the pipelines' conditions. If pipe repair or replacement is the solution to some of these projects, using the annual recommended repair and replacement budget to offset a portion or all of the costs of identified projects will lower the overall 20-year cost to the City.

In order for the City to properly budget for the CIP projects and repair/replacement projects, Keller Associates recommends developing an annual reserve to cover both costs. Table 6.3 depicts the annual reserve the City would need to budget in order to pay for the first 5 years of CIP and repair/replacement projects. With a recommended annual CIP Reserve of at least $738,320 (five-year average of Priority 1 CIP) the City will break even after five years of CIP expenses based on the CIP timetable presented in Table 6.2 above. With a recommended annual Repair and Replacement (RR) Reserve (excludes RR addressed by the CIP) of at least $1,130,480 (five-year average) the City will break even after five years of RR expenses if the City spends its full RR budget each year. Keller Associates recommends a minimum combined annual reserve of $1,868,800 to fund both CIP and RR expenses each year in the first five years.

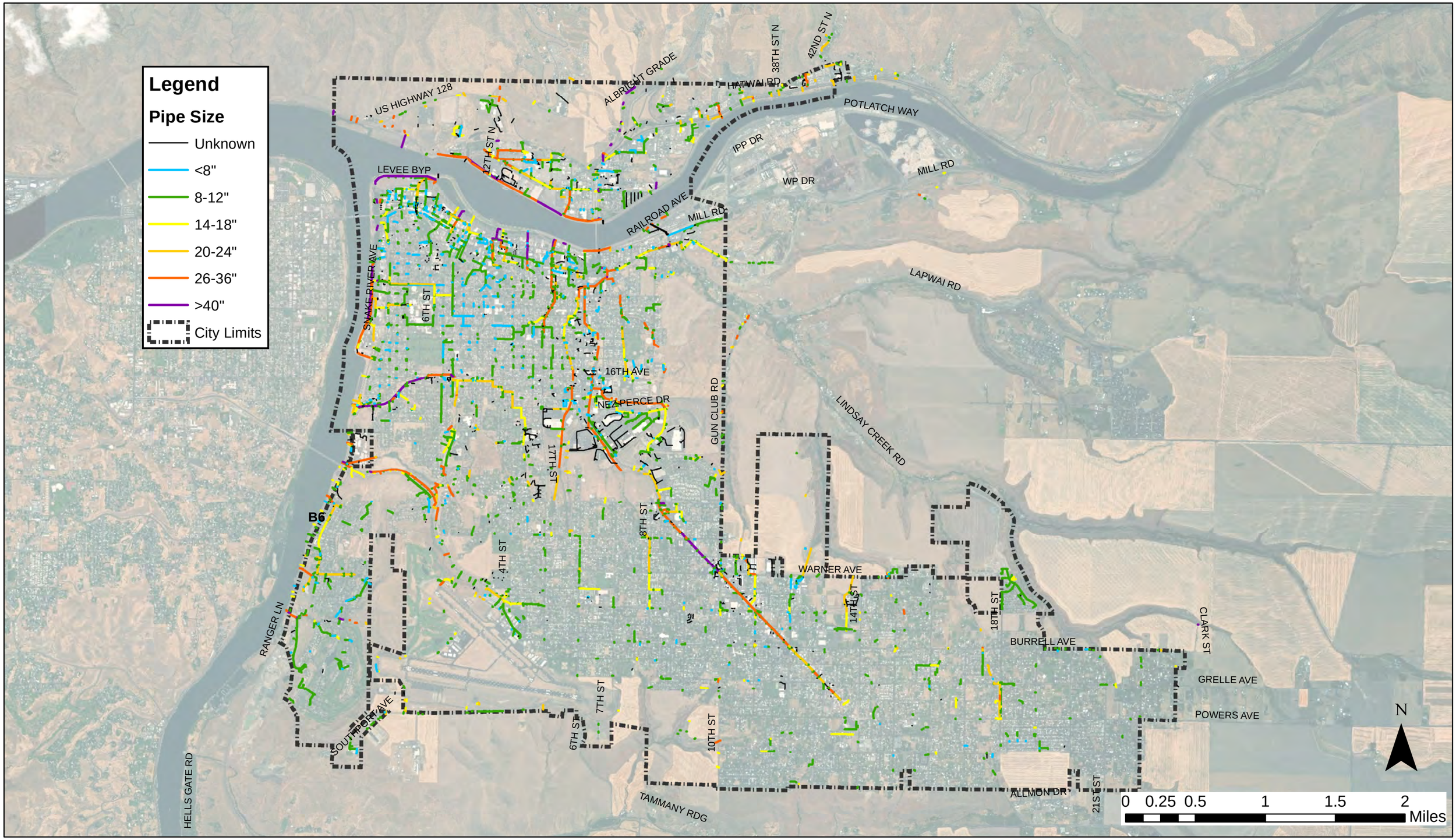
TABLE 6.3: RECOMMENDED ANNUAL CIP AND REPAIR/REPLACEMENT RESERVE

	Year 1	Year 2	Year 3	Year 4	Year 5
Annual CIP Reserve	$ 738,320	$ 738,320	$ 738,320	$ 738,320	$ 738,320
CIP Project Total	$ 716,000	$ 727,200	$ 729,900	$ 779,700	$ 738,800
Unused Reserve at Year End	$ 22,320	$ 11,120	$ 8,420	$ (41,380)	$ (480)
Year End Cumulative Reserve Balance	**$ 22,320**	**$ 33,440**	**$ 41,860**	**$ 480**	**$ -**
Annual RR Reserve (minus RR CIP)	$ 1,130,480	$ 1,130,480	$ 1,130,480	$ 1,130,480	$ 1,130,480
Unassigned Annual Pipeline RR Budget	$ 1,077,000	$ 1,067,800	$ 1,067,800	$ 1,067,800	$ 1,372,000
Unused Annual RR Reserve	$ 53,480	$ 62,680	$ 62,680	$ 62,680	$ (241,520)
Year End Cumulative Reserve Balance	**$ 53,480**	**$ 116,160**	**$ 178,840**	**$ 241,520**	**$ -**
Recommended Annual CIP + RR Reserve	**$ 1,868,800**	**$ 1,868,800**	**$ 1,868,800**	**$ 1,868,800**	**$ 1,868,800**

APPENDIX A

Full Size Figures

KELLER ASSOCIATES



KELLER ASSOCIATES

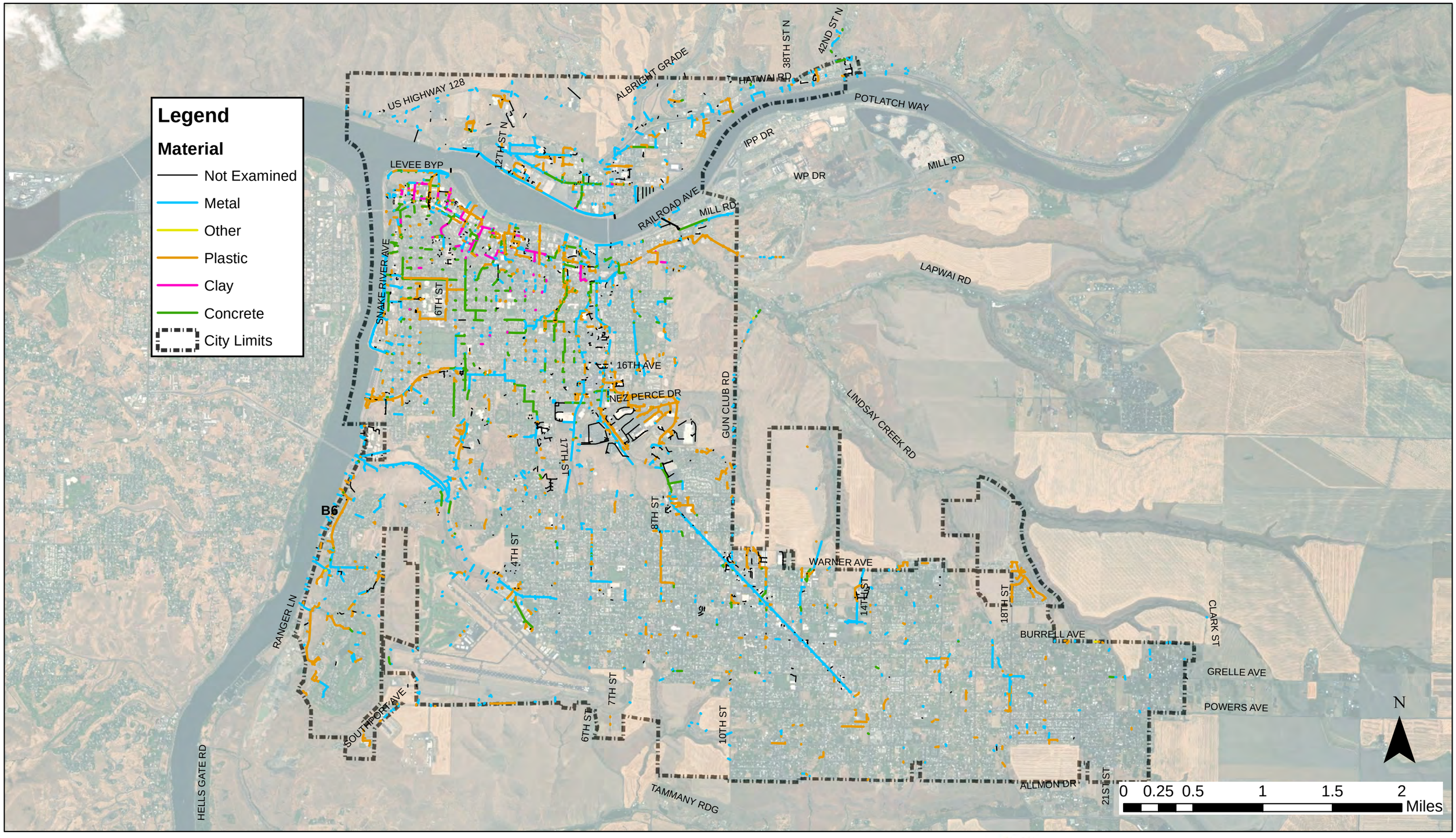
Existing System - Pipe Size

Stormwater Master Plan

CITY OF LEWISTON EXPLORE IDAHO'S FIRST CAPITAL 1861

Figure 1.1

City of Lewiston, ID
September 2019



KELLER ASSOCIATES

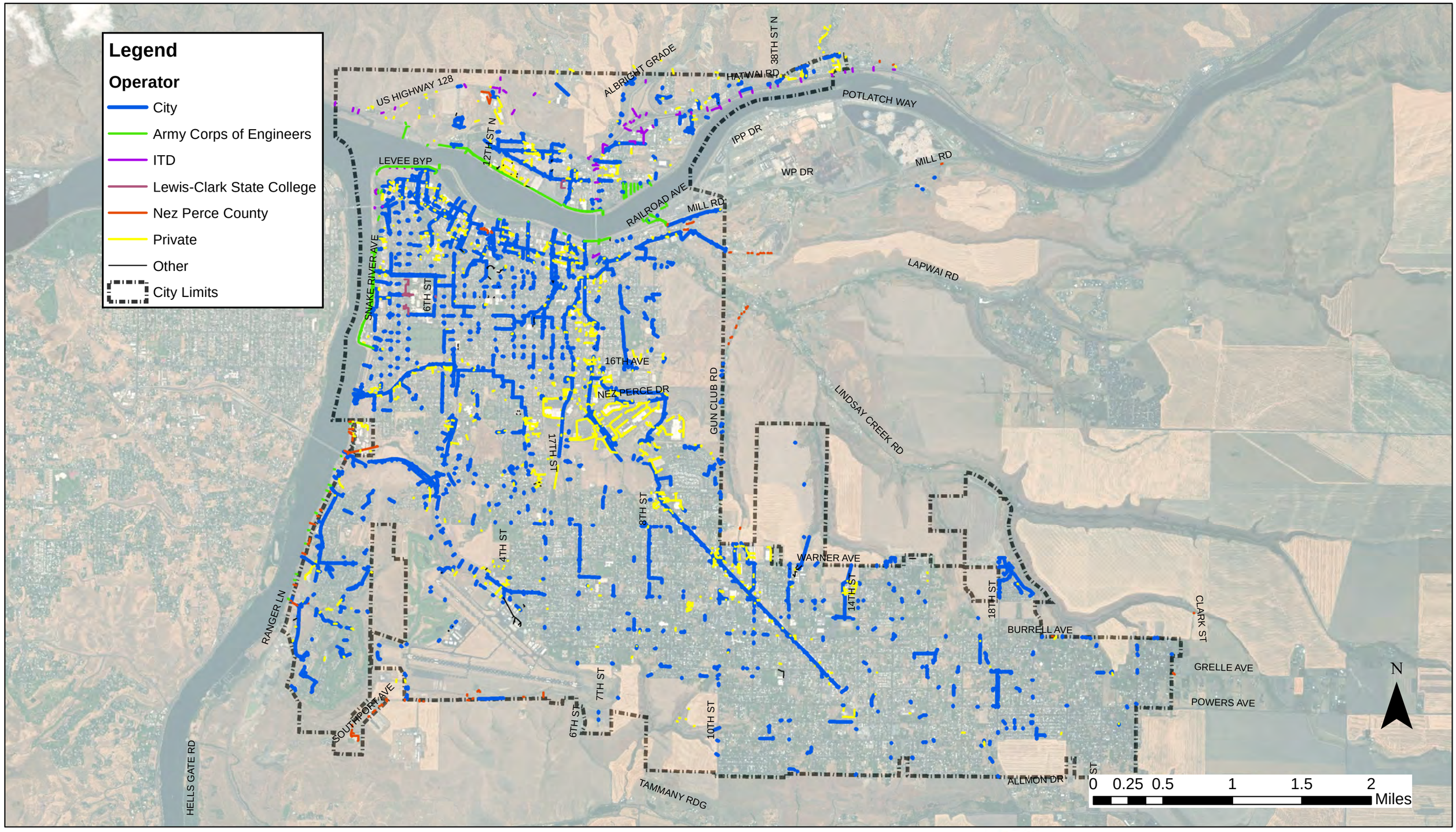
Existing System - Pipe Materials

Stormwater Master Plan

CITY OF LEWISTON EXPLORE IDAHO'S FIRST CAPITAL 1861

Figure 1.2

City of Lewiston, ID
September 2019



KELLER ASSOCIATES

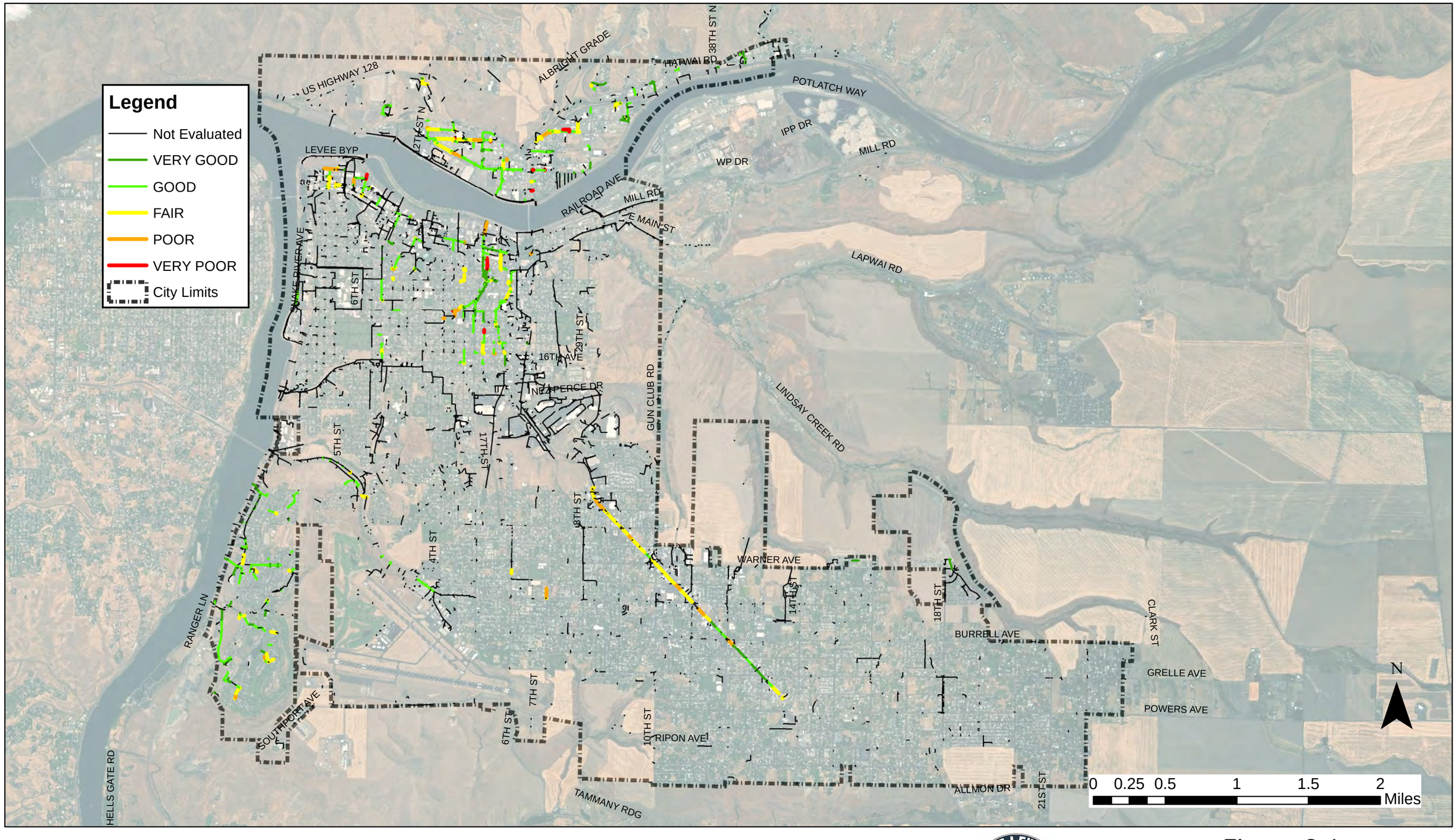
Existing System - Pipe Ownership

Stormwater Master Plan

CITY OF LEWISTON EXPLORE IDAHO'S FIRST CAPITAL 1861

Figure 1.3

City of Lewiston, ID
September 2019

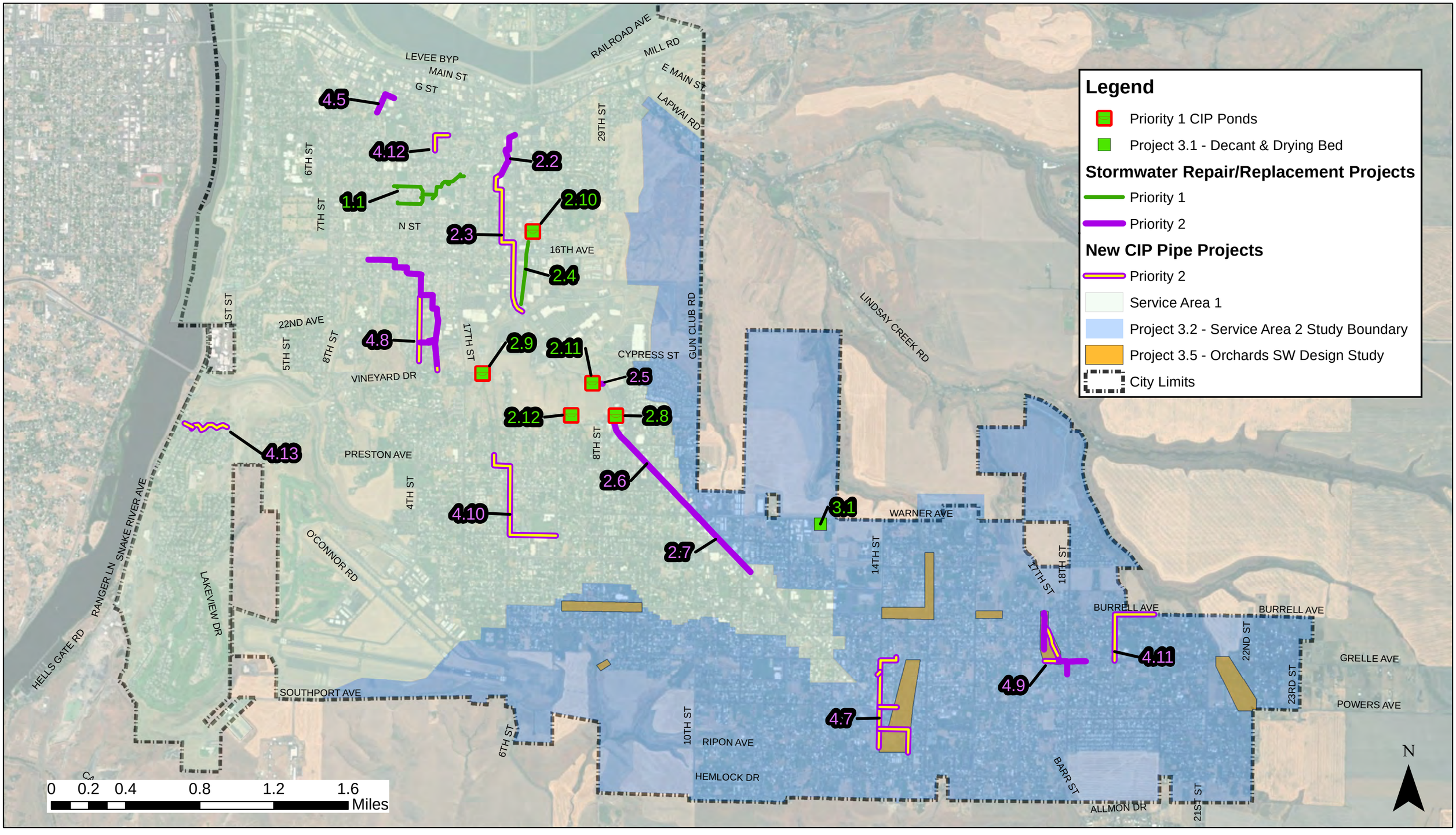


Existing System - Pipe Condition

Stormwater Master Plan

Figure 2.1

City of Lewiston, ID
September 2019



KELLER ASSOCIATES

Capital Improvement Projects

Stormwater Master Plan

CITY OF LEWISTON EXPLORE IDAHO'S FIRST CAPITAL 1861

Figure 6.1

City of Lewiston, ID
September 2019

APPENDIX B

System Replacement Cost Calculations

KELLER ASSOCIATES

Unit Price Summary

ITEM	UNIT	UNIT PRICE*	
PVC Pipe			*Including manhole cost*
12-inch Pipe - Excavation, Backfill	LF	$84	$96
15-inch Pipe - Excavation, Backfill	LF	$100	$112
18-inch Pipe - Excavation, Backfill	LF	$116	$128
21-inch Pipe - Excavation, Backfill	LF	$132	$144
24-inch Pipe - Excavation, Backfill	LF	$148	$160
30-inch Pipe - Excavation, Backfill	LF	$172	$187
36-inch Pipe - Excavation, Backfill	LF	$196	$214
42-inch Pipe - Excavation, Backfill	LF	$212	$238
48-inch Pipe - Excavation, Backfill	LF	$244	$270
Concrete Pipe			
60-inch Concrete Pipe - Excavation, Backfill	LF	$300	
72-inch Concrete Pipe - Excavation, Backfill	LF	$450	
84-inch Concrete Pipe - Excavation, Backfill	LF	$600	
96-inch Concrete Pipe - Excavation, Backfill	LF	$750	
108-inch Concrete Pipe - Excavation, Backfill	LF	$900	
			Manhole cost per foot [a]
Manholes - 48"	EA	$4,200	$12.00
Manholes - 60"	EA	$5,300	$15.00
Manholes - 72"	EA	$6,400	$18.00
Manholes - 84"	EA	$9,000	$26.00
			a - Assumed one manhole per 350 feet, rounded to nearest dollar
Existing Utility Protection	LF	$4	
Full Lane Pavement Repair	LF	$50	
Half Lane Pavement Repair	LF	$25	
Permitting	LS	$4,000	(not used)
Easement	LF	$15	(not used)
Easement lump sum per parcel	LS	$2,000	(not used)
Mobilization - Percent of Item Cost Sum	%	10%	
Contingency - % of construction costs	%	35%	
Engineering and CMS - % of construction costs	%	20%	

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.

City of Lewiston
218004 - Stormwater Master Plan Update

Approach 1 - DesignLifeReplace

ITEM	Loaded Cost/Ft (includes surface restoration, manholes, mobilization, contingency, and engineering)	Total feet of PVC pipe in system	Replacement Cost of PVC Pipe	Total feet of Concrete Pipe	Replacement Cost of Concrete Pipe	Total feet of Clay Pipe	Replacement Cost of Clay Pipe	Total feet of Metal Pipe in System	Replacement Cost of Metal Pipe
Replace with PVC Pipe [g]									
12-inch Pipe	$223	63,724	$14,195,000	33,807	$7,530,000	10,437	$2,325,000	57,106	$12,720,318
15-inch Pipe	$251	631	$159,000	1,155	$290,000	177	$45,000	820	$205,974
18-inch Pipe	$280	19,418	$5,433,000	4,388	$1,228,000	1,811	$507,000	15,336	$4,290,627
21-inch Pipe	$308	92	$28,000	-	$0	-	$0	59	$18,310
24-inch Pipe	$337	14,107	$4,751,000	5,823	$1,961,000	-	$0	19,747	$6,650,827
30-inch Pipe	$385	6,244	$2,403,000	1,210	$466,000	-	$0	13,088	$5,037,772
36-inch Pipe	$433	2,919	$1,264,000	4,073	$1,764,000	-	$0	19,320	$8,366,260
42-inch Pipe	$476	1,816	$864,000	-	$0	-	$0	2,289	$1,089,280
48-inch Pipe	$533	2,642	$1,408,000	-	$0	-	$0	1,661	$884,979
Total Replacement Pipe (Rounded)		*111,594*	**$ 30,505,000**	*50,457*	**$ 13,239,000**	*12,426*	**$ 2,877,000**	*129,427*	**$ 39,264,000**
Assumed lifespan of pipe material (years)		**100**		**100**		**100**		**50**	
Annual Length and Cost of Replaced Pipe Material [a]		*1,116*	**$ 305,050**	*505*	**$ 132,390**	*124*	**$ 28,770**	*2,589*	**$ 785,280**
Replace with Concrete Pipe [g]									
60-inch Pipe	$631	552	$348,466	-	$0	-	$0	0	$0
72-inch Pipe	$898	-	$0	371	$333,000	-	$0	347	$311,921
84-inch Pipe	$1,165	-	$0	4	$5,000	-	$0	31	$36,677
96-inch Pipe	$1,433	-	$0	-	$0	-	$0	0	$0
108-inch Pipe	$1,700	-	$0	-	$0	-	$0	240	$408,707
Total Replacement Pipe (Rounded)		*552*	**$ 348,000**	*375*	**$ 338,000**	-	**$ -**	*619*	**$ 757,000**
Assumed lifespan of pipe material (years)		**100**		**100**		**100**		**50**	
Annual Length and Cost of Replaced Pipe Material [a]		*6*	**$ 3,480**	*4*	**$ 3,380**	-	**$ -**	*12*	**$ 15,140**

Subtotal Price [b]	**$ 1,273,490**
Subtotal Pipe Length (of known material)	*305,450*
Total Length of All Pipe (Including unknown material)	313,834
Adjustment Factor [c]	1.027
Annual Cost Including Unknown Pipe Materials (Rounded) [d]	**$ 1,308,000**
Annual Replacement Length of Pipe [e]	*4,475*
Average Cost per foot of pipeline repair (Rounded) [f]	$ 292

a - Annual Length Replaced of material found by dividing Total feet by Assumed lifespan of the pipe material. Annual Costs of material found by dividing Total Replacement Cost by Assumed lifespan of the pipe material
b - Subtotal Price calculated by the summation of all Annual Costs per Pipe Material
c - Adjustment Factor = Total Length including unknown material / Subtotal of known material
d - Annual Costs Including Unknown Pipe Material calculated by multiplying the subtotal price by the Adjustment Factor
e - Annual Replacement Length of Pipe= summation of all Annual Lengths of Replaced Pipe Material * Adjustment Factor
f - Average Cost per foot = (Annual Cost Including Unknown Pipe Materials / Annual Replacement Length of Pipe)
g - Assumed: Pipe less than 48 inches will be replaced by PVC, greater than 48" will be Concrete (and not given manholes)

Pipeline Replacement Lengths & Budgets - Examined Pipeline Only

ITEM	Loaded Cost/Ft (includes surface restoration, manholes, mobilization, contingency, and engineering)	Feet of VERY POOR pipe examined	Cost of VERY POOR Pipe examined	Feet of POOR pipe examined	Cost of POOR Pipe examined	Total feet of FAIR Metal pipe examined	Total feet of FAIR Clay/Concrete Pipe examined	Total Length of Examined FAIR Pipe to be replaced [a]	Cost of FAIR Pipe examined	Feet of GOOD Metal Pipe examined	20% of GOOD Metal Pipe examined	Cost of GOOD Metal Pipe examined	Total Length of examined pipe	Total Cost of examined pipe
Replace with PVC Pipe[k]														
12-inch Pipe	$ 223	656	$ 146,000	2,153	$ 480,000	2,534	2,937	4,981	$ 1,109,000	9,118	1,824	$ 406,000	9,614	$ 2,141,000
15-inch Pipe	$ 251	-	$ -	-	$ -	82	-	82	$ 21,000	171	34	$ 9,000	116	$ 30,000
18-inch Pipe	$ 280	-	$ -	571	$ 160,000	828	-	828	$ 232,000	1,348	270	$ 75,000	1,669	$ 467,000
21-inch Pipe	$ 308	-	$ -	-	$ -	-	-	-	$ -	-	-	$ -	-	$ -
24-inch Pipe	$ 337	324	$ 109,000	1,191	$ 401,000	1,637	101	1,721	$ 580,000	3,617	723	$ 244,000	3,959	$ 1,334,000
30-inch Pipe	$ 385	-	$ -	622	$ 240,000	2,832	-	2,832	$ 1,090,000	2,268	454	$ 175,000	3,908	$ 1,505,000
36-inch Pipe	$ 433	-	$ -	920	$ 398,000	2,134	63	2,186	$ 947,000	1,401	280	$ 121,000	3,386	$ 1,466,000
42-inch Pipe	$ 476	-	$ -	428	$ 204,000	1,126	-	1,126	$ 536,000	308	62	$ 29,000	1,616	$ 769,000
48-inch Pipe	$ 533	-	$ -	-	$ -	326	-	326	$ 174,000	84	17	$ 9,000	343	$ 183,000
Total PVC Pipe (Rounded)		*980*	**$ 255,000**	*5,885*	**$ 1,883,000**	*11,498*	*3,100*	*14,082*	**$ 4,689,000**	*18,315*	*3,663*	**$ 1,068,000**	**24,610**	**$ 7,895,000**
Replace with Concrete Pipe[k]														
60-inch Pipe	$ 631	-	$ -	-	$ -	-	-	-	$ -	-	-	$ -		$ -
72-inch Pipe	$ 898	-	$ -	-	$ -	-	-	-	$ -	-	-	$ -		$ -
84-inch Pipe	$ 1,165	-	$ -	-	$ -	-	-	-	$ -	-	-	$ -		$ -
96-inch Pipe	$ 1,433	-	$ -	-	$ -	-	-	-	$ -	-	-	$ -		$ -
108-inch Pipe	$ 1,700	-	$ -	-	$ -	-	-	-	$ -	-	-	$ -		$ -
Total Concrete Pipe (Rounded)		-	$ -	-	$ -	-	-	-	$ -	-	-	$ -		$ -
										Subtotal (Examined Pipe Only) [b]			***24,610***	**$ 7,895,000**

Pipeline Replacement Lengths & Budgets - Extrapolated to Entire System

Extrapolated Length of VERY POOR pipe	Extrapolated Length of POOR pipe	Extrapolated Length of FAIR Metal pipe	Extrapolated Length of FAIR Clay/ Concrete pipe	Extrapolated FAIR Clay/ Concrete pipe past useful life (~83%)	Extrapolated Length of 20% of GOOD Metal pipe	Total Known Length of Extrapolated Pipe[c]	Total Length of All Known Pipe	Total Length of All Pipe (Including Unknown)	Adjustment Factor [d]	Total Length of Pipe to be Replaced in 20 years [e]	Length Ratio[f]
3,074	19,593	40,538	8,776	7,313	12,716	***83,234***	305,450	313,834	1.027	**85,519**	3.475

Grand Total (Rounded 20 Year Total) [g]	**$ 27,430,000**
Average Cost per foot of pipeline repair (Rounded) [h]	$ 321
Annual Cost [i]	**$ 1,372,000**
Annual Length to be replaced [j]	4,276

a - Total Length of FAIR pipe to be replaced is calculated by summation of 100% of FAIR metal pipe and 83.3% of FAIR Clay and Concrete pipe, as approximately 83.3% of Clay and Concrete pipe will be beyond their 100 year service life in 2040.
b - Subtotal length calculated by summation of examined lengths of VERY POOR, POOR, 100% of FAIR metal, 83.3% of FAIR clay/concrete, and 20% of GOOD metal pipes
c - Total Known Length calculated by summation of extrapolated lengths of VERY POOR, POOR, 100% of FAIR metal, 83.3% of FAIR clay/concrete, and 20% of GOOD metal pipes
d - Adjustment Factor = Total Length of all Pipe (Including Unknown) / Total Length of All Known Pipe
e - Total Length of Pipe to be Replaced in 20 years = Total Known Length of Extrapolated Pipe * Adjustment Factor
f - Length Ratio = Total Length of Pipe to be Replaced in 20 years / Subtotal Length of Examined Pipe
g - Grand Total price = Subtotal Price * Length Ratio
h - Average Cost per foot = Grand Total / Total Length replaced in 20 years
i - Annual Cost = Grand Total / 20 years
j - Annual Length to be replaced = Total Length of Pipe to be Replaced in 20 years / 20 years
k - Assumed: Pipe less than 48 inches will be replaced by PVC, greater than 48" will be Concrete (and not given manholes)

APPENDIX C

City Planning Projects

KELLER ASSOCIATES

CIP Project Number: 4.1

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Annual Storm Drainage Improvements

PROJECT DESCRIPTION:
This project provides funds for a much needed maintenance, repair, and development program for the City's storm water infrastructure.

NEED/JUSTIFICATION:
This project provides funds for emergency and opportunity infrastructure development of the storm drainage system. Situations occur every year which have not been planned for but must be dealt with, never-the-less. Or opportunities arise during other construction project where it is to the advantage of the City to improve storm drains at that time.

BENEFITS:
Increase safety and efficiency of drainage system.

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Potential risk to public health and safety or property damage.
Limits City's ability to take advantage of construction opportunities

PROJECT RELATED TO:
Safety/Loss of Property/Storm Water Master Plan/Stormwater Permit

COMMENTS:
Was to be financing through a Storm Water Utility Fund. Replaced with 1% general fund property tax increase in FY 2011 dedicated to stormwater improvements beginning with the FEMA drainage mitigation project.

METHOD OF FINANCING:	
To Be Identified	250,000
TOTAL	250,000

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	
LAND:	
CONSTRUCTION:	94,000
MISC. EQUIP:	
ENGINEERING:	
OTHER:	
TOTAL :	94,000

COST SCHEDULE:

Prior to 2016	
2016	50,000
2017	50,000
2018	50,000
2019	50,000
2020	50,000
After 2020	
Total Cost:	250,000

IMPACT ON ANNUAL OPERATING BUDGET:
Reduce O&M costs associated with emergency repairs. By building and taking care of the storm drainage infrastructure systematically, O&M costs will continue to decrease over the years. However, it will take some time to catch-up before real savings can be realized.

LOCATION AND AREA MAP:
City-wide

CIP Project Number: 4.3

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
21st Street & Thain Drainage Improvements

PROJECT DESCRIPTION:
Study the 21st Street drainage network, from the head of the basin in Thain Road to the Outfall near Memorial Bridge. Based on study construct stormwater detention ponds, repair critical components while they can still be repaired trechlessly, or other improvements to increase performance and expected life of the current 21st Street drainage system.

NEED/JUSTIFICATION:
Currently the 21st Street drainage system undersized according to the Stormwater Master Pan, and is overtaxed to the point that downstream bolted down manholes have been known to break loose in storm events. This results in flooding of the roadway and adjacent property, such as Hells Canyon Harley Davidson and the Red Lion area. Many components of this system are past their design life and up to 50' deep, making trenchless rehabilitation far less expensive than repairing failures once they occur.

BENEFITS:
Reduce peak flow rates in drains downstream of Ponds
Reduce flooding and flood related damage along 21st Street
Provide some water quality treatment

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued damage from flooding along 21st Street.

PROJECT RELATED TO:
Storm Water Master Plan, Damage Claims, NPDES Permit

COMMENTS:
This project would provide needed relief from flooding in area that has had recent problems. Stormwater Coordinator will look into possible grant funds to help with this project. Stormwater comes from as far upstream as the intersection of Thain and Alder.

METHOD OF FINANCING:	
To Be Identified	750,000
TOTAL	750,000

TOTAL 5-YEAR COST
Cost Breakdown

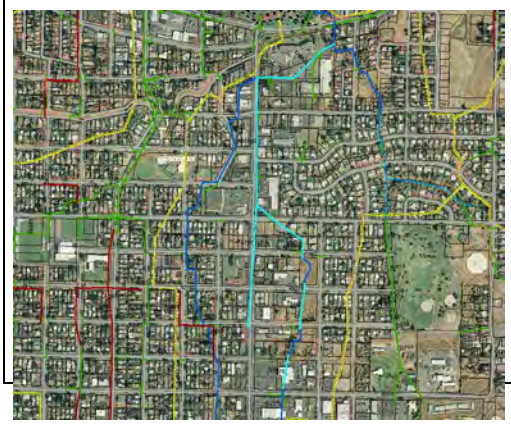
PLANNING:	50,000
LAND:	150,000
CONSTRUCTION:	450,000
MISC. EQUIP:	-
ENGINEERING:	100,000
OTHER:	-
TOTAL :	750,000

COST SCHEDULE:

Prior to 2016	
2016	100,000
2017	100,000
2018	100,000
2019	
2020	
After 2020	450,000
Total Cost:	750,000

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.4

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Bengal Field Storm Drainage

PROJECT DESCRIPTION:
Complete Storm Drainage system from the west side of Bengal Field all the way to the 18th St. system.

NEED/JUSTIFICATION:
Poor storm water drainage in this area has caused property damage and safety concerns. Storm drainage for the Bengal field area of 14th Street and 12th Avenue is considered a high priority for the City. The needs for the storm drain through the Bengal Field area is identified in the Storm Water Master Plan. This area has experienced routine flooding for many years with depth greater than 2' on 14th Street. Part of the system in this area has been constructed but needs to be upgraded to reduce flooding and property damage.

BENEFITS:
Reduce/eliminate private & public property damage
Mimimize flooding of the playing fields
Control storm water entering the 18th St. system
Increase safety
Increase efficiency of drainage system

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainage problems with major storm events results in potential liabilities, including property damage and safety concerns for pedestrians, sports players, and motorists.

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims

COMMENTS:
Storm water from relatively minor events pools on these playing fields because they are flat and drainage is inadequate. A system upgrade is needed to move the water into the 18th St. storm drain, with some provision for water quality treatment in the process.

METHOD OF FINANCING:	
To Be Identified	450,000
TOTAL	450,000

TOTAL 5-YEAR COST
Cost Breakdown

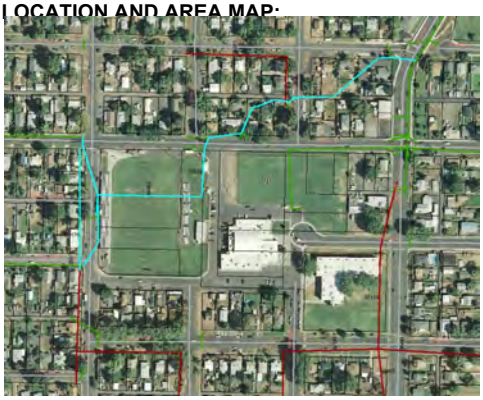
PLANNING:	
LAND:	
CONSTRUCTION:	391,000
MISC. EQUIP:	
ENGINEERING:	59,000
OTHER:	
TOTAL :	450,000

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	100,000
2020	100,000
After 2020	250,000
Total Cost:	450,000

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.5

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Miller Grade & Rigby LN

PROJECT DESCRIPTION:
Install adequately sized storm sewer system from Master Plan in Miller Grade and Rigby LN to handle flows in that area. Ties into drainage constructed as a part of the FEMA project. Design was completed as a part of FEMA project development. All that remains is construction and inspection.

NEED/JUSTIFICATION:
Poor storm drainage in this area has caused property damage and safety concerns.

BENEFITS:
Save O&M costs
Increase safety for motorists
Decrease property damage
Increase efficiency of drainage system

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Potential risk to public health and safety or property damage, continued drainage problems with major storm events. Potential liabilities for property and for motorists and pedestrians.

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims, Compliance with the stormwater NPDES permit

COMMENTS:
Existing system is woefully undersized. Even moderate rains result in inundation of the travel way. Will solve general flooding problems on streets in this part of town during large rainfall events.

METHOD OF FINANCING:	
To Be Identified	302,500
TOTAL	302,500

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	275,000
MISC. EQUIP:	-
ENGINEERING:	27,500
OTHER:	-
TOTAL :	302,500

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	302,500
Total Cost:	302,500

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:

CIP Project Number: 4.6

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
20th Street System Rebuild

PROJECT DESCRIPTION:
Rebuilding the 20th Street trunk line from 17th Ave north to its intersection with the 21st Street system. May include construction of water quality improvement structures.

NEED/JUSTIFICATION:
The storm drains in this area are undersized, missized, and incomplete. This is a major trunk line that needs to be modernized and updated to accommodate development in this part of the City.

BENEFITS:
Provide proper drainage
Reduce property damage
Improve safety for motorists
Allow rational development
Improve storm water quality

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainage problems along 20th Street
Property damage and safety liabilities
Poor water quality being discharged to Lower Granite Reservoir

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims
Stormwater NPDES permit. Waters of the U.S.

COMMENTS:
The project solves a significant problem associated with development in this part of the City. Waters in this section are likely jurisdictional Waters of the U.S. such that the system needs to be rationalized and controlled for water quality. Major reconstruction will require a permit from the ACOE. Water quality improvement structures will likely be required.

METHOD OF FINANCING:	
To Be Identified	1,679,590
TOTAL	1,679,590

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	1,460,510
MISC. EQUIP:	-
ENGINEERING:	219,080
OTHER:	-
TOTAL :	1,679,590

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	1,679,590
Total Cost:	1,679,590

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:

CIP Project Number: 4.7

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
14th & Powers Storm Drainage

PROJECT DESCRIPTION:
Develop a storm drainage system from Ripon north along & east of 14th St to Grelle Ave, including drainage from Birch and Ripon. Project may be a pipe or a series of detention ponds or a combination.

NEED/JUSTIFICATION:
Poor storm water drainage in this area has caused property damage and safety concerns. Storm drains for this are are identified in the Storm Water Master Plan, but have yet to be constructed. Generalized flooding begins at Ripon and 14th and continues northward to Grelle, running through private property.

BENEFITS:
Minimize drainage related problems in the area.
Enhance water quality to meet Lindsay Creek TMDL requirements
Reduce flooding in the area

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainge problems with major storm events results in potential liabilities, including property damage and safety concerns for pedestrians and motorists.

PROJECT RELATED TO:
Sotm Water Master Plan, Safety, Insurance Claims
Lindsay Creek TMDL

COMMENTS:
Flooding begins with the large impervious surfaces of Trus-Joist. The church on powers has agreed to help construct a storm water detention facility in their parking lot. Potential exists for several other detention factilities. Final design may be able to dispose of most of the storm through infiltation and detention in the area.

METHOD OF FINANCING:	
To Be Identified	1,207,860
TOTAL	1,207,860

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	1,050,310
MISC. EQUIP:	-
ENGINEERING:	157,550
OTHER:	-
TOTAL :	1,207,860

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	1,207,860
Total Cost:	1,207,860

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:

CIP Project Number: 4.8

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
McSorley School to Southway Storm Drain Upgrade

PROJECT DESCRIPTION:
Upgrade and complete the storm drainage system along 14th Street from above McSorley School all the way through to Southway.

NEED/JUSTIFICATION:
Poor storm water drainage in this area has caused property damage and safety concerns. The needs for the storm drain down 14th St. is identified in the Storm Water Master Plan. Part of the system in this area has been constructed and the remainder is needed to reduce flooding and property damage.

BENEFITS:
Minimize drainage related problems in the area.
Mimimize flooding of the school grounds
Control storm water rushing down 14th St

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainge problems with major storm events results in potential liabilities, including property damage and safety concerns for pedestrians and motorists.

PROJECT RELATED TO:
Sotm Water Master Plan, Safety, Insurance Claims
Drainage for Regence Complex

COMMENTS:
Storm water rushes down 14th St. pass the school and creates considerable flood hazard. Similarly, storm drainage from the Regence Complex drains pass the school. The school has agreed to work with the City to investigate the possibility of regrading the playing fields to be used as shallow detention/infriltration basins. The lower end of the system near Southway needs to be upgraded to handle the volume of stormwater, with or without detention.

METHOD OF FINANCING:	
To Be Identified	807,630
TOTAL	807,630

TOTAL 5-YEAR COST
Cost Breakdown

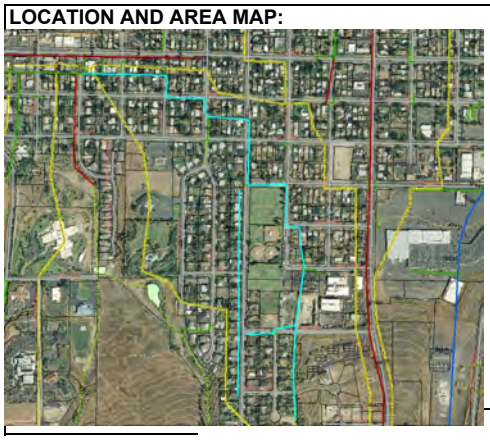
PLANNING:	-
LAND:	-
CONSTRUCTION:	702,290
MISC. EQUIP:	-
ENGINEERING:	105,340
OTHER:	-
TOTAL :	807,630

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	807,630
Total Cost:	807,630

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.9

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
18th & Grelle Storm Drain Upgrade

PROJECT DESCRIPTION:
Upgrade and complete the storm drainage system from 8th St. and Grelle Ave. down to its intersection with Lindsay Creek at Burrell Ave.

NEED/JUSTIFICATION:
Poor storm water drainage in this area has caused property damage and safety concerns. The needs for the storm drain is identified in the Storm Water Master Plan. Part of the system in this are has been constructed and the remainder is needed to reduce flooding and property damage.

BENEFITS:
Minimize drainage related problems in the area.
Enhance water quality to meet TMDL requirements prior to discharge to Lindsay Creek.

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainge problems with major storm events results in potential liabilities, including property damage and safety concerns for pedestrians and motorists.

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims
Lindsay Creek TMDL

COMMENTS:
Storm drainage for this area is identified in the Master Plan. Part has been constructed and part needs to upgraded. This is one of the particular storm drains in the Master Plan that needs to be completed based on experience with flooding in the area. Storm water dentention possibilities will be examined during construction design.

METHOD OF FINANCING:	
To Be Identified	277,410
TOTAL	277,410

TOTAL 5-YEAR COST
Cost Breakdown

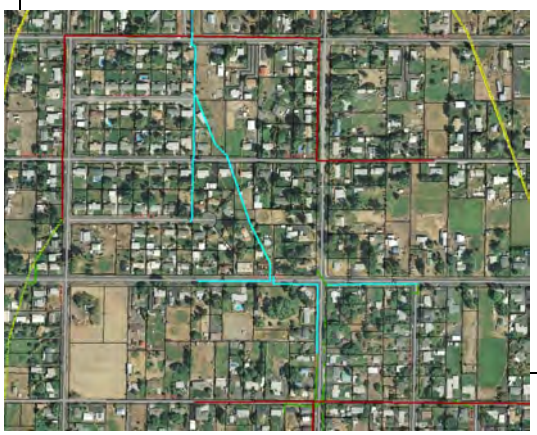
PLANNING:	-
LAND:	-
CONSTRUCTION:	241,220
MISC. EQUIP:	-
ENGINEERING:	36,190
OTHER:	-
TOTAL :	277,410

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	277,410
Total Cost:	277,410

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.10

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
6th Street, Linden to Preston/Nez Perce Grade

PROJECT DESCRIPTION:
Develop a storm drainage system from 7th St to 6th St along Linden, then north along 6th to Preston, discharging to Waters of the U.S. near Nez Perce Grade. Project may be a pipe or a series of detention ponds or a combination

NEED/JUSTIFICATION:
Poor storm water drainage in this area has caused property damage and safety concerns. Storm drains for this area are identified in the Storm Water Master Plan, but have yet to be constructed. Generalized flooding begins along Linden and throughout this relatively flat area.

BENEFITS:
Minimize drainage related problems in the area.
Enhance water quality prior to discharge to Waters of the U.S.
Reduce flooding in the area

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainage problems with major storm events results in potential liabilities, including property damage and safety concerns for pedestrians and motorists.

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims
NPDES Stormwater permit

COMMENTS:

METHOD OF FINANCING:	
To Be Identified	713,470
TOTAL	713,470

TOTAL 5-YEAR COST
Cost Breakdown

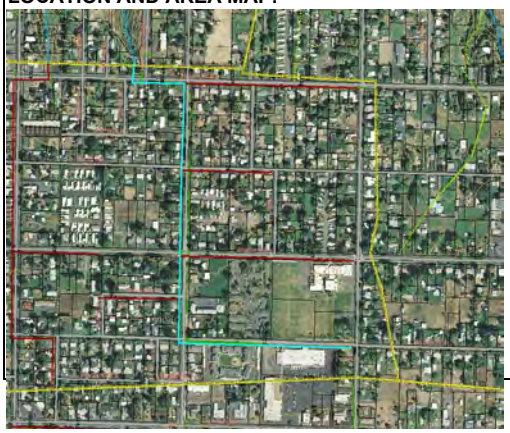
PLANNING:	-
LAND:	-
CONSTRUCTION:	620,420
MISC. EQUIP:	-
ENGINEERING:	93,050
OTHER:	-
TOTAL :	713,470

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	713,470
Total Cost:	713,470

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.11

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
19th & Cedar Storm Drain Construction

PROJECT DESCRIPTION:
Provide storm water drainage for 19th Street & Cedar north to Burrell Avenue, and then down Burrell to a draw feeding Lindsay Creek.

NEED/JUSTIFICATION:
Poor storm water drainage in this area has caused property damage and safety concerns. The need for the stormwater system is identified in the Storm Water Master Plan.

BENEFITS:
Minimize drainage related problems in the area
Helps meet water quality requirements

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainage problems with major storm events results in potential liabilities, including property damage and safety concerns for pedestrians and motorist.

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims
NPDES water quality requirements

COMMENTS:
Storm drainage is identified in the Master Plan but has never been constructed. This is one of the particular storm drains in the Master Plan for the Orchards that needs to be constructed based on experience with flooding in the area. Storm water detention possibilities will be examined during construction design.

METHOD OF FINANCING:	
To Be Identified	203,200
TOTAL	203,200

TOTAL 5-YEAR COST
Cost Breakdown

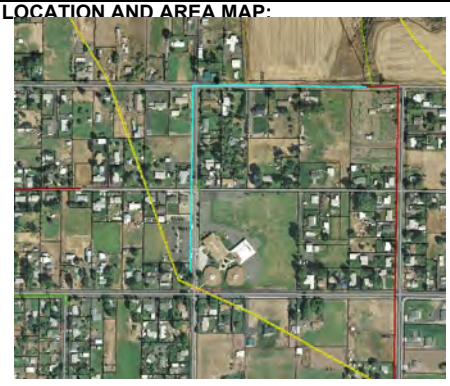
PLANNING:	-
LAND:	-
CONSTRUCTION:	176,700
MISC. EQUIP:	-
ENGINEERING:	26,500
OTHER:	-
TOTAL :	203,200

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	203,200
Total Cost:	203,200

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.12

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
8th Ave. Blvd. and 14th Street

PROJECT DESCRIPTION:
Install adequately sized storm sewer system to convey runoff from 14th Street down 8th Blvd., down 15th Street, down 7th Ave. to the 16th St. system.

NEED/JUSTIFICATION:
Periodic flooding during rain events leads to property damage. Roadway flooding is a hazard to motorists. Most of the project identified in the Storm Water Master Plan.

BENEFITS:
Increase safety for motorists
Decrease property damage
Control storm water discharging to the Corps ponds
Increase efficiency of drainage system

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Potential risk to public health and safety or property damage

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims, Compliance with the stormwater NPDES permit

COMMENTS:
Will solve general flooding problems on streets in this part of town during large rainfall events.

METHOD OF FINANCING:	
To Be Identified	172,980
TOTAL	172,980

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	150,410
MISC. EQUIP:	-
ENGINEERING:	22,570
OTHER:	-
TOTAL :	172,980

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	172,980
Total Cost:	172,980

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:

CIP Project Number: 4.13

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Country Club Area Drainage

PROJECT DESCRIPTION:
Install adequately sized storm sewer system to convey runoff from Seaport Dr, Echo Hills Dr, and Meadow Lark Dr. down to the Country Club Dr. trunk line.

NEED/JUSTIFICATION:
Periodic flooding during rain events leads to property damage along the outside curves of the roads. Roadway flooding is a hazard to motorists. Most of the project is identified in the Storm Water Master Plan, but very little of it has been constructed, with most storm water currently running down roadways.

BENEFITS:
Increase safety for motorists
Decrease property damage
Control storm water discharging to jurisdictional waters.
Increase efficiency of drainage system

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Potential risk to public health and safety or property damage

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims, Compliance with the stormwater NPDES permit

COMMENTS:
Will solve general flooding problems on streets in this part of town during large rainfall events. Water accumulates in particular areas and washes out over private property.

METHOD OF FINANCING:	
To Be Identified	229,350
TOTAL	229,350

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	199,430
MISC. EQUIP:	-
ENGINEERING:	29,920
OTHER:	-
TOTAL :	229,350

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	229,350
Total Cost:	229,350

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:

CIP Project Number: 4.14

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
21st Street System Rebuild

PROJECT DESCRIPTION:
Rebuilding the 21st Street trunk line from 17th Ave north to its intersection with the 20st Street system. Will likely include construction of water quality improvement structures.

NEED/JUSTIFICATION:
The storm drains in this area are undersized, miss-sized, and incomplete. This is a major trunk line that needs to be modernized and updated to accommodate development in this part of the City. Runoff from as far away as the intersection of Thain and Alder is routed through this trunk line.

BENEFITS:
Provide proper drainage
Reduce property damage
Improve safety for motorists
Allow rational development
Improve storm water quality

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued drainage problems along 21st Street and between 21st and 22nd Streets. Property damage and safety liabilities
Poor water quality being discharged to Lower Granite Reservoir

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims
Stormwater NPDES permit. Waters of the U.S.

COMMENTS:
The project solves a significant problem associated with development in this part of the City. Waters in this section are likely jurisdictional Waters of the U.S. such that the system needs to be rationalized and controlled for water quality. Major reconstruction will require a permit from the ACOE. Water quality improvement structures will likely be required.

METHOD OF FINANCING:	
To Be Identified	2,559,260
TOTAL	2,559,260

TOTAL 5-YEAR COST
Cost Breakdown

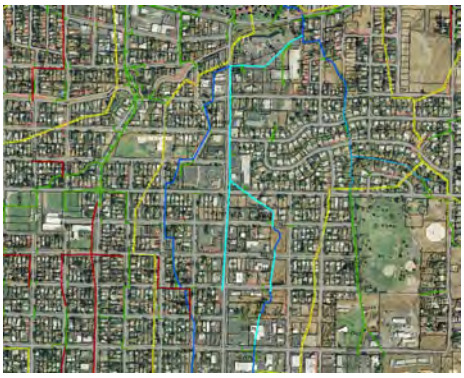
PLANNING:	-
LAND:	-
CONSTRUCTION:	2,225,440
MISC. EQUIP:	-
ENGINEERING:	333,820
OTHER:	-
TOTAL :	2,559,260

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	
2019	
2020	
After 2020	2,559,260
Total Cost:	2,559,260

IMPACT ON ANNUAL OPERATING BUDGET:
May decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.15

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Stormwater Rapid Assessment Project (STRAP)

PROJECT DESCRIPTION:
TV inspection of existing stormwater pipes. This project would purchase a TV camera for use with the jet truck and the associated computer equapment to download and maintain the video inspections in GIS. It would also hire a term employee in streets to assit existing staff to clean, jet and inspect all of the accesable existing City owned stormdrainage system.

NEED/JUSTIFICATION:
half of the city's stormdrainage infrastructure is steel pipe nearing the end of its usefull life. Planning and budgeting for rehabiliation in order to simply mainatain the current level of service requires inspection. There is currently no systematic inspection of underground infrastructure.

BENEFITS:
Allow accurate assessment of pipe conditions
Allow for planning and budget based on assessments

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued ignorance of actual conditions of underground infrastrucure resulting in unforseen and expensive emergency repairs that could have been avoided with planned rehabilitation

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims

COMMENTS:
This is the first recommendation from the Public Works Director's Stormwater Task Force.

METHOD OF FINANCING:	
To Be Identified	255,600
TOTAL	255,600

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	-
MISC. EQUIP:	50,000
ENGINEERING:	
OTHER:	205,600
TOTAL :	255,600

COST SCHEDULE:

Prior to 2016	
2016	65,000
2017	51,000
2018	52,000
2019	53,200
2020	34,400
After 2020	
Total Cost:	255,600

IMPACT ON ANNUAL OPERATING BUDGET:
Term employee will increase budget durring project

LOCATION AND AREA MAP:

CIP Project Number: 4.16

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Stormwater Capital Master Plan

PROJECT DESCRIPTION:
Current Master Plan only considers pipe sizes and storm flow capacity. In order to budget for future capital needs based on deterioration of existing infrastructure, a plan is needed based on City TV inspections of existing pipe conditions. This plan would outline and define projects, their budgets, and their schedule as well as the funding level required to keep the current system operating into the future.

NEED/JUSTIFICATION:
half of the city's stormdrainage infrastructure is steel pipe nearing the end of its usefull life. Planning and budgeting for rehabiliation in order to simply mainatain the current level of service requires an Capital Plan, including budget projections, based on actual TV inspection of underground infrastructure.

BENEFITS:
Allow accurate assessment current and future Capital needs

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued ignorance of actual conditions of underground infrastrucure resulting in unforseen and expensive emergency repairs that could have been avoided with planned rehabilitation. This plan will provide the framework and budget projections needed to begin this rehabiltation.

PROJECT RELATED TO:
Storm Water Master Plan, Safety, Insurance Claims

COMMENTS:
This is the second recommendation from the Public Works Director's Stormwater Task Force.

METHOD OF FINANCING:	
To Be Identified	100,000
TOTAL	100,000

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	-
LAND:	-
CONSTRUCTION:	-
MISC. EQUIP:	-
ENGINEERING:	100
OTHER:	-
TOTAL :	100

COST SCHEDULE:

Prior to 2016	
2016	
2017	
2018	50,000
2019	50,000
2020	
After 2020	
Total Cost:	100,000

IMPACT ON ANNUAL OPERATING BUDGET:

LOCATION AND AREA MAP:

CIP Project Number: 4.17

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
21st Street & Highway 12 Stormwater Outfall

PROJECT DESCRIPTION:
Idaho Transportation Dept is rebuilding the intersection of 21st Street and Highway 12 in Fiscal Year 2019. A new stormwater outfall is required to be constructed under the new intersection in coordination with ITD's project. This outfall will releave the frequent flooding experienced near the Red Lion and will service areas from the Moneysaver on Thain to the Bryden Ave and 6th St intersection.

NEED/JUSTIFICATION:
Currently the 21st Street drainage system undersized according to the Stormwater Master Pan, and is overtaxed to the point that downstream bolted down manholes have been known to break loose in storm events. This results in flooding of the roadway and adjacent property, such as Hells Canyon Harley Davidson and the Red Lion area. ITD is planning to rebuild the intersection in FY19 making this a criticatl date for this improvement.

BENEFITS:

Reduce flooding and flood related damage along 21st Street

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
Continued damage from flooding along 21st Street.

PROJECT RELATED TO:
Storm Water Master Plan, Damage Claims, NPDES Permit

COMMENTS:
This project would provide needed relief from flooding in area that has had recent problems. Stormwater comes from as far upstream as the intersection of Thain and Alder. Delaying the outfall construction until after the ITD project will make this improvement much more expensive.

METHOD OF FINANCING:	
To Be Identified	484,800
TOTAL	484,800

TOTAL 5-YEAR COST
Cost Breakdown

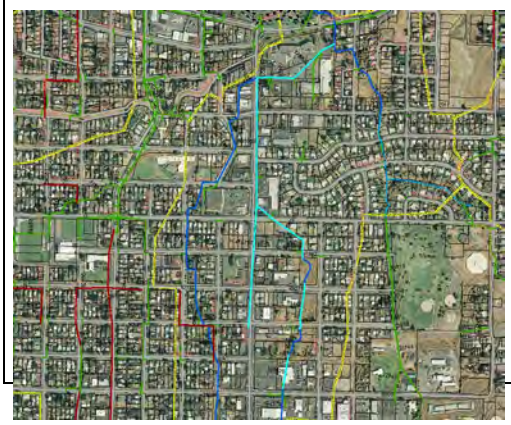
PLANNING:	-
LAND:	-
CONSTRUCTION:	434,000
MISC. EQUIP:	-
ENGINEERING:	50,000
OTHER:	-
TOTAL :	484,000

COST SCHEDULE:

Prior to 2016	
2016	50,000
2017	
2018	168,000
2019	266,800
2020	
After 2020	
Total Cost:	484,800

IMPACT ON ANNUAL OPERATING BUDGET:
Decrease amount of labor and maintenance dollars spent on storm response.

LOCATION AND AREA MAP:



CIP Project Number: 4.18

FUND: Transportation

CATEGORY: Stormwater

DEPARTMENT: Public Works

PROJECT NAME:
Hall Ford Stormwater Rehabilitation

PROJECT DESCRIPTION:
Repair a crushed section of stormdrain at great depth by direct dig and replace and trenchlessly rehabilitatate the adjacent pipe segements.

NEED/JUSTIFICATION:
Currently the 21st Street drainage system undersized according to the Stormwater Master Pan, and is overtaxed to the point that downstream bolted down manholes have been known to break loose in storm events. This results in flooding of the roadway and adjacent property, such as Hells Canyon Harley Davidson and the Red Lion area. This particular pipe segement is crushed and cannot be rehabilitated any other way than direct replacement, even though it is approximately 35 feet deep. If it failed unexpectadly, the largest drainage basin in the City would be cut off.

BENEFITS:
Avoid a forseeable failure

CONSEQUENCES OF DELAYING/ELIMINATING THIS PROJECT:
an expensive and unplaned for catastrophic failure and much more costly emergency repair.

PROJECT RELATED TO:
Storm Water Master Plan, Damage Claims, NPDES Permit

COMMENTS:
This is the worst known pipe section in the 21st Street trunk line. Stormwater comes from as far upstream as the intersection of Thain and Alder.

METHOD OF FINANCING:	
To Be Identified	400,000
TOTAL	400,000

TOTAL 5-YEAR COST
Cost Breakdown

PLANNING:	10,000
LAND:	-
CONSTRUCTION:	350,000
MISC. EQUIP:	-
ENGINEERING:	40,000
OTHER:	-
TOTAL :	400,000

COST SCHEDULE:

Prior to 2016	
2016	
2017	300,000
2018	100,000
2019	
2020	
After 2020	
Total Cost:	400,000

IMPACT ON ANNUAL OPERATING BUDGET:

LOCATION AND AREA MAP:

City Project Summary 2018-2023

PROJECT SUMMARY - STORMWATER

EXPENDITURES

CIP Pg #	PROJECT	TOTAL 5 YEAR COST	2019	2020	2021	2022	2023	AFTER 2023	TOTALS
4.1	Annual Storm Drainage Improvements	150,000			50,000	50,000	50,000		150,000
4.15	Stormwater Rapid Assessment Project (TV)	139,600	52,000	53,200	34,400				139,600
4.16	Stormwater Capital Master Plan	100,000	50,000	50,000					100,000
4.17	21st Street & Hwy 12 Storm Outfall	434,800	168,000	266,800					434,800
4.18	Hall Ford Stormwater Rehab	100,000	100,000						100,000
4.3	21st Street & Thain Road Drainage Improvments	925,600			285,600	320,000	320,000		925,600
4.4	14th St & 12th Ave (Bengal Field Area)							450,000	450,000
4.5	Miller Grade & Rigby Lane							302,500	302,500
4.6	20th Street System Rebuild							1,679,590	1,679,590
4.7	14th Street & Powers Avenue							1,207,860	1,207,860
4.8	Drainage Upgrade-McSorley School Area to Southway							807,630	807,630
4.9	Drainage Upgrade-18th Street & Grelle Avenue							277,410	277,410
4.10	6th St, Linden Ave to Preston Ave/Nez Perce Grade							713,470	713,470
4.11	Drainage at 19th Street and Cedar Avenue							203,200	203,200
4.12	8th Avenue Blvd. and 14th Street Storm Drainage							172,980	172,980
4.13	Country Club Area Drainage							229,350	229,350
4.14	21st Street Drainage System Rebuild							2,559,260	2,559,260
	TOTALS	**1,850,000**	**370,000**	**370,000**	**370,000**	**370,000**	**370,000**	**8,603,250**	**10,453,250**

FUNDING SUMMARY - STORMWATER

REVENUE

SOURCE OF FUNDS	TOTAL 5 YEAR COST	2019	2020	2021	2022	2023	AFTER 2023	TOTALS
Property Tax	750,000	150,000	150,000	150,000	150,000	150,000	150,000	900,000
Source Unidentified	1,100,000	220,000	220,000	220,000	220,000	220,000	8,453,250	9,553,250
TOTALS	**1,850,000**	**370,000**	**370,000**	**370,000**	**370,000**	**370,000**	**8,603,250**	**10,453,250**

APPENDIX D

Seepage Bed and Retention Pond Sizing Calculations

KELLER ASSOCIATES

KELLER ASSOCIATES

733 5th Street, Ste. A
Clarkston, WA 99403

Project: 218004 Lewiston Stormwater MP Up
Client: City of Lewiston
Designer: Mikel Sangroniz, E.I.
Description: Stormwater Design
Date & Time: 8/30/2019 14:47

STORM RUNOFF STORAGE VOLUME

Basin 1 - Seepage Bed

Method = NRCS Curve Number (CN) Method

$$R = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad S = \frac{1000}{CN} - 10 \qquad R = 0 \text{ when } P < 0.2S \qquad V_{ro} = \frac{R}{12} * A_{total}$$

R = the actual direct runoff depth (storm water runoff depth) (inches)
P = the total rainfall depth over the area (inches) (1.2 inches for the 2-year, 24-hour design storm for Lewiston)
S = the potential abstraction or potential maximum natural detention over the area due to infiltration, storage, etc. (inches)
CN = the runoff curve number (from Table B-2, Lewiston Stormwater Policy and Design Manual)
V_{ro} = runoff volume of stormwater (cubic feet)

$$CN_{comp} = \frac{(CN_1 * A_1 + CN_2 * A_2 + \ldots + CN_X * A_X)}{A_{total}}$$

A_{total} = 1,327,774 sqft = 30.48 acres

$A_{pavement}$ = 995,831 sqft $CN_{pavement}$ = 98 Ryan - 0.5 Coefficient between pavement/landscape

$A_{landscaping}$ = 331,944 sqft $CN_{landscaping}$ = 79 Stillman - 0.75 split would be more conservative

CN_{comp} = 93

S = 0.72

R = 0.63 inches

V_{ro} = 69252.89 cf

A_i = 27,360 sqft Infiltration Area Provided (length x width of seepage bed)

length = 3420.00 ft **width = 8.00 ft** **depth = 5.00 ft** **(seepage bed dimensions)**

I_r = 0.5 in/hr Infiltration Rate of underlying soils

Q_i = 1140 cf/hr Infiltration Flow Rate

V_i = 27,360 cf Volume Infiltrated in 24 hours

$V_f = V_{ro} - V_i$ Final Runoff Volume after Infiltration

V_f = 41,893 cf

f_v = 1.15 Volume Increase Factor (for sediment buildup)

$V_r = V_f * f_v$ Required Volume (cubic feet)

V_r = 48,177 cf

Drain Rock Void Volume = 35%
Perforated Pipe Diameter = 4 in
Length of Perforated Pipe = 3419 ft

V_p = 48,178 cf Storm Facility Volume Provided (cubic feet)

KELLER ASSOCIATES

733 5th Street, Ste. A
Clarkston, WA 99403

Project: 218004 Lewiston Stormwater MP U
Client: City of Lewiston
Designer: Mikel Sangroniz, E.I.
Description: Stormwater Design
Date & Time: 8/30/2019 14:47

STORM RUNOFF STORAGE VOLUME

Basin 1 - Seepage Bed

Method = NRCS Curve Number (CN) Method

$$R = \frac{(P - 0.2S)^2}{P + 0.8S} \qquad S = \frac{1000}{CN} - 10 \qquad R = 0 \text{ when } P < 0.2S \qquad V_{ro} = \frac{R}{12} * A_{total}$$

R = the actual direct runoff depth (storm water runoff depth) (inches)
P = the total rainfall depth over the area (inches) (1.2 inches for the 2-year, 24-hour design storm for Lewiston)
S = the potential abstraction or potential maximum natural detention over the area due to infiltration, storage, etc. (inches)
CN = the runoff curve number (from Table B-2, Lewiston Stormwater Policy and Design Manual)
V_{ro} = runoff volume of stormwater (cubic feet)

$$CN_{comp} = \frac{(CN_1 * A_1 + CN_2 * A_2 + \ldots + CN_X * A_X)}{A_{total}}$$

A_{total} = 1,327,774 sqft = 30.48 acres

$A_{pavement}$ = 995,831 sqft $CN_{pavement}$ = 98 Ryan - 0.5 Coefficient between pavement/landscape

$A_{landscaping}$ = 331,944 sqft $CN_{landscaping}$ = 79 Stillman - 0.75 split would be more conservative

CN_{comp} = 93

S = 0.72

R = 0.63 inches

V_{ro} = 69252.89 cf

A_1 = 18,225 sqft (top) Infiltration Area Provided (length x width of retention pond)

A_2 = 5,625 sqft (bottom)

top length = 135.00 ft **top width = 135.00 ft** **(retention pond dimensions)**
Side Slope (h:v) = 6 :1 **depth = 5.00 ft**
bottom length = 75.00 ft **bottom width = 75.00 ft**

I_r = 0.5 in/hr Infiltration Rate of underlying soils

Q_i = 759 cf/hr Infiltration Flow Rate

V_i = 18,225 cf Volume Infiltrated in 24 hours

$V_f = V_{ro} - V_i$ Final Runoff Volume after Infiltration

V_f = 51,028 cf

f_v = 1.15 Volume Increase Factor (for sediment buildup)

$V_r = V_f * f_v$ Required Volume (cubic feet)

V_r = 58,682 cf

V_p = 59,625 cf Storm Facility Volume Provided (cubic feet)

$$V_p = h * \frac{(A1 + A2)}{2}$$

APPENDIX E

Stormwater System Age Analysis

KELLER ASSOCIATES

Stormwater System Capital Value Estimate
Lewiston Idaho

8-Nov-18

prepared by Joe Kaufman, PE

Material	Total	Average Diameter	Poor Condition	Design Life	Avg Age	Remaining Design Life
	[ft]	[in]	[ft]	[years]	[years]	[years]
POLY	112,452	18.3	572	100	14	86
CMP	130,909	20.6	19,676	50	49	1
Clay/Concrete	63,579	13.4	2,419	100	99	1
Total	306,940		22,667			

Assumed Installation Dates by end of Decades [ft]

Installation Date	Clay/ Concrete [ft]	CMP (ft)	Poly (ft)	Age	Length of Pipe Beyond Useful Life by: 2020	2040
1900	10,597			124	10,597	10,597
1910	10,597			114	21,193	21,193
1920	10,597			104	31,790	31,790
1930	10,597			94	31,790	42,386
1940	10,597			84	31,790	52,983
1950	10,597			74	31,790	52,983
1960		32,727		64	64,517	85,710
1970		32,727		54	97,244	118,437
1980		32,727		44	97,244	151,164
1990		32,727		34	97,244	183,891
2000			37,484	24	97,244	183,891
2010			37,484	14	97,244	183,891
2020			37,484	4	97,244	183,891
Total	63,579	130,908	112,452		97,244	183,891

APPENDIX F

Lewiston Stormwater Rating Chart

KELLER ASSOCIATES

Ratings Chart

BLUE	GREEN	Yellow	Orange	RED
1	2	3	4	5
Very Good Condition	Good Condition - MinorDefects Only	Fair or moderate Condition - Maintenance Required to return to Accepted Level of Service	Poor Condition - Consider Renewal	Very Poor Condition - Approaching Unserviceable
		Failed Pipe Coating	Failed Pipe Coating	Failed Pipe Coating
		Starting to show signs of Belly's	Starting to show signs of Belly's	Starting to show signs of Belly's
		Point repairs needs		
			25 % of pipe Replacement is a point repair	26-100 % of pipe Replacement is a FULL Replacement.
		Moisture Failure	Moisture Failure	Moisture Failure
			Not soil tight	Soil Penetration
		Simple point Repair = 10' or less than 10% of pipe	Pipe point repair = Less than 50' or 25% of pipe	Complete Replace
0.0 - 1.00	1.01 - 2.00	2.01 - 3.00	3.01 - 4.00	4.01 - 5.00
Very Good	Good	Fair	Poor	Very Poor

APPENDIX G

Basin 7 Update

KELLER ASSOCIATES

CITY OF LEWISTON

STORMWATER MASTER PLAN – BASIN 7 UPDATE

June 2017

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TABLE OF CONTENTS

1 SUMMARY 1

2 PURPOSE AND NEED 2

2.1 Purpose and Need 2

2.2 Study Goals 2

3 BASIN DESCRIPTION 4

3.1 Land Use 4

3.2 Climate 4

3.3 System Description 4

3.4 System Assessment 5

4 DESIGN CRITERIA & ASSUMPTIONS 7

4.1 Existing and Future Conditions 7

5 MODEL DEVELOPMENT 10

5.1 Model History and Conversion 10

5.2 Model Parameters and Assumptions 10

5.3 Model Calibration 12

6 CAPITAL IMPROVEMENT PLAN 14

6.1 Costs 18

7 SUMMARY 20

LIST OF FIGURES

Figure 4.1 – 25-year, 24-hour Hyetograph 8
Figure 4.2 – 10-year, 3-hour Hyetograph 9

LIST OF TABLES

Table 3.1 – Basin 7 Detention.....5
Table 6.1 – Detention Basin Projects.....15
Table 6.2 – Project Construction Costs.....19

APPENDIX

Appendix A Mapbooks
Appendix B Flooding Observations June 2, 2015
Appendix C Model
Appendix D Costs

1 SUMMARY

Basin 7 of the Lewiston Stormwater system is the largest of the City's basins, reaching south along Thain Road in the heart of Lewiston Orchards North along 21st street to the outfall near the Clearwater River. Portions of the system were installed in ravines that were subsequently developed, resulting in lines at significant depth up to 70 feet. Portions of the system are also located beneath privately owned buildings. The system is undersized, but the City recognizes that the depth makes upsizing cost prohibitive due to the cost of excavation.

For this reason, City staff requested that this analysis leverage the use of detention facilities to collect stormwater and release it at a controlled rate. As a result, downstream piping can be sized more economically. City staff further requested that the analysis utilize existing pipe sizes where the system is at its greatest depth to facilitate use of trenchless rehabilitation techniques to minimize costs.

This study identifies a series of 12 capital projects to minimize flooding within the basin. The capital projects are categorized as follows:

- **Detention Basins (Projects 8 – 12)** – These projects allow the City to maximize use of the existing stormwater system and leverage trenchless construction to minimize rehabilitation costs.
- **Rehabilitation (Projects 4, 6, 7)** – This piping is either undersized, or has been noted by City staff to be aged beyond its useful life. In areas where piping is located at a generally shallow depth, open trench construction is anticipated with an upsize in pipe if deemed necessary by this Study. In areas at more significant depth, trenchless rehabilitation with replacement of like size is scheduled to minimize excavation costs.
- **New Systems (Projects 1-3, 5)** – These systems are intended to relieve pressure on existing piping and leverage use of detention with the added benefit of adding stormwater treatment.

The study has not assessed the condition of the existing pipes in Basin 7. It is highly recommended that the City complete a pipe evaluation to supplement this report.

2 PURPOSE AND NEED

The City of Lewiston Stormwater Master Plan was completed in 2001 to provide a conceptual drainage plan and tool for City Staff in system planning. Since that time, the City has revisited portions of the Plan to make updates, generally to meet specific funding agency requirements. The City initiated this planning effort to update Master Plan recommendations in the area delineated by Basin 7. The study area is identified in mapbooks given in **APPENDIX A**.

2.1 PURPOSE AND NEED

Portions of the Basin 7 Stormwater System are aged and in need of repair, and the City recognizes the value of planning for replacement and/or rehabilitation. In 2006, a portion of the system on 17th Avenue east of 21st Street collapsed and City Staff completed a point repair at a cost of approximately $60,000 for materials and equipment rentals needed to accomplish repair of the 36-inch trunk line. Installed in a ravine prior to subsequent development, the trunk line is located at a depth of over 30 feet. Further, the 2001 Master Plan recommends that this line in particular be upsized to a 60-inch trunk line.

The high cost of replacing/upsizing a line so deep in the ground lends itself to a closer review of the big picture to determine the most cost effective way to manage long term and short term needs. Full replacement of the system to recommended sizes of the Master Plan on a short timeframe is not economically feasible.

2.2 STUDY GOALS

The City has emphasized the need to prolong the useful life of the existing system due to the potential costs of upsizing trunk lines located, in areas, at a significant depth. One focal point of this Update was to evaluate the use of hydraulic detention and to utilize existing pipe sizes needed to convey stormwater. Use of trenchless construction techniques was also emphasized to minimize excavation and surface repair costs. As reviewed more thoroughly in Sections 3 and 4, the study utilizes a computer model to assess flooding and pipe capacity based on a theoretical storm event and associated detention facility upgrades. A 10-year, 3-hour storm event was utilized as an initial screening criteria to identify and prioritize those pipes in highest need of replacement. Once a pipe upgrade is required under this

event, the recommended upgrade is consistent with the 25-year, 24-hour storm utilized in the 2001 Master Plan.

To this end, the goal of this Basin 7 Update was not to prepare an all-inclusive list of system deficiencies and recommended projects. Instead, the Update was completed to identify and prioritize the most likely candidate projects providing the highest value to the City in terms of reduced flooding and continued service. As the City completes the recommended projects of this Update, the City should revisit the Master Plan as a whole to identify a full list of projects, including potential projects in Basin 7 which were not identified as part of this Update.

3 BASIN DESCRIPTION

Basin 7 is the largest in Lewiston, covering nearly 1,600 acres. Located in the central portion of the City, the basin drains the main traffic corridors in the vicinity of 21st Street and Thain Road. The area is generally characterized by two flat areas separated by an incline dividing the lower, northern area from an upper, southern plateau created by the Lake Bonneville floods and covered by loess. The upper area serves a portion of the vicinity known as the Lewiston Orchards.

3.1 LAND USE

The study area is developed with commercial and residential properties. Commercial areas surround the 21st Street and Thain Road corridors with residential development forming the perimeters of the basin. Ground cover consists of impervious areas including asphalt, concrete, sidewalks, roofs and driveways, as well as pervious vegetated areas.

3.2 CLIMATE

The City of Lewiston has a relatively moderate climate due to its elevation at 740 feet above sea level near the confluence of the Snake and Clearwater Rivers. Average annual temperature at the Lewiston Airport is 52.5°F from the period of record of 1948-2006. Average annual precipitation is 12.7 inches.

3.3 SYSTEM DESCRIPTION

The existing stormwater collection system within Basin 7 consists of:

- Pipes
- Culverts
- Streets
- Natural Channels

A mapbook of the existing system is given in **APPENDIX A.** The Orchards area utilizes one main trunk line along Thain Road from Alder Avenue to Stewart Avenue. The Thain Road system upstream of Stewart was installed approximately 50 years ago as part of a federal aid project. All other areas of the Orchards are served by natural drainage ways with roadside ditches and periodic culverts. Sidewalks are generally limited to proximities adjacent to area elementary schools; most properties do not have sidewalk access.

The lower, more commercialized portion of the basin is served by three systems of pipes and open channels paralleling 21st Street. One of the systems in particular was installed in the bottom of a ravine which was subsequently filled to facilitate development. As a result, portions of the stormwater system are now located at significant depths ranging up to 70 feet below grade and/or under buildings. The trunk line is in poor condition, and the City completed a spot repair in 2006 to repair a portion of a collapsed pipe.

The system utilizes detention to collect stormwater and temporarily store water during large storm events and extend the timeframe of release to the stormwater system by controlling the outflow release rate. **TABLE 2.1** lists the detention basins considered as part of this Update. Of these, one of the largest is located near the intersection of Stewart Avenue and Thain Road, at the bottom of the Orchards system. The City notes that the pond does not typically fill during a storm event, and has requested recommendations to maximize use of the pond and its downstream impact to the system.

TABLE 3.1 – BASIN 7 DETENTION

ID	Address	Constructed Volume (Ac-Ft)
STOR-14	Stewart Ave and Thain Road (North 40)	1.82
STOR-16	Thain Grade (Home Depot)	0.31
STOR-20	Thain Grade [a] (Big 5/Staples)	1.96
STOR-22	Thain Grade [a] (Shopko)	1.04
STOR-24	Below Holiday Inn Express	0.25
STOR-26	Below Holiday Inn Express	0.91
STOR-28	Thain Grade North 40 [a] (North Pond)	0.22
STOR-30	Thain Road [a] (McDonalds)	0.35

[a] Detention is less than 35% utilized at peak use under 25-year, 24-hour storm conditions, indicating that stormwater is not getting to the basin.

3.4 SYSTEM ASSESSMENT

The basin experiences periodic flooding, particularly near the bottom of the drainage due to undersized piping in the vicinity of 21st Street, Main, and G Streets. Notable flooding has also been observed in the following locations:

- 7th Avenue East of 21st Street in the Red Lion Hotel Parking Lot
- 20th Street & 7th Avenue
- 20th Street & 9th Avenue
- Nez Perce Drive beneath Bedrock Plaza
- Thain Road near its intersection with Vista Avenue.

Pictures of the observed flooding are provided for reference in **APPENDIX B** to show the general nature and magnitude of flooding in each area based on pictures obtained from a storm on June 2, 2015.

4 DESIGN CRITERIA & ASSUMPTIONS

The 2001 Master Plan utilized a 25-year recurrence interval to assess system capacity and determine recommendations. The recurrence interval represents the statistical likelihood of an event occurring.

The resultant recommendations of the 2001 Master Plan are not feasible for the City to implement in a relatively short timeframe. This analysis utilized a 10-year, 3-hour storm event to prioritize and identify potential projects. Once a project is identified, however, the resultant sizing recommendations are consistent with sizing recommendations for the 25-year, 24-hour storm event. Rainfall hyetographs for the 25-year, 24-hour and 10-year, 3-hour storm events is given in **FIGURES 3.1** and **3.2**. Sizing for detention is also based on the 25-year, 24-hour storm event identified in **FIGURE 3.1**.

4.1 EXISTING AND FUTURE CONDITIONS

The EPA has not issued a stormwater permit to the City. A draft NPDES Phase II Permit was issued by the EPA in 2012, but the effort was abandoned and the Agency is currently in process of developing a statewide general MS4 permit. The City has developed a draft Stormwater Policy and Design Manual that serves as a working document to meet anticipated requirements of the stormwater permit, but the manual will not be officially adopted until the permit is finalized.

In the interim, the City utilizes Resolution 80-100 which defines and requires a “Zero Run Off” condition. The condition requires development and additions of impervious areas to limit stormwater runoff to the pre-development condition. Design criteria for major facilities requires consideration of a 100 year frequency storm, and minor facilities must utilize a 10 year frequency storm. Large commercial development within the City typically utilizes on-site detention for compliance with this policy. The stormwater model therefore is based on existing conditions and does not allow for future increases in flow.

Figure 3.1
25-Year, 24-Hour Hyetograph

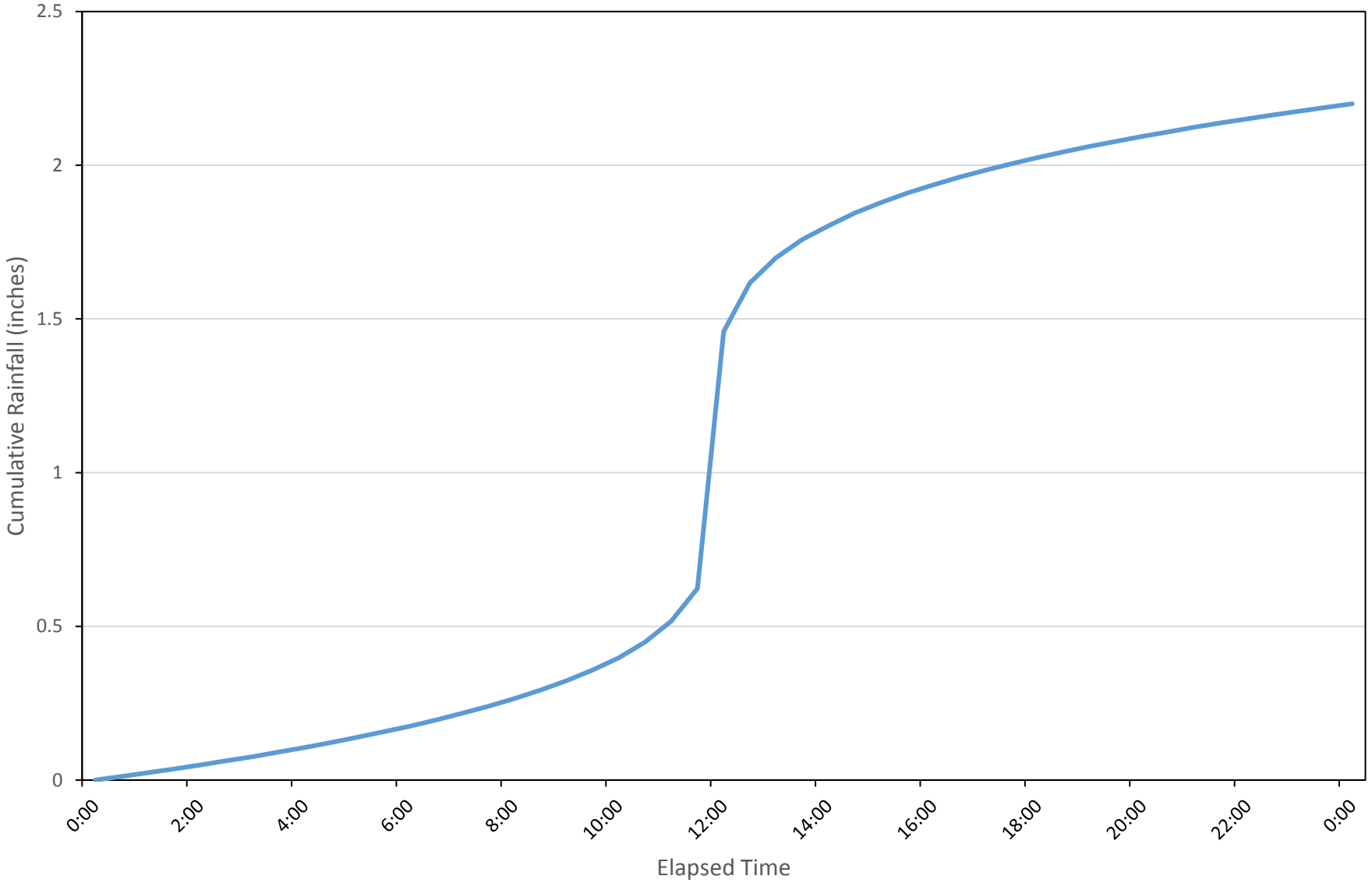
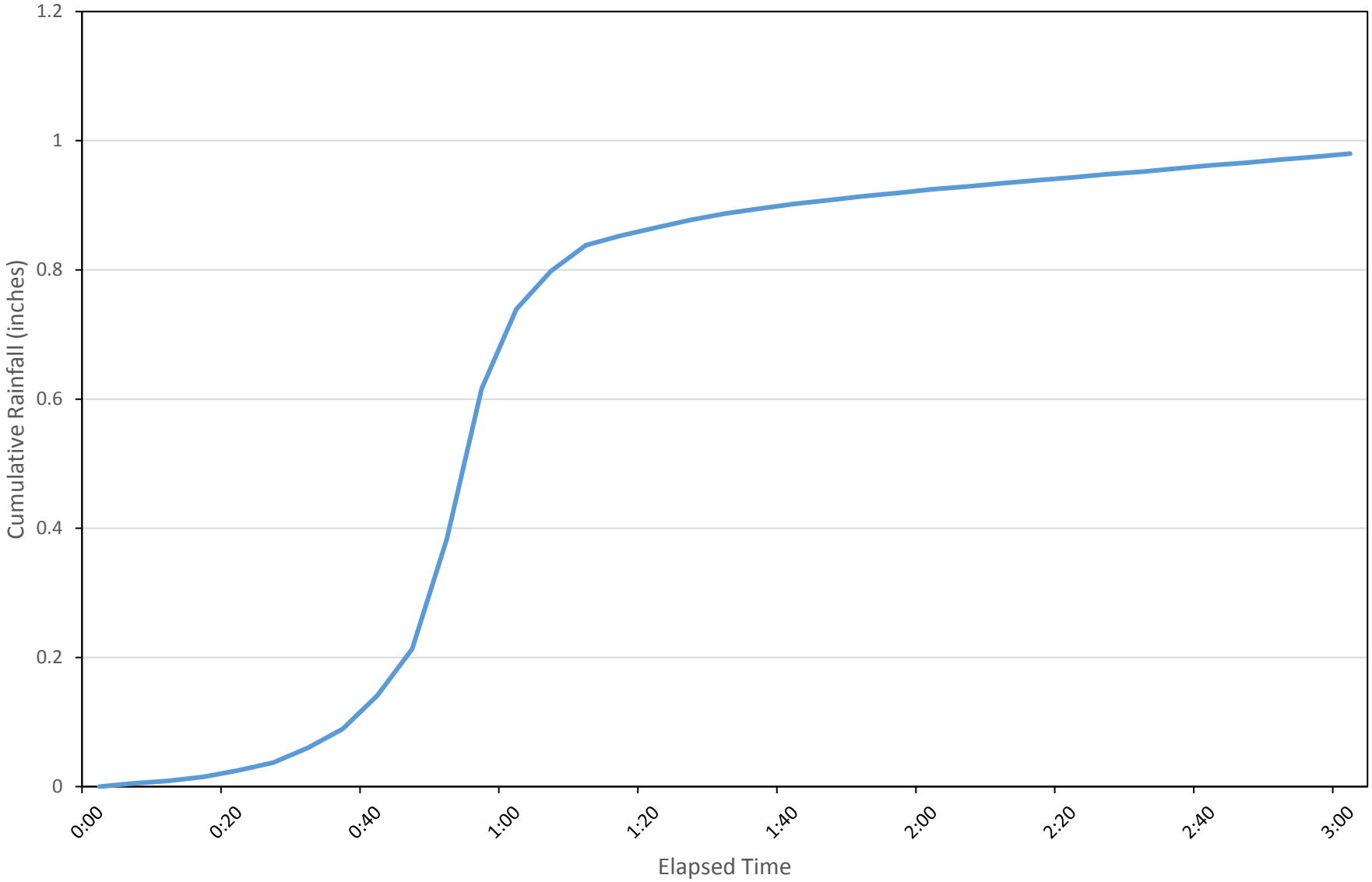


Figure 3.2
10-Year, 3-Hour Hyetograph



5 MODEL DEVELOPMENT

Due to variability in storm events, stormwater modeling is considered an approximation. Even so, a model provides the best indication of what might happen in a given storm event, and a general idea of how water might flow through the system. It provides valuable information and direction to evaluate and improve a stormwater collection system. A model provides the best known way to initiate project planning and associated budgets.

5.1 MODEL HISTORY AND CONVERSION

The City originally developed a hydraulic model of their stormwater system with the assistance of J-U-B ENGINEERS in 2001. The model utilized HYDRA™ modeling software to create a conceptual storm drain system for the City. This Update utilized the base model from 2001 to develop more detailed recommendations for Basin 7.

The model was initially converted for this Update to a modeling software platform called InfoSWMM which was developed by Innovyze. InfoSWMM utilizes the Soil Conservation Services (SCS) methodology to model stormwater runoff based on curve numbers. The model was delivered to the city of Lewiston's public works department for use in implementing the Update.

5.2 MODEL PARAMETERS AND ASSUMPTIONS

Model Parameters and Assumptions for the Update include Design Criteria established in Section 3, pipe network, curve numbers, time of concentration, initial abstraction, and storm distribution.

Efforts to refine the 2001 model included an update of the pipe network and a review of curve number assumptions. The City currently uses ArcGIS for system inventory and mapping. The GIS platform was utilized for model updates as applicable.

The modeled system includes several simplifying assumptions that may affect peak runoff and total volumes. Although these factors combine to create a conservative model where identified flows are likely greater than actual flows, efforts have been made to present realistic results. The model identifies where storm drain improvements are needed.

PIPE NETWORK

Additional information for system components including pipe diameter, pipe material, and both vertical and horizontal positioning was recommended in the 2001 Master Plan for further analysis of portions of the system, including Basin 7. The City completed a full visual and GIS update of system components in 2015. Updates including pipe diameter, pipe material, inverts and rim elevations were transmitted to J-U-B in GIS format and uploaded to the model.

CURVE NUMBER

Curve numbers are empirical numbers used to represent soil type, soil condition, vegetation type and density. Curve numbers range from 0 to 100 with lower numbers being used for areas where little runoff is expected and higher numbers being used for areas with heavy soils, little vegetation, high percentages of impervious area, and saturated soil conditions.

The 2001 Master Plan utilized curve members based on land use consistent with designations identified in the City's 1999 Comprehensive Plan. As part of this update, soil data from USDA-Natural Resources Conservation Service was provided by the City, together with updated zoning data. A summary of 2001 curve numbers and updated curve numbers based on this data is provided for reference in **APPENDIX C**.

TIME OF CONCENTRATION

The time of concentration is used to generate a runoff hydrograph using the NRCS (SCS) method. The time of concentration is simply defined as the time that it takes runoff to travel from the most distant point in the basin hydraulically to the outlet point. This Update uses a new time of concentration calculated using the SCS method. The time of concentration utilized for each area in Basin 7 is provided in **APPENDIX C**.

SUB-CATCHMENTS

Flows are routed to the system using sub-catchments which divide drainages according to pipe configurations and local topology. Sub-catchments are consistent with those developed and utilized in the 2001 Master Plan.

INITIAL ABSTRACTION

This is a term used to describe the ability of the drainage area to absorb or store initial amounts of moisture from a given storm. The model uses the Soil Conservation Service Method to approximate

initial abstraction. The SCS method calculates and removes the maximum retention at the onset of the storm. The initial abstraction is applied once and does not account for retention which affects runoff as the storm progresses.

The initial abstraction was assumed to be higher in the orchards than other parts of basin 7. This assumption was made because of the lack of storm drain infrastructure, lower slopes, and general runoff characteristics of the area. Initial abstraction is calculated by using equation 1.

Equation 1

Ia = ((1000/CN)-10)*P
Ia=Initial Abstraction
CN=Curve Number of the subcatchment
P=0.1 (subcatchments not in the orchards)
P=0.15 (Subcatchments in the orchards)

STORM DISTRIBUTION

The storm in the model uniformly covers the entire basin at the same time. Storm patterns in Lewiston, however, are more complicated and do not cover the entire basin with equivalent intensity.

5.3 MODEL CALIBRATION

It is inherently difficult to calibrate a stormwater system, as flows are correlated with storm events which range in intensity and duration, even across a given basin.

A time series was developed to run in the model that mimicked a large storm which occurred late in the afternoon of June 2, 2015. The first level of calibration occurred by comparing visual reports by city personnel with results from the model. The areas where the model showed flooding resembled areas that did flood during that storm event, and the model was determined to reasonably predict the system response to a storm event.

The second level of calibration used information from a gauging station located near the bottom of the basin. The City has installed two gauging stations in the basin, the first is located at the detention basin near Stewart Avenue and Thain Road, the second near the basin outfall along East Main street. Limited information from the stations is available for calibration, but rainfall data from 380 outlet was used from the June 2, 2015 storm to calibrate the model against the station near East Main, as the station near Stewart and Thain washed out during the event.

The recorded data from the gauging station was compared to the output from the model for the storm event described above. It was discovered that the model was showing more flow than what was calculated at the gauging station. After considering several options, it was determined that one possible explanation is an obstruction in the piping through the Red Lion Hotel Parking Lot.

A third level of calibration was used to further refine the model. The third level of calibration used pictures of the June 2, 2015 flooding in the Red Lion Hotel parking lot to determine the extent of flooding from that event. The model was adjusted until the extents of the flooding from the model reflected the same extents taken from the pictures. After this level of calibration and following discussion with the City, the calibrated model was considered acceptable and the other tasks of the Update were completed. Subsequent to the calibration efforts, the City completed a CCTV inspection of the line and identified a partial blockage that has been removed.

6 CAPITAL IMPROVEMENT PLAN

The Capital Improvement Plan has been prepared based on model results to help the City address high priority stormwater issues. Identified projects were reviewed with public works staff and prioritized using the following criteria:

- Public Works Department assessments
- Frequency of flood events
- Magnitude of flooding (peak flow and total volume)
- Extent (number of people affected) of flooding
- Reports of property damage

Project vicinities are defined in the mapbooks given in **APPENDIX A.** Although the projects are identified by number, the designations are not indicative of the relative importance or priority of each project.

FORD DEALERSHIP REPAIRS (PROJECT 4)

Deteriorated pipe at a depth of 30-35 feet beneath the Ford dealership is a high priority for repair due to the overall system implications if the pipe cannot be rehabilitated. One reach in particular, approximately 150 linear feet, shows through video inspection that the pipe is ovalized and installed with grade breaks.

Proposal: Open trench replacement of the ovalized section is the most likely rehabilitation method to maximize pipe capacity and address grade issues. The City should review options to complete Cured-in-Place Pipe (CIPP) rehabilitation upstream and downstream of the open trench cut.

DETENTION BASINS (PROJECTS 8 – 12)

Early in the planning process, the City identified a desire to use detention to minimize storm impacts to the system and maximize use of existing pipe sizes, with the specific intent to optimize use of trenchless rehabilitation techniques where upsizing a pipe is problematic. A summary of detention recommendations is provided in **TABLE 5.1**.

TABLE 6.1 – DETENTION BASIN PROJECTS

Project Number	Description	Recommended Volume (Ac-Ft)	Outlet Orifice Size (in)
8	Stewart Avenue Basin Expansion	8.5	21
9	Cable One Basin	11.0	10
10	Toyota Dealership Basin	6.1	12
11	Thain Grade East	1.8	24
12	Thain Grade West	2.8	9

- *Stewart Avenue Basin Expansion* (Project 8) – The basin at Stewart Avenue and Thain Road does not historically fill during a storm event. This basin was constructed with an at-grade outlet that may not restrict the outflow sufficiently enough to fill the basin.

  Proposal: The basin outlet should be reconstructed with a new outlet box that contains a grate that parallels the slopes of the basin and an adjustable gate over the existing outlet pipe. The pond should also have an emergency overflow. The expansion would add 6.66 Acre-ft of capacity to the basin, and would require expansion to the east of the existing pond, and excavation of approximately 290,000 cubic feet of soil. This also includes making the entire basin 5 feet deeper. A portion of the identified expansion area is not currently owned by the City. Additional recommendations regarding the Thain Road system upstream of the basin are discussed in the "Thain Road Upgrades" portion of the Capital Improvement Plan.

- *Cable One Basin* (Project 9) – A natural drainage area south of the Cable One property is conducive for detention basin construction with minimal site work. Detention at this location will help utilize existing pipe sizes needed to convey the design storm downstream.

  Proposal: Outlet and overflow structures should be constructed to maximize detention at this location. This project facilitates use of approximately 1,480 LF of 30 inch pipe and 1,686 LF of 36 inch existing piping downstream of the pond which would otherwise need to be upsized. Further, when an upsize is required, the required increase is less due to the impacts of added detention.

- *Toyota Dealership Basin* (Project 10) – A natural drainage area north of the Toyota Dealership is conducive for detention basin construction with minimal site work. Detention at this location will help utilize existing pipe sizes needed to convey the design storm downstream.

- *Proposal:* Outlet and overflow structures should be constructed to maximize detention at this location. This project facilitates use of approximately 340 LF of 24 inch pipe, 1,682 LF of 30, and 686 LF of 36 inch existing piping downstream of the pond which would otherwise need to be upsized. Further, when an upsize is required, the required increase is less due to the impacts of added detention.

- *Thain Grade Basins* (Projects 11 & 12) – Two natural drainage areas located in the drainage south of Staples lot development are conducive for detention basin construction with minimal site work. Detention at these locations will help utilize existing pipe sizes needed to convey the design storm downstream.

- *Proposal:* A berm will need to be constructed on the north side of each detention pond in order to create the basin. Outlet and overflow structures should also be constructed to maximize detention at each location. The City may consider a series of ponds at the location adjacent to Thain Grade based on coordination with the developer. This project facilitates use of approximately 1,956 LF of 36 inch existing piping downstream of the ponds which would otherwise need to be upsized. Further, when an upsize is required, the required increase is less due to the impacts of added detention.

ITD INTERSECTION - HIGHWAY 12 & MAIN STREET (PROJECT 1)

ITD is planning to re-align the intersection at Highway 12 and Main Street in 2019, near the Basin 7 outfall. The stormwater system currently conveys flows through a hotel parking lot along 7th Avenue to Main Street. The pipe is undersized, and significant flooding is periodically noted in this vicinity.

Proposal: The timing of the ITD project is conducive for re-alignment of the stormwater system to follow 21st Street to Main Street through the intersection. By incorporating a stormwater project together with a larger ITD project, the City may be able to minimize ancillary costs including contractor mobilization and surface repair. In addition, the storm line would be relocated in City right-of-way, facilitating better access, operations and maintenance.

NEW 20TH STREET SYSTEM (PROJECTS 2 & 3)

As noted in the 2001 Master Plan, the trunk line east of 21st Street is recommended for replacement as a 60-inch pipe. The existing 36-inch cannot be upsized without open trench replacement, which is problematic and very costly at depths that range up to 35 feet.

Proposal: A new 20th street system is needed to provide relief to the indicated trunk line. Located at a shallower depth, the new system is more economically feasible than an upsize of the existing system, and will facilitate use of trenchless rehabilitation to extend the useful life of the existing system. The project is separated into two phases as follows to facilitate budgeting and construction:

- *10th Avenue to 21st Avenue (Project 2) –* The system continues along 20th Avenue to tie in at 21st Street with the ITD Intersection project. The lower 20th Street system (Project 2) must be constructed prior to the upper 20th Street system (Project 3).

- *Nez Perce Drive to 10th Avenue (Project 3) –* The system diverts flows conveyed from Thain Grade towards the new system. The upper 20th Street system (Project 3) must be constructed following the lower 20th Street system (Project 2).

THAIN GRADE CROSSING (PROJECT 5)

The existing Thain Grade crossing, west of North 40, is undersized after improvements are made upstream. The Stewart Ave detention pond is proposed to be upsized as well as the piping directly upstream of the detention pond.

Proposal: The Thain Grade crossing should be upsized to a 36" pipe and can discharge into the existing channel on the west side of Thain Grade.

THAIN ROAD REHABILITATION (PROJECTS 6 & 7)

The Thain Road system is conditionally deficient; pieces of degraded CMP have washed into the basin during large storm events. Further, minimal inlets upstream of the basin together with small diameter, corrugated metal pipe may further limit flows from reaching the basin located near Stewart Avenue. This is further evident by reported flooding near the intersection of Thain Road and Vista Avenue.

Proposal: The Thain Road system should be replaced, and inlets upgraded to convey water to the basin near Stewart Avenue.

OTHER POTENTIAL PROJECTS

There were several areas that the model showed were flooding during a 10-year, 3-hour event in Basin 7. The city chose to pick key projects to analyze in this Update instead of a comprehensive list of all recommendations. Following construction of the improvements recommended within this Update,

there are several areas in basin 7 that are identified in the model as “flooding” or surcharging out of a manhole. These projects should be revisited at a future date.

6.1 COSTS

Opinions of probable cost are included in **APPENDIX D**. A summary of project costs are given in **TABLE 5.2**. Costs were developed using a calculator with base assumptions as follows:

- All Pipes will have 4 feet of cover.
- Imported materials will be used for the full length of pipe, including the trench foundation.
- All new pipes will be installed under asphalt.
- Junction boxes will be installed every 400 feet.
- The cost to remove an existing line and install a new line will cost 1.25 times the cost to install a new line with no existing line to remove.
- One existing water main will have to be looped for each block of new storm drain line installed.
- One water service line will have to be looped for every 66 feet of new storm drain line installed.
- If new storm drain lines are larger than 48" vertically, existing sewer services will not fit under storm drain. A new 8" sewer main will be installed in the road to serve homes on 1 side of the road for lines 48” or larger.
- Existing gas lines and phone lines will have to be re-located along 25% of the length of the new storm drain lines.
- Boxes placed on 12” of imported foundation material.

TABLE 6.2 – PROJECT CONSTRUCTION COSTS

Project No.	Description	Escalated Planning Level Construction Cost by Year			
		2016	2021	2026	2031
	Construction Cost Index [a]	10,328	11,984	13,907	16,138
1	ITD Intersection	$1,017,965	$1,181,186	$1,590,507	$2,485,245
2	Lower 20th Street System	$991,460	$1,150,432	$1,549,095	$2,420,536
3	Upper 20th Street System	$1,937,510	$2,248,172	$3,027,239	$4,730,208
4	Ford Dealership Rehabilitation	$1,128,075	$1,308,951	$1,762,547	$2,754,065
5	Thain Grade Crossing	$104,813	$121,618	$163,763	$255,888
6	Lower Thain Road Rehabilitation	$1,257,790	$1,459,465	$1,965,219	$3,070,750
7	Upper Thain Road Rehabilitation	$1,385,623	$1,607,794	$2,164,949	$3,382,838
8	Stewart Avenue Basin Expansion	$291,000	$337,659	$454,669	$710,443
9	Cable One Basin	$72,500	$84,125	$113,277	$177,000
10	Toyota Dealership Basin	$65,500	$76,002	$102,340	$159,911
11	Thain Grade – East Basin	$94,500	$109,652	$147,650	$230,711
12	Thain Grade – West Basin	$114,000	$132,279	$178,118	$278,318

[a] Planning level construction costs are escalated by 3.0 %, consistent with Construction Cost Index values observed from 2005 – 2015 as published by Engineering News Record.

7 SUMMARY

The results of this Basin 7 Update provide a plan for Lewiston to meet its most pressing stormwater needs. It is recommended that the City:

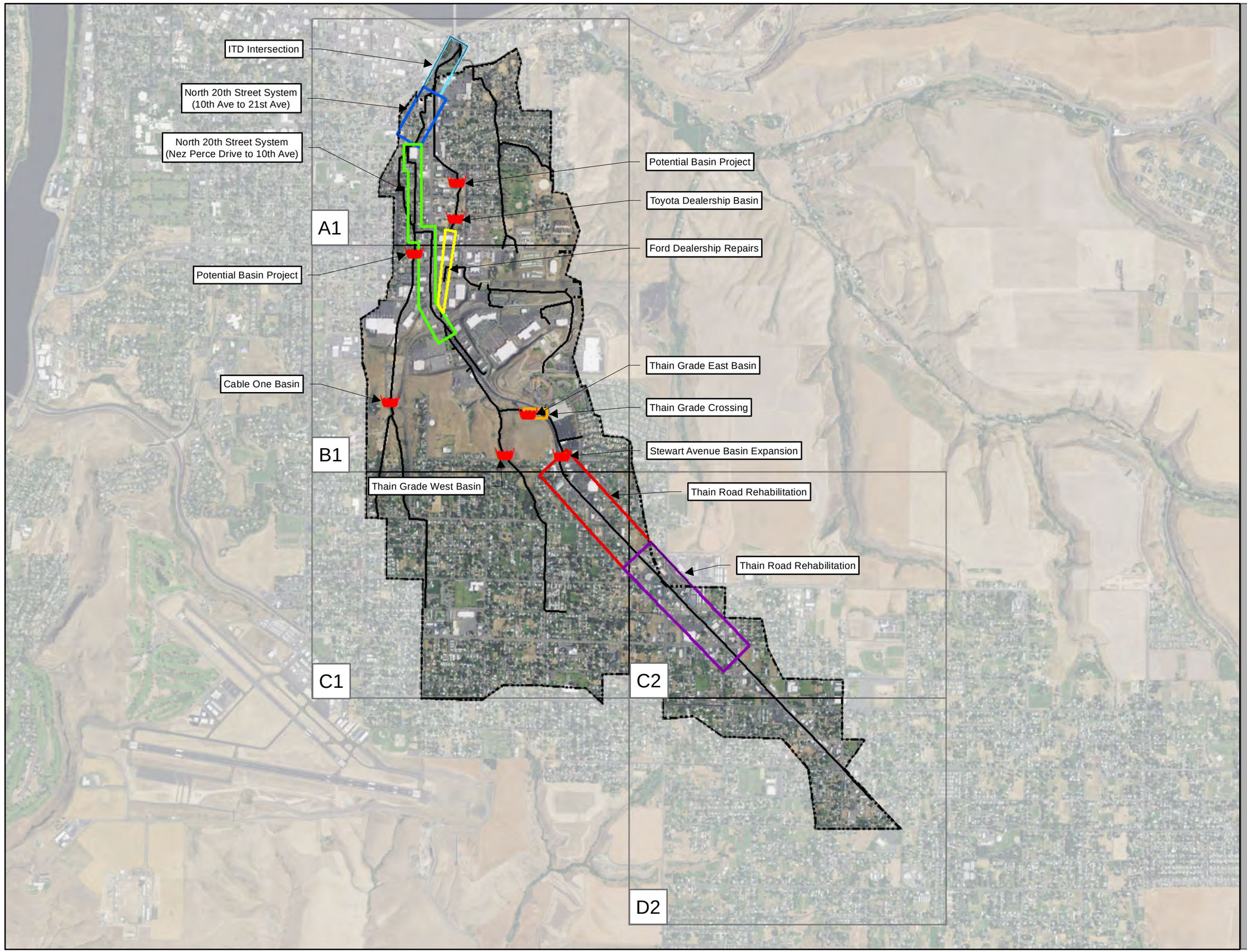
- Utilize the Capital Improvement Plan to secure funding and guide stormwater upgrade design
- Continue a conditional assessment of the physical condition of the existing stormwater system. Anecdotal evidence suggests that much of the system is approaching the end of its useful life, and the City may identify a need to modify project priorities and/or accelerate project construction. As part of the conditional assessment, the City may identify project candidates for CIPP rehabilitation that could significantly decrease the Capital Improvement Costs presented in Section 5.
- Revisit the Master Plan as a whole to prioritize projects across the City, including projects in Basin 7 that were not identified as part of this Update.
- Once the statewide general MS4 permit is issued by the EPA, the City should revisit, revise, and formally adopt the draft Stormwater Policy and Design Manual. Assumptions of this Update and the Master Plan in general should be revisited to assess consistency with requirements of the Permit.

APPENDIX A

Mapbooks

Proposed Projects

CITY OF LEWISTON
Basin 7 Mapbook
Proposed Projects



See Project Detail Sheet

A1

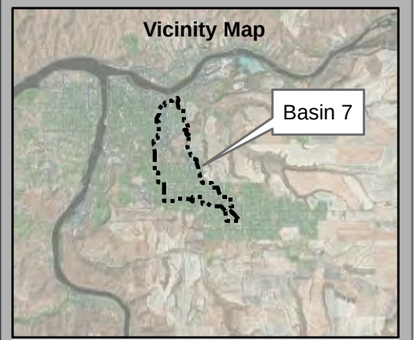
Legend

- Detention Project
- Storm Drain Piping
- Basin 7

Projects

- ITD Intersection
- North 20th Street (10th Ave to 21st Ave)
- North 20th Street (Nez Perce Drive to 10th Ave)
- Ford Dealership Repairs
- Thain Grade Crossing
- Thain Road Rehabilitation
- Thain Road Rehabilitation

Vicinity Map



J-U-B ENGINEERS, INC.

THE LANGDON GROUP

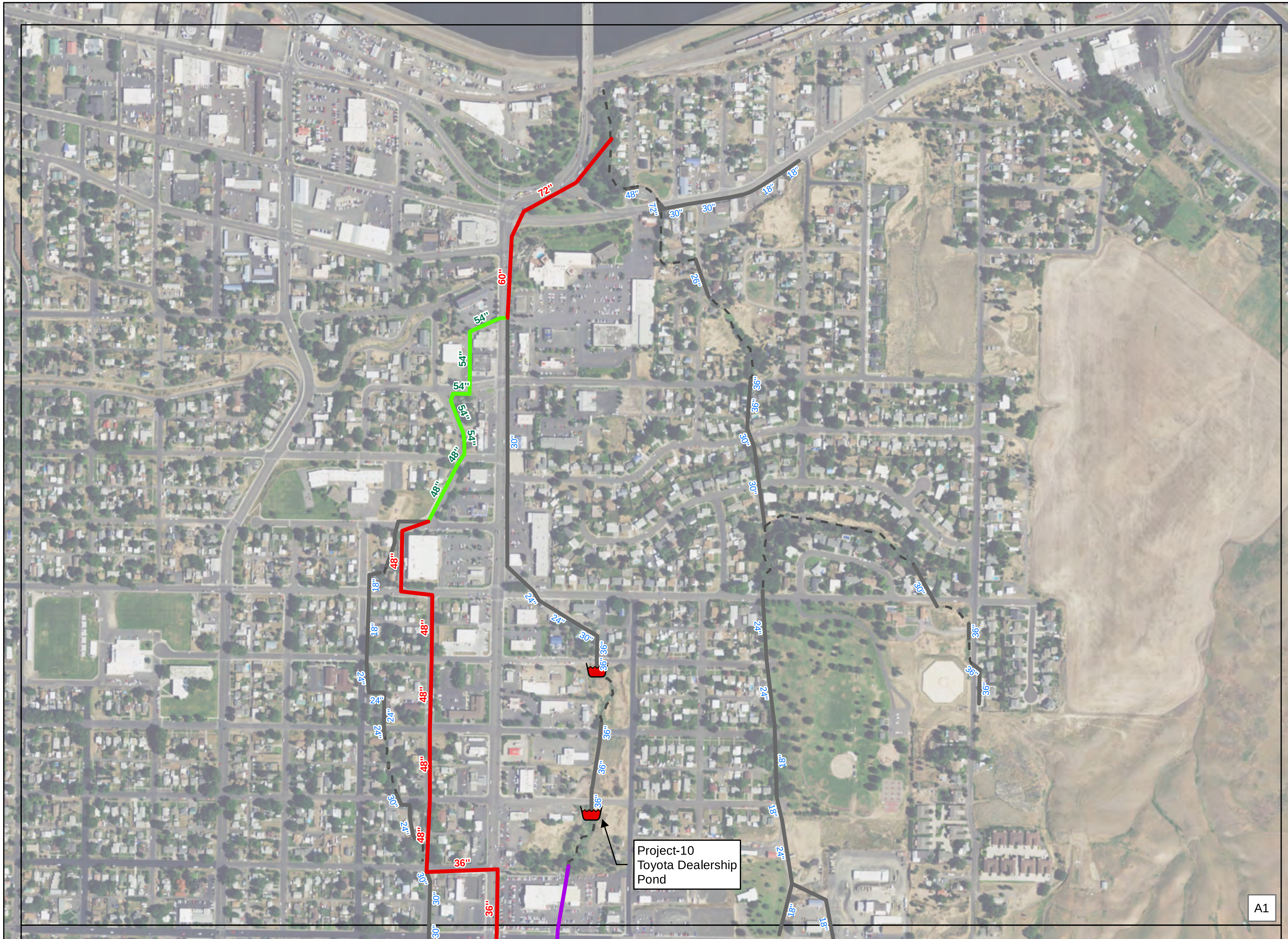
GATEWAY MAPPING INC.

OTHER J-U-B COMPANIES

0 1,000 2,000 Feet

1 inch = 2,000 feet

N



CITY OF LEWISTON Proposed Storm Drain Projects

Project Detail Sheet A1

N

Legend

- Existing
- Active, New
- Active, Upgrade
- Existing Modeled Pipes
- Existing Open Channel
- New Pipe
- Replace or Upsize Existing Pipe
- Slipline

J-U-B ENGINEERS, INC.

THE LANGDON GROUP — GATEWAY MAPPING INC.

OTHER J-U-B COMPANIES

0 250 500 Feet

1 inch = 500 feet

CITY OF LEWISTON
Proposed Storm Drain Projects

Project Detail Sheet B1

Project-9
Cable 1 Pond

Project-11
Thain Grade East Pond

Project-12
Thain Grade West Pond

Project-8
Stewart Ave Pond

Legend

- Existing
- Active, New
- Active, Upgrade
- Existing Modeled Pipes
- Existing Open Channel
- New Pipe
- Replace or Upsize Existing Pipe
- Slipline

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

OTHER J-U-B COMPANIES

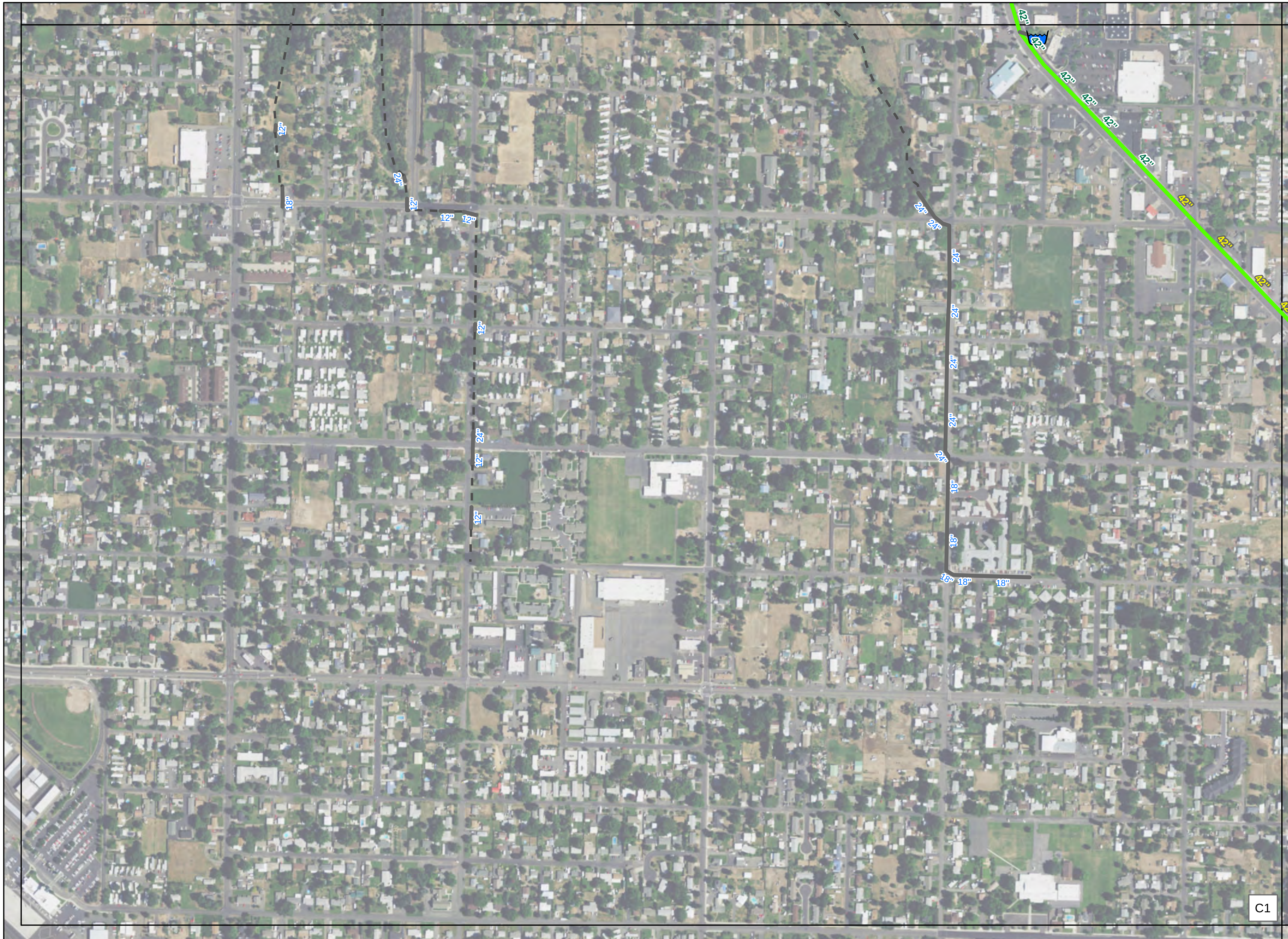
0 250 500 Feet

1 inch = 500 feet

B1

CITY OF LEWISTON Proposed Storm Drain Projects

Project Detail Sheet C1



Legend

- Existing
- Active, New
- Active, Upgrade
- Existing Modeled Pipes
- Existing Open Channel
- New Pipe
- Replace or Upsize Existing Pipe
- Slipline

J·U·B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

OTHER J·U·B COMPANIES

0 250 500 Feet

1 inch = 500 feet

CITY OF LEWISTON Proposed Storm Drain Projects

Project Detail Sheet C2

Legend

- Existing
- Active, New
- Active, Upgrade
- Existing Modeled Pipes
- Existing Open Channel
- New Pipe
- Replace or Upsize Existing Pipe
- Slipline

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

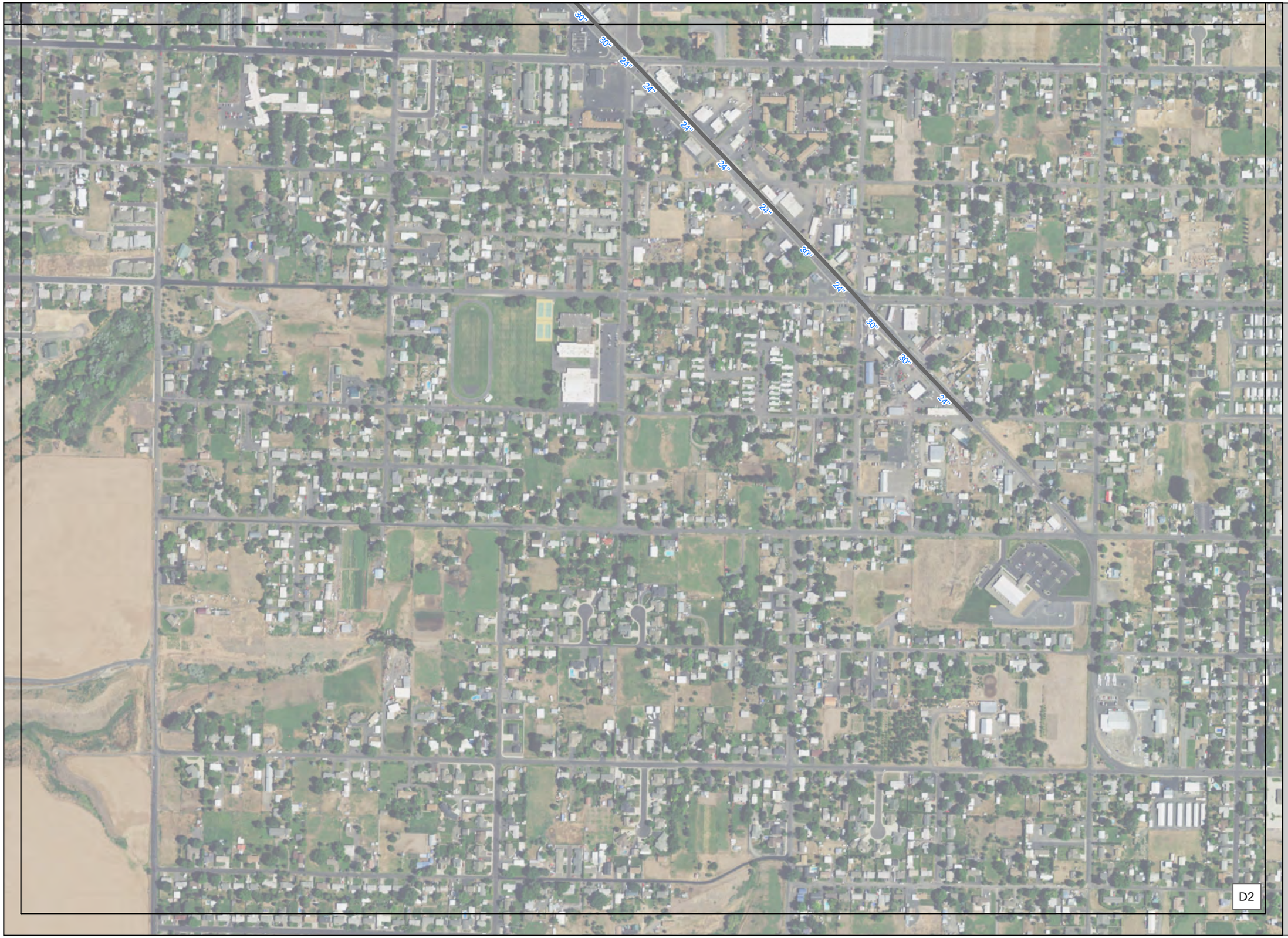
OTHER J-U-B COMPANIES

0 250 500 Feet

1 inch = 500 feet

CITY OF LEWISTON
Proposed Storm Drain Projects

Project Detail Sheet D2



Legend

- Existing
- Active, New
- Active, Upgrade
- Existing Modeled Pipes
- Existing Open Channel
- New Pipe
- Replace or Upsize Existing Pipe
- Slipline

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

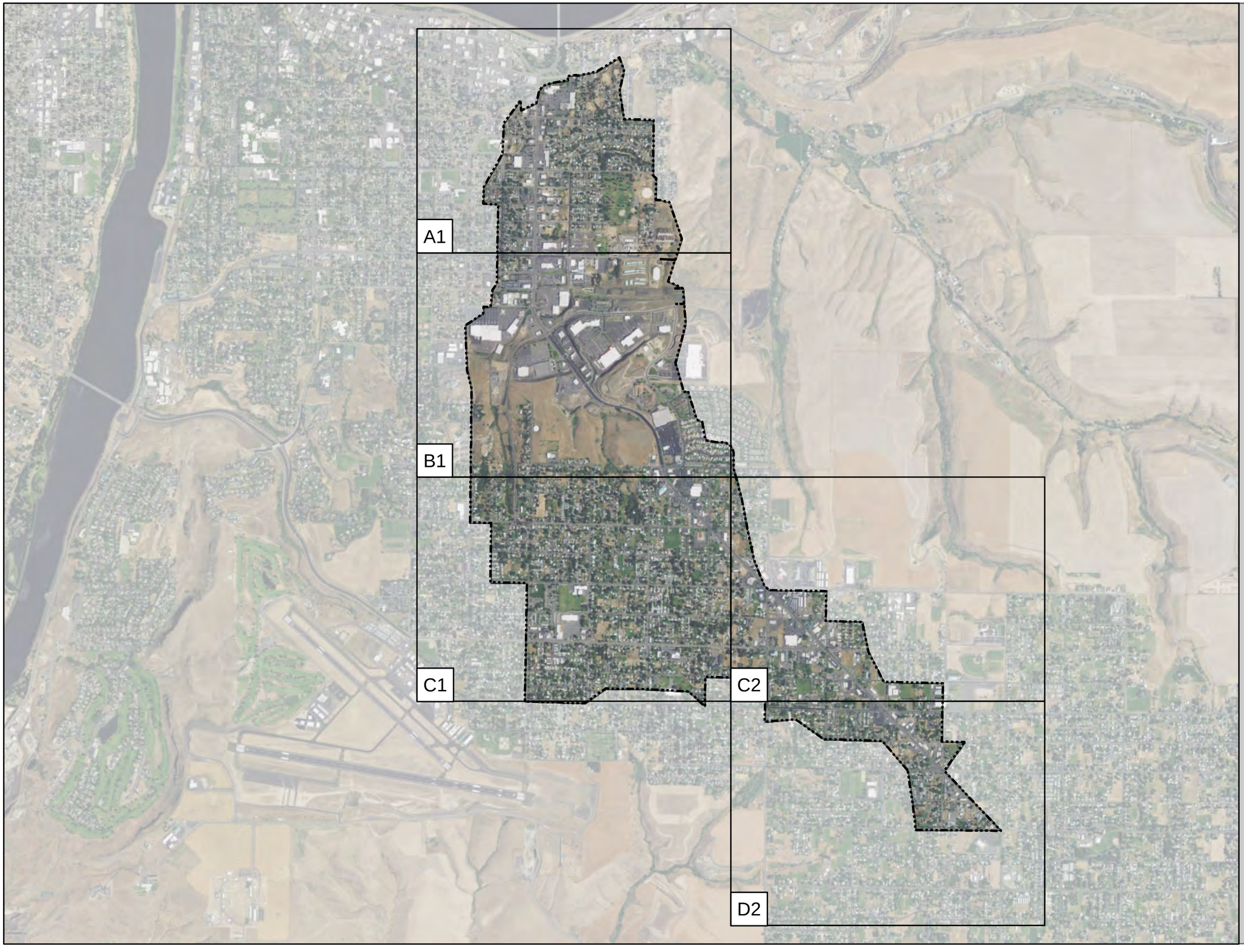
OTHER J-U-B COMPANIES

0 250 500 Feet

1 inch = 500 feet

Existing System

CITY OF LEWISTON
Existing Storm Drain System



See Project Detail Sheet

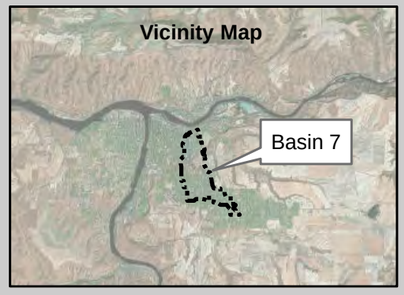
A1

N

Legend

Basin 7

Vicinity Map



J-U-B ENGINEERS, INC.

THE LANGDON GROUP

GATEWAY MAPPING INC.

OTHER J-U-B COMPANIES

0 1,000 2,000 Feet

1 inch = 2,000 feet

CITY OF LEWISTON
Existing Storm Drain System

Project Detail Sheet A1

N

Legend

- Existing Detention Pond
- No Size
- 1
- 3
- 4
- 6
- 7
- 8
- 10
- 12
- 14
- 15
- 18
- 24
- 26
- 30
- 36
- 42
- 48
- 60
- 75
- Open Channel

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a JUB Company

GATEWAY MAPPING INC. a JUB Company

OTHER J-U-B COMPANIES

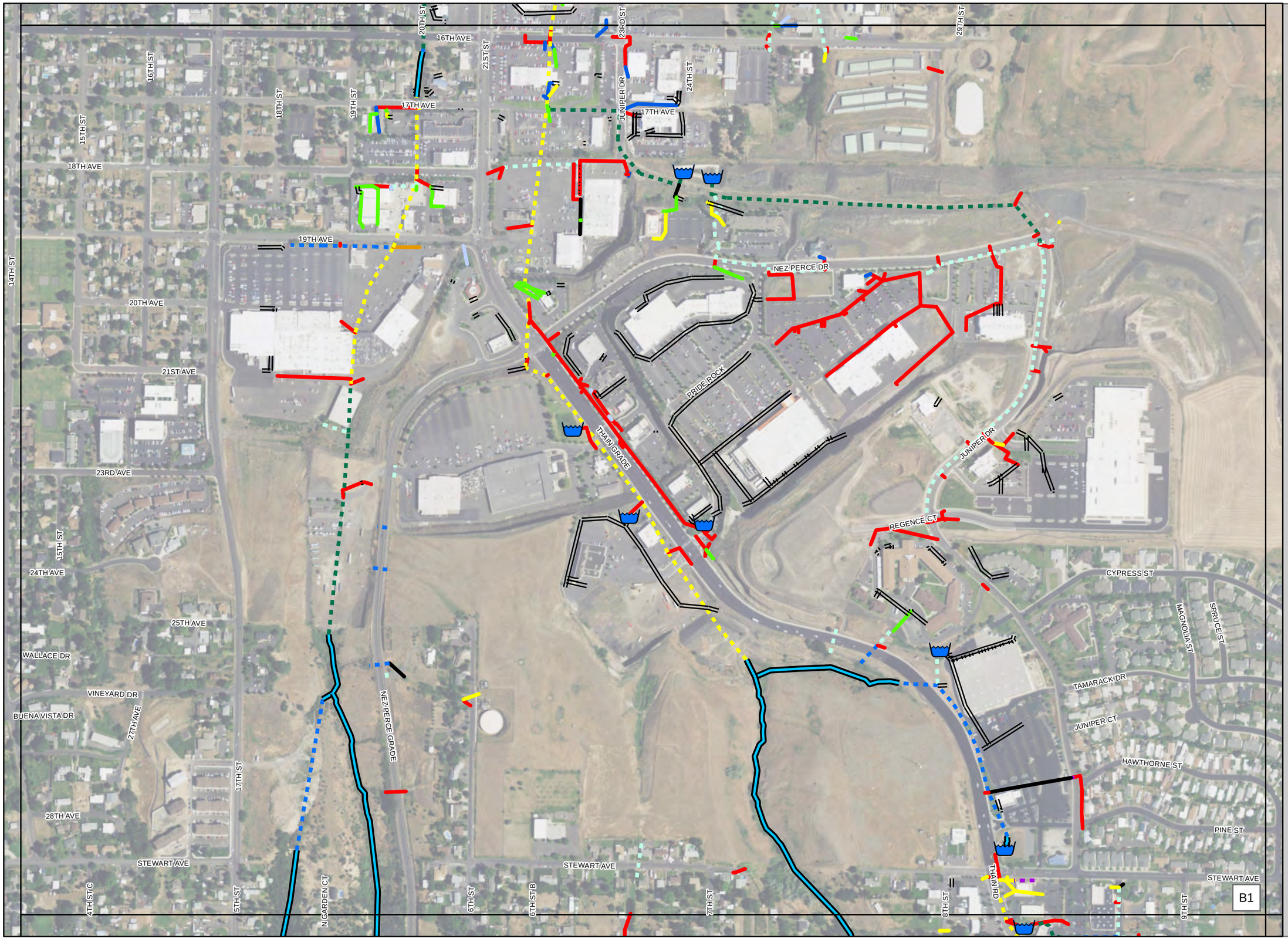
0 250 500 Feet

1 inch = 500 feet

A1

CITY OF LEWISTON
Existing Storm Drain System

Project Detail Sheet B1



Legend

- Existing Detention Pond
- No Size
- 1
- 3
- 4
- 6
- 7
- 8
- 10
- 12
- 14
- 15
- 18
- 24
- 26
- 30
- 36
- 42
- 48
- 60
- 75
- Open Channel

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

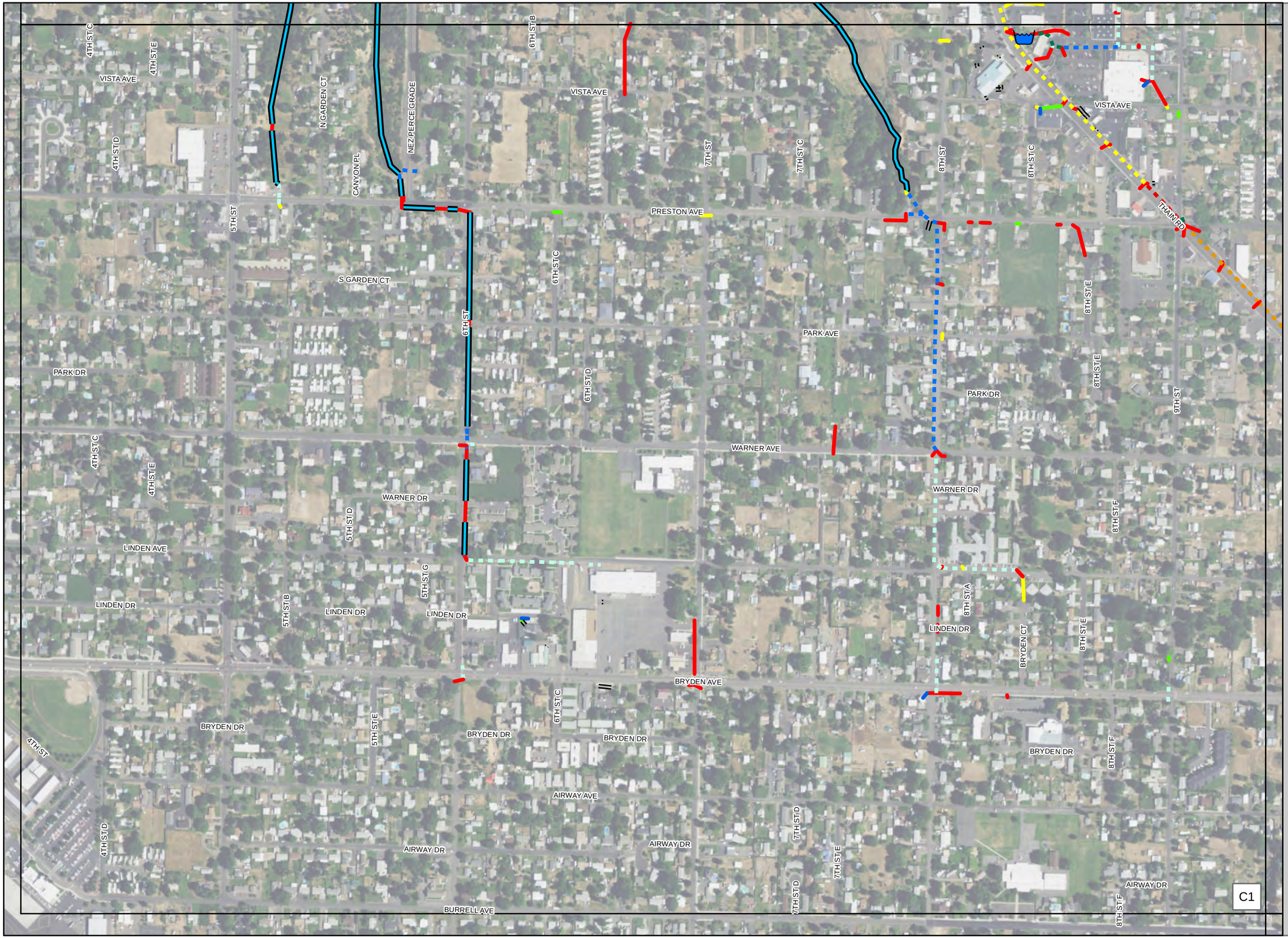
OTHER J-U-B COMPANIES

0 250 500 Feet

1 inch = 500 feet

CITY OF LEWISTON
Existing Storm Drain System

Project Detail Sheet C1



Legend

- Existing Detention Pond
- No Size
- 1
- 3
- 4
- 6
- 7
- 8
- 10
- 12
- 14
- 15
- 18
- 24
- 26
- 30
- 36
- 42
- 48
- 60
- 75
- Open Channel

J-U-B ENGINEERS, INC.

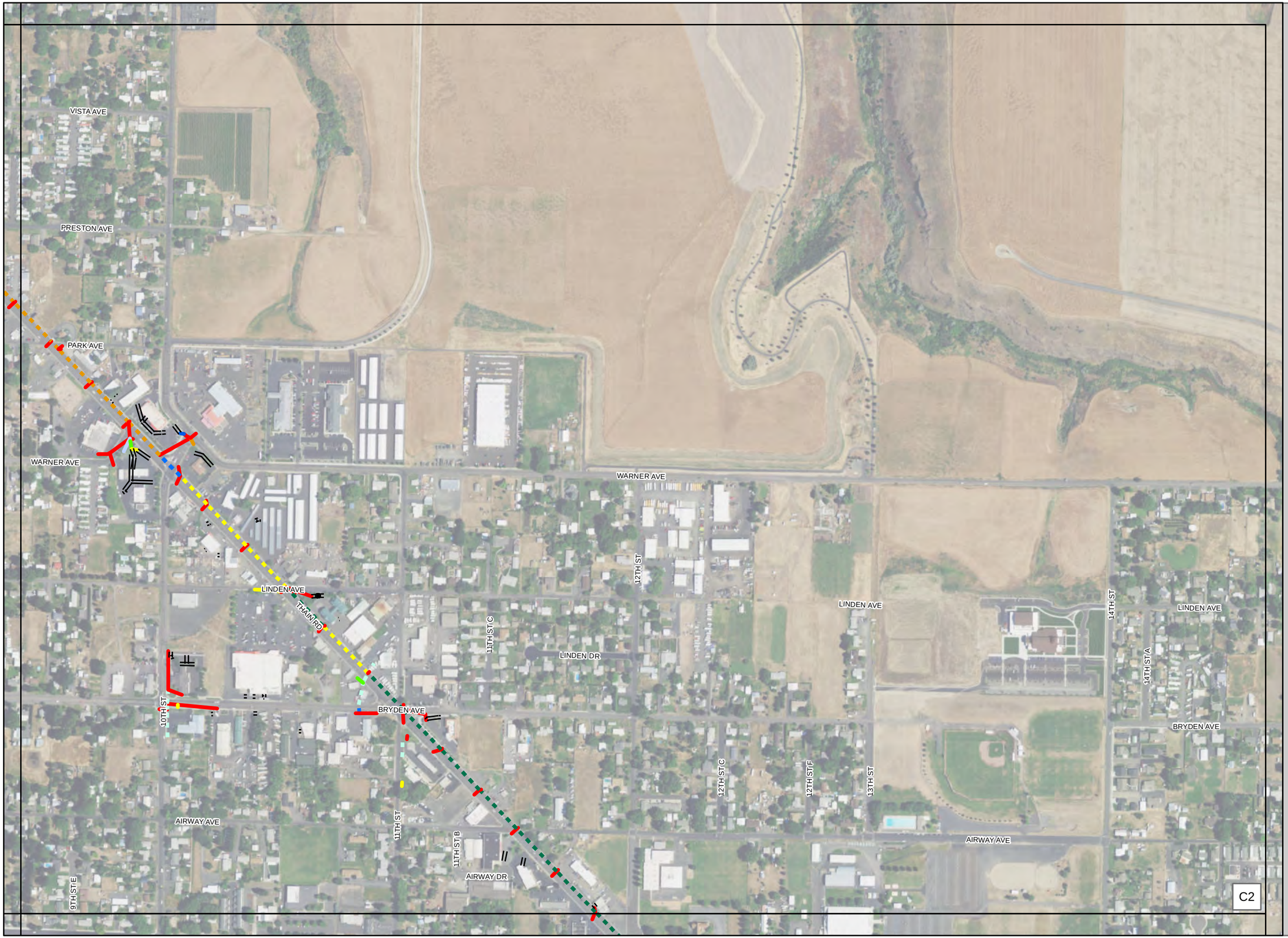
THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

OTHER J-U-B COMPANIES

0 250 500 Feet

1 inch = 500 feet



CITY OF LEWISTON
Existing Storm Drain System

Project Detail Sheet C2

Legend

- Existing Detention Pond
- No Size
- 1
- 3
- 4
- 6
- 7
- 8
- 10
- 12
- 14
- 15
- 18
- 24
- 26
- 30
- 36
- 42
- 48
- 60
- 75
- Open Channel

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

OTHER J-U-B COMPANIES

0 250 500 Feet

1 inch = 500 feet

CITY OF LEWISTON
Existing Storm Drain System

Project Detail Sheet D2

N

Legend

- Existing Detention Pond
- No Size
- 1
- 3
- 4
- 6
- 7
- 8
- 10
- 12
- 14
- 15
- 18
- 24
- 26
- 30
- 36
- 42
- 48
- 60
- 75
- Open Channel

J-U-B ENGINEERS, INC.

THE LANGDON GROUP a J-U-B Company

GATEWAY MAPPING INC. a J-U-B Company

OTHER J-U-B COMPANIES

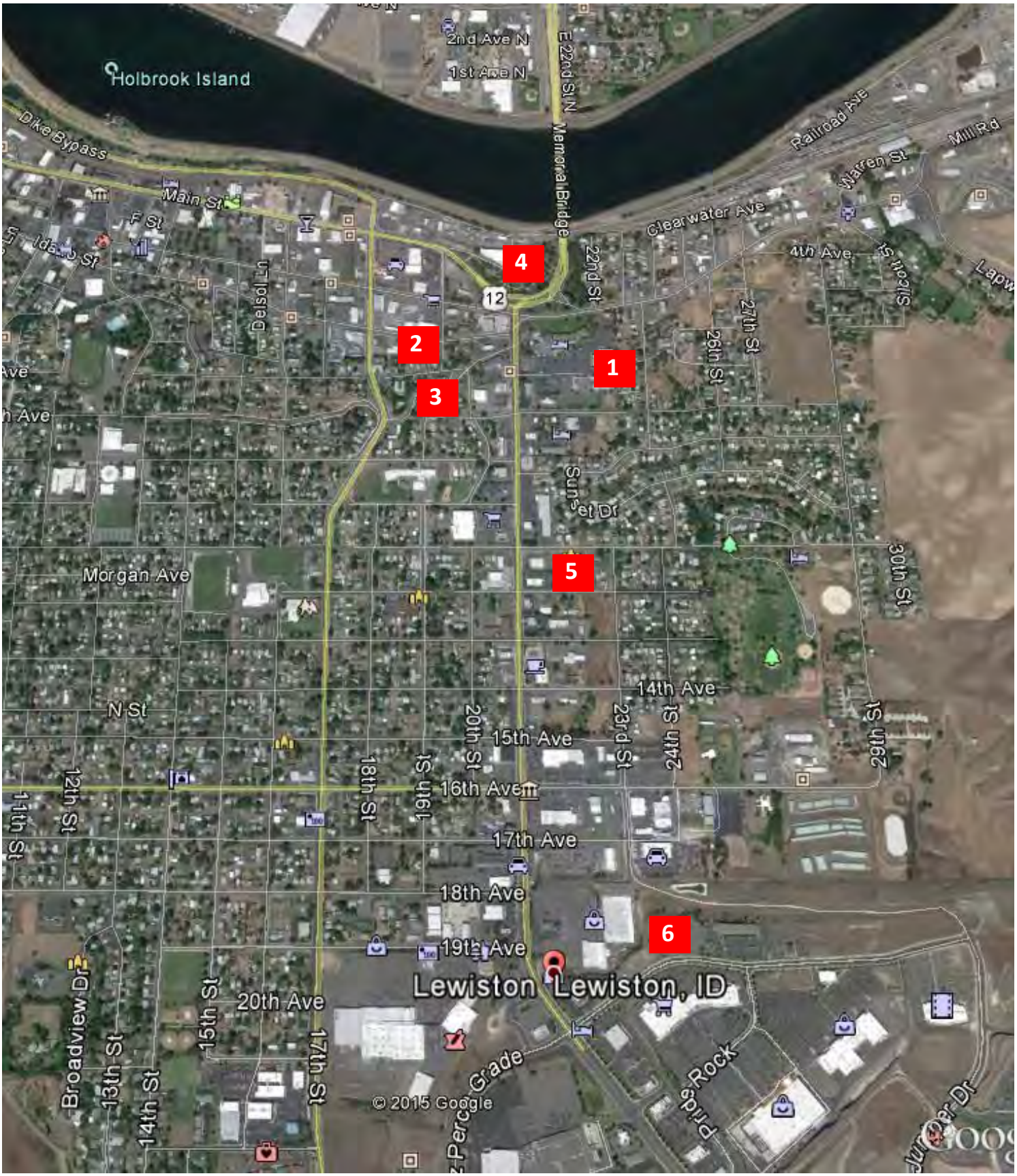
0 250 500 Feet

1 inch = 500 feet

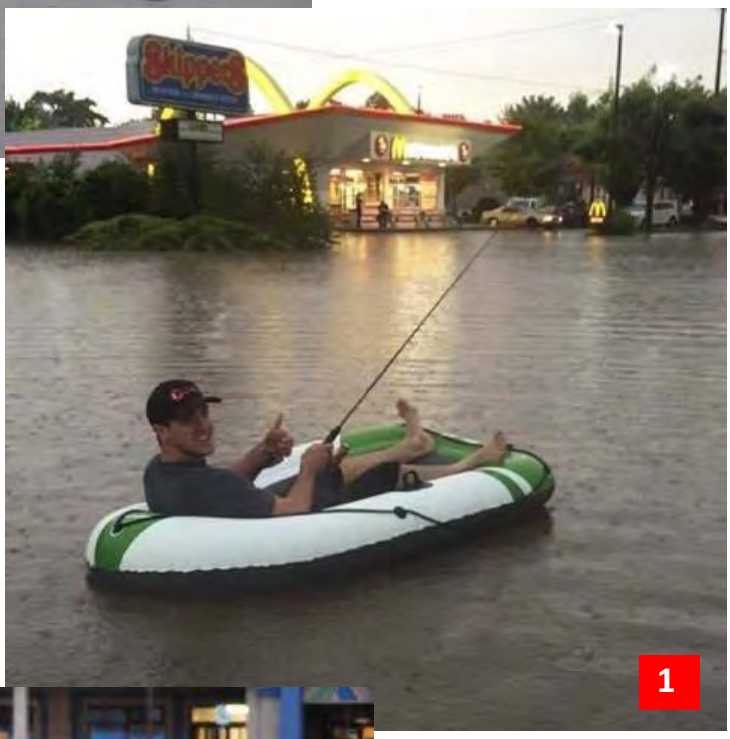
D2

APPENDIX B

Flooding Observations June 2, 2015


Holbrook Island
Dike Bypass
Main St
F St
Idaho St
Deisel Ln
2nd Ave N
1st Ave N
E 22nd St N
Memorial Bridge
Railroad Ave
Mill Rd
Warren St
Clearwater Ave
4th Ave
22nd St
27th St
26th St
12
4
2
1
3
Sunset Dr
5
Morgan Ave
30th St
14th Ave
N St
20th St
15th Ave
23rd St
24th St
29th St
12th St
11th St
18th St
19th St
16th Ave
17th Ave
18th Ave
19th Ave
6
Lewiston
Lewiston, ID
Broadview Dr
13th St
14th St
15th St
20th Ave
17th St
Grade
Ridge Rock
© 2015 Google

SITE 1 – ROAD INLET AND PARKING LOT AT RED LION HOTEL/MCDONALDS OFF 21ST STREET.



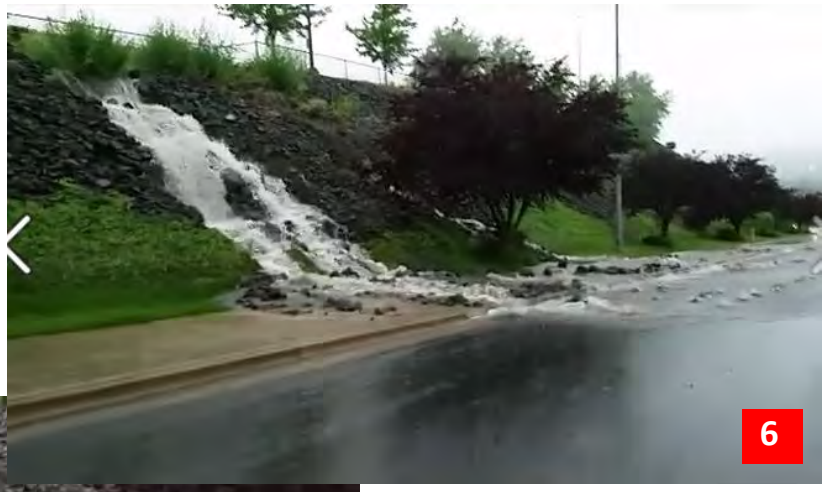
SITE 2 – 20TH STREET AND 7TH AVE

SITE 3 - 20TH STREET AND 9TH AVE

SITE 4 – HIGHWAY 12, 21ST STREET JUNCTION

SITE 5 – 21ST STREET AND 11TH AVE

SITE 6 – BEDROCK PLAZA STRIP MALL – NEZ PERCE DRIVE



APPENDIX C

Model

Model Development

J-U-B ENGINEERS, INC.

Lewiston Stormwater Master Plan - Basin 7 Update
Curve Number (CN) Assessment

Subcatchment ID (Char)	2001 Master Plan CN	2016 Basin 7 Update CN	Change
47	90	78.8	-11.2
102	75	63.8	-11.2
71	92	81.6	-10.4
94	88	77.8	-10.2
48	90	79.8	-10.2
79	90	80.0	-10.0
114	80	70.0	-10.0
96	88	78.8	-9.2
72	87	77.8	-9.2
97	75	66.1	-8.9
116	92	83.7	-8.3
88	80	72.3	-7.7
101	90	82.7	-7.3
95	88	80.9	-7.1
104	92	86.2	-5.8
92	75	70.0	-5.0
98	75	70.0	-5.0
89	75	70.0	-5.0
91	75	70.0	-5.0
90	75	70.1	-4.9
113	82	77.1	-4.9
87	75	71.3	-3.7
105	92	88.3	-3.7
73	87	83.3	-3.7
75	92	88.5	-3.5
81	75	72.0	-3.0
86	88	85.0	-3.0
99	75	72.0	-3.0
106	92	89.0	-3.0
112	78	75.3	-2.7
76	84	81.4	-2.6
115	84	82.4	-1.6
103	92	90.6	-1.4
78	92	91.5	-0.5
108	87	86.9	-0.1
107	92	92.0	0.0
84	73	73.7	0.7
110	70	71.3	1.3
100	75	78.8	3.8
109	75	81.1	6.1
111	74	80.8	6.8

J·U·B ENGINEERS, INC.

Lewiston Stormwater Master Plan
Basin 7 Update
Time of Concentration

ID	Peak Runoff (cfs)	Time of Concentration (minutes)
100	15.6	35.6
101	17.8	12.8
102	5.5	37.0
104	28.5	12.7
105	61.3	16.1
108	24.0	10.0
110	29.8	26.2
111	37.5	14.9
112	8.6	12.6
113	21.8	26.9
114	14.0	31.4
115	33.8	31.1
116	10.5	7.2
134	4.8	73.7
135	9.5	39.6
136	6.8	75.7
137	6.7	92.0
262	12.9	26.4
47	16.9	22.5
71	11.8	4.9
72	6.7	101.1
73	13.7	40.4
74	6.5	39.6
75	17.5	19.5
76	22.3	36.3
77	17.1	41.5
78	27.0	20.4
79	11.1	47.1
80	7.0	39.8
81	12.0	39.2
82	24.2	30.0
83	6.5	45.0
84	6.2	41.6
86	14.0	24.6
87	7.0	41.4
88	9.7	9.7
89	7.6	46.2
90	5.2	47.5

J·U·B ENGINEERS, INC.

Lewiston Stormwater Master Plan
Basin 7 Update
Time of Concentration

ID	Peak Runoff (cfs)	Time of Concentration (minutes)
91	3.7	46.2
92	6.4	31.6
94	10.0	27.8
95	15.3	33.4
96	13.1	21.0
97	12.8	24.3
98	5.4	59.1
99	28.0	32.9
SUB-52	19.0	7.7
SUB-54	11.9	6.3
SUB-56	19.0	13.9
SUB-60	14.3	5.6
SUB-62	5.0	3.7
SUB-64	17.7	9.2
SUB-66	4.7	7.5
SUB-68	22.9	16.7
SUB-70	18.1	19.3
SUB-72	19.9	9.1
SUB-74	24.7	11.0
SUB-76	16.8	5.2
SUB-78	10.7	28.7
SUB-80	13.1	13.5
SUB-82	5.8	10.6
SUB-84	11.9	7.8
SUB-86	13.0	7.1
SUB-88	26.5	6.6
SUB-90	15.5	6.1
SUB-92	2.1	14.3
SUB-94	12.5	7.5
SUB-96	4.1	4.5

Model

APPENDIX D

Costs

J-U-B ENGINEERS, INC.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 1 - ITD Junction**

DATE: May, 2016

PROJECT DESCRIPTION:
21st Street to Outfall

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$95,000	$95,000
2	Site Work (3%)	1	LS	$20,000	$20,000
3	Traffic Control (3%)	1	LS	$20,000	$20,000
4	Quality Control (1%)	1	LS	$6,000	$6,000
5	Utility Relocation [a]	1	LS	$185,000	$185,000
6	Excavation and Backfill [b]	1,255	LF	$55.00	$69,025
7	Rock Excavation [c]	90	CY	$150	$13,500
8	60" RCP	535	LF	$190	$101,650
9	72" RCP	720	LF	$250	$180,000
10	Junction Boxes [d]	6	EA	$2,500	$15,000
11	Surface Restoration - 3" Asphalt [e]	1,255	LF	$36	$45,180
12	Road Base - 10"	1,255	LF	$22	$27,610
13	Dewatering [f]	1	LS	$5,000	$5,000

Construction Subtotal ($2016)	**$782,965**
Planning Level Construction Contingency (30%)	$235,000
Planning Level Construction Cost ($2016) [g]	**$1,017,965**

[a] Estimated relocation for water main, water service, sewer service, gas and phone line relocation
[b] Assumes 4 feet of cover, with material import.
[c] Quantity assumes 6" rock depth over width of trench for half of the replacement length
[d] Assumes one junction box located every 400 feet
[e] Assumes full asphalt surface restoration required
[f] Dewatering cost is provided as a placeholder cost and should be re-evaluated during pre-design
[g] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

J-U-B ENGINEERS, INC.
1630 23rd Ave., Suite 1101-A, LEWISTON, IDAHO 83501 (208) 746-9010

J·U·B ENGINEERS, INC.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 2 - Lower 20th Street**

DATE: May, 2016

PROJECT DESCRIPTION:
20th Street System (10th Avenue to 21st Street)

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$95,000	$95,000
2	Site Work (3%)	1	LS	$20,000	$20,000
3	Traffic Control (3%)	1	LS	$20,000	$20,000
4	Quality Control (1%)	1	LS	$6,000	$6,000
5	Utility Relocation [a]	1	LS	$162,500	$162,500
6	Excavation and Backfill [b]	1,440	LF	$45.00	$64,800
7	Rock Excavation [c]	80	CY	$150	$12,000
8	48" RCP [h]	425	LF	$170	$72,250
9	54" RCP [h]	970	LF	$205	$198,850
10	60" RCP [h]	45	LF	$240	$10,800
11	Junction Boxes [d]	7	EA	$2,500	$17,500
12	Surface Restoration - 3" Asphalt [e]	1,440	LF	$34	$48,960
13	Road Base - 10"	1,440	LF	$20	$28,800
14	Dewatering [f]	1	LS	$5,000	$5,000

Construction Subtotal ($2016)	**$762,460**
Planning Level Construction Contingency (30%)	$229,000
Planning Level Construction Cost ($2016) [g]	**$991,460**

[a] Estimated relocation for water main, water service, sewer service, gas and phone line relocation
[b] Assumes 4 feet of cover, with material import.
[c] Quantity assumes 6" rock depth over width of trench for half of the replacement length
[d] Assumes one junction box located every 400 feet
[e] Assumes full asphalt surface restoration required
[f] Dewatering cost is provided as a placeholder cost and should be re-evaluated during pre-design
[g] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.
[h] Assumes use of existing alignment

J-U-B ENGINEERS, INC.
1630 23rd Ave., Suite 1101-A, LEWISTON, IDAHO 83501 (208) 746-9010

J-U-B ENGINEERS, INC.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 3 - Upper 20th Street**

DATE: May, 2016

PROJECT DESCRIPTION:
20th Street System (Nez Perce Drive to 10th Avenue)

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$185,000	$185,000
2	Site Work (3%)	1	LS	$35,000	$35,000
3	Traffic Control (3%)	1	LS	$35,000	$35,000
4	Quality Control (1%)	1	LS	$12,000	$12,000
5	Utility Relocation [a]	1	LS	$137,500	$137,500
6	Excavation and Backfill [b]	5,010	LF	$37.50	$187,875
7	Rock Excavation [c]	250	CY	$150	$37,500
8	36" RCP	2,805	LF	$90	$252,450
9	48" RCP	2,205	LF	$135	$297,675
10	Junction Boxes [d]	20	EA	$2,500	$50,000
11	Surface Restoration - 3" Asphalt [e]	5,010	LF	$32	$160,320
12	Road Base - 10"	5,010	LF	$19	$95,190
13	Dewatering [f]	1	LS	$5,000	$5,000

Construction Subtotal ($2016)	**$1,490,510**
Planning Level Construction Contingency (30%)	$447,000
Planning Level Construction Cost ($2016) [g]	**$1,937,510**

[a] Estimated relocation for water main, water service, sewer service, gas and phone line relocation
[b] Assumes 4 feet of cover, with material import.
[c] Quantity assumes 6" rock depth over width of trench for half of the replacement length
[d] Assumes one junction box located every 400 feet
[e] Assumes full asphalt surface restoration required
[f] Dewatering cost is provided as a placeholder cost and should be re-evaluated during pre-design
[g] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

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1630 23rd Ave., Suite 1101-A, LEWISTON, IDAHO 83501 (208) 746-9010

J-U-B ENGINEERS, INC.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 4 - Ford Lot Repairs**

DATE: April 12, 2016

PROJECT DESCRIPTION:
Deep Section Open Trench Replacement and CIPP Repairs

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
1	Mobilization	1	LS	$113,250	$113,250
2	Site work	1	LS	$10,000	$10,000
3	Excavation and Backfill [a]	10,200	CY	$15	$153,000
4	Rock Excavation [b]	60	CY	$150	$9,000
5	36" RCP	150	LF	$350	$52,500
6	Slipline 36" CMP with CIPP [c]	1645	LF	$280	$460,600
7	Surface Restoration - 3" Asphalt	340	Ton	$115	$39,100
8	Road Base - 10"	1,025	Ton	$25	$25,625
9	Dewatering	1	LS	$5,000	$5,000

Construction Subtotal	**$868,075**
Planning Level Construction Contingency (30%)	$260,000
Planning Level Construction Cost [d]	**$1,128,075**

[a] Assumes on-site stockpile can be utilized for
[b] Quantity assumes 2' rock depth over 10' wide
[c] Price includes installation, traffic control, bypass pumping, cleaning, and CCTV inspection
[d] Planning Level Construction Cost does not include survey, design engineering, geotechnical investigation, construction management or legal and administrative fees.

J-U-B ENGINEERS, INC.
1630 23rd Ave., Suite 1101-A, LEWISTON, IDAHO 83501 (208) 746-9010

J-U-B ENGINEERS, INC.

ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 5 - Thain Grade Crossing**

DATE: May, 2016

PROJECT DESCRIPTION:
Thain Grade Crossing

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$10,000	$10,000
2	Site Work	1	LS	$5,000	$5,000
3	Traffic Control	1	LS	$5,000	$5,000
4	Quality Control (1%)	1	LS	$1,000	$1,000
5	Utility Relocation [a]	1	LS	$5,000	$5,000
6	Excavation and Backfill [b]	225	LF	$32.50	$7,313
7	Rock Excavation [c]	10	CY	$150	$1,500
8	36" RCP [h]	225	LF	$110	$24,750
9	Junction Boxes [d]	2	EA	$2,500	$5,000
10	Surface Restoration - 3" Asphalt [e]	225	LF	$32	$7,200
11	Road Base - 10"	225	LF	$18	$4,050
12	Dewatering [f]	1	LS	$5,000	$5,000

Construction Subtotal ($2016)	**$80,813**
Planning Level Construction Contingency (30%)	$24,000
Planning Level Construction Cost ($2016) [g]	**$104,813**

[a] Estimated relocation for water main, water service, sewer service, gas and phone line relocation
[b] Assumes 4 feet of cover, with material import.
[c] Quantity assumes 6" rock depth over width of trench for half of the replacement length
[d] Assumes one junction box located every 400 feet
[e] Assumes full asphalt surface restoration required
[f] Dewatering cost is provided as a placeholder cost and should be re-evaluated during pre-design
[g] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.
[h] Assumes use of existing alignment

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 6 - Lower Thain Road Rehabilitation**

DATE: May, 2016

PROJECT DESCRIPTION:
Thain Road Rehabilitation (Park Avenue to Stewart Avenue)

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$120,000	$120,000
2	Site Work (3%)	1	LS	$25,000	$25,000
3	Traffic Control (3%)	1	LS	$25,000	$25,000
4	Quality Control (1%)	1	LS	$8,000	$8,000
5	Utility Relocation [a]	1	LS	$77,500	$77,500
6	Excavation and Backfill [b]	2,840	LF	$37.50	$106,500
7	Rock Excavation [c]	150	CY	$150	$22,500
8	42" RCP [h]	2,645	LF	$140	$370,300
9	48" RCP [h]	195	LF	$170	$33,150
10	Junction Boxes [d]	12	EA	$2,500	$30,000
11	Surface Restoration - 3" Asphalt [e]	2,840	LF	$32	$90,880
12	Road Base - 10"	2,840	LF	$19	$53,960
13	Dewatering [f]	1	LS	$5,000	$5,000

Construction Subtotal ($2016)	**$967,790**
Planning Level Construction Contingency (30%)	$290,000
Planning Level Construction Cost ($2016) [g]	**$1,257,790**

[a] Estimated relocation for water main, water service, sewer service, gas and phone line relocation
[b] Assumes 4 feet of cover, with material import.
[c] Quantity assumes 6" rock depth over width of trench for half of the replacement length
[d] Assumes one junction box located every 400 feet
[e] Assumes full asphalt surface restoration required
[f] Dewatering cost is provided as a placeholder cost and should be re-evaluated during pre-design
[g] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.
[h] Assumes use of existing alignment

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 7 - Upper Thain Road Rehabilitation**

DATE: May, 2016

PROJECT DESCRIPTION:
Thain Road Rehabilitation (South of Bryden Avenue to Park Avenue)

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$130,000	$130,000
2	Site Work (3%)	1	LS	$25,000	$25,000
3	Traffic Control (3%)	1	LS	$25,000	$25,000
4	Quality Control (1%)	1	LS	$9,000	$9,000
5	Utility Relocation [a]	1	LS	$87,500	$87,500
6	Excavation and Backfill [b]	3,185	LF	$37.50	$119,438
7	Rock Excavation [c]	160	CY	$150	$24,000
8	36" RCP [h]	895	LF	$110	$98,450
9	42" RCP [h]	1400	LF	$140	$196,000
10	48" RCP [h]	890	LF	$170	$151,300
11	Junction Boxes [d]	13	EA	$2,500	$32,500
12	Surface Restoration - 3" Asphalt [e]	3,185	LF	$32	$101,920
13	Road Base - 10"	3,185	LF	$19	$60,515
14	Dewatering [f]	1	LS	$5,000	$5,000

Construction Subtotal ($2016)	**$1,065,623**
Planning Level Construction Contingency (30%)	$320,000
Planning Level Construction Cost ($2016) [g]	**$1,385,623**

[a] Estimated relocation for water main, water service, sewer service, gas and phone line relocation
[b] Assumes 4 feet of cover, with material import.
[c] Quantity assumes 6" rock depth over width of trench for half of the replacement length
[d] Assumes one junction box located every 400 feet
[e] Assumes full asphalt surface restoration required
[f] Dewatering cost is provided as a placeholder cost and should be re-evaluated during pre-design
[g] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.
[h] Assumes use of existing alignment

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 8 - Stewart Avenue Basin**

DATE: May, 2016

PROJECT DESCRIPTION:
Enlarge detention pond south of North 40 parking lot

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$30,000	$30,000
2	Site Work (3%)	1	LS	$5,000	$5,000
3	Quality Control (1%)	1	LS	$2,000	$2,000
4	Excavation	10,800	CY	$15	$162,000
5	Demolition Existing Structure	1	LS	$8,000	$8,000
6	Outlet Structure	1	LS	$17,000	$17,000

Construction Subtotal ($2016)	**$224,000**
Planning Level Construction Contingency (30%)	$67,000
Planning Level Construction Cost ($2016) [a]	**$291,000**

[a] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 9 - Cable One Basin**

DATE: May, 2016

PROJECT DESCRIPTION:
Construct new detention pond

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$5,000	$5,000
2	Site Work (3%)	1	LS	$2,500	$2,500
3	Quality Control (1%)	1	LS	$1,000	$1,000
4	Excavation	2,000	CY	$15	$30,000
5	Demolition Existing Structure	1	LS	$2,000	$2,000
6	Outlet Structure	1	LS	$15,000	$15,000

Construction Subtotal ($2016)	**$55,500**
Planning Level Construction Contingency (30%)	$17,000
Planning Level Construction Cost ($2016) [a]	**$72,500**

[a] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 10 - Toyota Dealership Basin**

DATE: May, 2016

PROJECT DESCRIPTION:
Construct new detention basin

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$5,000	$5,000
2	Site Work (3%)	1	LS	$2,500	$2,500
3	Quality Control (1%)	1	LS	$1,000	$1,000
4	Excavation	2,000	CY	$15	$30,000
5	Demolition Existing Structure	1	LS	$2,000	$2,000
6	Outlet Structure	1	LS	$10,000	$10,000

Construction Subtotal ($2016)	**$50,500**
Planning Level Construction Contingency (30%)	$15,000
Planning Level Construction Cost ($2016) [a]	**$65,500**

[a] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 11 - Thain Grade - East Basin**

DATE: May, 2016

PROJECT DESCRIPTION:
Construct new detention basin

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$10,000	$10,000
2	Site Work (3%)	1	LS	$2,500	$2,500
3	Quality Control (1%)	1	LS	$1,000	$1,000
4	Excavation	3,000	CY	$15	$45,000
5	Demolition Existing Structure	1	LS	$2,000	$2,000
6	Outlet Structure	1	LS	$12,000	$12,000

Construction Subtotal ($2016)	**$72,500**
Planning Level Construction Contingency (30%)	$22,000
Planning Level Construction Cost ($2016) [a]	**$94,500**

[a] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

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ENGINEER'S OPINION OF PROBABLE COST

PROJECT: **Project 12 - Thain Grade - West Basin**

DATE: May, 2016

PROJECT DESCRIPTION:
Construct new detention basin

CLIENT:
City of Lewiston

J-U-B PROJ. NO.: 21-14-007

ITEM NO.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST ($2016)
1	Mobilization (15%)	1	LS	$10,000	$10,000
2	Site Work (3%)	1	LS	$2,500	$2,500
3	Quality Control (1%)	1	LS	$1,000	$1,000
4	Excavation	3,500	CY	$15	$52,500
5	Demolition Existing Structure	1	LS	$2,000	$2,000
6	Outlet Structure	1	LS	$20,000	$20,000

Construction Subtotal ($2016)	**$88,000**
Planning Level Construction Contingency (30%)	$26,000
Planning Level Construction Cost ($2016) [a]	**$114,000**

[a] Planning Level Construction Cost does not include survey, design engineering, construction management or legal and administrative fees.

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