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Memorandum

Date: 7 January 2013

To: John Cushing, Cascade Corporation

Copies to: Charlie Andrews, SSPA

From: Joey Hickey, Cindy Bartlett, Brent Miller

Subject: TGA Remedy: Shepard Springs Realignment Project Completion
Geosyntec Project: PNG0564G

This technical memorandum has been prepared to document the completion of the Shepard Springs discharge realignment project. The purpose of the project was to reroute the Shepard Springs discharge from the TSA Central Treatment System (CTS) directly into the City of Gresham (City) storm drain via a manhole located in the northwestern portion of the Site. In August 2013, Geosyntec submitted the design drawings to the City for review. The City approved the proposed design on 11 September 2013 and issued Permit #13-1718.

On 1 October 2013, Geosyntec met with Cascade Corporation (Cascade) to discuss the project design, logistics, and status of the project. During the project meeting, Cascade authorized Geosyntec to proceed with the realignment project.

Geosyntec contracted with Anderson Environmental Contracting (AEC) of Kelso, Washington, to complete the project. The construction activities began on 14 October 2013 and were completed on 24 October 2013. During the construction activities, the City inspected the project and approved all field modifications (described below). In general, the project was completed in general accordance with the proposed drawings. A number of design modifications were implemented during the field work, with these changes summarized below:

- During the placement of the piping runs from the existing square vault (SV) and the new manhole (NMH-1), one poplar tree was removed to allow access for the excavation equipment. The felled tree was staged on Site near the CTS.
- The new 6-inch drain pipe from SV to NMH-1 was changed to Schedule 40 PVC from C900 pipe.
- The original drawings called for NMH-1 to be 48-inches in diameter. Due to product availability, a 60-inch diameter manhole was used.

- The proposed location of NMH-1 was moved 9-feet north. The movement of NMH-1 was necessary to provide a straight piping run from NMH-1 to existing manhole "A". The movement of the manhole allowed the new piping run to avoid MW-46.
- The original drawings called from the use of C900 pipe from NMH-1 to existing manhole "A". After the approval of the design, the City and AEC noted that the use of SDR 3034 (storm drain line) was acceptable and more cost effective. As such, the 6-inch line from NMH-1 to existing manhole "A" was constructed with SDR 3024 pipe.
- The original drawings noted the use of a minimum of 12-inches of crushed rock to cover the piping from SV to MNH-1. After approval of the plans, Geosyntec realized that a design specification (size, presence of fines, etc.) had not been prepared for the crushed rock. The concern was that if standard ¾-minus rock was used, drainage would be limited due to compaction issues. It was determined that the use of pea-gravel would be used to backfill the 6-inch drain line and the two 6-inch perforated collection pipes.
- During the planning phase of this project, it was assumed that up to 212 cubic yards (approximately 300 tons) of soil would be excavated and transported to Hillsboro Landfill for disposal. In total, 114 tons of soil was removed and disposed.

As previously noted, the City inspector approved all the changes detailed above during field construction activities. The City inspector and the City permit do not require submittal of "as-built" drawings or other final documents, and closure of the permit was conducted via the City's online permit portal. Upon completion of the project, Geosyntec prepared a set of "as-built" drawings and tabulated site photographs to document the completed construction. The drawings and photographs are attached to this memorandum.

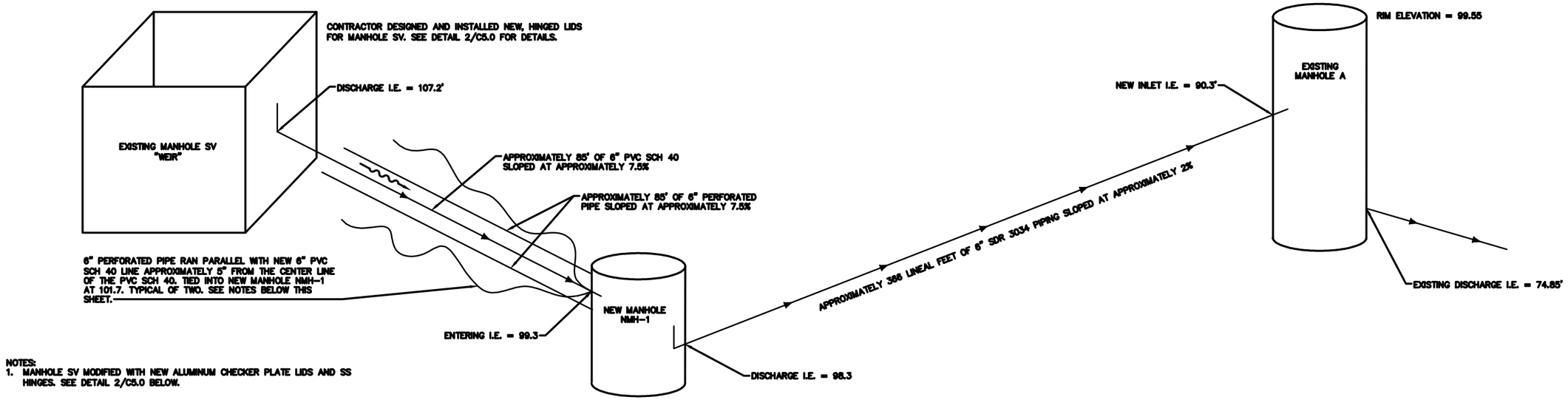
* * * * *

Attachments:
As-Built Drawings
Site Photographs

ATTACHMENTS

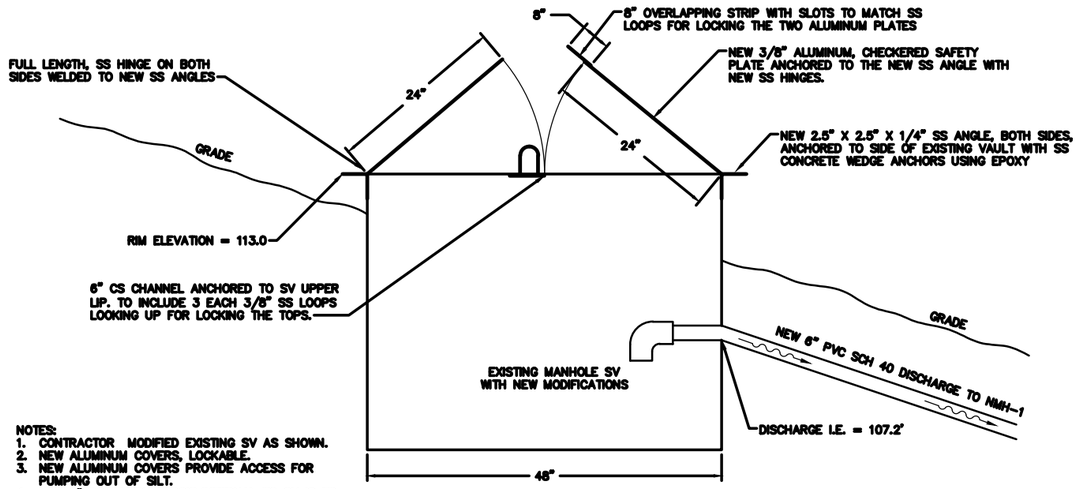
As-Built Drawings

Site Photographs



NOTES:
1. MANHOLE SV MODIFIED WITH NEW ALUMINUM CHECKER PLATE LIDS AND SS HINGES. SEE DETAIL 2/C5.0 BELOW.

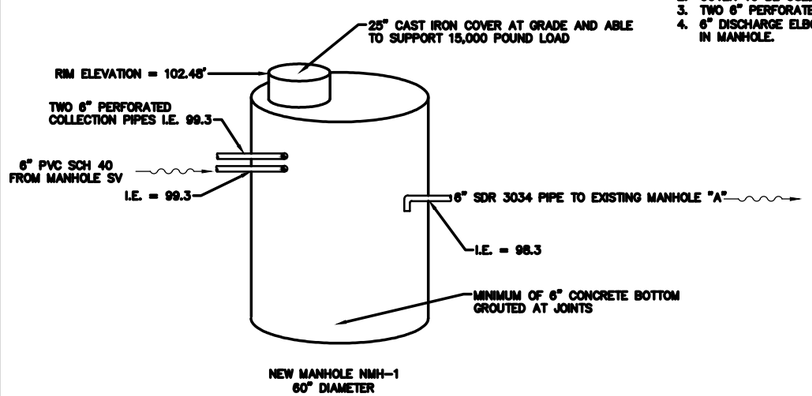
1 / C5.0 DETAIL
NEW WORK SCHEMATIC
SCALE: NTS



NOTES:
1. CONTRACTOR MODIFIED EXISTING SV AS SHOWN.
2. NEW ALUMINUM COVERS, LOCKABLE.
3. NEW ALUMINUM COVERS PROVIDE ACCESS FOR PUMPING OUT OF SILT.
4. NEW 6" DOWNTURN ELBOW INTERNAL TO SV IS TO PREVENT FLOATABLES FROM ENTERING DISCHARGE LINE TO NMH-1.

2 / C5.0 DETAIL
EXISTING COLLECTION SQUARE VAULT (SV)
SCALE: NTS

NOTES:
1. 6" DOWNTURN DISCHARGE ELBOW FOR ELIMINATION OF POTENTIAL FLOATING DEBRIS.
2. COVER TO BE USED TO PUMP OUT ACCUMULATED SILT.
3. TWO 6" PERFORATED PIPE COLLECTION PIPES TO ENTER MH AT 99.3.
4. 6" DISCHARGE ELBOW LOCATED AT 98.3 WILL SET THE WATER LEVEL IN MANHOLE.



3 / C5.0 DETAIL
MANHOLE NMH-1
SCALE: NTS

DRAWING NOTES:
1. CONTRACTOR REMOVED ALL ORGANIC BIOMASS MATERIALS AFFECTED BETWEEN MANHOLES SV AND NMH-1.
2. CONTRACTOR EXCAVATED APPROXIMATELY 34" DEEP BETWEEN COLLECTION SQUARE SV AND NMH-1 FOR INSTALLATION OF NEW 6" PVC SCH 40 AND 6" PERFORATED PIPES.

SHEPARD SPRING DRAINAGE PROJECT
NEW WORK SCHEMATIC ELEVATIONS FOR
NMH-1 AND SV - "AS BUILT"
TGA REMEDY
EAST MULTNOMAH COUNTY

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FIGURE: C5.0

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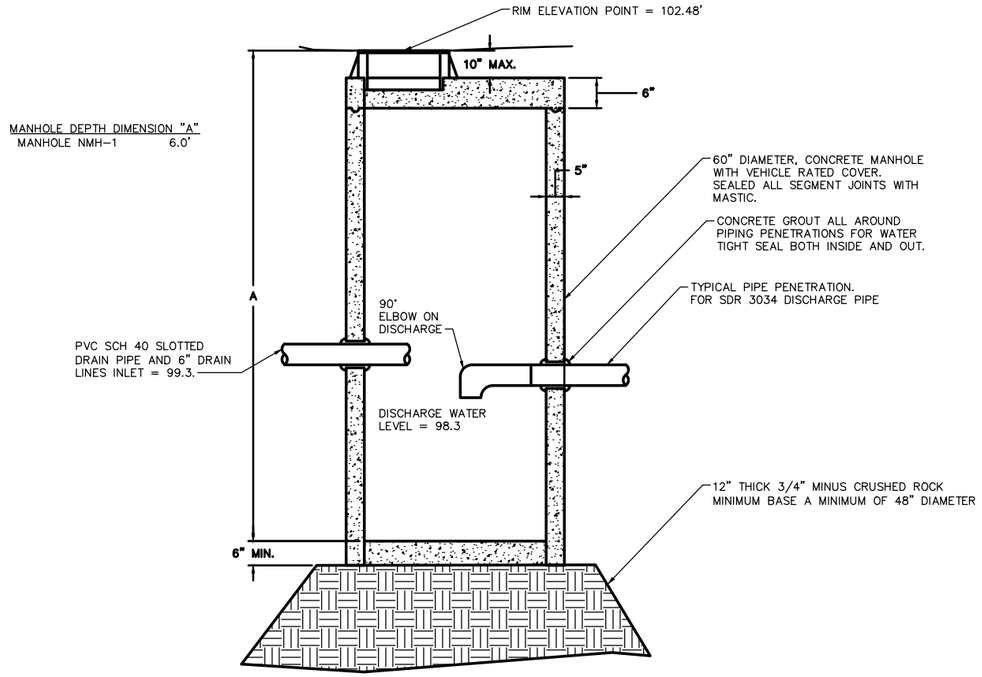
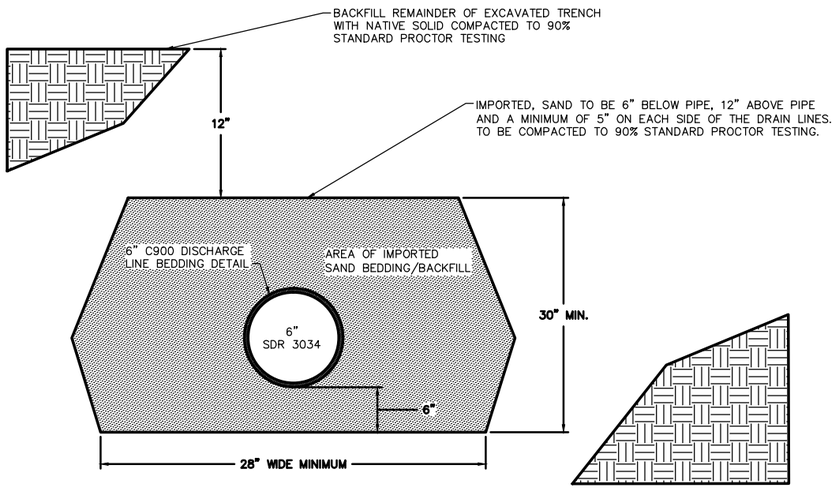
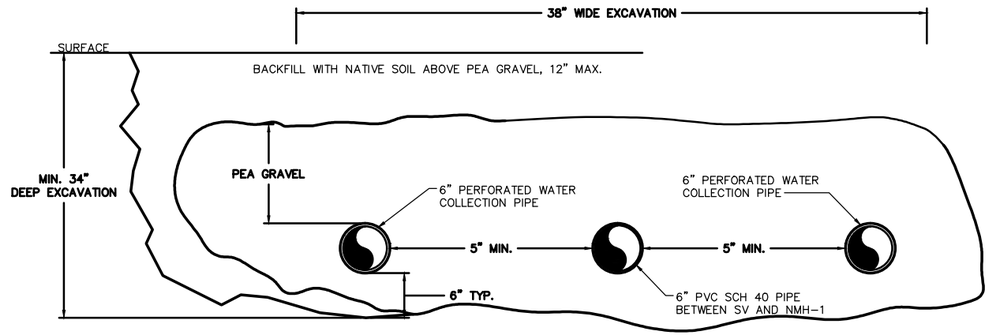


1 C4.0 DETAIL
NMH-1 ELEVATION AND BEDDING
SCALE: NTS



2 C4.0 DETAIL
SDR 3034 BEDDING ELEVATION BETWEEN NMH-1 AND EXISTING MANHOLE A
SCALE: NTS



NOTES:
1. EXCAVATED A MINIMUM OF 38" WIDE BY 30" DEEP FOR PIPING.
2. BEDDED ALL PIPES WITH 6" OF PEA GRAVEL.
3. COVERED PERFORATED PIPE AND CONVEYANCE PIPE WITH AT LEAST 12" ø PEA GRAVEL
4. BACKFILLED WITH NATIVE SOIL TO ORIGINAL GRADE.

3 C4.0 DETAIL
PVC SCH 40 AND PERFORATED COLLECTION PIPING
SCALE: NTS

SHEPARD SPRING DRAINAGE PROJECT
DETAILS
"AS BUILT"
TGA REMEDY
EAST MULTNOMAH COUNTY

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FIGURE: C4.0

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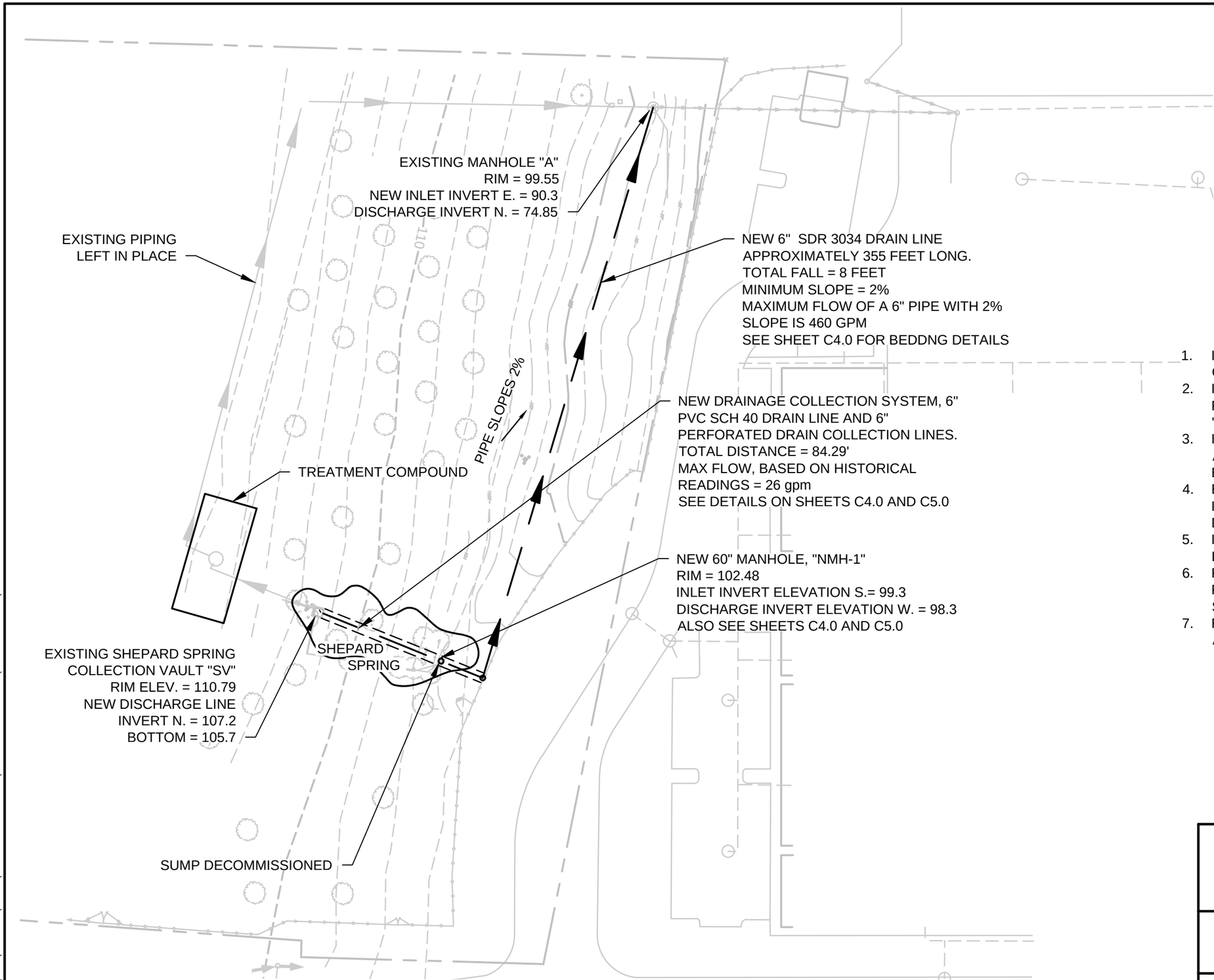

Legend

- CHAN LINK FENCE
- TREE
- GATE
- NEW DRAINAGE LINES
- FORMER DRAINAGE LINES

SCOPE OF WORK COMPLETED

1. INSTALLED 60" MANHOLE, "NMH-1", WITH CAST IRON COVER SUITABLE FOR VEHICLE TRAFFIC.
2. INSTALLED 6", PVC SCH 40 GRAVITY DRAIN LINE FROM EXISTING VAULT "SV" TO NEW MANHOLE, "NMH-1".
3. INSTALLED 6", SDR 3034 GRAVITY DRAIN LINE WITH A TYPICAL 2% SLOPE FROM MANHOLE "NMH-1" TO EXISTING MANHOLE "A". SEE SHEET C3.0
4. EXCAVATED A MINIMUM OF 28" WIDE TRENCH; INSTALLED NEW SDR 3034 LINES AND BED PER DETAIL ON C4.0
5. INSTALLED 6" PERFORATED DRAIN COLLECTION LINES AS SHOWN ON SHEETS C4.0 AND C5.0.
6. REMOVED EXISTING ABOVE GROUND INSULATED, PVC PIPE SUMP TO EXISTING SQUARE MANHOLE, SV.
7. REMOVED EXISTING PVC PIPE WITH SUMP PUMP AND ELECTRICAL POWER.

N

0 60'

SCALE IN FEET

SHEPARD SPRING DRAINAGE PROJECT
SYSTEM MODIFICATIONS
"AS BUILT"
TSA REMEDY
EAST MULTNOMAH COUNTY

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FIGURE: C3.0

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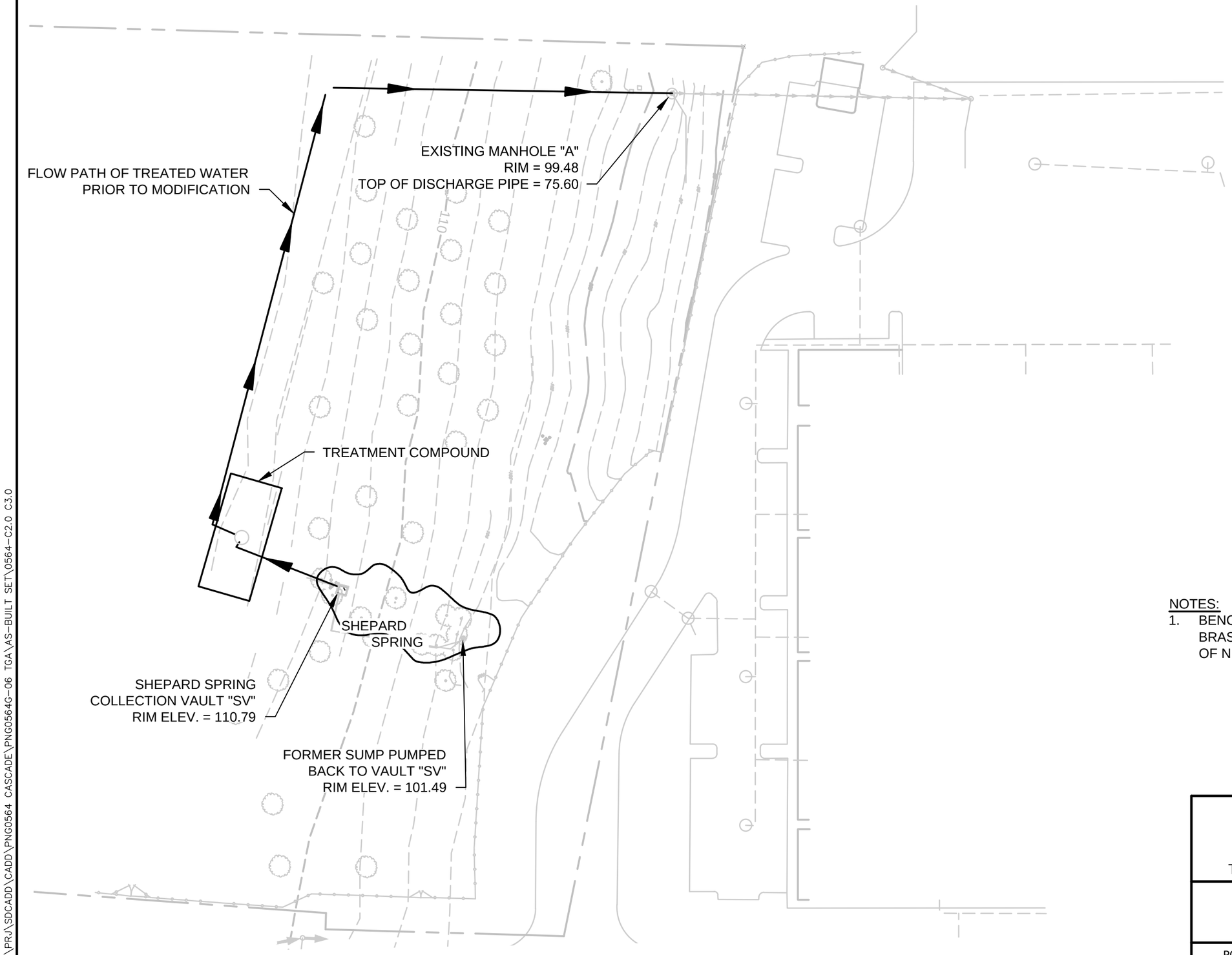

Legend

- CHAN LINK FENCE
- TREE
- GATE

NOTES:

1. BENCHMARK: GEODETIC SURVEY STATION NO. 210. BRASS DISC IN MONUMENT BOX AT INTERSECTION OF NE SANDY AND NE 201ST. ELEVATION 134.80.

N

0 60'

SCALE IN FEET

SHEPARD SPRING DRAINAGE PROJECT
TREATMENT FLOW DIAGRAM
PRIOR TO MODIFICATIONS
STORMWATER DISCHARGE LINES
TSA REMEDY - EAST MULTNOMAH COUNTY

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FIGURE: C2.0

P:\PRJ\SDCADD\CADD\PNG0564 CASCADE\PNG0564G-06 TGA\AS-BUILT SET\0564-C2.0 C3.0

FAR NORTH GROUNDWATER TREATMENT SYSTEM (2007)

EW-17 (2008)

FAIRVIEW LAKE

Columbia Slough

NORTH GROUNDWATER TREATMENT SYSTEM (2008)

RPW-2 (2008)

Storm Drain Creek

EW-9

EW-19

EW-6 AND EW-20 (2006)

EW-7

EW-7,-9,-19 (2008)

EW-22 (2010)

EW-23

EW-8

EW-3

EW-13

EW-4

EW-5

EW-12

EW-1

EW-14

EW-2

EW-18

EW-16

EW-15

EW-11

EW-21/PMX-417

EAST GROUNDWATER TREATMENT SYSTEM (2005)

EW-10/PMX-410

CENTRAL GROUNDWATER TREATMENT SYSTEM

SEE SHEET C3.0 AND C4.0 FOR DETAILS ON NEW SHEPARD SPRINGS DRAINAGE

WEST GROUNDWATER TREATMENT SYSTEM

CASCADE CORPORATION

EW-21 GROUNDWATER TREATMENT SYSTEM (2007)

NE 205th AVE

NE 207th AVE

NE 201st AVE

Osbourn Creek

NE SANDY BLVD

INTERSTATE 84

NE SAN RAFAEL ST.

N

0 600'

SCALE IN FEET

Legend

- EXTRACTED GROUNDWATER CONVEYANCE LINE
- TREATED GROUNDWATER DISCHARGE LINE
- LOWER TSA EXTRACTION WELLS. OPERATING EXTRACTION WELLS SHOWN IN BLUE
- SGA EXTRACTION WELL
- NON-OPERATING EXTRACTION WELL
- DECOMMISSIONED WELLS AND TREATMENT SYSTEMS WITH DECOMMISSION YEAR

SHEPARD SPRING DRAINAGE PROJECT

TSA REMEDIATION SYSTEM LAYOUT
TGA REMEDY
EAST MULTNOMAH COUNTY

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FIGURE: C1.0

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GEOSYNTEC CONSULTANTS
Photographic Record

Client: Cascade Corporation Project Number: PNG0564G

Subject Site: Shepard Springs Realignment

Photograph 1	
Comments: View of new manhole (NMH-1) with inlet and outlet pipes.	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Cascade Corporation Project Number: PNG0564G

Subject Site: Shepard Springs Realignment

Photograph 2	
Comments: View of new 6-inch SDR 3034 pipe from NMH-1 to Existing Manhole "A".	

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Cascade Corporation Project Number: PNG0564G

Subject Site: Shepard Springs Realignment

Photograph 3

Comments: View of new 6-inch SDR 3034 pipe with backfill.

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Cascade Corporation Project Number: PNG0564G

Subject Site: Shepard Springs Realignment

Photograph 4

Comments: View from NMH-1 south toward the existing square vault.

GEOSYNTEC CONSULTANTS
Photographic Record

Client: Cascade Corporation Project Number: PNG0564G

Subject Site: Shepard Springs Realignment

Photograph 5

Comments: View from NMH-1 west towards existing manhole "A".